

## Construction Environmental Management Plan (CEMP) Seawater Supply Pipeline: Stage 2



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## Document Control Sheet

<b>Title</b>	Construction Environmental Management Plan (CEMP): Seawater Supply Pipeline – Stage 2
<b>Current Version</b>	B
<b>Current Version Date</b>	This construction environmental management plan has been prepared for approval with the relevant authority and for ultimate use by staff and contractors on-site. It details the measures to be undertaken in the management of potential environmental impacts during the construction of stage 2 of the ABLP Seawater Supply Pipeline connecting the ABLP facility at 9484 Tweed Valley Way, Chinderah, to two intake structures offshore of Kingscliff Beach, Kingscliff.
<b>Author</b>	Australian Bay Lobster Producers Limited

## Amendments

Version Number	Version Date	Authorised by	Amendment Details
A	16 December 2021	ABLP	Original Publication
B	21 January 2022	ABLP	DPE Revisions

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# Table of Contents

## Contents

Limitation of Use.....	3
Table of Contents .....	4
1 Introduction.....	6
1.1 Purpose and Scope.....	6
1.2 Environmental Policy.....	6
1.2.1 CEMP Objectives.....	6
1.3 Overview of ABLP Development .....	7
1.3.1 Seawater Supply Pipeline .....	7
1.4 Construction Activities & Timeline .....	8
2 CEMP MANAGEMENT.....	11
2.1 General .....	11
2.2 Planning .....	11
2.2.1 Environmental Aspects and Impacts.....	11
2.2.2 Legal and Other Requirements.....	11
2.3 Implementation.....	11
2.3.1 Roles and Responsibilities .....	11
2.3.2 Competence, Training and Awareness .....	11
2.4 Communication.....	11
2.4.1 Public Relations.....	11
2.4.2 Site Meetings .....	12
2.4.3 Board Meetings.....	12
2.4.4 Internal Reports – Environmental / CEMP compliance .....	12
2.4.6 Recording of and reacting to complaints .....	12
2.4.7 Sub-contractor relations.....	13
2.5 Documentation .....	13
3 OPERATIONAL CONTROLS.....	14
3.1 Environmental Management Plans .....	14
3.2 Emergency Response.....	14
3.3 Monitoring and Auditing .....	14
3.4 Non-compliance .....	14

4	ATTACHMENTS .....	15
	A - Administration .....	15
	B – Environmental Management.....	15
	C – Forms.....	15
	D – Drawings and Construction Site Layouts.....	15
	SCHEDULE 1: Pipeline Drillers Group Construction Environmental Management Plan .....	16

# 1 Introduction

## 1.1 Purpose and Scope

This Construction Environmental Management Plan (**CEMP**) documents Australian Bay Lobster Producers (**ABLP**) environmental management policies and procedures for the construction of stage 2 of its Seawater Supply Pipeline (**SSP**). It serves as a commitment to mitigating environmental impacts during the project through compliance with relevant state and local laws, regulations and ABLP's Development Approval (DA282-11-2004-i).

This CEMP is intended to be an effective and practical guide to the environmental risks associated with the construction of the SSP. In doing so it identifies all activities with the potential to cause significant environmental incidents and details the management procedures to minimise the occurrence or scale of any impact from these activities. Accordingly, it will serve as a guide to environmental risk management for contractors and personnel involved with the project. Where contractors or sub-contractors are to undertake activities on behalf of ABLP they will be required to adhere to the documented procedures detailed in this plan. Compliance with these procedures will ensure all construction activities related to the project are effectively managed.

## 1.2 Environmental Policy

ABLP has observed the burden our growing populations are placing on wild caught fisheries which, without support from sustainable aquaculture practices, will be severely restricted in years to come. In response to this threat ABLP has set out to become the benchmark for sustainable aquaculture involving environmentally safe practices that do not compromise natural resources. This is the basis on which the company has dedicated more than 20 years of focused research and development towards developing a world first methodology for cultivating *thenus spp.* in a recirculating aquaculture system (**RAS**). ABLP believes that by scaling this methodology and commercialising the biotechnology it has developed it can play a role in alleviating the increasing burden our population is placing on Australian fisheries. The final step in executing this strategy is the construction of the company's SSP which, once connected will supply the seawater required to scale ABLP's RAS.

In line with its overarching environmental philosophy ABLP is focused on ensuring that the supporting construction and operational activities of its business are undertaken in an environmentally conscious manner. This includes the construction of its SSP and is the basis on which this CEMP has been prepared.

### 1.2.1 CEMP Objectives

This CEMP is intended to ensure compliance with the highest standard of environmental controls in the construction of the SSP. To this end the following objectives will be pursued throughout the course of the project works:

- Compliance with relevant legislation, regulations, approvals and standards in the construction and operation of the SSP.
- Continual improvement of environmental management practices through training, management audits, research and development activities, and consultation with the local community.
- Integration of environmental considerations into planning and construction activities.
- Mitigation of pollution and management of potential environmental impacts from construction activities.
- Promotion of efficient use, reuse and recycling of resources and implement best waste management practices.
- Education of employees and contractors to support our environmental goals and objectives.

- Monitoring and reporting on environmental performance to relevant external bodies.

### 1.3 Overview of ABLP Development

ABLP is underway with developing an aquaculture precinct on its 45 hectare site at 9484 Tweed Valley Way, Chinderah. The precinct will be developed over three stages, with stage one to be completed with the construction of the SSP. The first facility which forms part of the wider precinct (Stage 1) has been constructed, consisting of a 1.6 hectare horticultural type structure (i.e. modified greenhouse) enclosing the proprietary *thenus spp.* RAS technology developed by ABLP. The SSP will supply seawater for the operations in this existing facility, although will have capacity to service the whole 45 hectare precinct once it is constructed. A concept design depicting the current ABLP facility and future stages 2 and 3 is below at Figure 1.1.

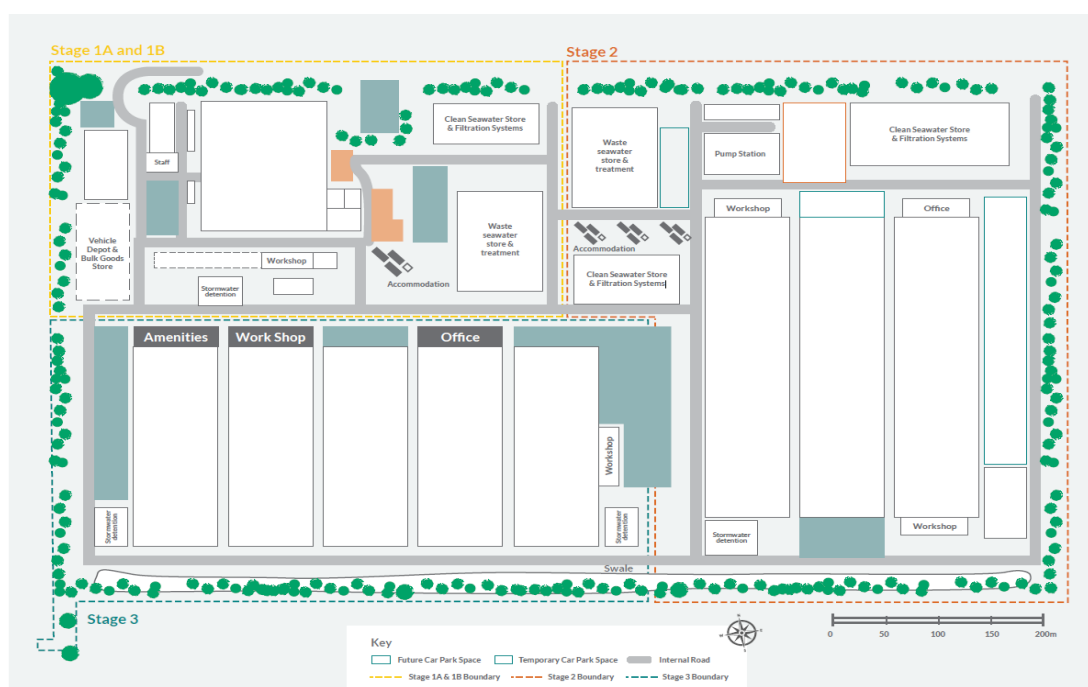


Figure 1.1: ABLP Aquaculture Precinct

#### 1.3.1 Seawater Supply Pipeline

*Thenus spp.* or, Bay Lobster (commonly known as 'Moreton Bay Buy'), is a marine species of lobster which is highly dependent on clean seawater in order to grow. This input is critical in the animal's development and as such is a vital component of ABLP's operations. Currently, ABLP sources seawater for use in its existing operations from the Gold Coast Desalination Plant by way of road haulage. Unfortunately, this method of sourcing seawater is inadequate in terms of quality and quantity and it is therefore critical to the company's existing operations and future development that the SSP is constructed. Once construction it will provide a secure and reliable source of clean seawater for ABLP's operations.

The SSP will consist of a Delivery Rising Main (**DRM**) extending underground from ABLP's site to a pump well located in Jack Bayliss Park, Kingscliff. This pump well will receive seawater from Wommin Bay via two Gravity Intake Lines (**GILs**) extending from the well to two intake structures on the seabed floor approximately 1.2km eastward of Kingscliff Beach. The intake structures will serve as a collection point for seawater which will be gravity fed back to the pump well in Jack Bayliss Park. From the pump well the water will be pumped back to the ABLP site via the DRM using submersible pumps mounted to the floor of the pump well. The total length of the pipeline is 6.7km, of which the onshore DRM comprises 5.5km and the GILs 1.2km.

## 1.4 Construction Activities & Timeline

The SSP is being constructed over two stages:

- Stage 1: ABLP Site to Tweed Coast Road crossing (Lot 3 DP 1111554)
- Stage 2: Elrond Drive stormwater drain to Kingscliff Beach.

Stage 2 of the SSP is approximately 3.1km in length and extends through public road reserve and private property from lot 3 DP 1111554 to the intake structures 1.2km eastward of Kingscliff Beach. The DRM will be constructed of a high-density polyethylene (**HDPE**) DN560 PN16 pipe installed using HDD / trenchless methods in combination with traditional trenched construction for the tie-in connections between each HDD section. The GILs will be constructed in the same manner although will consist of a DN500 PN20 pipe. The GILs will connect two independent intake structures to the pump well in Jack Bayliss Park. The pump well will be constructed as a caisson which will be internally excavated to sink the well to its intended depth. Detailed drawings for the DRM along with the drawings for the pump well and intake structures are provided in Attachment D1 - Detailed Design.



Figure 1.1: ABLP Seawater Supply Pipeline Alignment

Construction of the first stage of the SSP is currently underway having commenced in October 2021. As for Stage 2, this is scheduled to commence in February/March with works occurring over a 9 month period to October/November 2022. Over the course of this timeframe the construction activities for the SPP will occur at six onshore construction locations between Tweed Coast Road and Kingscliff Beach. These locations are shown in Figure 1.2 below.



Figure 1.2: Stage Two Construction Locations - 1 to 6

Three main types of construction works will be performed at each of the locations depicted in the Figure 1.2. These works include, the drilling activities associated with the ‘entry’ side of a horizontal directional drilled (**HDD**) line, the drilling activities associated with the ‘exit’ side of a HDD line and the trenched tie-in connection between two drills. Location 2 will also be the site of activities associated with the construction of the pump well caisson. In addition to the onshore locations a small marine team will occupy an area in Wommin Bay over a 10-day period in May/June 2022. This marine team will assist in the installation of the intake pipes which will connect to the pump well. The site layouts for each of the construction locations is detailed at Attachment D2 and the Construction Manager’s CEMP at Schedule 1.

An approximate timeline for the Stage 2 works with the estimated period of occupation for each of the construction locations in Figure 1.2 is detailed in Table 1.1 below. There is potential to shorten this timeline by operating multiple teams concurrently, however this will be dependent on labour availability and weather conditions.

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct/Nov
<b>Trenchless Construction</b>	L1 – L2				L2 – L4	L3 – L5	L5 – L6		
<b>Other Construction</b>				L2: Construction pump well			L2 – L4	L5 – L6	
<b>Marine Installation</b>				Beach & Offshore					
<b>Testing &amp; Remediation</b>									L1 – L6

Table 1.1: Construction Calendar

\*L = Location

In addition to the construction locations referred to above there will be areas in Jack Bayliss Park which will be occupied throughout the course of the Stage 2 works. These areas, marked A to E in Figure 1.3 below, will be temporarily inaccessible for certain times over the course of the works.

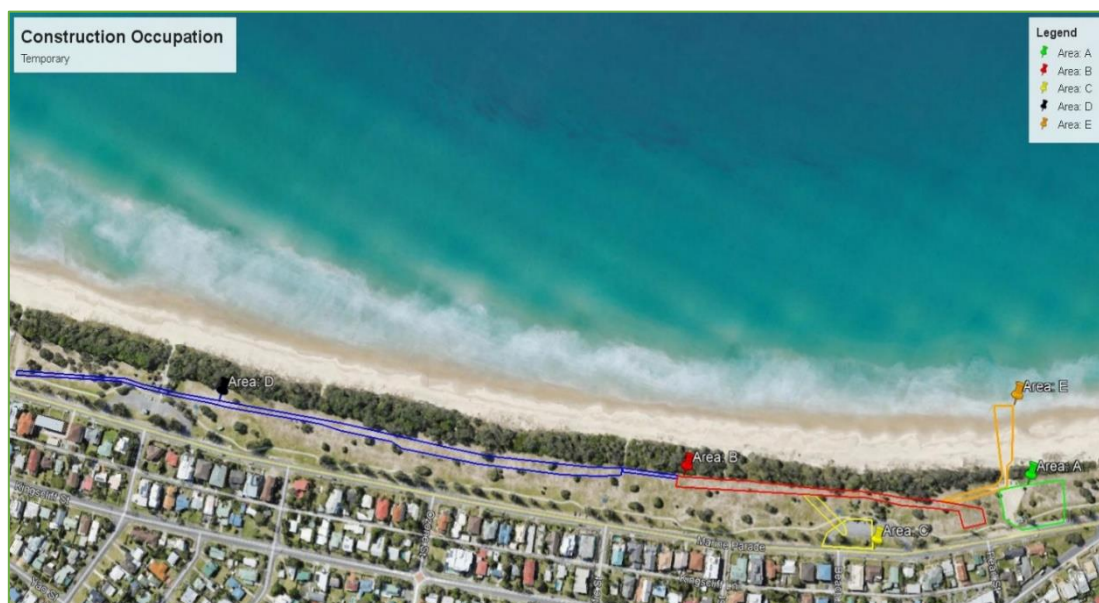


Figure 1.3: Temporary closures in Jack Bayliss Park

Areas A and C represent construction locations 2 and 3 where trenchless construction machinery and excavators will be positioned to construct the pipeline and pump well. Otherwise areas B, D and E will be used for short term storage of pipe lengths before it is installed.

The carpark opposite the Kingscliff Police Station (Area A) will not be accessible for the duration of the works, whereas the carpark opposite Beach Street (Area C) will be partly accessible. As for the footpaths intersecting the areas outlined in Figure 1.3, temporary footpaths will be established to ensure beach and park access is maintained throughout the course of the works.

The estimated closure periods for the areas in Jack Bayliss Park are shown in the following table.

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct/ Nov
<b>Area A</b> – Carpark and area opposite Kingscliff Police Station									
<b>Area B</b> – Area along beach dune between Pearl & Zephyr Streets									
<b>Area C</b> – Carpark opposite Beach Street									
<b>Area D</b> – Area along beach dune between Zephyr Street and Tweed Holiday Parks									
<b>Area E</b> – Area of beach eastward of Kingscliff Police Station									

Table 1.2: Calendar of temporary closures in Jack Bayliss Park

## **2 CEMP MANAGEMENT**

### **2.1 General**

The construction of the SSP will adhere to the requirements as outlined in this document and the Construction Manager's CEMP at Schedule 1. ABLP management will drive the implementation and management of the CEMP and all contractors will be briefed on their requirements and monitored throughout the project to ensure compliance.

### **2.2 Planning**

#### ***2.2.1 Environmental Aspects and Impacts***

The attachments to this CEMP detail the methodology utilised for identifying and assessing the various environmental impacts related to the SPP's processes, services, activities and property, whether direct or indirect (eg: contractors, sub-contractors).

Environmental risks will be assessed at various stages of the project in order to identify aspects or potential impacts of particular significance during construction.

#### ***2.2.2 Legal and Other Requirements***

The Environmental Manager / Representative is responsible for identifying and maintaining a register of applicable legislation, regulation and other policy documents relevant to the project. It is the responsibility of the Environmental Manager / Representative to ensure compliance with the legislative requirements of the register.

### **2.3 Implementation**

#### ***2.3.1 Roles and Responsibilities***

The relevant roles and responsibilities and a description of each of these roles are shown as a flowchart in Attachment A1 – Roles and Responsibilities.

#### ***2.3.2 Competence, Training and Awareness***

ABLP will ensure all employees and contractors are appropriately trained and/or qualified to carry out their duties. Site induction will be carried out to ensure all new employees and contractors are appropriately briefed on the relevant aspects of this CEMP. Employees, particularly those whose roles are defined as part of this CEMP, shall be appropriately experienced and qualified for their roles.

### **2.4 Communication**

#### ***2.4.1 Public Relations***

Consultation between ABLP and the public is important for maintaining a good relationship with the community. In line with this view ABLP is committed to being a part of the community and consulting with the public to gain advice and perspectives on how the project should be executed.

To inform the public of the SSP works and the corresponding impacts these may have to the community, ABLP will circulate a newsletter to all residents located within 250m of a construction location. The newsletter will include the details of:

- a) The construction activities, including the project timeline and temporary occupation of public areas;
- b) A general summary of the potential impacts to local services or public infrastructure; and
- c) The contact information referenced in section 2.4.6 for complaints and enquiries.

A mariner's notice will also be issued closer to the date of the marine works to provide local mariners with details of these works.

#### **2.4.2 Site Meetings**

Regular site meetings will be held to maintain avenues of communication between ABLP, the principal contractor and subcontractors. Attachment A5 – Contractor Management sets out arrangements to ensure this is undertaken.

#### **2.4.3 Board Meetings**

ABLP will undertake regular management level meetings as part of its monthly Board meetings. These meetings will facilitate open communication between senior personnel, management and the Board as part of an overarching management review process. As part of this process the environmental objectives and targets, project progression and status of approvals will be assessed. In addition to this management will review audit reports, non-compliance notifications and project timetables as appropriate.

#### **2.4.4 Internal Reports – Environmental / CEMP compliance**

The results of internal audits, monitoring reports and any non-compliance will be directed to the Site Manager / Environmental Representative as they become available. The Site Manager / Environmental Representative should be advised as soon as practicable of any monitoring results or other activity that does not comply with any of the conditions of ABLP's development approval or this CEMP. Refer to Section 3.4 for details on responding to non-compliance events.

#### **2.4.6 Recording of and reacting to complaints**

All complaints and enquiries should be directed to the Environmental Manager / Representative. In consultation with the Site Manager the Environmental Manager / Representative will assess the validity and seriousness of the complaint or inquiry and respond as appropriate. Any complaints will be recorded on Form C1 - Incidents / Complaints form in Attachment C.

Complaints or inquiries can also be submitted by those with internet access via email to [ssp@ablp.com.au](mailto:ssp@ablp.com.au). Otherwise, those without internet access can lodge complaints with head office by contacting 0402 369 817. Alternatively written complaints or inquiries can be mailed to ABLP at the following address:

- Australian Bay Lobster Producers  
9484 Tweed Valley Way  
CHINDERAH NSW 2487

The phone contact, postal address and website details for complaints will be advertised on the company website and circulated in the local letterbox drop prior to the commencement of the stage two works. This contact information will also be displayed on a sign near the entrance of each construction site in a position that is clearly visible to the public.

Complaints will be logged with the following information:

- a) the date and time, where relevant, of the complaint;
- b) the means by which the complaint was made (telephone, mail or email);
- c) any personal details of the complainant that were provided, or if no details were provided, a note to that effect;
- d) the nature of the complaint;
- e) any action(s) taken by ABLP in relation to the complaint, including any follow-up contact with the complainant; and
- f) if no action was taken by ABLP in relation to the complaint, the reason(s) why no action was taken.

The complaint will be forwarded to either the environmental representative or ABLP depending on the nature of the complaint. A response to a complaint during the working week will be actioned within 48 hours of receipt. A register of complaints and the respective responses will be maintained by ABLP and will be available for inspection by authorised authorities on request.

#### **2.4.7 Sub-contractor relations**

Subcontractors are required to confirm they have policies and procedures in place to allow them to conform to the relevant aspects of this CEMP. Attachment A5 – Contractor Management sets out arrangements to ensure this is undertaken.

#### **2.5 Documentation**

Document control is managed by the Environmental Manager / Representative. Only current documents shall be in use and all points of issue will be maintained by the Environmental Manager / Representative on an appropriate register. It is their responsibility to ensure that any updates are incorporated as required and any old issues are taken out of circulation.

Changes in documentation or legislative or regulatory requirements will be followed by a review of the possible impacts on the remainder of the document and changed where necessary. The scale of this review will be relative to the nature of the changes and it is the responsibility of the Environmental Manager / Representative to ensure the review is effective in maintaining a valid CEMP.

## **3 OPERATIONAL CONTROLS**

### **3.1 Environmental Management Plans**

Environmental Management Plans (**EMP**) have been developed for the management of identified significant environmental impacts and are maintained by the Environmental Manager / Representative as required.

### **3.2 Emergency Response**

Attachment B6 – Emergency and Incident Response has been developed to ensure effective management of incidents associated with the project that may occur.

### **3.3 Monitoring and Auditing**

Monitoring and auditing of performance to gauge compliance with, and the effectiveness of this CEMP and relevant legislation, policies and regulations is to be undertaken throughout the construction phase of the development.

Attachment A4 – Inspection, Monitoring and Auditing Schedule shows the monitoring to be performed as well as requirements for internal and external audits and management review of the sites, project and this CEMP. Part of this review process is to audit the application of and compliance with the monitoring and auditing schedule.

### **3.4 Non-compliance**

Non-compliance with any aspect of this CEMP, the project consent conditions and/or monitoring limits will require corrective action and reporting. The type and scale of corrective action and reporting will depend on the type and scale of the non-compliance and will be undertaken in accordance with Attachment B6 – Emergency and Incident Response.

## **4 ATTACHMENTS**

### **A - Administration**

- A1 – Roles & Responsibilities
- A2 – Environmental Aspects and Impacts Register
- A3 – Legislation, Planning and Approval Register
- A4 – Inspection, Monitoring and Auditing Schedule
- A5 – Contractor Management

### **B – Environmental Management**

- B1 – Erosion and Sediment Control Plan
- B2 – Acid Sulfate Soils Management Plan
- B3 – Noise Management Plan
- B4 – Waste Management Plan
- B5 – Traffic Management Plan
- B6 – Emergency and Incident Response
- B7 – Dewatering Management Plan

### **C – Forms**

- C1 – Incidents and Complaints, and Site Inspection Forms

### **D – Drawings and Construction Site Layouts**

- D1 – Drawings
- D2 – Construction Locations and Site Layouts

## **SCHEDULE 1:** Pipeline Drillers Group Construction Environmental Management Plan



SEAWATER SUPPLY PIPELINE | 047-CST-PLN-001  
Prepared for Australia Bay Lobster Producers



# CONSTRUCTION & ENVIRONMENTAL MANAGEMENT PLAN

047-CST-PLN-001



Revision	Issued for	Date	Author	Checked	Approved
A	Issued for Approval	08/12/2021	Colin Harris	Tom Dalton	John Whitbread

## TABLE OF CONTENTS

<b>1</b>	<b>DOCUMENT PURPOSE</b> .....	<b>5</b>
<b>2</b>	<b>PROJECT SCOPE</b> .....	<b>6</b>
<b>3</b>	<b>ABBREVIATIONS AND DEFINITIONS</b> .....	<b>7</b>
<b>4</b>	<b>REFERENCE</b> .....	<b>9</b>
4.1.	Relevant Standards .....	9
<b>5</b>	<b>ROLES AND RESPONSIBILITIES</b> .....	<b>11</b>
5.1.	HDD Project Manager .....	12
5.2.	HDD Engineer/Designer .....	12
5.3.	Steerer .....	12
5.4.	Mud Engineer .....	12
5.5.	HDD Superintendent .....	13
5.6.	Driller .....	13
5.7.	Leading Hand and Rig Hand .....	14
5.8.	Mud Hand .....	14
5.9.	Mechanic .....	15
5.11.	Site-Specific Induction .....	15
5.12.	Health Safety and Environment (HSEQ) Manager (ABLP) .....	15
<b>6</b>	<b>PLANT AND EQUIPMENT</b> .....	<b>17</b>
6.1.	HDD Equipment Allocation .....	17
<b>7</b>	<b>SITE ESTABLISHMENT</b> .....	<b>20</b>
7.2.	Site Survey Set Out .....	20
7.5.	Weed, Seed, and Pest Management .....	20
7.6.	Water Supply .....	20
7.7.	Entry Pit Excavations.....	21
7.8.	Rig Anchor.....	21
<b>8</b>	<b>CONSTRUCTION PLAN</b> .....	<b>22</b>
8.1.	HDD Equipment Setup .....	22
8.2.	Surface Casing Installation.....	22
8.3.	Pilot Hole - 12 1/4" Jetting - Blind.....	22
8.4.	Reaming - 32" - Blind.....	23
8.5.	Pilot Hole - 12 1/4" Jetting - Punch Out.....	23
8.6.	Ream/ Swab 32" - Punch Out .....	23
8.7.	Cleaning Pass - Optional.....	24
8.8.	Borehole Complete .....	24
8.9.	Stringing And Welding .....	24
8.10.	Pipe management – marine .....	26
8.11.	Pullback – Breakover.....	28
8.12.	Pullback - Pipe Installation .....	28
8.13.	Pullback - Complete .....	28

8.14.	diffuser installation and commissioning.....	29
8.15.	product pipe connection to thrust block.....	29
8.16.	construction of pump well.....	29
8.17.	Connection of product pipe to pump well.....	32
<b>9</b>	<b>MARINE METHODOLOGY.....</b>	<b>33</b>
9.1.	Purpose.....	33
9.2.	Project Scope.....	33
9.3.	Organisation Roles and Responsibilities.....	34
9.4.	Marine Support Methodology.....	38
9.5.	Marine Equipment.....	42
<b>10</b>	<b>ENVIRONMENTAL MANAGEMENT PLANS.....</b>	<b>46</b>
10.1.	Control of off-site dust emissions.....	46
10.2.	Measures to reduce the transfer of site mud to roads.....	47
10.3.	Control of noise.....	47
10.4.	Hours of operation.....	47
10.5.	Erosion control.....	48
10.6.	Storm water runoff.....	48
<b>11</b>	<b>INSPECTION AND TEST PLAN.....</b>	<b>49</b>
<b>12</b>	<b>DAILY REPORTING.....</b>	<b>50</b>
<b>13</b>	<b>APPENDIX A – STEERING PROCEDURE.....</b>	<b>51</b>
13.1.	Survey Overview.....	51
13.2.	Survey Operation.....	51
13.3.	Downhole Surveying – P2 System.....	51
<b>14</b>	<b>APPENDIX B – CONTINGENCY PLAN.....</b>	<b>54</b>

**FIGURES**

Figure 1: HDD Organisation Chart.....	11
Figure 2: Rig Anchor .....	21
Figure 4: Paratrack 2 BHA Configuration Motor and Jetting Assemblies .....	52
Figure 5: PRCI Figure 1-4 – Surface Monitoring System .....	52
Figure 6: AC Beacon in Operation .....	53

# 1 DOCUMENT PURPOSE

The purpose of this document is to describe the framework for the management of HDD operations, for the completion of trenchless crossings for the Seawater Supply Pipeline project. This document describes:

- the prescribed:
  - Pilot drilling and borehole enlarging reaming passes
  - Supplementary passes, including drill pipe tripping and borehole conditioning
  - Welding and stringing operations
  - Marine installation support operations
  - Product pipe installation
- the Pipeline Drillers Group roles and responsibilities of HDD operations
- the marine operators roles and responsibilities of HDD operations
- the HDD project requirements, variables, and assumptions
- the relevant calculations and prerequisites for HDD construction/operations each pass, including:
  - Rig Anchor
  - Pulling Head
  - Ballast Control
  - Installation Force
- the specific contingency measures in case for unforeseen drilling failure or marine operation failure
- Pipeline Drillers Group required tools and site management:
  - Entry Side and Pipe Side
  - Mud Return Line (not including the HDD Outfalls)
  - Drill Pipe Management
  - Tail String
  - Marine Vessels, infrastructure and diving
- Pipeline Drillers Group Equipment requirements
  - Equipment site layout requirements
  - Transport and traffic management requirements
  - Equipment impact on site
- SIMOPS compliance and management of:
  - Hard Stand construction
  - Access tracks preparation
  - Preparation of pipe stringing and welding
  - Marine operations

This Construction & Environmental Management Plan must be read in conjunction with the project-specific engineering calculations and drawings that describe the construction engineering for the Seawater Supply Pipeline trenchless crossings.

## 2 PROJECT SCOPE

Pipeline Drillers Group, as the HDD Contractor, has been engaged to complete specialist HDD works for the Seawater Supply Pipeline (SSP) project in compliance with project specifications mandated by the Asset Owner, Australian Bay Lobster Producers.

The SSP is being constructed over two stages:

- Stage 1: ABLP Site to Tweed Coast Road crossing (Lot 3 DP 1111554)
- Stage 2: Elrond Drive stormwater drain to Kingscliff Beach.

This document concerns the construction of stage 2 of the project only.

Construction of stage 2 of the seawater supply pipeline covers the provisional area between lot 3 DP 1111554 and final costal pipeline outfalls.

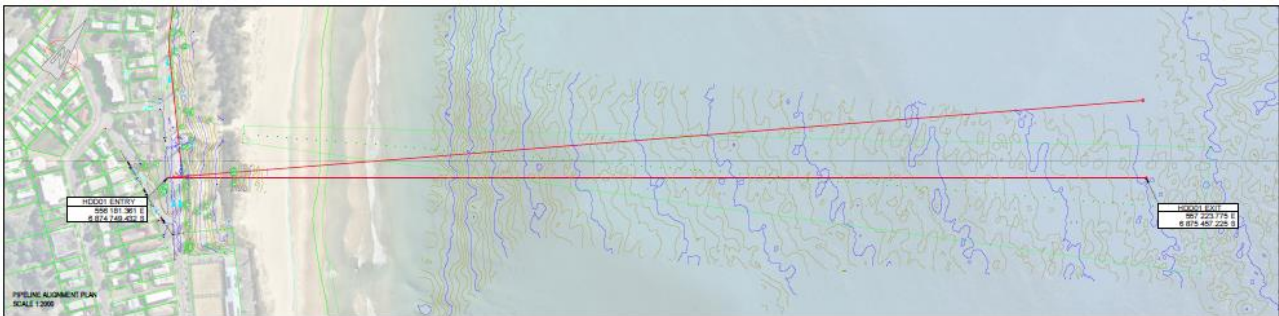


Figure 0: Stage 2 SSP Alignment of costal pipeline outfalls

The Horizontal Directional Drilling (HDD) Crossing scope of work will include:

- Detailed Design and Construction Engineering: Performance of all installation design, engineering, interface management and procedure development necessary for the Works,
- Engagement with local community and stakeholders, regarding the projects' temporary impacts on the area,
- Mobilisation and demobilisation of all necessary HDD subcontractor equipment, materials, consumables and human resources,
- Stringing and Welding (inc. pre-installation testing) of product pipe into multiple strings to be installed into the completed/enlarged bore hole,
- Temporary installation of overland mud return line for the transfer of drilling fluids from exit to entry side of drilling operations (not including the HDD Outfalls),
- Marine Operations to assist in the installation of HDD pipeline and subsea infrastructure,
- Horizontal Directional Drilling for the installation of permanent product pipeline, and
- Remediation and restoration of construction areas.

### 3 ABBREVIATIONS AND DEFINITIONS

<b>Term or Acronym</b>	<b>Definition</b>
<b>ALARP</b>	As Low As Reasonably Practicable
<b>Asset Owner</b>	Australia Bay Lobster Producers
<b>ASTT</b>	Australian Society for Trenchless Technology
<b>AS</b>	Australian Standard
<b>AS/NZS</b>	Australian/New Zealand Standard
<b>ASS</b>	Acid Sulphate Soils
<b>ANSI</b>	American National Standards Institute
<b>API</b>	American Petroleum Institute
<b>BHA</b>	Bottom Hole Assembly
<b>CAD (3D DXF/DWG)</b>	Computer Aided Design (saved format)
<b>CEMP</b>	Construction Environmental Management Plan
<b>Client Name</b>	Australia Bay Lobster Producers
<b>Contractor</b>	Pipeline Drillers Group
<b>Contractor Acronym</b>	PDG
<b>CPEP</b>	Contractor Project Execution Plan
<b>CSMP</b>	Construction Safety Management Plan
<b>DBYD</b>	Dial Before You Dig
<b>GBR</b>	Geotechnical Baseline Report
<b>HAZID</b>	Hazard Identification
<b>HAZOP</b>	Hazard and Operability
<b>HDD</b>	Horizontal Directional Drilling
<b>HSEQ</b>	Health, Safety, Environment, and Quality
<b>IFC</b>	Issued for Construction
<b>IMS</b>	Integrated Management System
<b>ISO</b>	International Standards Organisation
<b>ITP</b>	Inspection and Test Plan
<b>JHA</b>	Job Hazard Analysis
<b>LCM</b>	Loss Circulation Material
<b>MDR</b>	Master Document Register
<b>MMH</b>	Mixed Metal Hydroxide
<b>MMO</b>	Mixed Metal Oxide
<b>MS</b>	Milestone
<b>MTO</b>	Materials Take Off

<b>NATA</b>	National Association of Testing Authorities
<b>N/A</b>	Not Applicable
<b>OD</b>	Outside Diameter
<b>OHS</b>	Occupational Health and Safety (used interchangeably with WHS/Workplace Health and Safety)
<b>OTR</b>	Other Than Rock
<b>PPE</b>	Personal Protective Equipment
<b>Principal</b>	Australia Bay Lobster Producers
<b>Project</b>	Seawater Supply Pipeline
<b>QA/QC</b>	Quality Assurance/Quality Control
<b>QMS</b>	Quality Management System
<b>RFI</b>	Request for Information
<b>ROP</b>	Rate of Penetration
<b>ROW</b>	Right of Way
<b>SDS</b>	Safety Data Sheet (formerly known as MSDS/Material Safety Data Sheet)
<b>SIMOPS</b>	Simultaneous Operations
<b>SOW</b>	Scope of Work
<b>SWMS</b>	Safe Work Method Statement
<b>TGS</b>	Traffic Guidance Scheme
<b>TQ</b>	Technical Query
<b>VOC</b>	Verification of Competency

## 4 REFERENCE

### 4.1. RELEVANT STANDARDS

No.	Document Number	Title
1	AS 1289	Methods of Testing Soils for Engineering Purposes (all parts)
2	AS 1418	Cranes, Hoists and Winches
3	AS 2550	Cranes, Hoists and Winches – Safe Use
4	AS 1442	Carbon Steels and Carbon-Manganese Steels – Hot Rolled Bars and Semi-Finished Products
5	AS 1726	Geotechnical Site Investigations
6	AS 2073	Methods for the Testing of Expanding Admixtures for Concrete, Mortar and Grout
7	AS 2350	Methods for Testing Portland, Blended and Masonry Cements
8	<del>AS/NZS 2885</del>	<del>Pipelines – Gas and Liquid Petroleum</del>
9	ASTM-F1962, 2011	Standard Guide For Use Of Maxi-Horizontal Directional Drilling For Placement Of Polyethylene Pipe Or Conduit Under Obstacles, Including River Crossings
10	AS/NZS 1554	Structural Steel Welding
11	AS/NZS 2033	Installation of Polyethylene Pipe Systems
12	AS 4130	Polyethylene (PE) pipes for pressure applications
13	AS 2566.1	Buried Flexible Pipelines Part.1: Structural Design
14	AS 5100.3	Bridge Design – Foundation and Soil Supporting Structures
15	AS 2870	Residential Slabs and Footings
16	AS 4678	Earth-Retaining Structures
17	AS 3600	Concrete Structures
18	AS 4041	Pressure Piping
19	AS 3750	Paints for Steel Structures - High-build epoxy (two-pack)
20	AS 3862	External Fusion-Bonded Epoxy Coating for Steel Pipes
21	NA	Ariaratnam, S. T., Allouche, E. N., 2000. Suggested practices for installations using horizontal directional drilling. Practice Periodical on Structural Design and Construction 5 :(4), 142–149.
22	NA	3. ASCE, 2005. Pipeline Design for Installation by Horizontal Directional Drilling. American Society of Civil Engineers, ASCE Manuals and Reports on Engineering Practice No. 108.
23	NA	Bennett, D., Ariaratnam, S., Como, C., 2008. Horizontal Directional Drilling: Good Practices Guidelines, 3rd Ed. HDD Consortium, 2008.
24	NA	Bennett and Wallin, 2008. Step-By-Step Evaluation of Hydrofracture Risks for HDD Projects, Proceedings of 2008 No-Dig Conference, Dallas, Texas, April 27-May 2, 2008

No.	Document Number	Title
25	NA	Petroff, L. J., 1997. Design guidelines for directional drilled PE pipe. ASCE Congress on Trenchless Technology, Boston, MA.
26	NA	Petroff, L. J., Dreher, P. L., 1997. Design considerations for HDPE for trenchless applications. No-Dig 1997, Seattle, WA.
27	NA	Petroff, L. J., 2010. Directional Drilling Design with ASTM F1962: A Decade of Success, Proceedings of ASCE Pipelines Conference, Keystone, CO.
28	NA	Pipeline Research Council International, 2015. Installation of Pipelines by Horizontal Directional Drilling: An Engineering Design Guide, Report PR-227-03110. Prepared by J.D. Hair and Associates, Inc., Louis J. Capozzi & Associates, Inc., Stress Engineering Services, Inc.
29	NA	Plastic Pipe Institute (PPI), 2007. Handbook of Polyethylene Pipe, 2nd Edition. Plastic Pipe Institute (PPI).

## 5 ROLES AND RESPONSIBILITIES

Management of the Seawater Supply Pipeline project works shall be undertaken following the quality principles, policies, and procedures defined within the Pipeline Drillers Group corporate management system. Inspection and test plans shall be utilised for this work scope to record in a single document all the relevant documents and inspectorate monitoring, hold, and witness points.

As the HDD contract holder, Pipeline Drillers Group shall be responsible for the management and supervision of all Pipeline Drillers Group and associated subcontractor activities onsite. The project will be supported offsite from the Pipeline Drillers Group Sydney office, with supplementary support provided onsite by Australia Bay Lobster Producers.

Method statements and procedures shall be developed for this scope of work and shall be written to comply with both Australia Bay Lobster Producers and Pipeline Drillers Group systems and specifications.

Subcontractors' documentation shall be developed and reviewed by Pipeline Drillers Group personnel to ensure consistency and correctness with scope.

The Pipeline Drillers Group HDD Project Manager and the HDD Superintendent shall be responsible for the recruitment of the HDD crew. The likelihood and consequences of injury, environmental incidents, and asset damage is deemed to increase with a drilling crew with insufficient experience and/or training, and a number of activities in the drilling operations identified in the Risk Register are especially prone to this risk. The Pipeline Drillers Group HDD Project Manager and the HDD Superintendent as part of their responsibilities shall ensure during the recruitment process that the hired drilling personnel's skills and experience suits the requirements of their roles and responsibilities. Only personnel with HDD experience shall be considered for Driller, Leading Hand/Rig Hand, Mud Hand, and Mechanic roles.

A summary of the general and specific roles and responsibilities are included below.

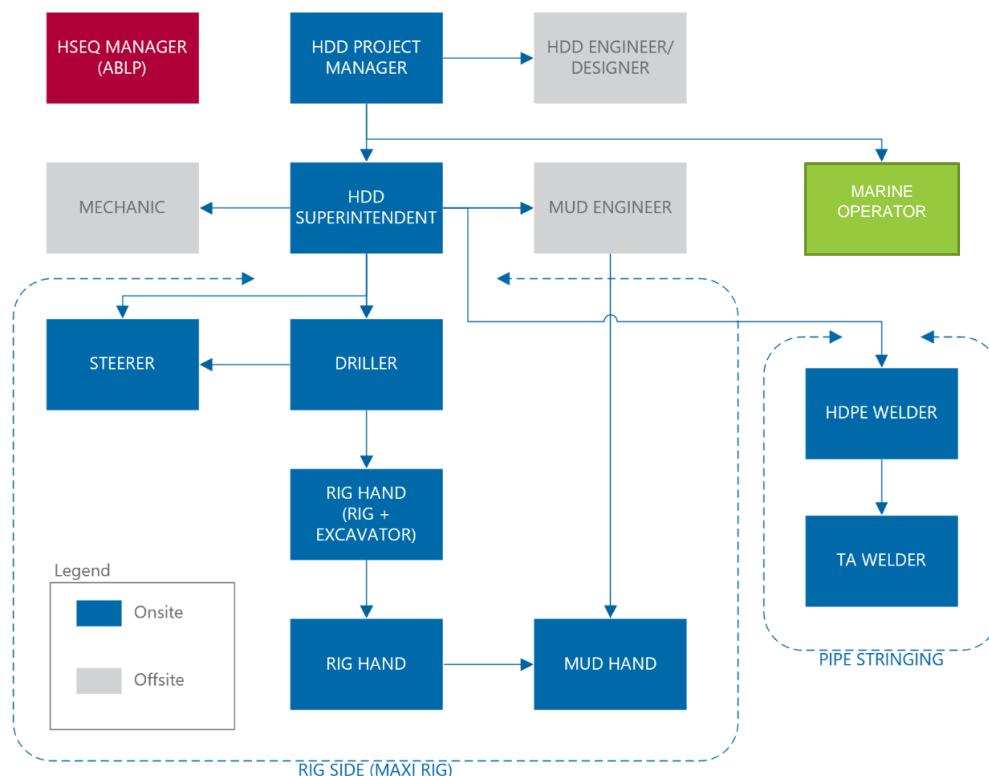


Figure 1: HDD Organisation Chart

## 5.1. HDD PROJECT MANAGER

The HDD Project Manager is responsible for the overall operation and management of the HDD works and HDD construction team. Their responsibilities include but are not limited to:

- Reviewing and approving method statements and project execution plans
- Ensuring adequate time and resources are applied to works
- Financial management and control of the overall project operations
- Serving as the interface between the major project disciplines (HDD, civil, and pipe fabrication)
- Ensuring all operational plans and methodologies are in place prior to mobilisation to site
- Ensuring compliance with approved plans and methods
- Ensuring all site staff have the correct training and inductions carried out
- Providing technical support to the drilling superintendent and crews
- Leading and coordinating the HDD construction and execution team
- Approving any onsite changes to the HDD operations, methods, and plans
- Serving as the interface with the Australia Bay Lobster Producers Project Manager.

## 5.2. HDD ENGINEER/DESIGNER

The HDD Engineer/Designer is responsible for the development and management of the HDD design in collaboration with the Pipeline Drillers Group HDD Project Manager and the HDD Superintendent. The HDD Engineer/Designer shall be located off site and will be engaged for the complete duration of the HDD crossing construction schedule. Their responsibilities include but are not limited to:

- Ensuring all project specifications are complied with for the delivery of each HDD crossing design
- Engaging with the Pipeline Drillers Group HDD Project Manager and the HDD Superintendent, Driller, Steering Engineer and Mud Engineer for the preparation of the optimal HDD crossing design and support material
- Verifying that the work scope is complete, and issuing as-built materials
- Verifying and signing off on quality documentation or checklists.

## 5.3. STEERER

The Steerer's responsibilities include but are not limited to:

- Providing experienced steering and tracking services for the duration of pilot hole drilling
- Engaging with the Site Surveyor and Site Engineer for requirements to deliver in-tolerance HDD design.

## 5.4. MUD ENGINEER

The Mud Engineer's responsibilities include but are not limited to:

- Providing knowledgeable drilling fluid expertise for the duration of drilling operations
- Engaging with the HDD Engineer/Designer and Mud Hand to determine optimal drilling fluid properties in the known geotechnical conditions.

## 5.5. HDD SUPERINTENDENT

The HDD Superintendent reports directly to the HDD Project Manager in all regards. Their responsibilities include but are not limited to:

- Ensuring that all drilling activities are performed in a safe and timely manner in accordance with the approved procedures, specifications, and industry good practice
- Ensuring that all work within scope complies with the safety and environmental plans and procedures
- Ensuring all necessary equipment and PPE is available for the works
- Ensuring that the responsibilities allocated under the Construction Safety Management Plan, Construction Environmental Management Plan, and other governing documents are adhered to
- Chairing routine toolbox meetings
- Chairing daily/shift prestart meetings
- Managing Driller
- Managing drilling supervision and labour
- Planning drilling operations with the HDD Engineer
- Verifying that the work scope is complete
- Monitoring and fine tuning the drilling operations
- Compiling and verifying drilling reports and steering reports for each shift
- Notifying of and reporting any incidents or near misses via the Pipeline Drillers Group and Australia Bay Lobster Producers systems
- Completing compliance reporting and incident investigations
- Serving as interface with the pipe fabrication team.

## 5.6. DRILLER

Responsibilities of the Driller include but are not limited to:

- Performing work activities in accordance with the prescribed methods and documented responsibilities contained within the project procedures and this Construction & Environmental Management Plan
- Reviewing and requesting consumables and equipment for the drilling works
- Recording daily drilling data, etcetera. Reports and charts include:
  - Daily drill logs (pilot hole/reaming passes/pipe installation)
  - Tooling reports
  - Survey data
- Assisting in the identification of drilling problems, and collaboratively developing solutions when necessary to ensure minimal disruption to the progress of the works
- Performing the drilling works in accordance to any established:
  - Quality management plans
  - Safety and environmental management plans
  - Work procedures, JHAs, inspection and test plans
- Ensuring that all work within scope complies with the safety and environmental plans and procedures

- Reporting any incidents/near misses.

## 5.7. LEADING HAND AND RIG HAND

Responsibilities of the Leading Hand and Rig Hand include but are not limited to:

- Performing tasks such as tripping drill pipe, making up and breaking down the drilling assembly, and maintaining a clean and tidy site
- Assisting the Mechanic with servicing and repairs to plant and equipment
- Preparing the downhole assembly as instructed by the HDD Superintendent and in conjunction with the Driller
- Reviewing and understanding the importance of the safety procedures, and utilising JHAs for work undertaken during the life of the project
- Monitoring all consumable stocks, and advising the HDD Superintendent when stocks are low
- Ensuring a disciplined approach to site regulations: in particular, compliance with safety and environmental management requirements for all tasks and activities, including but not limited to refuelling activities and handling and storage of oils, lubricants, and fuel on site
- Reporting any environmental incidents/near misses (e.g., spills in or outside the work site) to the HDD Superintendent
- Maintaining and promoting safe working conditions for the workforce and all other parties
- Each morning, completing a daily start-up checklist on the:
  - Power pack
  - Mud pumps and associated engines
  - Drill rig
- Sending daily start-up checklists to the HDD Superintendent each day for review.

## 5.8. MUD HAND

The Mud Hand's responsibilities include but are not limited to:

- Liaising with the HDD Superintendent and Driller to achieve optimum drilling fluid properties, as follows:
  - Viscosity
  - Mud weight
  - Fluid rheology
  - Sand content
  - Screen sizes/grades
- Engaging with the Mud Engineer throughout HDD operations
- Completing routine mud kit tests
- Monitoring daily the pressures through the de-sanding and de-silting cones
- Mixing drilling fluid products into the system as required and approved in the Drilling Fluid Plan
- Maintaining and cleaning the fluids control system
- Replacing and changing the shaker screens and de-sanding and de-silting cones as required to maintain efficient cleaning of the drilling fluid
- Monitoring all consumable stocks, and advising the HDD Superintendent when stocks are low
- Completing daily mud logs

- Assisting the Driller to complete the drill log records
- Fulfilling HSEQ responsibilities including safety compliance, environmental compliance, and reporting any incidents (including near misses)
- Seeking assistance from the Rig Hands as required.

## 5.9. MECHANIC

The Mechanic's responsibilities include but are not limited to:

- Reporting to the HDD Superintendent to schedule all maintenance and repair works
- Servicing and maintaining all plant and equipment
- Monitoring the operational hours on all machinery to establish when a maintenance service is required
- Ensuring that correct parts and equipment are available for servicing and maintenance
- Completing weekly/monthly maintenance checklists of all mechanical equipment. These checklists will also be sent to the HDD Superintendent for review (as engaged)
- Checking that sufficient spare parts are available on site, and advising the HDD Superintendent and HDD team of all parts and consumables required
- Fulfilling HSEQ responsibilities, including safety compliance, environmental compliance, and reporting of any incidents (including near misses).

## 5.11. SITE-SPECIFIC INDUCTION

Pipeline Drillers Group requires that all persons attending site, including visitors, complete Pipeline Drillers Group site-specific inductions. Non-inducted persons will not be permitted access to site due to safety hazards to non-inducted persons onsite.

The Pipeline Drillers Group HDD team will complete the Australia Bay Lobster Producers site-specific induction prior to commencing works at the Australia Bay Lobster Producers site.

## 5.12. HEALTH SAFETY AND ENVIRONMENT (HSEQ) MANAGER (ABLP)

The HSEQ Manager is accountable to the Seawater Supply Pipeline Project Asset Owner but will work closely with Pipeline Drillers Group and the marine contractor on a day to day basis. The HSEQ Manager has the following responsibilities, accountabilities, duties and deliverables:

- **HSEQ management and leadership:** The HSE Manager is responsible for all matters pertaining to the Seawater Supply Pipeline HSEQ Management Systems, to display exemplary commitment to HSEQ and to provide very visible leadership through daily action in the field.
- **HSE Project plan:** The HSE Manager will develop and implement the Project specific HSE Management Plans, and be responsible for the implementation of actions contained within the plans as well as reviewing the plan on a regular basis.
- **Stakeholder engagement:** The HSEQ Manager will ensure that the Project works closely with the community to make communications open and timely and that to the greatest extent practicable concerns are addressed, adverse impacts minimised and the opportunity for delivering positive Project outcomes is maximised.
- **HSEQ Project execution:** The HSEQ Manager will ensure that processes, systems, reports, and data are analysed and reviewed to provide continuous improvement initiatives, advice and service in the fields of occupational health, safety and the environment.

- **HSEQ performance monitoring:** The HSEQ Manager ensures monitoring and reporting of HSEQ performance, observations, audits and workplace inspections is undertaken. This may involve the measurement of various quantifiable emissions, hazards, dust, fumes, noise etc.
- **Frontline engagement:** A vital aspect of the HSEQ Manager's role is to ensure that hazards are identified and reported, reviewed, maintained and acted on.

## 6 PLANT AND EQUIPMENT

Pipeline Drillers Group plant and equipment allocated for the completion of HDD works will be serviced and tested prior to mobilisation to site. Plant and equipment will be stored at an appropriate temporary staging area before being positioned on site.

General plant and equipment required for HDD works is listed below. Refer to SWMSs for individual and specific operating risks for each piece of plant and equipment on site.

Risk assessments for plant and equipment are maintained by the Site Engineer and are available for review onsite.

Plant and equipment repairs and maintenance continue while on site for the duration of HDD works. Maintenance records are maintained by the Mechanic and are available for review on site.

Equipment consumables including first aid kits, fire extinguishers, pre-start books, etc. are checked and restocked prior to mobilisation to site.

### 6.1. HDD EQUIPMENT ALLOCATION

#### 6.1.1. General Entry Side Equipment



Item	Equipment Description	Make/Model	Capacity	Max dB
<b>Drill Rig</b>	Cab Container/Rig Frame Track	HK250C	250 Tonne	85dB
<b>Recycler</b>	Cleaning and separation system	Kemtron	15,000 L	80dB
<b>Generator</b>	Recycler generator	Cummings	250 KVa	85dB
<b>Mud Pump</b>	High pressure pump	Mud Tech	500 GPM	90dB
<b>Pump</b>	Pit pump		Charge	70dB
<b>Excavator</b>	Excavator	Case	22 Tonne	70dB

Item	Equipment Description	Make/Model	Capacity	Max dB
<b>General Support</b>	Equipment	Assorted		70db
<b>Transport</b>	LV	Nissan Navara		
<b>Transport</b>	LV	Nissan Navara		

### 6.1.2. General Exit Side Equipment

Item	Equipment Description	Make/Model	Capacity	Max dB
<b>Generator</b>	Recycler generator	CAT	250 KVa	85dB
<b>Recycler</b>	Cleaning and separation system	Kemtron	25,500 L	70dB
<b>Pump</b>	Transfer pump		Centrifuge	80dB
<b>Pump</b>	Pit pump		Charge	70dB
<b>Excavator</b>	Excavator	Sumitomo	22 Tonne	70dB
<b>General Support</b>	Equipment	Assorted		70dB
<b>Transport</b>	LV	Nissan Navara		

### 6.1.3. Shared Logistics

Item	Equipment Description	Make/Model	Capacity	Max dB
<b>Logistics</b>	Tooling & Equipment	Isuzu (or similar)		
<b>Logistics</b>	Fuel Cart Service	Isuzu (or similar)		
<b>Logistics</b>	Vacuum Truck	Renders	10,000 L	110dB
<b>Logistics</b>	Tip Truck	Isuzu (or similar)		
<b>Logistics</b>	Heavy Vehicle Truck	Kenworth		
<b>Transport</b>	LV	Nissan Navara		

Refer to project [Equipment Register](#) for complete inventory and allocation of project equipment.

Vehicle and equipment movements are required routinely throughout the drilling process. Refer to Vehicle and Equipment movements below:

EQUIPMENT ITEMS	MOVEMENT FREQUENCY (Operational Days)	WORK AREA
Drill Rig – Containers	Commencement/Conclusion (Single Day)	HDD Entry Area
Cleaning System – Containers	Commencement/Conclusion (Single Day)	HDD Entry Area
Mud Pump – Skids	Commencement/Conclusion (Single Day)	HDD Entry Area

Support Equipment – Container	Commencement/Conclusion (Single Day)	HDD Entry Area
Support Truck - Medium Rigid	Multiple Daily	HDD Entry Area
Water Cart - Heavy Rigid	Multiple Daily	HDD Entry Area
Vacuum Truck - Heavy Rigid	As Required (In-frequent)	HDD Entry Area
Personnel - Light Vehicles	Multiple Daily	All Areas
Re-Fueling - Medium Rigid	Multiple Daily	HDD Entry Area
Rubbish Truck - Medium Rigid	Once Weekly	HDD Entry Area
Toilet Service - Medium Rigid	Once Weekly	HDD Entry Area

Refer to Traffic Management plan for details on construction site access

**Document Name**

**B5\_Traffic Management Plan**

## 7 SITE ESTABLISHMENT

Trenchless construction methodologies significantly reduce the surface impacts of pipeline construction by removing the destructive excavation requirements of traditional pipe trenching methods. However, the entry and exit positions of a typical HDD borehole require some earthwork preparation and the static positioning of HDD equipment to make trenchless construction possible. The remainder of this section outlines arrangements for such.

Note: Allocated Rostered Schedule 21 Days on, 7 days off

Note: Extended hours may be required and will be requested on an as needed basis.

### 7.2. SITE SURVEY SET OUT

Once site areas have been suitably prepared for the set out of the For Construction design, Surveyor will place site markers to:

- Assist in the placement of HDD plant and equipment
- Mark location for the construction of HDD anchor
- Mark the steering entry/exit points
- Mark the alignment for wire lines and breakover establishment.

The surveyor may also be required to capture key surface features and mark the boundary limits of the construction easement. Surveyor is selected by Australia Bay Lobster Producers and engaged by Pipeline Drillers Group.

### 7.5. WEED, SEED, AND PEST MANAGEMENT

Prior to the mobilisation of the drill rig and support equipment, Pipeline Drillers Group maintains appropriate wash-down requirements and procedures to eliminate the spread of weeds, seeds, or pests. Subsequent washing to access site during HDD operations will not be required.

### 7.6. WATER SUPPLY

Water for drilling fluid make up and equipment wash down will be supplied to site from local potable water hydrants. With approval, a 50mm HDPE pipe will transport water from the nearest hydrant with standpipe to the entry side HDD pad site.

If approval is not provided to use local network water, two water tankers will be utilised to transport water to site and store the water on site before refill. This will require two tanker trailers of 20,000-30,000L. Water required for use on exit side will be either transported via the mud return line, as required, or trucked to site and stored in the exit side holding tank.

Drilling fluids will be recycled as part of the HDD operations, thereby limiting the HDD works' consumption of potable water. For reference to total water used by the HDD operations, refer to the Drilling Fluid Plan/s.

Water for dust suppression and main road wash down during and post construction will be sourced from a responsible water source. Water for pre and post installation hydrotesting and ballast control fill pipe will be sourced separately from the HDD operations.

## 7.7. ENTRY PIT EXCAVATIONS

Small excavations will be required at the entry side of the borehole for the capture of drilling fluid returns to surface. The pits act as sumps for the placement of pit pumps, to collect the drilling fluid returns from the borehole. The pits are not constructed to be suitable for entry by personnel or used for the construction of pipe tie-ins. Excavation size may vary over time due to the duration of drilling.

Any required excavations for tie-in pits and trenching works are to be carried out by a dedicated contractor engaged by Pipeline Drillers Group.

## 7.8. RIG ANCHOR

The HDD rig must be secured in place by a suitably sized anchor(s). The anchor is a temporary structure which is removed at the completion of drilling operations. Rig anchor design and installation is to be managed by Pipeline Drillers Group. The rig anchor's dimensions, composition, and steel configuration is prescribed by the calculated maximum pulling load required by the drill rig to successfully install the product pipe string into the borehole, with an additional factor of safety. Refer to the Installation and Integrity calculation for maximum pull force applied to the rig anchor.

Dependent on the ground conditions post site pad construction, Pipeline Drillers Group may amend the anchor design to best fit site conditions and schedule requirements.

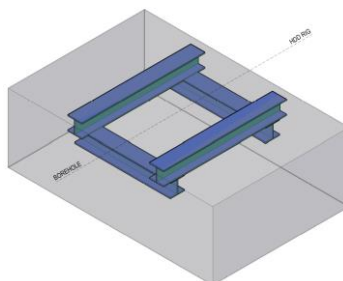


Figure 2: Rig Anchor

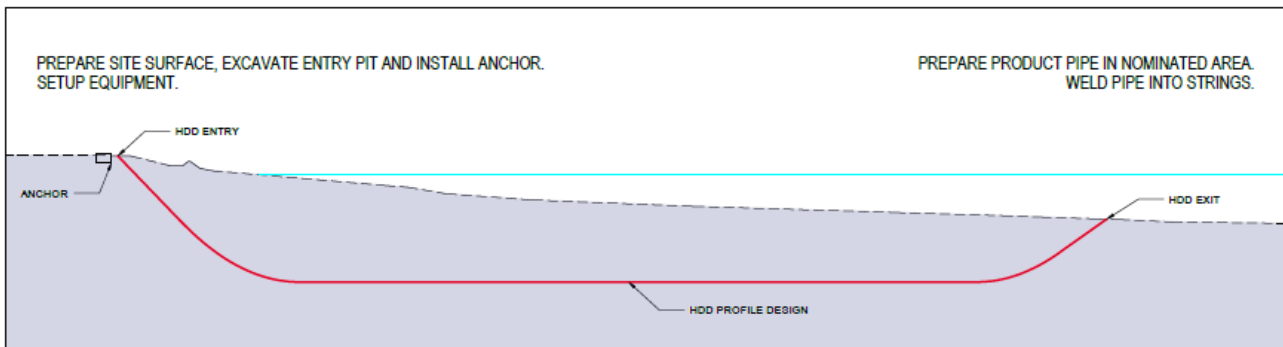
### RIG ANCHOR INSTALLATION METHOD

- 1 Surveyor to survey centre of anchor and mark the excavation dimensions.
- 2 Prior to excavation commencement, HDD Superintendent to order correct volume of concrete prescribed by the anchor calculation.
- 3 Prior to the arrival of concrete delivery, Rig Hand excavator operator excavates the block dimensions.
- 4 Concrete pour is commenced, with the prefabricated structural steel set into the concrete as it is poured.
- 5 Flex drives with concrete agitators are used to settle voids in the concrete pour and more easily adjust the structural steel placement
- 6 Once pour is completed, the rig can be positioned after 4 hours; concrete shall be allowed to set over 6-8 hours (depending on the use of accelerant) prior to loading. It is not a requirement to allow the concrete to hydrate to maximum strength prior to the commencement of pilot hole, as the force loading for pilot hole is very low.

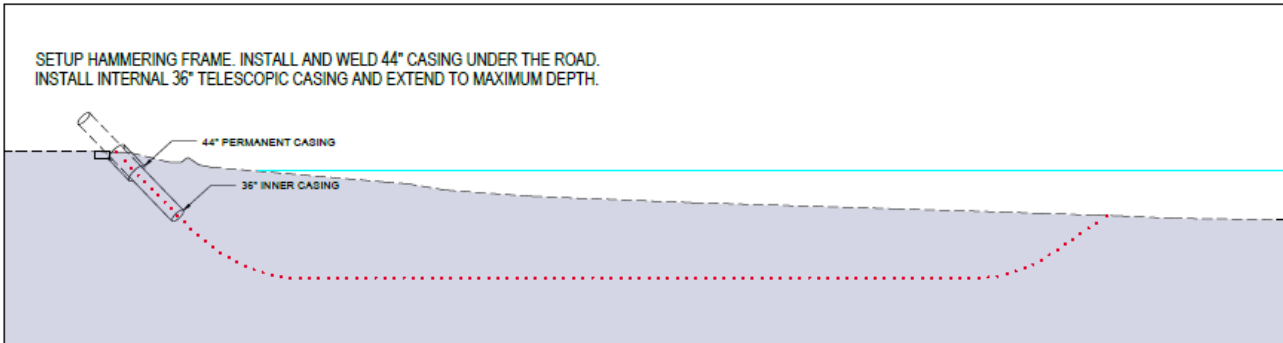
## 8 CONSTRUCTION PLAN

Generally, horizontal directional drilling on the Seawater Supply Pipeline project will be carried out in accordance with the following procedure. Drilling operations are summarised below;

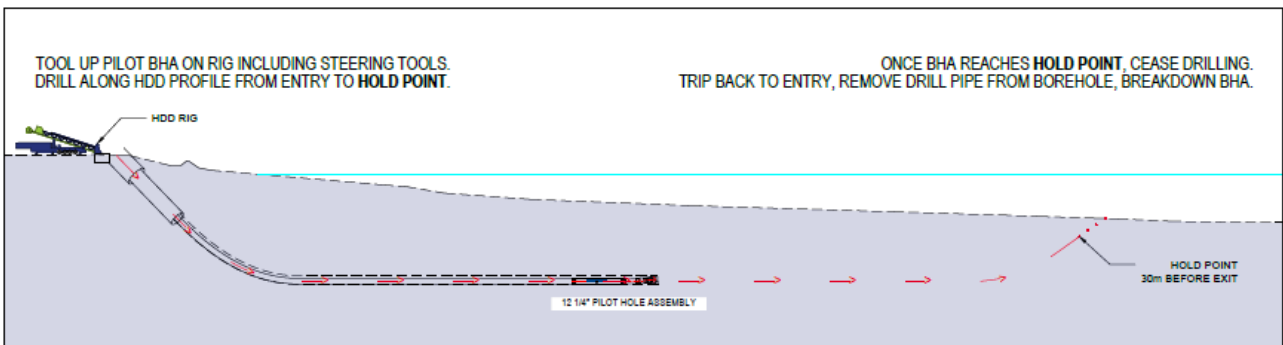
### 8.1. HDD EQUIPMENT SETUP



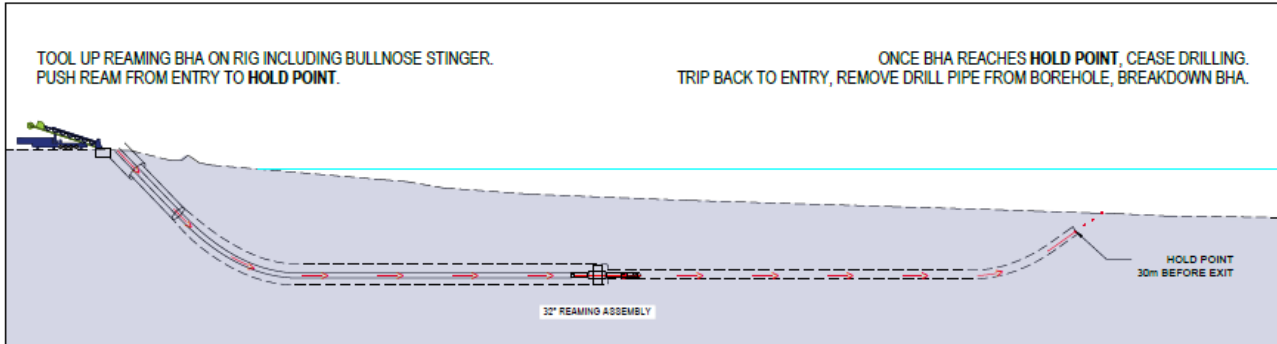
### 8.2. SURFACE CASING INSTALLATION



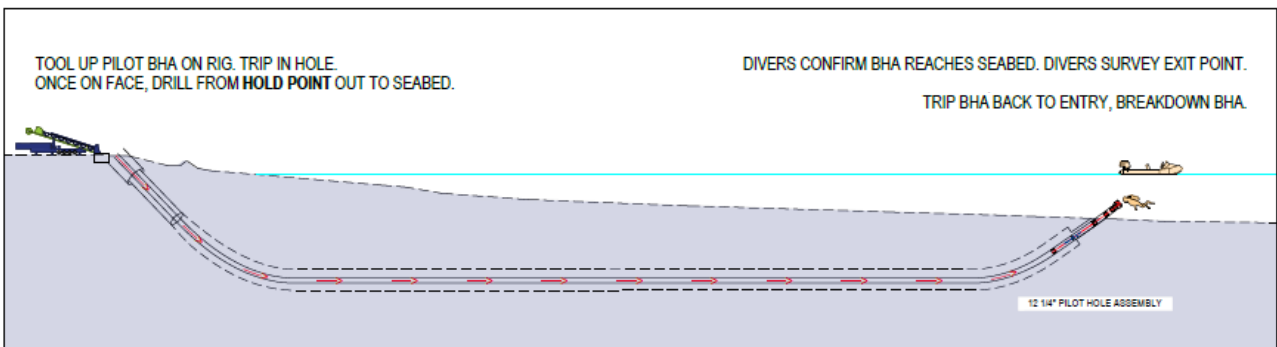
### 8.3. PILOT HOLE - 12 1/4" JETTING - BLIND



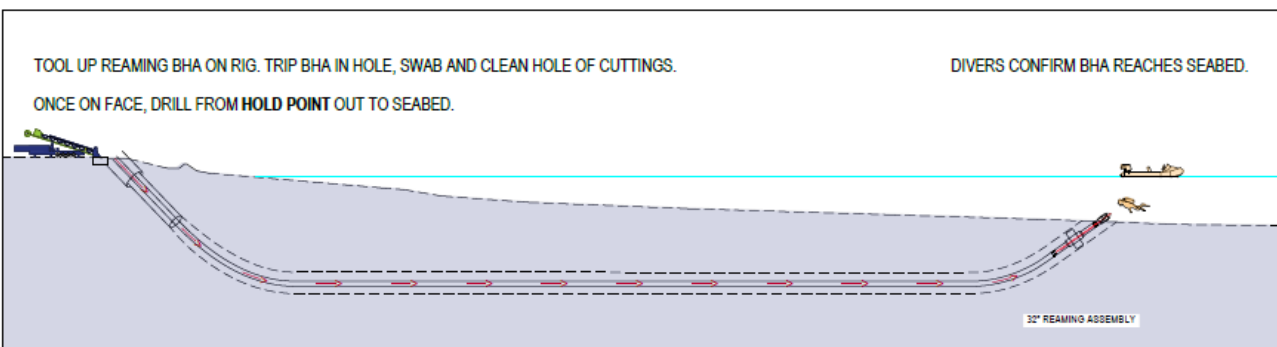
8.4. REAMING - 32" - BLIND



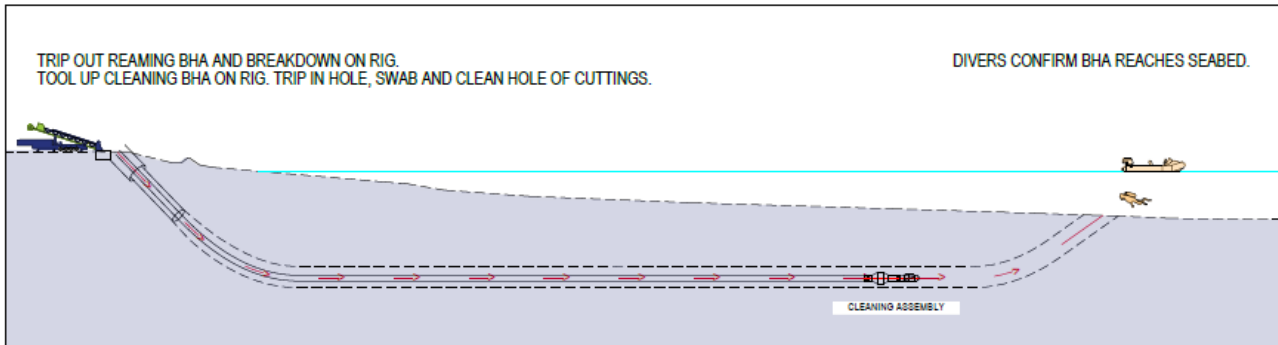
8.5. PILOT HOLE - 12 1/4" JETTING - PUNCH OUT



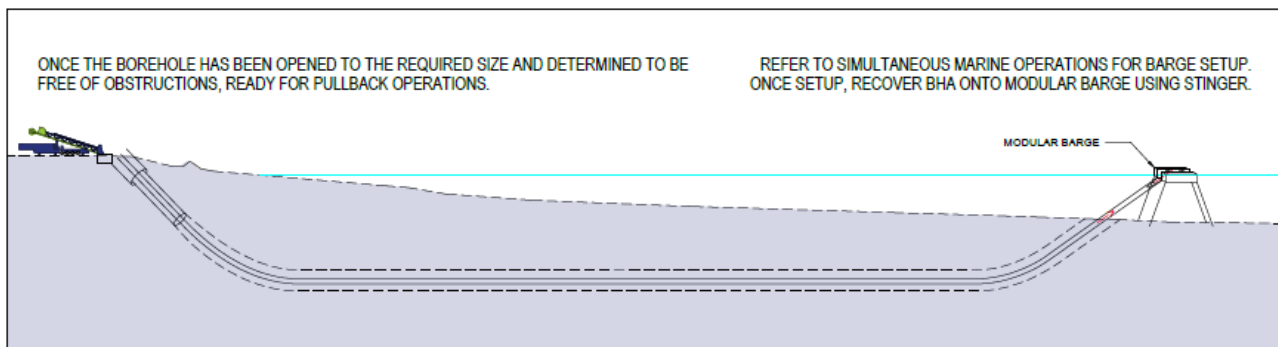
8.6. REAM/ SWAB 32" - PUNCH OUT



## 8.7. CLEANING PASS - OPTIONAL



## 8.8. BOREHOLE COMPLETE



## 8.9. STRINGING AND WELDING

Prior to the commencement of welding, the personnel responsible for welding pipe have their Welding Qualification confirmed and (if required) renewed. Further, all allocated welding personnel are required to complete a test weld, which is then mechanically tested and confirmed as compliant with the weld specifications and procedures. Prior to the commencement of welding, machines are serviced by their manufacture and calibrated to within tolerances. Any equipment faults or discrepancies are rectified prior to the commencement of welding.

The methodology identifies and explains how the weld is to be completed according to the requirements of the AS/NZS Standard.

The methodology process includes:

- 1) Clean pipes;
- 2) Scrape/peel pipes; Clean pipes; Clamp pipes and fittings; Weld; Cool in the clamped position; removal of bead.

All welds are recorded for the construction record, including:

- 1) Weld number;
- 2) operator identification;
- 3) Date and time;
- 4) Welding equipment type and model;

- 5) Pipe DN and SDR;
- 6) Hot plate condition in terms of roughness and cleanliness;
- 7) essential parameters as outlined for the method in ISO 21307 (i.e. hot plate temperatures, heat soak and cooling times, drag, calculated and total pressures); confirmation that the weld appears good (no signs of misalignment, porosity, or contamination; beads even and well formed).



The most critical requirements of successful and compliant butt welds are the reliability of correctly calibrated welding equipment and, the commitment to correct surface preparation and the welding procedures by the skilled welding personnel.



## 8.9.1. PRODUCT PIPE WELD TESTING

### *Timing*

Testing of butt welds will be completed prior to the pullback of pipe strings for trenchless sections and the backfill of pipe for trench sections. Specifically welds to be tested, in accordance with the testing frequency, will be selected by the Project Manager, before being transported to the testing facility. Results of tested welds are distributed before pipe pullback for trenchless sections and prior to backfill of trench sections. Testing results collected prior to pipeline completed installation, are including the final construction record.

### *Frequency*

The following allowances have been made for weld testing:

- Two test prior to production welding (to qualify the welding equipment and the welding personnel)
- Additional (1) Spot Test is to be carried out at random and selected by the PDG Superintendent
- The weld will be completed by the welding team and cut from the lengths of pipe, before being transported to the testing facility. Each completed weld test result is then reviewed and distributed to relevant project team members and client stakeholders.

## Product Pipe Hydrostatic Testing

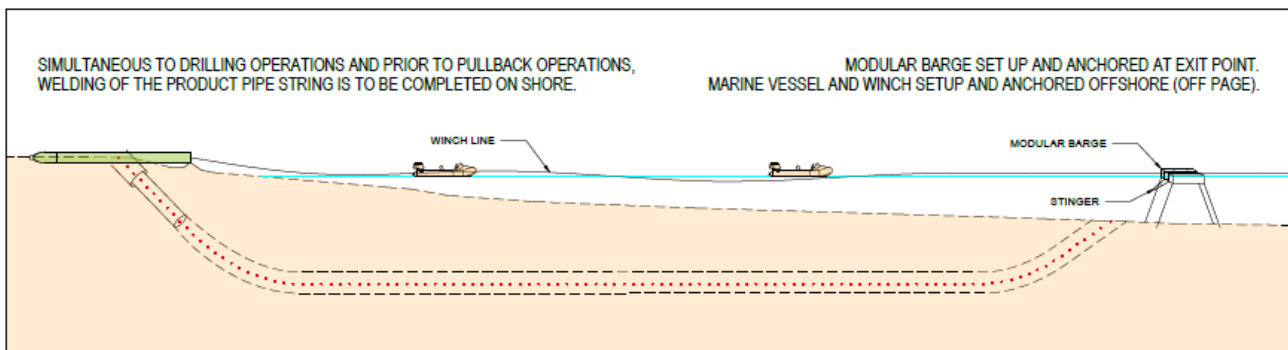
Testing will be performed in accordance with a constant pressure method detailed in AS2566.

Work to be performed by Hydrostatic Tester includes:

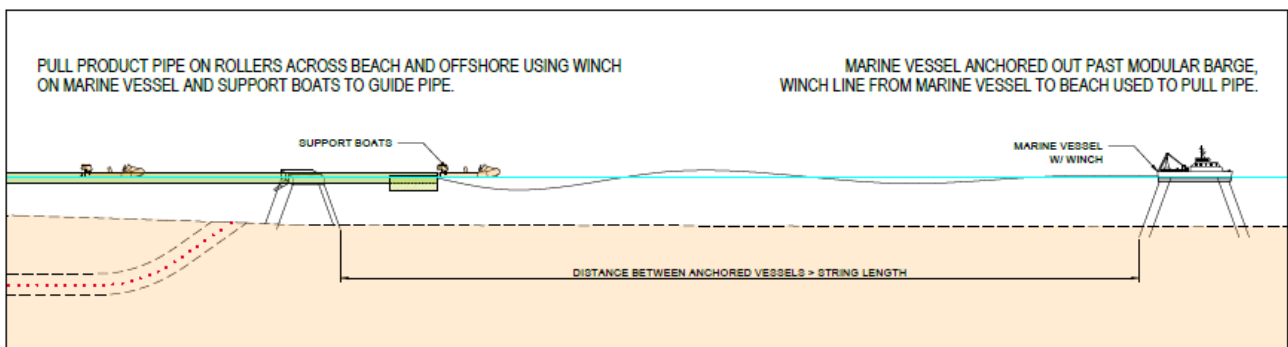
- Pig Fill and flush pipeline – flush to be performed at the rate of the supplied pump until water appears clear and free of debris
- 12 hour overnight pressure and temperature stabilisation
- Re-pressurise and perform 3 hour constant pressure hold
- Depressurise system, with water to be left in the pipeline

## 8.10. PIPE MANAGEMENT – MARINE

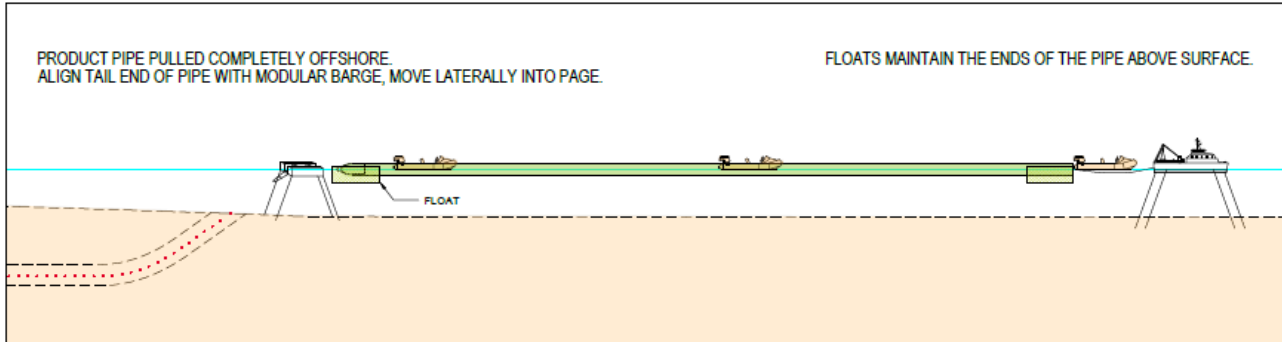
### 8.10.1. Marine Operations - Preparation



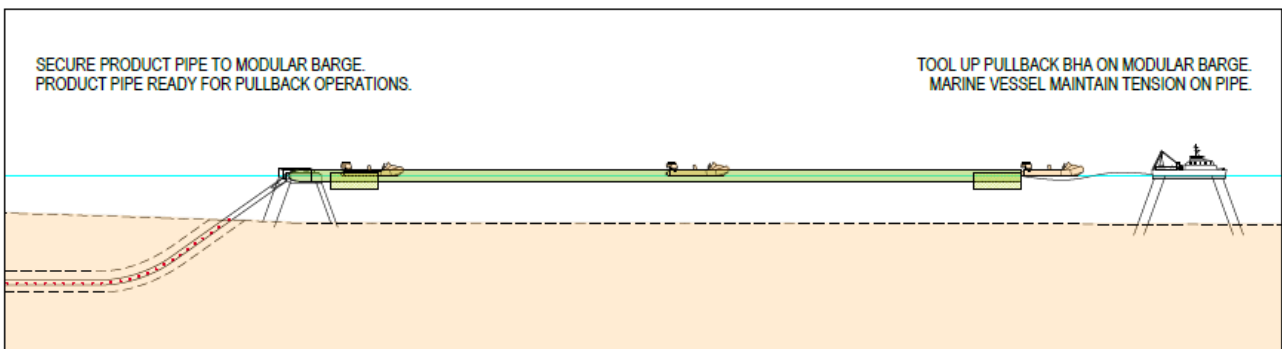
### 8.10.2. Marine Operations - Beach Pull



### 8.10.3. Marine Operations - Pipe Offshore



### 8.10.4. Marine Operations - Secure Pipe



### 8.10.5. Ballast Control

Ballast control will require the installation of a pipe inside the product pipeline for the delivery of ballast weight during the pipeline pullback. Refer to Installation & Integrity Calculation requirements of ballast control and for the dimensions and specification of the fill pipe.

**Document Name**

**INSTALLATION & INTEGRITY - HDD01/02**

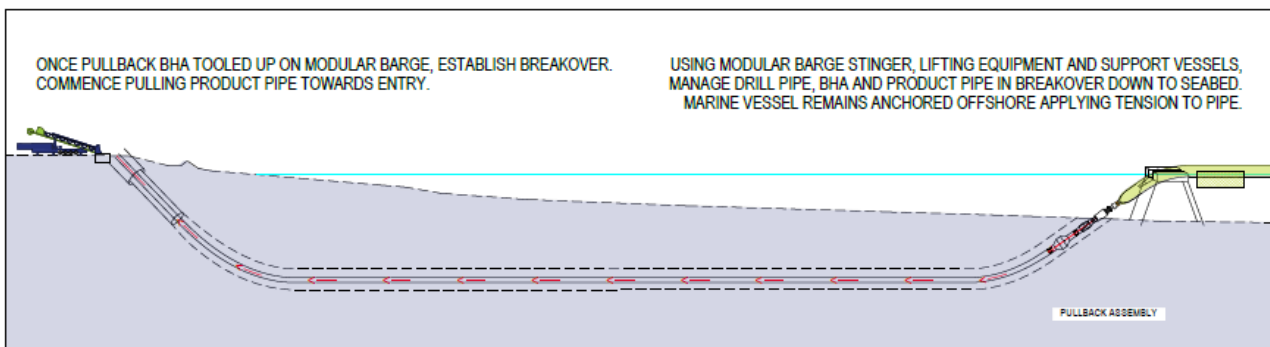
**BALLAST LINE INSTALLATION METHOD**

- 1 Delivery of minimum 100mm HDPE pipe to welding and stringing pad.
- 2 Mobilise 250mm HDPE high pressure welder to welding and stringing.
- 3 Commence welding of string, pulling each complete welded section away from weld point (i.e., pulling out the string).
- 4 Pull string out and along the side of the welding and stringing with mobile/roadworthy plant/machinery, i.e., a small wheeled excavator, manitou, or similar – even a light vehicle.
- 5 Utilising compressor and tow pigs, install small gauge rope inside product pipe for ballast line installation while on surface.
- 6 Utilising small gauge rope, pull into pipe 19mm tow rope. Utilise 19mm rope to pull ballast line pipe into product pipe prior to installation into completed bore hole.

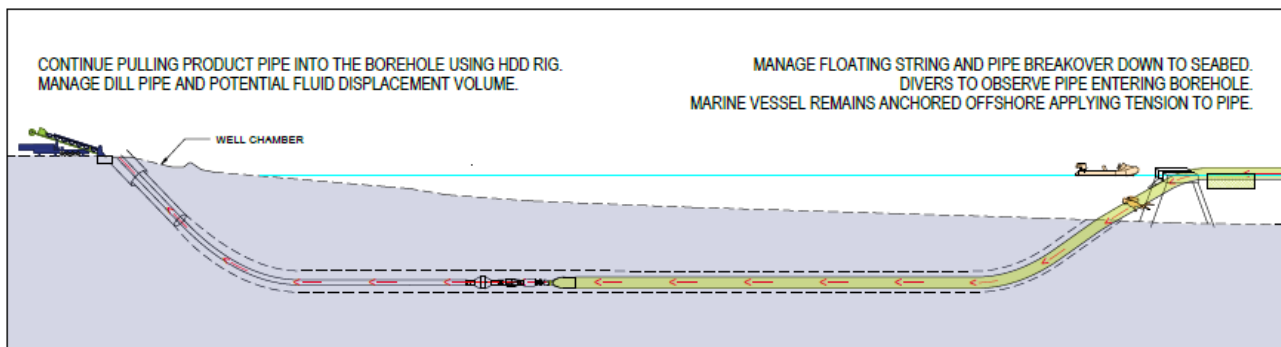
- 7 Install flanges and flexible hose for connection to water source/pump.
- 8 Prior to the commencement of pullback of product pipe with pre-installed ballast line pipe, use pump to fill with seawater as the pipe is being positioned via the Marine Operations.

On completion of HDD operations, the ballast pipe will be removed from the product pipe. Product pipe will then be left filled with water until commissioning and diffuser is installed.

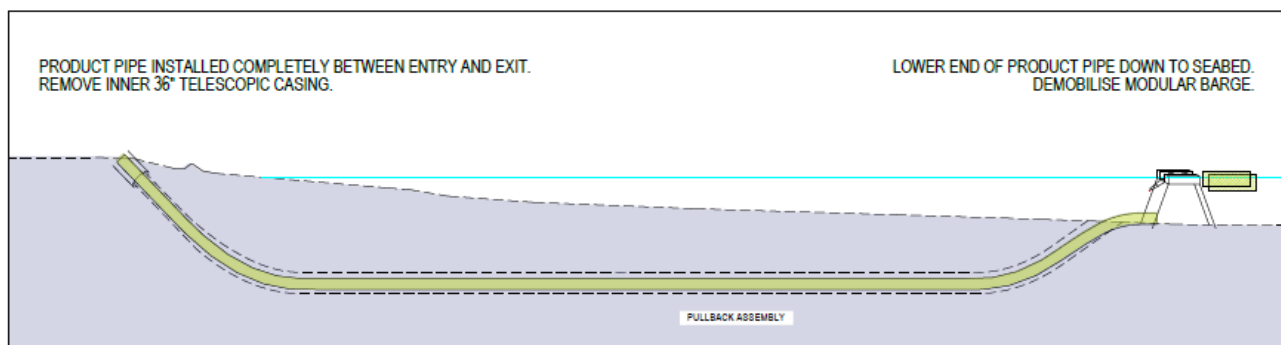
## 8.11. PULLBACK – BREAKOVER



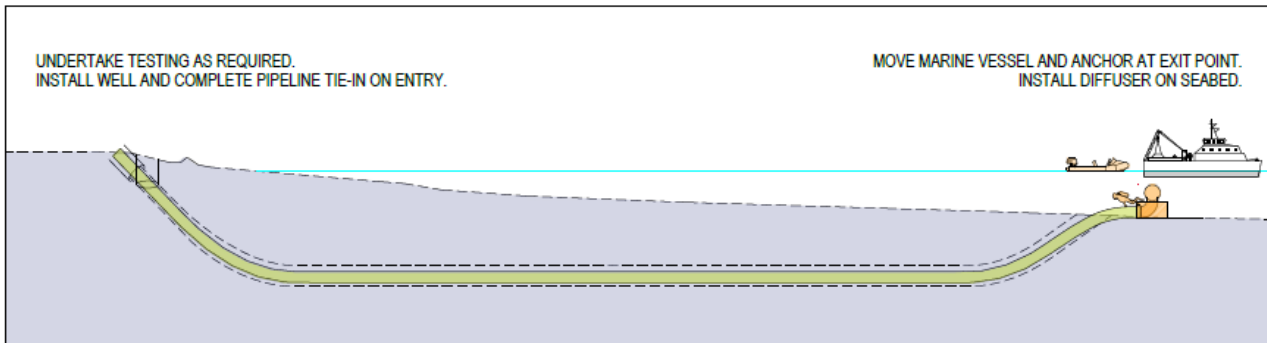
## 8.12. PULLBACK - PIPE INSTALLATION



## 8.13. PULLBACK - COMPLETE



## 8.14. DIFFUSER INSTALLATION AND COMMISSIONING



## 8.15. PRODUCT PIPE CONNECTION TO THRUST BLOCK

Once the product pipe is installed the civil contractor will mobilise to Jack Bayliss Park to commence construction of the thrust block at a point approximately 60m from the HDD entry pit. In order to install the thrust block the civil contractor will first install a wellpoint dewatering system before excavating to depth to expose the product pipe. Prior to excavation Pipeline Drillers Group will seal the annulus between the product pipe and bore wall at the location of the thrust block via grout injection.

Once the product pipe is exposed the civil contractor will confirm with the marine contractor that the intake diffuser is sealed with an inflatable plug to prevent inflow of marine water into the product pipe. Following this the civil contractor will cut the product pipe and Pipeline Drillers Group will pullback the tail ends of the product pipe to the rig before sealing the void remaining from the product pipes by means of grout injection.

With the removal of the tail ends the civil contractor will proceed with install of special bends and flange arrangements to the product pipe before forming up and pouring the concrete inline thrust restraint to the product pipe. Whilst the concrete thrust restraint is curing to >32mpa a detailed survey will be undertaken of the flanged ends to calculate the connection points and bend radius to connect the thrust block to the pump well. On completion of the survey and when the concrete is at strength the excavation will be backfilled and compacted.

## 8.16. CONSTRUCTION OF PUMP WELL

The pump well is to be constructed by caisson method. This method minimises the overall construction footprint and the dewatering requirements for the works. The caisson method will follow the below steps:

- Step 1:** Survey set out of the centre point of the well and establish dewatering system.
- Step 2:** Excavate to a depth of approximately 2m below surface and prepare area for the cutting ring form work (steel frame and boards).
- Step 3:** Form up foundational cutting ring and install steel cutting edge to the base of the ring.
- Step 4:** Perform concrete pour of cutting edge. This pour represents a hold point until concrete has cured to strength of >32mpa.

- Step 5:** Once hold point is cleared (concrete strength achieved) strip form work of cutting ring and setup form work for the first lift ring of the wet well (3m height).
- Step 6:** Perform concrete pour of lift ring. This pour represents a hold point until concrete has cured to strength of >32mpa.
- Step 7:** Once hold point is cleared (concrete strength achieved) strip form work of lift ring and sink well to ground level by excavation of the internal area within the well.
- Step 8:** Setup form work for the next lift ring of the wet well (1.5m height).
- Step 9:** Perform concrete pour of lift ring. This pour represents a hold point until concrete has cured to strength of >32mpa.
- Step 10:** Once hold point is cleared (concrete strength achieved) strip form work of lift ring and sink well to ground level.
- Step 11:** Repeat steps 8-10 for final lift ring.
- Step 12:** Confirm invert level of the well is correct as per design before over excavating internal well floor to accommodate concrete “dummy floor”.
- Step 13:** Pour concrete “dummy floor” to design specifications. This pour represents a hold point until concrete has cured to strength of >32mpa.
- Step 14:** Once is cleared (concrete strength achieved) remove water from well and seal internal voids to prevent further ingress of groundwater.
- Step 15:** Form up final ring lift and pour concrete lift ring to ground level. This pour represents a hold point until concrete has cured to strength of >32mpa.
- Step 16:** Once hold point is cleared (concrete strength achieved) strip form work and backfill and compact area around well.
- Step 17:** Form up well floor and construct to design drawings.



Steel formwork of lift/cutting ring before concrete pour



Lift/Cutting ring post excavation to sink ring



Steel formwork of lift/cutting ring tied in to lower ring

## 8.17. CONNECTION OF PRODUCT PIPE TO PUMP WELL

Post construction of the pump well the civil contractor will re-establish the wellpoint dewatering system in the area between the pump well and thrust block. The area will then be excavated to depth and trench boxes installed between the flanged ends of the product pipe and the pump well. With the trench boxes in place the well is to be cored to accommodate the connection fittings of the product pipe. The connecting pipework and fittings between the product pipe and pump well will then be installed before the area is backfilled and compacted.

## 9 MARINE METHODOLOGY

### 9.1. PURPOSE

The purpose of this Project Execution Plan is to outline the method of execution by the marine contractor for the marine related works.

This Marine Methodology has been developed to provide guidance on the management and execution of the services to be conducted on behalf of Pipeline Drillers Group. It includes the following information:

- Overall Method Statement,
- Work Scope Job Steps, and
- Organisational Roles and Responsibilities.

### 9.2. PROJECT SCOPE

The marine contractor's scope of work will include:

- Dive to confirm HDD punch out location and state
- Prepositioning of modular barge stinger arrangement and set moorings
- Preposition of set moorings for AMS Shine
- Transportation of concrete block mattresses, diffusers and assembly joints
- Winching of pre-welding pipe string into position for pullback
- Offshore stringing management
- Recovery of HDD BHA onto modular barge stinger
- Assistance with connection pre-welding pipe string to BHA for pullback
- String management during pipeline pullback
- Diver for diffuser attachment and concrete block mattress placement
- Dive for final as-built record and logs

#### 9.2.1. Project Controls

On commencement of Marine Operations all parties involved will be required to undertake project hazard discussion to finalise sequence, undertake detailed risk assessments and formalise the execution of the detailed methodology.

The marine contractor will manage the scope utilizing a number of tools with respect to communications, meetings and reporting.

This will include:

- Bi-weekly meetings;
- Regular (Bi-weekly) Progress updates in the form of Supplier Document Register update and Project Execution Schedule Status;
- Identification and tracking of key interface issues and actions;

- Establishment of an offshore execution schedule incorporating and working with PDG on a mutually agreed integrated schedule.

## 9.2.2. Sub-Contractor Management

For this project, the marine works will be undertaken solely by the marine contractor without the assistance of subcontractors for any elements of the work.

## 9.2.3. Engineering

The marine contractor will work closely with Pipeline Drillers Group to ensure the technical requirements are met through the relevant engineering input throughout the project and delivery of the scope.

The Engineering team will be responsible for the early delivery of the project procedures to allow timely reviews and performance of the HAZID's and subsequent close-outs. Through this process any specific engineering requirements to complete the scope will be identified and performed to allow the design of equipment and installation tooling.

Engineering will be completed with the full knowledge of the Vessel parameters and input from the marine and diving personnel, ensuring that the solutions are practical and effective.

The following Engineering Tasks will be prioritised in the schedule:

- Identification of the project equipment (winch) and installation aids and associated design requirements,
- Development of the key Project Plans including Diving Project Plan (DPP), Emergency Response Plan, Inspection and Test Plan and other project specific Documentation,
- Co-operation with Pipeline Drillers Group and its interfaces to allow input to key documentation,
- Input into the component designs (Pull-Heads), and
- Compilation and issue of the Close-Out report (COR).

## 9.3. ORGANISATION ROLES AND RESPONSIBILITIES

### 9.3.1. PDG Superintendent

The marine contractor will take direction from Pipeline Drillers Group Superintendent. The Superintendent is responsible for ensuring that the executions of both onshore and offshore operations are performed in a manner that meets the safety and environmental requirements of Pipeline Drillers Group. The Superintendent shall ensure prompt documentation and investigation, by the relevant parties, of any incidents which may occur. The Pipeline Drillers Group Superintendent is responsible for technical input, confirmation of isolations, and advice on technical aspects of the work procedure, permit coordination and issues.

No work shall commence on site without the approval of the Superintendent.

### 9.3.2. Offshore Manager / Superintendent

The Offshore Manager reports directly to the Pipeline Drillers Group Superintendent and must work closely with the Superintendent.

Before the start of the operation the Superintendent shall:

- a) Assist in the selection, mobilisation and training of personnel.
- b) Be familiar with:
  - The operation and check the procedures to ensure that they comply both with legal and PDG safety standards
  - HSE Management Plan and Offshore Operations Manual, prepare checklists, and / or verify existing checklists.
  - Emergency Response Procedures.
- c) Work with the other Supervisors and members of the crew to ensure a smooth operation.
- d) Refer any problems outside his area of responsibility to the Project Manager or the Subsea Operations Manager. During the operation, the Superintendent shall:

Ensure all operations are conducted safely and in accordance with legal and company requirements.

- a) Maintain full records of all operations carried out on his shift.
- b) Liaise with the all personnel.
- c) Ensure a smooth handover at shift changes.
- d) Encourage safe working practices on his shift and monitor the performance of the project crew.

At the end of the operation the Diving Superintendent shall:

- a) Assist in the demobilisation
- b) Assist in the preparation of any final reports.
- c) Attend any debriefing.

The Superintendent's general responsibilities are to ensure the safety of the offshore team and any other persons who may be engaged in the operation and to complete the work to the satisfaction of the Client.

Safety is the prime concern and the Superintendent shall never deviate from proper protocol to reduce time in a manner which may increase the risks of an already dangerous occupation. At the same time, the Superintendent should realise that no regulation or procedure can cover every situation. Experience, clear thinking and common sense are all essential.

The Superintendent shall:

- a) Be fully conversant with:
  - All appropriate regulations, including general safety legislation and employment legislation.
  - BMSD processes and procedures and Company IMS.
  - All relevant Safety Notices.
  - The safe use of all plant and equipment under his control.
- b) Carry out all practicable recommendations where they comply with Company policy and have access to the relevant parts of the BMSD operations rules.
- c) Ensure that safety procedures are followed and encourage a safe attitude to work in the diving team.
- d) Report and investigate all accidents and incidents. Take any necessary action to prevent a recurrence.

- e) Know the experience and ability of the members of the diving team and take this into consideration when planning the operation.
- f) Brief the whole offshore team on the planned operation and ensure that each member is aware of their responsibilities.

### 9.3.3. Diving Supervisor

The Diving Supervisors reports directly to the Diving/Offshore Superintendent and must work closely with the CSR and Offshore Engineer. The responsibilities of the BMSD Diving Supervisor are laid down within BMSD-T3-001 DSMS 5.3.5 Diving Supervisor Although only the Client shall define the work to be done, only the Diving Supervisor may make the decision to dive.

Before the start of the operation the Diving Supervisor shall:

- a) Be presented with a signed Letter of Appointment
- b) Assist in the selection, mobilization and training of personnel.
- c) Be familiar with:
  - The operation and check the procedures to ensure that they comply both with legal and company safety standards
  - DSMS, DPP and Diving Operations Manual, prepare checklists, and / or verify existing checklists.
  - Emergency Procedures.
- d) Work with the other Supervisors and members of the diving crew to ensure a smooth start to the operation.
- e) Refer any problems outside his area of responsibility to the BMSD Project Manager or the Subsea Operations Manager.

During the operation, the Diving Supervisor shall:

- f) Conduct all diving operations safely and in accordance with legal and company requirements.
- g) Maintain full records of all operations carried out on his shift.
- h) Liaise with the CSR / OIM / PIC / Vessel Master.
- i) Ensure a smooth handover at shift changes.
- j) Encourage safe working practices on his shift and monitor the performance of the diving crew.

At the end of the operation the Diving Supervisor shall:

- a) Assist in the demobilisation
- b) Assist in the preparation of any final reports.
- c) Attend any debriefing.

The Diving Supervisor's general responsibilities are to ensure the safety of the diving team and any other persons who may be engaged in the operation and to complete the work to the satisfaction of the Client. Safety of the diver and crew is the primary concern for the Diving Supervisor. The Supervisor shall never take short cuts, or allow any activity which may increase the risks of an already complex occupation. At the same time, he should realise that no regulation or procedure can cover every situation. Experience, clear thinking and common sense are all essential.

The Diving Supervisor shall:

- a) Be fully conversant with:
  - All appropriate regulations, including general safety legislation and employment legislation.
  - BMSD processes and procedures and Company IMS.
  - All relevant Safety Notices.
  - The safe use of all plant and equipment under his control.
- b) Carry out all practicable recommendations where they comply with Company policy and have access to the relevant parts of the BMSD diving rules.
- c) Ensure that safety procedures are followed and encourage a safe attitude to work in the diving team.
- d) Report and investigate all accidents and incidents. Take any necessary action to prevent a recurrence.
- e) Know the experience and ability of the members of the diving team and take this into consideration when planning the operation.
- f) Brief the whole diving team, including non-diving personnel on the planned operation and ensure that each member is aware of their responsibilities.

#### 9.3.4. Vessel Master

The Master reports primarily to the assigned Marine Superintendent and where necessary the Designated Person Ashore (DPA) for matters concerning safety and the Company Security Officer for matters relating to security of the crew and vessel. The Master's primary responsibility is to the safety of his/her crew and vessel. NO commercial consideration shall ever affect his/her decisions in relation to personnel or vessel safety. The Master has the ultimate responsibility and authority to stop any operation where safety and health of personnel is at increased risk and has the full support of the senior management.

The Master has direct responsibility and ultimate authority for:

- Ensuring that the vessel is navigated, operated and maintained in accordance with Flag and statutory rules and regulations.
- All matters affecting the safety of the crew, passengers and or subcontractors including the security of the vessel and cargo
- Motivating the crew where necessary to adhere to Company Policies and procedures onboard the vessel
- Writing, maintaining and issuing standing orders / night orders and providing direction for all crew members.
- Reviewing the effectiveness of the Vessel SMS procedures and report any deficiencies or areas of improvement.
- Ensuring that all crew are qualified to serve in the position for which they have been appointed onboard the vessel and verify validity of crew certificates.
- Ensuring that adequate time and resources are assigned to the following:
- Complying with Company reporting requirements as defined in BM- T3- 001 "Vessel SMS", Section 17 – Vessel Administration & Communication. Maintaining and managing Company Online HSE Database – INX In Control

## 9.4. MARINE SUPPORT METHODOLOGY

### 9.4.1. Pre-Pullback Operation

Once all vessels and barges are on site and anchor spread deployed for the “AMS Shine”, Modular barge and a day mooring installed for the dive vessel “Lonestar” (marine contractor also recommend that a Concrete Block mattress be deployed to assist with preventing bored hole cave in and additional scour protection of the site with the Intake diffuser head and additional pipe protection guarding from recreational vessel anchors to be placed on this concrete mattress), the client supplied pull line will be transferred to the “AMS Shine’s” 25T line pull anchor handling winch via a work punt and with the assistance of the 2 work punts and their custom fabricated bow pipe push pads “Rescue 1” and “Charlie Bill” along with the shoreside excavators and beach rollers, the pipe will be towed to sea with seaward end of pipe raised to the stern of the “AMS Shine” for later ballasting.

Step 1 – Position and set on moorings the modular barge stinger arrangement above the HDD punchout.



Step 2 – Position AMS Shine



## 9.4.2. Pipe String Launch and String Assistance

The shoreside pipe end with the assistance of the work punts and divers will then be fed through the modular barge stinger arrangement and in conjunction with the ballasting of the pipe and the weighted stinger being lowered to the correct 10 degree inclination, divers using subsea rigging consisting of choked round slings to the steel pipe ends and chain block will undertake the connection to the drill string for pull back to commence, divers to monitor the first 1 hour of pull back to ensure all systems operational and pipe running freely.

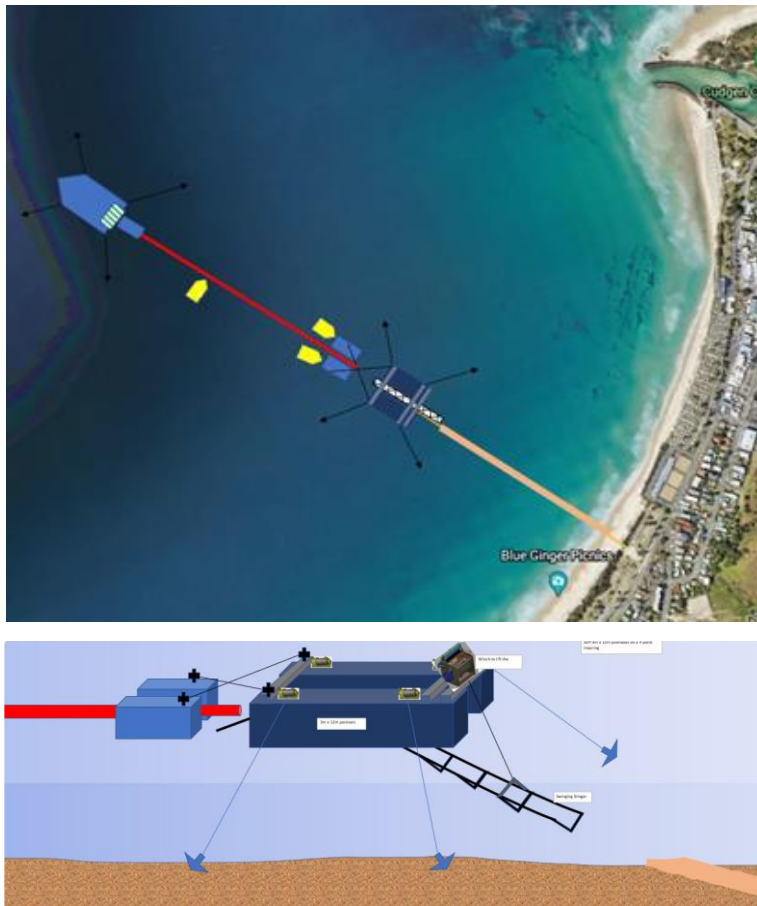
Step 3 - Beach pull pre-welded product pipe from the onshore stringing and welding area out to sea stringing position.



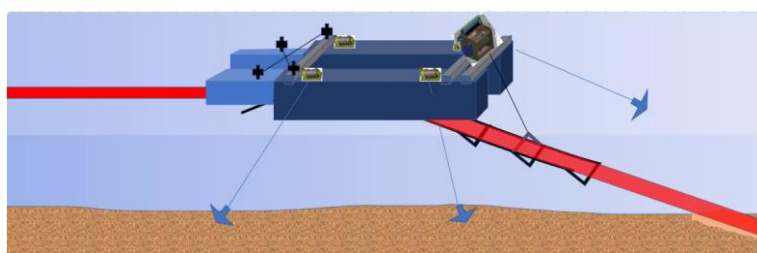
Step 4 - Work punts assist with floating pipe into position and alignment with the HDD punchout.



Step 5 – Connection with modular barge stinger arrangement, ready for pullback.



Step 6 – Connection of pipe pulling head to BHA Assembly and commence pullback



Depending on the duration of these steps and the speed of pull back, divers are then to assist with maintaining pipe alignment whilst the work punt crew undertake a crew change as per the marine contractor's fatigue management guidelines once the work punt crew change has been completed, Divers to also be transferred to shore for rest period. "AMS Shine" crew to be undertaking staggered shifts for winch out operations.

Pipe pull back continues.

As the seaward end of the pipe nears the Modular Barge the Divers will be transferred back to site and monitor the final positioning of the end of the pipe, notifying both the shoreside pull back team and the "AMS Shine" of an "all stop" as a predetermined pipe mark enters the bored hole.

Disconnection of the “AMS Shines” winch will be undertaken by divers and the end of the pipe will be secured to the concrete mattress if installed or clump weights to prevent wave/current action damaging the pipe or pipe alignment with the hole.

All personnel to stand down for rest period.

### 9.4.3. Diffuser Installation

Work punts will then relocate the modular barge to the Day Mooring whilst the “AMS Shine” (guided by ROV or Subsea camera) lowers the Intake Diffuser head and armoured pipe to sea floor for Diver connection.

Divers to undertake connection of pipe, once connected marine contractor recommend placement of Concrete Guarding for Pipe protection to ensure vessel anchors cannot contact the pipe.

Step 7 – Diffuser attachment with Dive vessel alongside the AMS Shine.



9.5. MARINE EQUIPMENT



**OVERVIEW**

Tank Capacities	
Fuel	141.2m <sup>3</sup>
Fresh Water	53.7m <sup>3</sup>
Water Ballast	38.6m <sup>3</sup>
Waste Oil	2.0m <sup>3</sup>
Sullage	Sewage treatment plant 4.5m <sup>3</sup> Holding Tank
Grey Water	4.8m <sup>3</sup>
Fuel Transfer Pump	1 x Fuel Pump 25m <sup>3</sup> / Hr
Bilge and Ballast Pump	1 x Ball/Bilge Pump 1 x GS Pump
Fire Pump	1 x Fire G/S Pump 2 x FW/SW Pump

Deck Machinery	
Anchor Handling Winch	1 x 25T Single Drum
Anchor Windlass	2 x Elec / Hyd 2T Windlass
Shark Jaws	MKB FTP 35T
Towing Pins	MKB FTP 35T
Towing Hook	30T Quick Release
Stern Roller	Bow and Stern Roller
Deck Crane	2 x Fassi F1100 RAFM 8T @ 11.25m



# CHARLIE BILL

ALUMINIUM WORK BARGE

VESSEL SPECIFICATION SHEET

## OVERVIEW

Specifications	
Survey Class	2D NSCV
Dimensions	
Length	11.95m
Beam	3.1m
Depth	1.2m
Deck Loading	1T/m <sup>2</sup>
Machinery	
Main Engines	2 x 150HP Outboards

Crew	
1 - 6 persons	
Operational Performance	
Full Operating Speed	15 Knots
Economic Operating Speed / Consumption	10 Knots / 75L/Hr
Consumption at Idle	9.3L/HR

# RESCUE 1

Workboat

VESSEL SPECIFICATION SHEET



## OVERVIEW

Primary Specification	
Registry	AMSA
Class	2D
Year Built	2017
Official Number/Unique Identifier	9669
Length (Overall)	6.84 m
Breadth	2.32 m
Depth	0.875 m
Draft	0.20 m
Max Passengers	10 pax + 2 crew
Tank Capacities	
Fuel	150L
Bilge and Ballast Pump	Yes

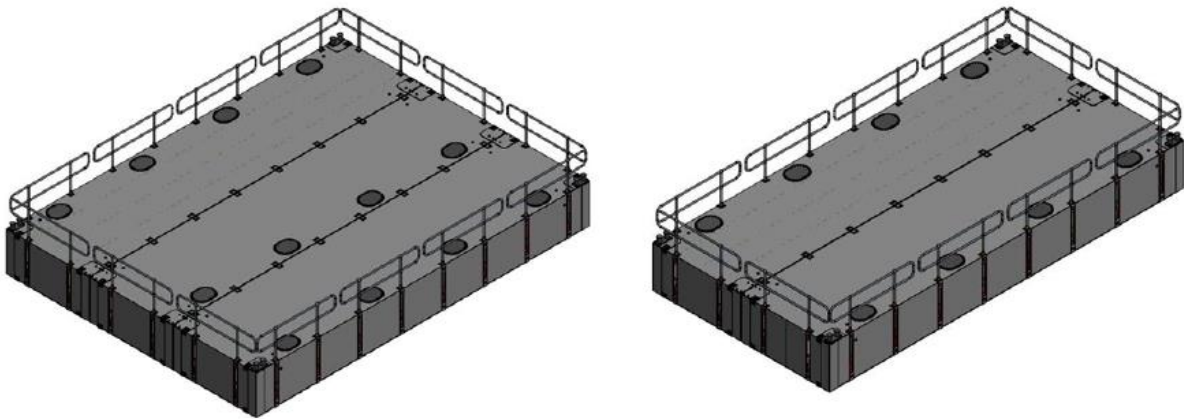
Machinery	
Main Engines	2 x Yamaha F115LB 115 HP
Operational Performance	
Full Operating Speed	30 knots
Economic Operating Speed	20 knots



# MODULAR BARGE

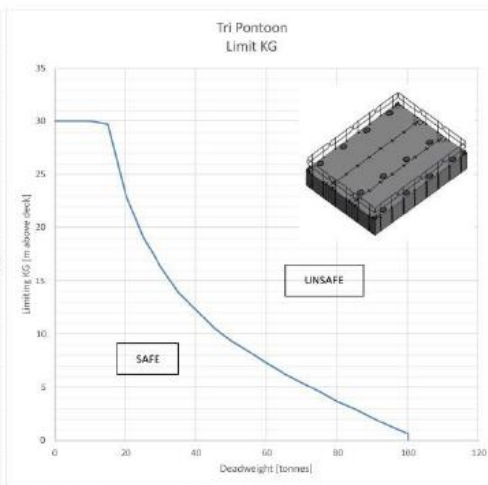
Configurable pontoon barge

VESSEL SPECIFICATION SHEET



## OVERVIEW

Primary Specification	Single Pontoon Specs
Design	Modular Pontoon Barge
Flag	Australia
Survey	2D / 2E
Displacement	9.52T
Max DWT	60T (Twin pontoon arrangement)
Length	12.19m
Moulded Breadth	3.05m
Moulded Depth	1.4
Draft	0.4m
Deck strength	4t/m2



## 10 ENVIRONMENTAL MANAGEMENT PLANS

Pipeline Drillers Group operates within the requirements of applicable Local, State and Federal environmental regulations, the conditions of approvals gained for the Project and its Environmental Management System 140001. Pipeline Drillers Group is committed to minimising or eliminating adverse effects of its operations and activities.

The ultimate environmental goals for the Project include:

- Compliance with environmental law.
- Maintaining and/or establishing open and transparent processes for stakeholders to help address key concerns.
- Adherence to conditions of approvals and approval commitments.
- Practicable minimisation of environmental impacts and disturbances.
- Provision of operational guidance in the form of procedures and instructions to ensure that activities are performed in an environmentally sensitive, planned, systematic and efficient manner.
- Promotion of environmental awareness and participation of all personnel.

Environmental Management Plans specific to the Seawater Supply Pipeline Project have been developed by each Pipeline Drillers Group with the aide of the marine contractor. These plans will be approved and implemented prior to mobilisation to site and included into the Project audit schedule for review on a regular basis.

This Plan will provide an overview of the contractor's environmental management system including relevant processes and supporting documents and shall detail how work is to be performed to deliver the targeted Project requirements. They shall also detail how environmental aspects will be managed including:

- Control of dust emissions,
- Measures to reduce the transfer of site mud to roads,
- Control of noise,
- Hours of operation,
- Erosion control, storm water runoff,
- Management of fuels, oils and hazardous chemicals,
- Minimise the generation of solid waste, and collection and disposal,
- Protection of flora and fauna,
- Minimise impact on the coastal area.

### 10.1. CONTROL OF OFF-SITE DUST EMISSIONS

Key controls to prevent the generation of dust include measures such as:

- Implementing a stockpile management to ensure that stockpiles and batters are managed to prevent dust generation and sediment run-off through dust suppression.
- Implementing a dust prevention strategy, including ensuring that water and a water truck/sprinklers are available to suppress dust at all times.

- Minimising earthworks to the greatest extent practicable during the drier months of the year, when dust generation is at its greatest.
- Using appropriate techniques to rip and leave large smooth surface areas.
- Ensure all road vehicles carrying dust generating material are covered.

## 10.2. MEASURES TO REDUCE THE TRANSFER OF SITE MUD TO ROADS

All vehicles and equipment leaving site shall have tyres checked for mud build up. If there is excessive mud (so that lumps could fall off onto the Council road) the vehicle shall be directed to the wheel wash down area for cleaning.

**Document Name**

**B5\_Traffic Management Plan**

## 10.3. CONTROL OF NOISE

During construction, unacceptable noise (including vibration) must not be emitted beyond the boundaries of the premises. Key controls for noise measures included in:

**Document Name**

**B3\_Noise Management Plan**

- Undertaking an environmental monitoring program that enables ABLP and the EPA to determine that noise at the boundary is acceptable.
- Ensuring all construction equipment complies with the manufacturers guidelines for noise emissions.
- Informing potentially affected residents by way of letter drop and/or consultation prior to commencement of noise intensive construction works.
- Complying with permitted hours of operation.

## 10.4. HOURS OF OPERATION

The approved hours of construction activity are:

PRE-PROJECT		PROJECT		PIPE PULLBACK	
Monday to Friday	7:00am 6:00pm	Monday to Friday	7:00am 6:00pm	Monday to Friday	Extend hours
Saturday	7:00am 6:00pm	Saturday	7:00am 6:00pm	Saturday	Extend hours
Sunday	N/A	Sunday (with approval)	9:00am 5:00pm	Sunday (with approval)	N/A

Public Holidays	N/A	Public Holidays (with approval)	9:00am 5:00pm	Public Holidays (with approval)	N/A
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(unless otherwise approved by the Department of Planning, Infrastructure and Environment in consultation with neighbours).

## 10.5. EROSION CONTROL

Key erosion control measures include in:

**Document Name**

**B1\_Erosion and Sediment Control Plan**

- Developing an erosion and sediment control plan prior to the commencement of construction.
- Commencing installation of erosion and sediment control measures before the start of earthworks.
- Monitoring the effectiveness of sediment control devices through an adequate inspection, maintenance and cleaning program. Inspections, particularly during storms, will show whether devices are operating effectively. Where a device proves inadequate, it should be quickly redesigned to make it effective.
- Developing contingency plans for unusual storm events.

## 10.6. STORM WATER RUNOFF

During construction, mitigation measures will be undertaken in order to minimise the quantity of, and manage the quality of, stormwater discharged from the site, these include:

- Clean stormwater will be diverted away from those parts of the site where soil is to be exposed wherever practicable. This will be done by requiring the construction of diversion banks and intercept drains around the site while ensuring that the water discharging from such banks or drains is disposed of without causing erosion.
- Where practicable, the new components of the stormwater drainage system will be installed before associated land disturbance activities commence and on-site inlets will not be connected until the site has been stabilised and rehabilitated. This will reduce the potential for silt-laden stormwater to escape the site and pollute surface waters. The retained water will require onsite treatment.
- Water velocities will be minimised over exposed soil to reduce the rate of erosion.
- Natural drainage lines that discharge water on to the top of a slope will be directed to grassed areas or appropriately designed intercept drains to reduce the erosion of slopes.
- Perimeter banks or sediment fences will be constructed at the toe of the slope to contain sediment run-off.

Key erosion control measures include in:

**Document Name**

**B1\_Erosion and Sediment Control Plan**

## 11 INSPECTION AND TEST PLAN

Works on the Seawater Supply Pipeline project shall be performed in accordance with the relevant inspection and test plans. Inspection and test plans detail the acceptance criteria for each applicable process of the HDD works and list the relevant specifications, inspection procedures, test frequency, inspection characteristics, and subsequent verifying records, including but not limited to:

- Compliance checks with HDD preparation, execution, inspection, and testing procedures and plans
- Compliance checks with technical queries and responses
- Validation of material certificates
- Validation of inspection and test certificates
- Validation of qualification test certificates
- Validation of personnel qualification records
- Evidence of survey reports
- Evidence of safety/environmental records
- Evidence of traceability procedures and records
- Evidence of testing procedures, including test equipment calibration certificates
- Captured daily drilling and mud monitoring logs
- Captured daily steering and pilot hole logs
- Captured daily pressure sub logs
- Evidence of construction equipment compliance, including drill rig, monitoring equipment, etcetera.

## 12 DAILY REPORTING

The HDD Superintendent shall prepare and submit on a daily basis a report capturing site details including crew, equipment, progress, measured depth, previous progress, total progress, issues, and safety and environmental incidents.

The information from the HDD Superintendent will then be distilled by the Site Engineer into the Australia Bay Lobster Producers approved daily report format, which captures the HDD site and other work areas' specific progress reportable, including but not limited to:

- General observations and progress
- HSEQ Report, including man hours
- The day's construction activities
- Distance drilled and cumulative distance
- Drilling fluid product volumes used and cumulative
- Fuel used and cumulative
- Fresh water used and cumulative
- Waste disposal volumes
- Interpretation and comment on current drilling conditions
- Planned activities for the next 24 hours
- Weather conditions
- Visitors
- Plant, labour, and equipment
- Minutes of meetings
- Drill string axial and torsional loads per joint
- Drilling fluids discharge rate and pressure, viscosity, sand content, mud weight in/out per hour
- Survey tabulation sheet for recording joint by joint survey readings and calculations
- Joint by joint radius of curvature calculations made over various radii segment lengths.

In addition to this information, detailed site logs shall be held onsite. These datasets will include but not be limited to logs recording drilling parameters, down hole survey records, casing tally, detail and drilling fluid parameters, etcetera.

Refer to project report templates:

Document Name
DRILL LOG
DAILY REPORT
MONTHLY REPORT

## 13 APPENDIX A – STEERING PROCEDURE

### 13.1. SURVEY OVERVIEW

The surveying equipment and techniques proposed in this method have been selected with due consideration of the particular surface and geotechnical conditions.

The methods proposed will allow for optimum tracking of the drill bit during the drilling process, so that the position of the bit will be known at all times in relation to the proposed profile.

The inclination throughout the drill will be available to the Driller in real time, which will optimise the borehole grades and prevent introduction of dips.

### 13.2. SURVEY OPERATION

During the drilling process, survey will be taken at the bottom of each joint drilled. The course length of each survey will be defined by the length of the drill pipe and will be approximately 9.2-9.7 metres for each pipe.

The frequency of the surveys may be increased to include half joint surveys in sections of higher interference or to provide more steering feedback; such will be at the discretion of the Steerer.

The procedure for each survey point will be as follows:

No.	Task
1	Drill down to the bottom of the joint (drill pipe).
2	Shut off mud flow and rotate drill string to highside.
3	Check real time data for quality.
4	Take survey.
5	Check survey data for quality (optional secondary data checks).
6	If survey is good, make connection.
7	If survey is outside the acceptable limits, then repeat steps 5 through 7 until an acceptable survey is achieved.

### 13.3. DOWNHOLE SURVEYING – P2 SYSTEM

#### 13.3.1. Description of the System

The AC Beacon consists of two wire wound coil solenoids mounted bi-axially on a non-magnetic table.

Power to the AC Beacon is supplied via a 12 V DC deep discharge battery, which under normal drilling conditions is good for around 12 hours of operation.

Typically, the Beacon is oriented with a Total Station to a known azimuth, either the line or actual drill azimuth, and is placed either on or offset to the drill path.

Once the Beacon has been energised, it generates a known AC magnetic field. As the Beacon is in effect a point source, the generated field can be modelled accurately, allowing for an accurate determination of the steering tool position.

Depending on the signal to noise ratio, it is possible to track up to 70m away from the Beacon, allowing in effect for a 140m tracking window.

In these cases the expected range is expected to be 70 m (140 m total) due to the expected low signal to noise ratio.

### 13.3.2. Technique

It is proposed to use three separate downhole surveying techniques to achieve the accuracy required for this hole. The three methods/techniques have been selected after considering all available surveying methods, and are as follows:

1. Magnetic steering tool utilising the Vector Magnetics P2 Magnetic Steering Tool
2. Solenoid tracking utilising the Vector Magnetics AC Beacon system.

Position and pressure will be continuously monitored throughout the drilling process.

Position will be monitored per joint in the PT2 software package (always accessible) and also in spreadsheet form showing deviations from designed profile, radii, etc. The final as-built will be in the format of a drawing and a spreadsheet.

The HDD Engineer/Designer will calculate minimum pressure via hydrofracture analysis (see Hydrofracture Calculation) required for hole cleaning and maximum allowable pressure to avoid frac out. As drilling progresses, records are made in Excel form.

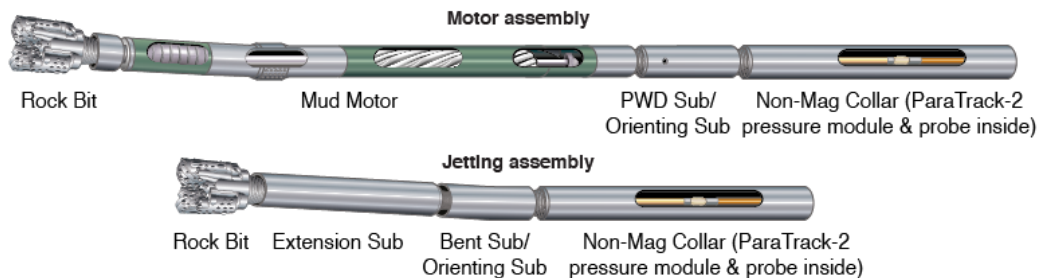


Figure 3: Paratrack 2 BHA Configuration Motor and Jetting Assemblies

#### *Paratrack 2 AC Beacon Survey System*

The Paratrack 2 system requires a local based co-ordinate system based on a reference azimuth. This is usually the line azimuth and is the line between entry point and exit point. Positions measured by the Paratrack 2 system are defined by the distance along this line (Away), the distance to the right of the line (Right), and the elevation.

Each beacon location needs to be pegged. These pegs will be placed so as to provide the maximum accuracy achievable.

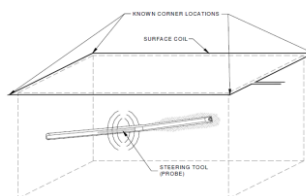


Figure 4: PRCI Figure 1-4 – Surface Monitoring System

As the accuracy of the system relies on the accurate positioning of the beacon itself, it is important that the beacon survey locations are defined as accurately as possible. The beacon locations will be pegged out and then picked up by a land surveyor. The grid co-ordinates as supplied by the land surveyor can then be translated into the Away, Right and Elevation co-ordinate system for entry into the Vector software.

The solenoid beacon can be placed anywhere that is convenient along the drill path. Typically, it is placed on the centre line and orientated along the entry to exit line.

As the footprint of the tool is small, it enables the operator to place the solenoid right up against structures or features that may eliminate the possibility of running a conventional wire.

The DC power supply for the solenoid will be provided by a 12v battery.



Figure 5: AC Beacon in Operation

## 14 APPENDIX B – CONTINGENCY PLAN

Pipeline Drillers Group has identified the potential risks to successful constructability. Each contingency category is discussed in brief in this section.

Contingency	Description
<p><b>Loss of Drilling Fluid Returns/ Drilling Fluid Circulation</b></p>	<p>Loss of drilling fluid, either predicted or unanticipated, is responded to in accordance with the response plan in the Drilling Fluid Management Plan. The plan includes procedures for the use of LCMs and for occurrence of loss in accessible and inaccessible areas.</p> <p>Prevention is key to prevent losses to surface, with the key design feature for such being sufficient vertical depth of cover, to maximise the overburden potential.</p> <p>Loss of drilling fluid returns are expected by Pipeline Drillers Group, as completed hydrofracture analysis predicts that returns will not be able to be maintained in some areas due to the ground conditions and limited cover. As a result of this information, Pipeline Drillers Group will prepare for losses from this measured depth until the exit point. This expected loss is acceptable on land.</p> <p>Control measures to prevent the potential will be implemented, where possible, including:</p> <ul style="list-style-type: none"> <li>• Reduction in the mud pump rate, and</li> <li>• Swabbing of the annulus to attempt to maintain returns.</li> </ul> <p>Note, these control measures may limit the ability to steer the vertical radius. The most effective measure in such a case is to complete the borehole and establish an exit side pit so that drilling fluids can more easily return to surface.</p> <p>Drilling of the pilot hole will be continued to the exit point while loss of drilling fluid is controlled and recovered. Once exit is reached and the borehole is completed, downhole pressure will be relieved, thereby stopping the losses of fluid. Once the borehole is open at either end of the crossing, full drilling fluid circulation can then be re-established, with fluids returning to surface via the annular space on both entry and exit sides. Reaming of the borehole can then commence.</p> <p>At the completion of pilot hole, once drilling fluid losses to surface have completely ceased, a more thorough remediation of the fluid release area can be undertaken.</p>
<p><b>Stuck Conductor Casing Pipe</b></p>	<p>Conductor Casing will not be utilised for the specific HDD project construction works.</p>
<p><b>Steering Off Course</b></p>	<p>Steering off course can be defined as:</p> <ul style="list-style-type: none"> <li>• Loss of alignment</li> <li>• Side tracking</li> <li>• Drilling tolerances exceeded.</li> </ul> <p>To minimise the potential for steering off course, drilling is to be surveyed with a Paratrack steering tool, which enables continuous monitoring of the borehole profile and alignment.</p> <p>As the BHA is both stiff and stabilised, it is seen as unlikely that any significant loss of angle will occur. Steering angles are to be kept to a minimum, wherever possible. Unforeseen drops or increases in angle may occur due to ground conditions such as voids, significant variance in layer strength, or soils with N=0 strength.</p> <p>In the case of doglegs too severe for recovery, a redesign of the HDD profile and alignment and redrill may be required.</p> <p>A Dogleg would be defined for 3 joints as less than 200m radii for 5" drill pipe, and as less than 300m radii for 6 5/8" drill pipe. The prescribed reaming diameter will also allow additional space for production pipe minimum bend radii. However, a dogleg of this size is extremely unlikely using a stiff assembly as it would require aggressive steering, would have to be deliberate in action, and would be difficult to achieve. A dogleg has an extremely low risk of occurrence using prescribed methodology in the known geotechnical conditions.</p>

Contingency	Description
<p><b>Steering Equipment Failure</b></p>	<p>Failures in the steering equipment must be rectified prior to the continuation of drilling to avoid steering out of tolerance. Tracking must be maintained to validate the pilot hole/bit location.</p> <ul style="list-style-type: none"> <li>• Wireline Failure</li> </ul> <p>Two types of fault in the signal wire to the HDD steering tool (P2 and Gyro) are possible. These are:</p> <ul style="list-style-type: none"> <li>- Short circuit</li> <li>- Open circuit.</li> </ul> <p>Amperage changes as a result of signal wire failure are as follows:</p> <ul style="list-style-type: none"> <li>- A short circuit will create an increase in the amperage seen at surface</li> <li>- An open circuit will cause a drop in amperage.</li> <li>- If an open circuit is located downhole, a small amperage reading will be evident at surface, as the signal can be transmitted through water</li> <li>- A complete dry open circuit results in no reading at all, with the problem to be found somewhere on surface.</li> </ul> <p>The first step is to determine whether the fault is downhole or uphole, which is completed by connecting test wires from the interface box directly down the hole, bypassing all surface wiring. The positive wire is then connected to the direct wire in the pipe, and the negative wire is taped to a clean section of pipe, ensuring this section of pipe is clean by using a wire brush. Once the problem is identified, a visual inspection of either the wire on surface or the wire downhole shall be done whilst tripping out of hole, and the problem rectified prior to continuation of drilling.</p> <ul style="list-style-type: none"> <li>• Steering Tool Failure</li> </ul> <p>Steering tools are specialist pieces of equipment, and repairs will not be able to be completed onsite. The steering tool will also be tested on surface prior to running into hole. Secondary steering tools may be mobilised as required by the steering contractor.</p> <ul style="list-style-type: none"> <li>• Pressure Sub Failure</li> </ul> <p>The pressure sub is part of the BHA. It measures annular pressure and transmits this data back to surface. It is used to monitor annular pressure against a fracture gradient (hydrofracture analysis) to minimise the potential for frac out at surface.</p> <p>A pressure sub can fail or read incorrectly due to blocked inlets or due to mechanical failure. If the sub is observed to fail, it will be tripped out of hole and inspected. If the ports cannot be unblocked or if this is deemed not to be the problem, a spare pressure sub will be mobilised and tripped back into hole whilst the issue with the other is diagnosed and resolved.</p> <p>Pressure subs are generally very reliable pieces of equipment, and failure of such an item is deemed unlikely to occur.</p>
<p><b>Pipeline Abandonment</b></p>	<p>In the unlikely event of an inability to complete pilot hole drilling or otherwise complete a borehole, abandonment of the borehole to date, as well as a redesign of the HDD profile and alignment and redrill, may be required.</p>
<p><b>Stuck BHA</b></p>	<p>A BHA gets stuck downhole when either the torque or the push/pull load necessary to move the tool or drill string is higher than that of the output of the drilling rig. There are several ways by which a BHA may become stuck downhole during drilling operations. These have been identified as:</p> <ul style="list-style-type: none"> <li>• Key Seating of Hole</li> </ul> <p>Key seating is a major cause of mechanical pipe sticking. It consists of a groove being cut into the low side of the hole caused by drill string rotation with a side force acting upon it. In the case of severe key seating, it is possible for the drill string to become stuck. It is generally found that if a key seating problem has occurred, it is possible to withdraw several pipe joints before getting stuck.</p> <p>Due to the length of the holes and corresponding drilling time, it is unlikely that key seating will be an issue during the HDD; however, if mechanical sticking occurs due to key seating,</p>

Contingency	Description
	<p>the string will be tripped out of hole until torque returns to normal levels, and drilling will resume on the free string.</p> <p>Recovery measures of the borehole will be implemented, and review of the drilling profile will be completed by the Engineering Team.</p> <ul style="list-style-type: none"> <li>Poor Drilling Fluid Properties</li> </ul> <p>Drilling fluid properties are to be managed in accordance with the Drilling Fluid Management Plan target properties in order to achieve adequate hole cleaning.</p> <p>The Mud Hand will be onsite for the duration of HDD operations for continuous monitoring and to make informed corrections to the drilling fluid properties. Surplus drilling fluid make up material and contingency products will be immediately available onsite for necessary fluid property corrections.</p> <ul style="list-style-type: none"> <li>Doglegs</li> </ul> <p>Boreholes are designed to have a large radius; however, during drilling, doglegs may occur at points along the borehole. To mitigate this, Pipeline Drillers Group recommends taking surveys continuously while drilling to minimise the effects of potentially steering offline and having to recover.</p> <p>A Dogleg would be defined for 3 joints as less than 200m radii for 5" drill pipe, and as less than 300m radii for 6 5/8" drill pipe. The prescribed reaming diameter will also allow additional space for production pipe minimum bend radii. However, a dogleg of this size is extremely unlikely using a stiff assembly as it would require aggressive steering, would have to be deliberate in action and be difficult to achieve. A dogleg has an extremely low risk of occurrence using prescribed methodology in the known geotechnical conditions.</p> <p>In the case of doglegs too severe for recovery, a redesign of the HDD profile and alignment and redrill may be required.</p> <ul style="list-style-type: none"> <li>Geological Issues</li> </ul>
<p><b>Cementing of Weak Zones</b></p>	<p>Weak zones can be encountered, resulting in excessive fluid loss. To address this issue, cementing of weak zones via use of LCM may be completed.</p> <p>Grouting is not recommended in soft ground conditions as the difference between the natural soil strength and grout mix can cause significant steering deviations.</p> <p>Grouting is not recommended due to the inability to pressurise the borehole to ensure grout is injected into the weak zones, resulting in the grout flowing along the bottom of the borehole further impacting normal drilling operations. Preventative adoption of good borehole design and good drilling practices is the optimal contingency measure for weak zones impacting the constructability of the HDD crossing.</p>
<p><b>Downhole Tooling Failures</b></p>	<ul style="list-style-type: none"> <li>Twist off due to excessive torque</li> </ul> <p>Twist off of a drill string occurs when the induced shearing stress caused by high torque exceeds the pipe material ultimate shear stress. To minimise the possibility of twist off, torque shall be monitored by the Driller, and if it becomes too high, the Driller is to pull back and attempt to clean the hole before continuing drilling operations.</p> <p>In the event of twist off, the free string will be tripped out of hole, and the point at which the twist off has occurred will be identified and marked on the profile drawing. Dependent on the type of connection at twist off and hole size, a fishing tool to retrieve the string will be selected via consultation with the Driller, HDD Superintendent, and HDD Engineer. Fishing operations will then commence and will continue until the string is successfully retrieved or instruction is given by Australia Bay Lobster Producers to cease fishing operations.</p> <p>Pipeline Drillers Group will transport some additional joints of drill pipe to site to allow for replacement of pipes if failure does occur. Pipeline Drillers Group personnel shall also conduct visual inspection of drill pipe as it enters and exits the hole to ensure no damage has been caused during the drilling process, with particular attention to be paid to the threads at either end of the drill pipe.</p> <ul style="list-style-type: none"> <li>Bits and Reamer Failure</li> </ul>

Contingency	Description
	<p>The most likely bit or reamer failure relates to:</p> <ul style="list-style-type: none"> <li>- Blockage or wash out of jets</li> <li>- Seized or worn cutters and body wear</li> <li>- Loss of cutters/cones.</li> </ul> <p>In such a case, the Driller is to take corrective action immediately. Any rotary action should cease, and tripping out to check tooling status shall commence. The Driller is to inspect the tool before electing on tool replacement, repair works, or to continue drilling.</p>
<b>Mechanical Equipment Breakdown</b>	<p>Surface equipment failure has the potential to significantly delay the drilling process. Contingencies will be developed and implemented for such occurrences as per the remainder of this section.</p> <ul style="list-style-type: none"> <li>• Electrical Component Failure</li> </ul> <p>Electrical component failure can be broken down into the following scenarios:</p> <ul style="list-style-type: none"> <li>- Wiring failures</li> <li>- Gen set failures</li> <li>- Switchboard failures</li> <li>- Earthing failures.</li> </ul> <p>Qualified electrical contractors shall conduct all installations, troubleshooting and repairs for the HDD site. They are to comply with the following electrical tagging and isolation procedures:</p> <ul style="list-style-type: none"> <li>- Electrical Safety and Testing of Electrical Equipment</li> <li>- Isolation, Lockout and Out of Service Procedure.</li> <li>• Mixing System Failure</li> </ul> <p>The main causes of a mixing system failure on the mud system are as follows:</p> <ul style="list-style-type: none"> <li>- Tank piping failure</li> <li>- Air pump failure</li> <li>- Blocked mixing hoppers</li> <li>- Low pressure pump failure</li> <li>- Valve failure</li> <li>- Agitator failure.</li> </ul> <p>All equipment is to be serviced to manufacturers' specifications at intervals specified by the manufacturer, but also during periods of non-drilling time while onsite.</p> <p>Tank piping has the same failure scenarios as most other piping, such as:</p> <ul style="list-style-type: none"> <li>- Internal erosion</li> <li>- Physical impact</li> <li>- Coupling leak/failure.</li> </ul> <p>Equipment on site is generally provided for in redundancy. Power pumps come with spares for completion of overhauls. There will also be spare pumps available in the case of extended downtime.</p> <p>If a low pressure pump fails in the mud system, it is able to be isolated and removed, and another pump will be put in place to minimise system downtime.</p> <p>Valves can be isolated and replaced with spares carried onsite.</p> <ul style="list-style-type: none"> <li>• Recycling System Failure</li> </ul> <p>The main causes of failure of the mud system recycling system are as follows:</p> <ul style="list-style-type: none"> <li>- Shaker motor failure</li> <li>- Low pressure return line failure</li> <li>- Screen failure</li> <li>- Cyclone failure</li> </ul>

Contingency	Description
	<ul style="list-style-type: none"> <li>- Pump failure.</li> </ul> <p>A comprehensive spare parts list will be provided on the project for the recycling system, and all components can be isolated and replaced.</p> <p>Screens are consumable items which are likely to wear out in situations where returns are maintained for a long period of time. Pipeline Drillers Group carries spare screens in a variety of sizes to replace those which are damaged or unsuitable. Screen repair and maintenance shall be done in accordance with manufacturers' specifications.</p> <p>It is not uncommon for a cyclone to wear out due to general wear and tear, as they are exposed to liquids of high solid/sand content. The mud system is designed so that cyclones can be isolated and replaced as required.</p> <p>In the event of a pump failure inside the mud recycling system, the pump will be isolated and assessed by mud system technicians before either changing out the pump with a spare or replacing seals of couplings from the list of supplied spares. Spare transfer pumps available onsite can be utilised as an alternative to continue operations while repairs are being undertaken.</p> <ul style="list-style-type: none"> <li>• Power Pack Failure</li> </ul> <p>Main causes of failure for drilling rig power packs are as follows:</p> <ul style="list-style-type: none"> <li>- Hydraulic line/system failure</li> <li>- Engine failure</li> <li>- Hydraulic valve failure</li> <li>- Contaminated hydraulic oil.</li> </ul> <p>In the event of a failure, the rig will be shut down; operations to commence repairs are made by Pipeline Drillers Group personnel.</p> <ul style="list-style-type: none"> <li>• Breakout Failure</li> </ul> <p>The breakout unit on the drilling rig can fail due to the following:</p> <ul style="list-style-type: none"> <li>- Hydraulic failure</li> <li>- Failure of rams</li> <li>- Failure of clamps.</li> </ul> <p>In the case of failure, the breakout unit/s are repaired by Pipeline Drillers Group personnel. Connections in the meantime can be broken with the use of bull tongs.</p> <ul style="list-style-type: none"> <li>• High Pressure Mud Valve Failure</li> </ul> <p>The main cause for high pressure mud valve failure is internal erosion due to high sand content drilling fluid passing through the valve on a regular basis. However, in the event of the high pressure mud valve failure on the drilling rig, drilling operations will cease while a spare valve (carried with the rig) is installed.</p> <ul style="list-style-type: none"> <li>• Top Drive Failure</li> </ul> <p>It is possible for the top drive to become unusable if one of the following failure modes applies:</p> <ul style="list-style-type: none"> <li>- Hydraulic line failure</li> <li>- Hydraulic motor failure</li> <li>- Mud swivel failure</li> <li>- Bearing failure</li> <li>- Valve failure.</li> </ul> <p>In the event of a top drive failure, the rig will be shut down whilst the problem is identified and fixed by Pipeline Drillers Group personnel. Spares for hydraulic line failures will be available onsite.</p> <ul style="list-style-type: none"> <li>• High Pressure Line Failure</li> </ul> <p>The high pressure line could fail due to the following:</p> <ul style="list-style-type: none"> <li>- Valve failure</li> </ul>

Contingency	Description
	<ul style="list-style-type: none"> <li>- Coupling failure</li> <li>- Internal erosion</li> <li>- Physical impact</li> <li>- Blocked line.</li> </ul> <p>To mitigate failure of the high pressure mud lines, high pressure relief valves have been fitted to the mud pumps; these are designed to protect the high pressure lines from increased pressure due to line blockage. The point at which the flexible high pressure line is connected to the high pressure hard line is an area at high risk of failure, and as such, heavy-duty 602 hammer unions are used on these connections, and whip checks are placed on the connection to prevent whip of high pressure lines causing potential injury.</p> <p>The lines are protected from internal erosion by limiting sand content of the drilling fluid to &lt;1% during drilling operations. The lines are protected from physical impact by location in a culvert and covered-in areas unlikely to be interfered with by traffic.</p> <p>In the event of a high pressure line failure, the pumps will be immediately shut down by the Driller from the control cabin and the damage assessed. Spares are held for flexible lines and couplings. During a high pressure line failure it is likely that drilling fluid or water would be spilled on open ground.</p> <ul style="list-style-type: none"> <li>• High Pressure Mud Pump Unit Failure</li> </ul> <p>Major failure could be realised by the following:</p> <ul style="list-style-type: none"> <li>- Engine failure</li> <li>- Gearbox failure</li> <li>- Pump failure.</li> </ul> <p>Pump failure is most likely to be caused by poor mud recycling resulting in high sand content mud, which in turn causes premature wear to the pump system. Foreign objects can damage pump components such as springs, seats, liners and valves; however, inline filters are installed into the pumps to minimise the potential for foreign objects to reach crucial components. The pump inlet/outlet can also become blocked. Pumps are fitted with pressure relief valves to ensure that the rated pressure of the high pressure lines is not exceeded. Unblocking of lines would require the isolation of the point of suspected blockage, pressure bleed out, and tag out/lock out of the pumps and control system.</p> <ul style="list-style-type: none"> <li>• Other Drilling Rig Failure</li> </ul> <p>Pipeline Drillers Group will provide one HDD rig for use onsite. Spare rigs are available from the Pipeline Drillers Group yard if catastrophic failure occurs. Additional causes of drilling rig failure include the following:</p> <ul style="list-style-type: none"> <li>- Control systems less than adequate</li> <li>- Hydraulic line failure</li> <li>- PLC/software failure.</li> </ul>
<b>Stuck or Buckled Product Pipe String</b>	<p>Stuck or buckled product pipe string is unlikely to occur if the borehole has been constructed in accordance with good drilling practice. The borehole should be:</p> <ol style="list-style-type: none"> <li>1. A well drilled pilot hole, free from dog legs with suitably designed radii to accommodate drill pipe and pipeline string minimum bend radius</li> <li>2. Reamed to enlarge the borehole correctly and maintain good returns for the thorough removal of cuttings</li> <li>3. Cleaned with final reaming pass, while being monitored by the Driller to note potential high torque values that may indicate poor sections of the borehole that may require additional passes prior to the attempt to install the pipeline string.</li> </ol> <p>Any indication of a borehole not suitable to commence pullback shall be remediated by Pipeline Drillers Group until such time that the borehole is suitable for pipeline string installation.</p> <p>If pullback of pipe string commences and sticking or buckling has occurred, evidence of this failure will be observed by a substantial increase in pullback load (many times the predicted</p>

Contingency	Description
	<p>maximum). Stuck or buckled pipe string will be validated by the post-installation gauging of the product pipe.</p> <p>Removal from the borehole or abandonment of the failed pipeline string will be required to remediate such a failure. This undertaking is substantial; as such, an appropriate and well-planned detailed design of the HDD alignment and profile that accounts for the contingency of drilling the borehole shall be the principal control measure for avoiding stuck or buckled pipeline string.</p>
<p><b>Adverse Weather Conditions</b></p>	<ul style="list-style-type: none"> <li>• Significant Rainfall</li> </ul> <p>In the instance of heavy rainfall with no localised lightning, drilling operations may be suspended at the direction of the HDD Superintendent. Principal risks to project and personnel would include:</p> <ul style="list-style-type: none"> <li>- Slips and trips</li> <li>- Limited visibility of mobile plant operators</li> <li>- Hard stand washout/erosion</li> <li>- Water ingress into mud systems and pits.</li> </ul> <p>Appropriate controls to mitigate risks shall be implemented in accordance with the project risk register, SWMS, and JHAs. Remediation works and HSEQ audit post significant rain fall may be required.</p> <ul style="list-style-type: none"> <li>• Significant Wind</li> </ul> <p>In the instance of extreme wind with no localised bush fire or other, drilling operations may be suspended at the direction of the HDD Superintendent. Principal risks to project and personnel would include:</p> <ul style="list-style-type: none"> <li>- Flying objects and debris</li> <li>- Working at heights/elevated work areas</li> <li>- Onsite communication between personnel</li> <li>- Dust lifting/disturbance.</li> </ul> <p>Appropriate controls to mitigate risks shall be implemented in accordance with project risk register, SWMS, and JHAs. Remediation works and HSEQ audit post significant wind may be required.</p> <ul style="list-style-type: none"> <li>• Proximity Lightning</li> </ul> <p>In the instance of lightning in the proximity of the rig within view and of sufficient frequency, drilling operations may be suspended at the direction of the HDD Superintendent. Principal risks to project and personnel would include:</p> <ul style="list-style-type: none"> <li>- Lightning strike to rig or support equipment resulting in harm to personnel</li> <li>- Lightning strike to rig or support equipment resulting in serious damage.</li> </ul> <p>Appropriate controls to mitigate risks shall be implemented in accordance with project risk register, SWMS, and JHAs. The drill rig shall be isolated from the drill string.</p>

# A1 – ROLES AND RESPONSIBILITIES

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

<b>Current Version</b>	B
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# A1 – ROLES AND RESPONSIBILITIES

## 1 - Purpose and Scope

The purpose of this document is to detail the hierarchy of roles and responsibilities in the construction of stage two of the Australian Bay Lobster Producers Limited Seawater Supply Pipeline.

Figure A1-1 shows the relevant flowchart of these roles and Section 3 describes the responsibilities of each role.

## 2 - Responsibilities

It is the responsibility of the Environmental Manager / Representative to ensure the register is periodically reviewed and updated.

## 3 - Description of Roles

### 3.1 Key Roles

#### Managing Director

The Managing Director has overall responsibility for ABLP's environmental performance and is responsible for defining the company's Environmental Policy and ensuring there are adequate policy compliance protocols in place.

#### Environmental Manager / Representative

The Environmental Manager / Representative, in conjunction with the Managing Director, is responsible for producing, maintaining and reviewing all elements of the Environmental Management Plans and ensuring the implementation of all parts of the CEMP.

The Environmental Manager / Representative will be available to advise the project team including the Managing Director, Site Manager and site contractors on environmental issues, wherever necessary. It is also the responsibility of the Environmental Manager / Representative, in conjunction with the ABLP Managing Director, to ensure that all contractors and sub-contractors are compliant to the CEMP. This includes reviewing and authorising project specific Environmental Management Plans (where required), and any Method Statements or Risk Assessments that may be developed. The Environmental Manager / Representative also serves as a point of contact for any interested external parties.

#### Site Manager

The ABLP Site Manager is responsible for day-to-day compliance with the CEMP, reporting to the Managing Director and Site Environmental Manager / Representative.

#### Compliance Officer / Site Environmental Coordinator

Provides support to the Site Manager and Environmental Manager / Representative with implementation and maintenance of the CEMP across all activities on the project.

This role will liaise directly with the Contractor's Environmental Officer(s) and project team to ensure the day-to-day CEMP management tasks are undertaken.

### Contractor Site Manager

Responsible for implementing the CEMP through the construction phase and undertaking tasks as defined by the CEMP, Compliance Officer / Site Environmental Coordinator and Site Manager. The Contractor Site Manager will also liaise with the Environmental Manager / Representative as required. These duties may be discharged by the Contractor Environmental Officer. Roles may be filled by the same person, where clear delineation is given as to responsibilities.

### Contractor Environmental Officer

Responsible for liaising with the Compliance Officer / Site Environmental Coordinator and the Environmental Manager / Representative and providing support to Contractor Site Manager with respect to environmental management of the project.

### **3.2 ABLP Organisational Overview**

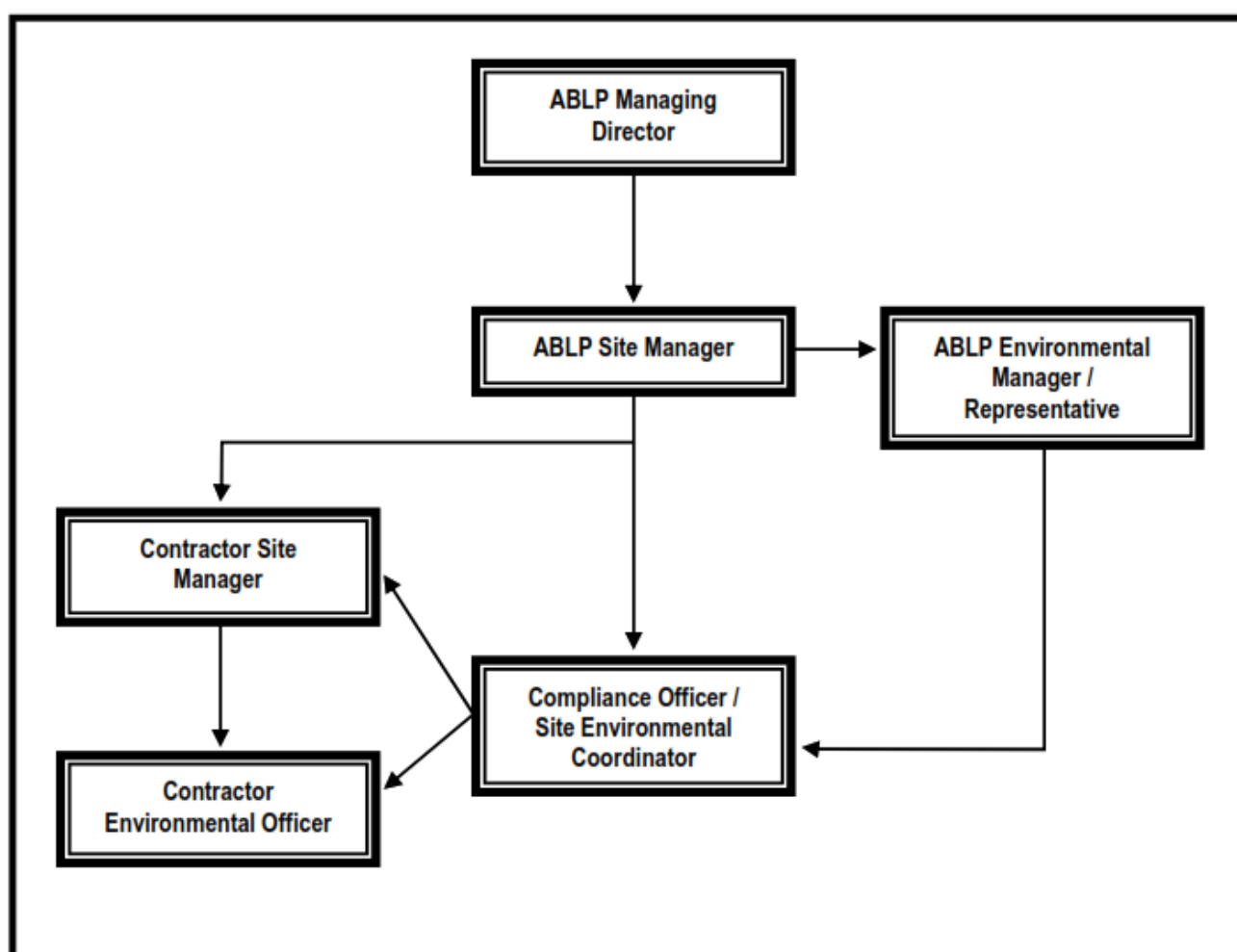


Figure A1-1: ABLP Organisational Chart

# A2 – ENVIRONMENTAL ASPECTS AND IMPACTS REGISTER

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

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## **A2 – ENVIRONMENTAL ASPECTS AND IMPACTS REGISTER**

### **1 Purpose and Scope**

The purpose of this document is to assess the environmental impacts associated with all aspects of construction on stage two of the Australian Bay Lobster Producers Limited Seawater Supply Pipeline.

Table A2-1 shows each construction activity, including its major components and potential impacts, and provides an assessment of the overall estimated risk. The table is to be used to identify and prioritize environmental management to ensure that ABLP, and by extension its associated contractors and subcontractors, are aware of the relevant risks and adequately prepared to manage them.

### **2 Responsibilities**

It is the responsibility of the Environmental Manager / Representative to ensure this register is periodically reviewed and updated.

### **3 Updating of Register**

This register should be updated as required to ensure it reflects the true potential risks and impacts of construction. An assessment of the applicability of the register should be undertaken with each CEMP audit with appropriate updates incorporated prior to the commencement of construction.

#### **3.1 Identification of Aspects and Impacts**

Each construction stage is split into major components (e.g. site preparation, excavation, construction and soil stabilisation etc.) which are further divided into aspects related to particular environmental impacts, such as noise, water and dust generation. Each component is assessed for potential impacts based on the aspects of each component. These impacts are then assessed in terms of environmental and organisational risk. Review of the register should be undertaken by the relevant parties including the Site Manager or principal contractor and their environmental representatives under the management of the Environmental Manager / Representative.

#### **3.2 Risk Assessment**

Each impact is assessed in terms of the likelihood of its occurrence (without any explicit management controls) and the subsequent consequence of the impact should it occur. These are then combined to give an overall risk value from low to high.

Likelihood 1 applies specifically to the resulting environmental impact. The frequency or probability of the initial incident or hazard event should not be solely used. Often a chain of events, each with an associated likelihood, leads to a final environmental impact. Each event in the chain is dependent upon the previous event occurring in the first place. These 'conditional probabilities' or 'conditional likelihoods' need to be factored in determining the final likelihood of the environmental impact occurring.

A Consequence 1 is the outcome or impact of an event. It may be expressed qualitatively or quantitatively, being a loss, injury, expressed concern, disadvantage or gain. There may be a range of possible outcomes associated with an event. This procedure uses a qualitative scale of consequence.

Table A2-2 shows matrices of likelihood and consequence categories after AS/NZS ISO 31000-2009.

### ***3.3 Measures to Manage High Risks***

Risks which are classified as High or Extreme must be appropriately addressed to reduce the overall risk for that aspect or impact to a Medium or (preferably) Low risk level. Any risk of a High or Extreme level remaining after amelioration has been factored must be further addressed to reduce the risk.

### 3.4 Risk Matrix

Table A2 – 1: Environmental Aspects and Impacts Register

Description	Aspect	Impact	Potential Risk Level	Ameliorating Factor/ Risk Reduction Strategies	Current Risk Levels
<b>Site Preparation</b>	Environmental impacts associated with survey and marking out, setup erosion and sediment controls, provide site access	<ul style="list-style-type: none"> <li>○ Erosion and sediment loss from site via wind or water erosion to local waterways, roads or residences etc.</li> <li>○ Noise impacts off-site</li> <li>○ Hydrocarbon and chemical pollution of land and groundwater from machinery use</li> <li>○ Damage or pollution to adjacent roads due to site access and access construction</li> </ul>	<p>U x 4 = L</p> <p>U x 5 = L</p> <p>U x 4 = L</p> <p>U x 3 = M</p>	<ul style="list-style-type: none"> <li>○ Erosion and Sediment Control Plan development as part of CEMP</li> <li>○ Noise Management Plan development as part of CEMP</li> <li>○ Waste Management and Erosion Sediment Control Plans developed as part of CEMP</li> <li>○ Emergency and Incident response Procedure developed as part of CEMP</li> <li>○ Traffic Management developed as part of CEMP</li> </ul>	<p>U x 4 = L</p> <p>U x 5 = L</p> <p>U x 4 = L</p> <p>U x 3 = M</p>
<b>Topsoil Stripping and Stockpiling, Site Filling</b>	Surface Waters / Stormwater	<ul style="list-style-type: none"> <li>○ Erosion of stockpiles and exposed soils resulting in increased sediment loads in runoff waters impacting on receiving waterways</li> </ul>	<p>L x 3 = H</p> <p>L x 3 = H</p> <p>L x 3 = H</p> <p>P x 2 = H</p>	<ul style="list-style-type: none"> <li>○ Erosion and Sediment Control Plan development as part of CEMP</li> </ul>	<p>P x 4 = L</p> <p>L x 4 = L</p> <p>P x 4 = L</p> <p>P x 4 = L</p>

		<ul style="list-style-type: none"> <li>○ Disturbance of soils by machinery resulting in enhanced erosion during rainfall</li> <li>○ Tracking of soil, mud or sand/silt off-site by trucks resulting in wash off into receiving waterways</li> <li>○ Oxidation and erosion of acid sulfate soils on site and subsequent acidification and mobilisation of heavy metals into runoff waters and receiving waterways</li> <li>○ Contamination of runoff waters by hydrocarbons and chemicals from onsite storage, leaking machinery, etc.</li> </ul>	P x 2 = H	<ul style="list-style-type: none"> <li>○ Acid Sulfate Soil Investigations Completed.</li> <li>○ Acid Sulfate Soil Management Plan developed as part of CEMP</li> <li>○ Emergency and Incident response Procedure developed as part of CEMP</li> </ul>	P x 4 = L
	Groundwater	<ul style="list-style-type: none"> <li>○ Oxidation and erosion of acid sulfate soils on site and subsequent acidification and mobilisation of heavy metals to groundwater through infiltration or direct exposure</li> <li>○ Infiltration of leaked hydrocarbons and chemicals from onsite storage, leaking machinery, etc.</li> </ul>	P x 2 = H P x 2 = H	<ul style="list-style-type: none"> <li>○ Erosion and Sediment Control Plan development as part of CEMP</li> <li>○ Acid Sulfate Soil Investigations Completed.</li> <li>○ Acid Sulfate Soil Management Plan developed as part of CEMP</li> <li>○ Groundwater monitoring program developed as part of CEMP</li> <li>○ Emergency and Incident response Procedure</li> </ul>	P x 3 = M P x 3 = M

				developed as part of CEMP	
	Dust Generation	<ul style="list-style-type: none"> <li>○ Fugitive dust emissions from development site and machinery operation resulting in health and safety impacts from dust, complaints from neighbours, staff and highway users.</li> <li>○ Dust loss from trucking material to and from site.</li> </ul>	<p>L x 3 = H P x 3 = M</p>	<ul style="list-style-type: none"> <li>○ Erosion and Sediment Control Plan development as part of CEMP</li> <li>○ Part of Traffic Management within CEMP – cover all loads to and from site</li> </ul>	<p>P x 4 = L U x 4 = L</p>
	Noise	<ul style="list-style-type: none"> <li>○ Noise emitted from plant and machinery with potential to impact on amenity of neighbours.</li> </ul>	<p>P x 3 = M</p>	<ul style="list-style-type: none"> <li>○ Noise Management Plan developed as part of CEMP</li> </ul>	<p>U x 4 = L</p>
	Land	<ul style="list-style-type: none"> <li>○ Oxidation of acid sulfate soils on site and subsequent acidification and mobilisation of heavy metals into soils (subsequently impacting receiving waters)</li> <li>○ Contamination of site by hydrocarbons and chemicals from on site storage, leaking machinery, etc.</li> </ul>	<p>P x 4 = L P x 3 = M</p>	<ul style="list-style-type: none"> <li>○ Acid Sulfate Soil Investigations Completed.</li> <li>○ Acid Sulfate Soil Management Plan developed as part of CEMP</li> <li>○ Emergency and Incident response Procedure developed as part of CEMP</li> </ul>	<p>P x 5 = L P x 4 = L</p>
<b>Training and Awareness</b>	<ul style="list-style-type: none"> <li>○ Limited environmental management experience and knowledge in contractors</li> </ul>	<ul style="list-style-type: none"> <li>○ Increased risk of environmental incident due to lack of training, inappropriate action, lack of response.</li> </ul>	<p>P x 2 = H</p>	<p>CEMP contains:</p> <ul style="list-style-type: none"> <li>○ Emergency, Incident and Complaint management procedures</li> </ul>	<p>P x 4 = L</p>

				<ul style="list-style-type: none"> <li>○ Subcontractor management procedures</li> <li>○ Environmental awareness training required for staff and contractors</li> </ul>	
<b>Visual Amenity</b>	<ul style="list-style-type: none"> <li>○ Maintenance of signage</li> <li>○ Control of dust emissions, maintain clean site</li> </ul>	<ul style="list-style-type: none"> <li>○ Negative public perception of poorly maintained / presented site</li> </ul>	L x 4 = H	<ul style="list-style-type: none"> <li>○ Information display</li> <li>○ Implementation CEMP</li> </ul>	P x 4 = L
<b>Community/Stakeholder Management</b>	<ul style="list-style-type: none"> <li>○ Management of relationships between key stakeholders</li> <li>○ Community, regulators, consultants, interest groups, Council</li> </ul>	<ul style="list-style-type: none"> <li>○ Negative perceptions and relations with community members</li> <li>○ Risk of community backlash</li> </ul>	<p>P x 4 = L</p> <p>P x 4 = L</p>	<ul style="list-style-type: none"> <li>○ Communication Procedures in CEMP</li> <li>○ Emergency and Incident Response procedures in CEMP</li> </ul>	<p>P x 4 = L</p> <p>P x 4 = L</p>
<b>Emergency Response and Incident Management</b>	<ul style="list-style-type: none"> <li>○ Management of emergencies and incidents</li> <li>○ Risks associated with system failure or lack of due diligence in identifying, reporting and actionizing incidents and hazards</li> <li>○ Non-compliance with incident reporting licence requirements</li> </ul>	<ul style="list-style-type: none"> <li>○ Negative community perception</li> <li>○ Fines imposed</li> </ul>	<p>P x 4 = L</p> <p>P x 1 = E</p>	<ul style="list-style-type: none"> <li>○ Emergency and Incident Response procedures in CEMP</li> <li>○ Internal/External audit schedule</li> <li>○ Reporting and Monitoring program</li> <li>○ Development and implementation of a CEMP</li> </ul>	<p>P x 4 = L</p> <p>U x 3 = M</p>
<b>Contract and Contractor Management</b>	<ul style="list-style-type: none"> <li>○ Contractor environmental performance</li> </ul>	<ul style="list-style-type: none"> <li>○ Impact on ABLP public image.</li> <li>○ Increased number of incidents and non-compliances</li> </ul>	<p>P x 4 = L</p> <p>P x 2 = H</p>	<ul style="list-style-type: none"> <li>○ Incident reporting process</li> </ul>	<p>P x 4 = L</p> <p>U x 3 = M</p>

	<ul style="list-style-type: none"> <li>Assigning environmental responsibilities to contractors through leases and agreements</li> </ul>	<ul style="list-style-type: none"> <li>Lack of knowledge, experience and systems to manage environmental aspects and impacts</li> </ul>	P x 3 = M	<ul style="list-style-type: none"> <li>On-going management and site meetings prior to and during construction</li> </ul>	U x 3 = M
<b>Legal Compliance</b>	<ul style="list-style-type: none"> <li>Compliance with appropriate legislation</li> </ul>	<ul style="list-style-type: none"> <li>Penalties imposed due to breaches of relevant acts or commitments</li> <li>Negative community perception</li> </ul>	P x 4 = L P x 1 = E	<ul style="list-style-type: none"> <li>Performance monitoring – audit schedule</li> <li>Legislation and Policies Register</li> <li>Audits and CEMP Review</li> </ul>	U x 3 = M P x 4 = L
<b>Performance Assessment and Reporting</b>	<ul style="list-style-type: none"> <li>Risks associated with system failure or lack of due diligence in identifying, reporting and actioning incidents and hazards.</li> </ul>	<ul style="list-style-type: none"> <li>Negative community perception</li> <li>Lack of commitment to due diligence, best practice and continuous improvement</li> <li>Fines imposed for breach of approval conditions</li> </ul>	P x 1 = E P x 1 = E P x 4 = L	<ul style="list-style-type: none"> <li>Audit schedule</li> <li>Monitoring schedule</li> <li>Competence of staff</li> </ul>	U x 3 = M U x 3 = M P x 4 = L

**Table A2-2: Qualitative Measures of Likelihood and Consequence and Corresponding Overall Risk Matrix**

Qualitative measures of likelihood					
Level	Descriptor	Description			
A	Almost certain	Is expected to occur in most circumstances			
L	Likely	Will probably occur in most circumstances			
P	Possible	Could occur			
U	Unlikely	Could occur but not expected			
R	Rare	Occurs only in exceptional circumstances			
Qualitative measures of impact					
Level	Descriptor	Example detail description			
1	Catastrophic	Toxic release off-site with detrimental effect, huge financial loss			
2	Major	Loss of operational / construction capability, off-site release contained with outside assistance and little detrimental impact, major financial loss			
3	Moderate	On-site release contained with outside assistance, high financial loss			
4	Minor	On-site release immediately contained, medium financial loss			
5	Insignificant	Low financial loss, negligible environmental impact.			
Qualitative risk analysis matrix: Level of risk					
Likelihood	Consequence				
	Catastrophic	Major	Moderate	Minor	Insignificant
Almost Certain (A)	E	E	E	H	H
Likely (L)	E	E	H	H	M
Possible (P)	E	H	M	L	L
Unlikely (U)	H	H	M	L	L
Rare (R)	H	H	M	L	L

**LEGEND:**

E = Extreme risk; immediate action required.

H = High risk; senior management attention needed.

M = Moderate risk; management responsibility must be specified.

L = Low risk; manage by routine procedures.

# A3 – LEGISLATION PLANNING AND APPROVAL REGISTER

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

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## **A3 – LEGISLATION PLANNING AND APPROVAL REGISTER**

### **1 Purpose and Scope**

The purpose of this document is to maintain a register of applicable environmental licenses, approvals, policies and legislation to assist in maintaining compliance in the construction of stage two of the Australian Bay Lobster Producers Limited Seawater Supply Pipeline.

This document contains a register of relevant legislation, regulations and policies (Table A3-1), existing approvals and permits (Table A3-2) and a checklist of licensing and permit requirements (Table A3-3). It is aimed to inform site management in the environmental management and compliance of the project.

### **2 Responsibility**

It is the responsibility of the Environmental Manager / Representative to ensure this register is periodically reviewed and updated.

### **3 Updating of Register**

This register should be updated as required to ensure it reflects the legislation, policies and approvals relevant to the development. An assessment of the applicability of the register should be undertaken with each CEMP audit and updated as and when documents or legislation listed in the register are updated.

**Table A3-1: Legislation, Planning and Approval Register**

Area	Legislation/ Regulation / Policy	Regulatory Authority	Related Control Procedures / Approvals
General	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>	Commonwealth	No matters of national environmental significance have been identified for the works.
	<i>Environmental Planning and Assessment Act 1999</i>	Department of Planning and Environment ( <b>DPE</b> )	This CEMP is submitted for approval by the Secretary of Planning.
	<i>Roads Act 1993</i>	Tweed Shire Council ( <b>TSC</b> )	The TSC will issue a s 138 RA approval based on the engineering drawings and CEMP for the works.
	<i>Protection of the Environment Operations Act 1997</i>	DPE	Environmental Protection Authority ( <b>EPA</b> ) to be notified of significant pollution events.
	<i>Rural Fires Act 1997</i>	State Emergency Services ( <b>SES</b> )	Limited risk of fires due to type of works (very low ignition risk).
	<i>Crown Lands Act 1989</i>	Crown Land	Licence required for works performed on Crown Land.
Water	<i>Water Management Act 2000</i>	Water NSW & National Resource Access Regulator	Works approval, licence and water share components required for certain works interfering with groundwater source.

	<i>Water Act 1912</i>	Water NSW & National Resource Access Regulator	Works approval required for certain activities (bores) within the groundwater source and all other activities outside the groundwater source.
Flora & Fauna	<i>Fisheries Management Act 1994</i>	NSW Department of Primary Industries	N/A
	<i>Local Land Services Act 2013</i>	DPE	Flora management, including weed control and the requirements of the Erosion and Sediment Control Plan.
	<i>Biodiversity Conservation Act 2016</i>	NSW Department of Primary Industries	
Social	<i>National Parks and Wildlife Act 1974</i>	DPE	No issues of heritage captured by the works.
	<i>Heritage Act 1977</i>	DPE	
	<i>Native Title Act 1993</i>	Commonwealth	No Native Title claims to be resolved.

Land: Soil & Erosion	<i>Contaminated Land Management Act 1997</i>	DPE	No contaminated sites will be disturbed in the course of the works.
	<i>Soil Conservation Act 1938</i>	DPE	Erosion and Sediment Control Plan included in this CEMP.
Noise and Vibration	Interim Construction Noise Guideline (2009) DRAFT Construction Noise Guideline (2020)	DPE Tweed Shire Council ( <b>TSC</b> )	Noise pollution to maintained within acceptable limits at noise receptors.
	Noise Policy for Industry 2017	DPE	Noise Management Plan included in this CEMP.
Waste	<i>Waste Avoidance and Resource Recovery Act 2001</i>	DPE	Waste control guidelines stipulated in this CEMP.
OH&S	<i>Occupational Health &amp; Safety Act 2000</i>	Safe Work	CEMP contains incident and accident reporting along with safety management procedures.

**Table A3-2: Existing Approvals Register**

Approval	Licence / Approval / Permit	Date Approved	Activities under control
General	DA 282-11-2004-i	21 December 2005	Overall project approval
	DA08_0038 (modifies the above)	15 December 2008	<p>This approval sought to modify the previously approved pipeline route. The modification sought to enable connection of the aquaculture facility to the new Kingscliff STP which was not envisaged in the original Development Approval. This modification was arrived at in consultation with Council.</p> <p>The pipeline will now be laid within council controlled road reserves and an easement on private land subject to written agreement in a rural location ensuring minimal inconvenience to the public.</p>
	MOD5	23 June 2021	Approval of additional types of fill material for earthworks and adjustment to pipeline alignment.
	MOD4	24 December 2021	Approval of onsite accommodation for aquaculture purposes and other general matters.

Lease	Crown Land		Lease over part of Kingscliff Beach for pumping station and associated pipelines nominated as lot 2 DP 1122062 and lot 7319 DP 1128430
Licence	Crown Land – 620655		Construction of all project infrastructure in Crown Land: lot 2 DP 1122062 and lot 7319 DP 1128430
Licence	Property NSW		Construction activities on lot 701 DP 1002309
Works Approval	National Resource Access Regulator		Dewatering activities associated with construction of the seawater supply infrastructure
Bore Licence			Approval for construction of test bores on Kingscliff Beach for Groundwater Investigation.
General	CEMP Approval (conditional pre requisite)	22 August 2008	Pre-construction works
General	CEMP Approval (conditional pre requisite)	13 June 2012	Pre-construction works
General	Environmental Protection Licence 12947 & Approval under Protection of the Environment Operations Act 1997		EPL 12947 obtained from EPA covers discharge water quality requirements for aquaculture facility



Easement	Private Easement		Construction through lots 1 DP 1075645 and lots 2 and 3 DP 1111554
Public Roads	Section 138 Works Approval – Tweed Shire Council		Construction of stages one and two of the pipeline project through the public road reserve under managed by the Tweed Shire Council.

**Table A3-3: Licensing and Permit Requirements**

Work Type/Location	Approval	Regulatory Authority
Private Land	Easement, lease or contract	Landholder
Works in public road reserve	Section 138 <i>Roads Act 1993</i> works approval	Tweed Shire Council
Works in Crown Land reserve	Crown Land licence	Crown Land
Works that intercept a groundwater source <ul style="list-style-type: none"> <li>- Tweed Brunswick Coast Sands Groundwater Source</li> <li>- No applicable water source</li> </ul>	Location dependent: <ul style="list-style-type: none"> <li>- <i>Water Management Act 2000</i> works approval &amp; licence</li> <li>- <i>Water Act 1912</i> works approval</li> </ul>	Water NSW and National Resource Access Regulator

# A4 – INSPECTION, MONITORING AND AUDITING SCHEDULE

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

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## **A4 – INSPECTION, MONITORING AND AUDITING SCHEDULE**

### **1 Purpose and Scope**

The purpose of this document is to list the monitoring, inspection and auditing programs for the environmental monitoring undertaken in respect of the construction stage two of the Australian Bay Lobster Producers Limited Seawater Supply Pipeline.

Table A4-1 shows the required monitoring, source (eg: consent conditions, monitoring program or management plan, etc.), frequency and reporting requirements for the project.

### **2 Responsibilities**

It is the responsibility of the Environmental Manager / Representative to ensure this schedule is periodically reviewed and updated.

### **3 Updating of Register**

This register should be updated as required to ensure it reflects and includes all environmental inspections, auditing and monitoring programs. An assessment of the applicability of the register should be undertaken with each CEMP audit with corresponding updates incorporated as appropriate.

**Table A4-1: Inspection, Monitoring and Auditing Schedule**

Phase	Task	Description	Frequency	Responsibility	Document Reference
Construction	<b>Surface Water</b>				
	Stormwater Runoff Monitoring	Conduct weekly monitoring of runoff events from areas subject to treatment and/or disturbance of ASS material or material that requires treatment as if ASS	Weekly while occurring	Construction Site Manager or Environmental Representative	CEMP – Acid Sulfate Soil Management Plan
	<b>Land / Soil</b>				
	Acid Sulfate Soil Treatment Monitoring	Amounts, timing and area of application of lime or other treatments applied to treat ASS material.	As required	Construction Site Manager or Environmental Representative	CEMP – Acid Sulfate Soil Management Plan
	<b>Noise</b>				
	Noise monitoring	Undertaken on request from administering authority at location specified by requesting authority	As required	Construction Site Manager or Environmental Representative	CEMP – Noise Management Plan
	<b>Audits / Inspections / Review</b>				
	CEMP Review			As required	Construction Site Manager or Environmental Representative

	Site Inspection		Daily	Construction Site Manager or Environmental Representative	CEMP – Erosion and Sediment Control Plan
	Visual Waste Monitoring		Daily	Construction Site Manager or Environmental Representative	CEMP – Waste Management Plan

# A5 – CONTRACTOR MANAGEMENT

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

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#### Amendments

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A	23 November 2021	ABLP	Original Publication
B	21 January 2022	ABLP	DEP Submissions

## **A5 – CONTRACTOR MANAGEMENT**

### **1 Purpose and Scope**

This procedure is intended to outline a basic set of actions to allow the effective management of contractors involved in the construction of stage two the Australian Bay Lobster Producers Limited Seawater Supply Pipeline. The terms contractor and sub-contractor have identical meanings in this document.

### **2 Responsibilities**

It is the responsibility of the Environmental Manager / Representative to ensure this procedure is periodically reviewed and updated. The Environmental Manager / Representative is also responsible for ensuring that ABLP staff and the principal contractor are aware of this procedure and have measures in place to comply.

### **3 Health and Safety**

The principal contractor is responsible for enacting effective site health and safety management procedures which are to be complied with by all personnel on the site. This procedure does not address health and safety concerns; however, all personnel on-site are to act within the bounds of an approved safety management system.

### **4 Contractor Management**

#### **4.1 Pre-Qualification Requirements**

ABLP's procurement process must include pre-qualification criteria suitable to the tasks that are to be undertaken during construction of stage two of the SSP. The nature of these criteria will be dependent upon the nature of the works to be performed by the contractor. In accordance with this ABLP must ensure it is reasonably confident the contractor will be capable of complying with the CEMP and relevant approvals, permits and legislation for the works.

In general, a contractor should be assessed based on the following system, where 1 presents the least risk and 3 the most risk:

1. Where a contractor / supplier has a certified Environmental Management System or similar and/or poses limited risks to ABLP.
2. Where a contractor / supplier has not yet developed a certified Environmental Management System or similar but is in the process of doing so and/or poses some risk to ABLP on-site.
3. Where a contractor / supplier has no formal Environmental Management System (or similar) and/or poses a higher risk to ABLP by being present on-site.

#### **4.2 Contracts**

References to the environmental management and control requirements are to be complied with as outlined in this CEMP, including reference to the relevant approvals and legislation.

#### **4.3 Responsibilities of Contractors engaged by ABLP (directly or indirectly)**

All contractors engaged, either directly or indirectly by ABLP, are considered equal to ABLP personnel in all aspects of environmental management and control. Contractors are therefore responsible for compliance with this CEMP in addition to the applicable approvals, permits and legislation. In particular, contractors are required

to be familiar with those aspects of the CEMP and the Environmental Management Plans (EMP's) and Procedures associated with their activities.

All contractors are to nominate environmental officers to be responsible for environmental management and compliance of their activities and to liaise with ABLP personnel and the Environmental Manager / Representative. The actions of sub-contractors under the control of the principal contractor are the responsibility of the principal contractor.

#### **4.4 Site Induction**

All personnel working on the SSP will undertake an environmental induction in addition to any other induction (such as health and safety) as directed by the Environmental Representative. Such other induction may include a range of issues including, but not limited to:

- The CEMP (purpose, objectives and key issues);
- Legal requirements including due diligence, duty of care and potential consequences of infringements;
- Environmental responsibilities;
- Conditions of licenses, permits and approvals;
- ABLP environmental policy;
- Significant environmental issues and areas of the site(s) including identification of vegetation clearing boundaries, waste bins, refuelling, parking and vehicle maintenance areas, plant and equipment and material stockpiles;
- Environmental management techniques for key environmental elements (soil, water, waste, recycling, flora and fauna, heritage, etc. where appropriate);
- Incident management and emergency plans;
- Reporting processes for environmental incidents;
- Protection and maintenance of environmental controls.

#### **4.5 Training**

All personnel associated with ABLP's project are to be appropriately trained in all aspects of environmental management and control. Any deficiencies in training or knowledge are to be rectified by appropriate training. Generally, ABLP will ensure that key site contractor(s) have a sufficient level of awareness and competence appropriate to their assigned activities. Further training or the dissemination of information to non-ABLP personnel will be the responsibility of the key contractor(s).

#### **4.6 Audit and Inspection of Contractors**

Audits and site inspections undertaken in accordance with other parts of the CEMP shall take note and report on any behaviour, activity or non-compliance by contractors / sub-contractors on the site. Additionally, a follow up audit / inspection will be undertaken of any contractor accessing the site (other than for minor works) to ensure they are effectively complying with the CEMP and relevant legislation, policies and approvals. Records will be maintained of any contractors in relation to any non-compliance noted during site audits.

#### **4.7 Contractor Performance Reports**

At the discretion of the ABLP Site Manager, Managing Director and/or ABLP Compliance Officer / Environmental Coordinator, contractors and suppliers may be required to submit a performance report to ABLP (Managing Director and/or ABLP Compliance Officer / Environmental Coordinator). This report will detail the contractor / supplier's compliance or non-compliance with the CEMP, relevant legislation, policies and approvals or other issues as appropriate.

#### **4.8 Contractor Communications**

Meetings between the ABLP Managing Director, Environmental Manager / Representative, Site Manager, Compliance Officer / Site Environmental Coordinator and representatives of all site contractors will take place weekly or as required to discuss all project issues including (but not limited to):

- Approvals
- Safety
- Environmental issues
- Incidents and complaints
- Performance
- Site management
- Project development
- Issues raised by ABLP, contractors, staff, community, etc.

#### **4.9 Contractor Environmental Management Plan**

At all times contractors will comply with the Environmental Management Plan (EMP) at Attachment A5-1 in performing any activities associated with the construction. In the event that the EMP conflicts with any other condition, requirement or standard in this CEMP, this CEMP will prevail to the extent that it imposes a higher standard of safety, risk management or environmental control, otherwise the contractor will be bound by the conditions of the EMP.

# **Attachment A5-1**

## **Environmental Management Plans and Procedures**



# ABLP SEAWATER INTAKE & DELIVERY PIPELINE AND PUMP STATION STRUCTURES



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SECTION	CHANGE	DATE	Rev No
All	For Review	30/07/2020	A
All	For Construction	10/08/2020	0
All			

## Associated Documents

Content	Procedure
Control of Documents	<b><i>PDGP001 Control of Documents</i></b>
Control of Records	<b><i>PDGP002 Control of Records</i></b>
Internal Audit	<b><i>PDGP003 Internal Audit</i></b>
Control of Nonconforming product	<b><i>PDGP004 Control of Nonconforming Product</i></b>
Corrective Action and Preventive Action	<b><i>PDGP005 Corrective and Preventive Action</i></b>
Risk Management	<b><i>PDGP006 Risk Management</i></b>
Maintenance and Inspection	<b><i>PDGP007 Maintenance and Inspection</i></b>
Organisation, Training and Competence	<b><i>PDGP008 Training and Competence</i></b>
Hazardous Substances Management	<b><i>PDGP009 Hazardous Substances Management</i></b>
Material Handling	<b><i>PDGP010 Material and Manual Handling</i></b>
Emergency Planning and Response	<b><i>PDGP011 Emergency Management</i></b>
Personal Protective Equipment	<b><i>PDGP012 Personal Protective Equipment</i></b>
Contractor Management	<b><i>PDGP013 Contractor Management</i></b>
Incident Management	<b><i>PDGP014 Incident Management</i></b>
Performance Monitoring and Audit	<b><i>PDGP015 Performance Management</i></b>
Consultation, Communication and Reporting	<b><i>PDGP016 Consultation, Communication and Reporting</i></b>
Journey Management	<b><i>PDGP017 Journey Management</i></b>
Fatigue Management	<b><i>PDGP018 Fatigue Management</i></b>
Management of Change	<b><i>PDGP019 Management of Change</i></b>
Isolation	<b><i>PDGP020 Isolation</i></b>
Mobile Equipment	<b><i>PDGP021 Mobile Equipment Operation</i></b>
Rehabilitation and Return to Work	<b><i>PDGP022 Rehabilitation and Return to Work</i></b>
Fitness for Work	<b><i>PDGP023 Fitness for Work</i></b>
Lifting Equipment Management	<b><i>PDGP024 Lifting Equipment Management</i></b>
Purchasing	<b><i>PDGP025 Purchasing</i></b>
Health and Hygiene Management	<b><i>PDGP026 Health and Hygiene</i></b>
Human Resources Management	<b><i>PDGP027 Human Resources</i></b>
Cyclone Management	<b><i>PDGP028 Cyclone Management Plan</i></b>
Traffic Management	<b><i>PDGP029 Traffic Management</i></b>
Permit to Work	<b><i>PDGP030 Permit to Work</i></b>

# Contents

<b>1</b>	<b>Introduction and Scope .....</b>	<b>5</b>
1.1	Project Scope .....	5
1.2	Personnel roles & responsibilities .....	5
1.2.1	Director .....	6
1.2.2	Project manager .....	6
1.2.3	Superintendent .....	6
1.2.4	HSEQ Advisor .....	7
1.2.5	Workers .....	7
1.3	Key Environmental Personnel .....	7
<b>2</b>	<b>Legislation and Other Requirements .....</b>	<b>8</b>
2.1	Permits .....	8
<b>3</b>	<b>Consultation, Communications and Cooperation / Coordination .....</b>	<b>9</b>
3.1	Consultation .....	9
3.1.1	Daily Pre-start Meetings .....	9
3.1.2	HSEQ Meetings .....	10
3.2	Communication .....	10
<b>4</b>	<b>Training, Development and Competence .....</b>	<b>10</b>
4.1	Inductions .....	10
4.1.1	General Induction .....	10
4.1.2	Site Specific Induction .....	11
4.1.3	Task Specific Induction .....	11
<b>5</b>	<b>Risk Management .....</b>	<b>11</b>
5.1	Risk Identification, Assessment and control .....	11
5.1.1	Project Specific risk register .....	11
5.1.2	Site Inspections, Audits & Task Observations .....	12
5.1.3	Safe Work Method Statements (SWMS) .....	12
5.1.4	Job Hazard Analysis (JHA) .....	12
5.1.5	SLAM cards .....	12
5.1.6	Management site visits .....	13
5.1.7	Consultation (Pre-start, Toolbox and HSEQ Meetings) .....	13
5.1.8	Corrective and preventative actions Register .....	13
5.1.9	Permit to work systems .....	13
5.1.10	Hierarchy of controls & Risk Matrix .....	14
<b>6</b>	<b>Environmental Management .....</b>	<b>14</b>
6.1	Water Management .....	14
6.2	Groundwater Management .....	15
6.3	Air Quality Management .....	15
6.4	Noise Management .....	16
6.5	Waste Management .....	17
6.6	Erosion and Sediment Control Management .....	18
6.7	Acid Sulfate Soils Management .....	19
6.7.1	Avoidance .....	19
6.7.2	Minimum Disturbance .....	20
6.7.3	Stockpile of Acid Sulfate Soil .....	20
6.7.4	Neutralisation Treatment .....	20
6.7.5	Liming Rate .....	21
6.7.6	Guard Layer .....	21
6.7.7	Off-site Disposal .....	21
6.7.8	Contingency Planning .....	21
6.8	Contaminated Land Management .....	22

<b>6.9</b>	<b>Asbestos Management</b> .....	<b>23</b>
<b>6.10</b>	<b>European and Indigenous Cultural Heritage Management</b> .....	<b>23</b>
<b>6.11</b>	<b>Flora and Fauna Management</b> .....	<b>24</b>
<b>6.12</b>	<b>Traffic Management</b> .....	<b>26</b>
<b>6.13</b>	<b>Hazardous Substances Storage and Management</b> .....	<b>27</b>
<b>6.14</b>	<b>Horizontal Directional Drilling Fluids Management</b> .....	<b>28</b>
<b>6.15</b>	<b>Contingency</b> .....	<b>29</b>
<b>6.16</b>	<b>Rehabilitation Management Plan</b> .....	<b>32</b>
<b>6.17</b>	<b>Monitoring, Inspection and Auditing</b> .....	<b>32</b>
<b>6.18</b>	<b>Objectives and Targets</b> .....	<b>33</b>
<b>7</b>	<b>Targets</b> .....	<b>34</b>
<b>8</b>	<b>Risk Matrix</b> .....	<b>36</b>

# 1 Introduction and Scope

This Environmental Management Plan (EMP) has been developed in consultation with Pipeline Drillers' workers and is aimed at addressing, in conjunction with its associated procedures, Safe Work Method Statements (SWMS) and Pipeline Drillers Group's Integrated Management System (IMS) Manual legislative requirements and provide guidance in a suitable framework to facilitate the successful implementation of HSEQ management practices. The document identifies the minimum requirements that shall be applicable for this project. Pipeline Drillers Group (PDG) have an ongoing commitment to protecting the environment as per Pipeline Drillers' Environment Policy. This Environmental Management Plan (EMP) identifies and outlines the environmental protection measures to be implemented by all PDG personnel and contractors during the construction of the ABLP Seawater Intake Pipeline and associated structures.

This plan includes the management measures to be implemented to prevent or minimise potentially adverse environmental impacts arising from project activities. Implementing these requirements will achieve compliance with environmental legislative and regulatory requirements.

## 1.1 Project Scope

PDG have been requested by ABLP to assist with their Bay Lobster upgrade. The upgrade works include the design and construction of two (2) seawater intake lines connecting intake structures located approximately 1-1.2km offshore, a pump station located at Marine Parade, Kingscliff and rising main seawater delivery line back to the ABLP site. The two intake lines will be constructed from 500mm PE112 HDPE and the delivery line will be constructed from 560mm PE112 HDPE.



## 1.2 Personnel roles & responsibilities

The environmental responsibilities of key personnel are outlined in this Environmental Management Plan. All personnel are accountable for their responsibilities as detailed below, in addition to this; personnel (including

contractors) are to participate in all environmental initiatives as required by Pipeline Drillers Group. Full details of responsibilities are contained within the relevant job descriptions; however key Environmental duties / responsibilities are outlined below.

### 1.2.1 Director

The director is the nominated Senior Manager responsible to ensure this Environmental Management Plan is adhered to.

- Implement a system which ensures Superintendents and all workers are aware of their responsibilities and given the support required to maintain standards outline in this EMP.
- To establish appropriate educational programs in environmental compliance.
- Implement a system which will ensure all subcontractors comply with Pipeline Drillers Group's Integrated Management System and the relevant legislation.
- Hiring of project staff and contractors and supplying resources to ensure the standards in this EMP are maintained.
- Other duties as shown in Pipeline Drillers Group IMS Manual.

### 1.2.2 Project manager

- Lead by example and always demonstrate commitment to environmental compliance.
- Support and commit to environmental compliance by actively participating in environmental initiatives and programs.
- Ensure corrective actions are implemented in a timely manner to rectify any identified project risks or hazards.
- Assessing any potential contractor's competence and ability to perform any subcontracted works safely.
- Ensuring communications are adequate to facilitate effective environmental consultation between stakeholders.
- Ensure other project personnel and contractors operate with due regard for environmental compliance at all times.
- Assist the environmental management team in ensuring implementation and continual improvement of all environmental management.

### 1.2.3 Superintendent

- Organise work to ensure compliance with Pipeline Drillers Group's Environmental Management Plan.
- Plan, organise and implement recording procedures for environmental management.
- Report to management any hazardous areas that require rectification and which cannot be rectified in the normal course of duties and stop work where the potential for injury /damage warrant such action.
- Reports incidents to management immediately.
- Conduct inspections and maintain a record of areas which need attention as well as supervising what corrective action was taken in those areas.
- Work closely with the crew in ensuring a commitment to working environmentally responsibly and provide information, instructions and supervision to workers on the project.

- To liaise and work with the crew in investigating and reviewing all environmental incidents and near misses, and to ensure incident reports are properly documented with appropriate corrective action taken where required.
- Provide environmental leadership to all workers.
- Ensuring permit systems are implemented and provide supervision and guidance during these activities.

#### 1.2.4 HSEQ Advisor

- Plan and conduct regular site inspections, task observations and documentation audits to ensure compliance with legislative, organisation and client requirements.
- Provide environmental guidance and advice to workers and Pipeline Drillers during meetings, toolbox talks, preparation of SWMS / JHAs and / or other safety procedures.
- Plan and conduct site environmental training including, but not limited to, inductions, Safe Work Method Statements / JHA / SLAM etc.
- Assist with competency / training management including maintenance of site training records, VOCs and identifying and addressing training needs.
- Assist in identifying and implementing corrective actions in a timely manner.
- Complete incident reports and participate in incident investigation and ensure organisational, legislative and client incident reporting / investigation procedures are adhered to.

#### 1.2.5 Workers

- Work with due diligence and duty of care in mind, ensuring no environmental harm is sustained during the project.
- To be familiar with and act in accordance with the relevant environmental legislation and Pipeline Drillers Group's IMS.
- To cooperate and comply with all instructions given by the site's management team.
- To immediately notify the Superintendent of any environmentally endangering situation and not to work in any way that could endanger the environment.
- To use appropriate environmental controls where required and to familiarise themselves with the safety data sheet prior to using any chemical
- To participate in risk management procedures.
- Report environmental incidents immediately to supervisor.
- Adhere to any SWMS, JHA or other risk management procedure at all times.

### 1.3 Key Environmental Personnel

Position	Name	Experience	Qualifications
Project Director	John Whitbread	15 years Horizontal Directional Drilling 35 years as Director	Advanced Diploma in Civil Construction

Project Manager	Paul Tredenick	20 years Horizontal Directional Drilling	Advanced Diploma in Civil Construction Certificate III in Trenchless Technology
Superintendent	Nick Sargent	15 years Horizontal Directional Drilling	Certificate IV in Drilling Operations Certificate IV in WHS Certificate III in Trenchless Technology
Superintendent	Bryce Webb	10 years Horizontal Directional Drilling	Certificate III in Trenchless Technology Certificate II in Drilling Operations
Senior Driller	Brett McMeekin	18 years Horizontal Directional Drilling	Diploma in Civil Construction Management

## 2 Legislation and Other Requirements

Pipeline Drillers Group ensures potential damage to the environment is eliminated or minimized as far as reasonably practicable through the:

- Provision and maintenance of a safe work environment,
- Provision and maintenance of safe plant and structures,
- Provision and maintenance of safe systems of work,
- Safe use, handling and storage of plant, structures and substances,
- Provision of necessary information, training, instruction and supervision; and
- Monitoring of conditions in the workplace for the purpose of preventing harm to the environment.

Pipeline Drillers Group's Environmental Management Plan and associated procedures addresses all of the Environmental requirements within (but not limited to) the following legislative and guidance material:

WH&S Act 2011	Aboriginal Cultural Heritage Act 2003
WH&S Regulations 2011	Heavy Vehicle National Law (Act) 2013
WH&S and Other Legislation Amendment Act 2017	Labelling of Hazardous Chemicals in the Workplace (2015)
Env Protection Act 1994	Managing Noise and Preventing Hearing Loss at Work (2018)
Env Protection Air Policy 2019	Managing Risk of Hazardous Chemicals in the Workplace 2013
Env Protection Noise Policy 2019	Hazardous Manual Tasks 2011
Env Protection Regs 2019	
Env Protection Waste Management Policy 2000	
Env Protection Water Policy 2009	

### 2.1 Permits

Works are to be carried out in accordance with the conditions of the Operational Works (Prescribed Tidal Works) development permit.

## 3 Consultation, Communications and Cooperation / Coordination

### 3.1 Consultation

Consultation is an integral part of Pipeline Drillers Environmental Management System. Pipeline Drillers manages consultation in such a way to ensure legislative compliance, facilitate continuous improvement in environmental management and to ensure effective communications of environmental information. The consultative mechanisms used to meet project Environmental obligations include:

- Daily pre-start meetings,
- HSEQ meetings
- Notice boards,
- Inductions,
- HSEQ Alerts / Bulletins; and
- Emergency Response Exercises / Drills.

In addition to the formal consultative mechanisms listed above, employees are involved and consulted with during the following management and decision-making processes:

- Development and review of the project Environmental Management Plan,
- Development and review of Risk Assessments, Safe Work Method Statements, Job Hazards Analyses (JHA) and SLAMs,
- Management of hazardous structures, plant and substances; and
- Workplace inspections and audits.

Updates or changes to environmental requirements for workers (including changes to this EMP) will be communicated to all relevant stakeholders through the appropriate processes. *Refer to PDGP016 Consultation, Communication and Reporting Procedure for more information.*

#### 3.1.1 Daily Pre-start Meetings

Daily pre-start meetings are attended by all workers on site and are facilitated by the Superintendent and / or HSEQ Advisor (Environmental). Topics covered during a daily pre-start meeting include:

- Proposed work activities including any associated hazards and controls,
- Communication of any environmental forms / procedures which will need to be completed / followed (Permit to Work, JHAs etc.),
- Any corrective actions in progress,
- Any problems / issues identified by the workers; and
- Incidents / near misses / environmental alerts that have occurred elsewhere but are relevant to this workplace.

*Pre-start safety meetings are documented on the form PDGF S028 Pre-Start Safety Meeting (daily).*

### 3.1.2 HSEQ Meetings

HSEQ meetings will be held periodically and be themed to address a current Environmental or issue. They are facilitated by the Superintendent and / or HSEQ Advisor (Environmental). The purposes of the HSEQ Meeting include:

- Communicating important topics to workers,
- Providing examples of incidents / near misses from other sites,
- Informing workers
- Providing a forum to allow Environmental issues to be communicated workers; and
- To communicate any corrective actions for Environmental issues

HSEQ Meetings are documented on the *form* PDGFS015 HSEQ Meeting Form.

### 3.2 Communication

Pipeline Drillers Group ensures that communication systems are in place to effectively manage Environmental compliance on the project. Project communications are carried out through:

- Management Meetings – formal (*PDGFQ004 Mgmt Review Agenda & Minutes*),
- Tool Box Meetings – informal & formal (*PDGF S015 HSEQ Meeting Form*),
- Emails/ HSEQ Alerts,
- Operational meetings ,
- Office meetings – informal,
- Inductions (*PDGFS013 Employee Induction*),
- Training sessions,
- Safe Work Method Statements, Risk Assessments and JHAs (*PDGF S004 Safe Work Method Statement & PDGFS003 Job Hazard Analysis Worksheet*),
- HSEQ notices and alerts,
- Providing access to safety plans, safety manuals, and safe work method statements to all interested parties,
- Site signage where required; and
- Leadership site visits ('visible leadership').

## 4 Training, Development and Competence

### 4.1 Inductions

All staff working on Pipeline Drillers sites are given general company inductions prior to starting work. In addition to this they are given a site-specific induction upon arrival at any site. Finally, task specific inductions are given for all high-risk operations or tasks that involve the use of a risk management technique (SWMS / JHAs).

#### 4.1.1 General Induction

This induction covers general environmental hazards and risk management procedures. It educates workers on their duties in relation to environmental management, as well as informing them of Pipeline Drillers environmental policies and procedures.

#### 4.1.2 Site Specific Induction

Site specific inductions are provided when workers are working on a new site. The site-specific induction covers:

- Entry requirements (construction white card + induction),
- Pipeline Drillers policies and procedures,
- Regulatory requirements and any relevant codes of practice,
- Risk Management procedures (Permit systems, SLAMs, JHAs and SWMS etc.),
- Site specific environmental rules and PPE requirements,
- Emergency Procedures and site setup; and
- Incident and hazard reporting requirements.

#### 4.1.3 Task Specific Induction

SWMS or JHAs are prepared for all major jobs that are conducted by Pipeline Drillers. The SWMS or JHA can be used as a task specific induction document, as it facilitates the training of the worker by providing them with a detailed description of the works being conducted, a step-by-step procedure for safe job completion and enables consultation between workers and project management staff (through the SWMS review process).

## 5 Risk Management

### 5.1 Risk Identification, Assessment and control

A range of risk management techniques are in place for identifying, assessing and controlling various workplace environmental risks. All hazards and risks are managed using:

- Project Specific Risk Register,
- Site Inspections / Audits / Task Observations
- SWMS,
- Job Hazard Analysis,
- SLAM cards,
- Management Site Visits,
- Consultation (Pre-start, toolbox and HSEQ meetings),
- Corrective and preventative actions,
- Permit to Work Systems; and
- Use of Hierarchy of Controls & Risk Matrix

#### 5.1.1 Project Specific risk register

A Project Specific Risk Register will be made for the project which identifies all foreseeable risks for the project. This risk register categorizes and assesses risks, recommends appropriate control measures and defines the personnel responsible for implementing / monitoring the control method/s. This information is recorded on *PDGR006 Project Specific Risk Register*.

### 5.1.2 Site Inspections, Audits & Task Observations

Site Inspections, Audits and Task Observations will be conducted periodically, including on any subcontractors. Their aim is to identify and control any hazards that may occur on-site during operations, for example poor housekeeping or inadequate procedures. Issues recorded are either rectified immediately or added to the *PDGR005 Corrective Actions Register*.

### 5.1.3 Safe Work Method Statements (SWMS)

SWMS are used to ensure work is carried out without causing excessive environmental impact. Development of SWMS should involve the workers and supervisor/s conducting the works and ALL workers must read, understand and agree (by way of signing the document) with the procedure and controls outlined PRIOR to starting any work. SWMS aid in:

- Identifying and assessing risks / hazards,
- Identifying appropriate controls,
- Identifying High Risk Tasks,
- Identifying PPE, competency or permit requirements,
- Assigning responsibility for hazard control,
- Consultation (by involving workers in development and review of SWMS),
- Providing a means for management approval of work processes and hazard control; and
- Inducting new staff (task specific induction).

SWMS allow for worker review of work procedures, using the SWMS form itself. This, with notes / amendments, is handed back to management for consideration / approval. Safe Work Procedures/Safe Working Method Statements (SWMS) for operations, maintenance and inspection are developed using the results of risk assessments. They shall be adhered to at all Pipeline Drillers Group offices, workshops and workplace locations. Compliance to procedures ensures the mechanical integrity of each facility is retained. To guarantee continual and long-term effectiveness, procedures/SWMS shall be periodically reviewed and updated. Prior to commencement of any subcontracted works, the relevant subcontractors must submit its safety management documentation, including any SWMS or other work procedure, to Pipeline Drillers Group for approval.

### 5.1.4 Job Hazard Analysis (JHA)

Job Hazard Analyses are completed as required by workers. This usually occurs when a job is not covered by a SWMS, when a hazard has been identified that isn't covered in the current SWMS or when environmental or scope changes require additional or altered hazard controls.

The JHA is an administrative measure, which is reliant on the work group having good knowledge and understanding of the activity and the risk management process. Where required work groups may need to draw on expert advice to assist in the assessment of risks and identification of appropriate risk control strategies. The intent of the process is to encourage workers to take the time to think about their task, identify potential hazards and the controls that are necessary to reduce the Environmental risks of the task. Job hazard analyses are completed on *PDGFS003 Job Hazard Analysis Worksheet*.

### 5.1.5 SLAM cards

SLAMs are a quick, pocket-sized risk management tool which workers can use for one-off activities that do not require the use of a SWMS or JHA. They allow for real-time risk management and encourage workers to take an

active role in risk management by identifying hazards and assigning risk controls without the aid of a supervisor or HSEQ staff member. The following basic steps are conducted when completing a SLAM:

- Stop
- Look
- Assess
- Manage

SLAMs are provided to all workers at time of induction (sub-contractors are provided with SLAMs in the absence of their own similar system).

#### **5.1.6 Management site visits**

Periodic Management Site Visits will be conducted to ensure due diligence is maintained by company officers and to aid in the identification and management of risks. These are conducted as required and may be done at the start of a new project, at key milestones or done “for-cause” after an incident, near miss or as requested during consultation.

#### **5.1.7 Consultation (Pre-start, Toolbox and HSEQ Meetings)**

These meetings are held to enable effective, two-way communication of environmental information between relevant stakeholders and to allow for stakeholder involvement in decision making processes. A key component of these consultative mechanisms is the identification of hazards / risks. The mechanisms are discussed in detail in section ‘Consultation’.

#### **5.1.8 Corrective and preventative actions Register**

A Corrective and Preventative Actions Register will be maintained for the project to allow for the recording, tracking and effective close-out of any project environmental risks / issues that may be identified. Corrective and preventative actions can be identified through:

- Inspections / audits / task observations,
- Machinery pre-starts / inspections,
- Risk assessments,
- Incident reports / near misses / investigations; and
- Consultation with workers, client or the public.

Corrective and Presentation Actions are reviewed by management and controls implemented as required (indicated by priority and level of risk). Once corrective actions have been implemented, management will review the effectiveness of the actions to ensure the item is adequately addressed. Please see section ‘Monitoring and Review’ for more details.

#### **5.1.9 Permit to work systems**

Certain tasks that are high risk in nature are managed by a permit to work system to ensure the works are completed in a systematic way that ensures risks to environment are effectively managed. The PTW system also enables the systematic coordination of site-entry controls to areas identified as restricted. Works which are included under the permit to work system are:

- Excavation – 300mm or deeper,

- Confined space entry,
- Hot works; and
- Working at heights.

Work permits allocate duties to workers, which must be followed. Workers and contractors are advised of permit to work requirements during inductions. For more details, please refer to *PDGP030 Permit to Work Procedure*.

Contractors will be required to work under Pipeline Drillers Group permit to work system in the absence of their own system.

#### 5.1.10 Hierarchy of controls & Risk Matrix

When deciding upon what control measure will be used to control identified hazards, the hierarchy of controls will be used to determine the most effective, practicable control. The more effective means of control will be examined before moving down the hierarchy to select which control reduces the risk as far as reasonably practicable. The hierarchy of controls used is outlined in PDGP006 Risk Management Procedure.

*Pipeline Drillers Group has established a risk matrix which allows staff to assess the level of risk involved with different hazards. This risk matrix is vital to allow staff to select the appropriate controls for different hazard, which is determined by examining the level of risk involved, among other factors.*

## 6 Environmental Management

Through risk assessment workshops, various risks have been identified. The following management tools will be employed to manage the identified risks.

### 6.1 Water Management

Use of water onsite will be required for hydro testing of the pipe, and mixing drill mud. All water used will be potable water and recycled where possible. Potable water will be transported to site via tankers. Where possible, water will be minimised to only what is necessary and will be reused where possible.

Prior to and/or during construction the following mitigation measures will be implemented:

- Storm water drains and local drainage lines within the construction footprint will be maintained during construction activities;
- Adjoining properties and roads will be protected from ponding or concentrated storm water flows as result of the works;
- Any upstream stormwater flows will be diverted around the worksite and returned to the receiving waters wherever possible;
- Wash down or hose down methods where wastewaters drain to land or surrounding waters are not to be used at any time.
- Where required provide flooding protection for construction works (gravel layer on gradient, bogmats, sediment fencing)
- Water will be discharged using a method that will not cause accelerated erosion and/or the discharge of sediment to waterways. This could be done using a water truck (water the surrounding areas), by discharging into a concrete storm water drain (where available) or a direct discharge point. The location and methodology of discharge is to be confirmed with all Stakeholders prior to discharge.

## 6.2 Groundwater Management

Groundwater hazards will vary during construction for the different phases and areas on site. The activities that are likely to impact on groundwater are listed below:

- Potholing and other ground penetrating activities; and
- Excavations, including open trenching and vacuum excavation.

In the event where groundwater is exposed, the following processes will be adopted to ensure minimal environmental damage occurs:

- Any groundwater that is dewatered will be stored appropriately and either discharged if suitable, treated or transported to an appropriate EPA accredited disposal facility for treatment.
- Dewatering management in areas where acid sulfate soil layers occur (e.g. to temporarily lower the natural groundwater level to permit dry excavations) will be aimed to minimise the radius of influence of the cone of depression. The cone of depression is the volume of soil around a dewatering point that becomes unsaturated (i.e. partially drained) during dewatering.

Strategies to manage dewatering activities in areas where acid sulfate soils occur include:

- Minimise the volumes of soil excavated and thus soils dewatered at any one time;
- Conduct dewatering in a number of steps to enable material to be removed (i.e. skimmed off) at the water table in a number of increments;
  - Minimise groundwater drawdown, seepage into the dry hole, and oxygen ingress to the soils within the cone of depression by using sheet piling or similar devices; and
  - Neutralise existing acidity that develops in groundwater within the cone of depression using Aglime (or hydrated lime (Ca(OH)<sub>2</sub>) slurry) to a pH range from 6.5 to 8.5. Appropriate health and safety management will be used for handling hydrated lime and Aglime.

## 6.3 Air Quality Management

The following management/mitigation measures should be implemented where practicable for each construction area:

- Prevent activities that may generate excessive dust;
- In the event activities cannot be prevented, dust suppression measures will be used;
- Stockpiles and batters will be managed to prevent dust generation and sediment run-off;
- Ensure water and a water truck are available to suppress dust, ensuring run-off is not contaminated and does not enter nearby waterways;
- Ensure silt is removed from silt fences to reduce the potential for dust generation.

Dust Prevention Strategy:

- Vegetation clearance will be kept to the specified area;

- Vegetation clearing area will be clearly defined to minimise the risk of further clearance;
- Ensuring that trucks transporting dusty materials are covered; and
- Assess wind strength and direction prior to undertaking work that is likely to generate large quantities of dust and postpone works if wind is blowing towards a sensitive place.

Pipeline Drillers will also implement the following management / mitigation measures where practicable for each construction area:

- Minimise the height of stockpiles to 2 m;
- Watering of stockpiles to maintain a moisture content that minimises dust generation where possible;
- Establishing a cover crop / grass or covered in jute / coir matting on long term topsoil stockpiles;
- Shade cloth will be installed on sections of security fence that will be erected along the perimeter of each site;
- Managing odorous excavated soil stockpiles through selective placement or covering to reduce potential odour impacts where required;
- Locate stationary dust generation activities as far as practical from sensitive places;
- Ensure that any dust collection systems including filters fitted to plant and equipment are maintained and cleaned as required to ensure their effective operation;
- Use of shakedown pads and road sweeping on sealed roads where required;
- Ensuring that vehicles and equipment are appropriately maintained to minimise air emissions; and
- Vehicle speeds on site will be limited as signposted to minimise the generation of dust on unsealed roads and exposed surfaces.

For trafficable areas mitigation measures will include:

- Keeping surfaces clean;
- Installing an effective truck body and wheel wash facility if rumble pad is ineffective; and
- Avoiding or minimising queuing in streets approaching the worksites or adjacent to other sensitive activities.

Regular visual and olfactory inspections will be conducted by the Superintendent, and any evidence of excessive dust or odour generation will be reported to the HSE Manager for further action. If public complaints are received and verified, corrective action measures will be undertaken to address such complaints and inform PDG and subcontractor personnel of appropriate and correct procedures.

## 6.4 Noise Management

The primary objective for noise management is to ensure that noise sources are identified and controlled in accordance with legislative and guideline requirements. Consultation will take place to inform members of the community of any foreseeable disturbance and address all potential concerns.

The following strategies will be implemented during all phases of the project:

- All equipment will be regularly inspected and maintained in good working condition.

- Limit machinery and vehicle movements to defined work areas and designated roads.
- For activities that cannot reasonably be carried out during business hours, additional noise mitigation measures may be implemented depending on the nature of the work and proposed location.
- Noise attenuation and vibration control is required in accordance with AS 2436 – 2010.
- Site Layout, where possible, will ensure plant and equipment will be located and orientated to direct noise away from sensitive receivers.
- Plant and equipment will be selected to minimise noise emission, where possible, whilst maintaining efficiency and function.
- All trucks regularly used for the project (e.g. spoil trucks) are to have mufflers, and any other noise control equipment, maintained in good working order. Trucking routes will use main roads, where feasible.
- Site induction training will include a noise awareness component.
- Conduct inspections, which assess the effectiveness of management measures to prevent noise pollution.

Should a noise complaint be received, the following steps will be taken:

- Construction activities will be investigated to determine the cause of the noise emission problem.
- Current procedures and control measures will be reviewed to prevent recurrences and, where necessary, additional control and mitigation measures will be investigated and installed.
- An ongoing noise monitoring program will be considered.
- Corrective actions will be taken if there is a continuing issue.
- Implementation of noise barriers or the installation of noise attenuation devices on equipment will be considered.

## 6.5 Waste Management

- Waste management follows the below hierarchy:
  - Waste avoidance (elimination and substitution)
  - Waste reduction
  - Waste reuse
  - Waste recycling
  - Waste treatment
  - Waste disposal
- Waste is reduced at the source wherever possible.
- Waste streams shall be separated into various components at the point at which they are produced.
- For large quantities of waste, on-site designated areas shall be allocated for the collection waste materials. These areas shall be designed to avoid leakages and spillages.
- The immediate construction site will be kept free of litter and waste and adequately sized refuse containers or skip bins are available on each worksite (lids contained if appropriate to minimise access to the bins by animals).
- Bins will be emptied at regular intervals to prevent overfilling.

- No liquid or solid wastes generated during maintenance works shall be discarded or placed in a location where they may potentially be released into the storm water system, roadside gutters, other waterways, drains or outside of designated waste disposal facilities on-site.
- Correct collection and transportation of general refuse waste and standard liquid wastes to local council approved disposal sites/landfills by a licensed operator.
- Drill cuttings, drill mud and concrete will be taken to an approved facility, using safe methods of transportation.
- Any spillage of waste, or other materials, will be cleaned up as quickly as practicable.
- Sewage from site amenities will be collected by a licensed contractor and disposed of at the closest municipal wastewater treatment plant which accepts the waste and tracked using Waste Transport Certificates.
- If other regulated waste is unexpectedly generated from construction activities it will be:
  - Stored in appropriate and clearly marked containers in bunded areas away from water courses;
  - Collected by approved waste contractor licensed for regulated waste removal; and
  - The waste tracking system will be implemented in accordance with EHP Waste Tracking Guidelines.

## 6.6 Erosion and Sediment Control Management

Objective of the Erosion and sediment control management plan is to

- Minimise incidences of accelerated erosion as a result of the construction activities.
- To prevent sediments entering storm water as a result of soil erosion.
- Minimises the potential for adverse impacts on the environmental values of the receiving waters.
- Operate in accordance with International Erosion Control Association (IECA) Australasia, Best Practice Erosion and Sediment Control (November, 2008).

Vegetation clearing and all activities that disturb the soil will increase the vulnerability of soil for erosion and therefore have the potential to impact adversely on surface water quality. Significant excavation, disturbance to soil and areas on steep slopes without vegetation coverage will be prone to erosion.

The following strategies will be implemented during all applicable phases of the project:

- Excavation will be undertaken in accordance with the approved site layout.
- Installation and maintenance of temporary perimeter control measures such as silt fences, earth banks etc. during construction phase.
- Sediment fences will be constructed as per best practice.
- Where works is in one location for a period of time:
  - Site access will be restricted to one stabilised location which will be clearly defined,
  - A rumble pad will be installed at entry/exit points where applicable to ensure sediment is not tracked off the site;
    - The rumble pad will be constructed using 150-200 mm deep pad of minimum 40 mm crushed rock
    - The pad will be at least 2 metres wide and extend from the kerb to the hardstand,

- Where the entry/exit point slopes towards the road, a 200 mm high bund will be installed across the pad to deflect storm water run-off to the side where it can be filtered by a sediment fence.
- Up-slope water will be diverted around the soil disturbance with the use of small catch drains or perimeter banks.
- Any high flow velocity drains will be lined with geotextile fabric and/or rock checks constructed to avoid unnecessary soil erosion.
- Work will be planned to minimise the quantity and duration of soil exposure.
- Cleared areas shall be progressively re-contoured to their original condition, mulched and revegetated as soon as practicable after construction activities;
- Areas that are hydro mulched and revegetated, will be maintained, with frequent moisture application until they are established and stabilised to a point where maintenance is no longer required for the vegetation to remain in place; and
- Pipeline Drillers Superintendent will conduct visual inspections of sediment control devices daily and after significant storm events. The inspection will include an assessment of the presence of sediment laden material in the containment areas and the integrity of silt fencing and other storm water runoff installations (i.e. silt socks, booms and coir logs).
- Inspection and maintenance of the erosion control measures will be undertaken at regular periods and continued until vegetation is established to the point where stabilisation is achieved.
- Good housekeeping will be enforced by Pipeline Drillers to ensure storm water runoff does not contain rubbish or contaminants.

## 6.7 Acid Sulfate Soils Management

Given the geology of the construction sites, it is expected they contain potential acid sulfate soil (PASS) and/or actual acid sulfate soil (ASS) materials. The management strategies to minimise potential impacts associated with acid sulfate soils during construction activities are:

- Provide management strategies, in terms of procedural guidelines, designed to limit PASS impacts.
- Minimise disturbance of ASS and PASS;
- Treat disturbed ASS so that potential environmental harm is minimised;
- Minimise the opportunities of oxidising PASS that are exposed during works; and
- Minimise potential for inappropriate material handling through accurate identification of PASS and ASS.

The following strategies are preferred to manage acid sulfate soils during the excavation program:

- Avoidance;
- Minimise disturbance;
- Temporary stockpiling while waiting for reinstatement in the excavation in a short time (within days);
- Neutralisation treatment followed by re-use on-site; and
- Off-site treatment and disposal at a licensed landfill facility.

### 6.7.1 Avoidance

Based on the field assessment results and the proposed work it is unavoidable to disturb known acid sulfate soils.

### 6.7.2 Minimum Disturbance

The preferred management approach to deal with acid sulfate soils on-site is to minimise disturbance wherever possible. The excavation width and depth shall be kept to a minimum required for the installation of the proposed pipeline. HDD methodologies are utilised whenever possible to minimise ASS contamination. Where practical, excavation activities in areas containing acid sulfate soils will be conducted during dry periods.

### 6.7.3 Stockpile of Acid Sulfate Soil

Stockpiling of untreated acid sulfate soils will be minimised on-site by preparing a detailed excavations strategy that includes:

- Acid sulfate soil materials will be kept separate from non-acid sulfate soil materials at all times
- Staging of disturbances such that area disturbance at any one time is limited and the amount of time that acid sulfate soils are exposed to the atmosphere is minimised (i.e. minimise the time that excavations are left open)
- Ensuring stockpiles are located, such that all leachate and run-off water will be directed towards a controlled area or already disturbed acid sulfate areas
- Sediment controls will be established to ensure sulfidic material is not eroded
- Stockpiles will be place on top of plastic sheeting
- Capping of the stockpile will be considered if stored longer than a few weeks.
- As far as practical, the stockpiled material will be reinstated in the excavation so that the natural lithological sequence is preserved

Acid Sulfate soil stockpile will be monitored and tested regularly. The excavation strategy will be approved by Pipeline Drillers prior to work commencing on site.

### 6.7.4 Neutralisation Treatment

Where the disturbance of acid sulfate soil is unavoidable on-site, the preferred management strategy is neutralisation of the soils with finely crushed (predominantly <0.5 mm) AgLime to ensure the potential of acid sulfate soils to generate acid is minimised or prevented.

The following acid sulfate soil neutralisation strategy will be used on site:

- The amount of AgLime required for neutralisation will be based on the highest net acidity concentration obtained for that acid sulfate soil.
- Neutralisation will be conducted by mechanical means to achieve uniform blending, as far as practical, of the acid sulfate soil with AgLime. The acid sulfate soil material should be allowed to dry partially to aid the mixing process. For clayey material, an excavator with specialised longer teeth on the excavator bucket will be used to rip the soil deep enough to thoroughly mix the AgLime. Blending of sands and sandy silts can be typically accomplished using mechanical tilling or bucket blending methods;
- Where neutralisation is not practical on-site (e.g. due to limited space), alternative neutralisation options such as off-site treatment and disposal at a licensed landfill facility will be considered.

- Ensuring appropriate dust control measures, associated with lime neutralising activities, are implemented to minimise dust emissions; and
- Appropriate leachate collection system, containment bunding and diversion drains will be used to prevent contaminated water leaving the treatment area.

### 6.7.5 Liming Rate

Sufficient AgLime needs to be used to ensure all existing acidity that may be present and potential acidity that could be generated from complete oxidation of the sulphides over time is neutralised.

The required liming rate is calculated using the following:

$$\text{Liming Rate } ([\text{kg CaCO}_3]_3/\text{m}^3) = \text{Net Acidity } (\%S) \times 623.7 / 19.98 \times \text{Wet Bulk Density } (t/\text{m}^3) \times 100 / \text{NV} \times 1.5 \text{ [Equation 1]}$$

- The neutralising value (NV) of the AgLime being used represents the purity or percentage of CaCO<sub>3</sub> in the limestone. A safety factor of 1.5 is typically used to recognise that the AgLime is not fully mixed with the soil regardless of the method used.
- The liming rates required for neutralising the net acidity of acid sulfate soil horizons, based on a wet bulk density of 1.2 t/m<sup>3</sup>, NV of 93% and a safety factor of 1.5.

### 6.7.6 Guard Layer

Excavated acid sulfate soil material will be stockpiled on a guard layer to reduce the risk of acidic leachate generated in the stockpile and assist in protecting groundwater quality. The guard layer will be constructed in an area that is not to be disturbed during the excavation and filling processes. The rate of neutralising agent used in the guard layer of medium term stockpiles will be based on 0.3 times the highest potential and existing acidity of the stockpile per square metre area per vertical metre of soil that is to be placed on the stockpile (Dear et al., 2002). Any medium-term stockpile will be placed on a guard layer of finely crushed AgLime, spread out onto the ground surface.

### 6.7.7 Off-site Disposal

Acid sulfate soil that is unsuitable for reuse on-site (e.g. for geotechnical purposes) or where neutralisation is not practical on-site (e.g. due to limited space), will be disposed off-site to a licensed landfill facility. The preferred management strategies for acid sulfate soil disposal are:

- Untreated to a licensed landfill facility capable of conducting the required soil neutralisation;
- Treated on-site then disposed at a licensed landfill facility as required by the facility's license conditions;
- All movement and volume of soils removed from site will be recorded and maintained by the HSEQ Advisor (Environmental)

### 6.7.8 Contingency Planning

Contingency plans during the excavation phase will include the following:

- In the event that the duration of the earthworks activities is extended (due to unforeseen circumstances), a reassessment of the management strategies will be undertaken, updated and implemented (if required);

- If any soils are encountered during excavation works that are not representative of the soils previously identified, laboratory tests or similar might be required to identify acid sulfate soil horizons and evaluate the amount of existing or potential acidity;
- If soil remaining untreated in stockpiles exceeds the maximum short-term or medium-term holding times due to unexpected circumstances (such as in emergency situations, problems associated with obtaining laboratory results or changes to earth work programs), the soil stockpile will be covered with a guard layer of AgLime and plastic sheeting;
- If verification testing of AgLime treated acid sulfate soil indicate the performance criteria has not been met, the material shall remain within the treatment area and be re-treated with sufficient lime to achieve the performance criteria prior to re-use on-site or disposed to a licensed off-site landfill facility.

The Pipeline Drillers team will conduct daily inspections of the effectiveness of the ASS management strategies. The inspection will include an assessment of the time soils have been stockpiled and that where applicable correct treatment with lime is occurring.

## 6.8 Contaminated Land Management

- Where contamination is suspected, the soils will be managed as follows:
  - The extent and rate of excavation will be controlled and minimised to ensure large areas of open trenching and exposed soil generation;
  - All excavated soil will be evaluated for evidence of petroleum contamination as the excavation work progresses based upon visual and olfactory observations
  - In the event that gross contamination with the potential to cause or threaten serious environmental harm or material environmental harm is suspected, all works in the area will cease and the appropriate government agency will be notified (within 24 hours of becoming aware of the event) so the risk can be assessed and managed prior to recommencement of works;
  - A Disposal Permit will be obtained prior to the removal of soil from site. Soil will be transported in accordance with the Disposal Permit requirements;
  - Potential direct contact with contamination will be prevented by barriers between humans and the residual contamination using PPE and appropriate barricading / fencing;
  - An impermeable surface is required to underlie contaminated soil or contaminated debris in stockpile areas;
  - Water potentially applied to contaminated soils for the purposes of dust control must not generate surface water runoff;
  - The exposed area of contaminated soils vulnerable to dust generation must not exceed the capacity of water cart/trucks; and
  - Vehicles exiting contaminated areas must be suitably cleaned (broom swept and wheel wash) to ensure that no residual soil contamination leaves the defined work areas.
- Contaminated soils must be covered and appropriately transported to a licensed receiving facility for disposal.
- All movement and volume of contaminated soil removed from site will be recorded and maintained by Pipeline Drillers.

- In the event that an offensive or noxious odour at the work site and/or evidence of gross contamination is encountered, all works will cease immediately and all stakeholders will be notified until a remediation plan is developed.
- Visual and olfactory observations will be recorded and maintained by Pipeline Drillers.
- In the event further soil contamination investigations are necessary, a report detailing the results of all testing and remediation works (if required) will be developed by a suitably qualified professional.

## 6.9 Asbestos Management

Although asbestos contamination is not expected to be encountered during construction, this EMP has been developed in case Asbestos Containing Materials (ACM) is unexpectedly exposed and disturbed during the construction works. Any material that is potentially contaminated with asbestos will be managed in accordance with the appropriate regulations and guidelines.

This applies to all works within the project footprint, above and below ground. The greatest potential for ACM discoveries exists during site preparation and earthmoving operations.

- If potential signs of ACM are discovered prior to or during excavation work will cease immediately. Pipeline Drillers will assess the risk and determine appropriate management prior to work recommencing.
- If the investigation proves that asbestos is present the ongoing management and any remediation will be handled by an Asbestos Removalist that holds the relevant licenses and insurances.
- Asbestos will be transported and disposed by a licensed contractor in accordance with the requirements of applicable legislation.
- If material is removed from site to a licensed landfill each load will be tracked using Waste Transport Certificates filled out and countersigned by the Class AR1 Licensed Asbestos Removalist.
- Any remedial works will be undertaken as per the regulations and guidelines mentioned above.

## 6.10 European and Indigenous Cultural Heritage Management

All reasonable and practical measures need to be taken during construction to prevent harm to Aboriginal Cultural Heritage, with all activities to be undertaken in accordance with the NSW Heritage Act 1977.

Upon discovery of cultural heritage items, all work will be immediately suspended in that area and the following implemented:

- Stop works within the area,
- Council is notified immediately,
- The area of discovery will be fenced off to prevent further disturbance,
- No further work will be undertaken within the isolated area until clearance has been provided by the relevant authorities,
- Ensure that all relevant construction personnel have adequate awareness, training and commitment to this EMP and what processes are necessary for its successful implementation,

- In the event that human remains are detected (although unlikely, work should be ceased immediately and the NSW Police Service notified,
- Visual inspection of any freshly disturbed and excavated areas will be performed by Pipeline Drillers' HSEQ Advisor, staff and contractors. Any potential cultural heritage find will be reported in the first instance to Pipeline Drillers/ Project Manager who will instigate the appropriate reporting procedure,
- Findings suggestive of Indigenous cultural heritage significance will be immediately reported to the relevant authorities.

## 6.11 Flora and Fauna Management

Pipeline construction works will be completed in a manner that will protect and manage flora and fauna species listed as threatened under the Threatened Species Conservation Act 1995 and/or the Environment Protection and Biodiversity Conservation Act 1999 and native species listed as specially protected or protected wildlife under the Biodiversity Conservation Act 2016.

### Flora

The following activities will be undertaken to ensure the effective management of hazards to flora:

- Minimise the area of vegetation to be cleared during the construction to only that required for pipeline installation activities.
- Access to the site will be restricted to construction works personnel. This will mitigate against existing levels of disturbance to vegetation, including unauthorised clearing, recreational driving, and the spread of introduced weed species.
- Street trees will be avoided during the loading and unloading of materials.
- Access of construction and operational workers to areas outside of the cleared areas will be permitted only with the prior approval of Pipeline Drillers.
- Council permissions are required to prune or trim trees or native vegetation; remove, clear, cut down, destroy, poison, ring bark, lop, top, injure or interfere with any tree or native vegetation;
- Council permissions are required to undertake any works within the area vertically beneath any part of any tree or native vegetation (including, but not limited to, changing the natural ground level by filling, excavation or paving), whether the trees or native vegetation are located on a public reserve or park or on privately owned land, without the prior consent in writing of the Superintendent, and then only in accordance with such conditions as stipulated by the Superintendent. Tree roots should also be protected where they are encountered by boring or tunnelling below roots, and the pipe installed without severing roots. If Pipeline Drillers considers such boring or tunnelling is not feasible, the tree roots must be uncovered by hand excavation to limit damage and to allow inspection by the Superintendent.
- Excavation near the trees and cutting and removal of tree roots from excavations shall not be carried out without the approval of the Superintendent and council arborist.
- Conduct work in accordance with AS 4970-2009 Protection of trees on development sites - No storing of equipment around tree root zones
- Any works within tree root zones needs approval from the council arborist – trenchless option might be required within these zones

- Such trees will be marked by Pipeline Drillers so that they can be readily identified by the Principal or Council prior to removal, lopping or pruning.
  - If the Superintendent approves cutting of tree roots by the contractor, the roots must be cut cleanly and a bituminous fungicidal sealant or another approved treatment applied to the cut surface. All such operations on trees, native vegetation, or tree roots shall be carried out by, or be under the supervision of, a suitably qualified arborist. All lopping shall be carried out by use of saws or other approved pruning implements; generally, lopping with axes will not be approved.
- Cleared vegetation should be preferably milled or chipped and returned to suit, used in rehabilitation works or made available for community projects. Any disturbed ground surfaces must be reinstated with turf, seed or mulch and in accordance with all commonwealth and state government law and regulations and local government by-laws.

### **Marine plants**

The following activities will be undertaken to ensure the effective management of hazards to marine plants:

- All applicable suitable marine plants within the footprint of the approved works will be salvaged prior to the commencement of clearing activities and will be retained if applicable.
- All tidal areas temporarily disturbed will be rehabilitated. Rehabilitation will be undertaken immediately after the completion of pipe installation activities, including:
  - Re-profiling of substrate to pre-works levels;
  - Re-planting of all marine plants salvaged prior to the commencement of works; and
  - Planting of additional purchased marine plants to compensate for marine plants that could not be salvaged.
- Rehabilitation will be undertaken immediately after the completion of pipe installation activities.

### **Fauna**

The following activities will be undertaken to ensure the effective management of hazards to fauna:

- If fauna is identified on site, a Spotter-Catcher may be required to relocate the fauna prior to the commencement of any clearing works.
- Trenches and open excavations will be inspected daily to ensure animals are not trapped or endangered.
- Fauna trapped in trenches or other work areas should be removed as soon as possible by trained personnel. No operations are to commence or continue until fauna have been removed.
- No untrained personnel should approach or unduly stress fauna.
- Pipe ends will be blocked with sandbags at the end of each work period to prevent fauna from entering the pipe during periods when the site is unattended.
- Surviving fauna are to be relocated to a suitable habitat by personnel trained in fauna handling procedures.
- Records must be kept of all live and dead fauna removed from trenches and excavated areas.
- All habitat breeding sites within or surrounding the alignment would need to be reported.

## Weed Management

The following activities will be undertaken to ensure the effective management of weeds:

- A site walkover is to be conducted to identify any weeds of national significance (WoNS) or declared weeds. Weeds will need to be removed or sprayed with appropriate herbicides.
- All weed species removed from the area will be disposed of appropriately by transporting it safely to a licensed waste disposal facility.
- All earthmoving machinery travelling from the site will be cleaned to prevent dispersal of weeds.
- All machinery should be inspected and clean upon arrival to site and should be cleaned prior to demobilisation.

## 6.12 Traffic Management

A traffic management plan will be developed that will address the management of stakeholder and general public motorist's and pedestrian response to vehicle movements (e.g. frequent stopping, turning, large turning circle, and greater stopping distances) to maintain the road safety along the proposed works area and transport route.

- Where works are occurring within a road reserve, Traffic Management Plans will be developed and implemented by a suitably licenced traffic control contractor and in accordance with the Road Transport (Safety and Traffic Management) Act 1999. The plan will include temporary access arrangements.
- Interference with access to any public convenience or private premises will be managed to prevent inconvenience.
- All works will be restricted within the fenced confines of the development site. No works are to occur on adjacent footpaths, roads or nearby vacant areas.
- Traffic management strategies implemented at the sites will include as a minimum:
  - Employee and visitor parking areas will be clearly signposted and accessible,
  - Kerb-side allocation signs and line marking will be properly maintained to accommodate temporary and new traffic arrangements,
  - Any footpath closures and/or temporary vehicle access will only be considered where no reasonable alternative can be provided due to site constraints and that safety, capacity and/or operation of public transport, vehicle and pedestrian traffic are not compromised,
  - Manage visibility issues by ensuring site signage is not obscured or interfered with by vehicles and machinery,
  - Where possible minimise the need for reversing vehicles by establishing a one-way in and one-way out flow of trucks and site vehicles (turning circle) around the site,
  - Lights used during any night works will be directed so as to not interfere with nearby road or river traffic, i.e. kept low to the ground, directed onto the works area and shielded to prevent light spill.
- An appropriately competent person will supply Traffic Guidance Schemes.
- Interruption to traffic flow, where permitted within the boundaries of all state- controlled roads, requires written approval by TMR. Traffic Control Applications (TCA's) for any works within the road reserve, and particularly if temporary lane closures are considered, are a mandatory requirement prior to commencement of works.

- Pipeline Drillers shall be responsible for traffic management wherever the normal flow of traffic is disrupted by the works.

### 6.13 Hazardous Substances Storage and Management

The primary objective for hazardous substances management is to safely manage, store, handle and dispose of hazardous substances and chemicals and prevent their uncontrolled release to the environment. There are very few hazardous or dangerous substances that will be used on site for the project and there will be no bulk storage of hazardous chemicals on site.

- The types of hazardous/dangerous substances that are likely to be used and/or stored on site includes:
  - Hydrocarbons for refuelling, machinery storage and maintenance. Note that maintenance of machinery will not occur on site unless it is unavoidable.
  - Lime for ASS treatment.
  - Oils and lubricants for equipment maintenance and lubrication.
  - Gas bottles such as acetylene, compressed oxygen and propane.
  - Aerosols, solvents, silicones etc. for general maintenance uses.
  - Cleaning products.
  - Drilling fluids and additives.

#### Equipment and Machinery

- Overnight parking of mobile machinery is to be in a designated compound area to prevent migration of fluid leaks to drainage paths.
- Refuelling should be undertaken within the designated compound area. If this is not possible, machinery should be moved to a level, impervious surface to minimise the potential for soil or water contamination due to leaks.
- During refuelling the tanker operator will always remain in the area and all refuelling tankers are to have stocked hydrocarbon spill kits and up to date fire extinguishers fitted.
- It will be ensured that vehicles and equipment are appropriately maintained to minimise potential for fuel and oil leaks and subsequent contamination.
- Waste lubricants and other oily wastes shall be contained in leak proof containers and taken off site by a licensed transport contractor to an appropriate recycling or disposal facility.
- Drip trays shall be provided where possible around equipment where leaks or spills are likely.
- Any spill greater than 20L shall be reported to the local Council and relevant Government bodies.

#### General

- Hazardous chemicals and fuels will be stored in accordance the relevant regulations, Australian Standards and the Safety Data Sheets (SDS).
- Chemicals will be stored in enclosed buildings or structures in appropriate storage cabinets for the type of chemical or banded to contain 110% of the largest container within the bund.
- Potential for storm water and groundwater contamination will be considered when assessing locations for storage of hazardous chemicals.

- Any leakage or spillages are to be immediately cleaned up and reported to the HSEQ or Project Manager. Major spills which have the potential to cause serious or moderate environmental harm will be reported immediately and managed as per the Emergency Response Plan.
- Adequate spill control equipment (to industry standards) and all associated personal protective equipment will be made readily available to personnel during any works that present a potential for release of chemicals to the environment.
- All staff will be trained in appropriate handling, storage, containment and clean up practices for chemicals and dangerous goods as is relevant to their position.
- Where possible, hazardous chemicals and materials will be replaced with less harmful alternatives.
- Lime for acid sulfate soils treatment will be stored within an enclosed building or structure or in a waterproof container with appropriate label and handling requirements on the outside.
- A list of hazardous materials kept on site shall be kept and relevant SDS shall be available in the site office and within the vicinity of the storage area(s) and available to personnel on site.
- Records will be kept on a dangerous goods inventory to include information such as storage location, SDSs, personnel training and disposal of waste for all chemical and dangerous goods used on-site.
- Fuelling of vehicles and equipment shall comply with the relevant regulations and standards. It shall be undertaken in locations away from drainage systems and precautions shall be in place to ensure accidental spills will not escape into storm water and local waterways.
- Site inspections in relation to chemical storage will be undertaken by the Pipeline Drillers representative.
- Spill response equipment such as spill kits shall be checked regularly by the Pipeline Drillers representative.
- Machinery maintenance and refuelling procedures will be checked periodically by the Pipeline Drillers representative.
- Inspections of chemical storage containers and the integrity of storage areas, pavement and associated containment systems will be conducted regularly.

#### 6.14 Horizontal Directional Drilling Fluids Management

- All liquids storage areas, including the mud mixing and separation plants, shall be contained within an impervious bund to prevent spills spreading. Pipeline Drillers are responsible for clean-up and remediation required.
- All unused drilling fluids will be disposed of or reused appropriately. Disposal methods will be as per the relevant SDS.
- The risk of mud return to surface from within the bore (frac-out) shall be minimised through the management procedures outlined in *the* Drilling Fluid Pressure Analysis Report.
- If a frac-out should occur, it shall be managed in accordance with the Frac-Out Contingency Plan.
- All drilling fluids and cuttings contained within impervious containers/areas.

## 6.15 Contingency

### 6.15.1.1 Drilling Fluid Loss (Frac-Out)

Drilling Fluid Loss or Frac out is defined as the loss of return fluids from the bore hole to the terrestrial and/or aquatic environment. Drilling Fluid Loss is identified either via visual assessment or drilling fluid loss indicators (Partial or Total fluid loss from the drilling system), monitored by Pipeline Drillers Drilling Fluid Personnel (i.e. the Drill Rig allocated Superintendent, Driller and Mud Technician).

The Pipeline Drillers Group allocated Superintendent and Driller are the first authority to suspect/identify and confirm if a loss of return fluid has occurred (Partial or Total). As a result of the fluid loss, the Pipeline Drillers Group Superintendent is responsible for communicating the occurrence to client and subsequent pre-approved stakeholders. Pipeline Drillers Group allocated Superintendent is responsible for the allocation of staff resources to find and commence the remediation of fluid loss to the terrestrial and/or aquatic environments.

### 6.15.1.2 Frac-Out Prevention

Throughout the drilling process the 'feed' rate, pressure and the 'effectiveness' of the drilling fluid application are to be continually monitored, reviewed and assessed by the Pipeline Drillers Driller and/or the Pipeline Drillers Superintendent via the Potential Fluid Loss Indicators Procedure.

VARIABLE	METHOD
Experience and well-trained staff	Experienced and well-trained Operators are an essential component to the mitigation and minimisation of potential fluid loss. Capable of understanding and identifying potential indicators prior to a potential fluid must be a significant priority of the Superintendents, Drillers and Mud Technicians.
Use of Pressure Sub	A Pressure Sub will be connected to the Steering Probe, which will allow the Driller and Steering Engineer to monitor the downhole annular pressure at all times. The annular pressure will continue to increase as the pilot hole progresses however if the pressure increases above the pre-determined predictions and/or modelling, the driller will immediately commence swabbing to reduce the annulus pressure before drilling ahead.
Consistent Monitor	In the event that the drilling fluid program exhibits any abnormal characteristics, and/or there is any reason to suspect losses (or potential for losses) greater than 35% of the borehole volume, the drilling process is suspended immediately and further investigation and visual assessment conducted before re-commencement of HDD operations. During the tracking of the fluid volume a loss of 0-35% of the borehole volume can be expected and work should continue on as normal.

### 6.15.1.3 Drilling Fluid Loss Response

In the event of potential fluid loss, HDD operations are suspended immediately, the relevant parties are immediately informed by the Pipeline Drillers Driller and/or the Pipeline Drillers Superintendent and the Pipeline Drillers HDD support team is engaged to remediate the fluid loss occurrence immediately. The Pipeline Drillers HDD personnel are equipped and trained in effective fluid loss control and remediation measures. Fluid loss response stations are available at Pipeline Drillers pads sites.

#### GENERAL FLUID LOSS PROCEDURE

1	The drill string will be pulled back off face to relieve pressure on the fluid loss.
2	All HDD works and operations are immediately suspended, including the recycling of drilling fluid. On suspension of works, pressure has dissipated the fluid that remains in the system into the bore hole, where it should remain.
3	GCCC informed immediately of Fluid Loss occurrence
4	Determine the location and extent of the Fluid Loss
5	Transport of additional resources and response equipment to Fluid Loss location
6	Allocation of Pipeline Drillers HDD support team to assist with fluid control and remediation
7	Assessment by Pipeline Drillers allocated Superintendent for best control and remediation method

#### 8a - TERRESTRIAL FLUID LOSS PROCEDURE

8a	The drill string will be pulled back off face to relieve pressure on the fluid loss.
8a	Drilling Operation suspended
8a	Containment of the area with sand bags, and/or silt fencing to surround and contain the drilling fluid
8a	If available and access allows, a mobile vacuum truck will be deployed to pump the drilling fluid from the containment area and recycled to the return pit.
8a	If unavailable or access is limited, flex drive/sykes pumps will be used to pump the drilling fluid from the contained area and recycled to the return pit by way of the mud return line
8a	Upon review, drilling fluid additives would be utilised to help seal the Fluid Loss Fracture before the commencement of full HDD works and operations
8a	Review and documentation of Fluid Loss occurrence and recommencement of project works.

#### 8b - AQUATIC FLUID LOSS PROCEDURE

8b	The drill string will be pulled back off face to relieve pressure on the fluid loss.
8b	Drilling Operation suspended
8b	Deployment of floating aquatic booms to contain fluid loss.
8b	Deployment of vacuum unit and/or pumps to pump the drilling fluid from the containment area and recycled to the return pit.

8b	Upon review, drilling fluid additives would be utilised to help seal the Fluid Loss Fracture before the commencement of full HDD works and operations
8b	Review and documentation of Fluid Loss occurrence and recommencement of project works.

#### 6.15.1.4 *Equipment Breakdown*

Prior to mobilisation, all Pipeline Drillers equipment is subject to pre-mobilisation servicing and repairs & maintenance schedule. In the event of equipment failure onsite, Pipeline Drillers' engages the following contingency measures:

- Remote Support from Pipeline Drillers mechanics and drilling equipment specialists
- Deployment to site of Pipeline Drillers mechanics and drilling equipment specialists
- Deployment of Pipeline Drillers contingency equipment
- Hire of contingency equipment from pre-elected local hire outlets

#### 6.15.1.5 *Borehole Collapse / Failure*

Project variable and unexpected ground conditions may result in potential hole collapse. To ensure hole integrity is maintained in the event of hole collapse, a tail string will be utilised during the reaming operations. If hole collapse does occur, we will review the following elements in our procedure prior to continuing on with further drilling operations.

- Drilling fluid design
- Reaming procedures
- Working hours

If an unexpected change in ground conditions is encountered, drilling operations will be stopped, and the following elements of our procedures will be reviewed to ensure down-hole tooling and drilling fluid design suit the changed ground conditions.

- Drilling head
- Type of reamers required
- Drilling fluid design

#### 6.15.1.6 *Downhole Tooling Failure*

All bore holes drilled by PDG are connected by drill pipe either side of the tooling. This is referred to as the tail string. In the unlikely event that the tooling down hole becomes stuck, a drill rig is relocated to the exit side of the drill pipe, connects onto the tail string and pulls the tooling from the bore hole.

In the unlikely event of breakage of both the drill string and the tail string from the down-hole assembly the following procedures will be engaged to recover any equipment from the borehole.

There are a variety of standard tools to recover the down-hole assemblies that may have broken off. These tools have been widely used in HDD operations, and have proven to be very successful in down-hole assembly recovery. These tools include:

- Overshots (Located at short notice)
- Spears (Located at short notice)
- Taper Taps (Located at short notice)
- Junk baskets (Fabricate on site)

- Magnets (Located at short notice)
- Wash over pipe (Located at short notice)
- Bumper subs and jars (Located at short notice)
- Packer & Grouting (Located on site)

Where recovery is not successful and the equipment is in a position that is accessible via excavation (i.e. close to entry or exit points), the equipment will be recovered by these means.

If either of these two (2) methods is not successful the equipment will be abandoned down hole and a new pilot hole drilled on a varied alignment.

#### 6.15.1.7 *Stuck Product Pipe*

All bore holes drilled by PDG are enlarged to the appropriate size, for the geological conditions, to pullback product pipe successfully. The borehole's integrity is maintained by the mud occupying the bore hole.

In the unlikely event of stuck pipe, the remaining product pipe is disconnected/cut from the pipe string. A secondary/contingency pulling head is welded in place at the exit side. A secondary drill rig is then mobilised into place and connects onto the contingency pulling head via the maximum number of drill pipes permissible. The drill rig then pulls back on the product pipe to remove it from the bore hole. The product pipe is cut into lengths, as it is removed from the bore hole, and the pulling head is then welded onto the remaining product pipe in the bore hole. The process is repeated until all the product pipe is removed from the borehole.

## 6.16 Rehabilitation Management Plan

### General Works

- All rehabilitation works will be in accordance with the conditions of all statutory approvals for the project.
- The site shall be remediated immediately after the completion of works. This will include repair to existing kerb and channel, footpath, driveway or roadway and reinstatement of existing traffic signs and pavement markings that have been removed or damaged during works carried out in association with the approved development.
- All materials shall be removed from site.
- All refuse shall be disposed of at appropriate waste handling facilities. Contractors shall provide Pipeline Drillers with certificates of disposal or similar to demonstrate that this requirement has been fulfilled.
- All hardstand shall be removed and the topsoil reinstated and scarified for revegetation, by seeding and/or hydro mulching. Sediment controls will be removed when the vegetation has been established and erosion is no longer likely.
- The proposed works will not damage or compromise the working ability of the existing infrastructure located in the vicinity of the proposed work. Pipeline Drillers are responsible for remediation works that may be required if damage to public utility mains (water and sewerage), existing mains, services (fibre optic cables, and/or telecommunications, gas electricity or landscaping) or installations is caused.
- The proposed works will not change surface or groundwater flow patterns and will not involve any significant reshaping of the natural landform at the completion of remediation works post construction.

## 6.17 Monitoring, Inspection and Auditing

At each operational site the Drill Superintendent with the Pipeline Drillers representative is to ensure monitoring, inspection and auditing is carried by conducting regular visual inspections and audits. This may include:

- Environmental impact,
- Plant and equipment condition,
- Human resources training levels and gaps,
- Compliance to this EMP; and
- Additional site-specific inspections.

Where a concern exists, environmental monitoring may include the collection of soil samples at the construction sites for subsequent analysis of contaminants. The result of any audit is to be recorded and forwarded to management. Should during the source of any inspection or audit, an event be detected which has or has the potential to cause (environmental) damage, then an incident report is to be completed and investigated as per PDGP014 Incident Management Procedure. Auditing is to be carried out by either the Superintendent or HSEQ representative or both as per internal audit schedule.

Inspections will be carried out regularly throughout the construction period as specified within project conditions and relevant documents. Workplace inspections will be carried out by the HSEQ Department as per the inspection schedule. These inspections take the form of:

- Environmental Site Walkthroughs,
- Weekly Environmental Inspection Checklist,
- Daily Fauna Inspections (Trenching),
- Routine Weed/Seed (Wash-down) Inspections,
- Plant and Vehicle Inspections,
- Monthly Senior Management Inspections; and
- Hazard Observations.

Environmental inspections will be utilised to monitor work practices/environmental aspects and identifying non-conforming areas and assessing the effectiveness of the environmental protection measures or controls on site.

## 6.18 Objectives and Targets

Pipeline Drillers' key Environmental Objectives for the project are:

- Meet all contractual obligations to ABLP/Council, comply and enforce the Project HSEQ Policies and guidelines, meet regulatory, legislative, industry standard and guideline requirements subscribed relating to the specific environmental aspects.
- Meet all relevant approval, permit and license requirements.
- Ensure environmentally conscious construction planning, acquisition, design and construction of all related activities through adequate resourcing to ensure work activities do not present a risk to the environment.
- Minimise, where possible, the release of pollutants.
- Development and implementation of effective and appropriate procedures that identify and document potential environmental hazards, risks and aspects and in turn implementing control measures to minimise or prevent environmental incidents and non-compliances from occurring.
- Communicate and ensure environmental training/awareness (internal/external) is conducted that will enable all employees and contractors to undertake their work in an environmentally friendly manner and increase environmental awareness.

- Actively communicate to all project employees, subcontractors and suppliers environmental requirements and hold them accountable for their actions accordingly.
- Maintain effective communication and liaison with relevant stakeholders, government bodies and the community.
- Achieve best practice environmental management on the project as assessed by internal/external audit, compliance checks, inspections and reviews which will ultimately ensure continual improvement to the EMS; and
- Implement appropriate waste management protocols through the principals of reduction, reuse, recycling and appropriate disposal of waste.

## 7 Targets

Activity – Lead Indicators	Frequency / Target	Responsible Person
Senior Management Tours / Audits	Monthly	HSEQ Manager
Pre-start Meetings	Daily	Supervisors
Completion of required Induction requirements	100% of workforce	HSEQ Manager
Completion of PDG Induction requirements and follow up by senior project management with new employees	100% of workforce	HSEQ Manager
Environmental Audits conducted	At least one a week	HSEQ Manager
SWMS Reviews	100% of all workforce	HSEQ Manager
Conductance of JHA when required	When required	HSEQ Manager
Incident Reporting and Notification and Investigation	Immediately to HSEQ department	HSEQ Manager
Incident Investigations Complete	Low / Medium Potential Risk – 3 days. High. Extreme Risk and all Notifiable incidents 7 -10 days	HSEQ Manager & Project Manager
HSEQ Alerts are developed and communicated to applicable staff and stakeholders	Within 7 days of investigation being finalized	HSEQ Manager
High to Extreme Actual Environment Incident occurrences	Zero	HSEQ and Project Manager
NCR's arising from 3rd party auditors and Client Audits	Zero	HSEQ and Project Manager
CAR's / NCR's / OFI's actions arising from Incidents, inspections, audits and non-conformance reports are closed out within allocated timeframes	100%	HSEQ and Project Manager
Environmental breaches or infringements received from regulatory bodies	Zero	HSEQ and Project Manager
Compliance to applicable approval/license/permit conditions	100%	HSEQ and Project Manager
Compliance to prescribed monitoring, sampling and testing requirements	100%	HSEQ and Project Manager

Daily and Monthly Reporting – Summary of environmental incidents, corrective actions, monitoring results, audit results, progress on constraints planning etc.	Daily and Monthly	HSEQ and Project Manager
<p>Groundwater</p> <p>No ponding of surface waters upstream of the work sites.</p> <p>No visible surface water impacts to neighbouring properties (ponding or concentrated flows).</p> <p>No recorded incidents of wash down water or visibly 'dirty' water discharged offsite</p> <p>No discharge of groundwater to the environment.</p> <p>Environment is not impacted by the groundwater being treated.</p>	Zero	HSEQ and Project Manager
<ul style="list-style-type: none"> <li>No visual observation of dusty conditions.</li> <li>No complaints from public/landowners/Council in relation to air quality.</li> <li>No complaints from public/landowners/Council in relation to noise; and</li> <li>Evidence of equipment maintenance</li> </ul>	Zero	HSEQ and Project Manager
<ul style="list-style-type: none"> <li>All waste to be separated into relevant categories and recycling / reuse is maximised.</li> <li>Site is clean and free of litter and bins are empty before they overflow.</li> <li>All regulated wastes are removed from site in accordance with waste tracking legislation.</li> <li>No complaints received in relation to waste management practices.</li> </ul>	100%	HSEQ and Project Manager
<ul style="list-style-type: none"> <li>Sediment/erosion control devices working.</li> <li>No signs of erosion on site.</li> <li>No un-managed build-up of sediment on or off site.</li> <li>No reduction in water quality entering the stormwater system as a result of poor sediment control.</li> </ul>	100%	HSEQ and Project Manager
<ul style="list-style-type: none"> <li>No disturbance to culturally sensitive sites.</li> <li>If cultural heritage items are identified they are not damaged and appropriate action is taken.</li> </ul>	Zero	HSEQ and Project Manager

# 8 Risk Matrix

		LIKELIHOOD					RISK RANKING SUMMARY	HIERARCHY OF CONTROL
		1 RARE	2 UNLIKELY	3 POSSIBLE	4 LIKELY	5 ALMOST CERTAIN		
CONSEQUENCE	5 CATASTROPHIC	Medium 5	Medium 10	High 15	Extreme 20	Extreme 25	<b>16 - 25</b> – Extreme risk; immediate action required. General Manager's approval required before commencement. <i>Significant Environmental Impact as per ISO 14001</i> <b>11 - 15</b> – High risk; management attention needed. Project Manager's approval required before commencement. <b>5 - 10</b> – Medium Risk; responsibility must be specified for approval before commencement. <b>1-4</b> – Low Risk; manage by routine procedure	<b>1 Eliminate</b> - Can you eliminate / remove the hazard? <b>2 Substitute</b> - Can you substitute the hazard with a safer material / substance / plant or way of doing the task? <b>3 Isolate</b> - Can you be isolated from the hazard? Or the hazard from you? <b>4 Engineering</b> - Can the hazard have engineering modifications to make it safer? <b>5 Administration</b> - Is a procedure / signage / permit / training required to enable safe work? <b>6 PPE</b> - As the least effective control is PPE required to protect you from the hazard?
	4 MAJOR	Low 4	Medium 8	High 12	Extreme 16	Extreme 20		
	3 MEDIUM	Low 3	Medium 6	Medium 9	High 12	High 15		
	2 MINOR	Low 2	Low 4	Medium 6	Medium 8	Medium 10		
	1 INSIGNIFICANT	Low 1	Low 2	Low 3	Low 4	Medium 5		
LIKELIHOOD DESCRIPTION								
1 RARE May occur only in exceptional circumstances		2 UNLIKELY Could occur at some time		3 POSSIBLE Might occur at some time		4 LIKELY Will probably occur in most circumstances	5 ALMOST CERTAIN Is expected to occur in most circumstances	
CONSEQUENCE TYPE								
	Health & Safety	Environment	Culture, Community & Reputation	Financial & Assets				
5 Catastrophic	Fatality - single or multiple	Major discharge, loss of containment or impact causing irreversible damage. Adverse publicity. Significant cost for recovery & remediation. Will incur penalty/ fine / litigation	Serious public or media outcry. Continuing adverse national press. Irreparable damage to highly valued items of great Cultural significance resulting in persecution of litigation.	Threatens viability of company. Total loss of buildings, plant & equipment, data records. Extended interruption to business with full recovery unlikely.				
4 Major	Long term illness or permanent disability that prevents further work or impacts on social / family life.	Loss of containment, spillage or impact that breaches an environmental standard or approval. Results in fine or prohibition notice.	Local community groups express dissatisfaction to media and government. Notable damage to items or areas of Cultural Heritage.	Impact greater than \$1M. Extensive damage to plant & equipment – repairs difficult. Up to 3 months business interruption. Loss of up to one month's of data.				
3 Medium	Requires ongoing treatment or support. Unable to work for a specified period	Loss of containment, spillage or impact that is reportable under a regulatory framework.	Direct impact to planned or existing projects through either delay or short term suspension. Client concern expressed to senior management. Casual disregard or harm to items/areas of Cultural Heritage.	Impact of \$200K - \$1M. Significant damage to plant & equipment – repairable. More than one week's business interruption. Loss of up to one week of data.				
2 Minor	Medical treatment or results in some form of modified duties.	Loss of containment, spillage or impact that requires external resource to remediate.	Complaints Register exceeds expected average. Impropriety or failure to observe required policies for preserving Cultural Heritage. Client rejects management plans.	Impact of \$20K - \$200k. Minor damage to plant & equipment – repairable. More than one week's business interruption. Loss of up to one day of data.				
1 Insignificant	Minor first aid treatment. Immediate return to normal duties	Minor impact that is readily remediated. No lasting damage.	Planning ignores cultural and community issues.	Impact less than \$20K. Localised damage easily repairable. More than one week's business interruption. Loss of less than one day of data.				

# B1 – EROSION AND SEDIMENT CONTROL PLAN

**Australian Bay Lobster Producers Limited**

**Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)**

## Document Control Sheet

<b>Current Version</b>	B
<b>Current Version Date</b>	21 January 2022
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## Amendments

<b>Version Number</b>	<b>Version Date</b>	<b>Authorised by</b>	<b>Amendment Details</b>
A	4 November 2021	ABLP	Original Publication
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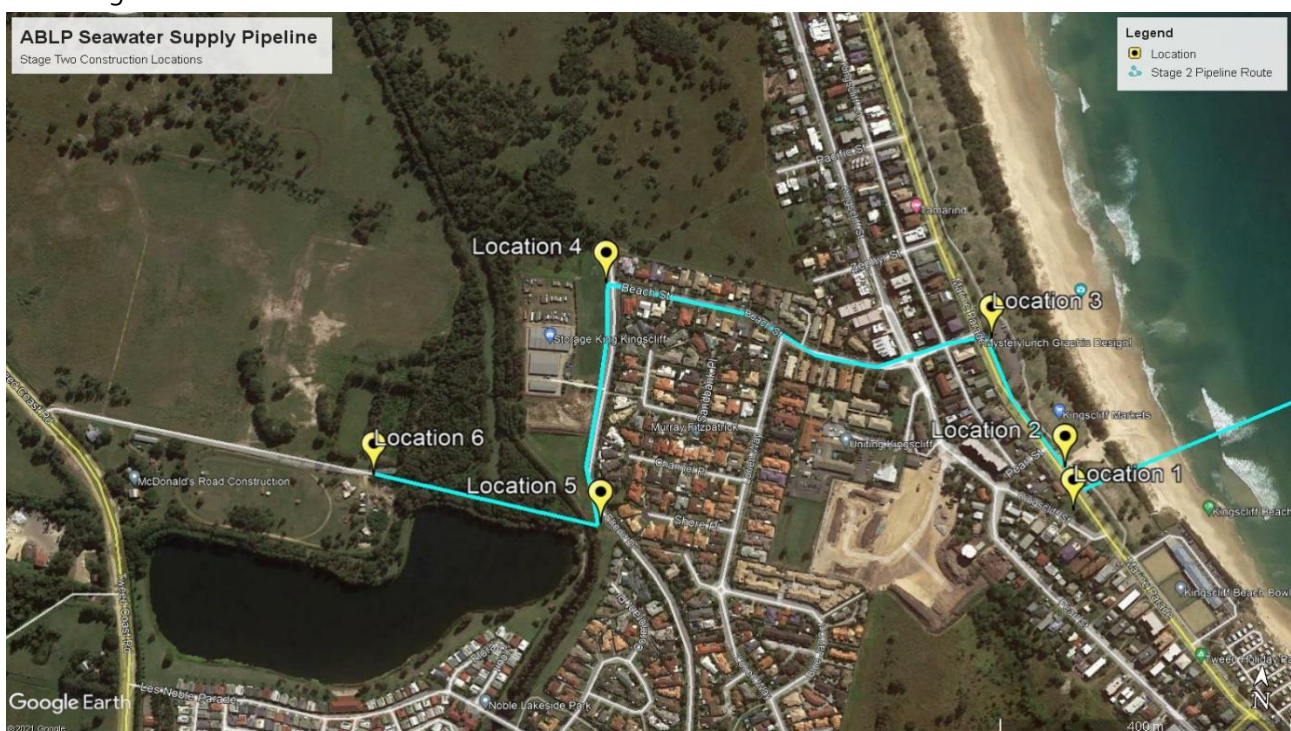
# B1 – Erosion and Sediment Control Plan

## 1. Introduction

The purpose of this document is to detail the erosion and sediment management strategy for the construction of stage two of the Australian Bay Lobster Producers Limited (**ABLP**) Seawater Supply Pipeline (**SSP**). Table B1-4 integrates the objectives and management measures to be implemented during construction and sets out clearly how the objectives can be accomplished by nominating responsible persons and establishing performance indicators, required management actions, monitoring, corrective actions and reporting procedures.

### Construction – Pipeline

Construction of stage 2 of the SSP covers the pipeline alignment between lot 3 DP 111154 and the intake structures mounted to the seabed eastward of Kingscliff Beach. This alignment is shown below, traversing through Kingscliff before continuing to a point 1.2km offshore to the seabed mounted intake structures. The primary construction method for this stage of the pipeline is horizontal directional drilling (**HDD**) and as a result the erosion and sediment risks associated with the construction are minimal and limited to locations 1 to 6 in Figure B1-1 below.



**Figure B1-1: Stage 1 SSP Alignment**

### Construction – Pump Well

Part of the stage two works will also incorporate the construction of a cylindrical pump well in Jack Bayliss Park (location 2). This well will be constructed by caisson methodology, reducing the excavation footprint associated with the works to the internal diameter of the well. As the excavation area will be contained by the walls of the well there will be minimal disturbance, degradation or erosion to the area surrounding the well. Notwithstanding, appropriate erosion and sediment controls will be implemented around the perimeter of the

works, with sediment fencing and bund walls to be utilised to contain and temporarily store all excavated material from the works before transportation offsite.

## 2 SITE ASSESSMENT

Table B1-1 below describes each of the above steps and the potential impacts relevant to this Erosion and Sediment Control Plan.

**Table B1-1 Unmitigated Construction Works**

Component	Description	Potential Unmitigated Impacts
Prepare Site	Install erosion and sediment controls around HDD rig hard stand, HDD entry/ exit pits, pipeline trenches or caisson works.	<ul style="list-style-type: none"> <li>○ Minor dust generation and soil disturbance through material handling.</li> <li>○ Loss of organic matter and sediment from exposed soils.</li> </ul>
Construction	Carry out construction works as required.	
Post-Construction	Remove erosion and sediment controls and stabilise remainder of site as appropriate. Ongoing landscaping and maintenance of the site to pre-construction state.	

The key pollutants which could potentially be generated from site construction works are given in Table B1-2 below.

**Table B1-2: Key Pollutants Generated from Unmitigated Construction Works**

Pollutant	Generated (Yes/No)
Gross Pollutants (litter, vegetation, etc.)	Yes
Sediment	Yes
Oxygen Demand Substances	Yes
Nutrients	No
Pathogens / Faecal coliforms	No
Hydrocarbons	Yes
Metals	No
Surfactants	No
Synthetic Organics	No

Thermal pollution	No
pH altering substances	Yes (associated with ASS soils)

The water quality objectives for contaminants identified in Table B1-2 are shown below in Table B1-3.

**Table B1-3: Water Quality Criteria for Discharge for Construction**

Parameter	Criteria*
pH	6.5-8.5
Total Suspended Solids	<50mg/L
Hydrocarbons and surface films or other visible contaminants	No visible films, odour or obvious discolouration of runoff waters
Litter and debris	No visible litter or debris washed from site

\* for maximum  $Q_{3\text{month}}$  storm event only taken as 40% of a  $Q_{1\text{year}}$  storm.

Annexure A - Code of Practice for Soil and Water Management on Construction Works of Tweed Shire Council's Development Design Specification D7 – Stormwater Quality gives compliance limits on discharges from construction sites.

## Dilapidation Assessment

### *Pipeline Construction*

HDD is a low impact method of construction which involves a small construction spread and minimal shallow ground excavation. The only ground disturbance caused by this type of construction is superficial surface disturbance at the entry and exit points of a drill crossing, and the drilling of the borehole for the pipe. Due to the small size of the construction spreads it is possible to perform all works in the unpaved road verge adjacent to sealed roads. This avoids disturbing road surfaces and limits post construction remediation works to the road verge. The potential for disturbance of the areas surrounding a borehole entry or exit point is also low due to the minimal shallow ground excavation associated with the works.

Despite the low impact nature of the works, additional protections will be installed to further reduce the risk of disturbance to the areas surrounding construction locations close to sensitive areas (e.g. roads, waterways). These protections include the installation of steel enveloper casings beneath the public roadway of Marine Parade at Location 1, Beach Street at Location 4 and the stormwater drain at Location 5. These casings will guide the alignment of the borehole from the ground's surface to depth in order to prevent any shallow ground disturbance to the surrounding areas. The services intersecting with the SSP alignment have also been surveyed as part of the project design and planning process to avoid disturbance of existing services during construction. To confirm the location of these services DBYD searches and potholing will be performed at each of the construction locations prior to drilling works commencing. This process will identify the exact location of all services in the vicinity of a construction location to ensure a clear drilling pathway is nominated.

Overall, the dilapidation risk to the surrounding environment at each of the construction locations will be negligible as the HDD process will permit a low impact installation of the pipeline without disturbance of the road surface or other public or private structures.

### *Pump Well Construction*

Caisson construction has been selected as the method of construction for the pump well. Unlike sloped or stepped shoring methods, caisson construction involves a relatively minimal excavation footprint. This method involves excavating the internal area of the well to allow the well to sink under its own weight. The benefit of this method is that excavation is not required to areas beyond the outer diameter of the well walls. The dilapidation risk to the surrounding area is therefore minimal. Considering the site of the pump well is in Jack Bayliss Park, clear of any underground services, nearby structures, or the roadway of Marine Parade, the dilapidation risk to public infrastructure due to these works is negligible.

### *Dilapidation Report*

Despite the low dilapidation risk for the construction works a dilapidation report will be prepared for each of the construction locations prior to works commencing (Pre-Construction Dilapidation Report). This report will detail the onsite review of each construction location and the surrounding 5 metre area. These areas will be photographed and included in the report along with commentary noting any damage to surrounding structures, services or infrastructure. At the completion of works the Pre-Construction Dilapidation Report will be reviewed to determine if any damage has been sustained as a result of construction. As part of this review the areas photographed in the Pre-Construction Dilapidation Report, along with any damage caused by construction works, are to be photographed and included in a Post-Construction Dilapidation Report detailing the extent of the damage and potential cause.

A dilapidation report will be provided to Council or other public utility provider upon request, or if damage is identified by either ABLP or the asset owner.

### **Utilities and Public Works**

In accordance with condition 6 of DA282-2004-i MOD4, all public utility services, roadway, nature strip, footpath, public reserve or any public areas that are associated with, and/or adjacent to the site, and/or are likely to be affected by any activity associated with construction of the SSP will be identified before construction commences at a particular location. In the event that a service or public utility is to be adjusted and/or relocated to permit construction of the SSP, the relevant service or utility provider will be consulted before relocation or adjustment works are undertaken. If damage is caused to public infrastructure as a result of construction, the damage will be repaired to the satisfaction of Council, or the relevant utility provider and within such period as specified by the Council, or relevant utility provider.

## **3 MANAGEMENT STRATEGIES**

This section presents the management measures, as detailed in Table B1-4, to be implemented during construction.

### **3.1 Aims and Objectives**

The objectives of this Erosion and Sediment Control Strategy are twofold:

- To facilitate compliance with the relevant regulations and guidance documents; and
- To guide the application of the principles of Ecologically Sustainable Development and General Environmental Duty of Care in relation to preventing the pollution of waters and mobilization of sediment during the construction phase.

In essence, the strategy aims to minimise or prevent erosion and sediment loss and the associated pollution of receiving waters from construction activities. It adopts Tweed Shire Council's Code of Practice for Soil and Water Management on Construction Works and the principles of Managing Urban Stormwater, Soils and Construction (Landcom, 2004) where possible. In particular it is intended to:

- Minimise soil erosion and exposure
- Minimise transportation of eroded soil by air and water
- Limit suspended solids concentration in stormwater to not more than 50mg/l
- Limit/minimise the amount of site disturbance
- Isolate the site by diverting clean upstream "run on" water around the development
- Control runoff and sediment at its point source rather than at one final point
- Stage ground disturbance/earthworks and progressively revegetate the site where possible to reduce the area contributing sediment
- Retain topsoil for revegetation works
- Locate sediment control structures where they are most effective and efficient

The implementation plan for the erosion and sediment controls integrates the objectives and management measures to be used to protect runoff water quality and receiving waters during the construction phase. It sets out clearly how the objectives can be accomplished by nominating responsible persons and establishing performance indicators, required management actions, monitoring, corrective actions, and reporting procedures. It is a first point of reference for those implementing this strategy.

### **3.2 Design Considerations**

The area of disturbance for the stage two of the SPP is considered negligible. The ground will be broken at the entry/exit pits of the six HDD drills and at the trenched sections for construction of the tie-in connections between each drill. Based on preliminary investigations the soil profile anticipated for this stage is described as coarse sand and silty sand, including a dark topsoil layer of approximately 300mm thickness.

To account for the overland runoff from areas in the vicinity of soil disturbance or stockpile areas, in particular for cane drains or stormwater drains crossing the path of the pipeline alignment, the following approach will be implemented:

1. Maintain trafficable areas on the site;
2. Install sediment fences on downslope toes of disturbed embankments which are not being actively worked until they are adequately stabilised;
3. Allow runoff to flow across vegetated areas wherever possible; and
4. Immediately make good any damage to infrastructure / improvements.

### **3.3 Erosion and Sediment Control Layout**

Attachment B1-1 details the type of erosion and sediment controls which are to be employed at each of the construction locations. Included in this attachment are drawings for each of the sediment controls that will be utilised.

## **4 References**

Landcom (2004) *Managing Urban Stormwater, Soils and Construction* 4<sup>th</sup> Edition

**Table B1-4: Erosion and sediment control plan**

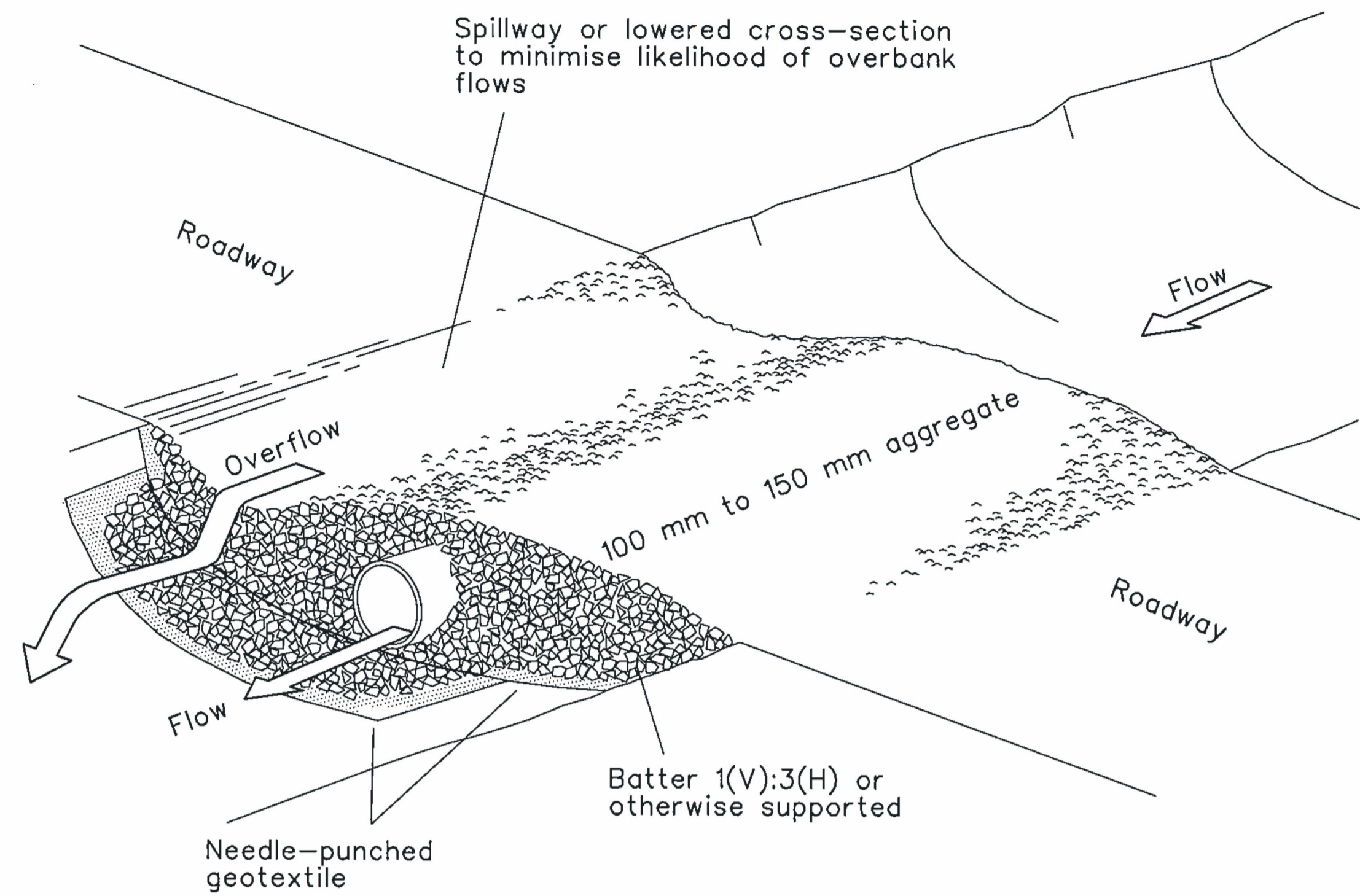
Item	Action										
<b>Objective</b>	Prevent or minimise the release or likelihood of release of contaminated runoff from the site which may cause pollution to waters or a dust nuisance.										
<b>Responsible Person(s)</b>	Site Manager or, if nominated, Site Environmental Officer.										
<b>Performance Criteria</b>	<ul style="list-style-type: none"> <li>○ Stormwater discharged from the site will not exceed the water quality objectives stated below without corrective actions being undertaken to reduce discharge water quality to within the stated limits.</li> <li>○ Significant erosion of land surfaces or contaminant transport off-site by wind or water shall not be permitted without corrective actions being undertaken.</li> </ul> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Criteria*</th> </tr> </thead> <tbody> <tr> <td>pH</td> <td>6.5-8.5 or &lt;10% further outside background* range</td> </tr> <tr> <td>Total Suspended Solids</td> <td>&lt;50mg/L</td> </tr> <tr> <td>Hydrocarbons and surface films or other visible contaminants</td> <td>No visible films, odour or obvious discolouration of runoff waters</td> </tr> <tr> <td>Litter and debris</td> <td>No visible litter or debris washed from site</td> </tr> </tbody> </table> <p>* Background is a site representative of an un-impacted area relevant to the site sampled.</p>	Parameter	Criteria*	pH	6.5-8.5 or <10% further outside background* range	Total Suspended Solids	<50mg/L	Hydrocarbons and surface films or other visible contaminants	No visible films, odour or obvious discolouration of runoff waters	Litter and debris	No visible litter or debris washed from site
Parameter	Criteria*										
pH	6.5-8.5 or <10% further outside background* range										
Total Suspended Solids	<50mg/L										
Hydrocarbons and surface films or other visible contaminants	No visible films, odour or obvious discolouration of runoff waters										
Litter and debris	No visible litter or debris washed from site										

<p><b>Actions</b></p>	<ul style="list-style-type: none"> <li>○ All subcontractors and site workers are to be informed of their responsibilities in relation to erosion and sediment control on-site and prevention of pollution.</li> <li>○ The site manager and contractors are to be familiar with the requirements of this <i>Erosion and Sediment Management Plan</i>.</li> <li>○ This management plan is to be kept on-site and accessible at all times during construction.</li> <li>○ All works are to be undertaken according to Tweed Shire Council requirements and the relevant standard drawings. An example of the appropriate erosion and sediment control plans, including drawings for each control, is provided at Attachment B1-1.</li> <li>○ All erosion and sediment controls are to be installed and operated according to this management plan and generally in accordance with the principles of Landcom (2004) and the Tweed Shire Council’s Development Design Specification D7 – Stormwater Quality.</li> <li>○ In the event that Acid Sulfate Soils (ASS) or Potential Acid Sulfate Soils (PASS) are encountered this material is to be managed in accordance with the Acid Sulfate Soils Management Plan at Attachment B2 of this CEMP. Note, all erosion and sediment controls must be in effect prior to furthering works involving ASS or PASS soils.</li> <li>○ Site works will not start until the erosion and sediment control works outlined in this report are installed and functional (Refer Attachment B1-1 for graphical reference). Documentary evidence is to be provided to the satisfaction of the Principal Certifying Authority that all erosion and sediment controls are in place.</li> <li>○ The Site Manger is to be aware of any declared noxious weeds (Refer <a href="https://www.dpi.nsw.gov.au/biosecurity/weeds">https://www.dpi.nsw.gov.au/biosecurity/weeds</a>) on-site as far as is practicable. These are to be managed appropriately.</li> </ul>
<p><b>Monitoring</b></p>	<p>Visual inspections are to be carried out weekly or after heavy rainfall events to ensure that areas of erosion or instability are minimised and repaired if necessary, and that adequate erosion and sediment control measures are in place and in good condition. To ensure control measures are maintained in adequate condition routine inspections will be performed to identify the maintenance and repair works to be undertaken.</p>
<p><b>Reporting</b></p>	<ul style="list-style-type: none"> <li>○ Date, time and results of weekly reports are to be noted on Form C2 – Site Inspection (CEMP Attachment C) or in the Site Manager’s logbook.</li> <li>○ The Site Manager is to be notified of any complaints, of evidence of on or off-site pollution and other non-compliance activities. These are to be recorded on Form C1 – Incidents / Complaints (CEMP Attachment C) and/or the Site Manager’s logbook.</li> <li>○ The Site Manager is to notify the Tweed Shire Council or the Environmental Protection Agency of any significant pollution occurring from site works.</li> <li>○ All records must be kept on-site and made available to authorised officers on request.</li> </ul>

<b>Training</b>	<ul style="list-style-type: none"> <li>○ Ensure site management and staff are familiar with the requirements of this Erosion and Sediment Control Plan.</li> <li>○ Incorporate training for environmental aspects including a person's responsibilities in relation to this management plan as part of site induction.</li> </ul>
<b>Corrective Action Triggers</b>	<ul style="list-style-type: none"> <li>○ Complaints</li> <li>○ Evidence of an on or off-site pollution incident (e.g., sediment, chemical or fuel spills, etc.)</li> <li>○ Signs of erosion of land surfaces on site or off-site due to site works.</li> </ul>
<b>Corrective Actions</b>	<p>If an area is being polluted as a result of site discharge, reasonable measures are to be implemented to prevent further pollution by containing discharge or run off onsite. Where applicable, discharge waters are to be retained and treated onsite before discharge. The treatment procedure is as described below:</p> <ul style="list-style-type: none"> <li>○ For low pH waters, lime water, and conversely for high pH waters, dilute water, to correct pH level;</li> <li>○ For high suspended solids, allow to settle, or discharge over filter strips or buffer areas. Alternatively, apply flocculation agents to bring level within discharge limits;</li> <li>○ For hydrocarbons or other surface films, discharge over filter strips or buffer areas, or utilise absorbent materials. Alternatively, skim materials off the surface; and/or</li> <li>○ For litter, screen or remove litter manually.</li> </ul> <p>Inspect site and identify the cause of the pollution, and where applicable:</p> <ul style="list-style-type: none"> <li>○ Repair or modify control devices, or introduce new devices in accordance with the principles of this report and as outlined in Landcom (2004) to prevent the recurrence of any incident;</li> <li>○ Remove accumulated material in sediment traps and dispose of it in an appropriate manner;</li> <li>○ Reinforce appropriate waste management and pollution prevention practices with subcontractors and site workers;</li> <li>○ Conduct specific water quality monitoring of discharge waters if repeat water pollution incidents occur; and/or</li> <li>○ Review this <i>Erosion and Sediment Control Plan</i> and management measures employed on site.</li> </ul>

## **Attachment B1-1**

# **Site Layout and Drawings for Erosion and Sediment Controls**

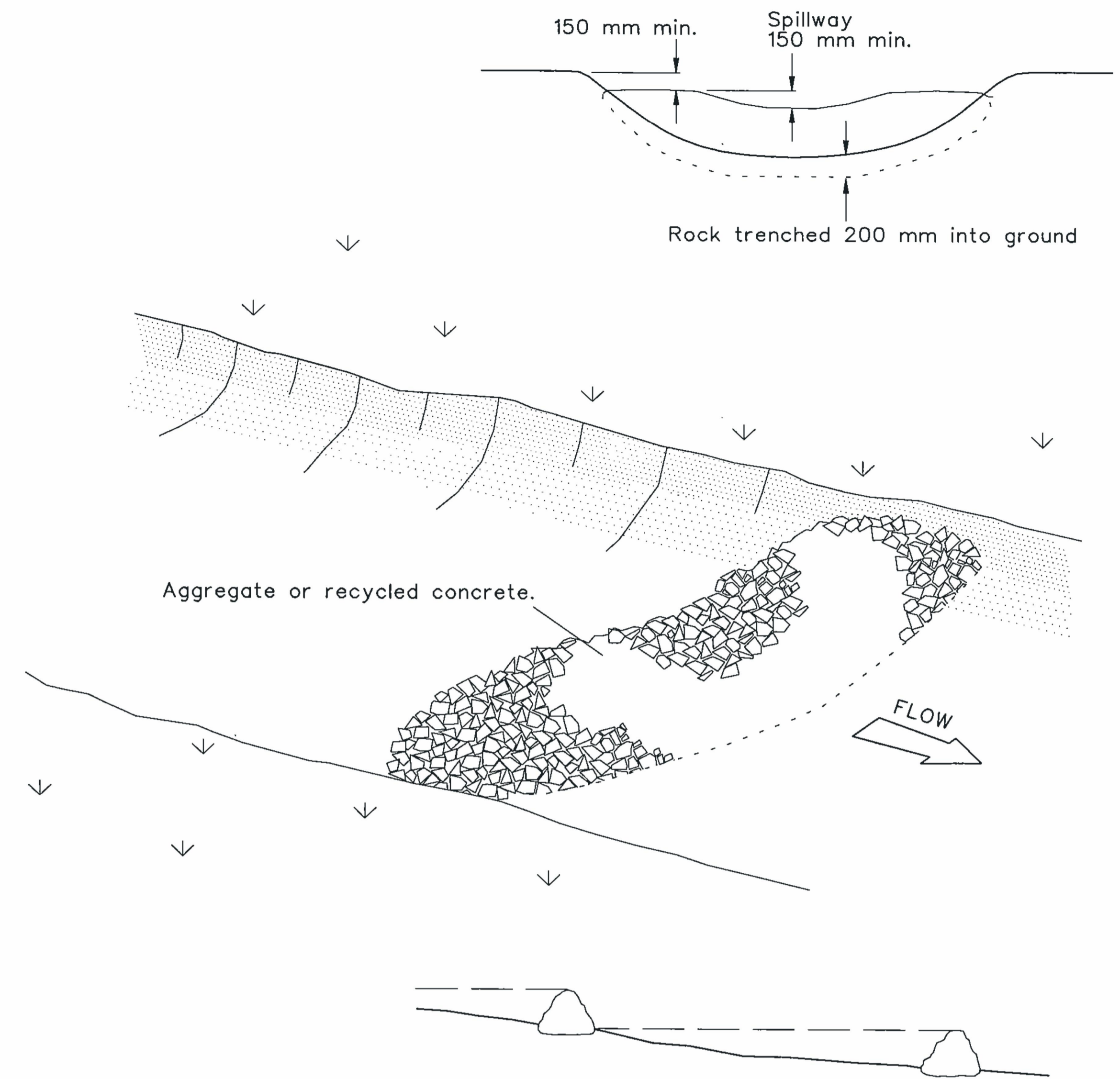


### Construction Notes

1. Prohibit all traffic until the access way is constructed.
2. Strip any topsoil and place a needle-punched textile over the base of the crossing.
3. Place clean, rigid, non polluting aggregate or gravel in the 100 mm to 150 mm size class over the fabric to a minimum depth of 200 mm.
4. Provide a 3-metre wide carriageway with sufficient length of culvert pipe to allow less than a 3(H): 1 (V) slope on side batters.
5. Install a lower section to act as an emergency spillway in greater than design storm events.
6. Ensure that culvert outlets extend beyond the toe of fill embankments.

**TEMPORARY WATERWAY CROSSING**

**SD 5-1**



Spacing of check dams along centreline and scour protection below each check dam to be specified on SWMP/ESCP

### Construction Notes

1. Check dams can be built with various materials, including rocks, logs, sandbags and straw bales. The maintenance program should ensure their integrity is retained, especially where constructed with straw bales. In the case of bales, this might require their replacement each two to four months.
2. Trench the check dam 200 mm into the ground across its whole width. Where rock is used, fill the trenches to at least 100 mm above the ground surface to reduce the risk of undercutting.
3. Normally, their maximum height should not exceed 600 mm above the gully floor. The centre should act as a spillway, being at least 150 mm lower than the outer edges.
4. Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.

**ROCK CHECK DAM**

**SD 5-4**

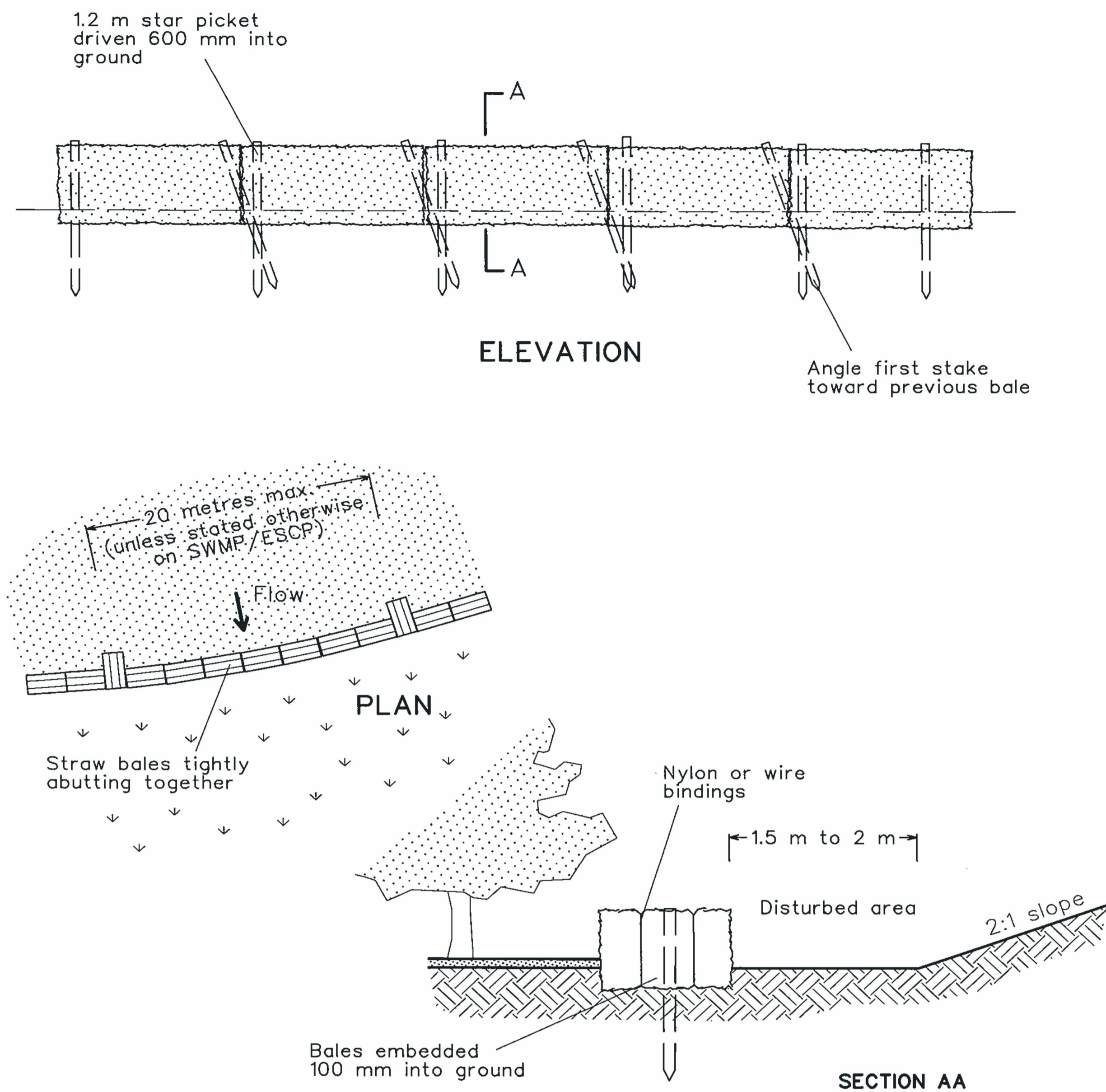
NOTES:  
1. EROSION SEDIMENT CONTROL PROCEDURE INFORMATION IS REFERENCED FROM 'Managing Urban Stormwater... Soils and Construction Volume 1 Fourth edition.pdf'.

LEGEND:

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APPD CONTRACTOR	CHECK OWNER	APPD OWNER
A	ISSUED FOR INFORMATION	17.09.21	MH	CH	PT		



PROJECT:	AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE
TITLE:	LAYOUT - HDD07 EROSION SEDIMENT CONTROL PROCEDURE
DRAWING No.:	096-CST-DWG-016-01
STATUS:	FOR INFORMATION

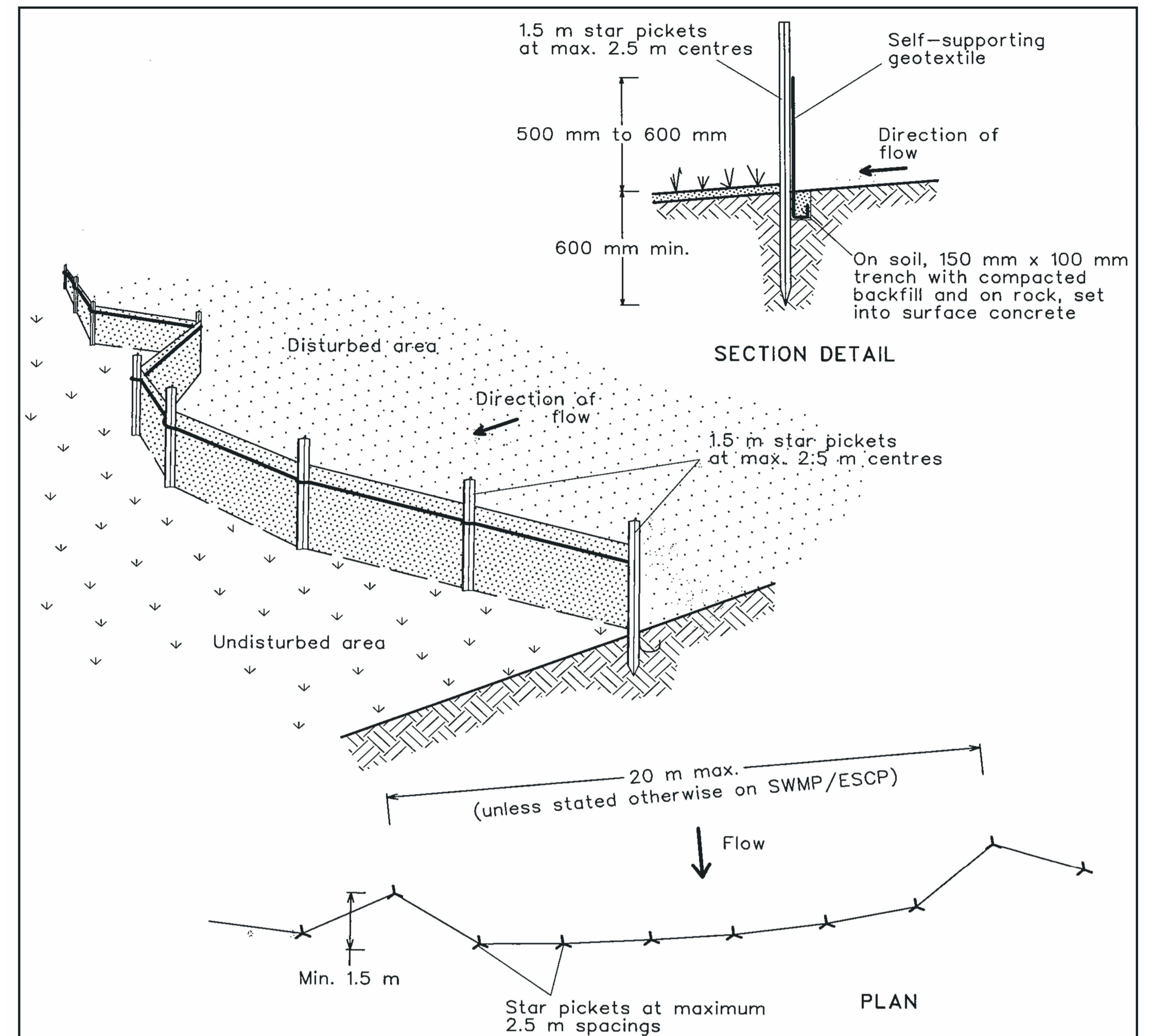


### Construction Notes

1. Construct the straw bale filter as close as possible to being parallel to the contours of the site.
2. Place bales lengthwise in a row with ends tightly abutting. Use straw to fill any gaps between bales. Straws are to be placed parallel to ground.
3. Ensure that the maximum height of the filter is one bale.
4. Embed each bale in the ground 75 mm to 100 mm and anchor with two 1.2 metre star pickets or stakes. Angle the first star picket or stake in each bale towards the previously laid bale. Drive them 600 mm into the ground and, if possible, flush with the top of the bales. Where star pickets are used and they protrude above the bales, ensure they are fitted with safety caps.
5. Where a straw bale filter is constructed downslope from a disturbed batter, ensure the bales are placed 1 to 2 metres downslope from the toe.
6. Establish a maintenance program that ensures the integrity of the bales is retained - they could require replacement each two to four months.

## STRAW BALE FILTER

SD 6-7



### Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

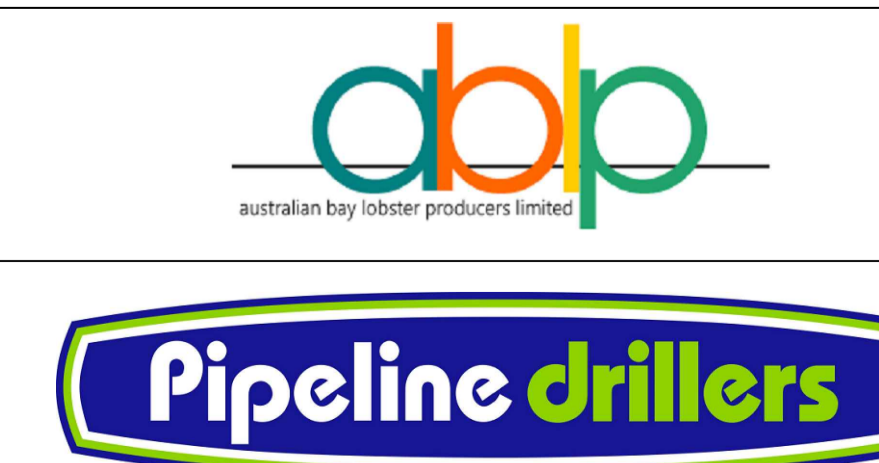
## SEDIMENT FENCE

SD 6-8

NOTES:  
1. EROSION SEDIMENT CONTROL PROCEDURE INFORMATION IS REFERENCED FROM 'Managing Urban Stormwater... Soils and Construction Volume 1 Fourth edition.pdf'.

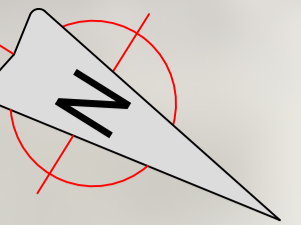
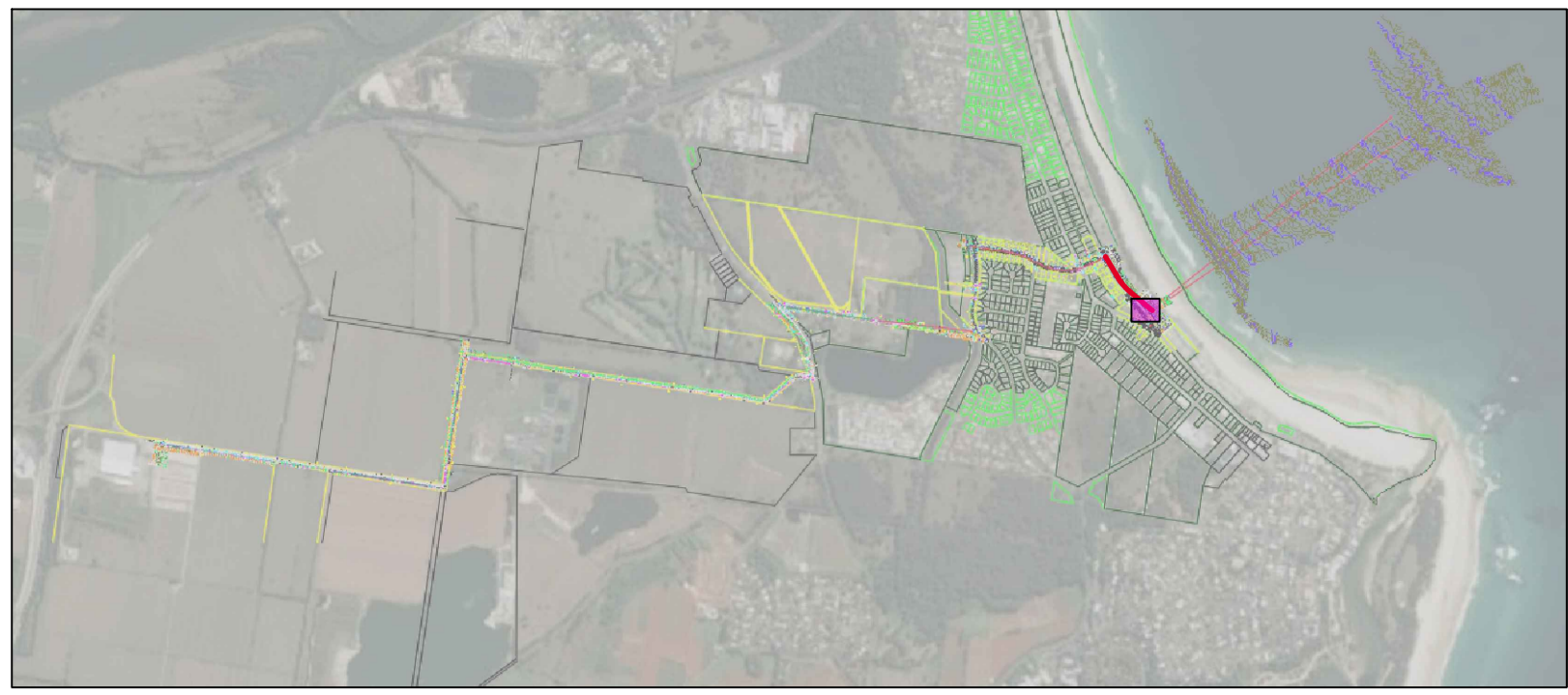
LEGEND:

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APPD CONTRACTOR	CHECK OWNER	APPD OWNER
A	ISSUED FOR INFORMATION	17.09.21	MH	CH	PT		

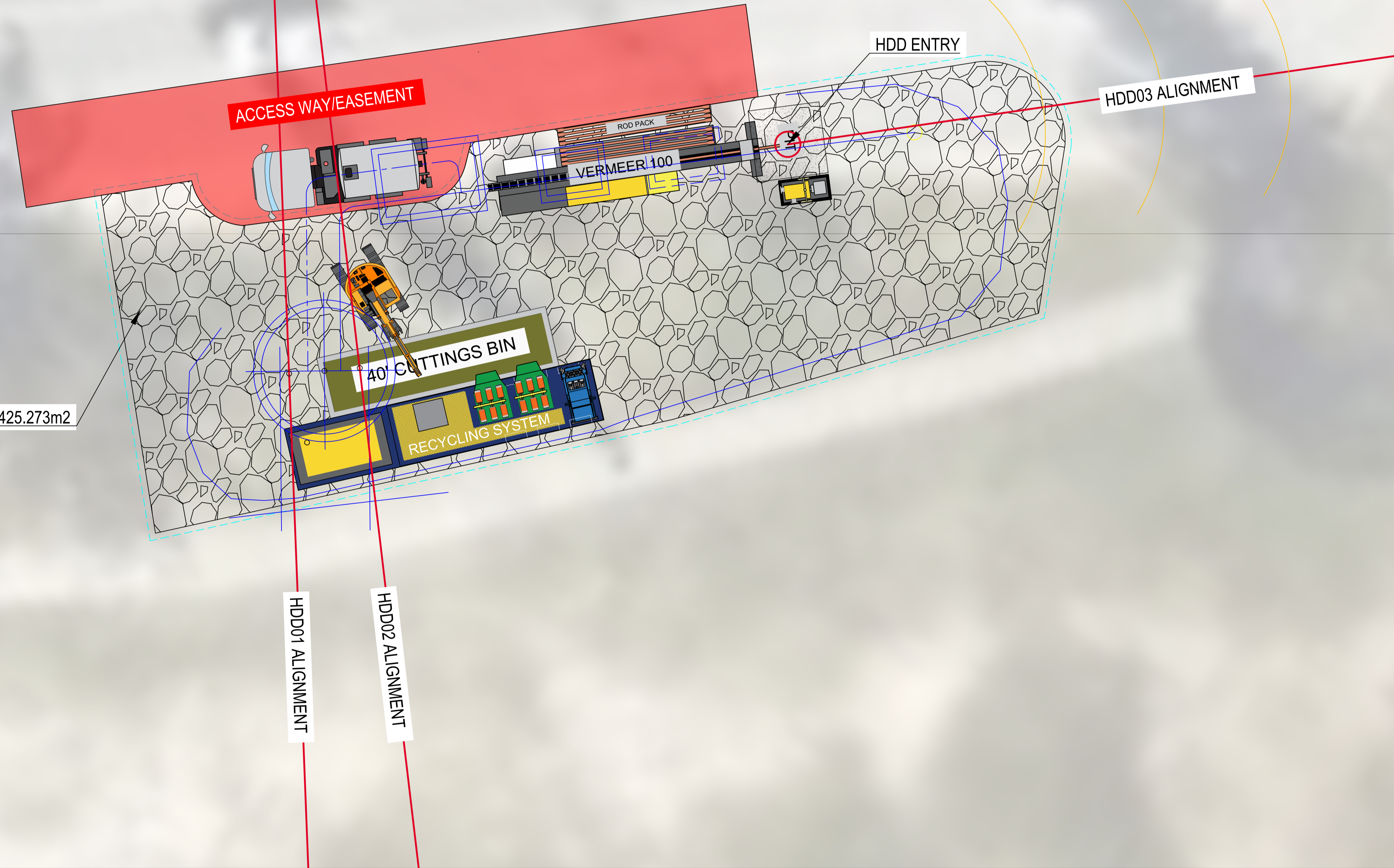


PROJECT:	AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE
TITLE:	LAYOUT - HDD07 EROSION SEDIMENT CONTROL PROCEDURE
DRAWING No.:	096-CST-DWG-016-02
STATUS:	FOR INFORMATION

## **Location 1 & 2: Horizontal Directional Drilling**



**MARINE PARADE**



LAYOUT PLAN  
SCALE 1:100

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM '7892\_PIPELINE\_DETAIL\_REV G.dwg'. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM84 ZONE 56S, AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

- LEGEND:
- HDD ALIGNMENT
  - BOUNDARIES
  - SITE FENCING
  - SEDIMENT FENCE
  - COIR LOG
  - HDD WORKS SITE AREA
  - ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APP'D CONTRACTOR	DATE	MD	PT	CH	MH
A	ISSUED FOR INFORMATION	06.10.21								

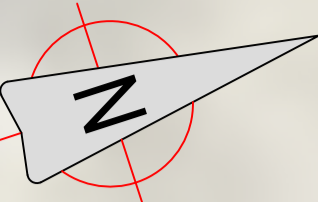
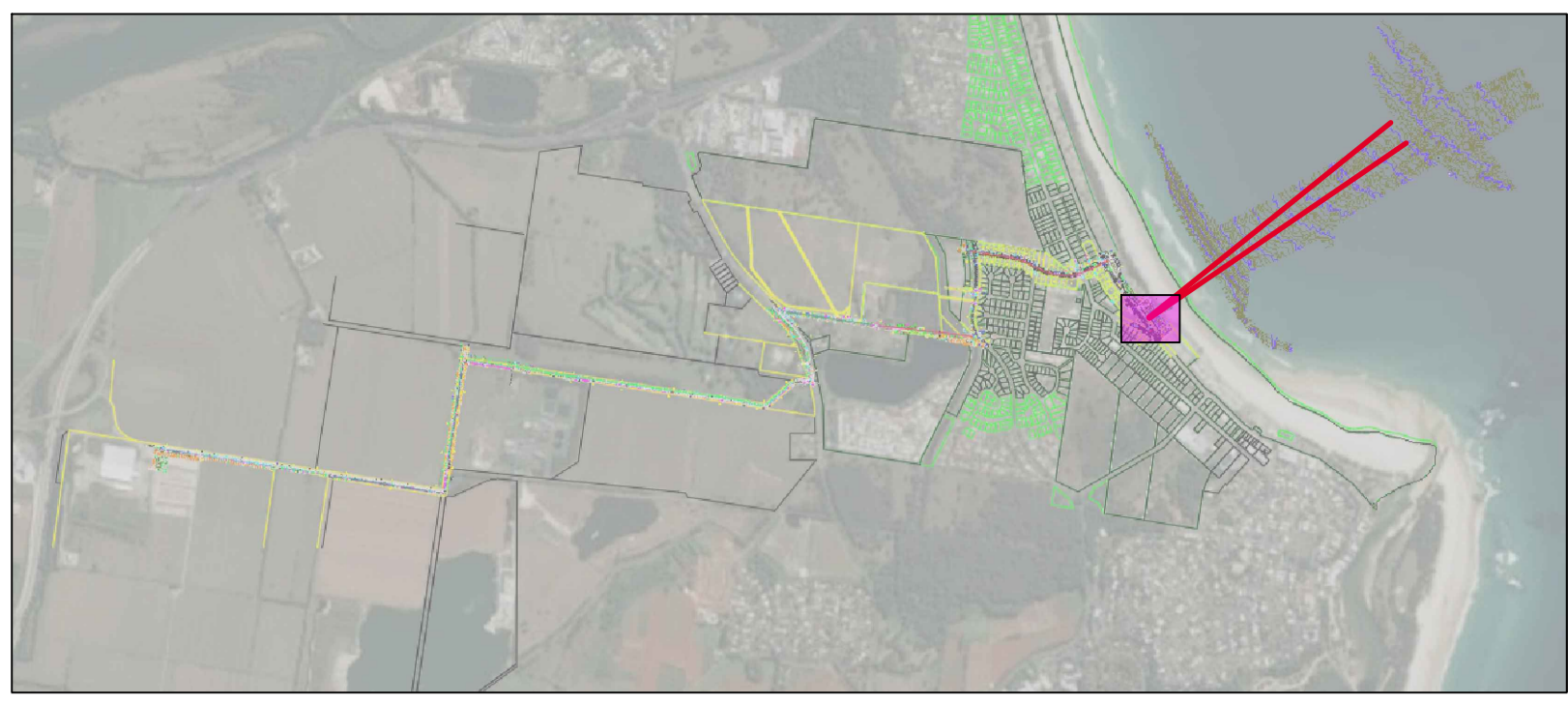


PROJECT:  
**AUSTRALIAN BAY LOBSTER PRODUCERS  
SEAWATER INTAKE**

TITLE:  
**ESC - HDD03 ENTRY  
MARINE PDE**

DRAWING No.: **047-HSE-DWG-003**

STATUS:  
**FOR INFORMATION**



LAYOUT PLAN  
SCALE 1:150

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM '7892\_PIPELINE\_DETAIL\_REV G.dwg'. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM84 ZONE 56S, AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

- LEGEND:
- HDD ALIGNMENT
  - BOUNDARIES
  - SITE FENCING
  - SEDIMENT FENCE
  - COIR LOG
  - HDD WORKS SITE AREA
  - ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APPD CONTRACTOR	PT	TD	MD	APPD OWNER
A	ISSUED FOR INFORMATION	06.10.21	MH	CH	PT	TD	MD		

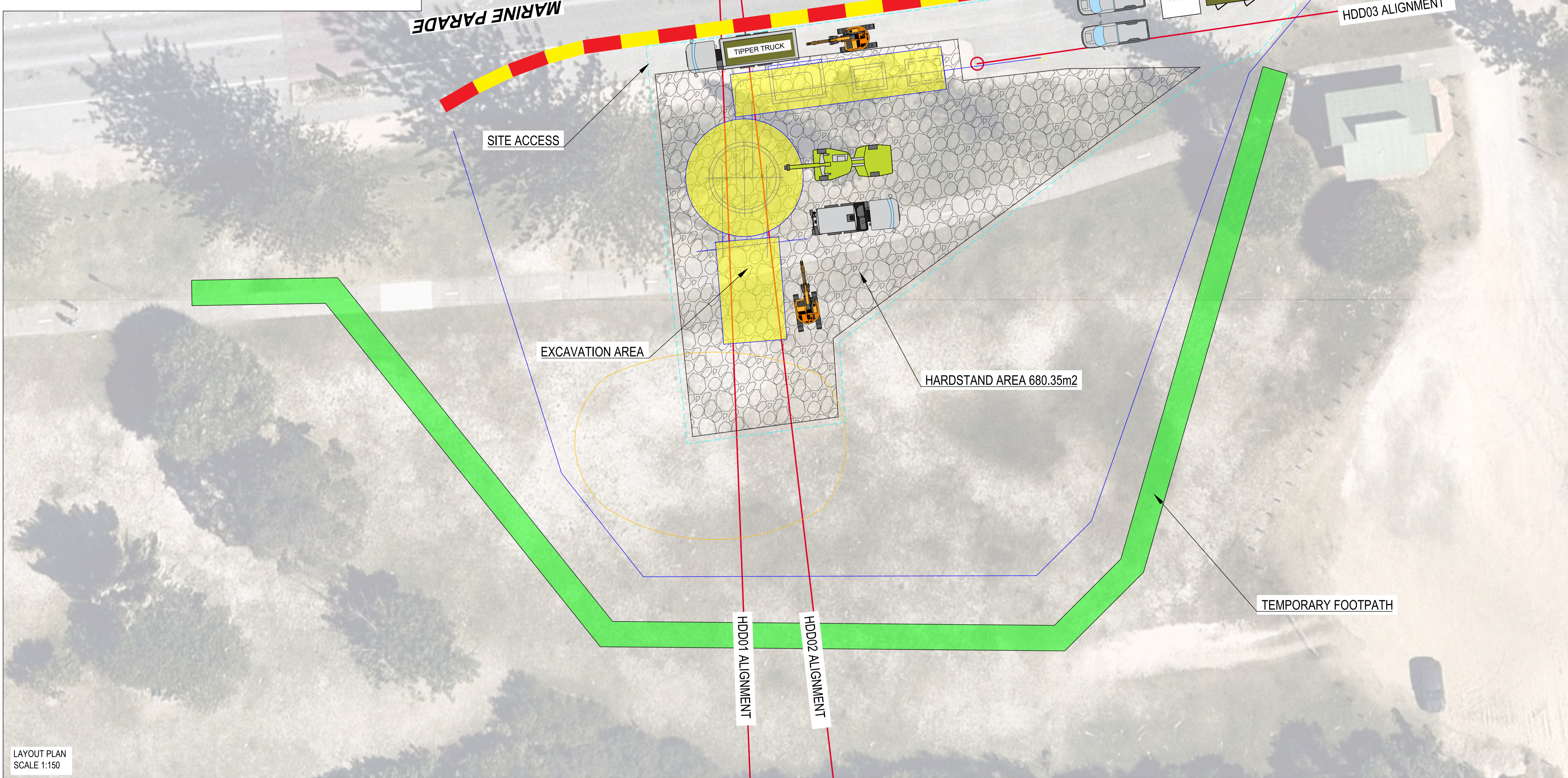
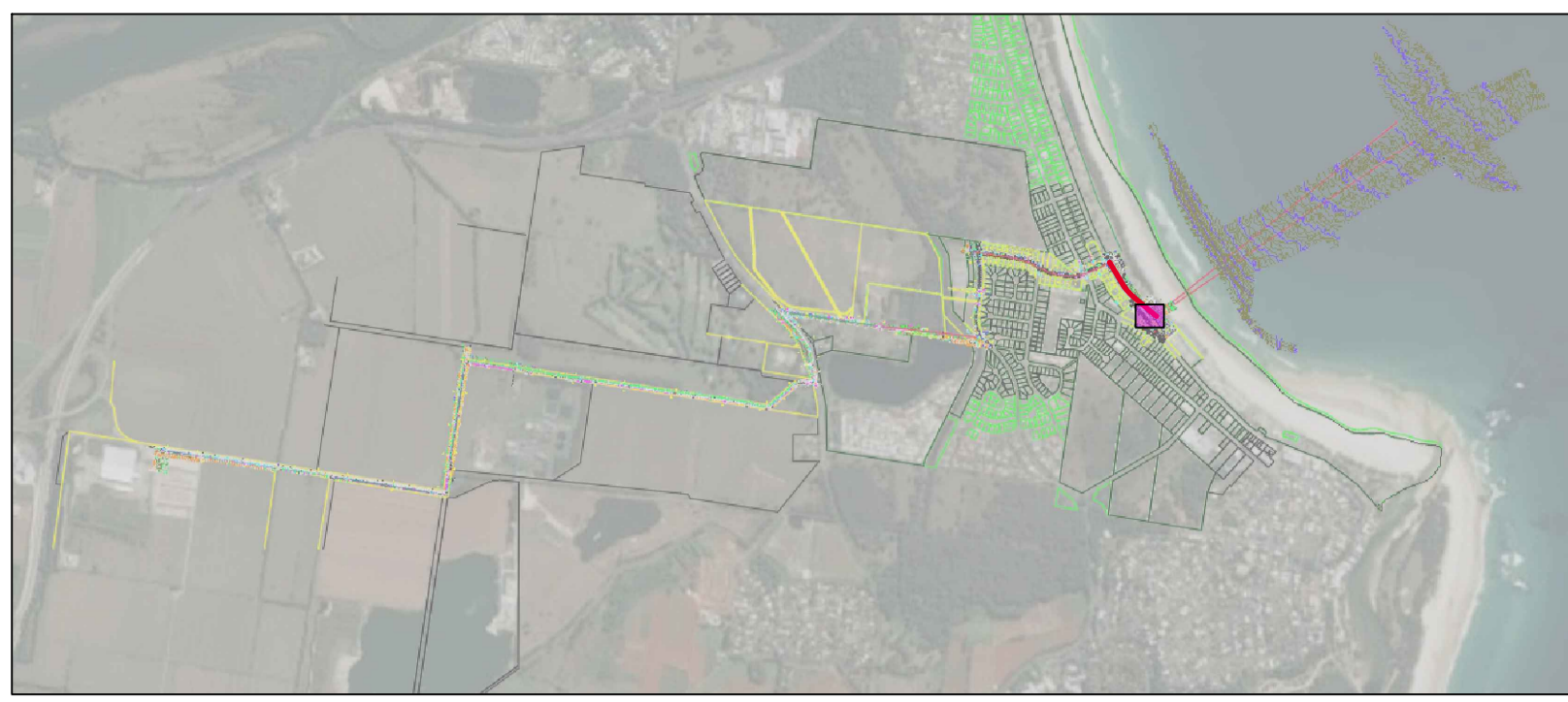


PROJECT:  
AUSTRALIAN BAY LOBSTER PRODUCERS  
SEAWATER INTAKE

TITLE:  
ESC - HDD01 & HDD02 ENTRY  
OUTFALL SOUTH & NORTH

DRAWING No: 047-HSE-DWG-001 STATUS: FOR INFORMATION

## **Location 2: Pump Well**



LAYOUT PLAN  
SCALE 1:150

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM '7892\_PIPELINE\_DETAIL\_REV G.dwg'. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM84 ZONE 56S, AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. EQUIPMENT SELECTION INDICATIVE.

LEGEND:

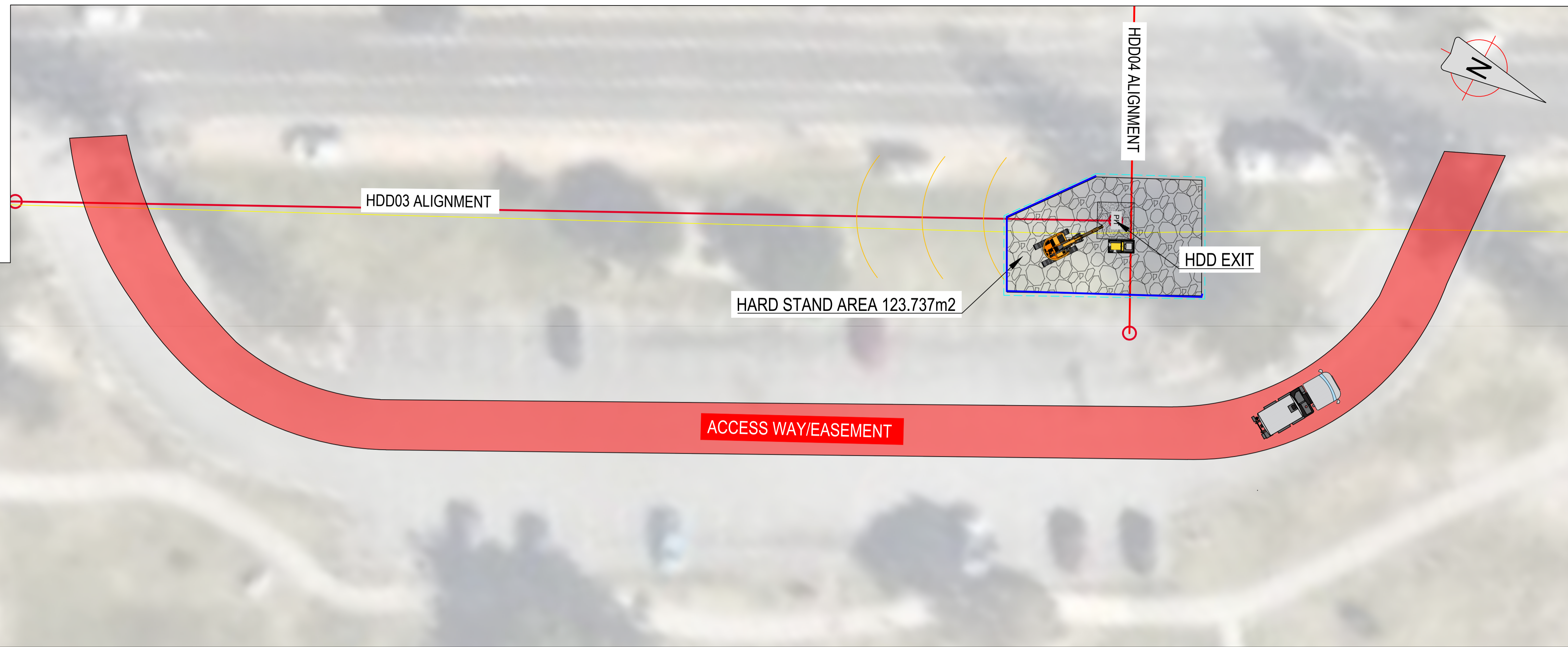
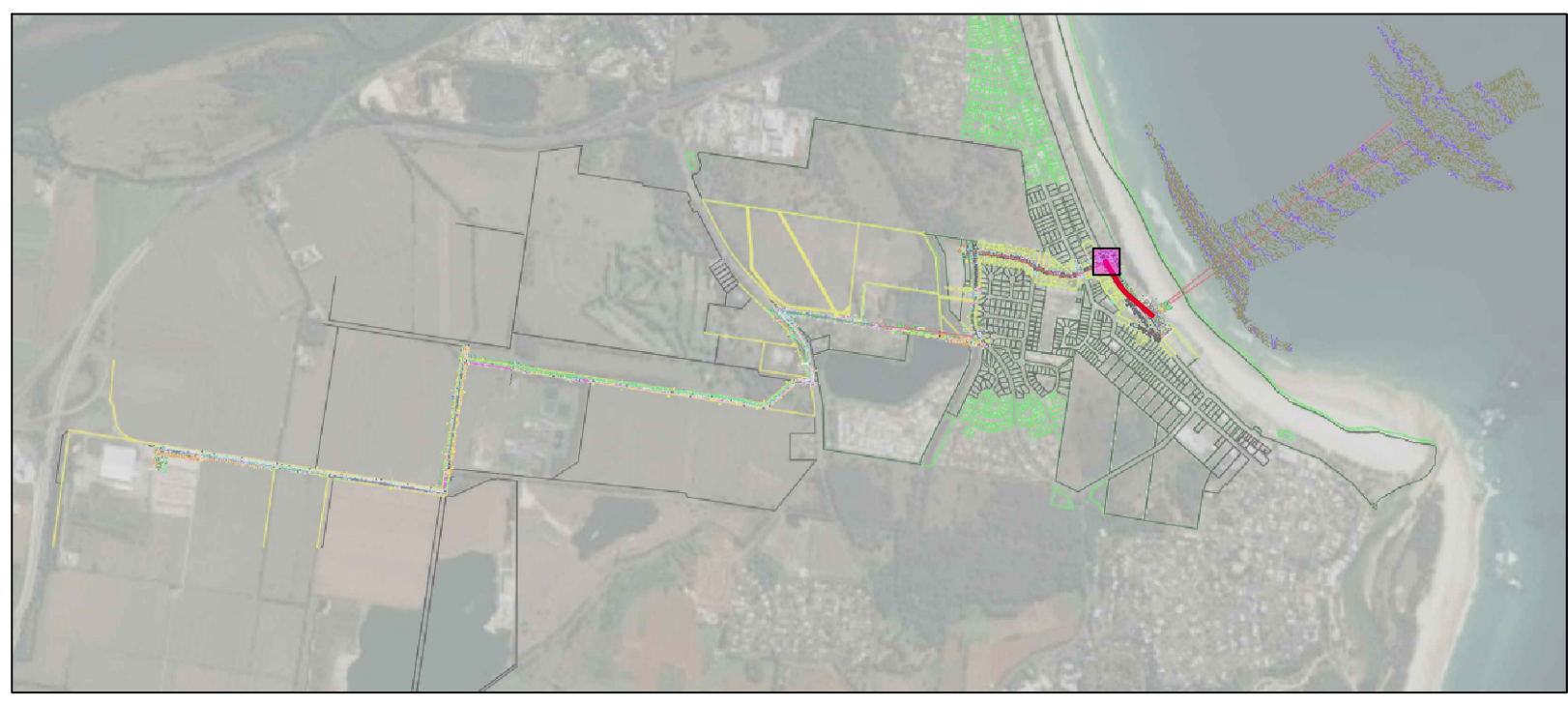
- HDD ALIGNMENT
- - - SITE FENCING
- TRAFFIC CONTROL
- HDD WORKS SITE AREA
- EXCAVATION AREA
- ACCESS WAY/EASEMENT
- TEMPORARY FOOTPATH
- SEDIMENT FENCE
- COIR LOG

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APPD OWNER	CHECK CONTRACTOR	APPD OWNER
B	ISSUED FOR INFORMATION	10.11.21	MH	CH	PT	TD	MD
A	ISSUED FOR INFORMATION	29.10.21	MH	CH	PT	TD	MD



PROJECT:	AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE
TITLE:	ESC - WELL CONSTRUCTION
DRAWING No.:	047-HSE-DWG-009
STATUS:	FOR INFORMATION

### **Location 3: Horizontal Directional Drilling**



- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM '7892\_PIPELINE\_DETAIL\_REV G.dwg'. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM84 ZONE 56S, AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

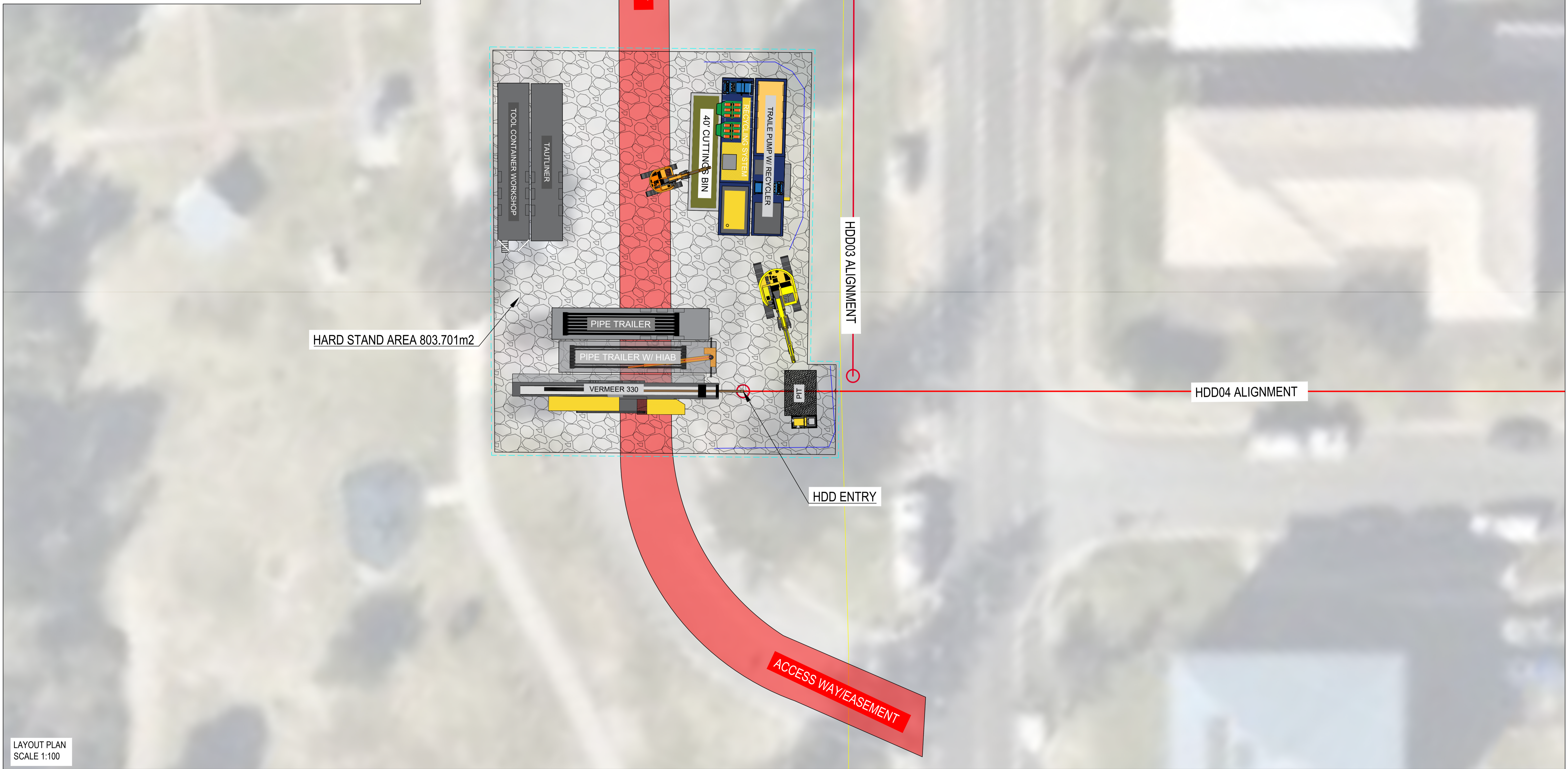
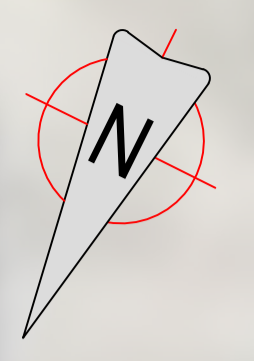
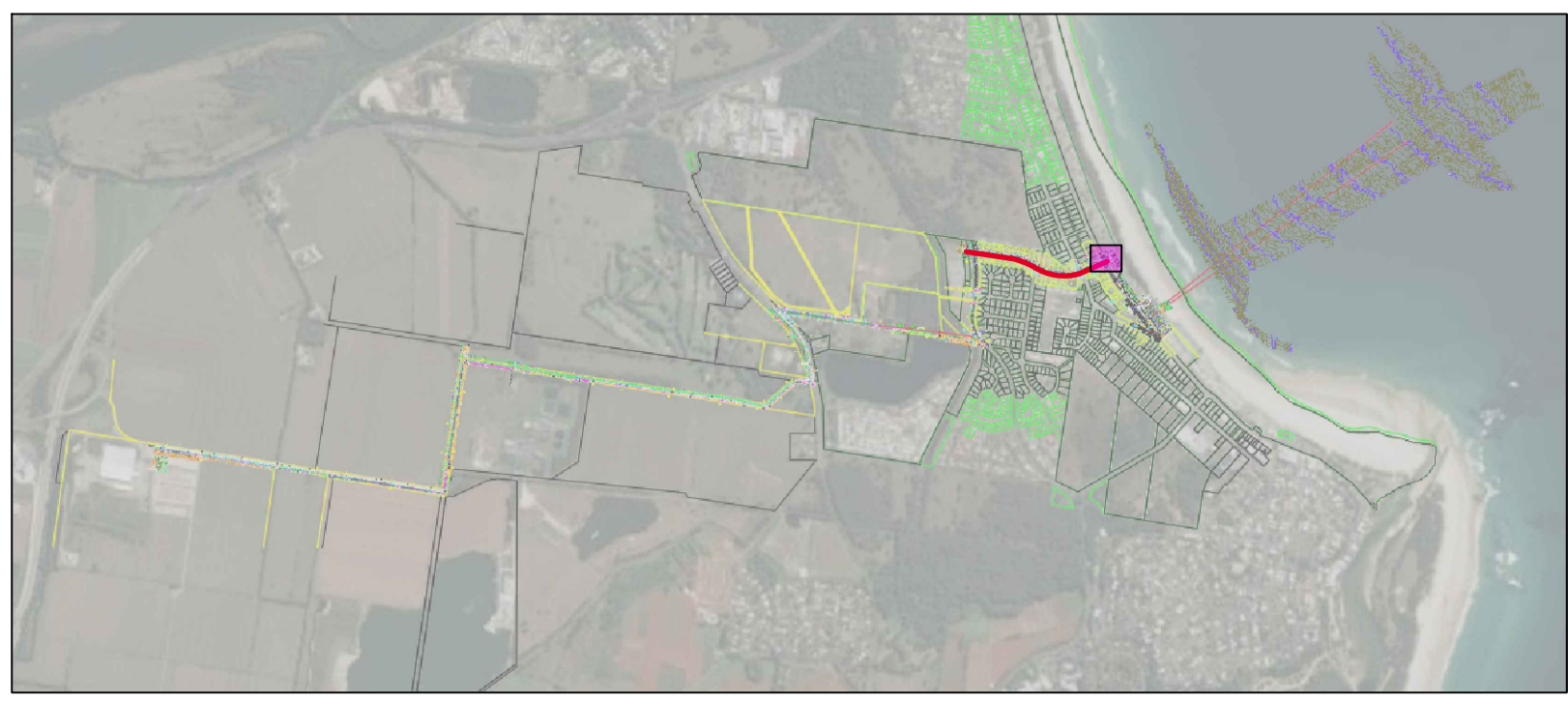
LEGEND:

- HDD ALIGNMENT
- WELDED PRODUCT PIPE STRING
- BOUNDARIES
- SITE FENCING
- SEDIMENT FENCE
- COIR LOG
- HDD WORKS SITE AREA
- ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APPD CONTRACTOR	CHECK OWNER	APPD OWNER
A	ISSUED FOR INFORMATION	06.10.21	MH	CH	PT	TD	MD



PROJECT:	AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE
TITLE:	ESC - HDD03 EXIT MARINE PDE
DRAWING No.:	047-HSE-DWG-004
STATUS:	FOR INFORMATION



LAYOUT PLAN  
SCALE 1:100

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. EXISTING SERVICES DETAILS TAKEN FROM FROM '7892\_PIPELINE\_DETAIL\_REV G.dwg'. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
3. DATUM: UTM84 ZONE 56S, AHD.
4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
5. HDD EQUIPMENT SELECTION INDICATIVE.

LEGEND:

- HDD ALIGNMENT
- BOUNDARIES
- SITE FENCING
- SEDIMENT FENCE
- COIR LOG
- HDD WORKS SITE AREA
- ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APPD CONTRACTOR	DATE	DRAWN	CHECK OWNER	APPD OWNER
A	ISSUED FOR INFORMATION	06.10.21	MH	CH	PT	TD	MD		

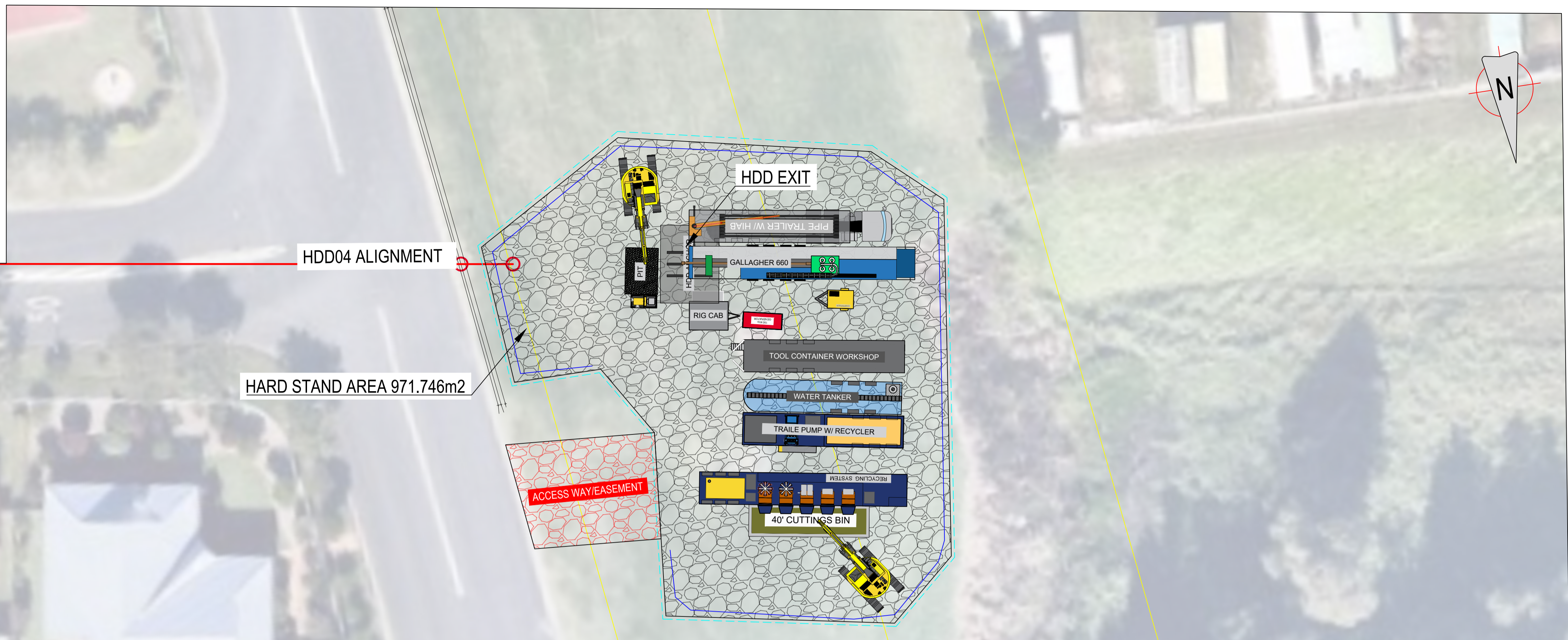
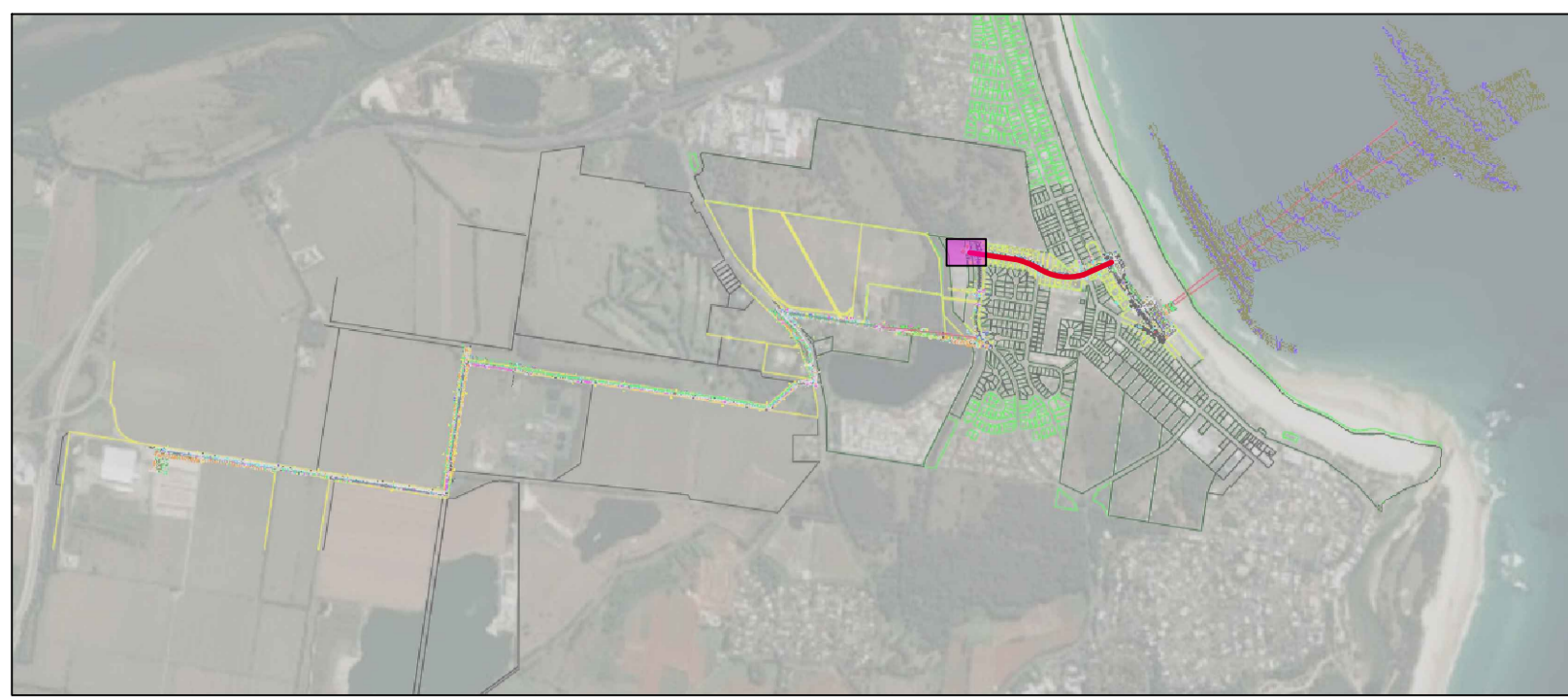


PROJECT:  
**AUSTRALIAN BAY LOBSTER PRODUCERS  
SEAWATER INTAKE**

TITLE:  
**ESC - HDD04 ENTRY  
BEACH ST**

DRAWING No: **047-HSE-DWG-005** STATUS: **FOR INFORMATION**

## **Location 4: Horizontal Directional Drilling**



LAYOUT PLAN  
SCALE 1:200



LAYOUT PLAN  
SCALE 1:250

**NOTES:**

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. EXISTING SERVICES DETAILS TAKEN FROM FROM '7892\_PIPELINE\_DETAIL\_REV G.dwg'. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
3. DATUM: UTM84 ZONE 56S, AHD.
4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
5. HDD EQUIPMENT SELECTION INDICATIVE.

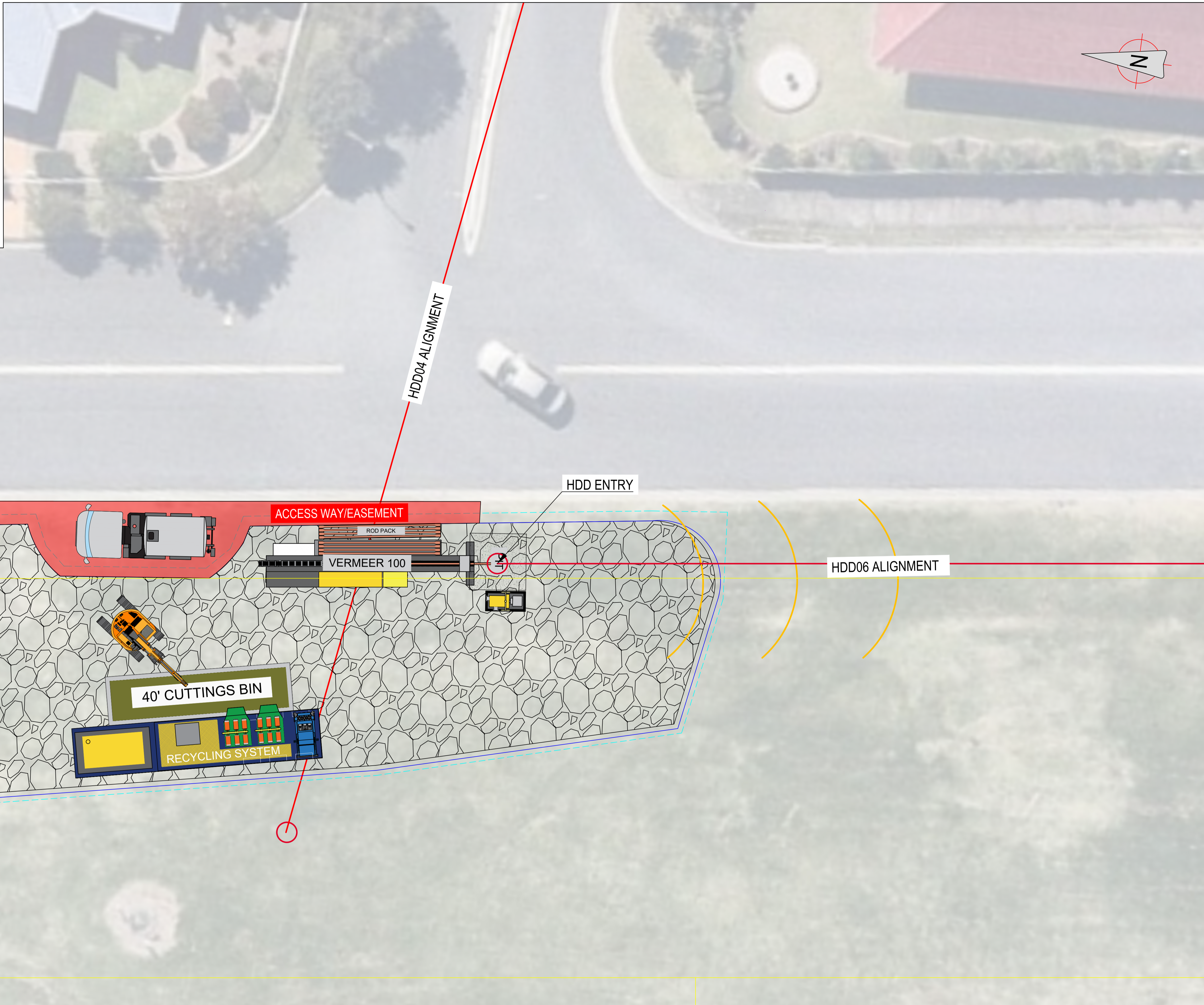
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- HDD ALIGNMENT
- WELDED PRODUCT PIPE STRING
- BOUNDARIES
- SITE FENCING
- SEDIMENT FENCE
- COIR LOG
- HDD WORKS SITE AREA
- ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APPD CONTRACTOR	CHECK OWNER	APPD OWNER
A	ISSUED FOR INFORMATION	06.10.21	MH	CH	PT	TD	MD



PROJECT:	AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE
TITLE:	ESC - HDD04 EXIT BEACH ST
DRAWING No.:	047-HSE-DWG-006
STATUS:	FOR INFORMATION



LAYOUT PLAN  
SCALE 1:100

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM '7892\_PIPELINE\_DETAIL\_REV G.dwg'. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM84 ZONE 56S, AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

- LEGEND:
- HDD ALIGNMENT
  - BOUNDARIES
  - - - SITE FENCING
  - - - SEDIMENT FENCE
  - COIR LOG
  - HDD WORKS SITE AREA
  - ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APP'D CONTRACTOR	DATE	DRAWN	CHECK OWNER	APP'D OWNER
A	ISSUED FOR INFORMATION	22.09.21	MH	CH	PT	TD	MD		

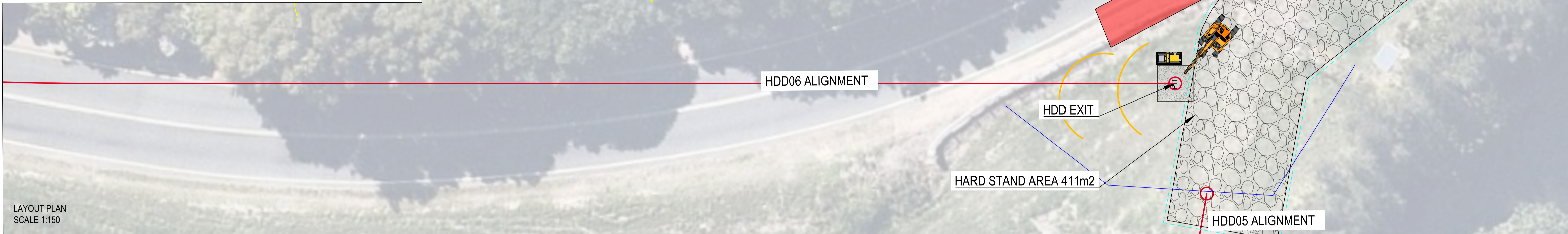


PROJECT: AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE

TITLE: ESC - HDD06 ENTRY ELROND DR

DRAWING No: 096-HSE-DWG-001 STATUS: FOR INFORMATION

## **Location 5: Horizontal Directional Drilling**



- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM '7892\_PIPELINE\_DETAIL\_REV G.dwg'. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM84 ZONE 56S, AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

LEGEND:

- HDD ALIGNMENT
- WELDED PRODUCT PIPE STRING
- BOUNDARIES
- - - SITE FENCING
- SEDIMENT FENCE
- COIR LOG
- HDD WORKS SITE AREA
- ACCESS WAY/EASEMENT

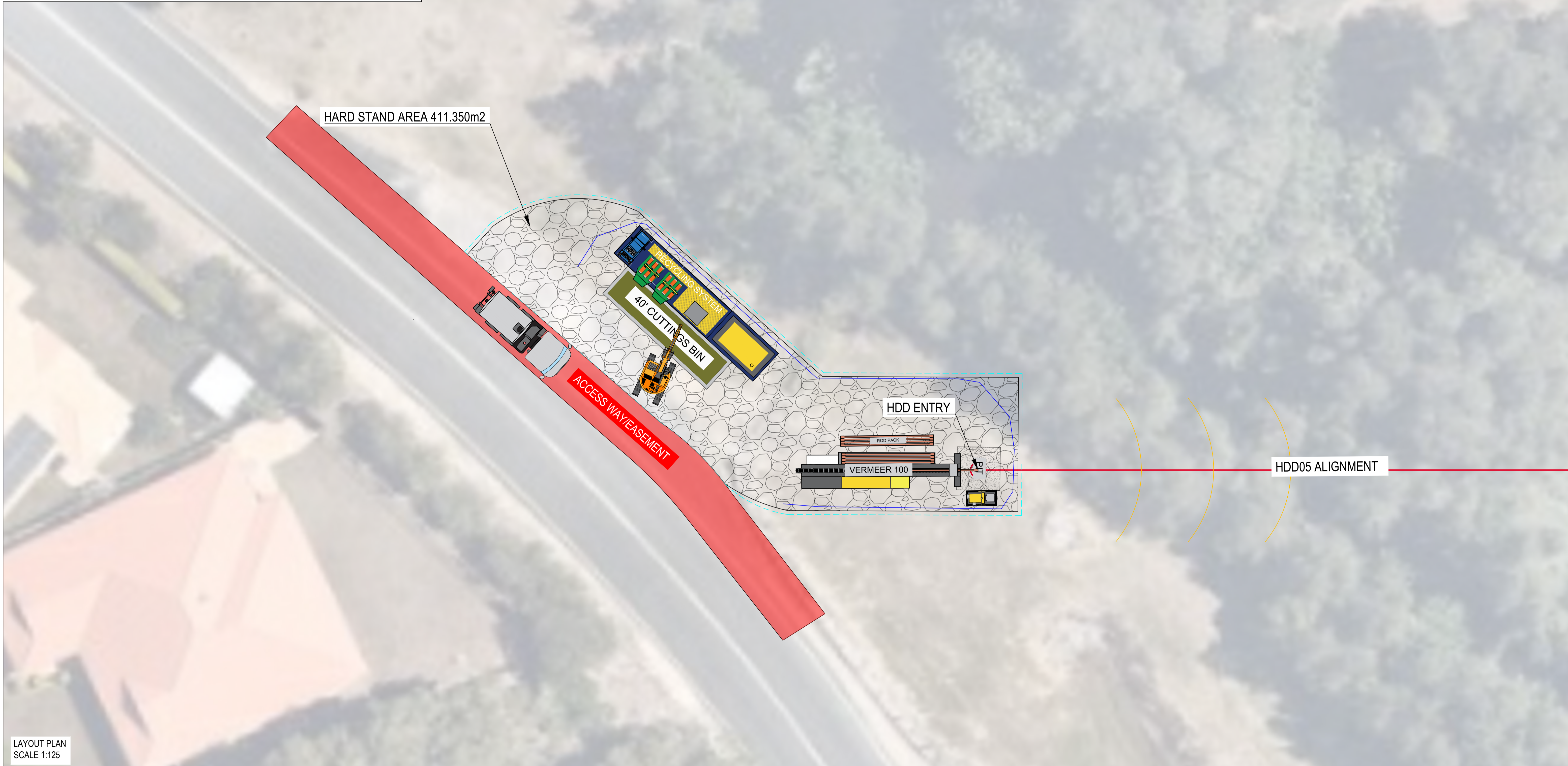
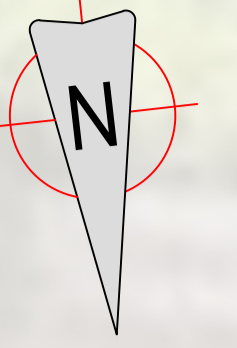
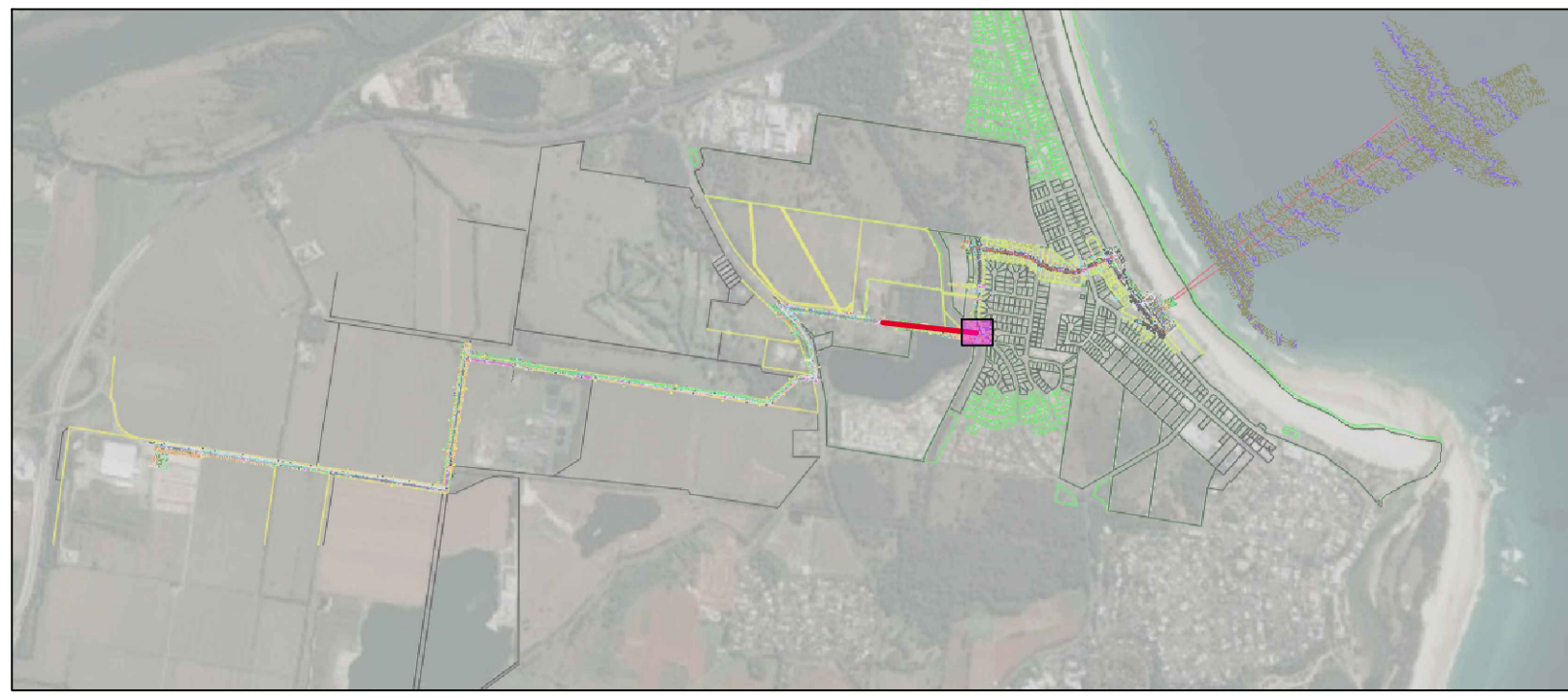
REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APP'D CONTRACTOR	DATE	MD	TD	PT	CH	MH
A	ISSUED FOR INFORMATION	22.09.21									



PROJECT: AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE

TITLE: ESC - HDD06 EXIT ELROND DR

DRAWING No: 096-HSE-DWG-002 STATUS: FOR INFORMATION



LAYOUT PLAN  
SCALE 1:125

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM '7892\_PIPELINE\_DETAIL\_REV G.dwg'. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM84 ZONE 56S, AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

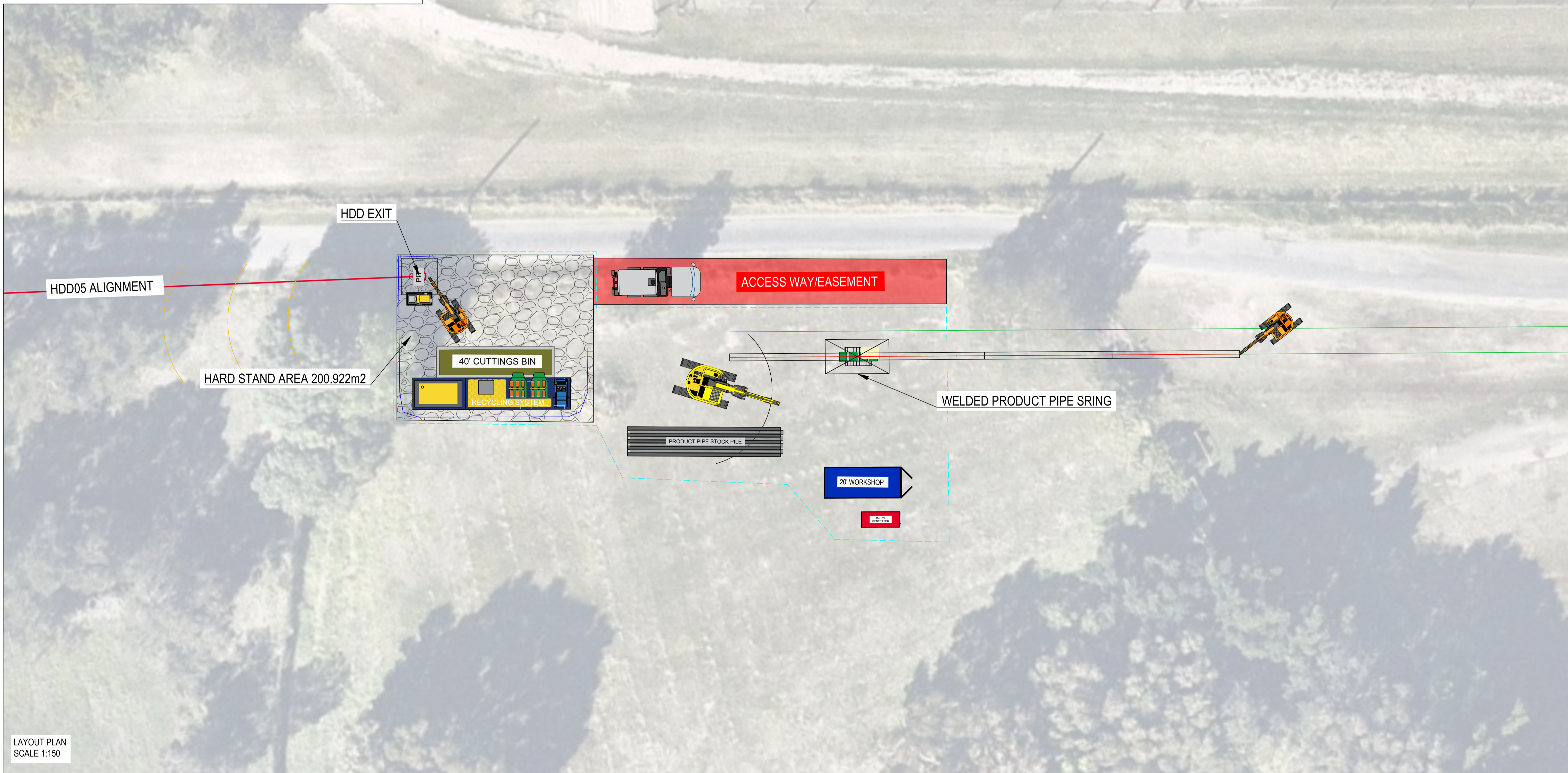
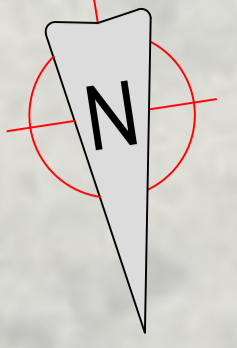
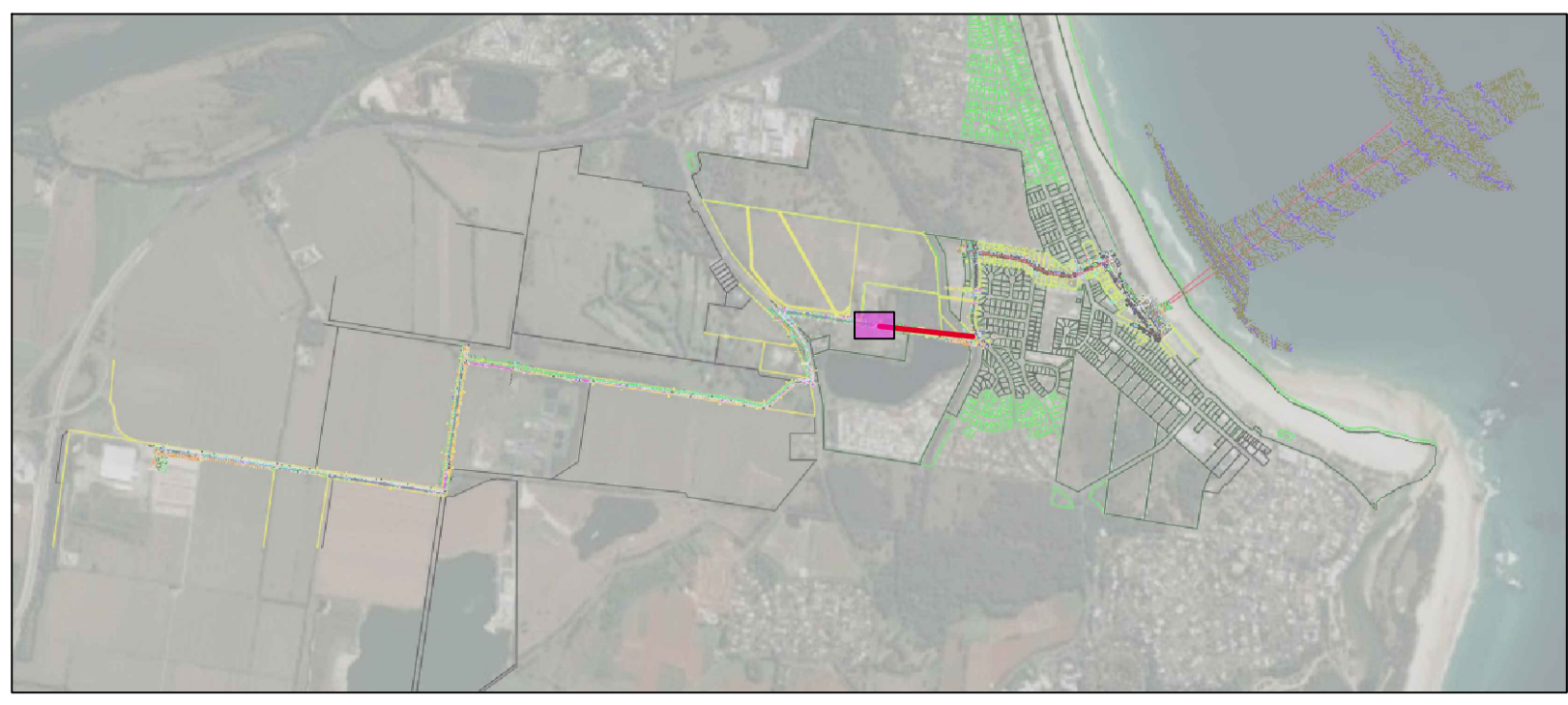
- LEGEND:
- HDD ALIGNMENT
  - BOUNDARIES
  - - - SITE FENCING
  - - - SEDIMENT FENCE
  - - - COIR LOG
  - HDD WORKS SITE AREA
  - ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APP'D CONTRACTOR	DATE	DRAWN	CHECK OWNER	APP'D OWNER
A	ISSUED FOR INFORMATION	06.10.21	MH	CH	PT	TD	MD		



PROJECT:	AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE
TITLE:	ESC - HDD05 ENTRY NOBLE LAKE
DRAWING No.:	047-HSE-DWG-007
STATUS:	FOR INFORMATION

## **Location 6: Horizontal Directional Drilling**



LAYOUT PLAN  
SCALE 1:150

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. EXISTING SERVICES DETAILS TAKEN FROM FROM '7892\_PIPELINE\_DETAIL\_REV G.dwg'. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
3. DATUM: UTM84 ZONE 56S, AHD.
4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
5. HDD EQUIPMENT SELECTION INDICATIVE.

LEGEND:

- HDD ALIGNMENT
- WELDED PRODUCT PIPE STRING
- BOUNDARIES
- SITE FENCING
- SEDIMENT FENCE
- COIR LOG
- HDD WORKS SITE AREA
- ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK CONTRACTOR	APP'D CONTRACTOR	CHECK OWNER	APP'D OWNER
A	ISSUED FOR INFORMATION	06.10.21	MH	CH	PT	TD	MD



PROJECT:	AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE
TITLE:	ESC - HDD05 EXIT NOBLE LAKE
DRAWING No.:	047-HSE-DWG-008
STATUS:	FOR INFORMATION

# B2 – ACID SULFATE SOILS MANAGEMENT PLAN

**Australian Bay Lobster Producers Limited**

**Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)**

## Document Control Sheet

<b>Current Version</b>	B
<b>Current Version Date</b>	21 January 2022
<b>Status</b>	Final

## Amendments

<b>Version Number</b>	<b>Version Date</b>	<b>Authorised by</b>	<b>Amendment Details</b>
A	23 November 2021	ABLP	Original Publication
B	21 January 2022	ABLP	N/A

## **B2 – ACID SULFATE SOILS MANAGEMENT PLAN**

### **1 Purpose and Scope**

The purpose of this document is to detail the Acid Sulfate Soils (ASS) management strategy to be followed during the construction of stage two of the Australian Bay Lobster Producers Limited Seawater Supply Pipeline. This follows a site-specific ASS Investigation and Management Plan developed by Willow and Sparrow (Attachment B2-1).

Note, the construction of the pipeline will result in minimal disturbance of ASS materials, particularly for the HDD works and as the pH level of the bore/drilled line is required to be neutral, any ASS material is treated in situ to ensure this neutral state is achieved. Nevertheless, if top soil stripping is to occur for the trenched tie-in connection works, these works are to accord with the management measures outlined below.

Table B2-1 integrates the objectives and management measures to be used during construction. It sets out clearly how the objectives can be accomplished by nominating responsible persons and establishing performance indicators, required management actions, monitoring, corrective actions, and reporting procedures.

### **2 Responsibilities**

It is the responsibility of the Environmental Manager / Representative to ensure that this management plan is periodically reviewed and updated and implemented.

**Table B2-1: Acid Sulfate Soils Management Plan**

Item	Action				
<b>Objective</b>	To prevent environmental nuisance and/or harm occurring due to the oxidation of acid sulfate soils from construction activities.				
<b>Responsible Person(s)</b>	Site Manager, or if nominated, Site Environmental Officer.				
<b>Performance Criteria</b>	<p>No soil material be disturbed that has been identified as ASS or PASS without appropriate treatment.</p> <p>Site runoff complies with the following criteria:</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Criteria</th> </tr> </thead> <tbody> <tr> <td>pH</td> <td>Not less than 6.5 pH units or not less than 10% below background* sample</td> </tr> </tbody> </table> <p>* background is a site representative of an unimpacted area relevant to the site sampled.</p>	Parameter	Criteria	pH	Not less than 6.5 pH units or not less than 10% below background* sample
Parameter	Criteria				
pH	Not less than 6.5 pH units or not less than 10% below background* sample				
<b>Actions</b>	<p><b>General</b></p> <ul style="list-style-type: none"> <li>○ This management plan relates only to the area of investigation in the ASS investigation and management plan. Areas outside the area of investigation may need to be further evaluated to ensure correct liming rates and methodology are applied if disturbance to these areas is required.</li> </ul> <p><b>Soil Disturbance</b></p> <ul style="list-style-type: none"> <li>○ Any excavation of soil that occurs within the topsoil layer or stripping of the topsoil layer should be preceded by:           <ul style="list-style-type: none"> <li>- An assessment of the bulk density of the soil to determine the rate of lime addition required in kg CaCO<sub>3</sub>/m<sup>3</sup> of soil (from kg CaCO<sub>3</sub>/t soil);</li> <li>- A subsequent determination of the liming rate per m<sup>2</sup> to allow determination of lime addition required in kg CaCO<sub>3</sub>/m<sup>2</sup> (or other measure such as acre or hectare as appropriate);</li> </ul> </li> </ul>				

	<ul style="list-style-type: none"> <li>○ Spreading of lime (preferably fine agriculture lime – ‘aglime’) at a rate exceeding 1.4 kg CaCO<sub>3</sub>/t soil by ploughing or ripping lime into soil ensuring that lime is distributed throughout the topsoil layer.</li> <li>○ A factor shall be applied to the liming rate depending on the equivalent CaCO<sub>3</sub> of the neutralising agent used. This shall be applied by calculating 100 / %CaCO<sub>3</sub> equivalent and multiplying this factor by the liming rate / tonne of soil (or m<sup>3</sup> of soil) to achieve the required rate of CaCO<sub>3</sub>.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>○ Treatment of soils by liming or other means to be recorded in Site Manager’s logbook, or Form C2 – Site Inspection (CEMP Attachment C) or similar as appropriate. Record to include details of amount of lime applied, method and amount of soil treated and subsequent soil work, movement or stockpiling as appropriate.</li> <li>○ Monitoring to be undertaken monthly while runoff is occurring from areas subject to treatment and/or disturbance of ASS material or material that required treatment for same. If no runoff occurs for the month, the next rainfall event shall be monitored if possible.</li> <li>○ Implement approved Groundwater Monitoring Program as required in that program.</li> </ul>
<b>Reporting</b>	<ul style="list-style-type: none"> <li>○ Complaints regarding ASS material or water pollution are to be reported to the Site Manager as soon as practicable and recorded on Form C1 – Incidents / Complaints in CEMP Attachment C.</li> <li>○ Site management to notify Tweed Shire Council or Office of Environment and Heritage of any significant pollution occurring from site works.</li> </ul>
<b>Training</b>	<ul style="list-style-type: none"> <li>○ Ensure site management and staff are familiar with the requirements of this ASS Management Plan.</li> <li>○ Incorporating training for environmental aspects including a person’s responsibilities in relation to this management plan as part of site induction.</li> </ul>
<b>Corrective Action Triggers</b>	<ul style="list-style-type: none"> <li>○ Complaint.</li> <li>○ Surface water runoff or groundwater monitoring results outside acceptable limits for pH, iron and/or aluminium indicative of ASS oxidation and subsequent acidification of these waters.</li> <li>○ Disturbed soils identified as Potential Acid Sulfate Soils (<b>PASS</b>) or untreated soils that require treatment, particularly if stockpiled on site.</li> <li>○ Soils identified as PASS removed from the site without being treated.</li> </ul>
<b>Corrective Actions</b>	<p>As appropriate:</p> <ul style="list-style-type: none"> <li>○ Identify and assess on site soil works, stockpiling and treatment of soils.</li> </ul>

- |  |   |
|--|---|
|  | <ul style="list-style-type: none"><li>○ Undertake follow up monitoring of surface or groundwaters to identify any plumes, sources and longevity of problem.</li><li>○ Review ASS Management Plan and amend as required.</li></ul> |
|--|---|

# **Attachment B2-1**

## **Acid Sulfate Soils Management Plan**

Willow+  
Sparrow

# **Acid Sulfate Soil Management Plan**

**For**

**Seawater Intake and Delivery Pipeline and  
Pump Station**

**Prepared for: Australian Bay Lobster Producers Limited**



**DOCUMENT CONTROL**

Revision number	Description	Prepared	Reviewed	Issued	Issue date
0	Acid Sulfate Soil Management Plan	JV	MC	MC	19/08/2020
1	Revised ASSMP with client amendments	JV	MC	MC	11/12/2020

**Document title:** Acid Sulfate Soil Management Plan for Seawater Intake and Delivery Pipeline, and Pump Station

**Document number:** 05-2001-ASSMP-01

**Author:** Michael Chamberlain, *BEng, RPEng, RPEQ*

**Client name:** Australian Bay Lobster Producers

**Client's representative:** Tom Dalton

**Council approval:** Tweed Shire Council

**Approved for use by:****Name:** Michael Chamberlain**Signature:**

**Date:** 11 December 2020**Willow & Sparrow Pty Ltd**

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**TABLE OF CONTENTS**

**1. INTRODUCTION .....4**

1.1 Project Description.....4

1.2 Scope of Work.....4

1.3 Acid Sulfate Soils.....4

**2. Geotechnical investigations .....5**

2.1 Scope of Investigations .....5

2.2 Subsurface Conditions.....5

2.3 Groundwater .....5

2.4 Acid Sulfate Soils Risk .....6

2.5 Findings.....6

    2.5.1 Screening Tests .....6

    2.5.2 Laboratory Testing .....7

**3. Acid Sulfate Soil Management PLAN.....8**

**4. Conclusion.....10**

**5. Limitations .....10**

**APPENDIX A .....11**

**APPENDIX B .....12**

**APPENDIX C .....13**

**APPENDIX D .....14**

## 1. INTRODUCTION

### 1.1 Project Description

Australian Bay Lobster Producers Limited (**ABLP**) have engaged Willow and Sparrow Pty Ltd to undertake an Acid Sulfate Soil Management Plan (**ASSMP**) for the construction of a seawater intake pipeline and pump well infrastructure which is intended to supply their onshore aquaculture facility located adjacent to the Pacific Motorway at 9484 Tweed Valley Way, Chinderah (**ABLP Site**). The infrastructure will provide an ongoing supply of fresh seawater to service the growth and development of its aquaculture operations which are centred around the cultivation of lobster species. The purpose of this report is to define the management procedures in respect of the acid sulfate soils which have been identified on sections of the proposed pipeline alignment.

### 1.2 Scope of Work

The seawater intake infrastructure is comprised of the following components:

- 5.3km OD560 PE112 rising main pipeline (**Delivery Pipeline**);
- Twin 1,200m OD500 PE112 intake pipelines (**Intake Pipelines**); and
- Pump station (switchboard) and cylindrical wet well with dimensions OD5.7m x 10m depth.

The Delivery Pipeline and Intake Pipelines are to be constructed by trenchless installation using Horizontal Directional Drilling (HDD) methods and the wet well is to be constructed by caisson construction method. The wet well will be the focal point of the seawater pipeline infrastructure, being located in Jack Bayliss Park, Kingscliff and connecting the ABLP Site via the Delivery Pipeline, to the offshore intake structures via the two Intake Pipelines. Refer to **Appendix A** for the site locality map.

### 1.3 Acid Sulfate Soils

Acid Sulfate Soils (ASS) are soils and sediments that contain iron sulfides. They are commonly formed when seawater mixes with land sediments containing iron oxides and organic matter under waterlogged conditions. When exposed to air these soils oxidise and produce sulfuric acid, often releasing toxic quantities of heavy metals, most notably iron and aluminium. Acidic leachate and heavy metals can then enter waterways killing aquatic organisms and vegetation along with inflicting damage to concrete and steel infrastructure. In coastal landscapes ASS are typically found in soils up to 5m Australian Height Datum (**AHD**) and more commonly in lowland areas such as flood plains and estuaries. As a significant portion of the Delivery Pipeline works will take place below 5m AHD there is a risk Potential Acid Sulfate Soils (PASS) and Actual Acid Sulfate Soils (AASS) will be encountered.

## 2. GEOTECHNICAL INVESTIGATIONS

To better understand the soil composition and presence of acid sulfate soils along the Delivery Pipeline alignment detailed geotechnical investigations and laboratory testing was undertaken.

### 2.1 Scope of Investigations

The purpose of the geotechnical investigation was to:

- Determine the presence of ASS along the alignment;
- Estimate the net acid generating potential of ASS material; and
- Recommend further action if necessary.

The investigations included the following works:

- Drilling of twenty-one (21) boreholes, 2.0m below the existing surface level along the proposed alignment of the Delivery Pipeline. Refer to **Appendix B** for the borehole locations; and
- Screening and laboratory testing of bore hole samples.

The investigation was conducted in accordance with the NSW Acid Sulfate Soil (ASSMAC) Guidelines 1998 and laboratory analysis was undertaken in accordance with the Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et. al. 2004).

### 2.2 Subsurface Conditions

The proposed alignment commences at the ABLP Site and traverses to the east through local road reserve before terminating at a point 1.2km offshore of Kingscliff Beach. The Geological Survey of Queensland and NSW, Moreton Geology Map 1:500,000 series, shows the alignment is located over alluvial water borne deposits, estuarine flood plains and tidal deposits of the Quaternary age. Based on the core samples obtained from the borehole drills the soils onsite typically consist of silty sand topsoil overlying alluvial sands to the termination depth of 2.0m. Borehole logs are attached as **Appendix C**.

### 2.3 Groundwater

Groundwater was encountered during the geotechnical investigation at varying depths along the alignment, ranging from 0.7m to 1.3m below surface level. This range is subject to local conditions as the groundwater levels are expected to fluctuate due to seasonal variations or during periods of heavy rainfall. Considering groundwater is expected to be

encountered during construction of both the pump well a separate Dewatering Management Plan is to be prepared to address this element of construction.

## 2.4 Acid Sulfate Soils Risk

The ASS Risk Map for 'Tweed Heads' produced by the NSW Department of Land and Water Conservation categorises the area along the Delivery Pipeline alignment as Class 3 Acid Sulfate Soils Risk, indicating that ASS are likely to be found beyond 1.0 metre below the natural ground surface in this area. As the alignment of the Delivery Pipeline traverses through this area it is projected that ASS will be encountered in the course of construction works.

## 2.5 Findings

### 2.5.1 Screening Tests

As part of the screening process two measurements of pH are taken from independent tests carried out on a soil:water paste from the bore samples. The first ( $pH_F$ ) is used to indicate the current pH of the soil. The second test ( $pH_{FOX}$ ) uses an oxidising agent comprised of 30% hydrogen peroxide to identify unoxidized sulfates/sulfides in the soil, which is then used to measure the potential effect of these compounds on soil pH after oxidation. The reaction rate is noted and logged on a scale from nil to very high. A soil with an initial pH ( $pH_F$ ) of less than 4 is considered likely to be an actual acid sulfate soil (AASS), while a soil exhibiting a pH after oxidation ( $pH_{FOX}$ ) of less than 3 is considered to be a potential acid sulfate soil (PASS) (Dear et al. 2002). Table 1 provides a summary of the screening test results and the corresponding laboratory certificates attached as **Appendix D**.

**Table 1 – Screening Test Results**

TEST	RANGE	ASS RANGE
$pH_F$	4.4 - 6.8	<4.0 (AASS)
$pH_{FOX}$	1.2 – 3.9	<3.0 (PASS)
Reaction to $H_2O_2$	Nil – Very High	Mod – Very High

Screening test results were greater than the indicative range for AASS, however considerable reactivity to peroxide was present in some samples which resulted in  $pH_{FOX}$  results within the range of PASS. This indicates that ASS might be present along the Delivery Pipeline alignment. As screening tests are indicative only quantitative laboratory testing was required to confirm this.

## 2.5.2 Laboratory Testing

A total of 42 samples were selected for laboratory analysis by the Chromium Reducible Sulfur Suite ( $S_{CR}$  Method 22B). Selection for laboratory analysis was based on the most positive screening test results, whilst maintaining a representative spread of samples across the soil profiles. The testing results indicated the following:

- The soil has existing pH above the range of AASS;
- 23 of the 42 samples submitted for chromium analysis breached the Acid Sulfate Soils Management Advisory Committee (ASSMAC) net acidity action criteria for coarse textured soil of 18 moles H<sup>+</sup>/tonne; and
- The soil does not contain an effective acid neutralising capacity (ANC).

Due to the presence of PASS within the site the following Acid Sulfate Soil Management Plan has been prepared to prevent the migration of acidic leachate offsite and to prevent adverse environmental outcomes as a result of earthworks activities along the Delivery Pipeline alignment.

### 3. ACID SULFATE SOIL MANAGEMENT PLAN

**Table 2 – Acid Sulfate Soil Management Plan**

<b>Issue</b>	Oxidation of PASS and associated migration of acidic leachate into the adjacent environment														
<b>Operational Objective</b>	To effectively neutralise all PASS material to avoid any adverse environmental impacts during and after the construction phase.														
<b>Performance Criteria</b>	<ul style="list-style-type: none"> <li>- Verification sampling indicates the appropriate treatment procedures have been employed such that results of these tests display no net acidity. Chromium suite acid base accounting shall be used to verify treated material in accordance with Table A3.6 of the Laboratory Methods Guidelines (Ahern et.al. 2004).</li> <li>- Where possible surface water runoff from ASS treatment areas is not to be discharged off site. In the event that surface water must be discharged offsite, water quality shall be within the discharge criteria values outlined below:</li> </ul> <table border="1"> <thead> <tr> <th>Water Quality Parameter</th> <th>Discharge Criteria</th> </tr> </thead> <tbody> <tr> <td>pH</td> <td>6.5 – 9.0</td> </tr> <tr> <td>Suspended Solids</td> <td>&lt;50mg/L</td> </tr> <tr> <td>Dissolved Oxygen</td> <td>&gt;6mg/L</td> </tr> <tr> <td>Aluminium</td> <td>&lt;0.1mg/L</td> </tr> <tr> <td>Iron</td> <td>&lt;1mg/L</td> </tr> <tr> <td>Oil and Grease</td> <td>No visible film or detectable odour</td> </tr> </tbody> </table>	Water Quality Parameter	Discharge Criteria	pH	6.5 – 9.0	Suspended Solids	<50mg/L	Dissolved Oxygen	>6mg/L	Aluminium	<0.1mg/L	Iron	<1mg/L	Oil and Grease	No visible film or detectable odour
Water Quality Parameter	Discharge Criteria														
pH	6.5 – 9.0														
Suspended Solids	<50mg/L														
Dissolved Oxygen	>6mg/L														
Aluminium	<0.1mg/L														
Iron	<1mg/L														
Oil and Grease	No visible film or detectable odour														
<b>Treatment Strategy</b>	<p><b><u>Lime is to be added to all excavated material at the rate of 38kg/m<sup>3</sup>.</u></b></p> <ul style="list-style-type: none"> <li>- The liming rate is based on the highest net acidity and is calculated using a combined safety and neutralising factor of 1.5. A bulk density of 1.7t/m<sup>3</sup> has been used to calculate the rate per m<sup>3</sup>.</li> </ul> <p><b>Treatment Procedure: Option 1</b></p> <ul style="list-style-type: none"> <li>- All excavated soils below depths of 1.0m will be placed within a bunded area onsite constructed of material that is known to be free of acid sulfate soils. This bunded area will be located in such a way as to minimise surface runoff away from the bunded area.</li> </ul>														

	<ul style="list-style-type: none"> <li>- Bund walls will be built to a height of approximately 300mm and setback 2.0m from the edge of the stockpile to provide water storage capacity during heavy rain events.</li> <li>- The bunded area will be prepared with a guard layer of lime at the rate of 5 kg/m<sup>2</sup> – including bund walls.</li> <li>- The specific size and location of the treatment pad will need to be determined by the contractor; however, it must be of sufficient size to allow for the return of validation results prior to removal of material from treatment pad and located away from any adjoining waterways.</li> <li>- Material will be placed to a depth of less than 300mm within the bunded area and lime added at the rate of <b>38kg/m<sup>3</sup></b>.</li> <li>- All treated material must be thoroughly mixed with an excavator bucket, rotary hoe or similar device. Excavated material is to be stockpiled for a maximum period of 18 hours before treatment.</li> <li>- Provided the treated material complies with the guideline values, the excavated soil can be reused as fill or taken off site.</li> </ul> <p><b>Treatment Procedure: Option 2</b></p> <ul style="list-style-type: none"> <li>- All proposed soils to be excavated below 1.0m will be mixed with lime prior to excavation using a tractor and rotary hoe at a rate of 38kg/m<sup>3</sup>.</li> <li>- Treated excavated materials are to be stockpiled in a windrow style (bund) adjacent to the pipeline route. The base of the window location is to be limed prior to placement of materials at a rate of 5 kg/m<sup>2</sup>.</li> <li>- The specific size of the treatment pad will need to be determined by the contractor.</li> <li>- Material will be sampled following excavation and tested in accordance with the ‘Validation Testing’ detailed below.</li> <li>- Provided material complies with the guideline values the excavated soil can be reused as fill or taken off site.</li> </ul> <p>Note: If it can be demonstrated that the prescribed liming rate is producing soil with excessive alkalinity when compared to the validation testing requirements, the rate may be revised with the written agreement of the Tweed Shire Council.</p>
<p><b>Validation Testing</b></p>	<ul style="list-style-type: none"> <li>- Validation sampling will be at the rate of one sample per 500m<sup>3</sup> of treated material. Validation testing of treated soil will include analysis for existing acidity, potential acidity and acid neutralising capacity (ANC). The soil must record zero net acidity and an ANC of greater than 0.5 times the potential acidity.</li> </ul>

	<ul style="list-style-type: none"> <li>- Chromium suite acid base accounting shall be used to verify treated material in accordance with Table A3.6 of the Laboratory Methods Guidelines (Ahern et.al. 2004).</li> </ul>
<b>Corrective Action</b>	<ul style="list-style-type: none"> <li>- If validation sampling indicates that excavated material has not been fully neutralised, additional lime will be applied based on validation test results.</li> </ul>
<b>Reporting</b>	<ul style="list-style-type: none"> <li>- The construction contractor will keep records of all test results and quantities of lime used during treatment to be available for inspection on site at all times.</li> <li>- A close out report detailing the implementation of the ASSMP, including validation results, will be compiled and provided to the Client.</li> </ul>
<b>Responsible Party</b>	<ul style="list-style-type: none"> <li>- The implementation of this ASSMP is the responsibility of the site manager and/or site managers representative. Collection and analysis of samples is to be carried out by a suitably qualified environmental consultant.</li> </ul>

#### 4. CONCLUSION

The results of the investigation suggest there is PASS within the alluvial material along the Delivery Pipeline alignment. By treating excavated material in accordance with the ASSMP, acidic leachate generated from the oxidation of sulfides during construction should be neutralised and any adverse environmental outcomes avoided. Recommendations set out in this report are based on the information supplied at the time of assessment. Should any details change then further testing and/or assessment may be required.

Should you require any further information or clarification please do not hesitate to contact Michael Chamberlain of Willow and Sparrow Pty Ltd.

#### 5. LIMITATIONS

This report has been prepared for and is to be solely used by the Australian Bay Lobster Producers Limited. It should be noted that this report is based on geotechnical testing that was conducted in February 2012 and that environmental conditions including contaminant concentrations can vary over time. Since the site has not been disturbed post 2012, it is assumed that the ASS test results provide the required degree of accuracy needed for preparation of an onsite management plan.

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**APPENDIX A**

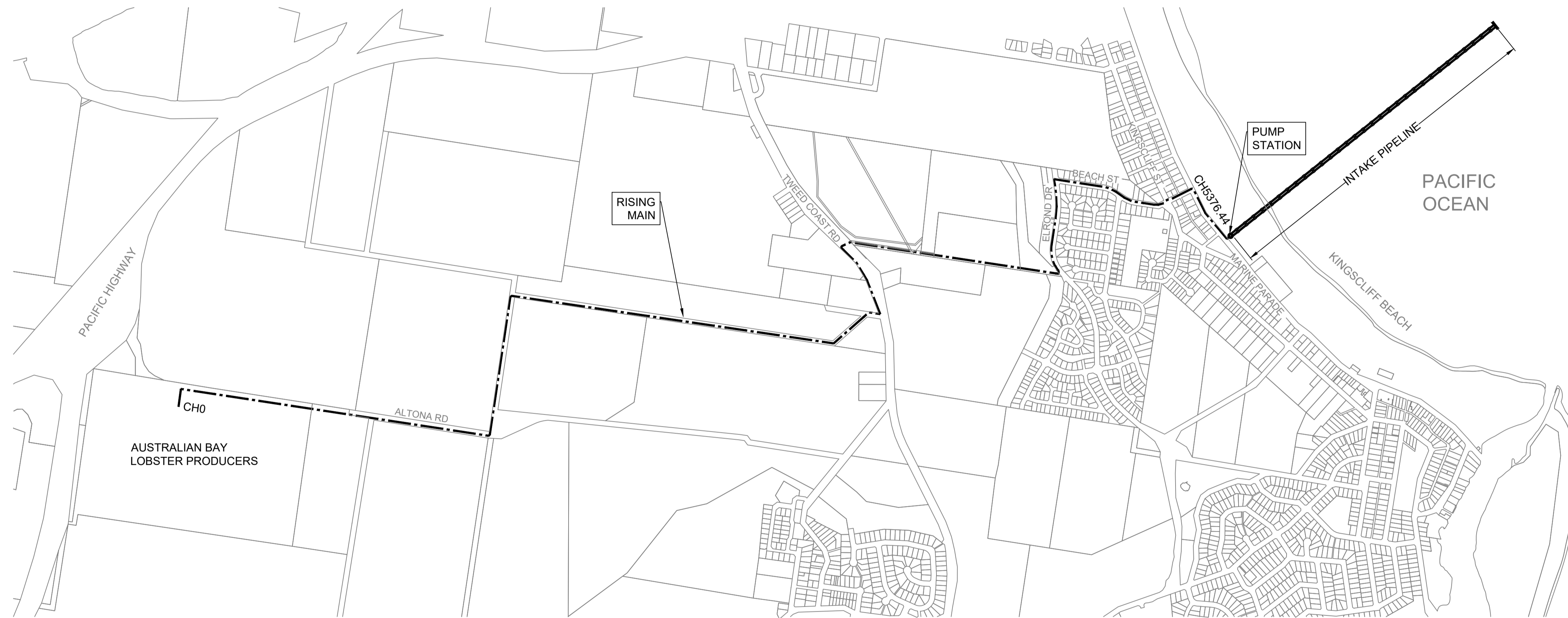
Site Locality Map

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# SEAWATER DELIVERY PIPELINE

SEAWATER INTAKE, PUMP STATION AND RISING MAIN DELIVERY PIPELINE  
FROM KINGSCLIFF BEACH TO LOT 20 DP 1082482

AUSTRALIAN BAY LOBSTER PRODUCERS PTY LTD



SITE LOCALITY PLAN

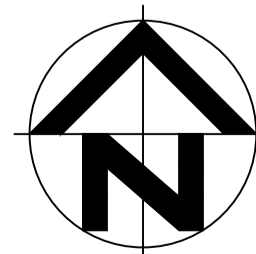
Willow+  
Sparrow



Dillions Lane, Alstonville NSW 2477  
Phone: [02] 662 86 192  
Email: michael@waseng.com.au  
WILLOW & SPARROW PTY LTD A.C.N. 606732512

ENGINEERING+DESIGN

Designed PJB	Drawn PJB	Checked	Survey
Scale SCALE [V] SCALE [H]		Date D/M/YYYY	
APPROVED - PRINCIPAL			



Datum AHD (m)

A	PRELIMINARY	DD/MM/YY
Issue	Description	Date By

CLIENT  
AUSTRALIA BAY LOBSTER PRODUCERS  
PROJECT  
SEAWATER INTAKE PIPELINE  
AND PUMP STATION

TITLE  
COVER SHEET  
AND OVERALL PLAN

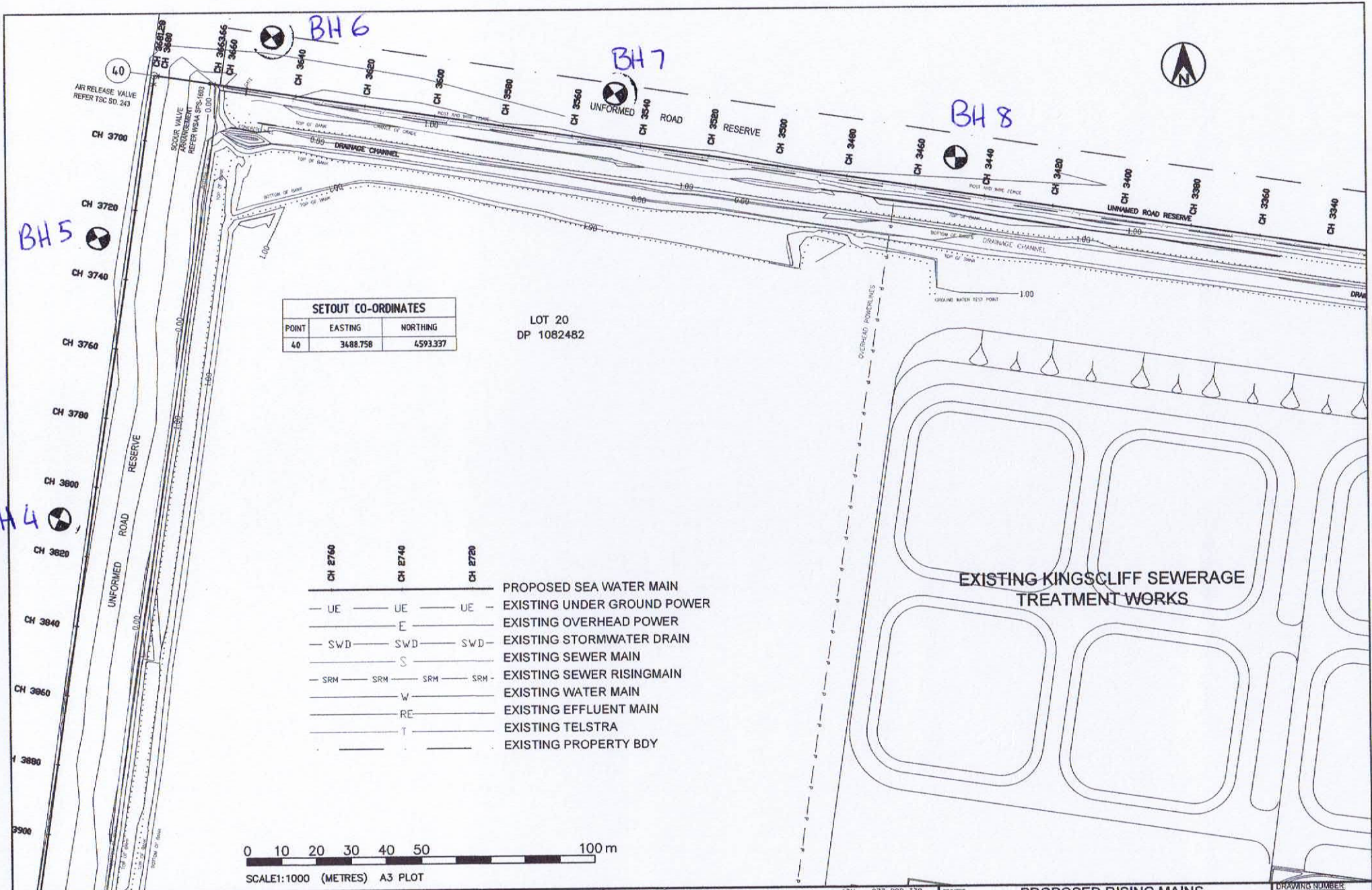
Drawing No. D05-2001-01/CS Sheet 1 of 1 A1

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**APPENDIX B**

**Borehole Locations**

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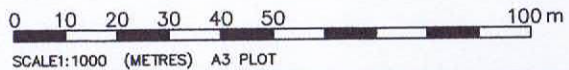


**SETOUT CO-ORDINATES**

POINT	EASTING	NORTHING
40	3488.758	4593.337

LOT 20  
DP 1082482

CH 2760	CH 2740	CH 2720	
— UE —	— UE —	— UE —	PROPOSED SEA WATER MAIN
— SWD —	— SWD —	— SWD —	EXISTING UNDER GROUND POWER
— SRM —	— SRM —	— SRM —	EXISTING OVERHEAD POWER
— W —	— W —	— W —	EXISTING STORMWATER DRAIN
— RE —	— RE —	— RE —	EXISTING SEWER MAIN
— T —	— T —	— T —	EXISTING SEWER RISINGMAIN
—	—	—	EXISTING WATER MAIN
—	—	—	EXISTING EFFLUENT MAIN
—	—	—	EXISTING TELSTRA
—	—	—	EXISTING PROPERTY BDY



<b>CLIENT</b> Australia Bay Lobster Products Limited		<b>DESIGNED</b> M.J.B. Mar-12 <b>DRAWN</b> M.J.B. Mar-12 <b>CHECKED</b> RRH Mar-12 <b>HORIZONTAL DATUM</b> BSC <b>VERTICAL DATUM</b> AHD <b>APPROVED</b> [Signature] Mar-12		<b>RPEQ No</b> 5055 <b>ACN:</b> 077 800 330 <b>PROJECT:</b> PROPOSED RISING MAINS, KINGSCLIFF, NSW <b>PLAN TITLE:</b> STAGE 1:- PLAN PIPELINE ALIGNMENT, SHEET 2		<b>DRAWING NUMBER:</b> A3-8028-CC-03 <b>SHEET 3 OF 14 SHEETS</b> <b>ISSUE A</b>	
<b>ASSOCIATE</b> Nigel White Consulting Surveyors		<b>IN THE EVENT THAT THE CONTRACTOR AND/OR ANY SUBCONTRACTOR OR ANY OTHER PARTY INCURRED ANY LIABILITY AS A RESULT OF THIS DRAWING BEING USED IN ANY MANNER UNLESS OTHERWISE SPECIFIED IN WRITING, THE CLIENT ACCEPTS FULL RESPONSIBILITY FOR THE ACCURACY OF THE INFORMATION PROVIDED AND THE CLIENT'S SOLE RESPONSIBILITY FOR THE DESIGN AND CONSTRUCTION OF ANY WORK SHOWN ON THIS DRAWING. THE ENGINEER'S SERVICES ARE PROVIDED AS A PROFESSIONAL SERVICE AND THE ENGINEER WILL NOT BE LIABLE FOR EACH USE OR ANY DAMAGES OF WHAT EVER TYPE OR EXTENT WHICH MAY RESULT.</b>		<b>PHONE:</b> (02) 66741178 <b>FAX:</b> (02) 66741854 <b>MOB:</b> 0421 656 439 <b>EMAIL:</b> richard@tweedengineers.com.au <b>REAR:</b> 12 McPHAIL AVE <b>PO BOX 1381 KINGSCLIFF NSW 2487 AUSTRALIA</b>		<b>ACAD FILE NO:</b> T:\UOBS-2012\8028-ABL\P 2012_002_CC_DESIGN JAN 2012.DWG	



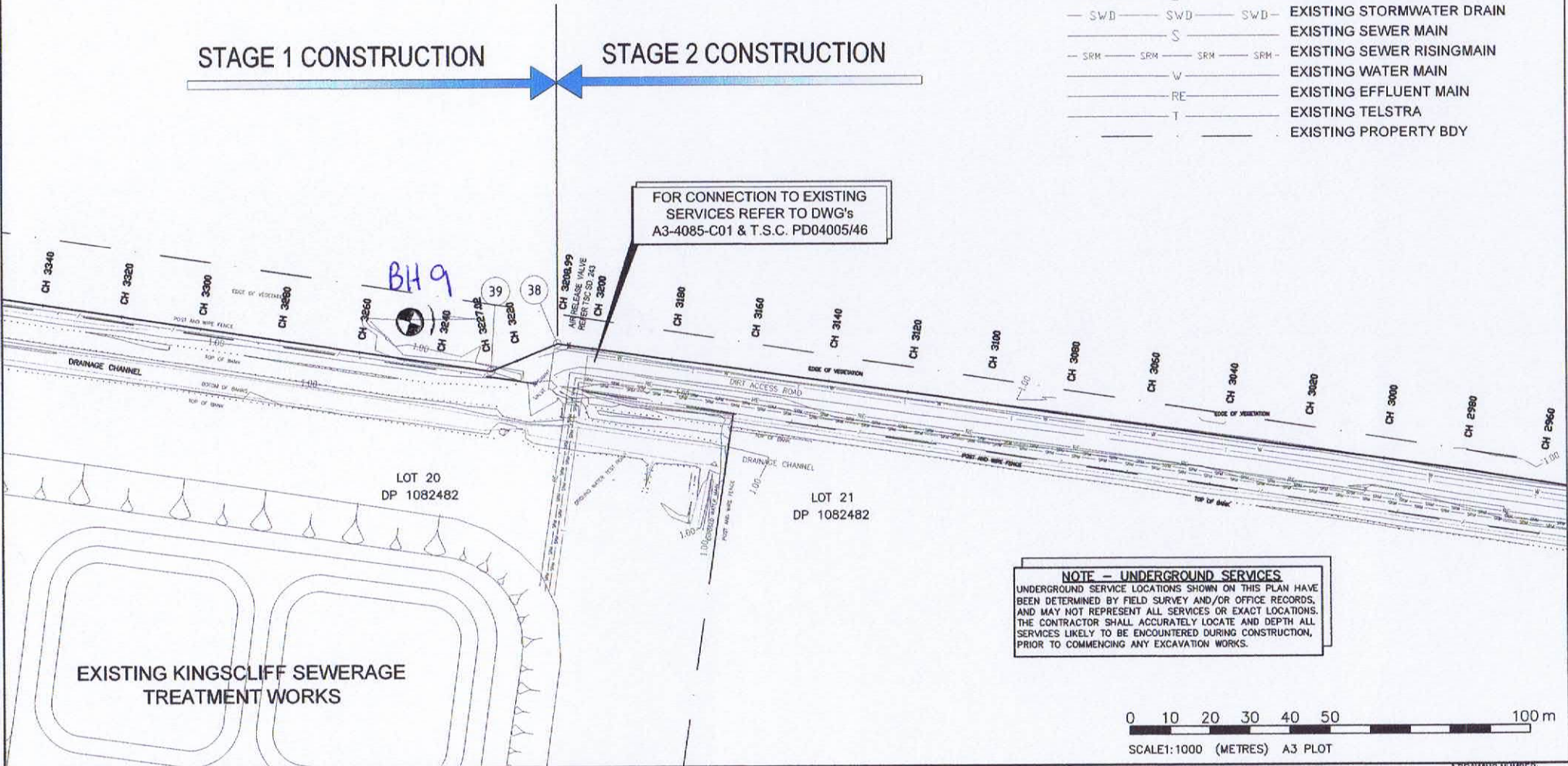
SETOUT CO-ORDINATES		
POINT	EASTING	NORTHING
38	3954.509	4531.781
39	3937.838	4524.932

CH 2760	CH 2740	CH 2720	
— UE —	— UE —	— UE —	PROPOSED SEA WATER MAIN
— E —	— E —	— E —	EXISTING UNDER GROUND POWER
— SWD —	— SWD —	— SWD —	EXISTING OVERHEAD POWER
— S —	— S —	— S —	EXISTING STORMWATER DRAIN
— SRM —	— SRM —	— SRM —	EXISTING SEWER MAIN
— W —	— W —	— W —	EXISTING SEWER RISING MAIN
— RE —	— RE —	— RE —	EXISTING WATER MAIN
— T —	— T —	— T —	EXISTING EFFLUENT MAIN
— —	— —	— —	EXISTING TELSTRA
— —	— —	— —	EXISTING PROPERTY BDY

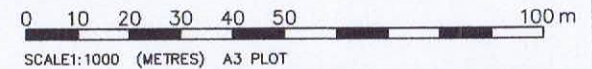
STAGE 1 CONSTRUCTION

STAGE 2 CONSTRUCTION

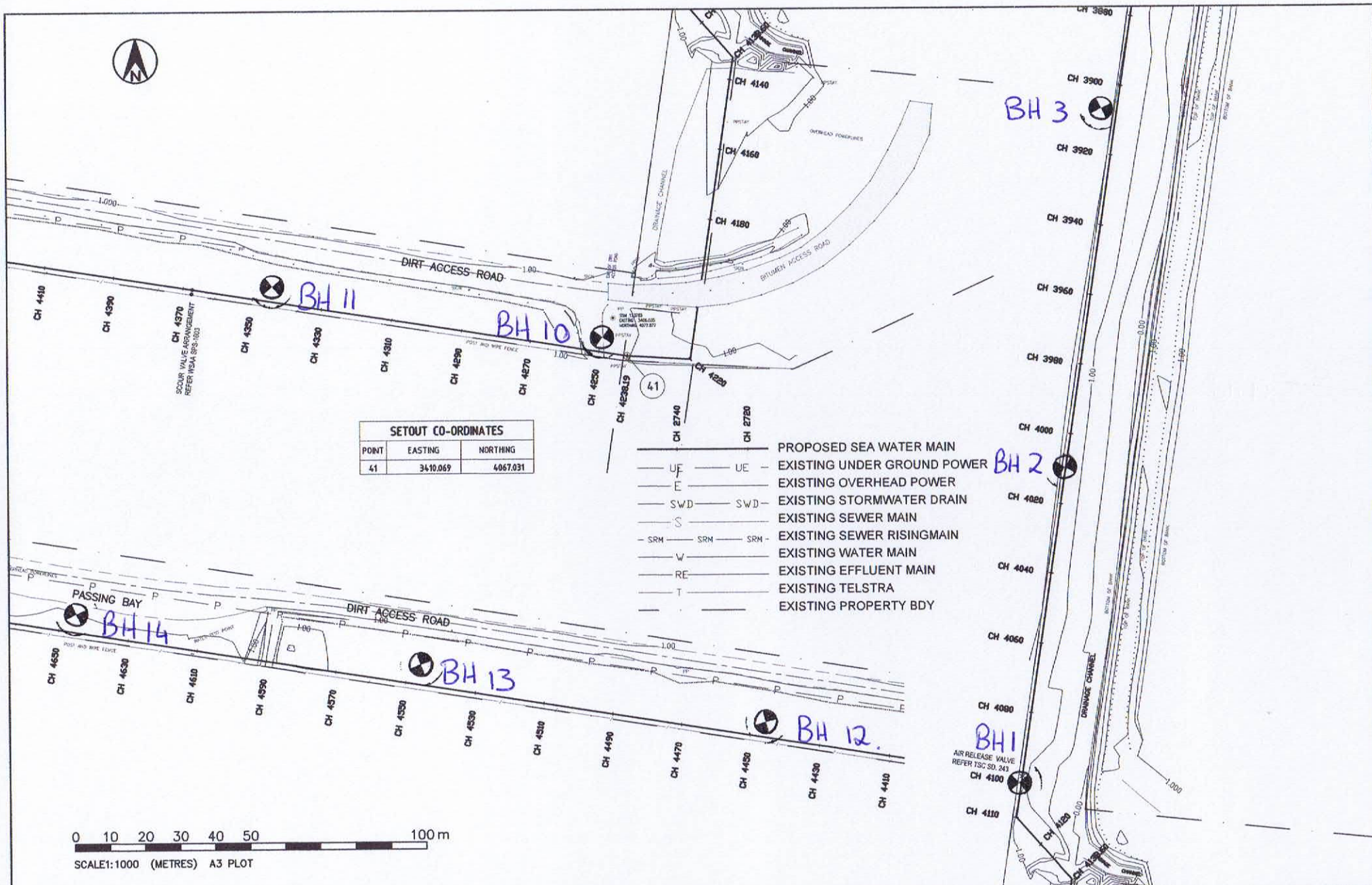
FOR CONNECTION TO EXISTING SERVICES REFER TO DWG's A3-4085-C01 & T.S.C. PD04005/46



**NOTE - UNDERGROUND SERVICES**  
 UNDERGROUND SERVICE LOCATIONS SHOWN ON THIS PLAN HAVE BEEN DETERMINED BY FIELD SURVEY AND/OR OFFICE RECORDS, AND MAY NOT REPRESENT ALL SERVICES OR EXACT LOCATIONS. THE CONTRACTOR SHALL ACCURATELY LOCATE AND DEPTH ALL SERVICES LIKELY TO BE ENCOUNTERED DURING CONSTRUCTION, PRIOR TO COMMENCING ANY EXCAVATION WORKS.



CLIENT: <b>Australia Bay Lobster Products Limited</b> ASSOCIATE: <b>Nigel White Consulting Surveyors</b>		DESIGNED: M.J.B. MNI-12 DRAWN: M.J.B. MNI-12 CHECKED: J.R.R. MNI-12 HORIZONTAL DATUM: ISG VERTICAL DATUM: AHD APPROVED: [Signature] MNI-12		RPEP No 5055 ACN: 077 800 330 <b>Tweed Coast Consulting Engineers Pty Ltd</b> REAR: 12 McPHAIL AVE PO BOX 1391 KINGSCLIFF NSW 2487 AUSTRALIA PHONE: (02) 66741176 FAX: (02) 66741854 MOB: 0421 656 439 EMAIL: tchard@tweedengineers.com.au		PROJECT: <b>PROPOSED RISING MAINS, KINGSCLIFF, NSW</b> DRAWING NUMBER: <b>A3-8026-CC-02</b> SHEET 2 OF 14 SHEETS ISSUE A	
ISSUE: ORIGINAL ISSUE AMENDMENT DETAILS: [Blank]		M.J.B. MNI-12 INITIALS DATE		#18# 18 Jan 22 Jan 30 Jan 49 Jan 50 Jan		NOTE: FULL SIZE ON ORIGINAL. 1380 HUNTER ST	



SETOUT CO-ORDINATES		
POINT	EASTING	NORTHING
41	3410.069	4067.031

- UF — UE — PROPOSED SEA WATER MAIN
- E — EXISTING UNDER GROUND POWER
- SWD — SWD — EXISTING OVERHEAD POWER
- SRM — SRM — EXISTING STORMWATER DRAIN
- W — EXISTING SEWER MAIN
- RE — EXISTING SEWER RISING MAIN
- T — EXISTING WATER MAIN
- — — EXISTING EFFLUENT MAIN
- — — EXISTING TELSTRA
- — — EXISTING PROPERTY BDY

BH 3

BH 11

BH 10

BH 2

BH 14

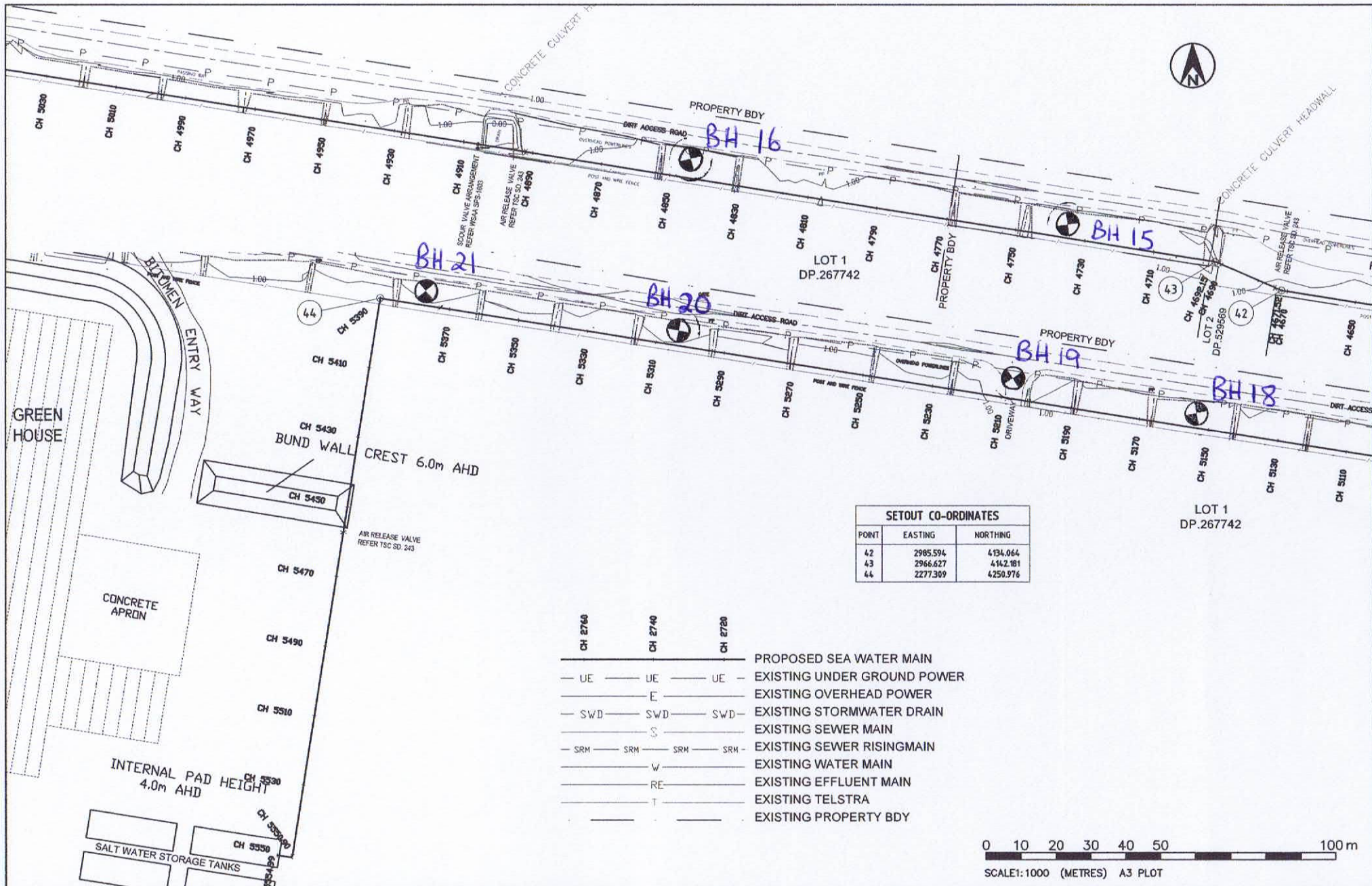
BH 13

BH 12

BH 1

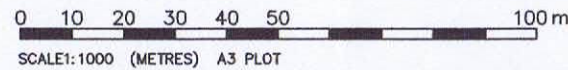
0 10 20 30 40 50 100 m  
SCALE:1:1000 (METRES) A3 PLOT

<b>Australia Bay Lobster Products Limited</b> Nigel White Consulting Surveyors		<b>Tweed Coast Consulting Engineers Pty Ltd</b> REAR: 12 McPHAIL AVE PO BOX 1391 KINGSCLIFF NSW 2487 AUSTRALIA PHONE: (02) 66741176 FAX: (02) 66741854 MOB: 0421 656 439 EMAIL: richard@tweedengineers.com.au		<b>PROPOSED RISING MAINS, KINGSCLIFF, NSW</b> SHEET 1:- PLAN PIPELINE ALIGNMENT, SHEET 3		DRAWING NUMBER: <b>A3-8026-CC-04</b> SHEET 4 OF 14 SHEETS ISSUE A	
SUBMIT: Australia Bay Lobster Products Limited ASSOCIATE: Nigel White Consulting Surveyors		DESIGNED: M.J.B. Mar-12 DRAWN: M.J.B. Mar-12 CHECKED: R.P.H. Mar-12 HORIZONTAL DATUM: BSC VERTICAL DATUM: AHD DRAWING NO: 1380 HUNTING		RPEO No: 5055 ACN: 077 800 330 PROJECT: PROPOSED RISING MAINS, KINGSCLIFF, NSW DATE: 12 MAR 2012		AIR RELEASE VALVE REFER TSC 80.243 CH 4100	



SETOUT CO-ORDINATES		
POINT	EASTING	NORTHING
4.2	2985.594	4134.064
4.3	2966.627	4142.181
4.4	2277.309	4250.976

CH 2760	CH 2740	CH 2720	
— UE —	— UE —	— UE —	PROPOSED SEA WATER MAIN
— E —	— E —	— E —	EXISTING UNDER GROUND POWER
— SWD —	— SWD —	— SWD —	EXISTING OVERHEAD POWER
— S —	— S —	— S —	EXISTING STORMWATER DRAIN
— SRM —	— SRM —	— SRM —	EXISTING SEWER MAIN
— W —	— W —	— W —	EXISTING SEWER RISING MAIN
— RE —	— RE —	— RE —	EXISTING WATER MAIN
— T —	— T —	— T —	EXISTING EFFLUENT MAIN
— — —	— — —	— — —	EXISTING TELSTRA
— — —	— — —	— — —	EXISTING PROPERTY BDY



<b>Australia Bay Lobster Products Limited</b> Nigel White Consulting Surveyors		IN THE EVENT THAT THIS DRAWING IS USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT WAS PREPARED, THE DESIGNER ACCEPTS NO LIABILITY FOR ANY DAMAGE OR LOSS OF ANY KIND THAT MAY BE INCURRED BY ANY PARTY.		DRAWN: M. J. B. Mar-12 CHECKED: FRH Mar-12 APPROVED: T. C. Haney Mar-12		RPEO No 5055 ACN: 077 800 330 <b>Tweed Coast Consulting Engineers Pty Ltd</b> REAR: 12 McPHAIL AVE PO BOX 1391 KINGSCLIFF NSW 2487 AUSTRALIA PHONE: (02) 66741176 FAX: (02) 66741854 MOB: 0421 656 439 EMAIL: richard@tweedcoast.com.au		<b>PROPOSED RISING MAINS, KINGSCLIFF, NSW</b> STAGE 1:- PLAN PIPELINE ALIGNMENT, SHEET 4		DRAWING NUMBER: <b>A3-8026-CC-05</b> SHEET 5 OF 14 SHEETS ISSUE A	
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**APPENDIX C**


Borehole Logs

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# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979


## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 1							
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031							
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1							
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation					
AD		0.5		(SP) Silty SAND: Trace of clay, fine to sand, moist, Dark grey				TOPSOIL					
		1.0		(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange				ALLUVIUM					
	▼	1.5		(SP) SAND: Trace of silt, fine sand, wet, Grey									
		2.0											
<b>BH 1 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>													
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>						
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U() - undisturbed (size in mm)					
RR	rock roller	HW	Highly	S	Soft	L	Loose	D - disturbed					
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS - bulk sample					
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP - dynamic cone penetrometer					
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT - standard penetrometer test					
		F	Fresh	Hd	Hard	Fb	Friable	N - Number of blows for SPT / 300mm					
				ELw	Extremely Low	VLw	Very Low	VS - Vane Shear					
				Lw	Low	M	Medium	A - Acid Sulfate Sample					
				H	High	VH	Very High	PP - Pocket Penetrometer (kPa)					
▼	water level												
►	water seepage												
»-	partial loss												
«-	complete loss												
<b>Logged By:</b>		DW		<b>Date:</b>		10-02-12		<b>Checked By:</b>				<b>Date:</b> 10-02-12	

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 2							
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031							
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1							
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation					
AD		0.5		(SP) Silty SAND: Trace of clay, fine to sand, moist, Dark grey				TOPSOIL					
		1.0		(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange				ALLUVIUM					
		1.5		(SP) SAND: Trace of silt, fine sand, wet, Grey									
		2.0											
<b>BH 2 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>													
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>						
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U() - undisturbed (size in mm)					
RR	rock roller	HW	Highly	S	Soft	L	Loose	D - disturbed					
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS - bulk sample					
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP - dynamic cone penetrometer					
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT - standard penetrometer test					
		F	Fresh	Hd	Hard	Fb	Friable	N - Number of blows for SPT / 300mm					
				ELw	Extremely Low	VLw	Very Low	VS - Vane Shear					
				Lw	Low	M	Medium	A - Acid Sulfate Sample					
				H	High	VH	Very High	PP - Pocket Penetrometer (kPa)					
<b>WATER</b> ▼ water level ► water seepage »- partial loss «- complete loss													
		<b>Logged By:</b>	DW	<b>Date:</b>	10-02-12	<b>Checked By:</b>		<b>Date:</b>	10-02-12				

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 3			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation	
AD		0.5		(SP) Silty SAND: Trace of clay, fine to sand, moist, Dark grey				TOPSOIL	
		1.0		(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange				ALLUVIUM	
		1.5		(SP) SAND: Trace of silt, fine sand, wet, Grey					
		2.0							
<b>BH 3 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>		
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
	<b>WATER</b>	ELw	Extremely Low	VLw	Very Low			VS	Vane Shear
▼	water level	Lw	Low	M	Medium			A	Acid Sulfate Sample
►	water seepage	H	High	VH	Very High			PP	Pocket Penetrometer (kPa)
»-	partial loss								
«	complete loss								
<b>Logged By:</b> DW		<b>Date:</b> 10-02-12		<b>Checked By:</b>		<b>Date:</b> 10-02-12			

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979


## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 4			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation	
AD		0.5		(SM) Silty SAND: Trace of clay, fine to sand, moist, Dark grey				TOPSOIL	
		1.0		(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange				ALLUVIUM	
		1.5		(SP) SAND: Trace of silt, fine sand, wet, Grey					
		2.0							
<b>BH 4 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>		
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
				ELw	Extremely Low	VLw	Very Low	VS	Vane Shear
				Lw	Low	M	Medium	A	Acid Sulfate Sample
				H	High	VH	Very High	PP	Pocket Penetrometer (kPa)
<b>WATER</b>									
▼	water level								
▶	water seepage								
»-	partial loss								
«	complete loss								
<b>Logged By:</b>		DW		<b>Date:</b>		10-02-12		<b>Checked By:</b>	
				<b>Date:</b>		10-02-12			

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 5							
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031							
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1							
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation					
AD		0.0		(SM) Silty SAND: Trace of clay, fine to sand, moist, Dark grey				TOPSOIL					
		0.5		(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange				ALLUVIUM					
		1.0		(SP) SAND: Trace of silt, fine sand, wet, Grey									
		1.5											
		2.0											
<b>BH 5 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>													
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>						
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U() - undisturbed (size in mm)					
RR	rock roller	HW	Highly	S	Soft	L	Loose	D - disturbed					
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS - bulk sample					
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP - dynamic cone penetrometer					
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT - standard penetrometer test					
		F	Fresh	Hd	Hard	Fb	Friable	N - Number of blows for SPT / 300mm					
				ELw	Extremely Low	VLw	Very Low	VS - Vane Shear					
				Lw	Low	M	Medium	A - Acid Sulfate Sample					
				H	High	VH	Very High	PP - Pocket Penetrometer (kPa)					
<b>WATER</b> ▼ water level ► water seepage »- partial loss «- complete loss													
		<b>Logged By:</b>	DW	<b>Date:</b>	10-02-12	<b>Checked By:</b>		<b>Date:</b>	10-02-12				

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 6		
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031		
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1		
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
AD	▼	0.5	[Shaded]	(SM) Silty SAND: Trace of clay, fine to sand, moist, Dark grey				TOPSOIL
				(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange				ALLUVIUM
				(SP) SAND: Trace of silt, fine sand, wet, Grey				
		2.0						

### BH 6 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION

<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>				<b>SAMPLES / TESTS</b>			
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)		
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed		
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample		
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer		
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test		
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm		
	<b>WATER</b>	ELw	Extremely Low	VLw	Very Low			VS	Vane Shear		
▼	water level	Lw	Low	M	Medium			A	Acid Sulfate Sample		
▶	water seepage	H	High	VH	Very High			PP	Pocket Penetrometer (kPa)		
»-	partial loss	<b>Logged By:</b> DW		<b>Date:</b> 10-02-12		<b>Checked By:</b> [Signature]		<b>Date:</b> 10-02-12			
«-	complete loss										

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 7		
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031		
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1		
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation
AD				(SM) Silty SAND: Trace of clay, fine to sand, moist, Dark grey				TOPSOIL
		0.5		(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange				ALLUVIUM
		1.0		(SP) SAND: Trace of silt, fine sand, wet, Grey				
		1.5						
		2.0						

### BH 7 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION

<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>				<b>SAMPLES / TESTS</b>			
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)		
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed		
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample		
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer		
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test		
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm		
				ELw	Extremely Low	VLw	Very Low	VS	Vane Shear		
				Lw	Low	M	Medium	A	Acid Sulfate Sample		
				H	High	VH	Very High	PP	Pocket Penetrometer (kPa)		
<b>WATER</b>											
▼	water level										
►	water seepage										
»-	partial loss										
«-	complete loss										
		<b>Logged By:</b>	DW	<b>Date:</b>	10-02-12	<b>Checked By:</b>		<b>Date:</b>	10-02-12		


# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 8		
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031		
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1		
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation
AD		0.0		(SM) Silty SAND: Trace of clay, fine to sand, moist, Dark grey				TOPSOIL
		0.5		(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange				ALLUVIUM, Trace of organics
	▼	1.0		(SP) SAND: Trace of silt, fine sand, wet, Grey				
		1.5						
		2.0						


### BH 8 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION

<b>METHOD</b> AD auger drilling RR rock roller MS mud support NMLC rock coring WB wash bore		<b>WEATHERING</b> XW – Extremely HW – Highly DW – Distinctly MW – Moderately SW – Slightly F – Fresh		<b>Consistency / Density / Rock Strength</b> VS - Very Soft      VL - Very Loose S - Soft              L - Loose F - Firm              MD - Medium Dense St - Stiff             D - Dense VSt - Very Stiff     VD - Very Dense Hd - Hard            Fb - Friable ELw - Extremely Low   VLw - Very Low Lw - Low              M - Medium H - High              VH - Very High		<b>SAMPLES / TESTS</b> U() - undisturbed (size in mm) D - disturbed BS - bulk sample DCP - dynamic cone penetrometer SPT - standard penetrometer test N - Number of blows for SPT / 300mm VS - Vane Shear A - Acid Sulfate Sample PP - Pocket Penetrometer (kPa)	
<b>WATER</b> ▼ water level ► water seepage »- partial loss «- complete loss		<b>Logged By:</b> DW	<b>Date:</b> 10-02-12	<b>Checked By:</b> 	<b>Date:</b> 10-02-12		

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979


## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 9				
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031				
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1				
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation		
AD		0.0		(SM) Silty SAND: Trace of clay, fine to sand, moist, Dark grey				TOPSOIL		
		0.5		(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange				ALLUVIUM		
		1.0		(SP) SAND: Trace of silt, fine sand, wet, Grey						
		1.5								
		2.0								
<b>BH 9 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>										
<b>METHOD</b> AD auger drilling RR rock roller MS mud support NMLC rock coring WB wash bore  <b>WATER</b> ▼ water level ▲ water seepage »- partial loss «- complete loss		<b>WEATHERING</b> XW – Extremely HW – Highly DW – Distinctly MW – Moderately SW – Slightly F – Fresh		<b>Consistency / Density / Rock Strength</b> VS - Very Soft      VL - Very Loose S - Soft              L - Loose F - Firm              MD - Medium Dense St - Stiff             D - Dense VSt - Very Stiff     VD - Very Dense Hd - Hard            Fb - Friable ELw - Extremely Low    VLw - Very Low Lw - Low              M - Medium H - High              VH - Very High			<b>SAMPLES / TESTS</b> U() - undisturbed (size in mm) D - disturbed BS - bulk sample DCP - dynamic cone penetrometer SPT - standard penetrometer test N - Number of blows for SPT / 300mm VS - Vane Shear A - Acid Sulfate Sample PP - Pocket Penetrometer (kPa)			
		<b>Logged By:</b> DW		<b>Date:</b> 10-02-12		<b>Checked By:</b> 		<b>Date:</b> 10-02-12		

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979


## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 10									
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031									
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1									
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows /100mm	Structure and additional observation							
AD	▼	0.0		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL							
		0.5		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM							
		1.0		(SP) SAND: Trace of silt, Fine sand, very moist to wet, Pale grey.											
		1.5		(SP) SAND: Fine sand, wet, grey											
		2.0													
<b>BH 10 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>															
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>		<b>SAMPLES / TESTS</b>									
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)						
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed						
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample						
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer						
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test						
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm						
	<b>WATER</b>	ELw	Extremely Low	VLw	Very Low			VS	Vane Shear						
▼	water level	Lw	Low	M	Medium			A	Acid Sulfate Sample						
►	water seepage	H	High	VH	Very High			PP	Pocket Penetrometer (kPa)						
»-	partial loss														
«	complete loss														
<b>Logged By:</b>		DW		<b>Date:</b>		10-02-12		<b>Checked By:</b>				<b>Date:</b>		16-02-12	

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979


## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCES LTD						<b>BOREHOLE I.D. :</b> BH 11			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation	
AD		0.0		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL	
		0.5		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM	
	▼	1.0		(SP) SAND: Trace of silt, Fine sand, wet, grey					
		1.5							
		2.0							
<b>BH 11 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>		<b>SAMPLES / TESTS</b>			
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
				ELw	Extremely Low	VLw	Very Low	VS	Vane Shear
▼	water level			Lw	Low	M	Medium	A	Acid Sulfate Sample
▶	water seepage			H	High	VH	Very High	PP	Pocket Penetrometer (kPa)
»-	partial loss								
«	complete loss								
<b>Logged By:</b> DW		<b>Date:</b> 10-02-12		<b>Checked By:</b> 		<b>Date:</b> 16-02-12			

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 12			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows /100mm	Structure and additional observation	
AD		0.5		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL	
		1.0		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM	
		1.5		(SP) SAND: Fine sand, wet, grey					
		2.0							
<b>BH 12 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>		
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
				ELw	Extremely Low	VLw	Very Low	VS	Vane Shear
				Lw	Low	M	Medium	A	Acid Sulfate Sample
				H	High	VH	Very High	PP	Pocket Penetrometer (kPa)
<b>WATER</b> ▼ water level ► water seepage »- partial loss <- complete loss		<b>Logged By:</b>	DW	<b>Date:</b>	10-02-12	<b>Checked By:</b>		<b>Date:</b>	16-02-12

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 13			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation	
AD		0.5		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL	
		1.0		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM	
		1.5		(SP) SAND: Fine sand, wet, grey					
		2.0							
<b>BH 13 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>		
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
	<b>WATER</b>	ELw	Extremely Low	VLw	Very Low	VS	Vane Shear	A	Acid Sulfate Sample
▼	water level	Lw	Low	M	Medium	PP	Pocket Penetrometer (kPa)		
►	water seepage	H	High	VH	Very High				
»-	partial loss								
«	complete loss								
<b>Logged By:</b> DW		<b>Date:</b> 10-02-12		<b>Checked By:</b>		<b>Date:</b> 16-02-12			

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 14			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation	
AD		0.0		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL	
		0.5		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM	
		1.0							
		1.5		(SP) SAND: Fine sand, wet, grey					
		2.0							
<b>BH 14 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>		
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
				ELw	Extremely Low	VLw	Very Low	VS	Vane Shear
				Lw	Low	M	Medium	A	Acid Sulfate Sample
				H	High	VH	Very High	PP	Pocket Penetrometer (kPa)
<b>WATER</b>									
▼	water level								
►	water seepage								
»-	partial loss								
«-	complete loss								
<b>Logged By:</b> DW		<b>Date:</b> 10-02-12		<b>Checked By:</b>		<b>Date:</b> 16-02-12			

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 15							
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031							
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1							
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation					
AD		0.5		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL					
		1.0		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM					
		1.5		(SP) SAND: Trace of silt, Fine sand, very moist to wet, Pale grey-brown.									
		2.0											
<b>BH 15 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>													
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>						
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U() - undisturbed (size in mm)					
RR	rock roller	HW	Highly	S	Soft	L	Loose	D - disturbed					
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS - bulk sample					
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP - dynamic cone penetrometer					
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT - standard penetrometer test					
		F	Fresh	Hd	Hard	Fb	Friable	N - Number of blows for SPT / 300mm					
				ELw	Extremely Low	VLw	Very Low	VS - Vane Shear					
				Lw	Low	M	Medium	A - Acid Sulfate Sample					
				H	High	VH	Very High	PP - Pocket Penetrometer (kPa)					
<b>WATER</b> ▼ water level ► water seepage »- partial loss <- complete loss													
		<b>Logged By:</b>	DW	<b>Date:</b>	10-02-12	<b>Checked By:</b>		<b>Date:</b>	16-02-12				

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 16			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows /100mm	Structure and additional observation	
AD		0.0		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL	
		0.5		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM	
		1.0							
		1.5		(SP) SAND: Trace of silt, fine sand, wet, grey-brown					
		2.0		(SP) SAND: Fine sand, wet, grey					
<b>BH 16 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>		<b>SAMPLES / TESTS</b>			
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
	<b>WATER</b>	ELw	Extremely Low	VLw	Very Low	VS	Vane Shear	A	Acid Sulfate Sample
▼	water level	Lw	Low	M	Medium	PP	Pocket Penetrometer (kPa)		
►	water seepage	H	High	VH	Very High				
»-	partial loss								
«	complete loss								
<b>Logged By:</b>		DW		<b>Date:</b>		10-02-12		<b>Checked By:</b>	
								16-02-12	

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD							<b>BOREHOLE I.D. :</b> BH 17		
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT							<b>JOB NO. :</b> GI 0031		
<b>EQUIPMENT TYPE:</b> MAIDTECH 500				<b>HOLE DIAMETER:</b> 110mm		<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation	
AD		0.0		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL	
		0.5		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM	
		1.0		(SP) SAND: Trace of silt, fine sand, very moist to wet, Pale grey.					
		1.5		(SP) SAND: Fine sand, wet, grey					
		2.0							
<b>BH 17 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>		<b>SAMPLES / TESTS</b>			
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
	<b>WATER</b>	ELw	Extremely Low	VLw	Very Low			VS	Vane Shear
▼	water level	Lw	Low	M	Medium			A	Acid Sulfate Sample
►	water seepage	H	High	VH	Very High			PP	Pocket Penetrometer (kPa)
»-	partial loss								
«	complete loss								
<b>Logged By:</b>		DW		<b>Date:</b>		10-02-12		<b>Checked By:</b>	
								16-02-12	

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 18			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation	
AD		0.5		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL	
		1.0		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM	
		1.5		(SP) SAND: Fine sand, wet, grey					
		2.0							
<b>BH 18 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>		
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
	<b>WATER</b>	ELw	Extremely Low	VLw	Very Low	VS	Vane Shear	A	Acid Sulfate Sample
▼	water level	Lw	Low	M	Medium	PP	Pocket Penetrometer (kPa)		
►	water seepage	H	High	VH	Very High				
»-	partial loss								
«	complete loss								
<b>Logged By:</b> DW		<b>Date:</b> 10-02-12		<b>Checked By:</b>		<b>Date:</b> 16-02-12			

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 19			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows /100mm	Structure and additional observation	
AD		0.0		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL	
		0.5		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM	
		1.0		(SP) SAND: Fine sand, wet, grey-brown					
		1.5		(SP) SAND: Fine sand, wet, grey					
		2.0							
<b>BH 19 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>		<b>SAMPLES / TESTS</b>			
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
	<b>WATER</b>	ELw	Extremely Low	VLw	Very Low			VS	Vane Shear
▼	water level	Lw	Low	M	Medium			A	Acid Sulfate Sample
►	water seepage	H	High	VH	Very High			PP	Pocket Penetrometer (kPa)
»-	partial loss								
«	complete loss								
<b>Logged By:</b>		DW		<b>Date:</b>		10-02-12		<b>Checked By:</b>	
								16-02-12	

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 20			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows /100mm	Structure and additional observation	
AD		0.0		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL	
		0.5		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM	
		1.0		(SP) SAND: Trace of silt, Fine sand, wet, orange-brown					
		1.5		(SP) SAND: Fine sand, wet, grey					
		2.0							
<b>BH 20 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>		<b>SAMPLES / TESTS</b>			
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U()	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
	<b>WATER</b>	ELw	Extremely Low	VLw	Very Low			VS	Vane Shear
▼	water level	Lw	Low	M	Medium			A	Acid Sulfate Sample
►	water seepage	H	High	VH	Very High			PP	Pocket Penetrometer (kPa)
»-	partial loss								
«	complete loss								
<b>Logged By:</b>		DW		<b>Date:</b>		10-02-12		<b>Checked By:</b>	
								16-02-12	

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South Ph (07) 5523 3979

## ENGINEERING LOG – BOREHOLE PROFILE

<b>CLIENT:</b> AUSTRALIAN BAY LOBSTER PRODUCERS LTD						<b>BOREHOLE I.D. :</b> BH 21			
<b>PROJECT:</b> KINGSCLIFF SEWAGE TREATMENT PLANT						<b>JOB NO. :</b> GI 0031			
<b>EQUIPMENT TYPE:</b> MAIDTECH 500			<b>HOLE DIAMETER:</b> 110mm			<b>PAGE:</b> 1 of 1			
Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows /100mm	Structure and additional observation	
AD		0.5		(SC) Clayey SAND: Fine sand, moist, dark grey				TOPSOIL / ALLUVIAL	
		1.0		(SP) SAND: Trace of silt, fine sand, moist, pale grey Mottled orange				ALLUVIUM	
		2.0		(SP) SAND: Fine sand, wet, grey					
<b>BH 21 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION</b>									
<b>METHOD</b>		<b>WEATHERING</b>		<b>Consistency / Density / Rock Strength</b>			<b>SAMPLES / TESTS</b>		
AD	auger drilling	XW	Extremely	VS	Very Soft	VL	Very Loose	U( )	undisturbed (size in mm)
RR	rock roller	HW	Highly	S	Soft	L	Loose	D	disturbed
MS	mud support	DW	Distinctly	F	Firm	MD	Medium Dense	BS	bulk sample
NMLC	rock coring	MW	Moderately	St	Stiff	D	Dense	DCP	dynamic cone penetrometer
WB	wash bore	SW	Slightly	VSt	Very Stiff	VD	Very Dense	SPT	standard penetrometer test
		F	Fresh	Hd	Hard	Fb	Friable	N	Number of blows for SPT / 300mm
				ELw	Extremely Low	VLw	Very Low	VS	Vane Shear
				Lw	Low	M	Medium	A	Acid Sulfate Sample
				H	High	VH	Very High	PP	Pocket Penetrometer (kPa)
<b>WATER</b> ▼ water level ► water seepage »- partial loss <- complete loss		<b>Logged By:</b>	DW	<b>Date:</b>	10-02-12	<b>Checked By:</b>		<b>Date:</b>	16-02-12

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**APPENDIX D**

Screening and Laboratory Test Results

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# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South NSW 2486

Ph: 07 5523 3979 Fax: 07 5523 3981

**Project:** Kingscliff STP

**Date:** 13/2/12

**Job No:** GI 0031

**Page No:** 1 of 5

## SCREENING TEST RESULTS

Sample No.	Bag No.	Soil Description	Reaction to H <sub>2</sub> O <sub>2</sub>	pH <sub>F</sub>	pH <sub>FOX</sub>
S1	BH01 0 – 0.5	(SP) Silty SAND: Trace of clay, fine to sand, moist, Dark grey	NIL	4.9	3.2
S2	BH01 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey	NIL	4.6	3.1
S3	BH01 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	4.5	1.5
S4	BH01 1.5 – 2.0	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.0	1.3
S5	BH02 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.0	3.2
S6	BH02 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.3	3.1
S7	BH02 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.5	1.6
S8	BH02 1.5 – 2.0	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.6	1.5
S9	BH03 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.9	2.8
S10	BH03 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.6	2.9
S11	BH03 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.1	1.6
S12	BH03 1.5 – 2.0	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.6	1.5
S13	BH04 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.9	2.8
S14	BH04 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.1	2.9
S15	BH04 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.4	1.6
S16	BH04 1.5 – 2.0	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.5	1.8
S17	BH05 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.8	3.1
S18	BH05 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.0	3.4
S19	BH05 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.4	1.4
S20	BH05 1.5 – 2.0	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.6	1.7

Screening Test Methods as per Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1.  
(Walling, K.M., Ahern, C.R, and Hey, K.M. 2004.)

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South NSW 2486

Ph: 07 5523 3979 Fax: 07 5523 3981

**Project:** Kingscliff STP

**Date:** 13/2/12

**Job No:** GI 0031

**Page No:** 2 of 5

## SCREENING TEST RESULTS

Sample No.	Bag No.	Soil Description	Reaction to H <sub>2</sub> O <sub>2</sub>	pH <sub>F</sub>	pH <sub>FOX</sub>
S21	BH06 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	Low	5.0	2.9
S22	BH06 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	Mod	5.0	1.3
S23	BH06 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.1	1.2
S24	BH06 1.5 – 2.0	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.7	1.4
S25	BH07 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	Very High	5.4	1.8
S26	BH07 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	Very High	5.2	1.7
S27	BH07 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.5	1.6
S28	BH07 1.5 – 2.0	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	5.9	1.7
S29	BH08 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange, trace of organics	Mod	6.7	3.3
S30	BH08 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange, trace of organics	Mod	6.4	1.7
S31	BH08 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, wet, Grey	High	6.6	1.6
S32	BH08 1.5 – 2.0	(SP) SAND: Trace of silt, fine sand, wet, Grey	High	6.4	2.0
S33	BH09 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.1	3.2
S34	BH09 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	Low	5.7	3.3
S35	BH09 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	6.3	1.5
S36	BH09 1.5 – 2.0	(SP) SAND: Trace of silt, fine sand, wet, Grey	Very High	6.4	2.6
S37	BH10 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	6.77	3.1
S38	BH10 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	6.14	2.9
S39	BH10 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, very moist, Pale grey	Mod	6.06	2.4
S40	BH10 1.5 – 2.0	(SP) SAND: Fine sand, wet, grey	High	6.05	1.8

Screening Test Methods as per Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1.  
(Watling, K.M., Ahern, C.R, and Hey, K.M. 2004.)

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South NSW 2486

Ph: 07 5523 3979 Fax: 07 5523 3981

**Project:** Kingscliff STP

**Date:** 13/2/12

**Job No:** GI 0031

**Page No:** 3 of 5

## SCREENING TEST RESULTS

Sample No.	Bag No.	Soil Description	Reaction to H <sub>2</sub> O <sub>2</sub>	pH <sub>F</sub>	pH <sub>FOX</sub>
S41	BH11 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	6.18	2.9
S42	BH11 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	6.04	3.1
S43	BH11 1.0 – 1.5	(SP) SAND: Trace of silt, Fine sand, wet, grey	High	6.04	1.6
S44	BH11 1.5 – 2.0	(SP) SAND: Trace of silt, Fine sand, wet, grey	High	6.15	1.8
S45	BH12 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	6.0	2.7
S46	BH12 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.8	2.8
S47	BH12 1.0 – 1.5	(SP) SAND: Trace of silt, Fine sand, wet, grey	Very High	5.9	1.5
S48	BH12 1.5 – 2.0	(SP) SAND: Trace of silt, Fine sand, wet, grey	Very High	6.0	1.5
S49	BH13 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.8	3.4
S50	BH13 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.9	3.1
S51	BH13 1.0 – 1.5	(SP) SAND: Trace of silt, Fine sand, wet, grey	High	6.1	1.9
S52	BH13 1.5 – 2.0	(SP) SAND: Trace of silt, Fine sand, wet, grey	Very High	5.9	1.7
S53	BH14 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.5	3.4
S54	BH14 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.8	3.2
S55	BH14 1.0 – 1.5	(SP) SAND: Trace of silt, Fine sand, wet, grey	High	6.1	1.9
S56	BH14 1.5 – 2.0	(SP) SAND: Trace of silt, Fine sand, wet, grey	Very High	6.0	1.6
S57	BH15 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.0	3.3
S58	BH15 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.3	3.2
S59	BH15 1.0 – 1.5	(SP) SAND: Trace of silt, Fine sand, very moist to wet, Pale grey-brown.	High	5.9	1.9
S60	BH15 1.5 – 2.0	(SP) SAND: Trace of silt, Fine sand, very moist to wet, Pale grey-brown.	High	6.0	1.7

Screening Test Methods as per Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1.  
(Watling, K.M., Ahern, C.R, and Hey, K.M. 2004.)

# GEOTECH INVESTIGATIONS PTY LTD

Unit 11/21 Enterprise Avenue, Tweed Heads South NSW 2486

Ph: 07 5523 3979 Fax: 07 5523 3981

**Project:** Kingscliff STP

**Date:** 13/2/12

**Job No:** GI 0031

**Page No:** 4 of 5

## SCREENING TEST RESULTS

Sample No.	Bag No.	Soil Description	Reaction to H <sub>2</sub> O <sub>2</sub>	pH <sub>F</sub>	pH <sub>FOX</sub>
S61	BH16 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.4	2.7
S62	BH16 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.5	2.8
S63	BH16 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, wet, grey-brown	NIL	4.9	2.6
S64	BH16 1.5 – 2.0	(SP) SAND: Fine sand, wet, grey	Very High	4.9	1.4
S65	BH17 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.2	3.7
S66	BH17 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, very moist to wet, Pale grey.	NIL	5.5	2.4
S67	BH17 1.0 – 1.5	(SP) SAND: Fine sand, wet, grey	Very High	5.7	1.7
S68	BH17 1.5 – 2.0	(SP) SAND: Fine sand, wet, grey	Very High	6.1	1.8
S69	BH18 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.7	2.6
S70	BH18 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	5.6	3.1
S71	BH18 1.0 – 1.5	(SP) SAND: Fine sand, wet, grey	Mod	5.9	1.9
S72	BH18 1.5 – 2.0	(SP) SAND: Fine sand, wet, grey	High	5.9	1.8
S73	BH19 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.8	2.8
S74	BH19 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.7	3.9
S75	BH19 1.0 – 1.5	(SP) SAND: Fine sand, wet, grey-brown	NIL	5.2	3.2
S76	BH19 1.5 – 2.0	(SP) SAND: Fine sand, wet, grey	High	5.7	1.4
S77	BH20 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.6	2.8
S78	BH20 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.8	2.9
S79	BH20 1.0 – 1.5	(SP) SAND: Trace of silt, Fine sand, wet, orange-brown	NIL	5.3	2.7
S80	BH20 1.5 – 2.0	(SP) SAND: Fine sand, wet, grey	High	5.7	1.7

Screening Test Methods as per Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1.  
(Walling, K.M., Ahern, C.R, and Hey, K.M. 2004.)

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**Project:** Kingscliff STP

**Date:** 13/2/12

**Job No:** GI 0031

**Page No:** 5 of 5

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## SCREENING TEST RESULTS

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Sample No.	Bag No.	Soil Description	Reaction to H <sub>2</sub> O <sub>2</sub>	pH <sub>F</sub>	pH <sub>FOX</sub>
S81	BH21 0 – 0.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.5	2.6
S82	BH21 0.5 – 1.0	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.5	3.5
S83	BH21 1.0 – 1.5	(SP) SAND: Trace of silt, fine sand, moist, Pale grey mottled orange	NIL	4.7	3.6
S84	BH21 1.5 – 2.0	(SP) SAND: Fine sand, wet, grey	Very High	5.3	1.6

*Screening Test Methods as per Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1.  
(Watling, K.M., Ahern, C.R, and Hey, K.M. 2004.)*

**Client:** Geotech Investigations **Project:** Kingscliff Sewage Treatment Plant – GI0031

**Mazlab Job No:** GTI 2227 **Date:** 17/02/2012

**LABORATORY TEST RESULTS**  
**Certificate of Test Results – Chromium Reducible Sulphur**

<u>Sample No.</u>	<u>Client I.D</u>	<u>Soil Description</u> <i>(truncated)</i>	<u>pH</u> <u>KCL</u>	<u>SCr</u> <u>mol IH+/t</u> <u>%S</u>	<u>TAA</u> <u>mol IH+/t</u> <u>%S</u>	<u>SNAS</u> <u>mol IH+/t</u> <u>%S</u>	<u>ANC</u> <u>mol IH+/t</u> <u>NA=</u> <u>Scr&lt;</u> <u>action</u> <u>limit</u>	<u>Net Acidity</u> <u>mol IH+/t</u> <u>%S</u>	<u>Liming Rate</u> <u>(Kg/ dry t)</u>
28886	BH01 0.00-0.50m	Silty SAND(SM) dark grey	4.7	<2 <0.01%	12 0.02%	- -	- -	12	Nil
28887	BH01 1.00-1.50m	SAND(SP) pale grey mottled orange	4.5	116 0.19%	15 0.02%	- -	- -	131	10.2
28888	BH02 0.50-1.00m	SAND(SP) pale grey mottled orange	5.0	<2 <0.01%	7 0.01%	- -	- -	7	Nil
28889	BH02 1.50-2.00m	SAND(SP) grey	4.8	190 0.30%	15 0.02%	- -	- -	205	15.9
28890	BH03 0.50-1.00m	SAND(SP) pale grey mottled orange	4.9	<2 <0.01%	10 0.02%	- -	- -	10	Nil
28891	BH03 1.50-2.00m	SAND(SP) grey	4.8	141 0.23%	12 0.02%	- -	- -	153	11.9
28892	BH04 0.00-0.50m	Silty SAND(SM) dark grey	4.8	<2 <0.01%	7 0.01%	- -	- -	7	Nil
28893	BH04 1.00-1.50m	SAND(SP) grey	4.7	160 0.26%	15 0.02%	- -	- -	175	13.6
28894	BH05 0.50-1.00m	SAND(SP) pale grey mottled orange	4.8	<2 <0.01%	12 0.02%	- -	- -	12	Nil
28895	BH05 1.50-2.00m	SAND(SP) grey	4.9	101 0.16%	12 0.02%	- -	- -	113	8.8
28896	BH06 0.00-0.50m	SAND(SP) pale grey mottled orange	4.9	<2 <0.01%	7 0.01%	- -	- -	7	Nil
28897	BH06 1.00-1.50m	SAND(SP) grey	5.0	119 0.19%	7 0.01%	- -	- -	126	9.8
28898	BH07 0.50-1.00m	SAND(SP) pale grey mottled orange	4.9	281 0.45%	12 0.02%	- -	- -	293	22.7
28899	BH07 1.50-2.00m	SAND(SP) grey	5.6	160 0.26%	5 0.01%	- -	- -	165	12.8
28900	BH08 0.50-1.00m	SAND(SP) pale grey mottled orange	6.0	68 0.11%	2 <0.01%	- -	- -	70	5.4
28901	BH08 1.50-2.00m	SAND(SP) grey	5.9	138 0.22%	2 <0.01%	- -	- -	140	10.9

Checked By:

Date:

Laboratory Test Methods follow procedures described in : QASSIT – Acid Sulphate Soils Laboratory Methods Guidelines – Version 2.1 June 2004

**Client:** Geotech Investigations **Project:** Kingscliff Sewage Treatment Plant – GI0031

**Mazlab Job No:** GTI 2227 **Date:** 17/02/2012

**LABORATORY TEST RESULTS**  
**Certificate of Test Results – Chromium Reducible Sulphur**

<u>Sample No.</u>	<u>Client I.D</u>	<u>Soil Description</u> <small>(truncated)</small>	<u>pH</u> <small>KCL</small>	<u>SCr</u> <small>mol IH+/t</small> <small>%S</small>	<u>TAA</u> <small>mol IH+/t</small> <small>%S</small>	<u>SNAS</u> <small>mol IH+/t</small> <small>%S</small>	<u>ANC</u> <small>mol IH+/t</small> <u>NA=</u> <u>Scr&lt;</u> <u>action</u> <u>limit</u>	<u>Net Acidity</u> <small>mol IH+/t</small> <small>%S</small>	<u>Liming Rate</u> <small>(Kg/ dry t)</small>
28902	BH09 0.00-0.50m	Silty SAND(SM) dark grey	5.4	2 <0.01%	7 0.01%	- -	- -	9	Nil
28903	BH09 1.00-1.50m	SAND(SP) grey	6.3	245 0.39%	2 <0.01%	- -	- -	247	19.2
28904	BH10 0.50-1.00m	SAND(SP) pale grey mottled orange	6.2	2 <0.01%	2 <0.01%	- -	- -	4	Nil
28905	BH10 1.50-2.00m	SAND(SP) grey	5.2	81 0.13%	5 0.01%	- -	- -	86	6.7
28906	BH11 0.00-0.50m	Clayey SAND(SC) dark grey	5.5	<2 <0.01%	5 0.01%	- -	- -	5	Nil
28907	BH11 1.00-1.50m	SAND(SP) grey	4.8	152 0.24%	12 0.02%	- -	- -	164	12.7
28908	BH12 0.50-1.00m	SAND(SP) pale grey mottled orange	5.7	<2 <0.01%	2 <0.01%	- -	- -	2	Nil
28909	BH12 1.50-2.00m	SAND(SP) grey	4.9	71 0.11%	10 0.02%	- -	- -	81	6.3
28910	BH13 0.00-0.50m	SAND(SP) pale grey mottled orange	5.2	<2 <0.01%	7 0.01%	- -	- -	7	Nil
28911	BH13 1.00-1.50m	SAND(SP) pale grey mottled orange	4.7	162 0.26%	15 0.02%	- -	- -	177	13.7
28912	BH14 0.50-1.00m	SAND(SP) pale grey mottled orange	5.0	<2 <0.01%	8 0.01%	- -	- -	8	Nil
28913	BH14 1.50-2.00m	SAND(SP) grey	4.9	116 0.18%	10 0.02%	- -	- -	126	9.8
28914	BH15 0.50-1.00m	SAND(SP) pale grey mottled orange	5.4	<2 <0.01%	5 0.01%	- -	- -	5	Nil
28915	BH15 1.50-2.00m	SAND(SP) light grey-brown	5.0	100 0.16%	7 0.01%	- -	- -	107	8.3
28916	BH16 0.00-0.50m	Clayey SAND(SC) dark grey	4.4	<2 <0.01%	32 0.05%	<0.02%	-	32	2.5
28917	BH16 1.00-1.50m	SAND(SP) grey-brown	4.6	<2 <0.01%	17 0.03%	- -	- -	17	Nil

Checked By:

Date:

Laboratory Test Methods follow procedures described in : QASSIT – Acid Sulphate Soils Laboratory Methods Guidelines – Version 2.1 June 2004

**Client:** Geotech Investigations    **Project:** Kingscliff Sewage Treatment Plant – GI0031  
**Mazlab Job No:** GTI 2227    **Date:** 17/02/2012

**LABORATORY TEST RESULTS**  
**Certificate of Test Results – Chromium Reducible Sulphur**

<u>Sample No.</u>	<u>Client I.D</u>	<u>Soil Description</u> <i>(truncated)</i>	<u>pH</u> <u>KCL</u>	<u>SCr</u> <u>mol IH+/t</u> <u>%S</u>	<u>TAA</u> <u>mol IH+/t</u> <u>%S</u>	<u>SNAS</u> <u>mol IH+/t</u> <u>%S</u>	<u>ANC</u> <u>mol IH+/t</u> <u>NA=</u> <u>Scr&lt;</u> <u>action</u> <u>limit</u>	<u>Net Acidity</u> <u>mol IH+/t</u> <u>%S</u>	<u>Liming Rate</u> <u>(Kg/ dry t)</u>
28918	BH17 0.50-1.00m	SAND(SP) pale grey mottled orange	5.2	<2 <0.01%	2 <0.01%	- -	- -	2	Nil
28919	BH17 1.50-2.00m	SAND(SP) grey	4.9	159 0.25%	7 0.01%	- -	- -	166	12.9
28920	BH18 0.00-0.50m	SAND(SP) pale grey mottled orange	4.6	<2 <0.01%	17 0.03%	- -	- -	17	Nil
28921	BH18 1.00-1.50m	SAND(SP) grey	4.8	101 0.16%	13 0.02%	- -	- -	114	8.8
28922	BH19 0.00-0.50m	Clayey SAND(SC) dark grey	4.4	<2 <0.01%	27 0.04%	- <0.02%	- -	27	2.1
28923	BH19 1.50-2.00m	SAND(SP) grey	5.1	86 0.14%	5 0.01%	- -	- -	91	7.1
28924	BH20 0.50-1.00m	SAND(SP) pale grey mottled orange	4.9	<2 <0.01%	10 0.02%	- -	- -	10	Nil
28925	BH20 1.50-2.00m	SAND(SP) grey	5.0	152 0.24%	10 0.02%	- -	- -	162	12.6
28926	BH21 0.00-0.50m	Clayey SAND(SC) dark grey	4.6	<2 <0.01%	15 0.02%	- -	- -	15	Nil
28927	BH21 1.50-2.00m	SAND(SP) grey	4.8	92 0.15%	10 0.02%	- -	- -	102	7.9

Checked By:

Date:

Laboratory Test Methods follow procedures described in : QASSIT – Acid Sulphate Soils Laboratory Methods Guidelines – Version 2.1 June 2004

**END OF REPORT**

# B3 – NOISE MANAGEMENT PLAN

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

<b>Current Version</b>	B
<b>Current Version Date</b>	21 January 2022
<b>Status</b>	Final

#### Amendments

<b>Version Number</b>	<b>Version Date</b>	<b>Authorised by</b>	<b>Amendment Details</b>
A	10 December 2021	ABLP	Original Publication
B	21 January 2022	ABLP	DPE Comments

## **B3 – NOISE MANAGEMENT PLAN**

### **1 Purpose and Scope**

The purpose of this document is to detail the noise management strategy to be followed during construction of stage two of the Australian Bay Lobster Producers Limited Seawater Supply Pipeline.

Attachment B3-1 integrates the objectives and management measures to be used during construction. It sets out clearly how the objectives can be accomplished by nominating responsible persons and establishing performance indicators, required management actions, monitoring, corrective actions and reporting procedures.

### **2 Responsibility**

It is the responsibility of the Environmental Manager / Representative to ensure that this management plan is periodically reviewed and updated. Day to day implementation is the responsibility of the relevant contractor undertaking noise generating activities associated with the development. This includes ensuring all reasonable steps shall be taken to muffle and, where practicable, acoustically baffle the plant and equipment utilised in the construction of the pipeline.

# **Attachment B3-1**

## **Noise Management Plan**

Stage 2 Seawater Supply Pipeline  
Kingscliff NSW

## **CONSTRUCTION NOISE MANAGEMENT PLAN**

**21 January 2021**

crgref: 21198 Construction Noise Management Plan Rev.B

## 1. INTRODUCTION

CRG Acoustics Pty Ltd have been engaged by Australian Bay Lobster Producers Limited to produce a noise management plan for the construction phase of Stage 2 works for the seawater supply pipeline in Kingscliff.

Australian Bay Lobster Producers (ABLP) is a local aquaculture company operating a facility at 9484 Tweed Valley Way, Chinderah. The company specialises in the cultivation of Bay Lobster, more commonly known as Moreton Bay Bug, an ocean dwelling crustacean typically found along the north east coast of Australia.

The development has both approval from Tweed Shire Council, and deemed an State Significant Project by State Government.

## 2. THE PROPOSAL

The aquaculture processes associated with cultivating the animal are centred around seawater as the critical input. For ABLP to source the seawater required for its operations the company is constructing a seawater supply pipeline (SSP) which will extend from the facility at Chinderah to a point offshore of Kingscliff Beach.

The SSP will consist of a single HDPE rising main, a pump well and two intake lines. The rising main will be located underground between ABLP's facility and Jack Bayliss Park along the alignment depicted in Figure 1. It will connect to a subterranean pump well located in Jack Bayliss Park opposite 152 Marine Parade, which will receive seawater from two intake lines extending 1.2km eastward of Kingscliff Beach. The well will house two submerged pumps which will be used to convey water back to the ABLP site via the rising main.

The rising main and intake lines will be constructed by horizontal directional drilling (HDD). This process involves a small construction footprint and reduces the need for extensive open excavation as the pipe can be installed from a fixed position without trenching. Further, the pump well is to be constructed as a caisson so as to minimise the construction area in Jack Bayliss Park.

The SSP is being constructed over two stages:

- Stage 1: ABLP Site to Tweed Coast Road crossing (Lot 3 DP 1111554); and
- Stage 2: Elrond Drive stormwater drain to Kingscliff Beach.

Construction on the first stage is currently underway having commenced in October 2021. Stage 2 is set to commence from February - March 2022 with an estimated completion dated in October – November 2022.

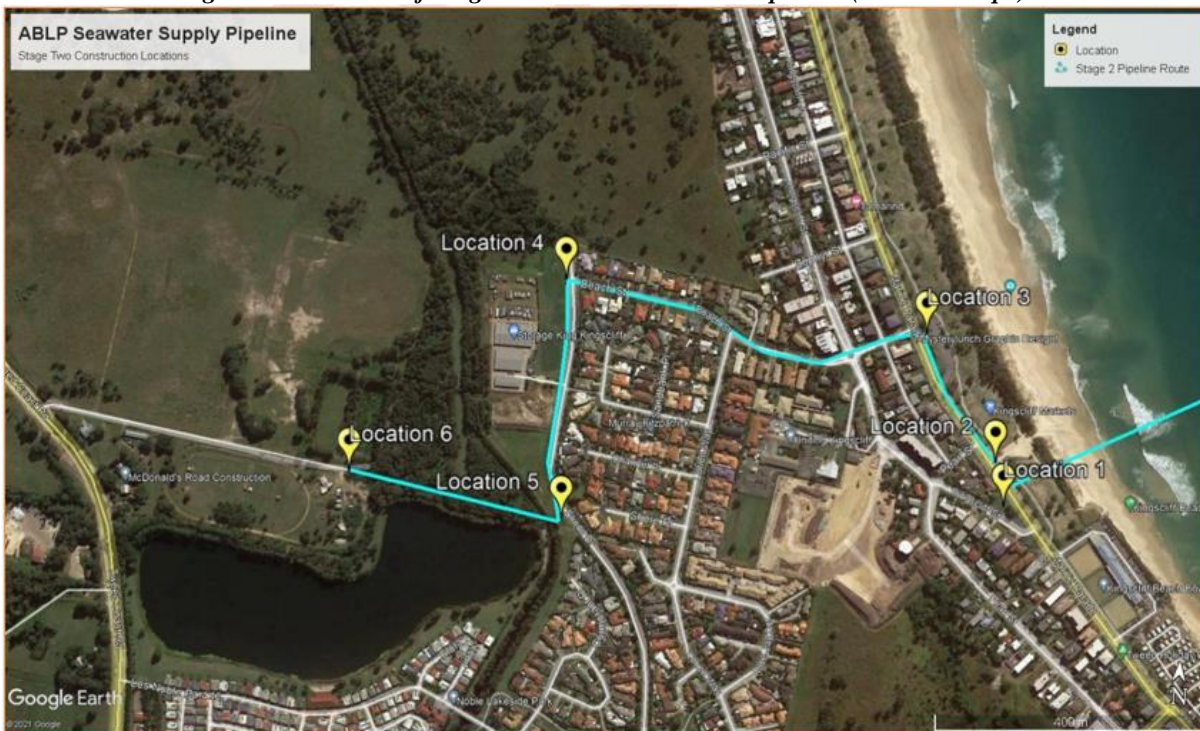
This construction noise management plan covers Stage 2 works.

The full Stage 1 and Stage 2 alignment for the SSP is depicted in Figure 1; with the Stage 2 construction work areas / spreads shown in Figure 2.

Figure 1 – Location of Stage 1 and Stage 2 Pipeline (NSW Sixmaps).



Figure 2 – Location of Stage 2 Construction Areas / Spreads (NSW Sixmaps).



The construction works for Stage 2 will take place at six construction locations between Tweed Coast Road and Kingscliff Beach. The site construction plans are provided in Appendix A.

At each of the locations there will be a construction site consisting of the drilling equipment and rigs associated with the HDD process. This equipment will remain at each location for the time required to construct the respective HDD section of the pipeline. On completion of the HDD construction the drilling spreads will be replaced by a small trenching spread to perform the tie-in/connection works to join the respective HDD sections together. At location two there will also be additional plant and equipment, such as concrete pumps and excavators, which will be used in the construction of the pump well.

There will also be a small marine spread in Wommin Bay approximately 1.2km eastward of Kingscliff Beach. This marine spread will assist in the installation of the intake lines that will connect to the pump well. The scope of the marine works is minimal and will transpire over a 10-day period in May or June. Given that no noise sensitive receivers would be impacted at the location it has not been assessed.

Currently Stage 2 works are scheduled to occur in succession, commencing at Locations 1 and 2 before progressing back to location 6. The estimated timeline for the works is 9 months, commencing in late February and concluding in October/November 2022. The project timeline with an approximate timeframe for the occupation of each construction location is detailed below:

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct/Nov
<b>Horizontal Directional Drilling (HDD)</b>	L1 – L2			L2 – L4		L3 – L5	L5 – L6		
<b>Non-HDD Construction</b>				L2: Construction pump well			L2 – L4	L5 – L6	
<b>Marine Installation</b>				Beach & Offshore	Beach & Offshore				
<b>Electrical Network Upgrade</b>			Road reserve from Kingscliff St to Marine Parade						
<b>Testing</b>									L1 – L6

There is potential to bring forward the completion date by running multiple teams concurrently, however this will be dependent on labour availability and weather conditions. The expected duration in days for each location is provided in greater detail over the following two pages.

All construction works will be performed between the following hours:

- Monday to Saturday from 7.00am to 6.00pm; and
- As required on Sundays or Public Holidays to manage construction risk.

The Client has advised that there is the need to perform works seven days per week from 7am to 6pm due to the construction risk associated with the HDD activities. Due to the ground conditions in the area, it is not possible to stop drilling activities once they underway otherwise the drilled hole will collapse. In the event that a collapse occurs, the hole needs to be re-drilled, adding significant time to the overall timeline. This will result in longer periods of noise emission and greater disruption to the community.

Location	Construction Activity	Construction Days
1 & 2	<b>HDD01 &amp; 02 - Intakes</b>	
	HDD Mobilisation	5
	<i>Steel Casing – Hammered</i>	
	Intake 1	8
	Intake 2	8
	Umbilical	1
	<b>Intake 1</b>	
	Pilot Hole	18
	Strip	1.5
	Forward Ream	17
	Reset	1
	<b>Intake 2</b>	
	Pilot Hole	18
	Strip	1.5
	Forward Ream	17
	Marine Spread Mobilisation	3
	Diver Establishment	2
	Pipe Installation - Intake 1	1
	Pipe Installation - Intake 2	1
	Pullback Tails - Intake 1 & 2	1
	HDD Demobilisation	5
	Hydrostatic Testing	6
	<b>Remediation</b>	
	Umbilical Lines	1
	Intake 1 Casing	1.5
	Intake 2 Casing	1.5
HDD Spread Site	4	
<b>Total Days</b>	<b>123</b>	
2	<b>HDD03 - Marine Parade</b>	
	Mobilisation	2
	Pilot Hole	2
	Ream (2 pass)	6
	Clean	1
	Pipe Installation	1
	Demobilisation	1
	Hydrostatic Testing	1
	Remediation	2
<b>Total Days</b>	<b>16</b>	
2	<b>Pump Well</b>	
	Mobilisation	5
	Thrust Block	
	Excavation	2
	Cut Pipe	2
	Pour Block	6
	Backfill	2
	<b>Caisson</b>	
	Construct well	42
	Connect pipes to well	12
	Construct roof of well	7
	Fit out	10
	<b>Pump Station</b>	
	Building	10
	Cable Pull	3
	Switchboard	7
	<b>Well Pits</b>	
	Valve Pit	15
	Pig Pit	15
	Meter Pit	15
	<b>Survey</b>	
	Set out, service	3
	<b>Remediation</b>	
	Pump well and pits	10
	<b>Commissioning</b>	
	Pump Well	2
<b>Total Days</b>	<b>168</b>	

Location	Construction Activity	Construction Days
3 & 4	<b>HDD04 - Beach Street</b>	
	Mobilisation	5
	Steel Casing	2
	Pilot Hole	5
	Ream (2 pass)	10
	Clean	1
	Pipe Installation	1
	Demobilisation	3
	Tie-in with HDD03	5
	Hydrostatic Testing	1.5
	Remediation	3
	<b>Total Days</b>	<b>36.5</b>
4 & 5	<b>HDD06 - Elrond Drive</b>	
	Mobilisation	3
	Pilot Hole	4
	Ream (2 pass)	8
	Clean	1
	Pipe Installation	1
	Demobilisation	2
	Air Valve Install	4
	Tie-in with HDD04	4
	Hydrostatic Testing	1
	Remediation	2
	<b>Total Days</b>	<b>30</b>
5 & 6	<b>HDD05 - Elrond Stormwater</b>	
	Mobilisation	3
	Steel Casing	2
	Pilot Hole	5
	Ream (2 pass)	10
	Clean	1
	Pipe Installation	1
	Demobilisation	2
	Air Valve Install	4
	Tie-in with HDD06	4
	Hydrostatic Testing	1
	Remediation	2
<b>Total Days</b>	<b>35</b>	

### 3.0 NOISE SURVEY

#### 3.1 Instrumentation

The following equipment was used to record existing background noise levels, and operational noise from the subject site.

- Rion NC 73 Calibrator.
- Rion NL 21 Sound Level Logger.
- BSWA 308 Sound Level Logger.

All instrumentation used in this assessment hold current calibration certificate from a certified NATA calibration laboratory.

#### 3.2 Background Noise Monitoring Methodology and Results

A BSWA 309 logger was located along Elrond Drive to the north of Location 5. The location was chosen to reflect the lower background noise levels experienced by dwellings near the work areas, but set back from Marine Parade and the beach. The microphone was in a free-field location, approximately 1.4m above ground level. For logger location refer to Figure 3.

The logger was set to record noise statistics in 15 minute blocks continually between Thursday 25/11/2021 and Thursday 2/12/2021, with the measurements conducted generally in accordance with Australian Standard AS 1055: 2018 “Acoustics-Description and measurement of environmental noise”. The operation of the sound level logging equipment was field calibrated before and after the measurement session with no significant drift from the reference signal recorded.

Daily weather observations were obtained from the Bureau of Meteorology Coolangatta weather station which is approximately 9km northwest of the site (refer to the attached results in Appendix B). Weather conditions during the noise monitoring period were rainy except for Sunday to Monday 28-29/11, with a temperature range between 19 and 29°C and a relative humidity range between 60 and 98%. Table 1 presents the measured ambient noise levels at the unattended logger location. It is noted that the Rating Background Level (RBL) calculations are based upon Sunday and Monday data. Graphical presentation of the measured noise levels is presented in the Appendix B.

Background Noise	Measured L <sub>90</sub> dB(A)		
	Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
Thursday 25/11/21	-	38	-
Friday 26/11/21	43	42	36
Saturday 27/11/21	40	40	41
Sunday 28/11/21	<b>40</b>	37	36
Monday 29/11/21	39	37	35
Tuesday 30/11/21	47	46	38
Wednesday 1/12/21	38	44	43
Thursday 2/12/21	42	42	40
<b>Minimum L<sub>90</sub></b>	<b>39</b>	<b>37</b>	<b>35</b>

**Table 1:** Measured ambient noise levels at the logger location.

It is noted that data collected on Monday and Sunday would be two of the quietest days of the week, and are deemed acceptable for use.

Data was also collected at No 152 Marine Parade in Kingscliff from the 25<sup>th</sup> March 2021 to the 28<sup>th</sup> March 2021 (at the southeast corner of the front yard, directly adjacent to construction Location 1. Measured background L<sub>90 15min</sub> levels during the measurement surveyed ranged from 45 dB(A) to 57 dB(A), however, this site is exposed to surf and wind noise.

Due to the poor weather during the recent logger period, and to account for seasonal fluctuations in the background noise levels, we provide previous noise logging data from the local area that was undertaken for other developments. The three separate measurement periods provide guidance on the background levels for the Kingscliff Area.

### 3.3 Background Noise Monitoring Methodology and Results – Winter Months

#### 3.3.1 Chinderah Bay Drive in Chinderah

A logger was located to the west of the subject site. The microphone was in a free-field location, approximately 1.4m above ground level. For logger location refer to Figure 3.

The logger was set to record noise statistics in 15 minute blocks continually between Friday 27/09/2019 and Friday 4/10/2019.

All measurements were conducted generally in accordance with Australian Standard AS 1055: 2018 “Acoustics-Description and measurement of environmental noise”. The operation of the sound level logging equipment was field calibrated before and after the measurement session with no significant drift from the reference signal recorded.

Daily weather observations were obtained from the Bureau of Meteorology Coolangatta weather station which is approximately 9km northwest of the site (refer to the attached results in Appendix B). We also note that the subject site is approximately 2km from the coastline with the weather station and approximately 1.3km from the coastline. Weather conditions during the noise monitoring period were generally fine (except for 4mm of rain on Tuesday 1/10), with a temperature range between 9 and 26°C and a relative humidity range between 45 and 61%.

Table 2 presents the measured ambient noise levels at the unattended logger location. It is noted that data collected on Tuesday 1/10 have been excluded from the final Rating Background Level (RBL) calculations due to the occurrence of rain. Rating Background Levels (RBLs) were calculated using the method provided in Appendix B of the “NSW Industrial Noise Policy”. Graphical presentation of the measured noise levels is presented in the Appendix B.

Background Noise	Measured L <sub>90</sub> dB(A)		
	Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
Friday 27/09/19	-	49	-
Saturday 28/09/19	48	43	42
Sunday 29/09/19	<b>41</b>	39	35
Monday 30/09/19	43	47	36
Tuesday 1/10/19	50	46	41
Wednesday 2/10/19	44	46	38
Thursday 3/10/19	48	42	39
Friday 4/10/19	50	37	37
<b>RBL L<sub>90</sub></b>	<b>46</b>	<b>43</b>	<b>38</b>

**Table 2:** Measured ambient noise levels at the logger location.

**3.3.2 River Street in Chinderah**

A logger was located at the west of the subject site along River Street. The microphone was in a free-field location approximately 1.4m above ground. For logger location refer to Figure 3.

The logger was set to record noise statistics in 15 minute blocks continually between Wednesday 6/07/2016 and Wednesday 13/07/2016.

All measurements were conducted generally in accordance with Australian Standard AS 1055:1997 “Acoustics-Description and measurement of environmental noise”. The operation of the sound level logging equipment was field calibrated before and after the measurement session with no significant drift from the reference signal recorded.

Daily weather observations were obtained from the Bureau of Meteorology Coolangatta weather station which is approximately 9km northwest of the site (refer to the attached results in Appendix B). We also note that the subject site is approximately 2km from the coastline with the weather station and approximately 1.3km from the coastline. Weather conditions during the noise monitoring period fine with a temperature range between approximately 6 and 23°C and relative humidity between approximately 40% and 80%.

Table 3 presents the measured ambient noise levels at the unattended logger location. Rating Background Levels (RBLs) were calculated using the method provided in Appendix B of the “NSW Industrial Noise Policy”. Graphical presentation of the measured noise levels is presented in the Appendix B.

Background Noise	Measured L <sub>90</sub> dB(A)		
	Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
Wednesday 6/07/16	-	40	-
Thursday 7/07/16	47	44	35
Friday 8/07/16	41	44	36
Saturday 9/07/16	47	43	35
Sunday 10/07/16	<b>46</b>	43	38
Monday 11/07/16	43	38	38
Tuesday 12/07/16	44	38	36
Wednesday 13/07/16	-	-	-
<b>RBL L<sub>90</sub></b>	<b>45</b>	<b>43</b>	<b>36</b>

**Table 3:** Measured ambient noise levels at the logger location.

**3.3.3 Naru Street in Chinderah**

A logger was located to the south of the subject site, fronting Naru Street. The microphone was in a free-field location, approximately 1.2m above ground. Refer to Figure 3 for the logger location.

The logger was set to record noise statistics in 15 minute blocks continually between Monday 18/07/2016 and Monday 25/07/2016.

All measurements were conducted generally in accordance with Australian Standard AS 1055:1997 “Acoustics-Description and measurement of environmental noise”. The operation of the sound level logging equipment was field calibrated before and after the measurement session with no significant drift from the reference signal recorded.

Daily weather observations were obtained from the Bureau of Meteorology Coolangatta weather station which is approximately 9km northwest of the site (refer to the attached results in Appendix B). We also note that the subject site is approximately 2km from the coastline with the weather station and approximately 1.3km from the coastline. Weather conditions during the assessed monitoring period were generally fine, with a temperature range between approximately 11 and 30°C and relative humidity between 35 and 85%.

Table 4 presents the measured ambient noise levels at the unattended logger location. Rating Background Levels (RBLs) were calculated using the method provided in Appendix B of the “NSW Industrial Noise Policy”. Graphical presentation of the measured noise levels is presented in the Appendix B.

Background Noise	Measured L <sub>90</sub> dB(A)		
	Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
Monday 18/06/16	-	46	-
Tuesday 19/06/16	44	43	37
Wednesday 20/06/16	43	44	37
Thursday 21/06/16	49	45	39
Friday 22/06/16	43	43	37
Saturday 23/06/16	45	46	40
Sunday 24/06/16	<b>43</b>	44	36
Monday 25/06/16	-	-	-
<b>RBL L<sub>90</sub></b>	<b>44</b>	<b>44</b>	<b>37</b>

**Table 4:** Measured ambient noise levels at the logger location.

Figure 3 – Location of Noise Loggers (NSW Sixmaps).



## 4. NOISE LEVEL GUIDELINES

### 4.1 Construction Noise

The NSW Interim Construction Noise Guideline has been applied in producing this plan. The guideline states the following in respect to management of noise impacts:

*“Where noise from construction is above the ‘noise affected’ levels presented below, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform potentially affected parties of the activities to be carried out, the expected noise impacts and duration.”*

Under the guideline, the management levels applied to construction noise is as follows:

Time of day	Management level L <sub>Aeq</sub> (15 min) *	How to apply
<b>Recommended standard hours:</b> Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. <ul style="list-style-type: none"> <li>Where the predicted or measured L<sub>Aeq</sub> (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</li> </ul>
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. <ul style="list-style-type: none"> <li>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:                             <ol style="list-style-type: none"> <li>times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences)</li> <li>if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ol> </li> </ul>
<b>Outside recommended standard hours</b>	Noise affected RBL + 5 dB	<ul style="list-style-type: none"> <li>A strong justification would typically be required for works outside the recommended standard hours.</li> <li>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.</li> <li>For guidance on negotiating agreements see section 7.2.2.</li> </ul>

It is also noted that Australian Standard AS 2436:2010 “*Guide to noise control on construction, maintenance and demolition sites*” provides extra guidance for management of onsite noise.

A Rating Background Level (RBL) of 39 dB(A) was recorded for the daytime period (7am to 6pm) at the logger location along Elrond Drive (near construction Location 5), which from the three additional logger data sourced from the local area, is deemed a reasonable determination of background levels. For receivers fronting the beach (i.e. along Marine Parade and Kingscliff Street), the 45 dB(A) L<sub>90</sub> level sourced from the March 2021 measurements collected at 152 Marine Parade have been adopted.

These levels also concur well with the estimated average background levels from Appendix A of Australian Standard AS 1055:1997 “Acoustics-Description and measurement of environmental noise” of 40 dB(A) daytime for “Areas with negligible transportation” (i.e. for noise sensitive receives around construction Locations 4 to 6 which are generally within local suburbs of minimal traffic) and 45 dB(A) daytime for “Areas with low density transportation” (i.e. for noise sensitive receives around construction Locations 1 to 3 which are generally front or a in close proximity to Marine Parade and Kingscliff Street) and are deemed acceptable for the assessment.

Table 5 below presents the resulting Management Levels based upon the measured and adopted background noise levels and the “Interim Construction Noise Guideline”:

**Construction Locations 1 to 3:**

Time of Day	Management Level L <sub>eq</sub> dB(A)
Standard Working Hours	“Noise Affected” 55 (Background RBL 45 + 10 dB(A))
Standard Working Hours	“Highly Noise Affected” 75
Outside Standard Working Hours	“Noise Affected” 50 (AS1055:1997 L <sub>90</sub> 45 + 5 dB(A))

**Construction Locations 4 to 6:**

Time of Day	Management Level L <sub>eq</sub> dB(A)
Standard Working Hours	“Noise Affected” 49 (Background RBL 39 + 10 dB(A))
Standard Working Hours	“Highly Noise Affected” 75
Outside Standard Working Hours	“Noise Affected” 44 (AS1055:1997 L <sub>90</sub> 39 + 5 dB(A))

**Table 5:** Construction activity noise management levels based upon the “Interim Construction Noise Guideline”.

## 4.2 Construction Vibration

The following minimum setback distance for vibration control are cited in Table 20 of the NSW Government Standard ST-157/4.1 “Construction Noise and Vibration Strategy, as follows:

### Minimum working distances for vibration intensive activities

As a guide, minimum working distances for typical items of vibration intensive plant are listed in Table 20. The minimum working distances are quoted for both “cosmetic” damage (refer BS 7385) and human comfort (refer OEH’s *Assessing Vibration – a technical guideline*). The minimum working distances for cosmetic damage must be complied with at all times, unless otherwise approved by the relevant authority.

**Table 20: Recommended minimum working distances from vibration intensive plant**

Plant Item	Approx. Size/ Weight/ Model	Minimum Distance - Cosmetic Damage (BS 7385)	Minimum Distance - Human Response (OE&H Vibration Guideline)
Vibratory Roller	1-2 tonne	5 m	15 m to 20 m
	2-4 tonne	6 m	20 m
	4-6 tonne	12 m	40 m
	7-13 tonne	15 m	100 m
	13-18 tonne	20 m	100 m
	> 18 tonne	25 m	100 m
Small Hydraulic Hammer	300 kg (5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	1600 kg (18 to 34t excavator)	22 m	73 m
Pile Driver - Vibratory	Sheet piles	2 m to 20 m	20 m
Piling Rig - Bored	≤ 800 mm	2 m (nominal)	N/A
Piling Rig - Hammer	12 t down force	15 m	50 m
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

Note: More stringent conditions may apply to heritage or other sensitive structures

The minimum working distances presented in Table 20 are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions. Vibration monitoring is recommended to confirm the minimum working distances at specific sites.

It is noted that we have been advised by the Client (refer over the page) that the proposed pipe ram is most similar to the medium hydraulic hammer (refer to the table above), which requires a minimum 23m of buffer separation distance to avoid the need for vibration monitoring / surveys.

Based on the plans provided by the Client, the nearest proposed pits are further than 23m from the nearest buildings; therefore, vibration monitoring / surveys need only to be undertaken should a complaint be made.

Prior to works being undertaken, these distances are to be confirmed before works are undertaken.

Letter from Australian Bay Lobster Producers Ltd in relation to the proposed pipe ram:



20 January 2022

Jay Carter  
Director  
CRG Acoustics

Dear Mr Carter

I refer to Table 20, titled "*Minimum working distances for vibration intensive activities*" in Appendix D of the Transport for New South Wales Construction Noise Vibration Strategy.

As you have noted, the plant that will be utilized in the installation of the steel enveloper casings at Construction Locations 1, 3 and 5 of our Seawater Supply Pipeline: Stage 2 is not accounted for as a "Plant Item" in Table 20 of the above vibration strategy.

I confirm the envelopers will be installed using a Gundoram Pneumatic Pipe Ramming tool mounted to a horizontal direction drilling rig, specifically a Vermeer D330X500 or Gallagher HDD660. I also confirm the maximum outside diameter of the enveloper casing at each of the Construction Locations will not exceed 1,000mm.

In consultation with our engineering team concerning the above-mentioned setup of the pipe ramming tool and the installation process for the enveloper casings, it has been determined that this activity is best aligns with the "Medium Hydraulic Hammer" Plant Item listed in Table 20. Accordingly, please proceed with the vibration assessment component of your Noise Management Plan on this basis.

Please do not hesitate to contact me should you have any queries.

Sincerely,

A handwritten signature in black ink, appearing to read 'M. Dalton', written over a light blue horizontal line.

**Michael Dalton**  
Managing Director

## 5. MANAGEMENT PLAN OBJECTIVE

The objective of this management plan is to minimise noise from construction activities and equipment impacting nearby noise sensitive uses.

## 6. ONSITE SOURCES OF NOISE EMISSION

During construction of the seawater supply pipeline, the primary noise sources are expected to comprise the following major plant and machinery:

Item	Equipment Description	Make/Model	Enclosed and/or muffled?	L <sub>eq</sub> dB(A) at 5m
<b>Drill Rig</b>	Plant	Vermeer D330X500 (maxi)	<b>Level 1</b>	90
		Vermeer D100X120 (midi)		85
<b>Hammer</b>	Grundoram Pneumatic Pipe Ramming Tools	Goliath	<b>Level 2</b>	105*
<b>Recycler</b>	Cleaning and separation system (Solid)	GN Solid	<b>Level 1</b>	80
<b>Recycler</b>	Cleaning and separation system (Mud)	Mudtech	<b>Level 1</b>	70
<b>Generator</b>	Recycler generator	CAT	<b>Level 1</b>	85
<b>Mud Pump</b>	High pressure pump	Ellis Williams	<b>Level 2</b>	90
<b>Pump</b>	Pit pump	Isuzu	<b>Level 1</b>	70
<b>Excavator</b>	Excavator	Case	<b>Level 1</b>	90
<b>Heavy Trucks</b>	Heavy Trucks	Assorted	<b>Level 1</b>	90
<b>General Support</b>	Equipment	Assorted	<b>Level 1</b>	70
<b>Pump</b>	Transfer pump	Sykes	<b>Level 1</b>	80
<b>Concrete pump</b>	Well construction		<b>Level 2</b>	83

\* Denotes + 5 dB correction for impulsiveness in accordance with AS1055:2018.

\*\* Denotes + 5 dB correction for tonality in accordance with AS1055:2018.

**Table 6:** Noise source levels assumed in PEN3D noise prediction modelling.

We have been advised by the client that all sites and plant items will comply, at a minimum, with Level 1 from the commencement of construction.

**Level 1:** Plant Item muffled with built housing / enclosure.

**Level 2:** Secondary Sound Shielding of the local area around the plant item.

**Level 3:** Site Enclosure Full Height, as secondary enclosure.

Further, for construction areas, we also recommend application of mass loaded vinyl temporary acoustic perimeter barriers, with a minimum height of 2.0m (as further detailed in Section 7.5).

For modelling purposes, the combination of the above treatments is estimated to provide an 8 dB reduction to the source levels provided in Table 6.

It is noted that modelling does not include screening from offsite building envelopes and is therefore considered conservative, with noise sensitive receivers set back behind the first row of offsite buildings expected to have lower noise impacts. Further, impacts are considered worst-case with all equipment in operation at the same time for the assessed 15 minute period.

It is anticipated the below works will be performed successively, starting with Location 1 and ending with Location 6.

Location	Construction Works	Construction Activity	Time (days)
1	HDD01 & HDD02	o Mobilisation	5
		o Hammering (1.5hr hammer intervals separated by 2.5hr respite periods for welding)	16
		o Drilling on a 7 day per week schedule o 7am to 6pm Monday to Saturday with reduced hours on Sunday	82
		o Remediation & Demobilisation	19
2	HDD03	o Mobilisation	2
		o Drilling on a 7 day per week schedule o 7am to 6pm Monday to Saturday with reduced hours on Sunday	9
		o Remediation & Demobilisation	2
3	HDD03 & HDD04	o Mobilisation	3
		o Drilling on a 7 day per week schedule o 7am to 6pm Monday to Saturday with reduced hours on Sunday	17
		o Trenched Tie-in Connection	8
		o Remediation & Demobilisation	3
4	HDD04 & HDD06	o Mobilisation	5
		o Hammering (1.5hr hammer intervals separated by 2.5hr respite periods for welding)	2
		o Drilling on a 7 day per week schedule o 7am to 6pm Monday to Saturday with reduced hours on Sunday	17
		o Trenched Tie-in Connection	8
		o Remediation & Demobilisation	3
5	HDD06 & HDD05	o Mobilisation	3
		o Hammering (1.5hr hammer intervals separated by 2.5hr respite periods for welding)	2
		o Drilling on a 7 day per week schedule o 7am to 6pm Monday to Saturday with reduced hours on Sunday	31
		o Trenched Tie-in Connection	8
		o Remediation & Demobilisation	2
6	HDD05	o Mobilisation	3
		o Drill exit side excavation	14
		o Trenched Tie-in Connection	8
		o Remediation & Demobilisation	2

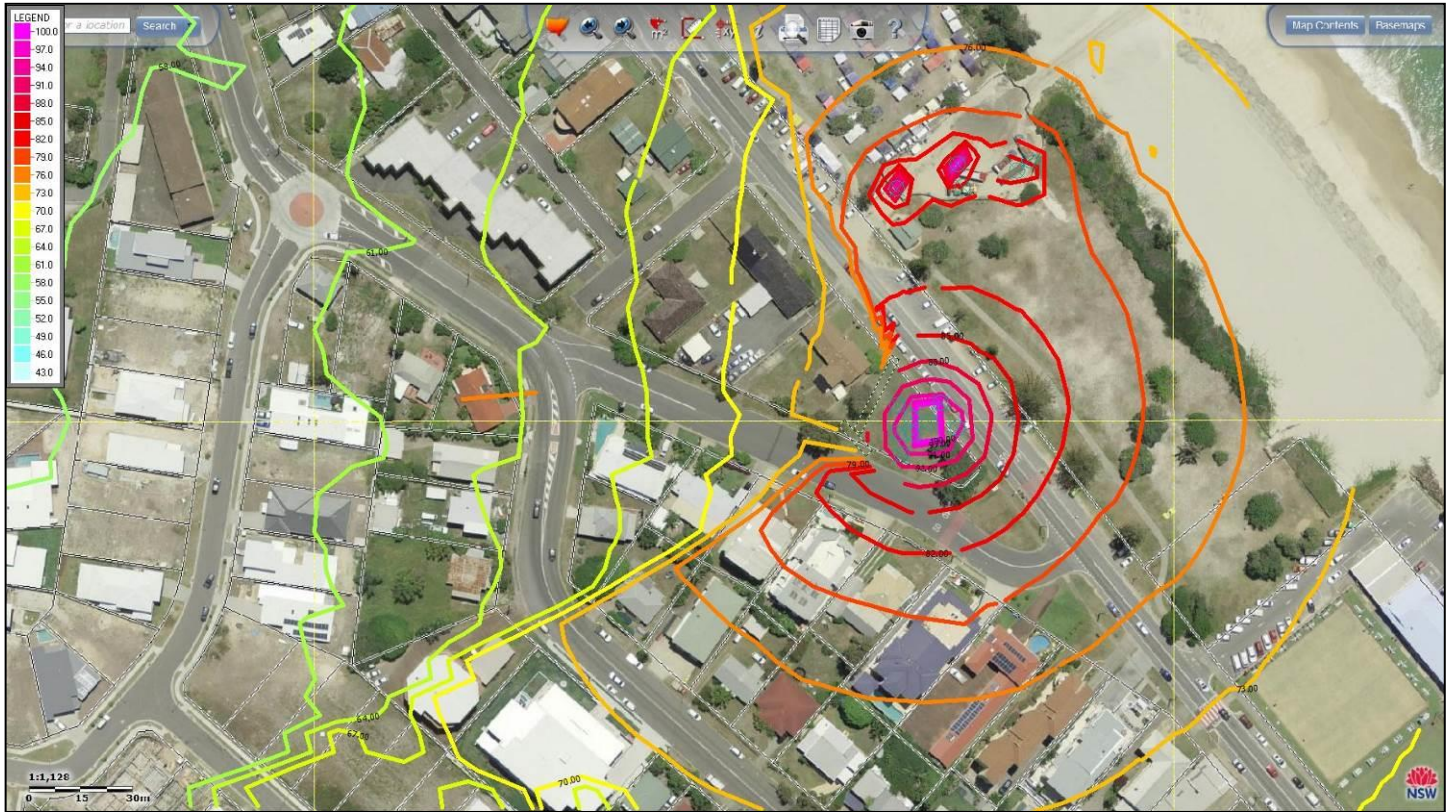
The construction plans provided in Appendix A provide the types and positions of the assessed plant at each location.

We have graphically presented predicted noise impact levels from the noisiest plant / activities as presented over the following figures (refer over the page) for each construction location.

For the worst impacted receiver for Location 1 activities (at Number 152 marine Parade), we have been advised by the client that the dwelling is owned by Property NSW and Public Works. Public Works have recommended the installation of removable boards on certain windows and doorframes throughout the house. The boards will be attached by Velcro so the resident can attach/remove at their choosing. The boards will be fabricated and installed by Public Works. These treatments will assist in further reducing noise impacts inside the habitable rooms of the dwelling. Further, storage containers will be placed between construction Location 1 and the dwelling, providing additional noise mitigation (refer to the construction spreads in Appendix A for Location 1).

Figure - Location 1 (Kingscliff Street):

Leq 15minutes Hammering Works (1.5hr Hammer Intervals):

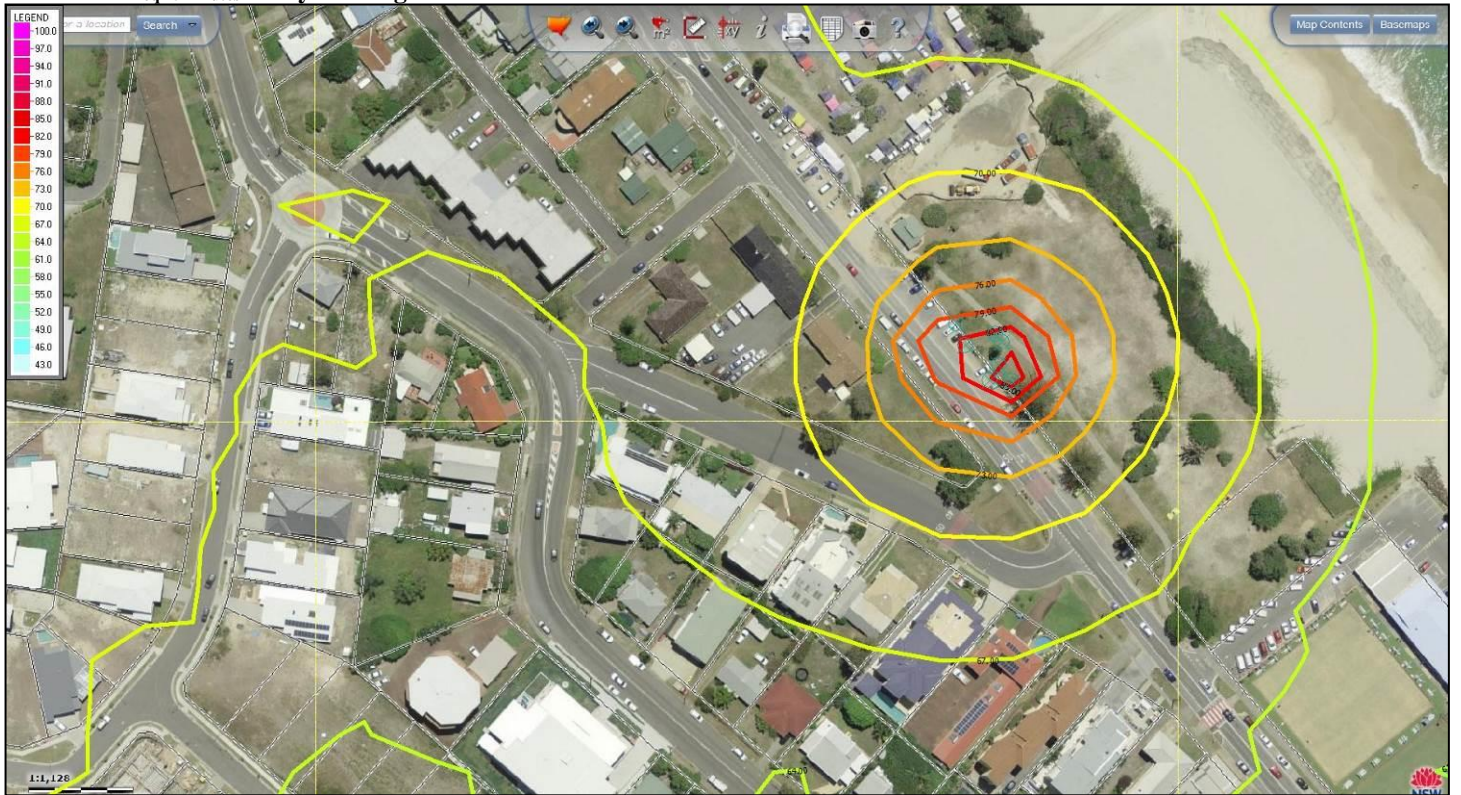


Leq 15minutes Drilling Works:



Figure - Location 2 (Marine Parade):

Leq 15minutes Entry Drilling Works:

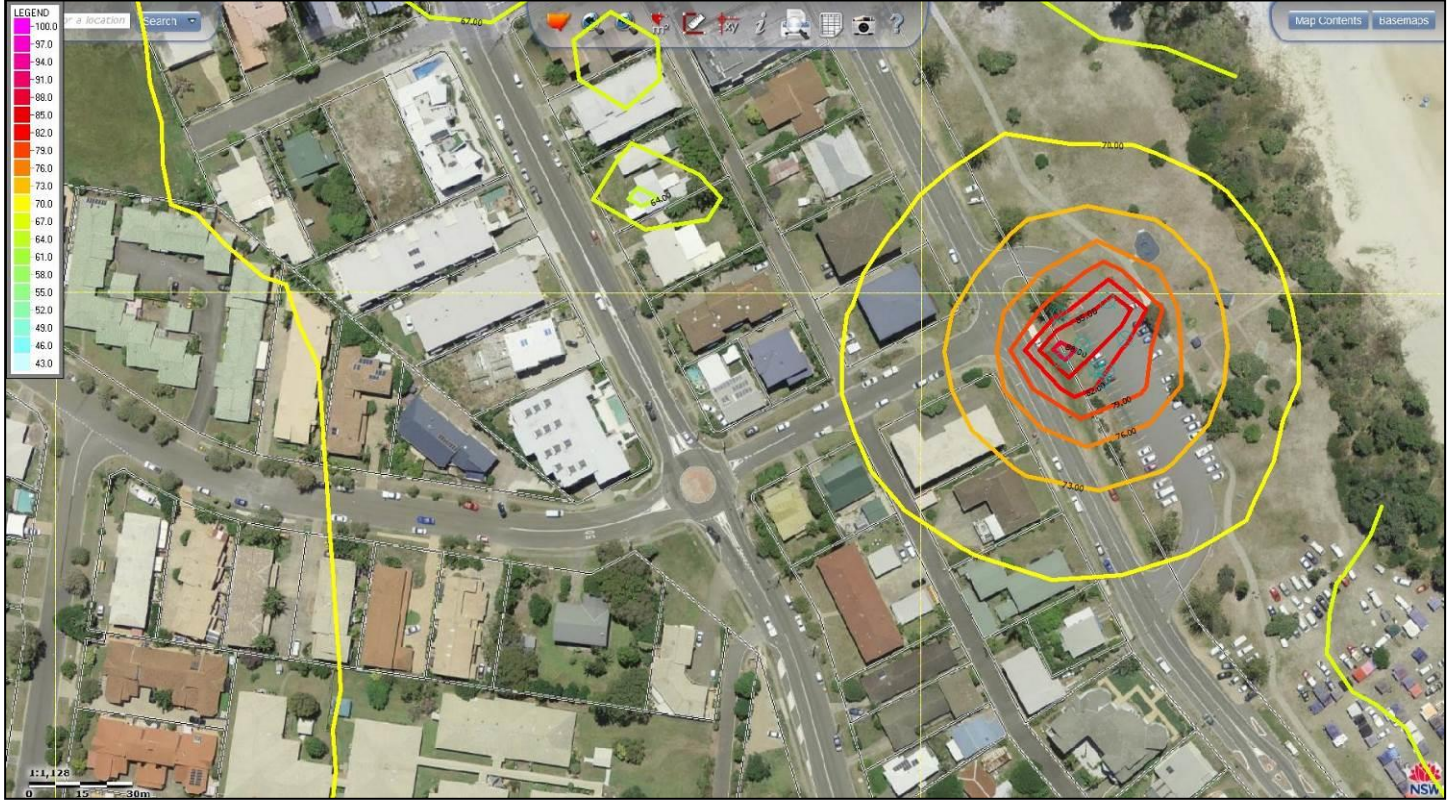


Leq 15minutes Pump Well Construction:



Figure - Location 3 (Beach Street East Carpark):

Leq 15minutes Entry Drilling Works:



Leq 15minutes Poly Welding / Stringing Location:



Figure - Location 4 (Elrond Drive North and Beach Street West):

Leq 15minutes Hammering Works (1.5hr Hammer Intervals):



Leq 15minutes Drilling Works:



Figure - Location 5 (Elrond Drive South):

Leq 15minutes Hammering Works (1.5hr Hammer Intervals):



Leq 15minutes Drilling Works:



Figure - Location 5 (Elrond Drive South):

Leq 15minutes Exit Works:

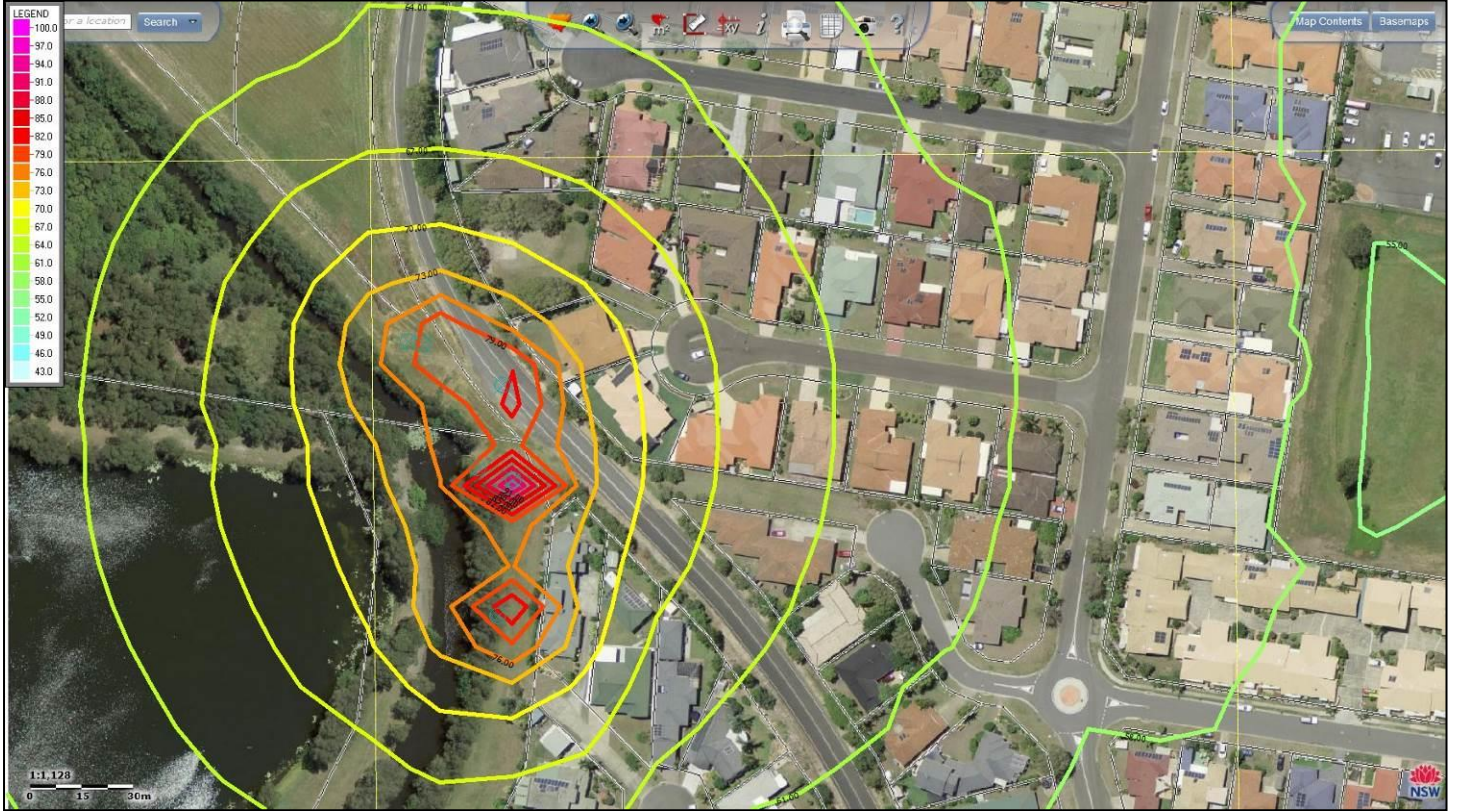


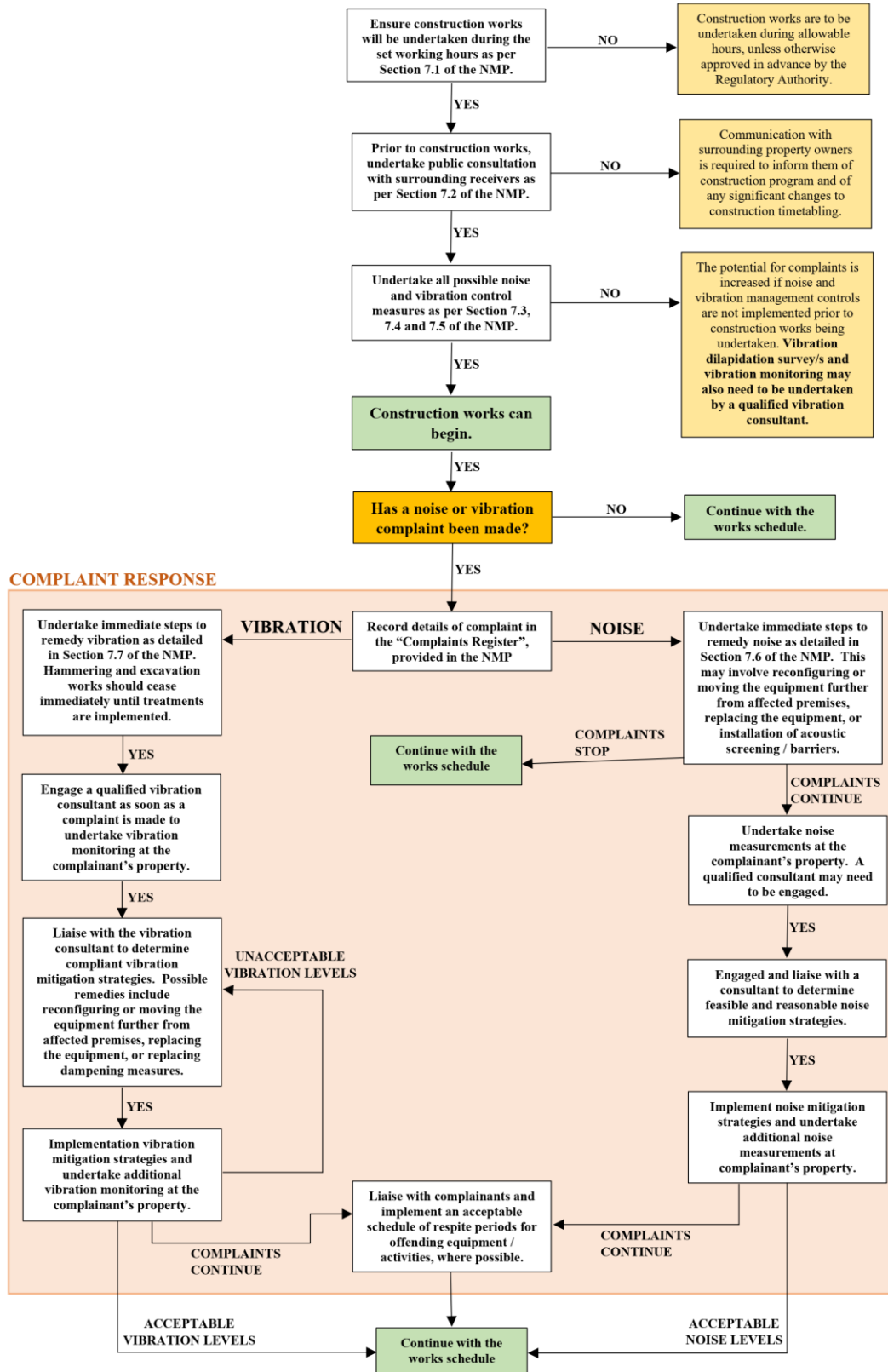
Figure - Location 6 (Noble Park):

Leq 15minutes Exit Works:



## 7. NOISE MANAGEMENT PLAN

### SUMMARY FLOWCHART FOR MANAGEMENT OF CONSTRUCTION ACTIVITIES



**7.1 Hours of Operation:** Construction activity be limited to the following hours unless otherwise approved by the Regulatory Authority (refer below in bold type for further information):

Monday – Friday:	7am – 6pm;
Saturday:	7am to 6pm (as per Council’s Approval Conditions); and
Sunday or Public holiday:	No activity.

As noted previously, the Client has advised that there is the need to perform works seven days per week from 7am to 6pm due to the construction risk associated with the HDD activities. Due to the ground conditions in the area it is not possible to stop drilling activities once they are underway, otherwise the drilled hole will collapse. In the event this occurs, the hole needs to be re-drilled, adding significant time to overall timelines. This will result in longer periods of noise emission and greater disruption to the community.

**The NSW Interim Construction Noise Guideline states the works may be undertaken outside these hours where:**

- a) **The delivery of materials is required outside these hours by the Police or other authorities;**
- b) **It is required in an emergency to avoid the loss of life, damage to property and/or to prevent environmental harm;**
- c) **Variation is approved in advance in writing by the Regulatory Authority;**
- d) **Residents likely to be affected by the works are notified in writing of the timing and duration of these works at least 18 hours prior to the commencement of works (with the exception of emergency work).**

***Aim:***

To allow seven days operation from 7am to 6pm due to the construction risk associated with the HDD activities.

***Tasks / Actions:***

Undertake communication with the Regulatory Authority/s to gain approval for out-of-hours operation. The correspondence should be specific in relation to the types of activity and equipment that will be undertaken, the specific out-of-hours time periods that will be needed, and the duration (i.e. number of days).

Upon approval from the Regulatory Authority, undertake a mailout/s (refer to Section 7.2 for further information) to the local and broader community of the timing and duration of these out-of-hours works (i.e. a separate mailout for each construction Location 1 to 6). The mailout should be completed at least 18 hours prior to the commencement of works.

***Responsible Person:***

The Environmental Manager is responsible for ensuring the approval is granted from the Regulatory Authority/s; and ensuring all mail outs (or other community consultation activities) are conducted at the appropriate time.

***Reporting:***

All forms of communications to surrounding residences should be documented, including any feedback received. Feedback should be reviewed and responded to accordingly.

***Corrective Action:***

Undertaking of disciplinary action against staff and third party operators should they continue to disregard noise management controls (i.e. out-of-hours limitations of equipment / activity / hours).

***Review:***

Reviewed at the beginning of new construction activities (i.e. at the start of building works program for the new construction area / location), or upon receipt of bona fide complaint or upon request by Tweed Council.

## 7.2 Communication with Surrounding Properties

### *Aim:*

To maintain open communication with surrounding property owners and to inform them of construction program and of any significant changes to construction timetabling.

### *Tasks / Actions:*

Prior to commencement of construction works, public consultation be undertaken, to advise the local and broader community of proposed construction works. Part of this consultation should include noting comments from the community in assisting in further refining the Noise Management Plan where appropriate (refer to Section 7.2.2 of the NSW Interim Construction Noise Guideline for further information on community engagement). Noise sensitive receivers within a 500m radius of hammering works, and 250m for all other work activities / areas, should be contacted directly and informed of the anticipated duration of works.

The community should be made aware of the location and duration of hammering activities (i.e. Grundoram Pneumatic Pipe Ramming Tools), and that such activities will occur for 1.5 hour intervals with a 2.5 hour respite period for welding.

Undertake a general mail out to noise sensitive receivers within a minimum 500m radius of hammering works, and 250m for all other work activities / areas, 10 days in advance of works, when construction operations are planning to occur or significantly change. The correspondence is to also include site contact details (as a minimum site address and a telephone contact number should a resident wish to discuss matters arising from the mail out), start and finish dates and daytime hours when the construction works will occur.

For works outside of normal daytime hours of 7am to 6pm Monday to Friday and 7am to 6pm Saturday (refer to Section 7.1): **Residents likely to be affected by the works are to be notified in writing of the timing and duration of these works at least 18 hours prior to the commencement of works (with the exception of emergency work). It is stressed that prior approval in advance in writing by the Regulatory Authority will be required.**

### *Responsible Person:*

The Environmental Manager is responsible for ensuring mail outs (or other community consultation activities) are conducted at the appropriate time.

### *Reporting:*

All forms of communications to surrounding residences should be documented as well as any feedback received. Feedback should be reviewed and responded to accordingly.

### *Review:*

Reviewed at the beginning of new construction activities (i.e. at the start of building works program for the new construction area / location), or upon receipt of bona fide complaint or upon request by Tweed Council.

**7.3 Onsite Plant & Equipment: fixed plant (i.e. compressors, combustion powered electrical generators, drilling rigs), mobile plant (i.e. excavators, trucks, personal vehicles, general vehicle movements).**

***Aim:***

To minimise noise and vibration associated with general fixed and mobile plant operation impacting surrounding noise sensitive receivers.

***Performance Indicator:***

Noise and vibration generated by construction activity does not cause complaints.

***Tasks / Actions:***

Prior to construction works being undertaken the surrounding noise sensitive receivers should be contacted and informed of the anticipated duration (start and finish dates) and daytime hours when the construction works will occur (refer to Section 7.2 for further detail).

Vibration dilapidation survey/s (for building cosmetic damage) prior to construction works being started, and vibration monitoring during construction works (for human response and cosmetic damage) are to be undertaken (by a qualified vibration consultant) if the minimum distances cited in Section 4.2 are breached by onsite construction equipment.

Special attention be given to hammering activities (i.e. Grundoram Pneumatic Pipe Ramming Tools) and excavation works (i.e. well installation). In the event that a complaint is made regarding vibration, works should be ceased immediately, and consultation with a person experienced in vibration monitoring be undertaken (refer to Section 7.7 for further detail).

Training of staff and third party operators should be completed prior to them being able to work at the construction site. Staff and third party operators should be given a copy of this Construction Noise Management Plan.

Where possible, install “croaker” type reversing alarms on vehicles used onsite, use flashing alarm lights for fixed plant, ban the use of horns, apart from emergency situations.

All mechanical plant, machinery and trucks are to be fitted with high performance noise control such as hay bales / temporary barriers around fixed location generators / compressors, enclosed engines, muffled exhaust controls and cooling air inlet silencers that minimise noise pollution in accordance with current legislation and industry best practices.

Plant and equipment that are used intermittently such as trucks, excavators and bobcats are to be shut down when not operated for extended periods.

Trucks shall not queue up outside residential properties.

Truck speeds onsite be limited to 10 km/hr.

Truck are not to use exhaust brakes onsite, subject to safety requirements.

Drivers (staff and third party operators) to operate equipment in a manner that does not generate unnecessary noise, through adherence to speed limits, avoiding excessive revving of motors, unnecessary idling, minimising compressive braking and avoidance of impact with solid objects.

Use and siting of equipment. By locating noisy equipment as far away from sensitive premises as is practical, distance separation will reduce potential noise impacts.

Stationary plant and equipment known to emit noise heavily in one direction are to be oriented so that the noise is directed away from the nearest noise sensitive receivers, where possible.

Locate stationary plant behind buildings (i.e. storage containers) or materials / pipe stockpiles to take advantage of acoustical screening from physical barriers, in particular, if a combustion powered electrical generator is used, an acoustical screen be constructed around this to further mitigate noise emissions.

Staggering times or plant locations, where possible, so that different plant items are in operation to avoid additive noise impacts. An example is if the excavator is being used near the southern boundary, then avoid moving other plant close to the boundary as well.

All engines, including trucks, are to be maintained and tuned to manufacturer's specifications to minimise noise emissions. All plant and equipment are to be regularly checked and inspected.

All onsite driveway crossovers and temporary roads be well maintained (no potholes) and levelled as required to minimise truck bounce as they move around the site.

***Responsible Person:***

The Environmental Manager is responsible for ensuring all staff and third party operators abide by the Noise Management Plan and is also responsible for the regular review of the Management Plan and the handling of complaints.

***Reporting:***

All complaints received are to be logged in a complaints register and dealt with as soon as practicable (Complaints Register is attached at the rear of this report).

All staff and third party operators training should be recorded and signed prior to be able to work onsite.

***Corrective Action:***

Driver training to instruct drivers of the relevant Tasks / Action presented above. If training is not effective, signage be erected requiring drivers to observe speed limits, and to minimise engine idling and revving. Management to maintain restrictions to hours of operations.

Undertaking of disciplinary action against staff and third party operators should they continue to disregard noise management controls (i.e. obeying speed limits and limiting the use of compressive braking).

***Review:***

Reviewed at the beginning of new construction activities (i.e. at the start of building works program for the new construction area / location), or upon receipt of bona fide complaint or upon request by Tweed Council.

#### 7.4 Temporary Loaded Vinyl Acoustical Barrier Screens

***Aim:***

Mitigate noise emissions to nearest receivers through use of localised acoustical barriers around the perimeters of the construction works areas.

***Tasks / Actions:***

A 2m high temporary acoustical barriers be erected around the perimeter of the works areas that emit noise. The barrier could be of loaded vinyl temporary acoustical barrier types. The barriers are to be located as close to the noise source/s as possible.

***Responsible Person:***

The Environmental Manager is responsible for erecting and maintaining the barrier screens.

***Reporting:***

The barrier be inspected each morning by The Environmental Manager. If the barrier has a gap detected, this is to be reported and remedy actions undertaken immediately.

***Review:***

Reviewed at the beginning of new construction activities (i.e. at the start of building works program for the new construction area / location).

## 7.5 Mechanical Plant Maintenance

***Aim:***

Undertaking of a regular maintenance schedule for all high noise emitting equipment to minimise noise associated with operation of equipment and to ensure existing plant emissions due not increase.

***Performance Indicator:***

Noise by construction activity does not increase or cause complaints.

***Tasks / Actions:***

All engines including trucks are to be maintained and tuned to manufacturer's specifications so as to minimise exhaust emissions.

All plant and equipment are to be regularly checked and inspected.

***Responsible Person:***

The Environmental Manager is responsible for ensuring all maintenance scheduling is undertaken on major equipment items used for construction activities and new plant / parts are assessed for noise performance.

***Reporting / Review:***

All complaints received are to be logged in a complaints register and dealt with as soon as practicable (Complaints Register Form is attached in Appendix B).

***Corrective Action:***

Any equipment / plant found (through monitoring) to emit higher noise levels than previously should be inspected / repaired or incorporate source treatments to reduce levels.

***Review:***

Reviewed at the beginning of new construction activities (i.e. at the start of building works program for the new construction area / location), or upon receipt of bona fide complaint or upon request by Tweed Council.

## 7.6 Noise Non-compliance Response / Compliant Confirmation and Monitoring

### ***Aim:***

To provide a management methodology to quickly and effectively respond to non-compliance or a noise complaint, should such events occur during construction activities.

### ***Tasks / Actions:***

Assign the task of managing noise emissions to the Environmental Manager, who would be responsible for handling complaints sensitively, and ensuring that work does not commence before the times specified in Section 7.1.

Any complaint is to be recorded using the Complaint Register form attached in Appendix B of this plan. The form should be used as a management tool, and permanent record of the complaint, remediation and follow-up with the Complainant.

If complaints arise regarding noise, the complaint will be directed to the Environmental Manager, who will determine the source of the noise and take immediate steps to mitigate. This may involve moving / reconfiguring the source of the noise further away from affected premises, replacing the equipment or installing additional acoustic screens / barriers.

If noise complaints continue after the abovementioned initial steps are taken, noise measurements are to be undertaken from the most affected point at the affected premise/s to confirm the non-compliance with the Management Levels. Engaging a suitably qualified and experienced consultant to provide specialist noise measurement and control advice should be sought.

Noise measurements (minimum  $L_{Aeq\ 15\ min}$ ) should be undertaken in accordance with Australian Standard AS 1055:2018 "*Acoustics-Description and measurement of environmental noise*". The noise meter/s should be set to "A" weight "Fast" response. Measurements should be undertaken during calm weather conditions with winds below 5m/s.

Should non-compliance be confirmed, liaise with the consultant to determine feasible and reasonable acoustic mitigation strategies. Such strategies may include modification of hours of activity, localised acoustic barriers, use of different equipment / methodology or any other appropriate treatment should be considered to provide additional mitigation. If required noise modeling should be undertaken of current operations to determine treatments that can be implemented. These treatment strategies are to be implemented and additional noise monitoring conducted.

Should complaints continue, open communication should be made with the complainants to implement an acceptable schedule of respite periods for offending equipment / activities. For example, these respite periods may be a commitment to later start time and earlier terminal time for noise generating activities to minimise annoyance.

For the worst impacted receiver for Location 1 activities at Kingscliff Street (dwelling at Number 152 Marine Parade), which is not separated by a road corridor to proposed construction activities, under extenuating circumstances, if no other solutions / treatments are available, and where feasible and reasonable, the option for relocating the resident during the high noise levels / activities should be implemented. It is noted that we have been advised by the Client, that this has previously been given as an option, as well as building shell treatments (i.e. for building shell treatments refer to Section 6).

***Responsible Person:***

The Environmental Manager is responsible for ensuring that non-compliance and complaint issues are handled in a prompt fashion until compliance with the set limits are achieved.

***Reporting / Review:***

Noise complaints are to be recorded in the register (Complaints Register Form is attached in Appendix B).

Non-compliance results are to be recorded.

Information to be included during monitoring and to be reported include (as a minimum):

- Date and time period when measurements were undertaken.
- The type of monitoring be conducted (i.e. compliance testing or in response to a complaint).
- Information on the measurement equipment used for monitoring including the serial numbers, pre-field and post-field calibration checks.
- Brief description of the location of the measurements (i.e. distance from nearest dwelling, direction and distance from construction activity).
- Prevailing weather conditions (i.e. temperature, wind strength and direction, cloud cover). It is noted that noise monitoring should be conducted during clear (i.e. no rain) and calm (i.e. less than 5m/sec. wind speeds) weather conditions. Daily weather observations can also be obtained from the Bureau of Meteorology's website.
- Comments outlining observations from measurements (i.e. expected dominant sources of noise including natural and onsite construction sources).
- Name and signature of person undertaking the monitoring.

## 7.7 Vibration Non-compliance Response / Compliant Confirmation and Monitoring

### *Aim:*

To provide vibration monitoring (and control if required) during underground pipe insertion activities (i.e. use of Grundoram Pneumatic Pipe Ramming Tool) and excavation works (i.e. well installation); and to provide a management methodology to quickly and effectively respond to non-compliance or a vibration complaint should such events occur during construction activities.

### *Tasks / Actions:*

Assign the task of managing vibration to the Environmental Manager, who would be responsible for handling complaints sensitively.

If a complaint is lodged regarding vibration, or the minimum distances cited in Section 4.2 are breached by construction, vibration monitoring (for human response and cosmetic damage) are to be undertaken (by a qualified vibration consultant). Prior to works being undertaken, these distances are to be confirmed before works are undertaken.

Special attention be given to hammering activities (i.e. Grundoram Pneumatic Pipe Ramming Tools) and excavation works (i.e. well installation).

Vibration monitoring is to be undertaken by a suitably qualified and experienced consultant. As a minimum, monitoring is to be undertaken with vibration loggers with triaxial geophones and accelerometers (i.e. Environmental Texcel Monitors). All vibration equipment should have appropriate laboratory calibration certificates. The monitors should be setup with a trigger threshold of less than the allowable limit/s (typically 2/3 of this level is recommended) to ensure compliance with the Vibration Limits presented in this Management Plan. As minimum the monitors should have an alarm or send a warning to the responsible person that the vibration limits (OR 2/3 of this level is recommended as a safety buffer) have been exceeded.

If complaints arise regarding vibration, the complaint will be directed to the Environmental Manager, who will determine the source and take immediate steps to mitigate.

Any complaint is to be recorded using the Complaint Register form attached in Appendix B of this plan. The form should be used as a management tool, and permanent record of the complaint, remediation and follow-up with the Complainant.

In the event that a complaint is made regarding vibration, works be ceased immediately, and remedies implemented. Possible remedies include reconfiguring or moving the equipment further from affected premises, replacing the equipment, or replacing dampening measures.

A consultant qualified and experienced in vibration should be engaged as soon as a complaint is made. Should non-compliance be confirmed by undertaking vibration monitoring, liaise with the consultant to determine compliant vibration mitigation strategies. These treatment strategies are to be implemented and additional vibration monitoring conducted to ensure compliance.

Should complaints continue, open communication should be made with the complainants to implement an acceptable schedule of respite periods for offending equipment / activities, where possible. For example, these respite periods may be a commitment to later start time and earlier terminal time for vibration generating activities to minimise annoyance.

***Responsible Person:***

Site Manger is responsible for ensuring that all vibration monitoring, non-compliance and complaint issues are handled in a prompt fashion until compliance with the noise limits are achieved.

***Reporting / Review:***

Onsite vibration monitoring results are to be recorded and reviewed on a weekly basis, with recorded vibration levels are to be stored onsite.

Vibration complaints are to be recorded in the register (Complaints Register Form is attached in Appendix B).

Non-compliance vibration results are to be recorded.

Information to be included during monitoring and to be reported include (as a minimum):

- Date and time period when measurements were undertaken.
- The type of monitoring be conducted (i.e. compliance testing or in response to a complaint).
- Information on the measurement equipment used for monitoring including the serial numbers.
- Brief description of the location of the measurements (i.e. distance from nearest dwelling, direction and distance from construction activity).
- Prevailing weather conditions (i.e. temperature, wind strength and direction, cloud cover). It is noted that noise monitoring should be conducted during clear (i.e. no rain) and calm (i.e. less than 5m/sec. wind speeds) weather conditions. Daily weather observations can also be obtained from the Bureau of Meteorology's website.
- Comments outlining observations from measurements (i.e. expected dominant sources of vibration).
- Name and signature of person undertaking the monitoring.

## 8.0 DISCUSSION and CONCLUSION

Overall, the proposed works will be of a relatively short duration, and there will be periods of either no activity or low levels of activity. There are six locations where works will be undertaken during the expected 9 months of construction. Further, the noisiest activity being the hammering equipment (i.e. Grundoram Pneumatic Pipe Ramming Tools), will be used for 1.5 hour intervals with 2.5 hour respites to allow for welding). Overall, these aspects of the construction works will assist in reducing the noise impacts.

Regardless, given the proximity to surrounding noise sensitive receivers, generally being residential dwellings and apartments, noise levels will be above the Management Levels, which is typical for the majority of construction activity that involves heavy earth works equipment.

Given the limited separation distance to the nearest surrounding offsite receivers available acoustic treatments to minimise noise impacts are limited to noise reduction at the source (i.e. application of mufflers and plant enclosures), erection of temporary acoustic barriers, and incorporation of management principles into the day to day operation of the construction sites, and good communication between the site and occupants of nearby receivers.

Council accept that in many cases it is not possible to operate below the Management Levels for construction activity – to require operations to be below the Management Levels would have a large impact on progress of development. It is noted that to achieve such noise reductions to below the Management Levels, a solid building structure would need to be erected over the construction site locations, which is neither practicable nor reasonable and would also be bound by the noise limits during its construction.

All available reasonable and feasible noise control strategies have been adopted, including application of mufflers and plant enclosures, erection of temporary acoustic barriers, incorporation of management principles into the day to day operation of the construction site and a means of establishing good communication between the site and occupants of nearby dwellings. For the scale and duration of the construction works, this is viewed as “best practice” noise control. It is also noted that we have assumed worst case scenario usage of plant, and that plant may be operated more sporadically than assumed, which will further reduce noise emission levels.

We note that noise impact levels at individual properties will vary from day to day depending on the location of construction works and the type of works being undertaken. The construction noise management plan has been prepared to reduce potential noise impacts by applying best practice noise controls.

For the worst impacted receiver for Location 1, we have been advised by the client that the dwelling is owned by Property NSW and Public Works. Public Works have recommended the installation of removable boards on certain windows and doorframes throughout the house. The boards will be attached by Velcro so the resident can attach/remove at their choosing. The boards will be fabricated and installed by Public Works. These treatments will assist in further reducing noise impacts inside the habitable rooms of the dwelling. Further, storage containers will be placed between construction Location 1 and the dwelling, providing additional noise mitigation (refer to the construction spreads in Appendix A for Location 1).

The key to managing noise impacts is to ensure that all practical steps are taken to minimise noise from the site. If the nearby residents are aware that the builder is mindful of noise impacting upon their premises, they will tend to be less annoyed than if they feel no regard is made as to their amenity. Good communication is an important factor in managing noise, as a good relationship between the builder and the residents will further ensure that should an issue arise it can be dealt with in a reasonable manner.

As noted previously, the Client has advised that there will be the need to perform works seven days per week from 7am to 6pm due to the construction risk associated with the HDD activities. Due to the ground conditions in the area, they are unable to stop drilling activities once they commence, otherwise the drilled hole will collapse. In the event this occurs, the hole needs to be re-drilled, adding significant time to the overall timeline. This will result in longer periods of noise emission and greater disruption to the community.

**The NSW Interim Construction Noise Guideline states the works may be undertaken outside these hours where:**

- a) The delivery of materials is required outside these hours by the Police or other authorities;**
- b) It is required in an emergency to avoid the loss of life, damage to property and/or to prevent environmental harm;**
- c) Variation is approved in advance in writing by the Regulatory Authority;**
- d) Residents likely to be affected by the works are notified in writing of the timing and duration of these works at least 18 hours prior to the commencement of works (with the exception of emergency work).**

In the event of a noise complaint, the complaint must be dealt with sensitively and respectfully, with the noise abated as soon as possible.

Report Prepared By:



**JAY CARTER BSc**  
Director

**APPENDIX A**

Construction Site / Spread Plans



LAYOUT PLAN  
SCALE 1:150

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM T182\_PIPELINE DETAIL\_REV G.dwg. DPOD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. OBTAIN UTILITY ZONE REFS AND.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

- LEGEND:
- HDD ALIGNMENT
  - BOUNDARIES
  - SITE FENCING
  - SEGMENT FENCE
  - CORR LOG
  - HDD WORKS SITE AREA
  - ACCESS WAY/EASEMENT

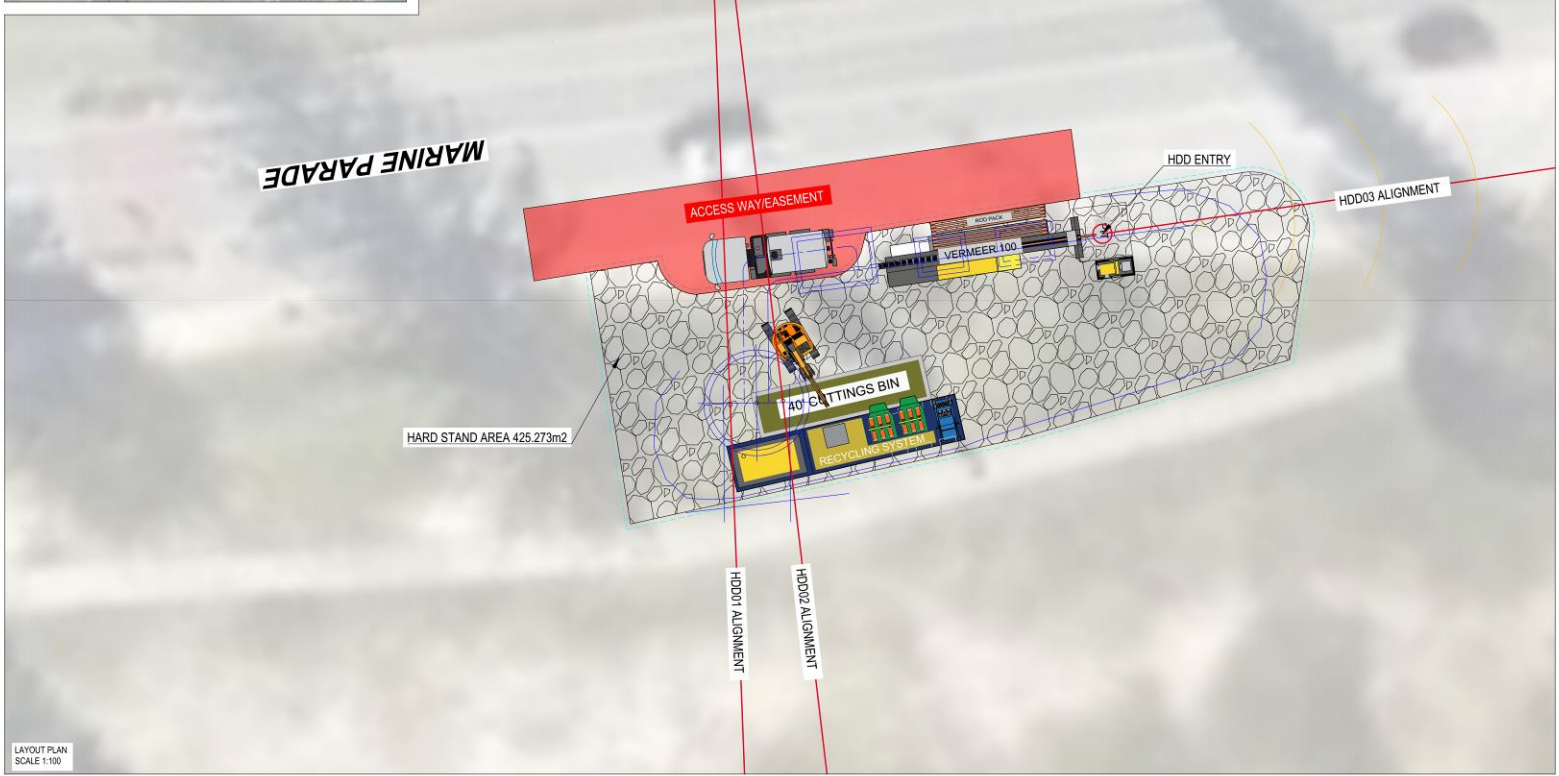
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A	ISSUED FOR INFORMATION	08.10.21	MM	CK	JF	TD	MD						



AUSTRALIAN BAY LOBSTER PRODUCERS  
SEAWATER INTAKE

ESC - HDD01 & HDD02 ENTRY  
OUTFALL SOUTH & NORTH

047-HSE-DWG-001 FOR INFORMATION



LAYOUT PLAN  
SCALE 1:100

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM T182\_PIPELINE DETAIL\_REV G.dwg. DPOD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. OBTAIN UTILITY ZONE REFS AND.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

- LEGEND:
- HDD ALIGNMENT
  - BOUNDARIES
  - SITE FENCING
  - SEGMENT FENCE
  - CORR LOG
  - HDD WORKS SITE AREA
  - ACCESS WAY/EASEMENT

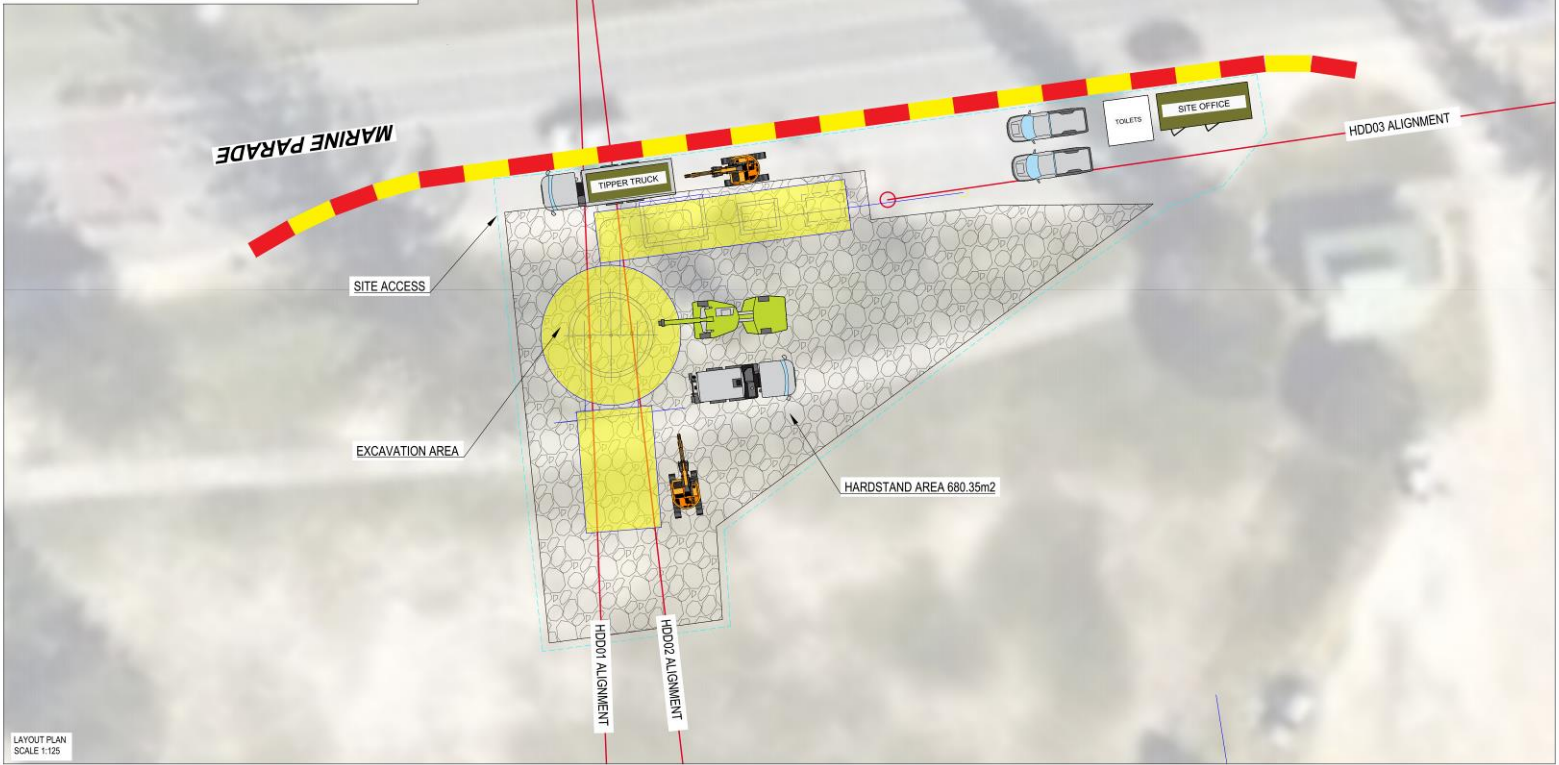
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A	ISSUED FOR INFORMATION	08.10.21	MM	CK	JF	TD	MD						



AUSTRALIAN BAY LOBSTER PRODUCERS  
SEAWATER INTAKE

ESC - HDD03 ENTRY  
MARINE PDE

047-HSE-DWG-003 FOR INFORMATION



LAYOUT PLAN  
SCALE 1:125

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM T882\_PIPELINES\_DETAIL\_REV G.dwg. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM ZONE 58S AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. EQUIPMENT SELECTION INDICATIVE.

- LEGEND:
- HDD ALIGNMENT
  - SITE FENCING
  - TRAFFIC CONTROL
  - HDD WORKS SITE AREA
  - SECURITY AREA
  - ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK	APP'D	DATE	BY	TO	NO.
A	ISSUED FOR INFORMATION	28.10.21	MH	CS	JT	TD	MD		

**Pipeline Drillers**

dbpo  
australian bay lobster producers (ablp)

PROJECT:	AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE
REV:	ESC - WELL CONSTRUCTION
DRAWING NO.:	047-HSE-DWG-009
STATUS:	FOR INFORMATION



LAYOUT PLAN  
SCALE 1:200



LAYOUT PLAN  
SCALE 1:250

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM T882\_PIPELINES\_DETAIL\_REV G.dwg. DBYD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM ZONE 58S AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

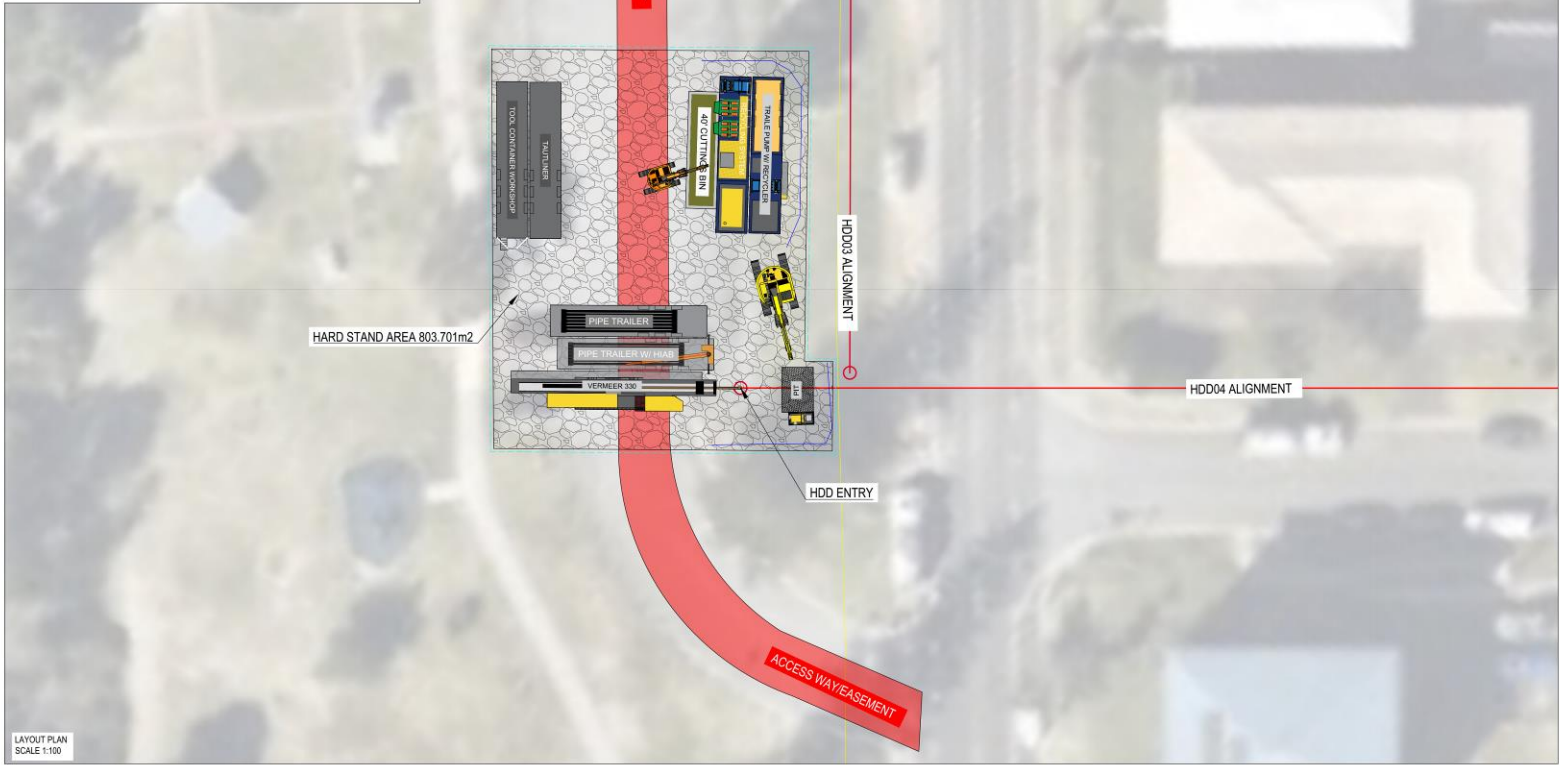
- LEGEND:
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  - WELDED PRODUCT PIPE STRING
  - BOUNDARIES
  - SITE FENCING
  - SEGMENT FENCE
  - ODP LOG
  - HDD WORKS SITE AREA
  - ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK	APP'D	DATE	BY	TO	NO.
A	ISSUED FOR INFORMATION	28.10.21	MH	CS	JT	TD	MD		

**Pipeline Drillers**

dbpo  
australian bay lobster producers (ablp)

PROJECT:	AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE
REV:	ESC - HDD03 EXIT MARINE PDE
DRAWING NO.:	047-HSE-DWG-004
STATUS:	FOR INFORMATION



LAYOUT PLAN  
SCALE 1:100

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM 7882\_PIPELINE DETAIL\_REV G.dwg. DPOD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM ZONE 56S, 480.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

LEGEND:

- HDD ALIGNMENT
- BOUNDARIES
- SITE FENCING
- SEGMENT FENCE
- COOR LOG
- HDD WORKS SITE AREA
- ACCESS WAYEASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK	APP'D	CONTRACTOR	OWNER
A	ISSUED FOR INFORMATION	05.10.21	MM	CH	JT	TD	MD



PROJECT: AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE  
 TITLE: ESC - HDD04 ENTRY BEACH ST  
 DRAWING NO: 047-HSE-DWG-005  
 STATUS: FOR INFORMATION



LAYOUT PLAN  
SCALE 1:200

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM 7882\_PIPELINE DETAIL\_REV G.dwg. DPOD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM ZONE 56S, 480.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

LEGEND:

- HDD ALIGNMENT
- WELDED PRODUCT PIPE STRING
- BOUNDARIES
- SITE FENCING
- SEGMENT FENCE
- COOR LOG
- HDD WORKS SITE AREA
- ACCESS WAYEASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK	APP'D	CONTRACTOR	OWNER
A	ISSUED FOR INFORMATION	05.10.21	MM	CH	JT	TD	MD



PROJECT: AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE  
 TITLE: ESC - HDD04 EXIT BEACH ST  
 DRAWING NO: 047-HSE-DWG-006  
 STATUS: FOR INFORMATION



LAYOUT PLAN  
SCALE 1:250

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM 7882\_PIPELINE DETAIL\_REV G.dwg. DPOD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM ZONE 56S, 480.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

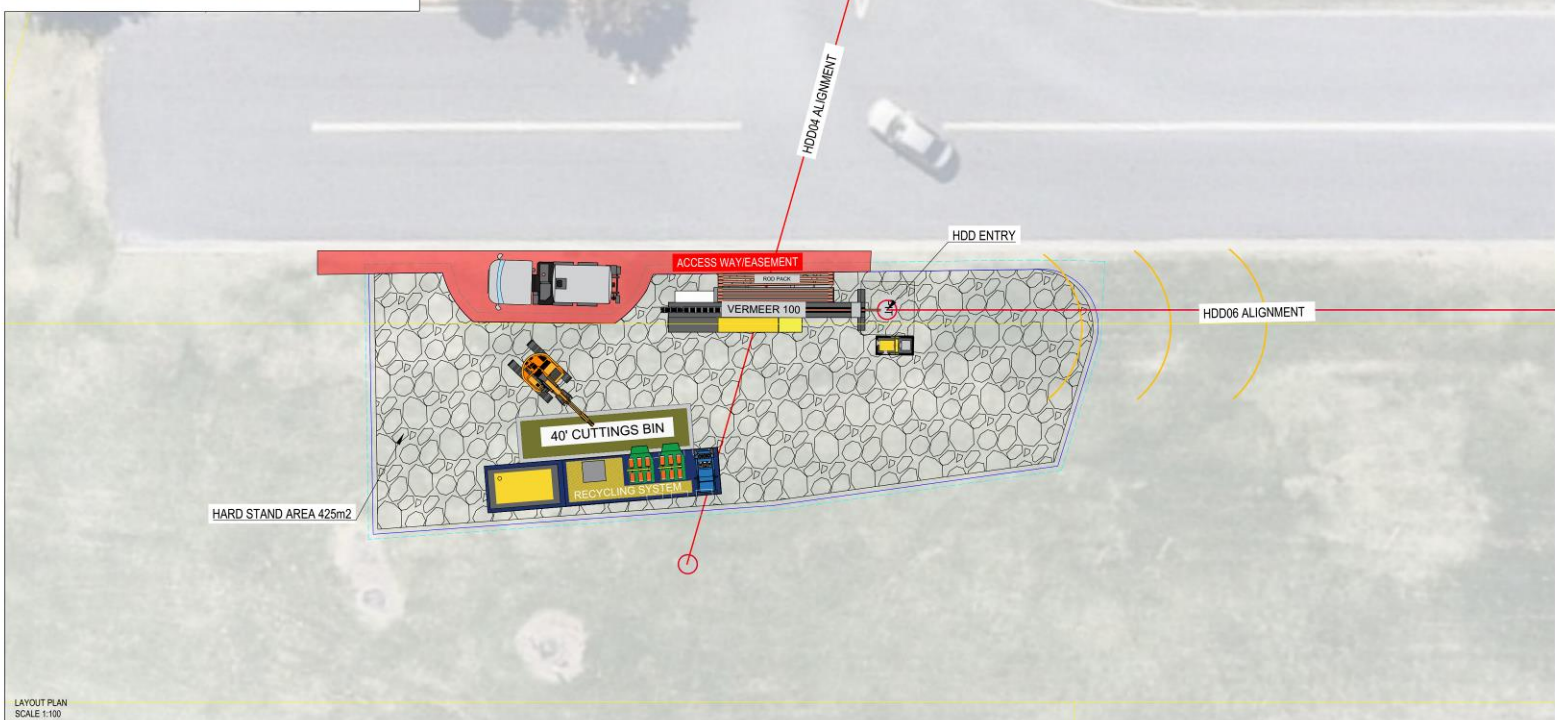
LEGEND:

- HDD ALIGNMENT
- WELDED PRODUCT PIPE STRING
- BOUNDARIES
- SITE FENCING
- SEGMENT FENCE
- COOR LOG
- HDD WORKS SITE AREA
- ACCESS WAYEASEMENT

REVISION	DESCRIPTION	DATE	DRAWN	CHECK	APP'D	CONTRACTOR	OWNER
A	ISSUED FOR INFORMATION	05.10.21	MM	CH	JT	TD	MD



PROJECT: AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE  
 TITLE: ESC - HDD04 EXIT BEACH ST  
 DRAWING NO: 047-HSE-DWG-006  
 STATUS: FOR INFORMATION



LAYOUT PLAN  
SCALE 1:100

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM 7882\_PIPELINE\_DETAIL\_REV 6.dwg. DPOD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DUSTM STOPPING ZONE SEE A10.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

LEGEND:

- HDD ALIGNMENT
- BOUNDARIES
- SITE FENCING
- SEGMENT FENCE
- CORR LOG
- HDD WORKS SITE AREA
- ACCESS WAY/EASEMENT

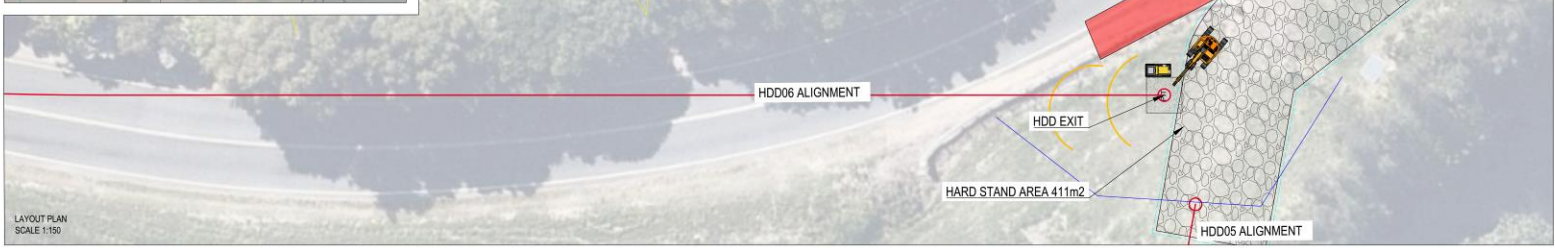
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A	ISSUED FOR INFORMATION	23/01/21	MM	CS	PT	TD	MD



AUSTRALIAN BAY LOBSTER PRODUCERS  
SEAWATER INTAKE

ESC - HDD06 ENTRY  
ELROND DR

096-HSE-DWG-001 FOR INFORMATION



LAYOUT PLAN  
SCALE 1:150



LAYOUT PLAN  
SCALE 1:150

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM FROM 7882\_PIPELINE\_DETAIL\_REV 6.dwg. DPOD RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DUSTM STOPPING ZONE SEE A10.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

LEGEND:

- HDD ALIGNMENT
- WELDED PRODUCT PIPE STRING
- BOUNDARIES
- SITE FENCING
- SEGMENT FENCE
- CORR LOG
- HDD WORKS SITE AREA
- ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DESIGN	CHECK	APPROV	CHECK	APPROV
A	ISSUED FOR INFORMATION	23/01/21	MM	CS	PT	TD	MD



AUSTRALIAN BAY LOBSTER PRODUCERS  
SEAWATER INTAKE

ESC - HDD06 EXIT  
ELROND DR

096-HSE-DWG-002 FOR INFORMATION



LAYOUT PLAN  
SCALE 1:125

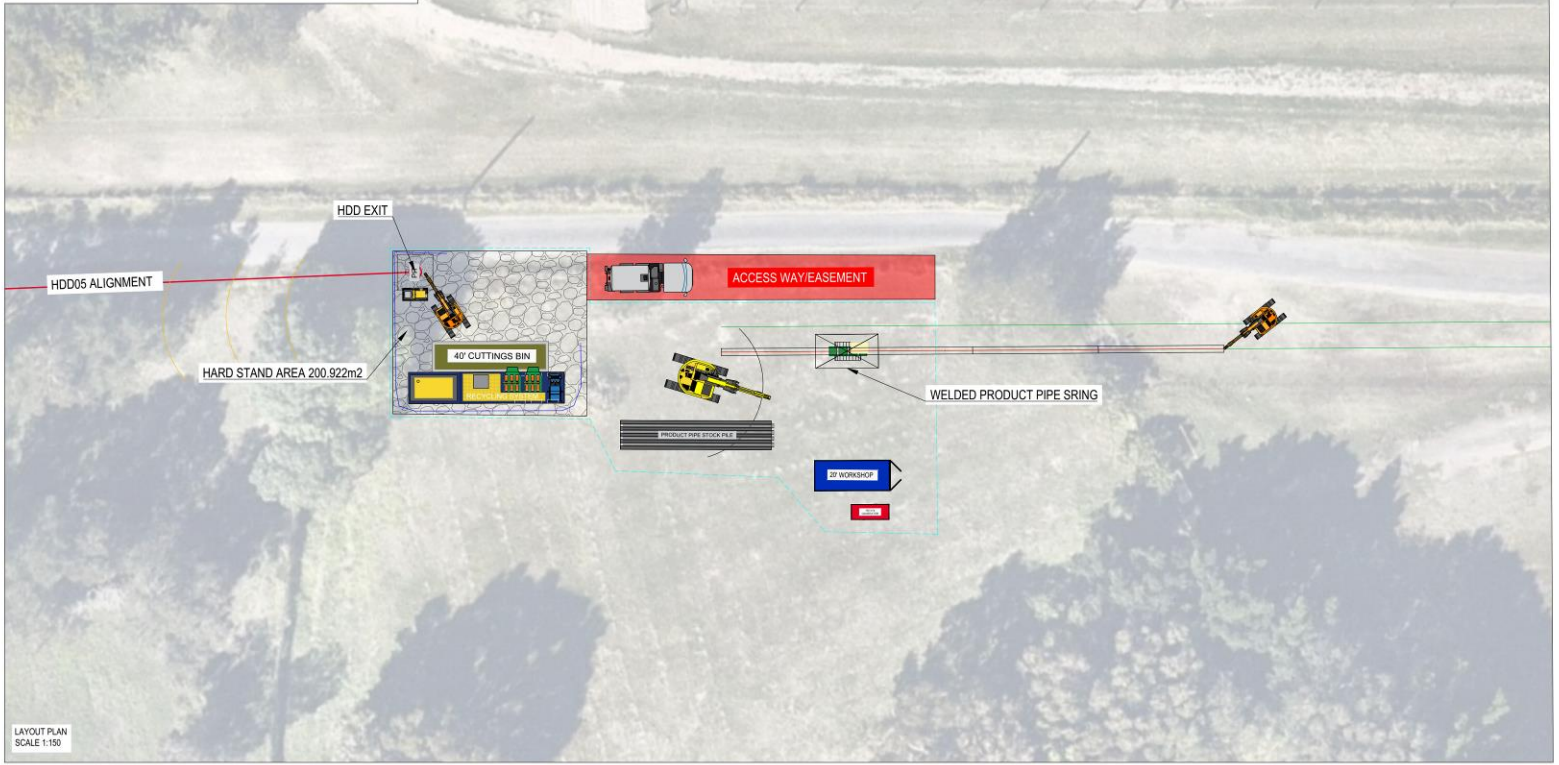
- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM 7892\_PIPELINE\_DETAIL\_REV G.dwg. D/D/D RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM ZONE 56S, AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

- LEGEND:
- HDD ALIGNMENT
  - BOUNDARIES
  - SITE FENCING
  - SEGMENT FENCE
  - COB LOG
  - HDD WORKS SITE AREA
  - ACCESS WAY/EASEMENT

REVISION	DESCRIPTION	DATE	DRW	CHK	APPD	CHKD	APPD	DATE
A	ISSUED FOR INFORMATION	06.10.21	MM	CH	PF	TD	MD	



PROJECT: AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE  
 SITE: ESC - HDD05 ENTRY NOBLE LAKE  
 DRAWING: 047-HSE-DWG-007  
 FOR INFORMATION



LAYOUT PLAN  
SCALE 1:150

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. EXISTING SERVICES DETAILS TAKEN FROM 7892\_PIPELINE\_DETAIL\_REV G.dwg. D/D/D RECORDS TO BE MAINTAINED BY CONTRACTOR.
  3. DATUM: UTM ZONE 56S, AHD.
  4. SITE SURVEY REQUIRED TO CONFIRM HDD SITE BOUNDARY. NO IMPACT TO PUBLIC ROADS.
  5. HDD EQUIPMENT SELECTION INDICATIVE.

- LEGEND:
- HDD ALIGNMENT
  - WELDED PRODUCT PIPE SPRING
  - BOUNDARIES
  - SITE FENCING
  - SEGMENT FENCE
  - COB LOG
  - HDD WORKS SITE AREA
  - ACCESS WAY/EASEMENT

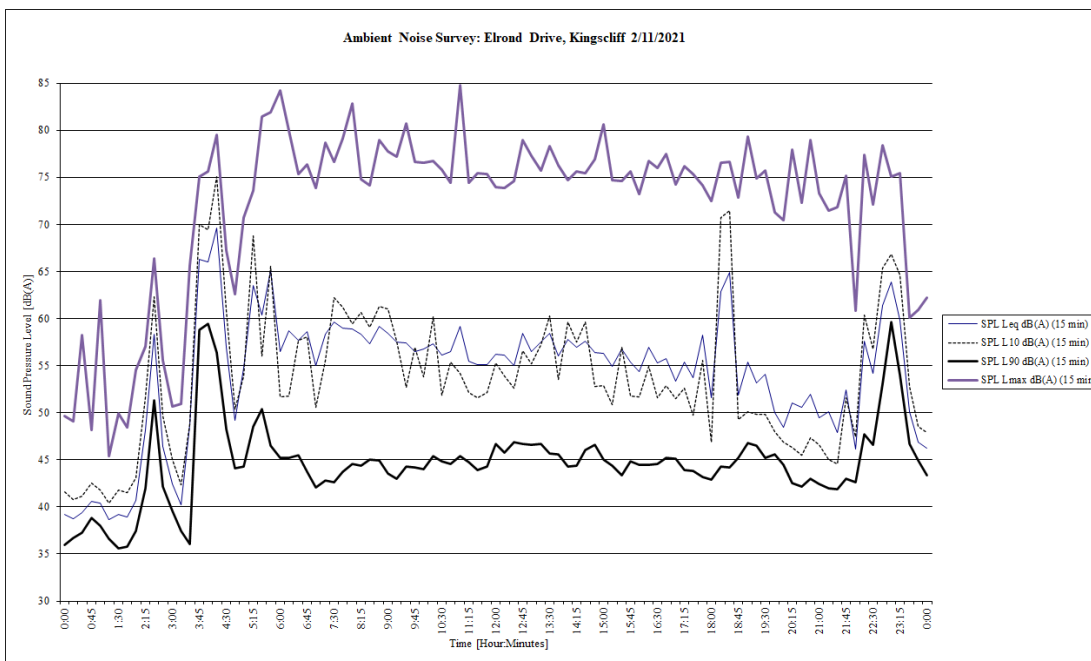
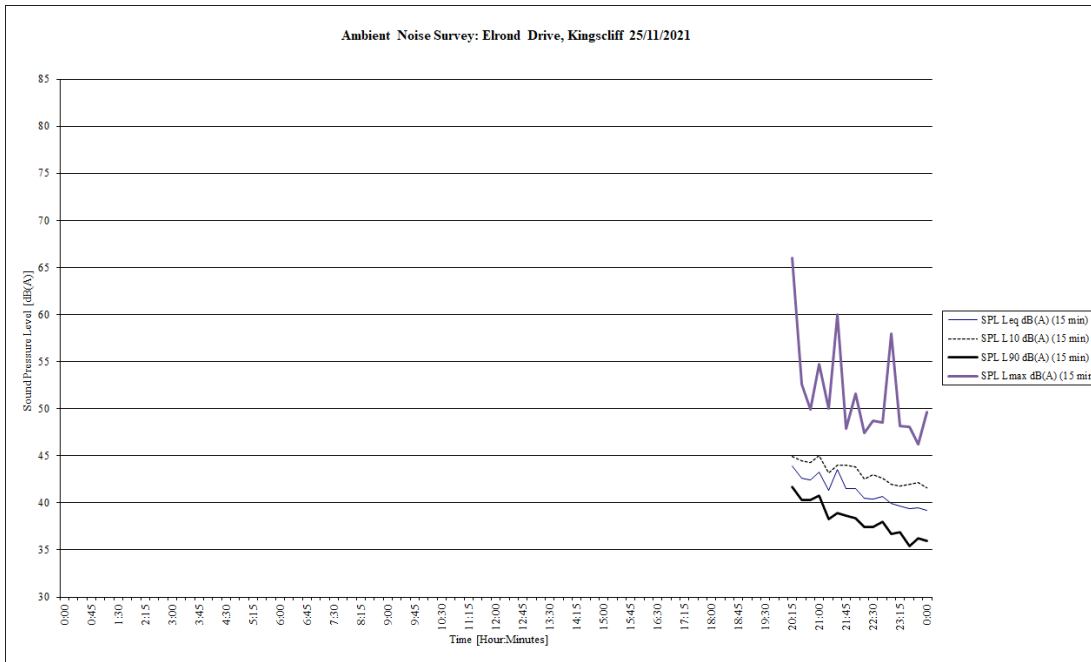
REVISION	DESCRIPTION	DATE	DRW	CHK	APPD	CHKD	APPD	DATE
A	ISSUED FOR INFORMATION	06.10.21	MM	CH	PF	TD	MD	

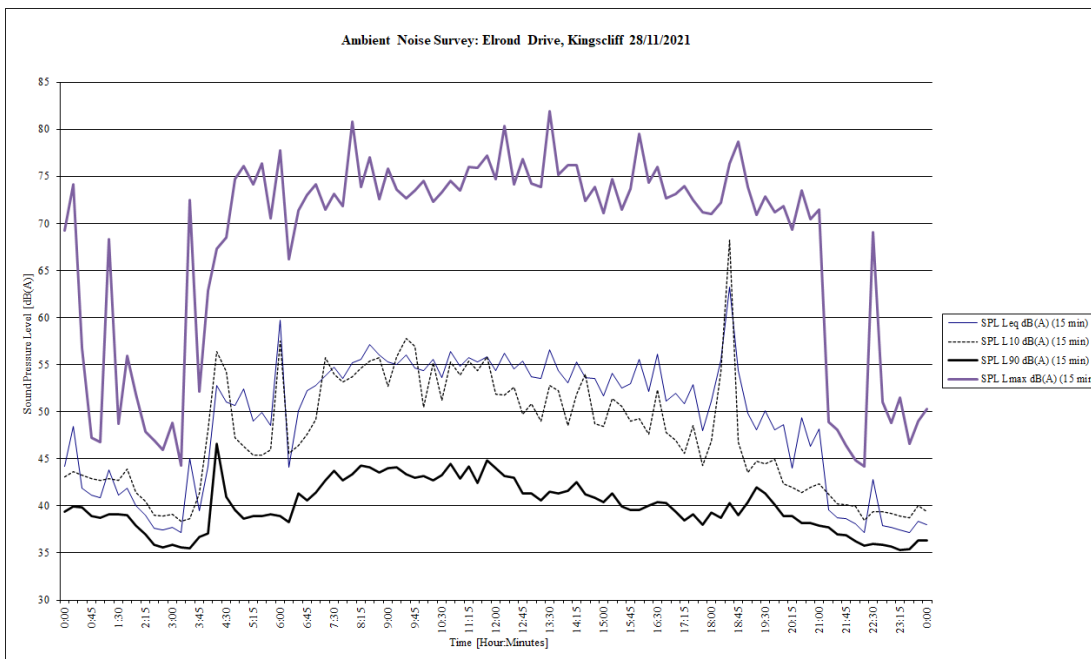
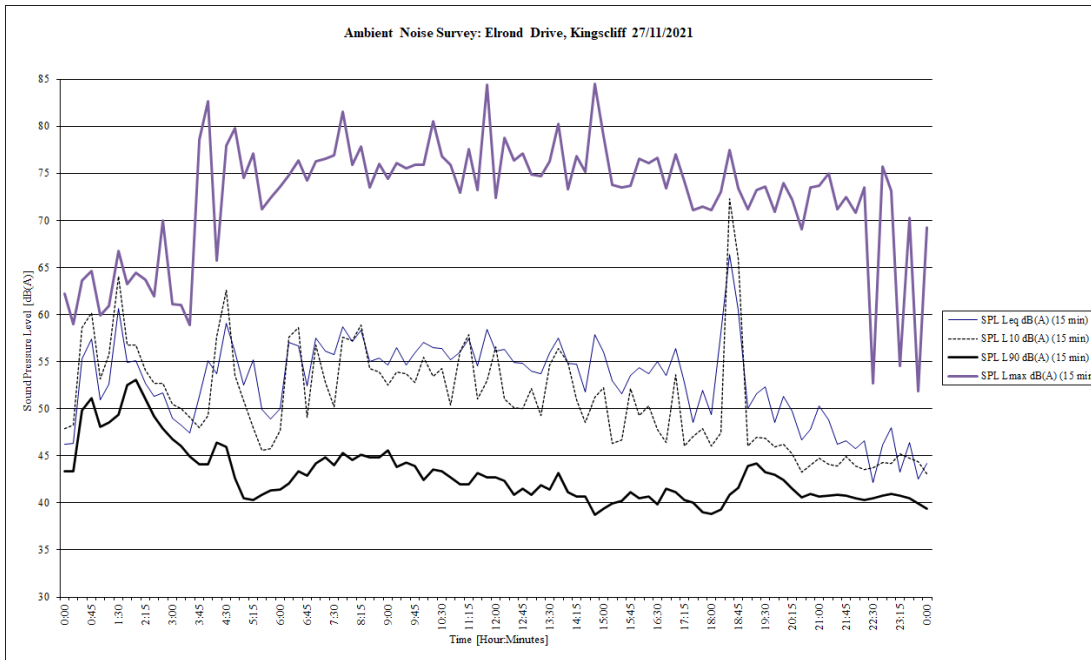


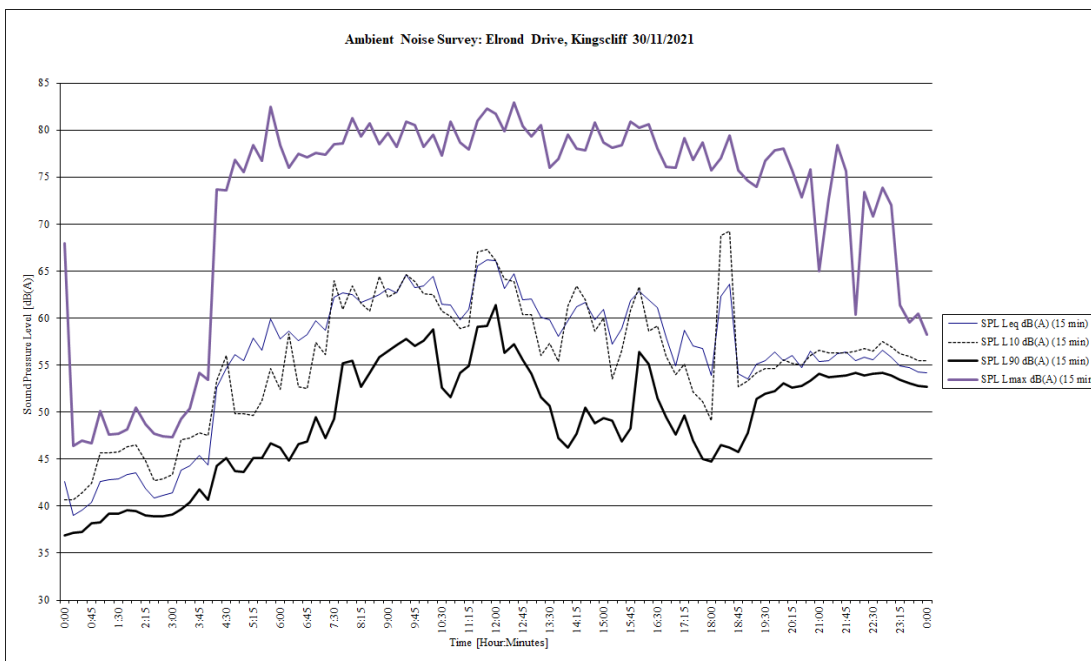
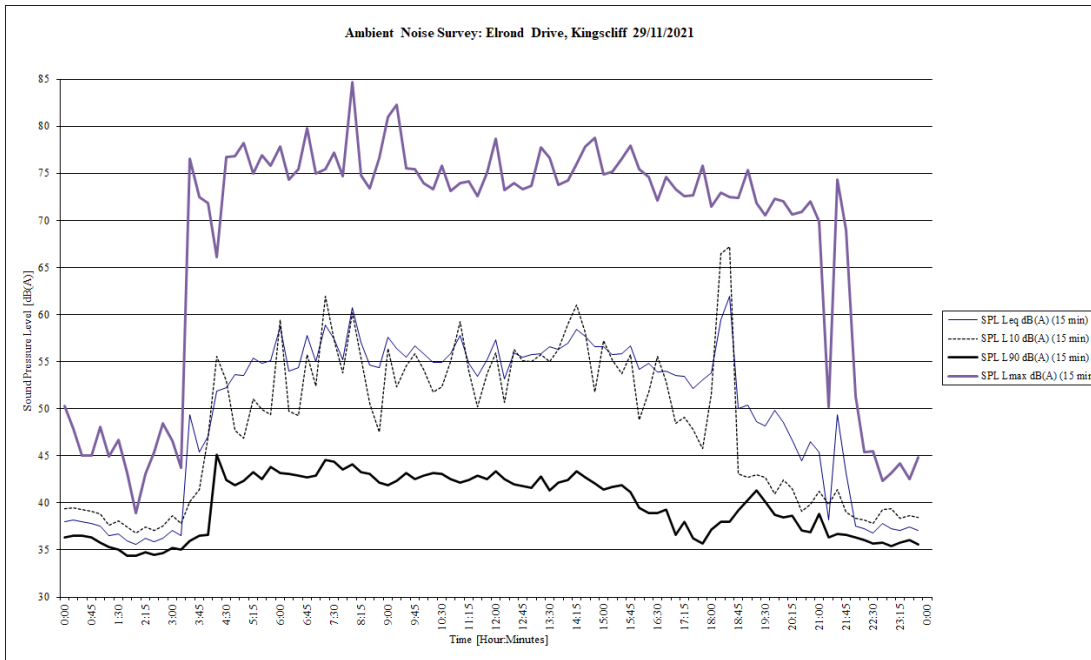
PROJECT: AUSTRALIAN BAY LOBSTER PRODUCERS SEAWATER INTAKE  
 SITE: ESC - HDD05 EXIT NOBLE LAKE  
 DRAWING: 047-HSE-DWG-008  
 FOR INFORMATION

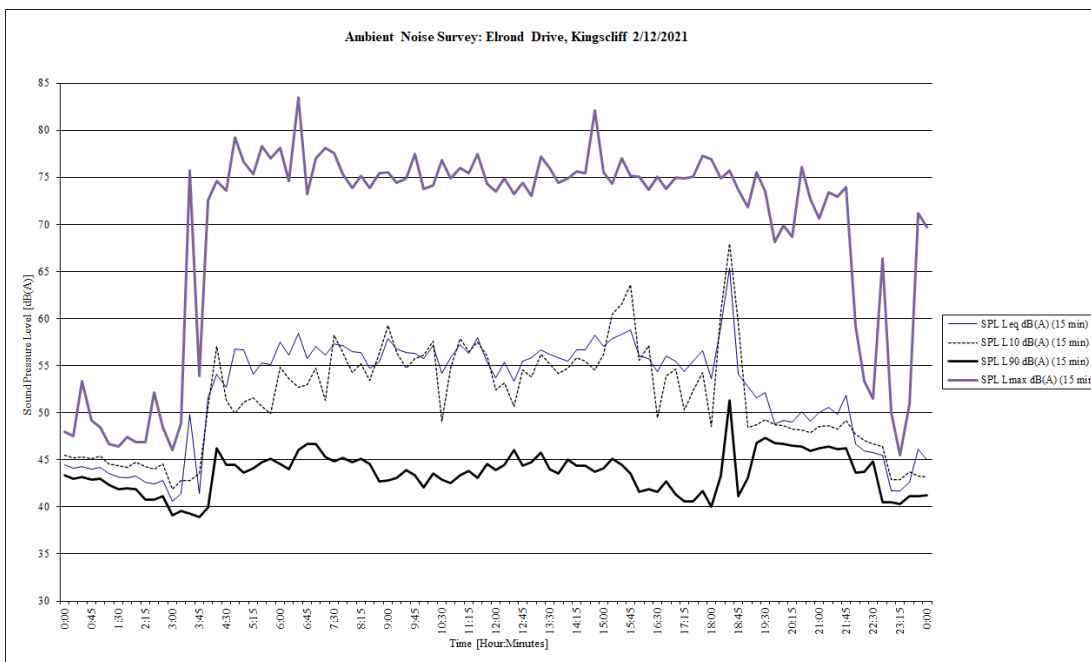
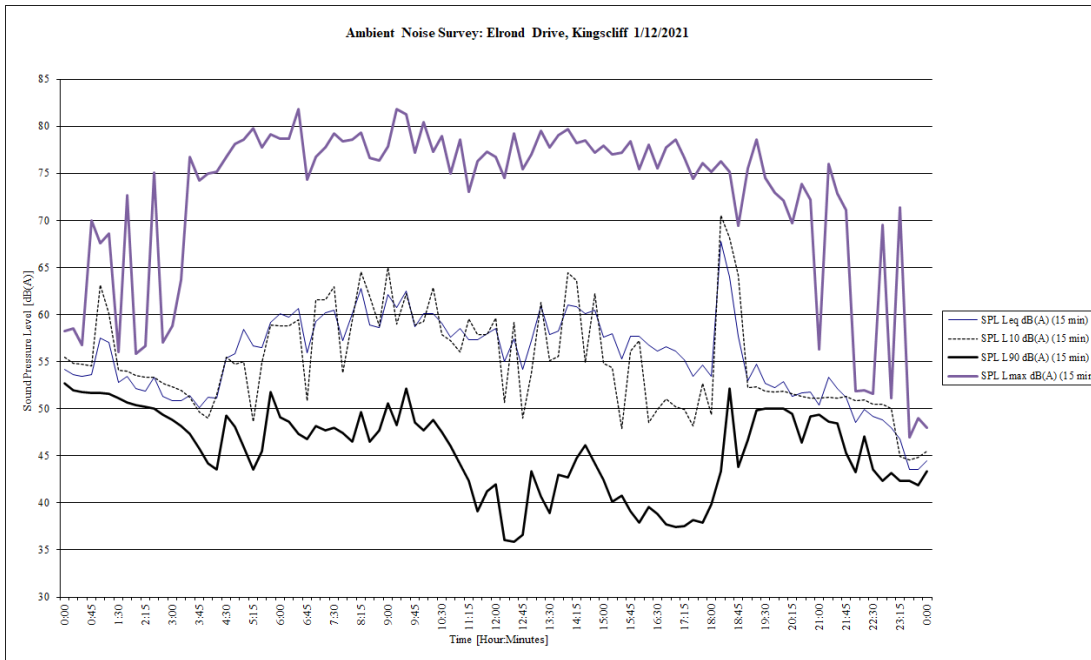
**APPENDIX B**

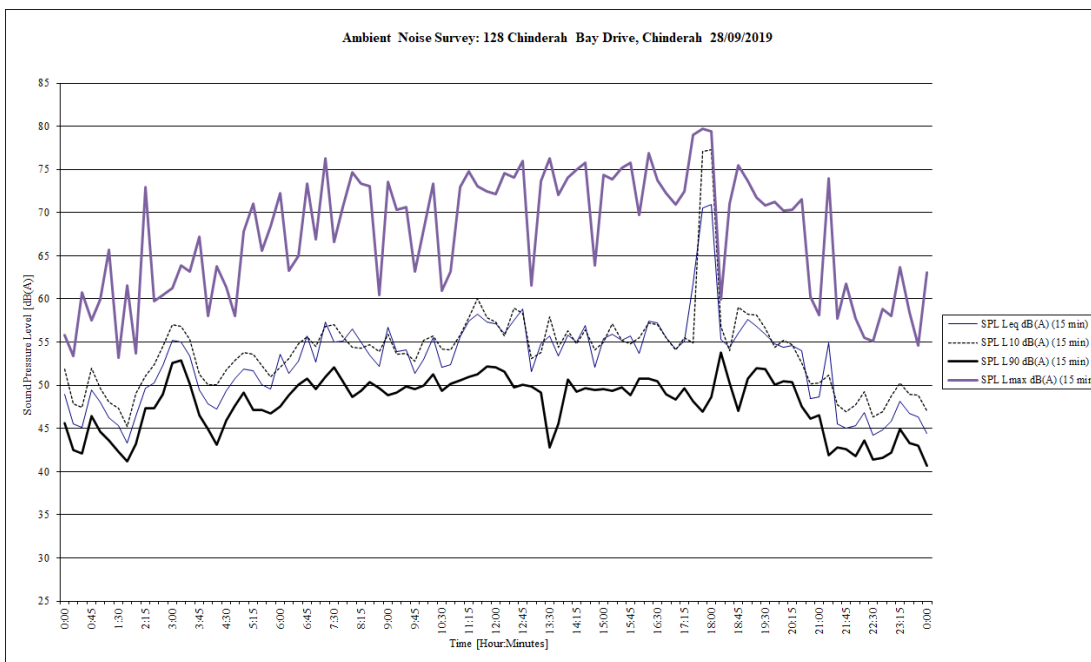
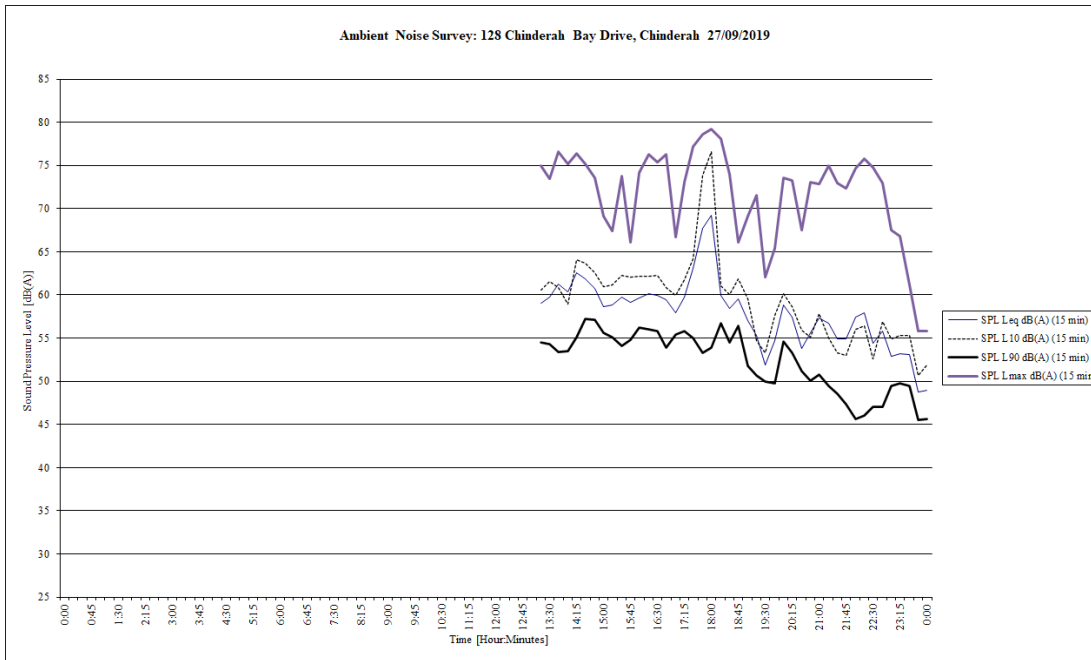
Logger Measurements Results and Noise Complaint Register Example

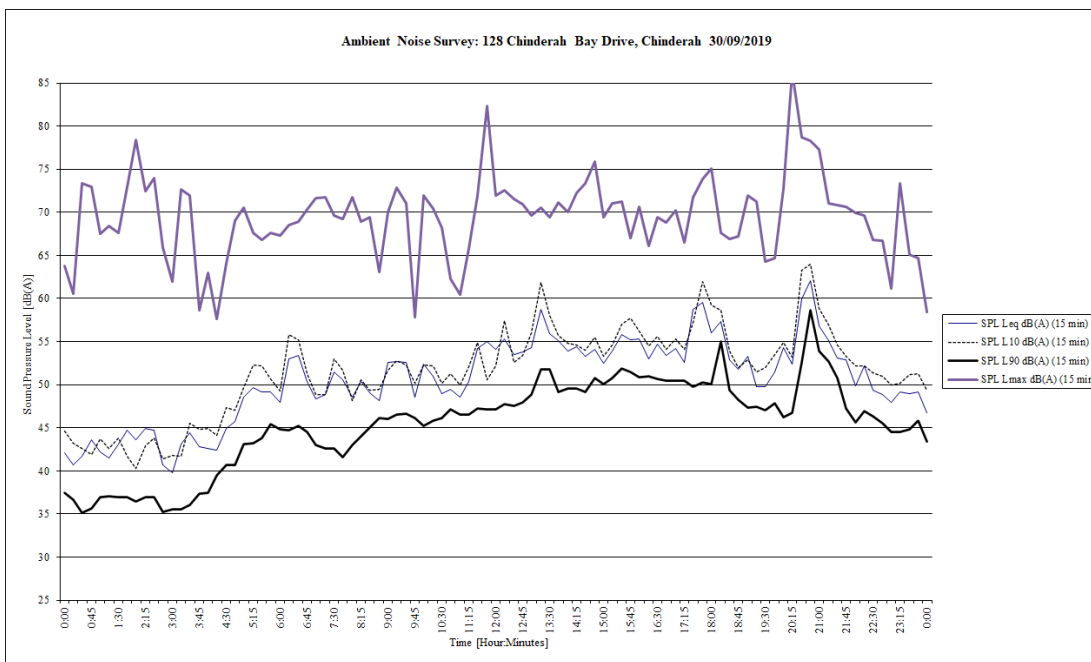
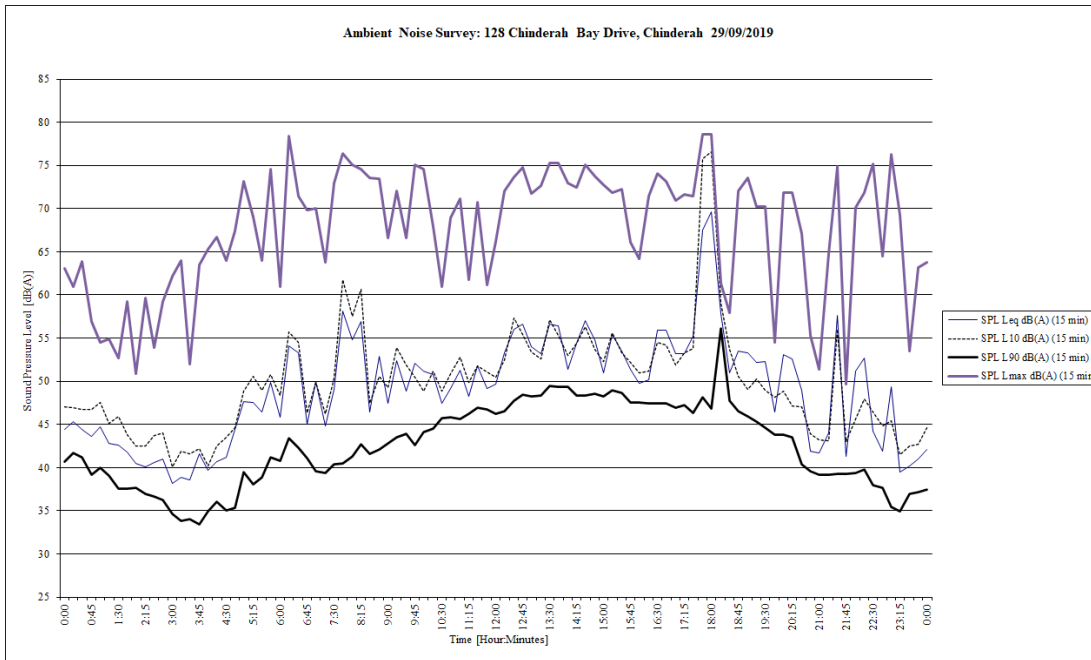


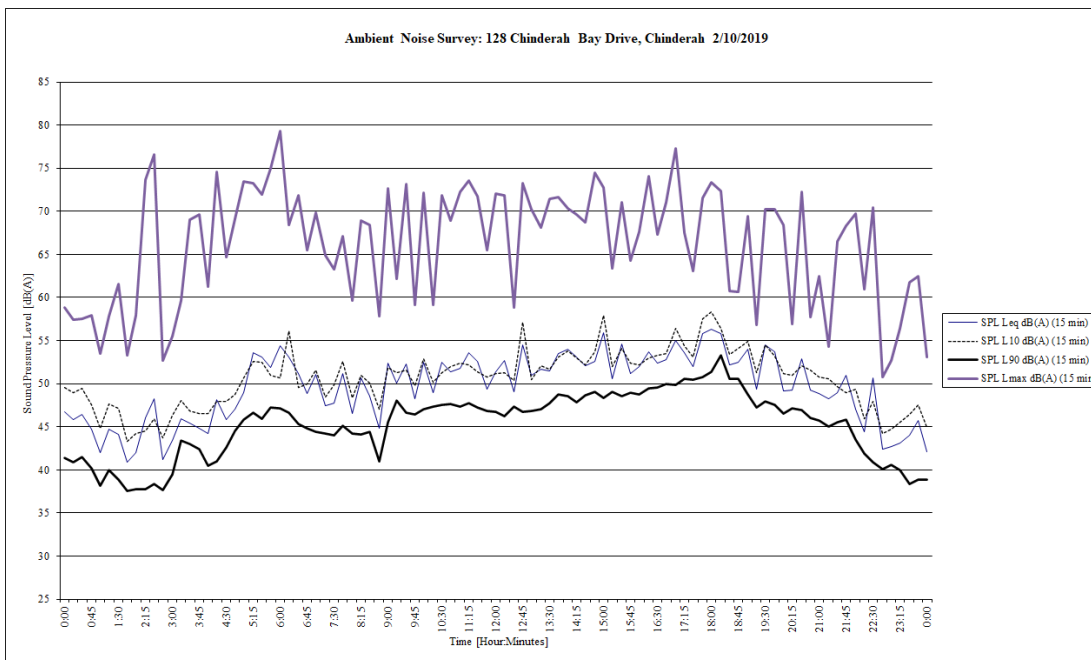
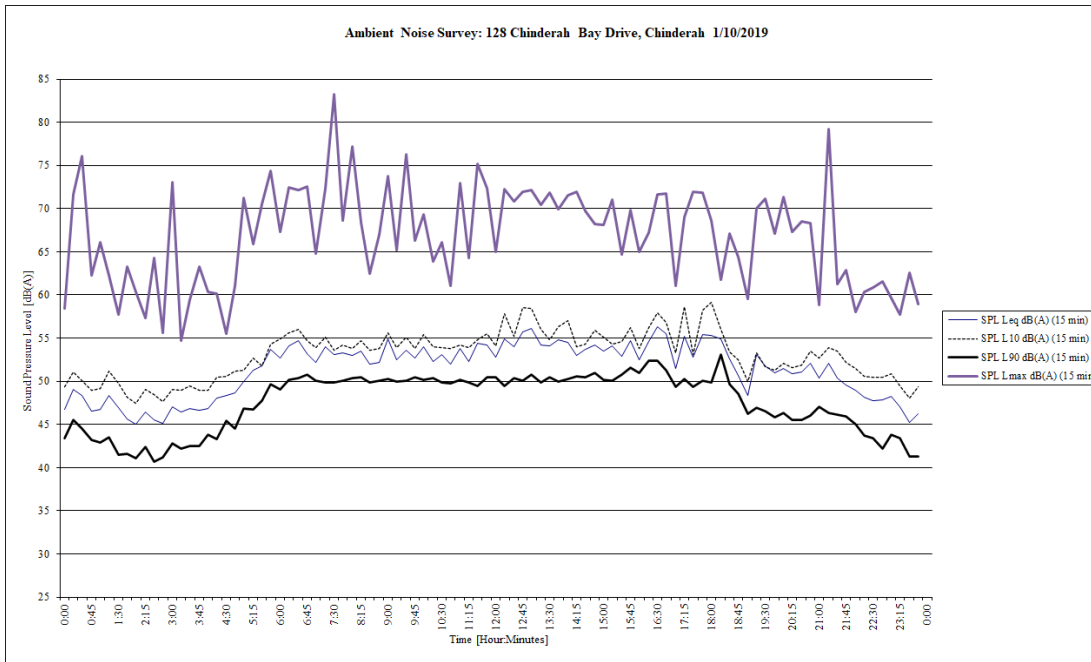


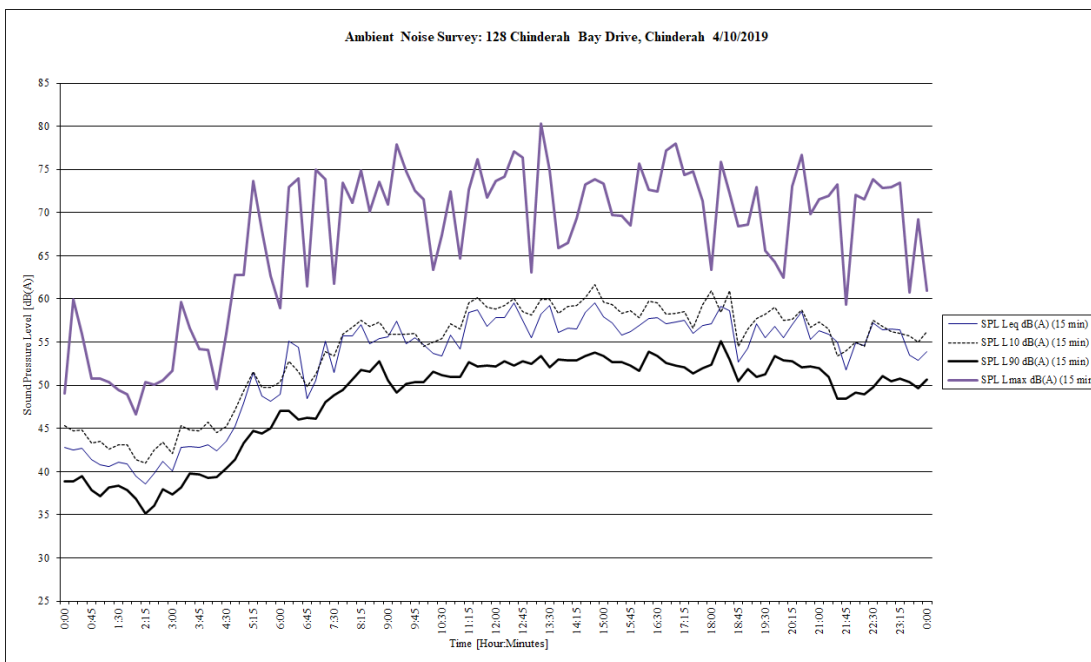
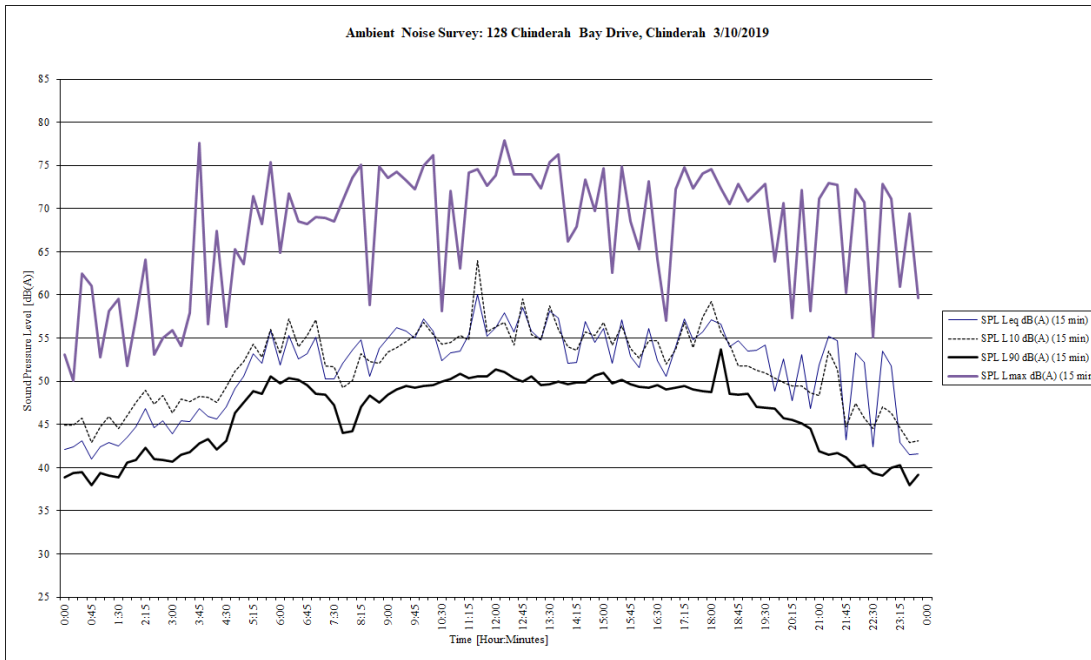


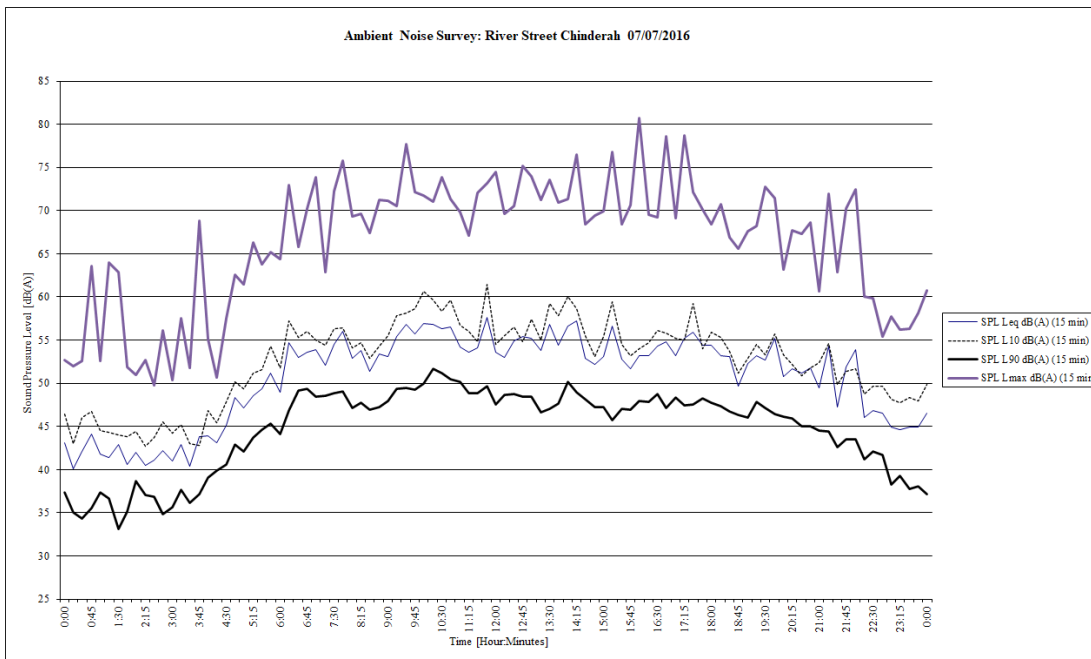
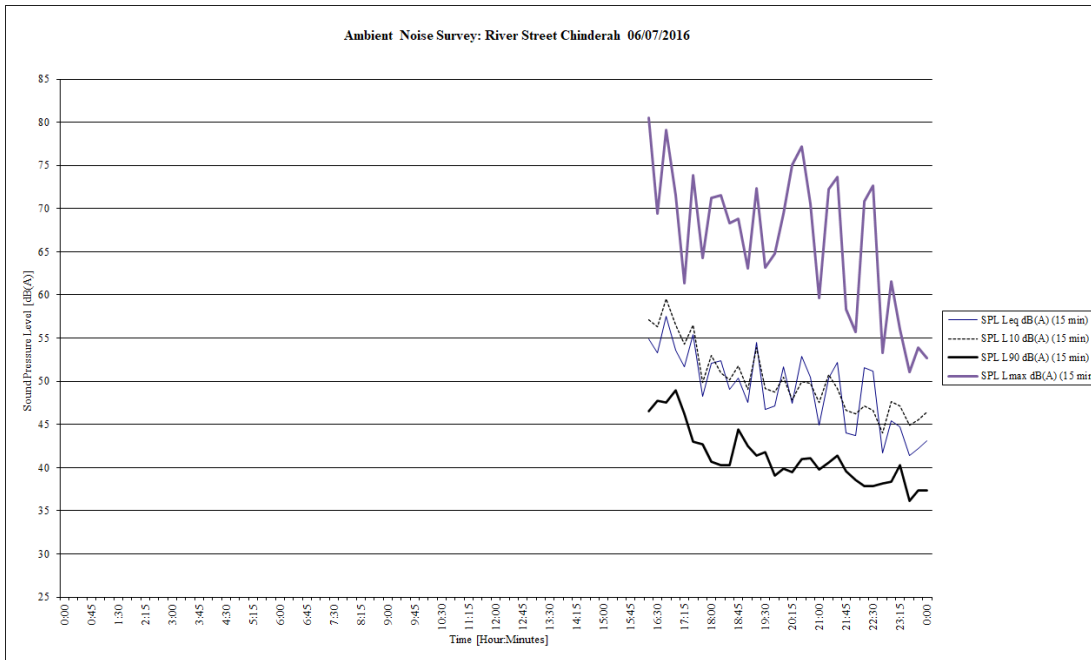


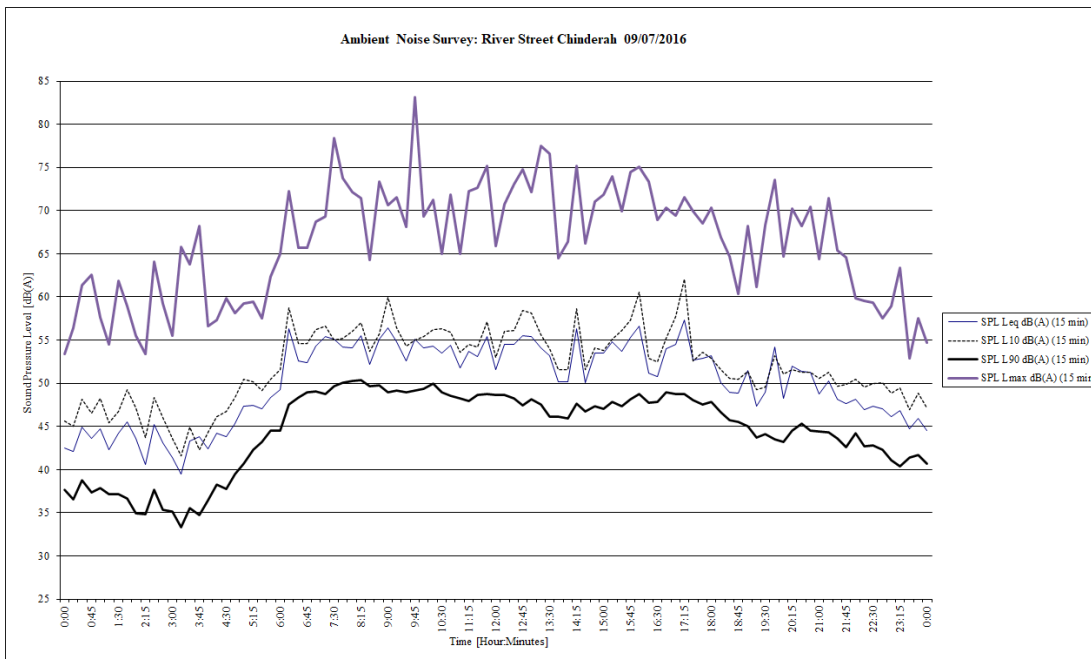
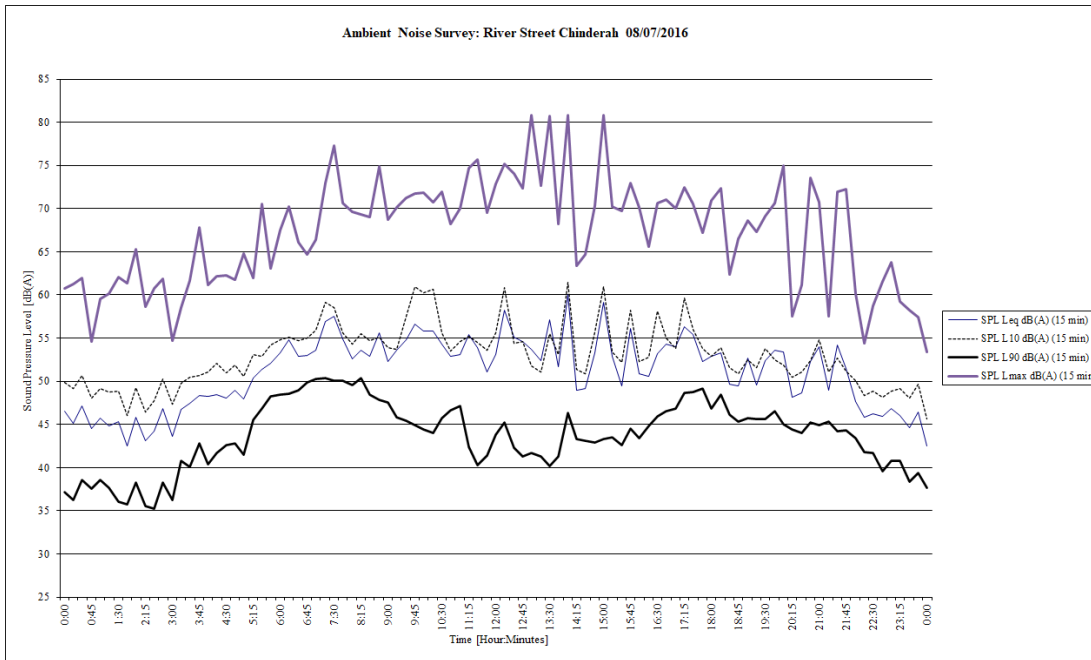


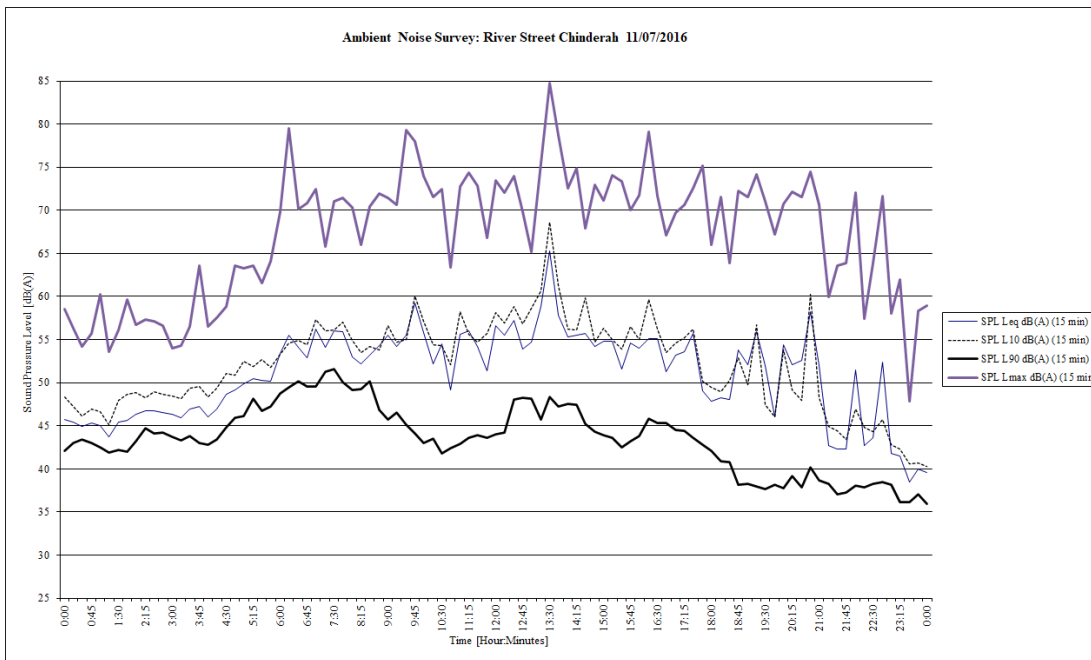
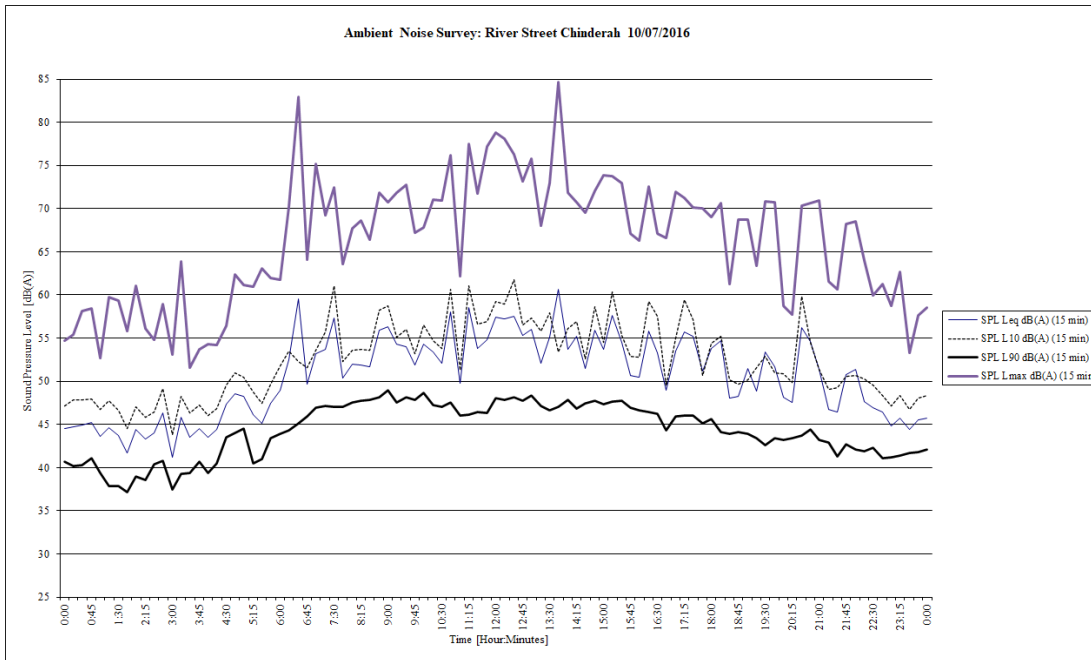


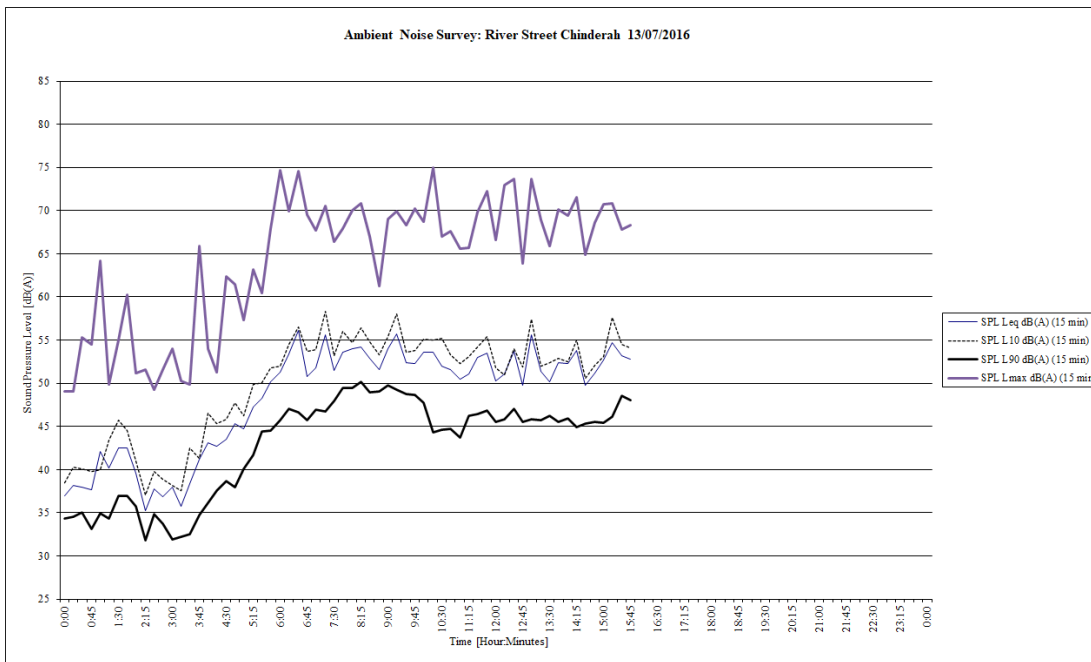
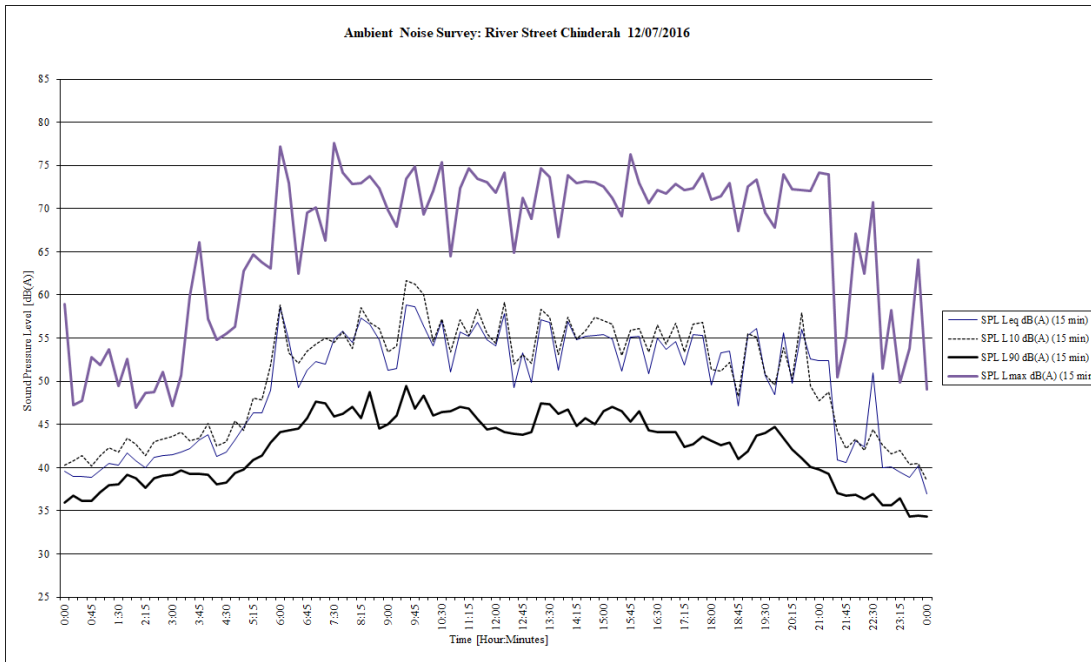


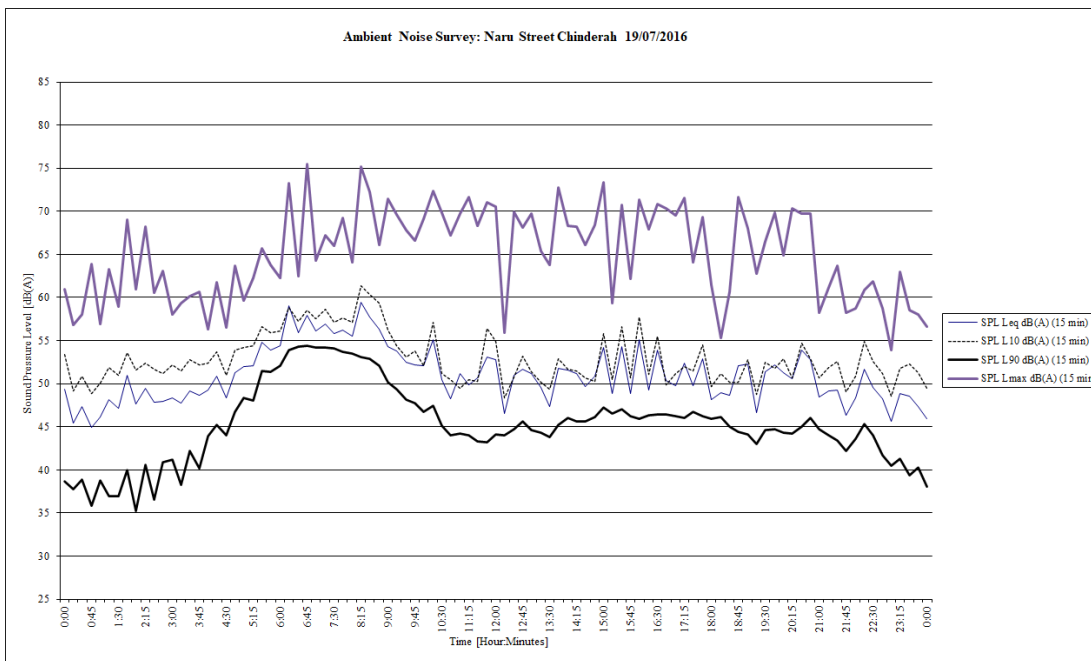
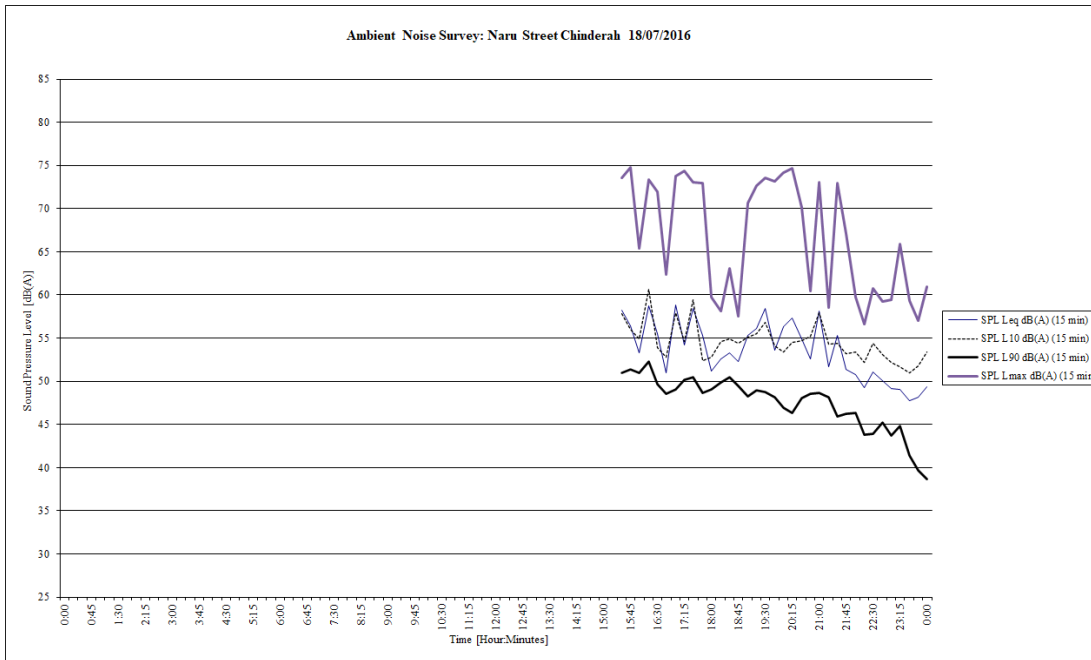


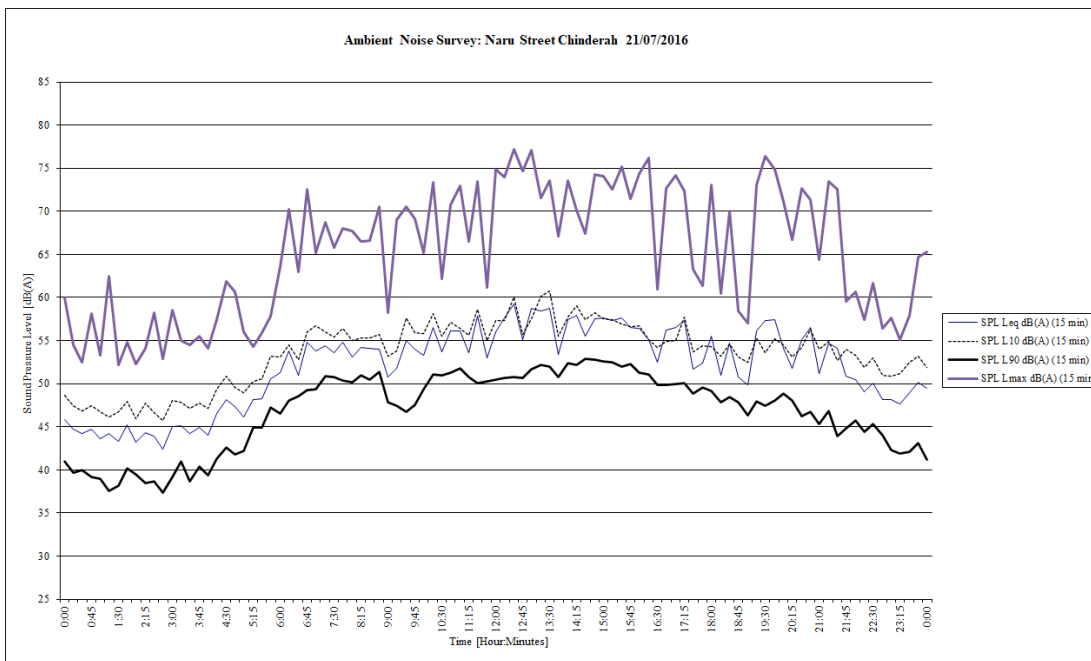
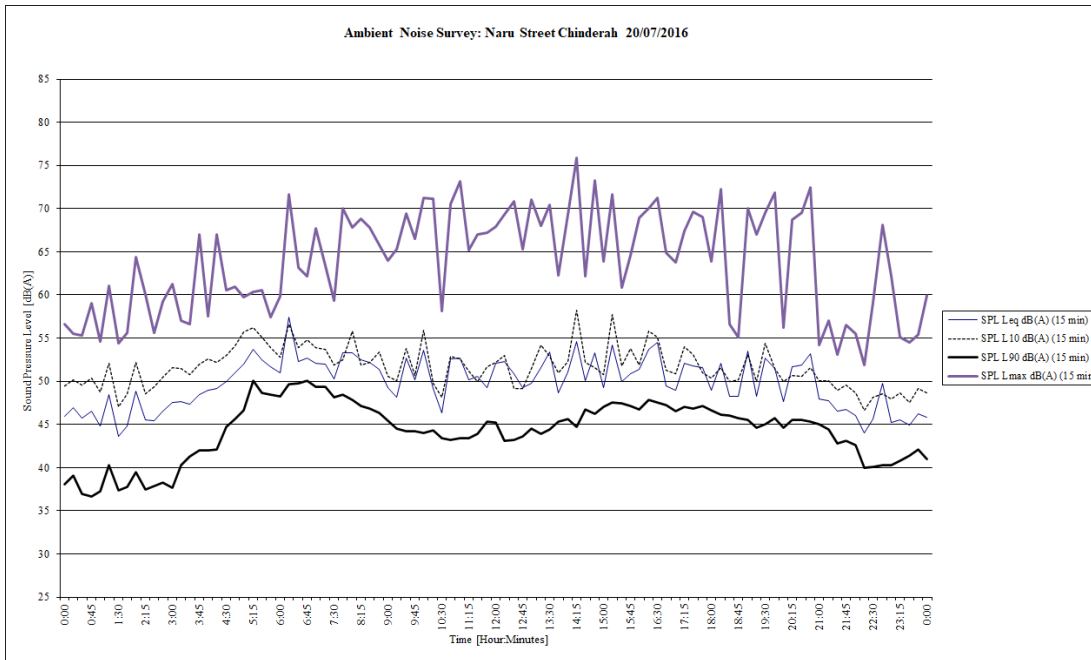


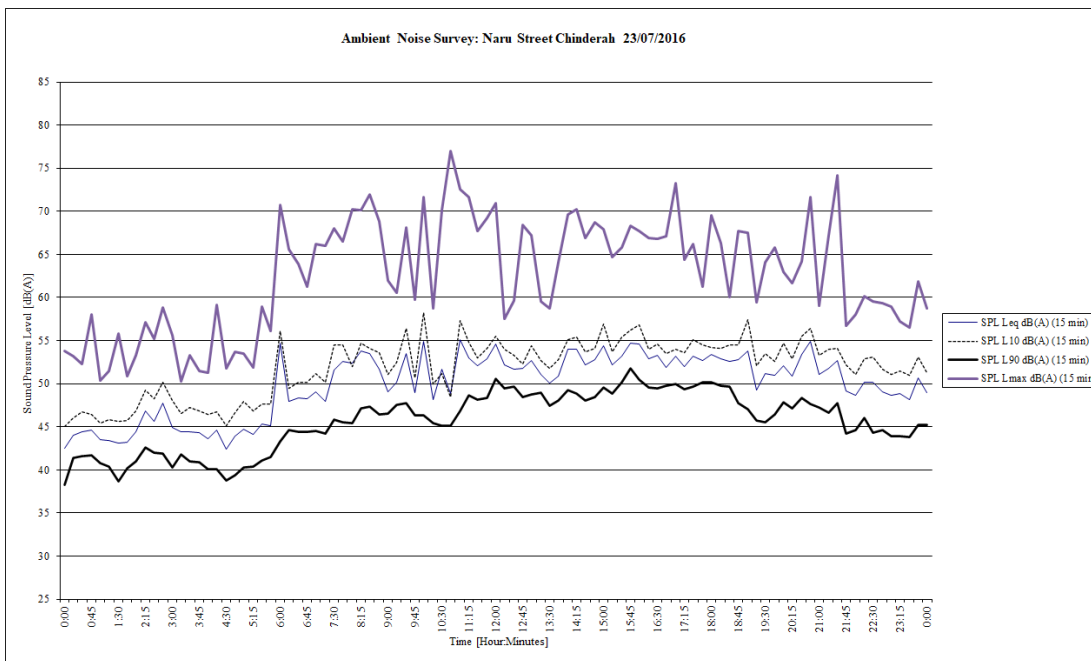
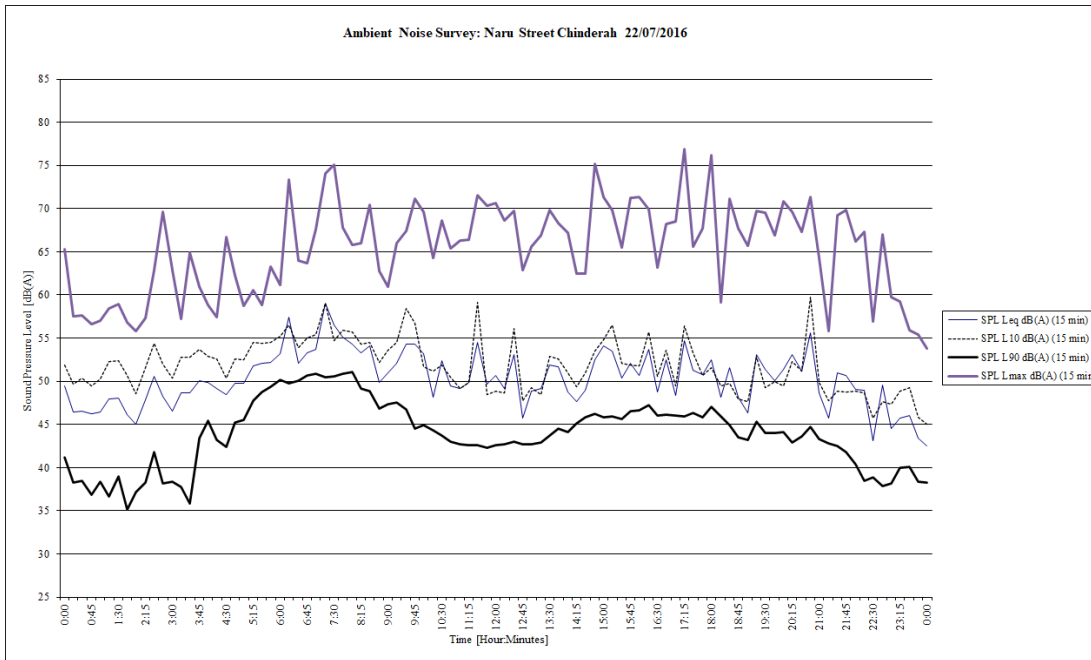


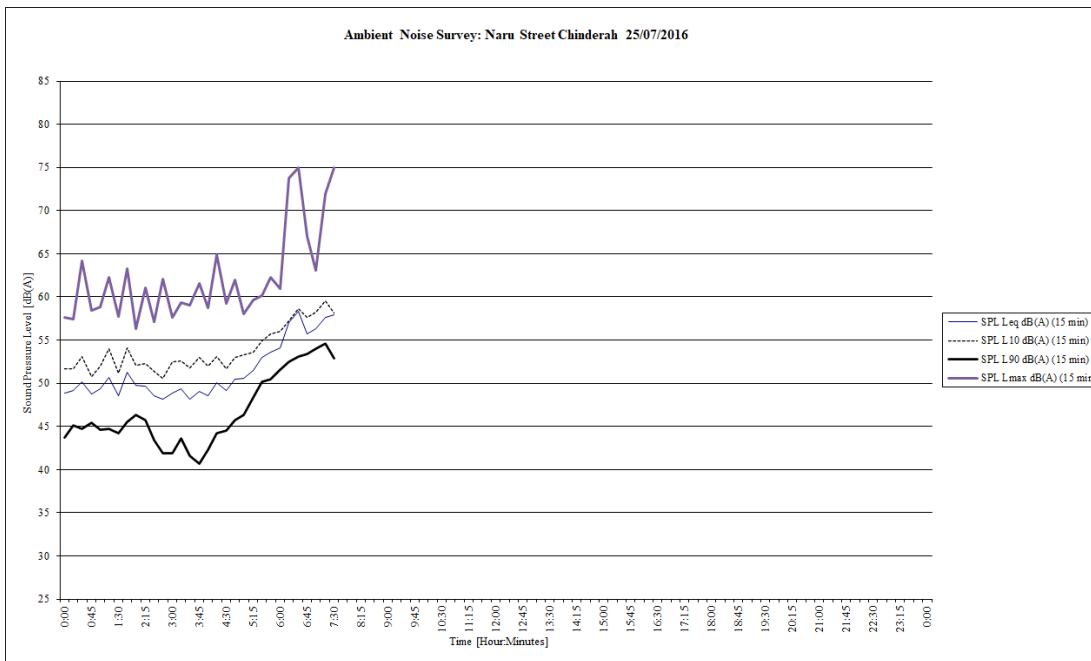
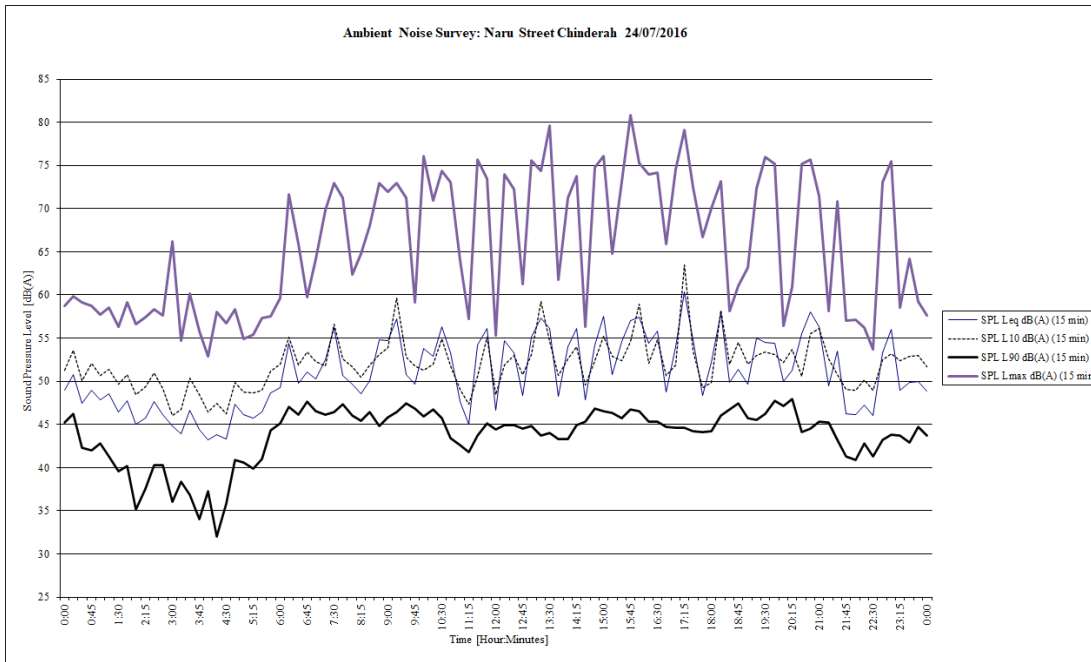












### Coolangatta, Queensland September 2019 Daily Weather Observations



Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours	km/h	local	°C	%	eighths	km/h	hPa	°C	%	eighths	km/h	hPa			
1	Su	8.1	23.4	0			ESE	41	12:23	19.7	49		SW	13	1020.9	21.7	53		SE	20	1017.8
2	Mo	10.4	24.3	0			N	35	11:53	20.1	57		NE	6	1019.4	22.3	60		NNE	19	1014.5
3	Tu	10.6	23.4	0			ESE	33	12:29	20.1	48		S	15	1018.6	21.3	45		E	15	1015.7
4	We	5.7	30.9	0			S	37	11:01	22.4	48		ENE	4	1015.6	24.4	46		SE	19	1012.3
5	Th	7.7	25.0	0			N	28	14:14	21.2	62		N	15	1016.3	23.7	64		N	13	1012.6
6	Fr	8.3	25.9	0			N	43	14:54	21.8	72		N	22	1013.6	24.3	63		N	31	1006.7
7	Sa	15.2	27.3	0			NW	41	02:52	20.4	22	8	NNW	19	1014.2	27.0	10	1	SW	13	1009.5
8	Su	4.6	23.5	0			E	37	14:04	18.4	25		SSW	7	1014.3	21.1	38		ENE	28	1009.1
9	Mo	12.8	23.8	0			SSW	54	20:17	18.7	27		WSW	17	1010.8	22.6	10		SW	31	1006.7
10	Tu	12.9	21.3	0			S	54	12:16	17.6	40	1	S	31	1019.3	19.0	48	8	SSE	31	1020.4
11	We	13.8	21.2	0			SE	50	12:34	17.3	61		SSE	22	1028.8	18.9	56		SE	35	1027.2
12	Th	8.3	21.3	0			NW	30	22:55	18.9	49		SSE	13	1028.2	19.6	53		NNE	20	1022.8
13	Fr	8.4	29.0	0			SSE	57	14:01	20.9	47		N	9	1019.9	23.9	24		SSE	33	1018.9
14	Sa	8.8	28.0	0			SSE	46	17:00	22.1	38		NW	20	1021.9	23.3	61		ENE	19	1017.7
15	Su	10.5	22.3	0			N	30	17:02	19.8	58	2	NE	9	1025.6	21.0	55		N	20	1022.3
16	Mo	15.1	24.0	0			N	48	11:44	22.2	51		NNW	24	1021.9	22.3	66		N	33	1016.8
17	Tu	16.0	23.3	0			NNW	65	17:52	21.4	61	6	ENE	9	1017.8	21.6	66	2	E	17	1014.6
18	We	11.9	22.7	5.4			E	33	12:48	20.2	32		WSW	13	1019.2	21.1	43		E	17	1018.8
19	Th	11.4	23.9	0			ESE	35	12:14	22.1	50		SSW	9	1024.0	21.5	61	1	ENE	20	1022.2
20	Fr	11.9	24.0	0			ESE	31	12:19	21.4	61		SSE	11	1026.6	22.5	60	1	ESE	22	1023.2
21	Sa	16.0	24.2	0			NNE	30	14:42	21.4	74	5	N	13	1026.5	22.9	68		NNE	20	1023.5
22	Su	18.6	24.8	0.2			N	41	13:45	20.6	78	3	N	20	1025.9	23.5	69		NNE	28	1022.4
23	Mo	18.7	27.7	0			N	44	13:00	23.8	52		NW	20	1022.9	23.6	68	4	N	22	1018.1
24	Tu	15.9	23.4	0			SE	44	08:59	21.4	50	1	SE	30	1026.1	20.7	52	8	E	17	1023.8
25	We	14.6	24.0	0			NNE	28	15:44	22.3	54	1	NE	11	1027.3	22.0	59	8	NNE	20	1024.4
26	Th	18.1	24.4	0.8			N	41	15:21	21.8	63	7	N	22	1026.8	22.3	62	2	N	28	1022.5
27	Fr	16.4	24.5	3.0			N	46	14:31	21.9	62	3	NNW	28	1022.5	22.5	65		N	35	1017.7
28	Sa	18.6	25.5	0.2			NNE	41	09:39	22.0	67		NE	20	1017.4	23.0	71	1	N	22	1012.8
29	Su	15.4	23.2	0			S	39	00:43	21.2	57		S	11	1019.8	21.9	58		NNE	19	1015.9
30	Mo	15.5	25.2	0			ESE	41	16:04	22.6	66	8	SSE	19	1020.9	22.7	65	7	ESE	24	1019.3
Statistics for September 2019		Mean	12.7	24.5						20.9	52	4		16	1021.1	22.3	53	3		23	1017.7
		Lowest	4.6	21.2						17.3	22	1	ENE	4	1010.8	18.9	10	1	#	13	1006.7
		Highest	18.7	30.9	5.4		NNW	65		23.8	78	8	S	31	1028.8	27.0	71	8	#	35	1027.2
		Total			9.6																

Observations were drawn from Coolangatta (station 040717)  
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day. Averages for Southport should be used as a guide only.

IDCJDW4036.201909 Prepared at 13:01 UTC on 7 Oct 2019  
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### Coolangatta, Queensland October 2019 Daily Weather Observations



Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours	km/h	local	°C	%	eighths	km/h	hPa	°C	%	eighths	km/h	hPa			
1	Tu	16.9	23.3	3.8			SSE	46	15:48	21.7	58		SE	28	1028.8	21.4	53	4	SE	28	1027.5
2	We	13.3	22.9	0.4			E	31	10:07	20.1	54	5	SSE	15	1030.5	21.4	47		ENE	20	1027.2
3	Th	9.4	23.6	0			NNE	31	09:59	21.0	48		N	22	1027.3	22.0	50		NNE	22	1023.8
4	Fr	13.9	24.6	0			N	41	15:49	22.7	53		N	24	1023.7	22.6	61		N	30	1019.9
5	Sa	16.9	27.1	0			SSE	57	15:05	22.3	56		SE	24	1020.8	22.8	60	7	SSE	33	1019.6
6	Su	15.6	23.8	0			NNW	35	22:28	21.7	56	3	NE	15	1021.9	22.2	60		NNE	20	1017.0
7	Mo	19.7	25.7	0			N	44	09:16	22.7	71		N	31	1015.1	23.4	76	6	N	24	1010.5
8	Tu	19.8	27.4	0			SSE	54	21:53	24.0	77		N	33	1011.0	23.5	78		N	22	1006.9
9	We	17.6		0								2	SE	28	1019.3						
Statistics for the first 9 days of October 2019		Mean	15.9	24.8						22.1	57	2		24	1022.0	22.4	60	5		24	1019.0
		Lowest	9.4	22.9						20.1	48	1	#	15	1011.0	21.4	47	4	#	20	1006.9
		Highest	19.8	27.4	3.8		SSE	57		24.0	77	5	N	33	1030.5	23.5	78	7	SSE	33	1027.5
		Total			4.2																

Observations were drawn from Coolangatta (station 040717)  
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day. Averages for Southport should be used as a guide only.

IDCJDW4036.201910 Prepared at 00:28 UTC on 9 Oct 2019  
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Coolangatta, Queensland  
July 2016 Daily Weather Observations



Date	Day	Temps		Rain	Evap	Sun	Max wind gust				9am					3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours	km/h	km/h	local	°C	%	heights	km/h	hPa	°C	%	heights	km/h	hPa		
1	Fr	10.0	22.1	0			NW	35	13:51	17.3	69		N	6	1019.5	21.7	35		WNW	13	1016.8
2	Sa	4.8	20.3	0			SE	30	13:27	15.9	42		SSW	13	1024.5	18.8	42		SE	19	1022.5
3	Su	7.9	20.6	0			E	24	14:42	15.6	74		Calm		1026.7	19.4	56		ENE	17	1023.2
4	Mo	6.1	21.1	0			N	22	17:51	14.8	84	3		Calm	1023.5	19.9	64		NNE	15	1018.9
5	Tu	13.3	19.2	8.4			NNW	33	04:33	17.6	95	8	W	13	1015.0	18.4	81	8	N	22	1011.1
6	We	7.1	18.8	2.0			WNW	39	10:00	14.0	50		WNW	11	1013.9	18.4	42		WNW	15	1010.1
7	Th	5.8	22.4	0			S	33	11:36	16.5	62		Calm		1013.2	21.8	43		SW	13	1012.2
8	Fr	9.5	22.3	0			SSW	26	23:55	18.4	67		WNW	2	1017.8	20.7	55	1	NNE	15	1014.7
9	Sa	8.3	20.9	0			SW	35	09:27	17.9	56		SSW	13	1020.4	20.2	48		SSW	15	1018.6
10	Su	13.6	22.1	0			SE	30	13:10	18.2	55	1	SSW	13	1023.6	20.6	60		SE	22	1020.7
11	Mo	11.9	22.3	0			N	35	12:37	18.3	81	7	NW	6	1021.3	20.6	72	8	N	22	1017.2
12	Tu	15.6	22.9	0			NNW	39	15:00	19.0	77	8	N	19	1018.0	22.4	64	8	NNW	26	1013.3
13	We	14.8	20.9	0			N	24	00:27	15.3	69	8		Calm	1020.0	18.0	45	8	SSW	7	1020.2
14	Th	12.3	17.0	0			SSW	31	08:11	15.7	48	8	SSW	20	1027.8	13.9	68	8	SSW	19	1026.3
15	Fr	12.0	17.3	0.2			SSW	30	15:15	15.3	70	8	S	15	1027.9	16.3	65	8	SSW	17	1025.3
16	Sa	14.8	18.9	0			S	30	03:28	16.0	69	7	SSW	17	1029.3	17.4	73	8	S	11	1026.6
17	Su	14.8	22.5	1.2			ESE	33	13:41	18.7	80	1	S	17	1027.7	20.9	68	2	SSE	19	1024.9
18	Mo	14.9	21.5	0.4			ENE	24	13:03	19.6	85		S	11	1026.7	21.1	71	7	ESE	11	1024.0
19	Tu	13.1	23.9	0.6			NNW	30	11:08	21.1	66		NW	13	1023.8	22.4	67		N	24	1020.5
20	We	12.6	24.5	0			N	35	13:59	21.0	77	8	NW	11	1022.1	22.8	68	2	N	28	1017.6
21	Th	17.5	23.7	0			ESE	26	13:44	19.9	79	7	SW	6	1018.3	21.9	77	8	SE	19	1015.5
22	Fr	14.1	24.7	0			N	41	15:22	20.8	79		N	13	1015.5	23.2	75		N	28	1010.0
23	Sa	14.7	29.6	0			W	46	13:44	23.1	71		N	26	1008.0	28.9	37		W	20	1006.2
24	Su	10.6	20.5	0			S	20	10:07	17.1	43		SSE	7	1016.8	19.1	50		NNE	15	1013.3
25	Mo	11.7	20.5	0			S	24	08:26	16.9	44		SSW	13	1018.1	19.4	41		ENE	13	1015.3
26	Tu	8.5	20.6	0			N	20	11:43	13.9	58	8	SW	6	1019.0	19.1	46	7	N	13	1015.7
27	We	11.8	20.5	0			WSW	20	08:16	14.4	71	7		Calm	1017.5	19.9	36	8	NNW	13	1015.4
28	Th	5.9	22.0	0			S	30	10:43	17.7	45		SSW	13	1023.6	20.3	48		SE	22	1021.7
29	Fr	7.2	23.4	0			N	30	14:05	17.1	68			Calm	1023.4	21.4	46		N	24	1019.1
30	Sa	6.3	22.2	0			E	28	13:54	16.9	62		SE	2	1020.8	21.0	52		ESE	20	1018.3
31	Su	12.1	22.9	0			N	30	15:48	18.8	74		NNE	9	1020.2	22.3	50		NNE	20	1016.2
<b>Statistics for July 2016</b>		Mean	11.1	21.7						17.5	68	6		9	1020.8	20.4	56	6		17	1017.8
		Lowest	4.8	17.0						13.9	42	1		Calm	1008.0	13.9	35	1	SSW	7	1006.2
		Highest	17.5	29.6	8.4		W	46		23.1	95	8	N	26	1029.3	28.9	81	8	N	28	1026.6
		Total			12.8																

Observations were drawn from Coolangatta (station 040717).  
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Coolangatta, Queensland  
December 2021 Daily Weather Observations



Date	Day	Temps		Rain	Evap	Sun	Max wind gust				9am					3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours	km/h	km/h	local	°C	%	heights	km/h	hPa	°C	%	heights	km/h	hPa		
1	We	20.2	25.5	81.8			SE	24	16:51	22.5	98	8	S	11	1012.9	22.4	96	6	SSE	9	1011.3
2	Th	20.8	28.6	8.4			SSE	41	13:22	25.0	70	5	SSE	24	1013.6	27.0	89	5	SE	24	1011.2
3	Fr	21.4	29.2	0.4			S	41	07:12	26.2	67		SSW	20	1014.7	27.3	67		SE	30	1012.9
4	Sa	19.4	27.7	0			SSE	72	18:33	25.9	63		NNE	13	1013.1	26.4	66		NNE	19	1008.9
5	Su	17.3	26.8	11.2			SSE	61	09:08	23.9	70	8	S	28	1014.5	25.8	56		SE	28	1014.0
6	Mo	18.8	27.1	1.6			ESE	35	13:08	24.5	64	1	SSE	20	1016.1	25.4	64	1	E	19	1013.7
7	Tu	19.8		2.6						23.9	78	4	S	9	1014.2						
<b>Statistics for the first 7 days of December 2021</b>		Mean	19.7	27.5						24.6	72	5		17	1014.2	25.7	69	4		21	1012.0
		Lowest	17.3	25.5						22.5	63	1	S	9	1012.9	22.4	56	1	SSE	9	1008.9
		Highest	21.4	29.2	81.8		SSE	72		26.2	98	8	S	28	1016.1	27.3	96	6	SE	30	1014.0
		Total			106.0																

Observations were drawn from Coolangatta (station 040717).  
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Coolangatta, Queensland  
November 2021 Daily Weather Observations



Date	Day	Temps		Rain	Evap	Sun	Max wind gust				9am				3pm						
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours	km/h	local	°C	%	eighths	km/h	hPa	°C	%	eighths	km/h	hPa			
1	Mo	14.5	24.7	1.4			E	35	11:55	20.8	57	8	ESE	20	1026.5	22.1	46	7	SE	20	1024.3
2	Tu	17.9	23.4	0.2			ESE	39	15:10	18.4	85	8	S	13	1026.3	21.2	64	8	ESE	22	1024.4
3	We	15.0	24.8	1.0			SSE	37	09:48	23.4	57	8	SE	19	1026.0	22.3	53	5	ESE	20	1023.1
4	Th	14.1	25.0	0			NE	30	12:44	23.0	49	8	ENE	15	1022.8	22.5	54	5	NE	20	1019.5
5	Fr	17.6	23.4	0			ESE	33	09:27	21.0	68	8	SSE	9	1020.8	21.8	65	8	ENE	22	1017.5
6	Sa	16.5	24.6	2.6			NE	26	10:55	19.1	82	8	SSW	9	1017.3	22.7	62	8	NNE	13	1013.6
7	Su	18.1	26.2	0.2			N	41	15:46	23.0	74	5	N	26	1013.0	24.9	69	8	N	31	1009.2
8	Mo	20.7	25.7	7.0			N	46	08:07	21.0	90	6	NNW	31	1008.6	24.4	79		NE	20	1005.8
9	Tu	19.0	26.9	0.4			ESE	33	13:32	25.0	68	4	SSE	13	1012.0	24.0	72	8	E	17	1010.6
10	We	20.9	26.5	0			N	33	23:48	24.0	81	7	NNE	13	1012.6	24.6	85	5	NNE	17	1008.1
11	Th	22.4	27.6	3.8			N	44	09:03	24.7	83		N	31	1005.9	24.4	87	8	NNW	15	1004.0
12	Fr	21.8	28.9	4.4			NNW	48	04:38	24.6	85		NW	19	1001.9	27.1	69	3	N	31	998.4
13	Sa	17.2	27.4	0.2			W	48	15:09	22.2	39		NNE	13	1006.5	26.8	27	1	WSW	26	1004.4
14	Su	10.2	28.8	0			NNE	43	13:02	24.1	31		WNW	13	1012.1	28.0	23		WNW	20	1007.7
15	Mo	10.0	31.2	0			NW	41	14:01	22.7	51		NNE	15	1012.3	30.6	15		WNW	24	1007.8
16	Tu	13.2	28.2	0			ESE	30	10:32	26.5	25		ESE	19	1015.4	24.3	53	4	ESE	15	1013.9
17	We	18.3	26.1	0			SE	41	10:58	24.4	57	1	SE	26	1022.3	24.2	54	1	SE	28	1020.3
18	Th	18.0	25.7	0			NE	26	12:49	23.1	58	8	N	13	1022.5	23.9	55	1	NNE	19	1018.6
19	Fr	13.8	26.3	0			N	39	11:34	24.8	59	3	N	24	1018.2	24.6	64		N	28	1014.8
20	Sa	20.0	27.3	0			N	41	10:12	25.6	63		N	28	1014.8	24.5	75	8	N	22	1011.7
21	Su	20.6	25.2	0			S	19	01:06	22.9	82	7	N	9	1013.5	24.3	74	8	ENE	13	1011.7
22	Mo	20.3	24.5	1.2			SSE	33	11:55	23.2	79	8	S	19	1014.7	23.6	74	8	SSE	22	1013.5
23	Tu	19.0	27.4	17.4			E	33	13:14	23.6	80	8	ENE	19	1016.8	25.8	65	8	ESE	24	1014.8
24	We	21.2	26.6	2.0			ENE	41	09:15	24.7	78	8	ESE	19	1016.4	24.7	82	8	ENE	20	1014.0
25	Th	21.3	23.9	12.4			N	43	18:22	23.5	89	8	NE	9	1013.7	22.8	94	8	N	11	1010.7
26	Fr	21.1	26.1	25.0			N	50	12:40	23.4	87	8	N	22	1008.8	25.0	85	8	N	24	1005.5
27	Sa	20.8	25.8	36.0			S	43	12:52	24.1	75	8	S	24	1011.4	24.2	70		S	26	1011.1
28	Su	20.0	25.8	0			S	46	09:25	22.1	72	8	S	26	1017.2	23.9	67	8	S	20	1016.1
29	Mo	19.1	26.9	0			SE	43	13:31	25.4	70	5	S	20	1018.5	26.1	63	1	SE	31	1016.4
30	Tu	20.2	22.7	12.2			S	30	07:25	20.3	96	8	S	17	1015.6	21.7	97	8	SSW	9	1012.6
<b>Statistics for November 2021</b>																					
Mean	18.1	26.1							23.2	69	6		18	1015.5	24.4	64	6		21	1012.8	
Lowest	10.0	22.7							18.4	25	1	#	9	1001.9	21.2	15	1	SSW	9	998.4	
Highest	22.4	31.2	36.0				N	50	26.5	96	8	#	31	1026.5	30.6	97	8	#	31	1024.4	
Total			127.4																		

Observations were drawn from Coolangatta (station 040717)  
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## NOISE COMPLAINT REGISTER

### Initial Complaint Recording

Date & Time of record: \_\_\_\_\_

Name of Complainant (if given): \_\_\_\_\_

Complainant Telephone Number: \_\_\_\_\_

Address of complainant (if given): \_\_\_\_\_

\_\_\_\_\_

Identification and description of source (e.g. noisy truck): \_\_\_\_\_

\_\_\_\_\_

Time of day noise is occurring: \_\_\_\_\_

Number of days the noise has occurred: \_\_\_\_\_

### Complaint Investigation & Remediation

Recommended control (e.g. fit new muffler): \_\_\_\_\_

Verification that controls have been implemented: \_\_\_\_\_

### Follow-up Complainant

Contact date: \_\_\_\_\_

Complainant comment (e.g. is noise still annoying ? – if yes, refer to Note below): \_\_\_\_\_

#### NOTE

If complainant is still affected after all reasonable steps have been taken to ameliorate the noise, specialist advice should be sought from a qualified acoustical consultant.

# B4 – WASTE MANAGEMENT PLAN

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

<b>Current Version</b>	B
<b>Current Version Date</b>	21 January 2022
<b>Status</b>	Final

#### Amendments

<b>Version Number</b>	<b>Version Date</b>	<b>Authorised by</b>	<b>Amendment Details</b>
A	23 November 2021	ABLP	Original Publication
B	21 January 2022	ABLP	N/A

## **B4 – WASTE MANAGEMENT PLAN**

### **1 Purpose and Scope**

The purpose of this document is to detail the waste management strategy for the construction of stage two of the Australian Bay Lobster Producers Limited Seawater Supply Pipeline. Table B4-1 integrates the objectives and management measures to be used during the construction phase and sets out how the objectives can be accomplished by nominating responsible persons and establishing performance indicators, required management actions, monitoring, corrective actions and reporting procedures.

### **2 Responsibility**

It is the responsibility of the Environmental Manager / Representative to ensure that this management plan is periodically reviewed and updated.

### **3 Generated Waste**

All waste generated on-site during construction and operation of the development must be classified in accordance with the Environmental Protection Authority's publication '*Waste Classification Guidelines*' and disposed of at a location that may lawfully accept that waste.

**Table B4-1: Waste Management Plan**

Item	Action
<b>Objective</b>	To prevent environmental nuisance occurring due to the generation of waste from construction activities.
<b>Responsible Person(s)</b>	Site Manager or, if nominated, Site Environmental Officer
<b>Performance Criteria</b>	<ul style="list-style-type: none"> <li>○ Waste is reduced at the source wherever possible.</li> <li>○ No uncontained waste to be stored on site.</li> <li>○ Adequate waste collection</li> </ul>
<b>Potential Waste Materials</b>	<ul style="list-style-type: none"> <li>○ Virgin Excavated Natural Material (VENM)</li> <li>○ Excavated Natural Material (ENM)</li> <li>○ Acid Sulfate Soils (ASS)</li> <li>○ Potential Acid Sulfate Soils (PASS)</li> <li>○ Drilling fluids/mud</li> <li>○ Contractor waste (paper, plastic bag, cans etc.)</li> </ul>
<b>Waste Management Hierarchy (WMH)</b>	<ol style="list-style-type: none"> <li>1. Waste avoidance (elimination and substitution)</li> <li>2. Waste reduction</li> <li>3. Waste reuse</li> <li>4. Waste recycling</li> <li>5. Waste treatment</li> <li>6. Waste disposal</li> </ol>

<b>Actions</b>	<ul style="list-style-type: none"> <li>○ Adhere to the WMH by minimising the quantity of waste generated and reusing or recycling waste where possible before disposal to an authorised waste receiver.</li> <li>○ All waste must be classified accordance to the EPA's <i>Waste Classification Guidelines</i> and disposed of at a facility which may lawfully accept the waste. This shall include separation as a minimum (but not exclusive) of oily material, recyclable materials (carboard, plastic metals etc.) and general waste.</li> <li>○ Hazardous/industrial waste shall be stored/disposed of in a manner so as to minimise its impact on the environment.</li> <li>○ Waste generated outside the site shall not be received on site for storage, treatment, processing or disposal unless permitted in accordance with ABLP's development approval.</li> <li>○ Waste removal contractors are to be qualified for the removal of the respective waste material for which they are engaged.</li> <li>○ Waste will be stored in a manner that securely contains the waste and minimises the potential for the off-site transport via wind or water. Wherever practicable waste bins shall be stored in the material storage area rather than spread across the site.</li> <li>○ Acid sulfate soils or potential acid sulfate soils will be managed in accordance with the Acid Sulfate Soil Management Plan provided at Attachment B2-1. The management of this material will be in accordance with the WMH in that ASS or PASS soils are to be treated for reuse where possible, otherwise disposed of at a licenced waste facility.</li> <li>○ Drilling fluid is to be managed in accordance with the Drilling Fluid Waste Management Plan at Attachment B4-1.</li> <li>○ Employee waste will be separated according to its type (recycling, general rubbish etc.) and contained in sealed, plastic lined bins for disposal via ABLP's industrial waste bins.</li> <li>○ Uncontained waste is to be immediately disposed of into the waste disposal bins provided.</li> <li>○ Waste management measures are to be implemented at all times during construction.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>○ Visual inspections are to be undertaken upon receiving a complaint, weekly or upon request from the administering authority to identify signs of:             <ul style="list-style-type: none"> <li>- Uncontained waste material; or</li> <li>- Waste material transported off site other than by a permitted person.</li> </ul> </li> </ul>
<b>Reporting</b>	<ul style="list-style-type: none"> <li>○ Complaints regarding waste are to be reported to the Site Manager and Environmental Manager / Representative as soon as practicable and recorded on Form C1 – Incidents / Complaints (CEMP Attachment C).</li> <li>○ Visual inspections are to be recorded on Form C2 – Site Inspection (CEMP Attachment C).</li> <li>○ The Site Manager is to notify the Tweed Shire Council or Department of Planning, Industry and Environment of any significant pollution occurring onsite.</li> </ul>

<b>Training</b>	<ul style="list-style-type: none"> <li>○ Ensure site management and staff are familiar with the requirements of this Waste Management Plan.</li> <li>○ Incorporate training for environmental aspects including a person's responsibilities in relation to this management plan as part of site induction.</li> </ul>
<b>Corrective Action Triggers</b>	<ul style="list-style-type: none"> <li>○ Waste generated exceeds waste removal.</li> <li>○ Uncontained waste found on site.</li> <li>○ Waste generated on site found beyond the boundaries of the site.</li> </ul>
<b>Corrective Actions</b>	<ul style="list-style-type: none"> <li>○ Where appropriate:             <ul style="list-style-type: none"> <li>- Contact waste contractor for removal of waste from site.</li> <li>- Remind contractors of their duty to utilise the provided waste disposal bins.</li> <li>- Immediately collect uncontained waste items and dispose of appropriately.</li> <li>- Review the containment practice of the waste disposal facility.</li> </ul> </li> </ul>

# **Attachment B4-1**

## **Drilling Fluid Waste Management Plan**



**DRILLING FLUID & WASTE MANAGEMENT  
PLAN**



SEAWATER SUPPLY PIPELINE | 096-CST-PLN-001  
Prepared for Australian Bay Lobster Producers





Revision	Issued for	Date	Author	Checked	Approved
0	Issued for Construction	15/09/2021	Colin Harris	Paul Tredenick	John Whitbread

# TABLE OF CONTENTS

<b>1</b>	<b>DOCUMENT PURPOSE</b> .....	<b>4</b>
<b>2</b>	<b>PROJECT SCOPE</b> .....	<b>5</b>
<b>3</b>	<b>ABBREVIATIONS AND DEFINITIONS</b> .....	<b>6</b>
<b>4</b>	<b>REFERENCE</b> .....	<b>8</b>
4.1.	Relevant Standards .....	8
<b>5</b>	<b>HDD DRILLING FLUID DESIGN</b> .....	<b>10</b>
5.1.	Drilling Fluid Purpose .....	10
5.2.	Drilling Fluid Process .....	10
5.3.	Drilling Fluid Properties .....	12
<b>6</b>	<b>DRILLING FLUID MANAGEMENT</b> .....	<b>18</b>
6.1.	Drilling Fluid System Loop .....	18
6.2.	Separation System .....	18
6.3.	Cuttings and Displacement Disposal .....	21
6.4.	Drilling Fluid Monitoring .....	24
6.5.	Drilling Fluid Reporting .....	26
<b>7</b>	<b>DRILLING FLUID MANAGEMENT DESIGN</b> .....	<b>28</b>
<b>8</b>	<b>DRILLING FLUID LOSS RESPONSE</b> .....	<b>29</b>
8.1.	Responsibility .....	29
8.2.	Fluid Loss Prevention .....	30
8.3.	No-Go Zones .....	30
8.4.	Public Areas .....	30
8.5.	Potential Fluid Loss Indicators .....	31
8.6.	Fluid Loss Response and Remediation .....	33
8.7.	Fluid Loss Procedure .....	34
8.8.	Response Close-Out Procedure .....	35
8.9.	HDD Operations Restart .....	35
8.10.	Communication and Reporting .....	35
<b>9</b>	<b>DRILLING FLUID PRODUCTS SDS</b> .....	<b>37</b>
<b>10</b>	<b>CLEAN FILL DISPOSAL COMPLIANCE</b> .....	<b>38</b>
10.1.	Disposal Material Legislation .....	38
10.2.	Disposal Material Classification .....	39
10.3.	Disposal Environmental Classification .....	40
10.4.	EPA Screening of Drilling Fluids Plan .....	41
10.5.	Responsible Disposal/Storage of Clean Fill .....	43

**FIGURES**

Figure 1: Forming the Bentonite Filter Cake ..... 11

Figure 2: Borehole Annulus Summary ..... 11

Figure 3: Bentonite (De-Hydrated Clay)..... 11

Figure 4: Seawater Supply Pipeline HDDS prescribed Target Properties (refer to specific Drilling Fluid Plan)..... 13

Figure 5: SEAWATER SUPPLY PIPELINE HDDS Estimated Water Consumption (refer to Drilling Fluid Plan)..... 14

Figure 6: Example Water to Drilling Fluid Product Ratio ..... 15

Figure 7: SEAWATER SUPPLY PIPELINE HDDS prescribed Mud Program (refer to specific Drilling Fluid Plan)..... 15

Figure 8: Example Mud Program Contingency Requirements (refer to specific Drilling Fluid Plan) ..... 16

Figure 9: Drilling Fluid System Flow Diagram ..... 18

Figure 10: Example Mud Pump (refer to Project Technical Data Sheets) ..... 19

Figure 11: Example Separation System (refer to Project Technical Data Sheets) ..... 21

Figure 12: SEAWATER SUPPLY PIPELINE HDDS Disposal Volume Calculation (refer to specific HDD Drilling Fluid Plan)..... 22

Figure 13: SEAWATER SUPPLY PIPELINE HDDS Displace Volume Calculation (refer to specific HDD Drilling Fluid Plan)..... 23

Figure 14: SEAWATER SUPPLY PIPELINE HDDS Hydrofracture Analysis (refer to Hydrofracture Calculation) ..... 25

Figure 15: Mud Log Template ..... 26

Figure 16: Example Mud Kit Equipment (Mud Hand use) ..... 26

Figure 17: Example Mud Laboratory Equipment (Mud Engineer use) ..... 27

Figure 18: Example Soil hazard categorisation thresholds (Reference Link) ..... 38

Figure 19: EPA Screening Tests ..... 41

Figure 20: Sample Collection Kits ..... 43

# 1 DOCUMENT PURPOSE

The purpose of this document is to describe the framework for the management of drilling fluids for use in the trenchless works for the Seawater Supply Pipeline project. This document describes:

- The prescribed type, composition, purpose, and properties of the drilling fluid
- The Pipeline Drillers Group roles and responsibilities of drilling fluid management
- The drilling fluid project requirements, variables, and assumptions
- The relevant calculations of drilling fluid volumes for each pass, including:
  - Borehole and makeup volume
  - Permeation volume: fluid seeping into formation to seal the borehole and form a filter cake
  - Surface recycling system: operational requirements, tank capacity, and screening losses
  - Estimated total volumes for each pass of the borehole
- The target fluid properties of the drilling fluid
- The specific primary and contingency drilling fluid products
- Pipeline Drillers Group resource management, including:
  - Water requirements
  - Cuttings production rates and disposal volumes for each pass
  - Drilling fluid displacement during product pipe installation
  - Equipment requirements
- The HDD designs' hydrofracture potential, and the measures to be taken by Pipeline Drillers Group to mitigate hydrofracture impact
- Drilling fluid environmental compliance and management, including:
  - The possible paths by which drilling fluid could be lost to the environment
  - Safeguards Pipeline Drillers Group will put in place to minimise the likelihood of drilling fluid being lost to the environment
  - Inspection processes Pipeline Drillers Group will implement to ensure that safeguards for drilling fluid control are adequately maintained
  - The drilling fluid volume tracking process Pipeline Drillers Group will use to ensure that drilling fluid volumes are being checked
  - The onsite processes that will be used if drilling fluid loss has been detected
  - The onsite process that will be used to remediate potential loss of drilling fluid
- Installation and operation of mud return line (if required).

This plan shall identify the processes relating to drilling fluid management onsite and define the approach that Pipeline Drillers Group shall apply to ensure trenchless operations are undertaken in compliance with the Australian Bay Lobster Producers project requirements.

This Drilling Fluid & Waste Management Plan must be read in conjunction with the project-specific engineering calculations and drawings that describe the application and use of drilling fluids for the Seawater Supply Pipeline trenchless crossings.

- Drilling Fluid Plans
- Hydrofracture Analysis

## 2 PROJECT SCOPE

Pipeline Drillers Group, as the HDD Contractor, has been engaged by the Principal, Australian Bay Lobster Producers, to complete specialist HDD works for the Seawater Supply Pipeline project in compliance with project specifications.

Construction of stage 2 of the seawater supply pipeline covers the rural area between lot 3 DP 1111554 and the seabed mounted intake structures located 1.2km offshore of Kingscliff Beach. This route is shown below, traversing beneath rural unmarked access roads on cane farming property and undeveloped land. The primary construction method for the pipeline is horizontal directional drilling and as a result the erosion and sediment risks associated with the construction are minimal and limited to locations 1 to 6 in Figure B1-1 below.



Figure B1-1: Stage 2 SSP Alignment

### 3 ABBREVIATIONS AND DEFINITIONS

<b>Term or Acronym</b>	<b>Definition</b>
<b>ALARP</b>	As Low As Reasonably Practicable
<b>Asset Owner</b>	Australia Bay Lobster Producers
<b>ASTT</b>	Australian Society for Trenchless Technology
<b>AS</b>	Australian Standard
<b>AS/NZS</b>	Australian/New Zealand Standard
<b>ASS</b>	Acid Sulphate Soils
<b>ANSI</b>	American National Standards Institute
<b>API</b>	American Petroleum Institute
<b>BHA</b>	Bottom Hole Assembly
<b>CAD (3D DXF/DWG)</b>	Computer Aided Design (saved format)
<b>CEMP</b>	Construction Environmental Management Plan
<b>Client Name</b>	Australian Bay Lobster Producers
<b>Contractor</b>	Pipeline Drillers Group
<b>Contractor Acronym</b>	PDG
<b>CPEP</b>	Contractor Project Execution Plan
<b>CSMP</b>	Construction Safety Management Plan
<b>DBYD</b>	Dial Before You Dig
<b>GBR</b>	Geotechnical Baseline Report
<b>HAZID</b>	Hazard Identification
<b>HAZOP</b>	Hazard and Operability
<b>HDD</b>	Horizontal Directional Drilling
<b>HSEQ</b>	Health, Safety, Environment, and Quality
<b>IFC</b>	Issued for Construction
<b>IMS</b>	Integrated Management System
<b>ISO</b>	International Standards Organisation
<b>ITP</b>	Inspection and Test Plan
<b>JHA</b>	Job Hazard Analysis
<b>LCM</b>	Loss Circulation Material
<b>MDR</b>	Master Document Register
<b>MMH</b>	Mixed Metal Hydroxide
<b>MMO</b>	Mixed Metal Oxide
<b>MS</b>	Milestone
<b>MTO</b>	Materials Take Off
<b>NATA</b>	National Association of Testing Authorities

<b>N/A</b>	Not Applicable
<b>OD</b>	Outside Diameter
<b>OHS</b>	Occupational Health and Safety (used interchangeably with WHS/Workplace Health and Safety)
<b>OTR</b>	Other Than Rock
<b>PPE</b>	Personal Protective Equipment
<b>Principal Contractor</b>	Australian Bay Lobster Producers
<b>Project</b>	Seawater Supply Pipeline
<b>QA/QC</b>	Quality Assurance/Quality Control
<b>QMS</b>	Quality Management System
<b>RFI</b>	Request for Information
<b>ROP</b>	Rate of Penetration
<b>ROW</b>	Right of Way
<b>SDS</b>	Safety Data Sheet (formerly known as MSDS/Material Safety Data Sheet)
<b>SIMOPS</b>	Simultaneous Operations
<b>SOW</b>	Scope of Work
<b>SWMS</b>	Safe Work Method Statement
<b>TGS</b>	Traffic Guidance Scheme
<b>TQ</b>	Technical Query
<b>VOC</b>	Verification of Competency

## 4 REFERENCE

### 4.1. RELEVANT STANDARDS

No.	Document Number	Title
1	AS 1289	Methods of Testing Soils for Engineering Purposes (all parts)
2	AS 1418	Cranes, Hoists and Winches
3	AS 2550	Cranes, Hoists and Winches – Safe Use
4	AS 1442	Carbon Steels and Carbon-Manganese Steels – Hot Rolled Bars and Semi-Finished Products
5	AS 1726	Geotechnical Site Investigations
6	AS 2073	Methods for the Testing of Expanding Admixtures for Concrete, Mortar and Grout
7	AS 2350	Methods for Testing Portland, Blended and Masonry Cements
8	<del>AS/NZS 2885</del>	<del>Pipelines – Gas and Liquid Petroleum</del>
9	ASTM-F1962, 2011	Standard Guide For Use Of Maxi-Horizontal Directional Drilling For Placement Of Polyethylene Pipe Or Conduit Under Obstacles, Including River Crossings
10	AS/NZS 1554	Structural Steel Welding
11	AS/NZS 2033	Installation of Polyethylene Pipe Systems
12	AS 4130	Polyethylene (PE) pipes for pressure applications
13	AS 2566.1	Buried Flexible Pipelines Part.1: Structural Design
14	AS 5100.3	Bridge Design – Foundation and Soil Supporting Structures
15	AS 2870	Residential Slabs and Footings
16	AS 4678	Earth-Retaining Structures
17	AS 3600	Concrete Structures
18	AS 4041	Pressure Piping
19	AS 3750	Paints for Steel Structures - High-build epoxy (two-pack)
20	AS 3862	External Fusion-Bonded Epoxy Coating for Steel Pipes
21	NA	Ariaratnam, S. T., Allouche, E. N., 2000. Suggested practices for installations using horizontal directional drilling. Practice Periodical on Structural Design and Construction 5 : (4), 142–149.
22	NA	3. ASCE, 2005. Pipeline Design for Installation by Horizontal Directional Drilling. American Society of Civil Engineers, ASCE Manuals and Reports on Engineering Practice No. 108.
23	NA	Bennett, D., Ariaratnum, S., Como, C., 2008. Horizontal Directional Drilling: Good Practices Guidelines, 3rd Ed. HDD Consortium, 2008.
24	NA	Bennett and Wallin, 2008. Step-By-Step Evaluation of Hydrofracture Risks for HDD Projects, Proceedings of 2008 No-Dig Conference, Dallas, Texas, April 27-May 2, 2008
25	NA	Petroff, L. J., 1997. Design guidelines for directional drilled PE pipe. ASCE Congress on Trenchless Technology, Boston, MA.



No.	Document Number	Title
26	NA	Petroff, L. J., Dreher, P. L., 1997. Design considerations for HDPE for trenchless applications. No-Dig 1997, Seattle, WA.
27	NA	Petroff, L. J., 2010. Directional Drilling Design with ASTM F1962: A Decade of Success, Proceedings of ASCE Pipelines Conference, Keystone, CO.
28	NA	Pipeline Research Council International, 2015. Installation of Pipelines by Horizontal Directional Drilling: An Engineering Design Guide, Report PR-227-03110. Prepared by J.D. Hair and Associates, Inc., Louis J. Capozzi & Associates, Inc., Stress Engineering Services, Inc.
29	NA	Plastic Pipe Institute (PPI), 2007. Handbook of Polyethylene Pipe, 2nd Edition. Plastic Pipe Institute (PPI).

## 5 HDD DRILLING FLUID DESIGN

### 5.1. DRILLING FLUID PURPOSE

The horizontal directional drilling process involves a non-hazardous drilling fluid consisting of water and bentonite (de-hydrated clay) and polymers. Drilling fluids serve multiple purposes during the completion of a HDD borehole, which cannot be completed by water alone. The three most critical functions of the drilling fluid include:

#### PRIMARY FUNCTIONS OF DRILLING FLUID

1	Stabilisation of the Borehole	Holding the borehole open, preventing collapse, thus maintaining the borehole annulus around the drill pipe and tools.
2	Suspension and Transport of the Borehole Cuttings	Suspending the cuttings from the borehole in a pumpable solution that with agitation through pumping can be removed from the borehole, for separation of cuttings and reuse of drilling fluid.
3	Prevent Fluid Loss from the Borehole	Penetrate the formation and coat the inside of the borehole, preventing uncontrolled drilling fluid losses to the permeable ground conditions along the bore path.

Efficient and effective drilling fluid is critical to the successful construction of the horizontal directional drilling method. In addition to its primary functions, drilling fluid further assists the drilling process by:

#### SECONDARY FUNCTIONS OF DRILLING FLUID

1	Tool Lubrication	Lubricating the drill pipe and the product pipe during final pullback into the borehole.
2	Tooling Temperature Management	Cooling of the drill bit and down hole tools during drilling operations.
3	Water Displacement	Preventing the ingress of groundwater into the borehole which could result in cutting flocculation and borehole collapse.

Drilling fluid products are an expensive component of the HDD method. As such, a planned and detailed drilling fluid design or mud program is essential to the effectiveness and efficiency of drilling fluid functions.

### 5.2. DRILLING FLUID PROCESS

Bentonite, the most common drilling fluid product used in HDD, is a naturally occurring, non-toxic, inert substance that meets NSF/ANSI-60 Drinking Water Additive Standards and is used for HDD projects and vertical drilling of potable water wells worldwide. Bentonite is added to water (either salt water or fresh water) to significantly increase the viscosity of the water and create a filtration control material (drilling fluid) that is absorbed by the ground formation immediately around the borehole. As the borehole is drilled, the drilling fluid is pumped down the drill string into the borehole in an initial controlled release of fluid in order to build a layer of mud (or filter cake) between the borehole and the surrounding geotechnical environment. This process is intended to avoid uncontrolled drilling fluid permeating further into the geotechnical environment and potentially reaching the surface level. Refer to [Water vs. Bentonite Drilling Fluid - Filter Cake](#) for reference demonstration.

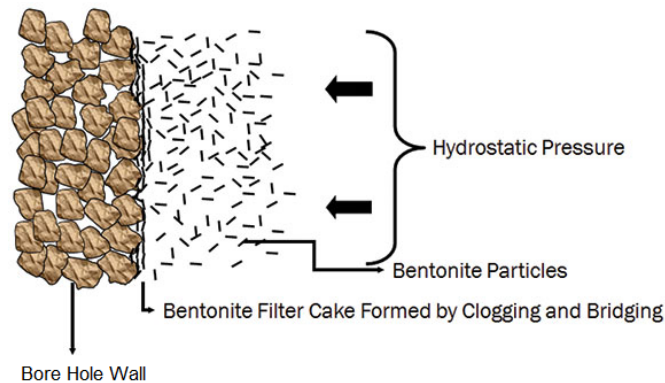


Figure 1: Forming the Bentonite Filter Cake

Once the initial drilling fluid has built a sufficient filter cake layer around the circumference of the borehole to hold a pressured seal, the higher velocity drilling fluid towards the centre of the borehole can then carry the generated cuttings out of the borehole via the open annulus. The transport of the cuttings is referred to as drilling fluid returns.

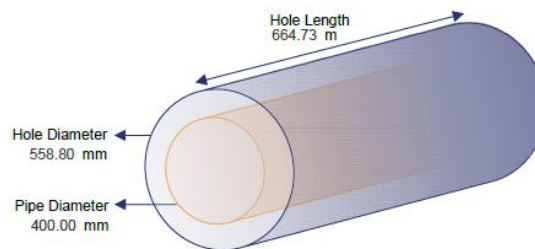


Figure 2: Borehole Annulus Summary (Example)

Drilling fluids heavy with suspended bore cuttings (silts, sands, and small pieces of rock), or returns, are then separated via equipment at the surface. The cleaned drilling fluids are recycled and pumped back down the borehole to continue removing further cuttings from the borehole. The separated cuttings of silts, sands, and small pieces of rock are disposed of offsite as wet clean fill.



Figure 3: Bentonite (De-Hydrated Clay)

## 5.3. DRILLING FLUID PROPERTIES

Drilling fluid is a dispersion of organic and inorganic chemical compounds added to water to impart specific properties to the suspension. Clay solids are dominant in their influence on the physical properties of a drilling fluid, and the chemical environment to which they are exposed is critical to their performance.

### 5.3.1. Rheology

The primary source of control of rheological and filtration properties is the control of the amount and type of solids in the fluid. In general, the main objectives are to:

#### RHEOLOGY OBJECTIVES

- 1 Minimise plastic viscosity for increased penetration rate.
- 2 Provide sufficient yield point or effective annular viscosity to clean the hole without causing unnecessarily high circulating pressures.
- 3 Provide sufficient gel strength to suspend cuttings.

To fulfil these requirements, the flow properties of a drilling fluid are adjusted to handle each situation that is encountered. Ideal drilling fluid properties to address one problem may exacerbate another; for this reason, there is no standard “recipe” for an ideal drilling fluid composition, but rather, tests are undertaken at regular intervals and additional products added to maintain the fluid at an optimal performance range.

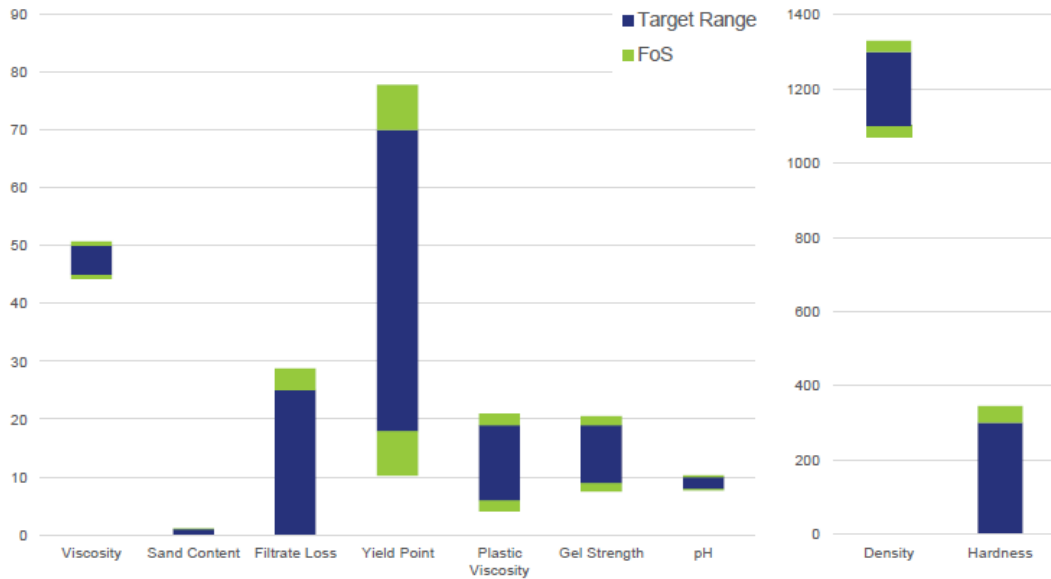
The drilling fluid mix is affected by the introduction of solids from the formation which is being drilled. Formation solids that enter the system from the drilling process can be roughly divided into two types: inert and active.

- **Inert solids** are those that have very little tendency to react with each other or to a change in environment. These are non-swelling solids which are electrically uncharged and easily dispersed. They consist of such materials as sand and silt, and they are undesirable in drilling fluid. They increase the plastic viscosity and crowd the system so that more desirable solids cannot be added. They do little to reduce fluid loss and can cause the filter cake to be undesirably thicker. Since they are not hydrated, they cause the filter cake to be dry and brittle with a high coefficient of friction. Excessive inert solids can consolidate in the borehole resulting in an under gauged borehole. As the total volume of solids in suspension is increased, the mechanical resistance to flow is increased.
- **Active solids** are those that have electrically charged surfaces and are reactive with their environment. Due to their charge distribution, they can interact with one another to form a gel structure within a fluid. Most of the active solids also have the ability to hydrate in water. Bentonite is an active solid.

Drilling fluid will be monitored to prevent an excessively high drilling fluid weight, which can adversely impact drilling fluid and trenchless operations. In the event that the drilling fluid properties are not being maintained via use of the drilling fluid cleaning system, and the inert solids are affecting drilling fluid flow characteristics, it may be necessary to replace the drilling fluid in the system partially or completely. This is at the discretion of the Mud Hand and Driller, in collaboration with the HDD Superintendent.

### 5.3.2. Target Properties

The Mud Hand, offsite Mud Engineer (if applicable), and the Driller all monitor and maintain the properties of the drilling fluid. The Mud Hand makes the primary observations of the drilling fluid properties via a series of onsite tests to establish the suitability of the drilling fluid for use. The Mud Hand checks the test results against the target properties established prior to the commencement of drilling and adjusts the composition of the recycled drilling fluid and new drilling fluid mixed. Target properties are prescribed by the Mud Engineer after review of the HDD design, HDD Methodology and the available geotechnical information.



PARAMETER	SYMBOL	MIN	MAX	NOTES
Density: Drilling Fluid	$\rho_{mud}$	1100	1300 kg/m <sup>3</sup>	Recommended density of drilling fluid
Viscosity: Marsh Funnel	$\mu_{mud}$	45	50 sec	Optimise for hole cleaning requirements
Sand Content	SC	0	1 %	Maintain as low as possible
Filtrate Loss	FL	0	25 ml/30min	Maintain as low as possible
Yield Point	$\tau_p$	18	70 lb/100ft <sup>2</sup>	Maintain as high as possible
Plastic Viscosity	$\mu_p$	6	19 cp	Maintain as low as possible
Gel Strength	10"/10'	9	19 lb/100ft <sup>2</sup>	Maintain as high as possible
Total Hardness: Calcium/ Magnesium Ions	Ca	0	300 ppm	Maintain under limit
Hydrogen Ion Concentration	pH	8	10	Maintain within limits to minimise bacteria

\* Target properties are based on available geotechnical information, they may be adjusted during the project to suit encountered conditions.

Figure 4: Seawater Supply Pipeline prescribed Target Properties (refer to specific Drilling Fluid Plan)

In collaboration, the Mud Hand, offsite Mud Engineer (if applicable), and the Driller may elect to vary the target properties of the drilling fluid as a result of changing or unforeseen ground conditions, changes to mud system equipment/configuration, and availability of drilling fluid products. Reactive and adaptive change to drilling fluid during HDD operations to ensure compliance with primary function of drilling fluid is critical to successful pipe installation. Changes to the onsite drilling fluid and its target properties are at the discretion of the Mud Hand, offsite Mud Engineer (if applicable), and the Driller.

### 5.3.3. Water Source, Chemistry, and Volume

HDD operations require the use of water for mixing of drilling fluid. Water and drilling fluid products must be compatible, with special consideration made if the available water source is not fresh. The water chemistry tests normally conducted onsite during drilling fluid makeup are:

- pH
- Chlorides
- Total hardness, or calcium and magnesium

Maintaining an adequate pH in a drilling fluid is important, and soda ash is added where required to maintain a pH of approximately 9 or above. There are two basic ways of measuring pH: either a pH meter or pH paper test strips. pH will be checked prior to drilling fluid being mixed, daily, or in the event that the Mud Hand (or offsite Mud Engineer) considers that the water pH may be affecting the drilling fluid properties.

#### Trucked to Site and Stored in Tankers

**Water Source:** Local Standpipes

Fresh

Water consumption per day is based on expected Rate of Penetration (ROP) per day. Insufficient water volume supplied to pad site may impact expected ROP, thereby adversely impacting trenchless operations.

PARAMETER	SYMBOL	VALUE	REFERENCE
Base Fluid	-	Fresh Water -	Nominated water source
Contingency Allocation	FoS <sub>w</sub>	15.00 %	Nominated factor of safety

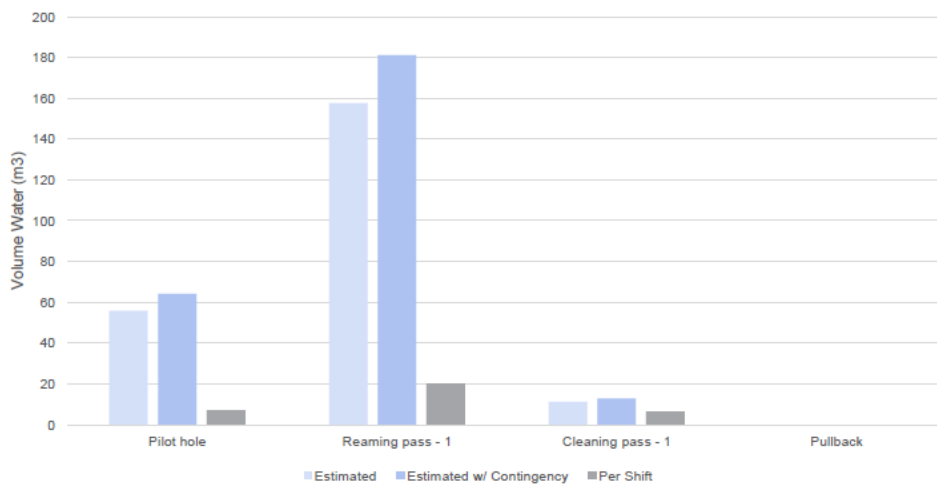


Figure 5: Seawater Supply Pipeline Estimated Water Consumption (refer to Drilling Fluid Plan)

Estimated water volume is dependent on maintaining good drilling fluid returns and limiting drilling fluid losses to the geotechnical conditions. Any unanticipated loss of returns will impact the required total water consumption. A complete loss of returns will significantly impact the required total water consumption.

Water makes up the greatest percentage of drilling fluid volume and composition.

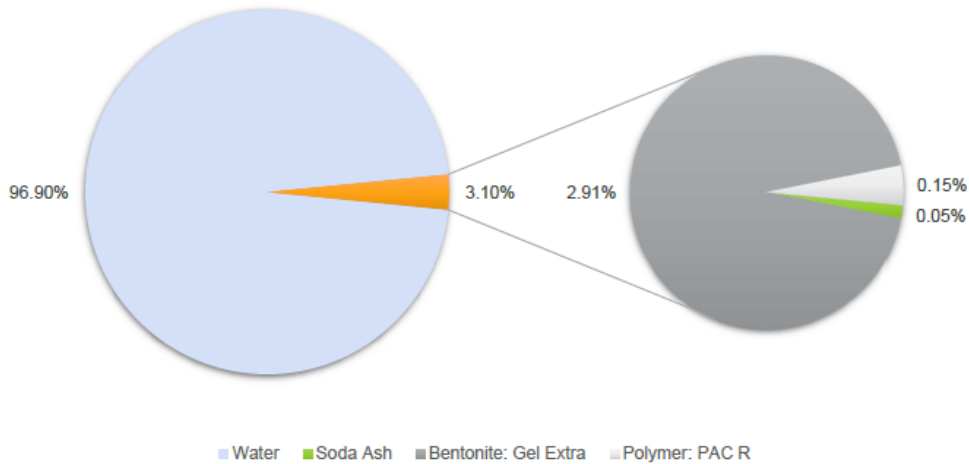


Figure 6: Example Water to Drilling Fluid Product Ratio

### 5.3.4. Drilling Product Mix

The drilling fluid mix is designed in cooperation with the Mud Engineer and suppliers of the drilling fluid products. Based on available geotechnical borehole data, target fluid characteristics are designed for fluid performance evaluation under simulated downhole conditions. To deal with extended periods where drilling fluid will be stationary in the hole (non-drilling hours), the fluid is to be designed based around enhanced gel and shearing characteristics. Regardless of prescribed drilling product mix, all efforts shall be made to limit consecutive non-drilling hours/days until product pipe has been installed into the borehole.

The use of specific products allows for a flat gel strength starting immediately once the pump is stopped (10 sec reading). This keeps the solids in suspension once the pumps are shut off. This gel strength is still found after 10 min, instead of being higher as typically seen in normal HDD drilling fluids.



PRODUCT	CONC. (kg/m <sup>3</sup> )	TOTAL RQD	UOM	UNITS RQD
Soda Ash	0.5 kg/m <sup>3</sup>	112.28 kg	25 kg Bag	5 Bags
Bentonite: Gel Extra	30 kg/m <sup>3</sup>	6736.6 kg	25 kg Bag	270 Bags
Polymer: PAC R	1.5 kg/m <sup>3</sup>	336.83 kg	25 kg Bag	14 Bags

Figure 7: Seawater Supply Pipeline prescribed Mud Program (refer to specific Drilling Fluid Plan)

Drilling fluid products are stored at site for immediate use in accordance with the known per shift drilling fluid product consumption schedule. Sufficient quantities of drilling fluid products for consecutive days of HDD operations are stored onsite (between 5-20 days, depending on available pad area) with the project inventory balance stored with the supplier. Transport of new product from supplier to site is completed routinely in consultation with the Mud Hand, offsite Mud Engineer (if applicable), and the Driller.

5.3.5. Contingency Drilling Products

The drilling fluid mix may require the introduction of contingency products to compensate for variable geotechnical conditions. Contingency drilling products shall only be implemented on advice of the Mud Engineer on review of daily drilling logs, and prior to being added to the drilling fluid mix shall be discussed and agreed between the Mud Hand, offsite Mud Engineer (if applicable), and the Driller.

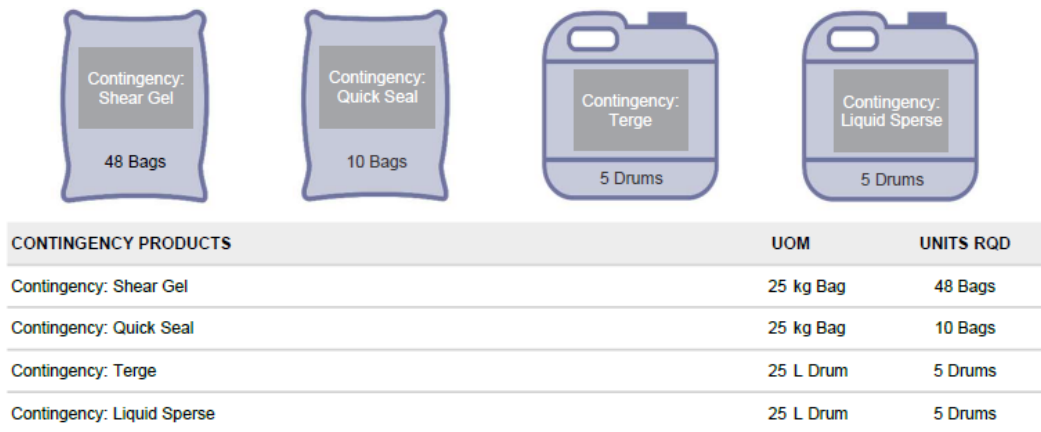


Figure 8: Example Mud Program Contingency Requirements (refer to specific Drilling Fluid Plan)

Regardless of potential use, contingency product estimated quantities have been included in the preparation of the drilling fluid plan for approved used in HDD operations as required.

Contingency drilling products are stored at site for immediate use in accordance with the known per shift drilling fluid product consumption schedule. Sufficient quantities of contingency drilling fluid products for consecutive days of HDD operations are stored onsite (between 5-10 days, depending on available pad area) with the project inventory balance stored with the supplier. Transport of additional contingency product from supplier to site is completed routinely in consultation with the Mud Hand, offsite Mud Engineer (if applicable), and the Driller.

5.3.6. Loss Circulation Material

Loss circulation material is used in combination with the prescribed drilling fluid as a tool to seal/inhibit the further loss of drilling fluid in the instance of significant drilling fluid losses or unanticipated hydrofracture as a result of latent geotechnical conditions.

Loss circulation materials are a composite of a naturally occurring, non-toxic, and inert substance. They are comprised of varying ratios of sawdust, nut husk, paper pulp, cellulose, and swelling starches, depending on their grade. All loss circulation materials used by the pipeline trenchless industry are suitable for disposal as general waste.

LCM use must be carefully considered before application in the known geotechnical conditions, known/assumed location of the drilling fluid losses along the measured depth, and resulting impacts of LCM products on the continued use of drilling fluid to complete the trenchless operations. The application (or “pill”) of LCM product to seal an area of loss is at the discretion of the HDD Superintendent, in collaboration with the Mud Hand, offsite Mud Engineer (if applicable), and the Driller.

If LCM application (or pill) is approved for use by the HDD Superintendent, the Mud Hand will mix the LCM pill in the mixing tank in accordance with the product concentrations prescribed by the Mud Engineer. The LCM pill is then pumped down hole via the drill pipe and BHA assembly. Once pumping of the LCM pill has been completed, the Driller will recommence drilling operations to check the effectiveness of the LCM to re-establish mud returns and circulation to surface. Multiple LCM pills may need to be applied before normal drilling operations can resume.

If the LCM pill(s) has been effective in sealing the borehole from further losses, normal drilling operations will recommence. The drilling fluid returns must then be monitored for any surplus LCM material that has not permeated the area of loss, thereby infesting the drilling fluid returns.

LCM is difficult to separate from drilling fluid with the separation system, if it is possible at all. Attempts will be made to separate the used LCM material from the drilling fluid; however, it may be necessary to replace the drilling fluid in the system partially or completely, flushing all infested drilling fluid from the borehole annulus. This is at the discretion of the Mud Hand and Driller, in collaboration with the HDD Superintendent.

LCM products are stored offsite with the supplier. Sufficient quantities of LCM products are available from the supplier as required for use. Transport of LCM product from supplier to site is completed at the request of the Mud Hand, offsite Mud Engineer (if applicable), and the Driller, in collaboration with the HDD Superintendent.

## 6 DRILLING FLUID MANAGEMENT

### 6.1. DRILLING FLUID SYSTEM LOOP

Drilling fluid is to be maintained in a closed loop system as follows:

#### DRILLING FLUID PROCESS

- 1 The drilling fluid is mixed in the mixing units (part of the separation system).
- 2 The fluid is transferred to the mud pump, which pumps the drilling fluid into the borehole via the drill rig, the drill pipe, and out of the downhole tooling.
- 3 Once pumped into the borehole, the drilling fluid is displaced by more fluid pumped down hole.
- 4 The drilling fluid is then returned to surface through the annulus until it reaches surface at either the entry or exit pit.
- 5 Once on surface, the drilling fluid is pumped to the separation system for removal of cuttings and rheological checks before starting the cycle again.

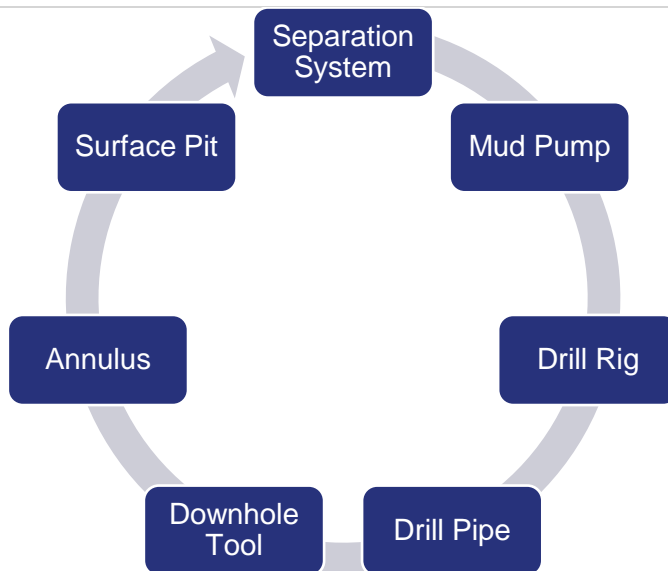


Figure 9: Drilling Fluid System Flow Diagram

### 6.2. SEPARATION SYSTEM

A separation system mixes new drilling fluid, holds the recycled drilling fluid, and separates solid cuttings from the drilling fluid returns. It comprises the following items:

- Mixing units
- Recycling units
- High/low pressure pumps
- Water tankers
- Active tanks
- Storage tanks
- Adequate pipework and housing
- Vacuum trucks

Separation system plant and equipment selected for use at the Seawater Supply Pipeline project has been serviced prior to mobilisation. Critical spares for the plant and equipment are available onsite in the designated spares containers. Non-critical spares for the selected plant and equipment are able to be sourced on-shelf from local suppliers.

### 6.2.1. Mixing System

Drilling fluid is mixed in the separation system’s mixing units. Drilling fluid products are fed into the primary water-filled mixing tank via a blending hopper system and are rapidly mixed with the water in the tanks by the internal agitators. Any additional mud products are then added as per the Drilling Fluid Plan to make up the drilling fluid to target properties. Fresh drilling fluid will be mixed and added to the system at regular intervals to replenish the volume lost as the borehole is enlarged and more fluid is required down hole to fill up the hole.

Mixing operations continue throughout pilot hole and reaming operations. Mixing may be a requirement for the cleaning pass; however, this is unlikely unless significant fluid losses down hole occur.

### 6.2.2. Active Tank

The drilling fluid is pumped from the mixing unit to the active tank. From there, the drilling fluid is pressure fed using a charge pump to the high-pressure mud pump, which transports it through high-pressure hoses to the drill rig and downhole via the ID of the drill pipe.

Drilling fluid must only be transferred from the mixing system to the active tank when well mixed, to prevent unyielded drilling fluid from being pumped down hole, leading to potentially blocked BHA jets and ineffective drilling fluid for borehole cleaning.

### 6.2.3. Mud Pump

The drilling fluid is pumped via a triplex mud pump connected to the drill rig that makes up the drill pipe string and BHA assembly. All connections to the high pressure/high flow rate mud pump are rated high pressure connections and hoses. Mud pump flow rate is controlled by the Driller from the drill cab. The Driller monitors the drill pipe pressure, confirming drilling fluid and BHA jets are balanced and free from blockage.

Depending on the specific drilling operation and measured depth of the specific BHA assembly in the borehole, the Driller sets the appropriate flow rate of the mud pump. Drilling fluid enters the borehole, suspends the geotechnical formation cuttings of the borehole, and comes to surface via the borehole annulus as returns.

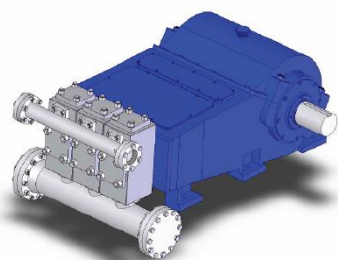


Figure 10: Example Mud Pump (refer to Project Technical Data Sheets)

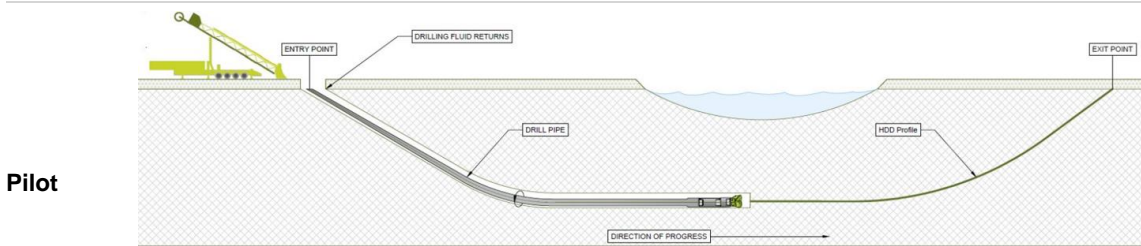
### 6.2.4. Drilling Fluid Returns

Drilling fluid returns are defined as the drilling fluid containing the suspended cuttings from the drilled borehole returning to surface at entry or exit sides of the borehole annulus. Returns collect in the entry and exit side pits before being transferred via pit pumps to the recycling system.

Drilling fluid returns are the primary indicator of a borehole's condition and are closely monitored by the Driller and the Mud Hand through visual observation, sampling, and volume comparison.

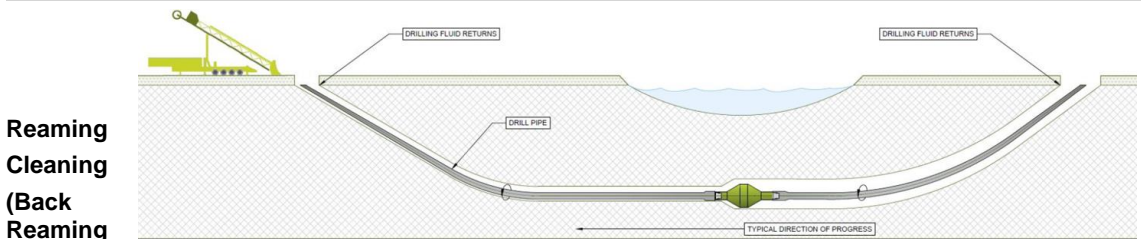
Returns flow in accordance with the specific stage of the trenchless operation:

#### STAGE DRILLING FLUID PROCESS



**Pilot**

Drilling fluids flow to entry for the duration of the pass. This pass has the highest risk of hydrofracture as the borehole has the smallest annulus of any stage of the HDD between the borehole OD and the drill pipe OD.

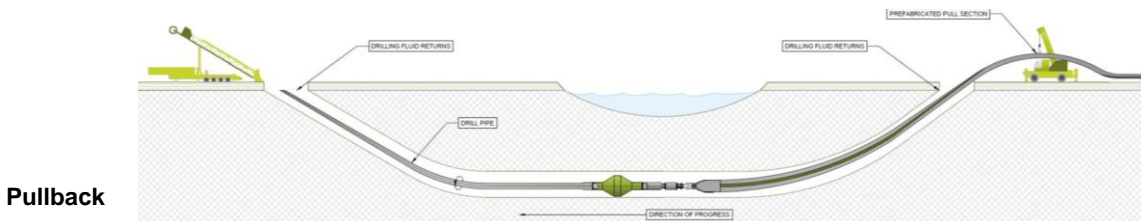


**Reaming  
Cleaning  
(Back  
Reaming  
Method)**

Drilling fluids flow to exit initially and entry towards the end of the pass. These passes have the largest production of cuttings.

During cleaning passes, the returns will generally flow to the closest side, and predominantly to the side the pass starts from. Similar is true for tripping passes; however, a limited quantity of fluid is pumped.

**Tripping** During tripping passes, the returns will generally flow to the closest side, and predominantly to the side the pass starts from.



**Pullback**

During pullback, the direction of drilling fluid returns is difficult to predict accurately.

Drilling fluid is displaced by the volume of the product pipe. All displacement fluid should be disposed of without attempting to recycle the returns. Drilling fluid initially flows around product pipe back to surface, then will typically switch to flow towards the rig later in the pass. This pass has the largest displacement of drilling fluid.

### 6.2.5. Recycling System

Drilling fluid returns must be separated into cuttings and cleaned drilling fluid before the fluid can be reused for further trenchless operation. Returns collected in surface pits are transferred via pit pump to the recycling system.

Fluid and suspended solids will be pumped across the separation units. Cuttings are separated from the drilling fluid using a series of de-sanders, screens, and de-silters. The solids are separated, and the cleaned fluid is transferred from the separation storage tanks to the active tank to be pumped back down the borehole. The recycled drilling fluid will have a sand content of <1% or will not be transferred to the active tank or pumped back downhole.

Recycled drilling fluid may also be reconditioned by adding freshly mixed drilling fluid products from the mixing system to achieve desired fluid properties.

Samples will be routinely taken from the separation storage tank and tested for sand content, viscosity, weight, and filtration loss, to ensure optimal drilling fluid mix.



Figure 11: Example Separation System (refer to Project Technical Data Sheets)

### 6.2.6. Drilling Fluid Return Line

Drilling fluid is required on the side of the borehole of the allocated drill rig and mud pump, to pump downhole.

The drilling fluid return line will be used to pump cleaned and/or conditioned drilling fluid from pipeside to rigside when returns are present in the pipeside pit. This mud return line will be routinely flushed as required with gauging pig (with clean water or clean mud) to prevent sediment blockage through continuous use.

## 6.3. CUTTINGS AND DISPLACEMENT DISPOSAL

During drilling operations, the drilling fluid will be recycled, and the excavated solids (cuttings) will be removed for disposal. The cuttings will run off the recycling system into containers, pits, or waste bins placed at the bottom of the separation system's chutes. This material will be collected and transported to its required disposal location.

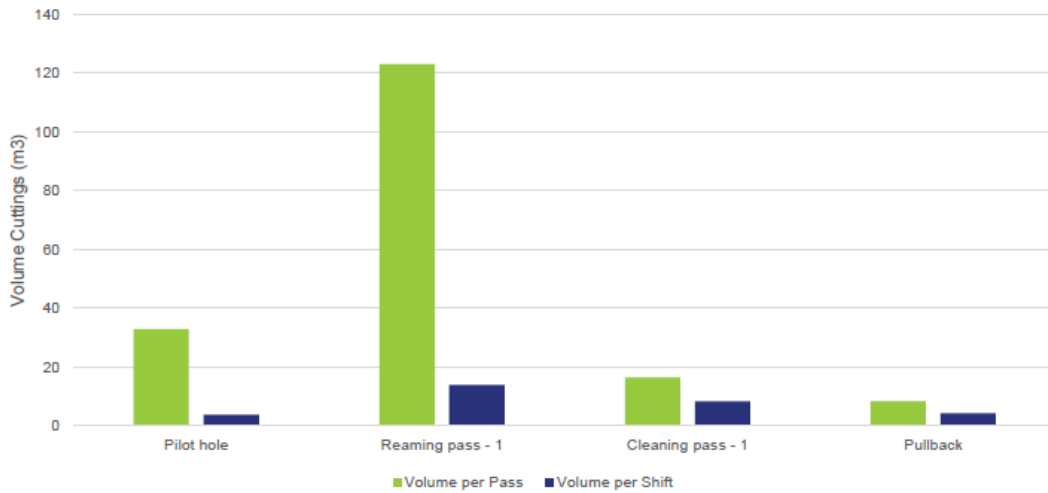
The quantity of dry/semi dry cuttings produced via the recycling system will vary depending on the formation. Depending on the consistency of the cuttings, a combination of vacuum tanker and body trucks will cart cuttings to the disposal site. Depending on the available storage of cuttings onsite, multiple transfers to disposal may be completed per shift.

In the event that the drilling fluid weight gets too high and the fluid is unable to carry cuttings out of the hole, the fluid in the system will be disposed of and new drilling fluid mixed. Partial or complete replacement of the

drilling fluid system, thereby necessitating the disposal of drilling fluid, is at the discretion of the HDD Superintendent, in collaboration with the Mud Hand, offsite Mud Engineer (if applicable), and the Driller.

### 6.3.1. Quantities of Waste

Quantities of cuttings for disposal will be recorded in order to track the total amount of cuttings excavated from the borehole. During pilot hole, reaming, and hole cleaning operations, cuttings will make up most of the disposal volume, along with some drilling fluid that was not completely separated in the recycling process.



PASS	EFFICIENCY	DURATION	VOLUME/ PASS	VOLUME/ SHIFT
Pilot hole	95%	9 days	32.76 m <sup>3</sup>	3.64 m <sup>3</sup>
Reaming pass - 1	90%	9 days	123.02 m <sup>3</sup>	13.67 m <sup>3</sup>
Cleaning pass - 1	10%	2 days	16.30 m <sup>3</sup>	8.15 m <sup>3</sup>
Pullback	5%	2 days	8.15 m <sup>3</sup>	4.08 m <sup>3</sup>
<b>Total</b>		<b>22 days</b>	<b>180.23 m<sup>3</sup></b>	-

\* Refer to Construction Methodology and Project Schedule for detailed programme.

Figure 12: Seawater Supply Pipeline Disposal Volume Calculation (refer to specific HDD Drilling Fluid Plan)

### 6.3.2. Pullback Displacement

During pullback of the product pipe for final installation in the completed borehole, the product pipe volume will be displaced from the borehole. The displacement fluid will return to surface as returns to both exit and then entry sides of the borehole. Pullback displacement drilling fluid will be disposed of continuously during the pullback operation, without being processed by the recycling system.

PARAMETER	SYMBOL	VALUE	REFERENCE
Volume: Total Displaced Fluid	PB	83.53 m <sup>3</sup>	Calculated
Volume: Displacement per JT	PB	1.22 m <sup>3</sup>	Calculated, based on 9.7m drill pipe

\* Volumes based on closed pulling head method, volume of installed pipeline.

Figure 13: Seawater Supply Pipeline Displace Volume Calculation (refer to specific HDD Drilling Fluid Plan)

### 6.3.3. Disposal Cartage

The HDD Superintendent is responsible for the removal of cuttings from site. Transport and removal operations include:

Type	Option	Comments
<b>Dry/Semi Dry Cuttings</b>	Removal from site by dump truck to fill disposal site.	Attempt to get cuttings as dry as possible on site for ease of transport.
<b>Wet Drilling Fluid</b>	Removal from site by tanker/vacuum truck to drying area before transport to fill disposal site.	Allowable volumes per trip quite low, requiring numerous vehicle movements.

## 6.4. DRILLING FLUID MONITORING

Monitoring drilling fluids is an important operational control process. Generally, drilling fluid used to complete HDD operations is pumped down hole, and the fluid returns to surface via the annular space between the drill pipe OD and the borehole, collecting in the entry and exit side pits. This closed and controlled system is the basis for trenchless pipeline construction and relies on maintaining the drilling fluids within the borehole and surface equipment. However, drilling fluid losses, both foreseen and unforeseen, can occur on all HDD crossings. Monitoring of the key drilling fluid closed system indicators is critical to preventing uncontrolled/unforeseen drilling fluid losses. Key monitoring indicators include:

- Drilling fluid (mud) returns
- Maximum annular pressure
- Visual identification of surface fracture.

### 6.4.1. Monitoring Returns

Visual monitoring of drilling fluid returns is undertaken by the Driller on entry side and the pipe side Rig Hand on exit side. In addition, volume monitoring of the drilling fluid returns is completed by the Mud Hand(s) operating the separation systems.

While the Driller is pumping, a steady stream of drilling fluid returns will flow from the borehole annulus and into either the entry or exit pit depending on the location of the BHA down hole.

Drilling fluid flow provides visual verification that the hole is open and that the fluids are not inadvertently escaping. Lost circulation or a slowing of drilling fluid returns may be an indication that the borehole annulus is blocked, or that the borehole is no longer able to hold pressure, and drilling fluids are escaping the borehole.

The Driller checks entry side returns and communicates with the pipe side Rig Hand to check returns on exit side if reaming operations have commenced and the borehole is open at both entry and exit sides.

If returns have stopped, the Driller will check the other key monitoring indicators to verify if the returns have stopped due to annulus blockage or if a loss of fluid may potentially have occurred.

The Driller will also perform a borehole swab by tripping back the current drill pipe joint to clear the annulus of a potential blockage. The Driller may further elect to trip out a number of drill pipe lengths to re-establish returns. This is at the discretion of the Driller.

Drilling fluid returns observations throughout HDD operations are logged by the Driller in the Drill Log, located in the drill cab.

### 6.4.2. Monitoring Annular Pressure (During Pilot Hole Only)

Included in the pilot hole BHA assembly is the pressure sub. The pressure sub houses the pressure monitoring tool that measures the annular pressure of the borehole. The annular pressure tool communicates the maximum pressure of the borehole annulus to the Driller and Steerer in real time, while the Driller is pumping on the BHA assembly. The annular pressure readings are then compared to the hydrofracture analysis calculated for the specific project's HDD design and known geotechnical conditions.

Hydrofracture analysis calculates the minimum circulating pressure required to pump drilling fluids from the bottom of the borehole to surface. Then, utilising the available geotechnical information, the hydrofracture analysis calculates the maximum overburden potential of the ground conditions. The overburden pressure is the maximum pressure that the ground conditions can be pumped on until fracture occurs.

The Driller compares the annular pressure readings from the HDD operations to the minimum circulating pressure and maximum overburden pressure at the measured depth that has been drilled. If the annular pressure readings are higher than the circulating pressure, this may indicate that an annular blockage has occurred and that the Driller may need to swab the borehole to clear the blockage.

If the annular pressure readings are lower than the circulating pressure, this may indicate that the annulus is no longer sealed and that a drilling fluid loss has occurred. The Driller will check the other key monitoring indicators to verify if a loss to surface has occurred.

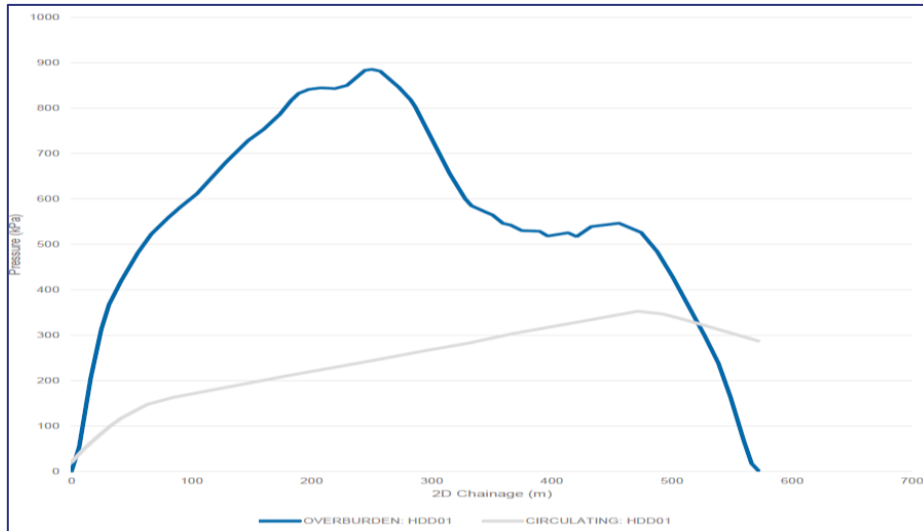


Figure 14: Seawater Supply Pipeline Hydrofracture Analysis (refer to Hydrofracture Calculation)

Hydrofracture is also predictable and unavoidable, specifically in the shallow sections of the borehole near entry and exit sides. This is determined via hydrofracture analysis, where the minimum circulating pressure exceeds the maximum overburden pressure of the ground conditions. However, this allows for practical planning and premobilisation of remediation equipment to deal with the predicted hydrofracture.

### 6.4.3. Monitoring Surface Fracture

Visual monitoring of the surface along the borehole alignment is undertaken by the designated Rig Hand. Pre-emptive monitoring for surface fractures can mitigate the volume of an unplanned drilling fluid release by providing the Driller with notice to turn off the mud pump and attempt to de-pressurise the ground conditions.

The Rig Hand, in radio communication with the drill cab, walks along the alignment checking for signs of ground deformation, ground fluid weeping, and complete fluid losses to surface. Any indications are immediately communicated to the Driller, and the mud pump is shut off if the hydrofracture is unplanned. The Rig Hand then commences the **Fluid Loss Response** initial tasks while waiting for the HDD support team to attend and assist in remediation.



### 6.5.2. Mud Laboratory (offsite)

The Mud Engineer performs the tests listed below.

- Gel Strengths
- Water Loss
- Filter Cake Thickness
- Bacterial Parts (not included)



Figure 17: Example Mud Laboratory Equipment (Mud Engineer use)

Mud Engineer mud laboratory tests may be completed both onsite and offsite, dependent on resource allocation for the project. The results of the mud laboratory tests provide an indication on the condition and properties of the borehole, in addition to the drilling fluid properties. Any tests completed by the Mud Engineer are recorded on the Mud Engineers Log. Mud laboratory tests are generally only included as part of drilling fluids management for projects of significant length and large borehole diameters.

The Mud Engineer (in addition to the Mud Hand responsibility/recommendations) is responsible for:

- Providing the results of these tests (taken typically once every hour during HDD operation) in an electronic or hardcopy report to the HDD Superintendent at the end of each shift
- Providing the HDD Superintendent with any recommendations for changes to drill fluid composition.
- Providing the HDD Superintendent with any recommendations for changes to drill fluid pump rates.
- Providing the HDD Superintendent with any recommendations for changes to the drill fluid recycling operation.

## 7 DRILLING FLUID MANAGEMENT DESIGN

Static or circulating (pumping) pressure is of utmost importance during drilling, as exceeding the formation strength leads to formation failure (hydrofracture/frac-out) and fluid leaving the borehole locally or potentially to surface. Pipeline Drillers Group in consultation with Australian Bay Lobster Producers, reviews the potential variables that can pre-emptively avoid fluid loss occurrence. Such include the following:

ROLE	RESPONSIBILITY
<b>Bore Design Profile</b>	All variables should be considered in the design of the bore profile, ultimately determining the success of the drilling project and the minimisation of potential uncontrolled or unexpected fluid losses. Maximum depths of cover and avoidance of gravel layers are critical to the minimisation of fluid loss.
<b>Known Ground Conditions</b>	Comprehensive geotechnical investigation should be completed prior to the commencement of directional drilling. Geotechnical evidence provided shall be considered during the design of the HDD profile. With sufficient geological information, a predicted hydrofracture analysis is produced, which can be utilised by the Driller as a guide to where potential fluid loss may occur and ultimately be avoided.
<b>Drilling Fluid (Mud) Properties</b>	Pipeline Drillers Group shall engage qualified mud product suppliers prior to mobilisation to undertake a comprehensive fluid design considering potential fluid loss, product ratios, and contingency products. The Drilling Fluid Plan is developed from this information.
<b>Local Drilling History Records</b>	Where available, historical records of completed significant excavations and completed HDD projects in the area of construction can add considerable understanding to the ground conditions and the potential for fluid loss in these areas.
<b>Installation of Casing (if required)</b>	It is noted that most losses occur in the first few metres (up to 30m) from the entry or exit points, where the bore is most shallow. Initial installation of casing pipe on entry significantly reduces the risk of fluid loss.

While geotechnical investigation has been completed, unexpected ground conditions may not support the pressure required for the drilling fluid to return to the entry and carry out the cuttings. Should the ground not be suitable, a revised bore alignment and/or mud program may be required in consultation with Australian Bay Lobster Producers and Australia Bay Lobster Producers.

Hydrofracture analysis has been undertaken for all boreholes. The Hydrofracture Analysis document calculates overburden pressure, which indicates the maximum that can be pumped while confining fluid within the borehole, thereby mitigating environmental and pipeline constructability risk.

## 8 DRILLING FLUID LOSS RESPONSE

Drilling fluid loss, hydrofracture, or “frac out”, is defined as the loss of drilling fluids from the borehole to the terrestrial and/or aquatic environment. Drilling fluid loss is identified either via visual assessment or drilling fluid loss indicators (partial or total fluid loss from the drilling system), which are monitored by the Pipeline Drillers Group Driller, Mud Hand, and Rig Hands.

The HDD Superintendent and Driller are the first authority to suspect/identify and confirm if a loss of drilling fluid has occurred (partial or total). As a result of the drilling fluid loss, the Pipeline Drillers Group HDD Superintendent is responsible for communicating the occurrence to Australian Bay Lobster Producers, who will then provide detail to Australia Bay Lobster Producers and subsequent pre-approved stakeholders.

The Pipeline Drillers Group allocated HDD Superintendent is responsible for the allocation of staff resources to find and commence the remediation of drilling fluid loss to the terrestrial and/or aquatic environments.

### 8.1. RESPONSIBILITY

ROLE	RESPONSIBILITY
<b>Project/Construction Manager (Australian Bay Lobster Producers)</b>	<ul style="list-style-type: none"> <li>Stakeholder communication and engagement</li> </ul>
<b>Project Manager (Pipeline Drillers Group)</b>	<ul style="list-style-type: none"> <li>Coordination of bore profile design</li> <li>Communication of fluid loss</li> </ul>
<b>HDD Superintendent</b>	<ul style="list-style-type: none"> <li>Supervision and assessment of drilling fluid</li> <li>Communication of fluid loss</li> <li>Documentation of fluid loss occurrence</li> </ul>
<b>Driller</b>	<ul style="list-style-type: none"> <li>Supervision and assessment of drilling fluid</li> <li>Drilling fluid monitoring</li> </ul>
<b>Mud Engineer (Offsite)</b>	<ul style="list-style-type: none"> <li>Documentation of mud program</li> <li>Supply of mud product SDSs</li> </ul>
<b>Mud Hand</b>	<ul style="list-style-type: none"> <li>Preparation and mixing of drilling fluid</li> <li>Drilling fluid monitoring</li> <li>Response and remediation of fluid loss</li> </ul>
<b>Rig Hand(s)</b>	<ul style="list-style-type: none"> <li>Response and remediation of fluid loss</li> </ul>

## 8.2. FLUID LOSS PREVENTION

### 8.2.1. During Drilling

Throughout the drilling process, the pump rate, pressure, and “effectiveness” of the drilling fluid application are to be continually monitored, reviewed, and assessed by the Driller and/or the HDD Superintendent.

Variable	Method
<b>Experienced and Well-Trained staff</b>	Experienced and well-trained operators are essential to ensuring effective mitigation and minimisation of potential fluid loss. Capability to understand and identify potential indicators prior to a potential fluid loss is a critical competence of HDD Superintendents, Drillers, and Mud Hands.
<b>Use of Pressure Sub</b>	A pressure sub will be connected to the steering probe, which allows the Driller and Steering Engineer to monitor the down hole annular pressure at all times. The annular pressure will continue to increase as the pilot hole progresses; however, if the pressure increases above the predetermined predictions and/or modelling, the Driller will immediately commence swabbing to reduce the annulus pressure before drilling ahead.
<b>Consistent Monitoring</b>	In the event that the drilling fluid program exhibits any abnormal characteristics, and/or there is any reason to suspect losses (or potential for losses) greater than 15% of the specific borehole circulating volume, the drilling process is suspended immediately, and further investigation and visual assessment along the entire alignment is conducted before re-commencement of HDD operations. During the tracking of the fluid volume, a loss of 0-15% of the specific borehole circulating volume can be expected, and work shall continue on as normal.

## 8.3. NO-GO ZONES

In the event of fluid loss occurrence, where fluid loss appears in a designated no-go zone, all applicable Australian Bay Lobster Producers stakeholders are to be contacted prior to entering the area. The Pipeline Drillers Group HDD support team will only enter the no-go zone once appropriate permission is provided and required Spotters and/or supervision has been implemented.

## 8.4. PUBLIC AREAS

In addition to the remediation activities documented in the [Drilling Fluid Loss Response](#) section, further actions are required to be considered before response and remediation activities can occur in public areas, as follows:

### Public Area Impact Additional Action (if required)

<b>Vehicle Traffic</b>	<ul style="list-style-type: none"> <li>• Traffic control</li> <li>• Detours</li> <li>• Barricading and signage</li> </ul>
<b>Pedestrian Traffic</b>	<ul style="list-style-type: none"> <li>• Barricading</li> <li>• Spotters and signage</li> </ul>
<b>Private property</b>	<ul style="list-style-type: none"> <li>• Land access approval sought before entering private property</li> </ul>

## 8.5. POTENTIAL FLUID LOSS INDICATORS

A partial or total loss of returns is a potential indicator that a fluid loss has occurred or may occur. The indicators set out in the [Drilling Fluid Monitoring](#) section consist of regular and accurate checks made periodically throughout drilling operations to ensure that any fluid loss is pre-emptively detected, potentially before visual identification of occurrence.

### 8.5.1. Partial Loss of Drilling Fluid Returns

Partial loss of returns will be noted if losses of the total drilling fluid system surface volume is greater than 1.5 m<sup>3</sup> per hour. These losses will be identified by a slowing of returns from the bore and a decrease in surface circulatory volumes. Both the Driller and Mud Hand will monitor and record via the Drill Logs and Mud Logs both the percentage of returns and system surface volume. Once partial returns are identified, the following steps will be taken:

#### **Partial Loss of Drilling Fluid Returns**

- 1 Hourly visual inspections are to be initiated along the drill alignment during drilling operations. If no indication of hydrofracture is present on surface, continue drilling.
- 2 Confirm annular pressure readings have not risen unexpectedly and are in line with predicted/modelled values.
- 3 If a sudden increase in pressure is noted, forward drilling should cease, and swabbing/circulating of the hole should be initiated to remove any cuttings build up or bore restriction.
- 4 Review of geotechnical data and drill cuttings to confirm if the bore has entered an unconsolidated formation.
- 5 Confirm drilling fluid properties are equal or less than target properties (refer to the Drilling Fluid Plan).
- 6 If mud parameters are outside limits, drilling should cease until the fluid has been reconditioned.
- 7 If lost returns are still being experienced, a plugging/bridging LCM may be considered for use, at HDD Superintendent discretion.
- 8 Drilling operations to continue whilst monitoring fluid returns and annular pressure readings.

### 8.5.2. Total Loss of Drilling Fluid Returns

Total loss of returns will be noted as a complete loss of visual returns. Both the Driller and Mud Hand will monitor and record via the Drill Logs both the percentage of returns and surface volume. If a total loss of mud returns is identified, the following steps will be taken:

#### **Total Loss of Drilling Fluid Returns**

- 1 Suspend drilling operations, and notify the Australian Bay Lobster Producers representative of suspension.
- 2 Initiate full time visual inspection of the drill alignment.
- 3 Mobilise contingency fluid loss clean up equipment to the vicinity of the BHA.
- 4 Confirm annular pressure readings have not risen unexpectedly and are in line with predicted/modelled values.
- 5 Recommence drilling operations at low flow pump rate; do not drill on without attempting further remediation to re-establish returns.
- 6 If a sudden increase in pressure is noted, tripping of the drill string should be initiated to remove any cutting build up or bore restriction and/or until returns are regained.
- 7 Review geotechnical data and drill cuttings to confirm if the bore has entered an unconsolidated formation.
- 8 Confirm drilling fluid properties are equal or less than target properties (refer to Drilling Fluid Plan).
- 9 If mud parameters are outside limits, the fluid shall be reconditioned, which may include dumping of old mud and mixing new mud.
- 10 Pump pressure can then be slowly increased to see if annular pressure is reduced and returns are regained.
- 11 If lost returns are still being experienced, a swelling LCM may be considered for use in the loss zone, at HDD Superintendent discretion.
- 12 A period of standby will be observed to allow the LCM to swell (as defined by the product data sheet).
- 13 Pump rates will be slowly increased to see if sealing of the fracture has been successful.
- 14 Additional placement of LCM may be initiated if the formation and position of the loss are suitable for further treatment, at HDD Superintendent discretion.
- 15 Drilling operations to continue whilst monitoring fluid returns, surface disturbance along the borehole alignment, and annular pressure readings.

## 8.6. FLUID LOSS RESPONSE AND REMEDIATION

In the event of potential fluid loss, HDD operations are suspended immediately, Australian Bay Lobster Producers is immediately informed by the Driller and/or the HDD Superintendent, and the HDD support team is engaged to remediate the fluid loss occurrence immediately. Pipeline Drillers Group’s HDD personnel are equipped and trained in effective fluid loss control and remediation measures, and fluid loss response stations are available at all Pipeline Drillers Group pad sites. Response stations consist of any of the following control measures, depending on the local environment and drilling fluid additives:

### ITEM

**Silt Fencing, with timber stakes**



Immediate response tool  
5 x 25m Rolls

**Lay Flat Hose and Flex Drive**



Immediate response tool  
Short-term transfer of fluid  
3 x Onsite

**Silt Socks**



Bunding of frac area short term  
30 x Socks (unfilled)

**Coir logs**



Bunding of frac area long term  
10 x Bags

**Sand bags**



Bunding of frac area long term  
50 x Bags (unfilled)

**Sykes Pumps**



Long term transfer of fluid  
1 x Onsite

**Vacuum Truck**



Immediate response tool and disposal tool for long/short term  
2 x Truck Units Onsite

## 8.7. FLUID LOSS PROCEDURE

### General Fluid Loss Procedure

- 1 The drill string will be pulled back off face to relieve pressure on the fluid loss area (critical requirement).
- 2 All HDD works and operations are immediately suspended. Drill and equipment to remain on standby while fluid loss is assessed.
- 3 Australian Bay Lobster Producers informed immediately of fluid loss occurrence.
- 4 Location and extent of the fluid loss determined.
- 5 Transport of additional personnel and response equipment to fluid loss location.
- 6 Allocation of Pipeline Drillers Group HDD support team to assist with fluid control and remediation.
- 7 Assessment by Pipeline Drillers Group Superintendent for best control and remediation method; deploy specific equipment and materials. Refer to [Fluid Loss Response and Remediation](#) section.

### 8a Terrestrial Fluid Loss Procedure

- 8a Contain the area with bunding to surround the drilling fluid for sweeping and pumping.
- 8a If available and access allows, deploy mobile vacuum truck to pump the drilling fluid from the containment area and pump to the return pit or directly dispose of offsite.
- 8a If unavailable or access is limited, flex drive/sykes pumps will be used to pump the drilling fluid from the containment area and pump to the return pit by way of the mud return line cut-in or lay flat pipe.
- 8a Upon review, utilise drilling fluid additives to help seal the fluid loss fracture before the recommencement of full HDD works and operations.

### 8b Aquatic Fluid Loss Procedure

- 8b Identify the exact aquatic location for accurate deployment of the Pipeline Drillers Group HDD support team.
- 8b If access allows, contain the area with silt fencing at the low tide points and potentially deploy appropriate pumps to remove drilling fluid from the aquatic containment area.
- 8b If not applicable or access is limited, immediate review of Drilling Fluid Plan to include sealing additives to seal the fluid loss fracture.

### 8c No Go Zone Fluid Loss Procedure

- 8c Identify the exact No Go Zone location for accurate deployment of the Pipeline Drillers Group HDD support team.
- 8c Obtain access to the No Go Zone, with supervision/Spotters to implement Fluid Loss Procedure.

- 9 Review and documentation of fluid loss occurrence.

## 8.8. RESPONSE CLOSE-OUT PROCEDURE

When the release has been contained and fluid loss measures have been initiated, closeout activities will be conducted at the direction of the Pipeline Drillers Group HDD Superintendent/HDD Project Manager and may include the following:

### Response Close-Out Procedure

- 1 The recovered drilling fluid will either be recycled or removed to an approved facility for disposal.
- 2 All fluid loss excavation sites will be returned to pre-project contours using clean fill, as necessary.
- 3 All containment measures will be removed unless otherwise specified by the Australian Bay Lobster Producers and Australia Bay Lobster Producers onsite construction team.

## 8.9. HDD OPERATIONS RESTART

For small fluid releases not requiring external notification, drilling may continue if:

- 100% containment is achieved via use of leak stopping compound (bunding, silt fence, etc); or
- Redirection of the bore and the clean-up crew remains at the fluid loss location throughout the HDD operations schedule.

For releases requiring external notification including stakeholders and/or agencies, construction activities will not restart without approval from Australian Bay Lobster Producers. Once suitable containment measures are in place and approval has been received to re-commence work, the following steps will be undertaken:

### HDD Operations Restart

- 1 Continue visual inspections along the drill alignment during drilling operations. If no indication of hydrofracture is present on surface, continue drilling.
- 2 Confirm annular pressure readings have not risen unexpectedly and are in line with predicted/modelled values.
- 3 Review geotechnical data and drill cuttings to confirm if the bore has entered an unconsolidated formation.
- 4 Confirm drilling fluid properties are equal or within tolerance of target properties (refer to Drilling Fluid Plan).
- 5 If mud parameters are outside limits, drilling should cease until the fluid has been reconditioned. The HDD Superintendent will seek further advice on variations to the Drilling Fluid Plan from the Mud Engineer.
- 6 If a sudden increase in pressure is noted, forward drilling should cease and swabbing/circulating of the hole should be initiated to remove any cutting build up or bore restriction.
- 7 If lost returns are still being experienced, a plugging/bridging LCM may be considered for use, at HDD Superintendent discretion.
- 8 If sealing and/or containment of the fluid loss is not possible, the pilot hole will be retracted to a suitable location to side-track out of the original bore and recommence the drill at an increased depth of cover/separation, at HDD Superintendent discretion, in collaboration with Australian Bay Lobster Producers and Australia Bay Lobster Producers project teams.

## 8.10. COMMUNICATION AND REPORTING

The Pipeline Drillers Group HDD Superintendent/HDD Project Manager will notify the Australian Bay Lobster Producers Project Manager and/or Construction Manager of the location and estimated volume of fluid loss. Australian Bay Lobster Producers will notify required stakeholders as per the Australian Bay Lobster Producers Emergency Response Plan.



An incident report for unplanned fluid loss will be generated by the Pipeline Drillers Group HDD Superintendent/HDD Project Manager for review and project record.

Fluid loss occurrence will be noted on the Daily Report. Any resulting corrective or preventative actions will be managed by Pipeline Drillers Group HDD Superintendent/HDD Project Manager.



## 9 DRILLING FLUID PRODUCTS SDS

### DRILLING FLUID PROGRAM PRODUCTS

<b>SODA-ASH</b>	pH ADJUSTMENT	<a href="https://amcmud.com/product/soda-ash/">https://amcmud.com/product/soda-ash/</a>
<b>AMC-BEN</b>	BASE VISCOSIFIER	<a href="https://amcmud.com/product/amc-ben/">https://amcmud.com/product/amc-ben/</a>
<b>AMC-EZEE-PAC-R</b>	POLYMER	<a href="https://amcmud.com/product/amc-ezee-pac-r/">https://amcmud.com/product/amc-ezee-pac-r/</a>
<b>HYDRATED LIME</b>	VISCOSIFIER INCREASER	<a href="https://www.cementaustralia.com.au/sites/default/files/2018-09/hydrated_lime_-_pds.pdf">https://www.cementaustralia.com.au/sites/default/files/2018-09/hydrated_lime_-_pds.pdf</a>
<b>AMC-MAXI-VIS</b>	VISCOSIFIER INCREASER	<a href="https://amcmud.com/product/amc-maxi-vis/">https://amcmud.com/product/amc-maxi-vis/</a>

### DRILLING FLUID CONTINGENCY PRODUCTS

<b>AMC-DET-XTRA</b>	DETERGENT	<a href="https://amcmud.com/product/amc-det-xtra/">https://amcmud.com/product/amc-det-xtra/</a>
<b>AMC-BORE-SEAL</b>	LCM	<a href="https://amcmud.com/product/amc-bore-seal/">https://amcmud.com/product/amc-bore-seal/</a>
<b>AMC-LIQUI-SPERSE</b>	POLYMER DISPERSANT	<a href="https://amcmud.com/product/amc-liqui-sperse/">https://amcmud.com/product/amc-liqui-sperse/</a>

## 10 CLEAN FILL DISPOSAL COMPLIANCE

Any excavation/excavated materials intended for disposal must comply with State and Local Government regulatory requirements for the responsible disposal of those materials. State Government legislation prescribes the waste classification of excavation/excavated materials and the legal method of disposal. Local Government authorities then provide approval/endorsement/permit of registered disposal locations to accept the identified waste classification. The disposal locations, depending on the classifications are generally categorized as:

- private land holders,
- recycling/reuse facilities, or
- waste treatment facilities.

**Note:** Disposal locations may be defined differently between state government and local government legislation documents and references. The excavation/excavated materials will comply with the most appropriate category for disposal depending on the composition of material.

Each disposal location is then responsible for the use or treatment of disposed materials in line with the category’s legal obligations and the terms of the approval/endorsement/permit issued by the Local Government authority.

### 10.1. DISPOSAL MATERIAL LEGISLATION

State Government legislation that defines the classifications of excavation/excavated materials include:

No.	Legislation / code	Jurisdiction
1	Resource Recovery Exemption under Part 9, Clauses 91 and 92 of the Protection of the Environment Operations (Waste) Regulation (2014) – <a href="#">Reference Link</a>	NSW
2	Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation (2014) – <a href="#">Reference Link</a>	NSW

The legislation documents the maximum limits/thresholds of the trace elements, chemical compounds, biological/organic compounds, and chemical properties that classify the waste into the disposal categories.

Table 1

Column 1	Column 2	Column 3
Chemicals and other attributes	Maximum average concentration (mg/kg 'dry weight' unless otherwise specified)	Absolute maximum concentration (mg/kg 'dry weight' unless otherwise specified)
1. Mercury	0.5	1
2. Cadmium	0.5	1
3. Lead	50	100
4. Arsenic	20	40
5. Chromium (total)	50	100
6. Copper	50	100
7. Nickel	30	60
8. Zinc	100	200
9. Electrical Conductivity	1.5 dS/m	3 dS/m
10. pH *	6 to 9	5.5 to 10
11. Total Polycyclic Aromatic Hydrocarbons (PAHs)	20	40
12. Benzo(a)pyrene	0.5	1
13. Total Petroleum Hydrocarbons (TPHs)	250	500
14. Total Chlorinated Hydrocarbons	0.5	1

\*Note: The ranges given for pH are for the minimum and maximum acceptable pH values in the treated drilling mud.

Figure 18: Example Soil hazard categorisation thresholds

Waste classified as clean fill is the most optimal disposal method for cuttings and drilling fluids from HDD construction and should be firstly considered before disposing under any other waste disposal classification due to the cost and resources associated with treating or transporting other material classifications.

## 10.2. DISPOSAL MATERIAL CLASSIFICATION

Disposal material classification is primarily defined by the contractor as either clean fill or contaminated fill. The contractor will then adhere with the disposal requirements defined by the State and Local Government regulatory legislation for the specific material classification.

### 10.2.1. Clean Fill

**Classification**

Clean fill is waste material, generally collected from construction projects, that can be repurposed for future projects. To be classified as clean fill, the waste material has to contain (in isolation or in combination) dirt, gravel, topsoil, sand, and/or rock.

As such, it cannot include organic or biological waste, glass, fibreglass, metals, cardboard, paper, contaminants, and contaminated soil (combustible, radioactive, noxious, poisonous, or combustible materials; materials tainted by chemicals, spilled oil, and/or other contaminants), household waste, hazardous products, and/or consumer products (electronics, batteries, rubber, tyres, and/or toxic chemicals).

**Disposal**

Clean fill disposal is considered an environmentally responsible process that ensures construction waste is recycled and reused, not simply sent to landfill. In practice, it sees a combination of dirt, gravel, topsoil, sand, and rock waste that is left over from a construction or civil project site, generated from excavation, that is then collected and reused on another project site or left in place as part of other excavation works.

### 10.2.2. Contaminated Fill

**Classification**

Contaminated fill is waste material, collected from construction projects, that cannot be repurposed for future projects. To be classified as contaminated fill, the waste material must contain (in isolation or in combination) contaminants of trace elements, chemical compounds, biological/organic compounds, and/or chemical properties that exceed the classification limits of clean fill.

As such, it may include organic or biological waste, glass, fibreglass, metals, cardboard, paper, contaminants and/or contaminated soil (combustible, radioactive, noxious, poisonous, and/or combustible materials; materials tainted by chemicals, spilled oil, and/or other contaminants), household waste, hazardous products and/or consumer products (electronics, batteries, rubber, tyres, and/or toxic chemicals).

**Disposal**

Contaminated fill can only be transported and disposed of in accordance with State and Local Government regulatory legislation requirements.

Locations for disposal and method of transport from site must be approved, endorsed, or permitted to accept contaminated fill material by the State and Local Government regulatory authority.

If drilling fluid material waste is identified as contaminated fill due to contamination from ground conditions, disposal shall be completed in accordance with the material disposal requirement for the specific contaminated material.

### 10.2.3. Laboratory Analysis

Waste characterisation involves an assessment of the soil/cuttings/drilling fluid to identify which contaminants require analysis to determine the hazard category. The assessment must be for all chemical substances known and reasonably expected to be present in the waste. All drilling fluid products for use by the contractor meet the threshold for clean fill natively. (Refer to EPA Screening sample of proposed Drilling Fluid Products)

The analysis assessment tool used to validate the soils/cuttings/drilling fluids classification is an EPA screening test for the specific State or Territory that the material is to be disposed within.

Contractor will complete EPA screening of samples, taken onsite, via a NATA accredited environmental testing laboratory.

Eurofins Environment Testing Australia Pty Ltd



Accreditation No.	Site No.	Date of Accreditation
1261	20794	16 Mar 2012
Address		Contact
Unit 1/21 Smallwood Place		Mr J Angell
Murarrie, QLD 4172		P: +61 (07) 39024606
Australia		JonathonAngell@eurofins.com

Samples for testing will be subject to general chain of custody requirements to maintain sample integrity.

### 10.3. DISPOSAL ENVIRONMENTAL CLASSIFICATION

To establish that soils/cuttings/drilling fluid from an HDD construction site meets the Clean Fill classification threshold, the contractor completes EPA screening of:

- 1) Samples of the intended drilling fluids for use
- 2) Samples of the geotechnical conditions at the drilling location onsite, and
- 3) Samples of the drilling fluids and cuttings onsite.

The results of the EPA screening sample are then compared to the thresholds prescribed by the applicable State Government Legislation. (Refer to DISPOSAL MATERIAL LEGISLATION)

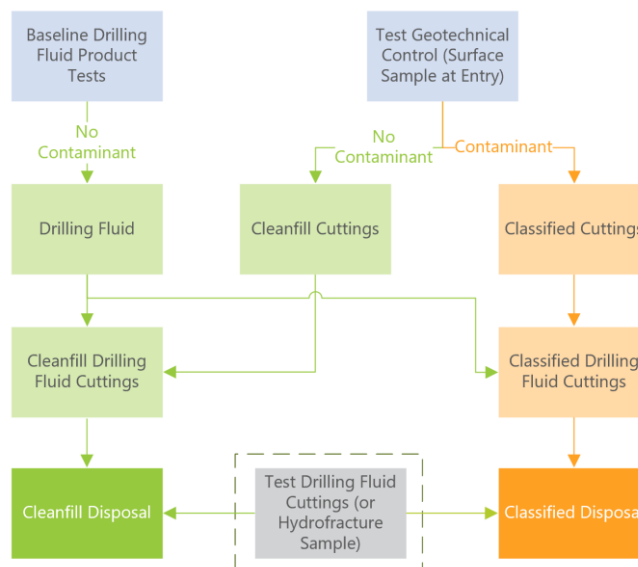


Figure 19: EPA Screening Tests

Material for disposal that meets the Clean Fill classification thresholds can then be disposed of at locations willing to accept the material. Contractor/Asset Owner may then seek agreement with local land holder, landfill, municipal dump, or similar party to arrange acceptance of Clean Fill materials.

Material for disposal that does not meet the Clean Fill classification thresholds will only be transported and disposed of at locations approved to accept the material, in accordance with State and Local Government regulatory requirements.

### 10.4. EPA SCREENING OF DRILLING FLUIDS PLAN

Prior to project commencement, the intended Drilling Fluid Plan was prepared (Refer to DRILLING FLUID PRODUCTS SDS) and sample taken for state specific EPA Screening test. Results are below.

Category	Chemical	AMC-Bentonite Fluid Plan Aug 09, 2021
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	TRH C6-C9	20
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	TRH C10-C36 (Total)	50
Volatile Organics	Vinyl chloride	0.5
Volatile Organics	Total MAH*	1.1
Volatile Organics	Vic EPA IWRG 621 CHC (Total)* (Chlorinated Hydrocarbons)	9
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene	0.5
Polycyclic Aromatic Hydrocarbons	Total PAH* (Total Polycyclic Aromatic Hydrocarbons)	8
Organochlorine Pesticides	Vic EPA IWRG 621 OCP (Total)*	1
Organochlorine Pesticides	Vic EPA IWRG 621 Other OCP (Total)*	0.75
Polychlorinated Biphenyls	Total PCB*	0.1
Phenols (Halogenated)	Total Halogenated Phenol*	15.5
Phenols (non-Halogenated)	Total Non-Halogenated Phenol*	57.6
Phenols (non-Halogenated)	Cyanide (total)	5
Phenols (non-Halogenated)	Fluoride (total)	100
Heavy Metals	Arsenic	2
Heavy Metals	Cadmium	0.4
Heavy Metals	Chromium	5
Heavy Metals	Copper	5
Heavy Metals	Lead	5
Heavy Metals	Mercury	0.1
Heavy Metals	Molybdenum	5
Heavy Metals	Nickel	5

Heavy Metals	Selenium	2
Heavy Metals	Silver	2
Heavy Metals	Tin	10
Heavy Metals	Zinc	5

Note: Results of Sample threshold assessment, Drilling Fluid Products are classified as clean fill.

### 10.4.1. Onsite EPA Screening Schedule

To ensure that all soils/cuttings/drilling fluids from the HDD construction sites are clarified as Clean Fill for disposal at approved clean fill disposal location, Pipeline Drillers Group will complete the below onsite EPA screening schedule. Results of EPA Screening Samples will be distributed with the weekly report.

Sample Description	Type	Milestone	Standard	Results
<b>Drilling Fluid Program Control</b>	Drilling Fluid Mix	Pre-Project	IWRG6Z1	Fill - Pass
<b>HDD07 – Control</b>	Excavation/Cuttings	Anchor Installation	IWRG6Z1	
<b>HDD08 – Control</b>	Excavation/Cuttings	Anchor Installation	IWRG6Z1	
<b>HDD07</b>	Cuttings	Pilot Hole	IWRG6Z1	
<b>HDD08</b>	Cuttings	Pilot Hole	IWRG6Z1	
<b>HDD012</b>	Cuttings	Pilot Hole	IWRG6Z1	

### 10.4.2. Sampling Procedure and Kits

Pipeline Drillers Group will collect samples in accordance with the third-party material sampling procedure. Refer to FPS-IMS-PRO-017 MATERIAL SAMPLING PROCEDURE. See below example

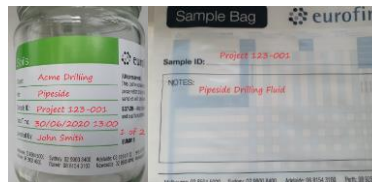


Figure 20: Sample Collection Kits

## 10.5. RESPONSIBLE DISPOSAL/STORAGE OF CLEAN FILL

Results of the EPA screening samples are made freely available to the disposal location administration or owner.

The disposal area should be away from flowing water sources to prevent turbidity impact on waterways, unless material is to be fully compacted down or used as backfill behind a stabilised area.

It is recommended that a bunded area or excavation be established for direct disposal at the location to allow for drying and separation of sediments and fluids before either long-term use of material or other.

### 10.5.1. Change in Clean Fill Classification

If soils/cuttings/drilling fluids become contaminated with trace elements, chemical compounds, biological/organic compounds, and/or chemical properties that exceed the classification limits of clean fill. Contaminated Fill Materials for disposal will be transported and disposed of at location approved, endorsed, or permitted to accept contaminated fill material by the State and Local Government regulatory authority.

The pre-existing source of contamination may then be located through sampling of site conditions to potentially isolate the source from the drilling fluids or cuttings.

# B5 – TRAFFIC MANAGEMENT PLAN

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

<b>Current Version</b>	B
<b>Current Version Date</b>	21 January 2022
<b>Status</b>	Final

#### Amendments

<b>Version Number</b>	<b>Version Date</b>	<b>Authorised by</b>	<b>Amendment Details</b>
A	4 November 2021	ABLP	Original Publication
B	21 January 2022	ABLP	N/A

## B5 – Traffic Management Plan

### 1 Purpose and Scope

The purpose of this plan is to outline the general traffic procedures for vehicles associated with the construction of stage two of the Australian Bay Lobster Producers Seawater Supply Pipeline. This plan primarily pertains to trucks delivering materials to and from a site, operation of machinery and vehicles on a site, and vehicles entering and exiting a site.

### 2 Responsibilities

It is the responsibility of the Environmental Manager / Representative to ensure that this management plan is periodically reviewed and updated. Day to day implementation is the responsibility of the Site Manager.

### 3 Relevant Documents

The Traffic Management Plan (**TMP**) for the stage two works is provided at Attachment B5-1. This management plan is to be complied with by all vehicles accessing or departing the pipeline construction activities at each of the respective construction locations. The respective Traffic Guidance Schemes (**TGS**) and Traffic Control Plans (**TCP**) for each location are provided at Appendix A of the TMP and are to be adhered to in respect of traffic movements at the respective locations.

### 4 General Procedures

The primary consideration with respect to construction traffic, other than dust and noise, is vehicular access to and egress from each construction location.

#### **General**

Traffic access, routes and management are to be undertaken in accordance with the relevant planning approvals for the site and Tweed Shire Council requirements.

#### **Access**

The access point for each construction location is detailed at Table B5-1 below:

**Table B5-1: Site Access Points**

Location	Construction Works	Access Point
1	HDD01 (Entry) & HDD 02 (Entry)	Marine Parade Kingscliff Street
2	HDD03 (Entry) Pump Well	Marine Parade
3	HDD03 (Exit) & HDD04 (Entry)	Carpark in Jack Bayliss Park opposite Beach Street – accessed via Marine Parade

Location	Construction Works	Access Point
4	HDD04 (Exit) & HDD06 (Entry)	Elrond Drive Beach Street
5	HDD06 (Exit) & HDD05 (Entry)	Elrond Drive
6	HDD05 (Exit)	Road easement across lot 1 DP 1075645 and lots 2 and 3 DP 1111554

### **Signage**

Signage will be erected to manage the flow of traffic accessing the site at the respective construction locations. The specific signage for each location is detailed in the Traffic Guidance Schemes provided at Attachment B5-1.

### **Construction and Transport Hours**

Construction activities associated with the development, including the arrival and departure of vehicles delivering or removing materials from the site, must only be carried out between the hours of:

- 7:00am to 6:00pm, Monday to Saturday; and
- During hours approved by the Tweed Shire Council on Sundays and Public Holidays.

### **Speed Limits**

All vehicles shall obey road speed limits along routes to and from the site.

### **Sediment and Dust Control**

Street sweepers will be employed to remove sediment and dust associated with construction activities from roadways as required. In addition, construction activities will be undertaken in accordance with the Erosion and Sediment Control Plan (Attachment B1 of the CEMP).

### **Load Coverage - to Prevent Dust Nuisance**

Trucks are to have loads covered at all times except when loading and unloading.

### **Traffic Control**

Construction works are to be undertaken in a manner that prevents the occupation or impediment of public roads. Contractors are responsible for limiting all construction activities to the confines of the designated Work Areas in the Traffic Control Plans and Traffic Guidance Schemes at Appendix A to Attachment B5-1. In the event that construction activities cannot be performed in a safe or reasonable manner, a designated traffic controller will be assigned to ensure the safe and proper movement of traffic impacted by the activities.

All vehicles will be required to enter and exit public roads from a construction location by travelling in a forward direction unless it is otherwise unsafe or unreasonable to do so. In the event that a vehicle is required to enter or exit a public road by travelling in reverse, a designated traffic controller will be assigned to ensure the safe and proper movement of the vehicle.

Subject to the exceptions referred to above, traffic controllers will not be utilised throughout the course of stage two of the project and traffic management measures will be limited to the speed restrictions, signage and traffic cones detailed in the Traffic Control Plans and Traffic Guidance Schemes at Appendix A to Attachment B5-1.

***Driver Code of Conduct***

Refer to Attachment B5-2 for the Driver Code of Conduct. This code is to be adhered to by all drivers associated with the construction activities for stage two.

## **Attachment B5-1**

# **Traffic Management Plan: Seawater Supply Pipeline - Stage Two**

# Traffic Management Plan

## Seawater Supply Pipeline: Stage Two



Australian Bay Lobster Producers Limited

## Contents

1. Overview .....	3
1.1 Objective .....	3
1.2 Scope.....	3
1.3 Traffic Guidance Schemes .....	4
2. Responsibilities .....	4
2.1 Project Site.....	4
3. Implementation.....	5
3.1 Entering Vehicles .....	5
3.2 Exiting Vehicles .....	5
4. Management of the TMP.....	5
4.1 Impact on Public Roads .....	5
4.2 Haulage Hours .....	7
4.3 Speed Limits .....	7
4.4 Sediment and Dust Control.....	8
4.5 Haulage Routes.....	8
4.6 Complaints.....	8
5. Plant and Equipment.....	9
6. Reviewing of Traffic Management Plan .....	9
Appendix A: Traffic Guidance Scheme .....	10

## 1. Overview

### 1.1 Objective

The principal objectives of this plan are to ensure that:

- An effective traffic management system is applied to the project;
- An ethos of **ZERO HARM** is instilled via demonstrated safe behaviours;
- Hazards and risks are identified and controlled to mitigate risks;
- Australian Bay Lobster Producers (**ABLP**) complies with applicable standards, legislation and contractual requirements;
- Independent contractors remain compliant to ABLP and local authority traffic requirements;
- Contractors maintain effective traffic control systems;
- Activities to monitor, evaluate and measure compliance to the Traffic Management Plan (**TMP**) are established; and
- Deficiencies are identified and addressed promptly and effectively.

### 1.2 Scope

The purpose of this document is to outline the general procedures for traffic associated with the construction of stage two of the ABLP Seawater Supply Pipeline (**SSP**) at the locations depicted in Figure 1. These works relate primarily to heavy vehicles accessing each of the locations associated with construction of stage two.

The primary issue with respect to traffic, other than dust and noise, is associated with vehicular access to and egress from each of the construction locations, including effective risk mitigants for the safety of personnel on site.



Figure 1: Seawater Supply Pipeline - Stage two Construction Locations

### 1.3 Traffic Guidance Schemes & Traffic Control Plans

Refer to Appendix A.

## 2. Responsibilities

### 2.1 Project Site

The Site Manager is responsible for the day-to-day implementation of this management plan and ensuring traffic management:

- is properly planned, organised, directed and controlled;
- is properly resourced with people, equipment, facilities and systems;
- complies with all other legislation; and
- is achieving its objectives.

In addition to the above the Site Manager is responsible for ensuring traffic access, routes and traffic management is undertaken in accordance with the relevant

planning approvals, including ABLP's DA 282-11-2004-i and Tweed Shire Council (TSC) requirements as appropriate.

### 3. Implementation

#### 3.1 Entering Vehicles

Access to the construction locations will be via the points identified in the Traffic Guidance Schemes (TGS) and Traffic Control Plans (TCP) at Appendix A. Vehicles may only access the construction locations by left hand turn from the relevant road adjacent to the construction location. At no time are vehicles permitted to access a construction location by crossing oncoming traffic.

#### 3.2 Exiting Vehicles

Vehicles are generally required to exit a construction location in a forward direction and are only permitted to enter a road via the nearest lane to a construction location (i.e. vehicles are not permitted to cross lanes to enter a roadway). In the event it is not possible for a vehicle to enter a roadway in a forward direction, or if a vehicle will temporarily impede a road before exiting a construction location, a traffic controller must first be deployed to direct local traffic before this activity is undertaken.

### 4. Management of the TMP

#### 4.1 Impact on Public Roads

ABLP in consultation with contractors are to monitor the integrity of access roads, understanding TSC authority in this regard and taking into account every effort to reduce any impact upon the public.

It is not anticipated the construction activities will restrict public access to any road network for the duration of the works, however in the event access is to be restricted to a public road, approval will be first obtained from the TSC for this purpose. In

notifying the public of any road access restrictions the Site Manager is to adhere to the conditions imposed by the TSC in the relevant works approval.

For the duration of the project the relevant TGS and TCP will be implemented which will outline the signage, barricading and general traffic control devices applicable to each construction location. A copy of the preliminary TGS and TCP is at Appendix A. The latest approved TGS and TCP will be available to visitors and delegates on site if required.

### *Public Carparks*

There are two public carparks on Marine Parade, Kingscliff that will be occupied by construction spreads for the stage two works. These carparks and the anticipated closure periods are detailed in the following table.

<b>Carpark</b>	<b>Extent of Closure</b>	<b>Period of Closure</b>
Carpark 1: Beach carpark located opposite 152 Marine Parade, Kingscliff	100%	9 months
Carpark 2: Park carpark located opposite Beach Street, Kingscliff	50-75%	6 months

## 4.2 Haulage Hours

Construction activities associated with stage two of the project, including the arrival and departure of vehicles, must only be carried out between the hours of:

Day	Time
Monday to Saturday	0700 and 1800
Sunday and Public Holidays	At no time unless otherwise approved by TSC or Department of Planning, Industry and Environment.

## 4.3 Speed Limits

All vehicles shall obey road speed limits along routes to and from the site, including the signed speed limits at Tweed Coast Road and the 10km/h speed limit at all construction locations.

The current speed limits for the primary roads impacted by the stage two construction activities are listed below:

- Marine Parade: 50km/hr

Note: This speed limit will be reduced to 40km/hr in the vicinity of construction locations 1, 2 and 3.

- Kingscliff Street: 50km/hr

Note: This speed limit will be reduced to 40km/hr in the vicinity of construction locations 1, 2 and 3.

- Elrond Drive: 50km/hr

Note: This speed limit will be reduced to 40km/hr in the vicinity of construction locations 4 and 5.

- Beach Street: 50km/hr
- Unnamed road accessing location 6: 50km/hr

#### 4.4 Sediment and Dust Control

Construction activities will be undertaken in accordance with the Erosion and Sediment Control Plan in ABLP's Construction Environmental Management Plan to mitigate sediment and dust pollution on local roadways. Trucks are to have loads covered at all times except when loading and unloading.

#### 4.5 Haulage Routes

Internal haul roads will be managed by the Principal Contractor to avoid community dust nuisance and contamination of external properties and waterways. Where required onsite dust suppression will be implemented in addition to regular track maintenance.

Heavy vehicles will access Construction Locations 1-4 from the M1 Motorway via Wommin Bay Road to the north, otherwise Construction Locations 4-6 will be accessible from the M1 Motorway via Tweed Coast Road and Turnock Street to the south.

#### 4.6 Complaints

In undertaking the project ABLP endeavours to implement mitigants which reduce impact on the community and environment. Any complaints received from the community due to traffic, dust, noise, vibration, smoke or material being tracked onto the local roadway are to be addressed immediately. To expedite close out and avoid unnecessary nuisance on the community ABLP will always make contact where details are provided of the complainant and work towards a resolution.

## 5. Plant and Equipment

All vehicles used in traffic control operations will be equipped with the appropriate vehicle mounted warning devices.

The Principal Contractor will be responsible for ensuring all vehicles are fit for purpose and have service and maintenance records evidencing the vehicles have been maintained in accordance with manufacturer guidelines.

All loading and unloading of plant and machinery will be conducted on site within the confines of the site boundary. Where machinery is oversize, or access is limited, the Principal Contractor will provide traffic control as required by law to unload adjacent to a roadway.

## 6. Reviewing of Traffic Management Plan

It is the responsibility of the Environmental Manager/Representative to ensure that this management plan is periodically reviewed and updated. As part of this review the Environmental Manager/Representative is to assess the plan to determine if it is appropriate for the contemporary traffic conditions.

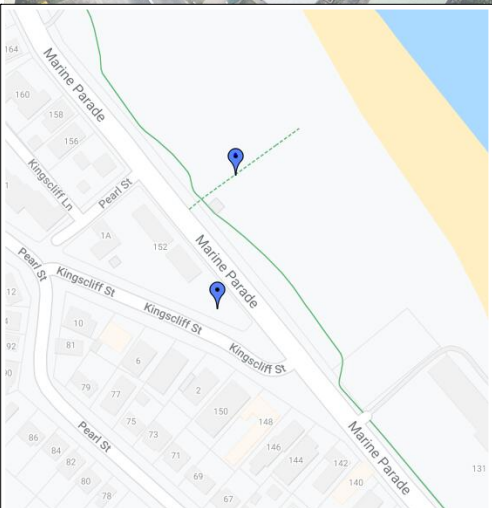
In the event the TMP requires amendment, whether due to a change of scope, audit recommendation, regulatory authority direction or otherwise, the TMP will be revised accordingly. The revised document and the input which led to the revisions will be reviewed by the Environmental Manager/Representative, approved by him/her, then filed on record.

The planned target dates (or frequencies) at which the TMP will be subject to formal review and the personnel who will participate in the review are to be identified by the Environmental Manager/Representative.

## Appendix A: Traffic Guidance Schemes & Traffic Control Plans

# TRAFFIC CONTROL PLAN

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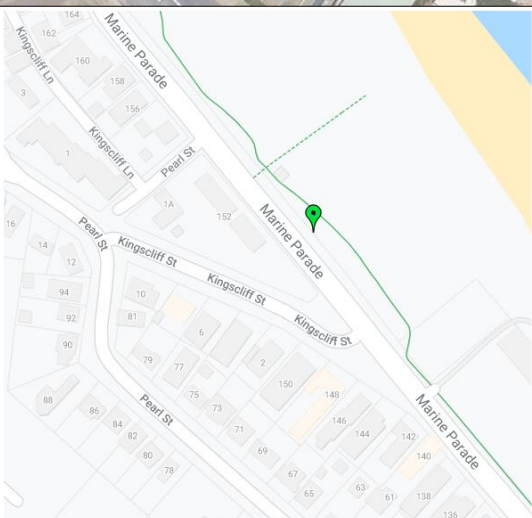
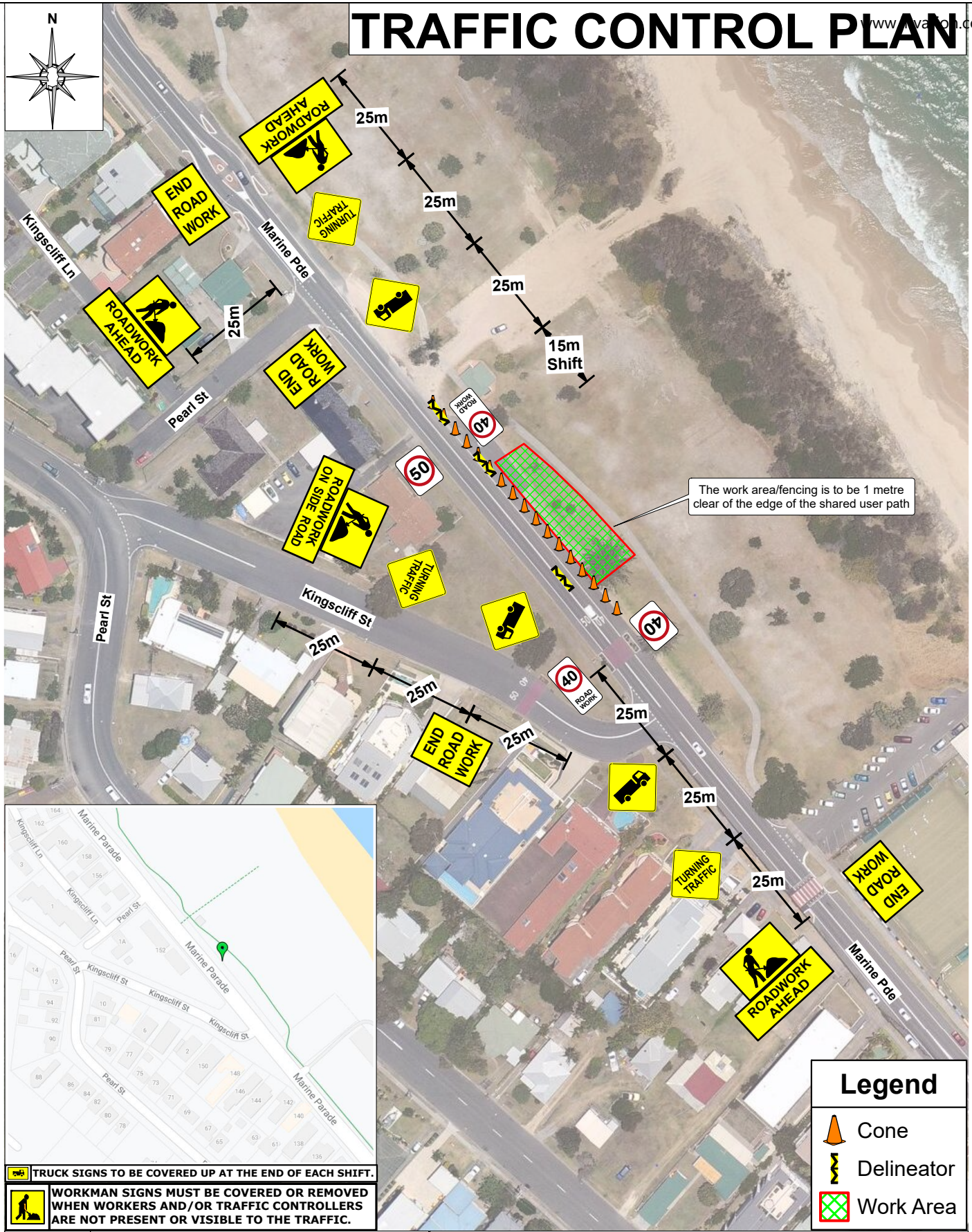
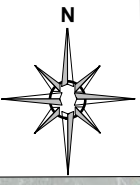
Legend	
	Cone
	Delineator
	Pedestrian Diversion
	Work Area

- TRUCK SIGNS TO BE COVERED UP AT THE END OF EACH SHIFT.
- WORKMAN SIGNS MUST BE COVERED OR REMOVED WHEN WORKERS AND/OR TRAFFIC CONTROLLERS ARE NOT PRESENT OR VISIBLE TO THE TRAFFIC.

	Date: 19/10/2021 Author: Daniel Smith TMR REG. #: 0218 Tiago Ortolani: NSW/TMD # 37826560
	Comments: Shoulder Closure & Trucks Turning signage to safely undertake seawater pipeline works.
Scale: NTS Diagram No: 41, 42 (modified) Sheet #: 1 of 1 Map No: xx	Notes:-
Client: Australian Bay Lobster Producers Ltd	1. All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
Site Contact: Tom Dalton - 0402 369 817	2. All existing speed signs to be covered if they conflict with this Traffic Control Plan
Project: Kingscliff St & Marine Pde, Kingscliff	3. Traffic Controllers are certified as competent in accordance to RTA's training course - Traffic Controllers
Between: Pearl St/ Marine Pde & Beach St/ Turnock St	4. This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA's course Apply Traffic Control Plans.
Plan Number: 21/2214 Version No: 01	5. Signs to be checked during each shift and daily records kept
Closure Type: Shoulder Closure/ Trucks Turning	6. This Plan is in accordance with TCWA Section 4.5 & 4.7
Posted Speed Limit: 40 Km/h & 50Km/h	7. The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4
Purpose: Civil Construction Works	

# TRAFFIC CONTROL PLAN

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**TRUCK SIGNS TO BE COVERED UP AT THE END OF EACH SHIFT.**

**WORKMAN SIGNS MUST BE COVERED OR REMOVED WHEN WORKERS AND/OR TRAFFIC CONTROLLERS ARE NOT PRESENT OR VISIBLE TO THE TRAFFIC.**

### Legend

- Cone
- Delineator
- Work Area

Date: 19/10/2021 Author: Daniel Smith TMR REG. #: 0218  
 Tiago Ortolani: NSW/TMD # 37826560

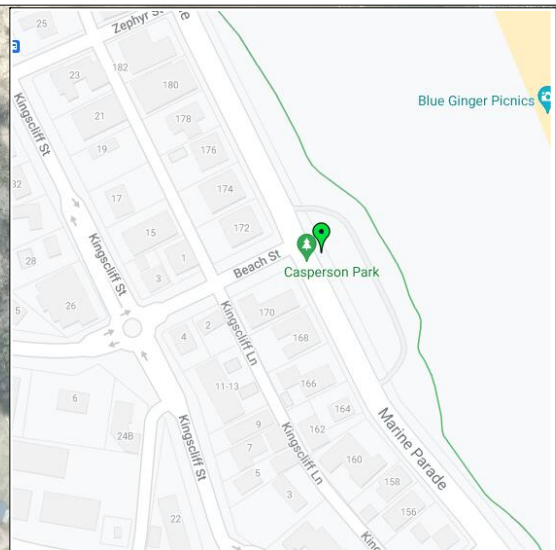
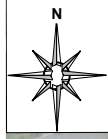
Comments:  
 Shoulder Closure & Trucks Turning signage to safely undertake seawater pipeline works.

Scale: NTS Diagram No: 41, 42 (modified) Sheet #: 1 of 1 Map No: xx

Client: Australian Bay Lobster Producers Ltd Plan Number: 21/2216 Version No: 02  
 Site Contact: Tom Dalton - 0402 369 817 Closure Type: Shoulder Closure/ Trucks Turning  
 Project: Marine Pde, Kingscliff Posted Speed Limit: 50Km/h  
 Between: Beach St & Kingscliff St Purpose: Civil Construction Works

- Notes:-
1. All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
  2. All existing speed signs to be covered if they conflict with this Traffic Control Plan
  3. Traffic Controllers are certified as competent in accordance to RTA's training course - Traffic Controllers
  4. This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA's course Apply Traffic Control Plans.
  5. Signs to be checked during each shift and daily records kept
  6. This Plan is in accordance with TCWA Section 4.5 & 4.7
  7. The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

# TRAFFIC CONTROL PLAN



Blue/Red arrows indicate direction of travel for construction traffic only and are not indicative of a southbound traffic lane

### Legend

- Cone
- Delineator
- Work Area

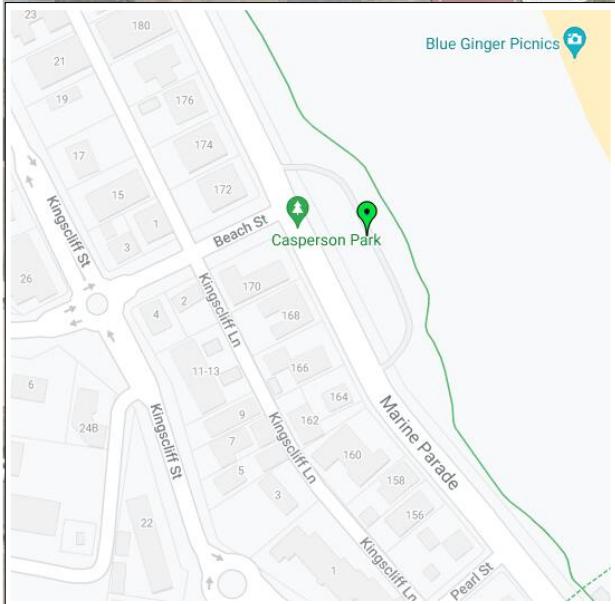
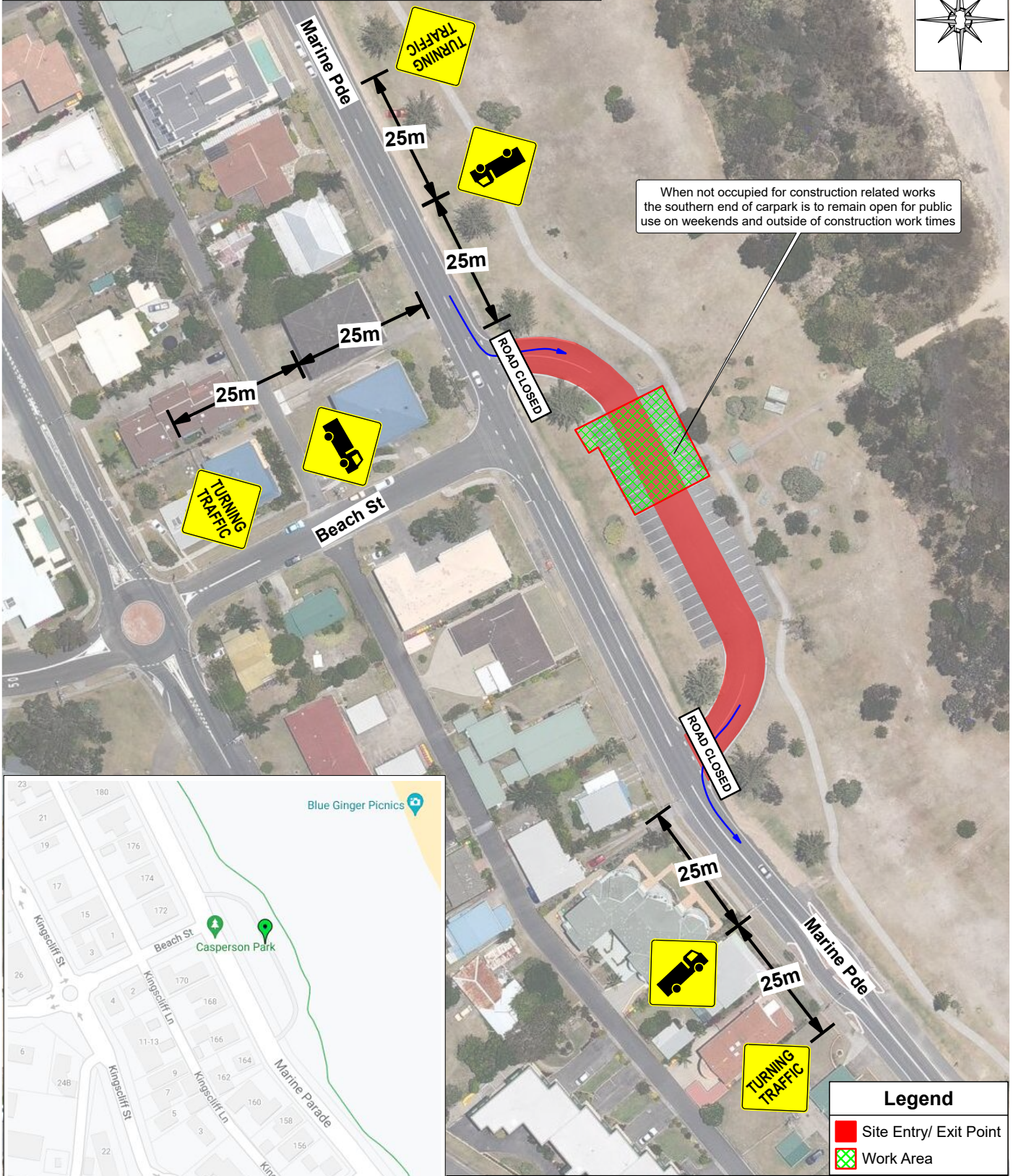
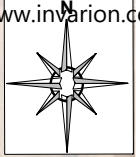
TRUCK SIGNS TO BE COVERED UP AT THE END OF EACH SHIFT.

WORKMAN SIGNS MUST BE COVERED OR REMOVED WHEN WORKERS AND/OR TRAFFIC CONTROLLERS ARE NOT PRESENT OR VISIBLE TO THE TRAFFIC.

	Date: 19/10/2021 Author: Daniel Smith TMR REG. #: 0218 Tiago Ortolani: NSW/TMD # 37826560	
	Comments: Shoulder Closure & Trucks Turning signage to safely undertake seawater pipeline works.	
Client: Australian Bay Lobster Producers Ltd	Plan Number: 21/2215	Version No: 02
Site Contact: Tom Dalton - 0402 369 817	Closure Type: Shoulder Closure/ Trucks Turning	
Project: Marine Pde, Kingscliff	Posted Speed Limit: 50Km/h	
Between: Zephyr St & Kingscliff St	Purpose: Civil Construction Works	

- Notes:-
- All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
  - All existing speed signs to be covered if they conflict with this Traffic Control Plan
  - Traffic Controllers are certified as competent in accordance to RTA's training course - Traffic Controllers
  - This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA's course Apply Traffic Control Plans.
  - Signs to be checked during each shift and daily records kept
  - This Plan is in accordance with TCWA Section 4.5 & 4.7
  - The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

# TRAFFIC CONTROL PLAN



Legend	
	Site Entry/ Exit Point
	Work Area

**TRUCK SIGNS TO BE COVERED UP AT THE END OF EACH SHIFT.**

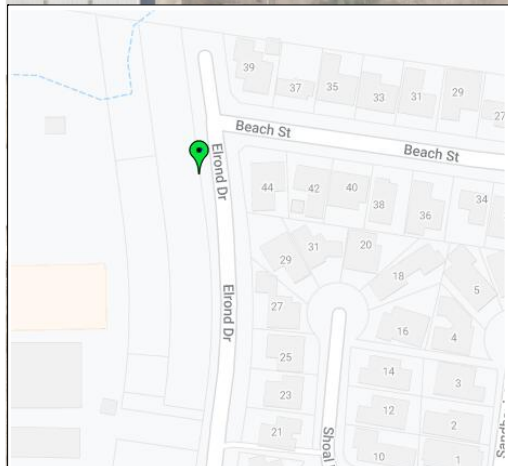
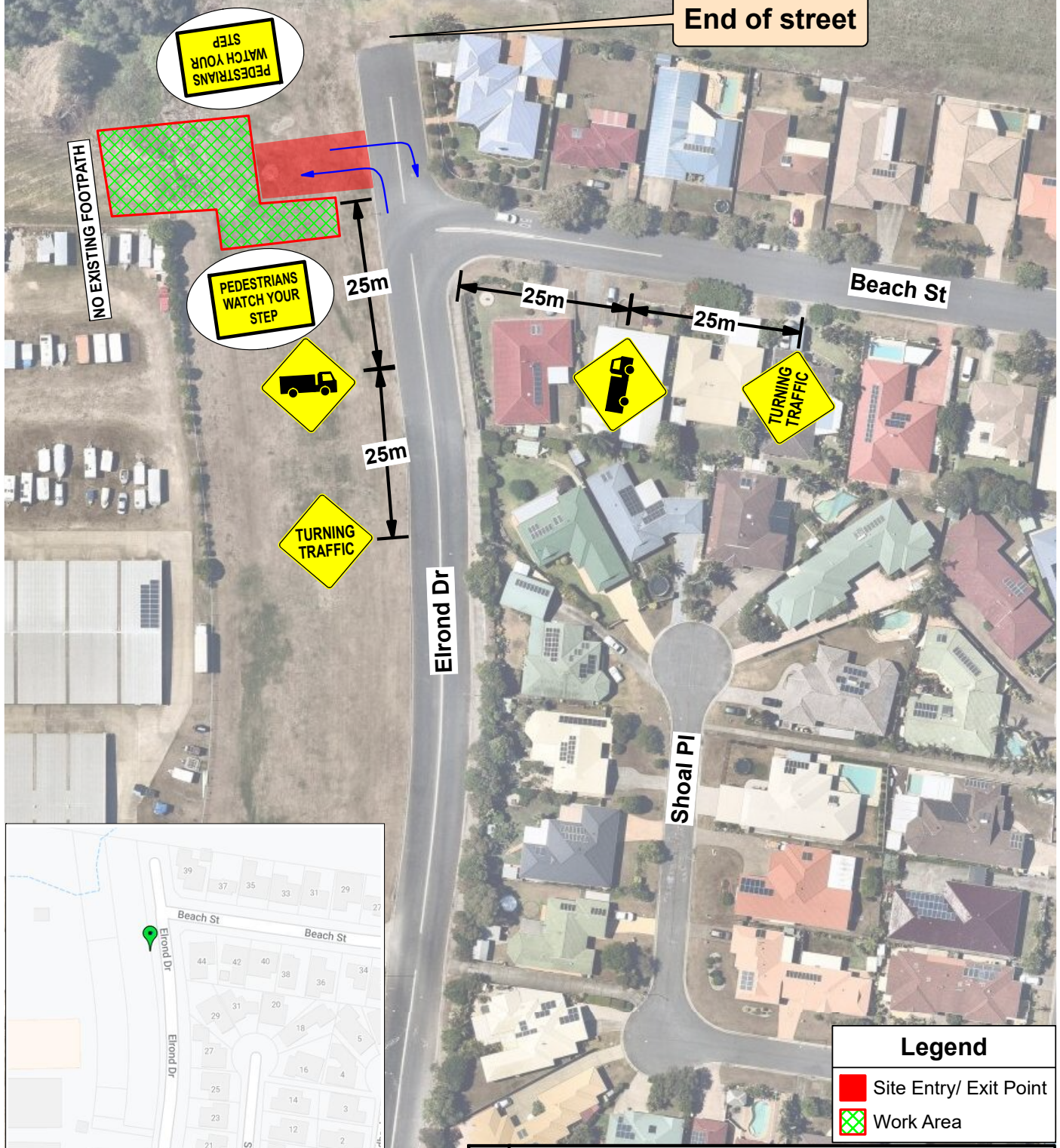
	Date: 19/10/2021 Author: Daniel Smith TMR REG. #: 0218 Tiago Ortolani: NSW/TMD # 37826560
	Comments: Trucks Turning signage for advanced warning to motorists of construction vehicles entering & exiting easement.
Scale: NTS Diagram No: Trucks Sheet #: 1 of 1 Map No: xx	Client: Australian Bay Lobster Producers Ltd Plan Number: 21/2222 Version No: 02
Site Contact: Tom Dalton - 0402 369 817	Closure Type: Trucks Turning
Project: Beach St @ Marine Pde, Kingscliff	Posted Speed Limit: 50Kmh
Between: Kingscliff St/ Marine Pde & Zephyr St & Pearl St	Purpose: Civil Construction Works

- Notes:-
1. All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
  2. All existing speed signs to be covered if they conflict with this Traffic Control Plan
  3. Traffic Controllers are certified as competent in accordance to RTA's training course - Traffic Controllers
  4. This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA's course Apply Traffic Control Plans.
  5. Signs to be checked during each shift and daily records kept
  6. This Plan is in accordance with TCWA Section 4.5 & 4.7
  7. The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

# TRAFFIC CONTROL PLAN



End of street



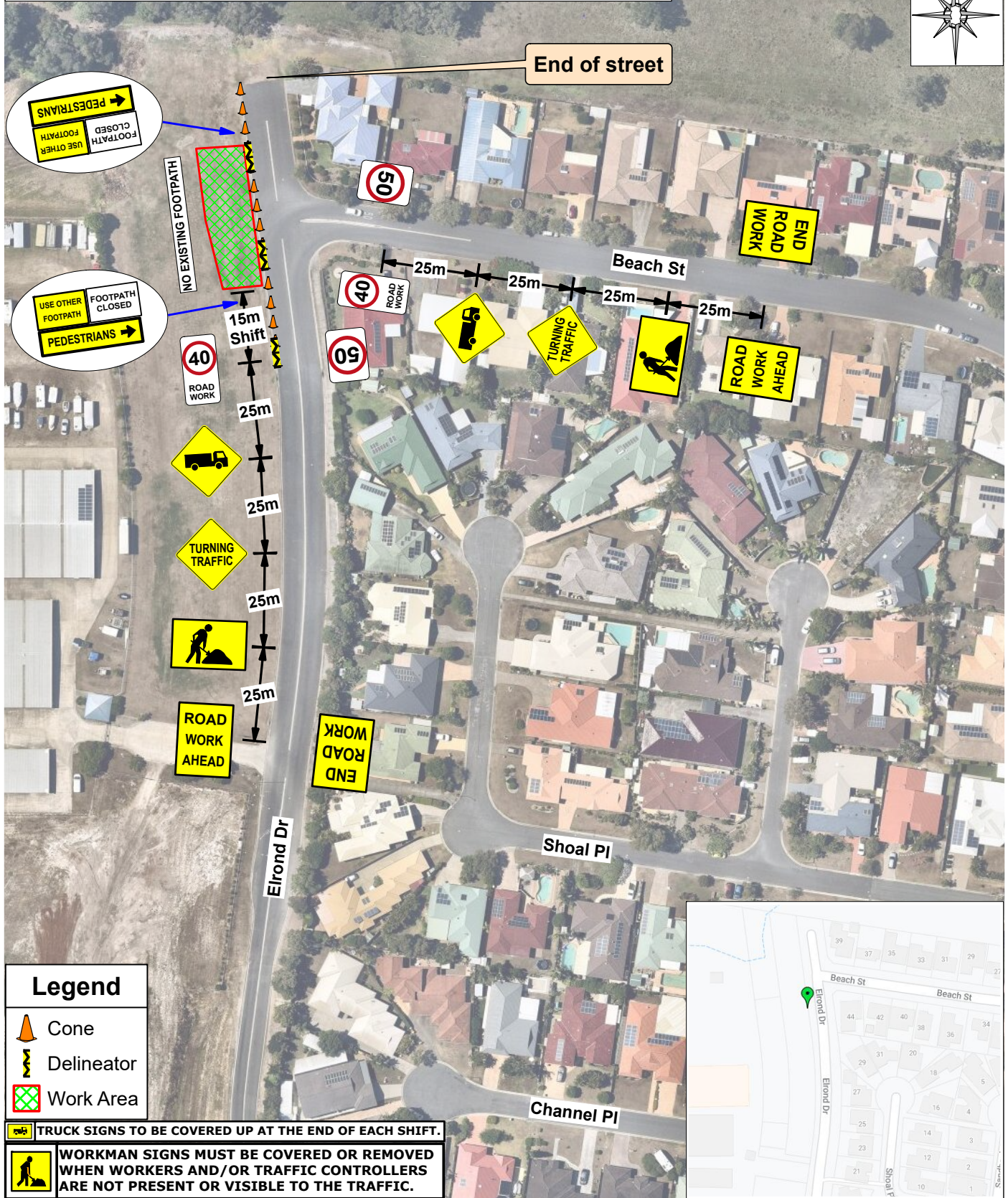
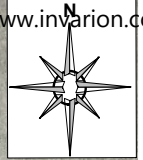
Legend	
	Site Entry/ Exit Point
	Work Area

**TRUCK SIGNS TO BE COVERED UP AT THE END OF EACH SHIFT.**

	Date: 19/10/2021 Author: Daniel Smith TMR REG. #: 0218 Tiago Ortolani: NSW/TMD # 37826560	
	Comments: Trucks Turning signage for advanced warning to motorists of construction vehicles entering & exiting easement.	
Scale: NTS Diagram No: Trucks Sheet #: 1 of 1 Map No: xx		
Client: Australian Bay Lobster Producers Ltd	Plan Number: 21/2221	Version No: 01
Site Contact: Tom Dalton - 0402 369 817	Closure Type: Trucks Turning	
Project: Beach St @ Elrond Dr, Kingscliff	Posted Speed Limit: 50Kmh/h	
Between: Lorien Wy/ Elrond Dr & Monarch Dr /End of Elrond Dr	Purpose: Civil Construction Works	

- Notes:-
- All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2.
  - All existing speed signs to be covered if they conflict with this Traffic Control Plan
  - Traffic Controllers are certified as competent in accordance to RTA's training course - Traffic Controllers
  - This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA's course Apply Traffic Control Plans.
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  - This Plan is in accordance with TCWA Section 4.5 & 4.7
  - The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

# TRAFFIC CONTROL PLAN



**Legend**

- Cone
- Delineator
- Work Area

**TRUCK SIGNS TO BE COVERED UP AT THE END OF EACH SHIFT.**

**WORKMAN SIGNS MUST BE COVERED OR REMOVED WHEN WORKERS AND/OR TRAFFIC CONTROLLERS ARE NOT PRESENT OR VISIBLE TO THE TRAFFIC.**

**tci**  
TRAFFIC CONTROL INNOVATIONS

Date: 19/10/2021 Author: Daniel Smith TMR REG. #: 0218  
Tiago Ortolani: NSW/TMD # 37826560

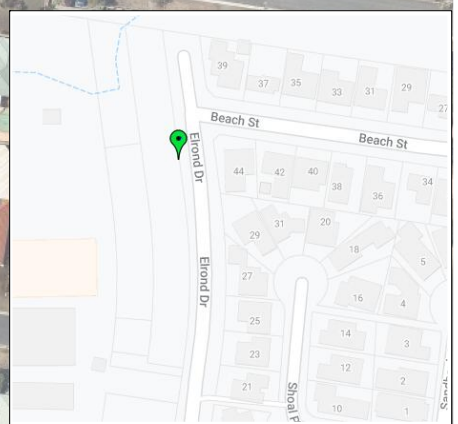
Comments:  
Shoulder Closure & Trucks Turning signage to safely undertake seawater pipeline works.

Scale: NTS Diagram No: 41, 42 (modified) Sheet #: 1 of 1 Map No: xx

**Notes:-**

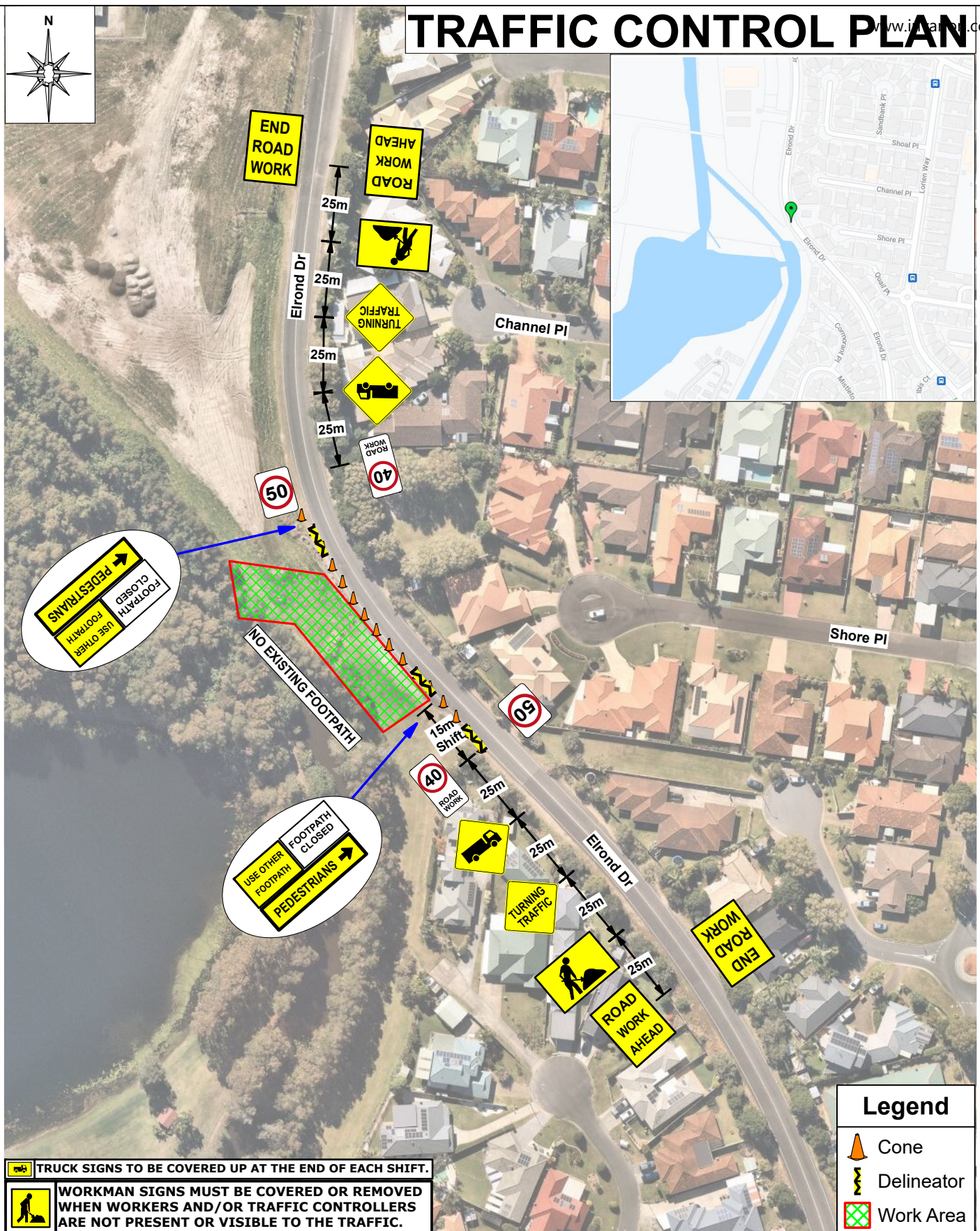
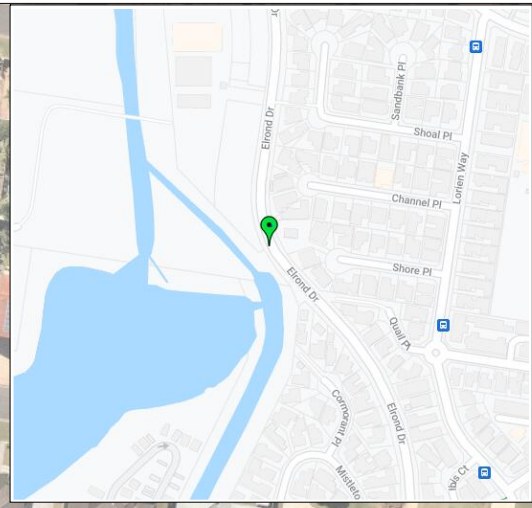
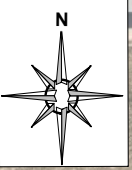
1. All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
2. All existing speed signs to be covered if they conflict with this Traffic Control Plan
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4. This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA's course Apply Traffic Control Plans.
5. Signs to be checked during each shift and daily records kept
6. This Plan is in accordance with TCWA Section 4.5 & 4.7
7. The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

Client: Australian Bay Lobster Producers Ltd	Plan Number: 21/2220	Version No: 01
Site Contact: Tom Dalton - 0402 369 817	Closure Type: Shoulder Closure/ Trucks Turning	
Project: Elrond Dr, Kingscliff	Posted Speed Limit: 50km/h	
Between: Monarch Dr & End of Elrond Dr	Purpose: Civil Construction Works	



# TRAFFIC CONTROL PLAN

www.tci.com



USE OTHER FOOTPATH  
PEDESTRIANS →

FOOTPATH CLOSED

USE OTHER FOOTPATH

FOOTPATH CLOSED

PEDESTRIANS →

### Legend

- Cone
- Delineator
- Work Area

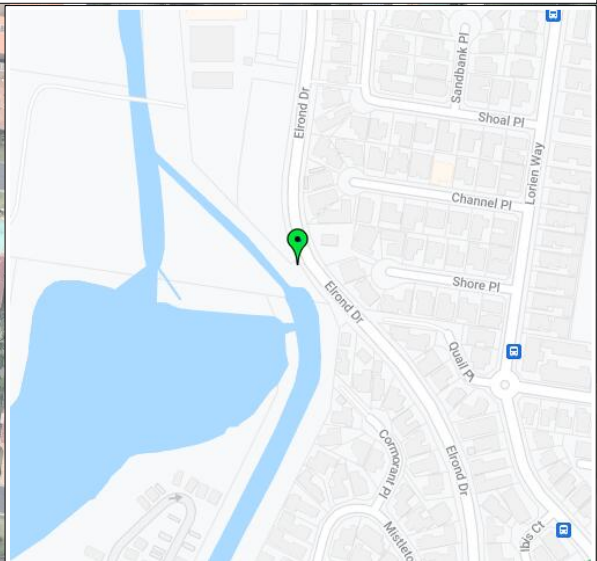
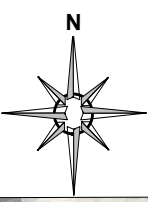
TRUCK SIGNS TO BE COVERED UP AT THE END OF EACH SHIFT.

WORKMAN SIGNS MUST BE COVERED OR REMOVED WHEN WORKERS AND/OR TRAFFIC CONTROLLERS ARE NOT PRESENT OR VISIBLE TO THE TRAFFIC.

	Date: 19/10/2021 Author: Daniel Smith TMR REG. #: 0218 Tiago Ortolani: NSW/TMD # 37826560	
	Comments: Shoulder Closure & Trucks Turning signage to safely undertake seawater pipeline works.	
Scale: NTS Diagram No: 41, 42( modified) Sheet #: 1 of 1 Map No: xx		
Client: Australian Bay Lobster Producers Ltd	Plan Number: 21/2219	Version No: 01
Project: Elrond Dr, Kingscliff	Closure Type: Shoulder Closure/ Trucks Turning	
Between: Monarch Dr & End of Elrond Dr	Posted Speed Limit: 50Km/h	
Purpose: Civil Construction Works		

- Notes:-
1. All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
  2. All existing speed signs to be covered if they conflict with this Traffic Control Plan
  3. Traffic Controllers are certified as competent in accordance to RTA's training course - Traffic Controllers
  4. This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA's course Apply Traffic Control Plans.
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  6. This Plan is in accordance with TCWA Section 4.5 & 4.7
  7. The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

# TRAFFIC CONTROL PLAN



PEDESTRIANS  
 FOOTPATH CLOSED  
 USE OTHER FOOTPATH

PEDESTRIANS  
 FOOTPATH CLOSED  
 USE OTHER FOOTPATH

TRUCK SIGNS TO BE COVERED UP AT THE END OF EACH SHIFT.

WORKMAN SIGNS MUST BE COVERED OR REMOVED WHEN WORKERS AND/OR TRAFFIC CONTROLLERS ARE NOT PRESENT OR VISIBLE TO THE TRAFFIC.

**tc**i  
 TRAFFIC CONTROL INNOVATIONS  
 Date: 19/10/2021 Author: Daniel Smith TMR REG. #: 0218  
 Tiago Ortolani: NSW/TMD # 37826560  
 Comments:  
 Shoulder Closure & Trucks Turning signage to safely undertake seawater pipeline works.  
 Scale: NTS Diagram No: 41, 42( modified) Sheet #: 1 of 1 Map No: xx

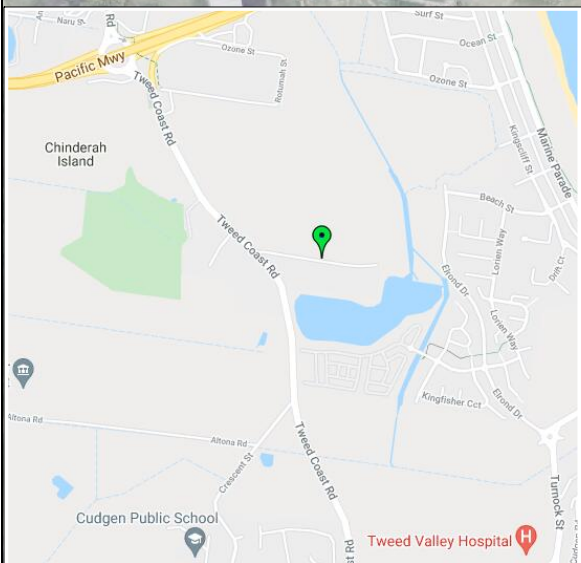
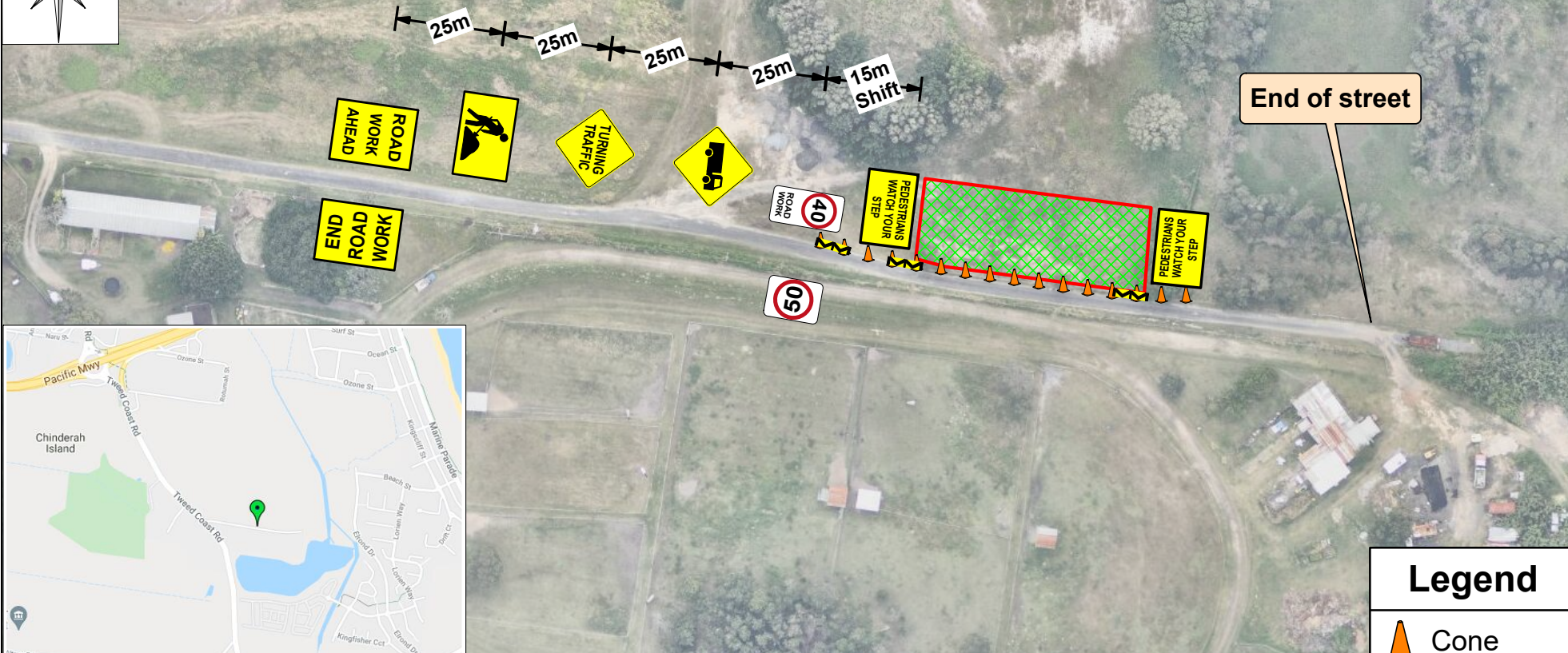
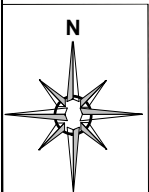
Client: Australian Bay Lobster Producers Ltd	Plan Number: 21/2218	Version No: 01
Site Contact: Tom Dalton - 0402 369 817	Closure Type: Shoulder Closure/ Trucks Turning	
Project: Noble Lake, Kingscliff	Posted Speed Limit: 50Km/h	
Between: Monarch Dr & End of Elrond Dr	Purpose: Civil Construction Works	

- Notes:-
- All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
  - All existing speed signs to be covered if they conflict with this Traffic Control Plan
  - Traffic Controllers are certified as competent in accordance to RTA's training course - Traffic Controllers
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  - This Plan is in accordance with TCWA Section 4.5 & 4.7
  - The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

**Legend**

	Cone
	Delineator
	Work Area

# TRAFFIC CONTROL PLAN



### Legend

- Cone
- Delineator
- Work Area

**TRUCK SIGNS TO BE COVERED UP AT THE END OF EACH SHIFT.**

**WORKMAN SIGNS MUST BE COVERED OR REMOVED WHEN WORKERS AND/OR TRAFFIC CONTROLLERS ARE NOT PRESENT OR VISIBLE TO THE TRAFFIC.**

	<b>Date:</b> 19/10/2021 <b>Author:</b> Daniel Smith <b>TMR REG. #:</b> 0218 <b>Tiago Ortolani:</b> NSW/TMD # 37826560	
	<b>Comments:</b> Shoulder Closure & Trucks Turning signage to safely undertake seawater pipeline works.	
Scale: NTS Diagram No: 41, 42 (modified) Sheet #: 1 of 1 Map No: xx		
<b>Client:</b> Australian Bay Lobster Producers Ltd	<b>Plan Number:</b> 21/2217	<b>Version No:</b> 01
<b>Site Contact:</b> Tom Dalton - 0402 369 817	<b>Closure Type:</b> Shoulder Closure/ Trucks Turning	
<b>Project:</b> Noble Lake, Kingscliff	<b>Posted Speed Limit:</b> 50Km/h	
<b>Between:</b> Tweed Coast Rd & End of street	<b>Purpose:</b> Civil Construction Works	

- Notes:-**
- All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
  - All existing speed signs to be covered if they conflict with this Traffic Control Plan
  - Traffic Controllers are certified as competent in accordance to RTA's training course - Traffic Controllers
  - This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA's course Apply Traffic Control Plans.
  - Signs to be checked during each shift and daily records kept
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  - The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

## **Attachment B5-2**

### **Driver's Code of Conduct**

## Driver's Code of Conduct

### Objectives

- To minimise the impact of earthworks and construction on the local and regional road network;
- Minimise conflict with other road users;
- Minimise road traffic noise; and
- Ensure truck drivers use project approved routes only.

### Code of Conduct

All drivers associated with the construction are to be issued with a copy of the Drivers Code of Conduct as part of their site safety induction, and must comply with all of the following:

- Demonstrate safe driving and road safety activities.
- Abide by traffic, road and environmental legislations.
- Follow site signage and instructions.
- Only enter and exit the site via the approved entry and exit points, and travel routes.

A driver who is found to have performed any of the actions listed below will be in breach of this Code of Conduct the subject of disciplinary action which may lead to disqualification from construction activities: These actions include:

- Reckless or dangerous driving.
- Driving without a seatbelt or whilst operating a mobile device.
- Driving whilst disqualified or unlicensed driving.
- Loss of demerit points leading to suspension of licence.
- Consuming alcohol or being under the influence of drugs or alcohol whilst driving.
- Failing to stop after a road incident involving the driver's vehicle.
- A breach of the governing road laws for the area in which the driver is travelling.
- Exceeding the speed limit whether temporary or permanent, or on a public road or site road.
- Travelling on a road other than a road designated for access to a construction location, including arriving or departing from a construction location in contravention of the site Traffic Management Plan or Traffic Guidance Scheme.

### Driver Responsibilities

All Drivers on site must:

- Be responsible and accountable for their actions when operating a company vehicle or driving for a construction related purpose.
- Display the highest level of professional conduct when driving a vehicle at all times.

- Ensure they have a current driver's licence for the class of vehicle they are driving and carry this licence at all times.
- Immediately notify their supervisor or manager if their drivers' licence has been suspended, cancelled, or has had a restriction applied.
- Comply with all traffic and road legislation when driving.
- Undertake daily pre-start checks of oil, tyre pressures, radiator fluid levels and battery levels.
- Drive within the legal speed limits and in accordance with the prevailing road conditions.

### **Conduct for Drivers Entering Construction Locations**

Drivers must adhere to the following requirements on entry to a construction site:

- Be cognisant of the noise and emissions requirements imposed within the CEMP, and in a broader sense, the NSW/ Australian Road Rules noting works must be constructed with the aim of achieving the construction noise plan detailed in the Noise Management Plan.
- Do not queue on public roads unless a prior approval has been sought.
- Be aware that at no time may a tracked plant be permitted or required on a paved road.
- All drivers to report to their supervisor if they have been prescribed medication prior to the start of work.
- Wear a safety seat belt at all times when in the vehicle.
- Avoid distraction when driving – the driver will adjust car stereos/mirrors etc. before setting off or pull over safely to do so.
- Report all near-misses and incidents, no matter how minor to a manager at the earliest opportunity,
- Report infringements to a manager at the earliest opportunity.
- Report vehicle defects to a manager prior to the next use of the vehicle.
- Follow the approved site access/egress routes only.
- Follow speed limits as imposed within the estate.
- Keep loads covered at all times.

### **Contractor Responsibilities**

The Contractor is responsible to take all steps necessary to ensure vehicles are serviced and maintained for the safe operation by drivers. This will be achieved by undertaking the following:

- Ensuring all vehicles are maintained and in good working order via:
  - Pre-commencement checks for all new plant arriving on-site and prior to undertaking any work.
  - Daily prestart inspections for all plant, vehicles and equipment on-site.

- Ensuring all construction plant is fitted with a flashing light, fire extinguisher and reverse alarms (or squawkers).
- Ensure all operators onsite have a current verification of competency (VOC) for their current
  - driver's licence and class.
  - Ensure maintenance requirements are met and recorded;
- Identifying driver training needs and arranging appropriate training or re-training, including but not limited to:
  - Operator VOC assessment as part of all contractor site inductions.
  - Regular Toolbox discussions on safety features, managing fatigue, approved heavy routes, driver responsibility and the requirements of this Code of Conduct; and
- Encouraging Safe Driving behaviour by:
  - Ensuring all contractors and subcontractors are notified if their respective employees become unlicensed.
  - Not paying directly or reimbursing, employees or contractors speeding or other infringement notices.
  - Implementing a no tolerance approach to the use of handheld devices whilst operating a vehicle.

## **Incident Procedure**

The following procedure is to be followed in the event of an incident involving a vehicle.

1. Stop the vehicle in the nearest safe location to the incident making sure not to hinder traffic or create a hazard.
2. Ensure your own safety as a first priority before assisting any injured people where it would not cause undue risk to oneself.
3. If required, seek assistance immediately by contacting 000.
4. Record the following information concerning the incident:
  - a) Details of the other vehicles and registration numbers.
  - b) Names and addresses of the other vehicle drivers.
  - c) Names and addresses of witnesses.
  - d) Insurers details.
  - e) Photos of all vehicles involved, including licence plates and the location of the incident.
5. If the damaged vehicle is not occupied, provide a note with your contact details for the owner to contact the company.
6. For a non-emergency contact the Police in the event of the following:

- a) If there is a disagreement over the cause of the crash.
  - b) If there are injuries to you or any other person.
  - c) If you damage property other than your own.
7. As soon as reasonably practical, report all details concerning the incident to your manager.

# B6 – EMERGENCY AND INCIDENT RESPONSE

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

<b>Current Version</b>	B
<b>Current Version Date</b>	21 January 2022
<b>Status</b>	Final

#### Amendments

<b>Version Number</b>	<b>Version Date</b>	<b>Authorised by</b>	<b>Amendment Details</b>
A	23 November 2021	ABLP	Original Publication
B	21 January 2022	ABLP	N/A

## **B6 – EMERGENCY AND INCIDENT RESPONSE**

### **1 Purpose and Scope**

This procedure aims to outline a basic set of actions to follow when responding to an incident associated with the construction of stage two of the Australian Bay Lobster Producers Seawater Supply Pipeline. Compliance with the procedures contained in this document is intended to ensure the correct containment, clean-up and reporting actions are undertaken for incidents which may occur.

### **2 Responsibilities**

It is the responsibility of the Environmental Manager / Representative to ensure this procedure is periodically reviewed and updated. The Environmental Manager / Representative is also responsible for ensuring that Australian Bay Lobster Producers staff and the principal contractor are aware of this procedure and have measures in place to comply.

### **3 Health and Safety**

Health and Safety concerns will always take precedence when managing an incident. If a situation is not safe, personnel will not enter the area unless they are:

- Properly fitted with Personal Protective Equipment (PPE) and trained in its use;
- Sufficiently experienced to deal with the situation; and
- Acting under an approved Safety Management Plan or Procedure for the specific site

The principal contractor is responsible for enacting effective site health and safety management procedures which are to be complied with by all personnel on the site.

### **4 Assessment of Importance of Incident – Environmental Aspects only**

Upon occurrence of an incident the category of incident should be immediately assessed to determine the appropriate course of action. The categories are outlined below.

**High Impact** - applies to any one or more of the following:

- where there is an immediate threat to human life or property (property damage or potential for damage of over \$100,000);
- where the incident could be associated with significant harm to native fauna and flora;
- creates an immediate observable harm to environmental receptors;
- where it occurs in water catchments that have recognized conservation and scientific values; or
- where the incident has the potential to seriously contaminate soil or water resources.

**Moderate Impact** - applies to any one or more of the following:

- where there is significant (but not immediate) threat to human life or property (property damage or potential for damage of over \$10,000);
- where the incident may result in chronic or long-term harm to native fauna and flora; or
- may have a long term (but not immediate) observable impact on environmental receptors.

**Low Impact** - applies to any one or a combination of the following:

- where there is no perceived threat to human life or property;

- where the incident is outside sensitive environments;
- where the incident poses no immediate or long term threat to environmental receptors.

## 5 Incident Response – Environmental Aspects only

Table B6-1 below shows the minimum responses to be undertaken based on the category of incident (Section 2).

**Table B6-1: Category of incident assessment**

Impact Class	Clean Up	Initial Notification	Written Notification	Review CEMP / Site Procedures	Environmental Monitoring
High	Immediate	As soon as practicable	Within 7 days	Yes	Yes
Moderate	Immediate	As soon as practicable	Within 7 days	Yes	Determine effective clean-up
Low	Within 4 hours	None	Via periodic report	No	No

## 6 Notification

The Environmental Manager / Representative must be notified of all incidents as soon as practicable. For a high impact event the relevant Government authority must be notified of any actual or potential significant off-site impacts to people or the biophysical environment as soon as practicable. For the occurrence of a moderate impact event the relevant Government authority must be notified within 24 hours of the event (**Initial Notification**).

At a minimum the Initial Notification is be provided to the Tweed Shire Council and the Department of Planning and Environment. Should the Environmental Manager / Representative not be able to be contacted within the notification timeframe, notification shall proceed without the prior knowledge of the Environmental Manager / Representative who will instead be notified as soon as possible thereafter.

Following initial notification, written details of the incident must be submitted to the Secretary of Planning along with any relevant Government authority within seven days of the date of the incident.

# C1 – FORMS

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

<b>Current Version</b>	B
<b>Current Version Date</b>	21 January 2022
<b>Status</b>	Final

#### Amendments

<b>Version Number</b>	<b>Version Date</b>	<b>Authorised by</b>	<b>Amendment Details</b>
A	23 November 2021	ABLP	Original Publication
B	21 January 2022	ABLP	N/A

## Form C1 – Incidents / Complaints

### Complaint / Incident Report Recipient

Date:			
Name:			
<input type="checkbox"/> Complaint		<input type="checkbox"/> Incident	
Nature of Incident / Complaint (tick one)	<input type="checkbox"/> water <input type="checkbox"/> air <input type="checkbox"/> land <input type="checkbox"/> other .....		

### Complainant / Incident Reporter

Name:			
Address:			
Contact Telephone:			
E-mail:			
Time of Complaint / Report			
Nature of Contact (phone, e-mail, etc.)			

Complaint / Incident			
Time:			
Location:			
Description:			
Actions Taken			
No.	Action	Date Acted On	Signed
1			
2			
3			
4			
5			

## Form C2 – Site Inspection Form

Date:	
Inspector:	
Inspection Checklist:	<p>Is the site in a satisfactory condition? Y <input type="checkbox"/> N <input type="checkbox"/></p> <p>Are there any signs of erosion, sediment loss or other pollution? Y <input type="checkbox"/> N <input type="checkbox"/></p> <p>Is any action required? Y <input type="checkbox"/> N <input type="checkbox"/></p> <p>Has required action been taken? Y <input type="checkbox"/> N <input type="checkbox"/></p>
Notes:	

### Details of Inspection

No.	Location	Details <sup>1</sup>	Action Undertaken	Date Action Taken
1				
2				
3				
4				
5				

<sup>1</sup> Erosion or potential erosion; pollution (on or off site); inappropriate activities or inadequate waste control, water quality controls in need of repair, replacement or reinstatement; new controls required; surface stabilisation or maintenance work required; etc.

# D1 – DRAWINGS

## Australian Bay Lobster Producers Limited

### Seawater Supply Pipeline: Stage Two – Lot 3 DP 1111554 to Marine Intakes (Kingscliff Beach)

#### Document Control Sheet

<b>Current Version</b>	B
<b>Current Version Date</b>	21 January 2022
<b>Status</b>	Final

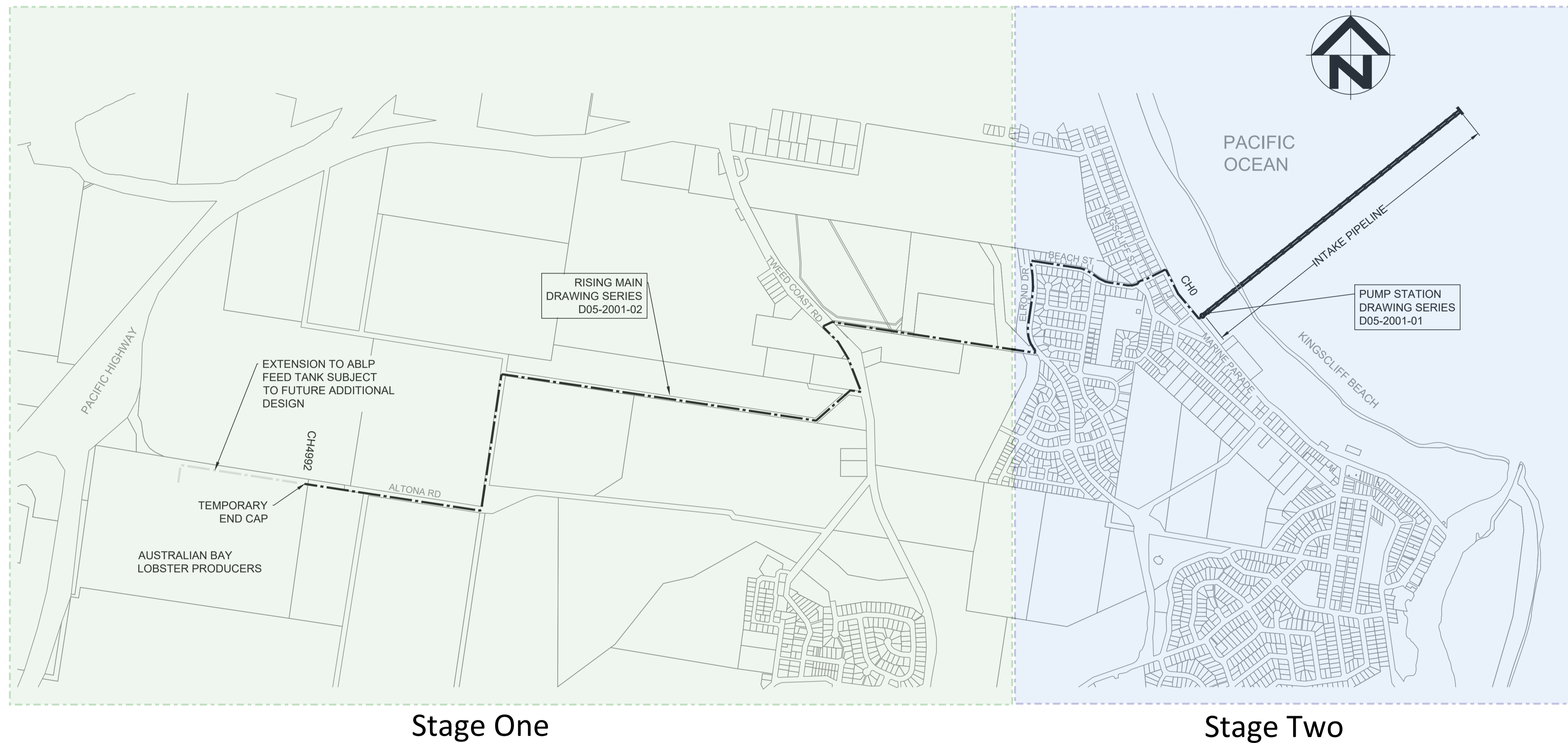
#### Amendments

Version Number	Version Date	Authorised by	Amendment Details
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B	21 January 2022	ABLP	N/A

# SEAWATER DELIVERY PIPELINE

## SEAWATER INTAKE, PUMP STATION AND RISING MAIN DELIVERY PIPELINE FROM KINGSCLIFF BEACH TO LOT 20 DP 1082482

AUSTRALIAN BAY LOBSTER PRODUCERS PTY LTD



Stage One

Stage Two

### DRAWING SERIES INDEX

DRAWING SERIES NO.	DESCRIPTION	CONSULTANT
D05-2001-01	SEAWATER DELIVERY PUMP STATION DRAWINGS	WILLOW AND SPARROW
D05-2001-02	SEAWATER DELIVERY RISING MAIN DRAWINGS (TBC)	WILLOW AND SPARROW

Willow+  
Sparrow



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ENGINEERING+DESIGN

WILLOW & SPARROW PTY LTD A.C.N. 606732512

DRAWING LIST

DRAWING NUMBER	SHEET	TITLE	ISSUE	DATE
D05-2001-01-IL	1 OF 1	DRAWING INDEX SHEET AND MASTER LEGEND	E	12/2/2021
D05-2001-01-NT	1 OF 2	NOTES SHEET	E	12/2/2021
D05-2001-01-NT	2 OF 2	NOTES SHEET	E	12/2/2021
D05-2001-01-HY	1 OF 3	HYDRAULIC INTERACTION OF SYSTEM RESISTANCE AND PUMP CURVES	E	12/2/2021
D05-2001-01-HY	2 OF 3	DIAGRAM OF PIPING AND INSTRUMENTATION	E	12/2/2021
D05-2001-01-HY	3 OF 3	HYDRAULIC SECTION VIEW OF INTAKE PIPELINE	E	12/2/2021
D05-2001-01-IN	1 OF 1	SEAWATER INTAKE DETAILS	E	12/2/2021
D05-2001-01-OP	1 OF 1	OVERALL PLAN FOR PUMP STATION CIVIL WORKS	E	12/2/2021
D05-2001-01-PS	1 OF 3	PUMP STATION GENERAL SITE PLAN	E	12/2/2021
D05-2001-01-PS	2 OF 3	PUMP STATION GENERAL ARRANGEMENT AND INTERNAL PIPE WORK	E	12/2/2021
D05-2001-01-PS	3 OF 3	PUMP STATION GENERAL ARRANGEMENT AND EXTERNAL PIPE WORK	E	12/2/2021
D05-2001-01-ST	1 OF 8	PUMP STATION CAISSON AND PLUG STRUCTURAL DETAILS	E	12/2/2021
D05-2001-01-ST	2 OF 8	PUMP STATION WALL AND PENETRATION STRUCTURAL DETAILS	E	12/2/2021
D05-2001-01-ST	3 OF 8	PUMP STATION WELL TOP SLAB STRUCTURAL DETAILS	E	12/2/2021
D05-2001-01-ST	4 OF 8	VALVE PIT STRUCTURAL DETAILS	E	12/2/2021
D05-2001-01-ST	5 OF 8	METER PIT AND PIGGING PIT STRUCTURAL DETAILS	E	12/2/2021
D05-2001-01-ST	6 OF 8	PUMP STATION WORKING PLATFORM ARRANGEMENT AND BRACKET DETAILS.	E	12/2/2021
D05-2001-01-ST	7 OF 8	PUMP STATION INTERNAL SUPPORT BRACKET DETAILS	E	12/2/2021
D05-2001-01-ST	8 OF 8	SEAWATER INTAKE STRUCTURAL DETAILS	E	12/2/2021

**LEGEND**

TREE NUMBER REFER TO TREE LIST FOR INFORMATION  
TREE SIZES ARE ESTIMATES ONLY

TREE TO BE REMOVED

NEW SEAWATER PIPELINE

OVERHEAD POWER  
UNDERGROUND POWER  
UNDERGROUND COMMUNICATIONS  
UNDERGROUND TELSTRA  
UNDERGROUND FIBRE OPTIC  
UNDERGROUND STORMWATER  
UNDERGROUND WATER  
UNDERGROUND SEA/RAW WATER  
UNDERGROUND SEWER RISING MAIN  
UNDERGROUND SEWER

TOP OF BANK  
BOTTOM OF BANK  
FENCE

EXISTING BOLLARD  
NEW BOLLARD  
ELECTRICITY PILLAR  
POWER POLE  
LIGHT POLE  
STOP VALVE  
TELSTRA PIT  
GATE  
STORMWATER GRATE  
STORMWATER MANHOLE  
SEWER MANHOLE  
CONTROL POINT  
WATER METER  
SPOT HEIGHTS  
FIRE HYDRANT

**FOR APPROVAL**

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ENGINEERING+DESIGN

Designed	Drawn	Checked	Survey
PJB	PJB	MC	
Scale		Date	
N/A		21/4/2020	
 12/2/2021 APPROVED - PRINCIPAL MICHAEL CHAMBERLAIN - RPEng			

Datum AHD (m)

Issue	Description	Date	By
E	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021	PJB
D	REVISED TENDER ISSUE	4/12/2020	PJB
C	ISSUED FOR TENDER	9/11/2020	PJB
B	REVISED WELL LOCATION	26/10/2020	PJB
A	PRELIMINARY	21/4/2020	PJB

CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**

PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE  
**DRAWING INDEX SHEET AND MASTER LEGEND**

Drawing No. **D05-2001-01-IL** Sheet 1 of 1 **A1**

**GENERAL**

- G1. ALL DRAWINGS UNDER THIS PACKAGE SHALL BE READ IN CONJUNCTION WITH THE PROJECT SPECIFICATION.
- G2. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE AND COMPLIANCE WITH THE:
  - A. RELEVANT AND CURRENT STANDARDS OF AUSTRALIA.
  - B. PROVISIONS OF THE BUILDING ACT 1975.
  - C. WATER SERVICES ASSOCIATION OF AUSTRALIA (WSA) WATER SUPPLY AND SEWERAGE DESIGN AND CONSTRUCTION CODES.
  - D. NSW ELECTRICITY ACT, REGULATIONS AND GUIDELINES
- G3. ANY DISCREPANCY SHALL BE REFERRED TO THE SUPERINTENDENT BEFORE PROCEEDING WITH THE WORKS.
- G4. UNLESS NOTED OTHERWISE (UNO):
  - A. ALL DIMENSIONS ARE IN MILLIMETERS.
  - B. ALL CHAINAGES ARE IN METERS.
  - C. ALL LEVELS ARE IN METERS TO AUSTRALIAN HEIGHT DATUM (AHD).
- G5. ALL DIMENSIONS SHOWN ON THE DRAWINGS ARE NOMINAL ONLY. THE CONTRACTOR SHALL VERIFY THE DIMENSIONS ON SITE PRIOR TO FABRICATION OR CONSTRUCTION. DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS..
- G6. THE CONTRACTOR SHALL CARRY OUT CLEARING AND GRUBBING OF REQUIRED AREAS AS SPECIFIED. THIS SHALL INCLUDE THE REMOVAL OF EXISTING VEGETATION EXCEPT FLORA NOMINATED FOR PRESERVATION.
- G7. NO SUBSTITUTE MATERIALS SHALL BE USED WITHOUT THE WRITTEN APPROVAL OF THE SUPERINTENDENT.
- G8. THE CONTRACTOR SHALL PROVIDE ADEQUATE TEMPORARY PROTECTION AND SITE FENCING TO PREVENT ENTRY OF ANY UNAUTHORISED PERSONS AND ANIMALS DURING CONSTRUCTION.
- G9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING PIPES AND PITS AGAINST FLOTATION DURING CONSTRUCTION.
- G10. FOR DETAILS REGARDING WORKING IN PRIVATE PROPERTY REFER PROJECT SPECIFICATION.

**SURVEY, SETOUT AND SERVICES**

- SS1. COORDINATE NOTES:  
 ORIGIN OF HORIZONTAL AND VERTICAL DATUM:  
 PM 66736  
 EASTING: 554 815.927  
 NORTHING: 6 874 732.248  
 RL: 1.928 (AHD)  
 MGA (MAP GRID OF AUSTRALIA 1994 - ZONE 56)  
 THIS PLAN IS ON GROUND COORDINATES ORIENTATED TO MGA AZIMUTH. TO CONVERT TO MGA GRID COORDINATES APPLY THE SCALE FACTOR OF 0.999630 BASED ON PM66736.
- SS2. LOT AREAS AND BOUNDARY DIMENSIONS HAVE BEEN COMPILED FROM DEPOSITED PLANS AVAILABLE AT LAND REGISTRY SERVICE NSW. NO BOUNDARY SURVEY OR INVESTIGATION HAS BEEN MADE AND NO BOUNDARIES HAVE BEEN MARKED. BOUNDARIES SHOWN HEREON ARE PROVISIONAL AND SUBJECT TO FURTHER SURVEY. POSITION OF IMPROVEMENTS RELATIVE TO BOUNDARIES SHOWN HEREON IS DIAGRAMMATIC ONLY.
- SS3. EXISTING SURVEY CONTROL STATIONS - THE CONTRACTOR SHALL ENSURE THAT SURVEY CONTROL STATIONS ARE NOT DAMAGED OR DISTURBED IN ANY WAY BY CONSTRUCTION ACTIVITIES.
- SS4. FOR SETOUT:
  - A. ALL SETOUT POINTS RELATE TO THE CENTRELINE OF THE PIPELINE, UNO.
  - B. ALL SETOUT POINTS AT BENDS REFER TO THE INTERSECTION POINT (IP), UNO.
- SS5. EXISTING SERVICES:
  - A. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING THE EXISTING SERVICES. VERIFICATION OF THE LOCATION OF THESE SERVICES MUST BE OBTAINED PRIOR TO ANY EXCAVATION COMMENCING .
  - B. ONLY UNDERGROUND SERVICES IN THE IMMEDIATE VICINITY OF THIS SURVEY HAVE BEEN LOCATED. INFORMATION OF THE EXISTING SERVICES ARE SHOWN IN THE DRAWINGS IN GOOD FAITH. NO GUARANTEE IS GIVEN OR IMPLIED THAT SUCH INFORMATION IS ACCURATE OR COMPLETE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE THE POSITION OF THE EXISTING SERVICES BEFORE COMMENCING CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO EXERCISE CARE WHEN IN CLOSE PROXIMITY OF SERVICES AND EXCAVATION IN GENERAL. CAREFUL HAND EXCAVATION IS RECOMMENDED WHEN WITHIN CLOSE PROXIMITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE EXISTING SERVICES DURING THE COURSE OF THE CONTRACT.
  - C. IN THE EVENT OF SERVICES DEVIATING FROM LOCATIONS SHOWN OR PRESENT BUT NOT SHOWN ON THE DRAWINGS, THE CONTRACTOR SHALL GIVE 3 DAYS NOTICE PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITY THAT MAY AFFECT THE SERVICE.
  - D. CONTRACTOR TO OBTAIN PRIOR APPROVAL FROM THE SUPERINTENDENT FOR ANY DEVIATIONS REQUIRED TO AVOID EXISTING SERVICES.

**EXCAVATION AND BACKFILLING**

- EB1. ALL EXCAVATION, BACKFILLING AND COMPACTION SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 3798.
- EB2. PRIOR TO COMMENCEMENT OF SITE CLEARANCE AND EXCAVATION, THE CONTRACTOR SHALL MAKE ALL ENQUIRIES AND INVESTIGATIONS TO PROTECT FROM DAMAGE ALL PUBLIC AND PRIVATE PROPERTIES & SERVICES.
- EB3. CLEARING AND DISTURBING OF VEGETATION SHALL BE KEPT TO A MINIMUM AND SHALL BE LIMITED TO AREAS CONTAINING THE EXCAVATIONS FOR THE CONSTRUCTION OF THE REQUIRED WORKS.
- EB4. ENSURE MINIMAL DISTURBANCE AND APPROPRIATE MANAGEMENT TO ACID SOILS, ACID SULFATE SOILS, CONTAMINATED LAND, AND HIGHLY ERODIBLE AND DISPERSIBLE SOILS. THE CONTRACTOR SHALL UNDERTAKE ALL NECESSARY SOIL TREATMENT IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED ACID SULFATE SOILS MANAGEMENT PLAN.
- EB5. ALL TOPSOIL STRIPPED FROM WORK AREAS SHALL BE STOCKPILED FOR LATER RE-SPREADING. RE-SPREAD SHALL BE TO A MINIMUM DEPTH OF 100mm TO A MAXIMUM 300mm
- EB6. COMPACTION OF TRENCH BACKFILL MATERIAL IN NON-ROAD PAVEMENT AREAS IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE REQUIREMENTS OF AS3798.

- EB7. ALL EXCAVATION OF TRENCHES SHALL BE:
  - A. THE MINIMUM NECESSARY TO INSTALL THE PIPELINE AND ASSOCIATED STRUCTURES.
  - B. MADE SECURE AGAINST MOVEMENT BY MEANS OF STABLE BATTERS, SHEET PILING OR ANY OTHER SUITABLE SYSTEM.
  - C. COMPLETELY DRAINED AT ALL TIMES BY TEMPORARY DRAINS OR PUMPING WHEN NECESSARY.
  - D. THE BOTTOM OF THE EXCAVATION FOR A TRENCH OR A FOUNDATION PIT SHALL BE FREE FROM LOOSE EXCAVATED MATERIAL AND SHALL SATISFY THE ALLOWABLE BEARING PRESSURE OF 50kPa.
- EB8. PIPELINES SHALL NOT BE LAID ON 'UNCONTROLLED' FILL MATERIAL OR LOOSE / SOFT ALLUVIAL SOILS. UNDER SUCH SOIL CONDITIONS, SOIL BELOW THE PIPE INVERT LEVEL MUST BE REMOVED AND REPLACED WITH 'CONTROLLED' FILL MATERIAL. CERTIFICATES SHALL BE LODGED WITH THE CONTRACT MANAGER CERTIFYING THE FILL IS 'CONTROLLED' FILL COMPACTED TO 95% DDR TO AS 1289.5.1.1.
- EB9. BACKFILLING SHALL BE CARRIED OUT USING THE MATERIALS SPECIFIED IN THE DRAWINGS AND PROJECT SPECIFICATION. UNO BACKFILL SHALL BE COMPACTED IN 150mm THICK FINISHED LAYERS, CONDITIONED AND COMPACTED IN ACCORDANCE WITH THE PROJECT SPECIFICATION.
- EB10. ALL FILL MATERIAL PLACED SHALL BE COMPACTED AND TRIMMED TO MATCH WITH THE FINAL EARTHWORKS LEVELS AND PROFILES SHOWN ON THE DRAWINGS AND TESTED IN ACCORDANCE WITH THE PROJECT SPECIFICATION.
- EB11. THE GROUND SURFACE EXPOSED AFTER TRIMMING SHALL BE COMPACTED IN ACCORDANCE WITH AS 3798.
- EB12. ROADWAY RESTORATION:
  - A. PAVEMENT AND DRAINAGE WORKS WITHIN ROAD CORRIDORS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH TWEED SHIRE COUNCIL STANDARD DRAWINGS AND SPECIFICATIONS AND TO THE SATISFACTION OF COUNCIL OFFICERS.
  - B. THICKNESS OF RE-INSTATED ROAD PAVEMENT LAYERS TO MATCH THE EXISTING.
  - C. SUB-GRADE AND ROAD PAVEMENTS ARE TO BE COMPACTED TO 98% DDR TO AS 1289.5.2.1.

- EB 13. ALL DISTURBED GRASSED AREAS SHALL BE REINSTATED WITH TURF. WATERING AND MAINTENANCE OF THE TURF TO ACHIEVE ESTABLISHMENT IS THE CONTRACTORS RESPONSIBILITY.
- EB14. ALL VALVE PIT LIDS (WITH THE EXCEPTION OF THE PUMP WELL) SHALL BE CONSTRUCTED TO ENSURE THE ARE LEVEL WITH THE ADJOINING GROUND SURFACE.

**PIPEWORKS**

- P1. FOR PIPES OTHER THAN POLYETHYLENE:
  - A. PROVIDE SUFFICIENT TRENCH DEPTH AND WIDTH TO ALLOW FOR DEFLECTION OF PIPES AT JOINTS.
  - B. CHANGES IN HORIZONTAL AND VERTICAL ALIGNMENT, OTHER THAN BY MANUFACTURED BENDS, SHALL BE ACHIEVED BY DEFLECTING THE PIPES AT JOINTS. MAXIMUM DEFLECTIONS SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS.
- P2. WHERE CONNECTING TO ANY EXISTING PIPEWORK, THE LEVEL AND THE SIZE OF THE EXISTING PIPEWORK SHALL BE CONFIRMED BY THE CONTRACTOR PRIOR TO CONNECTION.
- P3. IF CUTTING OF PIPES IS NECESSARY ON SITE REFER TO MANUFACTURERS REQUIREMENTS.
- P4. MINIMUM CLEARANCE TO EXISTING SERVICES SHALL BE IN ACCORDANCE WITH WSA03-2011 CODE UNO.
- P5. MINIMUM COVER TO ALL PIPELINES UNDER EXISTING OR FUTURE ROAD FORMATION IN RMS AND CONTROLLED ROAD RESERVES SHALL BE BASED ON RMS SPECIFICATIONS AND DRAWINGS.
- P6. ALL PIPES SHALL HAVE MARKER TAPE TO AS 2648.1 COLOURED AS FOLLOWS:
  - A. WATER MAIN - GREEN;
  - B. SEA WATER - TBC;
 THE MARKER TAPES SHALL BE PLACED ON TOP OF THE PIPE EMBEDMENT AND CONTAIN A CONTINUOUS METALLIC STRIP.
- P7. FOR ALL POLYETHYLENE PIPEWORK:
  - A. PIPE TO BE MANUFACTURED IN ACCORDANCE WITH AS 4130.
  - B. POLYETHYLENE FITTINGS TO BE MANUFACTURED IN ACCORDANCE WITH AS 4129.
  - C. PIPE TO BE INSTALLED IN ACCORDANCE WITH AS 2033 AND WSA01-2004 CODE.
  - D. POLYETHYLENE PIPE MAY BE CURVED ON SITE TO A MINIMUM RADIUS OF 25 TIMES THE PIPE OUTSIDE DIAMETER (UNO) PROVIDED THE AMBIENT TEMPERATURE IS ABOVE 15°C. PIPES MUST NOT BE BENT AROUND STAKES. SAND BAGS MAY BE USED TO BEND THE PIPES.
  - E. THE SEWER RISING MAIN SHALL BE SOLID CREAM OR SHEATHED CREAM IN COLOUR.
  - F. FOR WELDING OF POLYETHYLENE PIPEWORK:
    - 2. PE WELDING MUST BE CARRIED OUT ONLY BY CERTIFIED PERSONS:
      - a. IN ACCORDANCE WITH PARTEC REQUIREMENTS.
      - b. WHO HAS SUCCESSFULLY CARRIED OUT PREVIOUS PRESSURE PIPELINE WELDING PROJECTS.
    - 2. FUSION BUTT-WELDED JOINTS SHALL BE MADE IN ACCORDANCE WITH WSA01-2004, AS 2033, AS 2566.2 AND THE PIPE MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS.
    - 3. JOINTS SHALL ONLY BE MADE BETWEEN PIPE MATERIALS OF THE SAME GRADE AS DEFINED IN AS4130. PILOT WELDS SHALL BE MADE AND TESTED FOR ANY PROPOSED JOINTS BETWEEN PIPES FROM DIFFERENT MANUFACTURERS.
    - 4. FUSION BUTT-WELDED JOINTS SHALL ACHIEVE AT LEAST 90% OF THE TENSILE STRENGTH OF THE PARENT PIPE. INTERNAL WELD BEADS SHALL BE REMOVED.
    - 5. ALL WELDING SHALL BE PERFORMED UNDER CONTROLLED ENVIRONMENTAL CONDITIONS. FIELD WELDING SHALL BE CARRIED OUT IN SHELTERS TO PREVENT DUST AND WATER CONTAMINATION. THE SHELTERS SHALL REMAIN IN PLACE UNTIL COMPLETION OF THE JOINT COOLING PERIOD. PIPE ENDS SHALL BE BLOCKED OFF TO PREVENT WIND CHILL AND DIRT CONTAMINATION.
    - 6. WELDING MACHINES USING HAND WOUND CARRIAGES WITHOUT PRESSURE GAUGES SHALL NOT BE USED. AT ALL TIMES DURING WELDING, THE WELDER SHALL HAVE A HAND-HELD TEMPERATURE SENSING DEVICE CAPABLE OF CHECKING THE TEMPERATURE OF THE HEATER PLATE AT THE CIRCUMFERENCE OF THE WELD.
    - 7. PILOT WELDING TRIALS SHALL BE COMPLETED AND APPROVED BY THE SUPERINTENDENT BEFORE THE FIELD WELDING IS CARRIED OUT.
    - 8. THE PILOT WELDS SHALL BE SUBJECTED TO TENSILE STRENGTH TESTING, TENSILE FRACTURE TESTING AND FLEXURAL BEAM TESTING, BY A THIRD PARTY APPROVED BY THE SUPERINTENDENT.

- 9. ACCEPTANCE CRITERIA FOR THE PILOT WELDS SHALL INCLUDE:
  - a. AT LEAST 90% TENSILE STRENGTH OF THE PARENT PIPE SECTION;
  - b. TENSILE FRACTURES ONLY IN DUCTILE MANNER WITH NO EVIDENCE OF CONTAMINATION OR DISLOCATIONS ON THE WELD FRACTURE SURFACE;
  - c. NO FRACTURE OF THE WELD IN FLEXURAL BEAM TESTING.
- P8. FOR ALL DI PIPE WORK:
  - A. ALL DI CL PIPES & FITTINGS MUST BE IN ACCORDANCE WITH AS 2280.
  - B. PIPES IN PITS AND WELLS SHALL BE FUSION BONDED EPOXY COATED TO AS 4158.
  - C. BURIED PIPES TO BE BITUMEN COATED AND COVERED WITH POLYETHYLENE SLEEVING AS PER THE MANUFACTURER'S RECOMMENDATION.
- P9. FOR ALL MILD STEEL PIPEWORK:
  - A. PIPES & FITTINGS SHALL COMPLY WITH AS 1579
  - B. ALL FITTINGS (COMPOSITE BENDS, BRANCHES ETC..) SHALL BE BUTT WELDED FROM OUTSIDE USING ROOT FILL AND HOT-PASS METHOD IN ACCORDANCE WITH AS 1554. PIPE ENDS MUST BE BEVELLED TO ACHIEVE A SOUND WELD.
- P10. FOR ALL FLANGES:
  - A. ALL FLANGES MUST BE IN ACCORDANCE WITH AS 4087 UNO. ALL VALVES AND FITTINGS SHALL BE DRILLED TO AS 2129 TABLE D OR AS4087 PN16 UNO.
  - B. ALL BOLTS, NUTS AND WASHERS MUST BE 316 STAINLESS STEEL (GRADE B8M) UNO. BOLTS ARE TO BE ASSEMBLED WITH ANTI-GALLING COMPOUND "DURALAC" OR WITH AN APPROVED EQUIVALENT. ALL BURIED FLANGES ARE TO BE WRAPPED WITH "DENSO" PETROLATUM TAPE TO MANUFACTURER'S REQUIREMENTS.
  - C. PRIME, CAULK AND WRAP ALL BURIED FLANGES AND BOLTS WITH DENSO PETROLATUM PRODUCTS OR APPROVED EQUIVALENT AS PER THE MANUFACTURER'S RECOMMENDATIONS.
- P11. EXTERNAL COATINGS ARE NOT TO BE REMOVED WHEN THE PIPE FITTINGS ARE SURROUNDED OR COVERED IN CONCRETE.

**THRUST BLOCKS AND ANCHOR BLOCKS**

- TB1. THRUST RESTRAINTS SHALL BE PROVIDED FOR RUBBER RING JOINTED MSCL AND DI CL PIPEWORK AT ALL TEES, BENDS, TAPERS AND CHANGES IN DIRECTION.
- TB2. THE BEARING FACE OF THE THRUST BLOCKS MUST BE CAST AGAINST UNDISTURBED GROUND.
- TB3. CONCRETE FOR THRUST BLOCKS SHALL BE N32 FOR REINFORCED AND N25 FOR UNREINFORCED UNO.
- TB4. CONCRETE MUST NOT SPILL OVER SOCKET JOINTS.
- TB5. VERTICAL THRUST BLOCKS MUST BE EMBEDDED INTO UNDISTURBED GROUND.
- TB6. CONCRETE MUST BE CURED FOR 72HRS (MIN) PRIOR TO PRESSURE TESTING.
- TB7. ALL DI PUDDLE/ THRUST FLANGES SHALL BE FACTORY FITTED ONTO PIPE. A MACHINE GROOVE SHALL BE CUT INTO THE OUTSIDE SURFACE OF THE PIPE AND THE PUDDLE FLANGE MACHINED ACCORDINGLY, TO PROVIDE A NOMINAL INTERFERENCE IN ACCORDANCE WITH AS 2280.
- TB8. THRUST BLOCK IN ACCORDANCE WITH SEQ WS&S D&C STD DRG SEQ-WAT-1205-1.

**TESTING**

- T1. ALL TESTING SHALL BE CARRIED OUT BY A THIRD PARTY N.A.T.A APPROVED TESTER IN ACCORDANCE WITH THE PROJECT SPECIFICATION.
- T2. THE TEST PROCEDURE FOR RISING MAINS SHALL BE IN ACCORDANCE WITH CLAUSE 36.5 OF WSA04-2005. THE HYDROSTATIC TEST PRESSURE FOR THE PROPOSED RISING MAIN SHALL BE MINIMUM 900kPa.
- T3. THE FREQUENCY OF COMPACTION TESTING SHALL BE IN ACCORDANCE WITH CLAUSE 36.3.4.4 OF WSA 04-2005. FOR EACH TRENCHED ROAD CROSSING, A COMPACTION TEST IN EACH 150mm LAYER OF FILL IS REQUIRED.
- T4. AUDIT AND FINAL INSPECTIONS OF THE WORKS CONSTRUCTED BY THE CONTRACTOR MUST BE ARRANGED TWO DAYS BEFORE-HAND WITH THE SUPERINTENDENT.


**FOR APPROVAL**



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Designed PJB	Drawn PJB	Checked MC	Survey
Scale N/A		Date 21/4/2020	
		 12/2/2021 APPROVED - PRINCIPAL MICHAEL CHAMBERLAIN - RPENG	

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Issue	Description	Date	By

CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**

PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE <b>NOTES SHEET</b>
Drawing No. <b>D05-2001-01-NT</b>
Sheet 1 of 2
<b>A1</b>

## CONCRETE

- C1. ALL CONCRETE WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 AND THE CONCRETE SPECIFICATION.
- C2. EXPOSURE CLASSIFICATION OF CONCRETE SHALL BE  
 C2.1 MEMBERS IN CONTACT WITH GROUND (NON AGGRESSIVE SOIL)- 'B1' (AS 5100.5 - 2004)  
 C2.2 SURFACES IN SEA WATER ENVIRONMENT - 'C' (AS 3735 - 2001)
- C3. CONCRETE SHALL BE FROM AN APPROVED SOURCE AND SHALL COMPLY WITH THE REQUIREMENTS OF THE FOLLOWING STANDARDS UNO  
 C3.1 AS 3600 - CONCRETE STRUCTURES  
 C3.2 AS3737 - CONCRETE STRUCTURES RETAINING LIQUID  
 C3.3 AS4671 - STEEL REINFORCING BARS FOR CONCRETE  
 C3.4 AS3972 - PORTLAND AND BLENDED CEMENTS  
 C3.5 AS1379 - SPECIFICATION AND SUPPLY OF CONCRETE  
 C3.6 AS2758.1 - CONCRETE AGGREGATES  
 C3.7 AS1141 - METHODS FOR SAMPLING AND TESTING AGGREGATES  
 C3.8 AS1478 - CHEMICAL ADMIXTURES FOR CONCRETE  
 C3.9 AS1012 - METHODS FOR TESTING CONCRETE  
 C3.10 AS3582 - SUPPLEMENTARY CEMENTITIOUS MATERIALS FOR USE WITH PORTLAND CEMENT
- C4. CONCRETE GRADE FOR SPECIFIC STRUCTURES UNO SHALL BE AS FOLLOWS  
 C4.1 BLINDING CONCRETE N20/20  
 C4.2 PUMP WELL N40/20  
 C4.3 PITS CHAMBERS N40/20  
 C4.5 THRUST BLOCKS N32/20
- C5. THE MAXIMUM SIZE OF AGGREGATE IN THE CONCRETE SHALL BE 20mm
- C6. CONCRETE MIX DESIGN INCLUDING PROPORTIONS OF ADDITIVES AND CEMENTITIOUS REPLACEMENT MATERIALS, SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR APPROVAL PRIOR TO PLACEMENT. CALCIUM CHLORIDE SHALL NOT BE USED IN ANY MIX.
- C7. A MIX DESIGN USING A HIGHER SLUMP AND SMALLER AGGREGATE SIZE SHALL BE CONSIDERED BY THE SUPERINTENDENT WHERE CONCRETING IS DONE BY PUMPING.
- C8. MINIMUM CLEAR CONCRETE COVER TO ALL REINFORCEMENT SHALL BE AS FOLLOWS, UNLESS NOTED OTHERWISE ON THE DRAWINGS:  
 C8.1 CAST AGAINST FORM, TOP OF MEMBER, INTERNAL FACES - 40mm  
 C8.2 CAST AGAINST GROUND IF THE SURFACE OF THE CONCRETE IS PROTECTED BY A DAMP-PROOF MEMBRANE - 40mm  
 C8.3 CAST AGAINST GROUND - 50mm  
 C8.4 CONCRETE IN CONTACT WITH SEA WATER (EXPOSURE CLASSIFICATION 'C') - 70mm  
 C8.5 UNLESS NOTED OTHERWISE - 50mm
- C9. SIZES OF CONCRETE ELEMENTS SHOWN ON THE DRAWINGS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.
- C10. THE FINISHED CONCRETE SHALL BE A DENSE HOMOGENEOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF ANY STONE POCKETS OR VOIDS. CONCRETE SHALL BE VIBRATED BY MECHANICAL VIBRATORS DURING PLACEMENT.
- C11. ALL FORMED EXPOSED EDGES HAVING A CONTAINED ANGLE OF LESS THAN 120° AND RE-ENTRANT CORNERS SHALL BE CHAMFERED OR FILLETED 25mm UNO.
- C12. NO PENETRATIONS, CHASES OR TEMPORARY FIXTURES OTHER THAN THOSE SHOWN ON THE DRAWINGS ARE PERMITTED IN THE CONCRETE MEMBERS WITHOUT PRIOR APPROVAL OF THE SUPERINTENDENT.
- C13. REINFORCEMENT AT PENETRATIONS SHALL BE TREATED THUS:  
 C13.1 FOR PENETRATIONS WITH DIMENSIONS SMALLER THAN 150mm, DO NOT CUT REINFORCEMENT. INSTEAD, DISPLACE REINFORCEMENT TO EACH SIDE OF PENETRATION UNO.  
 C13.2 FOR PENETRATIONS WITH DIMENSIONS LARGER THAN 150mm, PLACE REINFORCEMENT IN REQUIRED POSITIONS AND CUT TO SUIT PENETRATION. PROVIDE ADDITIONAL BARS TO MATCH THE SIZE, LENGTH AND NUMBER OF BARS CUT, AND PLACE EQUALLY ON ALL SIDES OF THE PENETRATION UNO. ADDITIONAL CIRCULAR TRIMMER BAR SHALL ALSO BE PROVIDED IN EACH FACE.
- C14. CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND USED ONLY WHERE SHOWN ON THE DRAWINGS OR SPECIFICALLY APPROVED BY THE SUPERINTENDENT. FURTHER CONCRETE SURFACES AGAINST WHICH NEW CONCRETE IS TO BE PLACED SHALL BE CLEAN, FREE OF ALL LAITANCE, AND BE DAMPENED DOWN PRIOR TO COMMENCEMENT OF POURING NEW CONCRETE.
- C15. ALL CONCRETE INTERFACES ARE TO BE ROUGHENED TO ENSURE SATISFACTORY BOND BETWEEN INSITU CONCRETE AND PRECAST CONCRETE OR BETWEEN DIFFERENT POURS OF INSITU CONCRETE UNO. ALL CONCRETE SURFACES TO BE FREE OF LAITANCE.
- C16. ALL PROPRIETARY FIXINGS TO CONCRETE MEMBERS (CHEMICAL ANCHORS ETC) SHALL BE INSTALLED STRICTLY IN ACCORDANCE WITH THE FIXING MANUFACTURER'S RECOMMENDATIONS.
- C17. CHEMICAL ANCHORS FOR FIXINGS TO CONCRETE SHALL BE AS SHOWN ON THE DRAWINGS.
- C18. INITIAL CURING OF CONCRETE SHALL COMMENCE NO LATER THAN 2 HOURS AFTER FINISHING OPERATIONS HAVE BEEN COMPLETED. THE CONCRETE SHALL BE KEPT CONTINUOUSLY MOIST AT LEAST OVERNIGHT BY :  
 C19.1 PONDING OR CONTINUOUS SPRINKLING WITH WATER  
 C19.2 USE OF AN ABSORPTIVE COVER KEPT CONTINUOUSLY WET  
 C19.3 COATING WITH AN APPROVED SPRAYED MEMBRANE CURING COMPOUND.
- C19. FINAL CURING SHALL IMMEDIATELY FOLLOW INITIAL CURING AND SHALL BE CONTINUED FOR 7 DAYS. ONE OF THE FOLLOWING CURING METHODS SHALL BE ADOPTED FOR FINAL CURING :  
 C20.1 PONDING OR CONTINUOUS SPRINKLING WITH WATER  
 C20.2 USE OF AN APPROVED MOISTURE RETAINING COVERING SUCH AS HEAVY GAUGE CLEAR POLYTHENE SHEETING OR BUILDING PAPER FIRMLY HELD AGAINST THE CONCRETE SURFACES TO PREVENT AIR CIRCULATION AT THE CONCRETE SURFACES. SUCH COVERS SHALL BE MAINTAINED UNDAMAGED DURING THE CURING PERIOD.  
 C20.3 COATING WITH AN APPROVED SPRAYED MEMBRANE CURING COMPOUND.
- C20. PLACE A 50mm MINIMUM THICKNESS CONCRETE BLINDING LAYER UNDER ALL CONCRETE CAST AGAINST THE GROUND.
- C21. COMPLIANCE TESTING AND SAMPLING OF CONCRETE SHALL BE IN ACCORDANCE WITH AS 3600, AS 1379, AS 1012, AND OTHER RELEVANT SPECIFICATIONS.

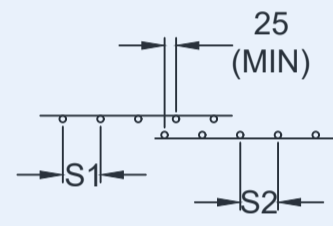
## REINFORCING

- R1. REINFORCEMENT SHOWN ON THE DRAWINGS IS REPRESENTED DIAGRAMMATICALLY AND NOT NECESSARILY SHOWN IN TRUE PROJECTION.
- R2. REINFORCING STEEL SHALL BE GRADE D500N TO AS/NZS 4671 (HOT ROLLED DEFORMED BAR) OR GRADE R250N TO AS/NZS 4671 (HOT ROLLED PLAIN ROUND BAR). REINFORCEMENT MESH SHALL BE CLASS L TO AS 4671 (500MPa GRADE) UNO.
- R3. REINFORCEMENT ABBREVIATIONS INDICATE THE FOLLOWING:-  
 R3.1 EF ——— EACH FACE  
 R3.2 NF ——— NEAR FACE  
 R3.3 FF ——— FAR FACE  
 R3.4 EW ——— EACH WAY  
 R3.5 T or TOP ——— TOP  
 R3.6 B or BTM ——— BOTTOM
- R4. REBENDING OF REINFORCEMENT BY MECHANICAL OR ANY OTHER MEANS IS NOT PERMITTED WITHOUT THE APPROVAL OF THE SUPERINTENDENT.
- R5. REINFORCEMENT SHALL BE LAPPED ONLY IN THE LOCATIONS SHOWN ON THE DRAWINGS OR AS OTHERWISE APPROVED BY THE SUPERINTENDENT. WHERE THE LAP LENGTH IS NOT SHOWN IT SHALL BE SUFFICIENT TO DEVELOP THE FULL STRENGTH OF THE REINFORCEMENT. BAR LAP LENGTHS SHALL BE AS SHOWN BELOW UNO

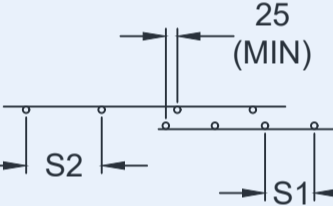
BAR DIAMETER (mm)	HORIZONTAL BARS WITH MORE THAN 300mm OF CONCRETE CAST BELOW THE BAR (mm)		ALL OTHER BARS (mm)	
	f <sub>c</sub> = 32MPa	f <sub>c</sub> = 40MPa	f <sub>c</sub> = 32MPa	f <sub>c</sub> = 40MPa
10	500	450	375	350
12	600	525	450	400
16	800	725	625	550
20	1050	925	800	725
24	1300	1150	1000	900
28	1550	1400	1200	1075
32	1850	1650	1425	1275

- R6. FABRIC REINFORCEMENT LAPS

R6.1 FOR S1 = S2 :



R6.2 FOR S1 < S2 :



- R7. MECHANICAL SPLICES SHALL ONLY BE USED WHERE APPROVED BY THE SUPERINTENDENT.
- R8. REINFORCEMENT SHALL NOT BE WELDED UNLESS SHOWN ON THE DRAWINGS OR APPROVED BY THE SUPERINTENDENT; ALSO REINFORCEMENT SHALL HAVE THE REQUIRED COVER TO THE PIPE WORK, CONDUITS, ETC.
- R9. ALL REINFORCEMENT SHALL BE SECURELY SUPPORTED ON PLASTIC OR CONCRETE BAR CHAIRS AT NOT GREATER THAN ONE METRE CENTRES EACH WAY. ALL REINFORCEMENT SHALL BE SECURELY TIED WITH GALVANISED WIRE TIES. TIE ENDS SHALL NOT EXTEND INTO THE COVER ZONE.
- R10. LAPS IN MESH SHALL BE THE SPACING OF TRANSVERSE WIRES PLUS 50mm UNO.
- R11. REINFORCING MESH SHALL NOT BE PULLED INTO POSITION THROUGH THE WET CONCRETE.

## STEELWORK

- S1. ALL STEELWORK SHALL COMPLY WITH THE REQUIREMENTS OF AS 4100 UNO.
- S2. ALL STEELWORK SHALL BE FABRICATED FROM MATERIAL COMPLYING WITH AS 3678 AND AS 3679.
- S3. FABRICATION SHALL COMPLY WITH THE SPECIFICATION AND THE REQUIREMENTS OF AS 4100 AND AS 1554 WHERE APPLICABLE.
- S4. TWO COPIES OF ALL WORKSHOP DRAWINGS SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR REVIEW 10 WORKING DAYS PRIOR TO FABRICATION.
- S5. ALL PLATES, CLEATS, GUSSETS, STIFFENERS ETC., SHALL BE 10mm THICK UNO..
- S6. CONTACT SURFACES BETWEEN DISSIMILAR METALS (ALUMINIUM AND GALVANISED STEEL, ALUMINIUM AND STAINLESS STEEL, STAINLESS STEEL AND GALVANISED STEEL ETC..) SHALL BE INSULATED WITH RUBBER WASHERS UNO.
- S7. ALL MASONRY ANCHORS SHALL BE 316 STAINLESS STEEL AND FITTED WITH ISOLATION WASHERS BETWEEN STAINLESS STEEL AND GALVANISING.

## CONCRETE RE-INSTATEMENT

- CR1. THOROUGHLY SCABBLE BACK THE EXISTING SURFACE AND CLEAN BY WATER BLAST BEFORE POURING THE NEW CONCRETE.
- CR2. AFTER CLEANING THE EXISTING CONCRETE SURFACE APPLY AN APPROVED BONDING AGENT AND HYDROPHILIC WATERSTOP BEFORE POURING NEW CONCRETE. COMPLY WITH MANUFACTURER'S REQUIREMENTS FOR THE PRODUCT AND ENSURE THAT NEW CONCRETE IS PLACED WITHIN THE TIME LIMITS SPECIFIED FOR THE BONDING AGENT.
- CR3. SHOULD DISTURBANCE TO ANY FOOTPATH BE NECESSARY THEN THE RESTORATION SHALL INCLUDE THE REPLACEMENT OF THE WHOLE CONCRETE SLAB SEGMENTS BETWEEN JOINTS FOR THE FULL WIDTH IN ACCORDANCE WITH COUNCIL'S STANDARD DRAWING SD013 "FOOTPATH AND CYCLEWAY DETAILS".

## STAINLESS STEEL

- ST1. STAINLESS STEEL SHALL COMPLY WITH THE FOLLOWING AUSTRALIAN STANDARDS :  
 ST1.1 AS1444 - STAINLESS STEEL PLATE  
 ST1.2 AS/NZS 4673 - STAINLESS STEEL SHEET
- ST2. ALL STAINLESS STEEL SHALL BE GRADE 316 UNO.
- ST3. ALL STAINLESS STEEL WHICH IS TO BE WELDED SHALL BE 316L. WHERE 316L IS NOT AVAILABLE CONSULT THE SUPERINTENDENT.
- ST4. ALL WELDING OF STAINLESS STEEL SHALL CONFORM WITH AS/NZS 1554.6. ALL WELDING CONSUMABLES TO BE E316L UNO.
- ST5. ALL STAINLESS STEEL WELDS SHALL BE PICKLED AND PASSIVATED.
- ST6. APPLY A NICKEL BASED LUBRICANT OR NICKEL IMPREGNATED TAPE TO THE THREADS OF ALL STAINLESS STEEL BOLTS PRIOR TO ASSEMBLY.
- ST7. TWO COPIES OF ALL WORKSHOP DRAWINGS SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR REVIEW 10 WORKING DAYS PRIOR TO FABRICATION.

## ALUMINIUM

- A1. UNO, ALUMINIUM SHALL BE GRADE 6061 - T6. ALL ALUMINIUM SECTIONS SHALL COMPLY WITH AS 1734 AND AS 1866.
- A2. UNO, WELDED CONNECTIONS SHALL BE AS FOLLOWS :  
 A2.1 BUTT WELDS SHALL BE WELD QUALITY 'A' IN ACCORDANCE WITH AS 1665  
 A2.2 FILLET WELDS SHALL BE WELD QUALITY 'B' IN ACCORDANCE WITH AS 1665  
 A2.3 FILLET WELDS SHALL BE 6mm ALL ROUND USING FILLER ALLOY 5356
- A3. GRIND OFF ALL SHARP EDGES AFTER FABRICATION.
- A4. PROVIDE NYLON OR POLYTHENE WASHERS BETWEEN ALUMINIUM AND CONCRETE INTERFACES.
- A5. ALL FASTENERS SHALL BE GRADE 316 STAINLESS STEEL. ISOLATE ALL DISSIMILAR METALS. THE ISOLATION ITEMS ARE TO BE APPROVED BY THE SUPERINTENDENT.
- A6. TWO COPIES OF ALL WORKSHOP DRAWINGS SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR REVIEW 10 WORKING DAYS PRIOR TO FABRICATION.

## ENVIRONMENT MANAGEMENT

- EM1. ALL WORKS ARE TO BE IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED ENVIRONMENTAL MANAGEMENT PLAN.
- EM2. SITE TO BE ASSESSED FOR DANGEROUS FLORA AND FAUNA PRIOR TO CONSTRUCTION. WORKERS TO WEAR LONG PANTS AND STEEL CAP BOOTS AT ALL TIMES.
- EM3. PRUNING OF TREES SHOWN ON THESE DRAWINGS "TO BE RETAINED" IS NOT PERMITTED WITHOUT PRIOR CONSULTATION AND ACCEPTANCE OF COUNCIL.

## TRAFFIC MANAGEMENT

- TM1. ALL WORKS ARE TO BE IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED TRAFFIC MANAGEMENT PLAN.
- TM2. THE CONTRACTOR SHALL MINIMISE ALL OBSTRUCTIONS TO TRAFFIC.
- TM3. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY APPROVALS FROM COUNCILS AND OTHER AUTHORITIES FOR TEMPORARY TRAFFIC ARRANGEMENTS.
- TM4. THE CONTRACTOR SHALL PREPARE AND IMPLEMENT A TRAFFIC MANAGEMENT PLAN PRIOR TO THE COMMENCEMENT OF WORK.
- TM5. ALL PERSONNEL MUST WEAR HIGH VISIBILITY VESTS/SHIRTS.

# FOR APPROVAL

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Designed	Drawn	Checked	Survey
PJB	PJB	MC	
Scale		Date	
N/A		21/4/2020	
 12/2/2021 APPROVED - PRINCIPAL MICHAEL CHAMBERLAIN - RPENG			

Datum AHD (m)

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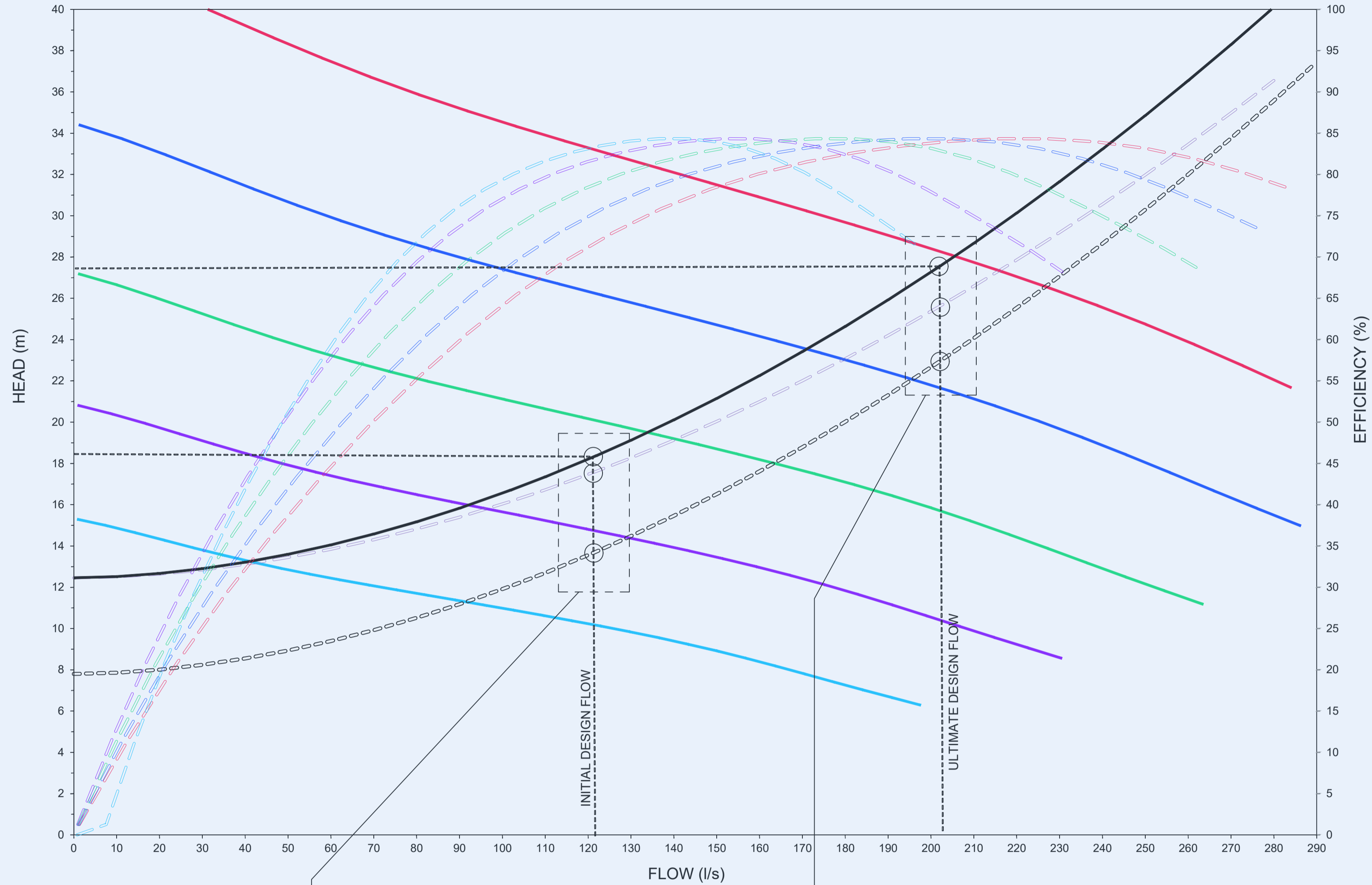
CLIENT  
 AUSTRALIA BAY LOBSTER PRODUCERS

PROJECT  
 SEAWATER INTAKE PIPELINE AND PUMP STATION

TITLE  
 NOTES SHEET

Drawing No. D05-2001-01-NT Sheet 2 of 2 A1

SEAWATER SYSTEM/PUMP CURVE



DUTY POINT FOR INITIAL DEMAND	
DESIGN FLOW	122 L/s
ROUGH CASE LOW TIDE	18.4m HEAD (38Hz)
SMOOTH CASE LOW TIDE	17.6m HEAD (37Hz)
HIGH TIDE	13.8m HEAD (34Hz)

DUTY POINT FOR ULTIMATE DEMAND	
DESIGN FLOW	202 L/s
ROUGH CASE LOW TIDE	27.5m HEAD (48Hz)
SMOOTH CASE LOW TIDE	25.6m HEAD (47Hz)
HIGH TIDE	22.9m HEAD (45Hz)

- Pump Curve (50Hz)
- Pump Curve (45Hz)
- Pump Curve (40Hz)
- Pump Curve (35Hz)
- Pump Curve (30Hz)
- System Curve: Low Tide (DN560 Smooth Case)
- System Curve: Low Tide (DN560 Rough Case)
- System Curve: High Tide
- Pump Efficiency (%) (50Hz)
- Pump Efficiency (%) (45Hz)
- Pump Efficiency (%) (40Hz)
- Pump Efficiency (%) (35Hz)
- Pump Efficiency (%) (30Hz)

Delivery Pipe (DN560 SDR 11 PE112)	Initial Demand	Ultimate Demand
L = Rising Main Length (m) (5371 + an allowance of 100m internal ABPL pipe to reservoir)	5476	5476
c = Hazen-Williams roughness coefficient (PE pipe = 140)	140	140
Q = Volume Flow (L/s)	122.2	202.0
dh = inside or hydraulic diameter (mm)	468.0	468.0
Hf = friction head loss (m) (Rough Case)	5.91	15.02
Hf = friction head loss (kPa)	58.0	147.3
Hk = Minor Head loss (m)	0.0136	0.0614
Total Head required (m) (Hf + Hk + Hs)	18.38	27.54
V = Flow Velocity (m/s)	0.7	1.2
Pump Station Low Tide Operating Level (RL)		-3.5
Pump Station High Tide Operating Level (RL)		-1.9
Design Delivery Level (RL)		9.0
Hs = Low Tide Static Head (m)		12.5
Hs = High Tide Static Head (m)		10.9
Hydraulic Grade Line Slope (m per 100m)	0.0658	0.1650
Suction Pipes (Dual Pipes - DN500 PE112 PN20)		
L = Length of Pipe (m)		1200
c = Hazen-Williams roughness constant		140
Q = Volume Flow (L/s)		101
dh = inside or hydraulic diameter (mm)		388.8
Hf = friction head loss (m H2O)		2.13
Hf = friction head loss (kPa)		20.9
V = Flow Velocity (m/s)		0.9
Minimum Low Tide Water Level (RL)		-0.8
Bottom Water Level (BWL) in Pump Station (RL)		-2.93
Hydraulic Grade Line Slope (m per 100m)		0.2
Design Pump Suction Level (RL)		-3.33
Design Pump Station Invert Level = BWL - 564mm (includes 400mm submersion to inlet of pumps & 164mm clearance to floor) (RL)		-3.49
Pump Selection		
Ultimate Design Duty	202 L/s @ 27.5m Head	
Pump	Flygt N 3315 MT 3~ 6p	
Motor	ON3315MT36p-3315.185 35-35-6AA-W	
Impeller (Hard Iron)	632 477mm PSTXZ	
Power	75kW	
Inlet Diameter	250mm	
Discharge Diameter	250mm	
Max Operating Speed	985 rpm	
Installation type	Wet Mounted	
Frequency	50Hz	
Rated Current	142 A	
Starts per hour (max)	15	
Overall Efficiency	77.40%	
Pump Efficiency	84.30%	
Required Power at Ultimate Duty	75kW	

FOR APPROVAL

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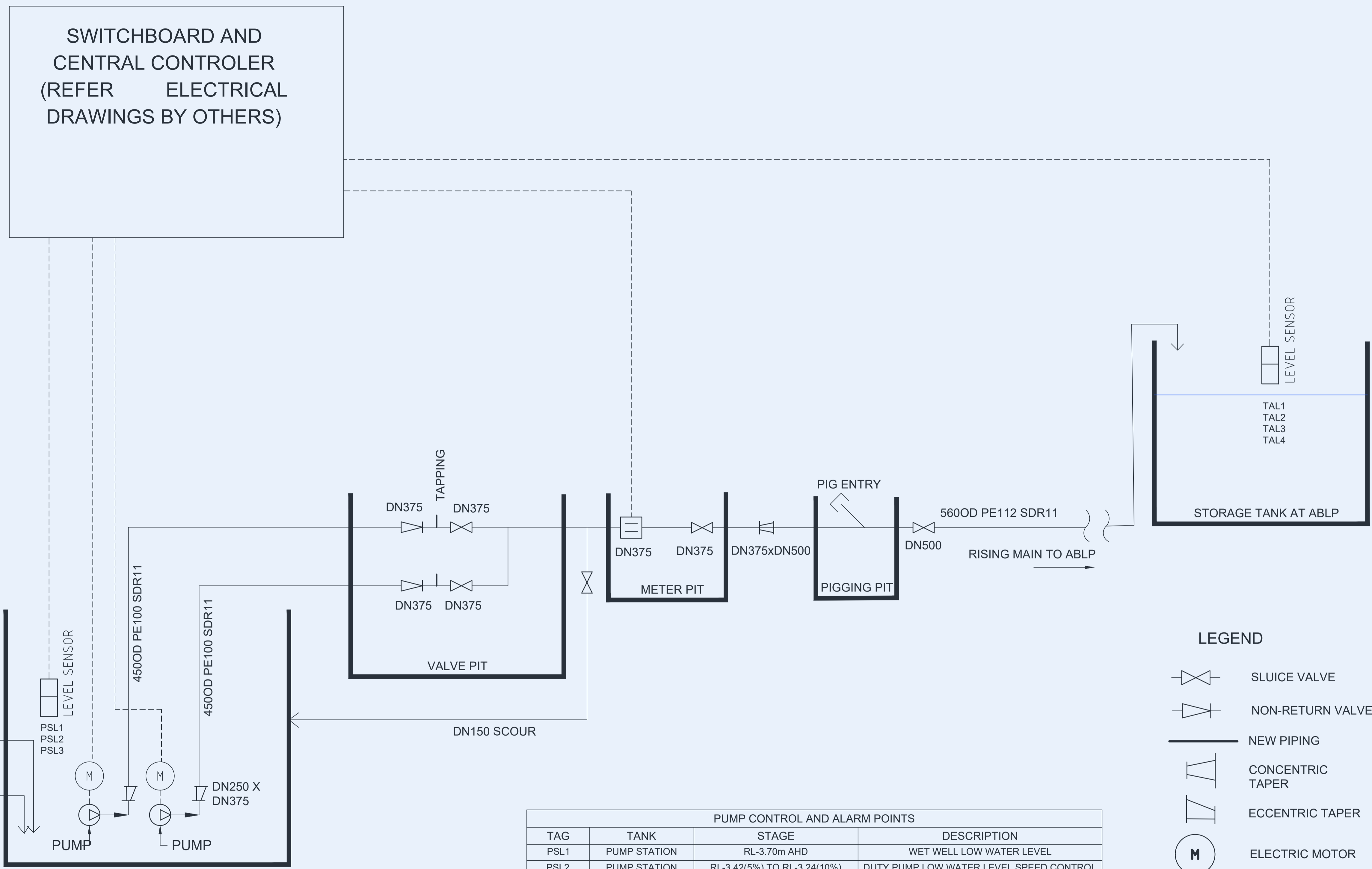
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 12/2/2021 APPROVED - PRINCIPAL MICHAEL CHAMBERLAIN - RPENG			

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CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**  
 PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE  
**HYDRAULIC INTERACTION OF SYSTEM RESISTANCE AND PUMP CURVES**  
 Drawing No. **D05-2001-01-HY** Sheet 1 of 3 **A1**



PUMP CONTROL AND ALARM POINTS			
TAG	TANK	STAGE	DESCRIPTION
PSL1	PUMP STATION	RL-3.70m AHD	WET WELL LOW WATER LEVEL
PSL2	PUMP STATION	RL-3.42(5%) TO RL-3.24(10%)	DUTY PUMP LOW WATER LEVEL SPEED CONTROL
PSL3	PUMP STATION	RL-3.24(10%) TO RL 0 (100%)	DUTY PUMP SPEED CONTROL DETERMINED BY STORAGE TANK
TAL1	STORAGE TANK	RL6.2m (107%)	ALARM AT STORAGE TANK OVERFLOW LEVEL
TAL2	STORAGE TANK	RL6.05m (100%)	DUTY PUMP CUT OUT LEVEL SET POINT
TAL3	STORAGE TANK	RL4.66m (30%)	DUTY PUMP CUT IN LEVEL SET POINT
TAL4	STORAGE TANK	15%-30%	DUTY PUMP SPEED MODULATES VIA MULTISMART CONTROL

REFER TO FUNCTIONAL DESCRIPTION BY WILLOW AND SPARROW FOR OPERATIONAL LEVELS AND ALARMS

- LEGEND**
- SLUICE VALVE
  - NON-RETURN VALVE
  - NEW PIPING
  - CONCENTRIC TAPER
  - ECCENTRIC TAPER
  - ELECTRIC MOTOR
  - PUMP
  - MAGNETIC FLOWMETER

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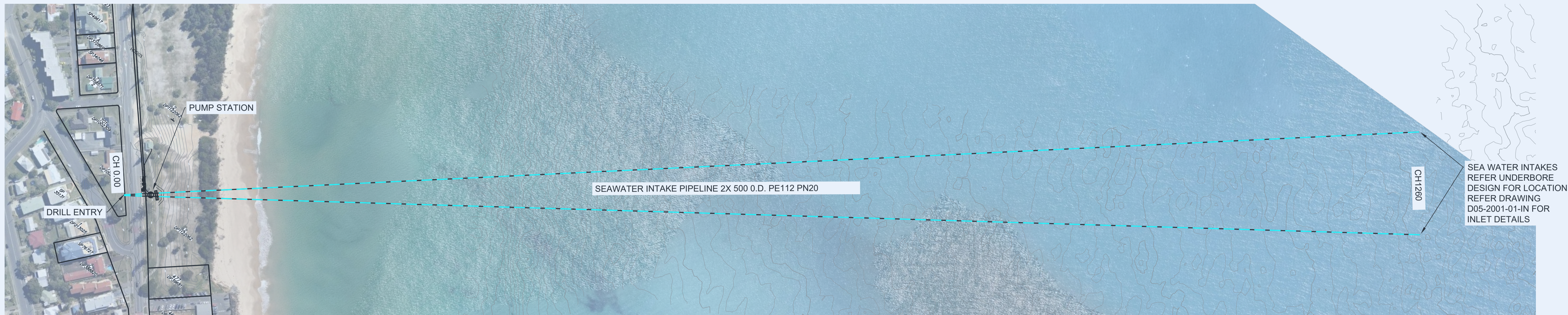
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Scale N/A		Date 21/4/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPEng	

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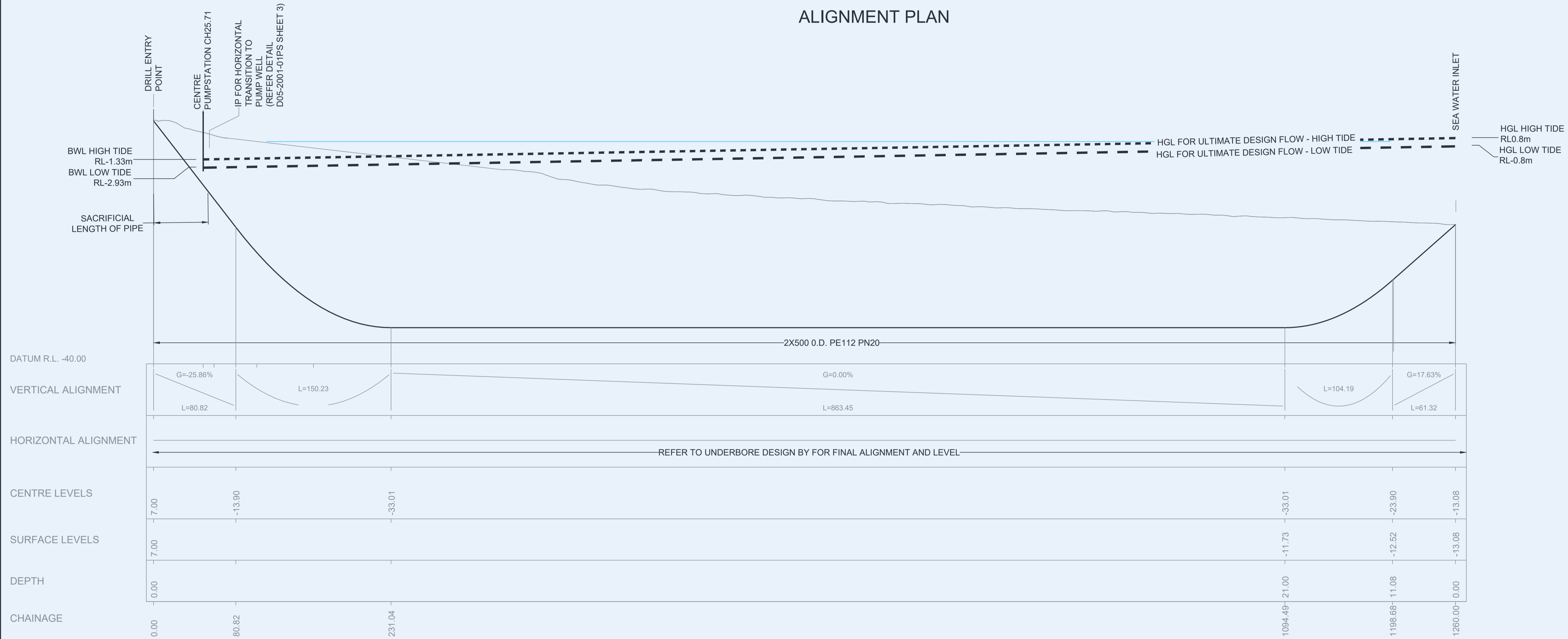
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CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**  
 PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE <b>DIAGRAM OF PIPING AND INSTRUMENTATION</b>	
Drawing No. <b>D05-2001-01-HY</b>	Sheet 2 of 3
<b>A1</b>	



ALIGNMENT PLAN



LONGITUDINAL SECTION

FOR APPROVAL

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Scale 1:400[V] 1:2000[H]		Date 21/4/2020	
APPROVED - PRINCIPAL			MICHAEL CHAMBERLAIN - RPEng

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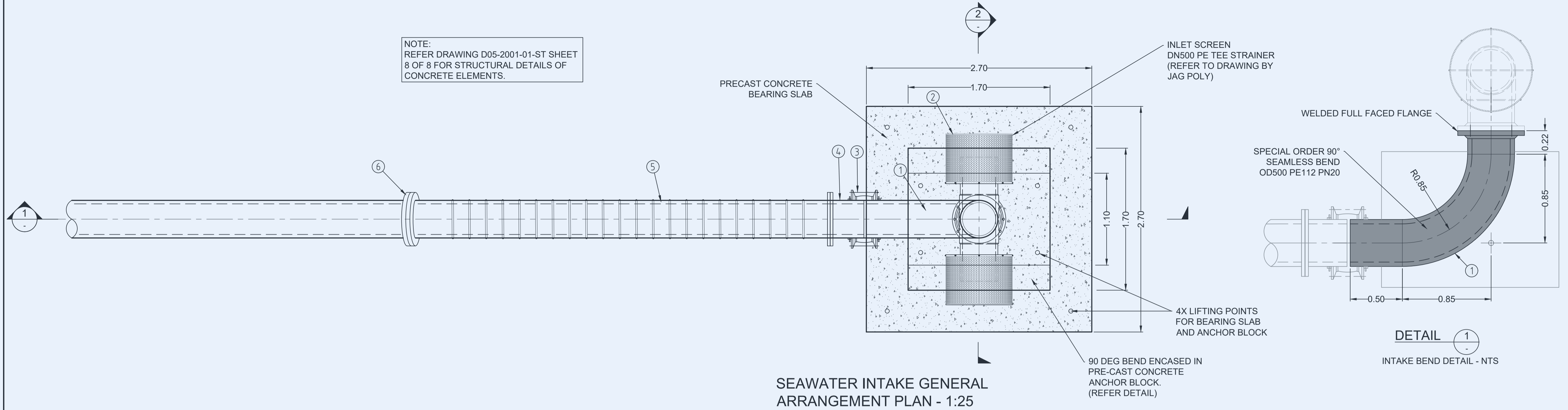
CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**

PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE  
**SEAWATER INTAKE PIPELINE SECTIONAL HYDRAULIC GRADE LINE**

Drawing No. **D05-2001-01-HY** Sheet 3 of 3 **A1**

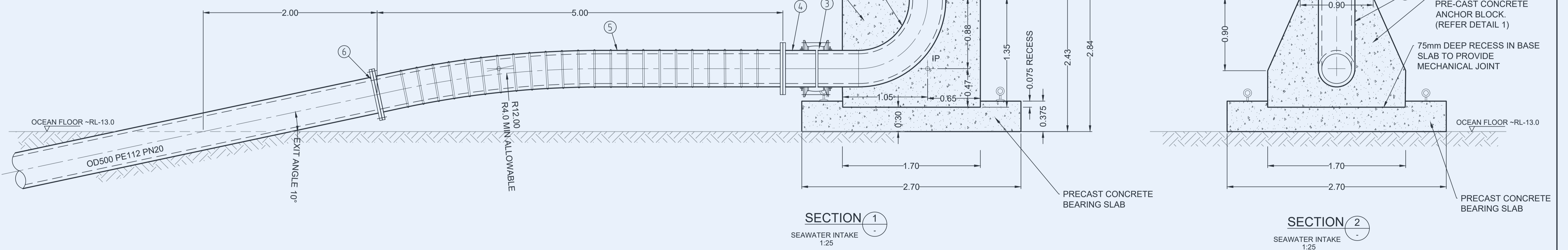
NOTE:  
REFER DRAWING D05-2001-01-ST SHEET  
8 OF 8 FOR STRUCTURAL DETAILS OF  
CONCRETE ELEMENTS.



FITTING SCHEDULE

ITEM NO.	DESCRIPTION	MATERIAL	SIZE	QTY
1	SPECIAL ORDER 90 DEGREE SEAMLESS BEND AS PER DETAIL 1.	PE112 PN20	500OD	2
2	"INLET SCREEN - PE TEE STRAINER TO DRAWING BY JAG POLY"	PE100	500OD	2
3	MULTIGRIP COUPLING	PE	500OD	2
4	SPOOL PIPE NOMINALLY 400 LONG CUT TO SUIT. WELDED FLANGE ON ONE END	PE112 PN20	500OD	2
5	SLURRYFLEX SA-SERIES SPECIALTY HARD WALL MINING HOSE WITH SUPERDUPLEX FLANGES 5.0m LONG. CONTRACTOR TO CONFIRM FLANGES ARE TABLE D AS2129.	COMPOSITE	DN500	2
6	STUB FLANGE WITH SUPERDUPLEX STAINLESS STEEL BACKING RING	PE112 PN20	500OD	2

REFER DRAWING D05-2001-01-ST SHEET 8 OF 8  
FOR STRUCTURAL DETAILS OF PRECAST BLOCKS



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Scale AS SHOWN		Date 21/4/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPENG	

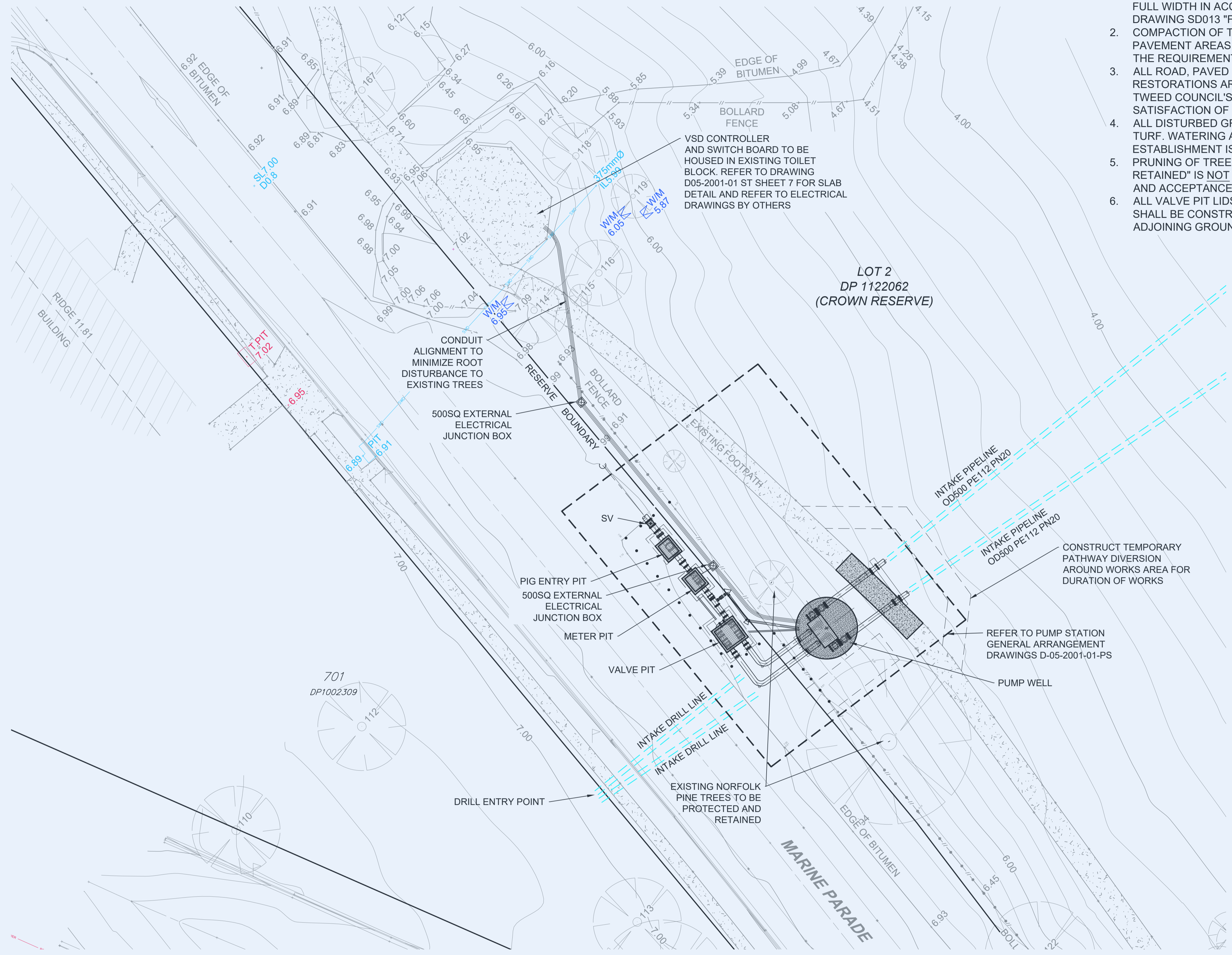
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AUSTRALIA BAY LOBSTER PRODUCERS  
PROJECT  
SEAWATER INTAKE PIPELINE  
AND PUMP STATION

TITLE  
SEAWATER INTAKE  
DETAILS

Drawing No. D05-2001-01-IN  
Sheet 1 of 1  
A1



- NOTES:**
1. SHOULD DISTURBANCE TO ANY FOOTPATH BE NECESSARY THEN THE RESTORATION SHALL INCLUDE THE REPLACEMENT OF THE WHOLE CONCRETE SLAB SEGMENTS BETWEEN JOINTS FOR THE FULL WIDTH IN ACCORDANCE WITH COUNCIL'S STANDARD DRAWING SD013 "FOOTPATH AND CYCLEWAY DETAILS".
  2. COMPACTION OF TRENCH BACKFILL MATERIAL IN NON-ROAD PAVEMENT AREAS IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE REQUIREMENTS OF AS3798.
  3. ALL ROAD, PAVED FOOTPATH AND GRASSED VERGE RESTORATIONS ARE TO BE CARRIED OUT IN ACCORDANCE WITH TWEED COUNCIL'S STANDARDS AND SPECIFICATIONS AND TO THE SATISFACTION OF COUNCIL OFFICERS.
  4. ALL DISTURBED GRASSED AREAS SHALL BE REINSTATED WITH TURF. WATERING AND MAINTENANCE OF THE TURF TO ACHIEVE ESTABLISHMENT IS THE CONTRACTORS RESPONSIBILITY.
  5. PRUNING OF TREES SHOWN ON THESE DRAWINGS "TO BE RETAINED" IS NOT PERMITTED WITHOUT PRIOR CONSULTATION AND ACCEPTANCE OF COUNCIL.
  6. ALL VALVE PIT LIDS (WITH THE EXCEPTION OF THE PUMP WELL) SHALL BE CONSTRUCTED TO ENSURE THE ARE LEVEL WITH THE ADJOINING GROUND SURFACE.

**FOR APPROVAL**

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 WILLOW & SPARROW PTY LTD A.C.N. 606732512

Designed PJB	Drawn PJB	Checked MC	Survey USH
Scale SCALE 1:200		Date 21/4/2020	
 APPROVED - PRINCIPAL MICHAEL CHAMBERLAIN - RPEng			

Datum AHD (m)

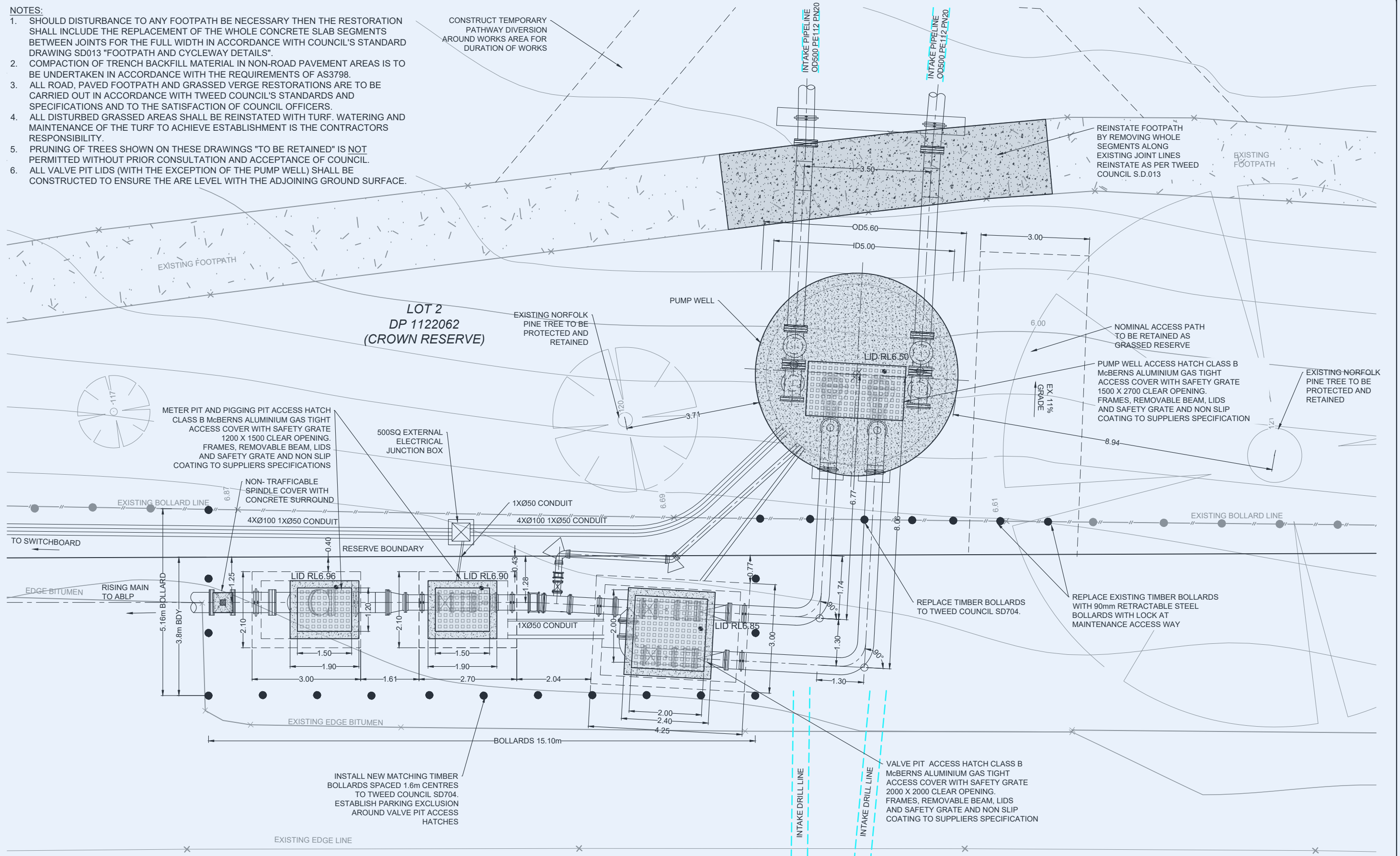
Issue	Description	Date	By
E	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021	PJB
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A	PRELIMINARY	21/4/2020	PJB

CLIENT <b>AUSTRALIA BAY LOBSTER PRODUCERS</b>
PROJECT <b>SEAWATER INTAKE PIPELINE AND PUMP STATION</b>

TITLE <b>OVERALL PLAN FOR PUMP STATION CIVIL WORKS</b>		
Drawing No. <b>D05-2001-01-OP</b>	Sheet 1 of 1	<b>A1</b>

**NOTES:**

1. SHOULD DISTURBANCE TO ANY FOOTPATH BE NECESSARY THEN THE RESTORATION SHALL INCLUDE THE REPLACEMENT OF THE WHOLE CONCRETE SLAB SEGMENTS BETWEEN JOINTS FOR THE FULL WIDTH IN ACCORDANCE WITH COUNCIL'S STANDARD DRAWING SD013 "FOOTPATH AND CYCLEWAY DETAILS".
2. COMPACTION OF TRENCH BACKFILL MATERIAL IN NON-ROAD PAVEMENT AREAS IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE REQUIREMENTS OF AS3798.
3. ALL ROAD, PAVED FOOTPATH AND GRASSED VERGE RESTORATIONS ARE TO BE CARRIED OUT IN ACCORDANCE WITH TWEED COUNCIL'S STANDARDS AND SPECIFICATIONS AND TO THE SATISFACTION OF COUNCIL OFFICERS.
4. ALL DISTURBED GRASSED AREAS SHALL BE REINSTATED WITH TURF. WATERING AND MAINTENANCE OF THE TURF TO ACHIEVE ESTABLISHMENT IS THE CONTRACTORS RESPONSIBILITY.
5. PRUNING OF TREES SHOWN ON THESE DRAWINGS "TO BE RETAINED" IS NOT PERMITTED WITHOUT PRIOR CONSULTATION AND ACCEPTANCE OF COUNCIL.
6. ALL VALVE PIT LIDS (WITH THE EXCEPTION OF THE PUMP WELL) SHALL BE CONSTRUCTED TO ENSURE THE ARE LEVEL WITH THE ADJOINING GROUND SURFACE.



**FOR APPROVAL**

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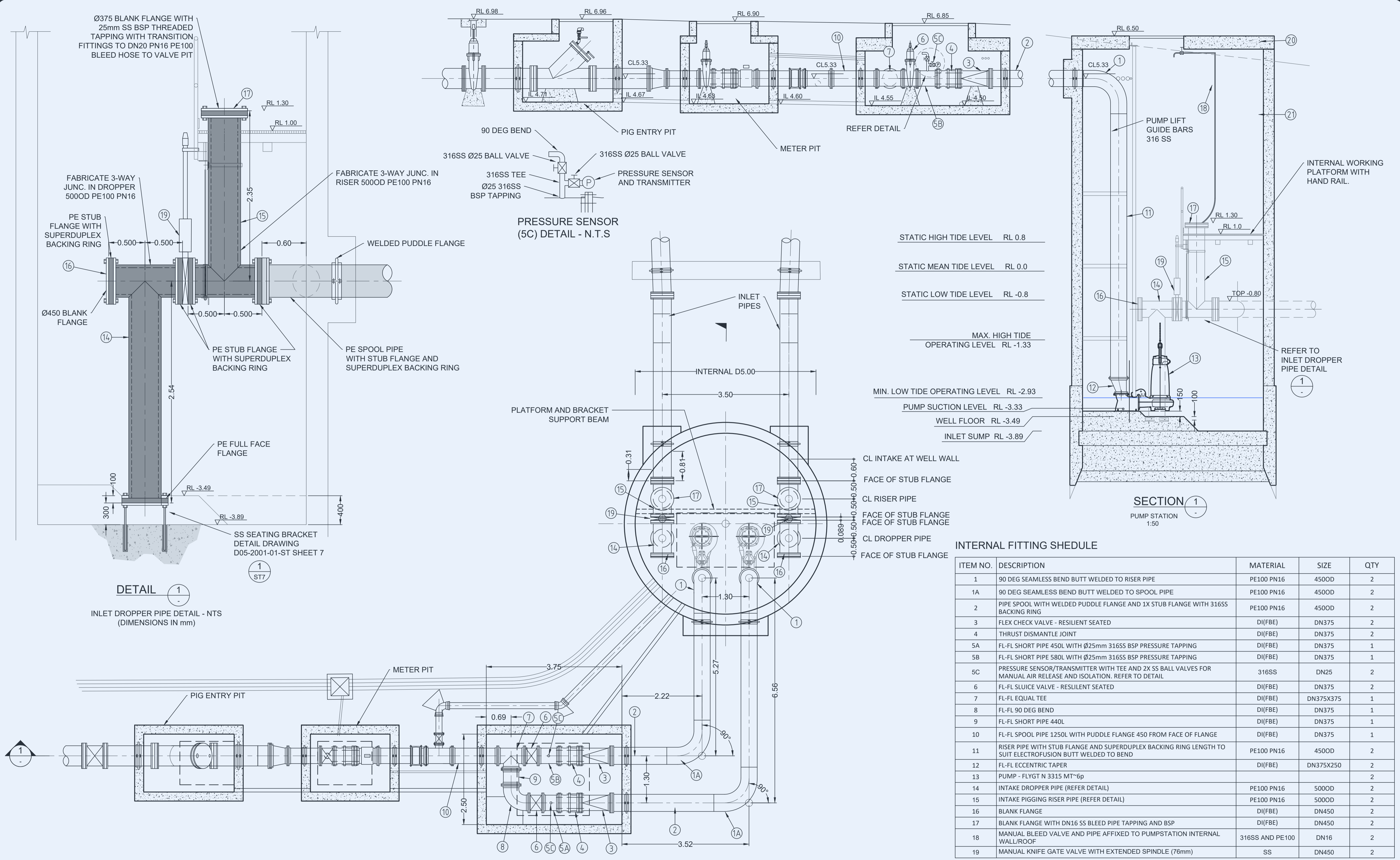
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APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RP Eng	



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**AUSTRALIA BAY LOBSTER PRODUCERS**  
 PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE <b>PUMP STATION GENERAL SITE PLAN</b>
Drawing No. <b>D05-2001-01-PS</b>
Sheet 1 of 3
<b>A1</b>



STATIC HIGH TIDE LEVEL RL 0.8  
 STATIC MEAN TIDE LEVEL RL 0.0  
 STATIC LOW TIDE LEVEL RL -0.8  
 MAX. HIGH TIDE OPERATING LEVEL RL -1.33  
 MIN. LOW TIDE OPERATING LEVEL RL -2.93  
 PUMP SUCTION LEVEL RL -3.33  
 WELL FLOOR RL -3.49  
 INLET SUMP RL -3.89

**INTERNAL FITTING SCHEDULE**

ITEM NO.	DESCRIPTION	MATERIAL	SIZE	QTY
1	90 DEG SEAMLESS BEND BUTT WELDED TO RISER PIPE	PE100 PN16	4500D	2
1A	90 DEG SEAMLESS BEND BUTT WELDED TO SPOOL PIPE	PE100 PN16	4500D	2
2	PIPE SPOOL WITH WELDED PUDDLE FLANGE AND 1X STUB FLANGE WITH 316SS BACKING RING	PE100 PN16	4500D	2
3	FLEX CHECK VALVE - RESILIENT SEATED	DI(FBE)	DN375	2
4	THRUST DISMANTLE JOINT	DI(FBE)	DN375	2
5A	FL-FL SHORT PIPE 450L WITH Ø25mm 316SS BSP PRESSURE TAPPING	DI(FBE)	DN375	1
5B	FL-FL SHORT PIPE 580L WITH Ø25mm 316SS BSP PRESSURE TAPPING	DI(FBE)	DN375	1
5C	PRESSURE SENSOR/TRANSMITTER WITH TEE AND 2X SS BALL VALVES FOR MANUAL AIR RELEASE AND ISOLATION. REFER TO DETAIL	316SS	DN25	2
6	FL-FL SLUICE VALVE - RESILIENT SEATED	DI(FBE)	DN375	2
7	FL-FL EQUAL TEE	DI(FBE)	DN375X375	1
8	FL-FL 90 DEG BEND	DI(FBE)	DN375	1
9	FL-FL SHORT PIPE 440L	DI(FBE)	DN375	1
10	FL-FL SPOOL PIPE 1250L WITH PUDDLE FLANGE 450 FROM FACE OF FLANGE	DI(FBE)	DN375	1
11	RISER PIPE WITH STUB FLANGE AND SUPERDUPLEX BACKING RING LENGTH TO SUIT ELECTROFUSION BUTT WELDED TO BEND	PE100 PN16	4500D	2
12	FL-FL ECCENTRIC TAPER	DI(FBE)	DN375X250	2
13	PUMP - FLYGT N 3315 MT-6p			2
14	INTAKE DROPPER PIPE (REFER DETAIL)	PE100 PN16	5000D	2
15	INTAKE PIGGING RISER PIPE (REFER DETAIL)	PE100 PN16	5000D	2
16	BLANK FLANGE	DI(FBE)	DN450	2
17	BLANK FLANGE WITH DN16 SS BLEED PIPE TAPPING AND BSP	DI(FBE)	DN450	2
18	MANUAL BLEED VALVE AND PIPE AFFIXED TO PUMPSTATION INTERNAL WALL/ROOF	316SS AND PE100	DN16	2
19	MANUAL KNIFE GATE VALVE WITH EXTENDED SPINDLE (76mm)	SS	DN450	2

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Scale 1:50 UNO		Date 21/4/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPENG	

Datum AHD (m)

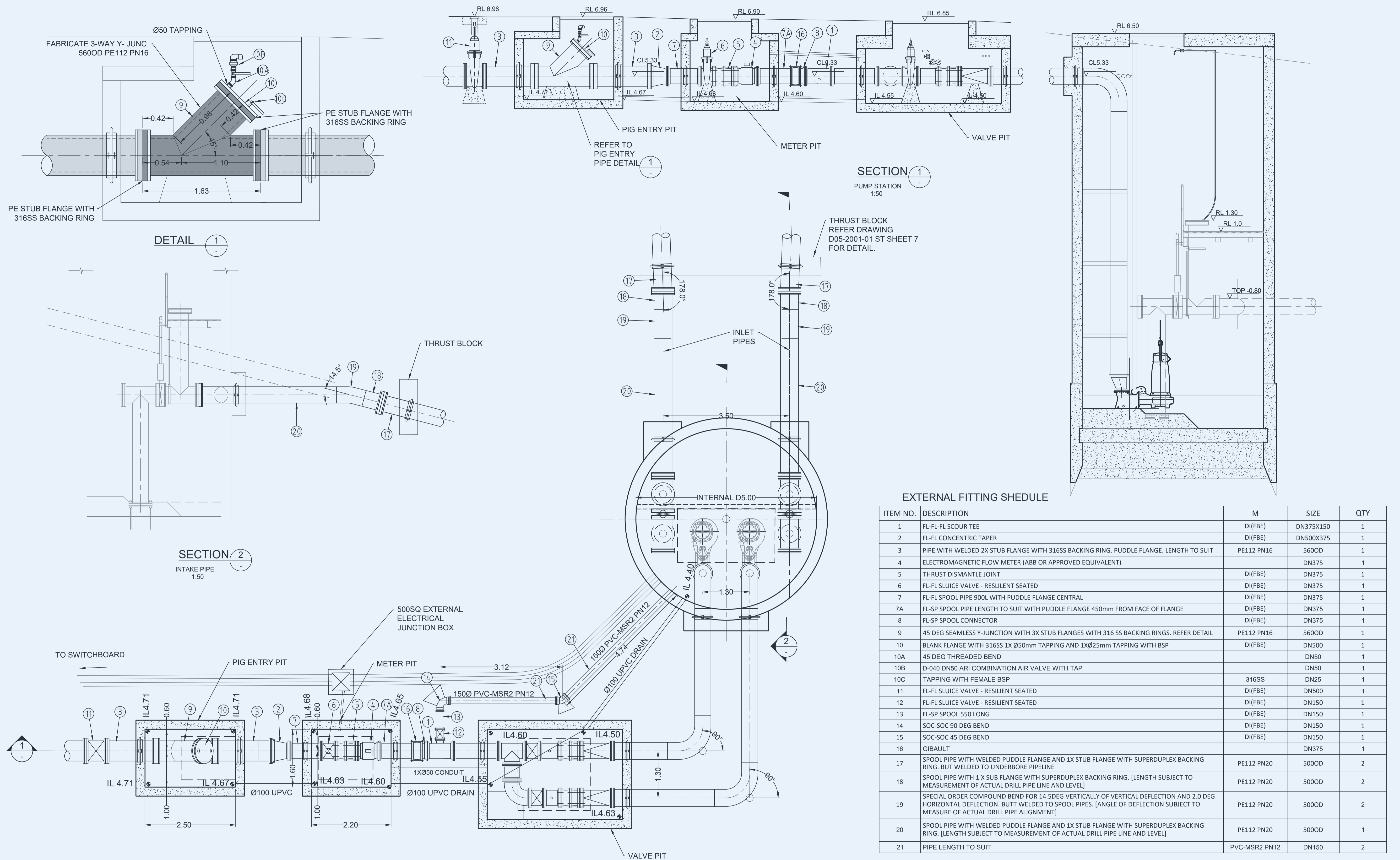
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CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**

PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE  
**PUMP STATION GENERAL ARRANGEMENT & INTERNAL PIPE WORK**

Drawing No. **D05-2001-01-PS** Sheet 2 of 3 **A1**



**EXTERNAL FITTING SCHEDULE**

ITEM NO.	DESCRIPTION	M	SIZE	QTY
1	FL-FL-FL SCOUR TEE	D(FBE)	DN375X150	1
2	FL-FL CONCENTRIC TAPER	D(FBE)	DN500X375	1
3	PIPE WITH WELDED 2X STUB FLANGE WITH 316SS BACKING RING. PUDDLE FLANGE. LENGTH TO SUIT	PE112 PN16	5600D	1
4	ELECTROMAGNETIC FLOW METER (ABB OR APPROVED EQUIVALENT)		DN375	1
5	THRUST DISMANTLE JOINT	D(FBE)	DN375	1
6	FL-FL SLUICE VALVE - RESILIENT SEATED	D(FBE)	DN375	1
7	FL-FL SPOOL PIPE 900L WITH PUDDLE FLANGE CENTRAL	D(FBE)	DN375	1
7A	FL-SP SPOOL PIPE LENGTH TO SUIT WITH PUDDLE FLANGE 450mm FROM FACE OF FLANGE	D(FBE)	DN375	1
8	FL-SP SPOOL CONNECTOR	D(FBE)	DN375	1
9	45 DEG SEAMLESS Y-JUNCTION WITH 3X STUB FLANGES WITH 316 SS BACKING RINGS. REFER DETAIL	PE112 PN16	5600D	1
10	BLANK FLANGE WITH 316SS 1X Ø50mm TAPPING AND 1X Ø25mm TAPPING WITH BSP	D(FBE)	DN500	1
10A	45 DEG THREADED BEND		DN50	1
10B	D-040 DN50 ARI COMBINATION AIR VALVE WITH TAP		DN50	1
10C	TAPPING WITH FEMALE BSP	316SS	DN25	1
11	FL-FL SLUICE VALVE - RESILIENT SEATED	D(FBE)	DN500	1
12	FL-FL SLUICE VALVE - RESILIENT SEATED	D(FBE)	DN150	1
13	FL-SP SPOOL 550 LONG	D(FBE)	DN150	1
14	SOC-SOC 90 DEG BEND	D(FBE)	DN150	1
15	SOC-SOC 45 DEG BEND	D(FBE)	DN150	1
16	GIBAULT		DN375	1
17	SPOOL PIPE WITH WELDED PUDDLE FLANGE AND 1X STUB FLANGE WITH SUPERDUPLEX BACKING RING. BUT WELDED TO UNDERBORE PIPELINE	PE112 PN20	5000D	2
18	SPOOL PIPE WITH 1 X SUB FLANGE WITH SUPERDUPLEX BACKING RING. [LENGTH SUBJECT TO MEASUREMENT OF ACTUAL DRILL PIPE LINE AND LEVEL]	PE112 PN20	5000D	2
19	SPECIAL ORDER COMPOUND BEND FOR 14.5DEG VERTICALLY OF VERTICAL DEFLECTION AND 2.0 DEG HORIZONTAL DEFLECTION. BUTT WELDED TO SPOOL PIPES. [ANGLE OF DEFLECTION SUBJECT TO MEASURE OF ACTUAL DRILL PIPE ALIGNMENT]	PE112 PN20	5000D	2
20	SPOOL PIPE WITH WELDED PUDDLE FLANGE AND 1X STUB FLANGE WITH SUPERDUPLEX BACKING RING. [LENGTH SUBJECT TO MEASUREMENT OF ACTUAL DRILL PIPE LINE AND LEVEL]	PE112 PN20	5000D	1
21	PIPE LENGTH TO SUIT	PVC-MSR2 PN12	DN150	2

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APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RP Eng	

Datum AHD (m)

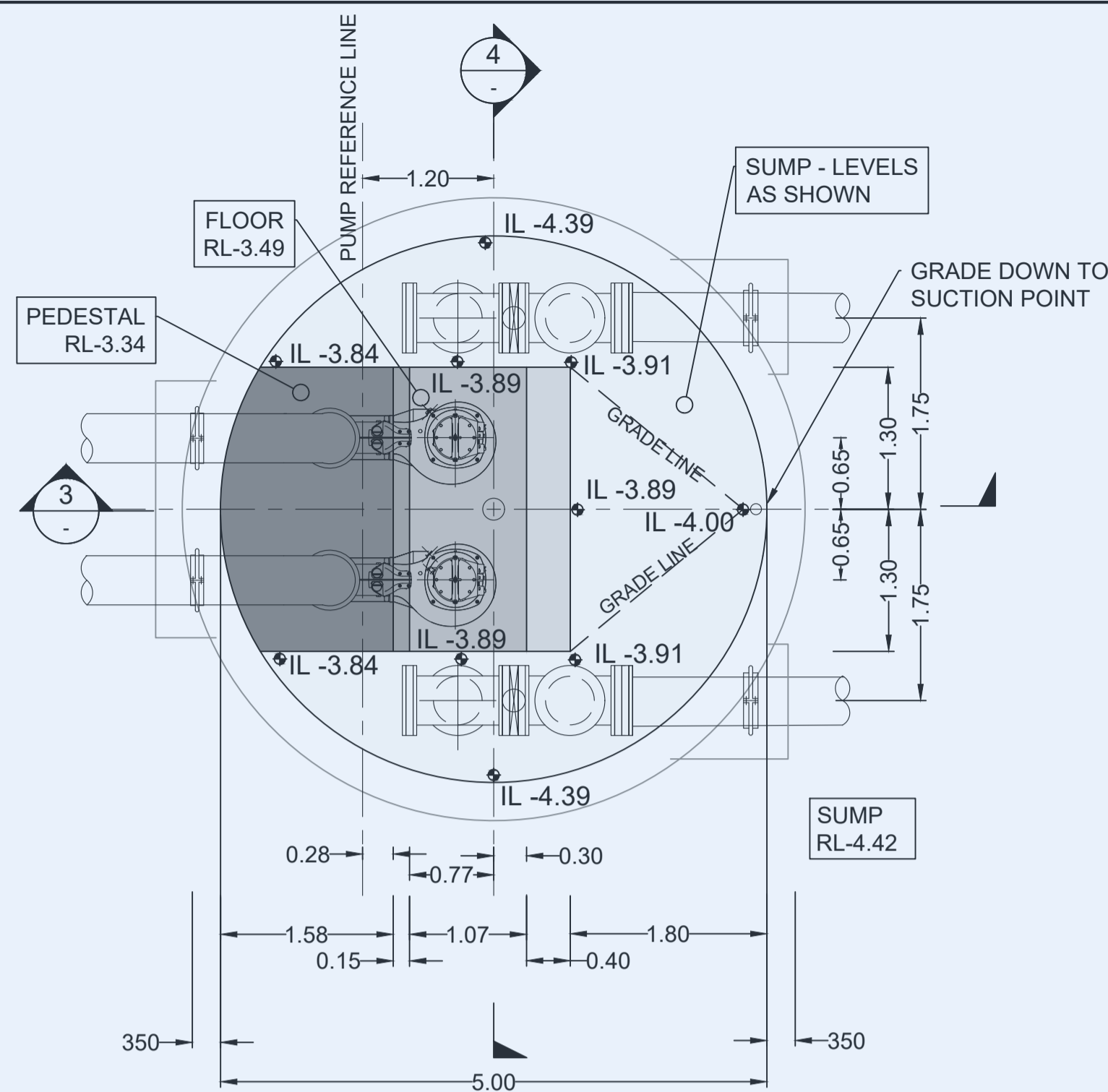
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Issue	Description	Date	By

CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**

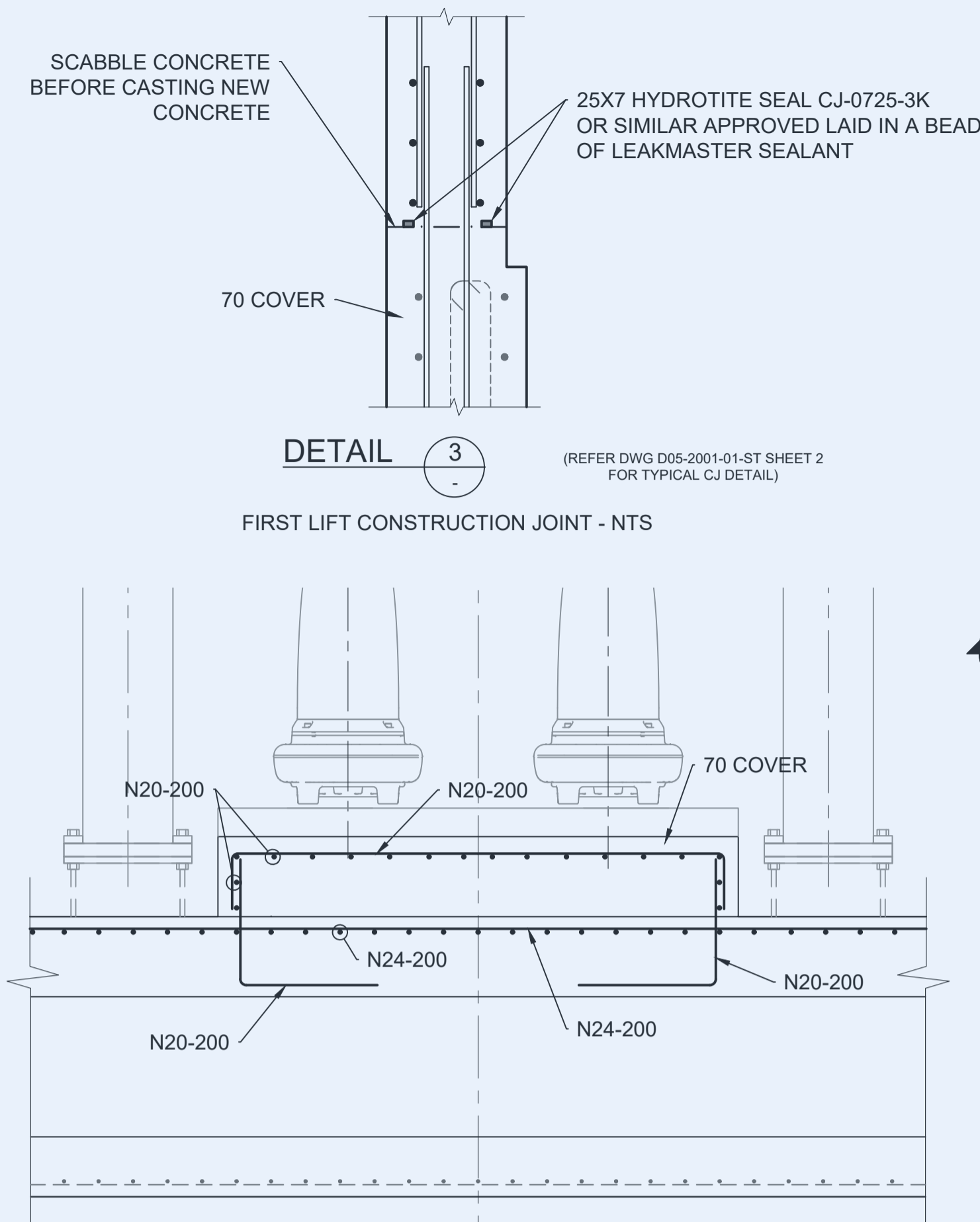
PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE  
**PUMP STATION GENERAL ARRANGEMENT & EXTERNAL PIPE WORK**

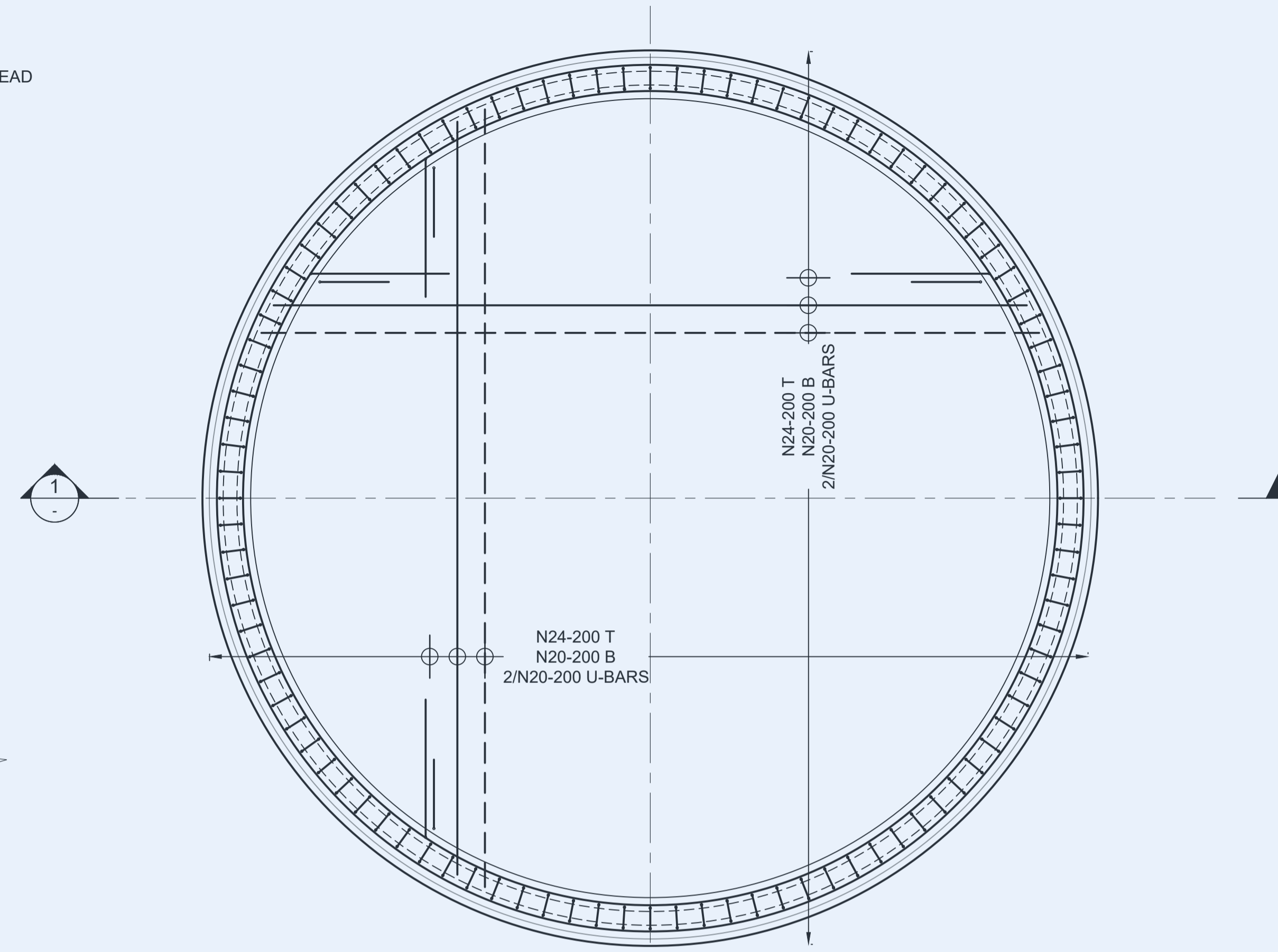
Drawing No. **D05-2001-01-PS** Sheet 3 of 3 **A1**



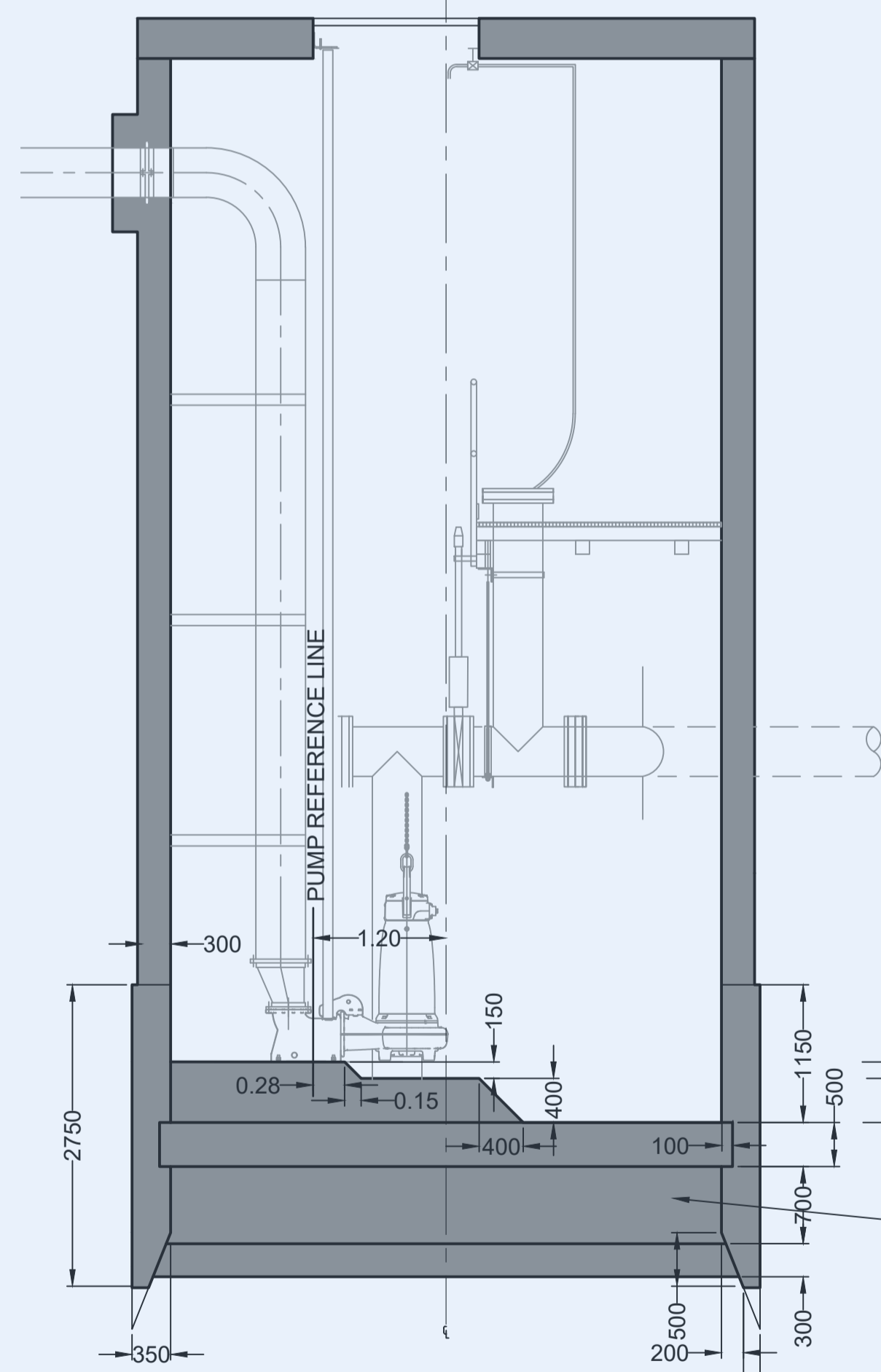
PUMP WELL BENCHING AND BASE  
DETAIL PLAN - 1:50



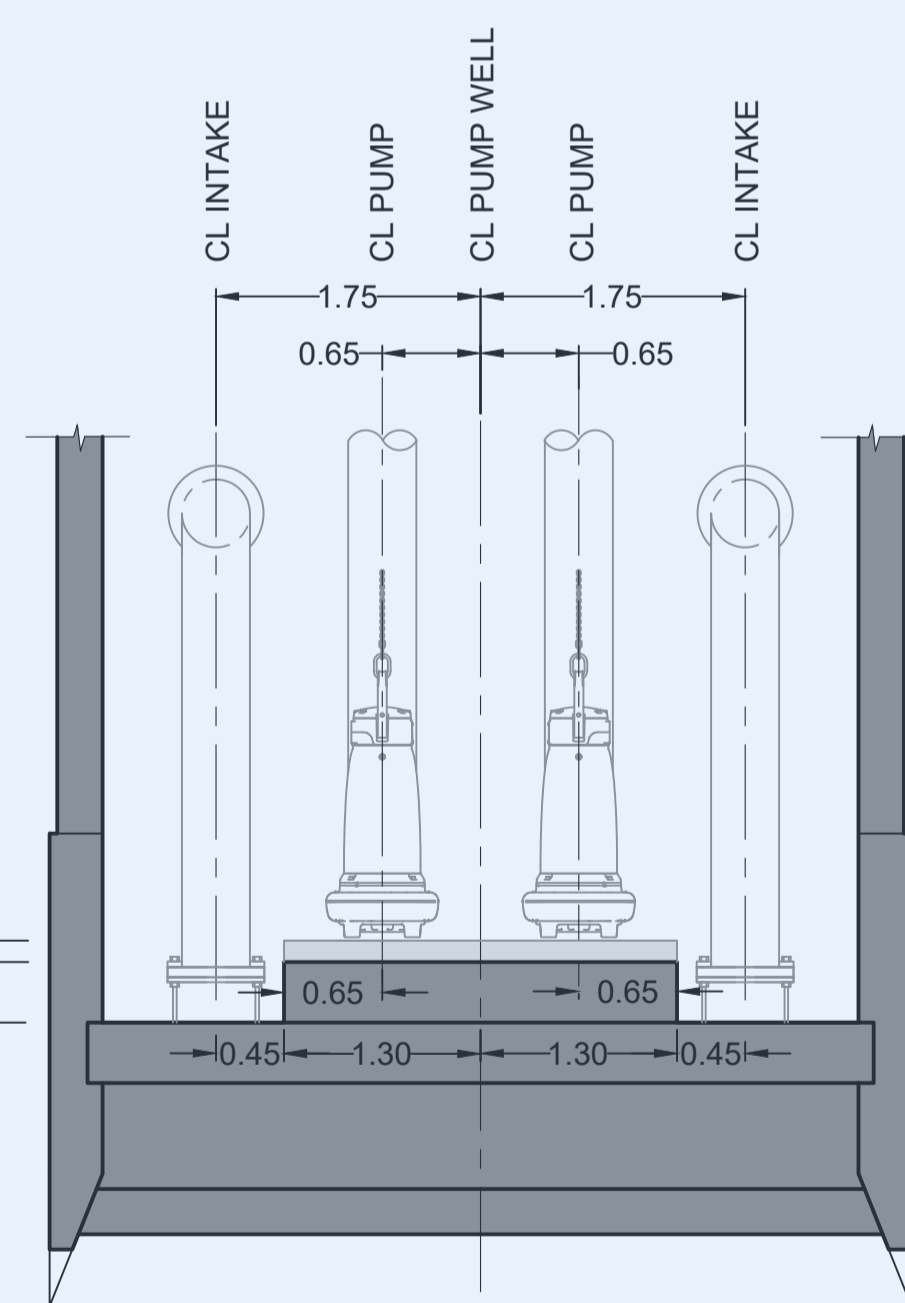
DETAIL 3  
(REFER DWG D05-2001-01-ST SHEET 2 FOR TYPICAL CJ DETAIL)  
FIRST LIFT CONSTRUCTION JOINT - NTS



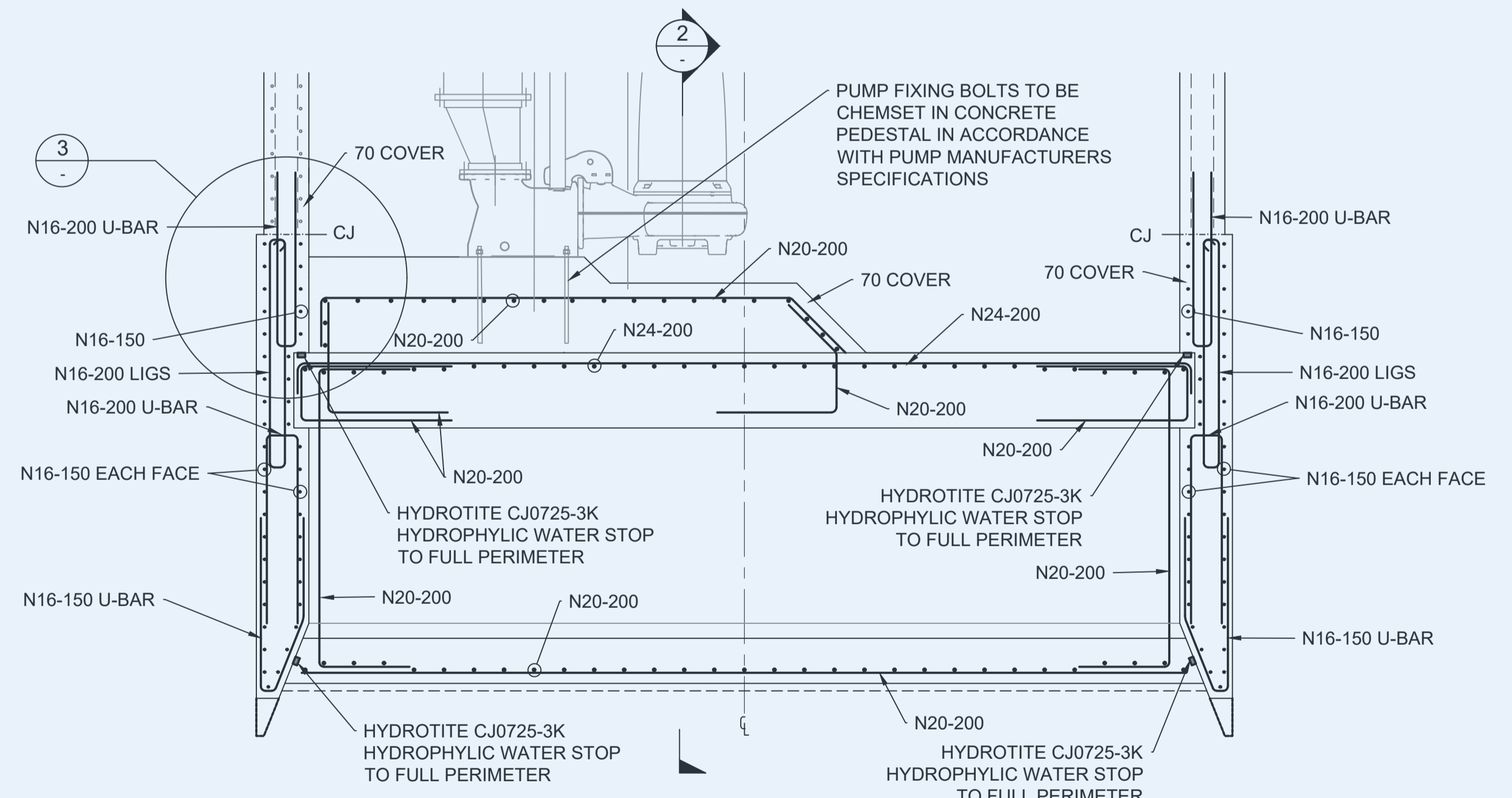
PUMP WELL CAISSON AND PLUG  
REINFORCEMENT PLAN - 1:25



SECTION 3  
CAISSON AND PLUG DETAIL  
1:50



SECTION 4  
PUMP PEDESTAL DETAIL  
1:50



SECTION 1  
CAISSON AND PLUG REO  
1:25

FOR APPROVAL

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Scale 1:25 UNO		Date 20/4/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RP Eng	

Datum AHD (m)

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**AUSTRALIA BAY LOBSTER PRODUCERS**

PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE <b>PUMP STATION CAISSON AND PLUG STRUCTURAL DETAILS</b>
Drawing No. <b>D05-2001-01-ST</b>
Sheet 1 of 8
<b>A1</b>

FOR JOINT DETAILS REFER  
DRG SEQ WS&S D&C  
STD DRG SEQ-SPS-1407-1.

4X EQUALLY SPACED  
50Ø FORMED HOLE,  
EPOXY FILL HOLE WITH  
HILTI HIT-RE500 AFTER  
INSTALLATION OF DOWEL

N16 GALV DOWEL  
450 LONG  
250 INTO WALL

DETAIL 5  
TOP SLAB JOINT - NTS

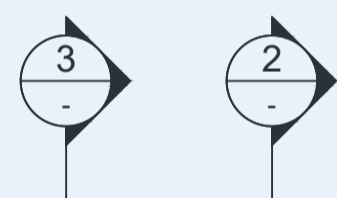
NOTE:  
LIFT HEIGHT IN PUMP  
WALL SHALL BE SUCH  
THAT THE CONCRETE  
FALL HEIGHT DOES  
NOT EXCEED 2m

SCABBLE CONCRETE  
BEFORE CASTING NEW  
CONCRETE

70 COVER  
INSIDE FACE

25X7 HYDROTITE SEAL CJ-0725-3K  
OR SIMILAR APPROVED LAID IN A BEAD  
OF LEAKMASTER SEALANT

DETAIL 7  
TYPICAL CONSTRUCTION  
JOINT - NTS



SECTION 1  
PUMP STATION WALL  
N.T.S

NOTE : THE PUMPS, PIPEWORK AND FITTINGS  
MUST BE IN PLACE WITH ALL FLANGE BOLTS  
TENSIONED BEFORE CONCRETE FILLING  
PENETRATIONS. DO NOT CAST IN PIPES AND  
THEN ATTEMPT TO FIT PIPEWORK AND  
PUMPS.

PUMP WELL WALL REINFORCEMENT  
PLAN - 1:25

OUTSIDE WALL  
N16-150 U-BAR  
SPECIAL  
HOOP BARS  
AROUND PIPE  
CJ

25X7 HYDROTITE CJ0725-3K  
HYDROPHYLIC WATER STOP  
TO BOTH FACES  
MIN. 50 COVER

300

300

LOCALISED THICKENING  
TO ACCOMMODATE  
THRUST FLANGE

DETAIL 4  
PIPE PENETRATION DETAIL - 1:25

PIPE PENETRATION DETAIL - 1:25

N16 DIAGONAL BARS EF (1500 LONG) CAST  
INTO WALL AT CORNERS OF BLOCKOUT.  
TYPICAL

N20 HOOP BARS

SECTION 2  
PENETRATION  
1:25

N16-150 EF CHEMICALLY ANCHORED  
170mm WITH HILTI HIT-RE500  
COG AROUND HOOP BARS.  
TYPICAL ALTERNATIVELY  
COUPLERS MAY BE USED.

N20 HOOP BARS  
N16-150 COG IN FAR  
FACE AND AROUND  
HOOP BAR  
N16-150 U-BARS

SECTION 3  
PENETRATION  
1:25

REINFORCEMENT ON  
INSIDE WALL  
REFER TO SECTION 2  
70 COVER  
INSIDE FACE  
CJ  
REINFORCEMENT ON  
OUTSIDE WALL  
REFER TO SECTION 3  
N16 U-BARS T&B  
CENTRAL TO WALL  
25X7 HYDROTITE CJ0725-3K  
HYDROPHYLIC WATER STOP  
TO FULL PERIMETER OF  
PENETRATION

DETAIL 6  
PIPE PENETRATION - 1:25  
(NON-PERPENDICULAR)

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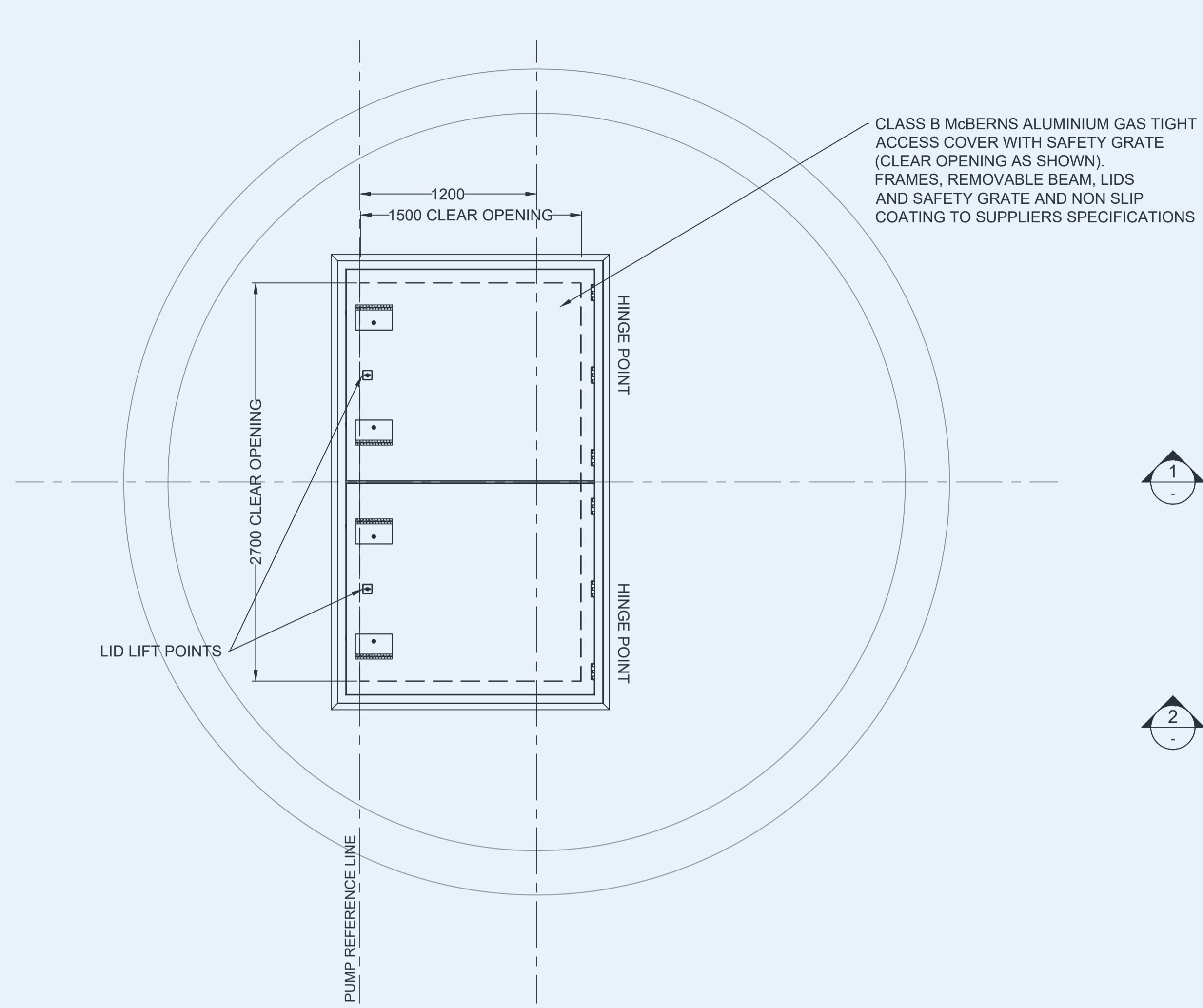
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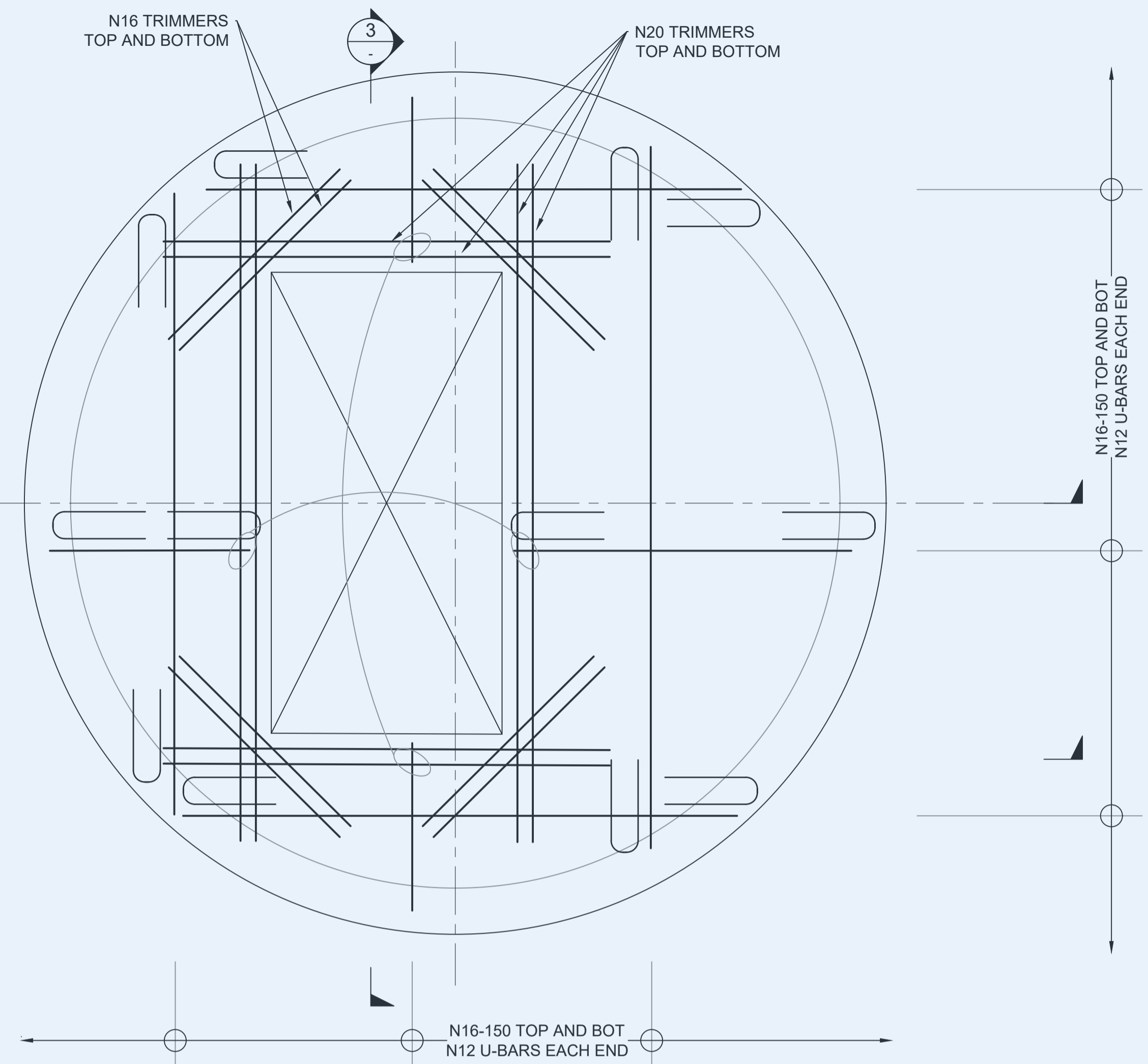
CLIENT  
AUSTRALIA BAY LOBSTER PRODUCERS  
PROJECT  
SEAWATER INTAKE PIPELINE  
AND PUMP STATION

TITLE  
PUMP STATION  
WALL AND PENETRATION  
STRUCTURAL DETAILS  
Drawing No. D05-2001-01-ST  
Sheet 2 of 8  
A1

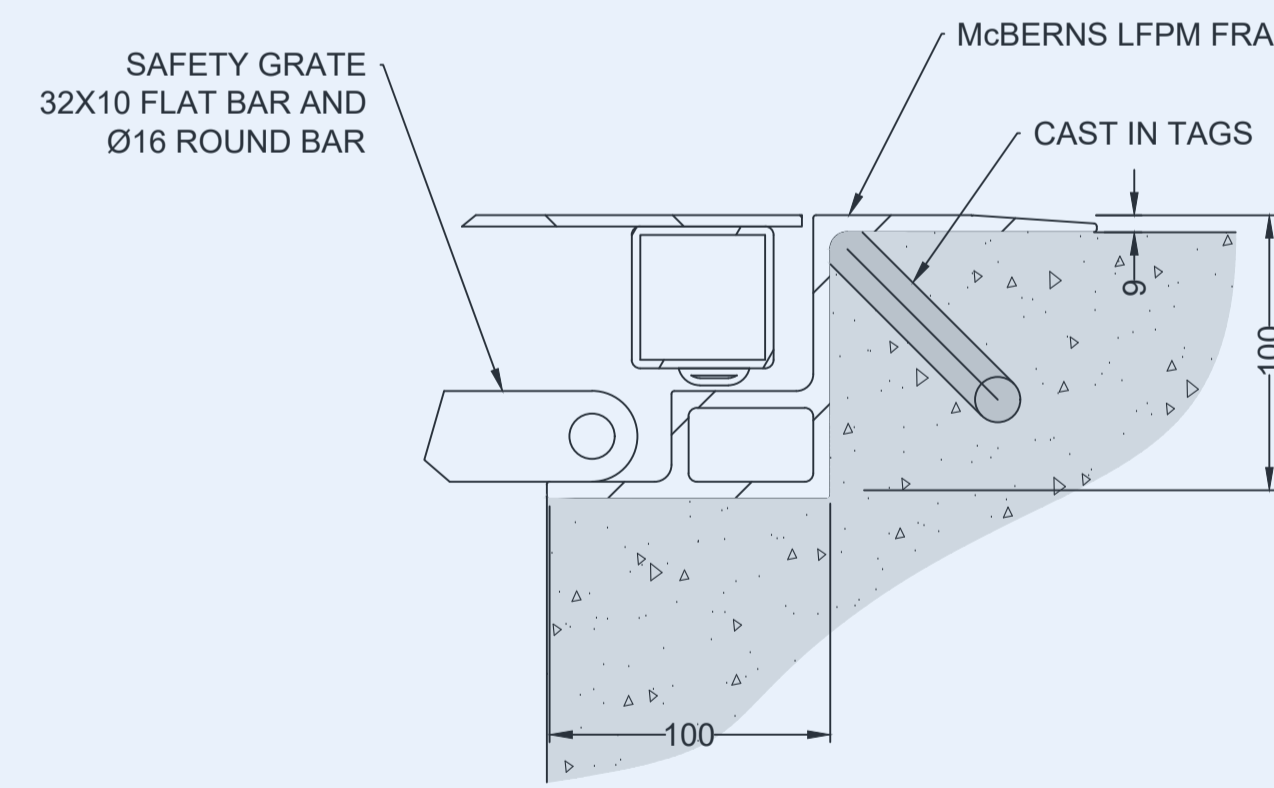
FOR APPROVAL



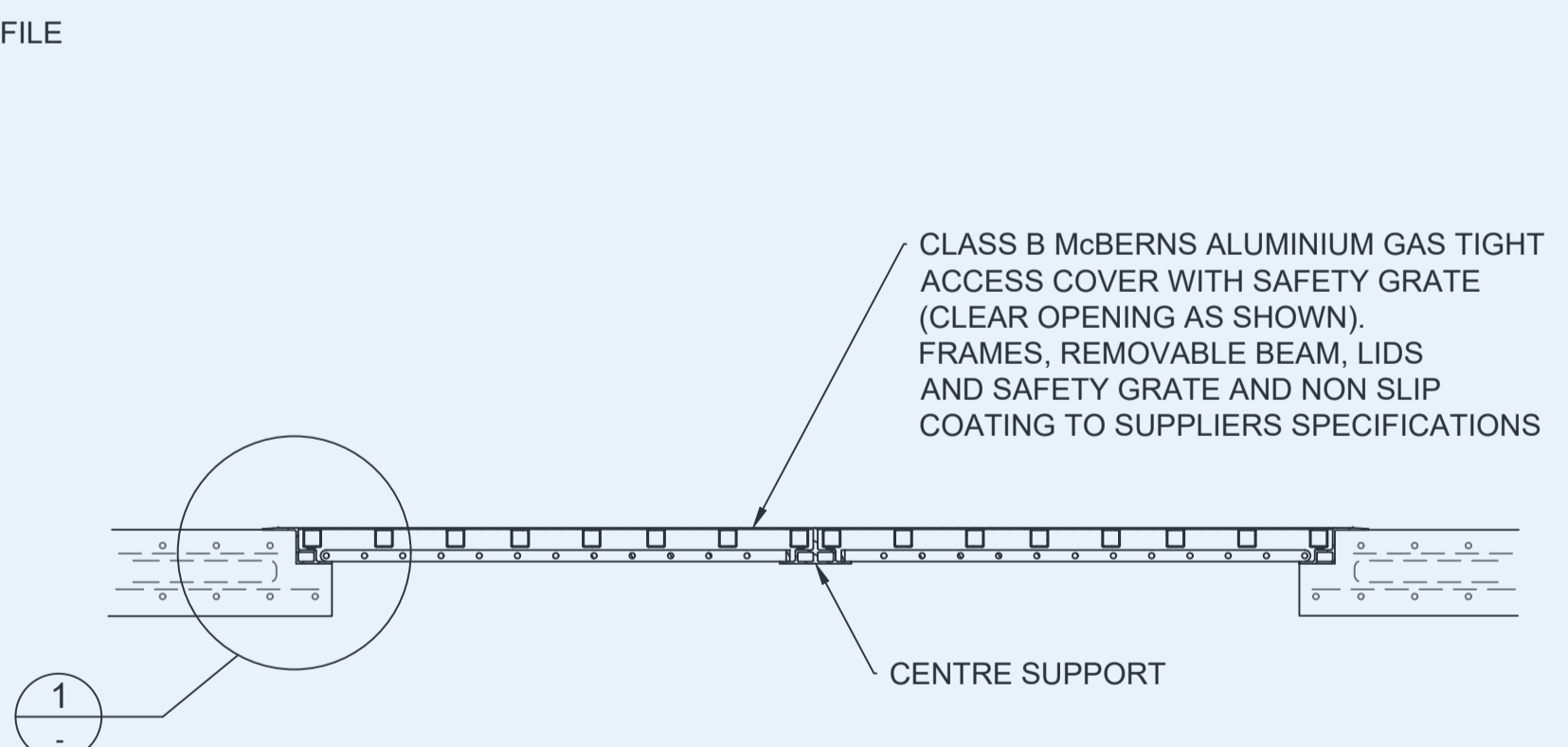
PUMP WELL PIT ACCESS COVER DETAIL  
PLAN - 1:25



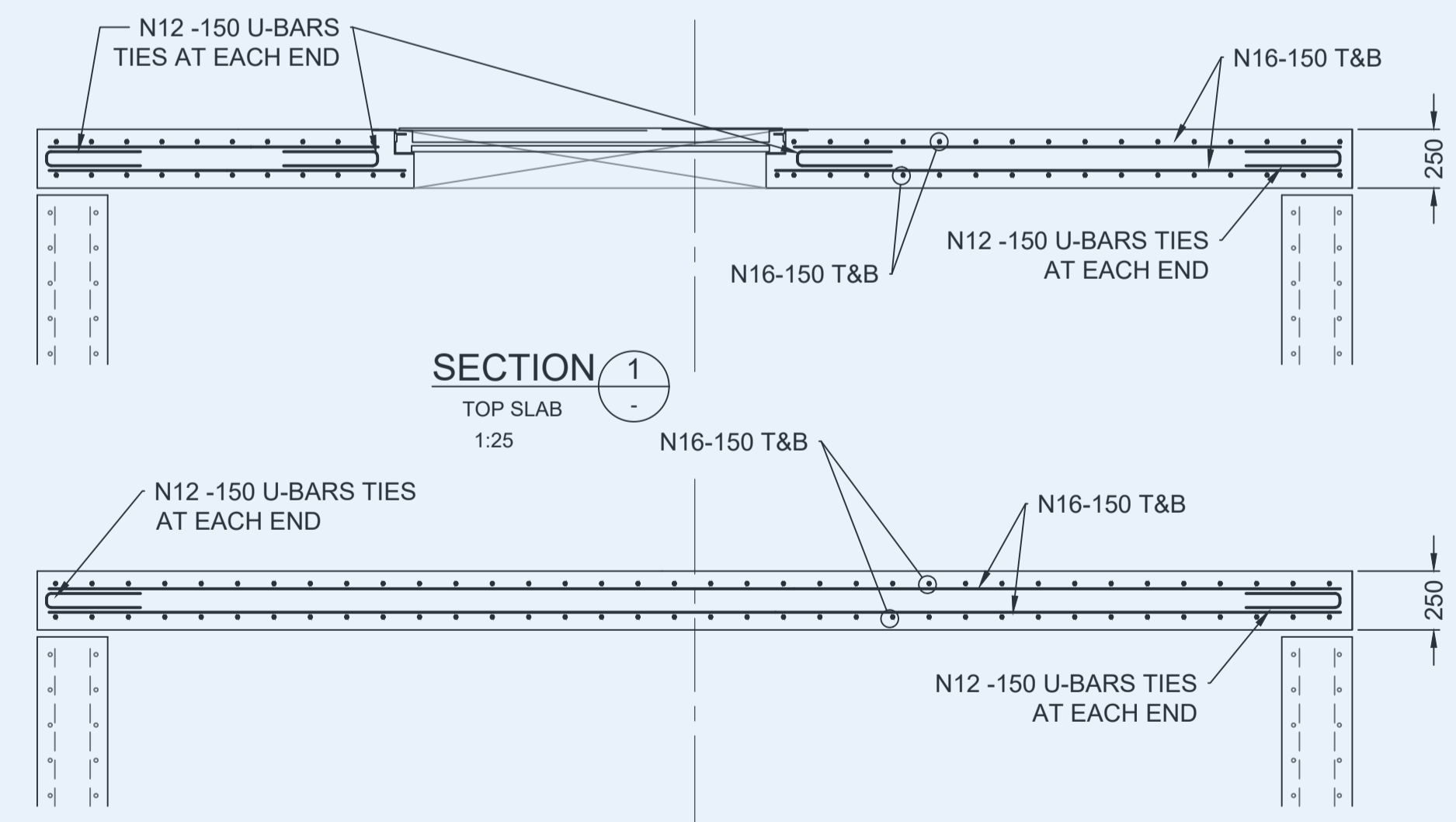
PUMP WELL TOP SLAB  
REINFORCEMENT PLAN - 1:25



DETAIL 1  
N.T.S.



SECTION 3  
ACCESS COVER  
1:20



SECTION 1  
TOP SLAB  
1:25

SECTION 2  
TOP SLAB  
1:25

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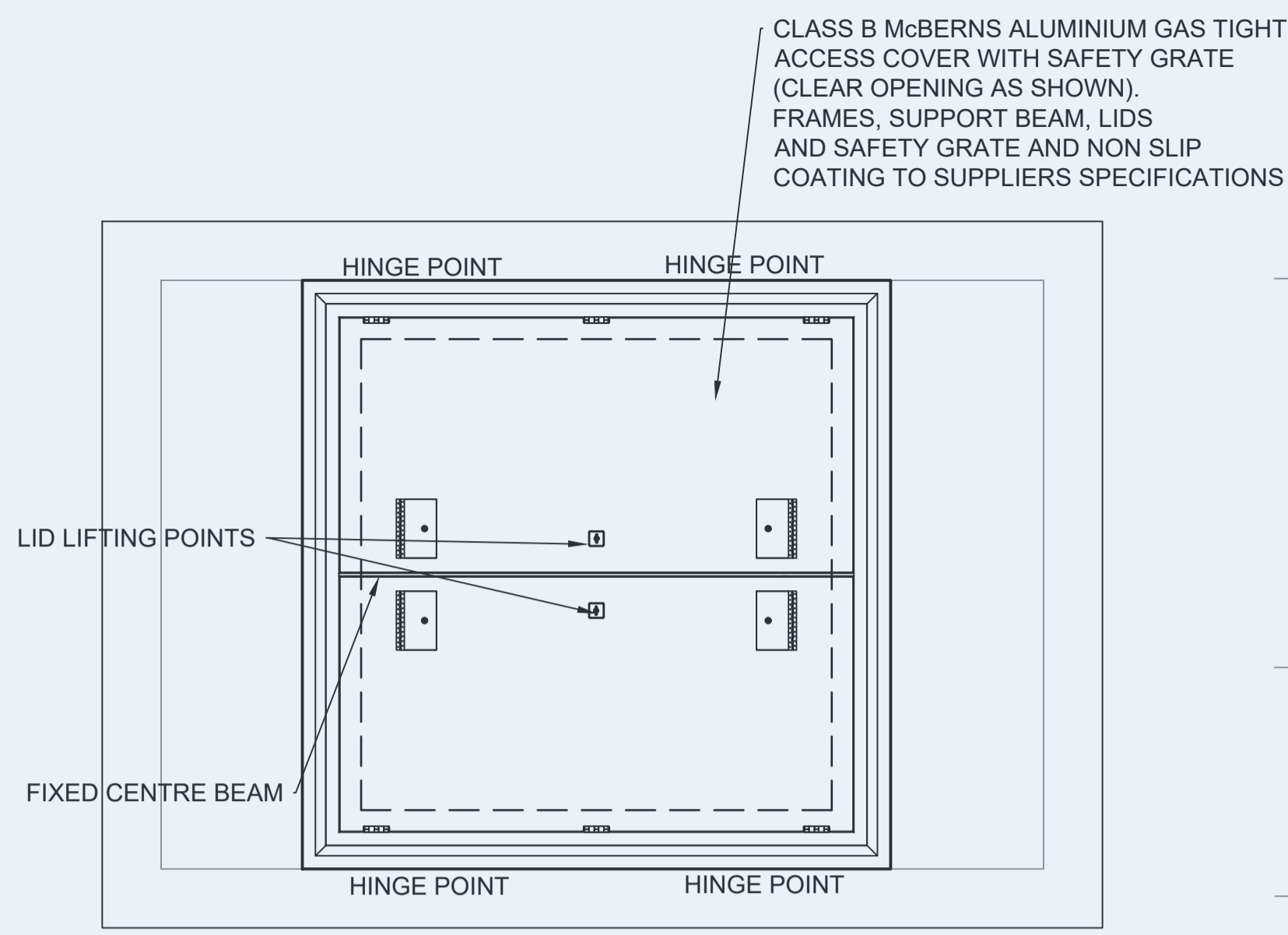
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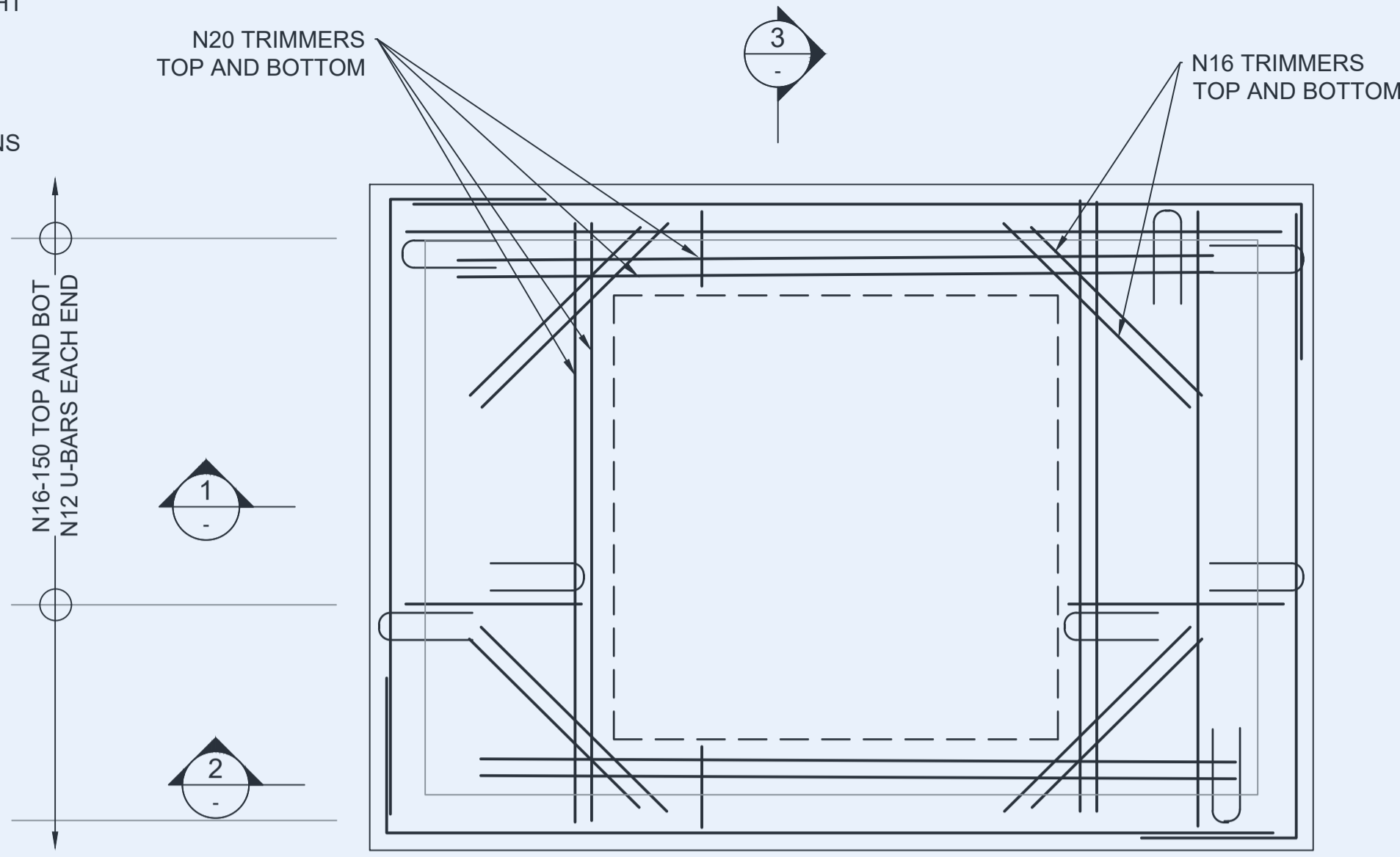
PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE  
**PUMP STATION TOP SLAB STRUCTURAL DETAILS**

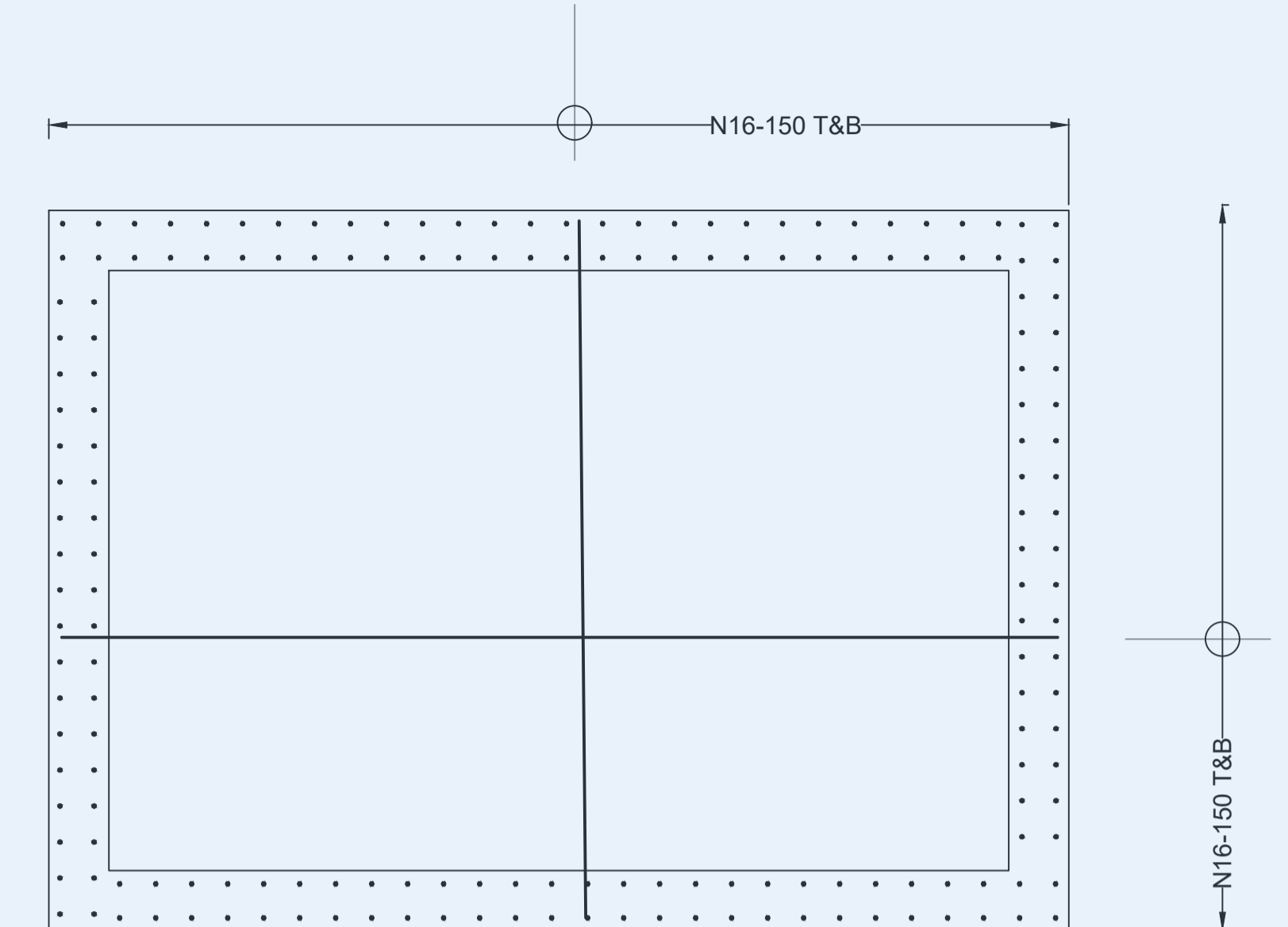
Drawing No. **D05-2001-01-ST** Sheet 3 of 8 **A1**



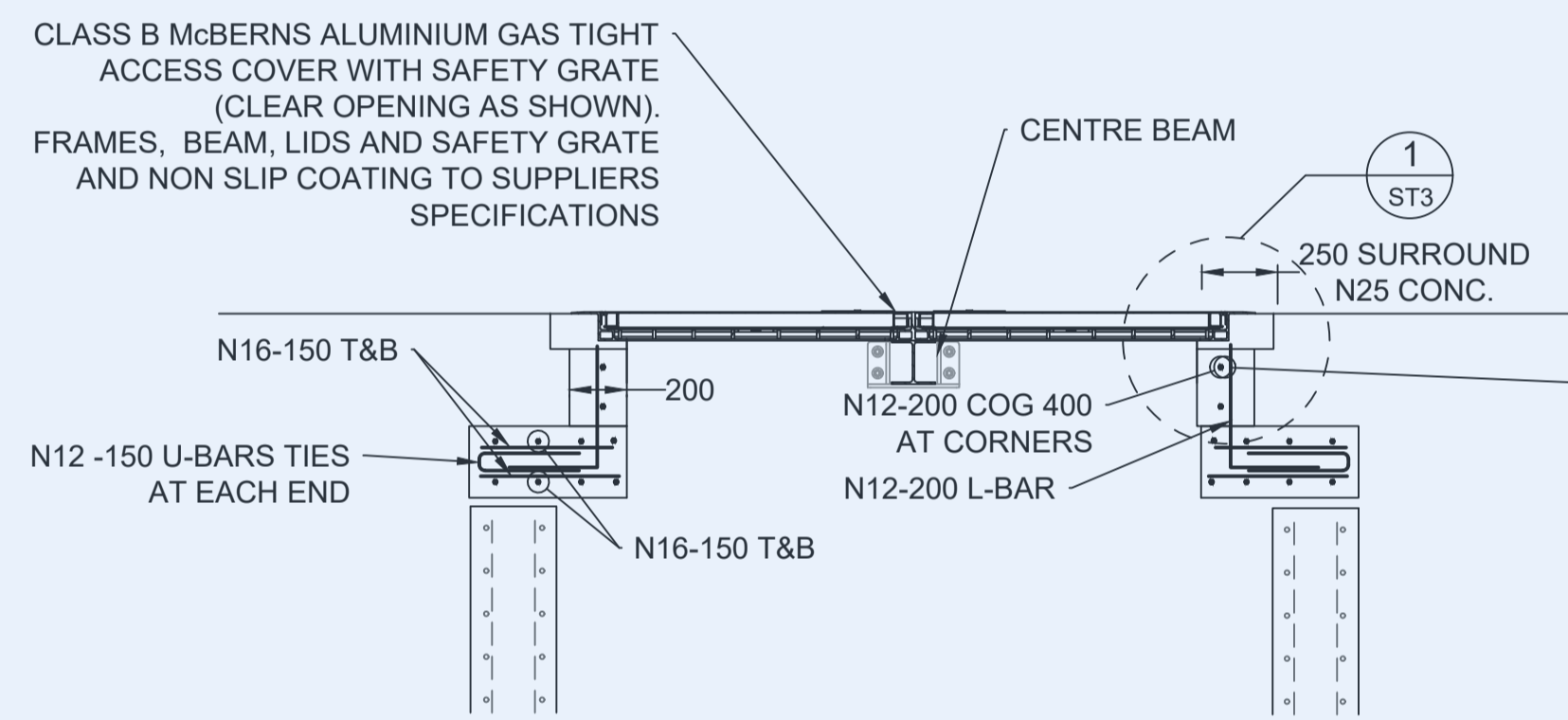
PUMP WELL AND VALVE PIT ACCESS COVER DETAIL PLAN - 1:25



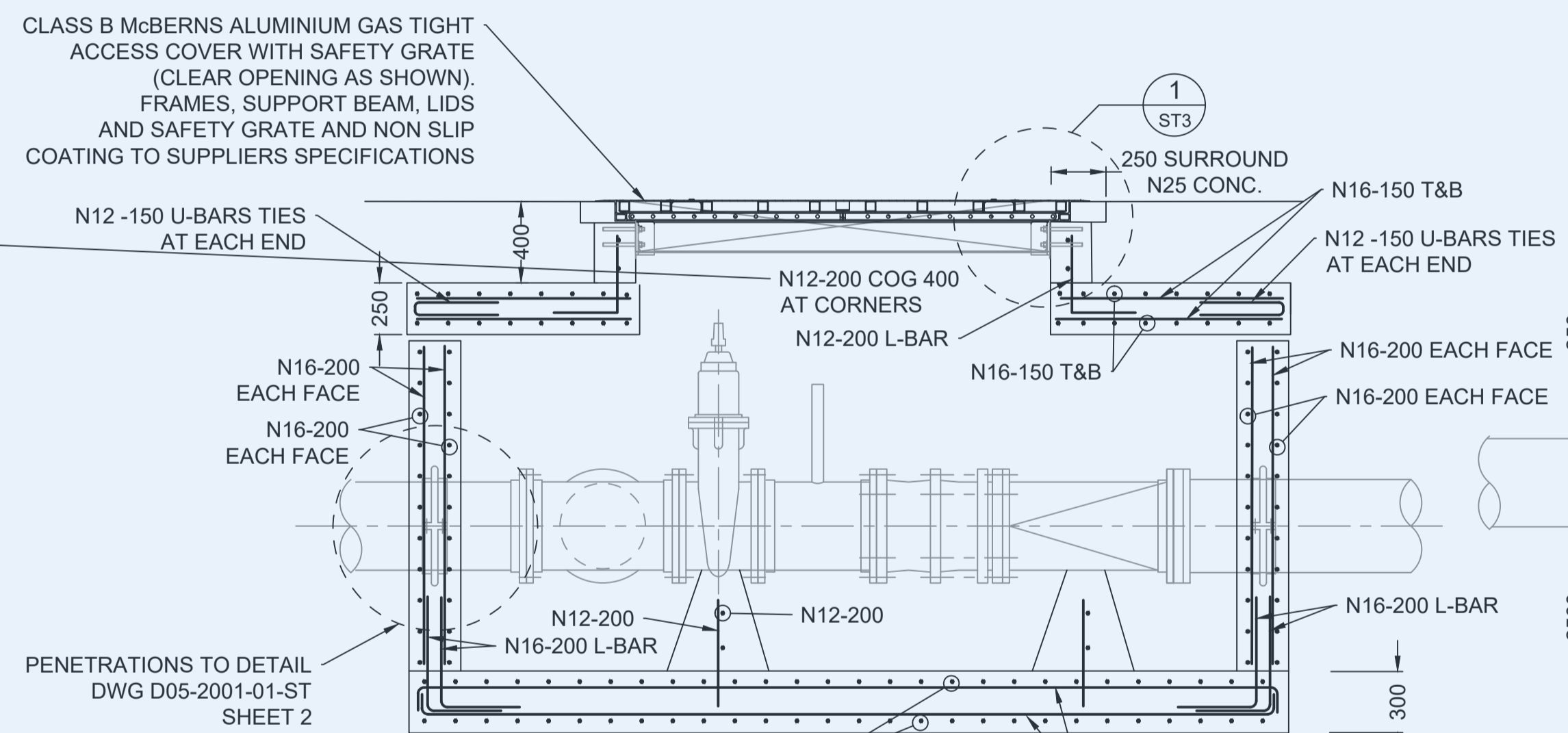
VALVE PIT TOP TRANSFER SLAB REINFORCEMENT PLAN - 1:25



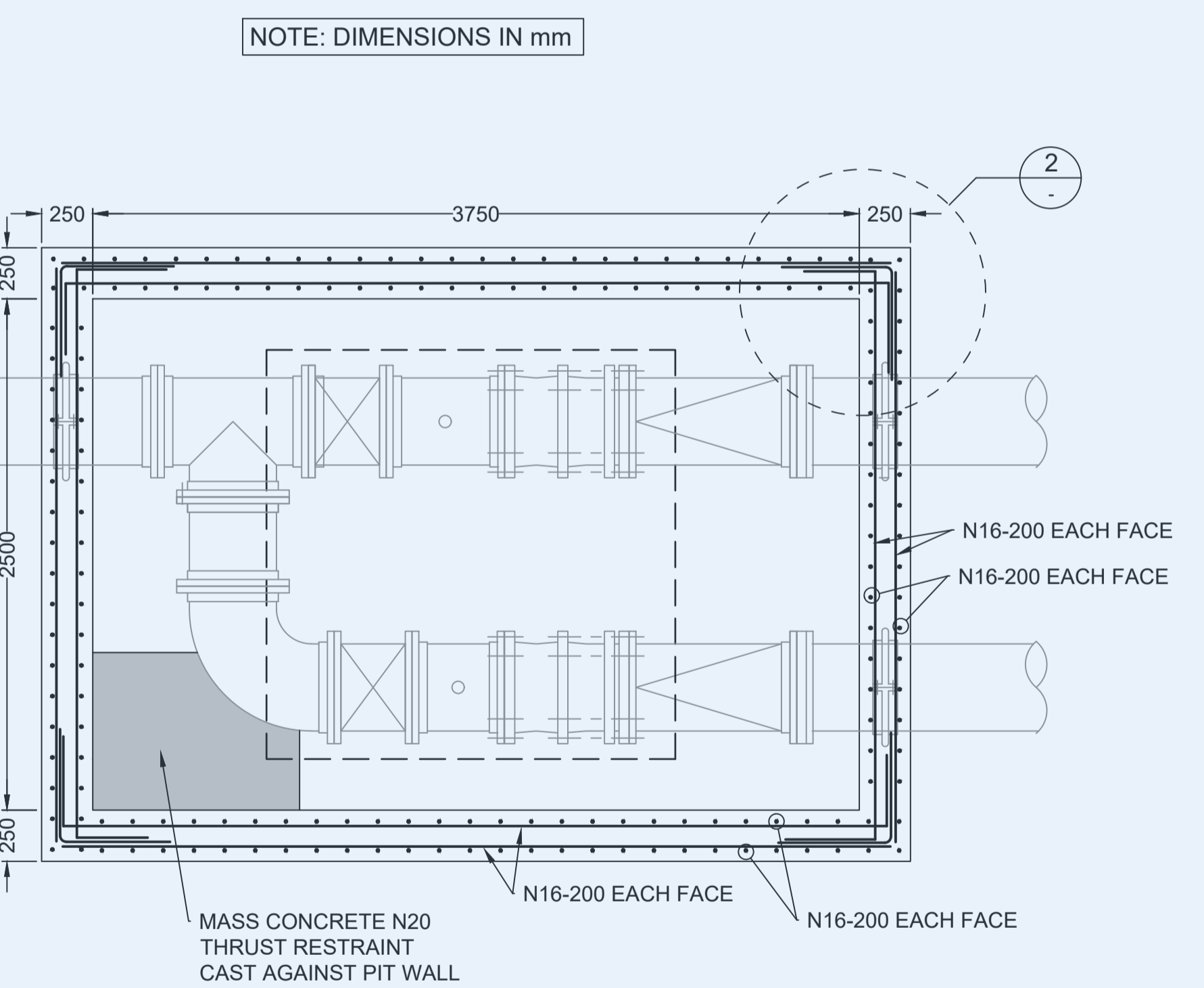
VALVE PIT BOTTOM SLAB REINFORCEMENT PLAN - 1:25



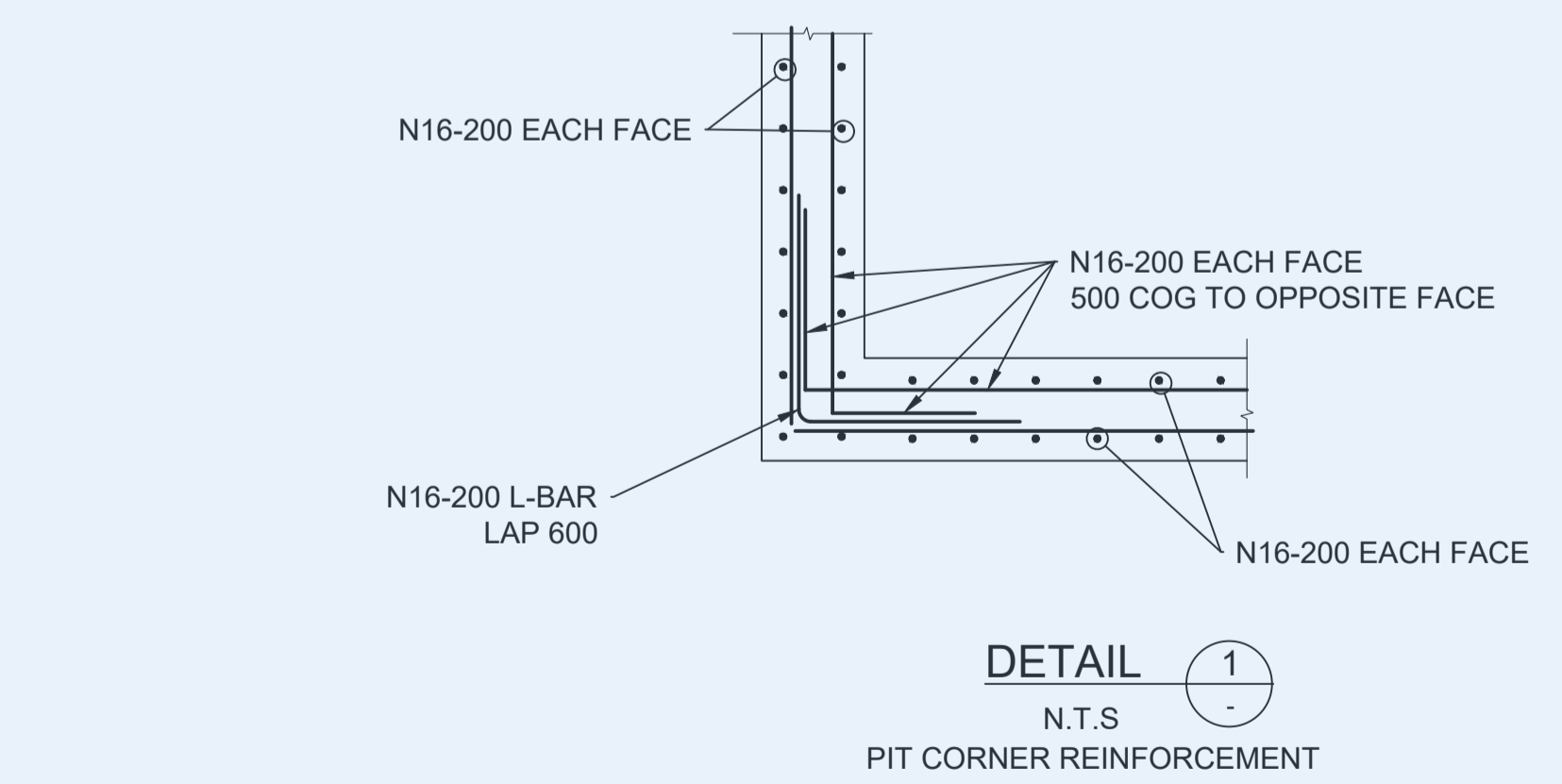
SECTION 3  
TOP SLAB  
1:25



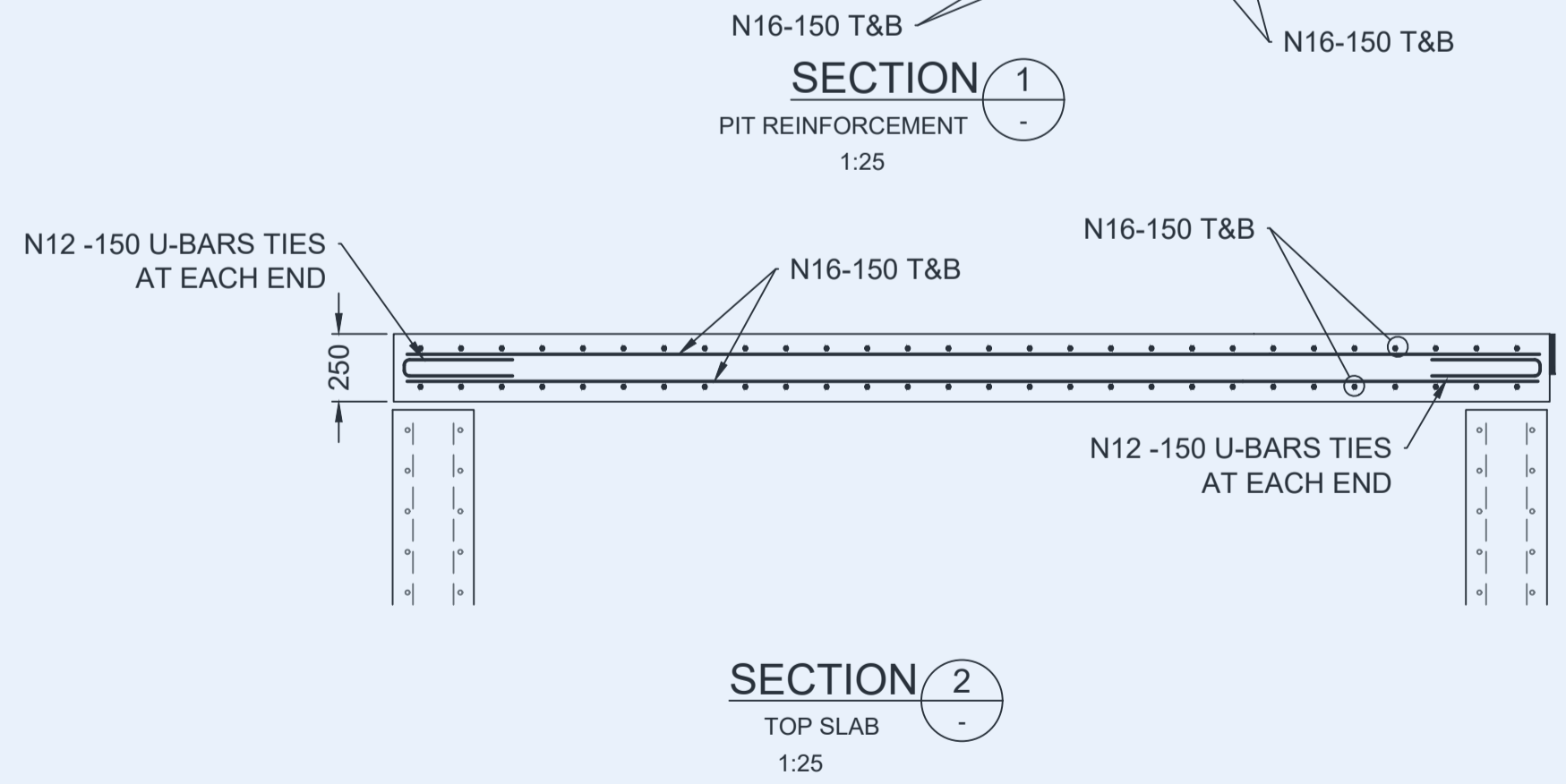
SECTION 1  
PIT REINFORCEMENT  
1:25



VALVE PIT WALL REINFORCEMENT PLAN - 1:25



DETAIL 1  
N.T.S.  
PIT CORNER REINFORCEMENT



SECTION 2  
TOP SLAB  
1:25

NOTE: DIMENSIONS IN mm

FOR APPROVAL

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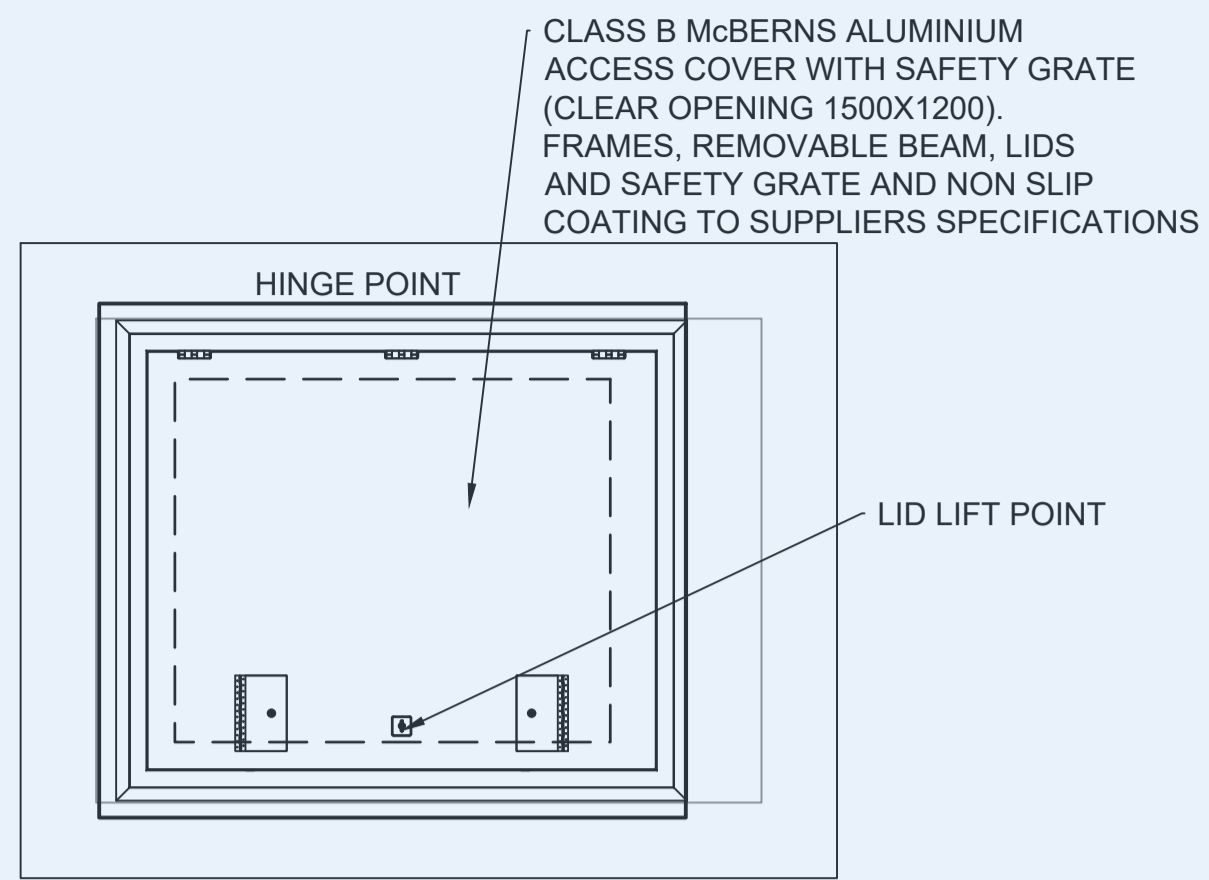
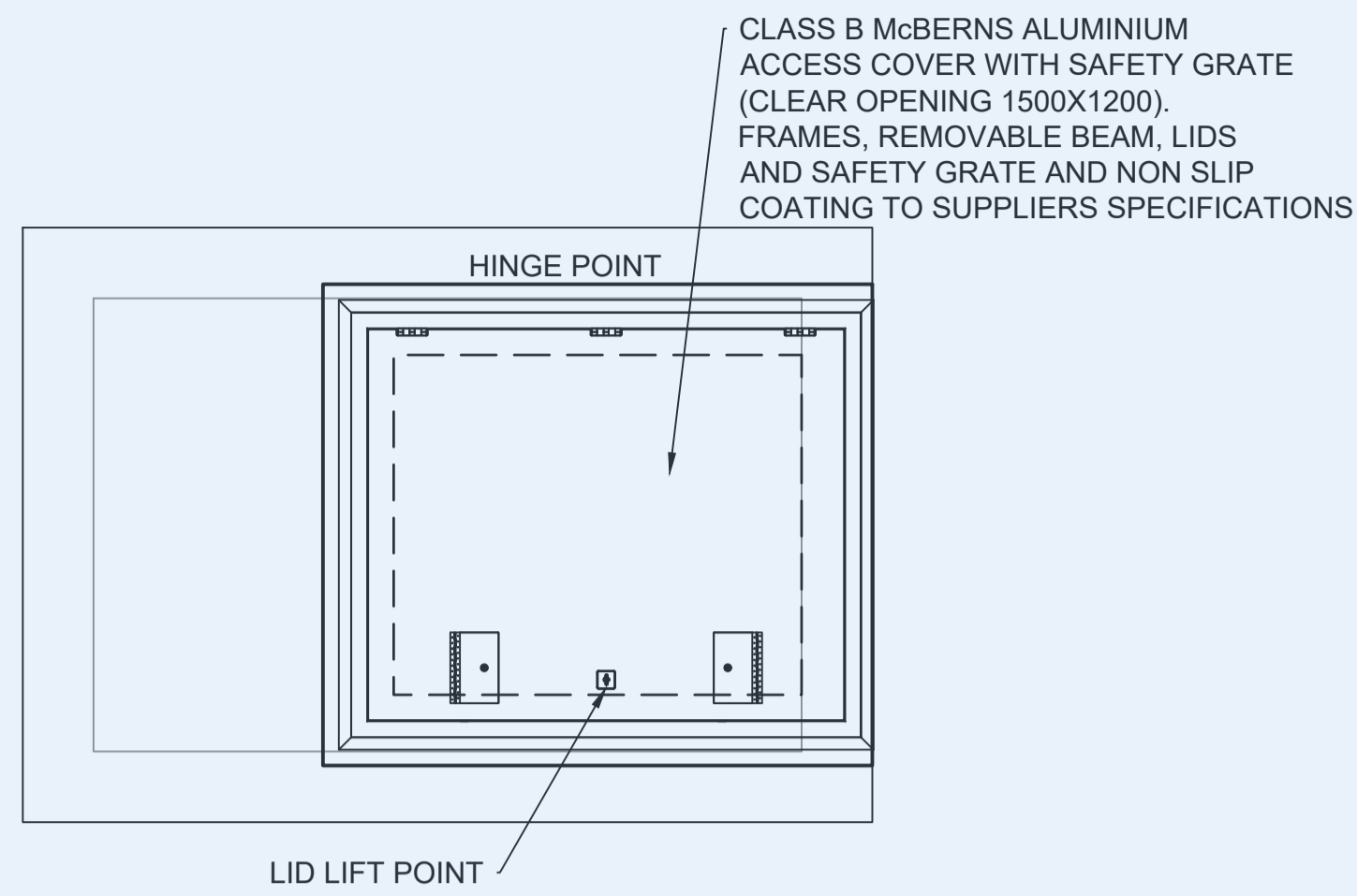
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Scale 1:25 UNO		Date 21/4/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPEng	

Datum AHD (m)

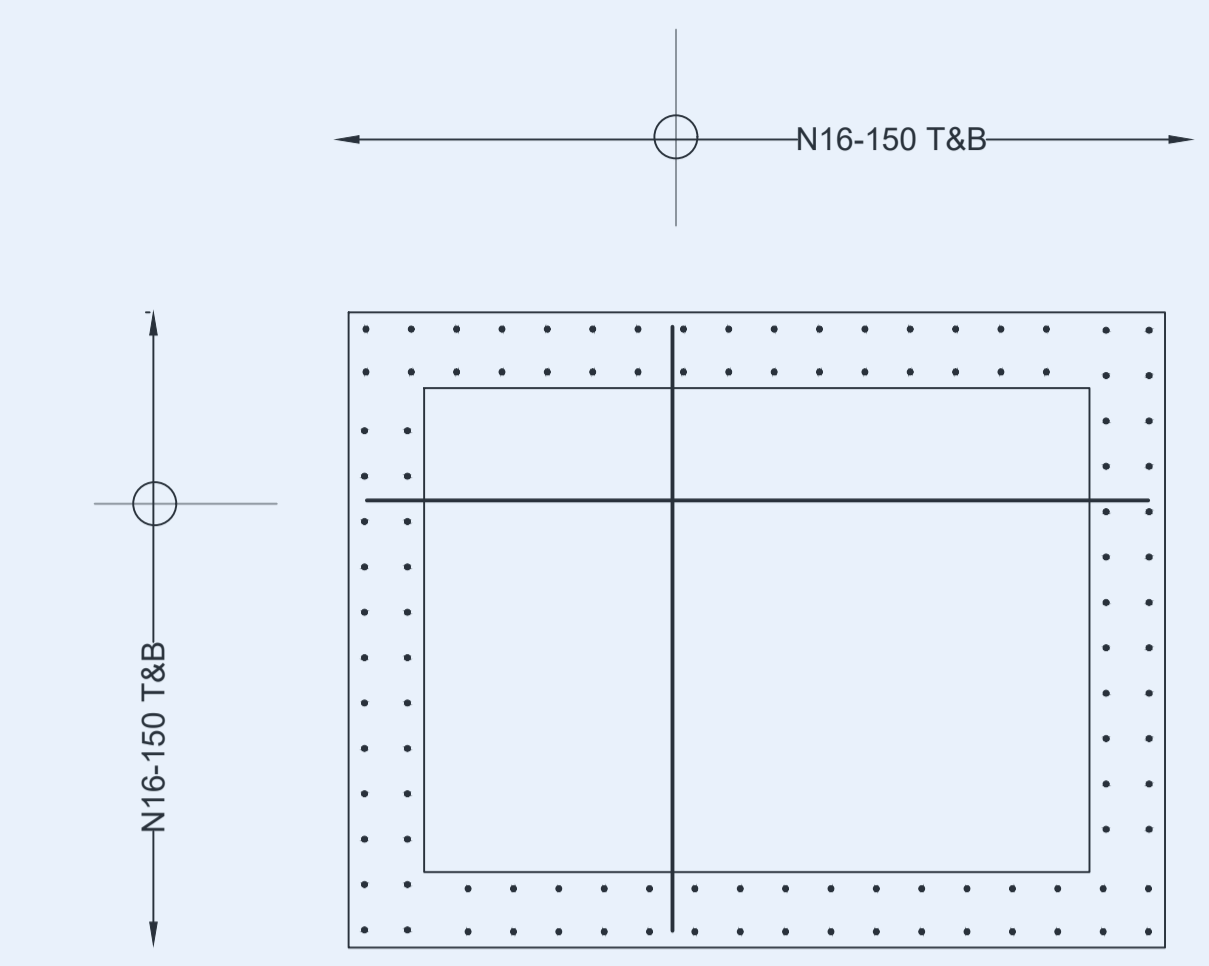
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D	REVISED TENDER ISSUE	4/12/2020	PJB
C	ISSUED FOR TENDER	9/11/2020	PJB
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A	PRELIMINARY	21/4/2020	PJB

CLIENT  
AUSTRALIA BAY LOBSTER PRODUCERS  
PROJECT  
SEAWATER INTAKE PIPELINE AND PUMP STATION

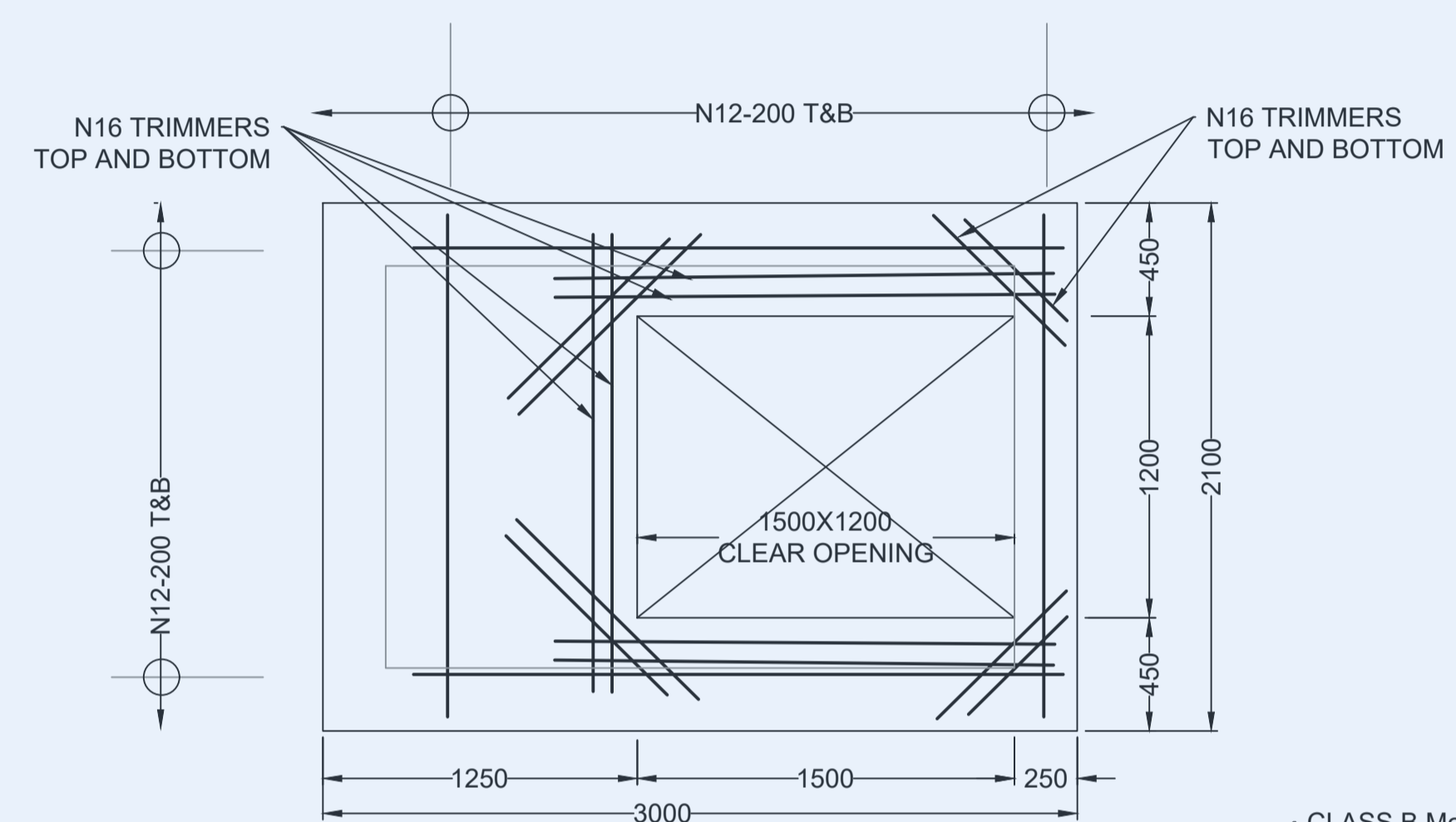
TITLE VALVE PIT STRUCTURAL DETAILS	
Drawing No. D05-2001-01-ST	Sheet 4 of 8 A1



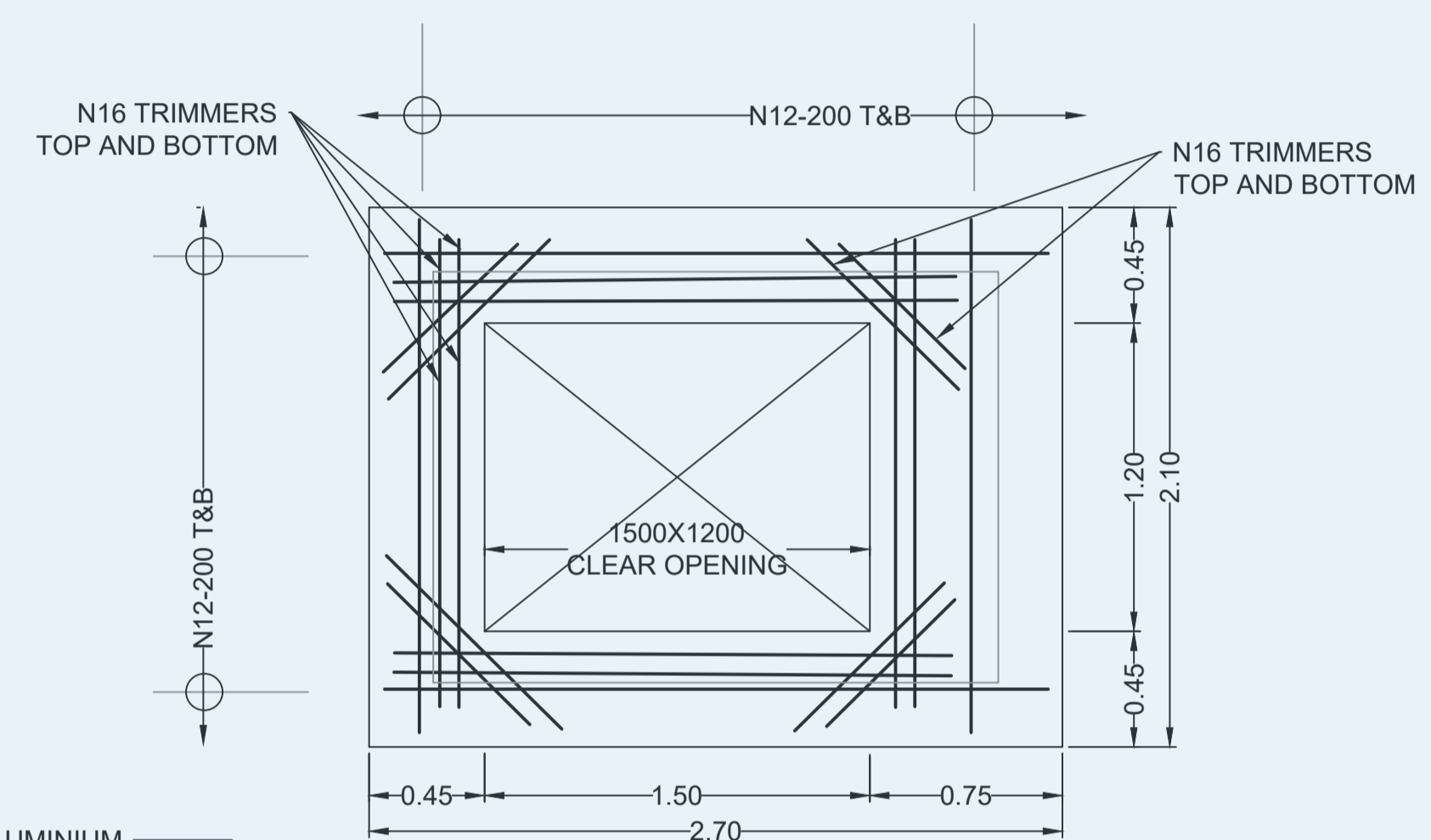
METER PIT ACCESS COVER AND SURROUND DETAIL PLAN - 1:25



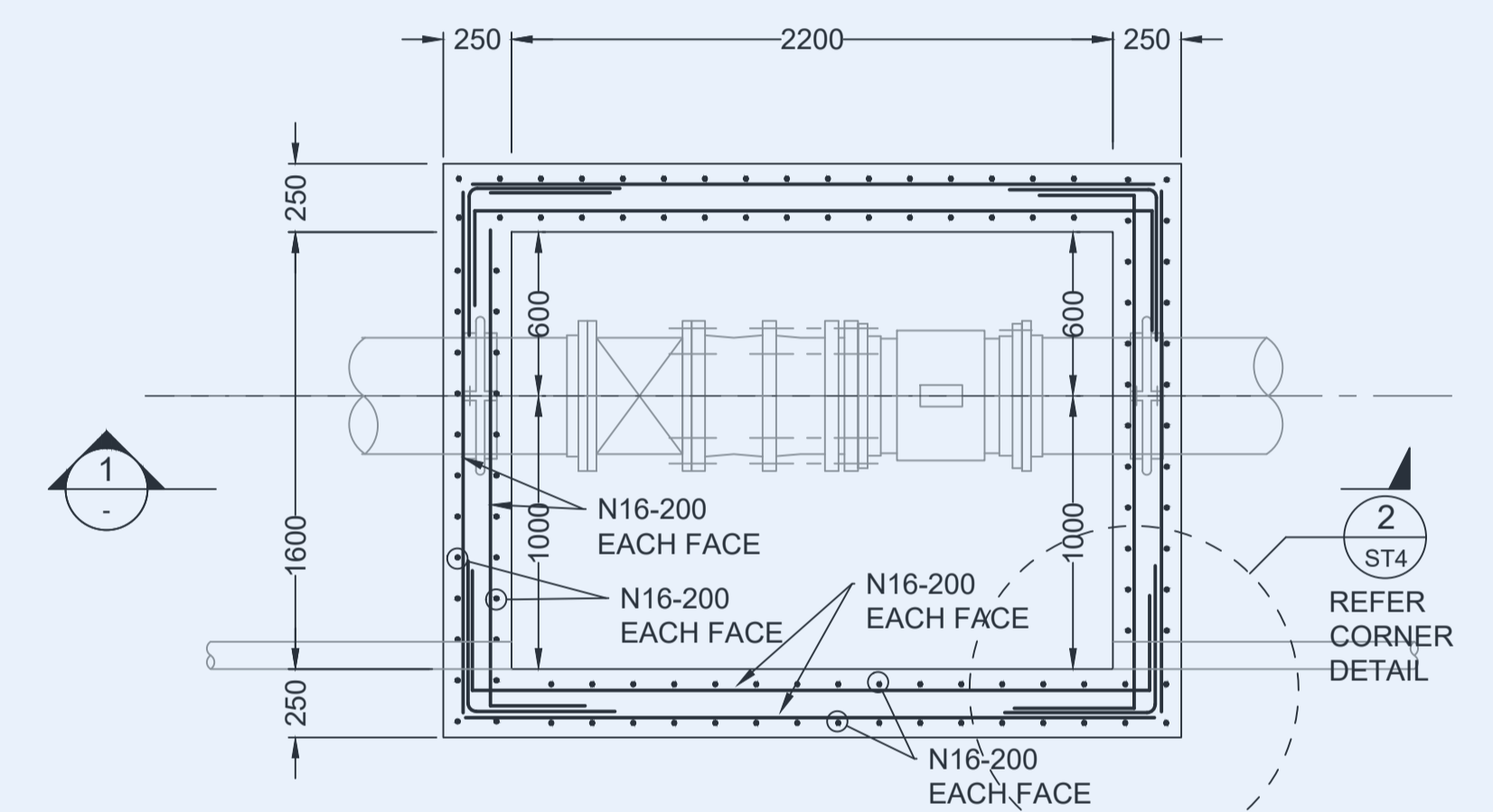
METER PIT AND PIGGING PIT BOTTOM SLAB REINFORCEMENT PLAN - 1:25



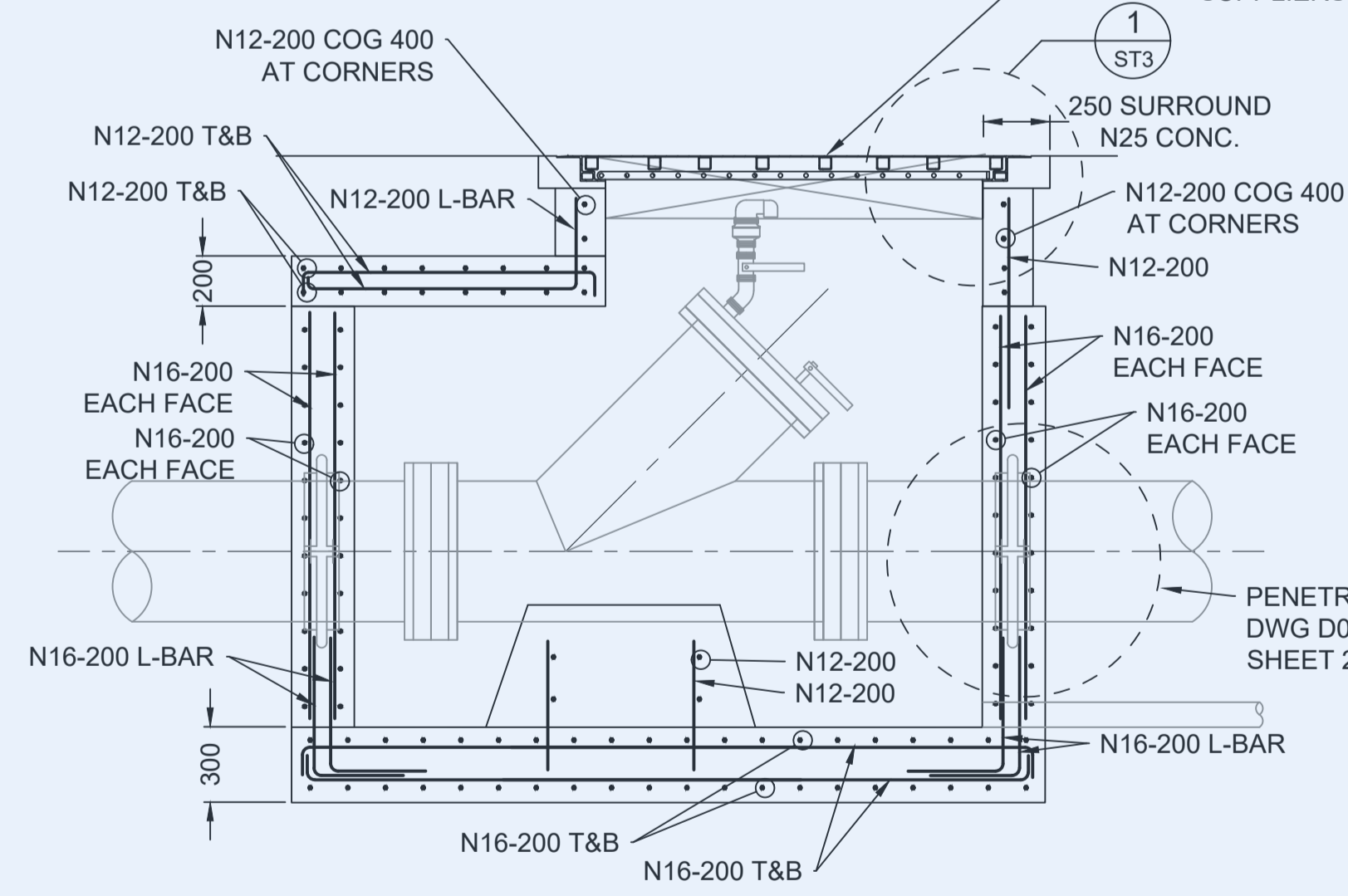
PIGGING PIT TOP SLAB REINFORCEMENT DETAIL PLAN - 1:25



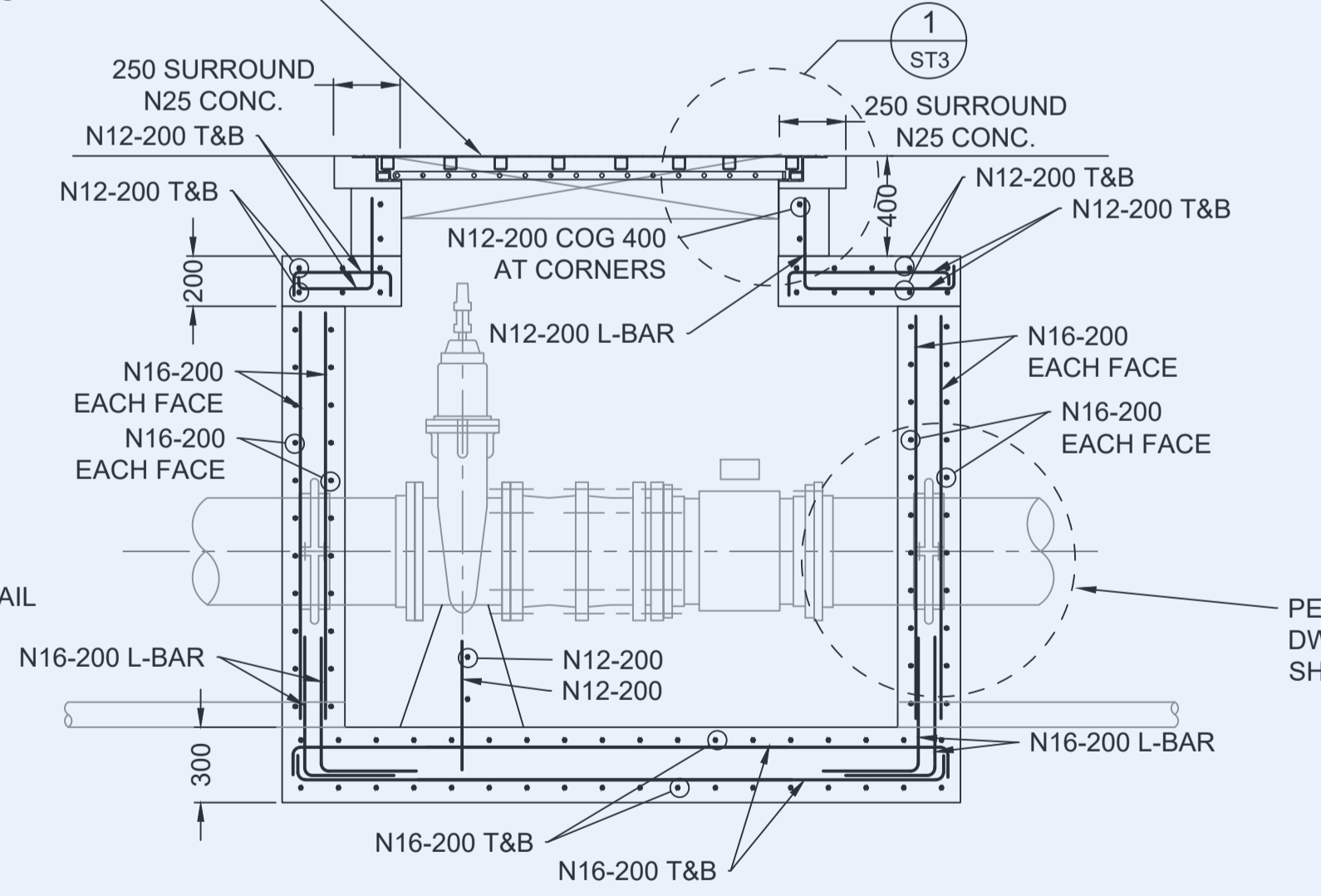
METER PIT TOP SLAB REINFORCEMENT DETAIL PLAN - 1:25



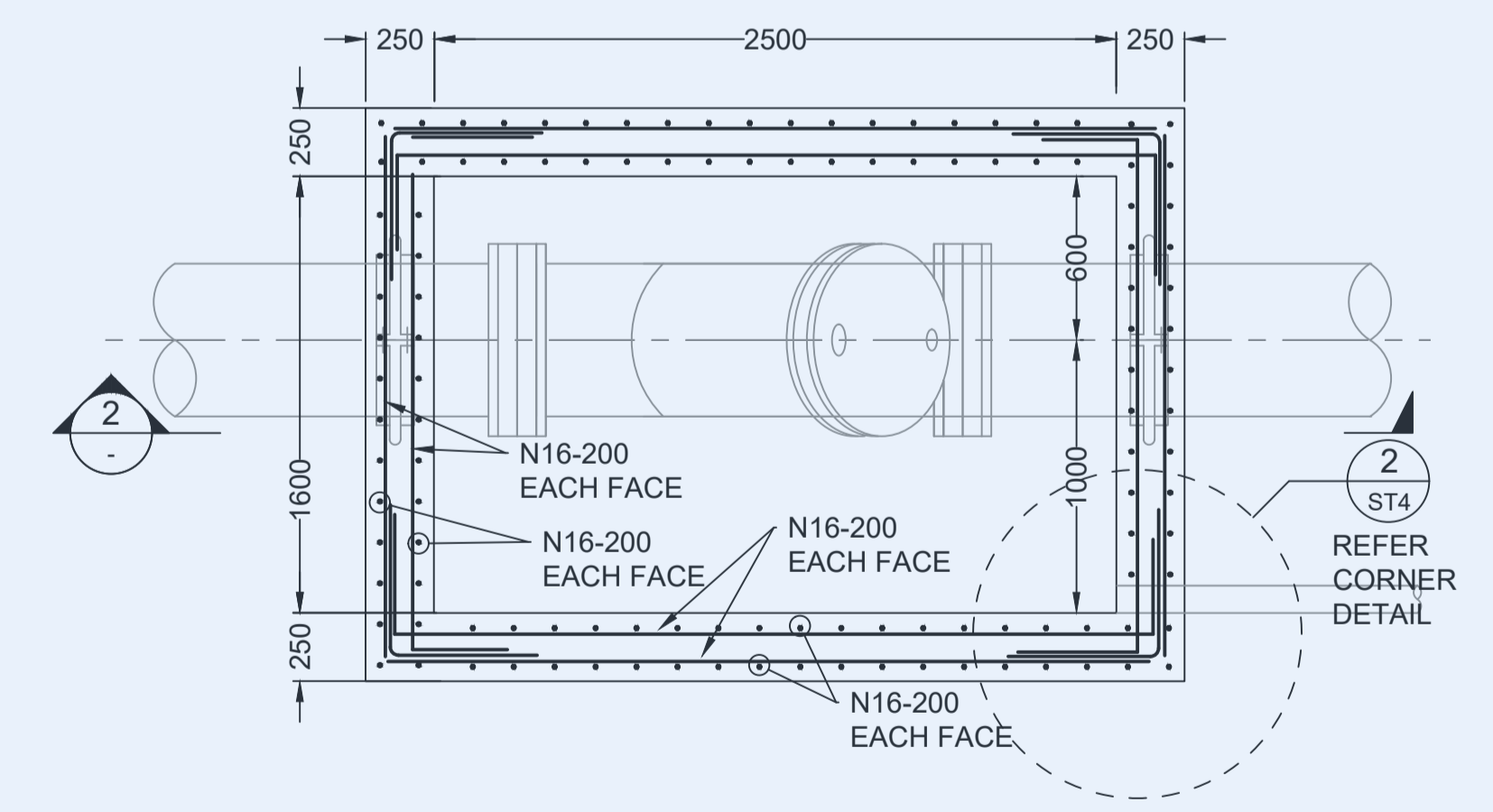
METER PIT WALL REINFORCEMENT PLAN - 1:25



SECTION 2 PIGGING PIT REINFORCEMENT 1:25



SECTION 1 METER PIT REINFORCEMENT 1:25



PIGGING PIT WALL REINFORCEMENT PLAN - 1:25

NOTE: DIMENSIONS IN mm

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Designed PJB	Drawn PJB	Checked MC	Survey
Scale 1:25 UNO		Date 21/4/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPENG	

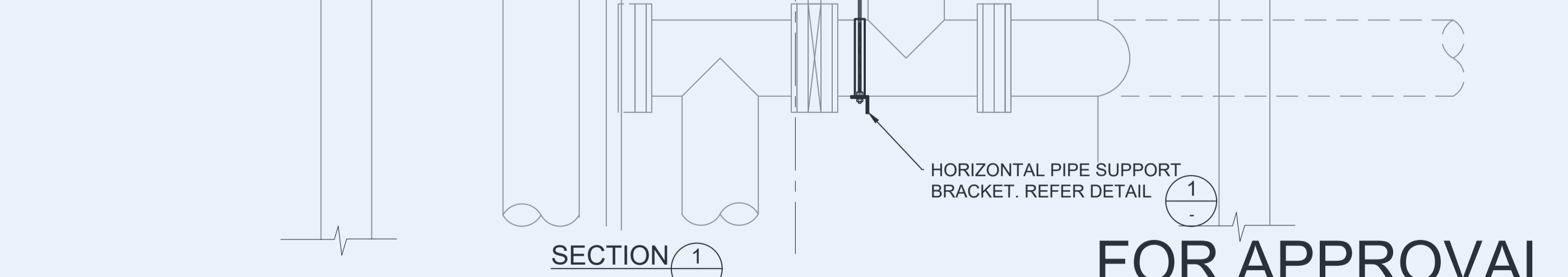
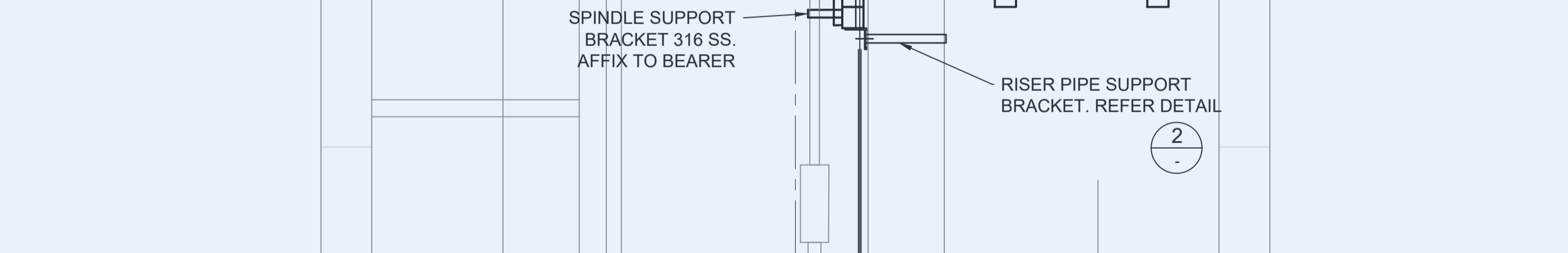
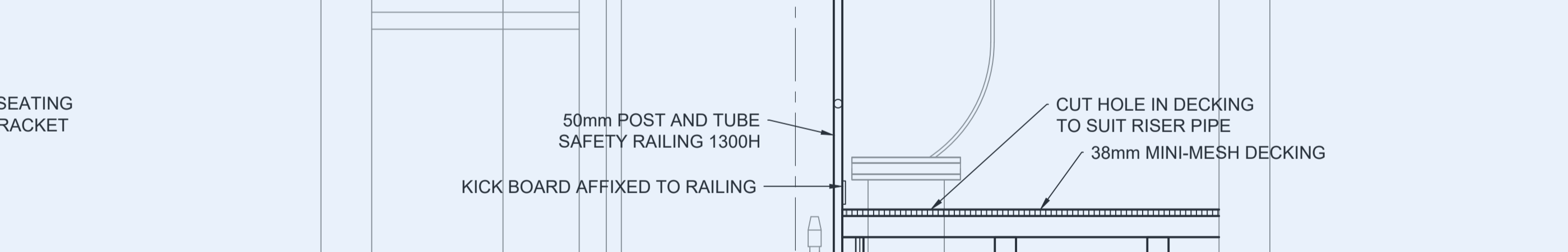
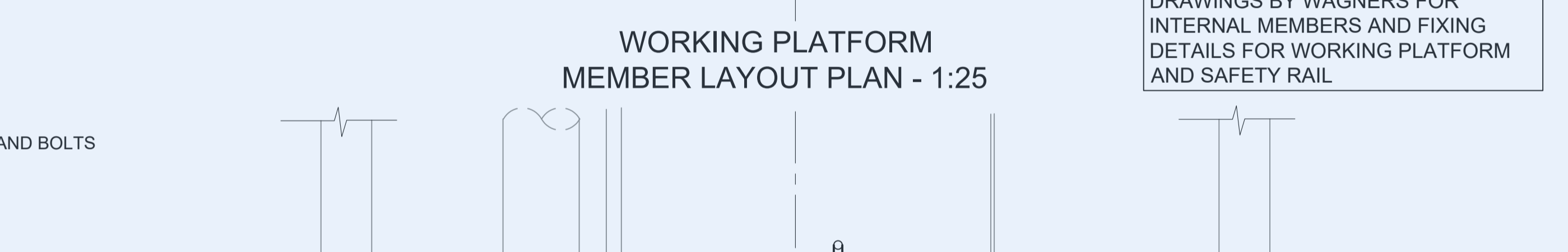
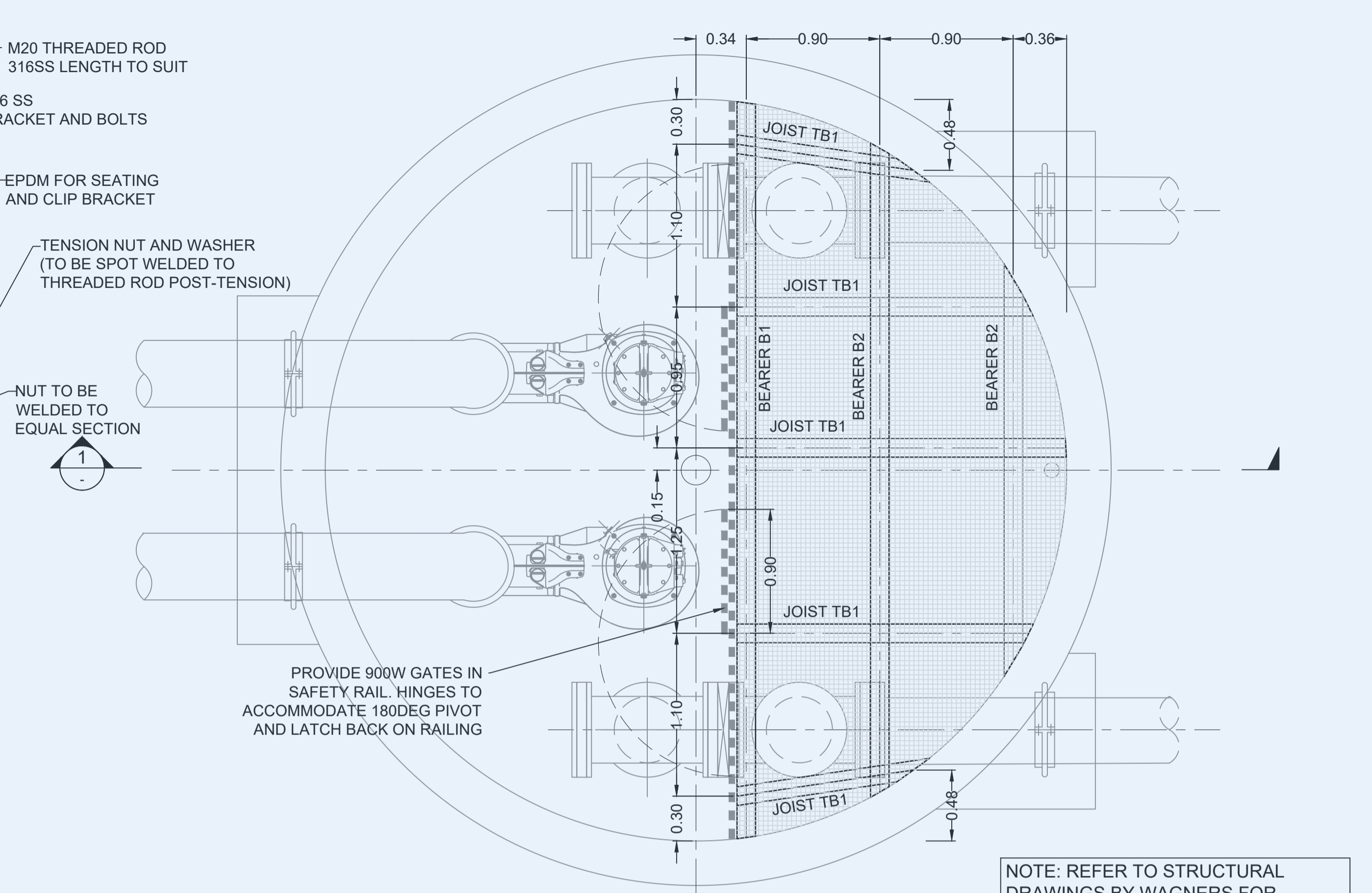
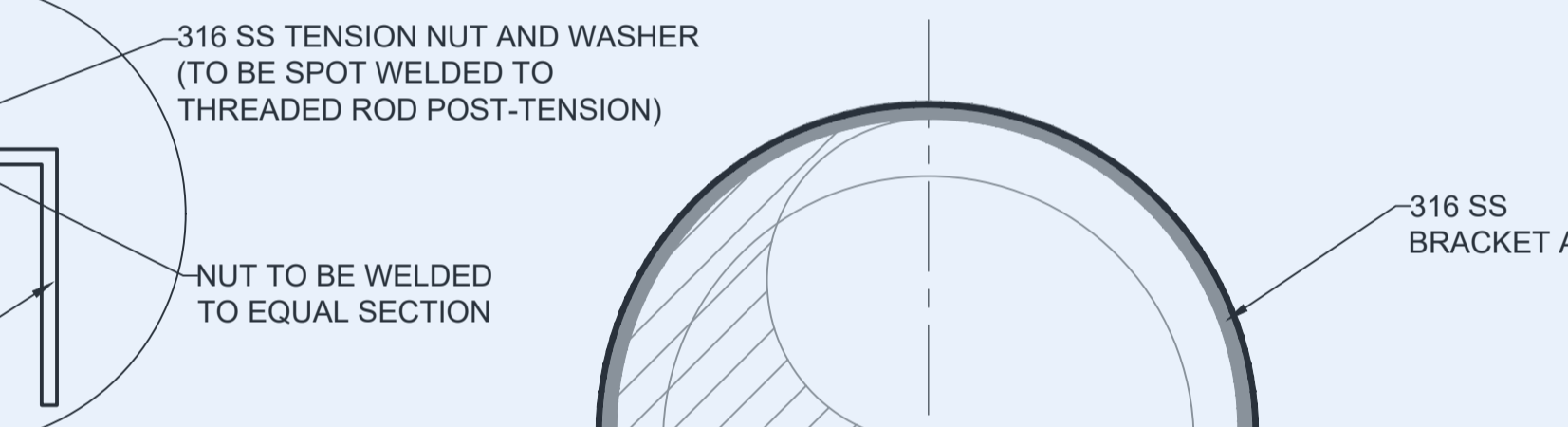
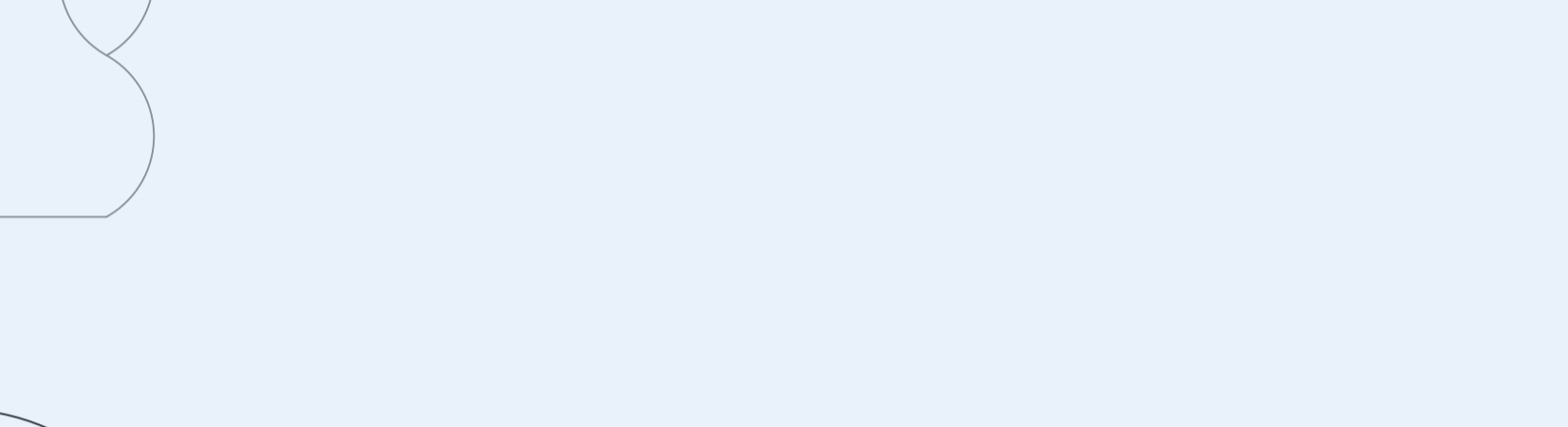
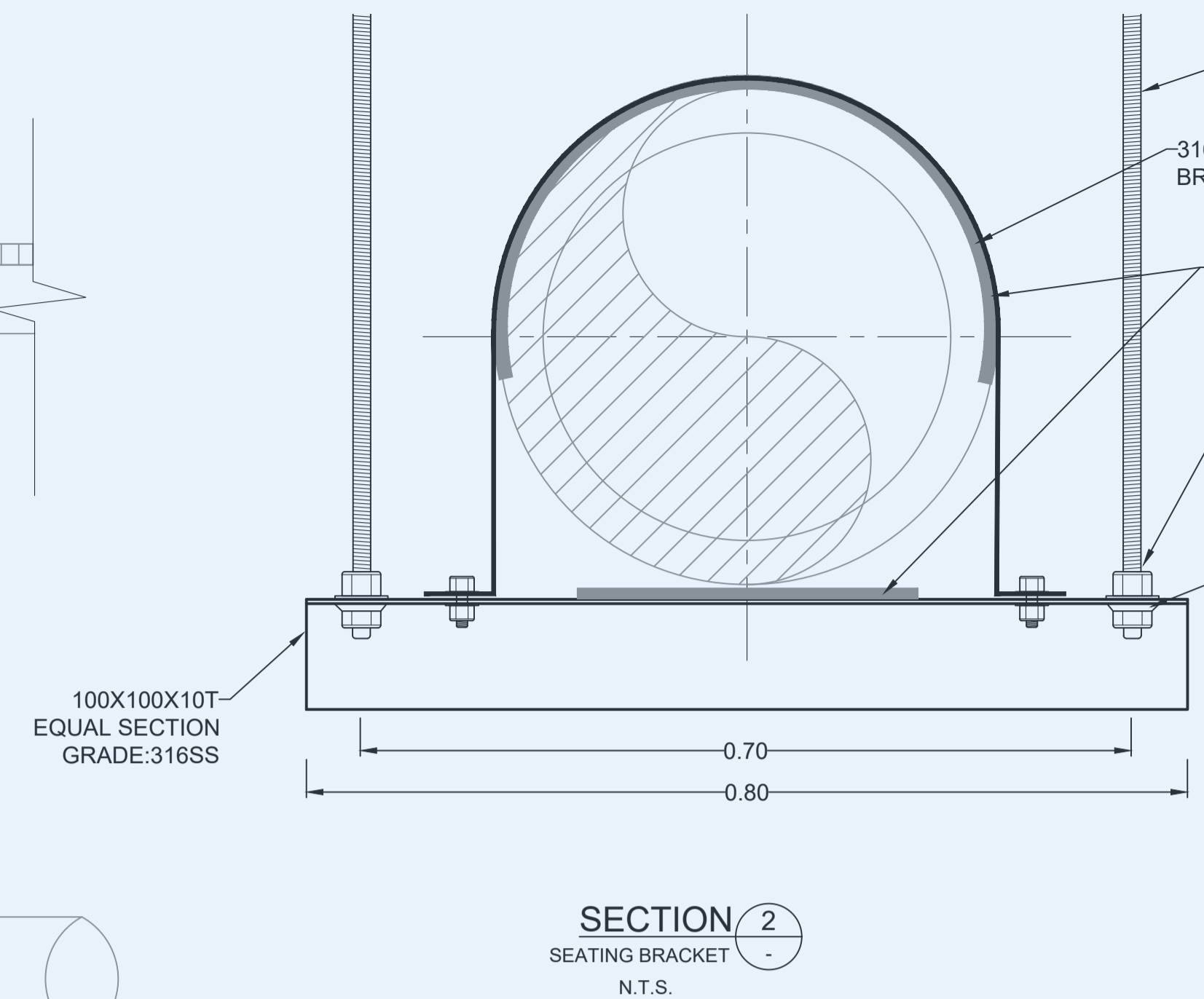
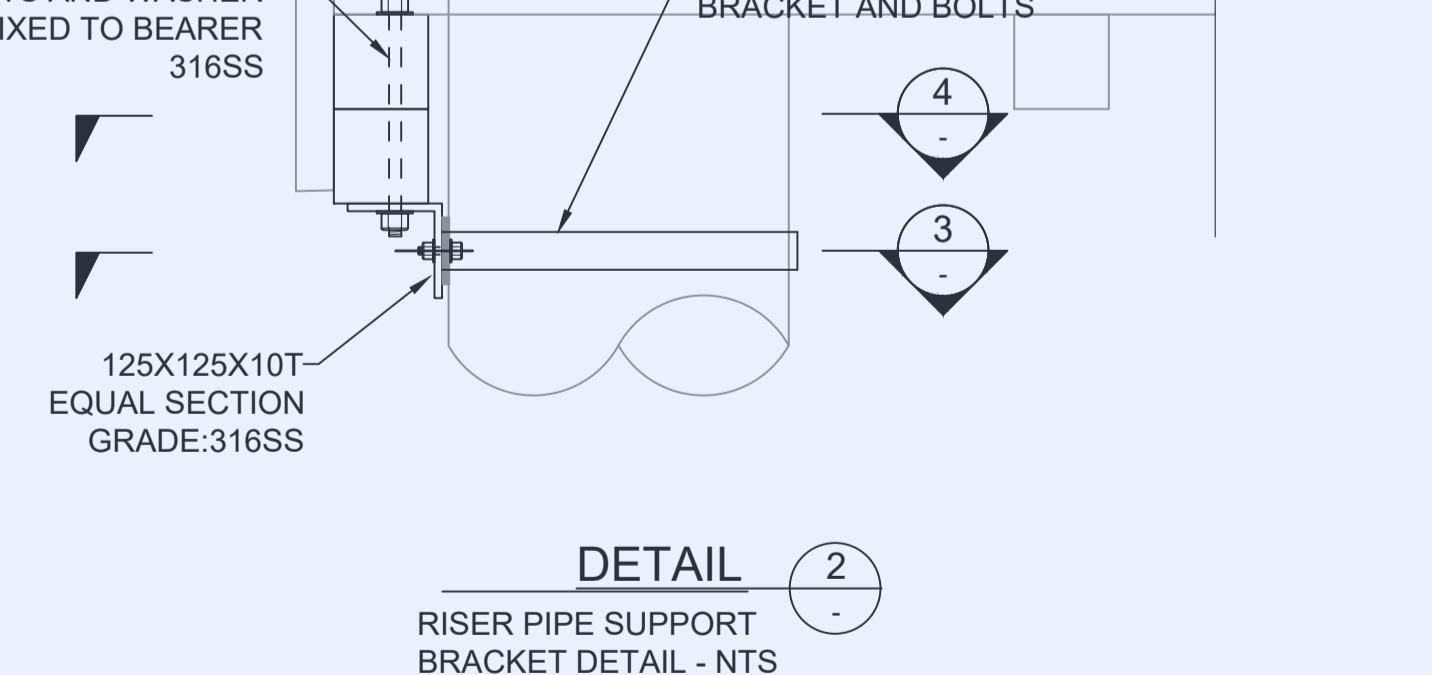
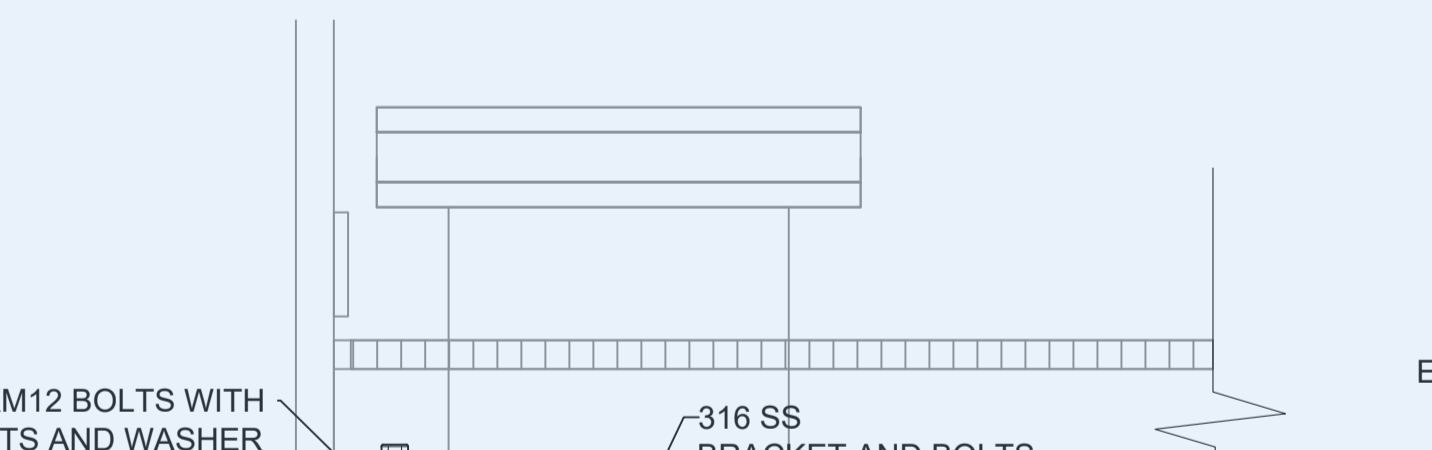
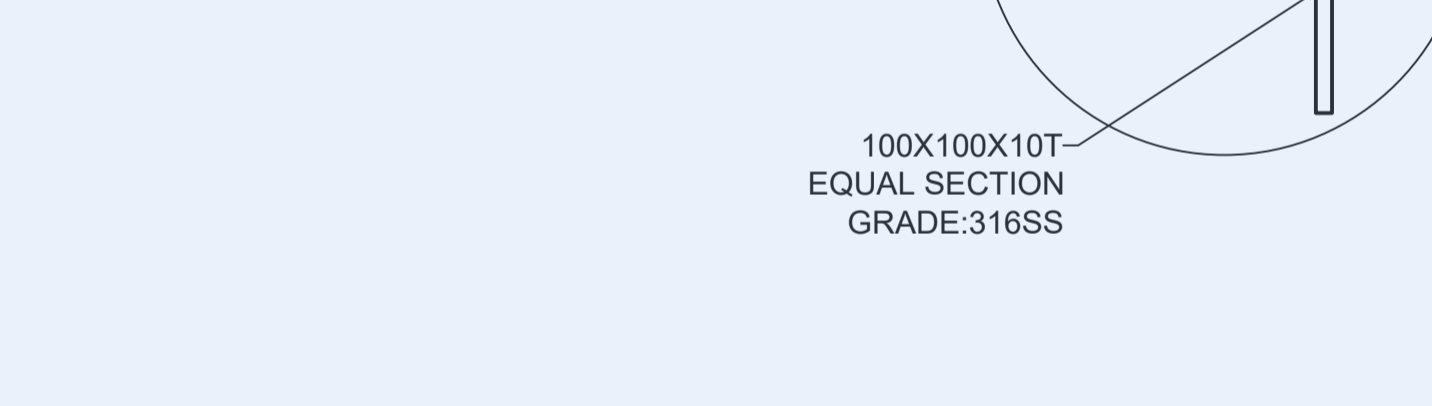
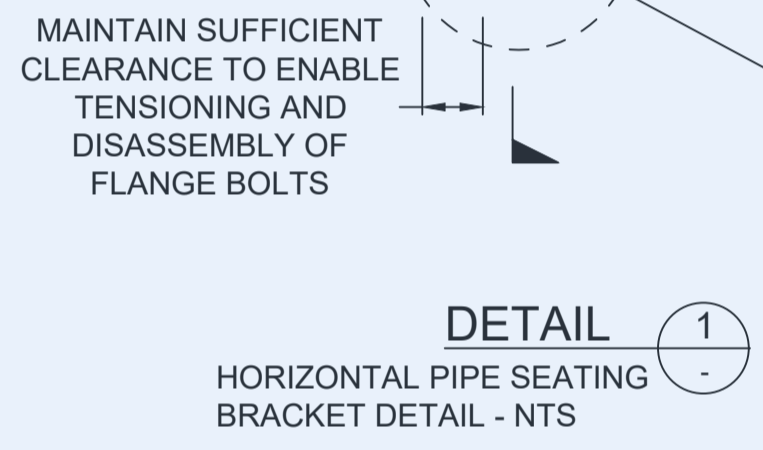
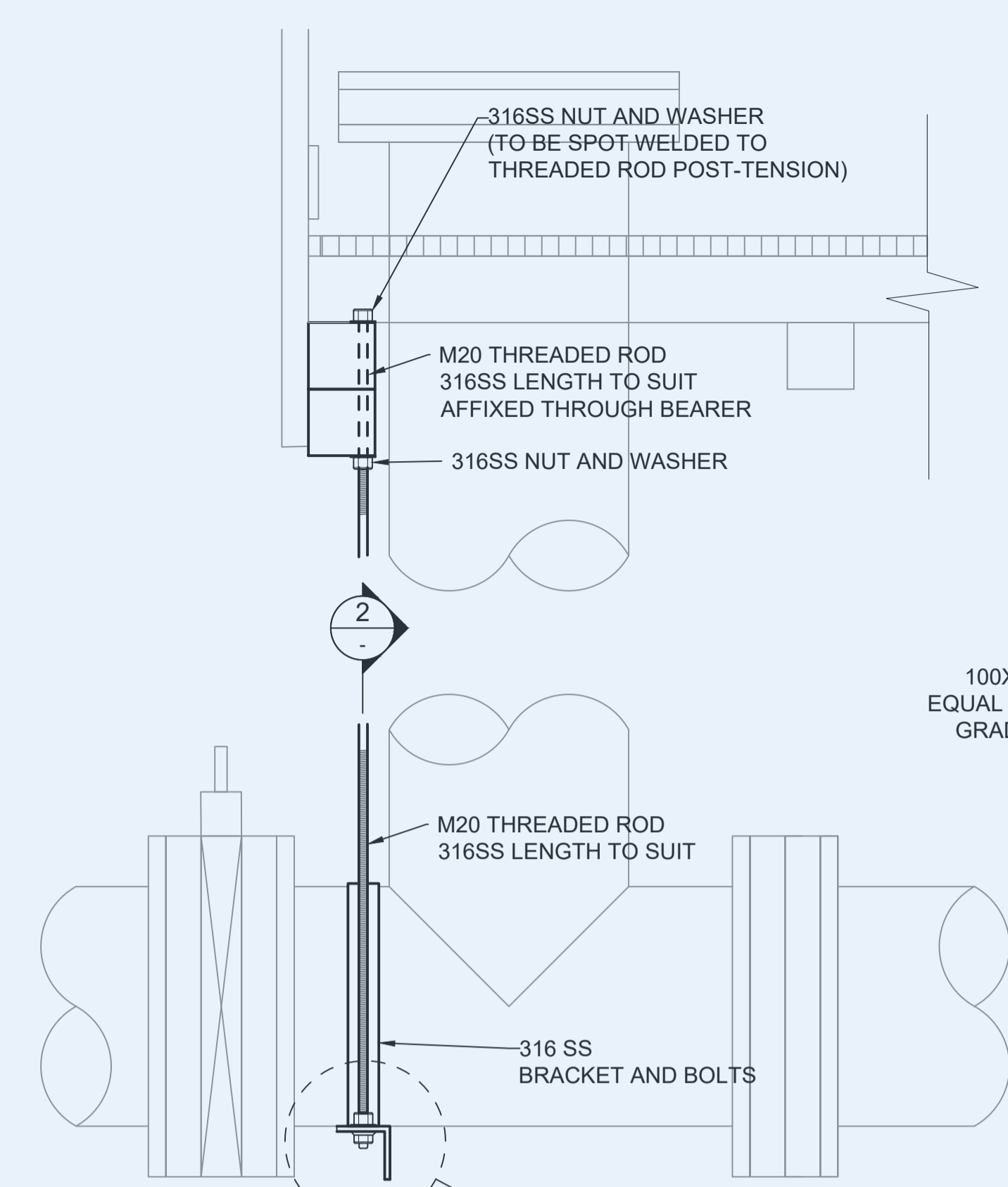
Datum AHD (m)

Issue	Description	Date	By
E	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021	PJB
D	REVISED TENDER ISSUE	4/12/2020	PJB
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A	PRELIMINARY	21/4/2020	

CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**

PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE <b>METER PIT AND PIGGING PIT STRUCTURAL DETAILS</b>	
Drawing No. <b>D05-2001-01-ST</b>	Sheet 5 of 8 <b>A1</b>



NOTE: REFER TO STRUCTURAL DRAWINGS BY WAGNERS FOR INTERNAL MEMBERS AND FIXING DETAILS FOR WORKING PLATFORM AND SAFETY RAIL

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Designed PJB	Drawn PJB	Checked MC	Survey
Scale 1:25 UNO		Date 21/4/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPEng	

Datum AHD (m)

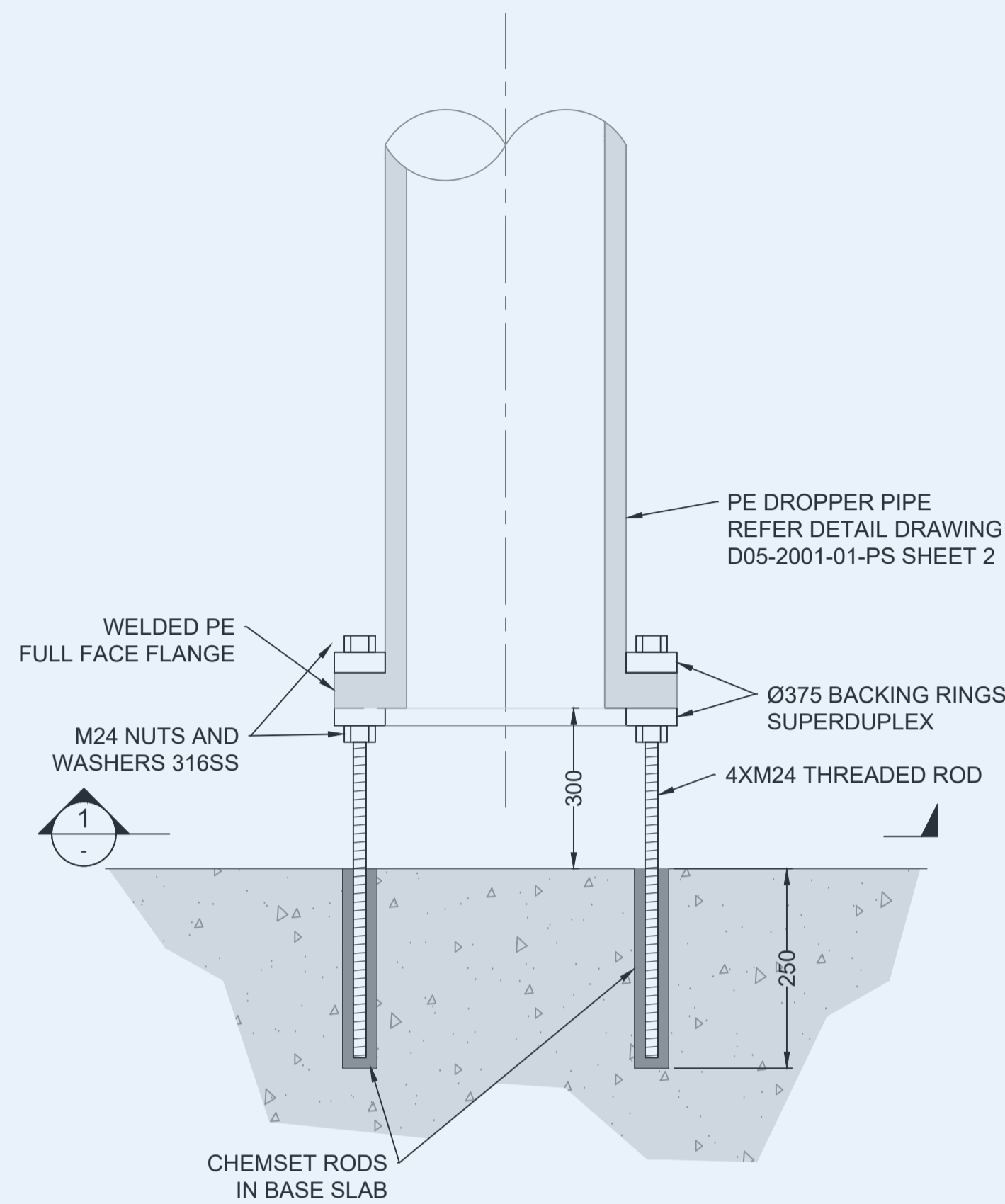
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D	REVISED TENDER ISSUE	4/12/2020	PJB
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A	PRELIMINARY	21/4/2020	

CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**

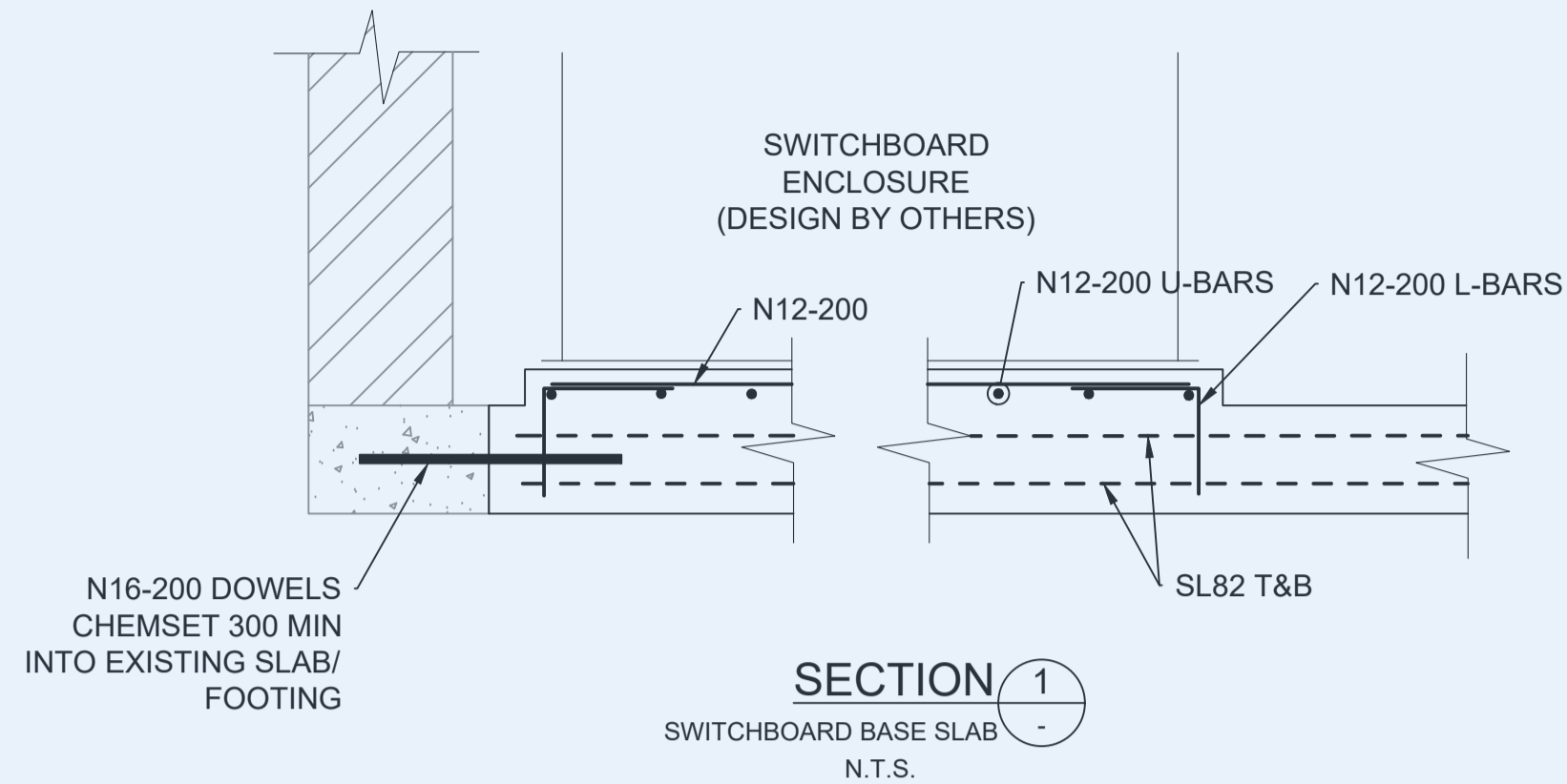
PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE  
**PUMP STATION WORKING PLATFORM ARRANGEMENT AND BRACKET DETAILS**

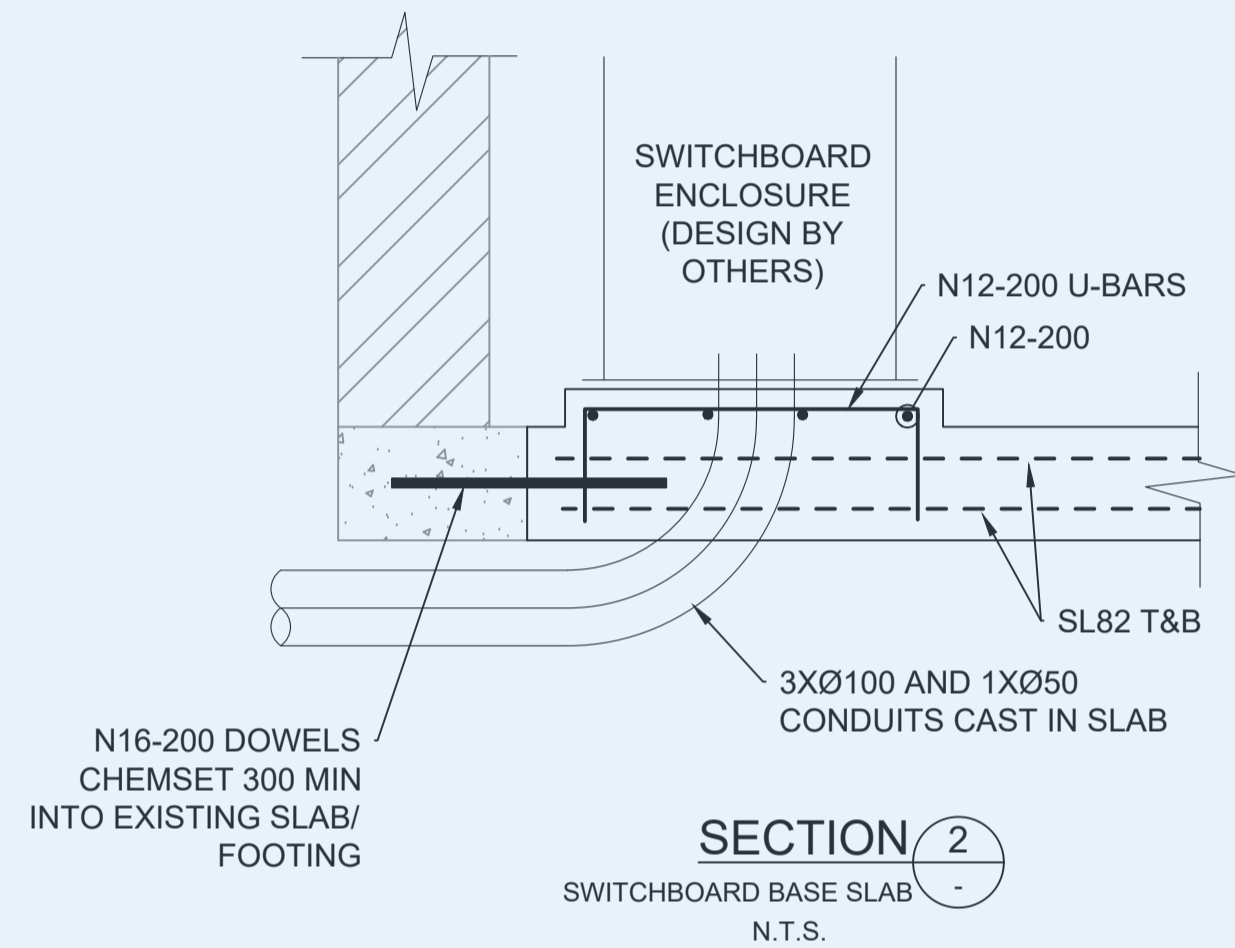
Drawing No. **D05-2001-01-ST** Sheet 6 of 8 **A1**



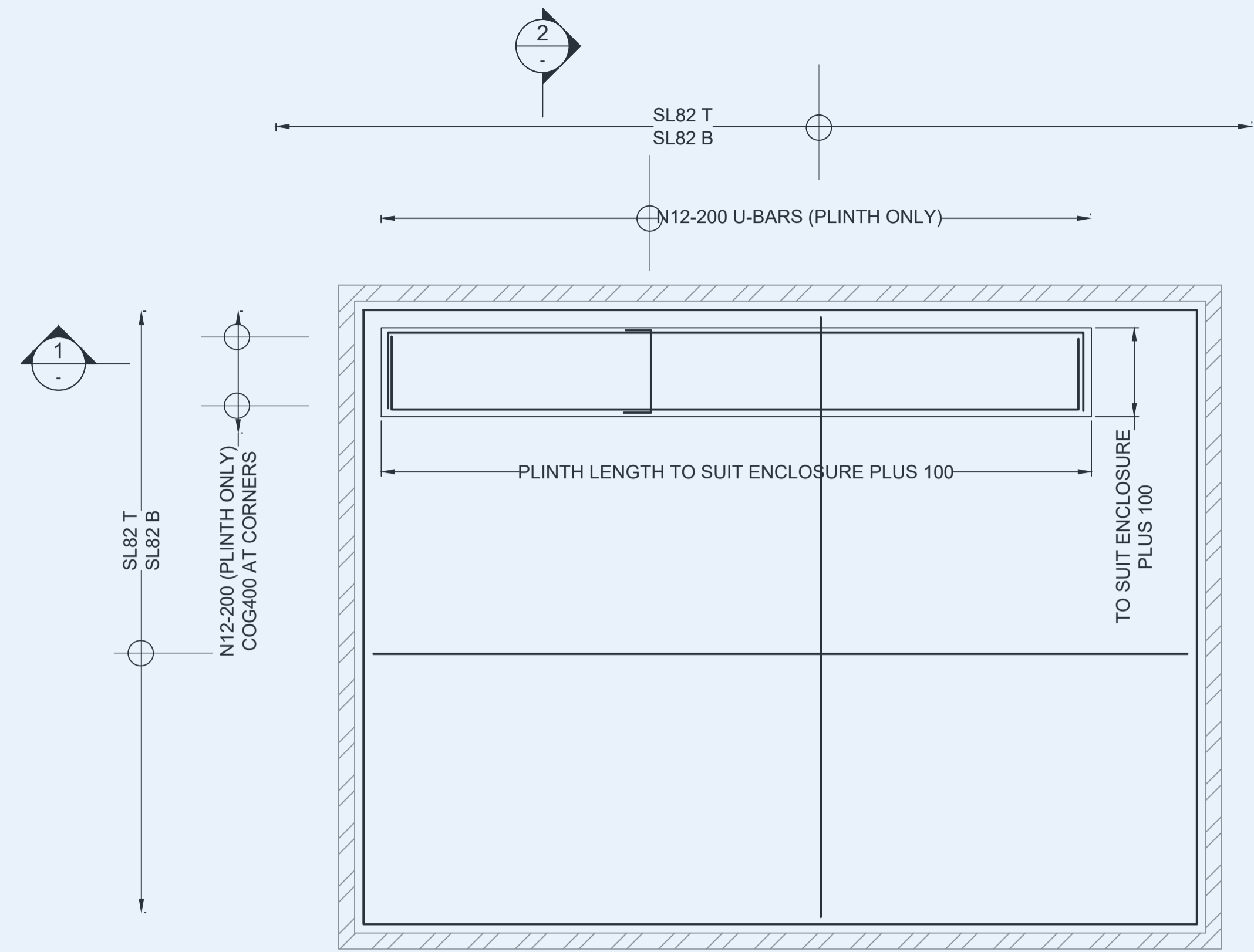
**DETAIL 1**  
DROPPER PIPE SEATING  
BRACKET DETAIL - N.T.S.



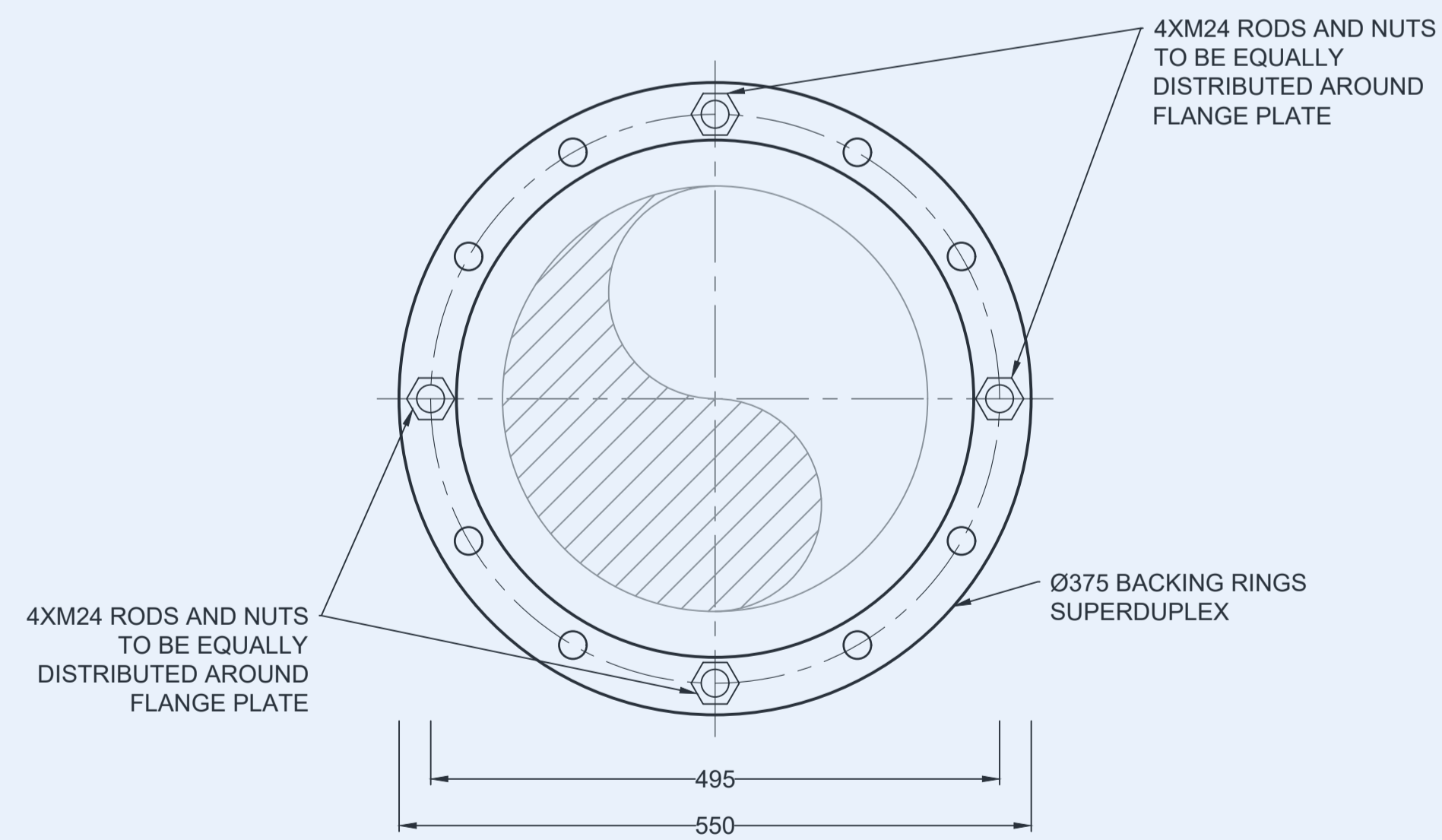
**SECTION 1**  
SWITCHBOARD BASE SLAB  
N.T.S.



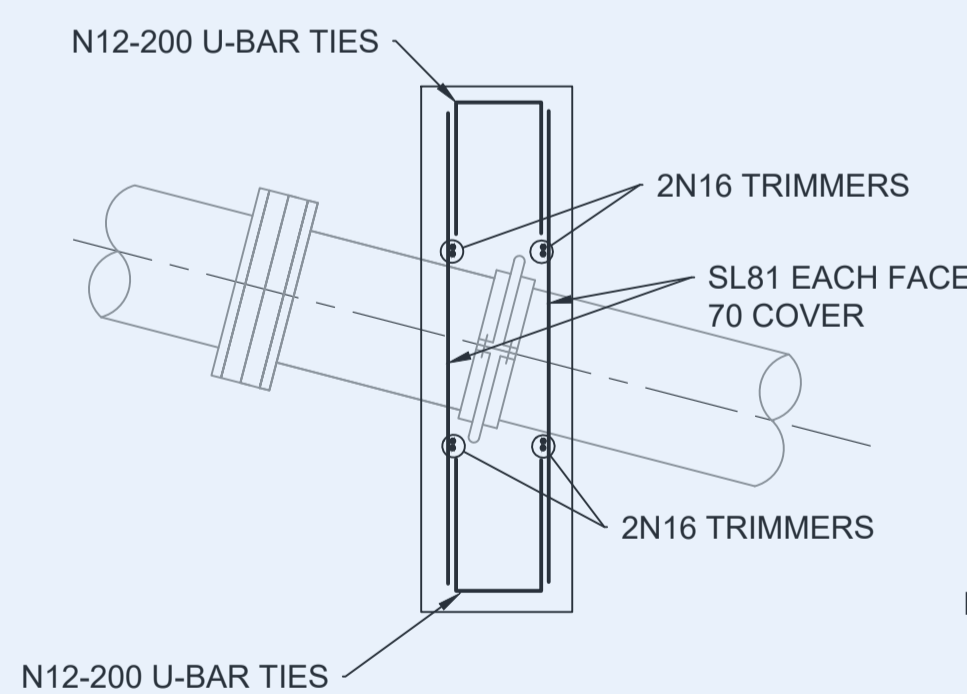
**SECTION 2**  
SWITCHBOARD BASE SLAB  
N.T.S.



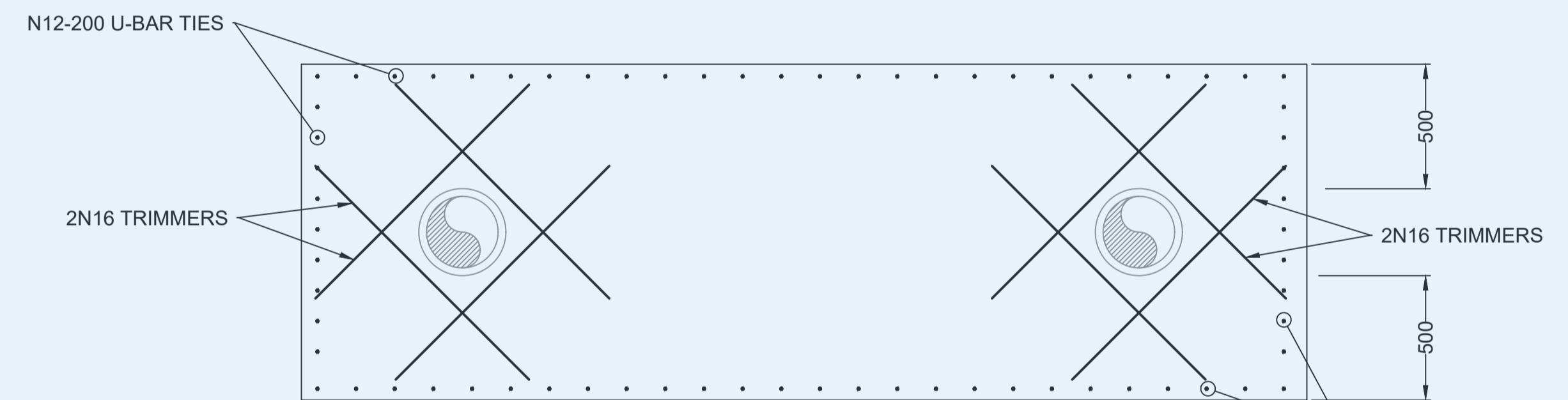
**SWITCHBOARD SLAB DETAIL PLAN - N.T.S.**



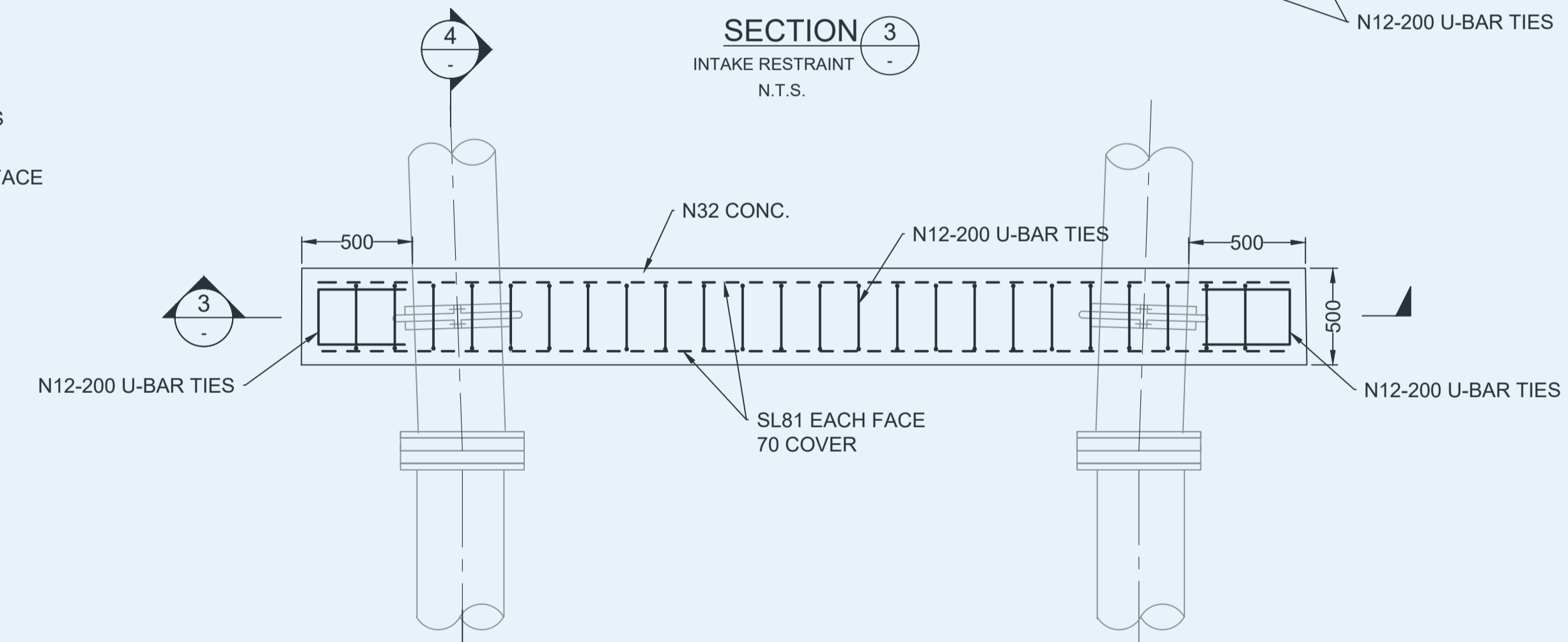
**SECTION 1**  
DROPPER SEATING BRACKET  
N.T.S.



**SECTION 4**  
INTAKE RESTRAINT  
N.T.S.



**SECTION 3**  
INTAKE RESTRAINT  
N.T.S.



**INTAKE PIPE RESTRAINT STRUCTURAL DETAIL PLAN - N.T.S.**

**FOR APPROVAL**

**Willow+ Sparrow**



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Designed PJB	Drawn PJB	Checked MC	Survey
Scale 1:25 UNO		Date 21/4/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPEng	

Datum AHD (m)

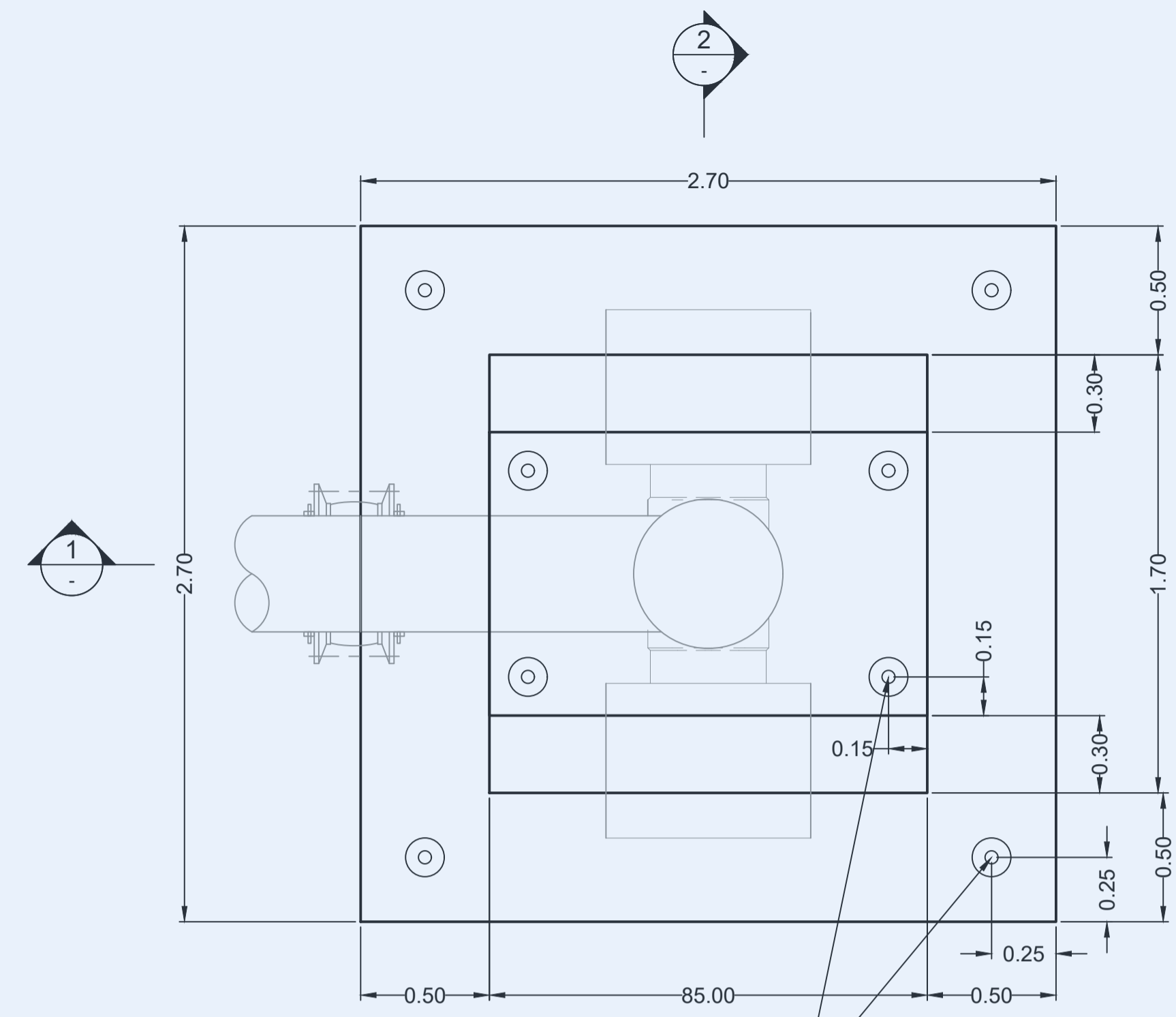
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D	REVISED TENDER ISSUE	4/12/2020	PJB
C	ISSUED FOR TENDER	9/11/2020	PJB
B	REVISED WELL LOCATION	26/10/2020	PJB
A	PRELIMINARY	21/4/2020	
Issue	Description	Date	By

CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**

PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

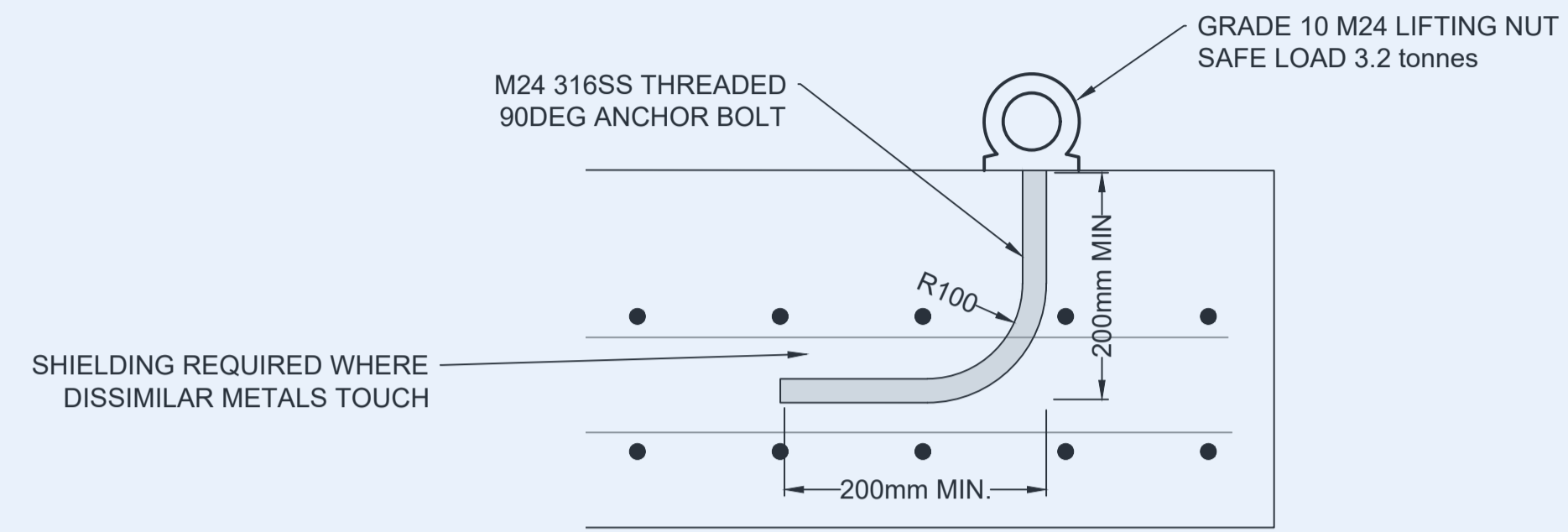
TITLE  
**INTERNAL SUPPORT BRACKETS AND STRUCTURAL DETAILS**

Drawing No. **D05-2001-01-ST** Sheet 7 of 8 **A1**



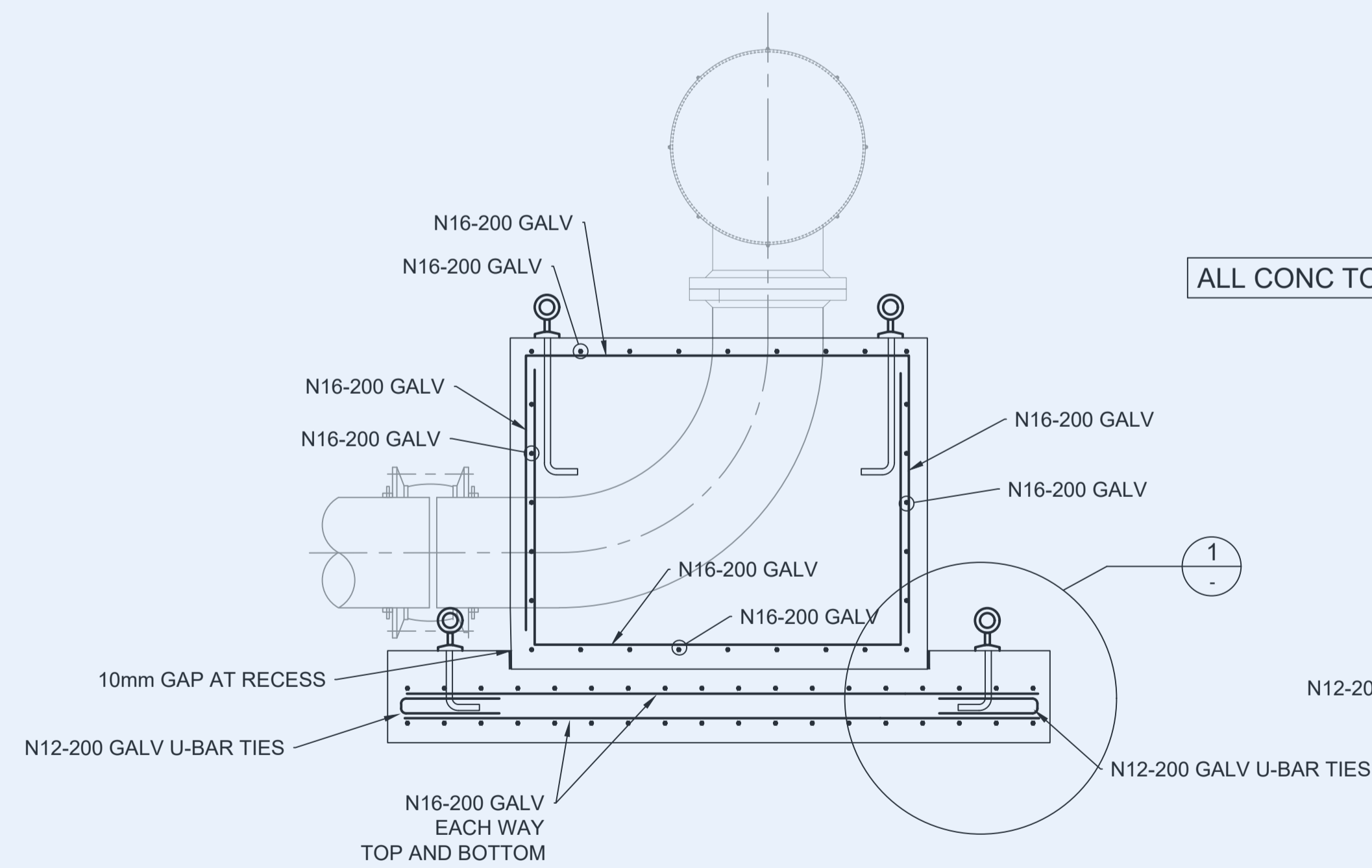
4X LIFTING POINTS  
ON BASE SLAB AND  
INTAKE BLOCK

SEAWATER INTAKE PIPE STRUCTURAL DETAIL PLAN - N.T.S

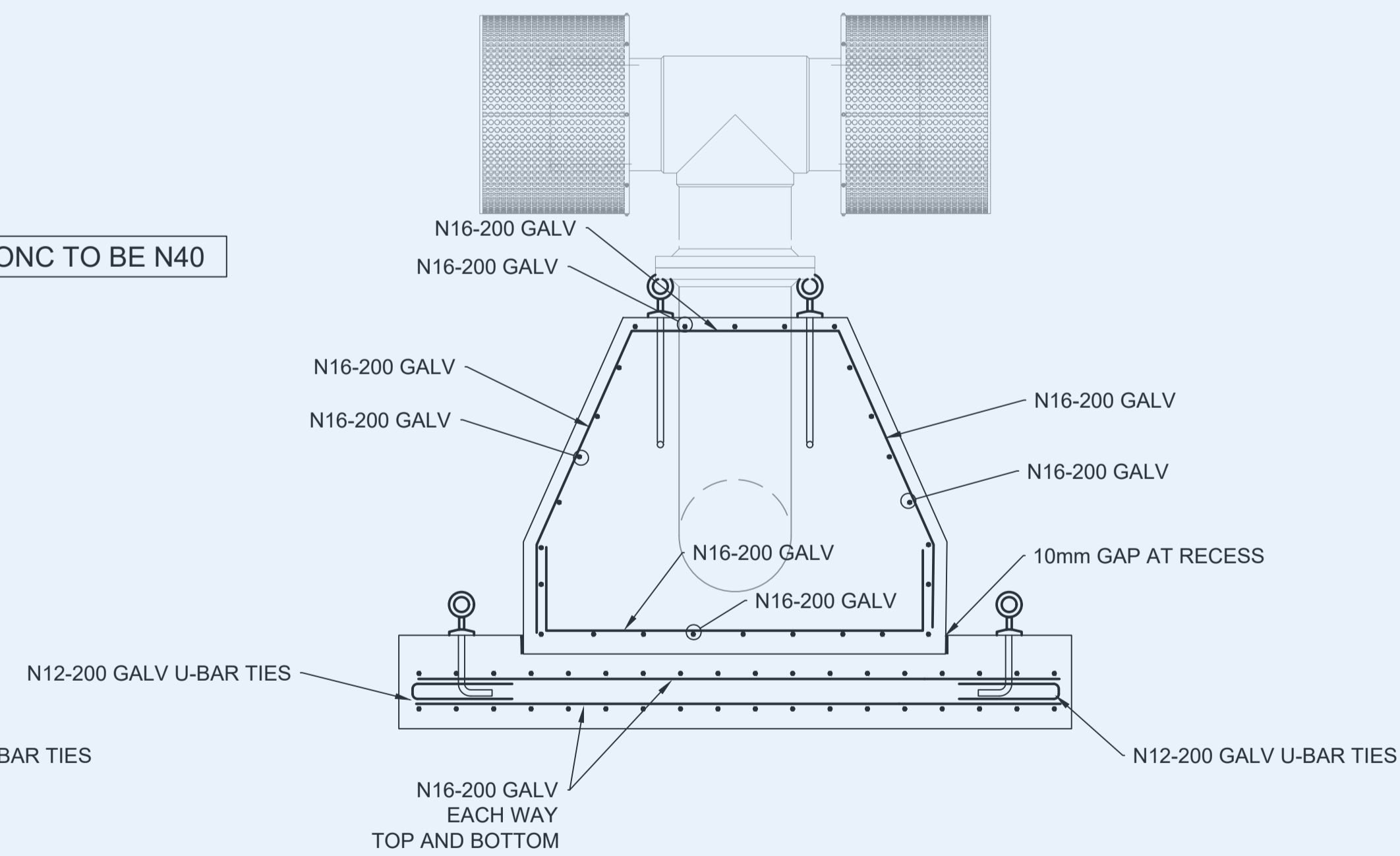


DETAIL 1  
LIFTING ANCHOR DETAIL - N.T.S

NOTE:  
ALL REINFORCING TO BE GALVANIZED  
UNLESS SPECIFIED OTHERWISE  
COVER TO BE 70mm MIN.



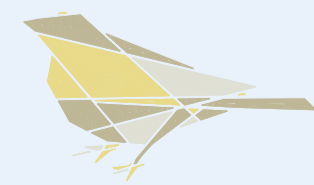
SECTION 1  
SEAWATER INTAKE  
N.T.S.



SECTION 2  
SEAWATER INTAKE  
N.T.S.

FOR APPROVAL

Willow+ Sparrow



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ENGINEERING+DESIGN

Designed PJB	Drawn PJB	Checked MC	Survey
Scale 1:25 UNO		Date 21/4/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPENG	

Datum AHD (m)

E	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021	PJB
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C	ISSUED FOR TENDER	9/11/2020	PJB
B	REVISED WELL LOCATION	26/10/2020	PJB
A	PRELIMINARY	21/4/2020	
Issue	Description	Date	By

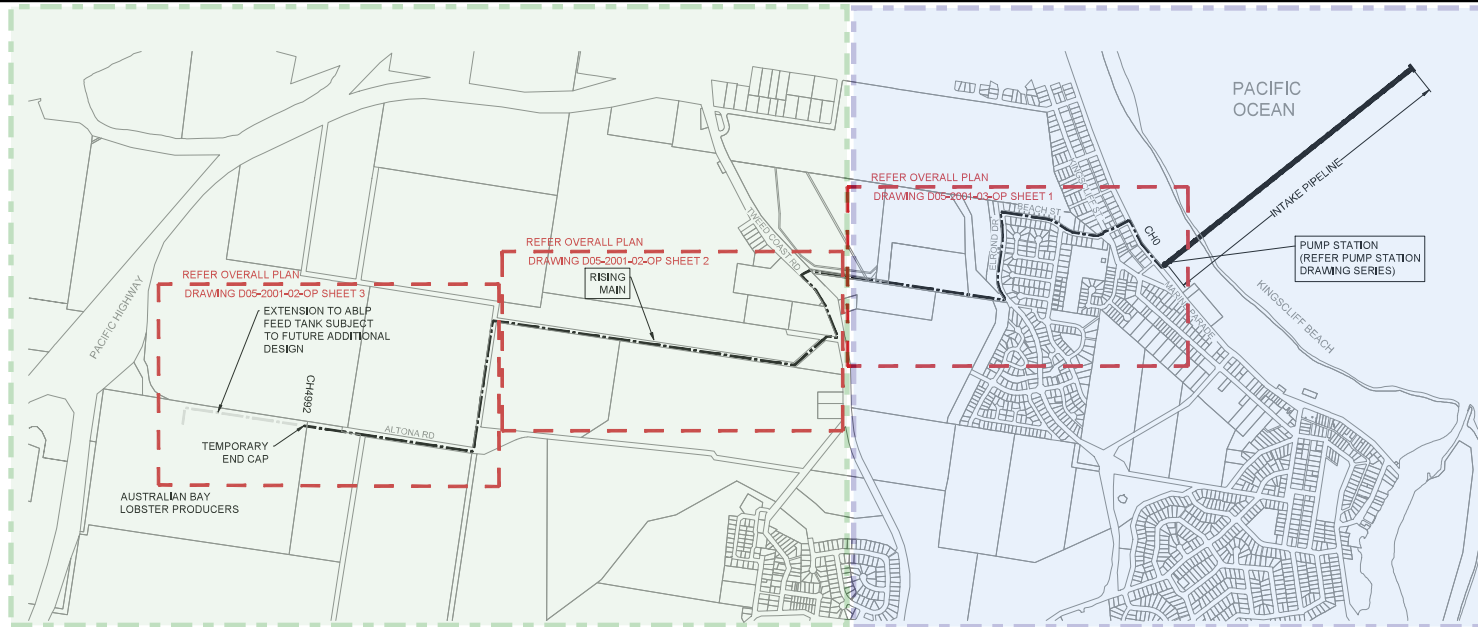
CLIENT  
AUSTRALIA BAY LOBSTER PRODUCERS  
PROJECT  
SEAWATER INTAKE PIPELINE  
AND PUMP STATION

TITLE  
SEAWATER INTAKE  
STRUCTURAL DETAILS

Drawing No. D05-2001-01-ST  
Sheet 8 of 8  
A1

# Stage 1

# Stage 2

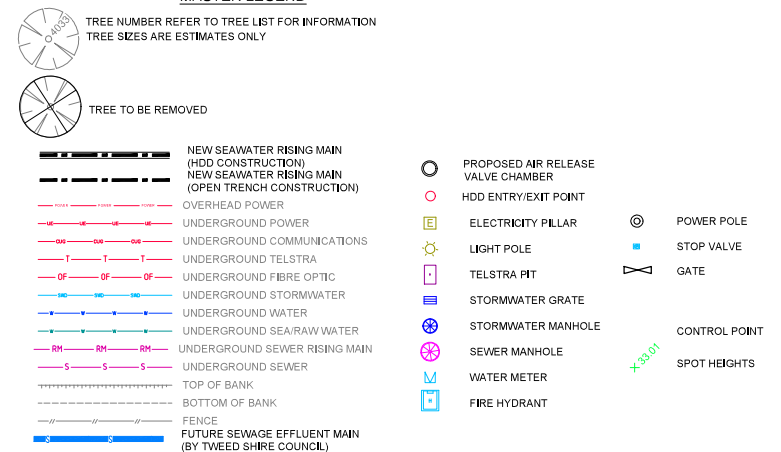


OVERALL INDEX PLAN OF SEAWATER DELIVERY RISING MAIN - N.T.S

### DRAWING LIST

DRAWING NUMBER	SHEET	TITLE	ISSUE	DATE
D05-2001-02-IL	1 OF 1	DRAWING INDEX SHEET AND MASTER LEGEND	C	12/02/2021
D05-2001-02-OP	1 OF 4	SEA WATER RISING MAIN OVERALL PLAN - CH0 TO CH1900	C	12/02/2021
D05-2001-02-OP	2 OF 4	SEA WATER RISING MAIN OVERALL PLAN - CH1900 TO CH3700	C	12/02/2021
D05-2001-02-OP	3 OF 4	SEA WATER RISING MAIN OVERALL PLAN - CH3700 TO CH5015	C	12/02/2021
D05-2001-02-OP	4 OF 4	RISING MAIN OVERALL HYDRAULIC SECTION VIEW - CH0 TO CH5015	C	12/02/2021
D05-2001-02-WP	1 OF 9	DETAILED WORKS PLAN BETWEEN PUMP STATION AND HDD04	C	12/02/2021
D05-2001-02-WP	2 OF 9	DETAILED WORKS PLAN BETWEEN HDD04 AND HDD06	C	12/02/2021
D05-2001-02-WP	3 OF 9	DETAILED WORKS PLAN BETWEEN HDD06 AND HDD05	C	12/02/2021
D05-2001-02-WP	4 OF 9	DETAILED WORKS PLAN BETWEEN HDD05 AND HDD07	C	12/02/2021
D05-2001-02-WP	5 OF 9	DETAILED WORKS PLAN BETWEEN HDD07 AND HDD08	C	12/02/2021
D05-2001-02-WP	6 OF 9	DETAILED WORKS PLAN BETWEEN HDD08 AND HDD09	C	12/02/2021
D05-2001-02-WP	7 OF 9	DETAILED WORKS PLAN BETWEEN HDD09 AND HDD10	C	12/02/2021
D05-2001-02-WP	8 OF 9	DETAILED WORKS PLAN BETWEEN HDD10 AND HDD11	C	12/02/2021
D05-2001-02-WP	9 OF 9	DETAILED WORKS PLAN BETWEEN HDD11 AND HDD12	C	12/02/2021
D05-2001-02-DT	1 OF 2	SEAWATER RISING MAIN TRENCH DETAILS AND AIR VALVE DETAILS	C	12/02/2021
D05-2001-02-DT	2 OF 2	TYPE 3 - AIR RELEASE AND ISOLATION VALVE PIT DETAILS	C	12/02/2021

### MASTER LEGEND



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Designed PJB	Drawn PJB	Checked MC	Survey
Scale	Date		
N.T.S	16/12/2020		
APPROVED - PRINCIPAL		12/02/2021	
MICHAEL CHAMBERLAIN - RPEng			



Datum AHD (m)

C FOR APPROVAL - NOT FOR CONSTRUCTION  
 B AMENDED COUNCIL COMMENTS  
 A FOR APPROVAL

Issue	Description	Date	By
C	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021	
B	AMENDED COUNCIL COMMENTS	25/1/2021	
A	FOR APPROVAL	16/12/2020	

CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**

PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

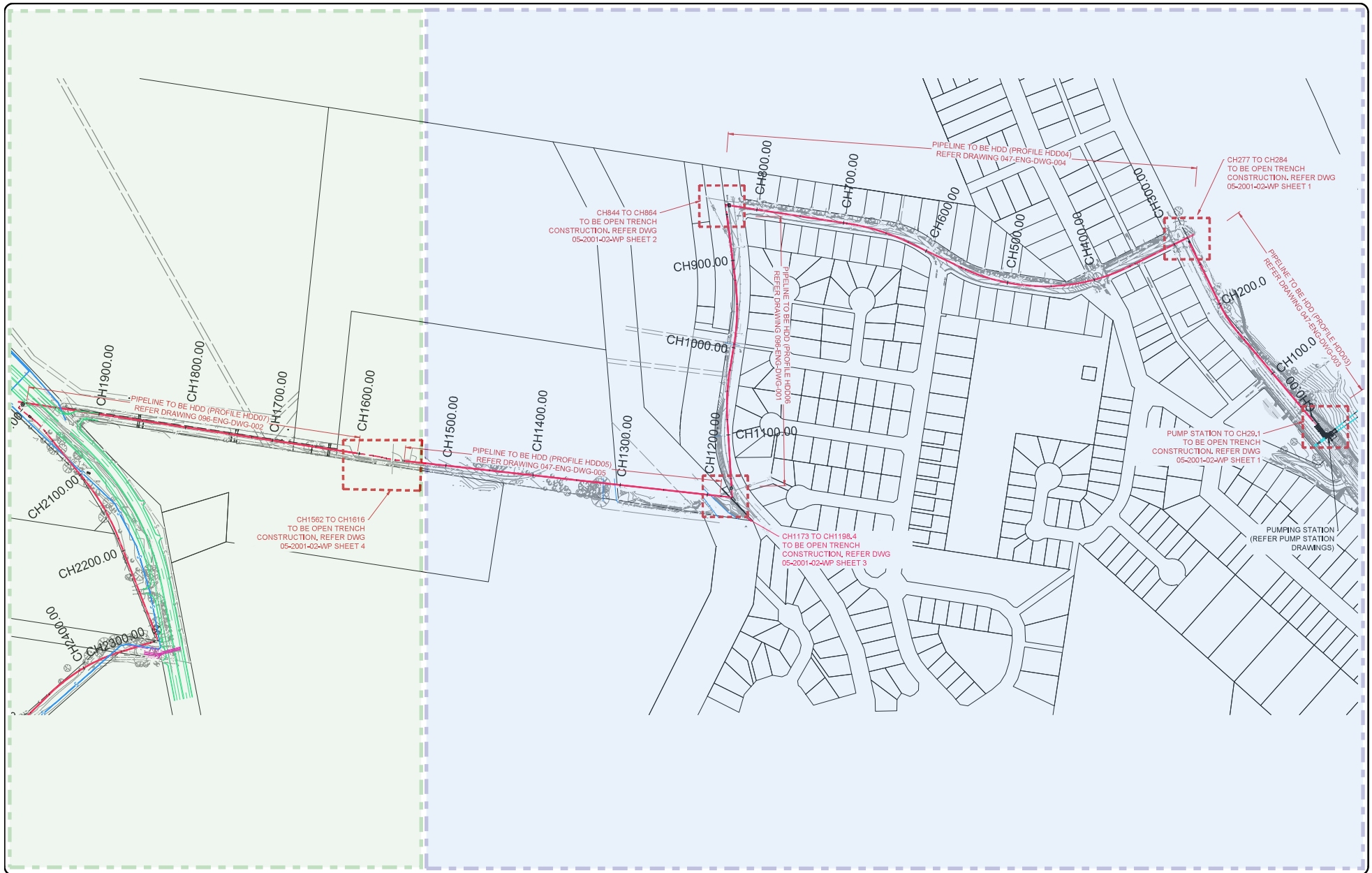
TITLE  
**DRAWING INDEX SHEET AND MASTER LEGEND**

Drawing No. D05-2001-02-IL Sheet 1 of 1

A1

Stage 1

Stage 2



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ENGINEERING+DESIGN

Designed	Drawn	Checked	Survey
PJB	PJB	MC	USH
Scale		Date	
SCALE 1:250		16/12/2020	
APPROVED - PRINCIPAL			12/02/2021
MICHAEL CHAMBERLAIN - RPEng			



Datum AHD (m)

C	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021
B	AMENDED COUNCIL COMMENTS	25/1/2021
A	FOR APPROVAL	16/12/2020

Issue	Description	Date	By

CLIENT  
 AUSTRALIA BAY LOBSTER PRODUCERS  
 PROJECT  
 SEAWATER INTAKE PIPELINE  
 AND PUMP STATION

TITLE  
 SEAWATER RISING MAIN  
 OVERALL PLAN  
 CH0 TO CH1900

Drawing No. D05-2001-02-OP Sheet 1 of 4 A1

Stage 2

Stage 1



Willow+ Sparrow



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Designed	Drawn	Checked	Survey
PJB	PJB	MC	USH
Scale 1:200[V] 1:10000[H]		Date 16/12/2020	
APPROVED - PRINCIPAL <i>[Signature]</i>		12/02/2021	
APPROVED - PRINCIPAL MICHAEL CHAMBERLAN - RPEng			



Datum AHD(m)

C FOR APPROVAL - NOT FOR CONSTRUCTION 12/2/2021  
 B AMENDED COUNCIL COMMENTS 25/1/2021  
 A FOR APPROVAL 16/12/2020

Issue Description Date By

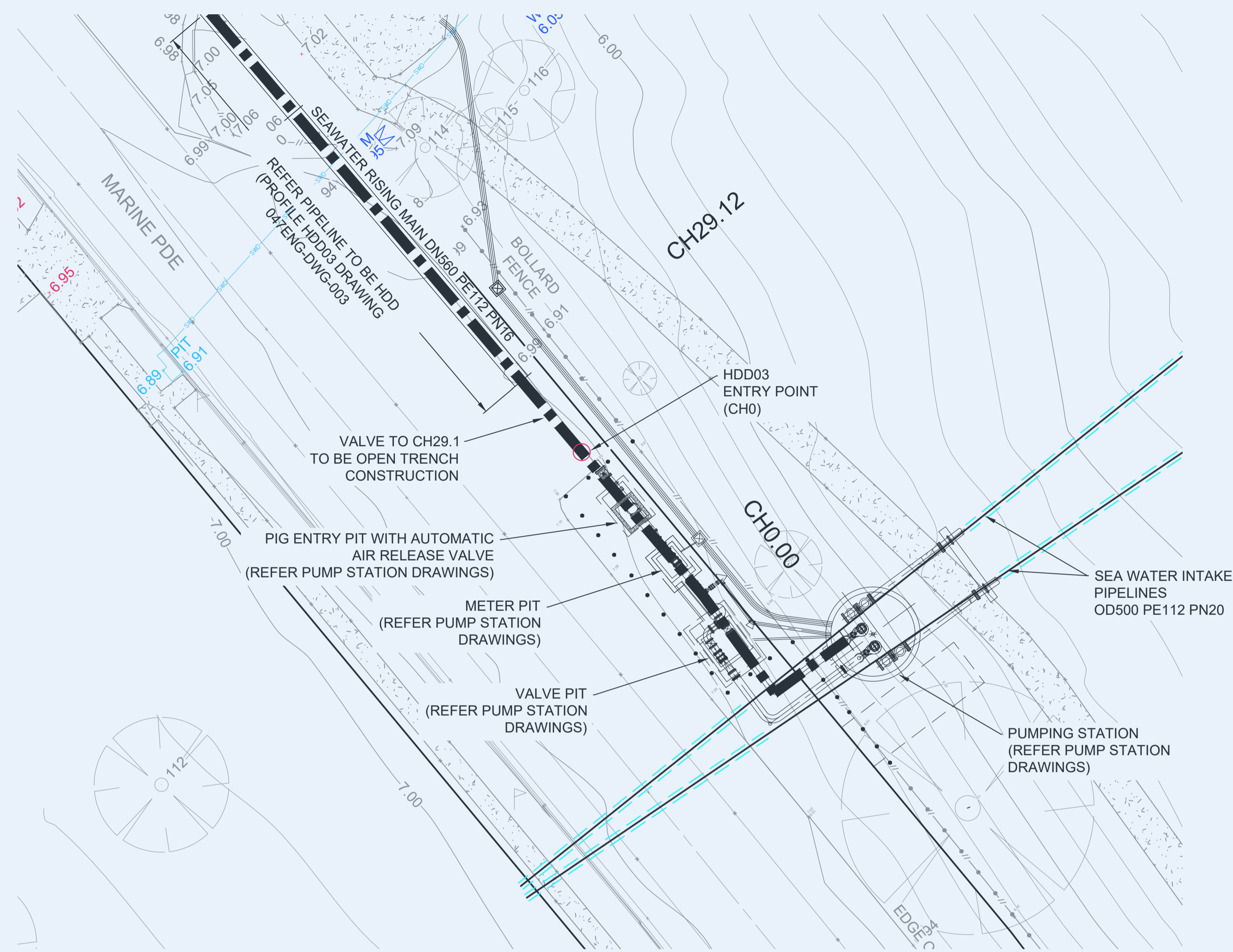
CLIENT AUSTRALIA BAY LOBSTER PRODUCERS

PROJECT SEAWATER INTAKE PIPELINE AND PUMP STATION

TITLE RISING MAIN OVERALL HYDRAULIC SECTION VIEW CH0.00 TO CH4992.26

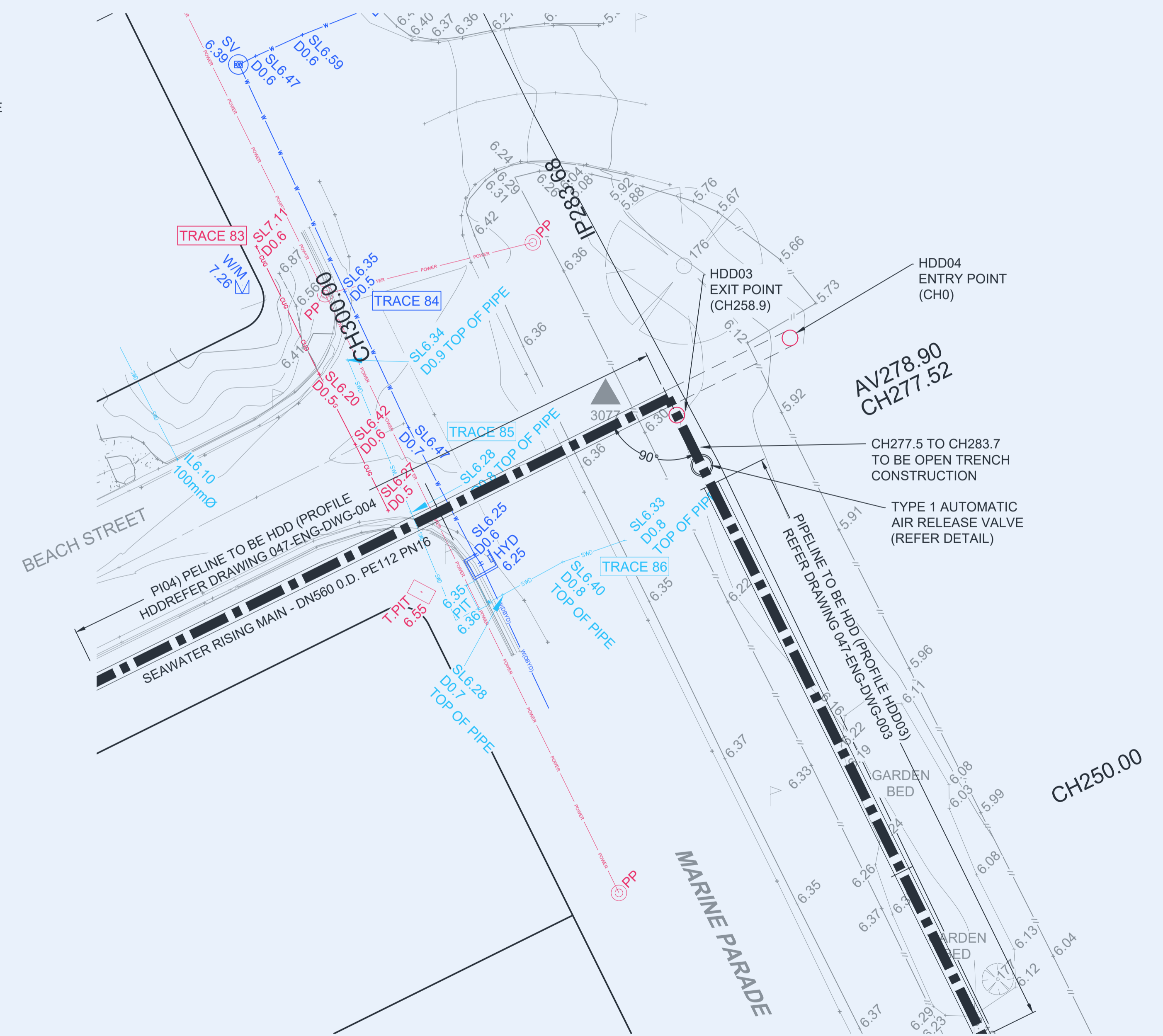
Drawing No. D05-2001-02-OP Sheet 4 of 4

A1



DETAILED WORKS PLAN BETWEEN PUMP STATION VALVES AND HDD03 - 1:200

LEGEND	
	NEW SEAWATER RISING MAIN (HDD CONSTRUCTION)
	NEW SEAWATER RISING MAIN (OPEN TRENCH CONSTRUCTION)
	PROPOSED AIR RELEASE VALVE CHAMBER
	HDD ENTRY/EXIT POINT (CH 0)
	DENOTES HDD CHAINAGE



DETAILED WORKS PLAN BETWEEN HDD03 AND HDD04 - 1:200

**FOR APPROVAL**

**NOTES:**

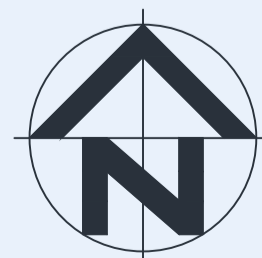
1. SHOULD DISTURBANCE TO ANY FOOTPATH BE NECESSARY THEN THE RESTORATION SHALL INCLUDE THE REPLACEMENT OF THE WHOLE CONCRETE SLAB SEGMENTS BETWEEN JOINTS FOR THE FULL WIDTH IN ACCORDANCE WITH COUNCIL'S STANDARD DRAWING SD013 "FOOTPATH AND CYCLEWAY DETAILS".
2. COMPACTION OF TRENCH BACKFILL MATERIAL IN NON-ROAD PAVEMENT AREAS IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE REQUIREMENTS OF AS3798.
3. ALL ROAD, PAVED FOOTPATH AND GRASSED VERGE RESTORATIONS ARE TO BE CARRIED OUT IN ACCORDANCE WITH TWEED COUNCIL'S STANDARDS AND SPECIFICATIONS AND TO THE SATISFACTION OF COUNCIL OFFICERS.
4. ALL DISTURBED GRASSED AREAS SHALL BE REINSTATED WITH TURF. WATERING AND MAINTENANCE OF THE TURF TO ACHIEVE ESTABLISHMENT IS THE CONTRACTORS RESPONSIBILITY.
5. PRUNING OF TREES SHOWN ON THESE DRAWINGS "TO BE RETAINED" IS NOT PERMITTED WITHOUT PRIOR CONSULTATION AND ACCEPTANCE OF COUNCIL.
6. ALL VALVE PIT LIDS SHALL BE CONSTRUCTED TO ENSURE THE ARE LEVEL WITH THE ADJOINING GROUND SURFACE.

Willow+ Sparrow



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 WILLOW & SPARROW PTY LTD A.C.N. 606732512

Designed PJB	Drawn PJB	Checked MC	Survey USH
Scale SCALE 1:200		Date 16/12/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPEng	

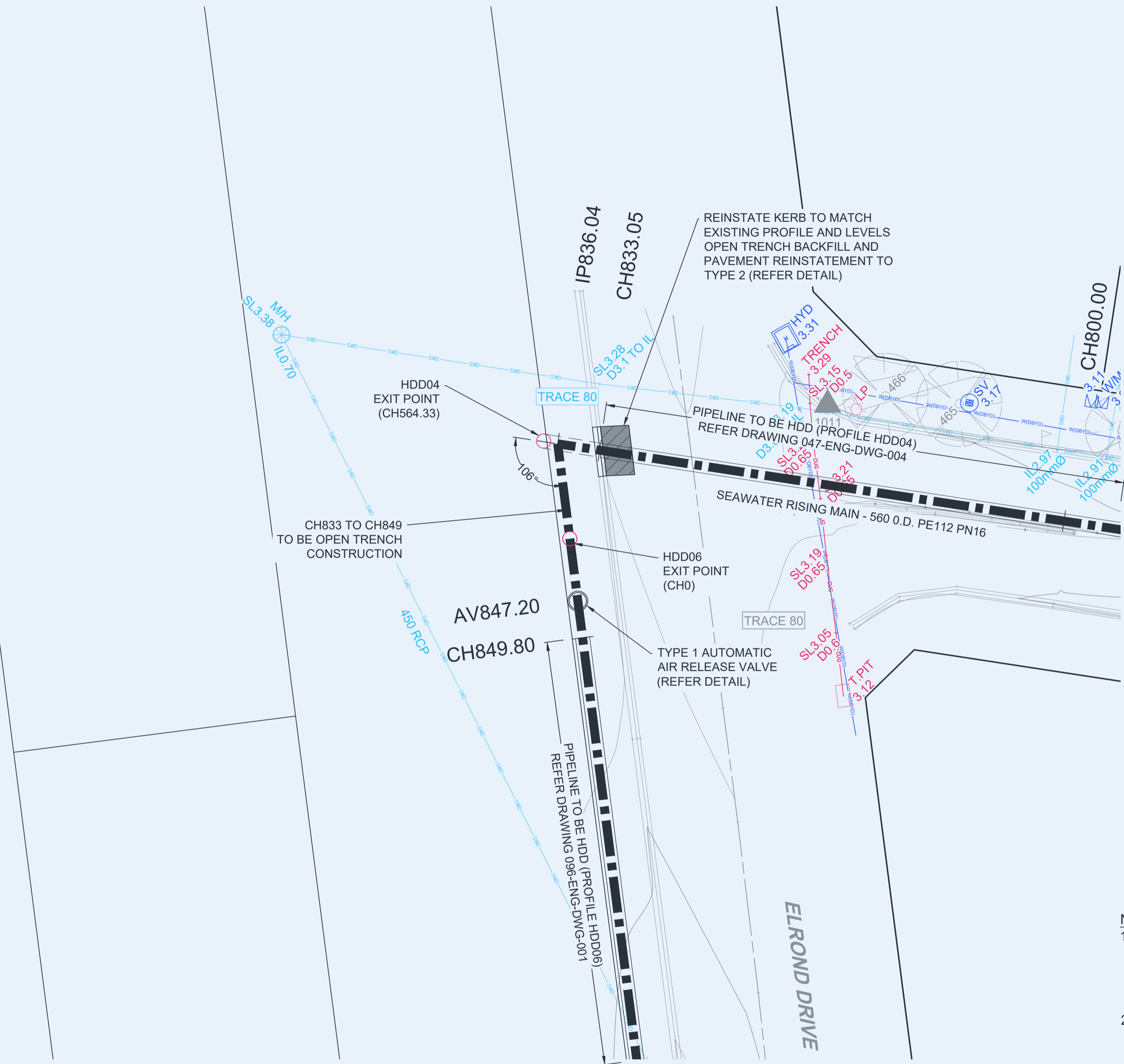


Datum AHD (m)

Issue	Description	Date	By
C	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021	
B	AMENDED COUNCIL COMMENTS	25/1/2021	
A	FOR APPROVAL	16/12/2020	

CLIENT  
 AUSTRALIA BAY LOBSTER PRODUCERS  
 PROJECT  
 SEAWATER INTAKE PIPELINE AND PUMP STATION

TITLE DETAILED WORKS PLAN BETWEEN PUMP STATION AND HDD04	
Drawing No. D05-2001-02-WP	Sheet 1 of 9 A1



**LEGEND**

	NEW SEAWATER RISING MAIN (HDD CONSTRUCTION)
	NEW SEAWATER RISING MAIN (OPEN TRENCH CONSTRUCTION)
	PROPOSED AIR RELEASE VALVE CHAMBER
	HDD ENTRY/EXIT POINT (CH 0) DENOTES HDD CHAINAGE

**NOTES:**

1. SHOULD DISTURBANCE TO ANY FOOTPATH BE NECESSARY THEN THE RESTORATION SHALL INCLUDE THE REPLACEMENT OF THE WHOLE CONCRETE SLAB SEGMENTS BETWEEN JOINTS FOR THE FULL WIDTH IN ACCORDANCE WITH COUNCIL'S STANDARD DRAWING SD013 "FOOTPATH AND CYCLEWAY DETAILS".
2. COMPACTION OF TRENCH BACKFILL MATERIAL IN NON-ROAD PAVEMENT AREAS IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE REQUIREMENTS OF AS3798.
3. ALL ROAD, PAVED FOOTPATH AND GRASSED VERGE RESTORATIONS ARE TO BE CARRIED OUT IN ACCORDANCE WITH TWEED COUNCIL'S STANDARDS AND SPECIFICATIONS AND TO THE SATISFACTION OF COUNCIL OFFICERS.
4. ALL DISTURBED GRASSED AREAS SHALL BE REINSTATED WITH TURF. WATERING AND MAINTENANCE OF THE TURF TO ACHIEVE ESTABLISHMENT IS THE CONTRACTORS RESPONSIBILITY. PRUNING OF TREES SHOWN ON THESE DRAWINGS "TO BE RETAINED" IS NOT PERMITTED WITHOUT PRIOR CONSULTATION AND ACCEPTANCE OF COUNCIL.
5. ALL VALVE PIT LIDS SHALL BE CONSTRUCTED TO ENSURE THE ARE LEVEL WITH THE ADJOINING GROUND SURFACE.

**FOR APPROVAL**

**Willow+ Sparrow**  
  
 Dillions Lane, Alstonville NSW 2477  
 Phone: [02] 662 86 192  
 Email: michael@waseng.com.au  
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Designed PJB	Drawn PJB	Checked MC	Survey USH
Scale SCALE 1:200		Date 16/12/2020	
 APPROVED - PRINCIPAL MICHAEL CHAMBERLAIN - RPEng			

Datum AHD (m)

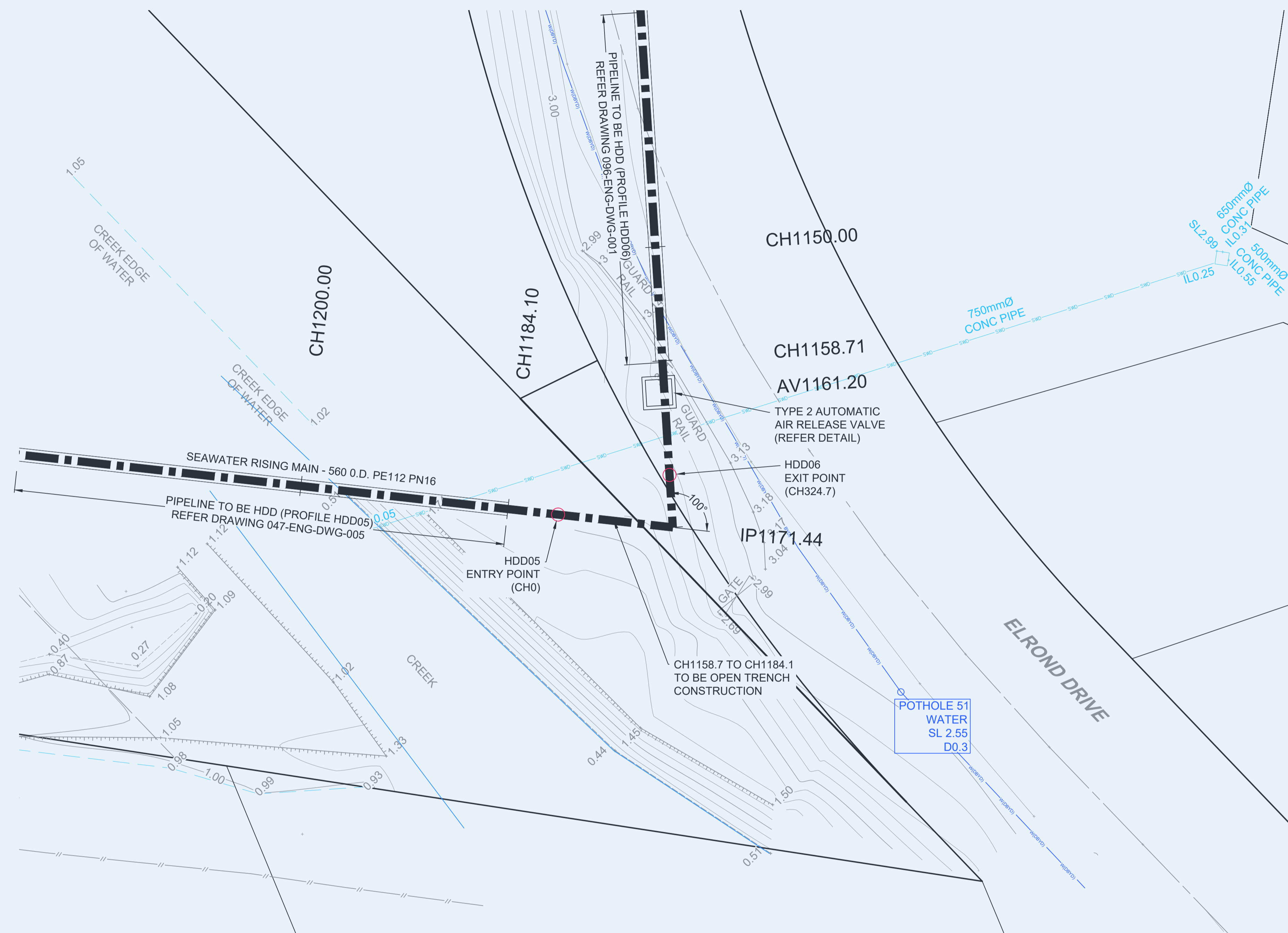
C	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021
B	AMENDED COUNCIL COMMENTS	25/1/2021
A	FOR APPROVAL	16/12/2020
Issue	Description	Date

CLIENT  
**AUSTRALIA BAY LOBSTER PRODUCERS**

PROJECT  
**SEAWATER INTAKE PIPELINE AND PUMP STATION**

TITLE  
**DETAILED WORKS PLAN BETWEEN HDD04 - HDD06**

Drawing No. **D05-2001-02-WP** Sheet 2 of 9 **A1**



LEGEND	
	NEW SEAWATER RISING MAIN (HDD CONSTRUCTION)
	NEW SEAWATER RISING MAIN (OPEN TRENCH CONSTRUCTION)
	PROPOSED AIR RELEASE VALVE CHAMBER
	HDD ENTRY/EXIT POINT (CH 0) DENOTES HDD CHAINAGE

- NOTES:**
1. SHOULD DISTURBANCE TO ANY FOOTPATH BE NECESSARY THEN THE RESTORATION SHALL INCLUDE THE REPLACEMENT OF THE WHOLE CONCRETE SLAB SEGMENTS BETWEEN JOINTS FOR THE FULL WIDTH IN ACCORDANCE WITH COUNCIL'S STANDARD DRAWING SD013 "FOOTPATH AND CYCLEWAY DETAILS".
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  6. ALL VALVE PIT LIDS SHALL BE CONSTRUCTED TO ENSURE THE ARE LEVEL WITH THE ADJOINING GROUND SURFACE.

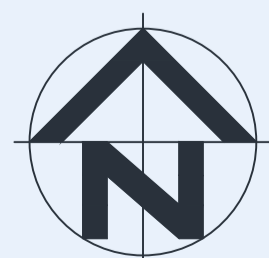
**FOR APPROVAL**

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Designed PJB	Drawn PJB	Checked MC	Survey USH
Scale SCALE 1:200		Date 16/12/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPEng	

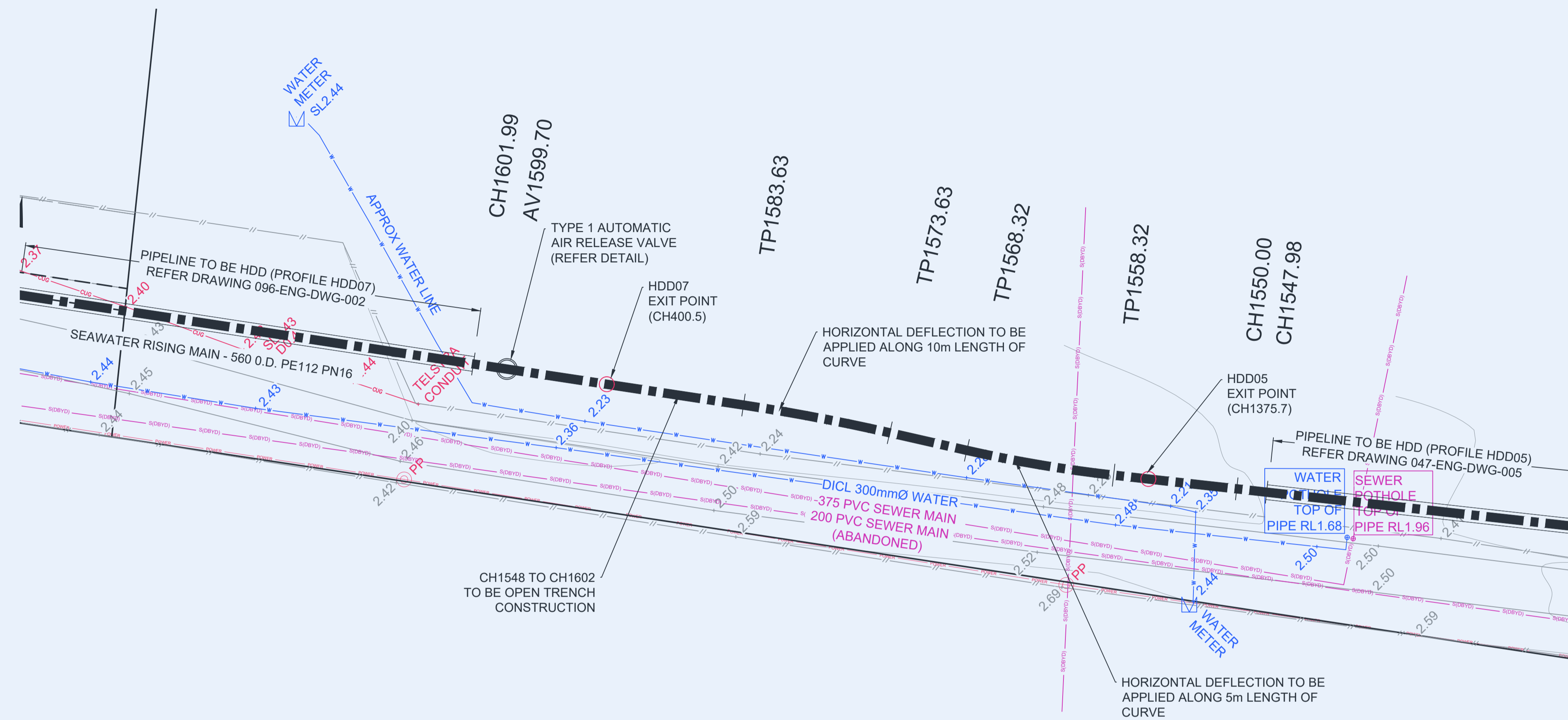


Datum AHD (m)

C	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021
B	AMENDED COUNCIL COMMENTS	25/1/2021
A	FOR APPROVAL	16/12/2020

CLIENT  
 AUSTRALIA BAY LOBSTER PRODUCERS  
 PROJECT  
 SEAWATER INTAKE PIPELINE AND PUMP STATION

TITLE DETAILED WORKS PLAN BETWEEN HDD06 - HDD05	
Drawing No. D05-2001-02-WP	Sheet 3 of 9 A1



LEGEND	
	NEW SEAWATER RISING MAIN (HDD CONSTRUCTION)
	NEW SEAWATER RISING MAIN (OPEN TRENCH CONSTRUCTION)
	PROPOSED AIR RELEASE VALVE CHAMBER
	HDD ENTRY/EXIT POINT (CH 0)
	DENOTES HDD CHAINAGE

**NOTES:**

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**FOR APPROVAL**

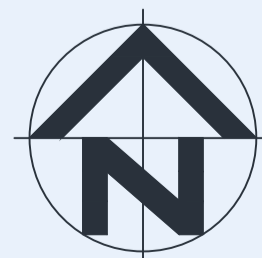
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ENGINEERING+DESIGN

Designed PJB	Drawn PJB	Checked MC	Survey USH
Scale SCALE 1:200		Date 16/12/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPEng	



Datum AHD (m)

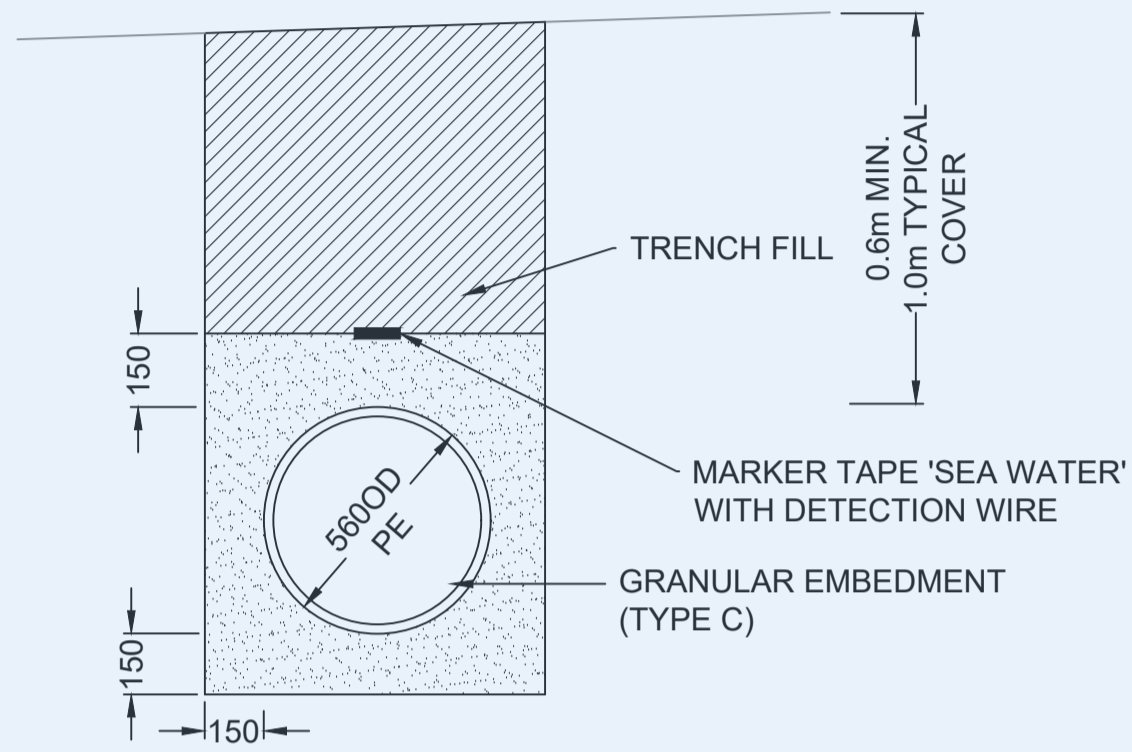
C	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021
B	AMENDED COUNCIL COMMENTS	25/1/2021
A	FOR APPROVAL	16/12/2020

Issue	Description	Date	By

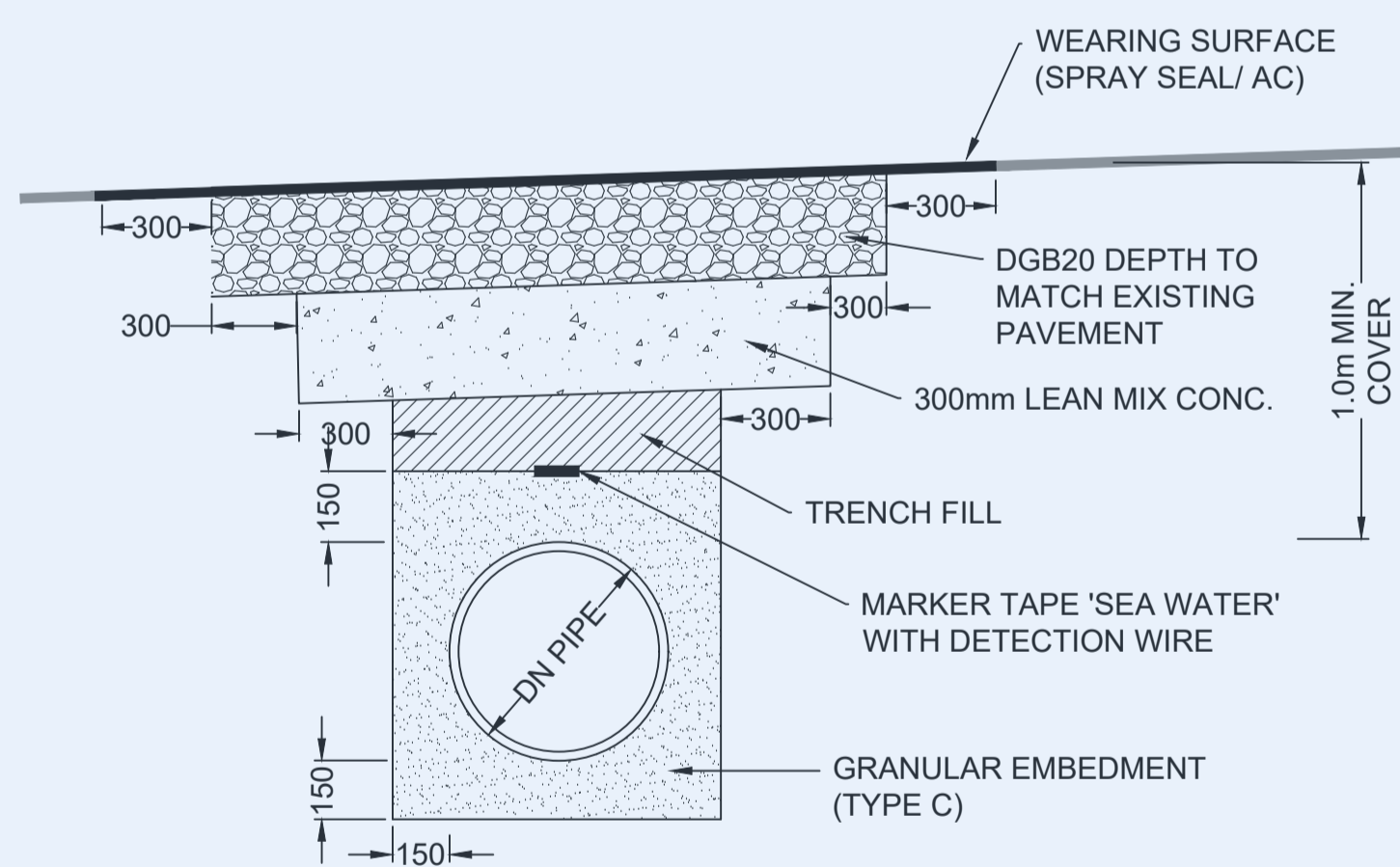
CLIENT  
 AUSTRALIA BAY LOBSTER PRODUCERS  
 PROJECT  
 SEAWATER INTAKE PIPELINE AND PUMP STATION

TITLE  
 DETAILED WORKS PLAN BETWEEN HDD05 - HDD07

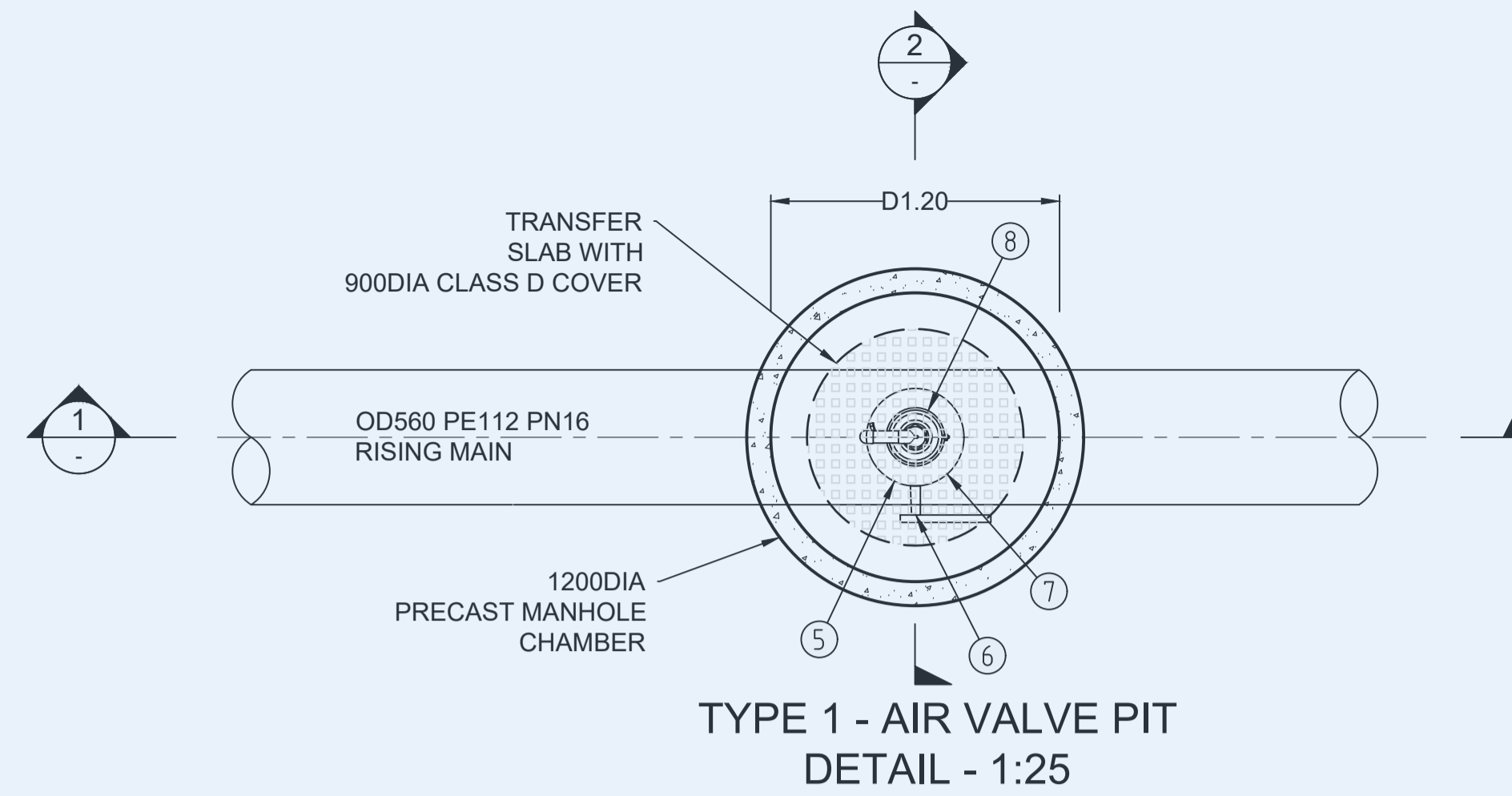
Drawing No. D05-2001-02-WP  
 Sheet 4 of 9  
 A1



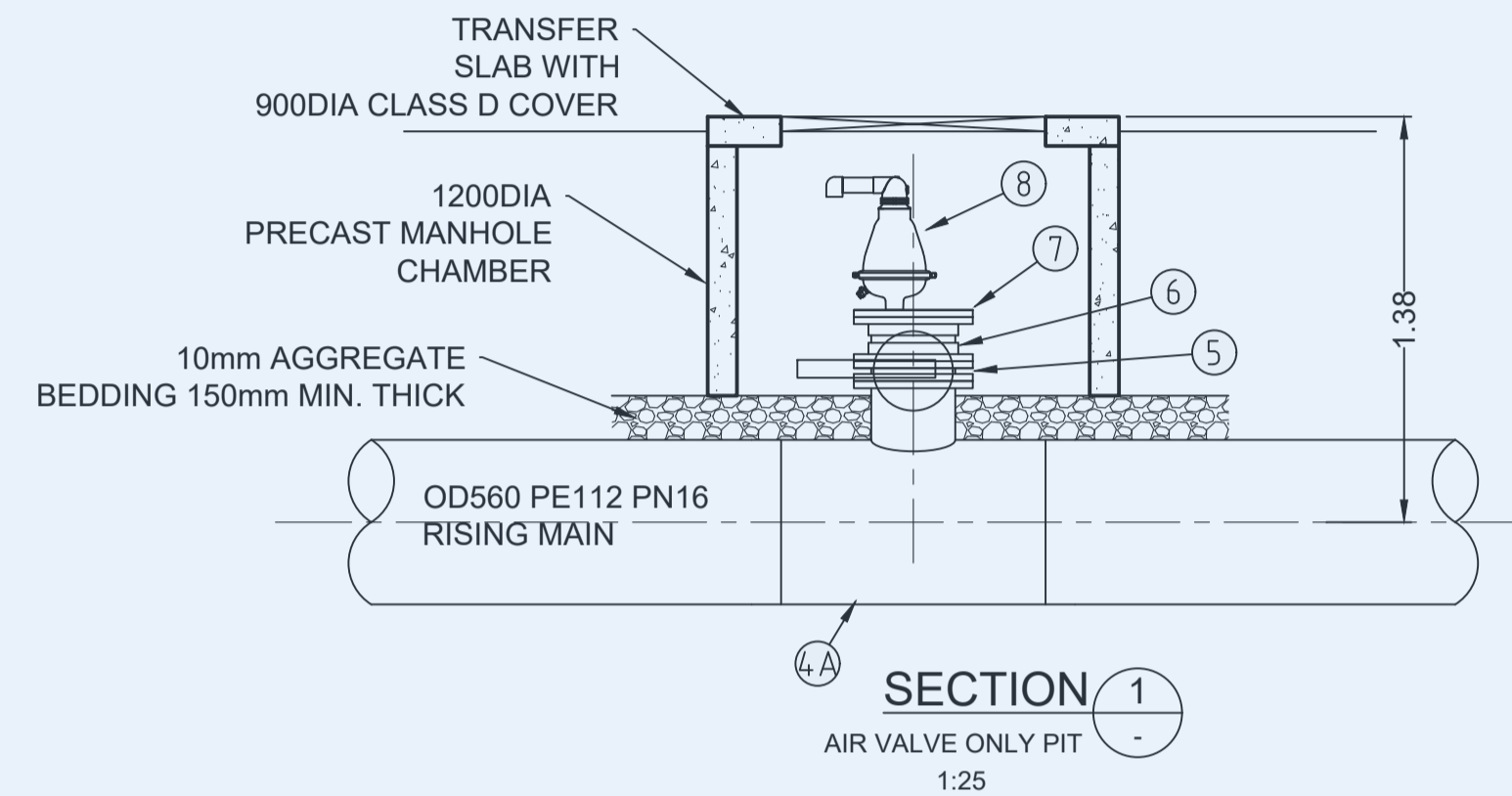
RISING MAIN EMBEDMENT AND TRENCH DETAIL - N.T.S.  
TYPE 1 - NON-TRAFFICABLE



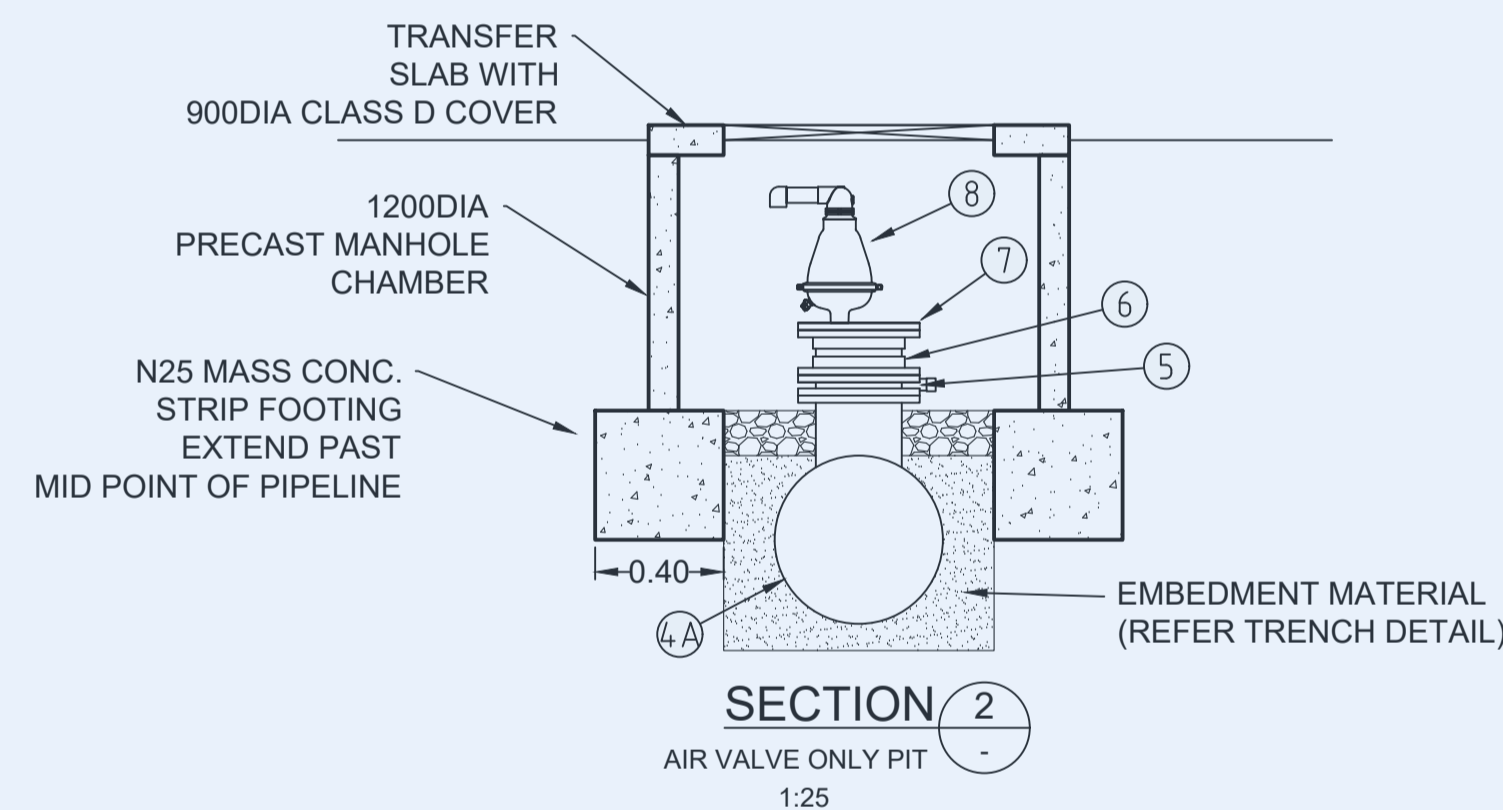
RISING MAIN EMBEDMENT AND TRENCH DETAIL - N.T.S.  
TYPE 2 - TRAFFICABLE WITH PAVEMENT REINSTATEMENT



TYPE 1 - AIR VALVE PIT  
DETAIL - 1:25



SECTION 1  
AIR VALVE ONLY PIT  
1:25



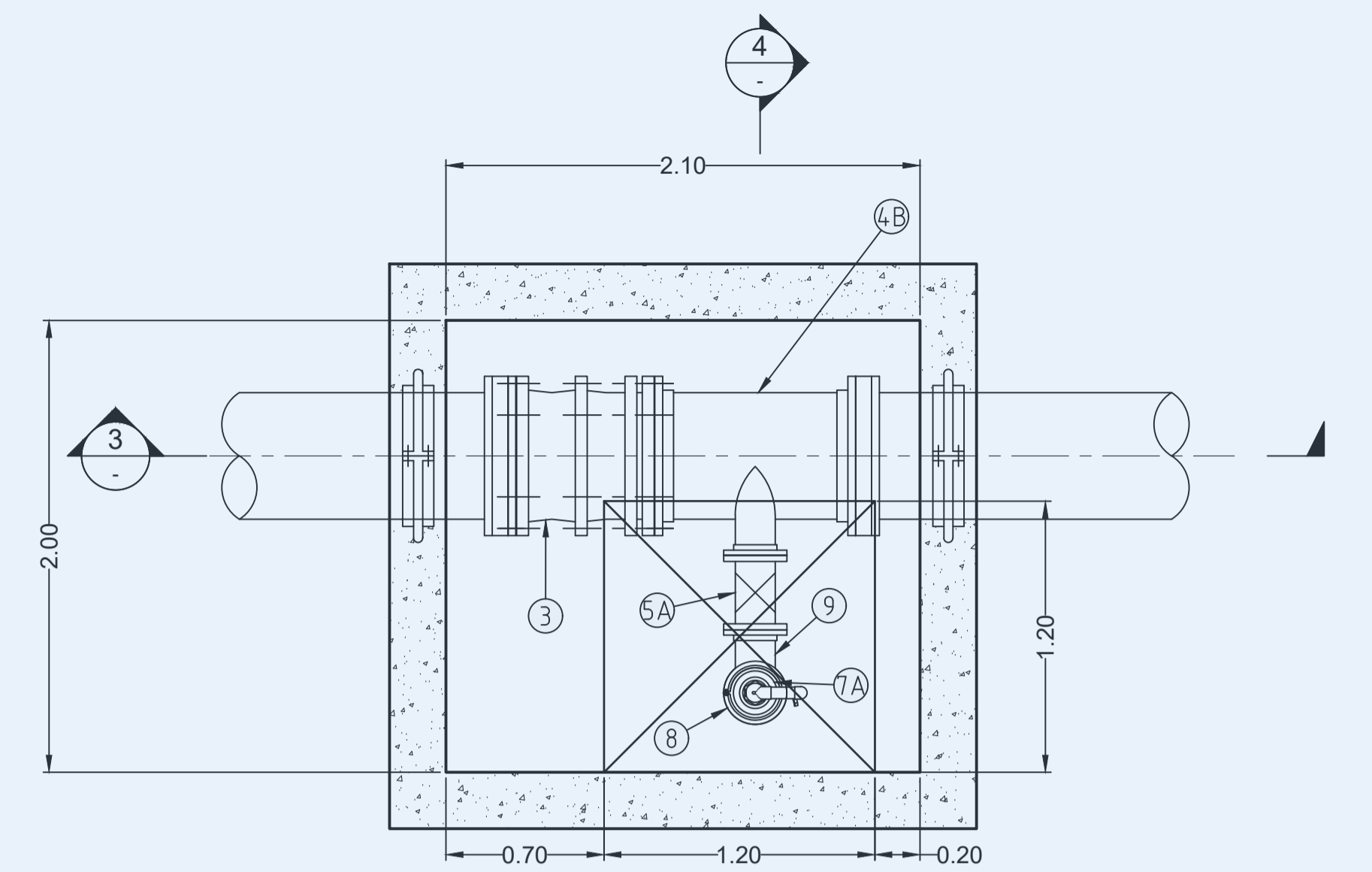
SECTION 2  
AIR VALVE ONLY PIT  
1:25

FITTING SCHEDULE - TYPE 1 - AIR VALVE ONLY PIT

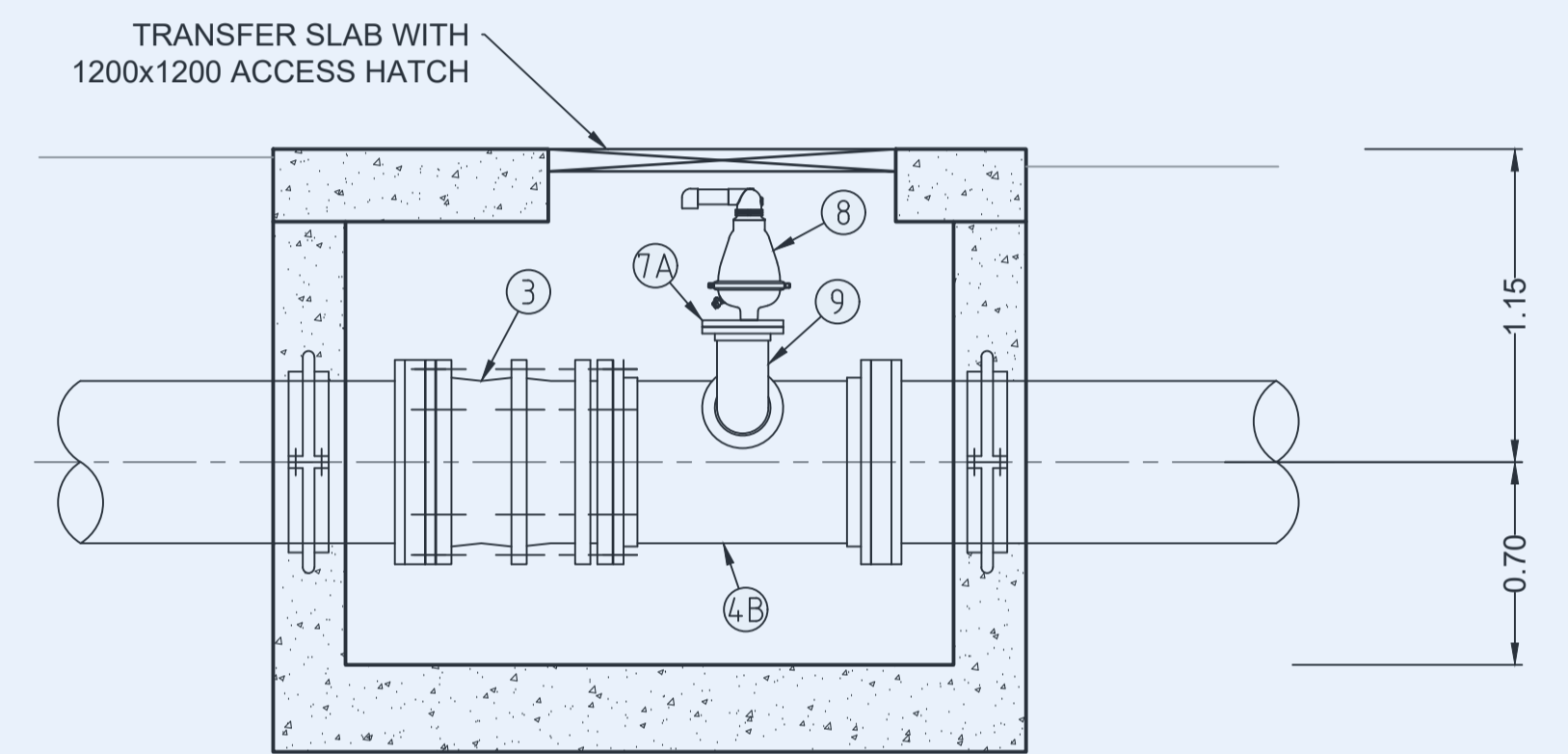
ITEM NO.	DESCRIPTION	MATERIAL	SIZE	QTY
4A	TEE BUTT WELDED TO MAIN PIPELINE. BRANCH TO HAVE STUB FLANGE WITH 316SS BACKING RING	PE112 PN16	OD560X OD315	1
5	FL-FL BUTTERFLY VALVE		DN250	1
6	FL-FL SHORT PIPE 150L	DI(FBE)	DN250	1
7	BLANK FLANGE WITH DN50 SS PIPE TAPPING AND BSP	DI(FBE)	DN250	1
8	ARI D-025 COMBINATION AIR VALVE	SS	DN50	1

FITTING SCHEDULE - TYPE 2 - AIR VALVE ONLY PIT

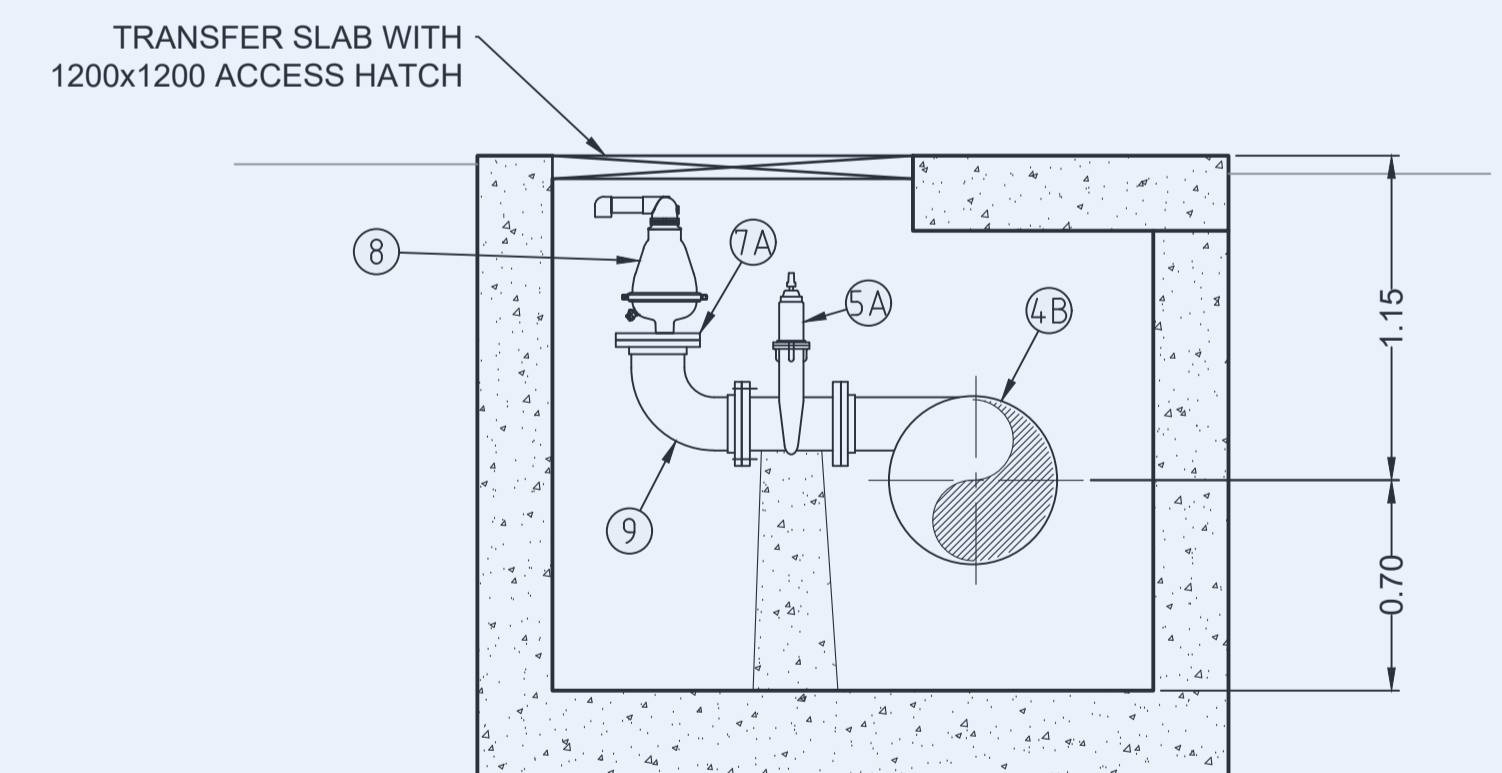
ITEM NO.	DESCRIPTION	MATERIAL	SIZE	QTY
3	DISMANTLE JOINT (THRUST TYPE)	DI(FBE)	DN500	1
4B	FL-FL-FL INVERTED SCOUR TEE	DI(FBE)	DN500X DN150	1
5A	FL-FL SLUICE VALVE RESILIENT SEATED	DI(FBE)	DN150	1
9	FL-FL 90 DEG BEND	DI(FBE)	DN150	1
7A	BLANK FLANGE WITH DN50 SS PIPE TAPPING AND BSP	DI(FBE)	DN150	1
8	ARI D-025 COMBINATION AIR VALVE	SS	DN50	1



TYPE 2 - AIR VALVE PIT  
DETAIL - 1:25



SECTION 3  
AIR VALVE ONLY PIT  
1:25



SECTION 4  
AIR VALVE ONLY PIT  
1:25

FOR APPROVAL

Willow+ Sparrow



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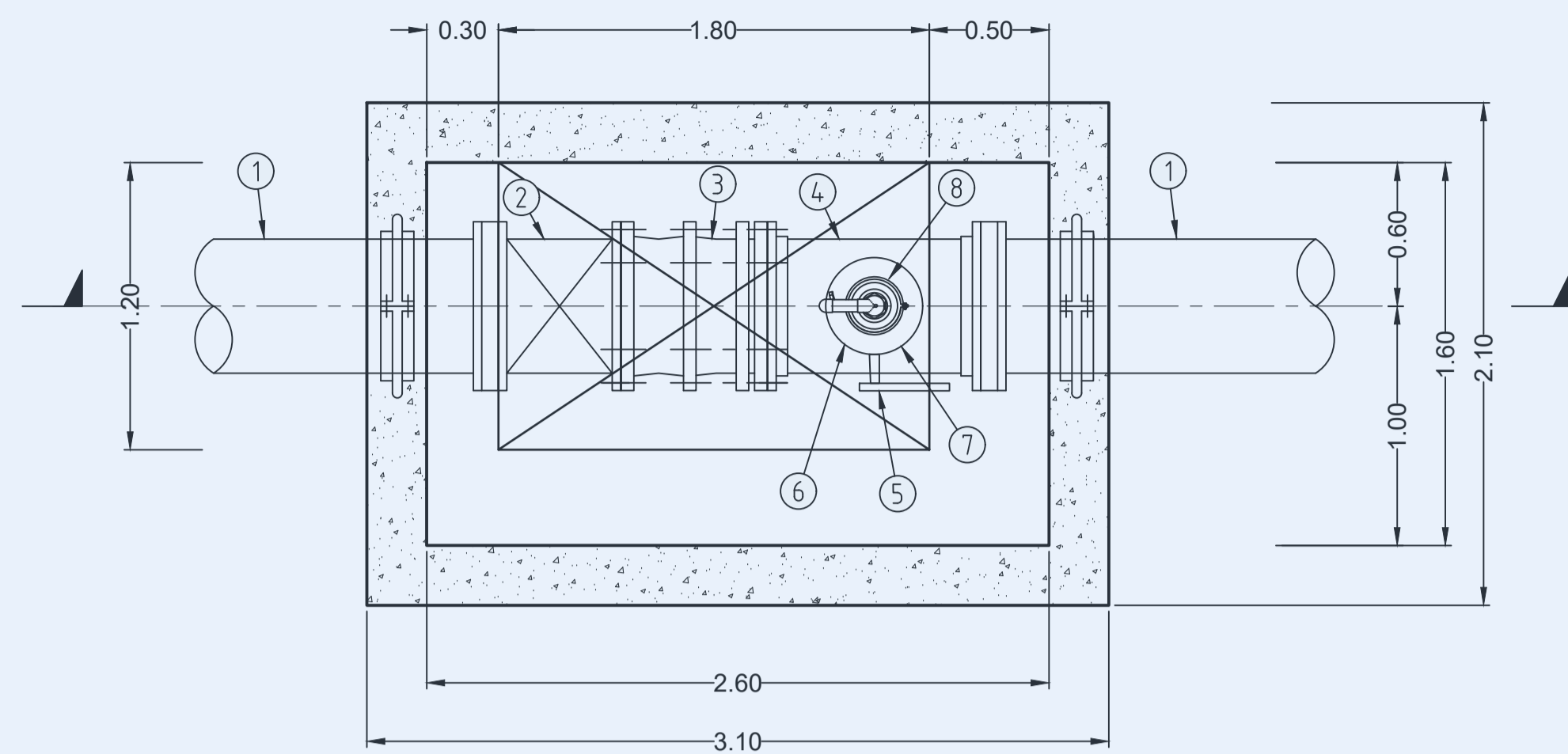
Designed	Drawn	Checked	Survey
PJB	PJB	MC	USH
Scale		Date	
AS SHOWN		16/12/2020	
APPROVED - PRINCIPAL MICHAEL CHAMBERLAIN - RPENG			

Datum AHD (m)

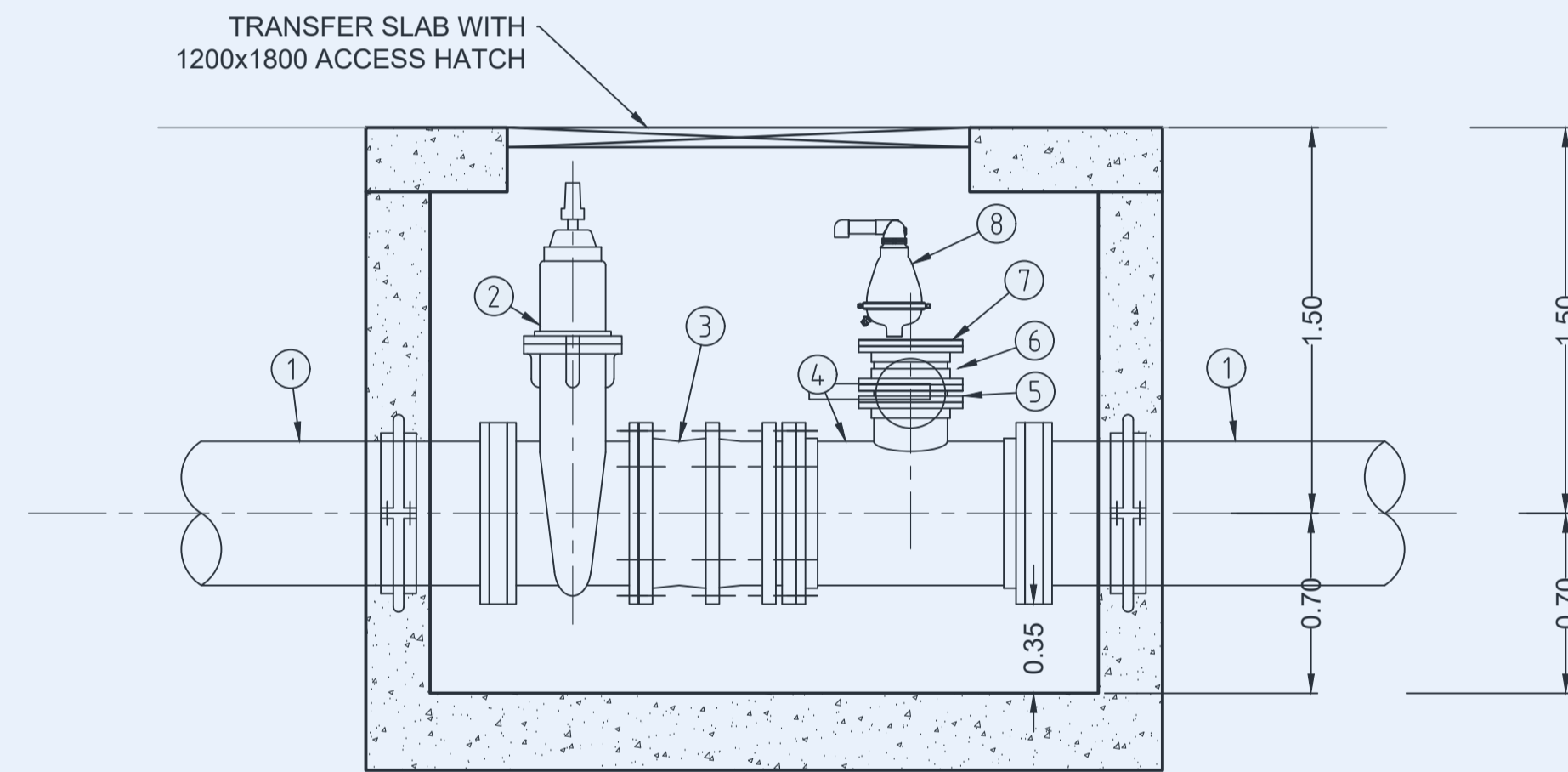
Issue	Description	Date	By
C	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021	
B	AMENDED COUNCIL COMMENTS	25/1/2021	
A	FOR APPROVAL	16/12/2020	

CLIENT  
AUSTRALIA BAY LOBSTER PRODUCERS  
PROJECT  
SEAWATER INTAKE PIPELINE  
AND PUMP STATION

TITLE  
SEA WATER RISING MAIN  
TRENCH DETAILS AND  
AIR VALVE DETAILS  
Drawing No. D05-2001-02-DT  
Sheet 1 of 2  
A1



TYPE 3 - AIR VALVE AND ISOLATION PIT  
GENERAL ARRANGEMENT PLAN - 1:25



SECTION 1  
AV/ISOLATION PIT  
1:25

FITTING SCHEDULE - AV ISOLATION PIT

ITEM NO.	DESCRIPTION	MATERIAL	SIZE	QTY
1	PIPE SPOOL WITH WELDED PUDDLE FLANGE AND 1X STUB FLANGE WITH 316SS BACKING RING	PE112 PN16	560D	2
2	FL-FL SLUICE VALVE - RESILIENT SEATED	DI(FBE)	DN500	1
3	THRUST DISMANTLE JOINT	DI(FBE)	DN375	1
4	FL-FL-FL TEE	DI(FBE)	DN500X250	1
5	FL-FL BUTTERFLY VALVE		DN250	1
6	FL-FL SHORT PIPE 150L	DI(FBE)	DN250	1
7	BLANK FLANGE WITH DN50 SS PIPE TAPPING AND BSP	DI(FBE)	DN250	1
8	ARI D-025 COMBINATION AIR VALVE	SS	DN50	1

FOR APPROVAL

Willow+ Sparrow



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ENGINEERING+DESIGN

Designed PJB	Drawn PJB	Checked MC	Survey USH
Scale AS SHOWN		Date 16/12/2020	
APPROVED - PRINCIPAL		MICHAEL CHAMBERLAIN - RPEng	

Datum AHD (m)

C	FOR APPROVAL - NOT FOR CONSTRUCTION	12/2/2021
B	AMENDED COUNCIL COMMENTS	25/1/2021
A	FOR APPROVAL	16/12/2020

Issue	Description	Date	By
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CLIENT  
AUSTRALIA BAY LOBSTER PRODUCERS  
PROJECT  
SEAWATER INTAKE PIPELINE  
AND PUMP STATION

TITLE  
TYPE 3 - AIR RELEASE  
AND ISOLATION VALVE PIT  
DETAILS

Drawing No. D05-2001-02-DT  
Sheet 2 of 2  
A1