



Dredge and Spoil Disposal Management Plan

MAINTENANCE DREDGING OF ACCESS CHANNEL TO CULLEN BAY

Northern Territory Government

Revision 4 | 08/05/2025

SMC Marine Pty Ltd. | ABN 48 096 465 333

DOCUMENT DETAILS:

Title:	Dredge and Spoil Disposal Management Plan
Reference ID:	SMC-DOC-PLN-0002
Revision:	04
Approval Date:	
Approved By:	Daniel Abbott-Wightman Project Manager

DOCUMENT HISTORY:

Revision:	Date:	Summary:	Developed:	Approved:
01	02/04/2025	Initial document draft	SF	DAW
02	14/04/2025	Update disposal location	SF	DAW
03	23/04/2025	Regulator-imposed updates to 14.2 – ASS, Table 4 and Figure 10 - Monitoring Locations	SF	DAW
04	08/05/2025	Updated Table 4 of the DSDMP to comply with WDL257	SF	DAW

SMC Marine Pty Ltd
ABN 48 096 465 333
www.smcmarine.com.au

P: 02 9818 4007

Admin Building 3/4,
Sydney Ports Secure Area,
White Bay (End of Robert Street),
ROZELLE NSW 2039

PO Box 68, GLEBE NSW 2037



Contents

1.0	INTRODUCTION	4
2.0	PROJECT REFERENCES.....	7
3.0	DEFINITIONS	14
4.0	COMMUNITY CONSULTATION	15
5.0	ORGANISATION & AREAS OF RESPONSIBILITY	16
6.0	DREDGING WORKS	22
7.0	RESOURCES.....	29
8.0	PIPELINES.....	33
9.0	SURVEY AND SURVEY CONTROLS	35
10.0	WHS REQUIREMENTS	37
11.0	ENVIRONMENTAL MANAGEMENT AND IMPLEMENTATION	39
12.0	WATER QUALITY	41
13.0	PROTECTED MARINE FAUNA	54
14.0	SEDIMENT QUALITY AND ACID SULFATE SOILS IN DREDGED MATERIAL	65
15.0	MONITORING SUMMARY	68
16.0	REPORTING SUMMARY.....	71
17.0	SAFE WORK METHOD STATEMENTS.....	73
18.0	CULTURAL HERITAGE / SACRED SITES	74
19.0	BIOSECURITY / PEST MANAGEMENT	75
20.0	HAZARDOUS MATERIALS	77
21.0	WASTE MANAGEMENT.....	78
22.0	AIR POLLUTION	80
23.0	EMERGENCY RESPONSE.....	81
24.0	APPENDICES.....	88

1.0 INTRODUCTION

1.1 Overview

SMC Marine [the Contractor] has been contracted by Northern Territory Government Department of Logistics and Infrastructure (DLI) [the Client] to provide Maintenance Dredging services for Maintenance Dredging of access channel to Cullen Bay located at Darwin, Northern Territory.

1.2 Scope of Work

Maintenance dredging is required to be undertaken to allow the channel to be utilised by local ferry services as well as local recreational and travelling vessels into Cullen Bay, Northern Territory (NT).

Dredging and disposal will be undertaken by cutter suction dredging (CSD) with at sea disposal methodology.

Approximately 85,000m³ (measured in situ) of sediment from the area surrounding the Cullen Bay Ferry pontoon and navigational channel to be dredged to a minimum design depth of RL -3.5m & RL -3.0m in each respective section as highlighted in **Appendix 1**.



Figure 1- Overview of Dredge Footprint – Cullen Bay.

1.3 Purpose

This Dredge and Spoil Disposal Management Plan (DSDMP) has been developed to outline SMC Marine's environmental management obligations in relation to dredging and spoil disposal, mitigation and minimization of Project and construction impacts on the environment.

This DSDMP provides details of environmental roles and responsibilities, management actions, monitoring programs and inspections. It also provides detailed descriptions of the dredging works, plant and equipment, and methodology that will be utilised for undertaking the dredging works.

1.4 Objectives

The intent of the DSDMP is that at a minimum, the environmental impacts arising from the proposed maintenance dredging and disposal activities will be managed at levels deemed acceptable by the requirements of the Conditions previously imposed by the Northern Territory Environmental Protection Authority (EPA).

The DSDMP presents the management measures including objectives, actions and associated key performance indicators (KPIs) that will be implemented throughout the dredging program. The DSDMP also presents the proposed monitoring and inspection programs required to determine any environmental impacts arising from the construction activities and allow for the effective and timely implementation of contingency measures if required.

The purpose of this plan is to outline the systems that are in place to effectively manage and protect the environment in the vicinity of Cullen Bay, whilst maintenance dredging activities are underway.

The Dredging Contractor's Integrated Management System (IMS) is configured with the intention of achieving a Safe, Incident and Injury Free (IIF) environment setting clear IIF objectives and targets.

Dredging Contractor - Maritime Constructions has appointed an IMS Manager to monitor the performance of the Company and the individual projects and will organise and execute internal project audits. External auditing and certification of the IMS for Maritime Constructions is accredited by ECAAS.

The responsibility of the Project Management System is vested in the line-management structure of Maritime Constructions. It passes from the CEO through the subsequent management levels to the ultimate responsibility on site. Therefore, the ultimate responsibility for Quality Assurance, WHS, QA and Environmental matters during this Project lies with the Project Manager.

This document shall be read in conjunction with the following documents:



- Vessel Integrated (Safety) Management System
- Vessel Emergency Response Plan
- Standard Operating Procedure(s)

2.0 PROJECT REFERENCES

2.1 Project Documents

A list of the drawings prepared for the project is provided in Appendix 1.

2.1.1 Reference Documents

Cardno 2014, Ichthys Nearshore Environmental Monitoring Program: Seagrass Monitoring End of Dredging Report. Report prepared for INPEX by Cardno Pty Ltd, December 2014.

Cassilles-Southgate N 2016, Interim Darwin Harbour Turbidity Water Quality Objectives for Neap Tide Conditions. Report Number 14/2016D. Aquatic Health Unit, Water Resources Division, Department of Land Resource Management. NT.

CEDA 2015, Integrating Adaptive Environmental Management into Dredging Projects. Central Dredging Association Position Paper, March 2015.

Darwin Harbour Advisory Committee 2007, Status on the implementation of the Darwin Harbour Regional Plan of Management 2005–2006.

DEH 2006, Australian National Guidelines for Whale and Dolphin Watching 2005. Department of the Environment and Heritage. Accessed at: <http://www.environment.gov.au/marine/publications/australian--national-guidelines-whale-w-and--dolphin--watching--2005>

DENR 2016, Darwin Harbour Region Report Card 2016. Department of Environment and Natural Resources.

DIPL 2017, Notice of Intent – Cullen Bay Ferry Terminal Dredging. Department of Infrastructure, Planning and Logistics.

Drewry J, Fortune J, Majid M, Schult J, Lamche G, Townsend S and Cusack S 2011, Darwin Harbour Region Report Cards 2011. Aquatic Health Unit, Department of Natural Resources, Environment, The Arts and Sport. Report No 17/2011D. Palmerston, NT, Australia.

Duggan S 2006, The water quality of Darwin Harbour: December 2002 - December 2004. AIMS Report No. 37, Australian Institute of Marine Science.

EcOz 2016, Sampling and Analysis Report: Sediment Core Sampling: Cullen Bay Dredge Material Phase II Assessment. Report prepared for NT Department of Infrastructure, July 2016.

Fortune J 2006, The grainsize and heavy metal content of sediment in Darwin Harbour. Environmental Protection Agency, Department of Natural Resources,

Environment and the Arts. Report No. 14/2006D.

Fortune J 2015, Spatial variability of Darwin Harbour water quality during the dry season neap tides of 2012 and 2013. Report No. 16/2015D. Department of Land Resource Management, Aquatic Health Unit. Palmerston, NT.

Fortune J 2016, Darwin Harbour Region 2016 Report Card Water Quality Supplement. Report No. 22/2016D. Aquatic Health Unit, Department of Environment and Natural Resources. Palmerston, NT.

Geo Oceans 2011, Ichthys Gas Field Development Project: Benthic Habitat Mapping of the Darwin Region – Methods of data collection, collation and map production. Appendix S6 to INPEX (2011).

Geo Oceans 2014, Ichthys Nearshore Environmental Monitoring Program: Seagrass Habitat Monitoring. Appendix A to Cardno (2014).

IADC 2016, Facts about: Adaptive Management. International Association of Dredging Companies.

INPEX 2010, Ichthys Gas Field Development Project: Draft Environmental Impact Statement.

INPEX 2011, Ichthys Gas Field Development Project: Supplement to the Draft Environmental Impact Statement.

INPEX 2013, Dredging and Spoil Disposal Management Plan – East Arm, Rev 4.

Jensen FH, Bejder L, Wahlberg M, Aguiar Soto N, Johnson M and Madsen PT 2009, Vessel noise effects on delphinid communication. Marine Ecology Progress Series, 395: 161-175.

Mills D and Kemps H 2016, Generation and release of sediments by hydraulic dredging: a review. Report of Theme 2 -- Project 2.1 prepared for the Dredging Science Node, Western Australian Marine Science Institution, Perth, Western Australia.

Moein Bartol S and Musick JA 2003, Sensory biology of sea turtles. In: Lutz PL, Musick JA and Wyneken J (eds) The biology of sea turtles, Vol 2. CRC Press, Boca Raton, FL, pp. 79 102.

Munksgaard NC, Kaestli M, Gibb K, Dostine P and Townsend S 2013, Darwin Harbour Baseline Sediment Survey 2012. Environmental Chemistry and Microbiology Unit (ECMU) Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin NT.

NT EPA 2013, Guidelines for the Environmental Assessment of Marine Dredging in the Northern Territory. NT Environment Protection Authority, November 2013.

NTG 2011a, Draft Environmental Impact Statement: East Arm Wharf Expansion Project.

NTG 2011b, Environmental Impact Statement Supplement: East Arm Wharf Expansion Project.

Padovan AV 2003, Darwin Harbour water and sediment quality. Marine and Estuarine Environments of Darwin Harbour. Proceedings of the Darwin Harbour Public Presentations, February 2003.

Peerzada N 1988, Distribution of heavy metals in Darwin Harbour; In: Larson HK, Michie MG, and Hanley JR (eds) Darwin Harbour. Proceedings of a Workshop on Research and Management held in Darwin, 2-3 September 1987. Australian National University, North Australia Research Unit, Mangrove Monograph No. 4: 59--71.

Peerzada N and Ryan P 1987, Determination of lead, zinc, copper and cadmium in Darwin Harbour. Marine Pollution Bulletin 18: 458-461.

Todd VLG, Todd IB, Gardiner JC, Morrin ECN, MacPherson NA, DiMarzio NA and Thomsen F 2015, A review of impacts of marine dredging activities on marine mammals. ICES Journal of Marine Science 72(2): 328-340.

URS 2004, Darwin City Waterfront Redevelopment Project: Draft Environmental Impact Assessment. Prepared for Department of Infrastructure, Planning and Environment, May 2004.

URS 2009, Ichthys Gas Field Development Project: Nearshore Marine Water Quality and Sediment Study. Report prepared for INPEX Browse, Ltd, R1382, August 2009. Appendix 9 to INPEX (2010).

URS 2010, Ichthys Gas Field Development Project: Nearshore Marine Ecology and Benthic Communities Study. Report prepared for INPEX Browse, Ltd, R1361, February 2010. Appendix 8 to INPEX (2010).

URS 2011, Ichthys Gas Field Development Project. Summary of the Long--Term Water--Quality Program for Darwin Harbour. Report to INPEX Browse, Ltd. by URS Australia Pty Ltd.

WA EPA 2011, Environmental Assessment Guideline for Marine Dredging Proposals (EAG7). Environmental Protection Authority, Western Australia, September 2011.

WA EPA 2016, Technical Guidance: Environmental Impact Assessment of Marine Dredging Proposals. Environmental Protection Authority, Western Australia, December 2016.

Water Monitoring Branch 2005, The Health of the Aquatic Environment in the



Darwin Harbour Region, 2004. Report 5/2005D. Natural Resource Management Division. Department of Natural Resources, Environment and the Arts. Darwin.

Williams D 2016, Cullen Bay Dredge Disposal Modelling, Part 1, Inshore disposal modelling results. Report prepared for the Northern Territory Government Department of Infrastructure. Australian Institute of Marine Science, Darwin.

2.1.2 Statutory Legislation

Document	Title
Commonwealth Legislation	<i>International convention for the prevention of pollution from ships 1973, as modified by the protocol of 1978 (MARPOL 73/78) (IMO)</i>
	<i>Maritime Safety (Domestic Commercial Vessels) National Law Act 2012</i>
	<i>Protection of the Sea (Prevention of Pollution from Ships) Act 1983</i>
	<i>Occupational Health and Safety (Maritime Industry) Act 1993</i>
	<i>Environmental Protections and Biodiversity Conservation Act 1999 (EPBC Act)</i>
	<i>Fisheries Act 1952</i>
	<i>Marine Act 1982</i>
	<i>National Environmental Protection Council Act (Sea Dumping) Act 1981</i>
	<i>National Environmental Protection Measures (implementation) Act 1998</i>
	<i>Port and Harbour Regulations 1966</i>
	<i>Protection of the sea (Harmful Anti-fouling systems) Act 2006</i>
COLREGS	<i>International Maritime Organisation's Convention on the International Regulation for Preventing Collisions at Sea (1972)</i>
STCW	<i>International Convention on Standards of Training, Certification, and Watch Keeping for Seafarers, 1978, as amended in 2010</i>
State Legislation	<i>Darwin Port Corporation Act 1983</i>
	<i>Territory Parks and Wildlife Conservation Act 1976</i>
	<i>Aboriginal Sacred Sites Act 1989</i>
	<i>Work Health and Safety (National Uniform Legislation) Regulations 2011</i>
	<i>Bushfires Management Act 2016</i>
	<i>Dangerous Goods Act 1998</i>
	<i>Environmental Offences and Penalties Act 1996</i>

	<i>Environment Protection Act 2019*</i>
	<i>*The Environment Protection Act 2019 replaced the Environmental Assessment Act 1982 on 28 June 2020</i>
	<i>Waste Management and Pollution Control Act 1998</i>
	<i>Water Act 1992</i>
	<i>Soil Conservation and Land Utilisation Act 1969</i>
	<i>Weeds Management Act 2001</i>
	<i>Heritage Act 2011</i>

2.1.3 Acronyms / Terms

Acronym / Term	Definition
AHD	Australian Height Datum
AMSA	Australian Maritime Safety Authority
AS	Australian Standard
CHD	Chart Datum on Hydrographic Charts
CTV	Crew Transfer Vessel
DCV	Domestic Commercial Vessels
DGPS	Differential Global Positioning System
DSDMP	Dredge and Spoil Disposal Management Plan
DOEE	Department of the Environment and Energy
DTM	Digital Terrain Model
HAT	Highest Astronomical Tide
HSE	Health, Safety, Environment
KPI	Key Performance Indicator
LAT	Lowest Astronomical Tide
m ³	Cubic meters
MBES	Multi Beam Echo Sounder
MDR	Manufacturers Data Report
MFO	Marine Fauna Observer
NT EPA	Northern Territory Environmental Protection Authority
%	Percent
PMS	Planned Maintenance System

Project	Cullen Bay Maintenance Dredging
QA	Quality Assurance
QC	Quality Control
RL	Reduced Level
SBES	Single Beam Echo Sounder
SWMS	Safe Work Method Statement
WDL	Waste Discharge License

3.0 DEFINITIONS

Term	Definition
Artificial Obstruction	Non-geological, man-made debris, fabricated materials, constructions, objects or articles encountered underwater during the dredging works that adversely affects the production of a dredge.
Dredge	Clear the bed of (a harbour, river, or other area of water) by scooping out mud with a dredge.
Dredge Spoil	Sediment removed through dredging.
Trimble	Dredge Software package.
Inspections and Test Plan	An ITP is a document which, for a process or activity, plans and describes what checks for compliance are required.
Maintenance Dredging	Maintenance Dredging is the activity of keeping existing watercourses, harbour basins etc., at the required nautical and / or hydrological depth by removing siltation.
Toe line	A toe line is the outer horizontal limit of the port declared depth of a channel, basin or berth. The toe line represents the demarcation between the declared depth and the side slope of the channel.
Volume	Refers to in situ (or 'in the ground') volume unless otherwise specified.



4.0 COMMUNITY CONSULTATION

DLI shall be responsible for community consultation as per the Project Consultation and Communication Plan (DLI, 2025). SMC Marine and the dredging contractor shall liaise closely with DLI during the consultation period and shall provide support and feedback, and revise plans as requested.

5.0 ORGANISATION & AREAS OF RESPONSIBILITY

5.1 Project Management Organisation

The following table lists the entities, and the services that they provide in the Project.

Designation	Entity	Function
Client	NT DLI	Principal (PM)
Contractor	SMC Marine	Contractor
Sub-Contractor	Maritime Constructions	Dredging
Regulator	NT EPA	Environmental Authority
Sub-contractor	TBC	Surveyor

5.2 Roles & Responsibilities

5.2.1 Project Manager (SMC)

The Project Manager is based in Darwin, Northern Territory and reports to the Northern Territory Regional Manager. The Project Manager shall:

- Have overall responsibility for the implementation of the DSDMP.
- Have overall responsibility for complying with all relevant legislation, standards and guidelines, and internal policies and procedures.
- Ensure dredging activities are conducted in a safe environment to both site personnel and the public.
- Ensure environmental management activities described within the DSDMP are completed by all relevant personnel, to the required standard.
- Report all incidents associated with the dredging works.
- Prepare and implement an environmental management plan.
- Implement and manage actions of the DSDMP.

5.2.2 HSE Manager (SMC)

The HSE Manager is based in Darwin, Northern Territory and reports to the HSE Director. The HSE Manager shall:

- Ensure Project compliance in relation to the DSDMP.
- Ensure Safety Management System (SMS) is being adhered to.
- Ensure relevant policies and procedures are effectively implemented on site.
- Provide advice to dredging crew/ site team in relation to all HSE matters.
- Provide guidelines and ensure crews are conducting works in accordance with relevant standards and understand scopes of work.
- Monitor Project performance against the DSDMP requirements and report to the Project Manager.

5.2.3 Dredging Project Manager

The Dredging Project Manager assigned to this Project is based in Adelaide, SA with periodic visits to site and reports to the Manager - Dredging & Ports. The Dredging Project Manager shall:

- Have responsibility for the implementation of the DSDMP.
- Have responsibility for complying with all relevant legislation, standards and guidelines, and internal policies and procedures.
- Ensure dredging activities are conducted in a safe environment to both site personnel and the public.
- Ensure environmental management activities described within the DSDMP are completed by all relevant personnel, to the required standard.
- Report all incidents associated with the dredging works.
- Implement the environmental management plan.
- Implement actions of the DSDMP.

5.2.4 Dredging Project Supervisor

The Dredging Supervisor assigned to this Project will be based in Darwin, Northern Territory and reports to Marine Operations Manager. The Dredging Supervisor shall:

- Review the cut plans provided by the surveyor

- Review hydrographic survey data and ensure the most efficient cut plan is in place
- Manage the day to day dredging activities
- Ensure dredging activities are executed as per the project plan and in accordance with the requirements described in the DSDMP.
- Report to the Project Manager and interface with other relevant stakeholders on environmental matters related to the project, as required by this DSDMP.
- Ensure the requirements described in this document are effectively implemented by the site team.
- Provide daily reports to the Project Manager.
- Ensure QAQC/HSE requirements and procedures are observed.
- Assess performance and suggest efficiency improvement activities. Identify risks and appropriate mitigations.
- Monitor, evaluate and control activities of subcontractors.
- Report any obstructions or impedances on the dredging works to the relevant parties.

5.2.5 Assets and Maintenance Manager

The Assets and Maintenance Manager is based in Adelaide, South Australia and reports to the General Manager – Maritime Constructions. The Assets and Maintenance Manager shall:

- Ensure the vessel has adequate and appropriate support in order to execute the works from a maintenance perspective.
- Be responsible for all technical issues in relation to NSCV, ISM and Classification Societies.
- Provide adequate spare parts to the vessel and critical spares.
- Manage the vessels planned maintenance system and ensure all work orders are executed.
- Ensure all reported maintenance defects are managed and rectified as soon as possible.
- Ensure maintenance defects that pose an environmental risk are prioritized and rectified as a matter of urgency.

5.2.6 Head of People, Culture & Safety

The Head of People is based in Adelaide and reports to General Manager – Maritime Constructions. The HR/IR Manager shall ensure:

- Necessary compliance checks are conducted to confirm that all selected crew members deployed to Project vessels comply with the Subcontractor fitness for work medical standards and adhere to the Drug & Alcohol Policy and standards.
- Ensure project personnel have undertaken inductions and training concerning environmental management aspects relating to the Project.
- If required, organise additional training to ensure personnel are adequately aware of and equipped to deal with the environmental management risks.

The risks of personnel who are fresh to the industry; unfamiliar with the specific type of vessel; the type of work; and Project requirements are managed under the Short Service Employee program.

5.2.7 Logistics Support

Subcontractor Logistics Support is based in Adelaide, South Australia and assists the Project Supervisor and Project Manager. Logistics Support shall:

- Ensure all purchased items for Project vessels are tracked and all key personnel at site are kept advised of logistics and delivery status.
- Ensure any hazardous materials ordered have been duly considered in the development of this DSDMP, and do not pose any new or significant risk to the environment.
- Verify that all purchased items have been receipted and inspected as appropriate prior to delivery to vessels.
- Ensure timely delivery of goods and services to Project deployed vessels.

5.2.8 Dredging Contractor Personnel

The Dredge Contractor shall maintain compliance with contract policies and procedures and ensure that all crew and 3rd Party personnel adhere strictly with the Project standards and expectations. The dredging contractor shall:

- Interface with the assigned Dredging Supervisor and Contractor

Representatives to ensure all safety and security reporting expectations are fulfilled.

- Report all incidents as required by Contractor Incident Reporting procedures.
- Follow cut plans at all times and advise the dredge supervisor on the performance of the cut.
- Move and position the dredge and guide the supporting work vessel on location of anchors.
- Manage and maintain the dredge in accordance with the PMS & SMS.
- Ensure safe navigation of the dredge and statutory regulations are followed at all times.
- Ensure the safety of the crew and all personnel on site.
- Raise any issues of defects with the relevant persons.

5.2.9 Crew

All crew shall conform to contractor policies, procedures and the requirements described in this DSDMP, and actively participate in all aspects of safety operations on-board and throughout the Project. Crew shall also engage in Project processes and reporting requirements as defined in Project Documentation.

5.3 Personnel Competency & Training

The selection of crew on this Project is determined as appropriate to the type of vessel; core competencies for the specified vessel; knowledge in the immediate area of operation; experience in the selected position; and their past HSE performance record. Additional training is identified through a training needs analysis in conjunction with any other Contractor Project requirements. A training profile is developed from the agreed Training Matrix.

5.3.1 Crew Competency & Training Profile

All crew are selected to meet compliance requirements as defined within Subcontractor vessel specific 'Competency & Training Profile' designed to identify all positions on-board and the respective core competencies and other training requirements necessary for each vessel.



5.3.2 Induction & In-House Training

All crew must complete the Subcontractor Induction and other In-House Training and competency as determined by the Dredging Project Manager and Dredging Project Supervisor in crew selection.

5.3.3 Vessel HSE Induction

All crew, contractors and visitors shall be inducted on board in compliance with the Vessel SMS.

5.3.4 Project Inductions & Additional Training

SMC Marine shall confer with the NT Government to identify other additional training requirements for the Project.

All crew and assigned Project specific personnel shall be provided with suitable Project Familiarisation Training as defined by Contractor. A Project Training Matrix shall be provided outlining specific Induction and Training requirements.

All Project Inductions and additional training necessary for the Project will be tracked and managed in an Online Management Database.

The Dredging Supervisor shall sight the original certificates of competency or rating, and any other training qualifications and/or licenses specific to the requirements of each position onboard and record relevant crew competency, training and induction details.

6.0 DREDGING WORKS

6.1 Key Elements to the Cullen Bay Maintenance Dredging Project

Component	Description
Design Depth	Design between CH0 – 240 RL--3.0 Design between CH240 – 400 RL--3.5
Total Volume to be dredged to meet design depth	Approximately 85,000 m ³ measured in situ
Over Dredging Tolerance	Nil
Disposal of Dredged Material	Disposal via semi submerged discharge line
Dredged Material Type	Material type is found to be a fine silty material

6.2 Area to Be Dredged

The Area to be dredged as detailed in Appendix 1, which sets out volumes and design levels.

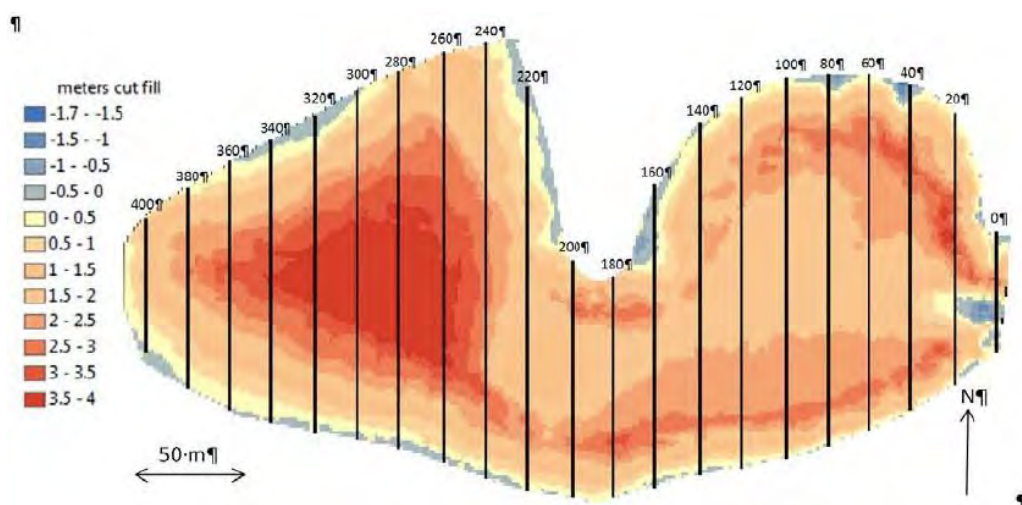


Figure 2 - Graphical Representation of Material.

6.3 Dredging Methodology Overview

All dredging is to be undertaken by Cutter Suction Dredge (CSD) “Ngurunderi” using a three anchor mooring spread, which is capable of achieving the design dredge depths and the required pumping capacity. CSD’s are often used for deepening and widening channels, maintaining navigation channels, beach nourishment, and creating new ports or berths. They can operate in a variety of water depths and sediment types.

It is envisaged that dredging will be undertaken to a depth of -3.0 m to -3.5 m RL, with the materials to be dredged reportedly consisting of silty loam to silty clay loam.

The side slopes of the dredged area will be cut using the 'box cut' method. The vessel will swing from port to starboard, utilising swing winches. The dredge will be anchored by 2 x forward anchors and stern anchor. Two multipurpose work vessels will also be on site to assist the CSD and discharge pontoon with anchor movements and positioning.

All dredged material shall be pumped by the CSD and booster if required, through a discharge line to a floating pontoon, into a diffuser located at the disposal location. Sufficient hard point anchoring will be deployed to the shoreline to keep the semi-submerged pipeline in position, with the location of these to be marked with yellow buoys and marker lights. Details of the pipeline are referenced in section 7.0 Pipelines.

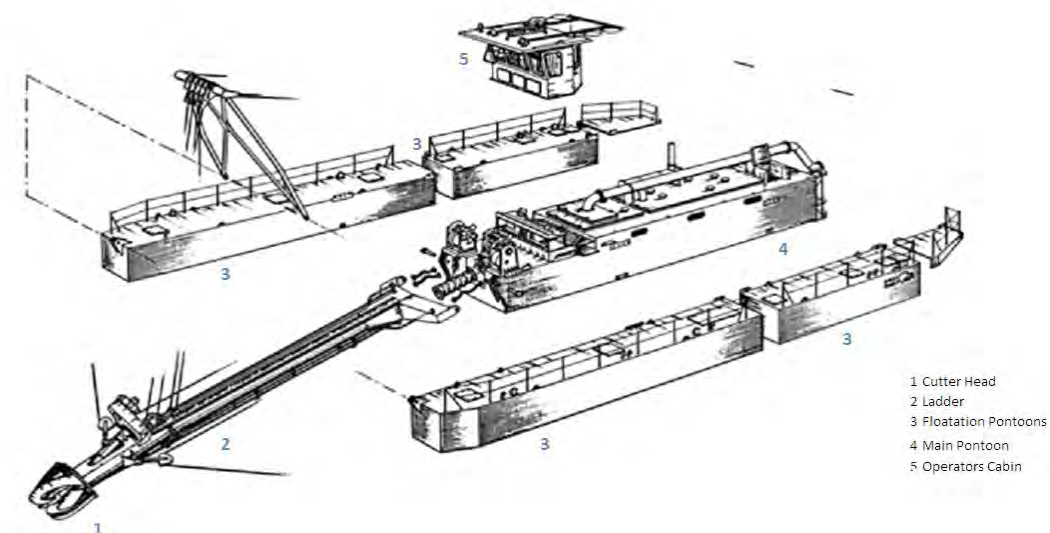


Figure 3 - General Layout of CSD.

6.3.1 Cutting Methodology

The sand is loosened by rotating a cutter head (the "cutter"). The cutter head, which is hydraulically driven, encloses the suction intake of a centrifugal (dredge) pump. The cutter head is mounted at the extremity of a fabricated steel structure (the 'ladder'), which is attached to the main hull by heavy hinges, enabling rotation in the vertical plane. The ladder assembly is lowered and raised by means of the ladder winch controlled from the operator's cabin. During the dredging activities, the CSD swings pivoting from the stern anchor using its side winches and anchors.

The anchors to achieve this movement will be placed such as to minimise

intermediate relocation of dredge material. The total area which a dredge can cover without re-locating its anchors is called the “cut”. Depending on the width and length of the dredge area, several “cuts” might be needed. Each “cut” will then have an overlap with another cut to cover the entire dredge area.

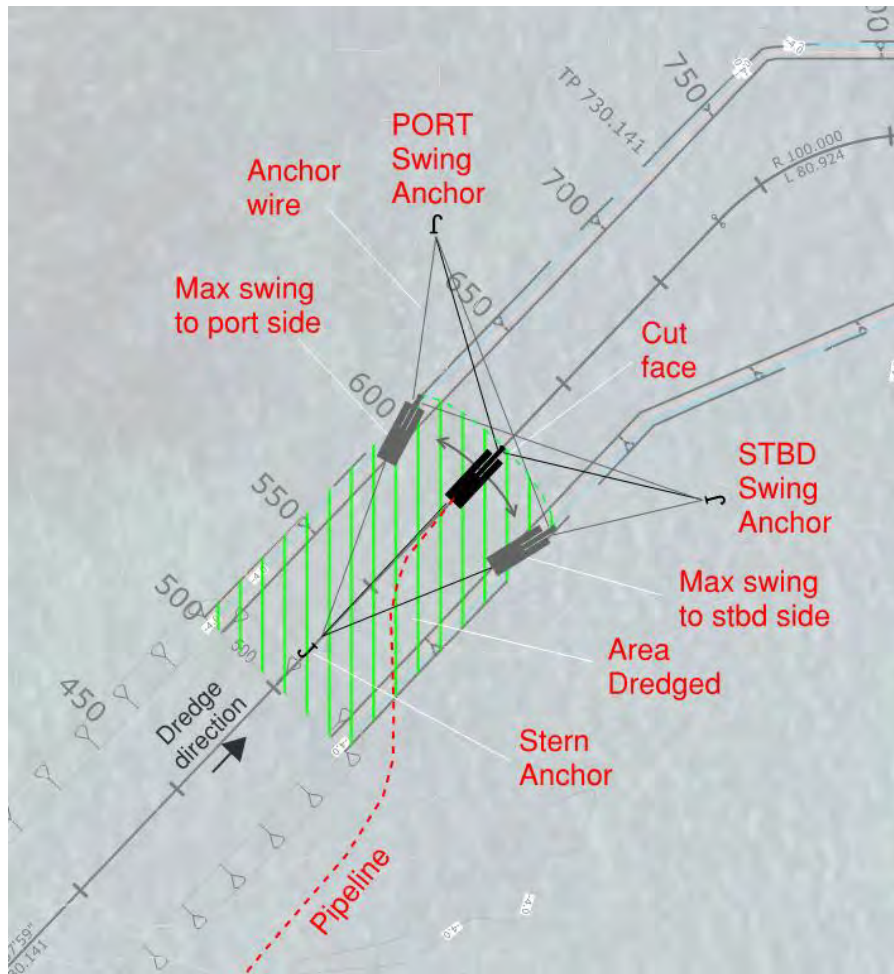


Figure 4 - Working Method of a stern anchored CSD.

6.3.2 Dredging Plan

The Harbour entrance will be cut, sweeping from the centreline bow facing North West. Higher volumes will be encountered on CH. 133 to Ch. 00 due to the open exposed area which has limited obstructions. Cutting to the port side the dredge will cut to the toe line of the batter. As swing distance is reached the dredge will be then relocated on a new centreline.

A cut plan will be developed from the Pre-dredge survey, this will indicate the run lines and quantities imposed through those areas.



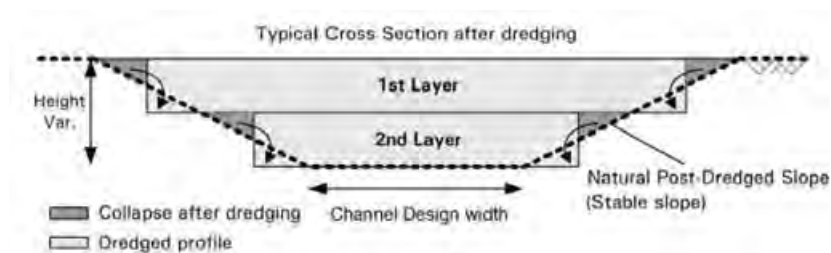
Cut plan example

6.3.3 Dredging around or near obstructions

When dredging around sensitive infrastructure, the swing speed will be reduced to ensure the dredging is controlled. The dredge will have a GPS model update highlighting existing infrastructure. Dredging around these sensitive areas will take increased time and it is assumed the cubic meters per hour will reduce.

6.3.4 Dredging of batters

Dredging of sloped batters is best achieved using the box cut method whereby the CSD cuts horizontally beyond the tow line and allows for natural collapse of the adjacent sediment. This is a cost effective method that avoids low production precision dredging by continuous ladder adjustment up and down a batter slope.



Box cut method

6.4 Proposed Works Schedule

Dredging operations will be conducted twenty-four (24) hours per day, seven (7) days per week Monday to Sunday.

Industry standard for dredging operations is based on 65% utilisation over a 12

hours/day, the proposed throughput dredging time is 24hrs:

The proposed dredging time frame for the proposed works is as follows –

- Installation of Pipeline – 5 days
- Maintenance Dredging – 90 days of dredging
- De-mobilisation – 5 days

Schedule of Works

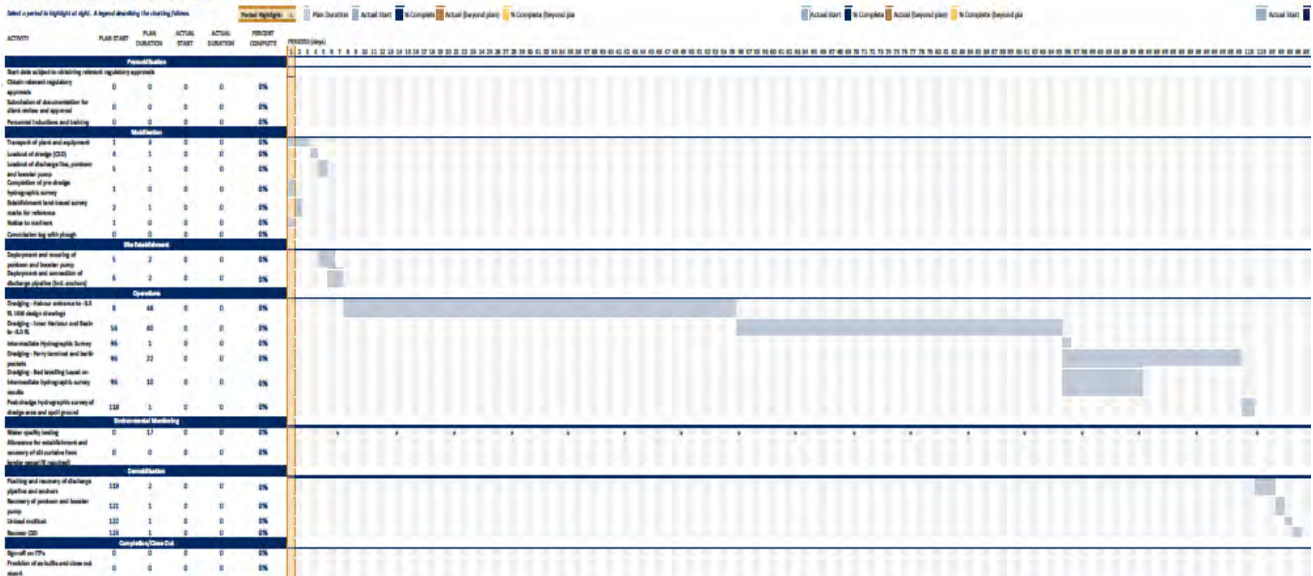


Figure 5 - Schedule of Works.

6.5 Offshore Spoil Disposal

The location of the discharge ground is -12.452432°, 130.812221°. The spoil ground has been investigated as an area of sufficient size to discharge the entire volume up to 85,000m³. These waters are within Port Limits, in a depth of -12m LAT and is clear of existing anchorages and shipping lanes. **Figure 6** displays the route to the proposed disposal location.

Disposal will be through a 6m flexi-pipe that is tensioned at a 45° angle downwards, targeting the slope at 12m depth, leading into 16m depth. The diffuser will be placed within a 100m disposal transect where it will be adjusted if any sedimentation is occurring.

PAGE 27 OF 88

6.6 Dredge Software

The CSD will operate with Trimble Marine Construction software, Trimble is designed for hydrographic mapping and the visualisation of submerged marine structures. The cut plan inside of Trimble will utilise pre-dredge survey data as a baseline, allowing the dredge operator to monitor the exact position, depth and angle of the active cut.

The dredge software also has remote access availability to ensure the surveyor and technical support can log into the dredge computer to ensure the most accurate and up to date information is available.

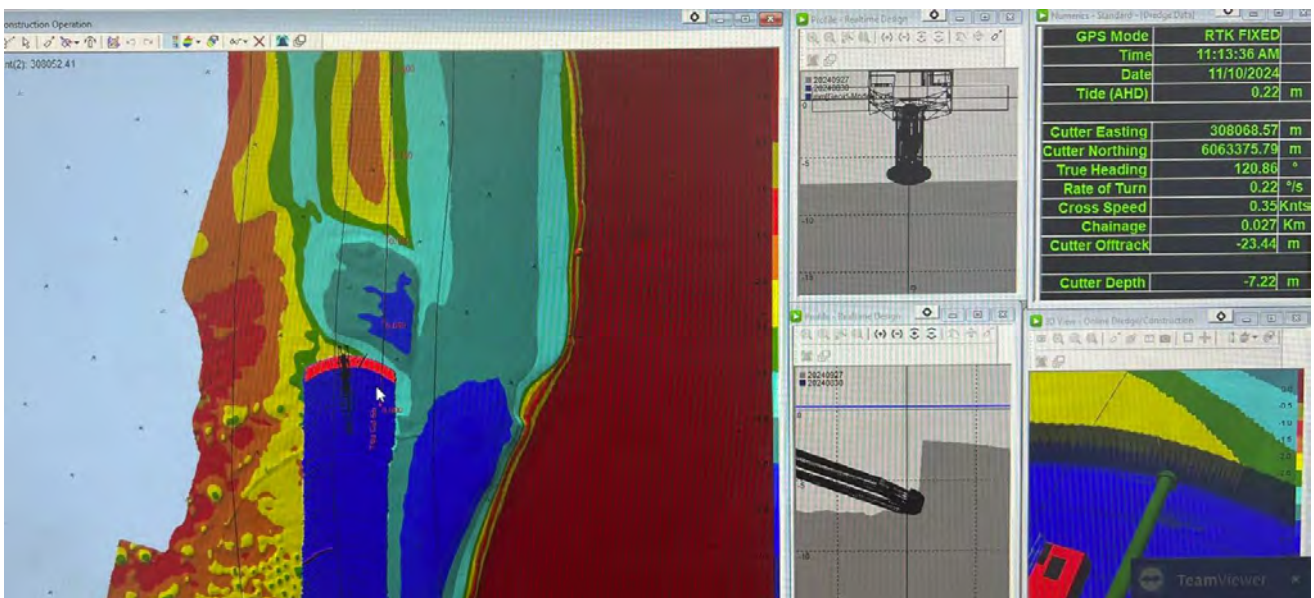
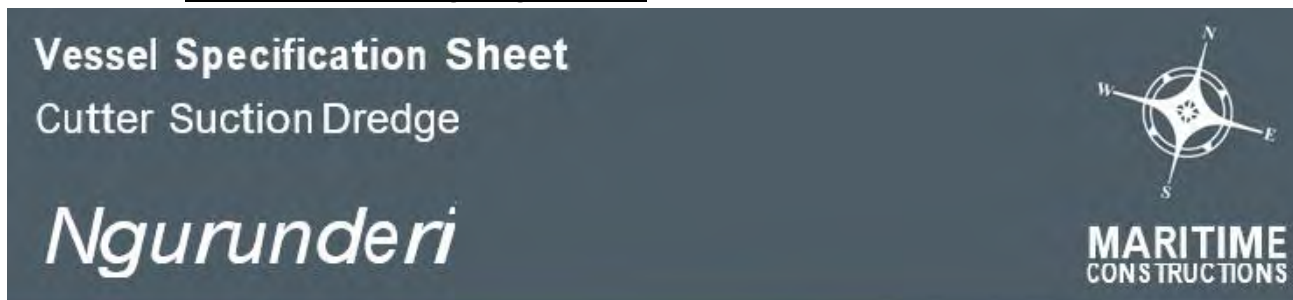


Figure 8 - Trimble Screenshot of Operating Dredge.

7.0 RESOURCES

7.1 Cutter Suction Dredge (Ngurunderi)



Dimensions		Particulars	
Length (m)	24.5*	Type	Cutter Suction Dredge
Beam (m)	6	Builder	Maritime Constructions
Depth (m)	1.38	Vessel ID	442380
Draft (m)	1.1	Survey	2D
Dredge and Engine Installation		Capacities	
Dredge pump type	10/8WARMAN	Crew numbers	4
Discharge diameter	315mm	Passengers	N/A
Cutter type	Rosebud / Jaden	DWT (t)	N/A
Cutter power	45kW	Fuel Oil (L)	18,000L
Dredge pump engine	Caterpillar 3412C	Water (L)	N/A
Continuous Power	403kW	Hydraulic Oil (L)	
Dredging Features			
Max. dredging depth	-10m or -18m w/- exten.	Flow rate	900 m ³ /h
Swing Width	60.0m	Spud/Winches	3 point hydraulic winches

*with extension pontoons

7.2 Anchor Barge (Kenny)

Vessel | Specification Sheet

Anchor Barge

'Kenny'



Maritime
Constructions



Dimensions		Particulars	
Length (m)	9	Type	Anchor/Fuel Barge
Beam (m)	3.5	Date Built	-
Depth (m)	1	Vessel ID	458128
Draft (m)	0.5	Survey	Class 2D
Engines		Capacities	
Type (Main)	2x Outboard	Crew numbers	2
Make	Yamaha	Passengers	-
Power	115Hp	DWT (t)	23
Hydraulic Engine	-	Fuel Oil (L)	-
Make	-	Water (L)	-
		Diesel Fuel (L)	1100
Deck Gear			
Crane	2T A-Frame	Lifting Winch (t)	1.9

During the entire works the multi-purpose work boat will be on site alongside the CSD to assist in: Crew Transfers, Bunkering and Provisions, Anchor handling support and Pipeline movements.

7.3 Anchor Barge (Curtin)

Vessel Specification Sheet

Anchor Barge

'Curtin'



MARITIME
CONSTRUCTIONS



Dimensions		Particulars	
Length (m)	9	Type	Anchor/Fuel Barge
Beam (m)	3.5	Date Built	-
Depth (m)	1.1	Vessel ID	463432
Draft (m)	0.5	Survey	Class 2D
Engines		Capacities	
Type (Main)	2x Outboard	Crew numbers	2
Make	Yamaha	Passengers	-
Power	115Hp	DWT (t)	7.7
Hydraulic Engine	-	Fuel Oil (L)	-
Make	-	Water (L)	-
		Diesel Fuel (L)	1000
Deck Gear			
Crane	2T A-Frame	Lifting Winch (t)	1.9

During the entire works the multi-purpose work boat will be on site alongside the CSD to assist in: Crew Transfers, Bunkering and Provisions, Anchor handling support and Pipeline movements.



7.4 Survey Vessel

Pre-Dredging works, the survey vessel will be deployed for approximately 1-2 days to carry out bathymetry survey as per section 9. Post-dredging works, the survey vessel will be redeployed for another 2 days following completion of the dredging program.

8.0 PIPELINES

With the approval of the Harbour Master, the discharge pipeline (DN 315mm HDPE pipe) will be established along a pre-approved path (indicative path provided in **Figure 6** section 6.5). Anchors will be attached to the pipeline along its entire length.

The pipeline will be assembled at Cullen Bay beach (approximately 250m NW of dredge site), into strings of 300m in length. Once multiple strings of pipeline have been full assembled, the pipeline will be deployed using the excavator to feed it to the tenders and then floated during calm sea states and connected to the rear of the dredge. Subsequent strings will be deployed and connected on the beach progressively whilst the dredge is positioned further away to allow for a controlled launch of pipeline. Once a satisfactory length of pipeline is connected, the pipeline will be kept buoyant with raw water and air, allowing for the positioning of the pipe over the land based sections during a high tide event and anchored in shallow water.

Channel crossing will need to be coordinated outside of ferry movements and submerged and anchored either side. Depending on tidal conditions and sequencing the discharge pontoon will be connected to the pipeline during the next slack water event.

Once secure, additional 500kg and 1000kg anchors will be connected in series to ensure submerged pipeline is fixed in location. Once fully assembled and secured with anchors, raw water will be pumped through, causing the pipeline to progressively submerge. Additional lengths of pipe will be connected to the back of the dredge to extend reach of the CSD within the cut plan and reduced in length to keep pumping distance to a minimum.

Special Markers (nighttime flashing) will be attached to the pipeline where necessary and appropriate, to indicate its presence to mariners in low light or nighttime conditions. A notice to mariners will be issued prior to establishment of the discharge pipeline and updates provided any time the line is moved/repositioned.

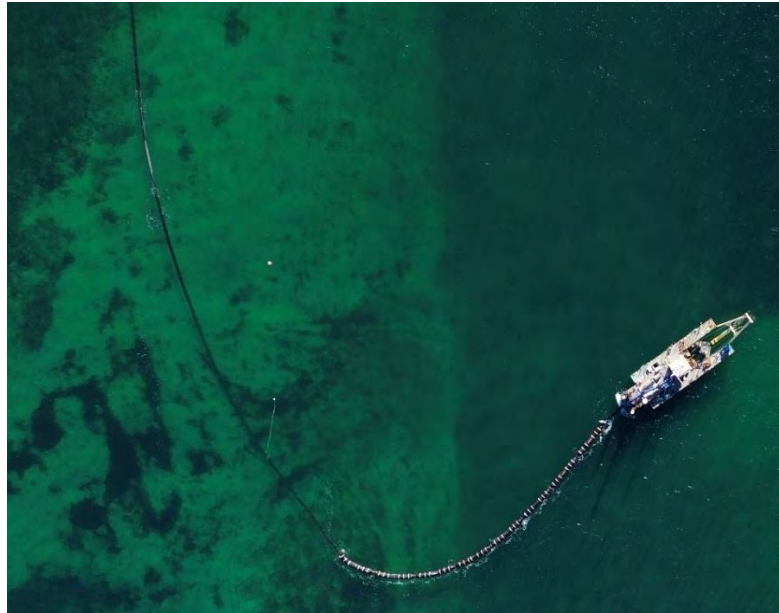


Figure 9 - Pipeline behind CSD.

9.0 SURVEY AND SURVEY CONTROLS

9.1 Survey Overview

Survey works are to be undertaken in accordance with:

- Ports and Survey Principles – Version 1.5 (Nov);
- IHO SP 44 5th Edition;
- Survey specifications as outlined in Scope of Works; and
- Darwin Port Corporation.

A pre-dredge survey shall be carried out with the area to be surveyed to extend to a distance not less than twenty-five (25) metres beyond the extent of the top of the slopes or toe lines where physically practicable for the survey vessel to access. The pre-dredge survey will also cover the entire dredge footprint, as outlined in Appendix 1 Doc. Ref R16-4599-Works extents and chainages.

The post-dredge clearance survey shall be carried out over the same area as the pre-dredge survey. Survey lines shall be such as to give 100% bottom coverage and 100% overlap. Long lines shall also be run along the toe lines in addition to the cross lines.

9.2 Accuracy of Surveys

The accuracy of Surveys shall be as follows.

9.2.1 Vertical Budget

The sum of the verified and/or certified accuracy of all survey information used for determining the depth measured by hydrographic surveys shall be less than or equal to 0.10 metres (m) at a 95% confidence level.

9.2.2 Horizontal Budget

The sum of the verified and or certified accuracy of all survey instruments used for determining the horizontal position of depths measured by hydrographic surveys shall be less than or equal to 1.50 metres at a 95% Confidence Level.

9.2.3 Total propagated error for hydrographic surveys

The accuracy of hydrographic surveys in the horizontal plane and vertical plane shall be 0.200 meter and 0.050 meter respectively.

In all cases above, an error budget analysis shall be prepared prior to acceptance of the survey spread. Any changes/replacement of equipment procedure will require analysis of errors and the updated/new error budget to be produced prior to acceptance of the modified survey spread.

Any expected error budget should be produced prior to mobilisation in an attempt to avoid delays in acceptance of the mobilized survey spread.

9.2.4 Measurement and registration of tidal levels

The accuracy of measurement of tidal observations including timing errors shall be ± 0.005 metres at a 95% Confidence Level.

9.2.5 Depth Measurements

Depth measurement shall be carried out utilising a high quality hydrographic Single Beam Echo Sounder (SBES), Multi-Beam Echo Sounder (MBES) or a Swath Echo Sounder (SES) in combination with a SBES.

The echo sounder transducer shall be located in the survey vessel's hull and be located as close as possible to the neutral point of the pitch and roll axis of the vessel.

Compensation for vessel motion shall be applied to soundings by a heave compensator or motion reference unit (MRU) except during echo sounder calibration bar checks. The heave compensator shall be positioned to minimise motion offsets (lever arm effects) in relation to the position of the SBES and MBES transducers.

Compensated depth data shall be acquired digitally, logged and computer processed. The echo sounder analogue records are original data records and are to be unambiguously annotated for each survey line with run line number, time, speed of sound and fix numbers.

10.0 WHS REQUIREMENTS

A Project specific Work, Health and Safety (WHS) Management Plan has been developed, which describes how the Project Team will address HSE matters during each stage of the Cullen Bay Maintenance Dredging Project lifecycle.

The WHS complies with SMC Marine's Health, Safety, Environment and Quality (HSEQ) management system. A full description of SMC's HSEQ management system is contained in the SMC HSEQ Manual.

The manual follows the AS/NZS ISO 45001 format and has recently had Federal Safety Commissioner (FSC) Audit Criteria requirements added.

The system and its implementation are audited annually by SMC, as well as external auditors in order to achieve WHS, Environment and Quality Certification, which SMC has maintained since 2015 in accordance with:

- AS/NZS ISO 45001:2018 - Occupational Health & Safety Management Systems;
- AS/NZS ISO 14001:2016 - Environmental Management Systems; and
- ISO 9001:2015 - Quality Management Systems.

The SMC HSEQ Manual provides comprehensive processes and procedures employed to effectively manage HSE related risks across the business. The manual is referenced extensively throughout the WHS Management Plan, along with several other key management documents.

Items covered comprehensively in the HSEQ Manual include, but are not limited to, the following:

- HSE Objectives
- Leadership & Accountability
- People Management
- Risk Management
- Health & Safety Planning and Performance
- Emergency & Incident Management (incl. spill response)
- Management of Change (MOC)
- Continuous Improvement
- Subcontractor & Supplier Management
- Information Management & Security

The WHS Management Plan will be subject to review prior to mobilisation to ensure all aspect of HSE are sufficiently addressed to the satisfaction of relevant stakeholders. It should be noted

that the WHS Management Plan is a “living” document which can and should change throughout the project, to ensure the detail contained therein remains up to date, relevant, and practical.

10.1 Off-Site Management

The Project Manager (PM) is ultimately responsible for the implementation of the WHS Management Plan, the successful delivery of the scope of the works in accordance with the schedule, and the QHSE performance of the project.

The PM is supported by several dedicated staff and can draw on the expertise of any employee within the company if needed, with the full support of the SMC Marine Directors and SMC Marine’s Head Office.

Resources dedicated to the scope will include:

- Project Manager (1)
- Superintendent (1)
- HSE Manager (1)
- Administration (1)

Other areas/resources that will support the scope indirectly/directly and as needed, include:

- Technical & Engineering
- Procurement
- HR/IR & Payroll
- Commercial

10.2 On-site Management

Site-based personnel will not need to operate remotely or independently of the off-site management team and will have all the support required to successfully achieve all project deliverables. The Superintendent and the HSE Manager will spend a significant percentage of their time on-site monitoring quality, providing technical support and guidance, and ensuring that the scope is executed safely, and that the relevant plans and procedures are effectively implemented.

Whilst the Project Manager holds ultimate responsibility for the project, the Superintendent will be the designated POC on-site.

The SMC HSEQ Manual includes an audit schedule which prescribes the frequency of mandatory management site visits.

11.0 ENVIRONMENTAL MANAGEMENT AND IMPLEMENTATION

Any and all environmental risks posed by dredging operations shall be effectively managed to mitigate potential harm to the environment. Based on the description of the dredging activities provided in previous sections, and the description of the existing receiving environment as presented in the Marine Environmental Impact Assessment Report - Cullen Bay Maintenance Dredging (Australasian Marine Associates [AMA], 2025), three key environmental risks have been identified for further consideration and impact assessment:

- Water quality
- Protected marine fauna
- Sediment quality, including actual and potential acid sulfate soils (AASS/PASS).

Each of these factors is considered in the following sections, where further discussion of the existing state of the environment with respect to each factor, potential environmental impacts, management measures, monitoring and reporting processes are provided.

Other environmental risks, including but not limited to, invasive marine species, weed translocation, and waste management are also duly considered.

The following sections present Environmental Management Frameworks (EMFs) that are instrumental to effectively manage and mitigate environmental risks to the sensitive receptors identified in each section.

Each EMF contains specific, measurable targets to achieve the objectives of managing the risk. It also summarises the management actions required to meet these targets, the relevant KPIs and the monitoring activities to be employed to measure success in meeting the requirements and to identify the need for corrective actions.

It should be noted that:

- Management actions are routine tasks that will be undertaken to meet the objectives of each EMF.
- Corrective actions are those tasks that are possible to be undertaken if monitoring indicates that trigger levels have been exceeded.

Where trigger levels are proposed, it should be noted that these are triggers for further investigation and are set well below levels at which significant adverse ecological effects could be anticipated. Each EMF also indicates the relevant monitoring reporting requirements (also detailed in following sections) and the responsibilities of project personnel.



11.1 Permits & Approvals

Various licenses, permits and approvals are required prior to commencement of dredging operations. These will be obtained by DLI and *may* include:

- Waste Discharge License (WDL)
- Development Permit
- AAPA Certificate
- Harbour Master Approval
- NTG (various agencies) approval of this DSDMP

12.0 WATER QUALITY

12.1 Existing Environment

The existing marine environment in the vicinity of the dredging and spoil disposal operation ('the Project'), including water quality, is summarised in the Marine Environmental Impact Assessment Report (EIAR) (AMA, 2025). Recent descriptions of the broader marine environment within Darwin Harbour are presented in Cullen Bay Maintenance Dredging Marine Environmental Monitoring Program - Technical Note/Memo (AMA, 2025). Those aspects of the existing environment that are of greatest relevance to the management of the dredging works are described within the relevant sections below.

12.2 Water Quality

12.2.1 Background

Darwin Harbour is a naturally turbid environment. The key processes that control the level of turbidity in Darwin Harbour include resuspension, transport and settling of sediment, which are caused by waves and tidal currents near the seabed. Turbidity varies over the spring-neap cycle, with the maximum daily-averaged turbidity coinciding closely with spring tides and the minimum coinciding with neap tides. Without the influence of episodic events and rainfall, the spring-neap cycle explained approximately 80% of the measured daily average turbidity in Darwin Harbour (Cardno, 2015a).

Turbidity remains the primary indicator for informing the potential impacts associated with dredging and spoil disposal activities at Cullen Bay. The tolerance of benthic communities to turbidity arising from the project has been previously assessed by AECOM (2017) as part of a previous maintenance dredging program at Cullen Bay.

12.2.2 Baseline Data

Although much time has lapsed since the INPEX Ichthys project, the most robust dataset from which naturally occurring turbidity levels can be derived remains the INPEX water quality monitoring program (URS, 2011). More specifically, the Weed Reef dataset (URS, 2011) is most relevant and applicable to the benthic communities in the vicinity of the Project as the monitoring site is located 5 km to the southwest of Cullen Bay, noting that background turbidity levels may be higher in areas to the north of the spoil discharge point (including Fannie Bay and East Point) than at Weed Reef (Fortune, 2015).

Table 1- Turbidity and SSC Data, Weed Reef (URS, 2011)

	Wet Season			Dry Season		
	Median	95 th percentile	Maximum	Median	95 th percentile	Maximum
Turbidity (NTU)	6.8	61.5	145.2	3.8	12.3	28.9
SSC (mg/L)*	12.5	63.1	140.5	9.7	17.6	33.0

* Calculated from NTU using relationship in URS (2011): $SSC = 0.9254 * NTU + 6.2053$

More recent turbidity and SSC data is also provided from the Ship Lift EIS (AECOM 2021) for comparison noting that only 2 months of turbidity data was collected and which also relies on the long term dataset collected by URS (2011) from South Shell Island.

For the 2 months of monitoring (for the Ship Lift EIS), average daily turbidity value ranged between 2 and 19.5 NTU across the whole deployment. NTU and SSC were highest during spring tidal periods when water movements were greatest. Notably daily PAR readings were highest during spring tides despite turbidity levels being at their greatest. This is because of the large tidal range and the very shallow water depths during low spring tide (as low as 1.9 m depth).

12.2.3 Tolerance Limits for biological communities

The tolerance limits for biological communities at Weed Reef derived by INPEX (2011) were adopted to determine zones of potential impact by the Project-induced excess turbidity. The original SSC tolerance limits for the Final EIS (INPEX 2010, 2011) were derived from a one-year (2010 to 2011) baseline turbidity dataset collected for the EIS Supplement (INPEX 2011). The data was collected from four monitoring sites inside Darwin Harbour, i.e. East Arm (South Shell Island and Northeast Wickham Point), Middle Arm (Channel Island) and Mid Harbour (Weed Reef).

For the maintenance DSDMP (refer to INPEX 2022), the SSC tolerance limits were further refined for coral and seagrass in consideration of the comprehensive water quality dataset collected as part of the NEMP (2012 to 2015) and baseline data (2010 to 2011) collected for the EIS Supplement (INPEX, 2011). For conservatism, turbidity data collected at South Shell Island and Northeast Wickham Point (in proximity to the dredge area) during the capital dredging activities were removed from the analysis, in addition to any turbidity data collected at sites further afield that were influenced by suspended sediment from dredging. This was irrespective of whether or not a corresponding impact to the receiving sensitive receptor was measured.

The region most relevant to Cullen Bay and the disposal area is Middle Harbour. The habitat of most relevance to the current dredging campaign is seagrass.

Table 2- Tolerance limits for excess SSC (adapted from INPEX, 2022)

Habitat	Location	Season	Capital Dredging	Current Analysis
			SSC (mg/L)	SSC (mg/L)
Corals	East Arm	Dry	10.5	11.9
		Wet	25.2	23.8
	Middle Arm	Dry	17.3	12.4
		Wet	32.6	27.0
	Mid Harbour	Dry	7.9	10.7
		Wet	50.6	28.4
	Offshore	Dry	10.5	17.9
		Wet	25.2	64.2
Seagrass	All Locations	Dry	12.8	13.3
		Wet	51.7	60.6

Note: turbidity (NTU) has been converted to SSC (mg/L) based on a 1:1 relationship that was found during capital dredging program (after Cardno 2013a).

12.2.4 Modelled Impact Zones, Dry Season Dredge

As summarised by Port and Coastal Solutions (2025), the main findings from the sediment plume modelling are as follows:

- the plume was predominantly due to the release of the sediment at the discharge point rather than due to the disturbance of the sediment due to the dredging activity. The sediment suspended by the dredge activity in the Outer Marina at Cullen Bay appeared to predominantly remain localised in that area;
- the plume was predicted to extend to the north-northwest and southeast of the discharge point;
- short duration peaks in Suspended Sediment Concentration (SSC) were predicted to occur followed by periods with low SSC. This was shown by the 50th percentile SSC being significantly smaller in spatial extent and of a lower concentration relative to the 95th percentile SSC. The results therefore highlight that the plume from the maintenance dredging was transient and does not result in a prolonged continuous elevated SSC;
- the modelling predicted that the SSC at Mandorah and Woods Inlet resulting from the maintenance dredging will be low, with a 95th percentile SSC of less than 0.5 mg/L at the two sites;
- the highest sedimentation (thickness of > 0.1 m and rate of > 20 mg/cm² /day) was predicted to occur at the discharge point and within the dredge

footprint, while sedimentation thickness and rates were predicted to be relatively low (thickness of < 0.01 m and rate of < 4 mg/cm² /day) away from the discharge point and dredge footprint; and

- the extent of the sedimentation was predicted to differ to the extent of the SSC plume, with limited sedimentation predicted within the main plume extending from the discharge point. This is due to the strong tidal currents which occur in the channel where the discharge point is located, limiting any sedimentation from occurring.

As the previous monitoring (AECOM, 2017) for the Cullen Bay maintenance dredging program focused on direct monitoring around the discharge point to validate the AIMS plume dispersion model (Williams, 2016), there is a good understanding of the plume dispersion characteristics associated with disposal at the historical disposal location.

12.3 Sensitive Receptor Monitoring

12.3.1 Turbidity Monitoring

The proposed monitoring program is based on the approach outlined in INPEX (2022) and Santos (2023). In the absence of light-based trigger values (which are currently under development for Darwin Harbour), turbidity will be used as the lead water quality indicator to manage dredging operations. Intensive (in situ) sensitive receptor monitoring is not recommended as the dredging program is relatively small in relation to dredge volume and dredge duration. Water quality monitoring is proposed adjacent to key sensitive receptor sites (i.e. coral and seagrass) rather than adjacent to the dredging and disposal activities which are typically used to validate the plume modelling. Validation of plume modelling was undertaken during the previous maintenance dredging program (Greencap, 2018). The focus of the current program is to maintain SSCs below the tolerance limits for turbidity-sensitive benthic communities at specific locations within Darwin Harbour.

Considering the reduced scale and nature of the proposed dredging, a mobile water quality monitoring program is proposed rather than a fixed program. No sedimentation monitoring is proposed as the modelling indicates no net sedimentation greater than 0.25 mm anywhere within the harbour.

The following monitoring sites are recommended based on the location of the sensitive receptor locations and assessment of the spread of the modelled sediment plume. Monitoring sites are recommended at:

- Fannie Bay
- Mandorah

- Woods Inlet

Three (3) additional sites for plume extent and behaviour analysis purposes, noting that any trigger values / compliance approach will not apply at these locations and they for information purposes only.

SMC/MC may seek out additional data points ad hoc to better understand unexpected plume scenarios during isolated events to drive improved knowledge of environmental related impacts or risks and response measures.

SMC/MC will also collect drone imagery to help interpret plume status if necessary. Collection of drone photography is at the discretion of SMC/MC and is subject to weather and other variables out of our control.

Turbidity monitoring will be undertaken daily for the duration of dredge spoil discharge. At each location, turbidity will be measured through the entire water column and the mean (i.e. depth averaged) turbidity calculated. Where possible, sampling should be completed within 2 hours either side of the high tide.

If dredging is undertaken during the Dry Season (May to October), then dredging-related turbidity at the monitoring sites will need to be maintained below the trigger values in **Table 3**.

Level 1 and Level 2 turbidity triggers were developed from daily average turbidity and are comprised of a turbidity value and allowable duration that both need to be exceeded for an exceedance to occur. Level 1 trigger turbidity values are the 95th percentile of the daily average turbidity data recorded (Santos, 2023). The allowable duration was then developed by reviewing the dataset to determine the number of consecutive days the turbidity values were exceeded, collectively known as individual event.

The 95th percentile for individual events was then identified as the allowable duration. Therefore, providing the allowable number of consecutive days the turbidity value can be exceeded. Level 2 trigger turbidity and allowable duration values were developed using the same method as Level 1 triggers, except the turbidity values are represented by the 99th percentile of daily average turbidity data (Santos, 2023).

A management trigger exceedance will only require action where the attributability assessment indicates that dredging activities have contributed to or caused each daily exceedance of the intensity value.

When a trigger is exceeded, the initial response is to investigate the cause of the exceedance and whether or not it can be attributed to dredging and/or spoil disposal activities. The first step is to determine whether or not the data is reliable. If the trigger is a false trigger resulting from data quality issues (e.g. fouling on the sensor),

then no action is required. However, to reduce the potential for future false triggers, an investigation into possible improvements in data collection and quality assurance will be undertaken. Where the data are considered reliable, the next step in the attributability assessment is to investigate multiple lines of evidence to determine the cause of the exceedance as per ANZG (2018) recommendations. Information considered in the investigation may include:

- recent weather and oceanographic conditions (e.g. tidal phase, wind speed and direction, significant wave height, rainfall and river discharge data), to determine if the exceedance is due to natural background variability.
- site specific water quality data from reactive and informative sites (e.g. turbidity, temperature, light, etc.)
- location of dredging and spoil disposal activities relative to the monitoring site recording the exceedance (e.g. are sentinel sites recording a deterioration in water quality?).
- nature of recent dredging activities in relation to the onset of the exceedance.

The following turbidity management criteria are recommended for implementation. The criteria are site specific and designed to protect key sensitive receptors in Darwin Harbour.

Table 3 - Level 1 and 2 turbidity management trigger criteria for ecological monitoring sites

Site	Season	Level 1 Trigger (daily average)			Level 2 Trigger (daily average)		
		Intensity (95 th Percentile)	Duration (consecutive days)	Frequency (days per 7 day rolling period)	Intensity (95 th Percentile)	Duration (consecutive days)	Frequency (days per 7 day rolling period)
Fannie Bay ¹	Dry	13 NTU	7 days	5 days	24 NTU	5 days	4 days
Mandorah ²	Wet	13 NTU	1 day	1 day	15 NTU	1 day	1 day
	Dry	16 NTU	4 days	4 days	20 NTU	2 days	2 days
Woods Inlet ²	Wet	16 NTU	2 days	2 days	20 NTU	1 day	1 day
	Dry	15 NTU	4 days	4 days	20 NTU	2 days	2 days

1 - INPEX (2022) 2 – Santos (2023), where turbidity was converted from SSC based on 1:1 relationship.

Table 4 - Proposed Monitoring Sites

Sensitive Receptor Monitoring Site	Latitude	Longitude
Fannie Bay	-12.432400	130.815200
Plume Monitoring Site	Latitude	Longitude
P400N <i>North to capture the ebb tide plume</i> <i>[approx. 400m from outfall]</i>	-12.448820	130.811350
Ambient Monitoring Site	Latitude	Longitude
Ambient <i>[approx. 2kms SSW of the Discharge Point]</i>	-12.468633	130.802829

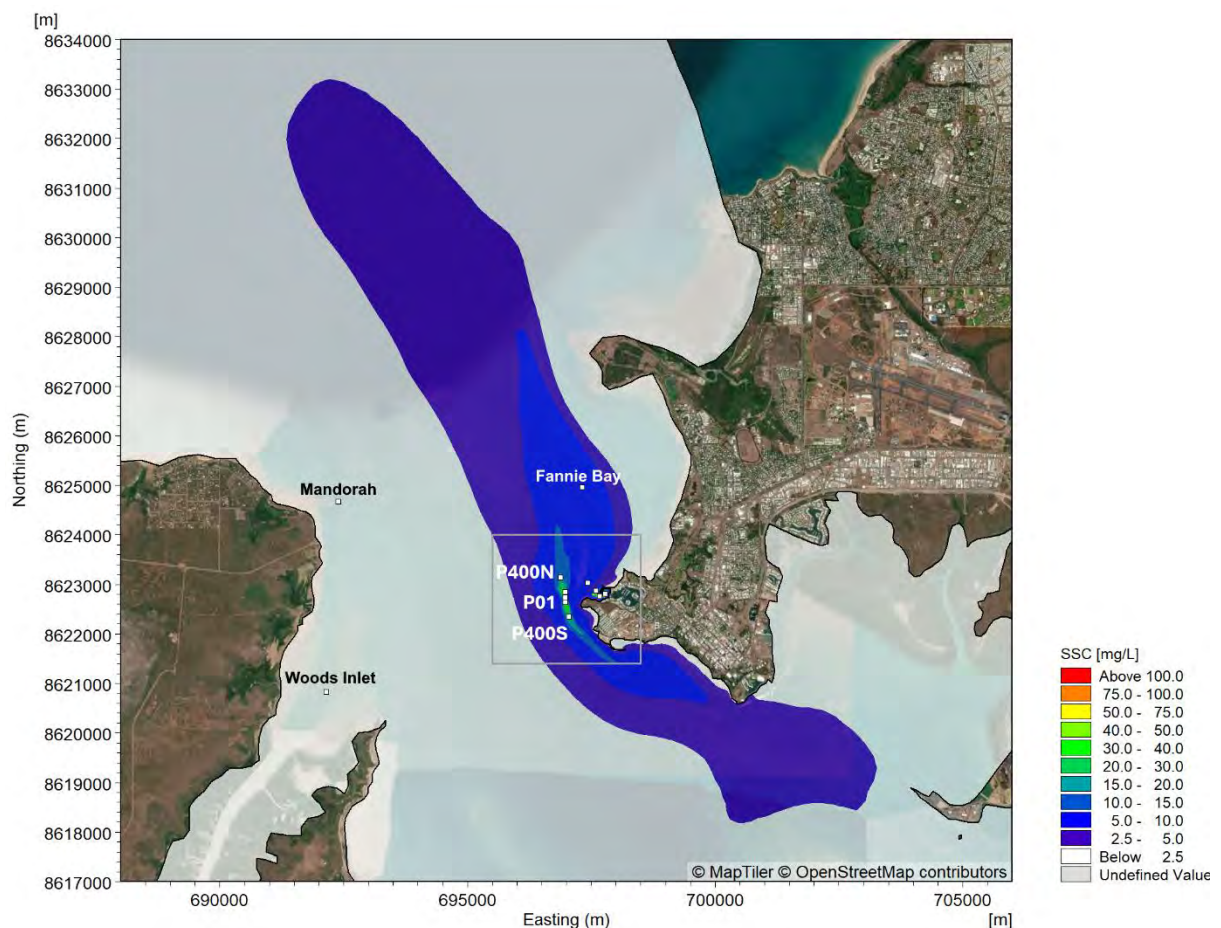


Figure 10 – Map Showing Locations of Sensitive Receptor and Plume Monitoring Sites

12.3.2 Seagrass Monitoring

There has also been historical seagrass mapping in the Fannie Bay area (Geo Oceans, 2012; Geo Oceans, 2013; Geo Oceans, 2014 & Geo Oceans, 2017), as well as survey data from the INPEX Ichthys project in 2013 and 2014. These previous monitoring surveys have indicated the following (Geo Oceans, 2017):

- The seagrass meadows comprised *Halophila* spp. and senescent *Halodule* spp. in the sandy substrate at the mouth of Cullen Bay, which tends to decline during the wet season.
- The seagrass beds within Fannie Bay have been shown to be ephemeral, with the above-ground biomass in some locations disappearing altogether during the wet season.

AMA MC was engaged by SMC to collect digital still (drop camera) imagery at locations in Fannie Bay. Historical seagrass surveys some eight years ago recorded the presence of seagrass. **Figure 12** presents the outcomes from the Geo Oceans (2017) Fannie Bay survey. Locations F02, F04, F12, F10, F11/F14, F16/F17 and F19/F20 had some seagrass present in October 2017.

On 20th February 2025 (eight years later), AMA deployed a High-Definition underwater drop camera and quadrat frame to capture still images at locations F02, F04, F10, F11, F12, F14, F16, F17 and F19, F20 (**Figure 13**). A total of six random still quadrat images were captured at each location (see example image in **Figure 11**).

Within the Fannie Bay survey area, nine locations were monitored. AMA targeted the locations monitored by Geo Oceans (2012, 2013, 2014 and 2017). This enabled the results from the present survey to be considered in the context of the longer-term INPEX dataset. A further sample location was surveyed at a reference location (Woods Inlet), which was outside of the Zone of Influence and provides reference data for examining the broader benthic communities at similar depths in Darwin Harbour, for comparison to those being monitored within Fannie Bay.

The footage was captured during the start of a neap tide cycle. This approach was adopted to optimise the tidal conditions and to try to optimise the visibility for capturing seabed images, pre dredging. The following conclusions were reported:

- From the drop camera footage captured in Fannie Bay, the majority of the seabed contained bare sand, with no benthic primary producers (marine flora, including seagrass meadows) reported.
- No seagrass was reported at the reference site in Woods Inlet. Seagrass was previously reported in Woods Inlet in Geo Oceans (2017), namely *Halophila* spp. and *Halodule* spp.

- These findings within Fannie Bay and at the adjacent reference location are comparable with previous findings in Geo Oceans (2012), Geo Oceans (2013), Geo Oceans (2014) and Geo Oceans (2017), where seagrass was reported absent during the wet season;
- Fine dark mud was reported on the sand at a number of locations (i.e. F04, F10, F11 and F14), with sand ripples also detected (refer **Figure 11** below);



Figure 11 - Quadrat image from February 2025 survey. Image from F11 – Bare sand, with some finer dark sediment.

- The only benthic species detected was a solitary sponge, reported in a quadrat image at F14; and
- The post dredging benthic survey to be completed during the dry season may provide a better opportunity to document the presence of seagrass meadows (where present) on the seabed.

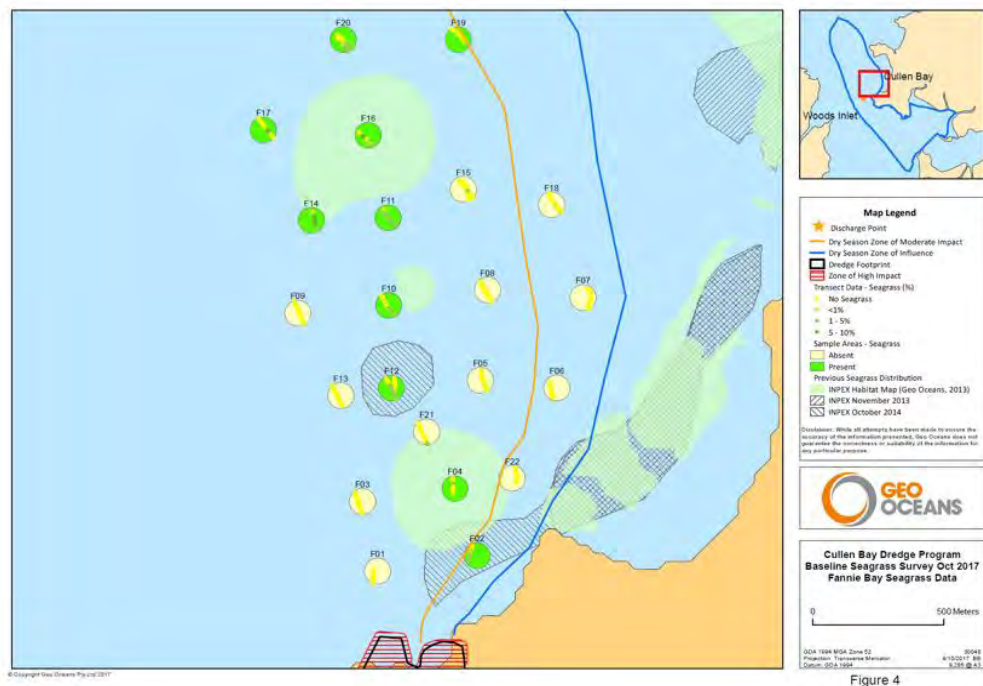


Figure 12 - GeoOceans seagrass survey outcome from 2017.



Figure 13 - AMA Fannie Bay Baseline Survey Locations, February 2025.

12.4 Water Quality Management Measures

If warranted from the plume monitoring described in Section 12.3.1 the corrective actions detailed in **Table 5** will be implemented to reduce the turbidity levels at the monitoring sites. The corrective actions have been developed in accordance with contemporary guidance, including that in Mills and Kemps (2016).

Table 5 - Water Quality Management Framework.

Water Quality Management Framework	
Element	Maintenance of water quality within Darwin Harbour.
Objectives	To minimise impacts upon the benthic communities in Darwin Harbour; in particular, seagrass communities in Fannie Bay, from dredge generated turbidity and release of toxicants.
Target	No adverse impacts upon the seagrass communities in Fannie Bay as a result of dredging and spoil disposal. No instances of exceedance of turbidity trigger levels at the monitoring sites (Table 4) No significant change in seagrass community composition (cover or density) in Fannie Bay compared to the Woods Inlet reference site.
Key Performance Indicator(s)	Number of instances of exceedance of water quality monitoring criteria (trigger levels) requiring dredge management measures to be implemented to return water quality in Darwin Harbour to an acceptable level. Percentage net reduction in seagrass cover at Fannie Bay monitoring sites (compared to changes at Woods Inlet reference sites).
Management	Management of water quality will be achieved through alteration of dredging operations to maintain turbidity to below trigger levels (see corrective actions below).
Monitoring	Water quality monitoring – at sensitive receptor locations; daily. Seagrass monitoring – Fannie Bay and reference sites at Woods Inlet; baseline, pre-dredging and post-dredging.

Reporting	Monitoring reports to be submitted to DLI within 10 working days after completion of each survey. Trigger level exceedances will be reported to DLI within 24 hours of becoming aware of an exceedance of turbidity trigger levels. To include recorded turbidity levels and corrective actions implemented to reduce turbidity to below trigger levels. End of dredging report to DLI including all water quality and seagrass monitoring data collected during the dredging campaign and a summary of any exceedances and any corrective actions implemented.
Corrective Action(s)	To decrease turbidity around discharge point: Decrease the sediment:water ratio in the spoil generated by the dredge. Vary dredge production rates over the tidal cycle. For example, reduce turbidity on ebb tides by decreasing production rates at slack High Water and at the commencement of the ebb phase of the tidal cycle. The converse would apply on flood tides if trigger levels were being exceeded. To decrease turbidity resulting from the cutter head: • Increase the suction intake velocity. • Slow the speed of rotation of the dredge cutter head. • Decrease the slew speed of the cutter head. • Reduce the depth of the cutter head. • Alter the angle of the ladder with respect to the seabed.
Term	Water Quality Monitoring for the duration of dredging activities and seagrass monitoring for a period of up to six months following completion of dredging, should adverse impacts on seagrass be detected.
Responsibility	HSE Manager to ensure documents are compliant with the DSDMP. HSE Manager to ensure implementation of monitoring program and water quality management measures.

12.5 Water Quality Reporting Requirements

Water quality results will be provided to DLI in a memo report summarising the results of the field sampling, comparison of measured turbidity to the trigger levels in this DSDMP and any management actions implemented should an exceedance be recorded. A summary report will be submitted to DLI weekly. **Where an exceedance of the monitoring turbidity trigger levels is detected**, a report of the results of turbidity monitoring and management measures implemented will be submitted to DLI and/or the NT EPA (where required) within 24 hours of completion of each monitoring event.

12.6 Seagrass Reporting Requirements

On completion of the baseline seagrass monitoring survey, a report will be provided to DLI including a summary of the towed video survey undertaken and seagrass cover and density estimates. Reports summarising the results of the pre- and post-dredging routine monitoring events will include the same information as the baseline report, as well as assessments of changes in seagrass cover and density.

13.0 PROTECTED MARINE FAUNA

Protected marine fauna can potentially be impacted by dredging operations due to physical interaction and underwater noise (Todd et al 2015). The risk of either of these impacts significantly affecting populations of protected marine fauna in the Project area is considered to be low due to the location and dredging methods to be applied.

13.1 Background

A search of the EPBC database was undertaken within a five kilometer radius of the study area and identified 51 listed threatened species and 71 listed migratory species (See Appendix A of the MEIA, AMA 2025). A total of 110 listed marine species and 12 whales and other cetaceans were also identified (see Figure 11 of the MEIA, AMA 2025).

13.2 Environmental management

13.2.1 Physical Interaction

The main risk of physical interaction with protected marine species will be in relation to the movement of dredge support vessels (e.g. tender vessels and workboats). The risk of direct impact to protected marine species from the operating dredge is considered to be very low; the dredge will be slow moving during most of the works, with the most mobile part of the equipment (the cutter head) generating noise and vibration, which is likely to discourage any species that may be present from approaching sufficiently close to the dredge for them to be exposed to the risk of impact. When moving between or within the dredging footprint, the dredge will transit at low speeds (<5 knots) and only over small distances (hundreds of metres).

It should be noted that physical interactions between dredging vessels and marine species are a higher risk when mobile dredges such as Trailer Suction Hopper Dredges are used and when dredged material is disposed offshore using barges. Neither of these scenarios is applicable to the Cullen Bay dredging.

Nevertheless, there will be monitoring and management measures implemented to reduce the risk of physical interaction with protected marine species, as depicted in **Figure 14** and **Figure 15** and described in the EMF (**Table 6**). These measures will apply to the operation of the dredge and also to any other vessels engaged in the works (e.g. tender vessels). All vessel operators/captains will be trained to apply appropriate avoidance mitigation measures to minimise potential impacts or collisions with marine fauna.

All MFOs will complete site-specific MFO training, that involves observation/awareness training relevant to the marine fauna in the region. This will ensure all MFOs are capable of making an accurate assessment and description on the Record Form to be used for recording protected marine species sightings (an example of which is shown in **Figure 16**).

Table 6 - Protected marine species EMF – physical interaction.

Protected Marine Species Management Framework – physical interaction	
Element	Vessel interaction with protected marine species.
Objective	Minimise the risk of injury to, or mortality of, protected marine species. Develop and maintain awareness of the need to protect marine species.
Target	No incidents of vessel interaction with protected marine species. All dredging personnel to complete an HSE induction, including protected marine species awareness and management requirements. All vessel masters are competent in protected marine species interaction procedures. At all times when the dredge is operational, at least one crew member is a trained Marine Fauna Observer (MFO).
Key Performance Indicator(s)	Number of personnel completing an HSE site induction. Availability of MFO trained dredge operator or assistant. Number of incident reports. Number of reported sightings of live, injured or dead protected marine species.
Management	Training of Vessel Masters in interaction procedures and specified crew as MFOs. A trained MFO must be on duty, above deck with good visibility, during all dredging operations. On each occasion that the dredge has been non-operational for a period exceeding 30 minutes, a visual assessment shall be undertaken of the 150 m radius Observation Zone by the MFO for a period of 20 minutes. Dredging will not recommence until no protected marine species have been sighted within the 150 m radius Observation Zone for a period of 20 minutes. The assessment of the Observation Zone will be made from an elevated position on the dredge, where a clear line of sight is achievable to the edge of the zone. The MFO shall not be engaged in any other activities during the 20 minute

	assessment period. Every 60 minutes whilst the dredge is operating, the MFO will dedicate a period of 15 minutes for scanning (from an elevated position) for protected marine fauna within the Observation Zone. If protected marine species are sighted within the Observation Zone, then a response in accordance with vessel interaction procedures will be implemented. Dredging will be temporarily suspended if turtles, dugongs or dolphins enter within 50 m of the cutter head, or dolphins with calves enter within 150 m of the cutter head. Rotation of the dredge cutter head will only start when it is positioned near the seafloor, and rotation will be stopped before the cutter is raised through the water column. Commonwealth Department of the Environment and Heritage (DEH 2006) Guidelines will be followed. Support vessels will adhere to Darwin Port speed restrictions. Support vessels will not approach, circle or wait in front of wildlife for the purposes of casual viewing. Watch will be maintained for stranded, injured or dead protected marine fauna; if observed, the NT Government Marine WildWatch line (1800-453-941) will be contacted for retrieval, treatment or post-mortem of the fauna.
Monitoring	Regular monitoring for the presence of stranded, injured or dead protected marine species. Marine fauna observations (refer to Management section).
Reporting	Any vessel interaction incidents and protected species injury or mortality will be reported by SMC Marine to DLI within six hours of the incident occurring. DLI will meet reporting obligations to other NT and Commonwealth agencies as appropriate. Sightings of protected marine fauna will be recorded on a form such as that shown in Figure 16. Details of the individual species observed, and the frequency, location and timing of observations will be recorded, along with photos (if available). The objective of these records is to identify potential interaction areas which will be incorporated by SMC Marine into pre-starts, toolboxes, marine fauna awareness training, or other general awareness sessions as required.

Protected Marine Species Management Framework – physical interaction	
	A summary of protected marine species sightings will be provided to DLI at the conclusion of dredging.
Corrective Action(s)	In the event that an incident or near miss occurs between vessels and protected marine species, the incident will be investigated and discussed to further improve awareness to reduce risk of collision. In the event of any impacts to protected marine species from vessel strikes, a dedicated MFO will be required on watch on all vessels while underway. For mobile vessels, a 5 knot vessel speed limit will be applied in areas where frequent sightings (an average of >1 per day in any one week) are made of protected marine species. If protected marine species approach within the Caution Zone, vessels that are under way will proceed at a “no wash” speed.
Term	For the duration of dredging activities.
Responsibility	HSE Manager to ensure documents are compliant with the DSDMP. HSE Manager to ensure protected marine species management and monitoring program is implemented. Project Manager to liaise with the relevant Government Department/s on response to stranded, injured or dead marine fauna and potential recovery, treatment or post-mortem

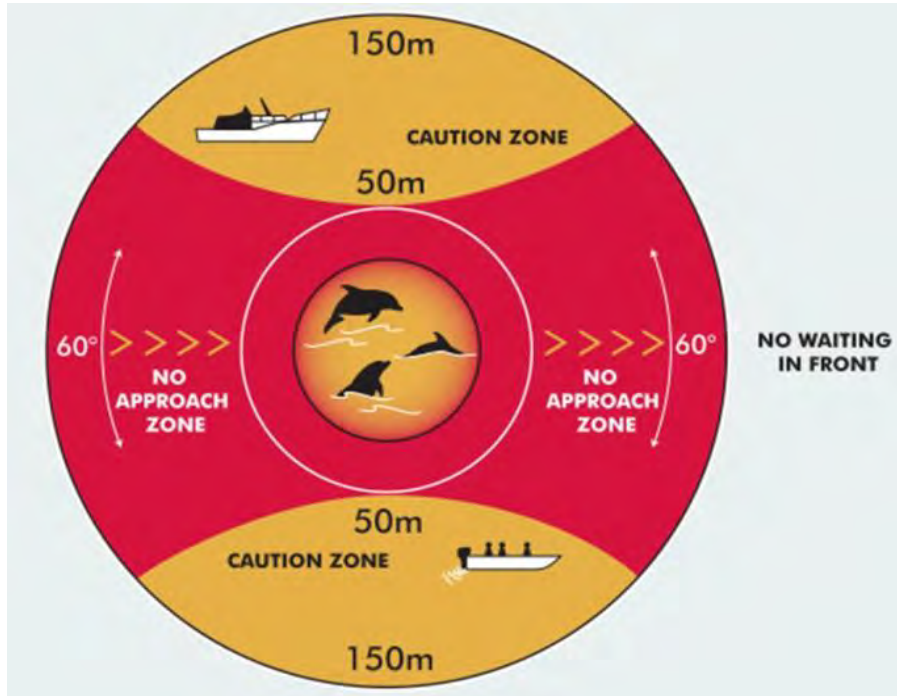


Figure 14 - Guideline Approach Distances for Protected Marine Species.

13.2.1 General Noise and Vibration

The noise and vibration generated by dredging operations will be minimal on the surface and the risk of terrestrial impact is considered low. Due to underwater acoustics and the speed travel of sound in water however, there will be some noise and vibration above ambient levels which may affect marine fauna.

13.2.2 Underwater Noise

Maintenance dredging of Cullen Bay will create additional underwater noise in various forms and intensity above current ambient levels in Darwin Harbour.

Monitoring of protected marine species and management measures to be implemented to reduce the risk of disturbance of protected marine species by underwater noise generated by the dredging works are listed in the EMF (**Table 7**).

Table 7 - Protected Marine Species Management Framework – underwater noise.

Protected Marine Species Management Framework – underwater noise	
Element	Impact of underwater noise on protected marine species.
Objectives	Minimise the risk of disturbance to protected marine species from underwater noise. Establish and maintain awareness of the importance of protecting marine species.
Target	No avoidable disturbance to protected marine species as a result of noise generated during dredging activities. All dredging personnel to complete a HSE induction. At all times when the dredge is operational, at least one crew member is a trained MFO.
Key Performance Indicator(s)	Number of personnel completing an HSE site induction. Availability of MFO trained dredge operator or assistant. Number of incident reports. Number of reported sightings of live, injured or dead protected marine species.

Management	Ensure that all equipment is maintained in good operating condition (balancing, greasing, etc.) and have proper noise control systems in place. Ensure all noise minimisation measures such as mufflers, special enclosures, and sound-insulation mounts are fitted and working. Minimise the noise generation of equipment by switching it off when not in use (i.e. avoid running on standby mode). Training of specified crew as MFOs. A trained MFO must be on duty, above deck with good visibility, during all dredging operations. On each occasion that the dredge has been non-operational for a period exceeding 30 minutes, a visual assessment shall be undertaken of the 150 m radius Observation Zone by the MFO for a period of 20 minutes. Dredging will not recommence until no protected marine species have been sighted within the 150 m radius Observation Zone for a period of 20 minutes. The assessment of the Observation Zone will be made from an elevated position on the dredge, where a clear line of sight is achievable to the edge of the zone. The MFO shall not be engaged in any other activities during the 20 minute assessment period. Every 60 minutes whilst the dredge is operating, the MFO will dedicate a period of five minutes for scanning (from an elevated position) for protected marine fauna within the Observation Zone. If protected marine species are sighted within the Observation Zone, then a response in accordance with vessel interaction procedures (Figure 12) will be implemented. Dredging will be temporarily suspended if turtles, dugongs or dolphins enter within 50 m of the cutter head, or dolphins with calves enter within 150 m of the cutter head.
Monitoring	Marine fauna observations.

Reporting	Any suspected noise related incidents will be reported to DLI within six hours of the incident occurring. Any corrective actions implemented in response to suspected noise related incidents will be detailed in a report to DLI. Sightings of protected marine fauna will be recorded on a form such as that shown in Figure 16. Details of the individual species observed, and the frequency, location and timing of observations will be recorded, along with photos (if available). The objective of these records is to identify potential interaction areas which will be incorporated into pre-starts, toolboxes, marine fauna awareness training, or other general awareness sessions as required. A summary of protected marine species sightings will be provided to DLI at the conclusion of dredging.
Corrective Action(s)	In the event that noise related impact is suspected, the incident will be investigated to confirm a noise related impact has occurred and identify the most appropriate action(s) to reduce the impact. This may include one or more of the following: noise reduction measures; soft-start start-up procedures, restriction on vessel movements/activities, increase the radius of the Observation Zone to 200m.
Term	For the duration of dredging activities.
Responsibility	HSE Manager to ensure documents are compliant with the DSDMP. HSE Manager to ensure noise management is implemented aboard vessels.



13.3 Marine fauna reporting requirements

Any marine fauna vessel interaction or noise related incidents will be reported to DLI within six hours of the incident occurring. The initial report will be followed by a summary of the causes leading to the incident and corrective actions implemented to reduce the likelihood of a repeat occurrence.

On completion of dredging, SMC Marine will provide all MFO records to DLI as part of the project environmental performance report. The report will include all MFO observations and a summary of any incidents and corrective actions implemented.

14.0 SEDIMENT QUALITY AND ACID SULFATE SOILS IN DREDGED MATERIAL

14.1 Sediment Quality

DLI commissioned CDM Smith to undertake sediment core sampling across the area proposed for dredging at the entrance to Cullen Bay Marina; referred to as the Outer Harbour. Maintenance dredging of the Outer Harbour including the navigation channel extending 380 m out to sea from the outer lock gates, and the manoeuvring basin adjacent to the Cullen Bay Ferry Terminal, is required on a regular basis (approximately every 7 to 10 years) due to the build-up of silt. For this current dredging campaign, approximately 85,000m³ of material is required to be removed. The dredge spoil is planned to be disposed of at the same marine location within the Darwin Harbour previously utilised for this purpose.

To assess any environmental risk associated with marine disposal of the dredge spoil, assessment of the sediment quality and potential contaminants of the material is required in accordance with the National Assessment Guidelines for Dredging (NAGD). This sampling program completed by CDM Smith represents Phase II of the NAGD (2009) decision-tree approach.

Sediment sampling was undertaken at 14 sites over three days (09, 10, 11 October 2024) from a barge using a vibracoring system to the full anticipated dredge depth and a maximum depth of 5 meters into the seabed.

The NATA accredited ALS laboratory was used for the primary sample analysis, and the NATA accredited Eurofins laboratory for the inter-laboratory quality control samples.

Sediments ranged from silty loam to silty clay loam and were fairly consistent with depth.

In summary the contamination results showed:

- All heavy metal concentrations at all sites were below the NAGD Screening Levels except for arsenic at SL3_0.5 and nickel at SL10_0.5. Assessment of the spoil material of the 95% UCL (upper confidence limit of the mean) as per the NAGD was undertaken confirmed all values were below the Screening Levels.
- All hydrocarbons (TPH, TRH, PAH) and Total Organic Carbon were below the NAGD Screening Levels.
- All Tributyltin concentrations were below detection limits.
- All BTEXN concentrations were below detection limits.
- There are no Screening Levels for nutrients. In general nutrient levels were similar to those recorded in 2016.
- Sediments were not classified as acid sulfate soils (ASS).

Overall, the results indicate a low likelihood of environmental contamination as a result of

dredging activities. Based on this assessment, it is considered that no specific monitoring or management measures for toxicants are required during the Project.'

14.2 Acid Sulfate Soils in Dredged Material

As stated above, sediment sub-samples were analysed for acid sulfate potential; sediments were not classified as acid sulfate soils (ASS). Field pH testing was also undertaken to determine the presence/absence of ASS/PASS. Field pH testing indicated no AASS or PASS anywhere within the survey area. Dames and Moore (1999) concluded that there was no potential for acid generation if sediments were not exposed to air (refer below re. lack of air exposure). Dames and Moore (1999) further concluded that the sediments in Cullen Bay were suitable for dredging and disposal at sea.

Potential for Acid Sulphate generation is *extremely* unlikely due to the lack of exposure to air (oxygen) during the dredging process. The CSD will interact with the seabed at depth and never have the opportunity to oxidise any sediment collected and transported underwater via pipeline and discharged under the water's surface. The CSD will never cut at a depth above the draft of the vessel (-1.2m) otherwise the dredge will 'run aground' as it advances forward. Even in scenarios where a CSD is cutting a channel of soils above LAT, the cutter will operate at least -1.2m below LAT to enable buoyancy and eventual navigation, soils will collapse to the cutterhead, which is operating under water.

There is no source of air other than manual introduction via a valve at the dredge. Introduction of air within the pipeline is only used during pipeline inspection to create pipeline buoyancy. Pipeline must be kept purposefully negatively buoyant during dredging by pumping only water and sediment. Uncontrolled buoyancy would create unacceptable vessel collision risk (to the ferry for example). At times where the pipeline is made buoyant during inspection, no dredging can take place (removal and transport of dredge materials) as this will affect the ability for the dredge operator to float the pipeline. Furthermore, the volume of air required to effectively oxidise the dredge material (to create ASS) would be significantly above the volume of air available from the pipeline valve.

pH readings will be taken at all Water Quality Monitoring sites for validation (already provided for under the proposed Monitoring Program). If ASS is suspected, additional field testing will be undertaken. If testing identifies the presence of ASS, the disturbed material will be kept wet and submerged (avoiding oxidation) and disposed of (at depth) in the nominated offshore disposal area (discharge location). The NT EPA and DLI will be notified within 24 hours of becoming aware of ASS. Based on all available information any further exposure of ASS will be strictly avoided, and monitoring will continue.

In summary, the proposed dredging and spoil disposal methodology, comprising a CSD and submerged pipeline, will prevent the dredge spoil from being exposed to air. This will prevent acid generation from oxidation of any undetected ASS that may be present in the material to be dredged. Conservatively, monitoring for signs of acidity* in the dredge area and at the



discharge location, and pH readings at all monitoring locations (refer Table 4), will occur.

*Signs of Acidity:

- Waterlogged soils – unripe muds, soft and sticky, blue-grey or greenish-grey with high water content.
- Sulfurous odour, e.g. hydrogen sulfide – “rotten egg” smell.
- Oily-looking iron or bacterial surface scum.
- Vegetation stress: dead, dying, stunted or inhibited plant growth.
- Yellow/orange (iron oxide) mottling, rust, flecks or staining.
- Presence of corroded shells, concrete or steel structures.

All site workers will be made aware of these signs, and their duty to notify, through the Site Induction to ensure that *if* any acid generating materials are encountered, this material is promptly recognised, identified, and managed appropriately.

15.0 MONITORING SUMMARY

The environmental monitoring program to be implemented as a part of this DSDMP comprises the following:

- Monitoring turbidity within Darwin Harbour (Section 12.2.5)
- Monitoring of seagrass communities within Fannie Bay (Section 12.5)
- Monitoring for presence of protected marine species in the vicinity of the Cullen Bay Dredging works (Section 13.2)

Key aspects of each of the monitoring programs are summarised in **Table 8**.

Table 8 - Monitoring Programs.

Parameter	Locations	Method	Frequency	Trigger
Turbidity Section 12.2.5	Refer Table 3 and Figure 10 .	Measurement of turbidity (NTU) through the entire water column using a calibrated hand held turbidity probe and calculation of the mean turbidity through the water column.	Daily during dredging.	Per Table 3 - Level 1 and 2 turbidity management trigger criteria for ecological monitoring sites Management measures will be applied until the measured turbidity reduces to below the trigger level.

Seagrass Section 12.5	Within the sensitive receptor locations in Fannie Bay and at reference site Woods Inlet (Table 4 and Figure 10)	Towed-video mapping surveys to record the occurrence and percentage cover of seagrass species in the outer reaches of Fannie Bay and at reference sites at Woods Inlet.	Baseline/Pre-Dredging survey: Neap tide period preceding the commencement of dredging. Post-Dredging Survey: Neap tide period following the cessation of dredging. No adverse changes detected – no further monitoring required. Adverse changes detected - monthly monitoring for up to six months post-dredging or until adverse changes in the Fannie Bay seagrass communities are no longer evident or are comparable to those observed in Woods Inlet.	Significant change in seagrass at Fannie Bay compared to changes observed at Woods Inlet. Significant change is a change in mean seagrass % cover at Fannie Bay (between surveys) more than 20% greater than the change observed at the Woods Inlet site.
-----------------------------	---	---	---	---

Protected Marine Fauna Section 13.2	Within the designated Observation and Exclusion Zones around the dredge and Project vessels.	Observation by trained MFO.	On each occasion that the dredge has been non-operational for a period exceeding 30 minutes, a visual assessment will be undertaken of the 150 m radius Observation Zone by the MFO, for a period of 10 minutes prior to the recommencement of dredging. Every 60 minutes, the Observation Zone will be assessed by the MFO for a period of five minutes.	Entry of protected marine species into the Exclusion Zone: 150 m for dolphin with calf 50 m for all other protected marine species, including dolphin without calf. Dredging shall not commence until no protected marine species have been sighted within the Observation Zone for a period of 10 minutes. If protected marine species enter into the Exclusion Zone, then dredging will cease until such time as there have been no protected marine species sighted within the Observation Zone for a period of 10 minutes.
--	---	------------------------------------	---	---

16.0 REPORTING SUMMARY

Reporting associated with the environmental performance of the dredging campaign will take the form of:

- Routine reporting;
- Exceedance notification and reporting;
- Environmental incident notification and reporting; and
- Complaints reporting.

16.1 Routine Reporting

Reports associated with routine turbidity will be submitted to DLI within five working days of completion and will include a summary of the data and assessment of results.

On completion of the dredging campaign, an environmental performance report will be submitted to DLI. The report will contain:

- Summaries of all monitoring program outcomes;
- Summaries of any monitoring exceedances;
- Details of corrective actions implemented to dredging and dredge spoil discharge methods in response to monitoring exceedances; and
- Marine fauna observer logs.

16.2 Exceedance notification and reporting

Notifications of exceedances recorded during turbidity monitoring (Section 12.3.1) will be made to DLI within 24 hours of the exceedances occurring. If required, exceedances will also be reported to DLI/NT EPA in accordance with the Project Waste Discharge Licence (WDL), the *Waste Management and Pollution Control Act* and the *Water Act*.

For each exceedance, SMC Marine will provide DLI with a report on the corrective actions implemented to address the cause of the exceedance. The reporting of monitoring results and management actions implemented will be completed 24 hours after completion of the monitoring event.

16.3 Environmental incident notification and reporting

In the event of the following environmental incidents, SMC Marine will notify DLI within 24 hours:

- Vessel interaction with protected marine species, including details of injury to, or mortality of, individuals; or



- Suspected disturbance of protected marine species related to noise generated by Cullen Bay dredging activities.

Other environmental incidents (spills, etc.) will also be recorded. If the incident is a notifiable incident under the *Waste Management and Pollution Control Act*, then the NT EPA will also be notified within 24 hours.

All incidents will be investigated and recorded in accordance with SMC Marine incident reporting procedures. Preventative and corrective actions will be established, and these will be recorded and progress tracked to completion.

16.4 Complaints reporting

In the event of a complaint received as a result of dredging activities, SMC Marine will maintain a complaints register. Details recorded will include:

- Date, time and method of complaints;
- Description of complaint;
- Complainant details; and
- Cause, action and proposed action, including allocation of a person to action the complaint and an action date.

SMC Marine will forward each complaint to DLI for follow-up and will assist with close-out.



17.0 SAFE WORK METHOD STATEMENTS

Safe Work Method Statements (SWMS) shall be developed by the dredge contractor for the works required and approved by DLI prior to the works proceeding. SWMS shall cover all the requirements as set out in the Dredging and Spoil Disposal scope of works and provide details of all construction activities including:

- Dredging works;
- Disposal pipeline supply installation and operation;
- Spoil disposal activities;
- Environmental monitoring and management;
- Health and safety management; and
- Survey and survey control of the works.

18.0 CULTURAL HERITAGE / SACRED SITES

18.1 Cullen Bay

The Aboriginal Areas Protection Authority (AAPA) is an independent statutory organisation established under the Northern Territory *Aboriginal Sacred Sites Act* and is responsible for overseeing the protection of Aboriginal sacred sites on land and sea across the whole of Australia's Northern Territory.

The AAPA achieves this accommodation between sacred site protection and land/sea use through the issuing of Authority Certificates, which provide legal indemnities for works carried out in accordance with Certificate conditions. As such, AAPA certificates provide details of how to manage and protect any sacred sites in the works area.

All works, including the extraction of materials and water extraction, are covered by valid AAPA certificates.

AAPA Certificate C2007/141 allows for all pre-construction, construction, rehabilitation and maintenance activities associated with the proposed Cullen Bay dredging program. This certificate was applied for in July 2007 and was granted to Department of Planning and Infrastructure (now known as DLI) for an indefinite period of time. The proposed works covered by the certificate include all dredging activities, ongoing maintenance and future dredging in the outer harbour at Cullen Bay.

No Restricted Work Areas (RWAs) exist within the Certificate. As such, no impact on Aboriginal Sacred Sites is expected from the proposed maintenance dredging works.

18.2 Disposal site

AAPA Certificate C2007/141 allows for disposal of material, including dredge spoil at the disposal site. This certificate was applied for in July 2007 and was granted to the Department of Planning and Infrastructure (now known as DLI) for an indefinite period of time.

No RWAs exist within the Certificate. As such, no impact on Aboriginal Sacred Sites is expected from the proposed disposal of dredge spoil.

19.0 BIOSECURITY / PEST MANAGEMENT

As per best practice under PIRSA Guidelines, vessels and equipment associated with the marine activities pose risks of introducing new marine pests and diseases from biofouling. The vessels and equipment should be clean before arriving to a new location, to not introduce or spread any more aquatic pests (e.g. a vessel originating from the Port River which has exotic species that are not found at interstate location) and cleaned before moving to new regions.

MC will undertake the following:

Biofouling management plans shall be developed and submitted to Biosecurity SA (PIRSA) for each of the vessels involved. The management plan shall consider inspection and cleaning prior to movement of the vessels to new regions using the following resources:

- National Biofouling Management Guidelines for Non-Trading Vessels:
http://www.marinepests.gov.au/marine_pests/publications/Documents/Biofouling_guidance_NTV.pdf
- National Biofouling Management Guidelines for Commercial Vessels:
http://www.marinepests.gov.au/marine_pests/publications/Documents/Biofouling_guidelines_commercial_vessels.pdf
- IMO guidelines:
<http://www.imo.org/en/OurWork/Environment/Biofouling/Documents/RESOLUTION%20MEPC.207%5b62%5d.pdf>

All equipment is based in Australia which reduces the risk of importing international exotic marine pests. All marine equipment utilised for the project will follow the national best practice biofouling management guidelines as governed by the *Biosecurity Act 2015*. All Biofouling management documents are maintained by Maritime Constructions and are subject to change depending on vessel availability.

19.1 Supply Chain

Subcontractor shall liaise closely with suppliers to identify and mitigate potential pest risks associated with machine hygiene. Strict pest management is particularly relevant to items procured from interstate and overseas. For these items, personnel in Darwin shall undertake a quarantine inspection upon receipt in Darwin.

The following Project plant and equipment are being procured from interstate:

- Cutter Suction Dredge (CSD)
- Spares
- Anchors

Pest bombs will be placed in containers and doors will remain closed for specified duration. Trained personnel will then undertake a thorough inspection of the plant, equipment and materials prior to removing them from the container.

Other items being procured locally and regionally include:

- Discharge Pipeline – all sections to be clean and inspected internally
- Discharge/Diffuser Pontoon

All other plant, equipment and materials will be procured locally or made available from within Subcontractor's asset pool in Darwin.

19.2 Vessel (CSD) – Operations

The CSD will spend minimal time alongside any berths. Any risk of pests boarding the vessel whilst alongside will be mitigated with controls such as rodent guards on mooring lines (where appropriate). Baits and traps may also be used if deemed necessary. Waste will be kept to a minimum to ensure pests are not attracted to the vessel.

20.0 HAZARDOUS MATERIALS

Subcontractor does not expect to hold significant volumes of hazardous materials onboard the CSD, and risk of loss of containment and/or loss to the environment, is considered low.

All contractor representatives using any Dangerous Goods or Hazardous Materials or carrying out any bunkering of plant, equipment or machinery must ensure storage and use of such materials is in accordance with SA/NT EPA requirements for the immediate environment. All contractors and visitors involved in such activities must be aware of the location and correct use of spill management equipment. Consult with the project personnel for further advice.

Where hazardous materials are kept on board, they shall be separated and securely stowed in accordance with their Safety Data Sheet (SDS). Materials which may be stored on board the CSD and support vessels in small quantities include:

- Oils and lubes – typically in vessel's holding tanks, not on deck.
- Degreaser – can(s).
- Cutting fluid – small bottle (if required).
- Oxy and Acetylene – stored separately in secure cylinder racks on deck or in a well-ventilated area.

20.1 Bunkering Operations

On site fuel deliveries, handling and transport are an ongoing occurrence and risk for dredging activities. The dredge vessel(s) for this project will be fuelled using an anchor barge as a fuel transfer vessel with a 1000 L capacity. The anchor barge will be loaded with fuel via a land-based delivery vehicle.

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

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

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

21.0 WASTE MANAGEMENT

The dredging contractor recognises the sensitivity of the marine environment and is committed to continuous improvement of its policies, procedures and practices to ensure its preservation.

The International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL) requires that applicable ships carry certain documentation relating to ship-sourced pollutants. Under the provisions of the Transport Operations (Marine Pollution) Act 1995 (the Act) and its supporting Regulation. The MARPOL requirements are also mirrored in the Territory legislation.

Documentation requirements are described in:

Pollution prevention for ships, required documents – specifies the documents to be carried under the provisions of MARPOL, the Act and Regulation.

The dredging contractor vessels have a comprehensive SMS in which the below listed plans, procedures and forms can be found:

- Waste Management Plan
- SOPEP
- Discharge Checklists
- JSEAs and Risk Assessment
- Safe Work Procedures

Different types of waste have the potential to cause environmental harm, whether directly via contamination, or indirectly by attracting pests such as rats etc. All waste is therefore managed in accordance with well-considered policies and procedures, and waste levels are constantly monitored.

Waste and litter are a risk to the environment. The project is split into three specific areas: Site compound, Dredge location(s), and pipeline locations. Each area requires waste management with litter avoidance practices maintained. All waste oil, rags and other hydrocarbon impacted materials must be contained in watertight dry containers and disposed of appropriately.

- **Site Compound:**

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

- **Dredge Location:**

Dredge barge and support vessels must be maintained on a constant basis with provision of a waste bin on each barge and regular inspection for litter and loose items

such as rags and packaging. Any item that enters the water must be retrieved immediately using a support vessel, provided it's safe to do so.

- **Pipeline outfall location:**

Pipeline outfall locations must be inspected daily for leaks, kinks and other damage. Repair/replace dredge pipe immediately if it is safe to do so.

21.1 Regulated Waste

There is an oily waste facility at Fisherman's Wharf for the disposal of oil and fuel filters, oily rags, and small amounts of dirty oil. Larger quantities of oily waste and bilge water will be transferred into approved self-bunded storage pods to be decanted by the local waste removal contractor in Darwin.

21.2 Effluent

All Effluent will be transferred into approved self-bunded pods to be decanted and disposed of ashore by local waste removal contractor in Darwin

21.3 General Waste

All general waste will be separated into recyclable and non-recyclable items onboard each vessel before being transferred into larger bins and delivered local waste removal contractor in Darwin for disposal.



22.0 AIR POLLUTION

Project plant and equipment emit low levels of exhaust, smoke, dust, and other substances that may be released to the atmosphere are not expected to be produced as a byproduct of the dredging operations. Air quality and dust management are low risk for this dredging activity. All of the sediment will be discharged in water and therefore is not a dust or air-quality risk.

Exhaust emissions will be visually checked on a periodic basis and plant and equipment will be maintained in accordance with manufacturers specifications and operating manuals.

23.0 EMERGENCY RESPONSE

The dredging contractor's emergency response procedures cover a wide range of emergency scenarios. The Emergency Response Plan details the organizational structure available to support teams in the event of an emergency, the processes and procedures to be followed, and high-level protocols and guidelines.

Vessel SMS further expands on this and outlines specific protocols for managing critical incidents.

The manual contains specific procedures for reporting and managing onboard emergencies including:

- Fire onboard the vessel;
- Abandon Ship Event;
- Man Overboard;
- Collision and/or Grounding;
- Electrical Failure and Blackout;
- Medical Emergencies including Medivac; and
- Emergency Muster.

A hard copy of the procedure shall be carried on-board Subcontractor's vessel(s) in its complete form. All Emergency Situations are identified and response measures drilled to test the emergency preparedness of all stakeholders. The procedures also outline the necessary performance standards expected of the emergency drills and exercises designed to test efficiency by which the crew are prepared for an emergency.

All personnel on board the vessel/barge will receive instructions on what to do in a shipboard emergency during their vessel specific induction and on board emergency drills and exercises.

23.1 Emergency Drills

Emergency Drills address emergency preparedness and details emergency drills and emergency exercises required to ensure the Master and crew have effective training and competency levels ready to deal with any unplanned event or critical situation.

The Vessel Master shall ensure Emergency Drills are conducted (as scheduled) on-board and documented appropriately. Emergency Exercises will be undertaken to test communications with Clough and Emergency Support Services.

23.2 Emergency Response Team

The dredging contractor's Emergency Response Team is defined within the "Vessel Emergency Response Procedures Manual" and assembled when necessary in

managing crisis or critical incidents.

23.3 SOPEP Manual

The Dredging Contractor's vessel(s) have a Shipboard Oil Pollution Emergency Plan (SOPEP) in place. These plans are written in accordance with the requirements of Regulation 37 Annex I of the International Convention for the Prevention of Pollution from Ships, 1973 as modified by Protocol of 1978 relating there to (MARPOL 73/78).

The purpose of the Plan is to provide guidance to the Master onboard the vessel with respect to the steps to be taken when an oil pollution incident has occurred or is likely to occur.

The Plan contains all information and operational instructions as required by the "Guidelines for development of the Shipboard Oil Pollution Emergency Plan" as developed by the Organisation (IMO) stated in MEPC.54(32), adopted 6th March 1992, as amended by Res MEPC.86(44) adopted 13th March 2000.

The SOPEP's have been approved by the Classification Society and no alteration or revision can be made to the plans without the prior approval of ABS Classification Society (Changes to Section 5 "Appendices" will not be required to be approved by ABS Classification Society. The appendices contain names, telephone, telex numbers, etc., of all contacts referenced in the Plan).

23.4 Hazardous Materials Release or Gas Leak:

The EC shall:

- On receipt of a call advising of a hazardous materials spill assess the extent of the spill and determine if external assistance is required to contain it. Seek further advice from the IMS Manager / Project Manager, if necessary,
- Should external assistance be required EC will notify the CFS by calling 000 and any other relevant Authorities (e.g., EPA) and provide them with as much information about the hazardous material or gas leak as possible, such as spill containment information on Material Safety Data Sheets,
- Isolate the area affected and ensure people remain upwind,
- If appropriate, commence an evacuation of the affected area and adjacent buildings/properties and coordinate the evacuation,
- If the primary muster point is unsuitable, nominate an appropriate assembly area,
- Notify all clear once the emergency has passed and on advice from Emergency Services Personnel.

23.5 Operational Spills

The Master shall ensure that all measures are taken to prevent oil spills from operational activities including the project requirement that spill kits are located in the vicinity chemical storage locations and areas where chemicals are frequently used.

All operational spills shall be reported immediately to the HSE Manager and Client Representative.

Any spills greater than 80 liters will be reported to the regulator and reported to AMSA by the dredging contractor using the 'Marine Pollution Report' (POLREP) approved by the Client.

The project manager/supervisor must report to the NT EPA all incidents causing or threatening serious or material environmental harm, upon becoming aware of the incident.

23.6 Fire Fighting & Life Saving Appliances

Vessel specific 'Fire Fighting Appliances Training Manual' and 'Life Saving Appliances Training Manual' are provided in accordance with SOLAS Chapter 11-2 Part E, Regulation 15 and Chapter III, Regulation 35. These manuals aim to provide instruction, information and a compressive understanding of all Firefighting and Life Saving Appliances (LSA) onboard, in addition to methods and techniques for survival at sea.

23.7 Security Threat

The EC shall:

- On receipt of a call advising of an armed and dangerous intruder, remain calm and do not do or say anything that may encourage irrational behaviour.
- If possible, notify the Police by dialing 000
- Note carefully any instructions given by the Police
- Establish communications with external Emergency Control Personnel, if possible
- Initiate procedures to advise all persons to stay out of sight of the intruder, to remain in their work areas (if safe to do so) until advised otherwise by Emergency Services personnel or Emergency Control personnel.
- Notify all clear once the emergency has passed on advice from Emergency Services Personnel.

23.8 Cyclone Contingency Plan

'Cyclone Contingency Plan' addresses the required actions necessary in the protection of the crew and the vessel in the event of cyclonic weather and provides information and guidance to the vessel Master when making decisions to vacate the area of potential danger.

If personnel are demobilised from the vessel, all personnel will be accounted for in the Master's Log with the location of the cyclone-rated housing in which they're accommodated. In addition, the assigned Superintendent will continue to update the DLI Representative of all vessel and personnel movements via email for the duration of the time that the vessel is away from site.

23.9 Medical Emergency Response

In the event of a medical emergency Maritime will employ the following procedure:

- Assess the response required, Minor Emergency or Major Emergency warranting escalation.
- Utilise radio communications stating Minor Emergency First Aid assistance required or Major Emergency, Emergency Services required. Ensure this is communicated to the Supervisor by yourself or a secondary party.

MINOR EMERGENCY:

- Notify the nearest First Aid person to attend to the injured party, stating the extent of the injury and an assessment of the first aid required.
- Upon treatment first aider is to assess the need for Emergency Services.

MAJOR EMERGENCY:

- Contact Emergency Services, Notify the nearest First Aid person to attend to the injured party, stating the extent of the injury and an assessment of the aid required.

MAJOR EMERGENCY ISOLATED AREA:

- These factors are critical to timely treatment to the injured party. Supervisor is to assess the requirement to escalate the retrieval of the injured person to the State Emergency Services (SES).
- Provide Critical information of area and the conditions will need to be communicated to the SES. Weather conditions encountered, Nature of the injury and the retrieval equipment on site (e.g., emergency stretcher etc.) ability of the work group to utilise the Emergency equipment available to respond and move the injured party if safe to do so, to the safest accessible area (Site facility) where an ambulance can access quickly.
- Follow instructions given by the emergency services.

- First Aid personnel shall, on becoming aware of a medical emergency, collect the closest first aid kit and attend to the injured person.
- If an ambulance is required, contract Emergency Services on 000. You will be required to provide, your name, exact location, a contact phone number, and provide details of the emergency,
- DO NOT HANG UP until told to do so.
- Arrange for a person to meet the ambulance at the nearest intersection, to direct the Emergency Personnel to where the injured person is located.
- If an ambulance has been called, alert the EC of details and which hospital the injured person was taken to. The closest Hospital is described within MC ERP.
- EC will contact next of kin and advise them of the patient's location.

Note If the incident requires medical treatment, contact the HR Manager immediately for advice. There is an increased risk of serious injury when work is performed in remote locations and because of potential delays in getting access to ambulances and emergency departments. For this reason, appropriate emergency communication equipment is provided, and first aiders must ensure that the first aid kit is adequately stocked.

23.10 Personnel Overboard:

- Shout, "MAN OVERBOARD" to get Master or other crew members attention and keep sight of person overboard,
- Throw life buoy, if possible,
- Other crew member(s) to mobilize tender vessel and retrieve man overboard.
- All crew to be briefed on evacuation plan,
- Employees to wear PFD type 1, high visibility tops as part of uniform and be equipped with all relevant PPE,
- Visitors/ Service Technicians to be signed in and equipped with relevant PPE and accompanied at all times by MC crew member,
- Only those persons who are holders of Certificates of Competency are to crew the appropriate class of vessel.
- No one to commence work unless vessel induction is carried out.

23.11 Communications

Whilst operating in the Project area the following communications shall be available on Subcontractors vessel(s)/barge(s).

23.11.1 Primary Communications

Vessel to shore communications will be established using UHF. The channel for use will be discussed, agreed and noted in the pre-start meeting, and will consider other operations at the time. The following shall be verified prior to commencement of operations:

- VHF Marine Band Channel.
- Ultra-High Frequency (UHF) hand held radio communication.
- Vessel Call sign.

23.11.2 Secondary Communications

- VHF Marine Band Channel: 16
- Vessel No: VSAT: TBC
- Vessel/Barge Mobile Number(s): TBC
- Vessel Email Addresses: [TBC](#)

23.1 Emergency Contacts

A list of key ER team contacts for the project are provided in the table below:

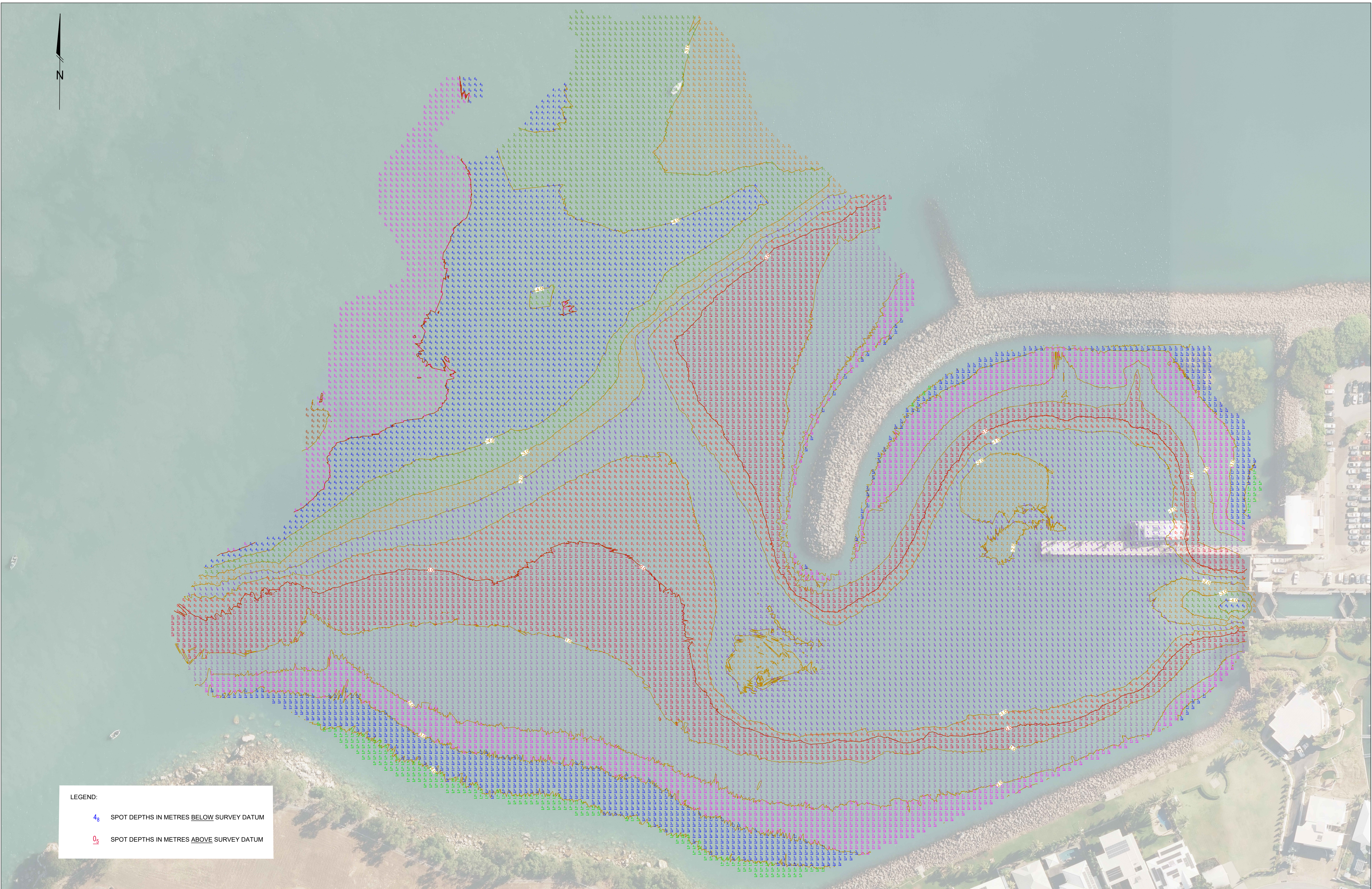
ER Team Role	Position	Name	Mobile
ER Team Leader	NT Regional Manager	Emil Tastula	0488 939 014
ER Coordinator	Marine Superintendent	Andrew French	0408 215 199
Technical Support	Technical Superintendent	Luke Morand	0407 664 266
Project ER POC	Project Manager	Bevan Lamb	0488 939 012

Emergency facilities and services contacts are as follows:

Company	Department / Name	Telephone Number	A/H Number
Hyperbaric Emergencies	Divers Emergency Service (DES)	(08) 8212 9242	1800 088 200
Darwin Hospital	General Enquiries	(08) 8922 8699	
NT Fire & Emergency	Call Station Operator	131444	24 hrs
Royal Flying Doctors	24 hrs	1800 625 800	1800 625 800 (08) 9417 6364
Poison Information	24 hrs	131 126	131 126
NT WorkSafe	General Enquiries	1800 064 567	24 hrs
Australian Maritime Safety Authority (AMSA)	Maritime Rescue Normal Tel Contact Aviation Rescue	1800 641 792 (02) 6230 6811 1800 815 257	24 hrs
Croc Wise	Report croc sightings	(08) 8999 4691	

24.0 APPENDICES

Appendix 1	Description
'A'	T-2024-0171-02-A_Contour and Depth Map
'B'	T-2024-0171-03-A_Cross Sections
'C'	T-2024-0171-01-A_Heatmap & Volumes



LEGEND:

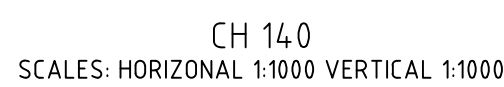
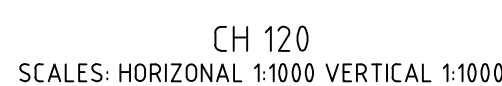
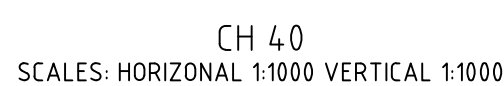
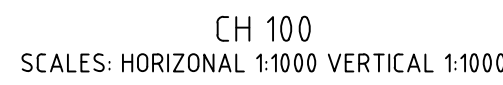
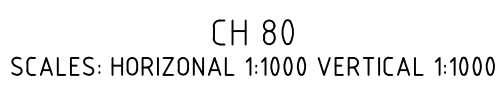
- 4.8 SPOT DEPTHS IN METRES BELOW SURVEY DATUM
- 0.5 SPOT DEPTHS IN METRES ABOVE SURVEY DATUM

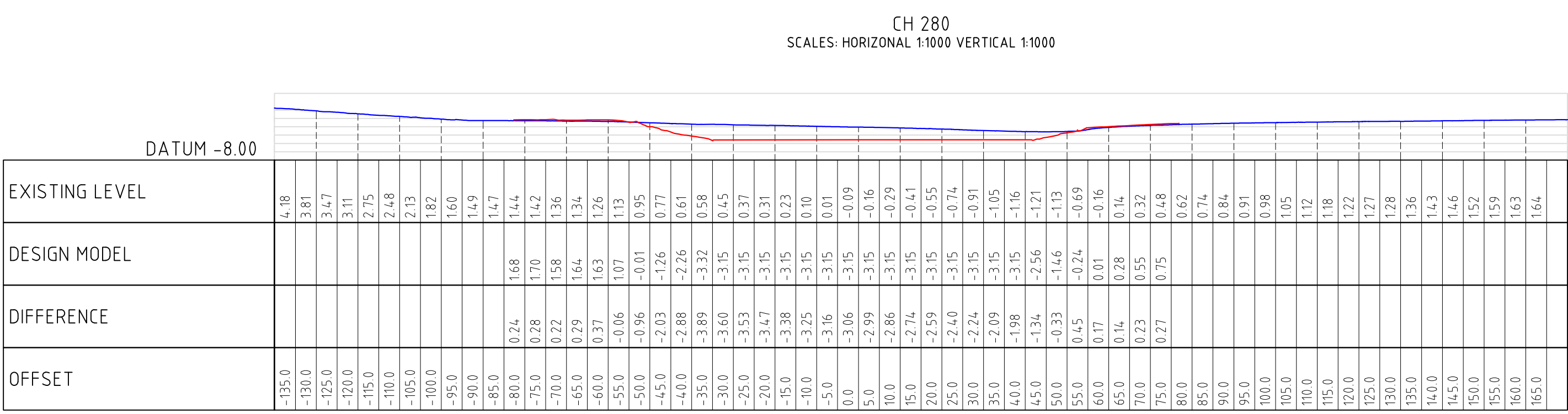
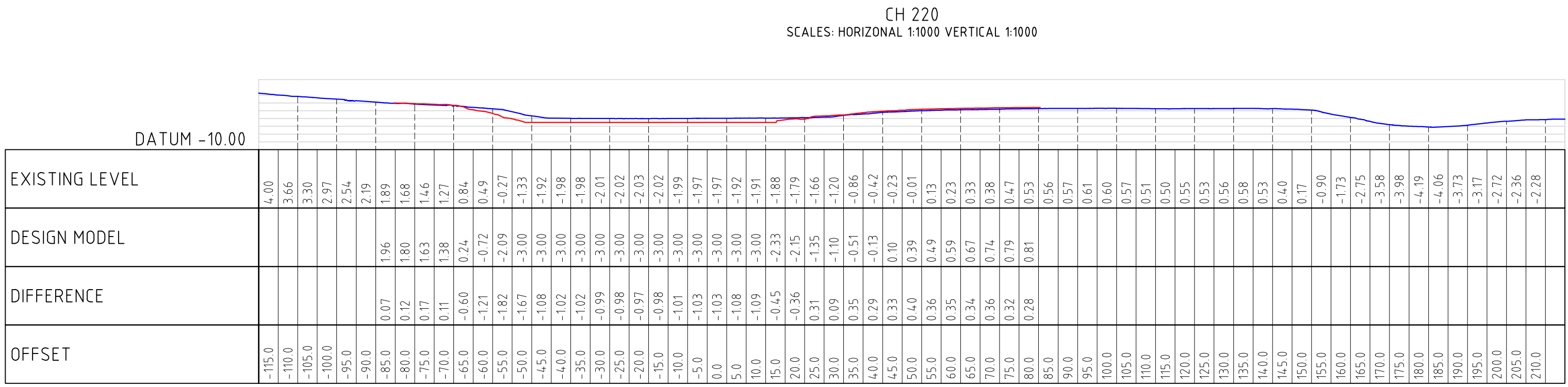
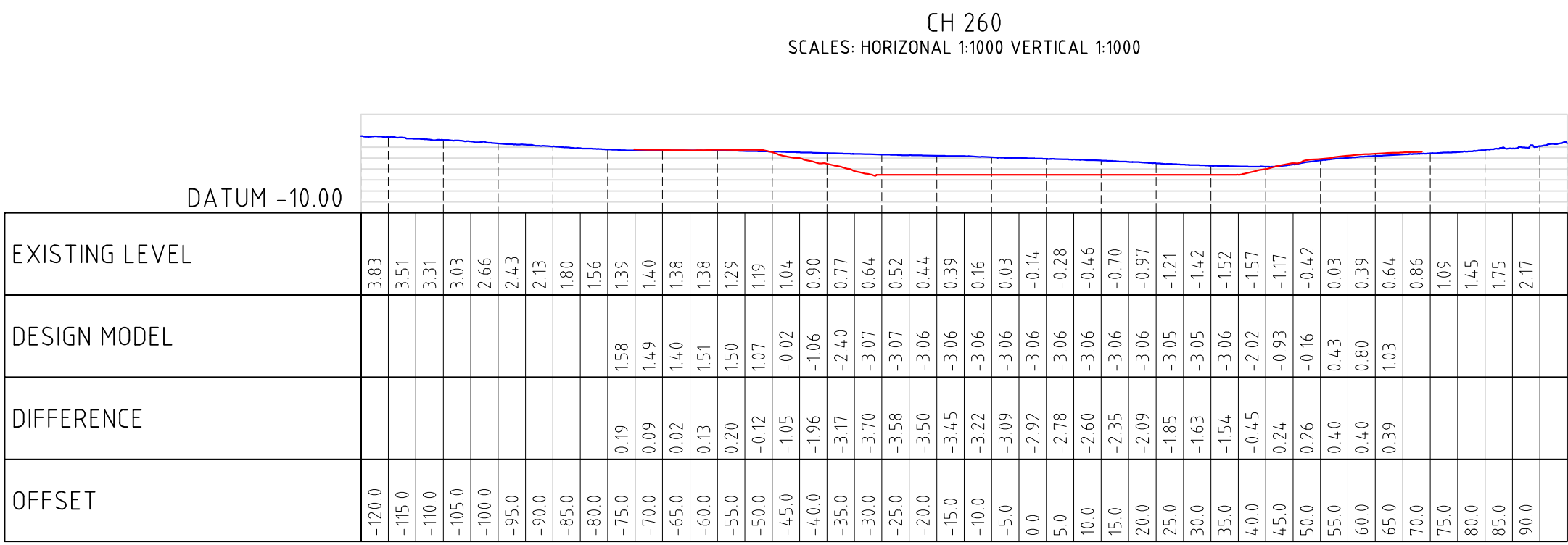
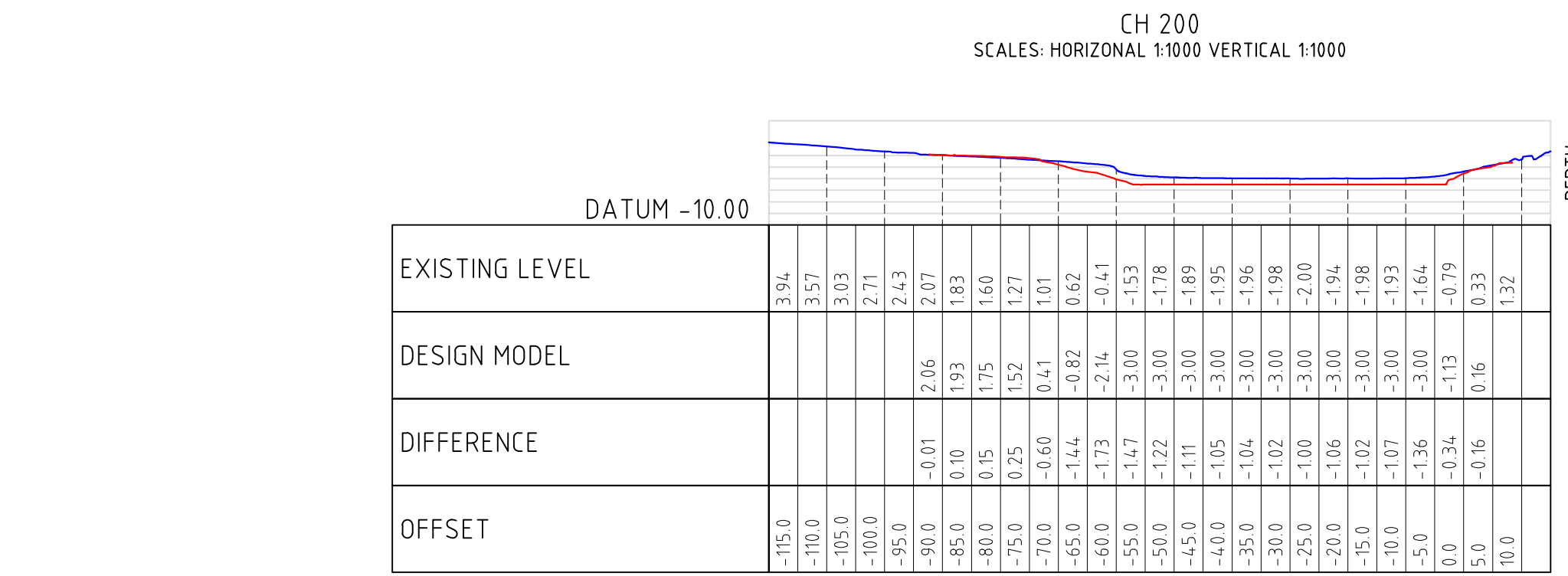
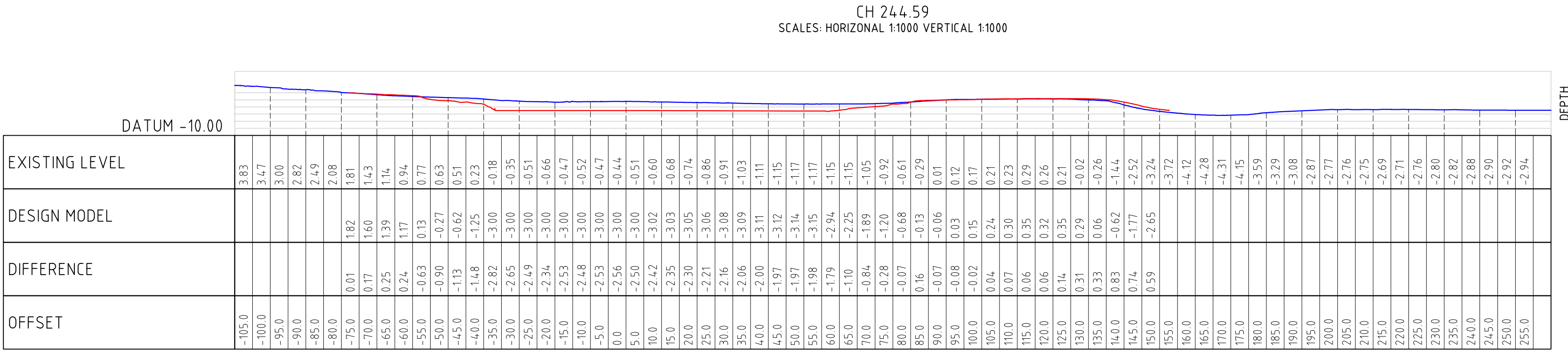
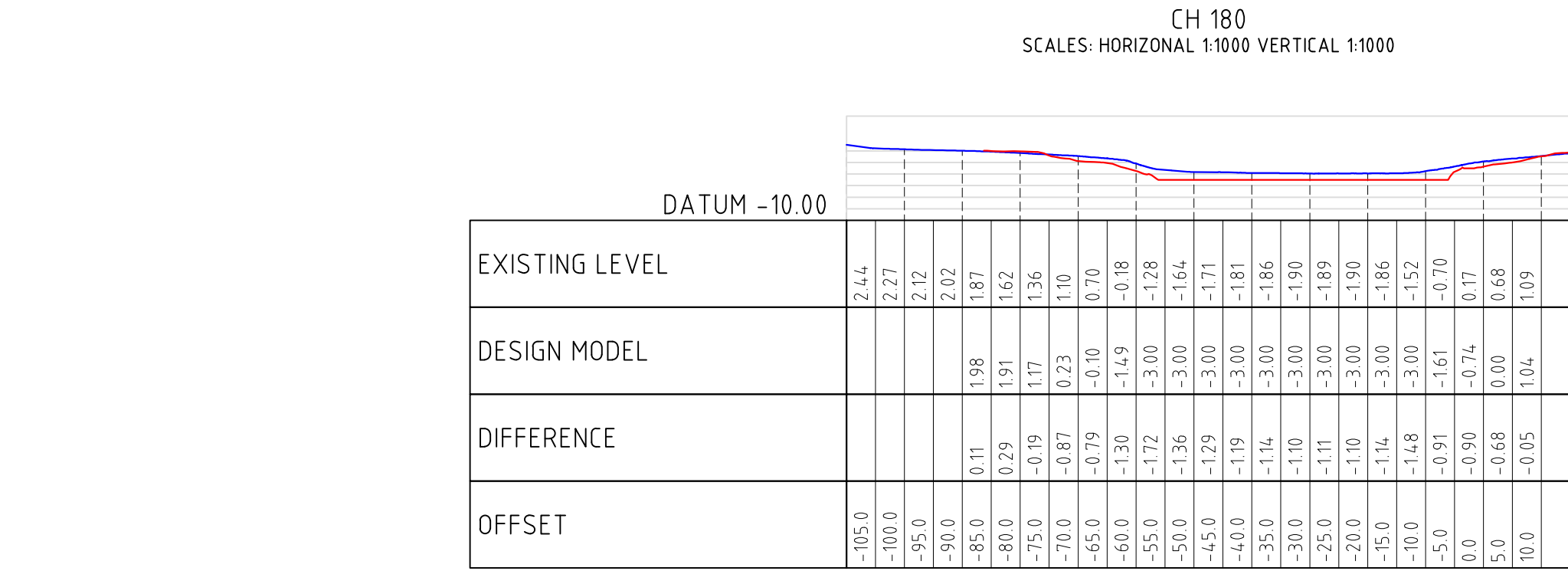
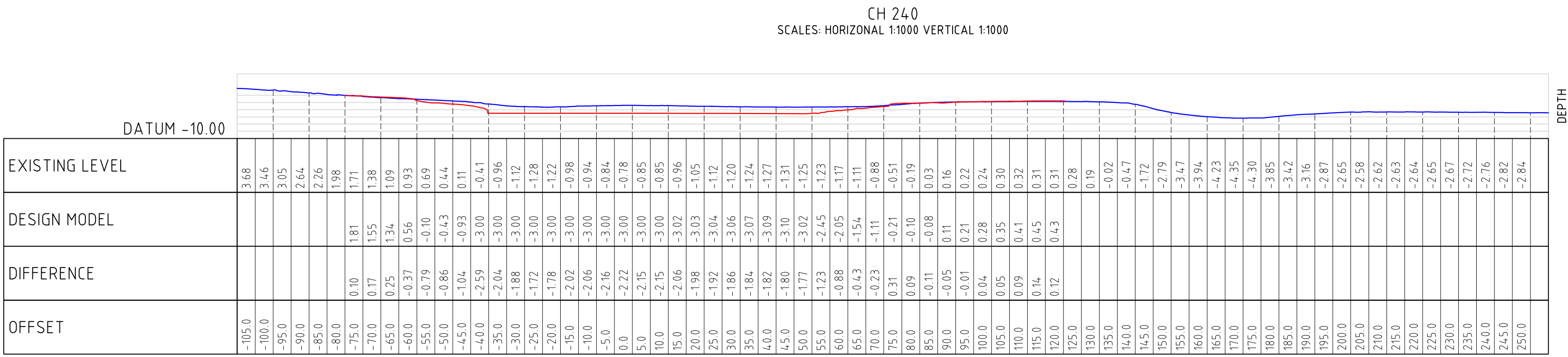
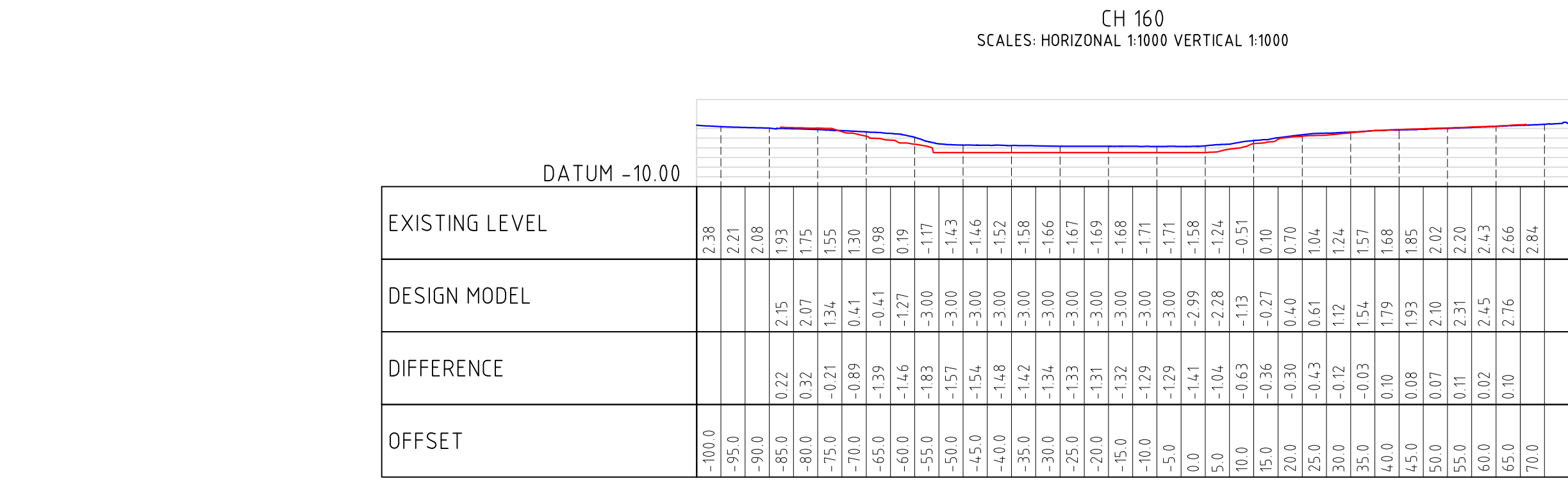


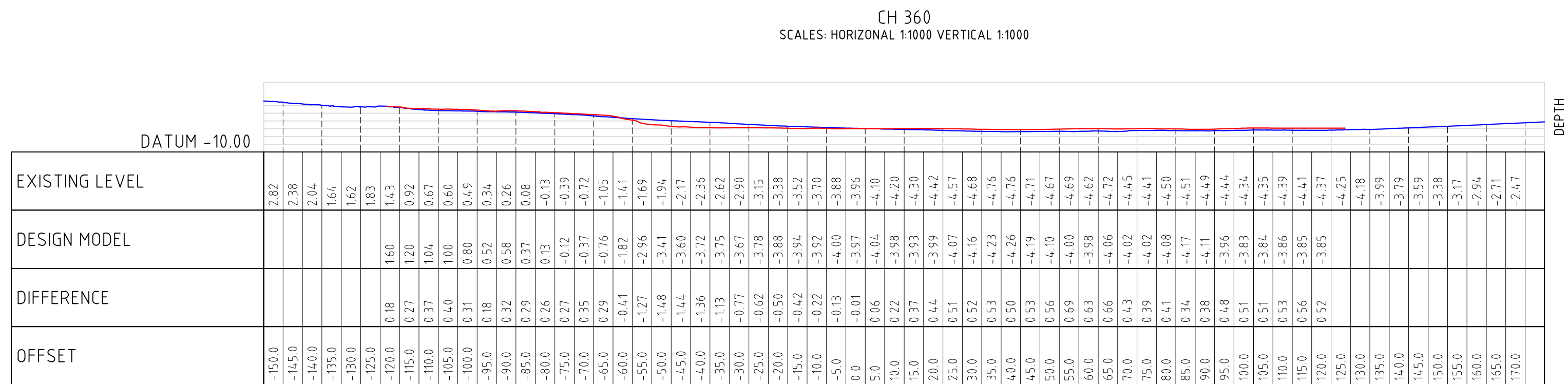
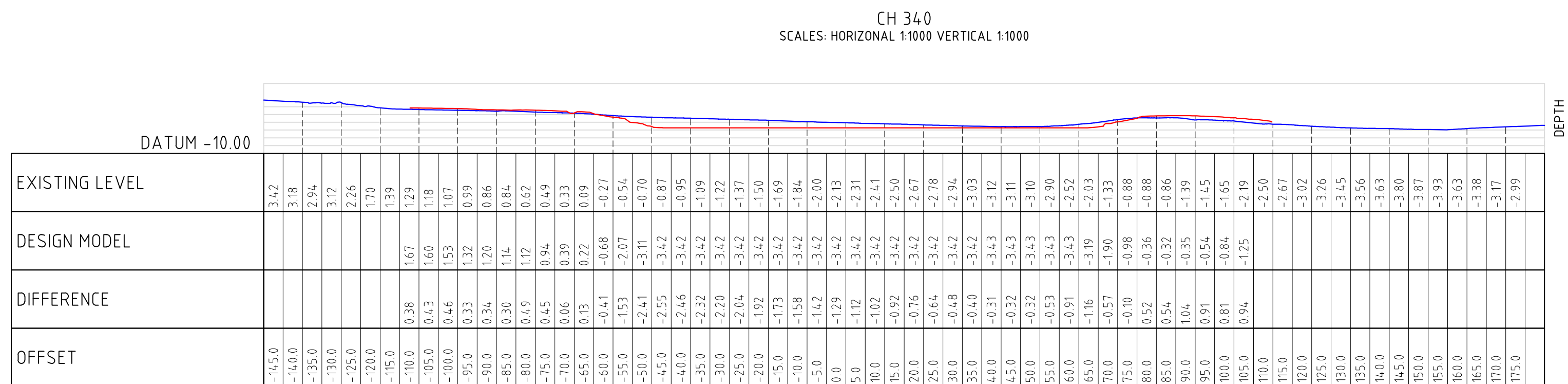
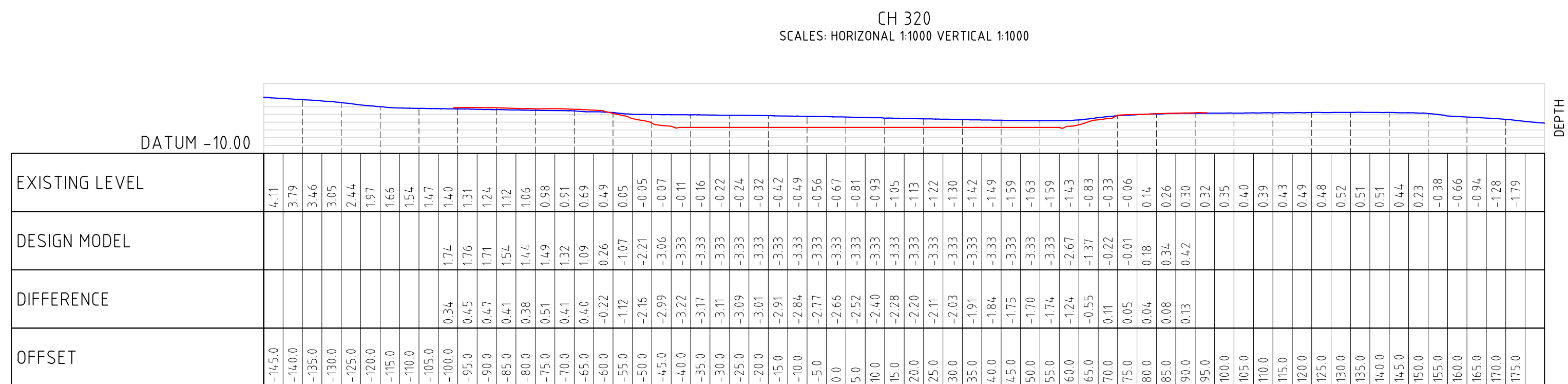
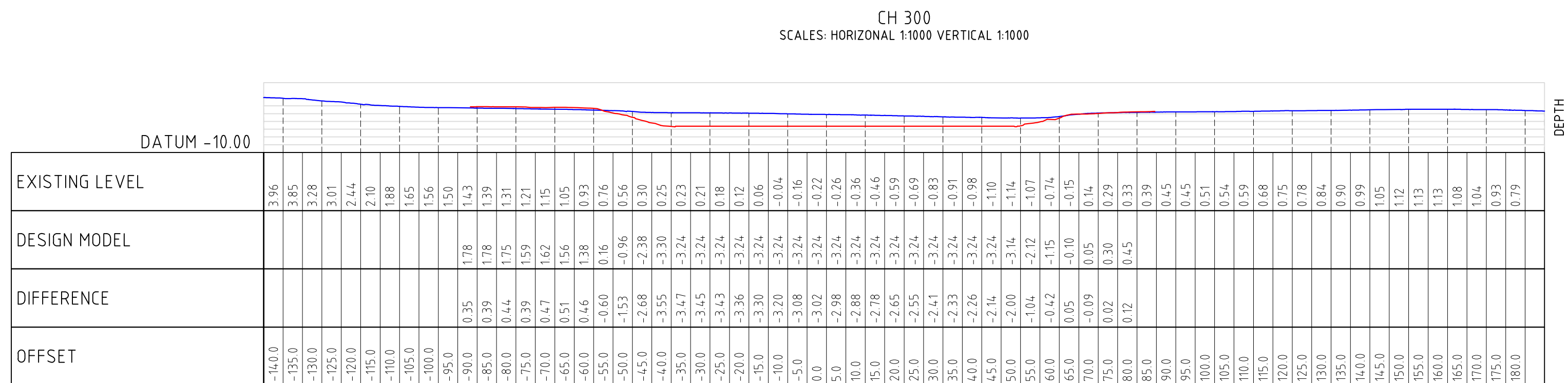
EMAIL: quotes@cross-solutions.com.au
WEB: www.cross-solutions.com.au



SURVEYOR:		JC		DRAWN BY:		IF	
SURVEY DATE:		13/05/2024		CHECKED BY:		DW	







LEGEND:

- NOTES:**

- ESTIMATED VOLUMES:

- 
- CROSS SOLUTIONS**
 EMAIL: sales@cross-solutions.com.au
 WEB: www.cross-solutions.com.au

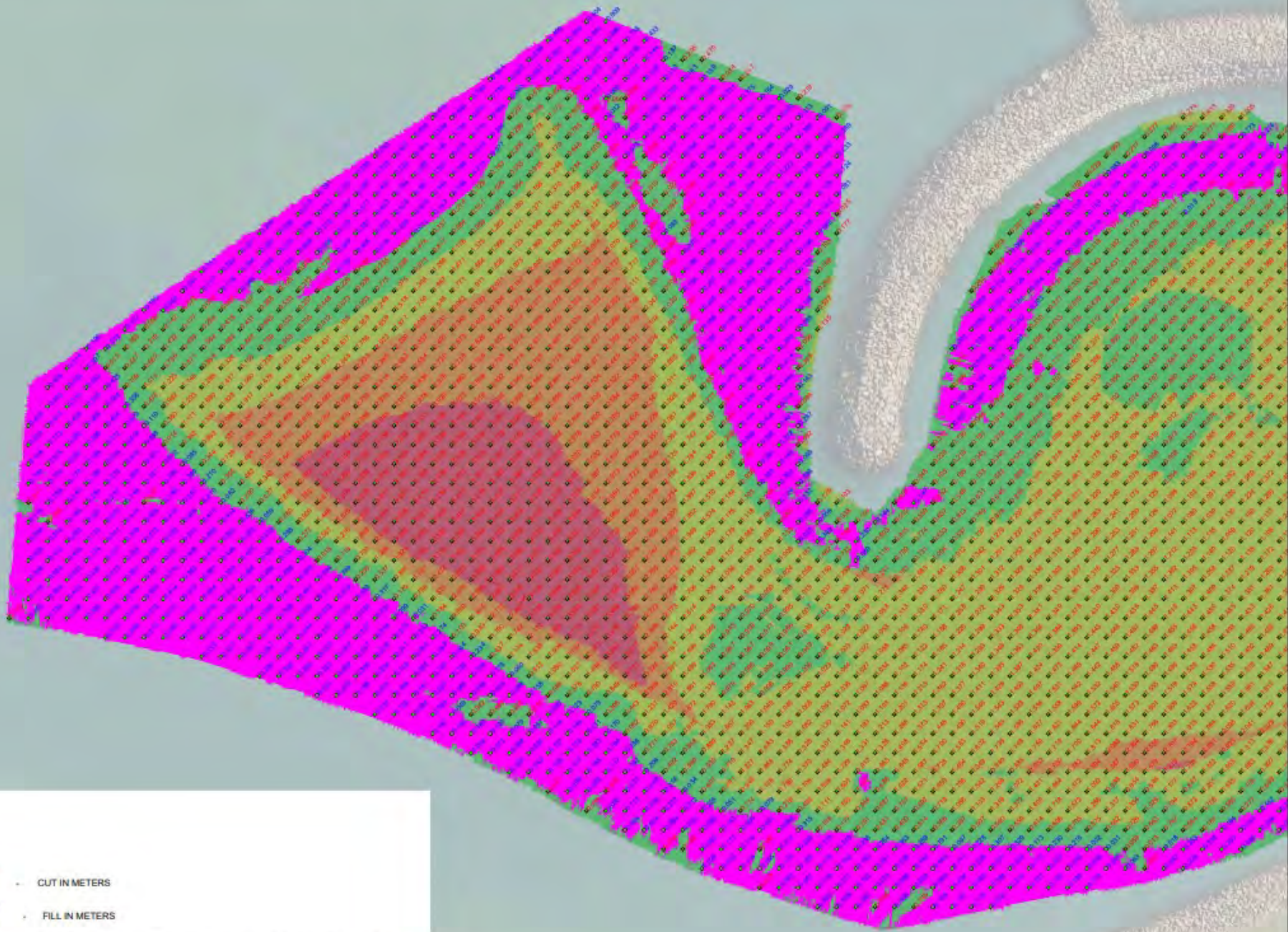
SCALE: 1:750
COORDINATE SYSTEM: MGA 94 ZONE 52
LEVEL DATUM: CHART DATUM - 0.000M
CONTOUR INTERVAL: N/A

15 0 15 30 45
METRES

SCALE: 1:750
COORDINATE SYSTEM: MGA 94 ZONE 52
LEVEL DATUM: CHART DATUM - 0.66M
CONTOUR INTERVAL: N/A

15 0 15 30 45
METRES

JOB No: 2024-0171	CLIENT: DEPT OF IPL - DARWIN	DRAWING No: T-2024-0171-01	REV A	SHEET No: 1 of 3	A1
----------------------	---------------------------------	-------------------------------	----------	---------------------	----



Levels Table			
No.	Min. Level	Max. Level	Colour
1	-4.047	-3.000	
2	-3.000	-2.000	
3	-2.000	-1.000	
4	-1.000	0.000	
5	0.000	2.254	

LEGEND:

0.117

CUT IN METERS

0.004

FILL IN METERS

AREA WHERE DESIGNED SURFACE HIGHER THAN SURVEYED SURFACE 2024



SURVEYOR: JC

SURVEY DATE: 13/05/2024

DRAWN BY: IF

CHECKED BY: DW

SCALE: 1:500

COORDINATE SYSTEM: MGA 94 ZONE 52

LEVEL DATUM: CHART DATUM (-3.864M)

CONTOUR INTERVAL: N/A

10 0 10 20 30

1000 00

AIRIAL IMAGE IS LICENSED TO METROMAP (MAY 2024)

BATHYMETRIC SURVEY

2024-0171

CULLEN BAY DREDGING

VOLUME CALCULATIONS AND HEATMAP

JOB No:

2024-0171

CLIENT:

DEPT OF PL - DARWIN

DRAWING No:

T-2024-0171-01

REV

A

SHEET No:

2 of 3

A1

COPYRIGHT ©

