COVERSHEET

Subject	Northland Shipyard & Floating Drydock Project Development Phase - Initial Report: October 2019 Portfolio of Provincial Development Unit Documentation

Due to the public interest in Northport's *Study to Establish a Ship Repair Facility in Northland*, and following consultation with the applicant, the Provincial Development Unit (PDU) has decided to proactively release some material which relates to information already available in the public sphere.

The application made by Northport to the Provincial Growth Fund (PGF) was approved by decision makers.

List of documents that have been proactively released		
Title	Summary	Applicable Pages
Northland Shipyard & Floating Dry Dock Project Development Phase – Initial Report: October 2019	Report from funding applicant updating the Provincial Development Unit (PDU) on the findings of the study.	2 - 11
[MAKE MODEL] Floating Dry Dock Specification Sheet	Document containing specifications and dimensions of the proposed dry dock.	12 - 13
[MAKE MODEL] Floating Dry Dock Profile	A series of visual designs depicting the profile of the proposed dry dock.	14
[COMPANY] Northport Ship Maintenance Facility: Concept Design & Construction Estimate	Report from a third-party contractor outlining the concept designs and construction estimate for the proposed dry dock.	15 - 57
Initia: Preliminary Geotechnical Report	Preliminary report from Initia outlining the process and results of extensive geotechnical testing.	58 - 71
Be-Software: Phase 1 Ship Simulation Dry-Docking Report	Preliminary report from the funding applicant and Be-Software outlining the process and results of a simulation study.	72 - 84
Consenting Process Report	Document outlining the consenting process for the Northland Shipyard and Floating Dry Dock Project.	85 - 87

Information redacted

Any information redacted in this document is redacted in accordance with MBIE's parameters for Proactive Release and is labelled with the reason for redaction. This may include information that would be redacted if this information was requested under Official Information Act 1982. Where this is the case, the reasons for withholding information are listed below. Where information has been withheld, no public interest has been identified that would outweigh the reasons for withholding it.

Some information has been withheld to protect the confidentiality of advice tendered by ministers and officials, to protect the commercial position of the person who supplied the information, and to maintain the effective conduct of public affairs through the free and frank expression of opinions.

Northland Shipyard & Floating Drydock Project

Development Phase

Initial Report : October 2019

PROVINCIAL DEVELOPMENT UNIT

Northport

Northland Shipyard & Floating Drydock Project

Development Phase – Initial Report

October 2019

Executive Summary:

Phase 1 of the Development Funding has now been completed, the proposed shipyard and floating drydock stakeholders have been consulted and a conceptual design for the shipyard facility with the capability to accommodate a [redacted] floating drydock (or a floating drydock of similar design) has been undertaken, the construction methodology investigated, and a cost estimate produced.

Ship-simulation for docking and undocking of various ship configurations that meet the stakeholder requirements has been undertaken to ensure the safe and efficient operation of a floating drydock in this location. All manoeuvres were carried out as dead-ship and used the current [redacted] marine plant and assumed suitable drydock mooring equipment. It should be noted that due to the strong tidal flows experienced in the Whangarei Harbour at Marsden Point, and potential for strong winds, there are some restrictions for docking/undocking operations; further modelling will be undertaken once the final floating drydock model/design and shipyard configuration is confirmed.

Phase 2 of the Development Funding provides for completion of the various studies and consultation required to produce and submit an AEE (Assessment of Environmental Effects) for resource consent application; proposed lodgement [redacted].

The estimated total cost of the proposed shipyard construction project, including provision for identified opportunities/risk and the consenting process is circa NZ$[redacted]

While no provision has been made for the costs of on-site buildings an estimate of NZ$[redacted] should be considered.

[redacted] has provided a cost estimate for the [redacted] floating drydock and, depending on final configuration and actual delivery, is circa NZ[redacted] (this is based on a drydock cost of c.€[redacted] and shipping of up to c.NZ$[redacted]).

[redacted]

Northport Ltd.

Background:

The concept of a NZ owned and operated floating drydock based in Northland was first raised many years ago by the NZ Shipping Federation and KiwiRail, at that time the focus was on a Port Whangarei location with both Commercial Information and floating drydock options explored; however no further work was undertaken.

Commercial Information

The concept was discussed with Northport directors and it was agreed that Northport should provide as much assistance to this project as possible; a stakeholder workshop was held at Northport in May 2018 to explore options and determine the best location for the proposed facility.

The preferred concept, and alternatives, were provided to Commercial Information and NZDF for discussion and input; it was agreed that the development proposed at the western end of the port facility would meet all the operational and infrastructure requirements.

Commercial Information

Northport Ltd. was asked to provide a high-level cost estimate for the project and on 30th November 2018 an application was made to the PGF for Development Phase Funding of $Commercial Information.

Funding Application Withheld in Full Due to Commercial Sensitivity

The PGF Independent Advisory Group visited Northport in April 2019 and were given an overview of the proposed facility and the cost estimate.

Funding approval was notified to Northport Ltd. on 29th July 2019.

Agreement:

The PDU Development Phase Funding Agreement was presented to the Northport Ltd directors at the Meeting of Directors held on 16th August 2019 and was signed on behalf of the company by the Chairman and CEO; as per the conditions of the agreement the following resolution was made and recorded on Page 569 of the company minute book:

> *It Was Resolved: -*
>
> *That the Company would carry out the Development Phase for a Shipyard / Floating Drydock at Marsden Point as proposed in the PGF Application dated 30th November 2018 and would enter into the Agreement as supplied by the Ministry of Business, Innovation & Employment in August 2019.* Funding Application Withheld in Full Due to Commercial Sensitivity
>
> *MOVED:* Privacy of natural persons
>
> *SECONDED:* Privacy of natural persons

The agreement was signed on behalf of the Sovereign by MBIE on 26th August 2019; this date is the agreed commencement date of the agreement.

Project Timeframes:

Phase 1: to be completed by [redacted]:

- Concept design to meet NZ Defence Force and domestic shipping requirements;
- Confirmed concept for drydock dimensions/capability;
- Confirmed operational feasibility by ship simulation with regard to the dry-docking and undocking of the various confirmed ship sizes (LOA, beam, drydocking draft and displacement);
- Geotech investigation of proposed location undertaken;
- Proposed final build methodology and high-level build cost based on the concept design and confirmed operational requirements; costs based on historical and latest port build/industry experience with no market approaches being undertaken;
- 3D visual overview of the proposed project and operational aspects;
- Initial Report.

Phase 2: to be completed by [redacted]:

- Identify suite of consents required;
- Identify best resource consent process (obtain Crown advice);
- Complete supporting technical information/reports;
- Consult with identified stakeholders;
- Undertake pre-lodgement meetings with NRC and WDC;
- Prepare an AEE (Assessment of Environmental Effects);
- Prepare consent application(s);
- Final Report.

Project Assumptions:

Floating Dry-dock:

Northport and [redacted]. entered into a HOA on 4th July 2018 to explore potential requirements for the provision of a shipyard facility with floating drydock at Northport; this document required consideration for a floating drydock that could accommodate the following minimum specification:

Length: [redacted]m / Beam: [redacted]m / Internal width: [redacted]m / Lift capacity: [redacted]t / Min load per metre length: [redacted]t / Operating draft: [redacted]m

Northport obtained information from the NZ Defence Force naval experts regarding current and future navy ship requirements and design dimensions; the current fleet and future projections could be well accommodated for in a drydock of [redacted]m LOA x [redacted]m beam and max. docking draft of [redacted]m.

Northport also obtained information from the NZ Shipping Federation regarding current and future ship design and the sector is comfortable with a drydock capability for vessels of: up to [redacted]m LOA x [redacted]m beam x max. docking draft of [redacted]m; note that the [redacted], this was discussed with [redacted] who could build recesses into the drydock walls to accommodate these appurtenances.

Based on the information/requirements provided by the various stakeholders Northport identified the Commercial Information Floating Drydock: Commercial Information m LOA x Commercial Information m internal beam x max. docking draft of Commercial Information m draft, submerged operating draft of Commercial Information m and max. lifting capacity of Commercial Information tonnes displacement in drydocking condition, as the most suitable and available equipment (see attached specification sheet).

Commercial Information visited Northport and entered into a Non-Disclosure Agreement with Northport; this enabled the project to access drydock models, general arrangement plans, operating criteria and infrastructure requirements. Commercial Information also provided a high-level cost estimate for the Commercial Information floating drydock.

Infrastructure Requirements:

To enable Northport to meet the future regional and Upper North Island freight demand the port facility will be required to expand its current footprint. Since 2010 there has been a number of reviews of the port's strategic infrastructure growth plans, the most recent being the 2017 Vision for Growth (www.vision4growth.co.nz), which provides for expansion to both the east and west of the current facility.

To accommodate the proposed shipyard and floating drydock a workshop was held with project stakeholders, port users, marine service providers and the Northport team to determine the most suitable site; issues considered were: the port's future freight handling requirements, floating drydock operating parameters and maintenance requirements, infrastructure requirements and constructability, water-depth and ship handling criteria, environmental sustainability and likely consent issues.

After all options were considered and reviewed the preferred site location was identified as the western end of the current port facility.

Based on this option, the constructability of the required shipyard infrastructure has been based on Northport's port design and construction management experience (see attached Commercial Information Concept Design & Construction Estimate).

Excluded from the cost estimate are buildings for workshops, administration and amenities/ablutions, heightened security requirements, landside plant/equipment for shipyard/drydock operations.

Floating Drydock Simulation:

A simulation study was conducted over the period 10th September to 25th September at Northport by Be-Software. The purpose of the study was to test the feasibility of operating a floating dry dock at the western extremity of the Northport facility.

The floating dry dock chosen for this study was a Commercial Information dock with two possible locations for the dry dock modelled at the proposed western site.

Three design ships (two containerships and one cruise ship) were chosen for the initial phase of the study which would test the feasibility of the operation and give an indication of requirements for dredging and environmental limitations.

- The study found the dry-docking operation was feasible in wind conditions up to 15 knots at high water slack tide; wind directions north west and south east are the hardest to manage;
- All the movements simulated were dead ship movements, engines and thrusters and rudders were unavailable;
- The existing tug fleet of Commercial Information would be capable of supporting the dry-docking operation. Commercial Information
- All the proposed locations for the dry dock are feasible for the operation.

It is recommended further simulation work is carried out to expand the environmental limitations for the operation of the dry dock, define the turning basin parameters, and to test the manoeuvring of the dry dock itself into the desired location.

Geotechnical Investigations:

Geotechnical Investigation was undertaken by INITIA (Geotechnical Specialists); the investigations were scoped for a set budget within a set timeframe due to equipment availability and included:

- Desktop study of previous geotechnical explorations;
- Drilling of deep ground investigations comprising machine boreholes and cone penetration tests to investigate the subsurface conditions at the specific target areas;
- Preparation of drilling logs from the field investigations;
- Collection of soil samples and testing in an accredited laboratory;
- Preparation of a Geotechnical Report documenting the geotechnical conditions at the site and the results of all field and laboratory investigations;
- Geotechnical laboratory testing to assess soil types.

It is considered that this phase of works is suitable for concept design only. Further stages of specific investigations will need to be carried out for developed and detailed design.

The work as carried out was to provide preliminary data for a concept plan to be devised for high level costings. The work was undertaken in a set time period for a set budget.

A more detailed geotechnical investigation will be necessary to fully develop the underlying geological model of the site; it should also be noted that the proposed turning basin extension was not investigated during this initial work. This should be investigated to confirm soils that are to be dredged are appropriate for the extensive reclamation earthworks required for this project.

Consideration should be given to the type of investigation/equipment techniques to be used given the lack of data obtained by the CPT due to the water depth and dense nature of the near subsurface sands.

A targeted investigation would confirm the ground conditions across the proposed development and would provide confidence that the design is applicable to the site in terms of geotechnical considerations.

It is recommended that additional investigations, which have not been allowed for in the initial development phase funding, are only undertaken when final detailed plans have been developed given the high costs associated with over-water investigations.

Concept Design and Construction Estimate:

Commercial Information have undertaken a concept design, including construction methodology and programme review, to determine a project construction cost estimate.

The initial phase was to determine user requirements while including a review of:

- Ship-simulation information;
- Historic Geotech information;
- Geotech investigation data as and when it became available;
- Existing Northport structures, design and construction methodology.

Followed by determining the concept design, which includes the following key attributes:

- Commercial Information ha Reclamation abutting the west boundary of the current port facility;
- Commercial Information ha turning basin (plus batter slopes) cut to -Commercial Information m CD;
- Commercial Information ha basin within the reclamation cut to -Commercial Information m CD;
- Determine volume of dredged material to be used in reclamation: Commercial Information m^3
- Determine volume of dredged material to waste: c. Commercial Information m^3
- Gravel Raft at pavement level to stiffen up berth structure to minimize seismic effect;
- Ground improvements, including vibro-compaction and stone columns to mitigate liquefaction risk;
- Additional Commercial Information m of berth structure: total Commercial Information m including eastern development;
- Commercial Information m Rock Seawall along South-West Boundary, including noise wall and security fence;
- Commercial Information m of Combi Wall piling, including deadman wall Commercial Information m behind combi wall, with tie rods at approx. +Commercial Information m CD;
- Concrete capping beam along length of combi wall, with bollards and fenders attached;
- Commercial Information m extension to Berth 1: deck suspended over water on tubular piles;
- 3 x mooring structures to secure the floating drydock;
- 1 x mooring dolphin sited off the western end with Commercial Information t minimum line capacity;
- ICCP (Impressed Current Cathodic Protection) system for the wharf components as well as connection and protection of the floating drydock;
- AC pavement – Commercial Information mm stabilised aggregate with Commercial Information mm asphaltic concrete to current NP site specifications;
- Combination of surface and sub-pavement drainage including mechanical treatment of the stormwater prior to entering Northport system;
- All services including lighting, potable water, fresh/saltwater supply for firefighting, sewer system and connections for site and drydock demand, reticulated power to meet the likely requirements of the site, drydock and vessels alongside/drydocked;
- Replacement fishing jetty to meet resource consenting requirements;
- An access ramp to the drydock c. Commercial Information m long x Commercial Information m wide, heavy truck/plant capable;
- Access road from the shipyard through to port boundary and into MMHL land.

Programme (assuming Resource Consents are in place)**:**

- Design Phase: Commercial Information
- Council Approval (Building Consent): Commercial Information
- Construction: Commercial Information
- Max total design and construction period: Commercial Information

Construction Estimate:

- Construction Cost: $Commercial Information
- Risk component: $ Commercial Information
- Total Cost: $Commercial Information

The construction cost estimate has been prepared by Commercial Information with inputs from Northport and Commercial Information Commercial Information has reviewed the estimate. Key assumptions are:

The construction cost estimate has been completed largely using first principle costing. Different contractors may select slightly differing methodologies, labour and plant rates, productivities and margins, resulting in different construction costs to varying degrees. As such this construction cost estimate must be viewed as a figure "for which the project can be constructed" in today's market. It does not represent what the construction tender prices will be, but rather a figure for the determination of a construction cost estimate.

The costing is as at the Commercial Information escalation of the estimate to reflect the actual timing of the activity has been excluded, but this will obviously be a cost to consider.

FOREX for items such as steel supply, assumes last quarter 2019 existing rate.

Disposal of surplus dredged material assumes the cost of disposal offshore; this is a cost of approximately NZ$Commercial Information however, this material may be useful for another, yet unidentified project.

The Regional Council Resource Consent cost is outside the Commercial Information engineering scope. At this stage the Resource Consent pathway contains uncertainty and could cost of the order of NZ$Commercial Information to $Commercial Information.

There are opportunities for improvement and thus may reduce cost, and also risks that have yet to be mitigated that may increase cost. This is normal for a project of this size and complexity at the concept design stage.

Commercial Information and Commercial Information have been through several iterations and changes in scope of the estimate, however, typically the outcome of the construction cost estimate has remained consistent at NZ$Commercial Information to $Commercial Information excluding GST for the project.

Potential Opportunities and Risk Component:

During the concept design process, several opportunities and risks have been identified. These relate to the ability to execute the works, the design scope and the construction cost estimate. Construction estimates should have allowance for risk. There are many methods for adjusting estimates to allow for risk.

A weakness of many risk processes is the fact that they do not often consider cost savings, it is also unrealistic for all risks to actually occur, and likewise for all potential cost savings to be achieved.

The total of the identified risks is +$[redacted] and the total of the potential savings is $[redacted] the cost estimate allows for +$[redacted] of risk. These risks and opportunities, together with the dollar figure included in the construction cost estimate for mitigation where appropriate, are included in the [redacted] report section 13.

[redacted]. indicated some uncertainty, from outside of the NZ stakeholders, around largest vessel docking dimensions and required docking uplift; i.e. [redacted] m LOA with a max. docking draft of [redacted] m and lifting capacity of up to [redacted] tonnes, this will need a berth pocket depth of [redacted] m. Clarification of these requirements are required asap as these drydock dimensions will significantly impact on dock location, additional build costs and dredging requirements.

Consenting:

An outline of the various consenting pathways is attached to this report; the consenting process is difficult to budget for; however, we recommend an allowance of $[redacted] should be considered.

It is assumed that the project would need to meet the consent requirements under the 'Decision Version' of the Proposed Regional Plan; this includes the location of a SEA to the west of the proposed reclamation that allows for [redacted] m buffer along the structure to operate within.

At this time there are several submitters to the Proposed Regional Plan objecting to the provision of a port expansion to the west, and therefore into a proposed/perceived SEA; considerable work is being undertaken by Northport to secure the council decision.

Commercial Information [redacted]

Commercial Information [redacted]

Summary:

Phase 1 of the Development Funding has now been completed, the proposed shipyard and floating drydock stakeholders have been consulted and a conceptual design for the shipyard facility with the capability to accommodate a Commercial Information floating drydock (or a floating drydock of similar design) has been undertaken and the construction methodology investigated and a cost estimate produced.

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Attachments:

- NZ Inc Shipyard/Floating Drydock Presentation to PGF IAG
- Withheld In Full Due to Commercial Sensitivity
- Commercial Information Floating Drydock Specification Sheet
- Commercial Information Northport Ship Maintenance Facility: Concept Design & Construction Estimate
- Initia: Preliminary Geotechnical Report
- Be-Software: Phase 1 Ship-Simulation Dry-Docking Report
- Consenting Process Report
- Withheld in Full Due to Commercial Sensitivity

Privacy of natural persons

Northport Ltd.

Commercial Information MODULAR FLOATING DRYDOCK Commercial Information

Outline Specification Commercial Information

GENERAL

Ref number	Commercial Information .
Description	Modular drydock type Commercial Information for vessels up to Commercial Information t and up to Commercial Information t/m keel load. Pontoons fit in the drydock itself for in-house maintenance.
Classification	Optional: Commercial Information

DIMENSIONS (drydock)

Length o.a.	Commercial Information m
Beam o.a.	Commercial Information m
Depth to upper deck	Commercial Information m
Depth to drydock floor	Commercial Information m
Max draught	Commercial Information m
Min Freeboard to upper deck (when fully submerged)	Commercial Information m
Min Freeboard to dock floor (with 22.000t load)	Commercial Information m
Length over keel blocks	Commercial Information m
Internal width at upper deck level	Commercial Information m
Internal width at dock floor level	Commercial Information m
Max draught above 1,5m blocks	Commercial Information m
Max draught above dragline pl.	Commercial Information m
Number of bottom pontoons	Commercial Information pcs

DIMENSIONS (vessel in drydock)

Max length	Commercial Information m
Max width	Commercial Information m
Max. Displacement	Commercial Information t
Max draught (on keel blocks)	Commercial Information m
Max draught (on dragline plates)	Commercial Information m
Max trim	Commercial Information cm/m

CAPACITIES

Max. lifting capacity (Commercial Information m freeboard to dock floor)	Commercial Information t
Max. load on center line	Commercial Information t/m
Max. load of one keel block	Commercial Information t
Total no of keel blocks	Commercial Information pcs
Max. load dock floor	Commercial Information t/m²
Drydock floor thickness	Commercial Information mm

BALLAST SYSTEM

Ballast volume pontoon	Commercial Information m^3
Ballast volume side walls	Commercial Information m^3
No of pumps in each pontoon	Commercial Information pcs
Total ballast cap (approx)	Commercial Information m^3@Commercial Information mwc
Pump rooms & voids volume	Commercial Information m^3
Ballast piping hot dip galvanised	Commercial Information %

PERFORMANCES (APPROX.)

Lifting time (from Commercial Information m to Commercial Information m draught, empty drydock)	Commercial Information h
Sinking time (from Commercial Information m to Commercial Information m draught, empty drydock)	Commercial Information h

CRANE

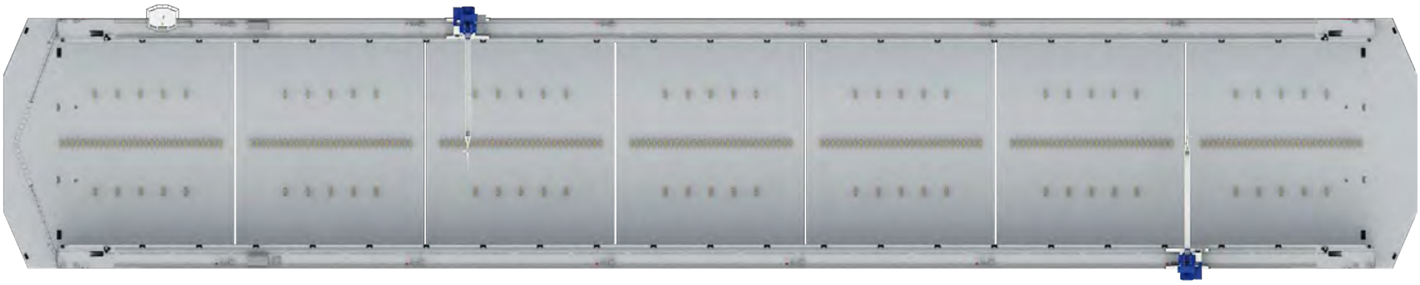
No. of mobile side wall cranes	Commercial Information pcs
Main hoist lift capacity	Commercial Information t @ Commercial Information m Commercial Information over keel blocks
Max main hoist reach	Commercial Information m
Aux hoist lift capacity	Commercial Information t @ Commercial Information m
Max aux hoist reach	Commercial Information m
Control via remote control unit	yes
Control via operator cabin	yes
Power consumption (approx.)	Commercial Information kW

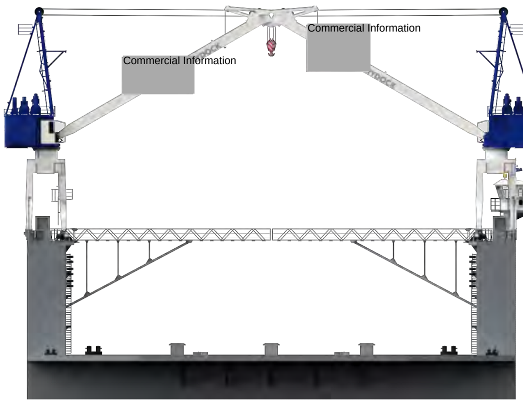
CONTROL ROOM

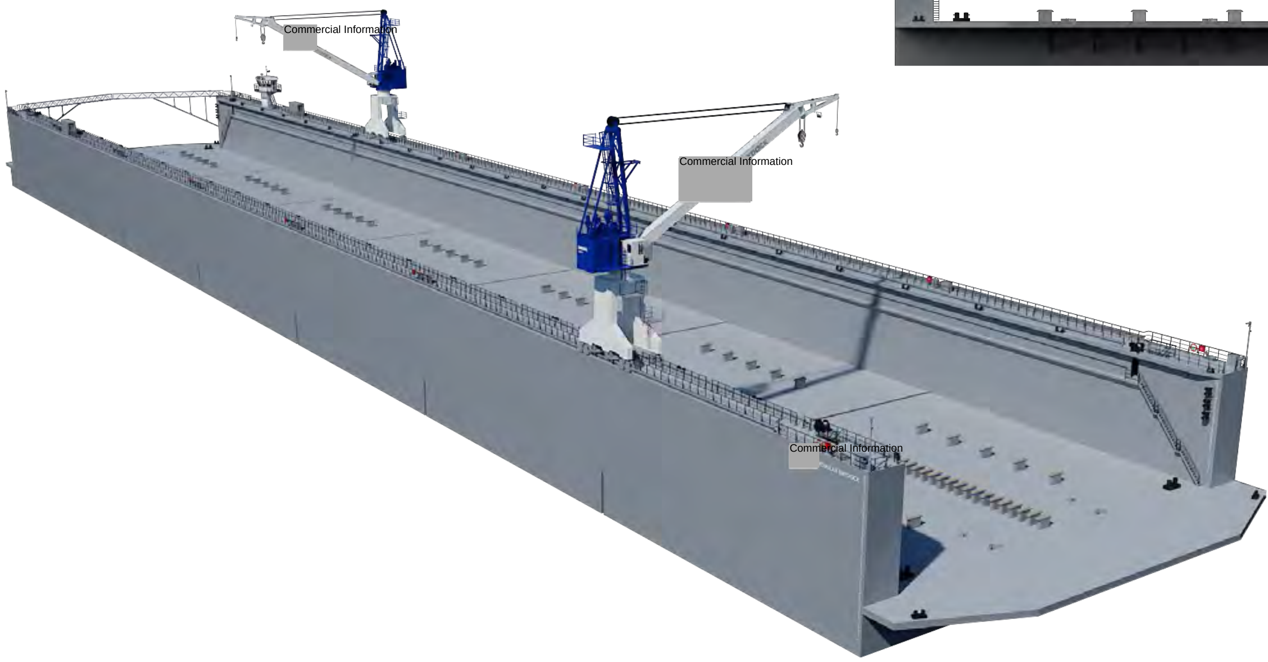
Control Room equipment	Ballast tank level system, Ballast control panel, Alarm panel, E-switchboard
Drydocking equipment	Deflection monitoring & alarm system, List & Trim monitors and backup, draft indication system
Standard equipment	VHF radio, anemometer, searchlight, binoculars, barometer
Other standard equipment	AC unit, charger for handheld VHF, charger for Crane Remote, first aid kit, fire extinguisher, life buoy with line.

FIRE FIGHTING SYSTEM

No. of fifi pumps	Commercial Information pc
Fifi pump capacity, each	Commercial Information m^3@Commercial Information mwc
No. of hydrants upper deck	Commercial Information pcs
No. of hydrants dock floor	Commercial Information pcs
Fifi piping hot dip galvanised	Commercial Information %







MODULAR FLOATING DRYDOCK Commercial Information

Outline Specification Commercial Information

Commercial Information

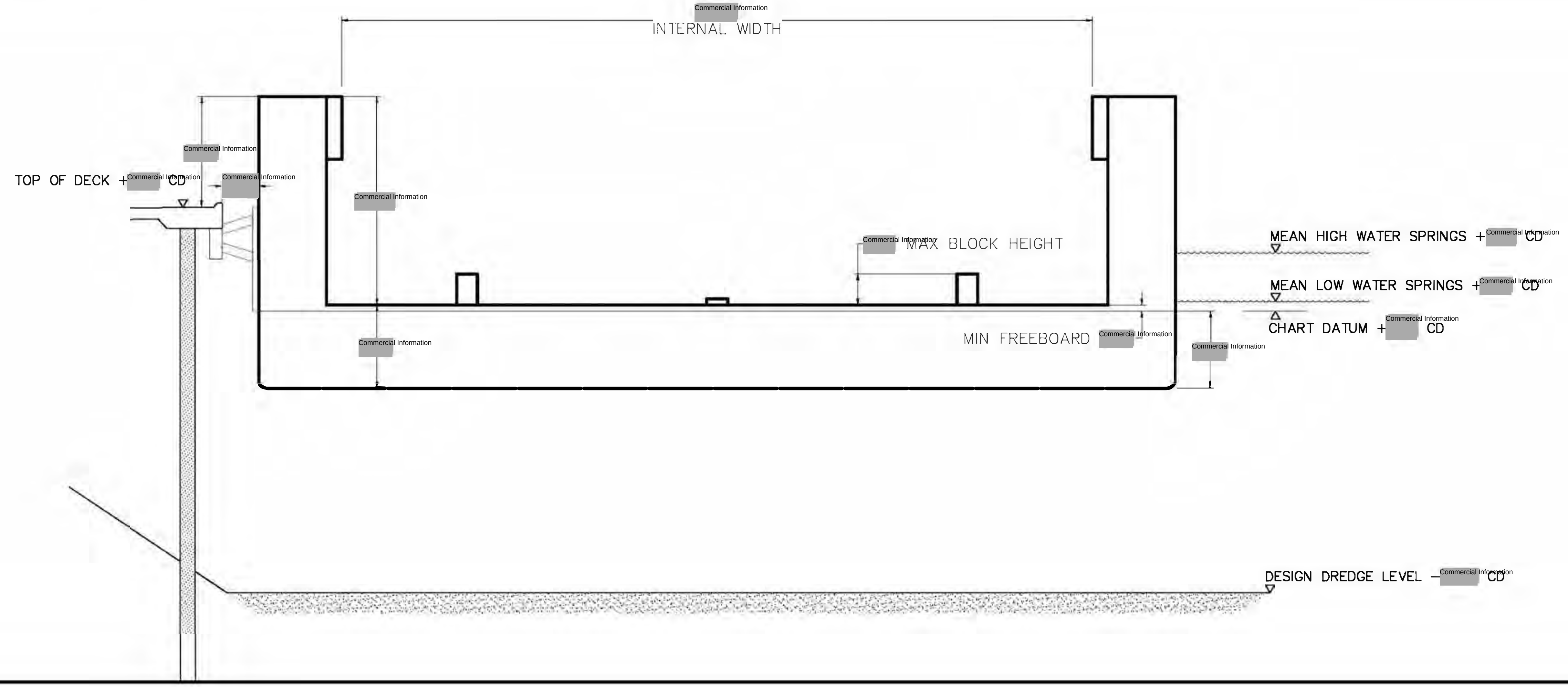
Commercial Information

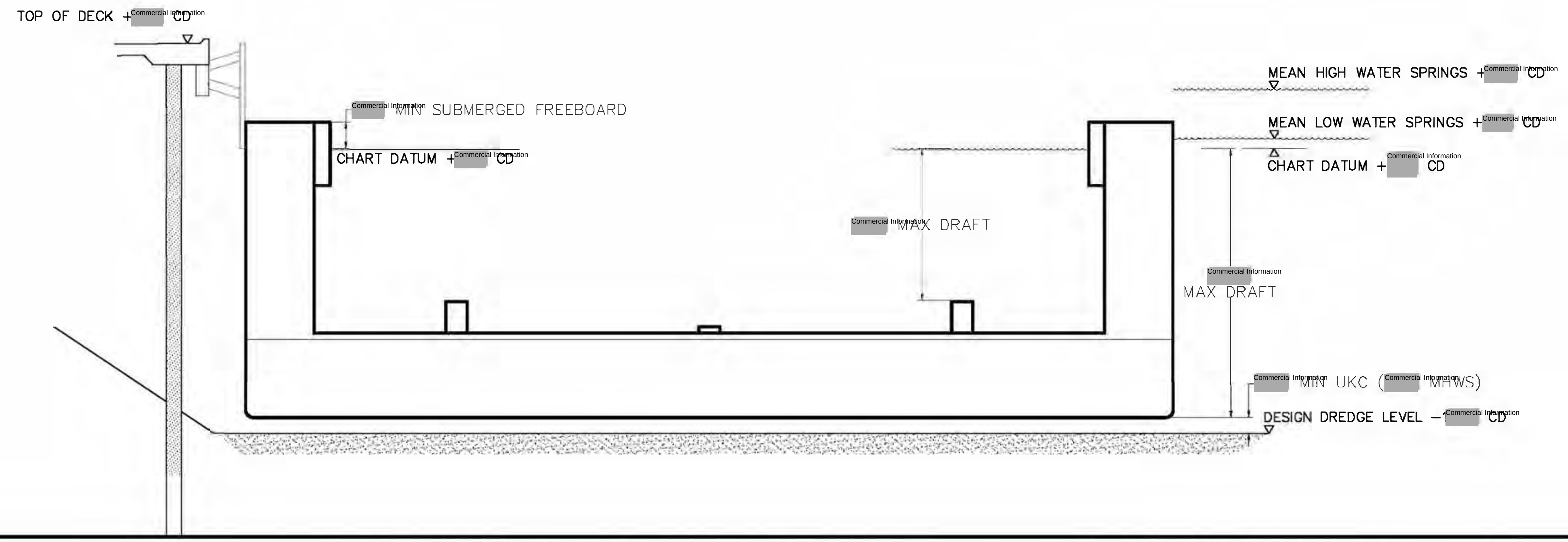
Commercial Information

FLOATING DRY DOCK

Commercial Information

PROACTIVELY RELEASED - [MAKE] Floating Drydock Profile [MODEL]

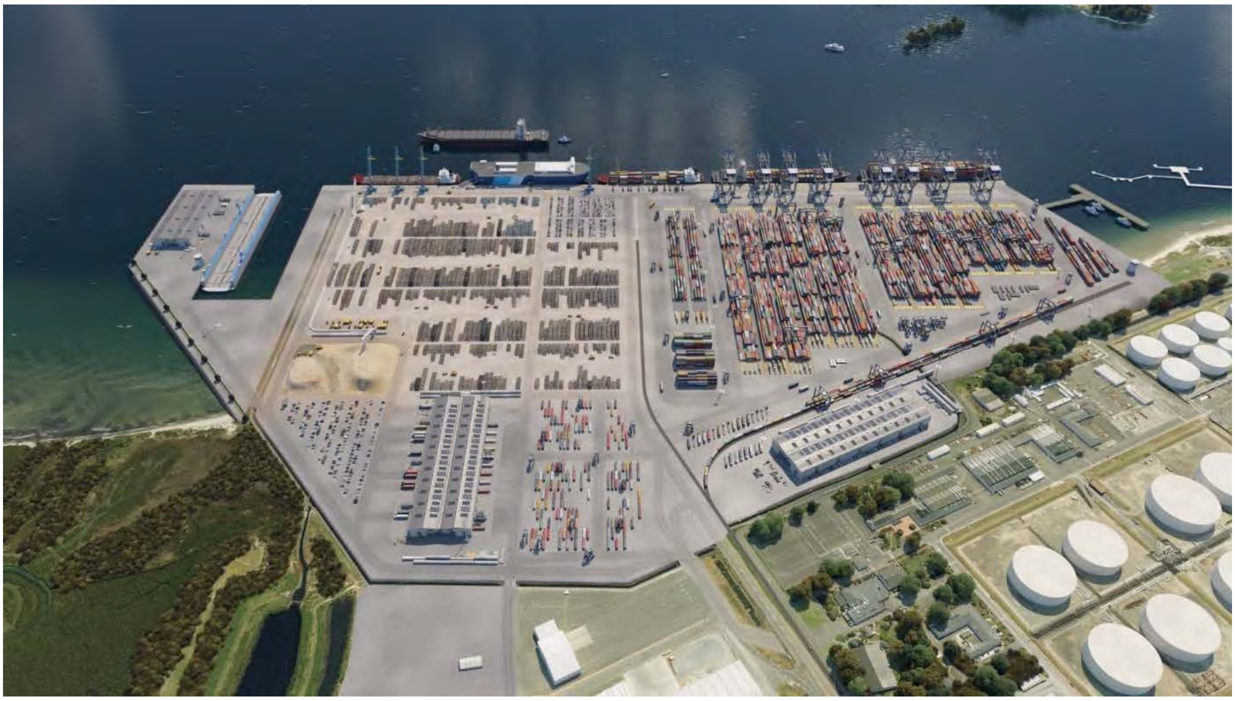




Northport Ship Maintenance Facility

2019-11-05

CONFIDENTIAL



Concept Design & Construction Estimate

Commercial Information

Contact Details

Privacy of Natural Persons

Document Details:

Date: 05 November 2019
Reference:
Status: Final
Revision: 01

Prepared by

Privacy of Natural Persons

Reviewed by

Privacy of Natural Persons

Approved for release by

Privacy of Natural Persons

Contents

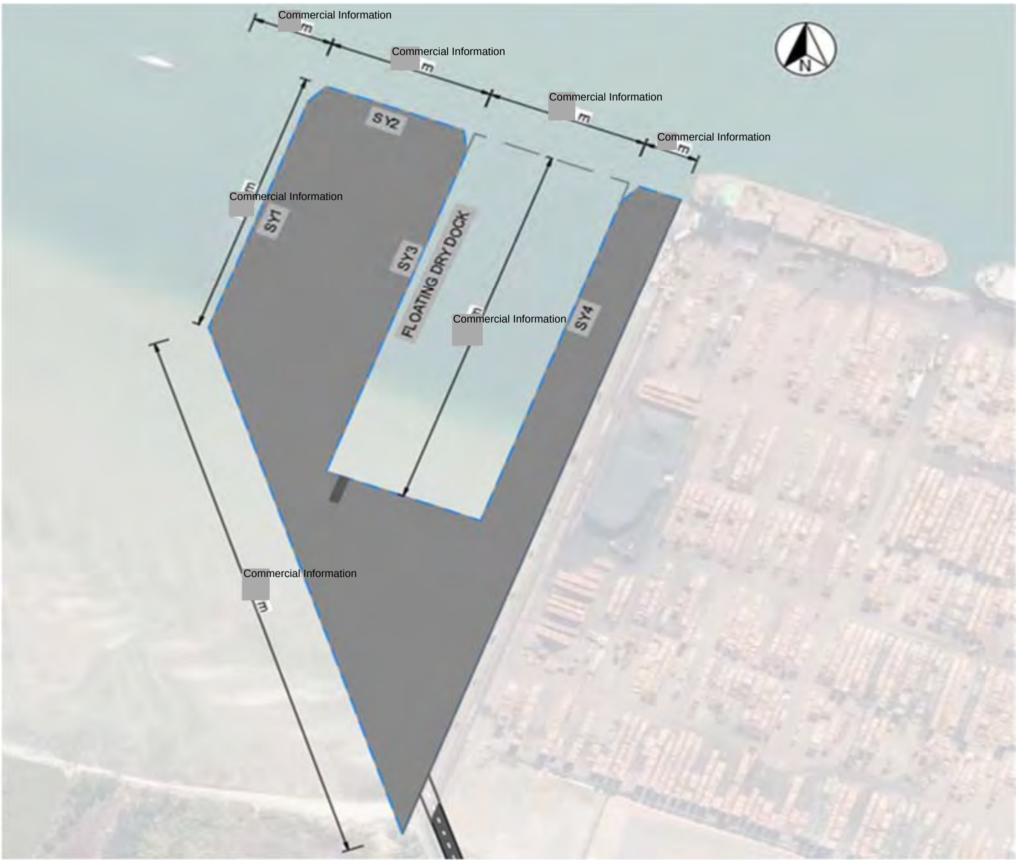
Commercial Information

Executive Summary

Northport has excellent recent technical and construction management experience. The port is less than 20 years old, with the most recent berth extension in 2007, and the hardstanding area doubled over the past decade. Northport has proven their capability in technical, construction, and maintenance management. Northport is a modern port design that meets high environmental standards. The proposed ship maintenance facility adopts Northport's proven construction and operational experience of sheet piling, drainage, lighting, pavement, cathodic protection of steel, fenders and bollards, etc.

This report contains the findings from Commercial Information of intensive investigation to establish a concept design and cost estimate for the civil infrastructure to enable a ship maintenance facility at Northport to be constructed. The objective of this report is to support a funding application for the consenting, detailed design and construction phase. Funding Application Withheld in Full Due to Commercial Sensitivity

User Requirements for this facility were developed by Northport with further assistance from Commercial Information The proposed facility provides for a Ship Maintenance facility consisting of Ship Yard 1 (SY1) Berth, SY2 Berth, SY3 Berth to house the floating dry dock, and SY4 Berth as indicated below. In total approximately Commercial Information metres of wharf is created to complement the existing Commercial Information metres of berth frontage. The key feature of the facility is to provide for a floating dry dock for ship maintenance. The cost of the floating dry dock is outside of the scope of this report, but the dry dock's mooring points to the SY3 Berth is included.



The scope of the proposed facility is:

- The ship maintenance yard is located to the West immediately adjacent to the existing Northport reclamation.
- To establish SY1, 2, 3 & 4 berths, the floating dry dock is to be positioned alongside SY3.
- To provide Commercial Information square metres of hardstanding consisting of asphaltic pavement.

- Approximately Commercial Information metres in length of a king-pile sheet-pile wall to contain the hardstanding and provide wharf frontage including bollards and fenders.
- The berth frontage is retained by king-pile and sheet-pile combined wall (combi-pile wall) that is tied back by anchors into the hardstanding area.
- There are 3 mooring points to accommodate the floating dry dock, a vehicle entrance ramp is also included to provide access to the floating dry dock from the south.
- Along the southern side diagonal of the site is a rock revetment retaining wall including a Commercial Information metre high visual and noise mitigation wall.
- All stormwater is retained within the ship maintenance facility, mechanically treated, and then discharged into the existing Northport stormwater management system.
- To extend the existing ship turning basin requires approximately Commercial Information cubic metres of dredging, approximately Commercial Information % is utilised in the construction, the other Commercial Information % is surplus to the project.
- Services such as waste water, potable water, fire protection, power, general yard lighting are included, there are no buildings.
- On the southern tip of SY1 there is a public fishing jetty with foot traffic access for the public.
- A Commercial Information metre long access road from the port boundary to Marsden Bay Drive through Marsden Maritimes Holding property.

From a Building Code perspective, an Importance Level 2 has been adopted for the facility, meaning it does not have a guaranteed post disaster function.

From the geotechnical information available the key differences compared to the existing reclamation are that this area has a higher level of variability, with clay layers present at critical depths. Also, the density of the upper layers and reclaimed sand fill require ground improvement.

Commercial Information different concepts were considered. The proposed concept based on the selection criteria adopted was a steel combi-pile wall with one level of tie backs above low tide level with as much length as possible constructed in the dry. Where this is not possible, Commercial Information, a more expensive construction sequence utilising floating platforms is proposed.

The construction period is approximately Commercial Information years. Commercial Information Commercial Information prior to construction allows for detailed design, early procurement of steel, Whangarei District Council Building Consent and any additional Resource Consent processing, and contractor mobilisation.

Commercial Information The second most significant risk is the ground conditions. Refer to Section 13 for further detail.

In summary:

1. The proposed ship maintenance facility construction cost estimate is $Commercial Information + GST. The additional allowance for Escalation and Resource Consent costs, which are not included in the construction cost estimate.
2. For a project of this nature it is recommended to allow the Contractor sufficient flexibility to redesign the works to match their skills and resources and thus provide added value.
3. Commercial Information
4. Commercial Information
5. The greatest opportunity is the ability to obtain a Resource Consents to allow construction of most of the works in the dry.

1 Introduction

Northport, working in conjunction with stakeholders, has successfully applied to the Provincial Growth Fund for funding to develop a concept for a Ship Maintenance Facility together with the completion of associated studies, investigations, construction cost estimates, business case and other relevant documentation.

This work is being undertaken as a series of workstreams coordinated and managed by Northport, one of which is this engineering workstream including concept design and cost estimate for the facility. The cost estimate excludes the floating dry dock.

Stakeholder User Requirements for the facility have been provided to Commercial Information by Northport through a workshop, Skype sessions and a series of questions and answers.

2 Scope of Engineering Workstream

The Ship Maintenance Facility concept development has a number of workstreams that are being undertaken by several different parties. These are set out in the application to the Provincial Growth Fund (PGF) dated 30 November 2018 and are not repeated here. Funding Application Withheld in Full Due to Commercial Sensitivity

The funding provided is to complete an in-depth operational feasibility study of the preferred location for the ship repair/ dry dock facility which will require a full risk assessment, design and capability review as set out in question 15 (under Part B: Project Description) of the PGF application. Funding Application Withheld in Full Due to Commercial Sensitivity

The workstream undertaken by Commercial Information is:

- Concept design of the civils/ marine infrastructure needed for the facilitation and operation of the proposed floating dry dock (Note the selection and procurement of the floating dry dock is outside this scope of work, as is the operational layout which has been developed by Northport and other stakeholders)
- Concept construction methodology, works programme, and construction cost estimate

Project memorandum PM01 provides further detail on:

- Outputs required
- Programme for delivery
- Proposed Methodology
- Discussion on technical aspects relating to the outputs, and
- Highlights some of the risks as seen at the start of the concept development

It should be noted that this phase of the work only covers the development of a proposed concept for this ship maintenance facility, and an estimate based on the proposed concept. It does not constitute a preliminary design for the ship maintenance facility.

3 User Requirements

Stakeholder User Requirements for the ship maintenance facility have been provided to Commercial Information by Northport through a number of engagement means, namely:

- Workshop on site (12/09/2019)
- Interactive Skype sessions
- Emails and phone calls containing a series of questions from Commercial Information with answers from Northport
- Commercial Information have not held any discussions with any other stakeholder other than Northport

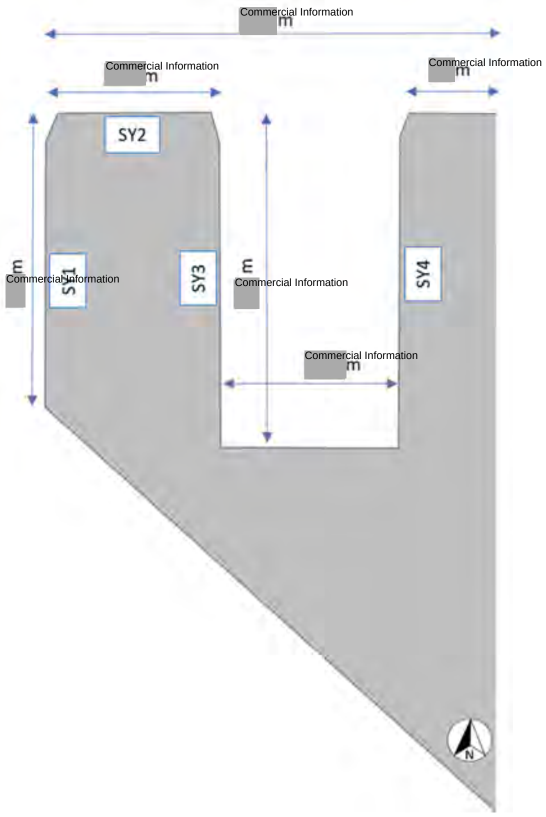
The record of user requirements serves as a written record of key discussions and decisions made, to enable the successful completion of the concept design stage.

The record also provides transparency concerning the reasoning at the time of the discussion, allowing for the opportunity to revisit decisions made, should there be a need to do so in the subsequent stages.

The key user requirements summarised below demonstrate the final decisions captured as part of completing the abovementioned stakeholder engagements.

3.1 High-level overview of reclamation

- The proposed reclamation which forms the ship maintenance facility, is to have a design life of at least Commercial Information years, which is in line with the design life of the drydock.
  - Additional durability interventions can be undertaken at Commercial Information years to enable the ship maintenance facility to achieve Commercial Information -year design life.
- The layout of berths and dimensions along the proposed reclamation is to be as follows:



3.2 High-level overview of the dry dock operation

- The dry dock to be considered, is offered by Commercial Information

  - Dimensions are [redacted] x [redacted] m
  - Maximum displacement that can be handled by the dry dock is [redacted] tonnes
  - The dry dock has a submerged draft of [redacted] m
  - Keel blocks will sit on the deck of the dry dock by means of gravity only – they will not be fixed to the structure

- The drydock is to be located along SY3, connected at 3 points

3.3 Berth (and immediate surroundings) requirements

- The existing berth depths at the wharf frontage along:

  - Berth 1 and 2 (chainage 0 – [redacted] m) is currently -[redacted] m CD but can be cut to -[redacted] m CD.
  - Berth 3 (chainage [redacted] – [redacted] m) is -[redacted] m CD but can be cut to -[redacted] m CD.

- The berth depth along the north face of the proposed reclamation (along SY2 and Berth 1 extension to the corner of SY4) is to be -[redacted] m CD. This allows for dredging tolerances and siltation build-up
- The dredged depth of the drydock basin is to be -[redacted] m CD, such that there is no depth difference between the north face berths and the dry dock basin
- The dredged depth along SY1 is to vary from -[redacted] m CD (southern extent of the berth) to -[redacted] m CD (northern extent of the berth)
- The fendering and bollards are to be designed for current vessels

  - SY1, SY2, and SY4 is to have fendering running along the entire length of each berth

- The dry dock will be moored to the SY3 berth by means of three spud pole connections (no fendering will be required along berth SY3)
- The dry dock will be located [redacted] m from the southern face of the dry dock basin

  - An access ramp is to be provided onto the dry dock from the south

    – The ramp is to cater for Class 1 vehicles
    – The ramp is to be [redacted] m wide and designed to +[redacted] m CD

- The surrounding heavy-duty pavement loadings is to be as per the existing berth structure loadings, including catering for harbour mobile crane operations
- There will be no need for crane rails (limited load carrying capacity) – crane operations will be carried out by means of harbour mobile cranes and drydock mounted cranes
- To cater for the high windage associated with cruise ships/ferries:

  - Normal bollards are to be spaced as per existing spacings ([redacted] m – determined from [redacted]
  - Storm bollards are to be spaced at [redacted] m

3.4 Dolphin requirements

- A mooring dolphin is to be provided:

  - The dolphin is to be located [redacted] m west of the SY1/SY2 interface and set back [redacted] m (south) from the SY2 berth face
  - The dolphin is to cater for 3 mooring lines (each able to cater for at least [redacted] ton) for a vessel from SY2 – allow for [redacted] ton on the dolphin
  - The maximum displacement of the vessel is assumed as [redacted] tonnes
  - The maximum length of the vessel is assumed as [redacted] m by [redacted] m
  - Mooring lines are assumed at [redacted] m above the water level

- No mooring study has been undertaken at this stage for the dolphin to ascertain horizontal arcs and vertical inclinations

3.5 Maintenance facilities & hard standing (away from berth faces) requirements

- The proposed facility operator will require basic buildings such as offices, ablutions, small workshops, lunch rooms, etc.
- The following services will need to be supplied:
  - Water:
    - Stormwater infrastructure (subsurface) – which can flow into the existing stormwater management system that is designed for a [redacted]-year Annual Reoccurrence Interval (ARI)
    - The stormwater infrastructure will need to cater for treatment prior to being discharged into the existing stormwater management system
    - Sewer infrastructure (including infrastructure to cater for waste water contained within the floating dry dock)
    - Potable water and Firefighting infrastructure
  - Power:
    - [redacted] kVA power supply; [redacted] Hz power supply for vessels
    - Substation, which should be located in the vicinity of SY1, SY2, and SY3
  - Lighting:
    - The existing Port grid layout for lights is to be extended along the proposed reclamation
    - It is assumed that the dry dock is self-contained for lighting
    - Lights to be [redacted] m high
    - It is assumed that any additional lighting required by the shipyard operator will need to be supplied on a case-by-case basis
- All services need to be located away from crane operation locations – the harbour mobile cranes will operate within [redacted] m of the berth face
- The finished level of the reclamation is to be +[redacted] m CD, which ties into the existing berth finish levels (along the perimeter)
  - Allowance is to be made for surface water drainage falls at [redacted] and [redacted] (where appropriate) – the reclamation is required to be as flat as possible
- The existing pavement design is deemed appropriate, given the good track record of the existing pavements, consisting of :
  - [redacted] mm AC
  - [redacted] mm stabilised Basecourse
  - A concrete beam will run along the perimeter of the proposed combi pile wall
- The existing noise wall will remain in its current location
- The proposed reclamation will require an additional visual and noise wall and security fence along the southwestern border of the reclamation

3.6 Geotechnical and associated construction aspects

- There is an expectation that the structure will still be serviceable after an earthquake with an annual probability of exceedance greater that [redacted]
- The structure is to be designed as an Importance Level 2 structure

- The construction sequence proposed must be constructible, with the primary objective to obtain a construction cost estimate and an associated high-level construction programme

3.7 Consenting / Environmental

- Dredge/sediment plumage during construction will needed to be managed and acceptable limits will be determined by the Resource Consent
- The proposed construction technique limits the dredge/sediment plumage
- A public fishing jetty and access route is to be provided at the southern extent of SY1, similar to the existing jetty

3.8 Material preferences

- Northport has indicated that they prefer the following berth structures along the proposed western expansion:
  - SY1 – Sheet piles and fendered (same structures as Berth 3)
  - SY2 and Berth 1 extension to the interface with SY4 – open piled structure (same structures as Berth 1 and 2)
  - SY3 and SY4 - combi pile wall and tied back deadman is acceptable
- The sheet piles to be painted in the tidal and splash zones and have cathodic protection
- ICCP to be installed (sheet piles and concrete reinforcing will therefore need to be electrically continuous)
- The proposed concept design has been based on a technique that allows for a large portion of the construction work to be completed off of land (in the form of reclamation) while still (at this concept design stage) demonstrating confidence in construction costs, constructability, and long-term performance

3.9 Agreed assumptions

Following the completion of preliminary vessel handling simulations, the following assumptions for the concept design were made in order to inform the engineering design:

- It is assumed that the dry dock and its connections will perform winching
- Breasting dolphins are provided at the entry points to the dry dock basin to avoid damage; the concept fendering system is to cater for the following:
  - Maximum vessel displacement of a vessel entering the drydock is Commercial Information tonnes
  - Maximum approach velocity is Commercial Information knots
  - Impact angle is Commercial Information degrees
- It is assumed that the SY1/SY2 corner is bevelled and contains fenders (i.e. roller fenders)
  - This allows vessels the ability to lean on the fendering and be rotated around the fendering
  - Vessel velocities are assumed to be Commercial Information knots in this instance
  - Impact angle is Commercial Information degrees
  - Maximum vessel displacement is assumed to be Commercial Information tonnes
- Cost rates for dredging were provided by Northport
- It is assumed that the mobile dredging operation will fit around the construction requirements. Examples of hopper dredger vessels are as follows:
  - The Albatross dredge has a Commercial Information - Commercial Information m draught with Commercial Information - Commercial Information m^3 capacity
  - The Fairway dredge has a Commercial Information m draught with Commercial Information m^3 capacity

- For cost estimating purposes, the worst case scenario was assumed, where excess dredging would be dumped offshore
- ICCP installations will be needed. Cost information was provided by Northport
    - Need to include for the dry dock within the overall cathodic protection system
    - In addition to ICCP, painting of the tidal and splash zones is also required
- The estimate is to assume current rates – do not allow for escalation

4 Project Constraints and Key Issues

There are a number of project constraints. The key constraints are briefly discussed below.

Northport's "Vision for Growth" includes a Commercial Information ha expansion to the west of the existing Port, the ship maintenance facility is to fit within this area.

The approximately Commercial Information ha footprint requires about Commercial Information m^3 of fill to create the reclamation. It is cost effective to obtain the fill material from the nearby dredging required to create the berth pockets/ turning basin and floating dry dock basin.

An operational constraint is the existing berths, and more critically Berth 1, which must remain operational at all times both during construction and during operation of the dry dock.

The dimensions and operational requirements of a range of possible floating dry docks has been assessed by Northport and advised that the design is to be based on a Commercial Information Commercial Information floating dry dock. We have utilised what information the manufacturer was prepared to provide at the time of undertaking the concept design.

Vessel simulations have been provided by Northport's in-house simulator, the geometry and detailed layout of the facility is based on preliminary simulation runs undertaken. These simulations are based on selected vessels likely to be maintained in the dry dock.

Vessel information on existing Navy vessels has been provided, and the concept design of the berths primarily used by Navy is based on this information.

The mooring of the floating dry dock in the basin is based on Commercial Information knot wind speed provided by Commercial Information but Northport have asked that this be increased. A figure of Commercial Information knots has been used.

The preliminary design phase was to be Commercial Information weeks, however to meet funding requirements timeframe of Commercial Information for an updated construction cost estimate a concept design and cost estimate has been provided. To provide confidence in the updated construction cost estimate, the development of a proposed concept design (including geotechnical testing completed by Northport utilising Commercial Information) together with an associated construction methodology and programme was completed within a Commercial Information period, this necessitated parallel workstreams and the inclusion of risks and opportunities (see Section 13).

5 Inputs from other Sources

Ideally, at the start of the concept design phase, inputs would be available from other Northport suppliers working on their respective workstreams, however, this was not possible due to the Commercial Information time frame in which the concept design and construction estimate needed to be completed. Therefore, should the project progress, like all projects, there will be review and refinement of the cost estimate. Other sources are:-

- Hydrodynamic study including sediment transport in the dry dock
- Geotech investigations and laboratory testing results, the final report was available as at 25th October at the end of concept design. Further testing of the unexpected clay layers is recommended Final Report Withheld in Full Due to Commercial Sensitivity
- Additional vessel simulations continue to be undertaken by Northport, this may further optimise the dredging
- Consenting strategy may require design or construction method refinements
- Ship maintenance yard users may also require design refinements, to date these have been provided by Northport

6 Design Methodology

The concept design methodology adopted was:

1. Collect and assess the Stakeholder User Requirements and the proposed layout. The more important user requirements needed to advance this workstream were provided by Northport at the workshop on 12 September 2019 and implications discussed; the remainder were provided via Skype sessions, and specific requests for information.
2. Develop Commercial Information views on issues of the status of the facility in terms of the coastal and marine requirements.
3. Gain Northport agreement to the adoption of Importance Levels used to develop design loadings.
4. Incorporate the Stakeholder User Requirements provided by Northport into the design.
5. Assimilate the existing geotechnical information and where possible include results from the investigations being undertaken in parallel with the engineering design.
6. Review and where appropriate incorporate previous Northport wharf designs for re-use within the new wharf and floating dry dock basin; this includes an assessment of the seismic liquefaction, and any construction issues specific to this site.
7. Develop a proposed concept design to satisfy the Stakeholder User Requirements, and comment on buildability/construction issues.
8. Identify where further work may be required in the following stages.
9. Develop the Functional Requirements for the final concept design.
10. Develop an updated construction cost estimate.
11. Comment on cost opportunities and risks.

7 Importance Level and Seismic Issues

7.1 Importance Level

Project Memorandum PM02 discusses the impact on the concept design for the adoption of various Importance Levels (as set out in AS/NZS1170.0 2002), asset life, and any implications of the CDEMA on this facility.

It was agreed with Northport that the development of the concept design is to be based on:

- The facility does not have a post disaster function
- An Importance Level 2 is to be adopted
- Asset life is to be at least Commercial Information [redacted] years

7.2 Seismic Issues

The seismic issues at the site are dictated by the prevailing seismic hazard at this location, and the ability of the reclamation to sustain the design levels of shaking with an acceptable level of damage.

The design levels of shaking are such that liquefaction of the upper layers of the sea bed and reclamation fill that is deposited through a water column cannot be discounted and some densification of these layers will be required.

Around the perimeter of the reclamation the level of densification of the sand layers down to approximately RL - Commercial Information [redacted] m is variable, and vibro-compaction is considered the most cost-effective means of improving this. However, due to the variability of the materials encountered in the September/October geotechnical investigation drilling, it may be necessary to also use other methods, such as stone columns in selected areas.

The proposed design of the reclamation bund and waterfront structures are sufficiently strong to contain the liquefied reclamation materials post-earthquake and prevent excessive lateral deformations.

8 Preliminary Geotechnical Analysis

Work on the concept design initially utilised the results of investigations undertaken for Berths 1, 2, and 3 with the assumption that ground conditions in the area of the floating dry dock basin would be similar. Results of the drilling work in October 2019 undertaken concurrently to this engineering workstream was to be utilised if it became available in time.

The investigations for Berths 1, 2, and 3 indicated that sands would be the predominate material encountered with isolated silty sand and clayey sand layers. Analytical work for the preferred combi-pile wall with tie backs proceeded on this basis utilising the vibro-compaction improved properties of the sand layers.

When the results of the concurrent geotechnical investigation drilling work became available, it was apparent that the site was much more variable than first assumed, and there are clay layers extending across the site at the level of the base of the dry dock basin. The upper section of the clay layer was relatively soft, becoming firmer with depth. The presence of weak clay extending in front of the combi-pile wall and into the basin required further assessment and analysis and was found to place higher bending demands into the combi-pile wall.

The concept design and analyses are based on some limited soil property data. The proposed CPT testing from floating plant failed to achieve significant penetration of the sea floor. Therefore, we relied on the available correlations between soil properties and the SPT tests performed down the bore holes. Free and frank opinions

The preferred design is sensitive to the undrained shear strength of the clay layer. It is expected that further sampling and testing to derive the undrained shear strength of these silt/clay layers will be undertaken in the following design phase to confirm these material properties and refine the design.

9 Options and Proposed Concept

9.1 Options Considered

A number of options for the wharves and the floating dry dock basin were considered prior to arriving at a proposed concept. These were as follows:

- Wharves similar to Berths 1 and 2
- Twin combi-pile wall structure similar to Berth 3
- Diaphragm wall with tieback anchors
- Interlocking circular caissons gravel or sand filled
- Single combi-pile wall with tieback anchors
- Typical marginal wharf

9.2 Selection Criteria

A number of criteria were considered when arriving at a proposed concept. These included:-

- Targeting optimal cost
- Workable construction sequencing considering floating platforms and the use of divers
- The possibility for the need for ground improvement
- Ability to take advantage of the shallow water depth over the site (when compared to Berths 1, 2 & 3) and the opportunity to construct in the dry rather than over water
- The cost benefits of construction in the dry rather than over water
- Optimising materials required
- Consideration of contractor capability including labour and plant required
- The benefits of dredged fill from the vessel turning area into the reclamation
- The relatively low cost of rock/gravel from nearby quarries
- An acceptable programme and a limited period of exposure to construction noise
- The ability to modify the construction methodology without major changes to the concept to address environmental constraints
- A robust approach to seismicity and liquefaction

9.3 Initially Proposed Concept Design

The initially proposed concept adopted was to create a temporary reclamation up to RL +Commercial Information [redacted] m CD outside the western and norther berth faces, protect this from wave action during construction, and except for a small section in the northeast corner, after filling, construct the works in the dry. The temporary platform would then be removed as part of the dredging of the floating dry dock basin. The small section in the northeast corner would then be the only section that required the use of floating plant, and divers.

The benefits of this concept (excluding the northeast corner) are as follows:

- Can be constructed in the dry
- Has very simple construction procedure, meaning construction will be cheaper
- No diving is required, and the tie backs constructed in the dry
- Requires Commercial Information [redacted] dredging campaigns but this is considered acceptable given mismatch in cut (Commercial Information [redacted] cubic metres) to fill volumes (Commercial Information [redacted] cubic metres)
- Uses less concrete and steel materials, and hence reduced labour to install/ construct
- There is no need for a concrete deck, so none is provided
- The combi pile capping beam can accommodate both bollards and fender systems, with storm bollards being located as separate elements further back from the berth face
- Ground improvement is expected to be economical and straight forward
- The concept can accommodate other ground improvement techniques

- The concept can be adjusted in geometry to cater for minor changes in User Requirements without necessitating a change in concept
- Durability requirements can be readily addressed using proven technologies
- A separate mooring structure for the floating dry dock can be accommodated within the basin in a straight forward manner

Commercial Information

The initially proposed concept was then revised to take into account the likely requirements for a Resource Consent with the main factors being Commercial Information The revised concept allows for enclosing the reclamation area with either a combi-pile wall, or rock revetment, or a combination of the two, prior to commencement of reclamation. Drawings of the final preferred concept is contained in Appendix A.

10 Proposed Construction Methodology

Northport has excellent recent construction management experience including proven capability in technical, construction, and maintenance management. Northport is a modern port design that meets high environmental standards. The ship maintenance facility adopts Northport's proven techniques of sheet piling, drainage, lighting, pavement, cathodic protection of steel, etc.

The construction summary methodology is:

1. Enclosing the hard-standing area including the dry dock basin. This requires the diagonal rock revetment to the south, the combi-pile walls for SY1, SY2 and temporary sheet piling across the entrance to the dry dock basin and sealing off against the existing Berth 1
2. Filling the site with dredged material from the turning basin
3. Install the dry dock basin perimeter combi-pile wall from on dry reclaimed land
4. Removal of the material within the dry dock basin to create the basin, followed by the removal of the entrance temporary sheet pile wall
5. In excess of approximately [redacted] cubic metres of dredged sand is at this stage costed for disposal to waste (location to be determined), while approximately [redacted] cubic metres is used in the reclamation
6. Hard standing and services are similar in nature to Northport's proven existing infrastructure

The following is a more detailed description of activities:

Sea Wall - this is constructed with traditional earthworks plant ([redacted] m^3 delivery trucks, [redacted] ton digger) working forward from dry land at the southern end. Geotextile will be laid over the wet areas prior to the core being placed. The seawall will be built [redacted] m wide to allow trucks to pass each other. The core will be constructed from greywacke ([redacted]) formed to final level with trucks progressively driving over it to deliver rock to the digger at the advancing workface. Geotextile, filter rock, and rip rap will be placed immediately as the seawall advances.

Removal of Soft Clays along Combi-pile Wall – these will be pre-dredged by a cutter-suction dredger to spoil, possibly offshore.

Temporary Floating Breakwater – this will be constructed in [redacted] m lengths on site in the form of [redacted]-[redacted] m vertical timber boards secured by a light steel framework to [redacted] no. diameter [redacted] mm steel tubes with closed ends. The floating breakwater sections will be tied to heavy duty temporary steel H-section piles driven into the seabed at approximately [redacted] m centres. The purpose of the breakwater is to control the height/size of waves impacting the unsecured combi-pile wall during installation, in high winds/weather, preventing undue deflections/damage to the combi-pile wall.

Combi-pile Wall and Dead Man – this will be installed from water with a [redacted] ton crane, vibro hammer, and hydraulic impact hammer working off a [redacted] ton Jack Up Barge (JUB). The combi-pile wall king piles and intermediate sheet piles are [redacted] m and [redacted] m long, respectively. They will be procured and delivered to site by ship in full lengths with the sheet piles pre-clutched into pairs. Corrosion protection painting will be done prior to driving, with touch-ups to damaged areas being done after driving. A long purpose-built trailer will transfer the units from the storage yard to a loading area with a wharf face, where a [redacted] ton crawler crane will load the units onto the service barge with a long lifting beam to control deflections. [redacted] no. suitably sized service barges will be utilised to ensure that the JUB has a continuous supply of units moored to it.

The combi-pile wall units will be placed on the service barge on a purpose-made tilting cradle which will enable the units to be lifted at one end and transferred into a vertical position slung by the crane on the JUB. From there the unit will be placed into a "double-decker" piling gate welded to the JUB in the correct position and alignment of the combi-pile wall. Once in the gate, the crane will place a [redacted]-[redacted] ton vibro hammer onto the unit and vibrate it down to refusal (which may be on intermediate hard layers or it may go down to full design depth immediately). If necessary, a [redacted]-[redacted] ton hydraulic impact hammer will be used to drive the units through any hard layers down to final design depth.

The dead man sheet pile wall will be installed in the same manner from the JUB, [redacted] m from the combi-pile wall.

Whalers and tieback anchors to the dead man wall will be installed with assistance of the crane on the JUB and men working from workboats attaching ties to the connections.

Dredged sand will then be pumped directly into the [redacted] m wide core between the dead man sheet pile wall and combi-pile wall. Working from the seawall end, access will be gained to the sand-filled combi-pile wall at level +[redacted] m CD with a 150 ton crane, vibro hammer, and heavy duty H-section steel “lance” which will be used to vibro-compact the sand within the combi-pile wall core. The crane will progressively work forward over the stable compacted core.

Reclamation – once the combi-pile wall, temporary steel bulkhead, and seawall have sealed off the reclaimed area, the reclamation will be completed by pumping dredged sand directly into progressive “settlement ponds” formed by a dozer and digger, allowing surplus water to decant off at controlled positions on slightly lowered weirs on the pond walls. The sand will self-compact as it dries out.

Partial temporary reclamation into the dry dock basin berth area will be done sufficiently to allow the dry dock basin combi-pile wall to be installed from the reclaimed area.

Potential clay/silt layers will be separately pumped into “reserved” ponds from where it will be carted to spoil on land at approved tip sites after it has sufficiently dried to be handled.

Dry Dock Basin Combi-pile Wall – once the reclamation and vibro-compaction has been completed this wall will be installed from the reclamation by traditional land-based means.

When the dry dock basin combi-pile wall is installed the dry dock basin will be dredged out to spoil. A cutter suction dredger (CSD) will be assembled by crane in water in the dry dock basin , where after it will pump the sand into settlement ponds behind the south end of the seawall, from where it will be carted to spoil once dried.

Once the dry dock basin is fully dredged out the temporary bulkhead is then removed with crane and vibro hammer from the JUB onto a service barge and then transported back to land storage where it can be resold. The CSD can then travel out of the drydock basin to its next deployment.

Completion works – services, drainage, pavement layer works, and finishings can then be installed in the traditional manner.

Dolphin – the entire dolphin (piles, table top deck, furniture) will be constructed from the JUB. Concrete can be pumped along a pump-line supported on temporary piles from the northwest corner of the reclamation or delivered to the dolphin in a ready-mix truck driven onto a service barge.

11 Proposed Construction Programme

It is likely that procurement in the Construction phase will allow the Contractor sufficient flexibility to optimise the design to suit their construction skills and resources, and thus cost. Therefore, it is assumed the Contractor would apply to the Whangarei District Council for a Building Consent and any modification to Resource Consents and as such will undertake the detailed design to support the Consents. The Design phase is likely to be Commercial to Commercial Information, followed by Commercial to Commercial Information Council approval of the Consents. This methodology assumes that Northport has already obtained a Resource Consent from the Commercial Information, and that this is not at this stage a critical path matter. The Commercial Information are not expected to require Development Contributions.

The Construction activity programme is approximately Commercial Information in duration.

1. In order to achieve a Commercial Information programme, based upon the proposed concept combi-pile wall design, two floating jack-up barges have been assumed. There are only two suitable jack-up barges in NZ. The estimate assumes a second barge will come from overseas, most likely from Australia.

2. Steel procurement may be a critical path item and will need to be considered early in the process and possibly procured during the preceding detailed design process.

3. Commercial Information

4. There are several factors that impact the programme, not the least being the actual methodology and design the appointed Contractor derives to suit his operations.

12 Construction Cost Estimate

The construction cost estimate has been prepared by [redacted] of [redacted] with inputs from Northport and [redacted] has reviewed the estimate. Key assumptions are:

1. The construction cost estimate has been completed largely using first principle costing. Different contractors may select slightly differing methodologies, labour and plant rates, productivities and margins – resulting in different construction costs to varying degrees. As such this construction cost estimate must be viewed as a figure “for which the project can be constructed” in today’s market. It does not represent what the construction tender prices will be, but rather a figure for the determination of a construction cost estimate.

2. The costing is as at the last quarter of 2019.. Escalation of the estimate to reflect the actual cash flow timing of the activity has been excluded, but this will obviously be a cost to consider. Escalation could be in the order of [redacted] - [redacted] % (+$ [redacted]) to match the proposed construction programme timing.

3. FOREX for items such as steel supply, assumes last quarter 2019 existing rate.

4. Disposal of surplus dredged material assumes the cost of disposal offshore, this is a cost of approximately $ [redacted] However, this material may be useful for [redacted]

5. The Regional Council Resource Consent cost is outside the [redacted] engineering scope, this is Northport’s responsibility. At this stage the Resource Consent pathway contains uncertainty and could cost of the order of $ [redacted] to $ [redacted]

6. There are opportunities for improvement and thus may reduce cost, and also risks that have yet to be mitigated that may increase cost. This is normal for a project of this size and complexity at the concept design stage. The following section explains this more extensively.

[redacted] and [redacted] have been through a number of iterations and changes in scope of the estimate, however, typically the outcome of the construction cost estimate has remained consistent at $ [redacted] to $ [redacted] excluding GST for the project.

13 Opportunities & Risks Summary

During the concept design process a number of opportunities and risks have been identified. These relate to the ability to execute the works, the design scope and the construction cost estimate. Construction estimates should have allowance for risk. There are many methods for adjusting estimates to allow for risk.

Many government agencies have very detailed procedures for this including use of AtRisk Software, Monte Carlo analysis, etc, many of these processes are conservative. A weakness of many risk processes is the fact that they do not often consider cost savings, it is also unrealistic for all risks to actually occur, and likewise for all potential cost savings to be achieved.

The total of the identified risks is +$Commercial Information and the total of the potential savings is $Commercial Information The cost estimate allows for +$Commercial Information of risk. The following are the risks and opportunities, together with the dollar figure included in the construction cost estimate for mitigation where appropriate.

1. A change in the geotechnical conditions in the area of the works from that encountered at Berths 1, 2 and 3 was identified as a risk prior to starting work. The results from the drilling work undertook by Northport in October 2019 was provided during the concept design period and confirmed the presence of clay layers that may require mitigation.

   The results identified the presence of clay layers and clay lenses that were not present in Berth 1, 2 & 3 construction. The investigation did not test the clay layers sufficiently for results to be fully utilised in the concept design. Clay is notoriously variable in strength. This risk still exists and will need to be managed by further drilling and testing the clay.

   The variability of conditions across the site in respect of compactness of the sand Commercial Information means there is a risk that additional ground improvement works to those included in the scope of work may well be required in some areas. This cannot be identified at this time because additional investigations are required to quantify material properties and variations in stratigraphy across the site. Allowance has been made for stone columns and vibro-compaction of sand in the construction cost estimate. (A possible $Commercial Information risk).

2. Commercial Information

3. Commercial Information

4. Commercial Information

5. Commercial Information

6. Commercial Information

7. Commercial Information

8. Commercial Information

9. Mooring of the dry dock, three major connections have been allowed for in the estimate, however this has not be confirmed . (A possible $Commercial Information risk).

10. Commercial Information

11. Commercial Information

12. Commercial Information

13. Commercial Information

14. Commercial Information

15. Commercial Information

16. Commercial Information

17. Commercial Information

18. It is assumed the Commercial Information Development Contributions will not be required and that Commercial Information will support the development.

14 Recommendations

The following is recommended:

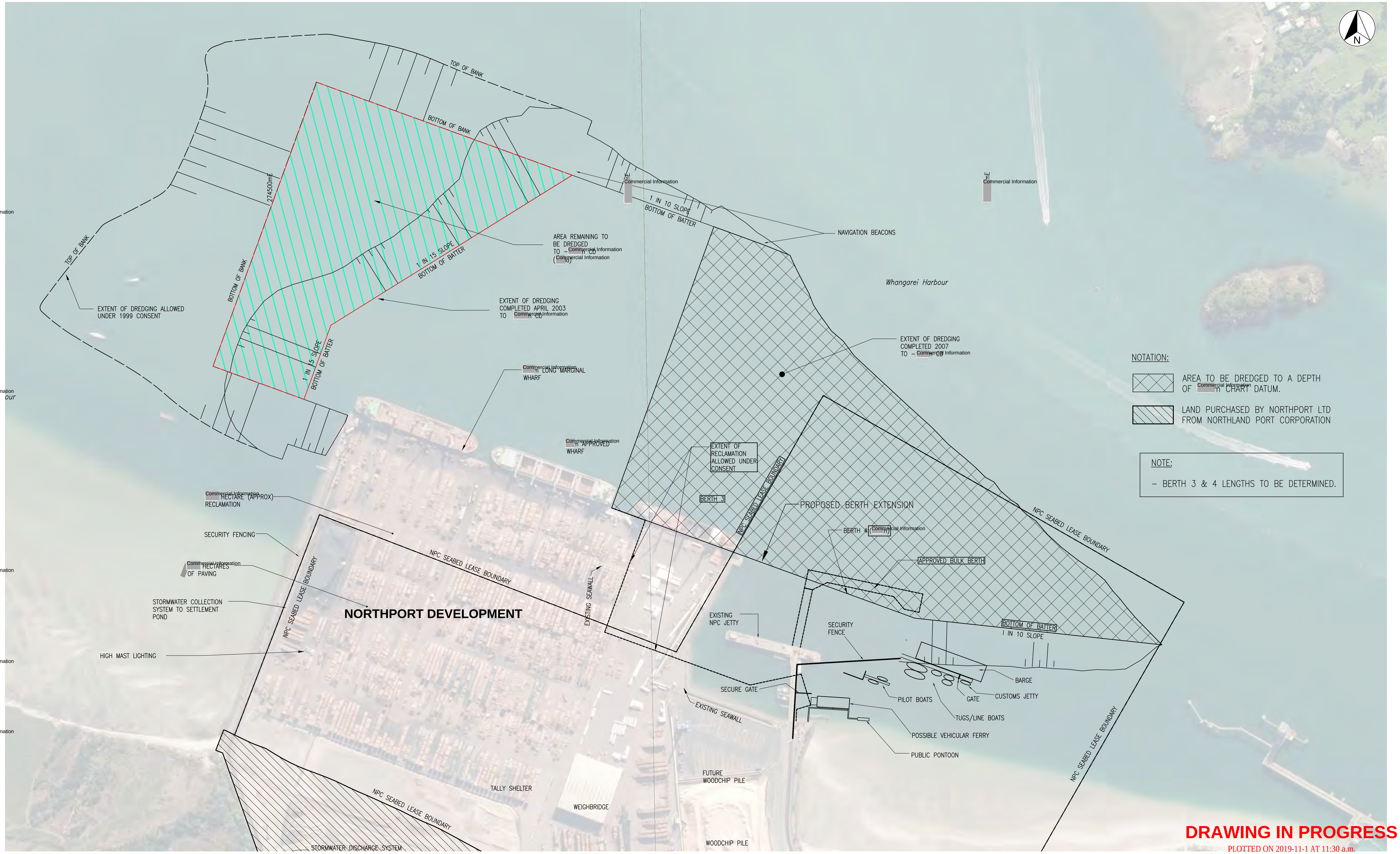
1. A construction cost estimate of $Commercial Information + GST (which includes $Commercial Information for risk) should be adopted for the proposed concept design. In addition to this Northport will make allowances for escalation and Resource Consent costs.

   Initial high-level construction cost estimates for the development were $Commercial Information + GST. Over the September/October period a number of scenarios for different construction techniques and structural forms confirmed a range between $Commercial Information and $Commercial Information for the construction estimate. This provides for a high level of confidence in the estimate.

2. For a project of this size it is recommended to allow the Contractor sufficient flexibility to design/redesign the works to match their skills and resources, and thus provide added value.

3. The highest and critical risk to the project is recognised as the Commercial Information

Appendix A
Proposed Concept Drawings



DRAWING IN PROGRESS

PLOTTED ON 2019-11-1 AT 11:30 a.m.

FEASIBILITY

NOTE:

- DRAWING SUPPLIED BY NORTHPORT ON 20/10/2019.
- COORDINATES ARE IN TERMS OF GEODETIC DATUM 1949, MT EDEN CIRCUIT.
- LEVELS ARE IN TERMS OF CHART DATUM.

Revision	Amendment	Approved	Revision Date
A	CONCEPT DESIGN FOR FEASIBILITY STUDY		

Northport

Commercial Information

Designed	Approved	Approved Date
-	-	-

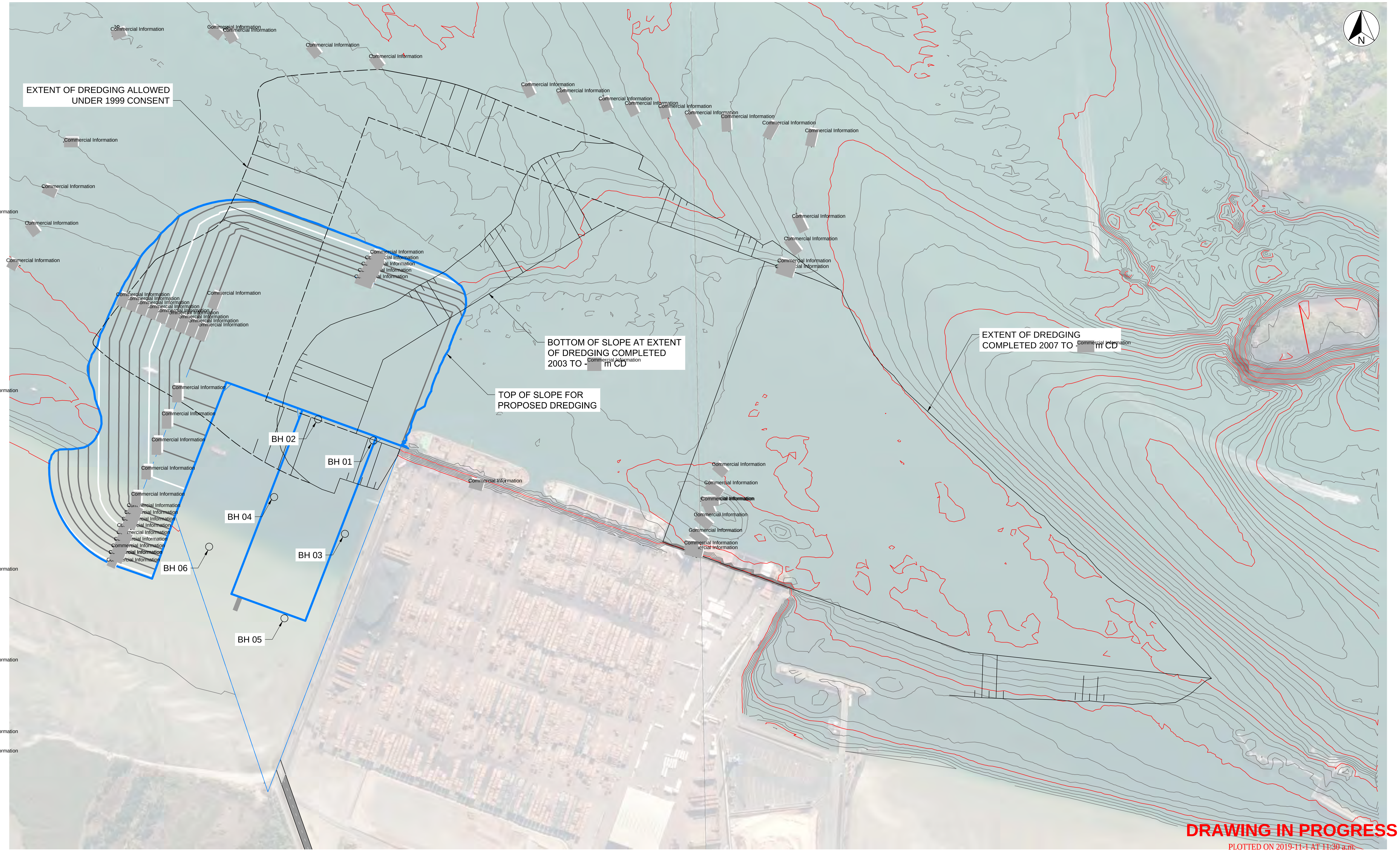
Drawn	Scales
Privacy of natural persons	1 Commercial Information

Project: NORTHPORT MARSDEN POINT SHIP MAINTENANCE FACILITY

Sheet: CONCEPT DESIGN EXISTING DREDGING EXTENT

Project No.	Sheet. No.	Revision
Commercial Information	C01	A

Original Sheet Size A1 [841x594] Plot Date 2019-11-01 at 11:30:33 a.m. Path Commercial Information



DRAWING IN PROGRESS

PLOTTED ON 2019-11-1 AT 11:30 a.m.

FEASIBILITY

Revision	Amendment	Approved	Revision Date
A	CONCEPT DESIGN FOR FEASIBILITY STUDY		

Northport

Commercial Information

Commercial Information

Commercial Information

Commercial Information

Designed	Approved	Approved Date
-	-	-

Drawn	Scales
Privacy of natural persons	1 Commercial Information

Project

NORTHPORT
MARSDEN POINT
SHIP MAINTENANCE FACILITY

Sheet

CONCEPT DESIGN
PROPOSED DREDGING EXTENT

Project No.	Sheet. No.	Revision
Commercial Information	C02	A

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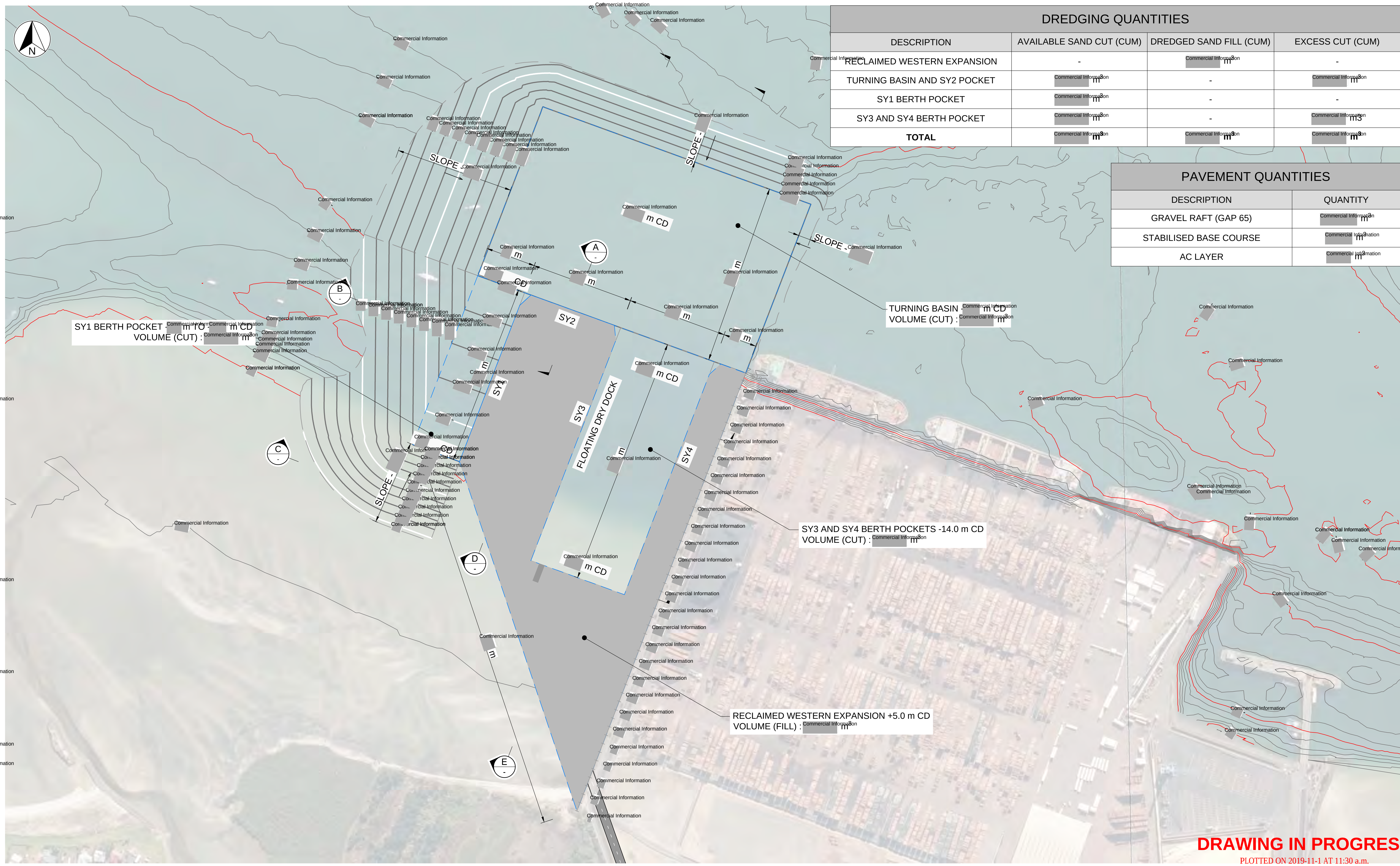
1 Commercial Information @ A3



DREDGING QUANTITIES

DESCRIPTION	AVAILABLE SAND CUT (CUM)	DREDGED SAND FILL (CUM)	EXCESS CUT (CUM)
RECLAIMED WESTERN EXPANSION	-	Commercial Information m³	-
TURNING BASIN AND SY2 POCKET	Commercial Information m³	-	Commercial Information m³
SY1 BERTH POCKET	Commercial Information m³	-	-
SY3 AND SY4 BERTH POCKET	Commercial Information m³	-	Commercial Information m3
TOTAL	Commercial Information m³	Commercial Information m³	Commercial Information m³

PAVEMENT QUANTITIES

DESCRIPTION	QUANTITY
GRAVEL RAFT (GAP 65)	Commercial Information m³
STABILISED BASE COURSE	Commercial Information m³
AC LAYER	Commercial Information m³

FEASIBILITY

Revision	Amendment	Approved	Revision Date
A	CONCEPT DESIGN FOR FEASIBILITY STUDY		

Northport

Commercial Information

Commercial Information

Commercial Information

Commercial Information

Designed	Approved	Approved Date
-	-	-

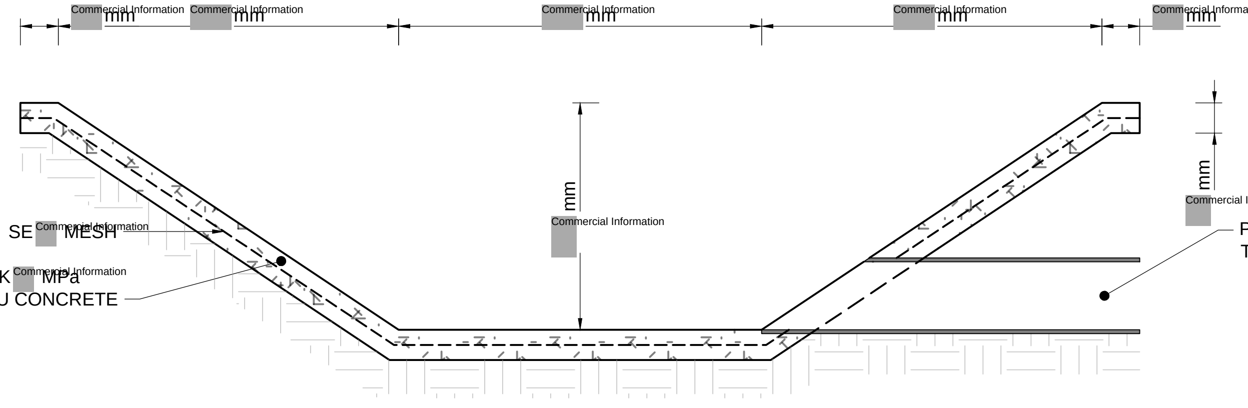
Drawn: Privacy of natural persons

Scales: 1 Commercial Information

Project: NORTHPORT
MARSDEN POINT
SHIP MAINTENANCE FACILITY

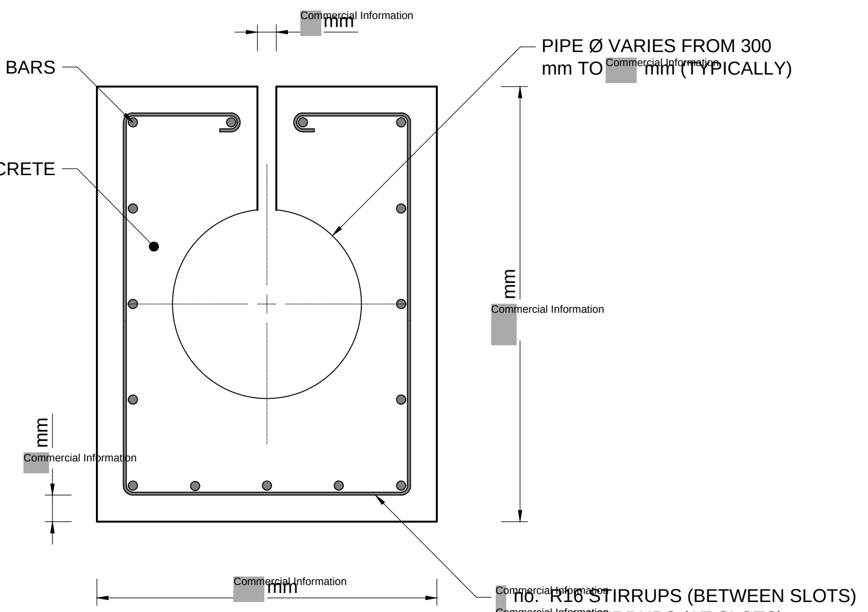
Sheet: CONCEPT DESIGN
OVERVIEW AND DREDGING PLAN

Project No.	Sheet. No.	Revision
Commercial Information	C03	A



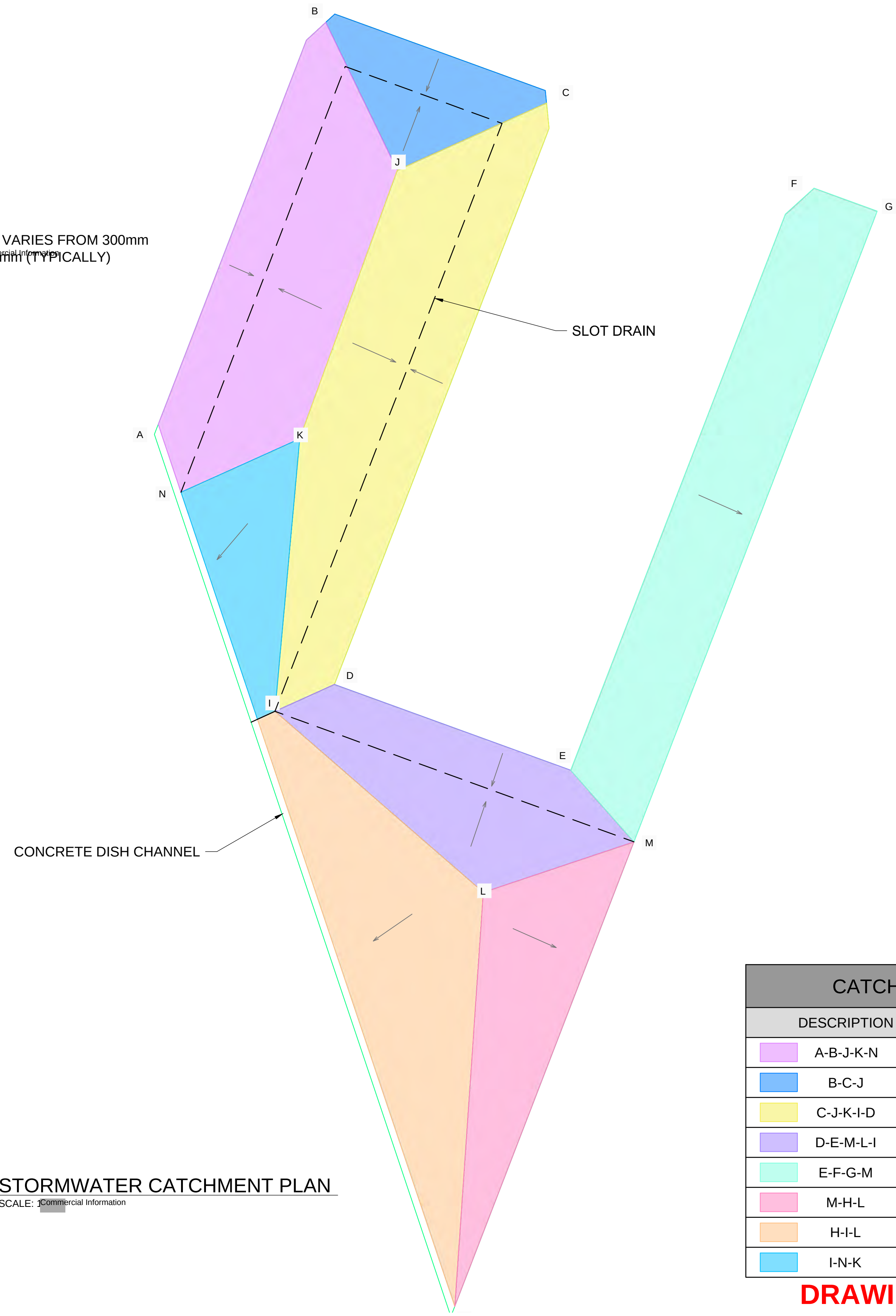
DETAIL - CONCRETE LINED DISH CHANNEL

SCALE: 1 Commercial Information



DETAIL - SUBSURFACE DRAINAGE (SLOT DRAIN INFRASTRUCTURE)

SCALE: 1 Commercial Information



STORMWATER CATCHMENT PLAN

SCALE: 1 Commercial Information

NOTE:

- SLOTS ASSUMED TO BE 500 mm LONG AND Commercial Information mm WIDE.
- SLOTS ASSUMED TO BE SPACES AT Commercial Information mm.
- INSPECTION PITS TO SLOT DRAIN INFRASTRUCTURE ASSUMED TO BE SPACED AT APPROXIMATELY Commercial Information m.
- SLOT DRAINAGE INFRASTRUCTURE (INCLUDING INSPECTION PITS AND CONCRETE LINED CHANNEL) TAKEN FROM NORTHPORT AS-BUILTS.
- DRAINAGE INFRASTRUCTURE LOCATED AT LEAST Commercial Information m FROM BERTH FACE TO ENABLE CRANE OPERATIONS.
- SURFACE SLOPES AT 1 Commercial Information TO SLOT DRAIN INLETS.

CATCHMENT AREAS

DESCRIPTION	AREA (m^2)
A-B-J-K-N	Commercial Information
B-C-J	Commercial Information
C-J-K-I-D	Commercial Information
D-E-M-L-I	Commercial Information
E-F-G-M	Commercial Information
M-H-L	Commercial Information
H-I-L	Commercial Information
I-N-K	Commercial Information

DRAWING IN PROGRESS

PLOTTED ON 2019-11-1 AT 11:30 a.m.

FEASIBILITY

Revision	Amendment	Approved	Revision Date
A	CONCEPT DESIGN FOR FEASIBILITY STUDY		

Northport

Commercial Information Commercial Information
Commercial Information
Commercial Information

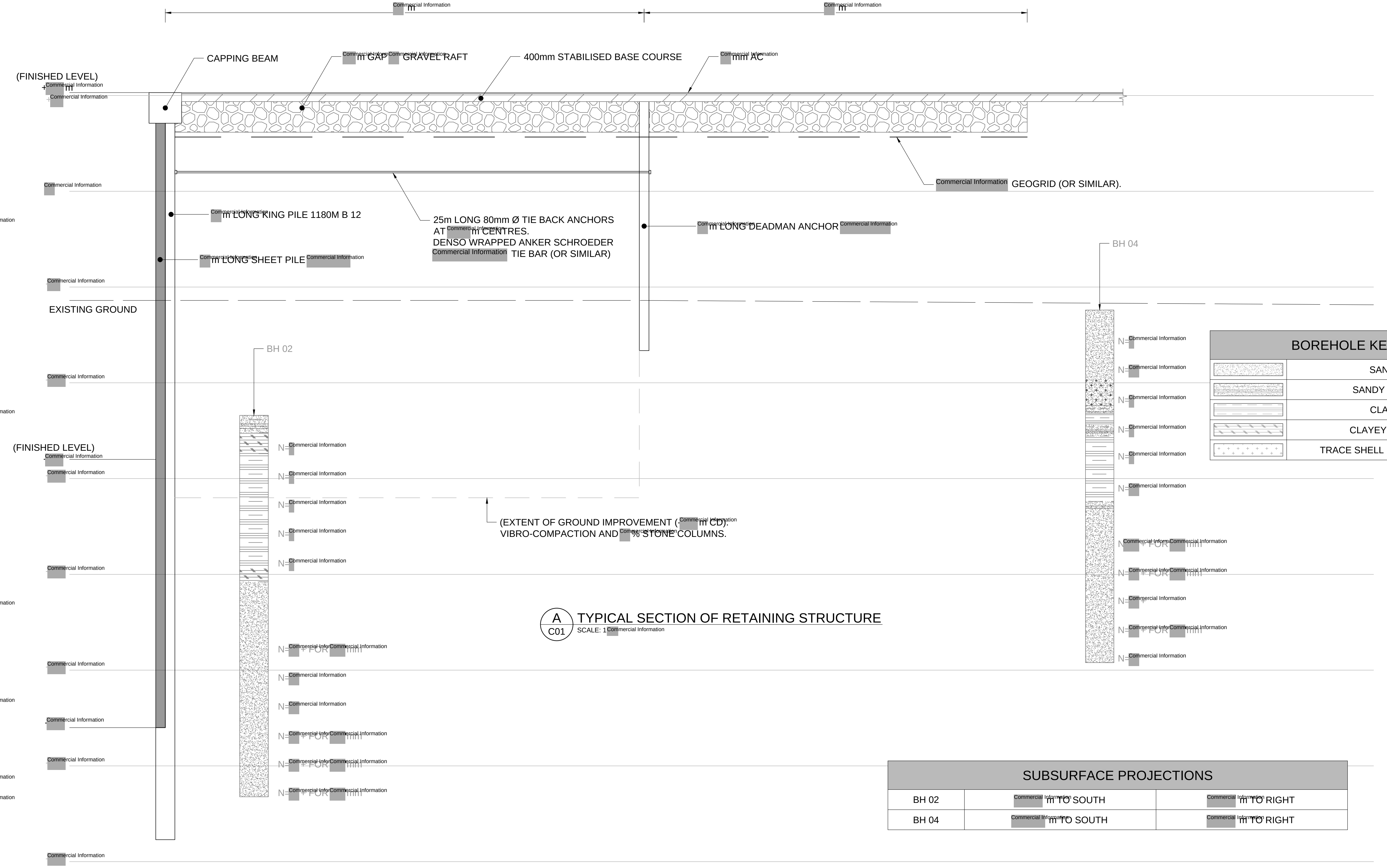
Designed	Approved	Approved Date
-	-	-

Drawn	Scales
Privacy of natural persons	1 Commercial Information

Project: NORTHPORT
MARSDEN POINT
SHIP MAINTENANCE FACILITY

Sheet: CONCEPT DESIGN
STORMWATER CATCHMENTS PLAN

Project No.	Sheet. No.	Revision
Commercial Information	C04	A



A C01 TYPICAL SECTION OF RETAINING STRUCTURE
SCALE: 1Commercial Information

BOREHOLE KEY	
	SAND
	SANDY CLAY
	CLAY
	CLAYEY SAND
	TRACE SHELL FRAGMENTS

SUBSURFACE PROJECTIONS		
BH 02	Commercial Information m TO SOUTH	Commercial Information m TO RIGHT
BH 04	Commercial Information m TO SOUTH	Commercial Information m TO RIGHT

DRAWING IN PROGRESS
PLOTTED ON 2019-11-1 AT 11:30 a.m.
FEASIBILITY

Revision	Amendment	Approved	Revision Date
A	CONCEPT DESIGN FOR FEASIBILITY STUDY		

Northport

Commercial Information
Commercial Information
Commercial Information
Commercial Information

Designed	Approved	Approved Date
-	-	-

Drawn	Scales
Privacy of natural persons	1 Commercial Information

Project
NORTHPORT
MARSDEN POINT
SHIP MAINTENANCE FACILITY

Sheet
DETAILS
DETAIL OF RETAINING STRUCTURE

Project No.	Sheet. No.	Revision
Commercial Information	C05	A

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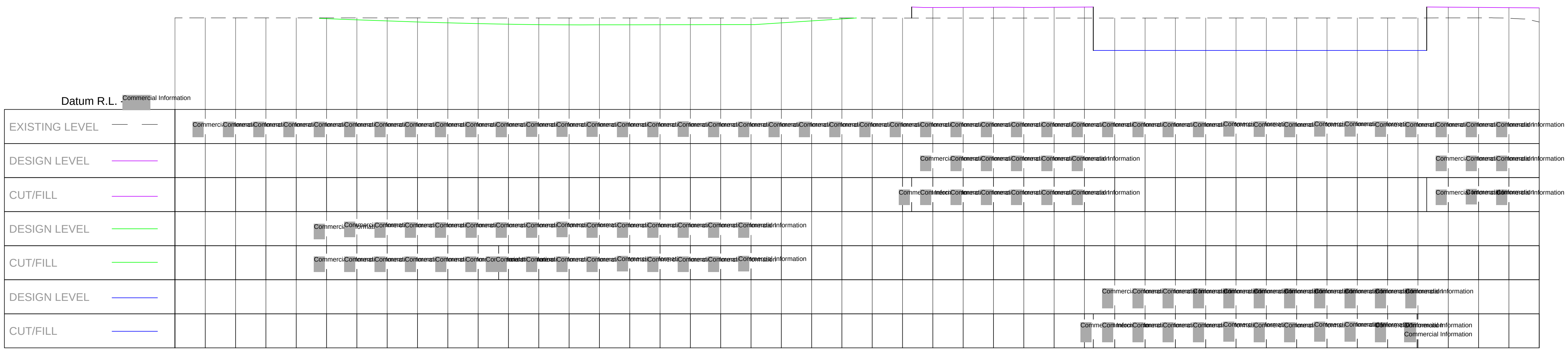
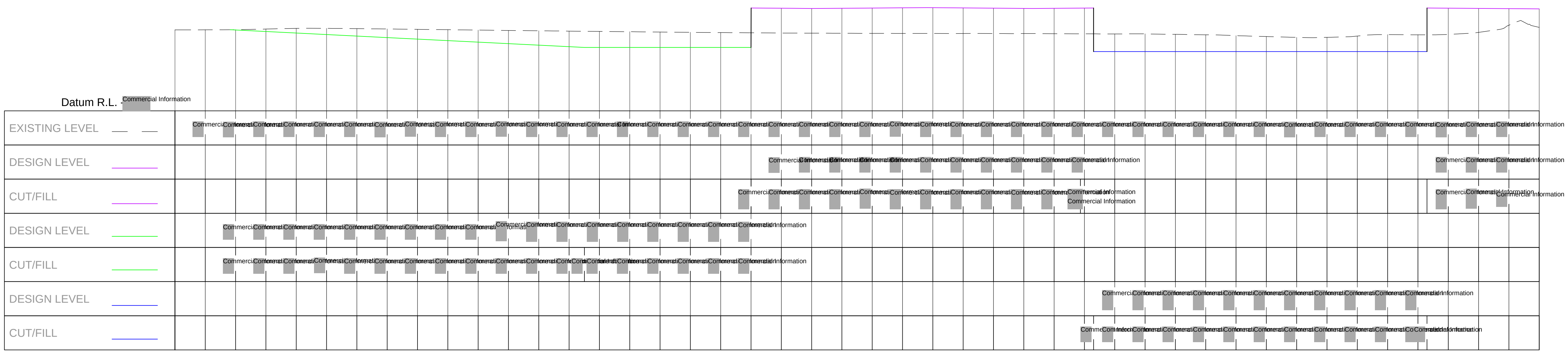
1 Commercial Information @ A3



C
C01
SECTION C
SCALE: 1 Commercial Information



B
C01
SECTION B
SCALE: 1 Commercial Information

mm
Commercial Information
Commercial Information
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mm
Commercial Information
Commercial Information

1 Commercial Information @ A1
1 Commercial Information @ A3

DRAWING IN PROGRESS
PLOTTED ON 2019-11-1 AT 11:30 a.m.
FEASIBILITY

Revision	Amendment	Approved	Revision Date
A	CONCEPT DESIGN FOR FEASIBILITY STUDY		

Northport

Commercial Information
Commercial Information
Commercial Information
Commercial Information

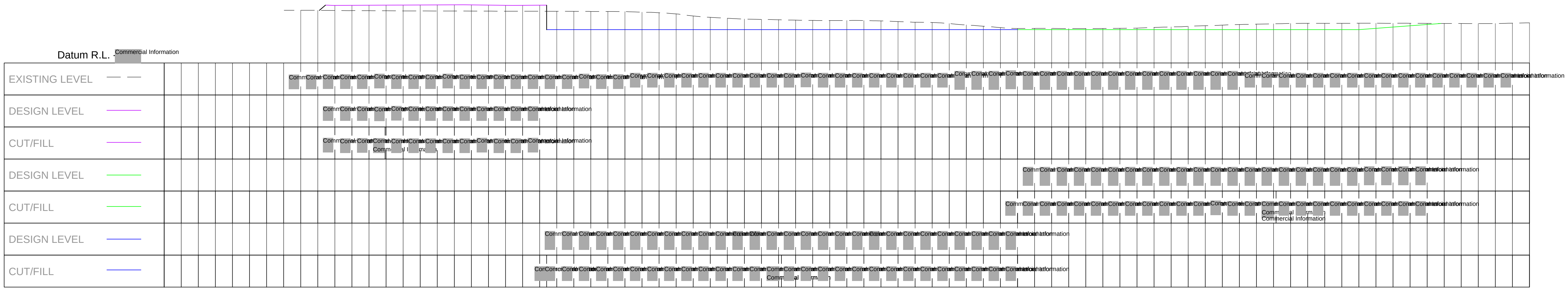
Designed	Approved	Approved Date
-	-	-

Drawn	Scales
Privacy of natural persons	Commercial Information

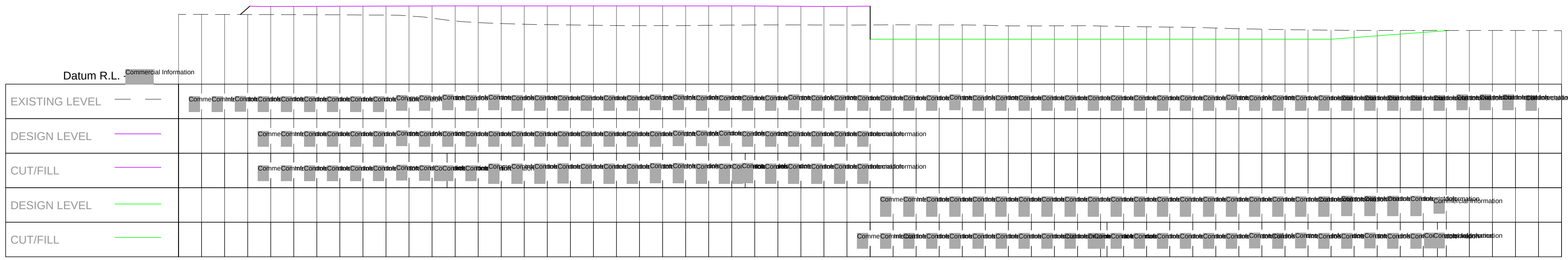
Project
NORTHPORT
MARSDEN POINT
SHIP MAINTENANCE FACILITY

Sheet
DETAILS
CROSS SECTIONS (SHEET ONE OF TWO)

Project No.	Sheet. No.	Revision
Commercial Information	C06	A



E
C01
SECTION E
SCALE: 1 Commercial Information



D
C01
SECTION D
SCALE: 1 Commercial Information

mm
Commercial Information

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PLOTTED ON 2019-11-1 AT 11:30 a.m.

FEASIBILITY

Revision	Amendment	Approved	Revision Date
A	CONCEPT DESIGN FOR FEASIBILITY STUDY		

Northport

Commercial Information
Commercial Information
Commercial Information
Commercial Information

Designed	Approved	Approved Date
-	-	-

Drawn	Scales
T. CARTER	1 Commercial Information AT A1

Project
NORTHPORT
MARSDEN POINT
SHIP MAINTENANCE FACILITY

Sheet
DETAILS
CROSS SECTIONS (SHEET TWO OF TWO)

Project No.	Sheet. No.	Revision
Commercial Information	C07	A

1 Commercial Information @ A1
1 Commercial Information @ A3
1 Commercial Information @ A1
1 Commercial Information @ A3

ISSUE	DATE	DETAILS	APPRVD	BY

Commercial Information
[redacted]

Title:
Commercial Information
[redacted]
DRY DOCK ACCESS ROADWAY
CONCEPT SKETCH

Privacy of natural persons
[redacted]

No	Issue:
60-X	R0

Scale	Date:	Sheet:
NTS	OCT 2019	01

CALCULATION SHEET

Project/Task/File No Commercial Information

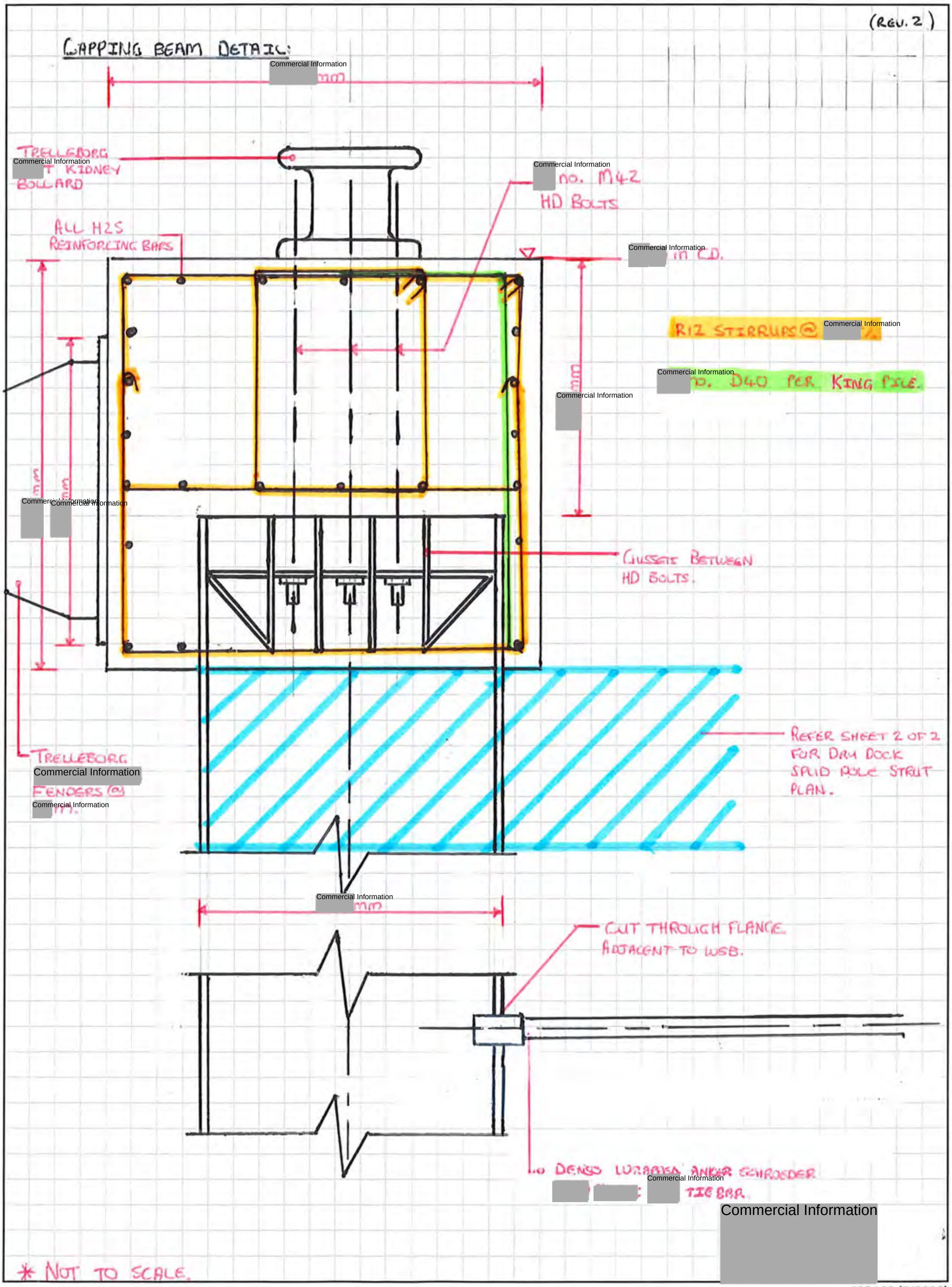
Project Description: NORTHPORT – SHIP MAINTENANCE FACILITY

Sheet No 1 of 2

Office:

Computed: 29 / 10 / 2019

Check: / /



CALCULATION SHEET

Project/Task/File No Commercial Information

Sheet No 2 of 2

Project Description: NORTHPORT - SHIP MAINTENANCE FACILITY

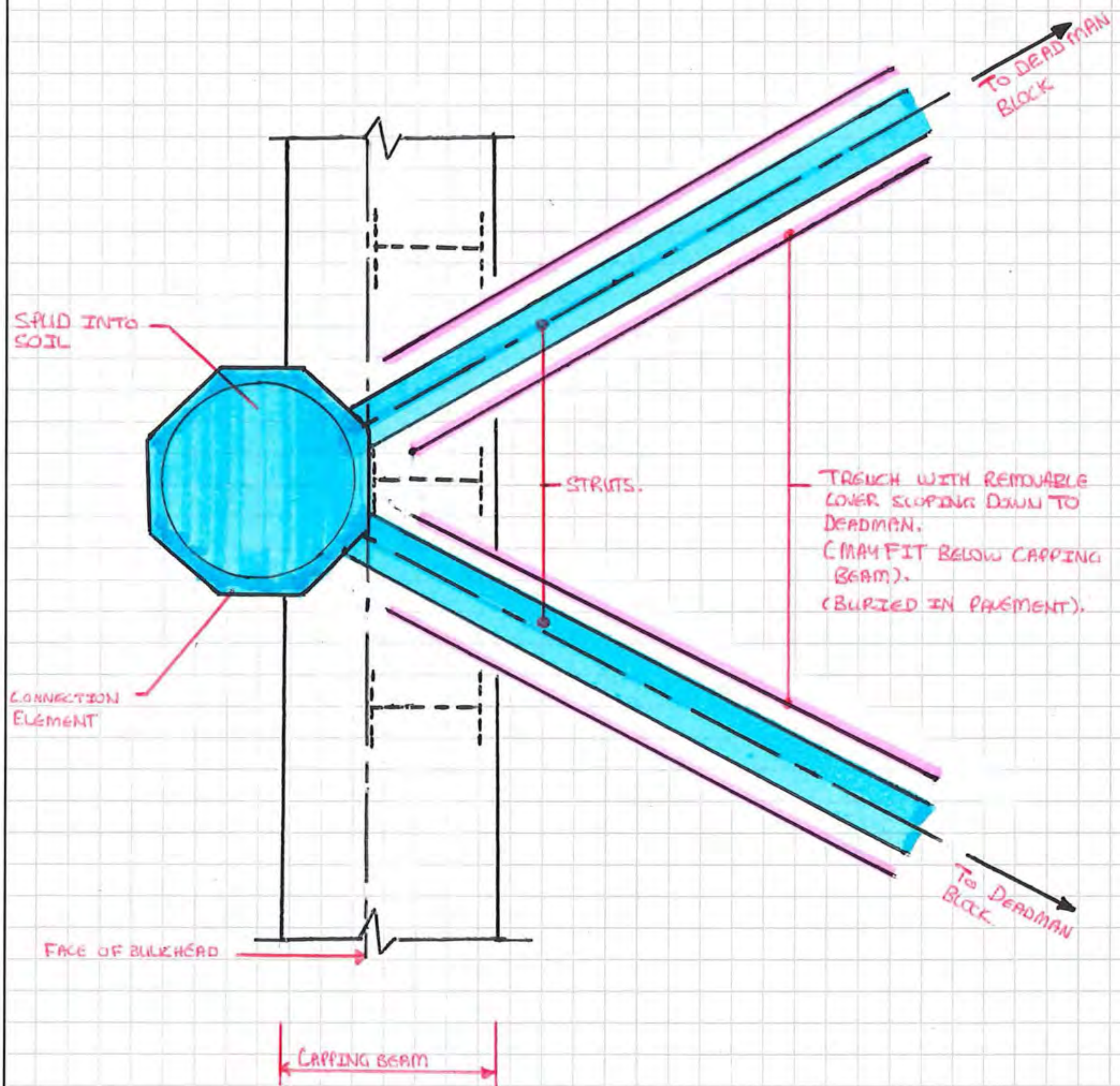
Office:

Computed: 29 / 10 / 2019

Check: / /

(REV. 2)

DRY DOCK SPUD POLE STRUT PLAN:



NOTE: STRUTS ARE RAKED TO TAKE THE TRANSVERSE AND LONGITUDINAL LOADS.

Commercial Information

* NOT TO SCALE.

CALCULATION SHEET

Project/Task/File No: Commercial Information

Project Description: NORTHPORT - SHIP MAINTENANCE FACILITY

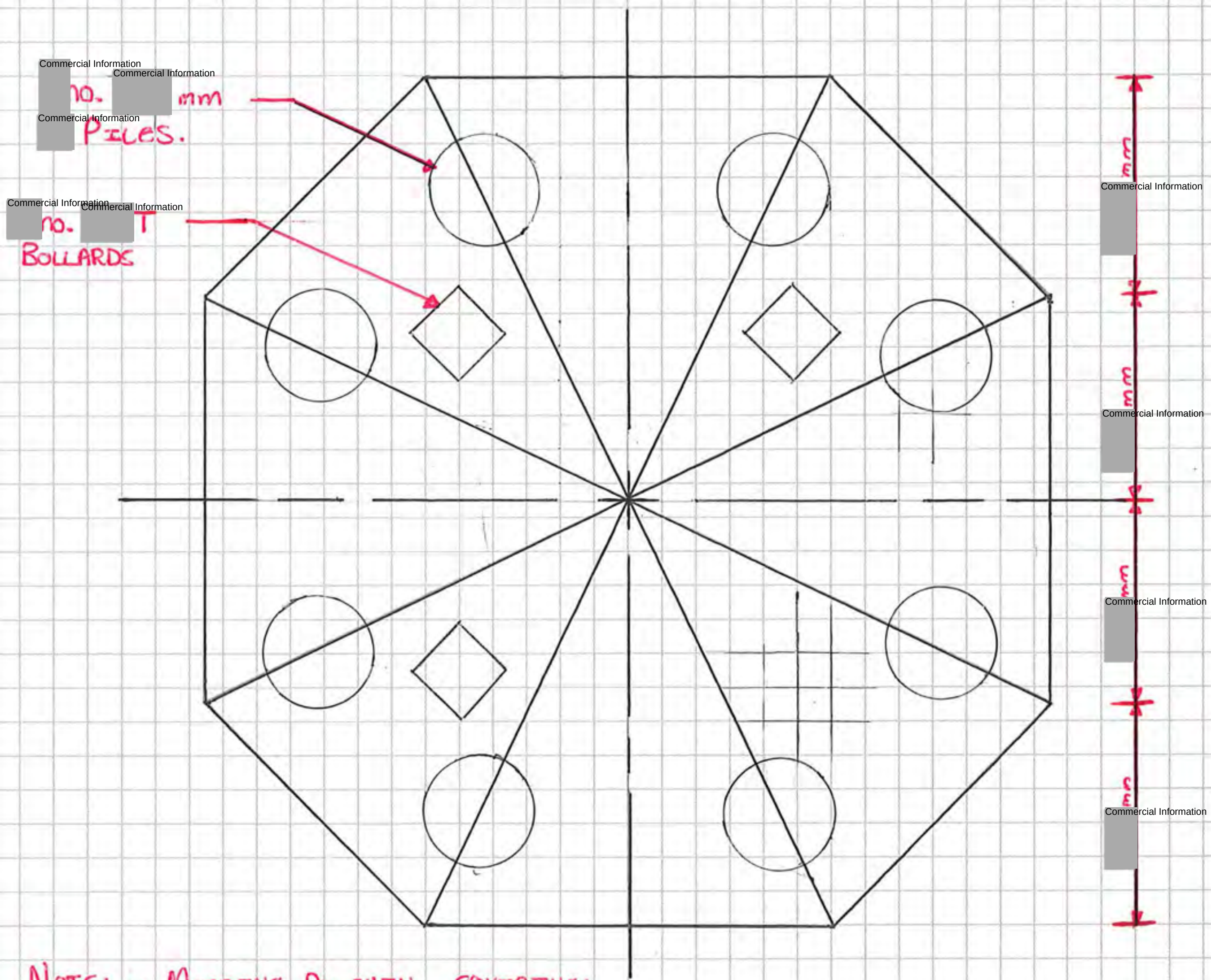
Sheet No 1 of 1

Office:

Computed: 31 / 10 / 2019

Check: / /

MOORING DOLPHIN:



NOTE: - MOORING DOLPHIN CONTAINS:

(i) Commercial Information no. FENDERS

(ii) Commercial Information no. ACCESS LADDER

- PILES DRIVEN TO - Commercial Information m CD AND FILLED WITH CONCRETE.

Commercial Information

* NOT TO SCALE.

Appendix B
Proposed Concept - Estimate

NorthPort Drydock development — Oct-19, Version 5

Summary of Construction Cost Estimate

Item	Unit	Qty	Rate	Amount
P&G, small tools, consumables, design and supervision	sum	Commercial Information	Commercial Information	$ Commercial Information
Demolition	sum	Commercial Information	Commercial Information	$ Commercial Information
Construct Seawall	m	Commercial Information	Commercial Information	$ Commercial Information
Temporary floating Breakwater	m	Commercial Information	Commercial Information	$ Commercial Information
Construct piling platform/bund	m	Commercial Information	Commercial Information	$ Commercial Information
Install Combiwall from bund (material ex temp bulkhead)	m	Commercial Information	Commercial Information	$ Commercial Information
On-offs for floating gear (JUB, service barges etc)	sum	Commercial Information	Commercial Information	$ Commercial Information
Install Combiwall from JUB				
Supply Combiwall material	m	Commercial Information	Commercial Information	$ Commercial Information
Supply deadman material (Commercial Information m long)	m	Commercial Information	Commercial Information	$ Commercial Information
Supply tiebacks + fittings	m	Commercial Information	Commercial Information	$ Commercial Information
Handle above materials	m	Commercial Information	Commercial Information	$ Commercial Information
Paint Combiwall to low-tide level	m	Commercial Information	Commercial Information	$ Commercial Information
Install Combiwall, deadman, tieback system complete	m	Commercial Information	Commercial Information	$ Commercial Information
S + Install Temp Bulkhead from JUB	m	Commercial Information	Commercial Information	$ Commercial Information
Extract (+ credit sale) temp bulkhead (re-use Commercial Information m at bund)	m	Commercial Information	Commercial Information	$ Commercial Information
Reclamation and dredging				
Multi-establish CSD incl accessories (on-off)	each	Commercial Information	Commercial Information	$ Commercial Information
Standdown period for CSD	mth	Commercial Information	Commercial Information	$ Commercial Information
Dredge turning basin to reclamation incl placing	m3	Commercial Information	Commercial Information	$ Commercial Information
Dredge drydock, dry, cart to spoil	m3	Commercial Information	Commercial Information	$ Commercial Information
Separate silts/clays on reclamation, cart to spoil	m3	Commercial Information	Commercial Information	$ Commercial Information
Dredge remainder of turning basin, dispose at sea	m3	Commercial Information	Commercial Information	$ Commercial Information
Install Drydock Combiwall from Reclamation				
Supply Combiwall material	m	Commercial Information	Commercial Information	$ Commercial Information
Supply deadman material (13m long)	m	Commercial Information	Commercial Information	$ Commercial Information
Supply tiebacks + fittings	m	Commercial Information	Commercial Information	$ Commercial Information
Handle above materials	m	Commercial Information	Commercial Information	$ Commercial Information
Paint Combiwall to low-tide level	m	Commercial Information	Commercial Information	$ Commercial Information
Install Combiwall, deadman, tieback system complete	m	Commercial Information	Commercial Information	$ Commercial Information
Excavate + backfill to install tiebacks	m3	Commercial Information	Commercial Information	$ Commercial Information
Drydock combiwall installation with additional JUB; temporary rock bund construction cross expansion, followed by reclamation.	sum	Commercial Information	Commercial Information	$ Commercial Information
Ground Improvement				
Vibrocompaction Commercial Information % of positions	probes	Commercial Information	Commercial Information	$ Commercial Information
Stone columns Commercial Information % of positions	probes	Commercial Information	Commercial Information	$ Commercial Information
Concrete works				
Combiwall capping beam	sum	Commercial Information	Commercial Information	$ Commercial Information
PC fender blocks	sum	Commercial Information	Commercial Information	$ Commercial Information
Wharf furniture				
Fenders (69#)	sum	Commercial Information		$ Commercial Information
Bollards (63#)	sum	Commercial Information	Commercial Information	$ Commercial Information
RC anchor blocks for storm bollards (12#)	sum	Commercial Information	Commercial Information	$ Commercial Information
Ladders (6#)	sum	Commercial Information	Commercial Information	$ Commercial Information
Drydock floating tank side supports	sum	Commercial Information	Commercial Information	$ Commercial Information
Cathodic protection system to Combiwall	sum	Commercial Information	Commercial Information	$ Commercial Information
Services (3 waters, power,lighting)				
Drainage	sum	Commercial Information	Commercial Information	$ Commercial Information
Water supply	sum	Commercial Information	Commercial Information	$ Commercial Information
Sewage	sum	Commercial Information	Commercial Information	$ Commercial Information
Power and lighting	sum	Commercial Information	Commercial Information	$ Commercial Information
Layer works and surfacing				
Commercial Information m thick gravel raft Commercial Information m behind Combiwall (Commercial Information m3)	sum	Commercial Information	Commercial Information	$ Commercial Information
Geotextile	sum	Commercial Information	Commercial Information	$ Commercial Information
Commercial Information m thick stabilised basecoarse to remaining area (Commercial Information m3)	sum	Commercial Information	Commercial Information	$ Commercial Information
Commercial Information mm thk asphalt over entire area (Commercial Information m2)	sum	Commercial Information	Commercial Information	$ Commercial Information
Access Road	sum	Commercial Information	Commercial Information	$ Commercial Information
Bridge ramp to floating dry dock	sum	Commercial Information	Commercial Information	$ Commercial Information
Fishing Jetty	sum	Commercial Information	Commercial Information	$ Commercial Information
Sight/noise wall	sum	Commercial Information	Commercial Information	$ Commercial Information
Dolphin	sum	Commercial Information	Commercial Information	$ Commercial Information
Construction cost total				$ Commercial Information
Risk	sum	Commercial Information	Commercial Information	$ Commercial Information
Total project Cost Estimate				$ Commercial Information

Escalation if work started in Jan 2020		Commercial Information %	Commercial Information	$ Commercial Information
Clients costs	sum	Commercial Information	Commercial Information	$ Commercial Information
Consenting	sum	Commercial Information	Commercial Information	$ Commercial Information

Commercial Information

INITIA
GEOTECHNICAL SPECIALISTS

NORTHPORT LTD

NORTHPORT WESTERN RECLAMATION OPTION– CONCEPT DESIGN STAGE

PRELIMINARY GEOTECHNICAL REPORT

INITIA REF Commercial Information

NOVEMBER 2019

Contents

1. Introduction

1.1 Project Overview

Northport Limited has commenced the Concept Design of a proposed floating dry dock and land reclamation area at their facility at Marsden Point, South of Whangarei. The new development is to be located directly west of the existing Northport Wharf structure. The existing dock is located on the south eastern edge of Whangarei Harbour, immediately north west of Marsden Point Oil Refinery. The proposed development comprises the construction of a new dry dock to service and maintain ships.

We understand that the facility will service The Royal New Zealand Navy Ships and private vessels.

We also understand that Northport have brought together a team of consultants to undertake early concept designs for the structure. Initia Limited (Initia) is providing the geotechnical data for these designs.

Prior to the investigations commencing, the consultant team provided input to the scope of works. Static Cone Penetration testing (CPT) was added to the original drilling programme in an attempt to gain comprehensive strength data of the soils.

1.2 Scope of Works

The scope of works is outlined in our 'Geotechnical Services for a Western Reclamation Option at Northport, Northland,[1]' which included:

- Desk study of previous geotechnical explorations;
- Drilling of deep ground investigations, comprising machine boreholes and CPTs to investigate the subsurface conditions at the specific target areas;
- Preparation of drilling logs from the field investigations;
- Collection of soil samples and testing in an accredited laboratory;
- Preparation of this Geotechnical Report documenting the geotechnical conditions at the site and the results of all field and laboratory investigations;
- Geotechnical laboratory testing to assess soil types.

We consider this phase of works to be suitable for concept design only. Further stages of specific investigations will need to be carried out for developed and detailed design. The Investigations were scoped for a set budget within a set timeframe due to equipment availability.

[1] 'Geotechnical Services for a Western Reclamation Option at Northport, Northland' dated 10 September 2019, prepared by Initia, addressed to Privacy of natural persons for Northport Limited.

2. Historical Geotechnical Testing

Numerous historical investigations have been carried out within the vicinity of the development area. These investigations have typically been undertaken to the south and east of the proposed dry dock area.

The following geotechnical reports and drawings have been received by Initia from Northport:

- Commercial Information [redacted]

Please refer to Appendix G for all the above previous reports, and we have summarised the main findings below.

- Investigations by Commercial Information have been carried out close to the dry dock facility but the actual borehole logs were not provided with the report.
- These investigations indicated that the near surface soils are predominantly fine to medium sands between Commercial Information m and Commercial Information m in thickness.
- No strength data was provided for this sand layer but CPTs carried out by Commercial Information to the south of the dry dock location indicated cone resistances in excess of Commercial Information MPa and up to Commercial Information MPa in the near surface sandy soils.
- The Commercial Information boreholes indicated that in some locations the sand layer was underlain by clayey sandy silt which varied from Commercial Information m to Commercial Information m in thickness.
- Laboratory testing indicated that this clayey material is highly plastic with an average of Commercial Information % fines. Again, no strength data was recorded for this layer. Below this clayey layer, a dense sand was identified with some pockets of clayey silt.
- Historical boreholes drilled to Commercial Information m have never encountered rock at Northport.

3. Geology

3.1 Geological Setting

The published geological map of the area[2] indicates that the land directly south of the site is within "loose to poorly consolidated sand in fixed parabolic dunes and local transverse dunes. Minor sand, mud and peat in interlude lake and swamp deposits" (Q1d) belonging to the Karotahi group.

The soil directly beneath the proposed dry dock can be considered to be marine sediments.

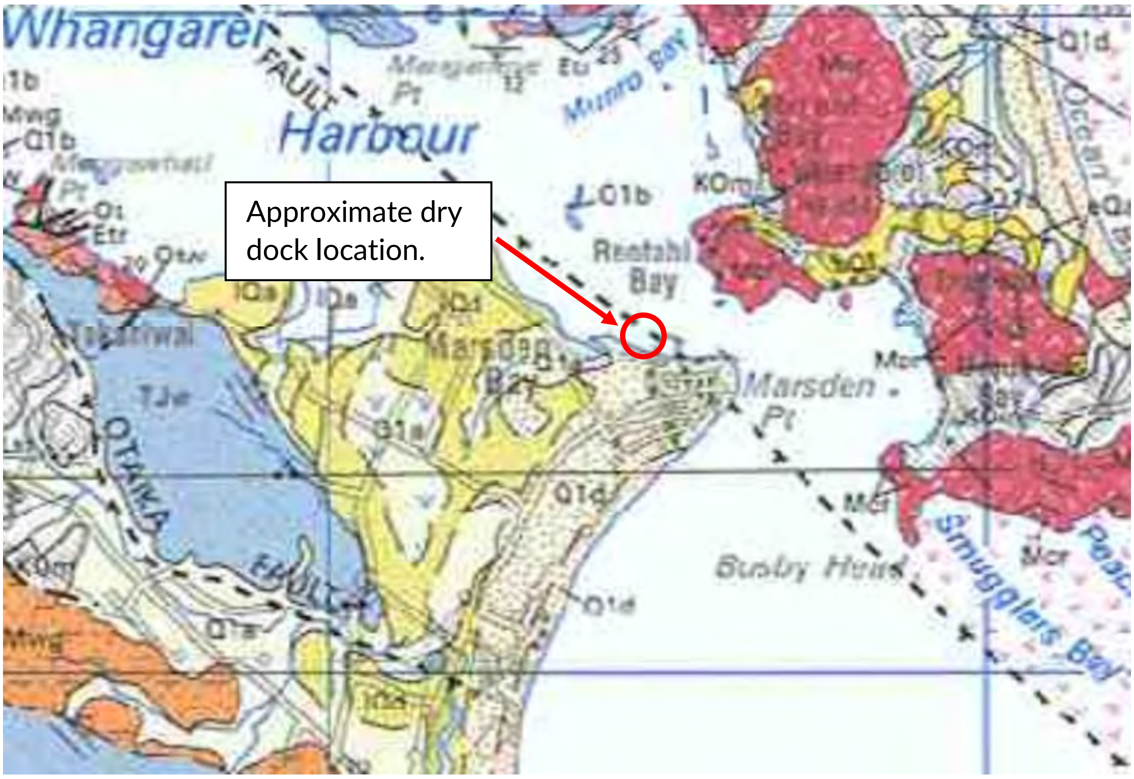


Figure 3.1: Geological map of the site.
Extracted from the 1:Commercial Information Geological map of Whangarei, (2009).

The geology of the study area generally comprises three groupings of soil and rock:

1. **Basement Rock**: Elevated greywacke and argillite of the Waipapa Group outcropping to the north and south of the Whangarei harbour.
2. **Volcanic Rocks**: andesitic lava and breccia intruded through the above basement rock, at the eastern side of the harbour
3. **Alluvial and Marine Sediments**: over the Marsden point area. Holocene alluvial and beach sediments are deposited over the underlying basement rock (less than Commercial Information years old).

The investigation logs received by Initia indicate deep alluvial sediments in the development area. No rock has been identified beneath the site to at least Commercial Information m BGL, the deepest investigation data.

---

[2] Commercial Information

4. Subsurface Investigations

4.1 General

Subsurface investigations were undertaken between 19 September 2019 and 27 September 2019. Field investigations comprised of rotary cored boreholes (BHs) with SPT Testing, and CPTs.

The locations of the tests were set out initially by a handheld GPS. Most of the test locations were then picked up by a Trimble R8 GPS receiver, test location 2 was solely determined using the handheld GPS.

Geotechnical testing of the seabed strata was made possible by using a barge provided by Commercial Information . The barge contained 2 moon holes in the deck to allow access to the seabed below. Geotech Drilling Ltd provided a tractor mounted sonic drilling rig for machine boreholes as well as a tractor mounted CPT rig; which were both positioned over the moon holes.

Generally, the height of which the barge's deck was set up at each test location was determined by the height of the incoming tide. This was to ensure the base and deck of the barge was set higher than the water level at high tide. Therefore, the deck of the barge would not flood during the drilling works and cause a safety risk.

Commercial Information

Boreholes and CPT tests were conducted under the supervision of an Initia engineering geologist with soil from the boreholes logged in accordance with the NZ Geotechnical Society (NZGS) guidelines[3].

4.2 Cone Penetration Testing (CPT)

Because of the depth to the seabed beneath test locations, tests were unable to penetrate to considerable depths as expected and met practical refusal due to inclination of the CPT rods (created by the lack of confinement above the seabed and the relatively high density of the near surface deposits). These high density sands were observed on the Commercial Information CPT data.

Because of the depths to the seabed at test locations 1 & 2, CPT's were unable to be undertaken.

Due to high winds and strong currents experienced due to bad weather during the 23 and 27 September, CPTs were unable to be attempted at test locations.

A total of 2 No. CPTs were completed (CPT-03 and CPT-04) during fine weather conditions. CPT results and the cone calibration certificate are presented in Appendix B.

Refer to Table 1 below for a summary of the CPT tests:

[3] Commercial Information

Table 1: Cone Penetration Testing Summary

CPT Ref	Easting (mE, NZTM2000)	Northing (mN, NZTM2000)	Termination depth (mBGL)	Water to Sea Floor Level (mBGL)	Termination Remarks
CPT-03	Commercial Information	Commercial Information	Commercial Information	Commercial Information	Refusal
CPT-04	Commercial Information	Commercial Information	Commercial Information	Commercial Information	Refusal

We recommend that a significant amount of pre-planning and co-ordination work is carried out prior to undertaking CPTs in these conditions given the costs involved and the lack of data obtained during this investigation programme.

4.3 Rotary Cored Boreholes

Drilling of 6 No. boreholes were undertaken using a tractor mounted rotary cored sonic rig. This type of rig was used to give maximum soil recovery.

SPT testing was undertaken typically every Commercial Information m on all machine boreholes due to the lack of data from the CPT tests at most locations.

The borehole series were drilled to depths ranging from Commercial Information m to Commercial Information m below seabed level. A summary of the boreholes is provided in Table 2 below:

Table 2: BH Series Borehole Summary

BH Ref	Easting (mE, NZTM2000)	Northing (mN, NZTM2000)	Water to Sea Floor Level (mBGL)	Termination depth (mBGL)
BH-01	Commercial Information	Commercial Information	-Commercial Information	Commercial Information
BH-02	Commercial Information	Commercial Information	-Commercial Information	Commercial Information
BH-03	Commercial Information	Commercial Information	-Commercial Information	Commercial Information
BH-04	Commercial Information	Commercial Information	-Commercial Information	Commercial Information
BH-05	Commercial Information	Commercial Information	+Commercial Information	Commercial Information
BH-06	Commercial Information	Commercial Information	-Commercial Information	Commercial Information

Note: BH-06 was terminated early due to tide times.

Refer to Appendix B for the borehole logs and core photographs. No photographs of the core boxes for boreholes 3 and 4 are attached. Camera equipment experienced water damage during the days that these two boreholes were undertaken.

4.4 Ground model

The boreholes across the proposed dry dock area encountered marine deposits to the full depth of the investigations. These deposits have been delineated into four distinct horizons as outlined below:

- Upper Sand: Very loose to medium dense sand with minor clay with SPT 'N' values ranging from Commercial Information – Commercial Information (Commercial Information average). This deposit was encountered from the surface within the near shore boreholes (not encountered in BH01 and BH02) with a base elevation in the order of -Commercial Information mRL.
- Upper Clay (interbedded with sand): Very soft to stiff clay with interbedded layers of sandy clay and clayey sand with SPT 'N' values ranging from Commercial Information to Commercial Information (Commercial Information average). This was

encountered below the ‘Upper sand’ (or from surface within BH01 and BH02) to a base elevation ranging between -Commercial Information m and -Commercial Information mRL.

- Lower Sand: Medium dense to very dense sand was found across the site from RL -Commercial Information to -Commercial Information m with SPT ‘N’ values ranging from Commercial Information – Commercial Information + (typically Commercial Information with a base elevation ranging between -Commercial Information m and -Commercial Information mRL.
- Lower Clay (interbedded with sand): Very soft to very stiff clay with SPT ‘N’ values ranging from Commercial Information – Commercial Information (18 average). This material was only encountered in BH01 below the medium dense to very dense lower sand from RL – Commercial Information m to -Commercial Information mRL.

The geotechnical ground model, based on the data at discrete locations, is presented on the cross sections, Figure 683-002 and 683-003 (Appendix D).

Given the thickness of the upper sand and upper clay, the ground conditions identified appear very similar to those described in the Commercial Information Report – note we do not have borehole logs for the Commercial Information report.

5. Laboratory Testing

5.1 Sampling

Soil samples were extracted from the Raymond split spoon from the SPT tests during the sonic borehole testing. Generally, 4 to 5 No. samples were taken per borehole.

5.2 Laboratory Test Scheduling

A total of 32 laboratory tests were chosen to be undertaken over the 6 No. machine boreholes. These tests included:

- A total of 25 No. samples to test for Particle Size Distribution (PSD) (14 No. wet sieve PSD, 9 No. wet sieve PSD FC only and 1 Hydrometer) were scheduled in layers of loose to very dense clayey sands and sands identified in the boreholes over a range of depths. This information was intended to support liquefaction susceptibility analyses.
- 7 No. samples to test for the Atterberg Limit to test the soils for their Liquid Limit, Plastic Limit, and Plasticity Index of characteristics.

Input to the geotechnical laboratory testing schedule was also provided by the consultant team.

5.3 Laboratory Testing

Geotechnical testing of soil samples was undertaken by Commercial Information . A summary table of the scheduled laboratory testing is presented in Appendix E.

Testing was carried out in accordance with the following specifications:

- Particle Size Distribution
  NZS4402: 1986: Test:
  2.8.1: Particle Size Distribution – standard method by wet sieving
  2.8.4: Particle Size Distribution – standard method for fine soils (hydrometer method)
- Atterberg Limits
  ASTM D4318 – 10e1: Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

5.4 Results

Copies of all the geotechnical laboratory test results are attached in Appendix E. The borehole records have been updated to reflect the laboratory classification.

6. Geotechnical Considerations

Recommendations and opinions in this report are based on the borehole and limited CPT data at discrete locations. The nature and continuity of subsoil conditions away from the boreholes and CPTs are inferred but it must be appreciated that actual conditions could vary from the assumed mode.

We also understand that the consultant team includes a specialist geotechnical port designer who is providing design data to the structural team. Accordingly, Initia's geotechnical considerations are an overview of other aspects of the project not relating to the structures.

6.1 Seismic Assessment

6.1.1 Site Subsoil Class

A seismic assessment for the site in accordance with the recommendations in the NZTA Bridge Manual and NZS 1170.5:2004 has been conducted. Given that historical boreholes have not encountered rock in the upper 40m, it is considered that the site be classified as a Class D Soil Category – deep or soft soil in accordance with NZS 1170.5.

6.1.2 Liquefaction Potential

Given the lack of deeper CPT data, we have used an SPT N-value correlation combined with the fines content of the soil from laboratory test results. Using SPT data only gives a liquefaction assessment at intervals through the soil profile. CPT data is more preferable to analyse liquefaction, but the dense upper sands were unable to be penetrated given the barges height above the water level.

We have used the computer software CLiq to analyse the SPT data assuming an importance Level 2 (IL2) structure. It is possible that such a facility may need to be an importance level 3 (IL3) structure. We can re-run the analysis based on a 1000-year return period earthquake event, if required.

In summary, the upper sands do have the potential to liquefy at discrete locations where the N values are typically less than 10. The clayey sand is typically non-liquefiable and the underlying sands appear to be too dense to liquefy, except in some discrete locations.

6.2 Consolidation Settlement

We are not aware of the final fill/reclamation depths for the dry dock, but it could be in the region of Commercial Information m. Obviously a fill load of this magnitude (>100kPa) will cause settlement of the underlying soil. This settlement should be monitored following placement of the fill to ensure that settlement is at least Commercial Information % complete prior to hard surfaces or structures are constructed. Pre-load and/or drainage can speed up these settlement rates. Further detailed analysis should be carried out when final plans are known.

This analysis should also include any additional loads from structures or stockpiles.

6.3 Reclamation Earthworks

Commercial Information Given the extent of these works, we recommend that sampling and analysis is carried out for this phase of the project to enable the best solution to be derived for the proposed reclaimed area.

7. Further works

The work recently carried out was to provide preliminary data for a concept plan to be devised for high level costings. The work was undertaken in a set time period for a set budget.

We consider that a more detailed geotechnical investigation is necessary to fully develop the underlying geological model of the site.

We recommend that the second stage of investigations are only undertaken when final detailed plans have been developed given the high costs associated with over-water investigations.

Consideration should be given to the type of investigation/equipment techniques to be used given the lack of data obtained by the CPT due to the water depth and dense nature of the near subsurface sands.

A targeted investigation would confirm the ground conditions across the proposed development and would provide confidence that the design is applicable to site in terms of geotechnical considerations.

Commercial Information This should be investigated to confirm soils that are to be dredged are appropriate for the extensive reclamation earthworks required for this project.

8. Applicability

This report has been prepared for our client, Northport Ltd, with respect to the brief provided to us. The advice and recommendations presented in this report should not be applied to any other project or used in any other context without prior written approval from Initia Limited.

Report prepared by:

Privacy of natural persons

Geotechnical Engineer

Report reviewed by:

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Senior Geotechnical Engineer

Document control record

Report Title		Northport Western Reclamation Option– Concept Design Stage Preliminary Geotechnical Report			
Initia Project Reference		Commercial Information			
Client		Northport Limited			
Revision	Date	Revision detail	Author	Reviewer	Approved by
A	06/11/2019	Final	Privacy of natural persons	Privacy of natural persons	Privacy of natural persons
Current Revision		A			

APPENDIX SUMMARY

Withheld in Full Due to Commercial Sensitivity

FLOATING DRY DOCK SIMULATION STUDY PHASE 1

Northport

besoftware
Maritime Simulation Solutions

Executive Summary

This simulation study was conducted over the period 10th September to 25th September at Northport New Zealand by Be-Software on behalf of Northport Limited. The purpose of the study was to test the feasibility of operating a floating dry dock at the western extremity of the Northport Facility. The floating dry dock chosen for this study was a Commercial Information dock which is capable of lifting a ship of maximum displacement Commercial Information tons with a maximum length of Commercial Information m LOA and Commercial Information m beam. Three possible locations for the dry dock were proposed at the western extremity of the Northport Facility.

Three design ships (two containerships and one cruise ship) were chosen for the initial phase of the study which would test the feasibility of the operation and give an indication of requirements for dredging and environmental limitations.

- The study found the dry-docking operation was feasible in wind conditions up to Commercial Information knots at high water slack tide. Wind directions north west and south east are the hardest to manage.
- The existing tug fleet of Commercial Information would be capable of supporting the dry-docking operation. However, Commercial Information All the movements simulated were dead ship movements, engines and thrusters and rudders were unavailable.
- All the proposed locations for the dry dock are feasible for the operation.
- Consideration should be given to fender protection of the wharf areas and floating dry dock itself. Commercial Information

It is recommended further simulation work is carried out to expand the environmental limitations for the operation of the dry dock and also to test the manoeuvring of the dry dock itself into the desired location.

Introduction

This simulation study is the first phase of a larger study into the operation of a floating dry dock at the western extremity of the Northport facility. This first phase study was conducted over the period 10th to 25th September.

The simulator used for the study was provided by Northport Limited which is located on site at the Northport Training Centre. The simulator was designed by Be-Software of Italy and is a port development and research simulator. Details on the simulator are available through the Be-Software website www.be-software.net

The simulator was run by Privacy of natural persons of Be-Software with the following active participation of pilots from Commercial Information

- Privacy of natural persons
- Privacy of natural persons
- Privacy of natural persons
- Privacy of natural persons
- Privacy of natural persons

Engineering staff from Northport Limited provided the design drawings. The Masters of the Commercial Information and Commercial Information provided hydrodynamic information and dry dock conditions for the two design container ships and Brisbane Marine Pilots provided docking information for the third design ship Commercial Information Specifications for the dry dock were provided by Commercial Information. The Harbourmaster Privacy of natural persons was briefed on the simulation project on the 24th September.

Bathymetry and tidal information were provided by Commercial Information and Commercial Information respectively. Both the bathymetry and tidal information will need to be updated after this preliminary study.

Three options for the location of the dry dock were simulated in this study. It is proposed the dry dock be located in a dock basin in a future area of reclaimed land to the west of the present Northport facility. Alignment of the basin will be at 90 degrees to the existing berth face on MP1. The dry dock can be located either at the eastern or western side of the basin and also aligned at 90 degrees to the existing berth face.

Floating Dry Dock Specifications

Name	LOA (m)	Outer/ Inner Beam (m)	Draft Max (m)	Draft on keel blocks (max)
Commercial Information	Commercial Information	Commercial Information	Commercial Information	Commercial Information m

See online specification from Commercial Information

Design Ships for Simulation

Name	LOA (m)	Beam (m)	Drafts (m)	Displacement tonnes	Type
Commercial Information	Commercial Information	Commercial Information	Commercial Information	Commercial Information	Container
Commercial Information	Commercial Information	Commercial Information	Commercial Information	Commercial Information	Cruise
Commercial Information	Commercial Information	Commercial Information	Commercial Information	Commercial Information	Container

Towage Units for Simulation

Name	LOA (m)	Beam (m)	Bollard Pull (y)	Maximum Draft (m)	Tug Type	Designation
Commercial Information	Commercial Information	Commercial Information	Commercial Information	Commercial Information	ASD	Commercial Information
Commercial Information	Commercial Information	Commercial Information	Commercial Information	Commercial Information	ASD	Commercial Information
Commercial Information	Commercial Information	Commercial Information	Commercial Information	Commercial Information	Conventional	Commercial Information
Commercial Information	Commercial Information	Commercial Information	Commercial Information	Commercial Information	Conventional	Commercial Information
Commercial Information	Commercial Information	Commercial Information	Commercial Information	Commercial Information	Rotor Tug	Commercial Information

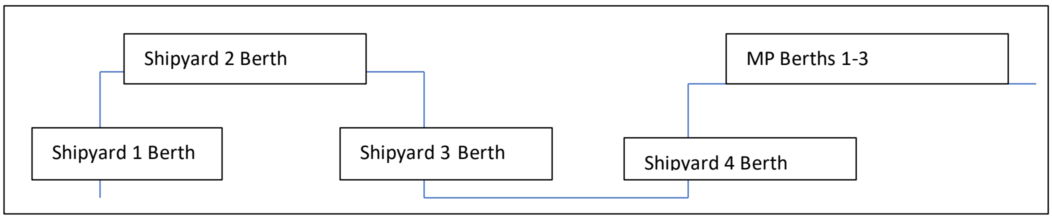
Winching Systems

Name	Working Load	Comment
Mooring Lines	Commercial Information t	Ships Lines on ship winches
Mules on trackway	Commercial Information t	Wire lines on a tracked winch
Dock Lines	Commercial Information t	Dock lines on dock winches worked successively

Dock Locations

Name	Area Model	Option Number	Drawing Number	Depths	Comments
Dock on Eastern Side of dock basin 50m back from berth faces	Marsden2	1	D60-X June 2018	Dock Basin Depth Commercial Information m Depth over keel blocks Commercial Information m	Centre Basin Dolphin to facilitate bridge across the basin face
Dock on Eastern Side of dock basin 15m back from berth faces	Marsden2A	2	D60-X Sept 2019	Dock Basin Depth Commercial Information m Depth over keel blocks Commercial Information m	No Centre Basin Dolphin
Dock on Western side of dock basin 15m back from berth faces	Marsden2B	3	D60-X Latest	Dock Basin Depth Commercial Information m Depth over keel blocks Commercial Information m	Mooring Dolphin Commercial Information m west of western extremity of layup berth

Designation of Berths



Summary of Simulated Runs

Each run simulated is recorded as an MP4 video file and has an associated track plot. These files are available as a separate electronic database to this report. Track plots showing the cumulative swept paths of the ships are available in the appendix section 1 of this report. Please note when observing the swept paths, consideration must also be given to the tugs operating the ship which can have a maximum towline length of 35m. Positions of the tugs in relation to the ship are shown in the MP4 file for the relevant simulated run. Details on the simulated runs are shown here. All movements simulated are dead ship movements, engines and thrusters and rudders were unavailable. It was assumed tugs would not be able to push on the transom of the design ships excepting the Commercial Information.

Runs 001 to 008. A selection of arrival runs using the Commercial Information Dock Option number 1. The ship was starting from MP1 into the dock bow first. Ship was winched into the dock using a succession of mooring lines then dock lines. Four tugs in support Commercial Information Environmental conditions simulated were winds 15 kts steady at highwater slack tide. The ship was controlled adequately in all conditions however it was considered the dock could have been damaged in Run005 with a north wind. It was considered by the pilots that a breasting fender on the eastern end of the basin at MP1 would have facilitated better the docking arrival movement. Refer Track Plots DDRUNS 001-008 Arrival Runs Commercial Information Option 1

Runs 009 to 018 A selection of departure runs using the Commercial Information Dock Option number1. Ship starting from the dock stern first into the main turning basin off MP1. Ship was towed from the dock using Commercial Information and dock lines. Three tugs in support Commercial Information Environmental conditions simulated were winds 15 kts steady at highwater slack tide. The ship was controlled adequately in all conditions however it was considered the dock could have been damaged in Run013 and Run 016 with a south and south east wind respectively. Refer: Track Plots DDRUNS 009-018 Departure Runs Banu Option 1

Runs 019 to 021 A small selection of arrival runs using the Commercial Information Dock Option number 2. The ship was starting from MP1 into the dock bow first. Ship was winched into the dock using a succession of mooring lines then dock lines. Four tugs in support Commercial Information Environmental conditions simulated were winds 15 kts steady at highwater slack tide. The ship was controlled adequately in all conditions. It was considered by the pilot that a breasting fender on the eastern end of the basin at MP1 would have better facilitated the docking arrival movement. It was also considered by the pilot that a centre basin dolphin would offer good protection for the dock itself. Refer: Track Plots DDRUNS 019-021 Arrival Runs Commercial Information Option 2

Runs 022 to 030. A selection of arrival runs using primarily the Commercial Information Dock Option number 2. The ship was starting from MP1 into the dock bow first. Ship was winched into the dock using a succession of mooring lines then dock lines. In runs 028 and 029 docking mules were used. Four tugs in support (Commercial Information Commercial Information Commercial Information MB). Environmental conditions simulated were Winds 15 kts steady at highwater slack tide. It was considered that with the winds from the south east this high windage ship the Commercial Information would be difficult to control. The ship was managed but it was considered the Commercial Information to be underpowered in some of the simulations. It was considered the dock could have been damaged in Run025 and Run 030 with a north and south west wind respectively. Refer: Track Plots DDRUNS 022-029 Arrival Runs Commercial Information Option 2

Runs 031 to 038. A selection of arrival and departure runs using primarily the Commercial Information Dock Option number 3 with a ship on MP1. The ship was starting from the shipyard 2 berth into the dock bow first in runs 031 and 032. The ship was arriving from sea into the dock bow first in runs 033 to 035. The ship was starting from the shipyard 2 berth into the dock stern first in runs 036 to 037. Run 038 was a departure stern out back to the shipyard 2 berth. Environmental conditions simulated were winds 15 kts steady at highwater slack tide. The ship was handled into and out of the dock using dock lines and mules. Four tugs in support (Commercial Information). Commercial Information was not used as the stern tug rather the Commercial Information The ship was managed well however it was considered the dock could have been damaged in run033 with a south west wind. It was considered by the pilot that two sets of mules be used with the dock, one set to control the bow and the second set to be used to take over from the tugs positioned aft controlling the stern when the ship is well into the dock. Refer: Track Plots DDRUNS 031-038 Arrival and Departure Runs Commercial Information Option3

Runs 039 to 045. A selection of arrival runs using the Commercial Information Dock Option number 3 with a ship on MP1. The ship was starting from the shipyard 2 berth into the dock bow first. The ship was winched into the dock using dock lines and mules. Four tugs in support (Commercial Information). Commercial Information was not used as the stern tug rather the Commercial Information. Environmental conditions simulated were winds 15 kts gusting 5% with a sector of 20° at highwater slack tide. It was considered the dock could have been damaged in runs 40 and 43 with winds south west and east respectively. Refer: Track Plots DDRUNS 039-045 Arrival Runs Commercial Information Option 3

Runs 046 to 047. A selection of departure runs using the Commercial Information Dock Option number 3 with a ship on MP1. The ship was taken from the dock stern first to the shipyard 2 berth. The ship was pulled from the dock using tug and controlled with mules. Four tugs in support (Commercial Information). Commercial Information was not used as the stern tug rather the Commercial Information. The pilot considered the Commercial Information to be not very manoeuvrable. Environmental conditions simulated were winds 15 kts gusting 10% with a sector of 15° at highwater slack tide. The manoeuvres were well managed. Refer: Track Plots DDRUNS 046-047 Departure Runs Commercial Information Option 3

Runs 048 to 049. A selection of arrival runs using the Commercial Information Dock Option number 3 with a ship on MP1. Both stern first and bow first entries into the dock were simulated. Environmental conditions simulated were winds west 15 kts gusting 10% with a sector of 15° at highwater slack tide. The ship was winched into the dock using dock lines and mules. Four tugs in support (Commercial Information Run 048 was an arrival from the shipyard 2 berth and run 049 was an arrival from sea. The manoeuvres were well managed. Refer: Track Plots DDRUNS 048-051 Arrival Runs Commercial Information and Commercial Information Option 3

Runs 050 to 051. A selection of arrival runs using the Commercial Information Dock Option number 3 with a ship on MP1. Environmental conditions simulated were winds north west 15 kts gusting 10% with a sector of 15° at highwater slack tide. The runs were arrivals from the shipyard 2 berth bow first into the dock. The ship was winched into the dock using dock lines and mules. Four tugs in support Commercial Information The ship was managed but it was considered the Commercial Information to be underpowered in some of the simulations. The north west wind was considered a limiting condition for the Commercial Information and it was possible the dock could have been damaged in run 051. Refer: Track Plots DDRUNS 048-051 Arrival Runs Commercial Information and Commercial Information Option 3

Runs 052 to 054. A selection of arrival runs using the Commercial Information Dock Option number 3 with a ship on MP1. Environmental conditions simulated were winds north west 15 to 20 kts gusting 10% with a sector of 15° at highwater slack tide. The runs were arrivals from the shipyard 2 berth bow first into the dock. The ship was winched into the dock using dock lines and mules. Four tugs in support Commercial Information Commercial Information was used on a line aft to control the speed into the dock. Commercial Information operated at full power pull to control speed however it was considered the speed could be managed in the dock with the use of forward springs. Refer: Track Plots DDRUNS 052-054 Arrival Runs Commercial Information Option 3

Run 055. This was a shift ship of the Commercial Information from the shipyard 2 berth to the shipyard 4 berth inside the dock basin. Environmental conditions simulated were winds south west 15 kts steady at highwater slack tide. Mooring lines were used with four tugs in support (Commercial Information The manoeuvre was controlled well but space for operational tugs was limited. Refer: Track Plots DDRUNS 055-056 Shift Ship Shansi Option 3

Run 056. This was a shift ship of the Commercial Information from the shipyard 2 berth to the shipyard 1 berth. Environmental conditions simulated were winds east 15 kts gusting 10% with a sector 15° at highwater slack tide. Mooring lines were used with four tugs in support Commercial Information The manoeuvre was controlled well. The far western mooring dolphin inhibited the movement of tugs, but it was controlled adequately. Refer: DDRUNS 055-056 Shift Ship Commercial Information Option 3

Runs 057 to 059 A selection of arrival runs using the Commercial Information Dock Option number 3 with a ship on MP1. The ship was starting from the shipyard 2 berth into the dock bow first. The ship was winched into the dock using dock lines and mules. Two tugs in support (Commercial Information Environmental conditions simulated were winds 15 to 20 kts gusting 10% with a sector 15° at highwater slack tide. It was considered the ship could be very precisely controlled using the two rotor tugs particularly in the initial line up of the ship prior to making fast the mules outside the dock. Run 059 had the ship moving too fast in the dock, but it was successfully stopped. Refer: Track Plots DDRUNS 057-059 Arrivals Commercial Information Option 3

Key Findings

From the preliminary round of simulations, it was considered the operation of the dry dock was feasible with all three options for dry dock location within the dock basin. The following key findings are presented:

- Option 1 and Option 2 dock locations require minimal disturbance of the seabed but will impact on the utilization of MP1. Cargo operations will have an impact on the docking operations See track plots in the appendix.

- Option 3 dock location maintains MP1 for cargo operations but will require significant dredging. See track plots in the appendix.

- Operation of the dock is feasible in wind conditions up to 15 knots gusting 10% with a sector of 15 °. Winds from the north west and the south east will be the most difficult to manage. The predominant south west wind is favourable for the dock operation.

- Operation of the dock is feasible at high water slack tide. The critical manoeuvres can be achieved within Commercial I to Commercial Information minutes which corresponds to the available tidal window of benign tidal streams about high water.

- From the simulation, it could be seen that protection for the dry dock itself and the corners of the dock basin and western extremity mooring dolphin must be considered Commercial Information In addition, the corner between the western layup berth and the far western fitting out berth must be protected. The ability to be able to breast a ship around the corners of the dock basin and the corner between the western layup berth and the far western fitting out berth should be considered.

- The operation of the dock is feasible with the existing tug power available to Commercial Information The tugs could be utilized in a number of different configurations by the pilots, but it was considered four tugs were required for dock arrivals and departures. Free and frank opinions All the movements simulated were dead ship movements which is the worst possible scenario. Operation of rotor tugs for docking arrival manoeuvres was considered favourable as it offered better control of the ship at the entrance to the dock prior to lines being made fast to winch into the dock. It also reduced the number of towage units used for the docking manoeuvres which will improve the communications and co ordination of the operation between pilot, dockmaster, ship master and tugmasters.

- Winching operations were considered improved by utilizing sets of mules on track ways. Two mules on the port and starboard bow with an additional two mules on the port and starboard quarters of the ship offered greater control. Winching power on the mules should be at least Commercial Information tonnes and wires would be adequate. Docking lines were also feasible to control the ship in the dock. It was considered a docking crew join the ship for the manoeuvres into and out of the dock. The use of ships lines on ship winches was not recommended by some of the pilots due to the complexity of the docking operation.

Recommendations

The following recommendations are offered as a result of the initial phase 1 simulation study.

- Further simulation (Phase 2) is required to fully develop the environmental limitations for the dock operation. In particular smaller ships may be able to operate in higher wind speeds and different tidal conditions.

- Further simulation is required to investigate the placement of the dock into the approved dock basin and potentially its movement into the port.

- Operation of different towage units should be more fully developed. Free and frank opinions Operation of rotor tugs should also be further investigated for both arrival and departures. Commercial Information can offer data on an ART32 design tug which they build.

- Additional information should be sought on dock operations in particular winching systems utilized in wind speeds up to 15 knots. Similar size docks operate around the world and procedures used by existing docks should be studied.

- Potential fendering arrangements to protect the dry dock itself and the corners of the dock basin, the western extremity mooring dolphin and the corner between the western fitting out berth and the western layup berth, should be investigated. Positions for all potential bollards and fenders should be assigned co ordinates for phase 2 simulations.

- Consideration to wind shadowing effects should be incorporated into future phase 2 simulation as this may allow the opening of the operational window of the dry dock. In particular a wind wall could be investigated along the SW corner of the dry dock site. A substantial wind wall could have noise reduction and image reduction possibility for the residents of Albany Road.

- Tidal streams should be remodelled to incorporate the approved dock basin and shipyard area design. The remodelled streams can then be used with a second round of simulations (Phase2)

- After the design dock basin is approved, the dry dock operations should be tested against the new design dock basin and proposed dredged depths.

Conclusion

This simulation study found the dry dock operation feasible under environmental limitations of 15 knots of wind gusting 10% through a sector of 15 °. The operation was feasible under slack water high tide conditions. The design ships are likely the largest size vessels which will use the dry dock. It is highly likely that smaller ships will be able to operate within a wider environmental window which should be investigated in the second phase of this study.

Available towage units for the dry dock operation are adequate Commercial Information All the movements simulated were dead ship movements which is the worst possible scenario. Engines and thrusters and rudders were unavailable. It was assumed tugs would not be able to push on the transom of the design ships with the exception of the Commercial Information.

Free and frank opinions. As the docking operations will run between 30 minutes to 60 minutes there is potential for conflict with Northport and Commercial Information vessel arrivals and departures. Free and frank opinions The arrival docking operation requires precise control of the ship until the dock lines or mules are attached. Rotor tugs or their equivalent offer that degree of control and can operate in confined locations which can reduce the total number of towage units used for a dry dock operation.

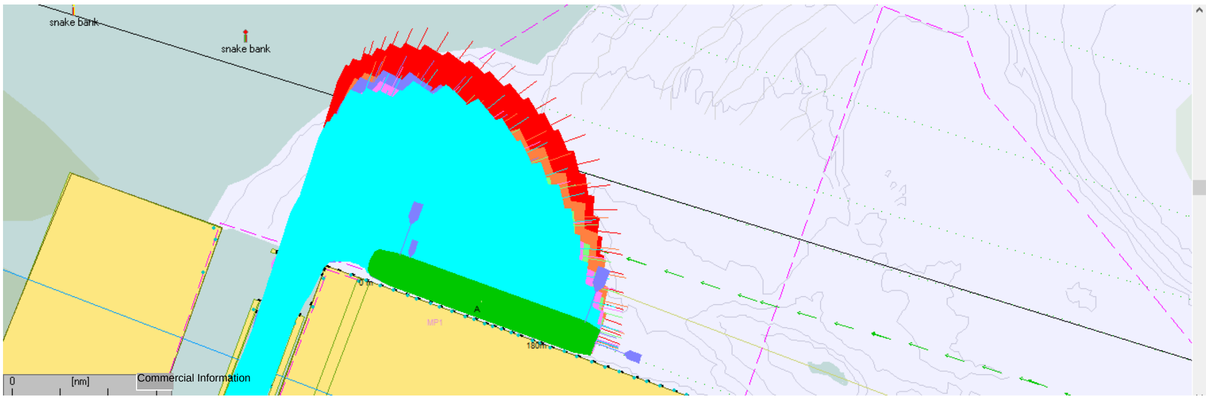
All the proposed locations for the dry dock are feasible. Option 1 and 2 require minimal dredging but there is a potential limitation for the dock when cargo operations are conducted on berth MP1.

Consideration must be given to fender protection of the wharf areas and floating dry dock itself. Commercial Information High quality winching systems, versatile tugs and experience of operators are considered appropriate tools to help manage this risk.

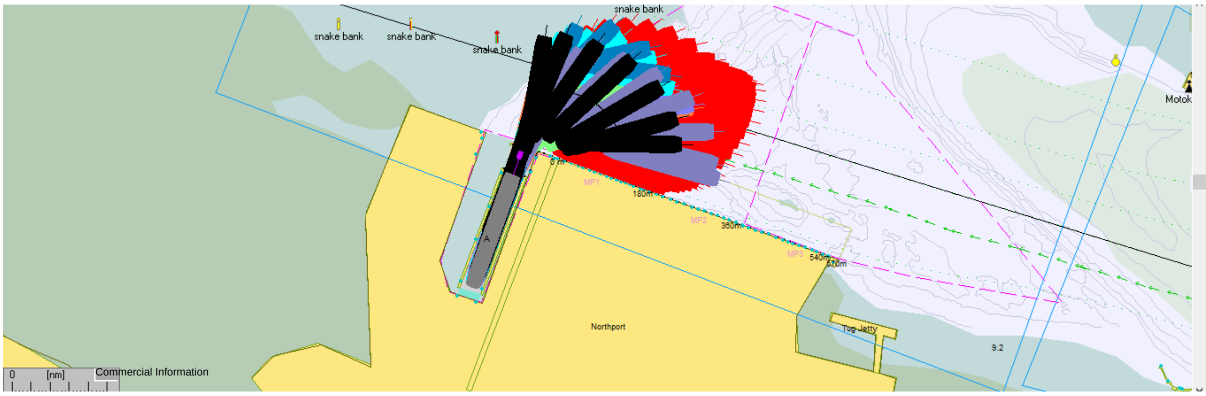
Appendix Section 1

Track Plots (Cumulative)

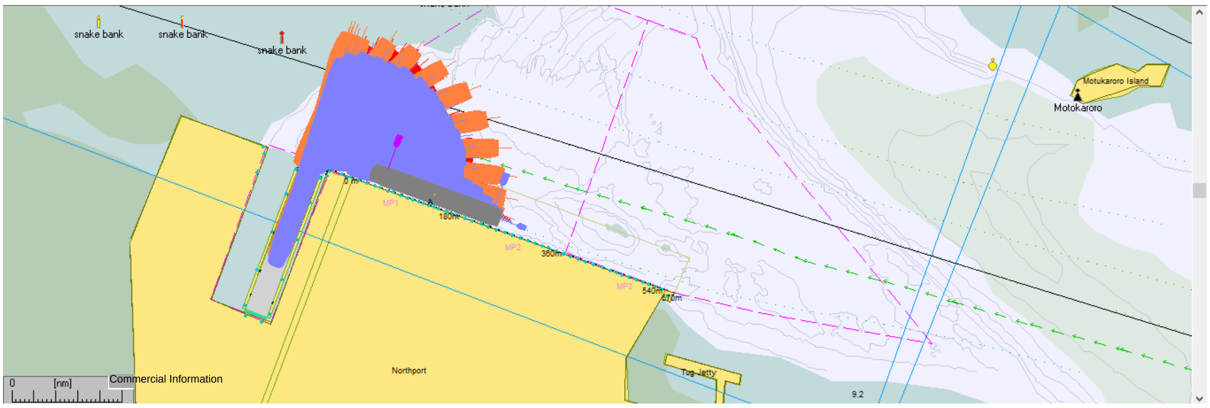
DDRUNS 001-008 Arrival Runs Commercial Information Option 1



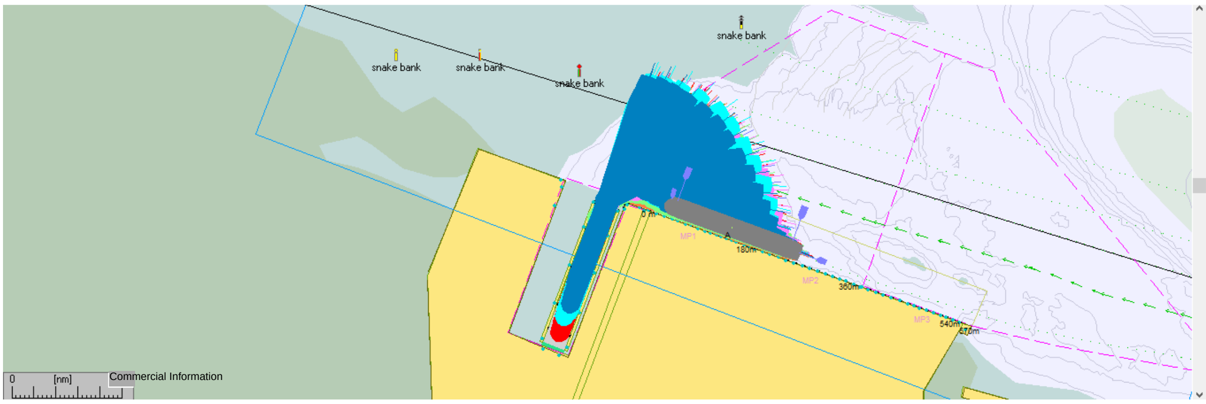
DDRUNS 009-018 Departure Runs Commercial Information Option 1



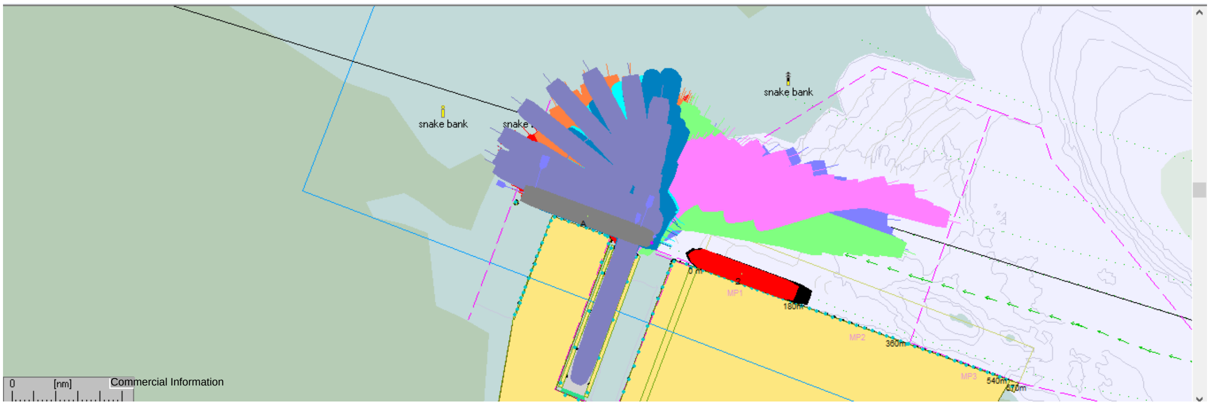
DDRUNS 019-021 Arrival Runs Commercial Information Option 2



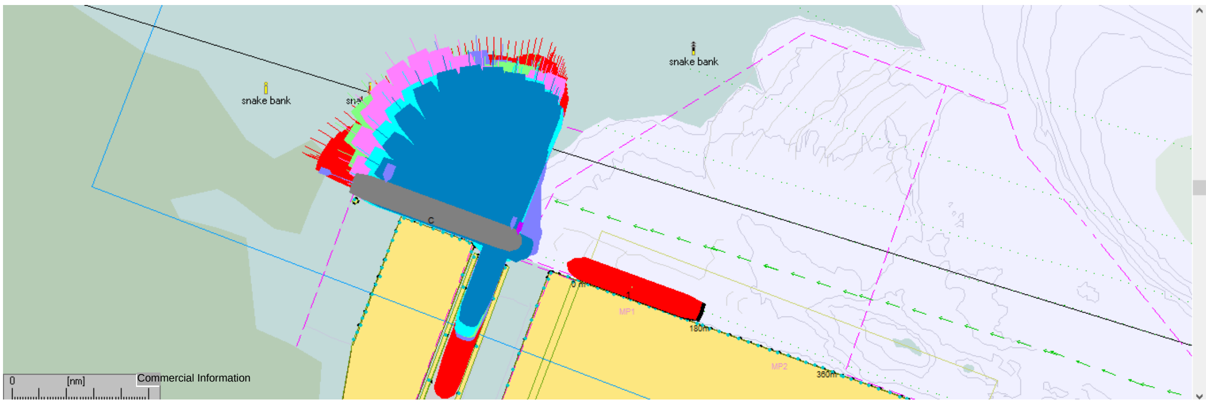
DDRUNS 022-029 Arrival Runs Commercial Information Option 2



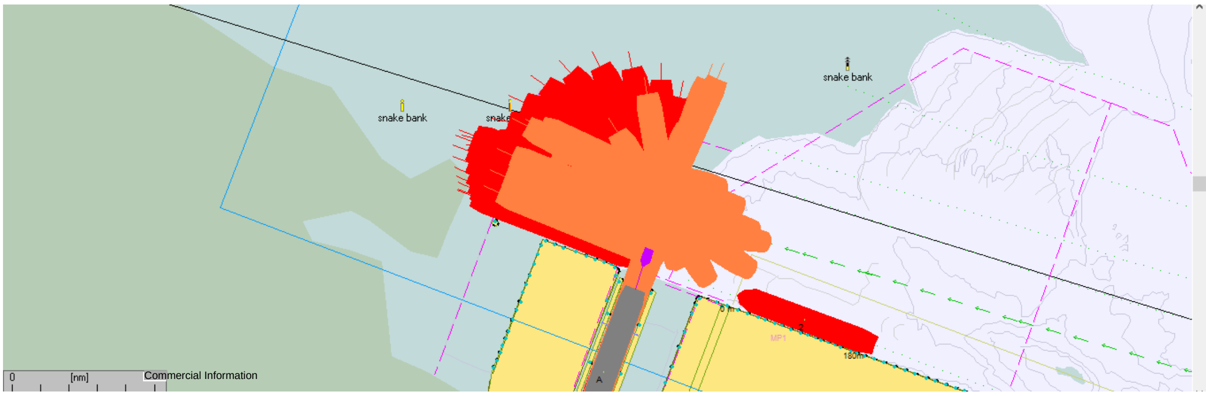
DDRUNS 031-038 Arrival and Departure Runs Commercial Information Option3



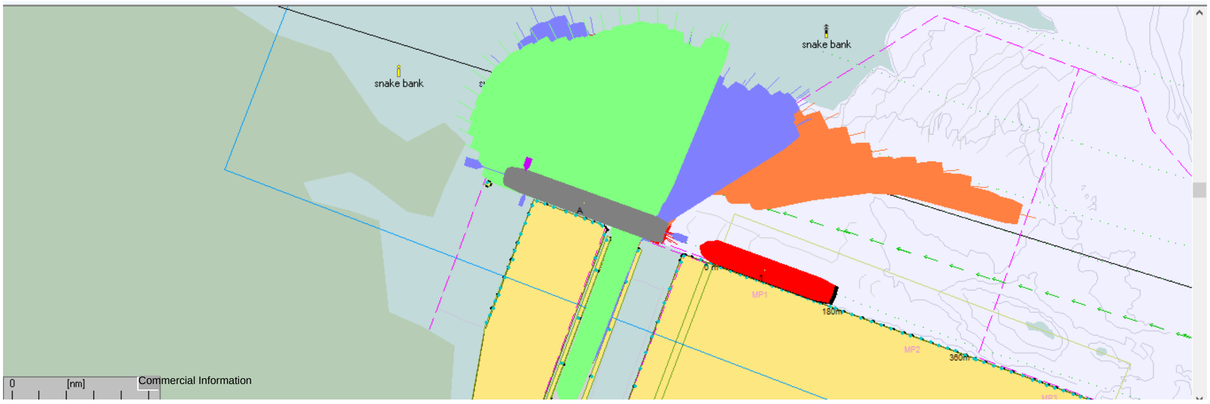
DDRUNS 039-045 Arrival Runs Commercial Information Option 3



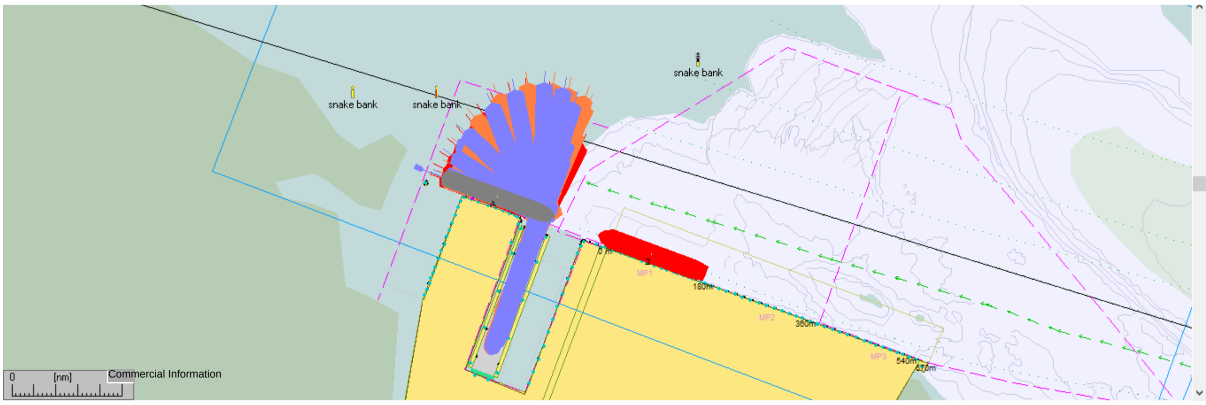
DDRUNS 046-047 Departure Runs Commercial Information Option 3



DDRUNS 048-051 Arrival Runs Commercial Information and Commercial Information Option 3

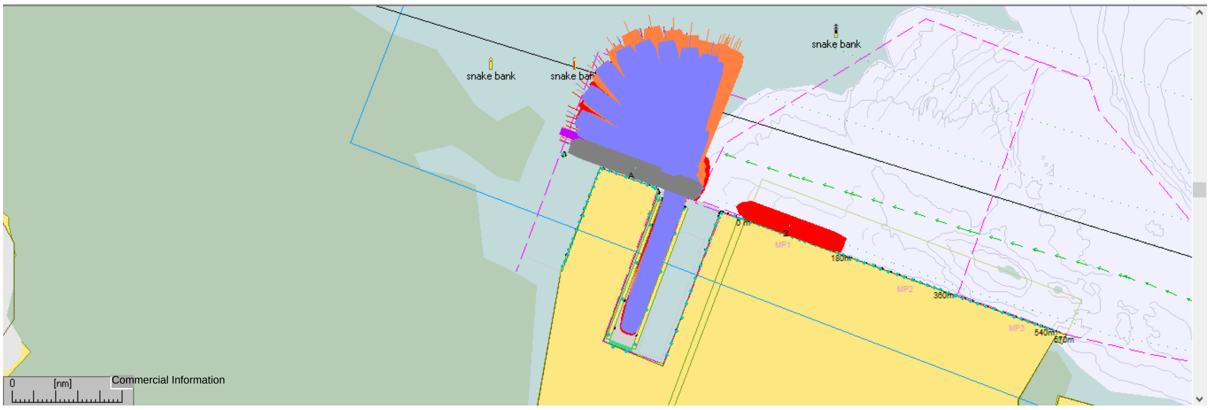


DDRUNS 052-054 Arrival Runs Commercial Information Option 3



DDRUNS 055-056 Shift Ship Commercial Information Option 3

DDRUNS 057-059 Arrivals Commercial Information Option 3



Northport

Northland Shipyard & Floating Drydock Project

CONSENTING PROCESS

1. Consenting Process:

There are three resource consent processes which may be followed in relation to the required resource consents for the reclamation:

1. The default process under the RMA
2. Direct referral to the Environment Court
3. Referral to the Environmental Protection Agency (EPA)

2. Consents Required:

Resource consents will be required in respect to the following matters:

- Reclamation
- Structures occupying space in the CMA
- Structures in the CMA
- Earthworks in the coastal marine area (construction)
- Stormwater discharge (during construction)
- Stormwater discharge (post construction)
- Capital dredging (including turning basin)
- Maintenance dredging
- Disposal of dredge material to land and/or into CMA
- Land use post construction (i.e. port related activities)

3. Supporting Information:

The application for the resource consents will require the following supporting technical information/reports:

- Visual/Landscape assessment
- Noise assessment; including noise predictions and modelling
- Air quality
- Economic effects
- Recreational effects
- Transport assessment
- Archaeological assessment
- Cultural assessment (Patuharakeke): Cultural Values & Cultural Effects
- Ecological assessment (shellfish, birds, marine ecology)

- Benthic ecology and pipi beds
- Hydrodynamic assessment (tidal current/sediment movement)
- Navigation and Environmental Spill risk assessments
- Stormwater and sediment control (during construction)
- Stormwater collection and treatment (post construction)
- Dredging management plan including water quality and underwater noise
- Engineering (design) and geotechnical report (including hazard assessment)
- Construction management plan

Technical reports covering most of these topics have been prepared for past resource consent applications for reclamation by Northport and more recently by Commercial Information [redacted]

As part of the Vision for Growth (V4G) project Northport has embarked on the work required for preparing for the consenting process for the full port footprint. For preparation of the AEE (Assessment of Environmental Effects) for inclusion of the shipyard/drydock facility some of the previous reports will need only to be reviewed where others will need to be fully updated.

As part of the Commercial Information [redacted] report 'Port Expansion Consenting' an overview of the reports covering the required supporting information/topics was undertaken and an estimate of cost to review and update was provided.

4. Key Stakeholders:

Consultation with the following key stakeholders to be undertaken in the lead up to lodging the application:

Commercial Information [redacted]

The consultation for V4G has been carried out in conjunction with the preparation of technical reports and design work. It will be important to now follow a coherent and structured consultation process which should be determined from the outset; this will include a 3D Animation of the proposed facility that compliments the 'Vision for Growth' video and supporting information brochure. We recommend a similar consultation website to www.vision4growth.co.nz

5. Projected Timeframes:

The overall project timeframe will depend on the process to be followed.

- Default Process : Commercial Information [redacted] overall project timeframe from inception to the final decision,
- Direct Referral : Commercial Information [redacted] overall project timeframe from inception to the final decision,
- EPA : expect a similar timeframe as to direct referral to the Environment Court.

6. Projected Costs:

The potential costs associated with obtaining the necessary resource consents depends on the process to be followed and to a certain extent, the strength of any opposition to the project. While the direct referral and EPA processes avoid the duplication associated with attendance at both a Council and Environment Court hearing, the costs associated with these processes are significant.

The overall cost of obtaining consent has been based on the Stage 2 consenting project and is expected to range between $Commercial Information and $Commercial Information depending on which process is followed.

7. Proposal:

- Undertake a full review of the technical reports available from previous consent applications and reports available from Commercial Information identify the reports that can be updated and the areas where new reports are required,
- Update existing reports and use for technical investigations to assess the environmental effects of the proposed reclamation(s) and activities,
- Undertake new technical investigations where required and provide reports for assessment of environmental effects,
- Structure and commence consultation process,
- Pre-lodgement meetings with Northland Regional Council / Whangarei District Council,
- Prepare consent applications,
- Pre-lodgement meetings with Northport Directors and confirmation to move forward,
- Default process under RMA – application to NRC,
- Concurrent applications to be made but as separate consents.

8. Potential consenting issues:

- Historically, the ability to obtain consents for work of this nature has become more difficult and therefore more expensive as time passes.
- Current status of the Regional Plan; the proposed Regional Plan has legal effect, but several aspects of the plan are under appeal that potentially affect this project;
- Areas mapped as SEA (Significant Ecological Areas) are under appeal; of significance to this project is the area directly to the west of the port facility – i.e. proposed site for shipyard;
- Forest & Bird have made an appeal to have the status of SBA (Significant Bird Areas) elevated in the Regional Plan, if this is successful it will create additional consenting issues for this project;
- Implications going forward of the customary marine title claims made under the Marine & Coastal Area (Takutai Moana) Act 2011;
- The difficulties encountered by Ports of Auckland in trying to expand their current operation by lack of consultation and stakeholder awareness.

9. External Advice:

Regarding the direct referral/EPA process v the default process; the feedback is that the direct referral is astronomically expensive, primarily because the Court costs are also incurred. Most importantly, the default process gives the applicant the opportunity to have a “dry run” where they can test the strengths/weaknesses of their evidence, they also get to see the strength and resolve of any opposition, and an opportunity to potentially address many of the issues before it gets in front of a judge.