DIATREME RESOURCES
GALALAR SILICA SAND PROJECT
INITIAL ADVICE STATEMENT

PROJECT NUMBER 559C
JUNE 2020

PREPARED BY: ENVIRONMENT NORTH
BIOTROPICA AUSTRALIA
& BMT



ENVIRONMENT NORTH

DOCUMENT CONTROL CERTIFICATE

PROJECT AND CLIENT DETAILS

Project name:	Galalar Silica Sand Project	Job Number:	559c
Title:	Initial Advice Statement		
Client:	Diatreme Resources		
Contact:	Neil McIntyre		
Description of report:	Diatreme Resources Limited (Diatreme) has current awarded tenement areas EPM 17795 and EPM 27265, and has current lodged applications noted as EPMA 27430 and EPMA 27212 covering an extensive dune field near Cape Bedford east of Hope Vale known to contain silica sand and mineral sands. Diatreme has recently (December 2019) sought a mining lease over the resource area and is soon to commence the process to obtain all approvals required for the project to proceed. It is a relatively small enterprise, targeting 950,000 tonnes per annum extraction for a project life of 15 to 20 years. Product will be processed on site and exported by ship for the manufacture of solar panels and other high-end glass products. This document is an Initial Advice Statement prepared under the *Environmental Protection Act 1994* (Qld) (EP Act) as part of the process of completing a voluntary Environmental Impact Statement under the EP Act. This process allows for assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) should the project be declared a controlled action.		

PREPARATION AND DISTRIBUTION DETAILS

Version	Purpose	Prepared by	Checked by	Date
1-3	Internal drafts	David Rivett	Greg Fisk	15 January 2020
4	Draft for agency consultation	David Rivett	Not checked	19 January 2020
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7	Final for ToR	David Rivett	Neil McIntyre	30 June 2020

8 Raintree Place
EDGE HILL Q 4870
Telephone: 0418 752 396
Email: Info@EnvironmentNorth.com.au

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APPENDIX A AFFECTED AND INTERESTED PERSONS (CONFIDENTIAL)

APPENDIX B EPBC ACT PROTECTED MATTERS SEARCH

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1 INTRODUCTION

1.1 PURPOSE AND NATURE OF THIS DOCUMENT

This document is an Initial Advice Statement (IAS) prepared under the *Environmental Protection Act 1994* (Qld) (EP Act) as outlined in Appendix 3 of the document 'Guideline: The environmental impact statement process for resource projects under the *Environmental Protection Act 1994*' prepared by the Department of Environment and Science (DES 2019a).

It describes the project and associated operational land and is required to be submitted with the draft Terms of Reference (ToR) for an Environmental Impact Statement (EIS) to be prepared under Chapter 3 of the EP Act (a 'voluntary EIS').

The report is based on a combination of desktop work and detailed field studies, with the latter including cultural heritage and terrestrial and marine ecological surveys as listed in **Table 1-1**. Detailed studies such as those referred to below are normally not undertaken before the EIS itself is underway. However, Diatreme Resources Limited (Diatreme) required that key environmental and cultural heritage constraints were to be identified early in project planning to allow the project to be optimised for local conditions and thereby reduce adverse impacts.

1.2 ADDRESSING REQUIRED CONTENTS OF AN IAS

At the beginning of each chapter of this IAS, italicised text in a box (as below) has been extracted from Appendix 3 of DES (2019a) in order to explain to readers the required scope of the following discussion. There is some repetition in the Appendix 3 table of contents and this is resolved as far as possible in this IAS by cross referencing to other sections where identical or similar matters are required to be t'discussed. Unfortunately this results in some repetition.

The Appendix 3 table of contents is followed as much as possible. In some cases additional matters are discussed where doing so will improve the understanding of the project.

Explanatory text from Appendix 3 of DES (2019a) follows.

Explain the function and purpose of the initial advice statement (i.e. why it has been prepared and what it sets out to achieve). Include an overview of the proposed project and the structure of the document.

Identify if:

- *the project has a medium or high probability of causing serious environmental harm or material environmental harm or a high probability of causing environmental nuisance*
- *the project is considered contentious (e.g., project has had media coverage or there is a public perception of potential environmental harm or nuisance).*

1.3 SNAPSHOT OF PROJECT

The Galalar Silica Sand Project (GSSP) will be an open cut mining operation designed to extract and process silica sand into a product suitable for manufacturing high quality glass products including solar panels. It will involve dry-mining silica sand above the water table, on-site processing involving washing and gravity separation, stockpiling processed product, and export via ship to overseas markets.

As explained in greater detail later, Diatreme has entered into a number of arrangements with the Hopevale Congress Aboriginal Corporation ('Hopevale Congress' or 'Congress') Registered Native Title Body Corporate (RNTBC). Hope Vale Congress is the representative body of all native title holders of the land on which the mine will be built and the owner of the Aboriginal freehold land.

The proposed mine is located near Cape Bedford some 20 km east of Hope Vale as shown on **Figure 1-1**. The company has current awarded Exploration Permit [for] Minerals (EPM), tenement areas EPM 17795 and EPM 27265, and has current lodged applications noted as EPMA 27430 and EPMA 27212.

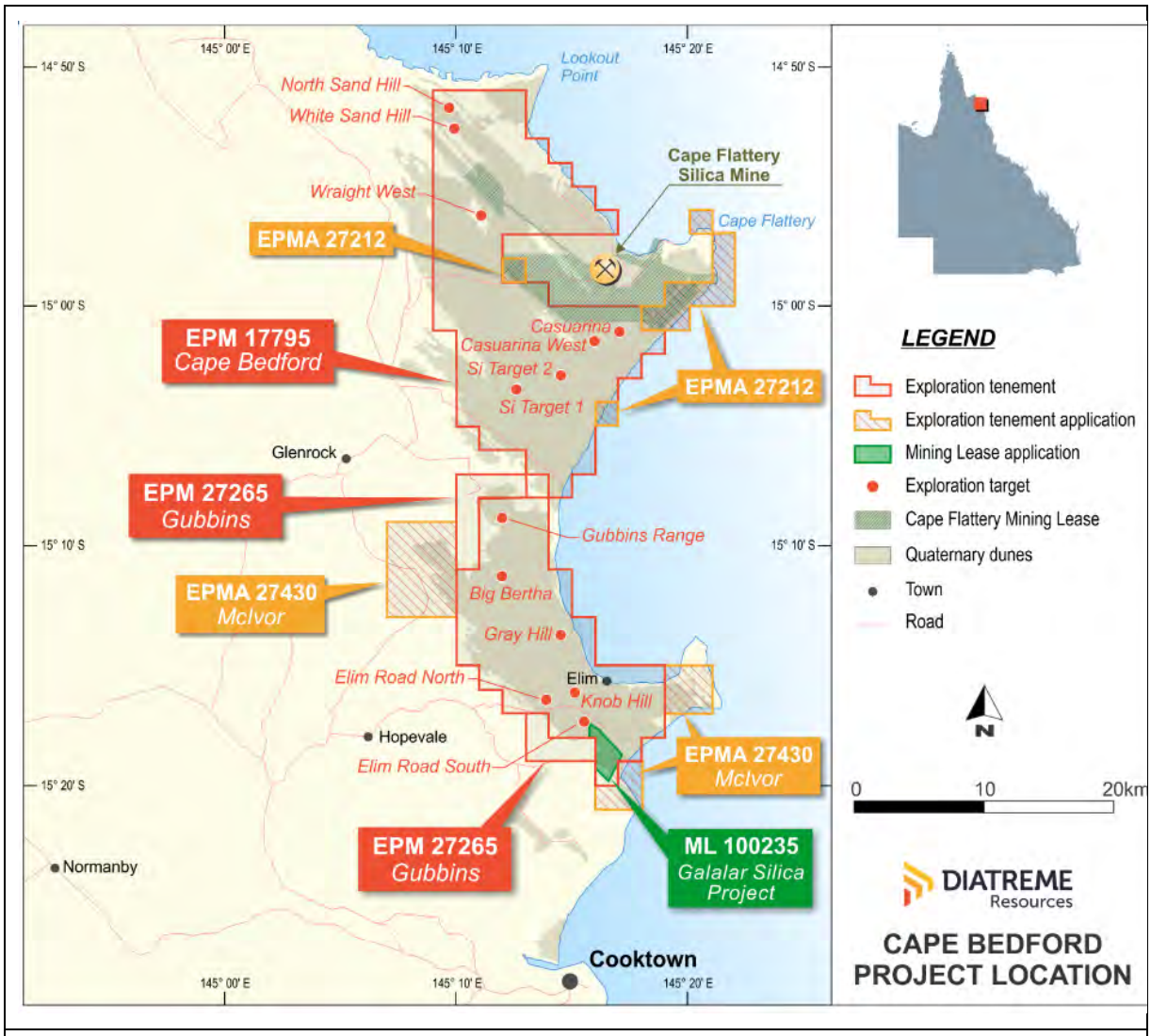


Figure 1-1 Locality plan and relevant EPMs and EPMAs.

Source: Diatreme Resources.

The current resource is approximately 47.5 million tonnes (Mt) and at the proposed rate of extraction (average of 0.95 Mt per annum (Mtpa)) will last in excess of 20 years. However, a conservative initial mine life of 15 years has been assumed. A heavy mineral by-product will be produced by the processing plant and stockpiled until there is a sufficient quantity for a heavy mineral shipment. Most of the products will be eventually exported.

Associated infrastructure at the site will include a workshop and office, a stockpile site, a mobile processing plant, slurry holding and treatment ponds, roads etc. There will be no camp at the mine – workers are expected to commute from Hope Vale, Cooktown, or elsewhere in the local area.

As explained in **Section 7.2**, the project consists of the Mining Area at Cape Bedford and export options based on two alternative barge loading locations. These have been selected from a large number of options as documented in this IAS. In broad terms:

- The **Mining Area:** Contains the silica resource and infrastructure required to process it for export.
- **Nob Point Loading:** Barge loading from Nob Point following road transport 3.6 km from the mine, and barging to one of the following alternative transhipment locations:
  - offshore from Nob Point opposite the barge loading area (BLA)
  - the Port of Cape Flattery
  - the Port of Cooktown (at an anchorage site that is either in the northern section of port limits near Indian Head or in the southern section of port limits near the town).
- **Cooktown Loading:** Barge loading from Marton (Cooktown) following road transport 63 km from the mine and barging via the Endeavour River to a transhipment anchorage in the Port of Cooktown (south, near the town as above).

It is proposed that all options (and some sub-options described later) will be assessed as part of an EIS process and the superior option will be selected and if possible, improved.

1.4 IAS AUTHORS

Principal authors of this IAS or supporting documents as later described are:

- David Rivett – Principal, Environment North (preparation of this report)
- Nigel Tucker – Managing Director, Biotropica Australia (terrestrial science inputs)
- Greg Fisk – Senior Principal Consultant, BMT (marine science inputs).

All project and commercial information has been provided by Diatreme and its specialist mining consultant Ausrocks Pty Ltd (Ausrocks).

1.5 OTHER RELEVANT PROJECT REPORTS

As explained later in this document, the EIS process under the EP Act allows for assessment of *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) issues. Accordingly, a referral under the EPBC Act was lodged on 28 February 2020. This was supported by a report that covers much of the same material as this IAS, although its focus is on Matters of National Environmental Significance (MNES). The principal authors of the referral report (Environment North *et al.* 2019) are identical to this IAS report (see **Section 1.4** above).

In addition, the other reports listed below have been prepared in support of the project to date. These are referred to where relevant in this IAS. Most of these are expected to be referenced in the eventual EIS.

Table 1-1 Other relevant project reports

DATE	TOPIC	REFERENCE
2017	Cultural heritage constraints	Archaeo Cultural Heritage Services (2017)
2018	Flora study for drilling program	Biotropica Australia (2018)
2019	Wet season terrestrial ecology study in support of EIS	Biotropica Australia (2019a)
2019	Indicated Resource and Updated Inferred Resource Assessment	Ausrocks Pty Ltd (2019a)
2019	Inputs to Initial Advice Statement and EPBC Act Referral (Water, Coastal Processes and Marine Ecology)	BMT (2019)
2019	Scoping Study to the ASX	Diatreme Resources (2019)
2019	Dry season terrestrial ecology study in support of EIS	Biotropica Australia (2019b) updated January 2020
2019	Mining Lease Application December 2019	Ausrocks (2019b)
2020	Galalar Project Revised ML Constraints Analysis	Biotropica Australia (2020a)
2020	Wet season supplementary terrestrial ecology study in support of EIS	Biotropica Australia (2020b)
2020	Marine ecology reconnaissance survey (Cooktown and Nob Point)	BMT (2020)
2020	EPBC Act referral supporting information (see above)	Environment North, Biotropica Australia, & BMT (2020)

Note that, in general, the reports listed above have been focused on the various resources relevant to the project and their associated values. While comment is sometimes made on possible impacts, none of the reports should be considered to be impact assessment studies as such. Their purpose was to help in the evolution of the project to minimise impacts and, where appropriate, to inform the future EIS. For example, the wet season and dry season terrestrial ecology studies are of EIS standard with respect to the survey, but do not assess impacts nor focus on the required management regime.

1.6 OVERVIEW OF PROPOSED PROJECT

Diatreme holds two Exploration Permits for Minerals (EPMs) covering an extensive dune field at Cape Bedford east of Hope Vale known to contain silica sand and heavy mineral (HM) sands. Formerly known as the Cape Bedford Project, the GSSP is located approximately 200 km north of Cairns, 20 km north of Cooktown, and 20 km east of Hope Vale in Far North Queensland.

It is proposed to cover a section of a large Quaternary sand dune field, the northern part of which is currently being mined by Cape Flattery Silica Mines Pty Ltd, a wholly owned subsidiary of Mitsubishi Corporation. The Cape Flattery project has operated since 1967 and is the world's largest silica sand mining operation. There is no relationship between the two projects.

The following is the current status of the GSSP:

- EPM 17795 (486 sq km) was granted under the *Mineral Resources Act 1989* (Qld) (MR Act) to Diatreme in June 2016 for a 5-year (renewable) term. See **Figure 1-1**.
- An Environmental Authority (EA) (EPSX00173613, granted 22/06/16) has been issued for exploration and for which standard conditions for mineral exploration apply.
- Diatreme executed a Compensation and Conduct Agreement (CCA) with Hopevale Congress (see **Section 2.2**) in January 2017 – thereby facilitating access to the land for exploration activity.
- Diatreme executed a Cultural Heritage Agreement (CHA) with Hopevale Congress in June 2017 covering a protocol for cultural heritage surveys prior to on-ground exploration activity.
- Under the terms of the CHA, Diatreme lodged a first pass exploration work program in July 2017, completed a cultural heritage survey over the then proposed area of exploration activity in August 2017, and undertook terrestrial ecology surveys in the initial exploration area in early 2018. A revised exploration program was subsequently undertaken outside the identified cultural heritage sites to avoid impacting a local population of a near threatened plant species. As explained later in this IAS, additional ecological fieldwork has resulted in further refinement of the project.
- Overall, drilling has been undertaken in September 2017, October 2017, April 2018, June 2018 and November 2018, totalling over 130 holes for some 3000 m of air core drilling. A regional exploration was completed in March 2019 using a helicopter for access and hand auger for shallow sampling. The Maiden Inferred Resource is 30.2 m tonnes of >99% Si (announced August 2018).
- A Scoping Study (Diatreme Resources 2019) was submitted to the Australian Stock Exchange (ASX) in September 2019 to explain the project. Much of the material in this IAS is based on the Scoping Study. This highlighted the project's potential to generate strong returns for all stakeholders as follows:
  - Pre-tax nominal Net Present Value (NPV) $231 million
  - internal rate of return (IRR) of 150%
  - Estimated capital payback within 8 months; start-up capital $24.4m
  - 15-year mine life, producing 750,000 tonnes per annum based on a 79% recovery rate (i.e. 950,000 t mined).
- Negotiations have commenced with the Cook Shire Council, Ports North, and the Department of Transport and Main Roads (TMR) regarding exporting product through the Port of Cooktown, and with Hope Vale Aboriginal Shire Council (HVASC) regarding the use of shire roads.
- EPM (A) 27430 (62.7 sq km) was granted under the MR Act to Diatreme in December 2019 for a 5-year (renewable) term in order to facilitate the exploration program. This EPM is not relevant to the IAS/EIS.
- An application for a mining lease (ML) under the MR Act was submitted on 19 December 2019. It is proposed that the EIS and ML processes will proceed in parallel.
- A referral under the EPBC Act was lodged with the Department of Agriculture, Water and the Environment (DAWE) on 28 February 2020.
- Approval was granted on 5 March 2020 to undertake a voluntary EIS under the EP Act.
- The project was declared a controlled action under the EPBC Act on 5 June

1.7 LIKELY ENVIRONMENTAL AND PERCEPTION ISSUES

1.7.1 Likely Environmental Impacts

Detailed desktop and field studies have been completed on cultural heritage and ecological resources and values and extensive desktop work has been undertaken on some other environmental issues. While only a limited amount of impact assessment has been performed (consistent with an IAS), based on what is known, it is considered that the construction and operation of the project does not have a medium or high probability of causing serious environmental harm or material environmental harm, or a high probability of causing environmental nuisance, all as defined by the EP Act.

This is largely because steps have been taken to minimise key impacts (e.g. effect on cultural heritage values, vegetation communities and species, and fauna habitats) by modifying the proposed mine footprint based on mapped constraints. The process whereby prudent and feasible alternatives were considered is summarised in **Section 7.1**.

The project is quite small by mining standards and involves simple technologies. The silica product is chemically and physically benign and requires only low-impact physical treatment. The silica sand originated in the adjacent marine area and is similar to material found in the current seabed.

In the context of the interface with the coastal and marine environment, the footprint of proposed infrastructure below high water mark associated with the project (barge ramps, moorings) are minimal and management plans and procedures can be developed to ensure transhipment areas and operations will not have a significant impact on the Great Barrier Reef's World Heritage values.

A similar but much larger operation has been successfully undertaken at nearby Cape Flattery for over 40 years. The regulatory environment that now exists is much stricter than when the Cape Flattery project commenced and higher standards will now be expected, especially in terms of rehabilitation.

1.7.2 Public Perceptions

Section 4.1 outlines the focussed consultation process undertaken to date. In addition to developing and cementing a relationship with Congress as an equity partner, this has involved:

- media releases and formal statements to the ASX by Diatreme (along with various Quarterly Activity Statements released during this period)
- targeted consultation with officers and elected representatives of the Cook Shire Council and Hope Vale Aboriginal Shire Council
- consultation with officers from Ports North, DES, TMR, and the Department of Natural Resources, Mines and Energy (DNRME), plus a raft of other state and Commonwealth agencies via the initial agency briefing (7 December 2018) and the follow-up briefing held on 12 February 2020. Agency consultation undertaken to date is summarised in **Section 5.1**.

As noted in **Section 5.3**, no 'general' public consultation has yet been undertaken, although the project is widely known in the local area due to involvement of the two local governments and Congress. At this time there is no evidence that the project is considered contentious (e.g. it has not had much media coverage other than some arising from the media releases) or that there is any public perception of potential environmental harm or nuisance that could arise from the project.

Consultation is required via the ML process that has recently commenced, and as part of the proposed EIS and EPBC Act referral processes as described later in this IAS.

2 PROPONENT

Provide information about the proponent(s) and their business, including: • *the proponent's full name, street and postal address, and Australian Business Number, including details of any joint venture partners (Note: The proponent is the persons or registered legal entity intending to carry out the activity and in whose name the applicable permits or licences are to be issued)* • *the nature and extent of the proponent's business activities* • *the proponent's environmental record including a list of any breach of relevant environmental laws during the previous ten years* • *the proponent's environmental, health, safety and community policies.*

2.1 GENERAL DETAILS

The proponent is Diatreme Resources Limited ABN 33 061 267 061. Some details are:

- Contact person:
  - Mr Neil McIntyre
    Chief Executive Officer
    Diatreme Resources Limited
- Street address:
  - Unit 8, 61 Holdsworth Street
    COORPAROO
    QLD 4151
- Postal address:
  - PO Box 382
    COORPAROO
    QLD 4151

2.2 CORPORATE/JOINT-VENTURE ARRANGEMENTS

Hope Vale Congress Aboriginal Corporation is the representative body of all native title holders encompassing an area of some 1100 sq km (Lot 35 SP232620) and includes all of EPM 17795 and EPMA 27430. Native title was determined in 1997 and the former Deed of Grant in Trust was converted to Aboriginal Freehold land under the *Aboriginal Land Act 1991* (Qld) (ALA) in December 2011.

Congress's foremost priority is to:

> … maintain the rights of the Traditional Owners as the custodians of their own country and to improve access and work collaboratively with Traditional Owners so they can get back on country to build their capacity in land management, business development and achieve their clans' aspirations.

Congress represents the interests of 13 clans.

Of relevance to the GSSP, Congress:

- holds both native title and Aboriginal Freehold over all of EPM 17795 and EPM 27430
- has signed a CCA and CHA with Diatreme
- will receive royalties from the GSSP

  Traditional owner groups through Hopevale Congress has a 12.5% project equity in the GSSP and hence will receive an income stream
- via a suitable Congress nominee – a 100% indigenous owned company – will be involved in contraction opportunities from construction to mining
- will assist with recruitment of local indigenous workers from the Hope Vale area.

2.3 NATURE AND EXTENT OF BUSINESS ACTIVITIES

Some details (see also www.diatreme.com.au):

- Diatreme Resources Limited (DRX) is a public company; ASX-listed since 2005; minerals exploration/development company.
- Current Market Capitalisation – Approx. $20 m.
- Current Projects – Heavy Minerals (HM)/Silica/Gold/Copper:
  - Cyclone Zircon Project, W.A. – Definitive Feasibility Study (DFS) announced November 2018. All primary approvals for development in place, including mining lease and environmental approvals. Project CAPEX estimated at $135 m. Currently finalising entry of major development partners.
  - Cape Bedford Silica/HM Project, Qld – Exploration for silica and heavy minerals. Located north of Cooktown, containing the Galalar Silica Sand Project.
  - Clermont Copper Project, Qld – Copper/Gold exploration tenement in central Queensland.

2.4 ENVIRONMENTAL RECORD

Diatreme is currently undertaking the following Heavy Minerals/Silica/Gold/Copper projects:

- Cyclone Zircon Project, Western Australia – Definitive Feasibility Study (DFS) announced November 2018. All primary approvals for development in place, including mining lease and environmental approvals. Project CAPEX estimated at $135 m. Currently finalising entry of major development partners.
- Cape Bedford Silica/HM Project, Queensland – Exploration for silica and heavy minerals. Located north of Cooktown, containing the Galalar Silica Sand Project.
- Clermont Copper Project, Queensland – Copper/Gold exploration tenement in central Queensland.

The company has not committed any breaches of environmental legislation in the states that it has operated in nor under Commonwealth law.

2.5 ENVIRONMENTAL, HEALTH, SAFETY AND COMMUNITY POLICIES

2.5.1 Code of Conduct

Diatreme has a formal Code of Conduct (Diatreme Resources 2015) that binds all employees. In general, it requires that all employees comply with the spirit and letter of all applicable laws, rules and regulations. Key areas of coverage are:

- avoid conflicts of interest
- participate in fair dealing
- respect company assets and property
- maintain confidential information
- engage in appropriate employment practices e.g.:
  - all employment practices are to be fair and non-discriminatory
  - a healthy and safe work place is to be maintained
  - environmental obligations and good practices are to be recognised and respected
  - the privacy rights of all individuals associated with the Company are to be respected.

2.5.2 Sustainability Policy

According to Diatreme's Sustainability Policy (Diatreme Resources 2018), the company is:

- committed to realising the full potential of its mineral sands assets while integrating the highest sustainable development practices in all areas of our work.
- committed to respecting the rights and interests of all stakeholders and maintain close relationships with them to understand and manage the environmental, economic and social impacts of its activities.

Specific policies are reproduced below.

a) Health & Safety

Our primary responsibility is to protect the health and well-being of all employees, consultants, contractors, service providers and visitors across all operations. We believe nothing less than zero harm is acceptable.

b) Environmental Management

The company approaches its responsibility to protect the environment with the same discipline, strategy, and accountabilities that drive any part of our business.

c) Landholder relations

Diatreme is required to access land to support many of our activities. We strive to negotiate in good faith with landholders. Trust and respect for their rights form the basis of our approach to negotiations with them.

d) Community Relations

Diatreme understands that our long-term success goes hand-in-hand with enhancing the broader wellbeing of the communities and regions in which we operate. We believe in open and accountable engagement processes and interactions to improve the effectiveness of our commitment.

2.5.3 Environment Policy

Diatreme's Environment Policy (Diatreme Resources 2014) is reproduced below.

DIATREME RESOURCES LIMITED
ABN: 33 061 267 061
ASX : DRX

ENVIRONMENT POLICY

Objectives

Diatreme Resources Limited ('Diatreme') undertakes mineral exploration and resource development in Australia. The Company is committed to the objective of achieving Best Environmental Practices by setting compliance with relevant legal obligations as the minimum standard for environmental performance.

At Diatreme we are committed to the goal of sustainable development where a balance of social, economic and environmental considerations are taken into account in how we manage our business. Across all our operations and activities we aim to minimise impacts on the environment.

Strategy

Diatreme aims to achieve these objectives by:

- Complying with the requirements of all relevant legislation and regulations and applying responsible standards where laws do not exist;
- Managing environmental risk, ensuring that all material risks are identified, objectively assessed, monitored and responded to in an appropriate manner;
- Minimising environmental impacts through the implementation of environmental management plans for operational activities;
- Preventing pollution, and developing response plans for emergency situations;
- Reducing our environmental footprint by efficient use of resources, management of water and energy consumption and management of waste and emissions;
- Continually improving environmental management practices and performance;
- Developing a workplace culture where all personnel, consultants and contractors understand and appreciate their environmental responsibilities.

Application

The CEO of Diatreme is accountable to the Board of Directors for ensuring this policy is effectively implemented.

Responsibility of the application of this policy rests with all Diatreme personnel, consultants and contractors involved in Diatreme's operations.

Anthony Fawdon
Executive Chairman & CEO
Diatreme Resources Limited

Signed: _____

Date: 21 MAY 2014

Postal Address: P.O Box 10288 Brisbane Adelaide Street QLD 4000
Registered Office: Level 2 87 Wickham Terrace Spring Hill QLD 4000
PH: +61 (0)7 3832 5666 FX: +61 (0)7 3832 5300 E: manager@diatreme.com.au www.diatreme.com.au

Figure 2-1 Diatreme Resources Environment Policy.

Source: Diatreme Resources (2014).

3 EIS PROCESS

Explain the need for the project and how it relates to the EIS process under the EP Act and, if applicable, under the Commonwealth EPBC Act.

Briefly outline the steps of the EIS process, noting which milestones have been completed, and an estimated timing for the remaining EIS stages. Highlight the steps in which the public will have the opportunity to provide input or comment. This information is required to ensure readers are informed of the EIS process and are aware of their opportunities for input and commenting.

3.1 NEED FOR THE PROJECT

3.1.1 Need

There is an increasing world demand for high quality silica sand for solar panels, mobile phones, computers, and other appliances requiring high transparency glass. The increasing demand requires quality raw materials from new suppliers of silica sand.

The project will provide direct employment for 60 to 65 people from the Hope Vale and Cooktown district and indirectly, a total of 110 full time jobs, in addition to specialist contractors and consultants who will provide technical expertise for the project on short term assignments. The Hope Vale Congress will also receive royalties, dividends, and other benefits under a Mining Project Agreement (MPA) outlined in **Section 2.2**. These royalties, dividends, and associated wages and salaries will have a much needed positive flow-on effect to the local economy.

The project is expected to be a profitable business in both the short and long terms. The capital required is relatively low and there is potential for a very long mine life (20+ years) due to the size of the likely silica deposit. The Queensland Government will receive royalty payments for the silica sand at the regulated rate of $0.90 per tonne and the Commonwealth Government will receive corporate and other taxes from the business activity associated with the project.

Unlike the Cape Flattery project to the north, the GSSP will supply a premium grade of low iron silica ideally suited to high-end products such as solar panels. It is in this high-end part of the market that there is a growing need and the demand for this premium silica is increasing at a greater rate than supply.

3.1.2 Silica – a 'New Economy' Mineral

The case for need has a broader context that is apparent in new state and national polices. Both the Commonwealth Government and the Queensland Government have recently announced policies regarding Australia's 'new economy' minerals. These generally constitute what Geoscience Australia describes as 'critical minerals':

> Critical minerals are metals and non-metals that are considered vital for the economic well-being of the world's major and emerging economies, yet whose supply may be at risk due to geological scarcity, geopolitical issues, trade policy or other factors. Among these important minerals are metals and semi-metals used in the manufacture of mobile phones, flat screen monitors, wind turbines, electric cars, solar panels, and many other high-tech applications. (Austrade 2019) (p1)

As a critical component in the manufacture of mobile phones, flat screen monitors, and solar panels, silica is an obvious target for attention in the near future.

a) Queensland Government

The Department of Natural Resources Mines and Energy's *New Economy Minerals* strategy (2019) notes that:

> In order to develop a sustainable pipeline of 'new economy minerals' projects into the future, the Queensland Government is investing in exploration activities to improve scientific understanding and supply the valuable geoscience data needed by industry to help locate and define deposits for future production. (p1)

The term 'new economy minerals' is defined as:

> … an umbrella term for a range of metals and mineral elements used in many emerging technologies including electric vehicles, renewable energy products, low-emission power sources, consumer devices, and products for the medical, defence and scientific research sectors. (p1)

Silica is listed as one of a range of new economy minerals. Although the strategy is currently limited to exploration, it can be expected to be expanded into development, processing, and export.

b) Commonwealth Government

The Australian Government's *Australia's Critical Minerals Strategy 2019* (Department of industry, Innovation and Science 2019):

> … aims to refine Australia's policy settings to enable the resources sector to supply the growing markets for raw and refined critical minerals. It is a key part of the Australian Government's broader plan for Australia's resources sector, set out in the *National Resources Statement*. The Strategy sets out actions to refine the settings in Australia's critical minerals market in three key areas. (p7)

These three areas listed are:

- promote **investment** into Australia's critical minerals sector and downstream processing activities
- provide incentives for **innovation** to lower costs and increase competitiveness
- connect current and pipeline critical minerals projects with **infrastructure** development.

It is expected that growing support will be given to critical minerals such as silica in coming years, underpinning the need for the GSSP.

3.1.3 Project Pre-feasibility Assessment

In September 2019 Diatreme submitted a Scoping Study to the ASX (Diatreme Resources 2019). This includes the following key points (verbatim extracts):

- The study's financial analysis demonstrates Galalar has the potential to be a highly profitable operation, with an estimated pre-tax nominal NPV of $231 m, an IRR of 150% and estimated capital payback within a year (8 months). Total estimated development capex is $24.4 m, with annual operating costs estimated at $42.0 m based on the currently planned logistics program that involves trucking product from the mine site to an area 63 km away, for transhipment outside Cooktown.

- In addition, Diatreme has identified potential improvements that offer further enhancements to project economics, including developing a purpose-built barge ramp closer to the mine site (approx. 4 km away from the proposed ML area) at a location called Nob Point (subject to various Queensland Government approvals), which could offer an estimated further $20-25 per tonne in cost savings on current scoping study operating costs.
- A further improvement could come from developing as a secondary silica product stream an 'ultra-low iron' silica sand sub 50 ppm Fe_2O_3 product, which is currently trading at a significant price multiple to the sub 100 ppm Fe_2O_3 product. This option is currently being evaluated by a China based industry specialist and at an independent laboratory in China.

3.1.4 Project Objectives

The Scoping Study also sets out Diatreme's objectives for the GSSP as follows (verbatim extracts):

- To become a globally recognised supplier of high purity silica sand to world glass markets.
- To continue exploration near the Galalar mineral resource to produce sufficient data that will enable estimation of a Proved Ore Reserve suitable for establishment of an efficient silica sand mining operation.
- To define at least 20 million tonnes (Mt) of JORC compliant mineable reserves for a mine life in excess of 20 years.
- To establish an efficient, safe and environmentally acceptable mining operation through co-operation with Hope Vale Congress and Government regulators.
- To establish an efficient, safe and environmentally acceptable system for transporting the product from the Galalar project site to international customers.
- To responsibly expand the business to meet the world demand for high purity silica sand required for the production of solar panels and other ultra-clear glass products.
- To be recognised as a valuable contributor to the local community by employing locally and supporting local businesses.

3.1.5 Summary of Key Strategic Benefits

The key strategic benefits of the project can be summarised as follows:

- Major new long life business for Far North Queensland that will commence as a medium scale silica operation with potential for efficiency improvements as the markets and local infrastructure are developed.
- New infrastructure for the Hope Vale area.
- Increased employment and business activity for the Hope Vale and Cooktown region.
- Not FIFO. Proposed operation suits workers living at home and travelling daily to work.
- Royalties for the Queensland Government and royalties and dividends for Hopevale Congress.
- New business opportunities for local contractors and service industries.
- Revenue for Ports North.

3.1.6 Justification

The Scoping Study assessment indicates that the project will be profitable and the increasing demand for silica in new technology devices and equipment provides confidence that the demand will continue to grow. There is potentially a very large resource base of high purity silica which will ensure the project will have a long life. The GSSP will be supplying a high quality product into an increasing world market for high purity and high tech glass products.

The Hopevale Congress is supportive of the project as it recognises the benefits that will flow to the Hope Vale community and the adjacent Cook Shire through profit sharing, royalties, employment, and new infrastructure.

3.2 EIS PROCESS DETAILS

3.2.1 Overview

According to DES (2019a), resource activities 'may only be carried out by a person holding, or operating under, an environmental authority (EA) issued under the EP Act and a resource tenement granted under relevant resource legislation, e.g. the *Mineral Resources Act 1989* or the *Petroleum and Gas (Production and Safety) Act 2004*'.

In addition, 'the tenements provide the right to access the land and to undertake exploration, resource assessment, feasibility studies, prospecting or production. No resource tenement may be granted without prior EA approval for the relevant resource activity'.

This section outlines the EIS process that is necessary to support a future EA.

3.2.2 Purpose

The purpose of an EIS and the EIS process is (DES 2019a) to:

- assess the potential adverse and beneficial environmental, economic and social impacts of the project
- assess management, monitoring, planning and other measures proposed to minimise any adverse environmental impacts of the project
- consider feasible alternative ways to carry out the project
- provide information to the public about the project
- help the administering authority decide an EA application for which the EIS is required
- give information to other Commonwealth and state authorities to help them make informed decisions
- allow the Queensland Government to meet its obligations for a single environmental assessment process under a bilateral agreement with the Australian Government (if relevant).

3.2.3 Level of Impact

The 'level of impact' is described in the 'Guideline: Criteria for environmental impact statements for resource projects under the *Environmental Protection Act 1994*' produced by DES (2019b). This states that:

- a high-impact resource project may be required to be assessed through an EIS process under Chapter 3, part 1 of the EP Act
- lower impact projects can be assessed on the basis of a standard or site-specific application for an EA.

Regardless of the above, DES (2019b) requires that in making the decision if an EIS is required, the department will take into account:

- the 'standard criteria' (Appendix A of DES (2019b)
- 'EIS triggers' (Appendix B of DES (2019b)
- the relative magnitude (scale and risk) of impacts (e.g. impacts on matters of state environmental significance, water quality and resources, environmentally sensitive areas (Category A, B and/or C), air, noise)
- the public interest
- uncertainty about possible impacts
- any significant issues with another Queensland Government/ Australian Government authority (e.g. matters of national environmental significance under the EPBC Act, agriculture, fisheries, transport)
- social and economic impacts
- cumulative impacts.

Irrespective of whether or not the GSSP would be considered to be a 'high impact' project, based on discussions with DES, Diatreme has elected to undertake a voluntary EIS, largely because it is an efficient way to deal with issues that will occur outside the proposed ML (e.g. the export process and associated off-lease project components) and also because it includes a mechanism for integrating assessment of issues under the EPBC Act. This is discussed in **Section 4.4**.

3.2.4 Steps

According to DES (2019b), the EIS process consists of a series of steps (see **Figure 3-1**). Status as of 12 June 2020is indicated, along with an approximate timeline for the completion of the whole process.

Table 3-1 EIS process and status – 30 June 2020

STEP	STATUS	DATE
Produce an Initial Advice Statement (IAS) (several drafts have been prepared)	Compete (this document)	17 April 2020
Request and receive permission to undertake a voluntary EIS	Applied for Permission received	28 January 2020 5 March 2020
Submit a referral under the EPBC Act	Complete	28 February 2020
Receive response that referral has been validated	Received	7 May 2020
EPBC Act	Call for submissions – Active Call for submissions – Closed Decision – Controlled action Inputs to DToR	7 May 2020 21 May 2020 5 June 2020 24 June 2020
Receive generic ToR from DES	Received	25 March 2020
Submission of draft ToR	Draft submitted for approval Revised draft with EPBC Act requirements submitted for approval	7 May 2020 24 June 2020
Public notification of draft ToR	Future – approximate date	July 2020
Final ToR issued	Future – approximate date	October 2020
Preparation of EIS by proponent	2 years permitted (Statutory period)	October 2022
Public notification of EIS	Future – approximate date	April 2021
Proponent response to submissions	Future – approximate date	July 2021
EIS assessment report (DES)	Future – approximate date	August 2021
Environmental Authority	Future – approximate date	November 2021

Source: Study team compilation (future dates are an estimate). Due to the advent of the Covid-19 pandemic, there have been some delays on accessing the site for field investigations so there is some uncertainty in the above timing.

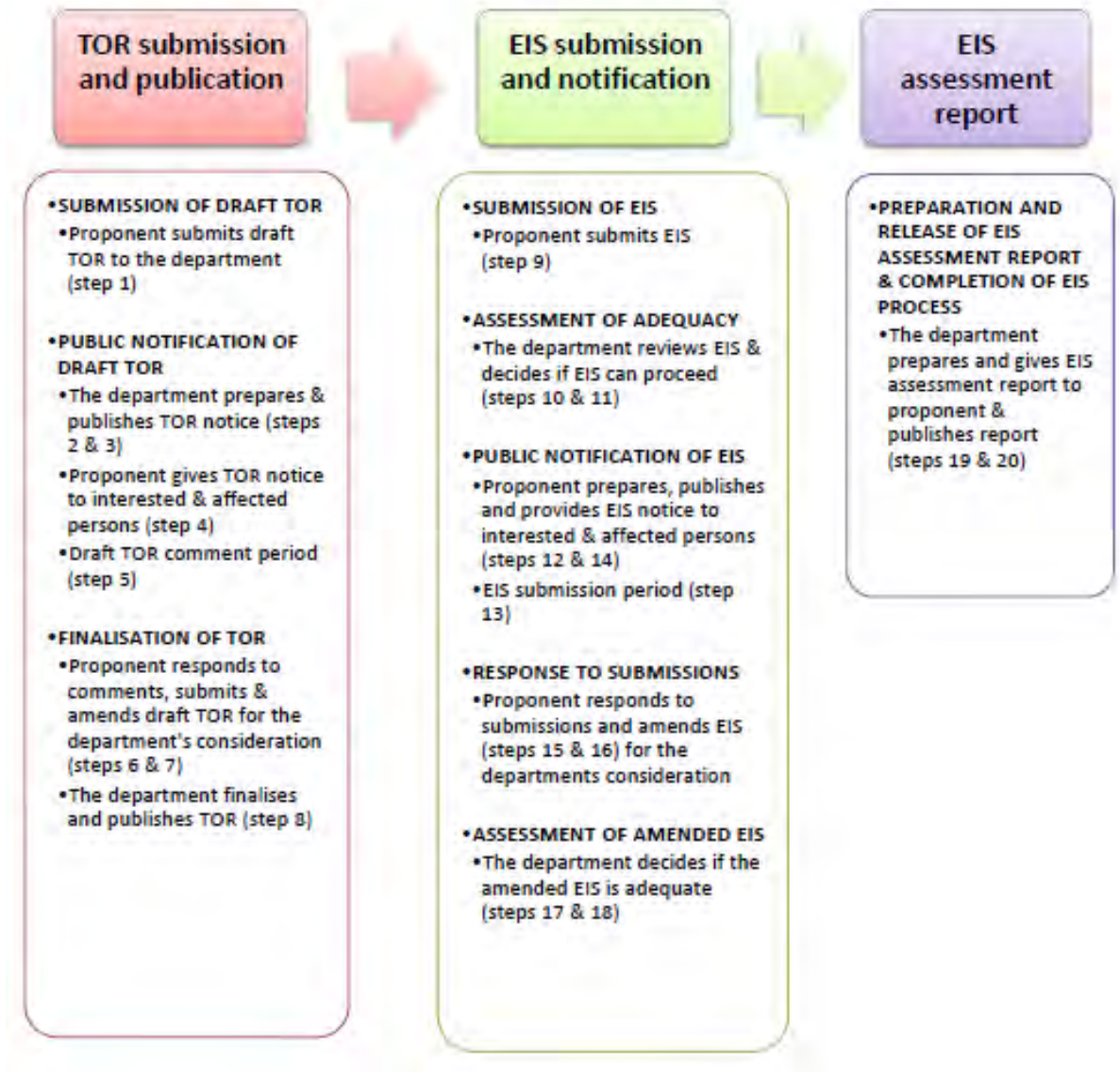


Figure 3-1 The EIS process under Chapter 3 of the *Environmental Protection Act 1994*.

Source: DES (2019b) Table 1.

3.2.5 Opportunities for Community Participation

The document 'Opportunities for community participation on projects that require an environmental impact statement under the *Environmental Protection Act 1994*' (DES 2019c) shows the available opportunities for community participation. A copy of this is shown on **Figure 3-2** below.

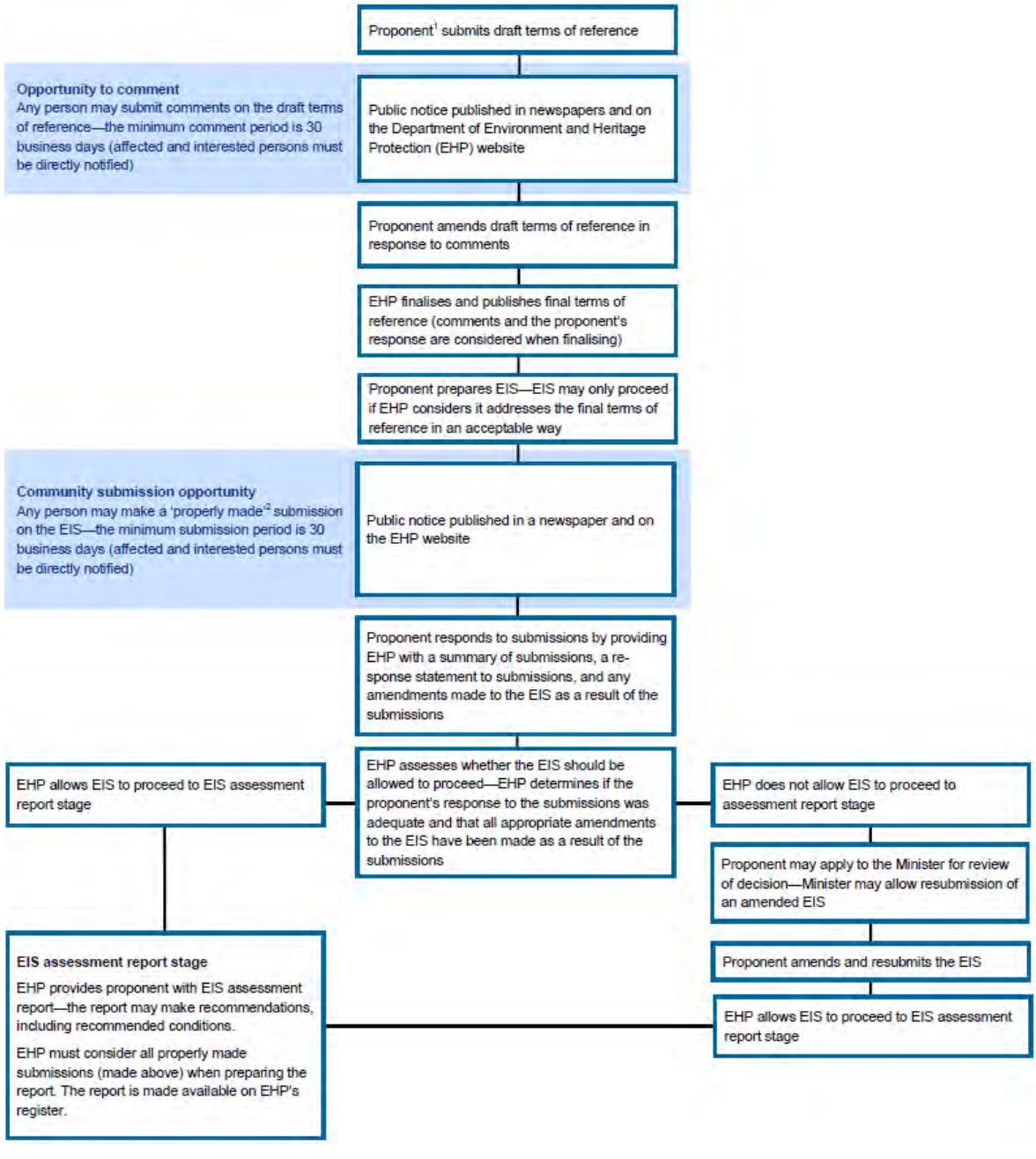


Figure 3-2 Opportunities for community participation.

Source: DES (2019c). https://www.qld.gov.au/environment/pollution/management/impacts-approvals/impacts-ep accessed 29 November 2019.

In addition to this statutory process:

- Chapter 6 of the generic ToR requires the development of a consultation program that is consistent with and complements the statutory notification requirements
- consultation is also required with 'affected' and 'interested' persons as described in **Section 6.1.1** and **Section 6.1.2**.

A consultation program to meet these requirements will be developed and implemented in the EIS.

4 PROJECT APPROVALS PROCESS

Insert a short summary of the key approvals under federal, state or local legislation that would likely be required to enable the proposed project to be constructed and operated, and note the legislation under which the approvals are assessed and issued.

Briefly explain how the EIS fits into the assessment and approval processes for the EA and other approvals required of the proposed project before construction and operations can start.

For proposed projects undergoing a voluntary EIS, describe when the application was (or will be) submitted to the department and when the department approved the application.

Explain if the EIS for the proposed project would be jointly assessed under the Queensland EP Act and the Commonwealth's EPBC Act in accordance with the assessment bilateral agreement between the Australian Government and the State of Queensland. Briefly describe the status of the project under the EPBC Act, including expected or determined controlling provisions.

The intent is to inform stakeholders and the public of the process.

4.1 KEY APPROVALS

4.1.1 Project Elements

A detailed description on the project is provided in **Section 7.2** where the various project components are described. Some of these are referred to below.

4.1.2 Queensland Legislation

a) Mine and Mining-related Activities (in ML)

Approvals are required for the mining operation and groundwater extraction under the MR Act, EP Act., and *Water Act 2000* (Qld) (Water Act). As noted in **Section 4.2.1**, certain prescribed Environmentally Relevant Activities (ERAs) can be authorised under an EA for a resource activity.

b) Other Approvals (outside ML)

Other aspects of the project outside the ML will also require approval. These are (to be confirmed following agency consultation)

Nob Point Loading

- works on a shire road and new access road (possibly including Waterway Barrier Works (WWBW) approvals)
- Development Permit under the *Planning Act 2016* (Planning Act) including prescribed tidal works, clearing of regulated vegetation the *Vegetation Management Act 1999* (Qld) (VM Act), and damage of marine plants
- works in a marine park to install infrastructure at Nob Point under the *Marine Parks Act 2004* (Qld) (Marine Parks Act)
- tenure/owners consent is required at Nob Point pursuant to the *Land Act 1994* (Qld) – Land Act
- clearing of protected plants under the *Nature Conservation Act 1992* (Qld) (NC Act) – possibly
- ERA 50(1)(a) – Mineral storage will be required for the Nob Point loading area.

Cooktown Loading:

- works on shire roads and a State Controlled Road (possibly including WWBW approvals)
- Development Permit under the Planning Act including prescribed tidal works and damage of marine plants at the barge ramp
- works in a marine park to install infrastructure under the Marine Parks Act
- tenure/owners consent is also required at Marton pursuant to the Land Act
- clearing of protected plants under the NC Act – possibly
- ERA 50(1)(a) – Mineral storage will be required for the Cooktown loading Area.

While it is recognised these other approvals cannot be applied for until the EIS is approved, it is proposed that the EIS will provide the necessary supporting information to inform applications for these future approvals.

c) Other Queensland Legislation

Other Queensland legislation is relevant as outlined below. The complexity of this legislation is one reason why this IAS contains several loading and export options (as detailed in **Section 7.2**). Plans are in hand to resolve some uncertainties prior to the release of the Draft EIS as noted below.

Sustainable Ports Development Act 2015 **(Qld) (SPD Act)**

Under s34 of the SPD Act, an assessment manager must refuse a development application to the extent the application is for development for, or relating to, a port facility, if the development is:

(a) within the State marine park; or

(b) within a restricted area that is outside a port's existing port limits.

'Port facility' is defined under the Act as 'a facility or land used in the operation or strategic management of a port authority's port'. 'Restricted area' means an area that is within the Great Barrier Reef World Heritage Area but outside the Commonwealth marine park.

Discussions with TMR are underway to confirm that the proposed loading infrastructure options at Nob Point which would be within the State marine park – i.e. the Great Barrier Reef Coast Marine Park as discussed in **Section 8.6.2e)** – as described in this IAS would not constitute a 'port facility' and would therefore not be inconsistent with section 34 of the SPD Act.

It is proposed to investigate and resolve this issue prior to the release of the Draft EIS to ensure that the option(s) selected for assessment are consistent with this legislation.

Transport Infrastructure Act 1994 **(Qld) (TI Act)**

Under s291 of the TI Act, the Governor in Council may decide that port activities of a substantial nature may be carried on at a place that is not a port managed by a port authority, the State or a local government (this is prohibited without Governor-in-Council approval).

Discussions with TMR are underway to confirm that the proposed loading, barging and transhipping operations at Nob Point (which is not within a port etc. as above) would not constitute 'port activities of a substantial nature'.

It is proposed to investigate and resolve this issue prior to the release of the Draft EIS to ensure that the option(s) selected for assessment are consistent with this legislation.

Proposed *Environmental Protection (Transhipping) Amendment Regulation 2019*

This draft regulation is in preparation to give effect to the current Queensland Government' Transhipping Policy (2018). In broad terms it is designed to modify provisions relating to environmental authorities for mineral and bulk material handling (ERA 50) to prohibit transhipping operations unless all of the activity is to be carried out in an area:

(a) within a port area of a port authority or port entity under the TI Act; and

(b) within the Great Barrier Reef World Heritage Area; and

(c) not within the Great Barrier Reef Marine Park.

Transhipping is defined as handling minerals or bulk materials in a way that involves—

(i) loading or unloading minerals or bulk materials from 1 ship to another ship at a rate of 100 t or more a day; or

(ii) storing minerals or bulk materials within 1km of the highest astronomical tide for transportation by a ship mentioned in subparagraph (i).

However, 'bulk material' does not include 'solid material packed, wrapped or entirely enclosed in a container'.

As such, in the context of GSSP, if the silica material is handled in covered skips or bags (i.e. packed, wrapped or entirely enclosed in a container) then the draft Regulation, should it become law, will not prohibit or otherwise regulate any of the transhipping operations described in this IAS.

However, should this draft Regulation become law, it would prohibit transhipping of bulk product for either of the two sub-options:

- opposite Nob Point (not within a port and within the Great Barrier Reef Marine Park)
- within the Port of Cooktown (in a port but also within the Great Barrier Reef Marine Park).

It would not prohibit transhipping of bulk product from the Port of Cape Flattery (within a port but not within the Great Barrier Reef Marine Park).

4.1.3 Commonwealth Legislation

Approval is required under the EPBC Act if the works constitute a controlled action (e.g. is an action that will or may cause a significant impact on a Matter of National Environmental Significance). To this end a referral was been submitted for a decision by the Commonwealth Minister.

On 5 June 2020 the Minister decided that the proposed action (to construct and operate the Galalar Silica Sand Mine with two alternatives for an associated barge loading facility, 20 km north of Cooktown [See EPBC Act referral 2020/8626]) is a controlled action. The relevant controlling provisions are:

- World Heritage properties (sections 12 & 15A)
- National Heritage places (sections 15B & 15C)
- Listed threatened species and communities (sections 18 & 18A)
- Listed migratory species (sections 20 & 20A)
- Commonwealth marine areas (sections 23 & 24A)
- Great Barrier Reef Marine Park (sections 24B & 24C).

The Minster also decided that the project will be assessed under a bilateral agreement with the Queensland Government (see **Section 4.4**). This decision constitutes a deemed application for a marine park permit under the *Great Barrier Reef Marine Park Act 1975* (Cwlth). This process will proceed in parallel with the EPBC Act and EP Act assessment and has already commenced.

4.2 LINKS WITH ENVIRONMENTAL AUTHORITY

4.2.1 Environmentally Relevant Activities

The *Environmental Protection Regulation 2019* (Qld) (EP Regulation) lists prescribed ERAs. Those relevant to the GSSP are:

- Resource activity – mining mineral sand under EP Regulation Schedule 3, Item 12 (ERA 12)
- Mineral processing under EP Regulation Schedule 2, Item 31 (ERA 31 (2) processing, in a year, the following quantities of mineral products, other than coke—(b) more than 100,000 t).

Where mining and processing are integrated such as will be the case for the GSSP, then the former (Schedule 3 ERA 12) applies.

It is also relevant that certain prescribed ERAs can be authorised under an EA for a resource activity. An activity that is a prescribed ERA can be authorised under an EA for a resource activity if the activity forms part of the resource activity (i.e. the prescribed ERA is an ancillary activity under section 19A of the EP Act). Ancillary activities are activities which are listed in Schedule 2 of the EP Regulation and are carried out as part of the resource activity.

4.2.2 Eligibility Criteria

Referring to the document 'Eligibility criteria and standard conditions for mining lease activities' produced by the Department of Environment and Heritage Protection (DEHP 2016), *eligibility criteria* need to be addressed in applying for an EA. These are constraints set to ensure that environmental risks associated with the operation of the ERA are able to be managed by the standard conditions. Eligibility criteria set out the circumstances in which a standard or variation application for an environmental authority can be made. If an applicant can meet all of the eligibility criteria, they can make a standard application for an environmental authority that is subject to all standard conditions.

Applicants who cannot meet the eligibility criteria must make a site-specific application for an EA.

A preliminary assessment indicates that the GSSP cannot meet all the eligibility criteria for a standard application. In this case a site-specific application will be required once the EIS process is completed. See following section.

4.2.3 EIS and Site-specific EA Application

According to the document 'Guideline: Environmental authorities Approval processes for environmental authorities' (DES 2019d), the EIS and EA processes (and the ML process) are linked as shown on **Figure 4-1** below.

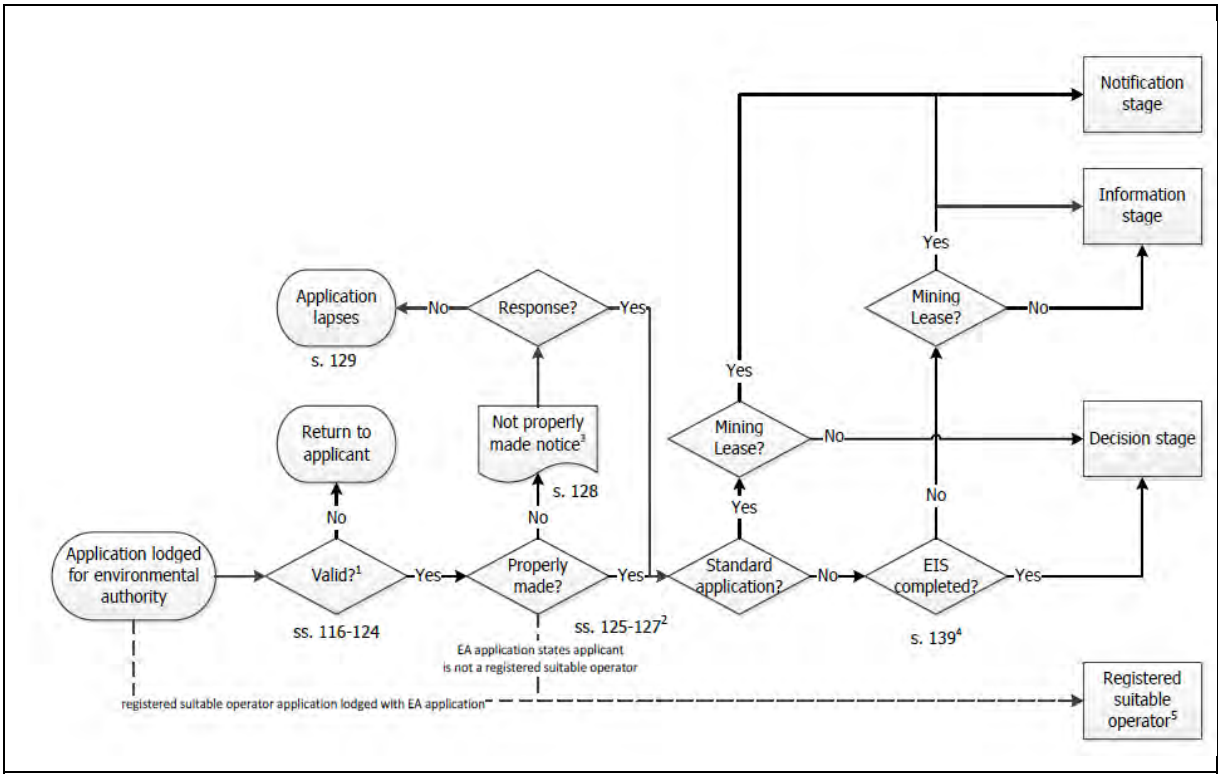


Figure 4-1 EIS and site-specific EA application.

Source: DES (2019d) Figure 1.

This shows that the site-specific application cannot be processed until the EIS has been completed and the ML issued or at least well-advanced.

For those resource activities for which a voluntary EIS has been completed, the assessment stages and processes which apply to an EA application are different (DES 2019d) as follows:

- The information stage will not apply to the application where:
  - the EIS process for an EIS covering all the relevant activities in the application has been completed
  - the environmental risks of the activities and the way the activities will be carried out have not changed since the EIS was completed.
- The notification stage will not apply to the application where:
  - the EIS process for all the relevant activities in the application was completed before the application was made
  - the environmental risks of the activity have not changed since the EIS was completed
  - if the application proposes a change to the way the relevant activity is to be carried out—the administering authority is satisfied the change would not be likely to attract a submission objecting to the thing the subject of the change, if the notification stage were to apply to the change.

During the decision stage, any properly made submissions made during the EIS process are taken to be properly made submissions for the EA application.

4.3 TIMING OF VOLUNTARY EIS PROCESS

Refer to **Section 3.2.4** and in particular **Table 3-1**.

4.4 USE OF THE EPBC ACT BILATERAL

The bilateral agreement between the Commonwealth of Australia and the State of Queensland relating to environmental assessment (Commonwealth of Australia and State of Queensland 2014) allows the Commonwealth Minister for the Environment to rely on specified environmental impact assessment processes of the State of Queensland in assessing actions under the EPBC Act. The objectives of the bilateral agreement are to:

- provide for the protection of the environment, and ensure high environmental standards
- promote the conservation and ecologically sustainable use of natural resources
- ensure an efficient, timely and effective process for environmental assessment and approval of actions
- minimise duplication in environmental assessments.

As noted previously, this bilateral is to apply. An EIS subject to the bilateral agreement must include a stand-alone assessment report for the MNES included in the controlling provisions. This usually takes the form of a dedicated chapter in the EIS.

5 CONSULTATION PROCESS

Briefly describe the planned consultation process, the involvement of advisory bodies and public and outcomes so far.

Describe how the results of that consultation will be used in the ongoing management of the proposed project.

Provide information on the proposed consultation plan for people and organisations identified as affected or interested persons and stakeholders for the proposed project.

5.1 ADVISORY BODIES

Consultation has been undertaken with many advisory bodies as summarised below and in **Table 5-1**. The key meetings that have occurred to date are:

- the first whole-of-government meeting (7 December 2018)
- the DES meeting to discuss the assessment process (21 November 2019) and subsequent conversations and exchange of emails
- the DNRME meeting to discuss the ML application (2 December 2019)
- the second whole-of-government meeting (12 February 2020).

Details of this and other consultation that has taken place in small groups or with individuals are as below. Note that the consultation described below precedes the commencement of the voluntary EIS process and no subsequent consultation is described here. All consultation will be recorded in the EIS.

Table 5-1 Advisory body consultation

NAME	POSITION	AGENCY
Whole-of-government meeting 7 December 2018		
Captain Michael Barnett	Regional Harbour Master (Cairns)	Department of Transport and Main Roads
Chris Clague	Senior Fisheries Biologist	Department of Agriculture and Fisheries
Darren Cleland	Executive Regional Director	Department of State Development Manufacturing Infrastructure and Planning
Don Elphick	A/Regional Manager	Department of Prime Minister & Cabinet
Filiz Tansley	Assessment Manager	Department of Environment and Science
Grant Gaston	Director Ports	Department of Transport and Main Roads
Hannah Neville	Principal Project Officer	Coordinator General
Ian Grant	Senior Conservation Officer	Department of Environment and Science
Ian McKirdy	Manager	Department of State Development Manufacturing Infrastructure and Planning

NAME	POSITION	AGENCY
Joanne Manson	Principal Planning Officer	Department of State Development Manufacturing Infrastructure and Planning
Julia Chandler	A/Assistant Director	Great Barrier Reef Marine Park Authority
Kevin Moore	General Manager Commercial	Ports North
Melissa Spry	Principal Natural Resource Officer	Department of Natural Resources, Mines and Energy
Mr Warren Cooper	Manager	Department of Natural Resources, Mines and Energy
Ms Terri Page	Director	Department of Aboriginal and Torres Strait Islander Partnerships
Ross Cunneen	A/Project Manager	Office of Coordinator General
Stephen Linnane	CEO	Hope Vale Aboriginal Shire Council
Tracy Wilson		Hope Vale Council/Working Visions
Department of Environment and Science meeting 21 November 2019		
Alison O'Brien	Principal Environmental Officer	Department of Environment and Science
Brendon Steytler	Senior Environmental Officer, Minerals Business Centre	Department of Environment and Science
Filiz Tansley	Manager, Mineral Business Centre	Department of Environment and Science
Ingrid Fomiatti Minnesma	Director, Minerals and North Qld Compliance	Department of Environment and Science
Michael Robinson	EIS Section	Department of Environment and Science
Rebecca McAuley	Team Leader Minerals and North Region Compliance, Environmental Services & Regulation	Department of Environment and Science
Department of Natural Resources, Mines and Energy meeting 2 December 2019		
Ben Johns	Manager, Mineral Assessment Hub	Department of Natural Resources, Mines and Energy
Warren Cooper	Manager Technical Assessment	Department of Natural Resources, Mines and Energy
Luke Croton	Director Mineral Operations	Department of Natural Resources, Mines and Energy
Rebecca Youngberry	Principal Mining Registrar	Department of Natural Resources, Mines and Energy

NAME	POSITION	AGENCY
Other consultation (various dates)		
Full Council	Full Council	Hope Vale Aboriginal Shire Council
Peter Scott	Mayor	Cook Shire Council
Linda Cardew	Chief Executive Officer	Cook Shire Council
David Klye	Infrastructure Director	Cook Shire Council
Lisa Miller	Manager Planning & Environment	Cook Shire Council
Michael Fallon	Planning Officer | Organisational Business Services	Cook Shire Council
Grant Gaston	Director - Ports | Ports and Transport Governance Unit	Department of Transport and Main Roads
Kevin Malone	GM Commercial	Ports North
Tycho Bunningh	Business Development Manager	Ports North
Whole-of-government meeting 12 February 2020		
Adam West	Regional Director	Department of Agriculture and Fisheries
Alison O'Brien	Principal Environmental Officer	Department of Environment and Science
Becky Youngbury	Principal Mining Registrar	Department of Natural Resources, Mines and Energy
Captain David Ferguson	Acting Regional Harbour Master (Cairns)	Marine Safety Queensland
Chris Clague	Senior Fisheries Biologist	Department of Agriculture and Fisheries
Connie Archer	Senior Adviser – Director	National Indigenous Australians Agency
Darren Cleland	Executive Regional Director	Department of State Development Manufacturing Infrastructure and Planning
Darryl Jones	Manager (PPCM)	Department of Transport and Main Roads
Filiz Tansley	Assessment Manager	Department of Environment and Science
Fran Maddern	Manager Cape	Department of Aboriginal and Torres Strait Islander Partnerships
Graham Herbert	Manager Water Monitoring	Department of Natural Resources, Mines and Energy
Grant Gaston	Director Ports | Ports and Transport Governance Unit	Department of Transport and Main Roads

(Continued over)

NAME	POSITION	AGENCY
Greg Tkal	Principal Environmental Assessment Officer	Department of Environment and Science
Hongyu Feng	Principal	Acumen Accounting and Advisory
Ian McKirdy	Manager	Department of State Development Manufacturing Infrastructure and Planning
Ivan Deemal	CEO	Hopevale Congress Board
Jason Richard	A/Director	Office of the Coordinator-General
Joanne Manson	Principal Planning Officer	Department of State Development Manufacturing Infrastructure and Planning
John Schaivo	A/Director Cultural Heritage	Department of Aboriginal and Torres Strait Islander Partnerships
Julia Chandler	A/Assistant Director	Great Barrier Reef Marine Park Authority
Kenneth Walker	Principal Environmental Officer	Department of Environment and Science
Kerry-Lee Bird	Principal Project Officer	Department of Aboriginal and Torres Strait Islander Partnerships
Kevin Malone	General Manager Commercial	Ports North
Kim Wright	Senior Permits Assessor	Great Barrier Reef Marine Park Authority
Leigh Preston	Cultural Heritage Coordinator	Department of Aboriginal and Torres Strait Islander Partnerships
Lisa White	Senior Environmental Officer	Department of Environment and Science
Luke Hulbert	A/g Assistant Director	Australian Department of Agriculture Water and the environment
Mark Kelleher	CEO	Hopevale Aboriginal Shire Council
Melissa Spry	Principal Natural Resource Officer	Department of Natural Resources, Mines and Energy
Michael Robinson	Principal Environmental Assessment Officer	Department of Environment and Science
Nathan Best	Manager (Vessel Traffic) Marine Operations Cairns	Marine Safety Queensland
Raphael Borough	Senior Environmental Officer	Department of Environment and Science
Shane Hillhouse	General Manager	Nambal
Stephanie Phillips	Coordinator Corporate Support MSQ (Cairns)	Marine Safety Queensland

NAME	POSITION	AGENCY
Wade Mullings	Director	National Indigenous Australians Agency

5.2 INDIGENOUS CONSULTATION

As described in **Section 2.2**, detailed statutory and other consultation has taken place with the Aboriginal Party (Congress). In summary, Congress holds both native title and Aboriginal Freehold over all of EPM 17795 and represents the interests of 13 clans. With respect to statutory processes, Diatreme:

- has signed a Compensation and Conduct Agreement under the *Native Title (Queensland) Act 1993* (Qld)
- has signed a Cultural Heritage Agreement under the *Aboriginal Cultural Heritage Act 2003 (Qld)* (ACH Act)
- has commenced Congress Mining Project Agreement negotiations/documentation with Mining Lease application (MLA) lodgement
- has held several community meetings and has several more planned prior to an official signing function associated with the above agreements.

5.3 CONSULTATION GENERALLY

Consultation with the broader community has taken the form of media releases and formal statements to the ASX by Diatreme (along with various Quarterly Activity Statements released during this period):

- 2 October 2018 – ASX Release – “Cape Bedford Project Update”
- 16 August 2018 – ASX Release – “Cape Bedford Bulk Sample Testwork”
- 13 August 2018 – ASX Release – “Maiden Resource – Cape Bedford”
- 28 June 2018 – ASX Release – “Cape Bedford Exploration Update”
- 13 March 2018 – ASX Release – “Cape Bedford Exploration Update”
- 2 March 2018 – ASX Release – “Testwork Confirms Prospects For New Silica Sand Mine”
- 30 November 2017 – ASX Release – “Cape Bedford Exploration Update”
- 30 June 2017 - ASX Release – “Cape Bedford Drilling Set To Commence”
- 18 January 2017 – ASX Release – “Cape Bedford Traditional Owner Agreement Signed”
- 7 February 2019 – ASX Release – “Galalar Silica Project Exploration Results Update”
- 7 March 2019 – ASX Release – “Galalar Silica Resource expands 22% to 26.4 million tonnes”
- 25 March 2019 – ASX Release – “Large silica exploration target boosts Galalar's prospects”
- 27 March 2019 – ASX Release – “$1.5m placement to progress Galalar Silica Project”
- 11 April 2019 – ASX Release – “New silica targets & heavy minerals discovery at Galalar”
- 14 May 2019 – ASX Release – “Galalar Silica Project further expands with maiden Indicated Resource”
- 20 June 2019 – ASX Release – “Boost for Galalar with sampling of regional exploration targets confirming continuity of high silica grades”
- 21 June 2019 – ASX Release – “Re-release: Boost for Galalar with sampling of regional exploration targets confirming continuity of high silica grades

- 16 July 2019 – ASX Release “Offtake MOU on Galalar Silica Project Signed With Fengsha Group”
- 7 August 2019 – ASX Release – “Regional support builds for Galalar silica mine”
- 9 September 2019 – “Galalar scoping study emphasises high return potential” (ASX release of Scoping Study)
- 19 September 2019 – ASX Release – “Second MOU signed for Galalar silica offtake”
- 29 November 2019 – ASX Release – “Product upgrade potential for Galalar”
- 23 December 2019 – ASX Release – “Mining Lease Application lodged for Galalar Silica Project”
- 6 February 2020 – ASX Release – “EIS application lodged as Diatreme advances Galalar Silica Project”
- 20 February 2020 – ASX Release – “Galalar Silica Project Resource Expanded 26% to 38 Mt”.
- 8 April 2020 – ASX Release – “Economic study shows Galalar Silica Project to deliver big boost to region”.
- May 12 2020– ASX Release – “Galalar silica resource expands 25% to 47.5 Mt”.

All ASX releases can be viewed in full at the Company’s website at www.diatreme.com.au.

Diatreme Resources will undertake consultation during the conduct of the EIS in accordance with the document ‘Opportunities for community participation on projects that require an environmental impact statement under the Environmental Protection Act 1994’ (DES 2019c). See **Section 3.2.5**.

Specifically, Chapter 6 of the generic ToR requires the development of a consultation program that is consistent with and complements the statutory notification requirements.

6 AFFECTED AND INTERESTED PERSONS

Provide the following information:

- *a list stating the name and address of the affected and interested persons for the project, as defined within sections 38 and 39 of the EP Act. Names and addresses of affected and interested persons should not be included in the initial advice statement but provided under separate cover to the department for privacy reasons*
- *for land privately owned or occupied by affected and interested persons, provide real property descriptions (lot on plan)*
- *provide maps showing lot on plan and resource tenures of affected and interested persons*
- *a statement of how you plan to consult with the affected and interested persons.*

6.1 DETAILS OF AFFECTED AND INTERESTED PERSONS

6.1.1 Affected Persons

Under s38 of the EP Act, a person is an ***affected person*** for a project if the person is:

- a person mentioned in subsection (2) for the operational land or any land joining it; or
- native title bodies/claimants listed under s38(1)(b) of the EP Act; or
- the relevant local government.

Referring to subsection (2) the only relevant category is the owner/lessee of the land subject to the MLA and all those properties that join it (i.e. direct neighbours) – in this case the same entity (Congress).

Details are provided in a confidential appendix (**Appendix A**).

6.1.2 Interested persons

Under s39 of the EP Act a person is an ***interested person*** means an interested person proposed by the proponent under section 41(3)(b). In the case of the GSSP, this includes persons with an interest in off-lease components of the project (road transport, barge loading areas) as well as the representative environmental group and any special interest groups that are identified. It also includes people or organisations such as government agencies, industry, and local members (local, state, Commonwealth).

Details are provided in a confidential appendix (**Appendix A**).

6.2 RP DESCRIPTIONS

Details are provided in a confidential appendix (**Appendix A**).

6.3 MAPS

Details are provided in a confidential appendix (**Appendix A**).

6.4 PROPOSED CONSULTATION WITH AFFECTED AND INTERESTED PERSONS

This is yet to be determined and will proceed based on DES advice.

7 PROJECT DESCRIPTION

7.1 PRUDENT AND FEASIBLE ALTERNATIVES

No IAS guidelines exist for prudent and feasible alternatives.

7.1.1 Introduction

World demand for high quality silica sand is increasing which requires development of new silica mines to meet the demand. The GSSP will supply silica sand to satisfy part of this increasing demand. There are currently no economically viable alternatives to silica sand as the base raw material for glass production.

The decision to initially explore in the Cape Bedford area was made following a review of previous exploration by other parties which indicated the presence of reasonable quantities of white silica sand in the dunes. The Cape Flattery mine to the north is mining similar sand dunes and has a long history of producing high quality silica sand. Access for exploration in the area around Cape Flattery is difficult, whereas access to the Cape Bedford area is straightforward using existing roads and tracks. The GSSP mineral resource is only 20 km from the town of Hope Vale, which will allow local workers to travel daily by road to work at the mine and avoid the FIFO issues that are associated with the Cape Flattery mine.

The current ML is the preferred site for the project after consultation with Congress.

The balance of this section describes the consideration of prudent and feasible alternatives for the mine and other project components, noting that further optimisation of the project will occur via the EIS process.

7.1.2 Alternative Mine Locations Within the EPM

Areas to the north and close to the existing Cape Flattery Silica Mines (CFSM) were initially investigated as potential sites for silica sand and heavy mineral exploration drilling.

These areas were found to be logistically unsuitable as there are no existing land access routes and the only practical access route for exploration and operational logistics is by barge through the Cape Flattery Port and across land held under mining tenements held by CFSM.

Diatreme was unable to negotiate an arrangement with CFSM for access across its tenements. Accordingly, the company then focussed on the Cape Bedford area to the south.

7.1.3 Options / Constraints Analysis

Having settled on the broad Cape Bedford area, Diatreme selected the current **mining area** through a number of iterations over several years based on resource studies, as constrained by cultural heritage and ecological considerations, as well as topographical and infrastructure issues. Coupled with this has been a number of investigations into alternative **export methods**.

These considerations are outlined below and summarised in **Section 7.1.5**. For reference, the red polygon shown on various figures is the mining area selected prior to the wet season and dry season ecological surveys. It is called the ‘trial mine area’. This trial mine area has been modified for this IAS and the ML application based on subsequent work. The new area is described alternatively as the ‘mining area’ or ‘ML’. It should be noted that the ML also includes ancillary infrastructure – in most cases this distinction is not relevant to the issues under consideration.

For planning purposes, three categories of constraint were developed as described below:

- **High-level constraint** (i.e. areas that if cleared are likely to result in a significant impact on Matters of State Environmental Significance (MSES) or Matters of National Environmental Significance (MNES) – see **Section 8.5.3** and **Section 8.5.4** respectively).
- **Medium-level constraint** (i.e. areas that if cleared could result in an impact on MSES/MNES that is not likely to be significant but that is nonetheless undesirable).
- **Low-level constraint** (i.e. areas that if cleared could result in an impact on a locally important community or species that is of lesser significance than other areas but that is nonetheless undesirable and should be avoided if possible).

Other areas are largely unconstrained from cultural heritage and ecological perspectives and should be considered to be opportunities for mining.

7.1.4 Mining Area Options

a) Cultural Heritage Constraints Analysis

As described in **Section 8.11.1**, a detailed Cultural Heritage Field Assessment (CHFA) was undertaken to identify Exclusion Zones where no disturbance should occur. This work, together with a terrain analysis, provided an initial set of constraints to the siting of the mine. Although intended for the exploration campaigns, the cultural heritage work has application for the development phase as well, although it will need to be expanded and updated during the EIS.

Figure 7-1 Cultural heritage Exclusion Zones.

Source: See **Section 8.11.1**.

The cultural heritage study area extends south as far as Alligator Creek (i.e. the southern boundary of the trial mine area above and within the current ML). Identified constraints effectively ruled out all land north of Deep Creek (this is a local name for the waterway located immediately north of the trial mine area).

For the Options Analysis, the cultural heritage constraint was considered to be a High-level constraint.

b) Ecological Constraints (January – March 2018 to December 2019)

2018 Vegetation Assessment

In 2018 a possible mine site near the trial mine area and outside the cultural heritage Exclusion Zones was considered based on mining prospects. A flora survey (Biotropica Australia 2018) was undertaken (wet season) and this located a local population of *Xanthostemon arenarius* in the area (see **Figure 7-2**). The area is also mapped as a flora trigger area of protected plants under the *Nature Conservation Act 1992* (Qld) (NC Act) – see **Section 8.5.3g)** – although this in itself is not a constraint.

This species is endemic to a small area around Cape Bedford-Cape Flattery. It is listed as Near Threatened under the NC Act but is not listed under the EPBC Act.

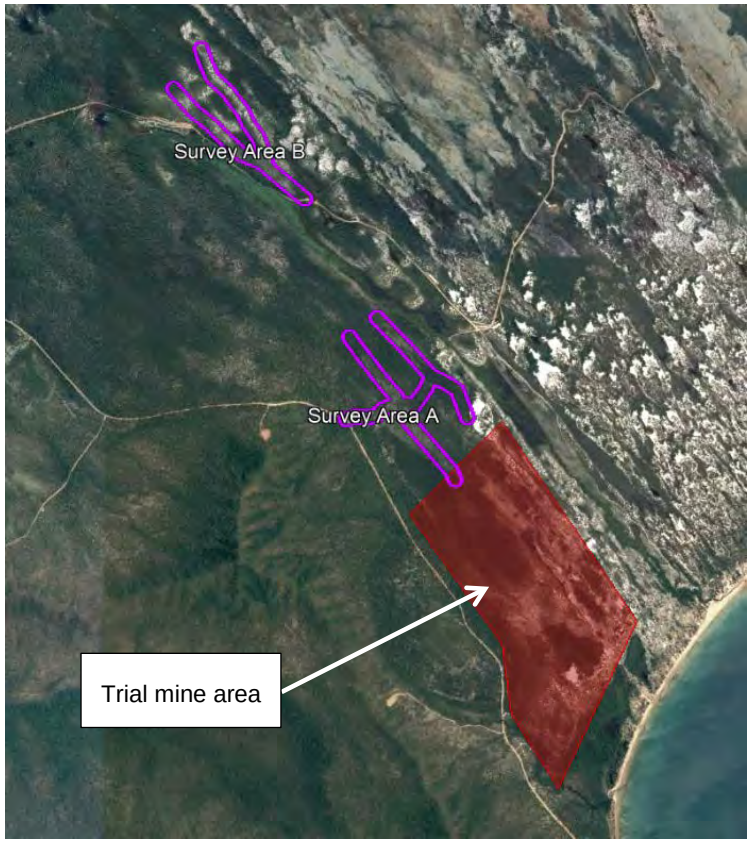


Figure 7-2 Alternative mine location initially rejected due to location of listed flora species (Survey Areas A & B).

Source: Based on Biotropica Australia (2018).

Diatreme initially decided that it would be prudent to avoid this plant population and its habitat if possible and subsequently relocated the proposed mine site to the south-east, clear of the mapped *X. arenarius* population. This trial mine area was the development footprint used in the wet season and dry season surveys (see above figure).

2019 Wet Season Ecological Assessment

The 2019 wet season survey (Biotropica Australia 2019a) involved detailed field investigations and mapping of vegetation communities and key fauna habitats. This work is described in **Chapter 8**.

A key finding was that four vegetation communities that exist in the surveyed area have moderate to high conservation values. Of these:

- the littoral rainforest (LRF) community corresponds to a critically endangered vegetation community listed under the EPBC Act
- other communities (riparian forest, wetland, and beach) contain EVNT (Endangered, Vulnerable, or Near Threatened) flora or may provide habitat for various EVNT fauna.

Note that the extent of the mapped LRF has since been revised based on recent (January 2020) field observations.

2019 Dry Season Ecological Assessment

The 2019 dry season survey (Biotropica Australia 2019b) involved a repeat of the wet season survey at a time when flowering plants made identification of some plants and vegetation communities more straightforward. The survey also targeted certain listed threatened fauna and associated habitats thought to possibly occur, based on prior wet season data.

The only change between the wet and dry season work (apart from a minor reclassification of the vegetation communities) was the identification of a further patch of the LRF community. This is a 2.6 ha outlier that is not connected to the larger patch. Note that the extent of the mapped LRF has since been revised based on January 2020 field observations.

December 2019 Constraints Analysis

All field survey data available in December 2019 was used in a preliminary constraints analysis to revise the trial mine area and confirm the boundary for the ML application. As part of this work, an investigation was undertaken into the nature and level of the constraint posed by the mapped vegetation communities (based on ecological criteria including ecological function and habitat for important flora species) and appropriate buffer distances to these communities and species were set to protect their values if the community was to be preserved.

Note that fauna species were not specifically addressed given that fauna is ‘mobile wildlife’. However, the recommendations for protection based on flora values will obviously also benefit many fauna species.

c) Ecological Constraints (January 2020)

2020 Wet Season Ecological Assessment

The 2020 wet season survey (Biotropica Australia 2020a) involved a wet season survey of parts of the ML and the Cooktown Loading Area only previously surveyed in the dry season, the mine infrastructure area within the ML south of Alligator Creek, and the Nob Point area.

January 2020 Constraints Analysis

Subsequent to the completion of the MLA, the 2020 wet season survey findings were used to refine the constraints analysis. Details are included in Biotropica Australia (2020a) and summarised below.

Vegetation Communities Constraints

As outlined above, four communities are considered to be important (community codes and descriptions are as per **Figure 8-17**). These are as follows.

- Littoral rainforest (LRF). This community is critically endangered under the EPBC Act and for planning purposes a 100 m buffer was recommended to protect the community directly and to quarantine it from adjacent mining works such as excavation and potential changes to groundwater levels. **These buffered areas were considered to be a High-level constraint.**
- Riparian forest (RipF) vegetation supports Ant plants (*Myrmecodia beccarii*), a wide range of specialised flora and fauna, and is a key source of fresh water for local wildlife. A buffer would be required to minimise potential impacts to ant plants. Specifically, the EA standard conditions note that clearing cannot be done on sloped banks or within 3 m of the top of the bank, or 5 m of the toe of the bank within, or on the levee banks of the normal flow channel. Ant plants occur up to 8 m from the top of the bank, suggesting that any disturbance to riparian vegetation should be at least 15-20 m from the top of the bank. A 20 m buffer was recommended. **These buffered areas were considered to be a Medium level constraint.**
- Wetlands (WET) are a specialised habitat for flora and fauna. A 100 m buffer was recommended in MSES requirements. This is required to minimise potential impacts to wetlands and associated terrestrial and aquatic wildlife (if surveys indicate that wetlands are actually present). **These buffered areas were considered to be a Medium level constraint.**
- Melaleuca woodland (MWL). This community is located south of Alligator Creek in the main mine infrastructure area. Its main value is as habitat for Ant plants. **This community was considered to be a Medium level constraint.**

Biotropica Australia (2020a) notes that there is considerable certainty in relation to these buffers, based as they are on surveys of on-ground vegetation and the boundaries between different plant communities. Only in the case of wetland communities in the far north of the revised ML is there some uncertainty regarding extent, and by implication, the derived buffer. This will be further examined as part of the EIS.

Flora Species Constraints

Including the Ant plant described above (Vulnerable NC Act, EPBC Act) and its two principal habitats, three particular species are considered to be important such that the habitat in which they are found (community) was assigned a buffer and constraint level as defined previously.

- *Acacia solenota* (Vulnerable NC Act) was confirmed in heath / dwarf heath and littoral rainforest, but does not appear to be present in riparian forest, wetland, or woodland communities. The species can be confused with the more common *Acacia calyculata*, although recent collections of fertile material suggest that *A. solenota* is common where it occurs, and may replace *A. calyculata* in parts of the surveyed area and the revised ML. It would not be possible to undertake any clearing in heath/dwarf heath or littoral rainforest without damaging or destroying numbers of *A. solenota*, a species which is restricted to the Cape Bedford area. **Areas supporting *A. solenota* represent a Medium-level constraint (i.e. as per the buffer applied to the communities in which the species is found).**
- *Xanthostemon arenarius* (Near Threatened NC Act) is restricted to the Cape Bedford area and has been recorded in heath, littoral rainforest and in some woodland sites. It would not be possible to undertake any clearing in heath or littoral rainforest, and some woodland areas, without damaging or destroying numbers of *X. arenarius*. **Areas supporting *X. arenarius* represent a Low-level constraint (i.e. as per the buffer applied to the communities in which the species is found).**

- *Myrmecodia beccarii* (Vulnerable NC Act / EPBC Act) occur in taller trees of the riparian zone, and have also been recorded in woodland directly adjacent to the riparian zone in the far southern portion of the revised ML. A total of 29 individuals were recorded in the dry season survey, and all occurred in the riparian zone and directly adjacent woodland**. Areas supporting *M. beccarii* represent a Medium-level constraint (i.e. as per the buffer applied to the communities in which the species is found).** As noted, riparian zones also support a wide range of species not seen elsewhere within the proposed extraction area.

Additional Species

Other protected plants e.g. *Dendrobium bigibbum* and *D. johannis* may be present within the ML although neither of these, nor other protected species, have been recorded. However, no survey has coincided with the flowering period for those species, and until a correctly timed survey is completed it cannot be said with certainty that they are not present. Such a survey is planned for May 2020.

Given that *D. bigibbum* is most likely to occur within the riparian forest community, the existing buffer and Medium-level constraint would still apply. *D. johannis* has the potential to occur within the littoral rainforest, eucalypt woodland, riparian forest, and the heath communities. Any new records within the littoral rainforest community, which comprises an existing High-level constraint, would not result in its level of constraint being changed, nor would there be any changes to the existing riparian forest Medium-level constraint. However, if *D. johannis* is subsequently recorded in the eucalypt woodland or heath/dwarf heath communities, then this may warrant an increased level of constraint.

The results of the constraints analysis are summarised in **Table 7-1** below and constraints are shown on **Figure 7-3**.

Table 7-1 Recommendations for avoidance

COMMUNITY OR SPECIES	CODE	BUFFER	CONSTRAINT LEVEL	NOTES (STATUS)
Communities				
Littoral Rainforest	LRF	100 m	High	Critically engendered (EPBC Act) vegetation community
Riparian forest	RipF	20 m	Medium	Also provides habitat for *Myrmecodia beccarii*
Wetlands	WET	100 m	Medium	Provides habitat for several threatened plant and animal species
Species – located				
Acacia solenota	H/DH LRF		Medium	Protected via buffer to heath, dwarf heath, and littoral rainforest
Xanthostemon arenarius	H/DH LRF EWL		Low	Protected via buffer to heath, dwarf heath, and littoral rainforest
Myrmecodia beccarii	RipF		Medium	Protected via buffer to riparian forest
Species – possible				
Dendrobium bigibbum	RipF		Medium	Protected via buffer to riparian forest
D. johannis (in LRF)	LRF		High	Protected via buffer to littoral rainforest, riparian forest and the heath communities
D. johannis (in RipF)	RipF		Medium	Protected via buffer to riparian forest
D. johannis (in H/DH and EWL	H/DH* EWL*		Medium*	Protected via buffer to eucalypt woodland and the heath communities * may require extent of buffer to be expanded

Source: Based on Biotropica Australia (2020a).

The recommended buffer areas are shown on **Figure 7-3** below for all but the 'possible' species listed above.

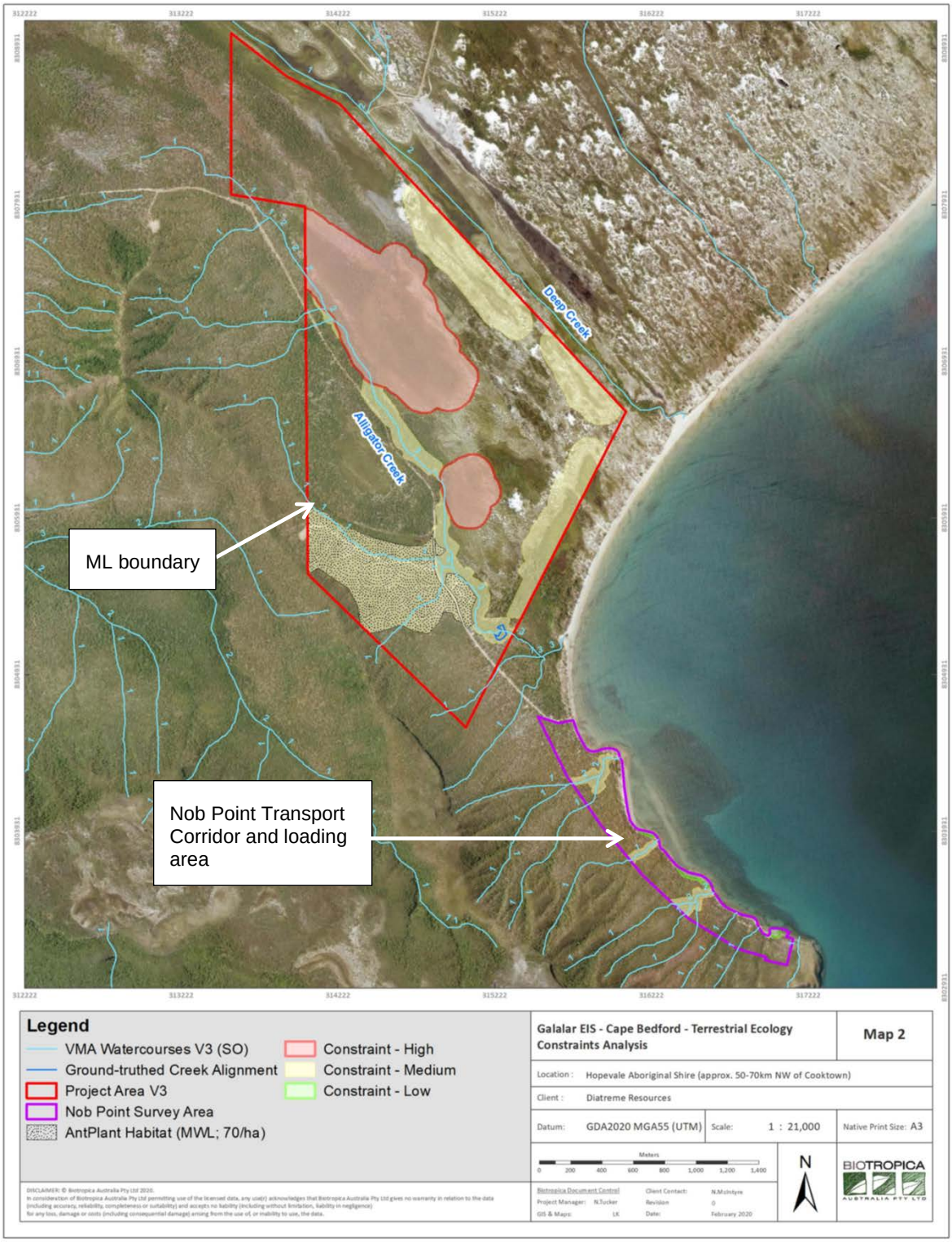


Figure 7-3 Constraints mapping.

Source: Biotropica Australia (2020a) Map 2.

d) Outcomes

The final mining area to be subject to the EIS is as documented in the MLA and described in **Section 7.2.2**. This layout was produced by considering, in addition to the cultural heritage and ecological constraints discussed above, the distribution of the targeted silica, technicalities of the mining operation, and economic factors. In this planning it was not possible to avoid the small patch of LRF and its buffer as well as small strips of buffer in other areas. Accordingly, the MLA mine layout will result in the direct loss of 2.6 ha of LRF. The large patch will not be directly impacted and the recommended 100 m buffer will be preserved.

7.1.5 Summary of Mining Area Options

Table 7-2 below is a summary of the findings of the options analysis regarding mining area options.

Table 7-2 Summary of Mining Area options analysis

OPTION	CONSTRAINTS	NOTES
Close to the existing Cape Flattery Silica Mines	Logistically unsuitable (transport). Diatreme was unable to negotiate access.	Reject sites in the north of the EPM, at least in the short to medium term.
Cape Bedford	2017 Sensitive cultural heritage sites north of trial mine area.	Consider as a High-level constraint.
	2018 Listed threatened plants north-west of trial mine area.	Consider as a Low- or Medium-level constraint
	January 2019 Listed threatened communities (LRF) within trial mine area – wet season extent.	Consider as a High-level constraint.
	August 2019 Listed threatened communities (LRF) within trial mine area – dry season extension.	Consider as a Medium-level constraint (impacts less significant in this small (2.6 ha) and isolated outlier).
	November 2019 Modelling of constraints within and outside trial area (updated January 2020).	Unconstrained / Low-level and Medium-Level LRF areas used to revise mining area and proposed ML – **mining area for IAS/EIS**.
	January 2020 LRF outlier reduced in size but upgraded to High-level constraint.	Mining area for ML already committed based on LRF outlier being a Medium-level constraint – boundary to be refined during EIS if required and if possible.
	February 2020 Mine infrastructure area south of Alligator Creek found to contain Ant plants in Melaleuca woodland.	Mine infrastructure relocated to protect Melaleuca woodland and Ant plants. **Mine Infrastructure Area for IAS/EIS**.

Source: Study team compilation.

Figure 7-4 below shows the concept design that is the basis of this IAS overlaid on the mapped avoidance categories.

Figure 7-4 Proposed mining area overlaid on constraints analysis mapping.

Source: Based on Biotropica Australia (2020b).

This figure shows that:

- all High-level constraints and associated buffer areas have been avoided except for the 2.6 ha LRF outlier
- all Medium-level constraints and associated buffer areas have been avoided, although there are minor incursions into the buffers (but not the communities themselves).

7.1.6 Alternative Export Methods

a) Overview

A number of export options for a mine located at Cape Bedford have been investigated over several years based on logistical, environmental, and commercial matters. In the following discussion, export consists of:

- trucking from the mine to a land-based loading area *
- transfer from the loading area to barges *
- barging to a transhipment site *
- transhipping to the export vessel
- shipping to China.

* Note that a slurry pipeline was also investigated to replace trucking, loading and barging as described below.

Central to the consideration of options other than the slurry pipeline was the selection of a suitable land-based loading methodology. Once this had been selected, barging and transhipment details could be investigated. Thus, the selection of a loading area was the starting point of the export options analysis, although the relationship of such sites with subsequent transhipment was critical.

b) Loading Area Options

Loading Option 1 – Cape Flattery

Loading at Cape Flattery has obvious attraction as Cape Flattery is an existing port used for silica export. This option involves transport of processed product by road from the mine at Cape Bedford to the Port of Cape Flattery.

While the jetty at Cape Flattery is a public facility and the Port of Cape Flattery is theoretically a common-user managed by Ports North, the shiploader installed on the jetty is privately owned by CFSM (i.e. is not common-user). Although there are no legal impediments to use the jetty infrastructure, Diatreme has not advanced a commercial agreement given commercial conflicts of interest.

A barge ramp located away from the jetty was then considered, at which barges would be loaded for transport of the product to a waiting ship where it would be transhipped.

The problem with both of these options is that they would involve the construction of a new haul road some 50 km long through virgin country from the mine site at Cape Bedford to the Cape Flattery port area. See **Figure 7-5** below. The road would traverse undulating sand dunes, require a bridge over the McIvor River, and would need to be suitable for large trucks. It would require construction involving enormous earthworks and very large quantities of road-building materials. This was considered to be undesirable from an environmental perspective, may not be approvable in light of current legislative constraints, and would involve extra construction and operating costs that would make the project unviable.

Finally, the mining tenements of CFSM extend across the full width of Cape Flattery and land access to the port can only be achieved by agreement with the tenement holder. Diatreme's approaches to the CFSM for access have been unsuccessful.

This option was considered to be neither prudent nor feasible, although transhipping in the Port of Cape Flattery is attractive for transhipping for a number of reasons listed later.

Figure 7-5 Schematic of road between mine and Cape Flattery.

Note – indicative only (no route section or design has been undertaken).

Loading Option 2 – Nob Point

The prospect of loading at Nob Point was described in the ASC release associated with the Scoping Study (Diatreme 2019) as being suitable for the establishment of a 'low intrusion barge ramp'. A suitable site of this is some 3.6 km south of the mine. Barges loaded at this location could transport product to three possible transhipping locations:

a) immediately offshore in deep water adjacent to the shipping channel **(Figure 7-6**)

b) north to the Port of Cape Flattery (**Figure 7-7**)

c) south to the Port of Cooktown (**Figure 7-8**).

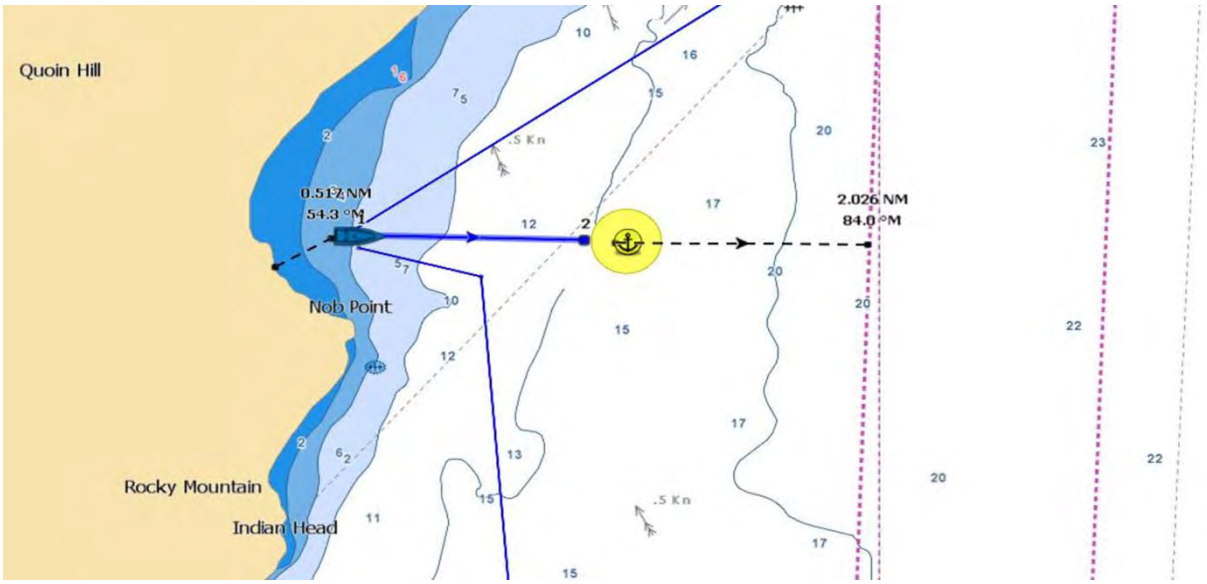


Figure 7-6 Nob Point loading, barging, and transhipping Option 2a – offshore from Nob Point.

Figure 7-7 Nob Point loading, barging, and transhipping Option 2b – north to Port of Cape Flattery.

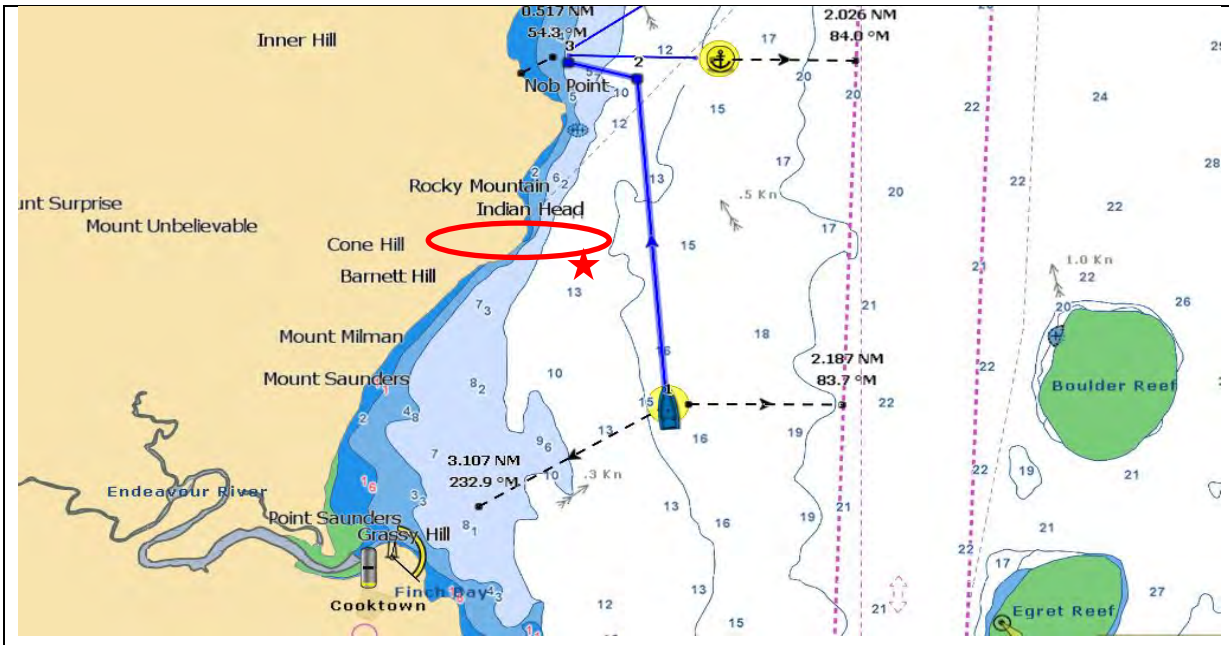


Figure 7-8 Nob Point loading, barging, and transhipping Option 2c – south to Port of Cooktown.

From a loading perspective, the Nob Point site is ideal due to its proximity to the mine and lack of any conflicts with existing residences or infrastructure, as is offshore transhipment immediately offshore (Option 2a) due to the very small barging distance.

The remaining options involve barging 44 km to Cape Flattery (Option 2b) and 13 km Cooktown (Option 2c).

An alternative transhipping site in the Port of Cooktown is located north of the town, just south of Indian Head (indicated on **Figure 7-8**). While the depth of water in this location is not ideal, it (Option 2d) is attractive due to its improved proximity to Nob Point (10 km barging versus 13 km as described above for the transhipping location further south).

Loading Option 3 – Marton, Cooktown

A third barge loading location is at Marton, Cooktown. The 'Cooktown Option' as it is described in the Scoping Study (Diatreme 2019) involves road train transport of the export product from the mine along 63 km of public roads via Hope Vale to an existing boat ramp (to be upgraded) at Ida Street in the Cooktown suburb of Marton, then barge transport 10 km down the Endeavour River to a transhipment site at the eastern limit of the Port of Cooktown. No dredging is required for this option, although the Endeavour River is not ideal for barging due to shallow water and shifting sand banks.

This option has been found to be economically viable, although it suffers a cost penalty and various sustainability problems when compared with all Nob Point options. As noted later, draft limitations will reduce the possible loads in the export ship and hence annual throughput.

c) Other Loading Options

Initial consideration was given during early 2019 to a possible pumped slurry solution that would involve a submerged slurry pipeline and return water line from the mine to an offshore mooring point located opposite Cape Bedford near the shipping channel for transfer of product to bulk carriers.

This option was found to have technical risks associated with the pumping process and water management.

d) Assessment of Loading Options and Associated Transhipping

Table 7-2 below is a summary of an options analysis that considered:

- logistics issues
- sustainability/environmental issues
- commercial issues (viability, ability to secure access).

To indicate relative performance, the following colour coding is used:

- low or lowest impacts or highly desirable (Green)
- medium or less than average impacts or generally desirable (Yellow)
- moderate or greater than average impacts or less desirable but still viable (Orange)
- high or highest impacts or undesirable (Red) – potentially fatal flaws.

The final column (Status) indicates whether or not the option is to be further considered in the EIS (✓ or **X**).

This assessment concludes that the most viable options to be considered in the EIS are (with appropriate nomenclature to be used throughout this IAS):

- Nob Point Export Option (Nob Point loading, Nob Point transhipping)
- Cape Flattery Export Option (Nob Point loading, Cape Flattery transhipping)
- Cooktown (North) Export Option (Nob Point loading, Cooktown (North) transhipping)
- Cooktown (South) Export Option (Nob Point loading, Cooktown (South) transhipping)
- Cooktown (Trucking) Export Option (Marton loading, Cooktown (South) transhipping).

These five options are documented below as part of the Proposed 'Project Description'.

Table 7-3 Assessment of Loading Options and Associated Transhipping

LOADING OPTION	FROM MINE	LOADING	BARGING	TRANSHIPPING	ASSESSMENT			STATUS
					LOGISTICS	SUSTAINABILITY	COMMERCIAL ISSUES	
1	Truck (50 km)	Cape Flattery	In port limits (3.2 km)	Port of Cape Flattery	Difficult terrain, major river crossing, very expensive construction	Non-sustainable (terrestrial biodiversity, cultural heritage impacts)	Diatreme was unable to negotiate access with CFSM for land access or use of shiploader Economics not tested but likely to be poor due to cost of road	X
2a	Truck (3.6 km)	Nob Point	To offshore anchorage (no port) (2.2 km	Off Nob Point	Very attractive due to short trucking distance and minimal barging	Minimal impacts (terrestrial and marine)	Cheapest capital and operating costs	✓
2b	Truck (3.6 km)	Nob Point	To port anchorage (43 km)	Port of Cape Flattery	Moderately attractive due to short trucking distance and acceptable barging	Minimal impacts (terrestrial and marine)	Slightly more expensive than 2a but still attractive	✓
2c	Truck (3.6 km)	Nob Point	To port anchorage (13 km)	Port of Cooktown (south)	Moderately attractive due to short trucking distance and acceptable barging	Minimal impacts (terrestrial and marine)	Slightly more expensive than 2a but still attractive	✓
2d	Truck (3.6 km)	Nob Point	To port anchorage (10 km)	Port of Cooktown (north)	Moderately attractive due to short trucking distance and acceptable barging	Minimal impacts (terrestrial and marine)	Slightly more expensive than 2a and 2b but still attractive	✓

LOADING OPTION	FROM MINE	LOADING	BARGING	TRANSHIPPING	ASSESSMENT			STATUS
					LOGISTICS	SUSTAINABILITY	COMMERCIAL ISSUES	
3	Truck (63 km)	Marton (Cooktown)	To port anchorage (11 km)	Port of Cooktown (south)	Unattractive due to long trucking distance, navigation constraints in Endeavour River, and shallow waters for export vessel (requiring smaller export loads)	Minimal impacts (terrestrial and marine) Amenity impacts arising from road and barge transport potentially inconsistent with State marine park zone	Highest cost option but still viable. Due to depth limitations in the Port of Cooktown, export is limited to 300,000 t/a (cf 750,000 t/a for other options)	✓
4	Pipeline	Pipeline	Pipeline	Off Nob Point	Technical risks associated with the pumping process and water management	Sustainability risks due to water management and leakage during pipeline operations	Economics not tested but likely to be only marginally attractive due to cost of infrastructure and operating costs	**X**

Source: Study team compilation.

7.2 PROPOSED PROJECT

Provide the following information:

- *the name of the proposed project*
- *a short summary on the key elements of the proposed project based on the initial advice statement, including the amount of resources to be mined or extracted, how the resources would be mined or extracted, and any separation, beneficiation or processing of the mineral or gas that will occur*
- *any major infrastructure requirements (including different options)*
- *the operational land*
- *location (geographical)*
- *size and type of mining/petroleum activities*
- *if any mining tenements relevant to the proposed project are granted or have been applied for*
- *information for off-lease activities*
- *land access for the purposes of EIS studies*
- *power and water supply (outline all options to be assessed in the EIS)*
- *accommodation and transport (outline any options for these components)*
- *size of project site, i.e. the operational land (ha)*
- *size of area disturbance (ha).*

7.2.1 Project Overview

The name of the project is the Galalar Silica Sand Project (GSSP). It was previously called the Cape Bedford Silica Project. For the purposes of the voluntary EIS, the project consists of:

- the mining area at Cape Bedford
- several alternative export options including options for transferring product (i.e. bulk or contained)
- coastal shipping.

An overview of these is provided below, with further details described in following sections.

a) Mining Area

The mining area contains the silica resource and infrastructure required to process it for export. See **Section 7.2.2** and **Section 7.2.3**.

b) Export Options

As outlined in **Section 7.1.6**, associated with the mining area are several export options, all that involve loading onto barges and transhipping from these to an export ship anchored in deep water offshore. These and other variations were assessed in the previous discussion of prudent and feasible alternatives – the ones described below are those that survived the options analysis documented in **Section 7.1.6d)**.

Options for export of processed product to be addressed in the EIS can be characterised as:

- **Nob Point Loading:** Barge loading from Nob Point following road transport a short distance from the mine, and barging to one of the following transhipment locations:
  - Nob Point
  - the Port of Cape Flattery
- **Cooktown Loading:** Barge loading from Marton following road transport from the mine, and barging to a transhipment anchorage in the Port of Cooktown (south near the town).

Note that the Nob Point loading options involving barging to the Port of Cooktown (either north near Indian Head – Option 2c in **Table 7-3** – or south near the town – Option 2d in **Table 7-3**) will not be further considered for logistical reasons related to limited water depth at the proposed transhipping locations.

Options for transferring (to barge and transhipping) are being considered as follows (not all modes are being considered for all export options):

- Bulk (uncontained product)
- Skips (8 cubic metre covered skips that will be re-used after emptying product into the export ship)
- Bags (1 cubic metre bags that will be opened in China).

The final decision as to which modes are proposed at which locations will be determined in the EIS.

c) Coastal Shipping

All export options involve coastal shipping to China using a 35,000 t *Handysize* cargo ship.

7.2.2 The Mining Area

Figure 7-9 below shows the concept layout of the mining area. In this discussion, the Mining Area includes the proposed mine and all associated infrastructure, all within the proposed ML as per the MLA (Ausrocks 2019b). This figure shows:

- The proposed mine (green polygons). A concept mining schedule has been prepared for the staged development of the resource and subsequent rehabilitation. See **Section 7.2.3b)**.
- Topsoil Stockpiles.
- Stockpiling Areas.
- Erosion and Sedimentation Control elements (labelled ‘Stormwater’).
- Mine Roads.
- Ancillary infrastructure described later in this section, including:
  - Power Generation
  - Laydown Areas & Storage
  - General Infrastructure (Office, Workshops etc.)
  - Parking.

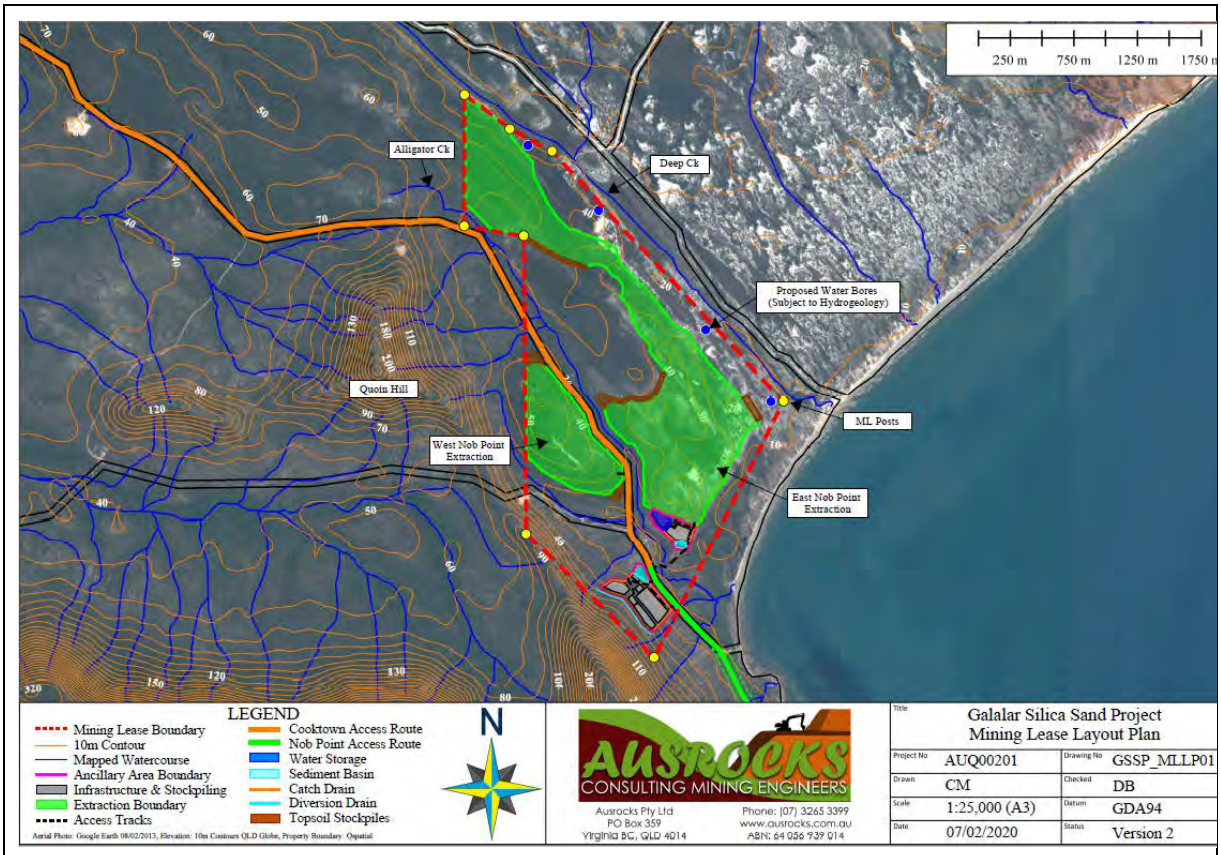


Figure 7-9 Layout of ML.

Source: Ausrocks (2019b) Figure 2.8 updated February 2020. See **Figure 7-10** for details of the ancillary infrastructure area (southern corner). See end of text for a larger version of this figure.

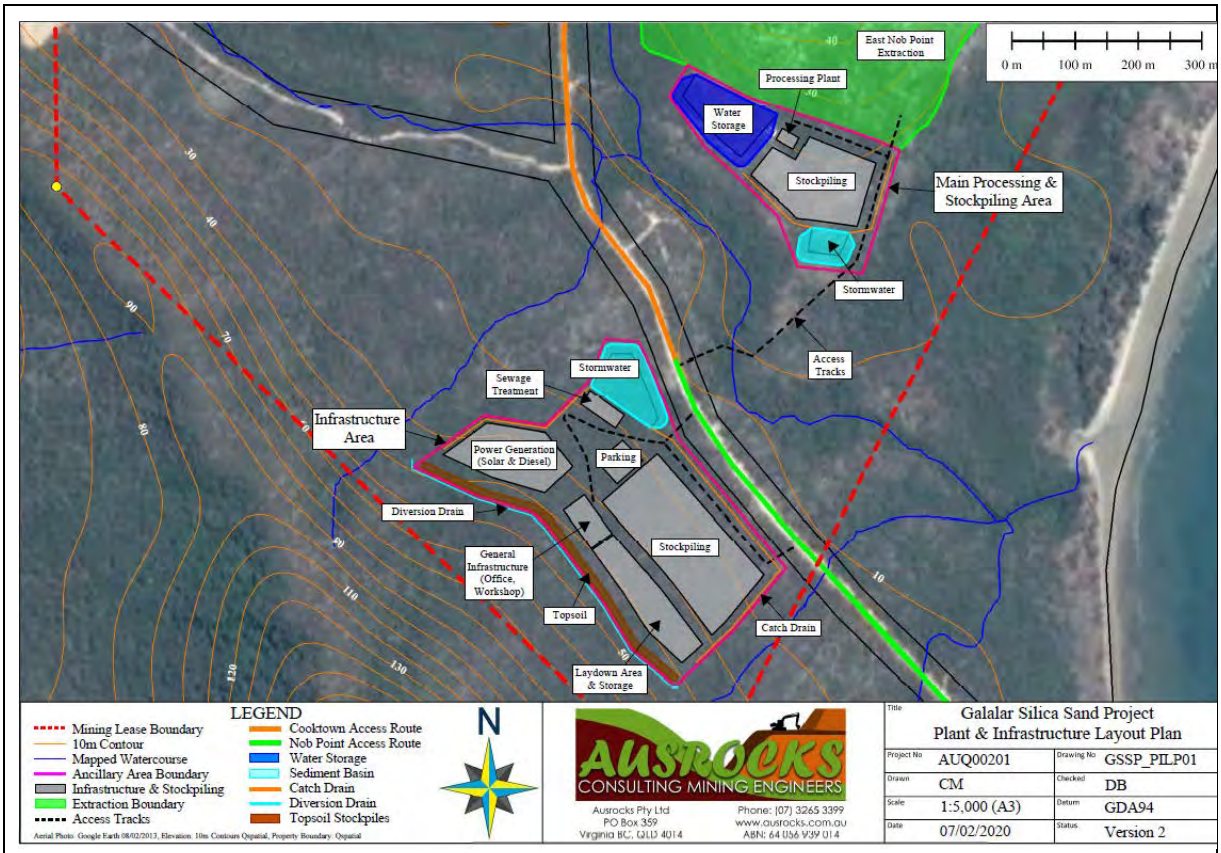


Figure 7-10 Layout of mining ML – detail of ancillary infrastructure.

Source: Ausrocks (2019b) Figure 2.9 updated February 2020. See end of text for a larger version of this figure.

Approximate areas are shown in **Table 7-4** below.

Table 7-4 Schedule of areas

ELEMENT	AREA	NOTES
Mining area: (215.68 ha total)	• 45.13 ha – Quoin Hill • 170.55 ha – Main Resource	The mine will be developed in stages aimed at achieving the desired throughput. A detailed mining plan (including staging) is included as **Figure 7-11**. ~6 ha on average per year (rehabilitated sequentially) – refer **Section 7.2.3b)**
Topsoil stockpiles (Mining Areas)	• 6.4 ha	These stockpiles will be placed strategically within the mining area and elsewhere following clearing and in preparation for rehabilitation.
Topsoil stockpiles (Infrastructure Areas)	• 0.55 ha	These stockpiles will be placed strategically within the infrastructure areas following clearing in preparation for rehabilitation.
Stockpiling Areas	• 4.84 ha	Stockpiling areas will be located on either side of the access road to suit the processing activity.

ELEMENT	AREA	NOTES
Processing Plant	• 0.06 ha	Wet processing plant located within a storage shed (20x30 m)
Water storage	• 1.31 ha	A lined pond is required for water storage (processing and potable). Water will be supplied from one or more production bores (location and details to be confirmed by proposed investigations).
Erosion and sedimentation control elements (3.54 ha total)	• 1.37 ha (sedimentation ponds) • 0.29 ha (diversion drains) • 0.54 ha (catch drains)	Catch banks and drains, diversion drains, sedimentation ponds and ancillary devices (e.g. silt fences and silt curtains) will be installed during the construction phase. Certain of these will be retained for the operational phase to protect water quality.
Roads	• 2.06 ha	A number of the existing exploration tracks and the current road to Hope Vale will be upgraded to facilitate internal vehicle movements and export.
Ancillary infrastructure: (9.26 ha total)		
• Power Generation	• 1.32 ha	Compound and switchgear etc. for hybrid diesel-solar system with battery storage (full site power demand expected to be up to 750 kW).
• Laydown Areas & Storage	• 1.12 ha	Hardstands for supporting all plant and equipment.
• General Infrastructure (Office, Workshops, Sewerage Treatment Plant etc.)	• 0.48 ha	Small industrial sheds / transportable buildings to support the on-site staff and activities.
• Parking	• 0.25 ha	Car parking will be provided for the drive-in/drive-out staff and mine site vehicles.
• Balance Area	• 6.09 ha	Remaining area within disturbance boundary not taken up by infrastructure (open space etc.).

Source: Ausrocks (2019b) updated February 2020.

7.2.3 Mining and Processing

a) Mining Area

Layout

Figure 7-9 and **Figure 7-10** above show the concept layout of the ML based on the MLA (Ausrocks 2019b).

Operation

The mining operation and processing plant will operate as a continuous process for 24 hours per day and 360 days per year. The shift roster will be a four-crew system and the crews will rotate on a schedule to be finalised following detailed discussions with the local employees. There will be no site camp and all personnel will reside at Hope Vale or Cooktown during their work roster.

The mining operation will commence with the removal of large vegetation on the mining areas ahead of the planned mining operation using a bulldozer.

The average depth of the sand to be mined is approximately 15 m. Disturbance varies from year to year from 3.2 ha to 13.5 ha per annum and averaging just under 6 ha per annum. Due to the lag between mining and rehabilitation it is possible that up to 16 ha may be exposed at any one time. If there is a variation to the mining schedule due to further resource development, there is not expected to be significant changes in the average area disturbed each year or the total over the planned 15 year duration.

Prior to mining, the area to be mined in the first stage (sequential mining and rehabilitation is proposed) and other areas where infrastructure is to be built will be cleared using a bulldozer to stockpile surface vegetation and surface soil. It is likely that local seeds will be salvaged in advance and grown out for future rehabilitation of disturbed areas when no longer needed.

The exposed silica ore will be excavated using a front end loader and loaded directly into a hopper-feeder unit at a rate of 138 tonnes per hour (tph) for 19.2 hours per day and 360 days per year. The average daily operating hours allows for maintenance and operational downtime, and the days per year includes an allowance of five public holidays that would not be worked. The hopper-feeder unit will screen out oversize rubbish and pump the sand to a mobile wet spiral plant in slurry form at a controlled feed rate of 138 tph.

The hopper-feeder unit will include:

- coarse screening at 50 mm aperture
- hopper and feed conveyor
- water supply pipeline
- wet trommel screening at 1 mm aperture
- constant density sump
- slurry pump and pipeline.

b) Proposed Production Schedule

The production target is based entirely on Indicated Mineral Resources and does not use any Inferred Mineral Resources. The production target has been modelled over a 15-year mine life with an annual mining rate of 950,000 t and an annual production rate of 750,000 t of low iron silica product. The total production target of 11,250,000 t of low iron silica will utilise only 66% of the available Indicated Mineral Resource.

Annual production and disturbance areas are shown in **Table 7-5** below.

Table 7-5 Fifteen year production schedule

YEAR	CUMULATIVE ROM PRODUCTION (Mt)	AREA DISTURBED (ha
1	950,000	7.96
2	1,900,000	3.81
3	2,850,000	4.86
4	3,800,000	5.46
5	4,750,000	7.11
6	5,700,000	8.59
7	6,650,000	4.06
8	7,600,000	3.18
9	8,550,000	2.76
10	9,500,000	3.80
11	10,450,000	4.41
12	11,400,000	3.15
13	12,350,000	7.05
14	13,300,000	13.49
15	14,250,000	4.84
Average	**950,000**	**5.6**

Source: Ausrocks (2019b) Table 2.8.

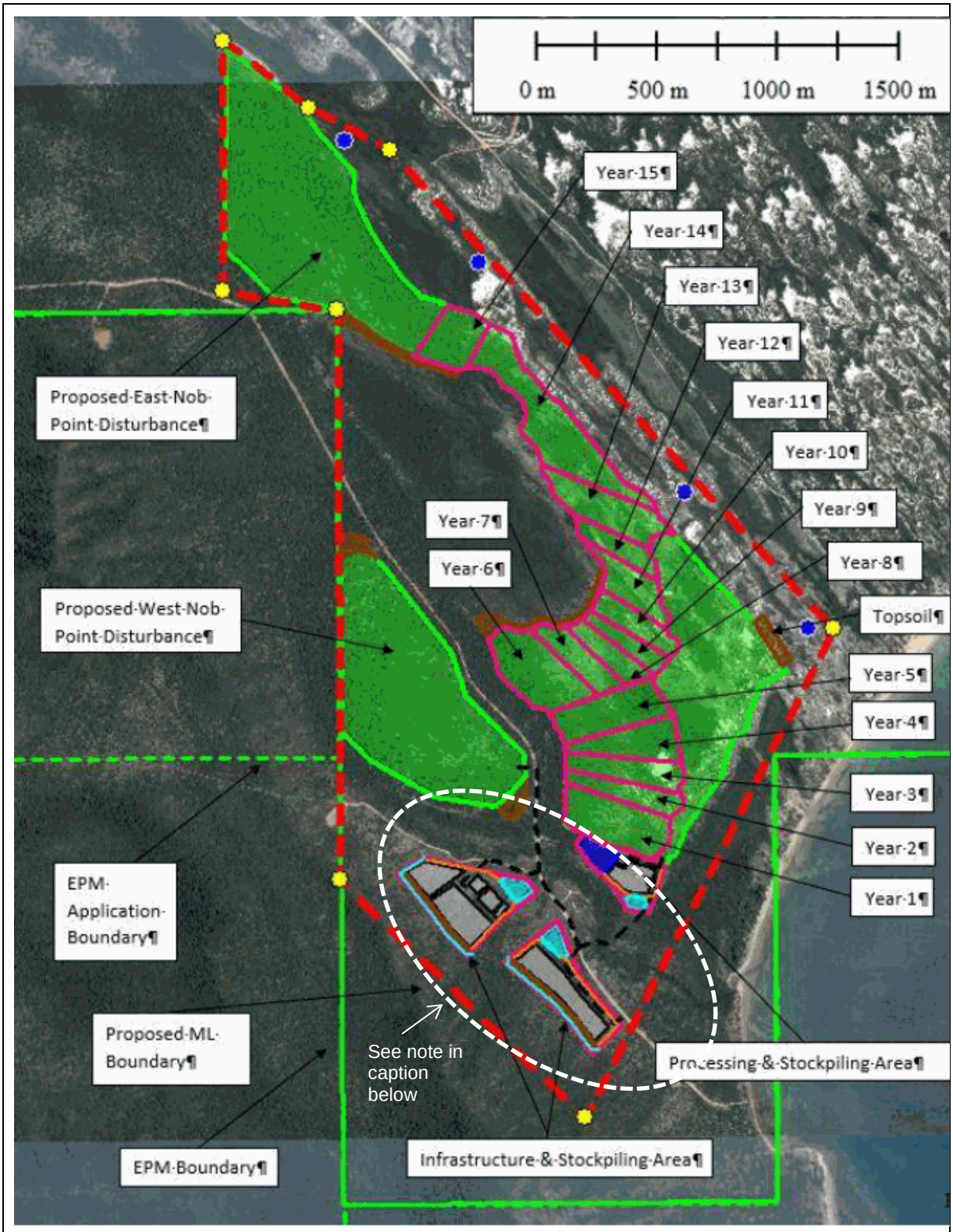


Figure 7-11 Fifteen year staged mining plan.

Source: Ausrocks (2019b). Figure 2.7. Note that the infrastructure in the bottom corner has changed from that shown above to that shown on **Figure 7-10** above to avoid the melaleuca woodland community.

c) Processing

The slurry from the hopper-feeder unit will be pumped into a controlled density tank at the wet processing plant.

Processing equipment will include spirals, attritioners (removes surface impurities from sand particles), classifiers (separates fine particles from coarse particles), and magnetic separators to remove heavy mineral, release surface impurities from the silica, remove fine particles, and remove magnetic particles.

Heavy mineral concentrate will be stockpiled for further concentration and sale when sufficient stocks have accumulated. Fine particles removed during processing will be pumped to a dam for settling to allow reuse of the process water. The low iron silica product will be dewatered and stockpiled ready for transport. The process flow in the wet spiral plant and related activities are as follows:

- 138 tph slurry from the controlled density tank will be pumped to a two stage spiral circuit which will be designed to remove heavy mineral and slimes from the ore.
- The spirals will achieve a recovery in the order of 85% and produce silica concentrate with approximately 200 ppm Fe_2O_3 at a rate of 117tph.
- The silica concentrate will be attritioned, classified and magnetically separated to remove fine particles of silica, iron, heavy mineral and clay.
- The silica product that will be produced after magnetic separation will have a grade of 80-100 ppm Fe_2O_3 and will be produced at a rate of approximately 110 tph.
- Heavy mineral and fine sand removed by the spirals will be dewatered using a hydrocyclone and stockpiled on the site.
- Slimes and fine particles removed during processing will be pumped to a dam for settling, dewatering, and later covering for rehabilitation.
- Upgraded white silica sand produced by the spirals will be pumped to a stockpile area where it will be dewatered using a hydrocyclone, stockpiled and allowed to drain to a low moisture content.
- The low moisture product will be loaded onto the trucks for transport to the loading area. The plant's gravity separation area will be a standard Mineral Technologies 150 tph processing circuit using MG12 spirals to remove the heavy minerals. The plant's surplus capacity will allow for variations in the feed rate to maintain an average processing rate of 138 tph.

Independent test work by IHC Robbins has shown that these spirals are efficient for the proposed gravity separation duty and will reduce the silica's iron content to 200 ppm Fe_2O_3 with a recovery to silica product of 85%. **Figure 7-12** shows typical plant and equipment used.

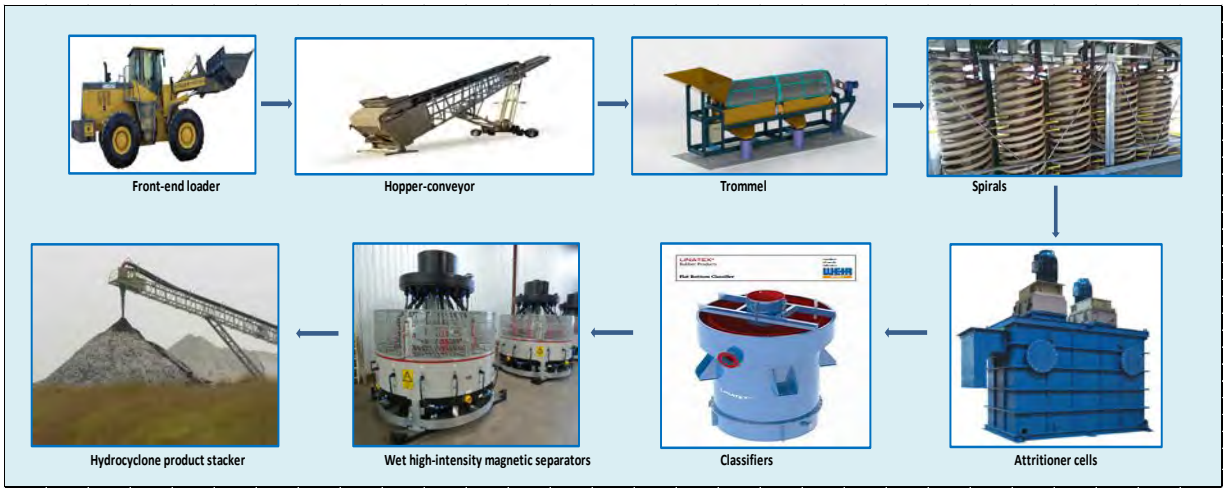


Figure 7-12 Mining and processing plant and equipment.

7.2.4 Export Options Overview

As outlined in the previous section, associated with the mining area are several export options, all that involve loading onto barges and transhipping from these to an export ship anchored in deep water offshore. These and other variations were assessed in the previous discussion of prudent and feasible alternatives – the ones listed below are those that survived the options analysis documented in **Section 7.1.6d)**. Further details follow, along with some sub-options where relevant.

Export options are grouped together depending in where processed product is loaded onto barges, i.e.:

- Nob Point Loading: Barge loading from Nob Point following road transport a short distance from the mine, and barging various transhipment locations.
- Cooktown Loading: Barge loading from Marton (Cooktown) following road transport from the mine, and barging to a transhipment anchorage in the Port of Cooktown (south near the town).

These options are described in **Table 7-6** below. Details of sub-options where relevant are provided in the following discussion.

Table 7-6 Export Options

EXPORT OPTION	BARGE LOADING LOCATION	BARGING	TRANSHIPPING
Nob Point Loading			
Nob Point Export Option (Option 2a above)	Nob Point (three loading sub-options are being considered)	Barge to anchorage immediately offshore of Nob Point (Nob Point Transhipment Anchorage)	Nob Point Transhipment Anchorage
Cape Flattery Export Option (Option 2b above)		Barge to anchorage in Port of Cape Flattery (Cape Flattery Transhipment Anchorage)	Cape Flattery Transhipment Anchorage in Port of Cape Flattery (in GBRMP exclusion area)
Cooktown Loading			
Cooktown (Trucking) Export Option (Option 3 above)	Cooktown (Marton)	Barge down Endeavour River to anchorage in or adjacent to Port of Cooktown (Cooktown Transhipment Anchorage)	Cooktown Transhipment Anchorage in or adjacent to the Port of Cooktown

These options are shown on **Figure 7-13** below.

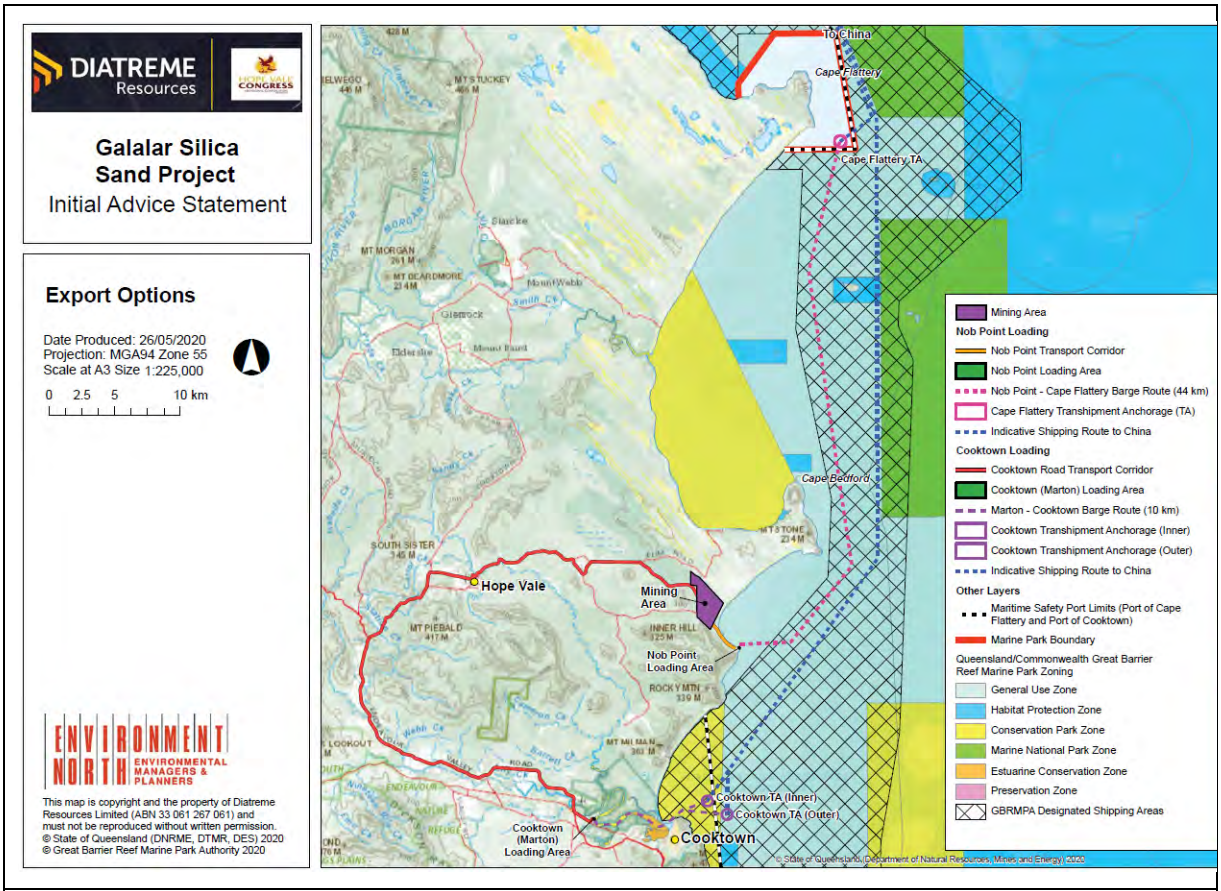


Figure 7-13 Export Options.

See end of text for larger copy of this figure.

It is proposed that all export options listed below (and associated sub-options) will be assessed in the EIS and that the EIS process will allow the superior project to be selected and if possible, improved.

7.2.5 Details – Nob Point Export Option

a) Overview

Components

The **Nob Point Export Option** has the following components (refer **Figure 7-13**):

- Nob Point Loading:
  - a short haul road (3.6 km) from the mine to Nob Point
  - barge loading at Nob Point – with two sub-options as explained below
- a coastal barging operation (approximately 2 km) between the barge loading area and the transhipment anchorage (see below)
- an offshore anchorage for transhipment of product (Nob Point Transhipment Anchorage)
- coastal shipping from the anchorage to China.

Sub-options

The loading infrastructure sub-options differ in the details of the on-shore and tidal/intertidal infrastructure.

Transhipping

Transhipping for this option will take place immediately opposite the loading site in deep water as shown on **Figure 7-14** below.

b) Road Transport Corridor

The silica product will be loaded onto semitrailers at the mine site for transport by road along the new Nob Point Transport Corridor to the new loading area. Each truck in the fleet of two will carry 24 tonnes of product. It is expected that 4000 t/d (154 semitrailers) of product will be transported from the mine to Nob Point 24 hours per day while the ship is being loaded (approximately 9 days at a time or for 187 days per year). Refer **Figure 7-14** above and **Figure 7-15** below.

c) Loading

The Nob Point loading infrastructure consists of barge loading equipment located adjacent to the coast at Nob Point. This infrastructure will be constructed on generally flat coastal land adjacent to Nob Point. Refer **Figure 7-15**.

Two barge ramp sub-options for loading the barge from the land will be assessed in the EIS, namely:

- Sub-option 1 (Nob Point 1) involves, both for loading the barge from the land:
  - (a) a conventional barge ramp featuring concrete slab-on-ground construction, or
  - (b) an elevated piled ramp (if required for environmental reasons)
- Sub-option 2 (Nob Point 2) involves a land-based crane for loading the barge directly from the land.

Both sub-options would require mooring piles for stabilising the barge during loading.

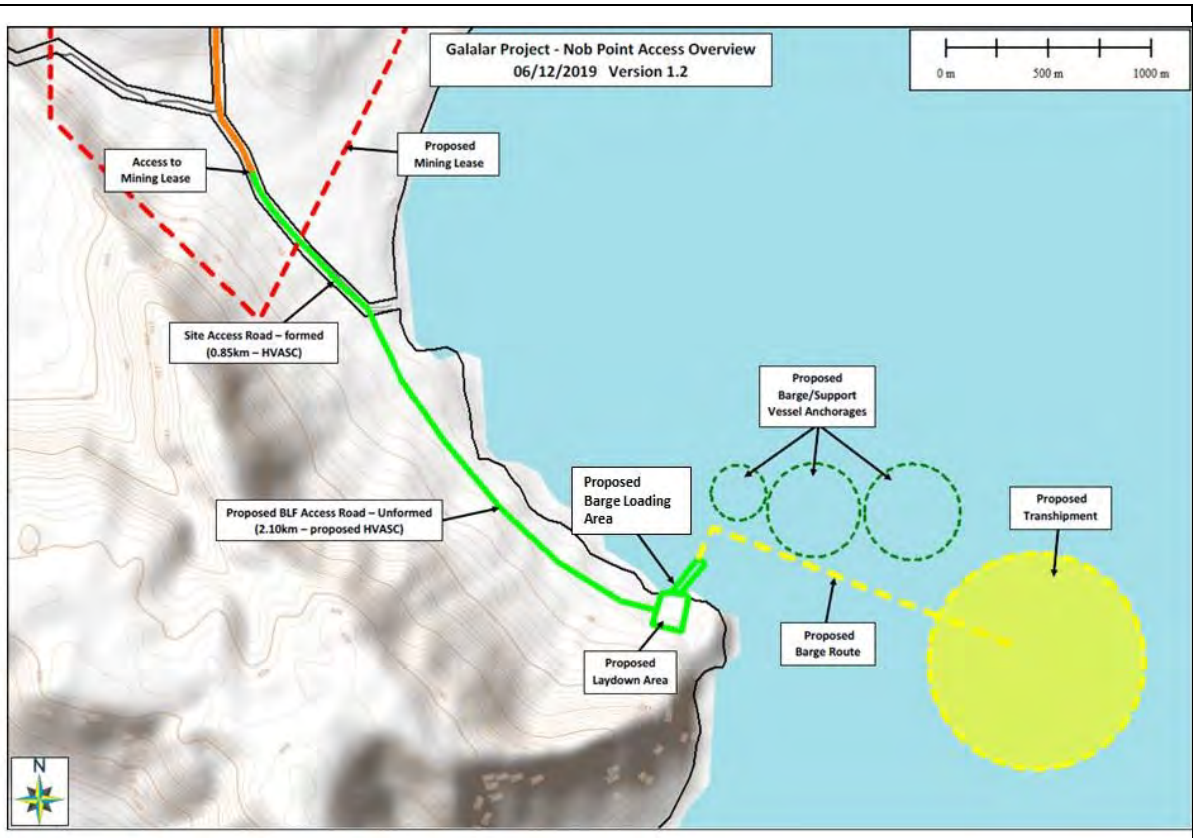


Figure 7-14 Nob Point Export Option using barge ramp, barging, and transhipment.

See **Figure 7-15** below for an enlargement of the barge ramp layout.

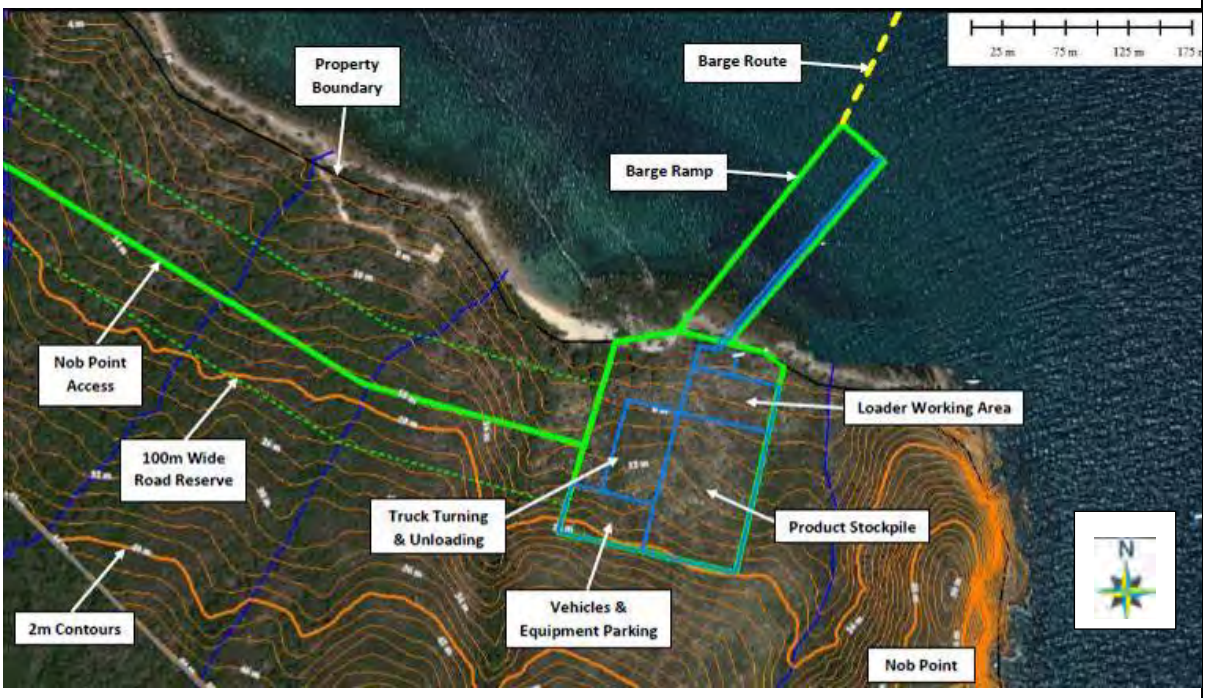


Figure 7-15 Nob Point barge ramp concept.

Source: Ausrocks (2019b) Figure 2.15.

Sub-option 1 – Barge Ramp

A barge ramp layout is shown schematically above. On the basis of recent bathymetric surveys (see **Figure 7-16**), this site appears to be suitable for the establishment of a low intrusion barge ramp.

Compared to the on-ground structure (Sub-option 1a), a slightly elevated barge ramp constructed on piles (Sub-option 1b) offers advantages through minimising impacts on the seabed and also ensuring the structure is more transparent to coastal processes (i.e. erosion and accretion of sediment). **Photo 7-1** below shows an elevated ramp at Palm Cove (since demolished) that is similar to what is to be investigated.

Figure 7-16 Bathymetry at the site of the proposed barge ramp (Sub-options 1a and 1b).

Photo 7-1 Palm Cove boat ramp (since demolished) showing elevated ramp.

This is conceptually similar to what is being investigated for Sub-option 1b.

Sub-option 2 – Land-based Crane

Sub-option 2 involves a land-based crane that would swing out across the water and lower the skips or bags onto a barge about 35 m to 40 m from the crane. The proposed site of this option is slightly to the south of that proposed for Option 1 to take advantage of deeper water close to shore. A crawler crane would be used so that it could be moved to shelter in the case of very severe weather (e.g. a cyclone). Other than mooring piles, no marine infrastructure would be required.

d) Barging

Loaded barges will transport product to a waiting ship anchored offshore. Due to wind and wave conditions there may be operational limits placed on this activity.

Barge size will vary depending on loading option:

- Sub-option 1a or 1b: 90 m / 5000 t barge (based on 3.5 m minimum water depth indicated by bathymetry at the ramp site. Loading rate will be 10,000 t/d.
- Sub-option 2: 70 m / 2000 t barge (based on 2.5 m minimum water depth indicated by bathymetry at the crane site as limited by the reach of crane). Loading rate will be 4000 t/d.

e) Nob Point Transhipment Anchorage

The waiting ship will anchor within the transhipment anchorage and product will be loaded from the barge. This site is approximately 2.2 km offshore in a minimum of 12 m water. This will permit the export vessel to carry its full load of 35,000 t and an annual export of 750,000 t/a.

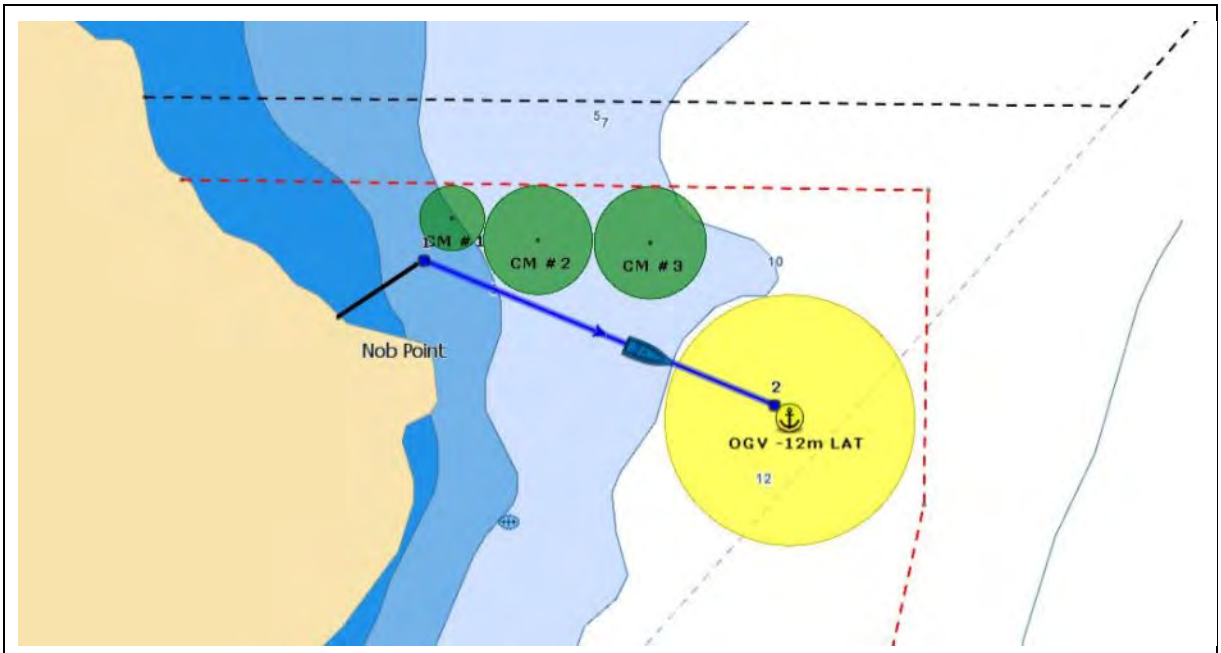


Figure 7-17 Nob Point Export Option showing the Nob Point transhipment anchorage.

Note that the barge route is schematic only.

In the above figure, the yellow circle represents the location of the ship whose anchor has been dropped in the centre of the designated anchorage. Note that no structure is anticipated be involved with the mooring (i.e. no piling).

The two larger green circles are the proposed anchorages for two barges, and the small circle for a tug. The barges may use an anchor that stays in the water attached to a buoy so the barge can quickly hook up and release without having to raise and lower the anchor every time a barge deploys.

7.2.6 Details – Cape Flattery Export Option

a) Overview

Components

The **Cape Flattery Export Option** has the following components (refer **Figure 7-13**):

- ***Nob Point Loading*** as above (transport corridor and loading infrastructure)
- a coastal barging operation (approximately 43 km) between Nob Point and the transhipment anchorage (see below)
- an anchorage for transhipment of product located in the Port of Cape Flattery (Cape Flattery Transhipment Anchorage)
- coastal shipping from the port to China.

Sub-options

Sub-options for the Cape Flattery Export Option are related to barge loading (i.e. Nob Point 1 or Nob Point 2 above).

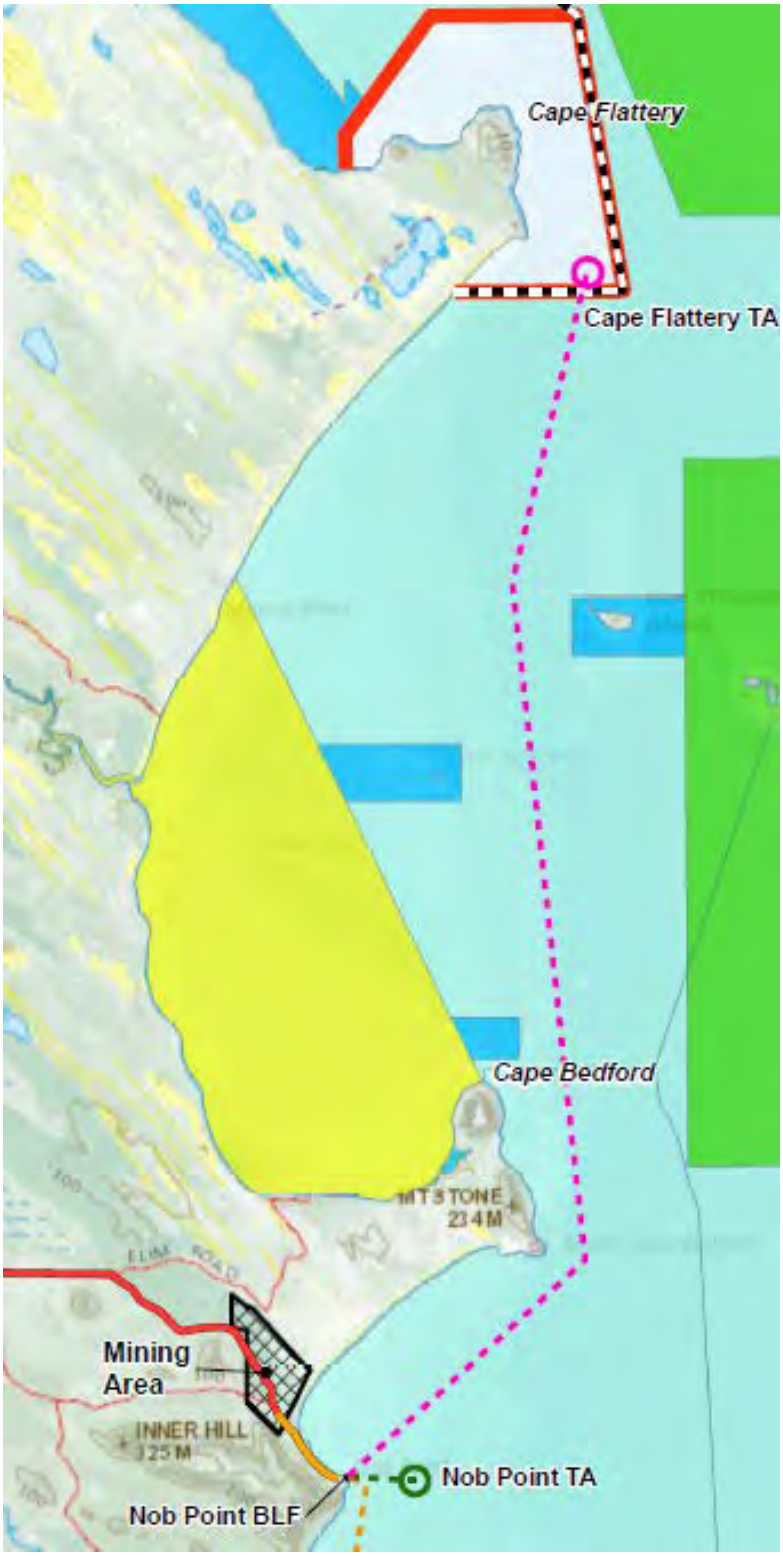


Figure 7-18 Cape Flattery Export Option.

This is an extract from **Figure 7-13**.

Transhipping

Transhipping for this option will take place within the Port of Cape Flattery.

b) Barging

Barging will be as for the Nob Point Export Option above with barge size to vary depending on the loading option.

c) Cape Flattery Transhipment Anchorage

The waiting ship will anchor at the transhipment anchorage within the Port of Cape Flattery and product will be loaded from the barge. The provisional site (to be discussed with Ports North) is just north of the southern port limits.

It is anticipated that a minimum of 12 m of water will be available at this site (to be confirmed). This will permit the export vessel to carry its full load of 35,000 t and an annual export of 750,000 t/a.

7.2.7 Details – Cooktown Export (Trucking) Option

a) Overview

Components

The **Cooktown Export (Trucking) Option** has the following components:

- Cooktown Loading:
  - the road transport corridor (63 km) between the mine and Cooktown via Hope Vale
  - brownfield expansion of existing infrastructure to allow barge loading on the banks of the Endeavour River at Marton, Cooktown
- a barging operation (approximately 10 km) in the Endeavour River between Marton and the Cooktown Transhipment Anchorage (Inner or Outer) as described above
- coastal shipping from the port to China.

Sub-options

Sub-options for this are the location of the Transhipment Anchorage as described below.

Transhipping

The waiting ship will anchor at the transhipment anchorage near the eastern limit of the Port of Cooktown near the town and product will be loaded from the barge.

Two possible transhipment anchorage options are shown on **Figure 7-19**.

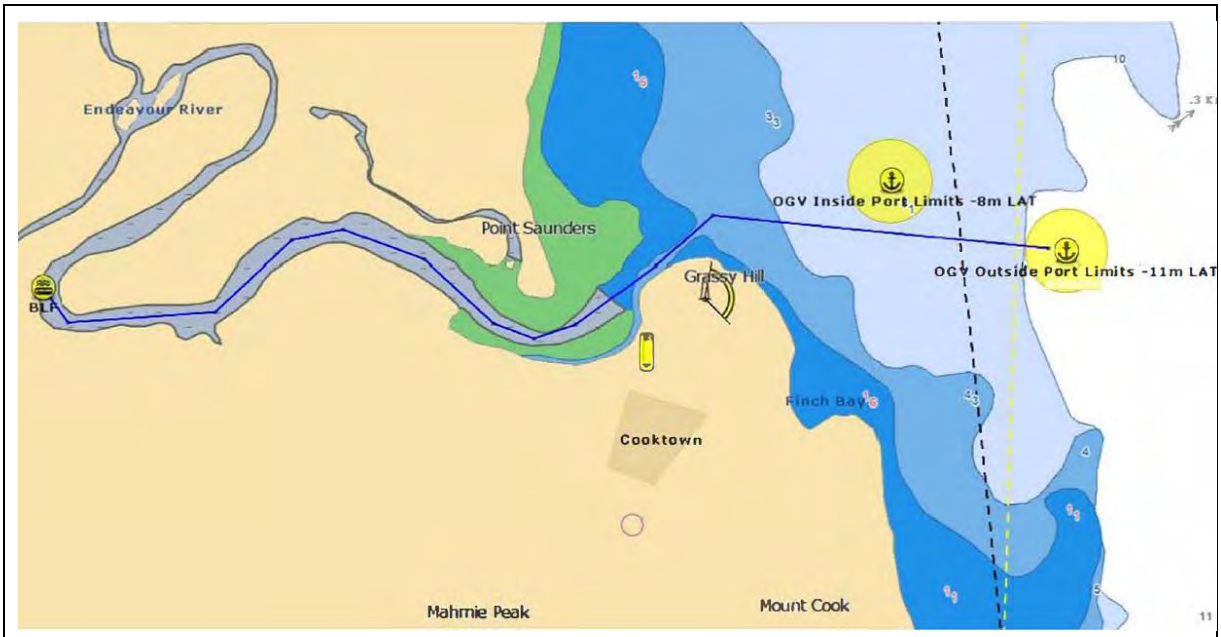


Figure 7-19 Cooktown loading barge route and transhipment anchorage options.

In the above figure the yellow circles represent possible alternative locations of the ship whose anchor has been dropped in the centre of the designated anchorage. Note that no structure is anticipated to be involved (i.e. no piling) in establishing the mooring. These alternative locations will be assessed during the EIS.

The provisional sites (to be discussed with Ports North) are either just inside or just outside the port limits. Recent surveys suggest that:

- a minimum of 7 m of water will be available at the inner site. This will limit the export vessel to 10,000 t per load and an annual export of 300,000 t (compared with 750,000 t/a for the above two options)
- a minimum of 11 m of water will be available at the outer site. This will permit the export vessel to carry its full load of 35,000 t and an annual export of 750,000 t/a

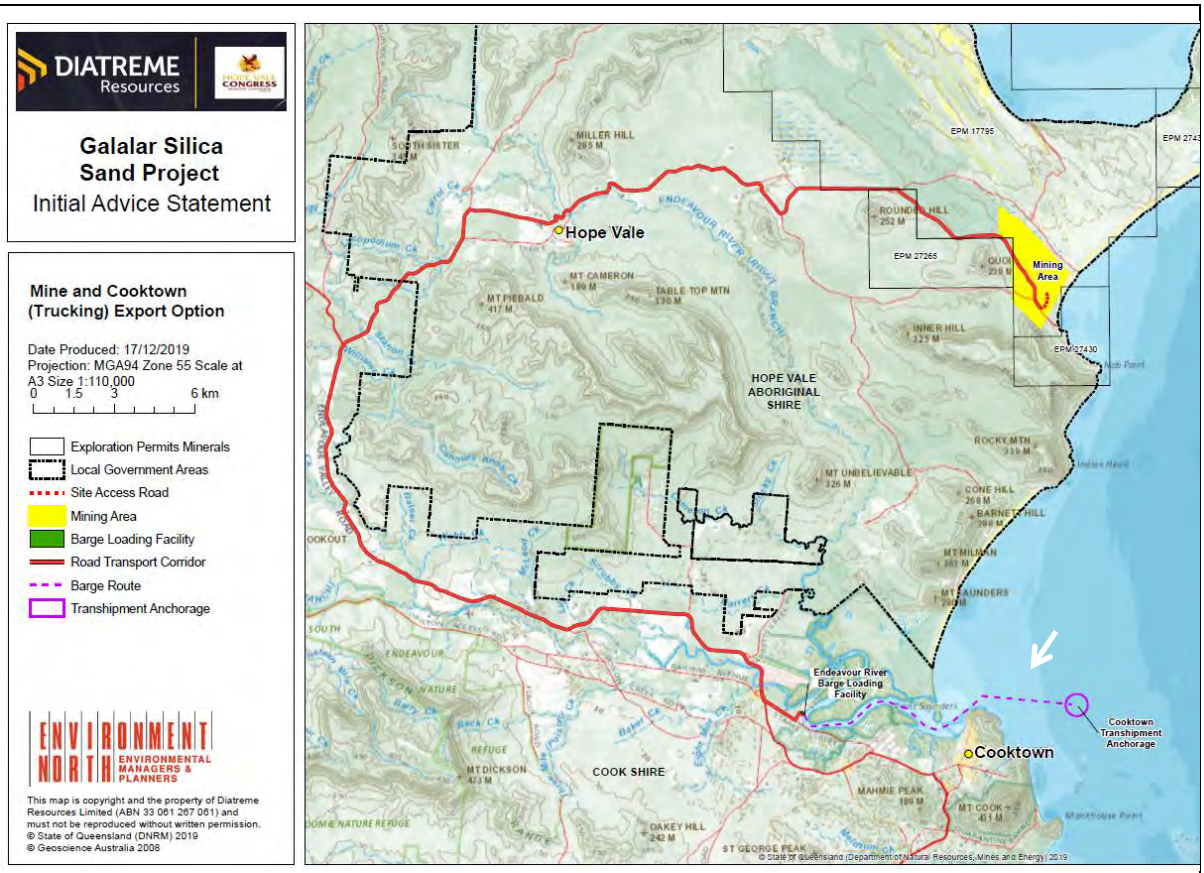


Figure 7-20 Cooktown (Trucking) Export Option.

See end of text for a larger version of this figure.

b) Road Transport Corridor

For this option, the silica product will be loaded onto double road trains at the mine site for transport by road to the loading area at Marton, Cooktown.

Each road train will carry 50 tonnes of product. The trucks will transport the product approximately 63 km to the Cooktown Loading Area travelling on a short site access road, Hope Vale Shire roads, Cook Shire roads, and the Endeavour Valley Road which is a State Controlled Road (SCR). Refer **Figure 7-21**.

It is expected that 2,100 t (42 double road trains) of product will be transported from the mine to Cooktown daily for 360 days of the year. The round-trip time for a truck will be approximately 2.5 hours, allowing each truck to complete five loads per day. On average there will be 3.5 trucks per hour in each direction or one every 9 minutes, on average.

Figure 7-21 Roads to be accessed for export via Cooktown.

The Cook Shire Council has a standard load limit of 42.5 t gross for trucks. Double road trains with 50 t loads can be used if two kilometres of council road is upgraded to the relevant standard. Double road trains can be used on Hope Vale Shire Council bypass road and the roads connecting to Galalar and Cooktown. The trucks will operate 12 hours per day and mainly during daylight to minimise noise and light impacts.

Nine side-tipping double road trains will be required for the road transport logistics. The trucks will deliver the product to the CLA and a front-end loader stack the product in the storage compound. The storage pad will have a capacity of 25,000 t which will allow shipments up to 35,000 t due to the duration of the transhipping which allows delivery of an additional 10,000 t to the CLA. The minimum shipment size is expected to be 15,000 t. Available ship load will depend on available draft at the selected transhipment anchorage.

The Local Government Association of Queensland (LGAQ), the Queensland Resources Council (QRC) and TMR have prepared a notifiable road use agreement protocol (TMR 2019). The protocol is a voluntary commitment by the parties about consultation, assessment, and negotiation of agreements for specific types of notifiable road uses. All upgrading and use of public roads will be in accordance with this protocol.

c) Loading

The Cooktown loading infrastructure consists of brownfield expansion of the Marton boat ramp at Cooktown. See **Figure 7-22** and **Figure 7-23**. It will include works to store 25,000 tonnes of product and load barges deployed in the Endeavour River.

Diatreme has commenced discussions on this proposal with Cook Shire Council and will address tenure issues during the EIS

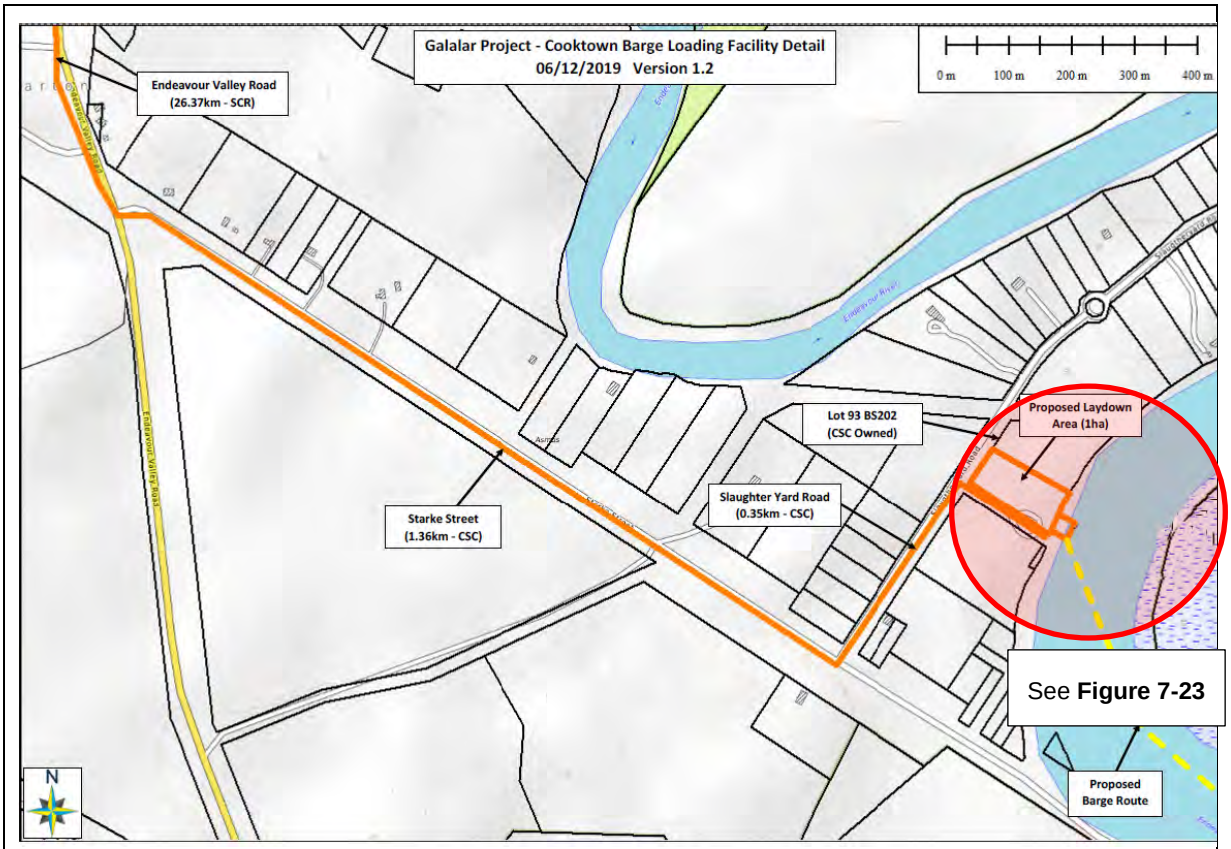


Figure 7-22 Cooktown loading infrastructure.

Source: Ausrocks (2019).

Figure 7-23 below shows the infrastructure proposed at Marton.

Figure 7-23 Cooktown barge loading infrastructure at Marton boat ramp.

Source: Ausrocks (2019b) Figure 2.12.

d) Barging

The Endeavour River is suitable for 70 m barges with maximum loads up to 2000 t at peak tides. The barging operation will be scheduled for loaded barges to travel at high tide. Risks that need to be managed include shallow sand banks and conflicts with general boat traffic. A Barge Navigability Assessment was undertaken in 2018 by Sea Swift to determine the operational environment for this process.

Details of the proposed barging and transhipping system are:

- two barge loads to the ship every day
- barges will travel 10 km to a moored ship just outside the Cooktown Port limits
- one-way travel time for the barge is 1 hour
- the ship will use on-board cranes to unload the barge
- barge loading time is 10 hours and transhipping time is 10 hours
- approximately 3700 t will be transhipped per day
- the marine vessel requirement is two 70 m barges, two shallow draft tugs, two assist tugs and a crew transfer vessel.

e) Cooktown (South) Transhipment Anchorage

For the Cooktown Export (Trucking) Option, one or other of the Cooktown transhipment sites will be used (**Figure 7-19**).

7.2.8 Transfer Mode Options

a) Bulk (Uncontained)

It is normal for benign minerals such as silica sand (and in fact many other minerals) to be transported in bulk and a whole materials-handling and shipping industry has been established to support this transfer mode. For this mode, the following details would apply for the GSSP:

- Transport in bulk by truck from the mine stockpile to a barge loading area stockpile at Nob Point (3.6 km).
- Use a bulk handling method to load barges. Options theoretically include front end loader, conveyor, crane with grab bucket, or skips.
- Bulk product on barge is transported over water to the export ship.
- Bulk product is transferred from the barge to the ship's hold using the ship's crane fitted with a grab bucket.

Photo 7-2 below shows a typical grab bucket for handling bulk product. This is just one method of bulk transfer.

Photo 7-2 Typical grab bucket for handling bulk product

b) Skips

Details:

- 8 cubic metre metal skips loaded with product at the mine stockpile and fitted with a removable cover.
- Product bulk density is 1.5 t/m^3, meaning that each skip can contain 12 t of product.
- Filled skips are loaded onto trucks using a crane (13 t for skips plus contents).
- Trucks transport skips to Nob Point where skips can be transferred from truck to barge (or stockpiled).
- Barge transports skips to ship where ship's crane transfers skips from barge to ship's hold and skips are tipped for bulk shipping. Note that during the over-water stage the product is contained within the covered skips. This is only emptied within the ship's hold.
- Ship's crane returns empty skips to barge which transports empty skips back to Nob Point.
- Loading crane (or forklift) returns empty skips to trucks for refilling at the mine stockpile.

Photo 7-3 below shows a typical skip being loaded.

Photo 7-3 Typical steel skips being loaded by crane.

c) Bags

Details:

- One cubic metre bulk bags would be filled at the mine site and stacked in a stockpile.
- The bags would be lifted using the straps which are part of the bag.
- The bags would hold 1.5 t of product which would be totally enclosed within the sealed bag.
- A metal lifting frame would be used to lift 8 bags at once using a crane.

- The total weight of the lifting frame and 8 full bags would be 13 t.
- A crane at the mine stockpile would load trucks with bagged product and the lifting frames would stay on the truck with each group of 8 bags.
- The trucks would transport the bagged product to the barge loading area where bags would be loaded directly onto a barge using a crane or stacked in a stockpile.
- Lifting frames would stay with the bags when loaded onto the barge.
- The barge would then transport the bagged product to a ship where the ship's crane would lift them using the lifting frames and stack the bags in the ship's hold. Note that at all times, including the over-water transfer stage, the product would be contained within the bags. Bags would be emptied when at the importer's facility (China).
- Lifting frames would be returned to the barge and then the stockpile for reuse.

Photo 7-4 below shows a lifting frame for handling 10 bags at once. The eight bag configuration proposed is similar.

Photo 7-4 Typical lifting frame for loading bags.

7.2.9 Coastal Shipping (All Export Options)

For all export options, the proposed maximum shipment size is 35,000 t which is in the *Handysize* class. See **Photo 7-5** for a typical *Handysize* vessel.

Photo 7-5 Typical *Handysize* (35,000 t) ship.

As noted above, the loading rate and overall load will be influenced by the available draft at the final transhipment anchorage. Loading will take between 9 and 17 days and on average there will be 21.4 shipments per year (35,000 t load) or 30 shipments per year (10,000 t load).

A shipping agent will be engaged for the project and will manage the ship scheduling and cargo documentation.

The designated shipping areas within the GBRMP are shown on **Figure 7-13**. It will be possible for coastal barging and shipping to stay within these areas for all but a very short distance from Nob point for either Nob Point loading option.

7.2.10 Other Infrastructure

Associated infrastructure at the site will include a small workshop and office, a stockpile site, a mobile processing plant, slurry holding and treatment ponds, roads, water supply, sewage treatment etc. There will be no camp at the mine – workers are expected to drive in and out from Hope Vale or Cooktown or elsewhere in the region.

7.2.11 Transport

As described in **Section 7.2.2** to **Section 7.2.7** above, the current logistics strategy for the project is to export the product from the mine site to a ship anchored offshore under one of two alternative loading options.

Table 7-7 below is a summary of the transport logistics for both options. The major differences are in the road transport and barging components. Coastal shipping is identical.

Table 7-7 Summary of transport (both options)

COMPONENT	NOB POINT LOADING	COOKTOWN LOADING
Road transport		
Distance	3.6 km	63 km
Size of truck	Semi-trailer (24 t)	Double road trains (50 t)
Number of trucks in fleet	2	9
Hours / day	24 (during loading)	12 (daylight hours)
Load / year	750,000 t – Nob Point Export, Cape Flattery Export	750,000 t – Cooktown Outer Export 300,000 t – Cooktown Inner Export
Days per year	360	188
Number of trucks / year	3125	6000 (for 300,000 t/a) 15,000 (for 750,000 t/a)
Number of trucks / day	154	41.7
Barging		
Size of barge	Sub-option 1a or 1b = 90 m / 5000 t	70 m / 2000 t
	Sub-option 2 = 70 m / 2000 t	
Barge loading time	10 h	10 h
Number of barges / day	2	1.85 (average)
Load / day	4000 t	2085 t
Days to load ship (ship at anchor)	Varies from 1 to 9	Varies from 3 to 10
Number of barges / year	Varies from 60 to 375	Varies from 160 to 405
Shipping		
Size of ship	Handysize (35,000 t)	Handysize (35,000 t)
Number of ships / year	Nob Point Export, Cape Flattery Export = 21.4	Cooktown Outer Export = 21.4
	Cooktown Inner Export = 30	Cooktown Inner Export = 30
Load / year	Nob Point Export, Cape Flattery Export = 750,000 t	Cooktown Outer Export = 750,000 t
		Cooktown Inner Export = 300,000 t

Source: Study team compilation.

7.2.12 Rehabilitation

Rehabilitation will be undertaken progressively as areas which have been used for mining or services are no longer required. Rehabilitation will commence in the third year of operations and will continue for the life of the operation. At the completion of operations and decommissioning of the mining and processing equipment all remaining areas in disturbed condition will be rehabilitated.

See **Section 8.2** for further details.

7.2.13 Major Infrastructure Requirements

Use of required of existing infrastructure is described below for each option and summarised in **Table 7-11**.

a) Nob Point Loading

Key items of major infrastructure are as follows:

- local roads between mining area and Hope Vale for general access but not export (Hope Vale Aboriginal Shire Council) (Diatreme to upgrade and maintain road as required)
- local road between mining area and Nob Point (Diatreme to upgrade and maintain road as required)
- land/tidal land at Nob Point for barge loading infrastructure (Diatreme to construct)
- All transhipment anchorages – no works involved other than perhaps navigation aids (Diatreme to install).

b) Cooktown Loading

Key items of major infrastructure are as follows:

- State Controlled Road (Endeavour Valley Road) and local roads between the mining area and Cooktown via Hope Vale (Hope Vale Aboriginal Shire Council, Cook Shire Council) (Diatreme to upgrade and maintain roads as required)
- upgrade of the existing Ida Street Boat Ramp to handle barges (Diatreme to construct)
- All transhipment anchorages – no works involved other than perhaps navigation aids (Diatreme to install).

7.2.14 Operational Land

The operational land is defined in the EP Act as ‘the land on which the project is to be carried out’. This is that part of EPM 17795 that is the subject of the future EA and includes the proposed mining area and ancillary infrastructure within the ML.

This generally can be defined as the ML, but is further described in **Section 7.3.1**.

7.2.15 Location (Geographical)

The locations of all project components (Nob Point Loading and Cooktown Loading) are described in **Section 7.2.1**. In summary these are:

- mining area and Nob Point facilities – near Cape Bedford 20 km east of Hope Vale
- barge loading infrastructure– in the Cooktown suburb of Marton on the banks of the Endeavour River
- transhipment anchorages – either at Nob Point near the mine, in the Port of Cape Flattery, or in or adjacent to the Port of Cooktown)

7.2.16 Size and Type of Mining Activities

This is described in detail in **Section 7.2.3**. In summary, the average depth of the sand to be mined is greater than 15 m and the area to be prepared for mining averages less than 6 hectares per year. The area of the ML is 525 ha.

7.2.17 Related Mining Tenements

EPM 17795 was granted to Diatreme under the MR Act in June 2016 for a 5-year (renewable) term. See **Figure 7-24** below.

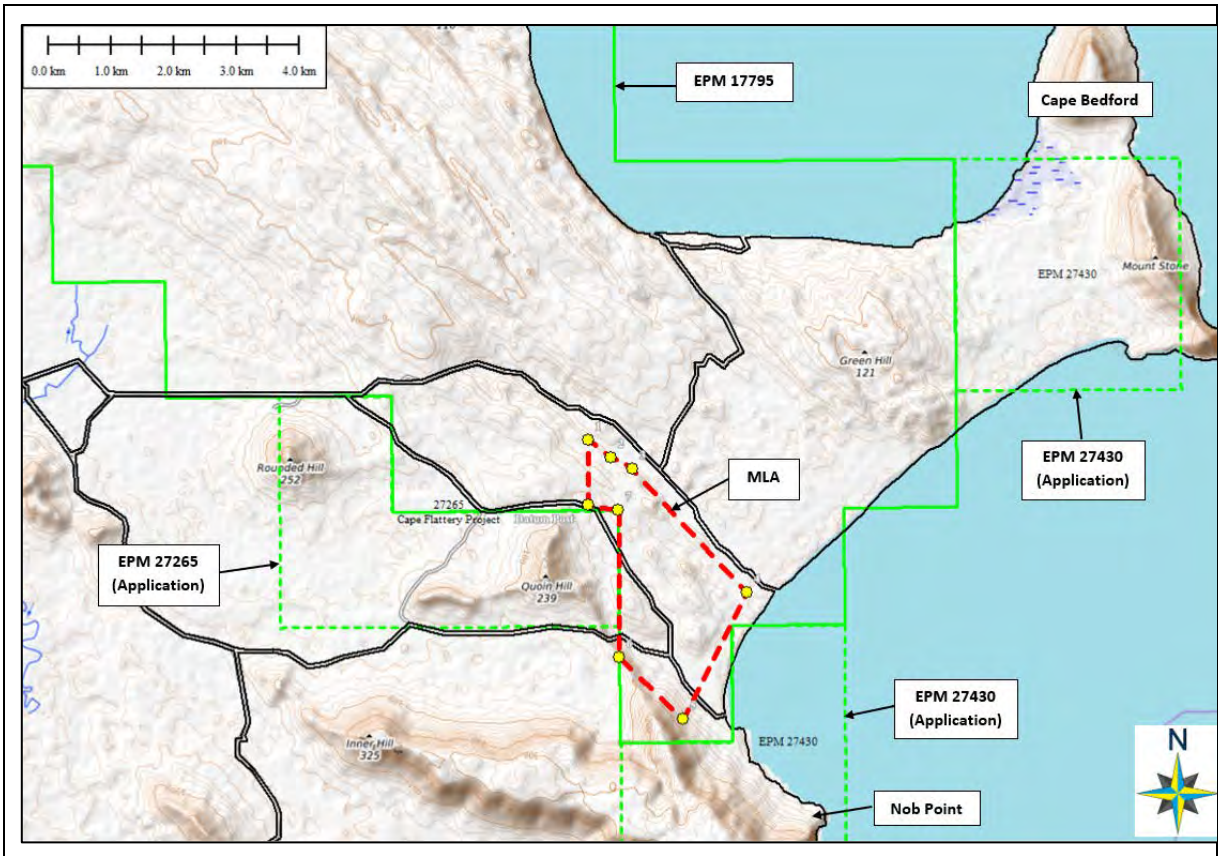


Figure 7-24 EPM and ML details.

Source: Ausrocks (2019b) Figure 1-2.

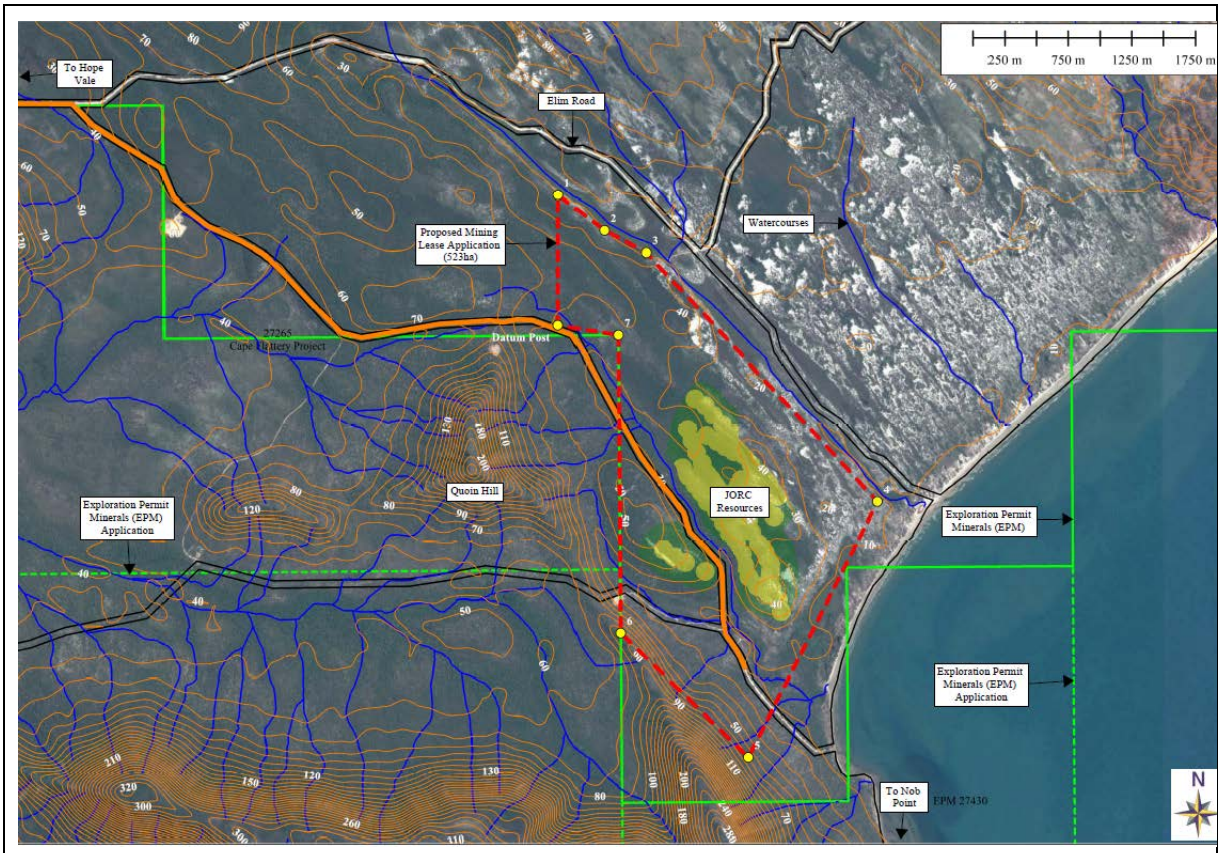


Figure 7-25 ML details.

Source: Ausrocks pers. comm.)

Diatreme holds Environmental Authority EPSX00173613 granted on 22 June 2016 under the EP Act for exploration and for which standard conditions for mineral exploration apply.

It is proposed that the EIS and ML processes will take place in parallel. A new EA will be applied for once the EIS is approved. As required under s.59 of EP Act, the EIS will set out recommended/prescribed conditions that must be attached to the future EA and this requires that appropriate information upon which to base such conditions will need to be documented.

7.2.18 Off-Lease Activities

a) Nob Point Loading

Off lease activities for Nob Point Loading will consist of export-related matters (see also **Section 7.2.5** and **Section 7.2.6**):

- upgrading and use of the Nob Point Transport Corridor
- construction and use of loading infrastructure at Nob Point
- barging product from Nob Point the Nob Point Transhipment Anchorage opposite Nob Point

b) Cooktown Loading

Off-lease activities for Cooktown Loading will consist of export-related matters (see also **Section 7.2.7**):

- upgrading and use of the Road Transport Corridor between the mine and Cooktown via Hope Vale
- upgrading and use of the existing boat ramp on the Endeavour River at Marton, Cooktown
- barging product from the Marton loading infrastructure to the Cooktown Transhipment Anchorage.

7.2.19 Land Access for the Purposes of EIS Studies

The various project elements and associated access requirements are summarised in **Table 7-8** below.

Table 7-8 EIS Study areas and access

PROJECT ELEMENT	LOCATION	DETAILS
Mining Area		
Mine and associated infrastructure	Within current EPM.	• Access permitted under current EA.
Nob Point Loading		
Nob Point Road Transport Corridor	• Part within current EPM. • Balance within Hope Vale Shire road.	• Access permitted under current EA. • No approval to access is required.
Nob Point barge loading infrastructure (both sub-options)	• Above HAT – Aboriginal land controlled by Congress. • Below HAT and above LAT – state waters • Below LAT – Commonwealth waters	• Access permitted under current agreement with Congress. • No approval to access is required. • Marine scientific studies and investigations (below HWM) will be undertaken by registered consultants in accordance with pre-existing scientific research permits.
Nob Point Export Option		
Transhipment Anchorage (Nob Point)	Open water.	• No approval to access is required. • Marine scientific studies and investigations (below HAT) will be undertaken by registered consultants in accordance with pre-existing scientific research permits.

(Continued over)

PROJECT ELEMENT	LOCATION	DETAILS
Cape Flattery Export Option		
Transhipment Anchorage (Cape Flattery)	Open water.	• No approval to access is required. • No additional marine scientific studies or investigations proposed (noting that the Port of Cape Flattery is in an exclusion area (for both the State and Federal marine parks)).
Cooktown Export (Trucking) Option		
Road Transport Corridor (mining area to Cooktown via Hope Vale)	Within Hope Vale Shire and Cook Shire roads and TMR's Endeavour Valley Road.	• No approval to access is required.
Cooktown Barge loading infrastructure	Located beside the Marton boat ramp on the Endeavour River. Land is owned by CSC and is proposed to be subject to a future lease.	• Approval to access the foreshore of the land for the EIS studies has been granted by CSC.
Barge route	Endeavour River.	• No approval to access is required. • Marine scientific studies and investigations (below HAT) will be undertaken by registered consultants in accordance with pre-existing scientific research permits
Cooktown Transhipment Anchorage (both sub-options)	Inside/outside Cooktown Port limit (below LAT).	• No approval to access is required. • Marine scientific studies and investigations (below HAT) will be undertaken by registered consultants in accordance with pre-existing scientific research permits

Source: Study team compilation. Note the term HAT (Highest Astronomical Tide) is used loosely to describe high water.

This table shows that the EIS studies can be undertaken on all land and water either under current agreements and permits or as-of-right.

7.2.20 Power and Water Supply (ML)

a) Power

The site's operational power supply will be a hybrid diesel-solar system where diesel generators will supply the base load and solar panels will provide a variable supply during the day to reduce the diesel fuel consumption.

The solar panels, together with battery storage, will also be used as a back-up supply for offices and workshops during generator maintenance. The diesel generators will be sized to suit the full site power demand which is expected to be up to 750 kW.

b) Water

The estimated water requirement for the mine and site facilities is 500 ML per year (average of 15.8 L/s). This supply is expected to be obtained from groundwater bores close to the mine site. A hydrogeological study is currently being planned to confirm the sustainability of this concept as part of the EIS process. Refer **Section 8.3.2j)**.

7.2.21 Personnel

a) Construction

There will be three separate construction sites for the 6 to 8 month project construction period:

- mining area
- barge loading (Nob Point or Cooktown)
- road upgrade site (mine to Nob Point or mine to Cooktown).

Table 7-9 below sets out an estimate of staffing for the mine and the two loading options during the construction phase. The construction workforce for the product logistics system will be estimated when full details of the system are finalised.

b) Operation

Table 7-9 below sets out an estimate of staffing for the mine and the two loading options during the construction and operational phase.

c) Summary

Table 7-9 Summary of staffing

STAGE	MINE SITE	NOB POINT LOADING	COOKTOWN LOADING
Construction			
	25	Road transport – 5 Barge loading – 10	Road transport– 5 Barge loading – 10
Total	***25***	***15***	***15***
Operation			
	Mine Manager Office Administrator Logistics Administrator Production Superintendent 2 x Laboratory Technicians 4 x Shift Supervisors 4 x Machine Operators 12 x Process Operators 1 x Night Watchman if necessary.	Road transport (drivers) – 9* Loading / transhipping – 9*	Road transport (drivers) – 9 Loading / transhipping – 25
Total	***27***	***18****	***34***

* estimate only

Based on these figures, total numbers are:

- Construction (both loading options): 40 people over less than one year
- Operation:
  - Nob Point loading: 27 + 18 = 45 people, OR
  - Cooktown loading: 27 + 34 = 61 people.

In addition, there will be short term contractors and others not based at the mine site (e.g. electrical and mechanical contractors who will supply maintenance services).

The market for low iron silica is expected to continue growing and additional employees will be required to increase the production rate in line with market demand.

7.2.22 Accommodation

The GSSP will not be a FIFO (fly-in fly-out) operation. It will not require a site camp and employees and contractors will be accommodated in the Hope Vale and Cooktown areas where there are adequate facilities for the workforce.

A bus will be used during construction to reduce the number of vehicles travelling on the road from Hope Vale to the construction site. Private and company vehicles will be used for transport during operations.

On-site accommodation will be limited to a night watchman.

7.2.23 Size of Project Site

The area of the ML is 531 ha.

7.2.24 Size of Area Disturbance

a) Mining

The expected area of disturbance consists of a one-off disturbance of approximately 24 ha for the construction of the mine infrastructure and a varying annual disturbance as the mining activity proceeds and is progressively rehabilitated. See **Table 7-4**. As noted previously, disturbance varies from year to year from 3.2 ha to 13.5 ha per annum and averaging just under 6 ha per annum. Due to the lag between mining and rehabilitation it is possible that up to 16 ha may be exposed at any one time.

b) Nob Point Loading

Construction of the Nob Point Access Corridor and the Nob Point loading infrastructure will involve clearing of up to approximately 27 ha (varies depending on loading option).

c) Cooktown Loading

Construction of the loading Cooktown infrastructure will involve clearing of approximately 1 ha.

7.3 SITE AND LOCALITY DESCRIPTION

Provide the following information for the project site and surrounding area, supported with maps where possible:

- *a description of the operational land*
- *real property descriptions*
- *easements*
- *existing resource tenures*
- *resource leases under application*
- *infrastructure (including transport (air, land and sea), state-controlled roads, utility services and rail networks*
- *topography*
- *landforms (including catchments)*
- *significant features*
- *geology (including aquifers, faults and economic resources)*
- *soils*
- *climate.*

7.3.1 Operational Land

Most of the project will take place within a mining lease (yet to be issued) over the resource area on part of EPM 17795. This EPM covers part of the large Lot 35SP232620 which is Aboriginal freehold land under the ALA.

The remainder of the project involves works on intertidal and subtidal land under the jurisdiction of the Queensland Government and Commonwealth Government respectively.

The nearest town to the proposed mine is Hope Vale (~20 km to the west). Other nearby localities are Cooktown (~20 km south) and Cairns (~200 km south). All distances are approximate and are line of sight.

This is a remote location without an appropriate street address. The nearest recognised landmark is Nob Point, Hope Vale, Queensland 4895 (15° 20.347'S 145° 17.759'E).

7.3.2 Real Property Descriptions

Relevant RP descriptions are as described below.

Table 7-10 Relevant RP descriptions

PROJECT ELEMENT	RP DESCRIPTION	NOTES
Mining Area and Associated infrastructure		
Mining area	35SP232620 (part)	Aboriginal freehold land held by Congress.
Nob Point Loading		
Nob Point Road Transport Corridor	• Part within current EPM 17795. • Balance within Hope Vale Shire road.	• Access permitted under current EA. • No approval to access is required.
Barge loading infrastructure	• Above high water – 35SP232620 • Below high water and above low water – state waters • Below low water – Commonwealth waters	Appropriate tenure arrangements for the component of the works below high water mark will be resolved with DNRME and Commonwealth agencies as part of the EIS process.
Cooktown Loading		
Road Transport Corridor (mining area to Cooktown via Hope Vale)	Road Reserve	
Barge loading infrastructure	93BS202	1 ha lease proposed (CSC is Trustee). Appropriate tenure arrangements for the component of the works below high water mark will be resolved with DNRME as part of the EIS process.

Source: Study team compilation.

7.3.3 Easements

There are no easements involved in the project.

7.3.4 Existing Resource Tenures

Refer **Section 7.2.17**. Existing resource tenure is EPM 17795.

7.3.5 Resource Leases under Application

Refer **Section 7.2.17**. An ML application was submitted in December 2019. The ML covers 525 ha.

7.3.6 Infrastructure

The proposed mine is in an area remote from infrastructure. Key infrastructure is listed in **Table 7-11** below, together with details of relevant infrastructure that the project will need to access. Refer also to **Section 7.2.10** for details of road transport infrastructure.

Table 7-11 Local/regional existing infrastructure

INFRASTRUCTURE	DETAILS	NOB POINT LOADING	COOKTOWN LOADING
State Controlled Road	Endeavour Valley Road (Cooktown to junction with Cooktown-McIvor River Road with Battle Camp Road (34.8 km)	-	To be accessed for road transport of product to Cooktown
Local roads	Cooktown-McIvor River Road to Hope Vale (10 km)	-	To be accessed for road transport of product to Cooktown
	Local road from Hope Vale to mining area (approximately 20 km)	-	To be accessed for road transport of product to Cooktown
	Local road from mining area to Nob Point (approximately 3.6 km)	To be accessed for road transport of product to Nob Point	-
HV electricity	Hope Vale	Not required	
Telstra	Hope Vale / Cooktown	Mine & Nob Point loading: no new infrastructure, although it is possible that a mobile booster may be installed as cell coverage in the area is patchy)	Mine: as for Nob Point loading Cooktown loading: no upgrade required
Ports	Cooktown (20 km*) – public infrastructure in designated port * line of sight	Required for vessel refuge in case of cyclones	Required for some transhipping options
	Cape Flattery (40 km*) – private silica export facility in designated port * line of sight	Required for some transhipping options	-
Hospitals	Hopevale Primary Health Care Centre, Hope Vale	If needed in emergency	Cooktown Hospital
Airports	Hope Vale Airstrip (1000 m strip, no facilities) Cooktown Aerodrome (1627 m strip, minimal facilities)	Occasional use possible Regular use likely	Occasional use possible Regular use likely
Rail Network	Nil.	N/A	N/A

Source: Study team compilation.

7.3.7 Geomorphology and Topography

The ML is part of the *Heathlands* landscape (Biggs and Philip 1995), described as follows

> The Heathlands landscape dominates the northern quarter of CYP, stretching from coast to coast. It consists principally of soils derived from sandstone that are vegetated with heaths and *E. tetrodonta* woodlands. Significant accumulations of windblown sand exist on the east coast as dune formations, with Giant Podosols (Daunt) the most common soil. Although only one site within the dune systems was described by NR02, it was observed that the depth to the B horizons varies with landscape position. Active blowouts are a feature with perched lakes common at the tail of the blowouts.

Refer also to Soils (**Section 7.3.12**).

The ML (red polygon in **Figure 7-26**) lies just south of Cape Bedford which rises to 234 m (Mt Stone) with a second peak to just over 220 m (unnamed). Several other hills exist in the vicinity of the ML including Rounded Hill (252 m), Quoin Hill (239 m), and Inner Hill (325 m). To the south is Nob Point which is the southern end of a ridge that runs north-west to Quoin Hill. Land falls quite steeply from this ridge to the ocean, flattening out to a broad basin that contains the proposed mine and ancillary facilities. The land rises from a low coastal dune to an elevation of about 50 m in the north-west corner of the ML. Refer to **Figure 7-26**.

The dominant land form of the broader Cape Bedford / Cape Flattery area is the extensive Quaternary sand mass and dune field that stretches inland from the present coast for approximately 10 km and extends 50 km from north to south. According to the CYPLUS Natural Resources and Ecology report (Environment Science and Services (NQ) 1995), the Cape Bedford / Cape Flattery dunefields contain a range of depositional and erosional landforms based on the interaction of sand-wind-water-rain-vegetation. The extent of the active parabolic dunes in the Cape Bedford-Cape Flattery area is of international significance.

The primary significance of these dune systems and their associated lakes generally relates to:

- their ability to provide indications of the geomorphological development of tropical dune systems
- the importance of the lakes with respect to endemic, restricted and rare fauna and flora
- the associated richness of landforms and biological features of the areas
- their ability to contribute to the understanding of the Quaternary development of the tropical region.

At the local level, the land is intersected by a number of small coastal streams which are largely unnamed. The exception is Deep Creek, a 1st order stream that runs in a south-easterly direction along the northern boundary of the ML to the coast. The southern part of the ML contains a 3rd order stream (locally known as Alligator Creek) that drains the swales between the dunes. Refer **Figure 7-27**.

Figure 7-26 Topography – context.

Source: Queensland Globe.

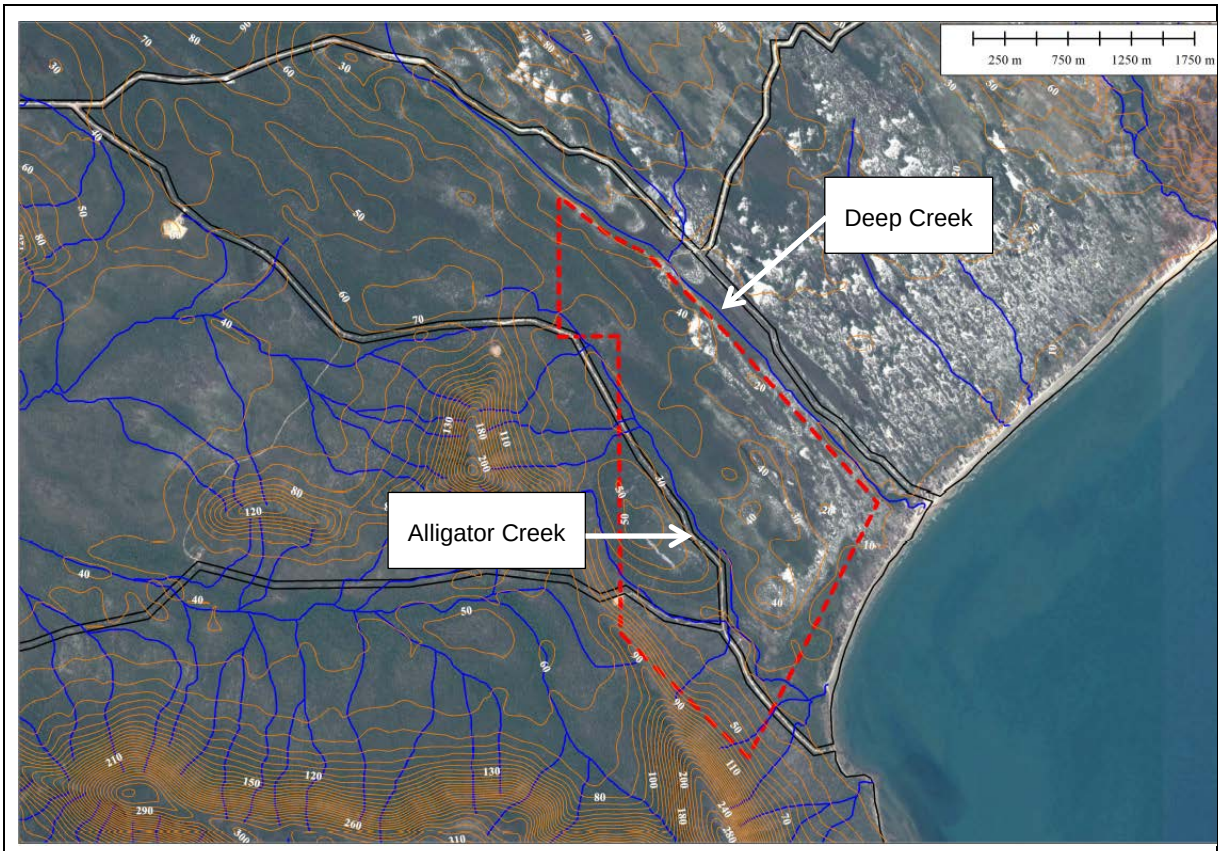


Figure 7-27 Topography – detailed.

Source: Ausrocks (2019a).

As part of initial planning, Diatreme has produced a Digital Surface Model (DSM) and Digital Terrain Model (DTM) from Stereo WorldView-3 Imagery. Ground-controlled aerial data was captured in 2017 and was produced in GDA94/MGA55 format. Final 50 cm (re-projected) DEMs (Digital Elevation Models i.e. both DSM and DTM) were produced and 50 cm tagged contours generated from the final 50 cm DEMs.

This elevation data covers the ML and a strip of coastal land between the ML and Nob Point and is suitable for the EIS and concept design.

Bathymetric data at Nob Point has also been collected and is shown on **Figure 7-16**.

7.3.8 Landforms and Catchments

a) Landforms

Figure 7-28 shows that the mining area has complex topography with a series of longitudinal sand dunes projecting into it from the beach. The intra-dune wetland to the north has formed within a deflation trough between low (c. 20 m AHD.), elongate, parabolic dunes. The two wetlands between the beach and the mining area are located in the relatively flat area between the foredunes, and the stabilised parabolic dunes.

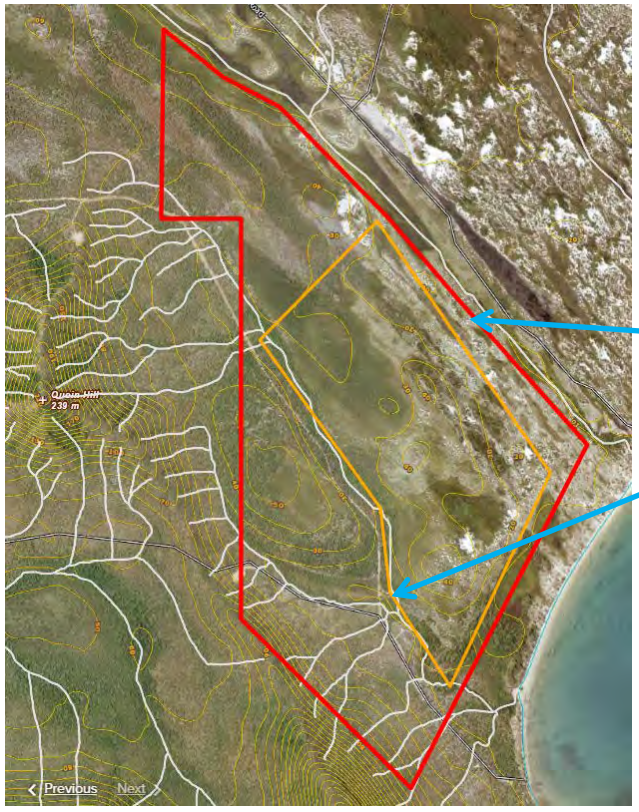


Figure 7-28 Relief and drainage.

Source: Queensland Globe. Note that all watercourses are shown as 'unmapped' on the Waterways Identification Map produced under the *Water Act 2000* (Qld). 'Deep Creek' and 'Alligator Creek' do not appear to be official names.

Both wetland locations appear to be independent of a defined waterway, and instead are fed by lateral flows from the slopes of the complex dune morphology. These flows would be limited and the wetlands may be seasonal and subject to drying out in the winter months.

During the dry season survey, standing water was present within the wetland behind the foredunes at the east of the ML and also within the wetland to the north-east of the ML, indicating the wetland's permanence, which is illustrated further by the vegetation present at each location. The wetland located in the northern corner of the ML is considered ephemeral and it is likely that water would only be present after heavy rainfall events.

b) Catchments

The mining area is within the Endeavour Basin of the Eastern Cape York water quality region. There are no major waterway features within the ML; rather, it forms part of a stretch of coastal dunes that drain towards a series of generally minor (2nd order stream) unnamed creeks. The ML is bounded to the north (Deep Creek) and south (Alligator Creek) by two such creeks which drain the site. The upstream catchments of these waterways are mostly undeveloped, suggesting that existing water quality is likely to be high. Based on Queensland Government mapping, there are several small palustrine wetland features located in or adjacent to the ML.

All streams are shown on the Waterways Identification Map (WIM) under the *Water Act 2000* (Qld) (Water Act) as 'unmapped'. See **Figure 7-28** above. This is not an indicator of value, just mapping effort. Water quality is discussed in **Section 8.3.1a)**.

7.3.9 Significant Features

The following is an extract from *The Geological Story of Cape York Peninsula* (Willmott 2009) prepared for the CYPLUS project.

> The east coast of the Peninsula is noted for the strong south-easterly winds which buffet the foreshores almost continuously for much of the year, and it is not surprising that several great fields of sand dunes have been blown inland from the coast. Two of these, one near Cape Bedford- Cape Flattery north of Cooktown, and another at Shelburne Bay in the north, cover hundreds of square kilometres, and contain the highest proportion of active coastal dunes in Australia. Other smaller fields are south of Cape Melville, at Cape Direction, north and south of Orford Bay and at Newcastle Bay.
>
> The dunes trend down-wind to the northwest and are of the long, narrow 'parabolic' type, with sand spilling over a nose from a blown-out rear section, and long trailing vegetated arms on the sides. Most of the dunes are now vegetated, but a significant number are active under the current climate. One large dune has moved right across the Shelburne Bay field to enter the sea in Shelburne Bay at the aptly named White Point. Between the dunes are hollows occupied by sizeable swamps and lakes of various types, and these and a mosaic of vegetation types are of great scenic interest.
>
> The dunes consist of white quartz (silica) sand of great purity, which contrasts with the shelly quartz sand on modern beaches derived in part from offshore coral reefs. It is believed that the sands originated on foreshores to the east of the present coastline at times when sea levels were lower (and reefs possibly less prevalent). Sand was brought down by rivers, transported by coastal currents, and washed up on beaches and into foredunes. From there some began to be blown inland. When the sea level started to rise, beaches moved westward, and an abundant supply of sand was rolled landward to be blown into higher and higher dunes. This process happened more than once, and there are several ages of dunes present, although later reworking of old dunes into new ones complicates the picture. It may not be a coincidence that these fields fringe a section of the north Queensland coast which is backed not far inland by sandstones of the Laura and Carpentaria Basins. Erosion by coastal streams would have contributed abundant sand to the beaches.
>
> The oldest dunes have been weathered and leached of any minor minerals so these have the purest sands. At Cape Flattery some of them are being mined for export for glass making. (p26)

7.3.10 Regional Geology

The geology of the area is dominated by Cenozoic age sandy sequences overlying Mesozoic and Palaeozoic sediments as shown on **Figure 7-29** (based on the Cooktown 1:100 000 Geological Map). The Devonian Hodgkinson Formation comprising fine to medium grained greywacke interbedded with siltstone, mudstone and minor conglomerate crops out to the south and west of the ML and to the northeast near Cape Flattery. These rocks have been intruded by granites to the west of Hopevale and near Cooktown. Remnants of Mesozoic sandstone (Dalrymple Sandstone and Gilbert River Sandstone) overlie the Hodgkinson Formation.

The principal sand bearing units have a north-westerly trend and are largely of Pleistocene and Holocene age, although blowouts forming younger dunes are common. Pleistocene dunes are commonly parabolic in shape and have thick A2 horizons overlying orange, yellow or brown coloured sand. In the area investigated, Holocene age dunes overlie the older sand sequence particularly closer to the coast. Close to the Mesozoic, and Devonian rocks are Quaternary units comprising sand, silt and clay often with blocks of Mesozoic sandstone.

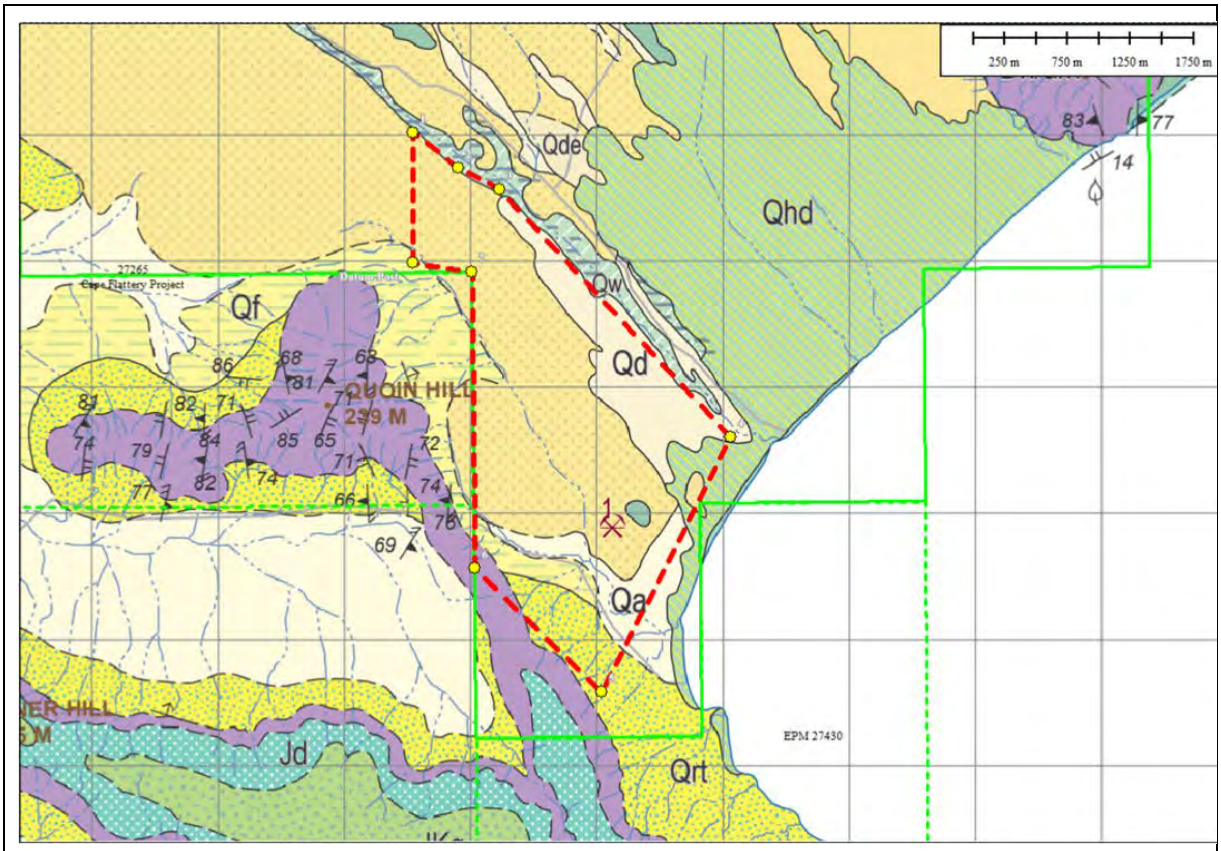


Figure 7-29 Regional geology.

Source: Ausrocks (2019b) Figure 2.1.

7.3.11 Site Geology

Ausrocks Pty Ltd (Ausrocks) completed an Indicated Resource and Updated Inferred Resource Assessment for the project in March 2019 (Ausrocks 2019a). This included a review of the regional geology as summarised above and details of the site geology of the proposed ML based on four drilling campaigns undertaken on site as follows:

- September 2017 – 29 Holes /606 m
- October 2017 – 26 Holes / 670m
- April 2018 – 9 Holes / 164m
- June 2018 – 32 Holes / 659.5 m
- November 2018 – 30 holes / 701 m.

From the drilling campaigns, 75 holes were used to define JORC Compliant ‘Indicated’ and ‘Inferred’ Resource boundaries for both the East and West Nob Point dunes. These terms are explained in **Table 7-12** below.

Table 7-12 JORC code terminology

TERM	MEANING
JORC Code	Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves
Maiden Inferred Resource	The first Mineral Resource estimate for the project that has reached the JORC classification 'Inferred'
Maiden Indicated Resource	The second Mineral Resource estimate for the project that has reached the JORC classification 'Indicated'
Proved Ore Reserve	This is the highest quality standard for Ore Reserve estimates under the JORC Code and can only be developed from a Measured Mineral Resource estimate

An assessment of the chip tray photos and the geological logs for the Nob Point area has indicated that the base of the geological sequence comprises fine grained red to brown coloured sand representative of an older weathering surface. The overlying sand (the target for the project) comprises white to cream and light grey, fine grained sand with some yellow, orange and brown overtones.

Drilling did not indicate any clay bands within the upper sand unit.

The sand is generally fine grained, although logging indicated some fine to medium grained sections. Detailed chemical analyses showed the majority of the samples contained > 98.5 % SiO_2, with variable proportions of Al_2O_3, Fe_2O_3, TiO_2 and Cr_2O_3 suggesting the presence of clays, iron oxides and heavy minerals. **Figure 7-30** is a typical section through the ML running from NW to SE.

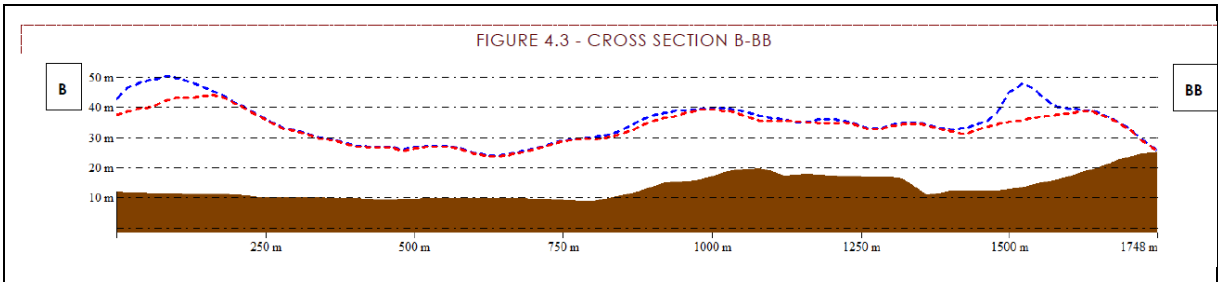


Figure 7-30 Site geology – typical section.

Source: Ausrocks (2019b) Figure 4.3.

This shows that the resource is between 10 and 30 m thick.

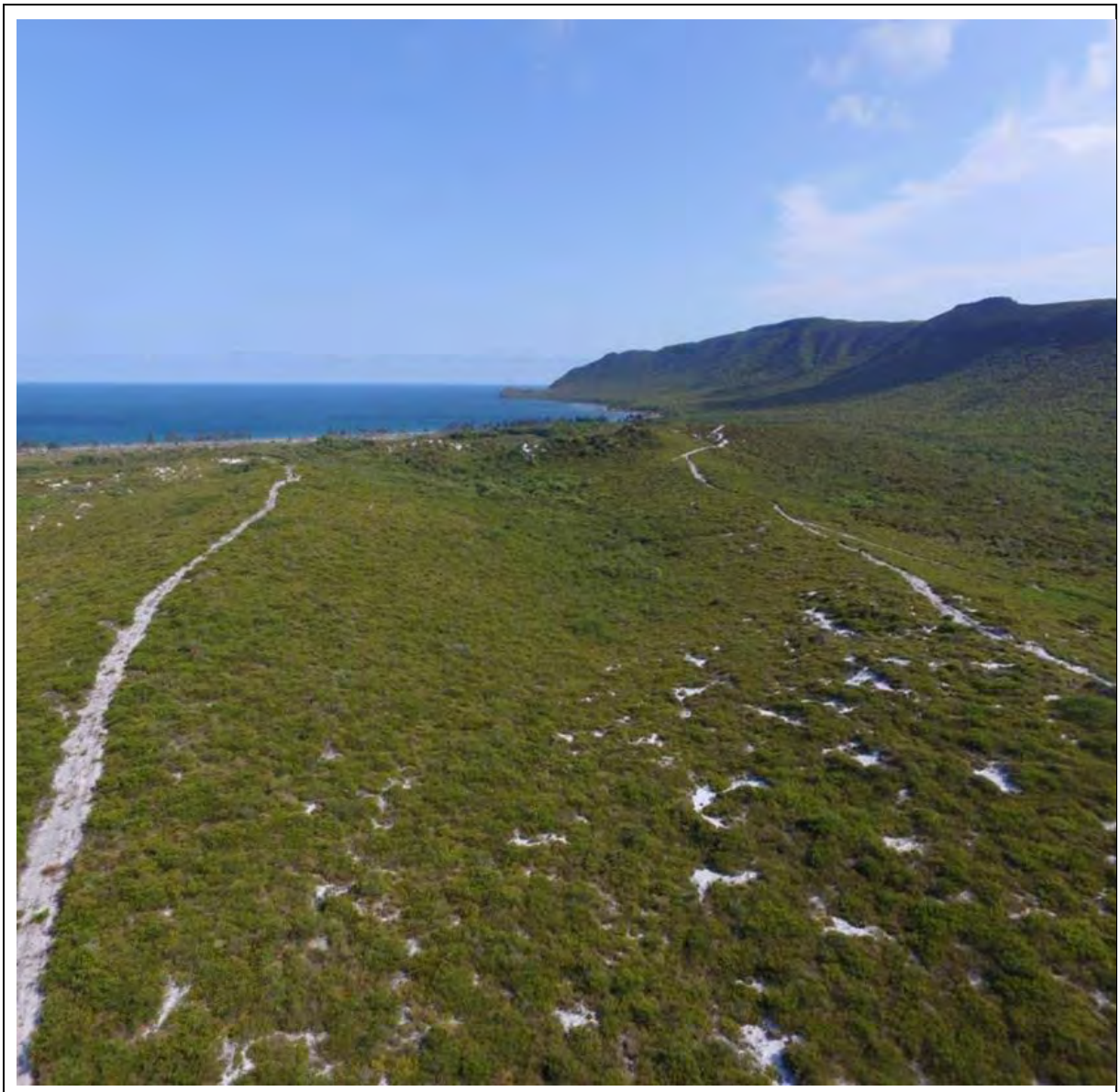


Photo 7-6 Drone view south across proposed ML area to Nob Point.

Photo: Diatreme (November 2017).

7.3.12 Soils

a) Mining Area & Nob Point

Figure 7-31 below is an extract of the regional soils map derived from the CYPLUS project (Biggs and Philip 1995). This data is available on Queensland Globe. Mapping shows that the soil of the ML is Dn (Daunt), described as *Giant Uniform bleached sand over orstein pan, in coastal sand dune.*

A small area of Db (Doughboy) occurs in the lower (eastern) part of the ML described as *Very deep bleached Uniform sands on coffee rock and occasionally orstein, formed in beach ridges.*

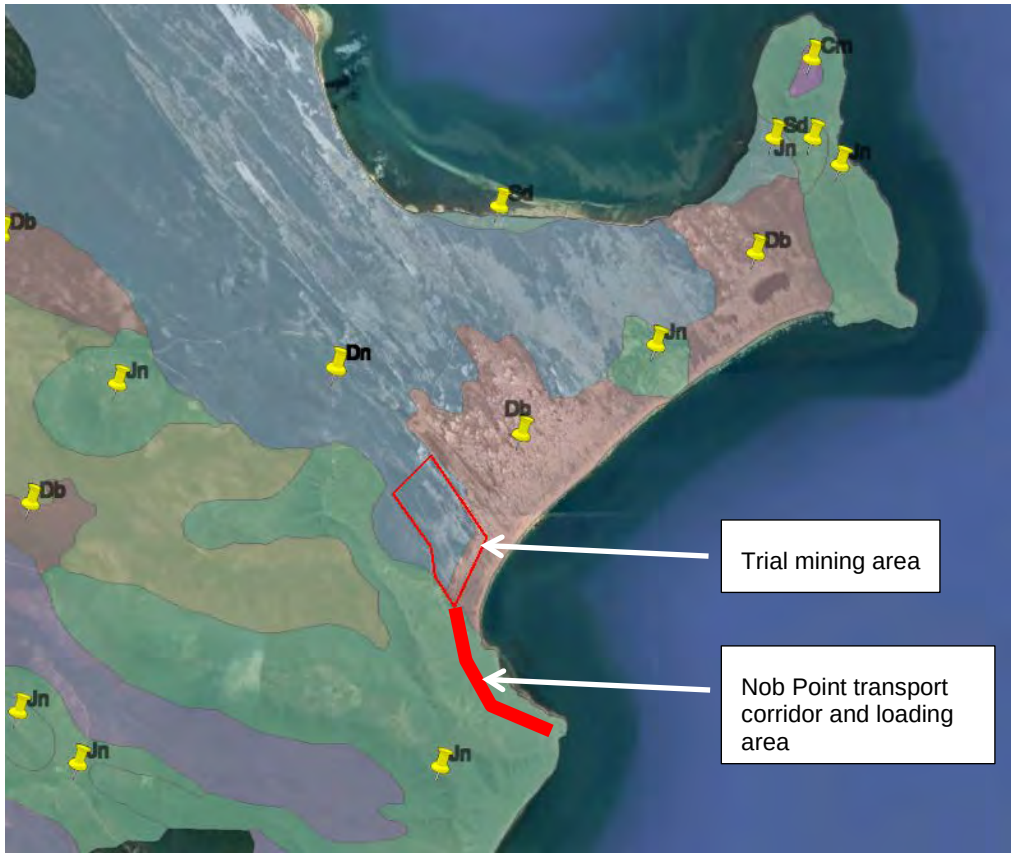


Figure 7-31 Soils.

Source: Queensland Globe based on Biggs and Philip (1995).

According to Biggs and Philip (1995):

> **Daunt** is found only in the dunefields of the east coast. A Giant Podosol, its nature probably varies in a similar manner to that of Doughboy, i.e. as a result of landscape position. Location within the dunefield may also have a significant bearing on depositional or erosional forces acting on the soil. Blowouts are a significant feature of the dunefields. Only one site was described for Daunt, due to the inaccessibility of the dunes. It consisted of a thin dark A1 overlying an extensive (15 m) bleached sand A2 below which were sesquic B2 horizons spanning nearly 5 m. Bleached 2A2 horizons and sesquic and humosesquic horizons are found below the B2. Vegetation on the dunefields is predominantly heath, but it may be lacking in active blowouts. Perched lakes are very common.
>
> **Doughboy** is largely restricted to beach ridge and dune deposits on the east coast. It is a Podosol with variable properties, depending on landscape position. Some occurrences, particularly in swales are more likely to be Aquic while others are Semiaquic. The surface horizon varies in depth considerably (0.2 -.5 m) and overlies a similarly variable bleached A2. A narrow B1 is occasionally present. The B21 horizon may be humic or humosesquic whereas the B22 is often sesquic in nature. Consistency of the B2 varies from very weak to firm. Below the B2, may lie 2A2e and 2B2 horizons. These are probably formed in a similar manner to the equivalent horizons in Caravan. Vegetation on Doughboy varies from woodlands to dwarf open heaths.

b) Cooktown Transport Corridor

Not assessed.

c) Cooktown Loading Area

Soils across the majority of the Cooktown loading area, which occur on alluvial plains, beyond the upper bank of the Endeavour River, comprise dark brown to grey loamy sands to loams (Dy3.41) (Biggs & Philip 1994). Further east, on the banks of the Endeavour River, soils comprise sandy alluviums.

7.3.13 Groundwater

a) Desktop Assessment

Based on Geology of the Cooktown 1:100,000 Sheet Area, North Queensland (Bultitude *et al.* 1991) there are likely to be two major groundwater domains within the ML and adjacent areas that need investigations. They are the Quaternary sand dunes hosting the silica sand and the metamorphic basement rocks of the Devonian Hodgkinson Formation.

Harrington and Cook (2014) define the groundwater resources present in the Cape Bedford area as, 'fractured or fissured, extensive aquifers of low to moderate productivity' with low salinity (between 1 and 30% of the area with salinity >1500 mg/L). While groundwater bores are known from the surrounding area (see below), data is not available from these bores to indicate the quality or quantity of groundwater for the ML. Despite this, due to high rainfall levels and sandy soils, there is expected to be a high level of groundwater recharge, particularly during the wet season.

The known groundwater bores are:

- Queensland Government monitoring bores at Cooktown and Hope Vale
- three bores located as shown on **Figure 7-32**.

Figure 7-32 Logged bores in the vicinity of the ML.

Note that none are currently operational.

Recent (January 2020) inspections reveal that none of these is still operational.

Domain 1 – Quaternary Sand Dunes

The Nob Point system hosting the silica sand is interpreted to a Pleistocene dune system containing significant sequences of leached A2 horizon sand profiles. The southern and eastern end of the dune system appears to have a more complex stratigraphy with later and younger (Holocene) dune systems uncomfortably superimposed on the older dune system. These younger dunes have marginally higher FeO_x contamination resulting in minor colour change.

The dune system irrespective of age most likely acts as one groundwater system as drilling results to date indicate negligible clay and aquitards within the dune profile between the different aged dunes. Direct monsoonal (?) rainfall will recharge the dune system annually and dry season seepage will discharge.

The dunes themselves appear to have little to no drainage system superimposed on top of them, as the porous nature of the sand appears to soak up most surface water.

The western edge of the dune system is bounded by the basement Hodgkinson Formation metamorphics, with the contact resulting in the Alligator Creek alignment. Alligator Creek appears ephemeral with seasonal surface water from the west. At the southern end of the resource area, there is tidal influence within Alligator Creek.

The Eastern edge is bound by Deep Creek which appears to be perennial and re-charged by groundwater from the dune system. This standing water level may reflect standing groundwater levels.

The southern end of dune system is bound by the coast and a 400 to 500 metre separate dune and swamp system forms a different geomorphology which is between 5 and 15 metres about AHD.

Domain 2 – Devonian Hodgkinson Formation

The basement sequence for the Nob Point dune system appears to be the Hodgkinson Formation (HF).The Mesozoic Dalrymple Sandstone crops out locally, but is limited to plateaux and appears stratigraphically too high to form the basement locally. The HF stratigraphy consists of interbedded fine to medium-grained arenite and mudstone. The HF is metamorphosed and protolith is interpreted to deep water sediments. This unit effectively forms the basement on which the Quaternary sand dunes unconformably sit. Palaeo surfaces most likely form the contact zone as the Quaternary sand dunes were superimposed.

b) Field Data

To date no formal investigations into groundwater have been undertaken. However, in most cases all drill holes completed for the resource evaluation terminated when water was encountered. Accordingly, the groundwater level is expected to closely align with the base of the resource. The only exceptions are where basement is above the standing water level within the sand dune and basement was reached before groundwater was encountered.

Figure 7-33 below is a conceptual groundwater model developed by Golder Associates prior to commencing the EIS hydrogeology study. This figure shows the likely movement of groundwater based on extensive experience with the Cape Flattery groundwater system and local topography. It will be updated in the EIS.

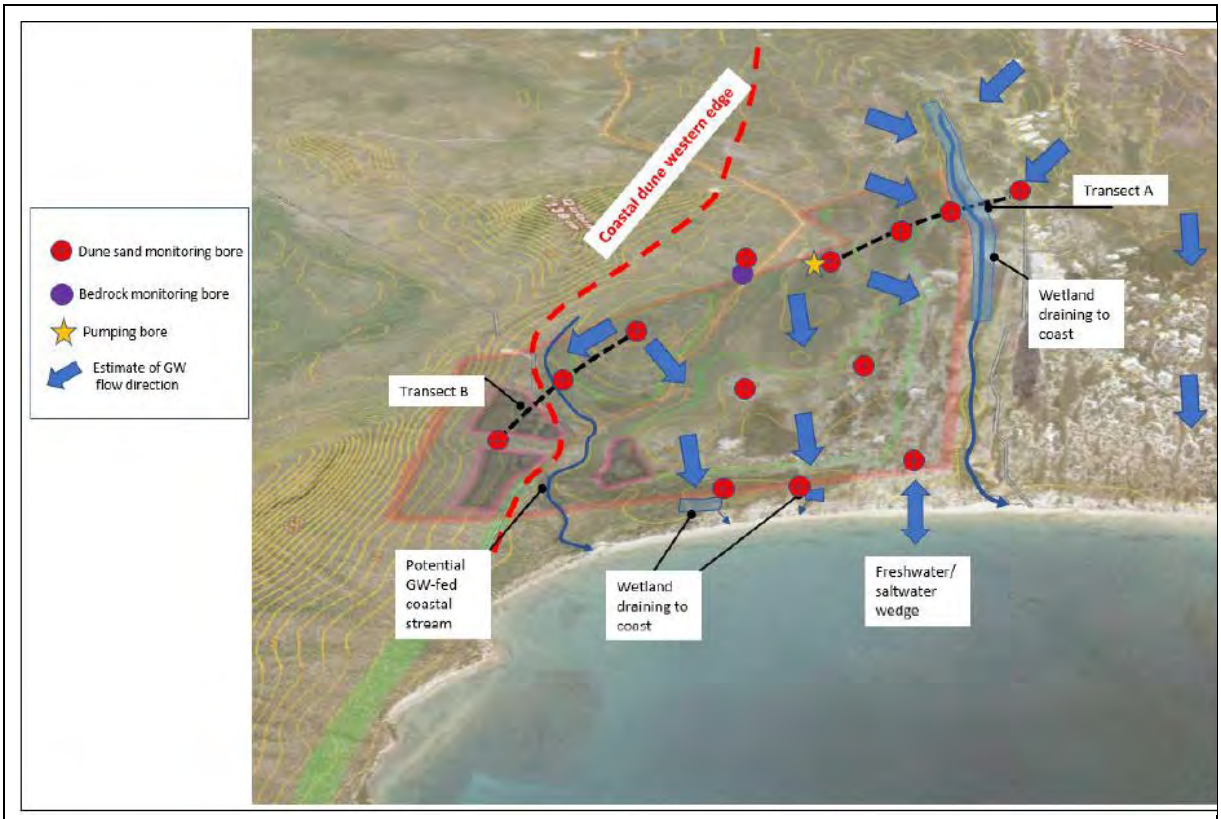


Figure 7-33 Initial conceptual groundwater model.

Source: Golder Associates (T Ezzy pers. comm. 22 January 2020).

7.3.14 Faults

Nil.

7.3.15 Economic Resources

According to Ausrocks (2019a), the JORC Compliant Resource Estimate (defined in Table 7-12 above) is as per **Table 7-13** below.

Table 7-13 Maiden Indicated Resource

Area	Cut-off SiO_2%	SiO_2% Grade	Indicated (Mt)	Inferred (Mt)	Inferred & Indicated (Mt)
East Nob Point	99%	99.26%	20.2	6.6	26.8
West Nob Point	99%	99.16%	1.3	2.1	3.4
Total			21.5	8.7	30.2

Source: Ausrocks (2019a) current as of March 2019.

7.3.16 Climate

a) Rainfall and Temperature

Climate and rainfall information for Cape Flattery (50 km north of the ML) is shown on **Figure 7-34**. The long term average rainfall at Cape Flattery is over 1500 mm per year with peak falls occurring in the summer months from December to April but with much lower rainfall in the winter dry season from July to October.

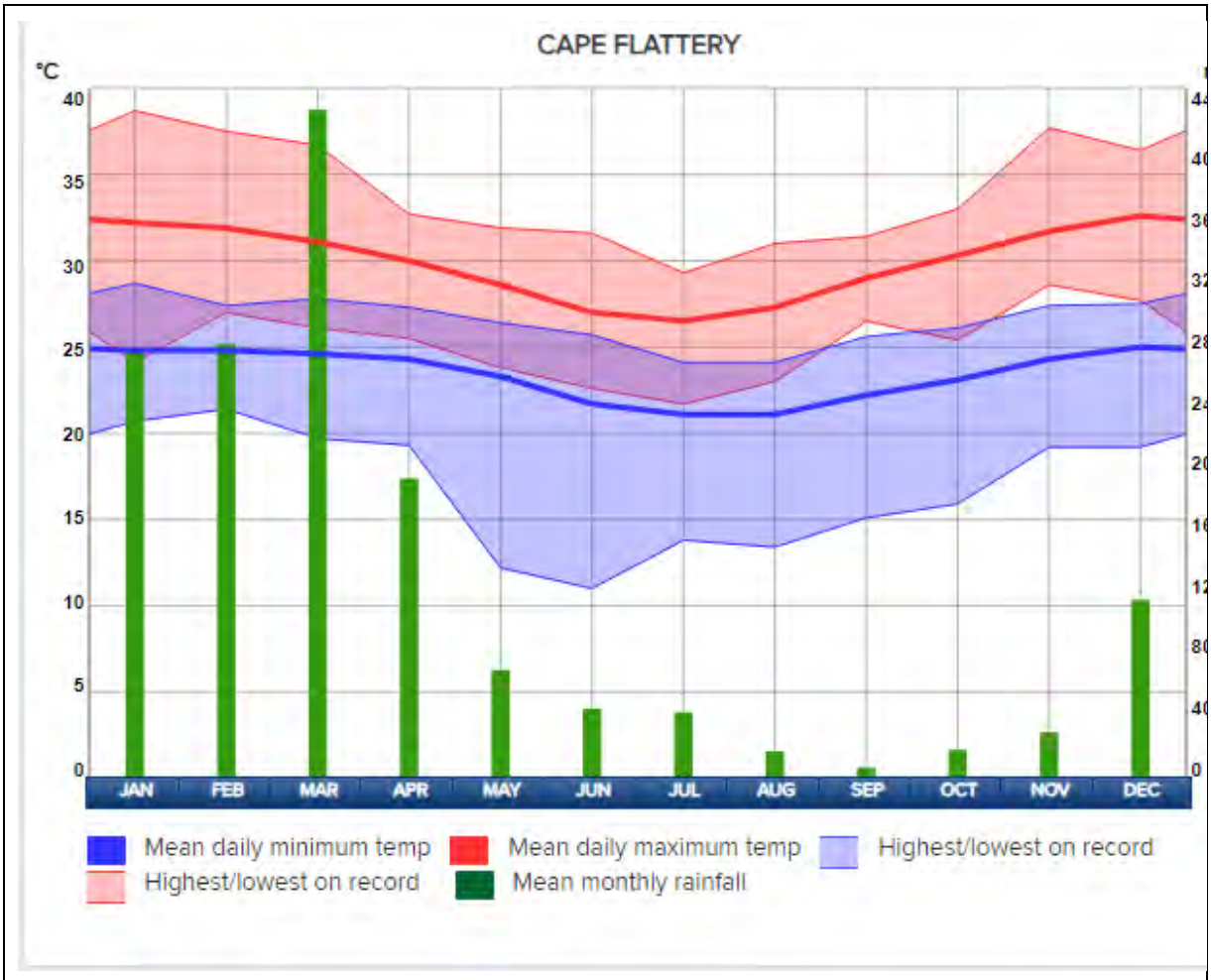


Figure 7-34 Climate and rainfall data for Cape Flattery.

Source: http://www.weatherzone.com.au/climate/station.jsp?lt=site&lc=31213 accessed 23 January 2019.

The mine site is located within a temperate climate zone with essentially no dry season, a warm summer and a cool winter. Temperature varies from a maximum monthly average of about 32˚C in November to February to a minimum monthly average of about 19˚C in July.

Recent annual rainfall data shows a relatively low to moderate level of annual variability ranging from a minimum of 668 mm (2002) to a maximum of 3208 mm (1973). The average annual pan evaporation is approximately 1991 mm. Higher evaporation rates occur in the warmer months between September and December and exceed rainfall in dry years.

The region experiences on average 0.5 tropical cyclones per annum. Historic records over a 50 year period indicated that 11 cyclones have passed through the site area within a 50 km radius – including Cyclone Peter (1969/1970) which was the wettest tropical cyclone on record in Australia and Cyclone Ita (2013/2014) recorded as the strongest tropical cyclone on record in Australia.

b) Wind and Wave Climate

At this time no investigations have been undertaken into the wind and wave climate other than a review of wind rose data for Cooktown. See **Figure 7-35** (9 am) and **Figure 7-36** (3 pm).

This data shows that there is a dominant wind from the south-east in both the morning and afternoon. Wind speeds are typically over 10 km/hour and regularly in the 10-30 km/h range. It is known that coastal shipping is exposed to the prevailing south-easterly winds on most days.

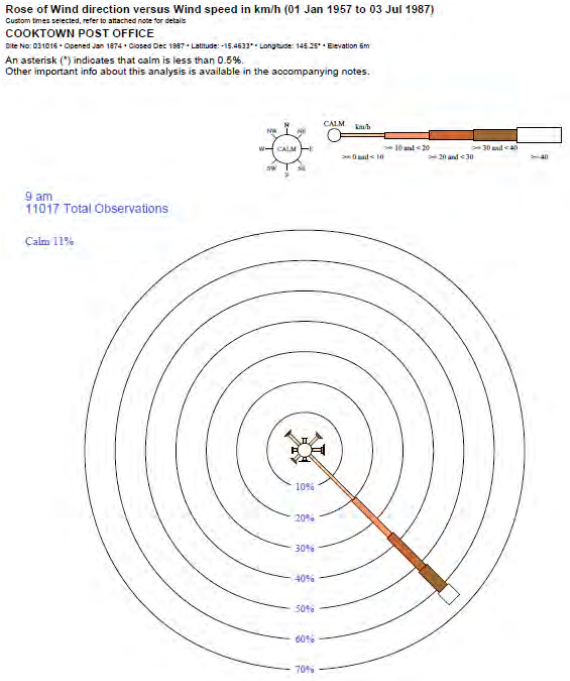


Figure 7-35 Wind rose date for Cooktown (9 am).

Source: BoM accessed 29 January 2019.

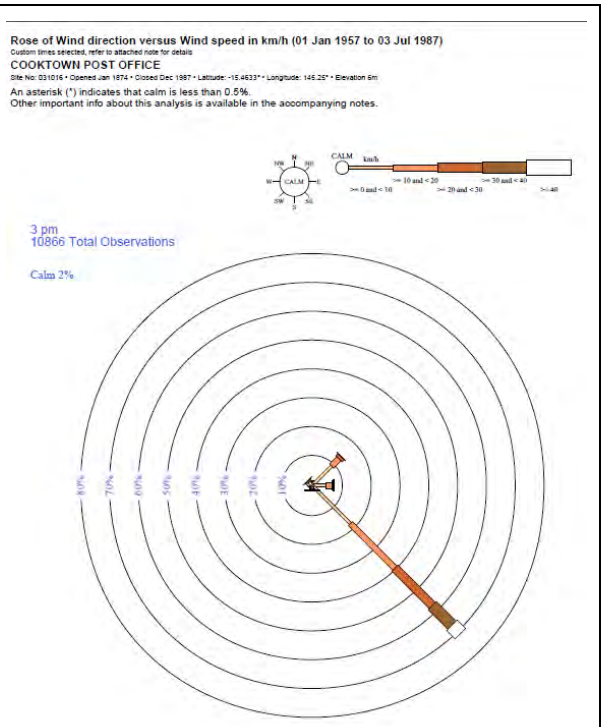


Figure 7-36 Wind rose date for Cooktown (3 pm).

Source: BoM accessed 29 January 2019.

7.3.17 Coastal Processes

This section applies to all project components unless noted otherwise.

a) Overview

The coastline and nearshore marine environment at Cooktown and Cape Bedford is characterised generally by an ambient low wave energy environment as the area is within the Great Barrier Reef lagoon. However, about once every five years the region experiences cyclonic activity with associated high rainfall, high energy waves and storm surge / storm tide impacts.

b) Tides

The tides in the Cooktown and Cape Flattery regions are predominantly semi-diurnal. **Table 7-14** shows the semi-diurnal tidal planes for both locations which are understood to be similar to the study area. Based on these planes the mean spring tide range for the study area is likely between 1.69 m and 1.73 m while the extreme tidal range under astronomical conditions is between 3.08 m and 3.20 m.

Table 7-14 Semi-diurnal tidal planes for Cooktown and Cape Flattery

LOCATION	TIDAL PLANE (M ABOVE LAT)*						
	MLWS	MLWN	AHD	MSL	MHWN	MHWS	HAT
Cooktown	0.71	1.32	1.48	1.49	1.77	2.40	3.20
Cape Flattery	0.65	1.32	1.48	1.48	1.71	2.38	3.08

Source: Marine Safety Queensland (2019).

*LAT: lowest astronomical tide, MLWS: mean low water springs, MLWN: mean low water neap, AHD: Australian height datum, MSL: mean sea level, MHWN: mean high water neap, MHWS: mean high water springs, HAT: highest astronomical tide.

c) Storm Tide

See **Section 8.10** for a discussion on natural hazards arising from storm tide.

d) Coastal Erosion

See **Section 8.10.2c)** for a discussion on natural hazards arising from coastal erosion.

7.4 CONSTRUCTION AND OPERATION

Provide the following information for the project site:

- *sequencing and staging of activities; including all pre-construction activities (including vegetation clearing, site access, interference with watercourses, wetlands and floodplain areas)*
- *the proposed construction methods, associated equipment and techniques*
- *proposed mine life, amount of resources to be mined and the resource base including total seam thickness and seam depths*
- *proposed extractive and processing methods*
- *associated equipment and techniques*
- *capacity of high-impact plant and equipment and their chemical and physical processes*
- *potential use of chemicals or hazardous materials*
- *locations of existing and new plant, structures and infrastructure both on and off-site*
- *any activity that would otherwise be a prescribed environmentally relevant activity if it were not undertaken on a mining or petroleum lease*
- *quarry material and forestry products sourced on or off-site*
- *road and rail infrastructure, and stock routes, including new constructions, closures and/or realignments*
- *the proposed methods and facilities to be used for the storage, processing, transfer, and loading of product, including off-site*
- *any borrow pits, streambed excavations, or expanded dredging, bed levelling, quarry and screening operations that may be required to service construction or operation of the proposed project.*

7.4.1 Sequencing and Staging

Some key dates are as set out below. Note that at this stage these are approximate only.

Table 7-15 Timeframe

ACTIVITY	APPROXIMATE DATE
Logistics plan	Q3 2019
Mine plan	Q4 2019
Mining Lease Application	Q4 2019
Feasibility study	Q1-Q3 2020
Statutory approvals and permits	Q1 2020 – Q4 2021
DRX Board approval	Q2 – Q3 2021
Financing	Q2 2021
Construction	Q4 2021 – Q1 2022
Commissioning	Q1 2022
Operation	Q1 2022

Source: Diatreme. Due to the advent of the Covid-19 pandemic, there have been some delays on accessing the site for field investigations so there is some uncertainty in the above timing.

7.4.2 Construction and Operational Processes

a) Mining Area

Construction

Refer **Section 7.2.3**. Construction activities will include:

- Delivery of earthmoving equipment by road. The earthmoving equipment required for this project is relatively small and similar in size to the equipment currently used in the area by Nambal.
- Removal of vegetation and topsoil from areas that will be used for offices and amenities, workshop and storage shed, processing plant, and the initial mining area. The topsoil and incorporated vegetation will be stockpiled and stored at the edge of the cleared areas for future use in rehabilitation.
- Earthmoving – appropriate equipment will be used to level the surface of the ground for all construction areas within the mining lease. Areas will be levelled for the wet processing plant, process water ponds, offices, workshop and amenities. Water supply ponds will be excavated in levelled ground close to the processing plant and lined.
- Delivery of diesel generators for construction power supply (to be converted to hybrid diesel-solar power supply system for operations).
- Delivery and installation of transportable buildings for offices and amenities.
- Installation of waste water treatment system.
- Construction of water bore and water supply system.
- Construction of processing plant, workshop and storage shed.

Operation

Operational activities at the mining area have been discussed in **Section 7.2.3**.

In summary, the operation is a very simple process that involves:

- removal and storage of topsoil as areas are progressively required for mining
- selectively mining the sand at 150 tonnes per hour using a front-end loader
- transporting the sand using the loader to the hopper-feeder unit
- processing as per Section 7.2.3
- stockpiling processed product on site for subsequent transport and loading (depends on transfer mode (i.e. bulk, skip, or bag).

b) Transport Corridor – Mine to Hope Vale

Construction

A short section of road between the ML and the Hope Vale road network will need to be built (prior to commencing work on the mine area) and some upgrading will be required on Hope Vale and Cook Shire roads. This will be necessary for the nine construction and operations as well as for both loading options, although for Nob Point loading there will be no product exported along this road.

Operation

Operation of this corridor for Nob Point loading will involve transport of plant and materials during construction and occasional transport of materials during the operational phase. Workers and contractors will use the corridor during both construction and operation.

For Cooktown loading the above use will apply, together with the transport of product bound for Marton.

c) Nob Point Loading

Construction

Nob Point Transport Corridor

A new road is required between the ML and the Nob Point Loading Area. The appropriate location and design of this road will be investigated in the EIS as will its designation (i.e. a shire road or private road).

Barge Loading Infrastructure

Construction activities will include:

- clearing of land at Nob Point
- construction of hardstands for truck turning and loading, parking, and product stockpile
- installation of infrastructure and equipment for barge loading, depending on the export option selected and the transfer mode) – could include:
  - on-ground barge ramp and barge mooring piles (Option 1a)
  - elevated barge ramp and barge mooring piles (Option 1b)
  - crane pad and foundations etc. and barge mooring piles (Option 2).

Operation

Nob Point Transport Corridor

Road transport has been described in **Section 7.2.5b)**. Refer **Table 7-7** for a summary of the road transport logistics.

Nob Point Loading

Operations at the barge loading area have been described in **Section 7.2.5c)**. Refer **Table 7-7** for a summary of the loading logistics.

Transhipment Anchorages

Operations at the various transhipment anchorages have been described in **Section 7.2.5** and **Section 7.2.6** (Nob Point loading).

When loaded, the ship will travel directly to the shipping lane then transport the product to the customer's port.

Refer **Table 7-7** for a summary of the transhipping logistics.

d) Cooktown Loading

Construction

Cooktown Transport Corridor

Other than works on the section of road between the mine and Hope Vale described above, double road trains can be used on Hope Vale Shire Council bypass road and the roads connecting to Galalar and Cooktown with one exception. As noted previously, double road trains with 50 t loads can be used if two kilometres of a Cook Shire road is upgraded to the relevant standard.

No works are expected to be required on the state-controlled Endeavour Valley Road other than a possible upgrade of the bridge over Isabella Creek (-15.386882° 145.034909°).

The need for road upgrades and responsibility for capital and maintenance work is currently under negotiation and will be addressed in the EIS.

Cooktown Loading Area

Construction activities at the Cooktown loading area at Marton will include:

- clearing of land north of the existing carpark
- construction of a suitable platform large enough to store 25,000 tonnes of product (approximately 1 ha is proposed)
- construction of barge mooring piles in the Endeavour River
- installation of equipment for loading silica product onto barges.

Operation

Road Transport

Road transport has been described in **Section 7.2.7b)** (Cooktown loading). Refer to **Table 7-7** for a summary of the road transport logistics.

Barge Loading

Operations at the barge ramp have been described in **Section 7.2.7b)**.

Refer to **Table 7-7** for a summary of the transport logistics.

Transhipment Anchorages

Operations at the various transhipment anchorages have been described in **Section 7.2.7b)** (Cooktown loading).

When loaded, the ship will travel directly to the shipping lane then transport the product to the customer's port.

Refer **Table 7-7** for a summary of the transhipping logistics.

7.4.3 Use of Water

As noted previously, the estimated water requirement for the mine and site facilities is 500 ML per year (average of 15.8 L/s). This supply is expected to be obtained from groundwater bores close to the mine site. All aspects of groundwater extraction will be addressed in the hydrogeology study planned for the EIS.

7.4.4 Wastewater Disposal

a) Mining

No waste water will be generated by the mining process (i.e. process water will be cleaned and recovered).

b) Ancillary Facilities

Ancillary infrastructure at the site (workshop and office) will generate a small amount of wastewater. It is proposed that this will be treated using a suitable package Sewerage Treatment Plant.

c) Barge Loading Areas

Nob Point Loading

At this stage no permanent on-site facilities are proposed.

Cooktown Loading

At this stage no permanent on-site facilities are proposed. However, should these be needed then wastewater can be reticulated to Cook Shire Council's sewerage system.

7.4.5 Access to Sea

a) Nob Point Loading

Sea access is required at the Nob Point loading area as described above. This will involve tidal works of various types, depending on the export option selected and the transfer mode) – could include:

- on-ground barge ramp and barge mooring piles (Option 1a)
- elevated barge ramp and barge mooring piles (Option 1b)
- barge mooring piles (Option 2).

b) Cooktown Loading

Sea (river) access is required at the Cooktown loading area as described above. This will most likely involve tidal works (i.e. construction of barge mooring piles).

7.4.6 Road Network

a) Nob Point Loading

Refer to **Section 7.2.5b)** and the summary in **Section 7.2.10**.

b) Cooktown Loading

Refer to **Section 7.2.7b)** and the summary in **Section 7.2.10**.

7.4.7 Solid Waste Disposal

a) Mining Area

Only small quantities of solid waste will be generated and this will be limited to the Workshop / Office. Solid waste will be sorted into recyclable and general waste, stored locally, and regularly returned to Hope Vale for handling via the municipal disposal system.

b) Nob Point Loading

Only small quantities of solid waste will be generated at the Nob Point loading area. Solid waste will be sorted into recyclable and general waste and returned to the mining area (see above).

c) Cooktown Loading

Only small quantities of solid waste will be generated at the Cooktown loading area. Solid waste will be sorted into recyclable and general waste and collected by the CSC's municipal disposal system.

7.4.8 Stormwater

a) Mining Area

Runoff arising from water falling on the mining area (most is expected to percolate into the sand soils) will be collected and led to existing drainage channels.

Stormwater from roof areas of ancillary structures will be collected and stored for re-use. Runoff from other impervious surfaces will be collected and conveyed to local watercourses after sediment is removed in accordance with routine stormwater management devices and approaches.

b) Nob Point Loading

Runoff from paved areas will be discharged to natural watercourses or direct to the sea after removal of sediments in accordance with routine stormwater management devices and approaches.

c) Cooktown Loading

Runoff from paved areas will be connected to Council's stormwater drainage system as approved at the time in accordance with routine stormwater management devices and approaches.

d) Rehabilitation

Refer to **Section 8.2**.

7.4.9 Construction Methods, Associated Equipment and Techniques

All equipment, machinery, plant, structures and buildings will be delivered to the construction sites by trucks using public roads.

Access roads on the construction sites will be prepared using diesel powered earthmoving equipment and formed using gravel from local quarries.

Diesel powered earthmoving equipment will clear vegetation where necessary from construction areas and level the ground.

Foundations for long term structures will be formed using ready-mixed concrete delivered by truck.

Components for long term structures will be delivered by truck and erected by qualified construction crews.

Relocatable plant and buildings will be delivered by truck, unloaded by crane, and secured to footings.

a) Proposed Mine Life

The proposed mine life is currently 15 years. The opportunity is likely to exist to increase this significantly (to be confirmed by exploration drilling proposed to be undertaken the north).

b) Proposed Extractive and Processing Methods

See **Section 7.2.3**.

c) Associated Equipment and Techniques

See **Section 7.2.3**.

d) High-Impact and Chemical and Physical Processes

The silica sand processing does not involve any high-impact chemical or physical processes. The entire operation is a wet process using local groundwater which is expected to be of high quality (e.g trace contaminants). The wet processing involves gravity separation, attritioning, classification and magnetic separation, none of which pose significant risks to the environment or receiving waters.

e) Potential Use of Chemicals or Hazardous Materials

Flocculant will be used to clarify plant reject water for reuse in the process. Without flocculant the process water demand would be approximately 8 times the planned demand and impacts to the groundwater profile would be significant.

f) Locations of Existing and New Plant etc.

See **Section 7.2.3**.

g) Prescribed Environmentally Relevant Activity

On-lease

The following activities would be prescribed ERAs if not undertaken on a mining lease:

- sewage treatment works at a site that have a total daily peak design capacity of at least 21EP (ERA 63)
- chemical storage (ERA 8)
- fuel:
  - mine fuel will be stored on lease
  - Nob Point Loading Area or Cooktown loading area – fuel storage will be less than 1000 litres.

As noted in **Section 4.2.1**, the above ERAs can be authorised under an EA for a resource activity as they form part of the resource activity.

Off-lease

An ERA (ERA 50(1)(a) – Mineral storage) will be required for both Nob Point loading or Cooktown loading unless the ML is extended to include the Nob Point loading area. This is a possibility pending negotiations with DNRME.

h) Quarry Material and Forestry Products

As noted, Congress's contracting arm Nambal will undertake all road upgrading works.

Congress owns a network of hard rock and pavement quarries throughout its land and Nambal will develop these areas to supply all road-building and engineering materials. Congress owns the forest products on the land granted under the *Aboriginal Land Act 1991* (Qld).

i) Road and Rail Infrastructure

Road infrastructure required for the project has been discussed in **Section 7.2.5b)** and **Section 7.2.7b)**.

Discussions will take place with DNRME regarding opening local currently un-gazetted roads in the vicinity of the mine.

The project will not require nor impact on rail transport.

j) Stock Routes

The project will not impact on stock routes.

k) Storage, Processing, Transfer, and Loading of Product

See **Section 7.2.3**

l) Borrow Pits and Quarries

See **Section 7.4.9h)**.

No streambed excavations will be required to service construction or operation of the proposed project.

m) Bed Levelling

No bed levelling of the Endeavour River is required. However, as noted in **Section 7.2.7d)**, the barging operation will be scheduled for loaded barges to travel at high tide due to the presence of shallow sand banks.

8 ENVIRONMENTAL, SOCIAL AND ECONOMIC VALUES

For the purposes of the initial advice statement and EIS process, 'environment' is defined in section 8 of the EP Act.

The initial advice statement must:

- *identify environmental, social and economic values associated with the proposed project*
- *describe briefly the potential adverse and beneficial environmental, economic and social impacts of the project*
- *propose management, monitoring, planning and other measures to minimise any adverse*
- *environmental impacts from the proposed project on these values.*

8.1 LAND

Provide information on the land use. Include strategic cropping land, priority agricultural areas, priority living area and strategic environmental areas under the Regional Planning Interests Act 2014 and the trigger map for strategic cropping land.

Provide a brief overview on:

- *landscape*
- *visual amenity*
- *existing resource tenures*
- *stock routes*
- *strategic cropping land*
- *subsidence*
- *contaminated land and notifiable activities*
- *native title.*

Illustrate using maps where possible.

8.1.1 *Regional Planning Interests Act 2014* (Qld) Matters

The GSSP is within the area covered by the Cape York Regional Plan (CYRP) which covers all areas north of about 16.5^0 south. See **Figure 8-1**. The CYRP was gazetted on 15 August 2014 and is still in place. In essence, the regional plan is used as a guiding policy document for plan making, development assessment, and infrastructure planning. Local governments in the Cape York region must ensure that the state interests as expressed in the regional plan are appropriately integrated in their planning schemes. DSDMIP checks for this when it undertakes the state interest review of their planning schemes. This means that the Planning Schemes of the Hope Vale Aboriginal Shire Council and Cook Shire Council are consistent with the CYRP.

The CYRP is also used when assessing resource activities or regulated activities under the *Regional Planning Interests Act 2014* (Qld) (RPI Act) and identifies the Priority Agricultural Areas (PAAs), Priority Living Areas (PLAs) and Strategic Environmental Areas (SEAs) (and designated precincts) and identifies the activities requiring assessment under the RPI Act. Refer to **Figure 8-1** and **Figure 8-2** below. Although the CYRP is now over 15 years old, it still has statutory effect.

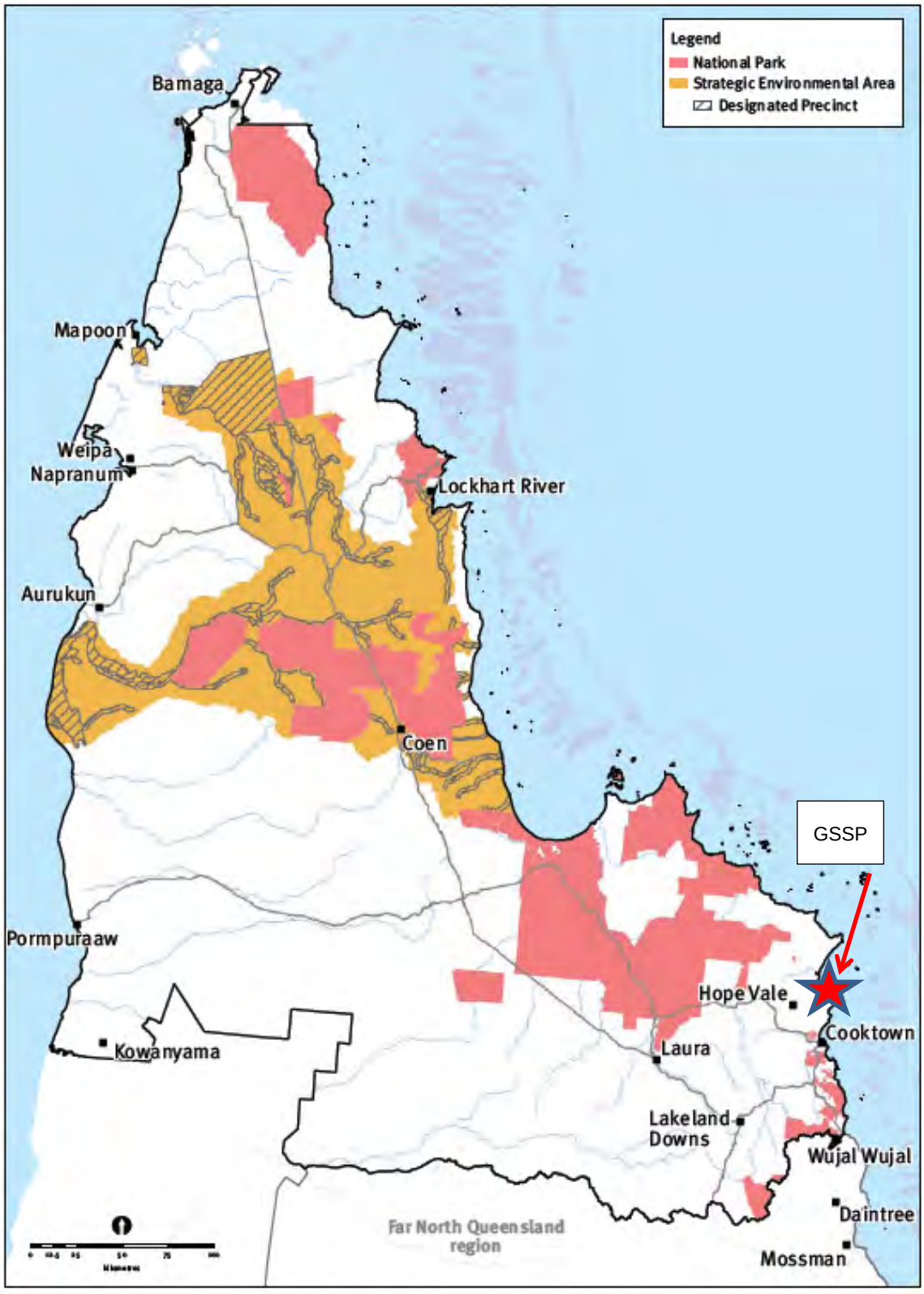


Figure 8-1 Regional land use categories (and CYRP planning area).

Source: Department of State Development, Infrastructure and Planning (2014) Map 1.

The key aspect of the CYRP is the suite of Regional Policies that aim to establish regional land use categories that balance economic development with environmental conservation. The policies provide specific direction about how the state's interests in land use planning and development should be achieved on Cape York Peninsula. **Table 8-1** below lists the seven policies and provides an assessment of how they apply to the GSSP.

This analysis shows that the GSSP is consistent with the CYRP.

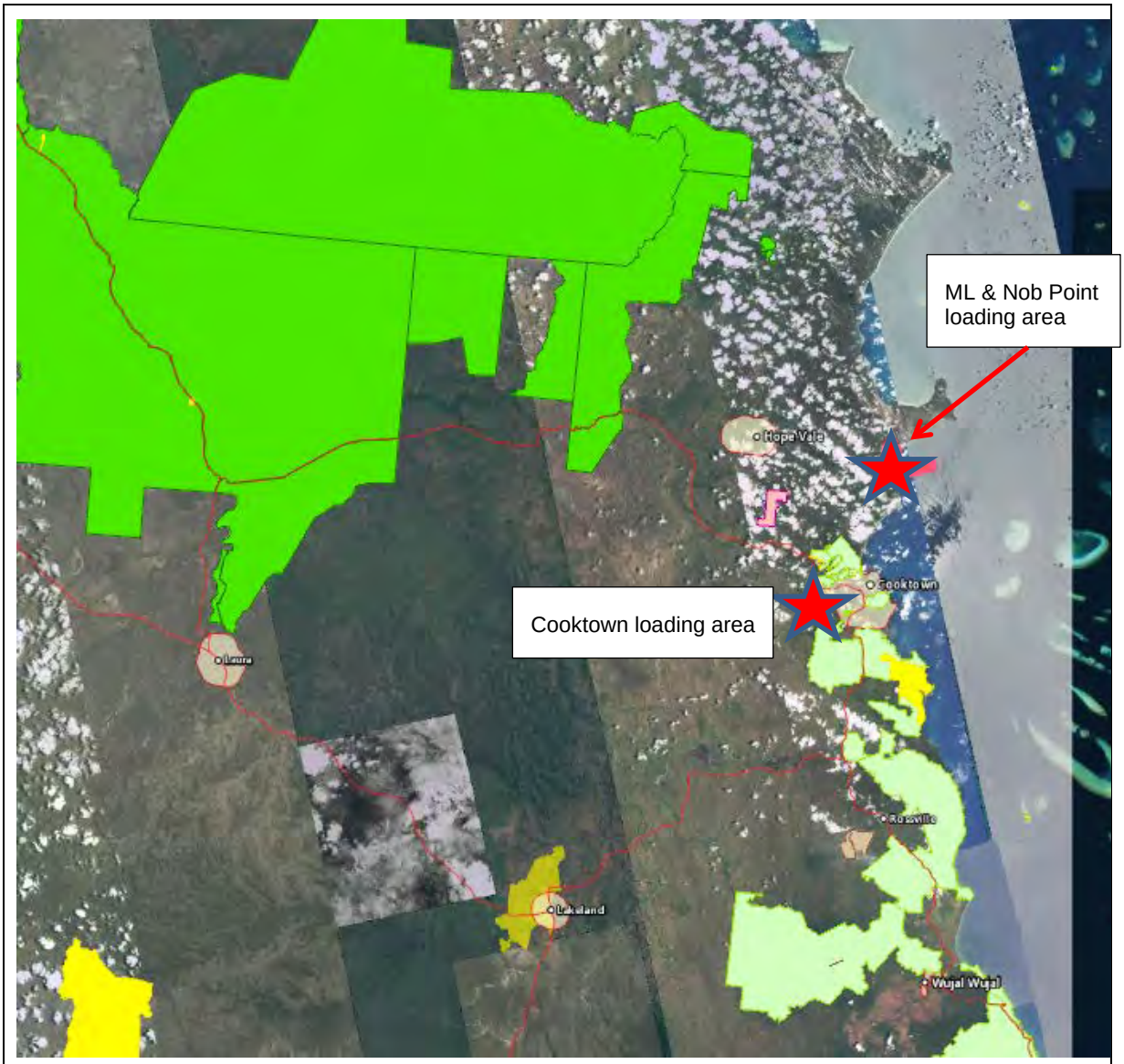
Table 8-1 Regional Policies

POLICY	ASSESSMENT - RELEVANCE TO GSSP
Balancing economic development with environmental conservation	
1. Provide for economic opportunities and appropriate development by facilitating opportunities for land uses that contribute to diverse economic and employment opportunities in the region.	Complies. The GSSP will provide economic and employment opportunities to the Hope Vale area in general and to Hope Vale Congress in particular.
2. Safeguard areas of significant biological diversity and ecological function (Map 1) by protecting the: • integrity of the Steve Irwin Wildlife Reserve from incompatible activities • ecological integrity of Strategic Environmental Areas (SEA) from incompatible development	Complies. Map 1 Regional land use categories (see **Figure 8-1**) shows that the ML and both loading areas are not within a SEA, National Park, or designated area.
Protecting Priority Agricultural Land Uses while supporting co-existence opportunities for the resources sector	
3. Planning schemes provide for potential recreation and commercial development opportunities that complement and contributes to the community value of national parks (**Figure 8-1**).	N/A (this is a direction to local government).
4. Protect Priority Agricultural Land Uses within Priority Agricultural Areas.	Complies. Map 2 Priority Agriculture Area (Lakeland Downs) shows that the ML and both loading areas are not within a Priority Agriculture Area. Refer **Figure 8-2**.
5. Maximise opportunities for co-existence of resource and agricultural land uses in Priority Agricultural Areas (PAA).	Complies. Map 2 Priority Agriculture Area (Lakeland Downs) shows that the ML and both loading areas are not within a PAA. Refer **Figure 8-2**.

(Continued over)

POLICY	ASSESSMENT - RELEVANCE TO GSSP
Providing certainty for the future of towns	
6. Safeguard the areas required for the growth of towns through establishment of Priority Living Areas (PLA) (Maps 3 to 15, Schedule 2).	Complies. Map 8 Priority Living Area (Hope Vale Aboriginal Shire, Hope Vale) covers the town area only and is therefore not affected by the GSSP (ML and Nob Point loading area). Map 5: Priority Living Area (Cook Shire, Cooktown)) covers the town area as far west as Ratcliff Road (approximately 360 m east of the Cooktown loading area) and is therefore not affected by the GSSP (Cooktown loading area). Refer **Figure 8-2** and **Figure 8-3**.
7. Provide for resource activities to locate within a Priority Living Area only where it meets the communities' expectations as determined by the relevant local government.	Map 8 Priority Living Area (Hope Vale Aboriginal Shire, Hope Vale) covers the town area only and is therefore not affected by the GSSP (ML and Nob Point loading area). Map 5: Priority Living Area (Cook Shire, Cooktown)) covers the town area as far west as Ratcliff Road (approximately 360 m east of the Cooktown loading area) and is therefore not affected by the GSSP (Cooktown loading area). Refer **Figure 8-2** and **Figure 8-3**.

Source: Column 1 from DSDIP (2014), column 2 study team compilation.



Priority Living Area

Priority Agricultural Area

Strategic Environmental Area

Strategic Environmental Area

Strategic Environmental Area - Designated Precinct

Protected areas of Queensland

National park

National park (scientific)

National park (Cape York Peninsula Aboriginal land)

Conservation park

Resources reserve

Forest reserve

State forest

Timber reserve

Figure 8-2 Regional interests in the vicinity of the ML and both loading areas.

Source: Queensland Globe data for Priority Agricultural Areas, Significant Environmental Areas, Significant Environmental Areas – Designated Precincts, and National Parks, all as applicable to the CYRP.

Figure 8-3 Regional interests in the vicinity of the Cooktown loading area.

Source: Queensland Globe data for Priority Agricultural Areas, Significant Environmental Areas, Significant Environmental Areas – Designated Precincts, and National Parks, all as applicable to the CYRP.

8.1.2 Key Regional Land Uses

Key regional land uses are shown on **Figure 8-4**. These include:

- nature conservation (Great Barrier Reef Coast Marine Park, Great Barrier Reef Marine Park, Great Barrier Reef World Heritage Area)
- mining (Cape Flattery)
- residential areas (Hope Vale, Cape Flattery, Cooktown)
- agriculture (grazing, cropping)
- 'other minimal use' (most of the land surrounding the ML and Hope Vale).

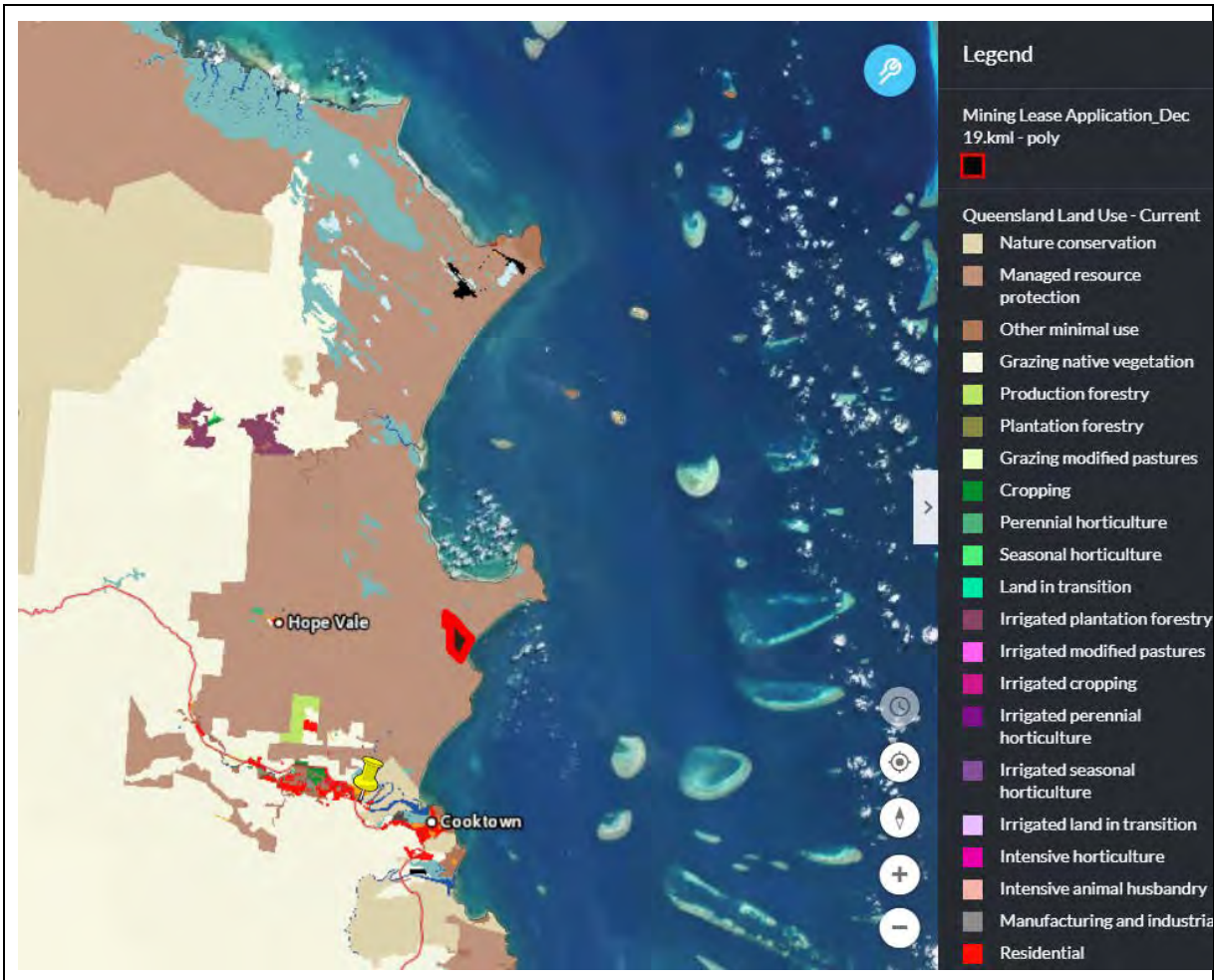


Figure 8-4 Key Regional Land Uses.

Source: Queensland Globe.

8.1.3 Local Government Issues

a) Local Government Areas

Components of the GSSP are within the Hope Vale Aboriginal Shire and the Cook Shire as follows. These local government areas are shown on **Figure 8-5**.

Table 8-2 Infrastructure in local government areas

PROJECT ELEMENT	HOPE VALE ABORIGINAL SHIRE	COOK SHIRE
Mining		
Mining area	Yes	-
Nob Point Loading		
Nob Point Road Transport Corridor	Yes	-
Nob Point loading area	Yes	-
Transhipment anchorages (varies)	N/A (offshore of shire boundary	N/A (offshore of shire boundary
Cooktown Loading		
Road Transport Corridor (mining area to Cooktown via Hope Vale)	Part	Part
Barge loading area	-	Yes
Barge route	-	Yes
Transhipment Anchorage (Cooktown)	-	N/A (offshore of shire boundary)

Source: Study team compilation.

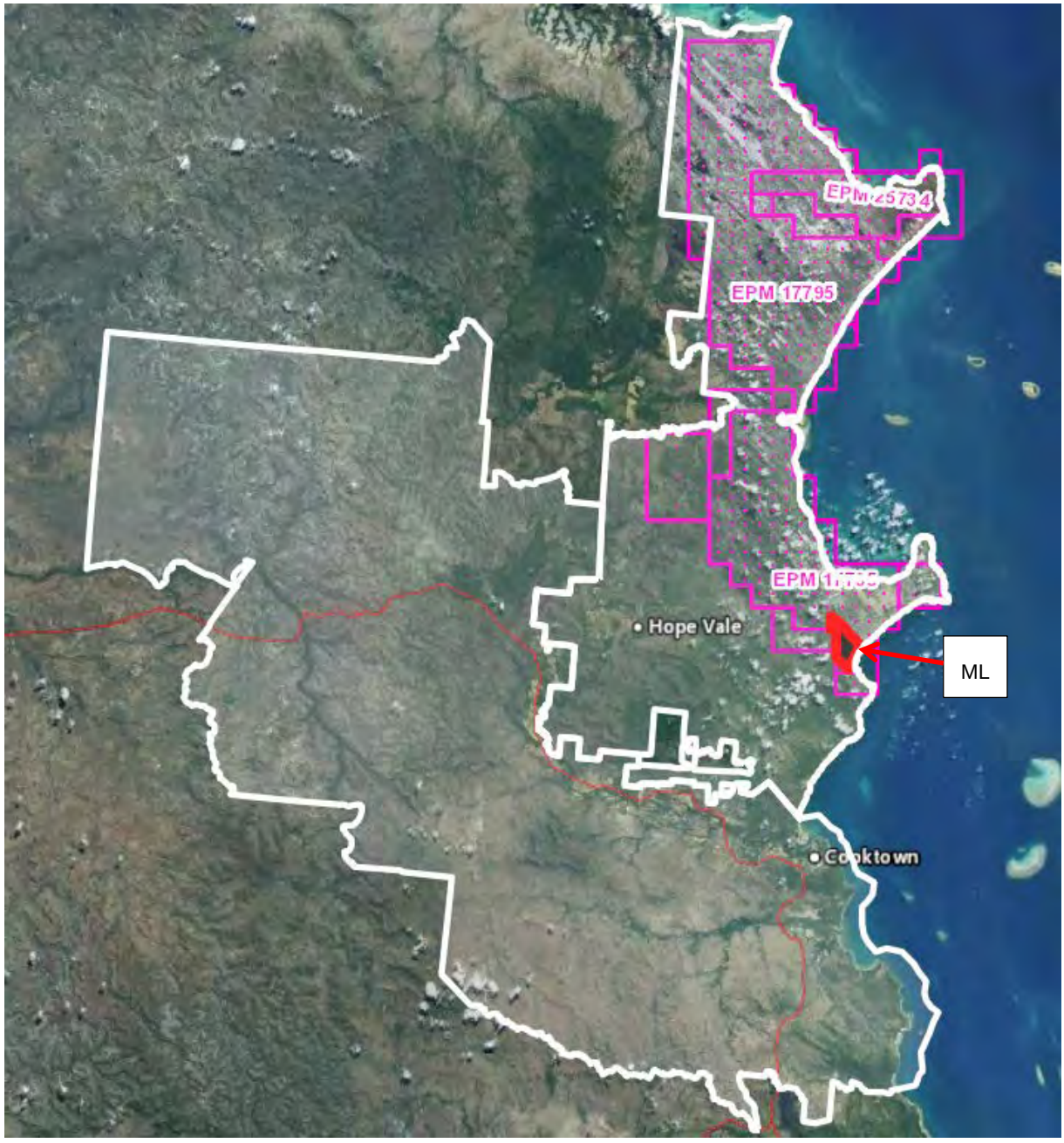


Figure 8-5 ML and EPM 17795 and shire boundaries of Cook Shire and Hope Vale Aboriginal Shire.

Source: Queensland Globe.

b) Local Government Planning Scheme – Mining area

The mining area and some other project components are within the area covered by the Hope Vale Aboriginal Shire Planning Scheme.

Although not relevant to the ML, the Planning Scheme provides useful data regarding planning matters and values that are important to Council and the community. There will be a small area of land outside the ML that is subject to the Planning Act and hence be covered by the Planning Scheme.

Planning Scheme

According to the Planning Scheme:

> Whilst Hope Vale Council will continue to be the dominant employer in the Shire, opportunities are emerging for the community to benefit from the bounty of the land through mining, plantations and agriculture; bringing potential for investment, economic diversity and employment. The Cape Flattery Silica Mine supplies royalties and employment opportunities to the local community, and the rich cultural heritage and spectacular natural beauty of the area has laid the foundations for a small but sustainable tourism industry with potential for growth.

Mining is recognised in general as well as specifically with respect to Cape Flattery (the GSSP will deliver similar benefits).

Strategic Framework

The ML is within the *Rural* designation on the Strategic Framework (**Figure 8-6**). Relevant aspirations are:

- provision of balanced and viable growth options for the residents of Hope Vale
- identification, celebration and conservation of Hope Vale's cultural and historical heritage
- development that balances the characteristics of the region with the needs and aspirations of the community
- recognition and protection of the Cape York natural landscape across the Shire and its special places like Cape Bedford and the coloured sands at Elim Beach
- continuation and protection of public access and use of Elim Beach for everyone
- preservation and management of the unique characteristics of the landscape and its natural resources
- protection and safety of residents and visitors by restricting development intensification in areas of risk of natural hazards and climate change
- creation of economic prosperity with opportunities for generations of Hope Vale residents present and future.

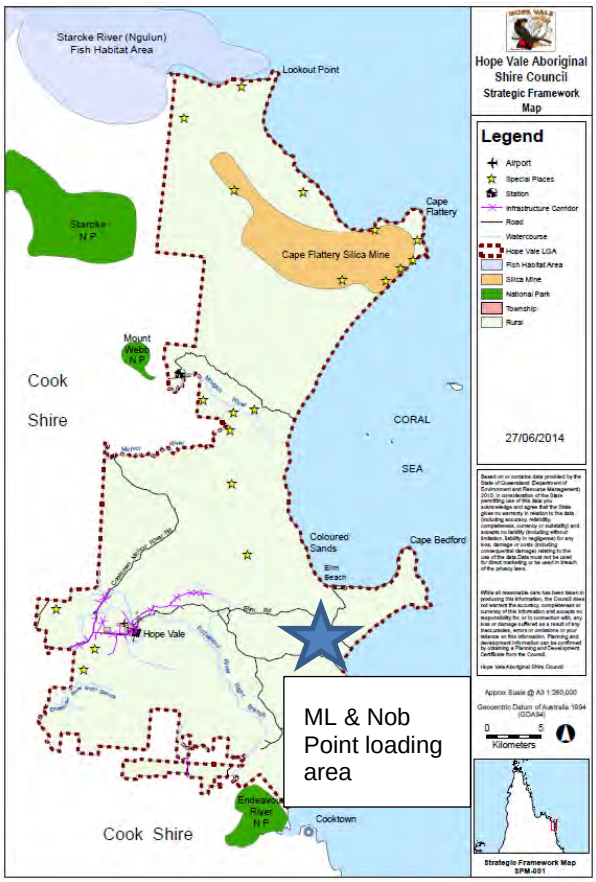


Figure 8-6 Strategic framework (Planning Scheme).

Source: Hope Vale Aboriginal Shire Council Planning Scheme (2014).

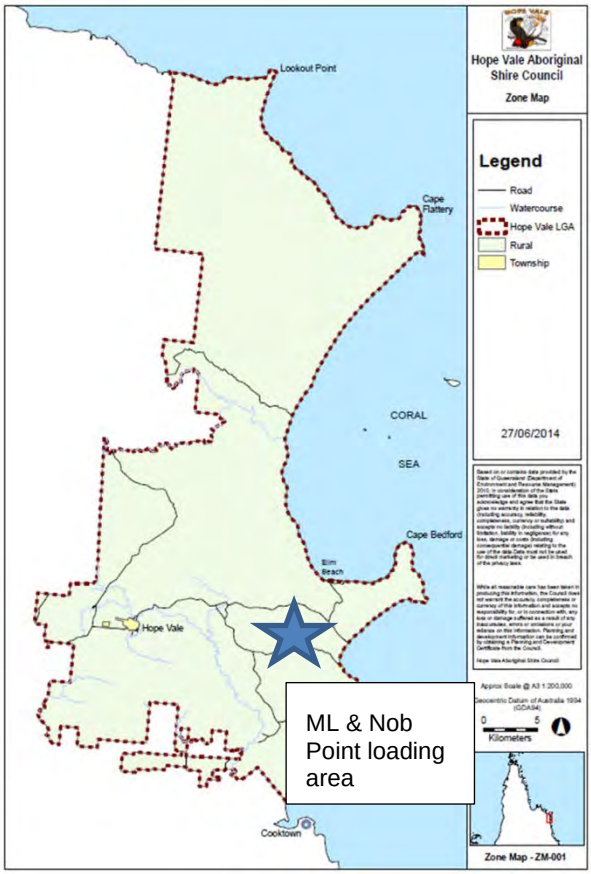


Figure 8-7 Zone map (Planning Scheme).

Source: Hope Vale Aboriginal Shire Council Planning Scheme (2014).

Zoning

The ML and Nob Point loading area are within the *Rural* zone on the Zone Map (**Figure 8-7**).

- (1) The purpose of this zone is to:
  - (a) provide for a wide range of rural uses including cropping, intensive horticulture, intensive animal industries, animal husbandry, animal keeping and other primary production activities.
  - (b) provide opportunities for non-rural uses that are compatible with agriculture, the environment, and the landscape character of the rural area where they do not compromise the long-term use of the land for rural purposes; and
  - (c) protect or manage significant natural features, resources, and processes, including the capacity for primary production
- (2) The local government purpose for the zone is to provide for a rural area that retains its natural values whilst providing for resource use.

- (3) The overall outcomes sought for the zone are:
  - (a) Development does not adversely affect and provides for the retention of:
    - (i) resources including land, plants, animals, minerals in the earth, salt water, fresh water, topography of the land, ecological processes and habitats and culturally important places;
    - (ii) identified wetlands, remnant vegetation and coastal areas shown in the Environmental management overlays;
    - (iii) access and use of resources by traditional owners, historical owners and local people in pursuit of traditional and lifestyle cultural practices or for economic benefit; and
    - (iv) places for people to live in Country and continue traditional practices and lifestyles.
  - (b) Development is designed and constructed so that it:
    - (i) responds to and respects the natural environment and potential risks from natural hazards and climate change;
    - (ii) does not detract from the character, usability, cultural importance or the ongoing practice of traditional activities;
    - (iii) embraces sustainable practices including land management, energy efficiency, water conservation and transport use; and
    - (iv) does not unnecessarily fragment areas with the potential for primary production.
    - (v) provides an ongoing benefit to the community.
  - (c) & (d) NA
  - (e) The viability of both existing and future rural uses and activities are protected from the intrusion of incompatible uses;
  - (f) The health and safety of residents and visitors in the rural area are maintained; and
  - (g) Development provides for infrastructure and its extension, appropriate to intended use and site characteristics, at no impost to council.

Relevant considerations are:

- 3.4.4 – Rural activities: Rural activities that use resources sustainably and add value to the existing economy are encouraged:
  - (h) Any future development at, or in the vicinity of Elim Beach and Cape Bedford is managed to balance economic, environmental, wider public interests and cultural impacts.
  - (i) The Cape Flattery Silica Mine adds value to the Hope Vale community through the distribution of royalties and potential employment opportunities for locals. [While this applies to Cape Flattery, the GSSP will deliver similar benefits]
- 3.5.4 – Natural resource management:
  - (b) Mineral and extractive resources are protected from incompatible uses to ensure a sustainable extractive industry.

Overlays

The Planning Scheme includes the following overlays that provide information on values and hazards:

- flood hazard*
- bushfire hazards*
- landscape heritage*
- environmental significance overlay*
- coastal management overlay*
- wetlands overlay*
- agricultural land overlay
- fish habitat areas
- Mt Piebald Aviation Facility overlay
- landslide hazard.

Of these, those marked '*' are expected to be relevant and contain information on values / hazards. In most cases, certainly for environmental issues, the values are derived from state assessments (e.g. Matters of State Environmental Significance).

c) Local Government Planning Scheme – Cooktown Loading Area

Land at the Cooktown loading area is currently open space (zoned as *Community Facilities*) under the Cook Shire Planning Scheme 2017. Immediately adjacent land is used for parking associated with the existing boat ramp and is similarly zoned. Nearby land is zoned *Rural Residential* zoning. See **Figure 8-9** below.

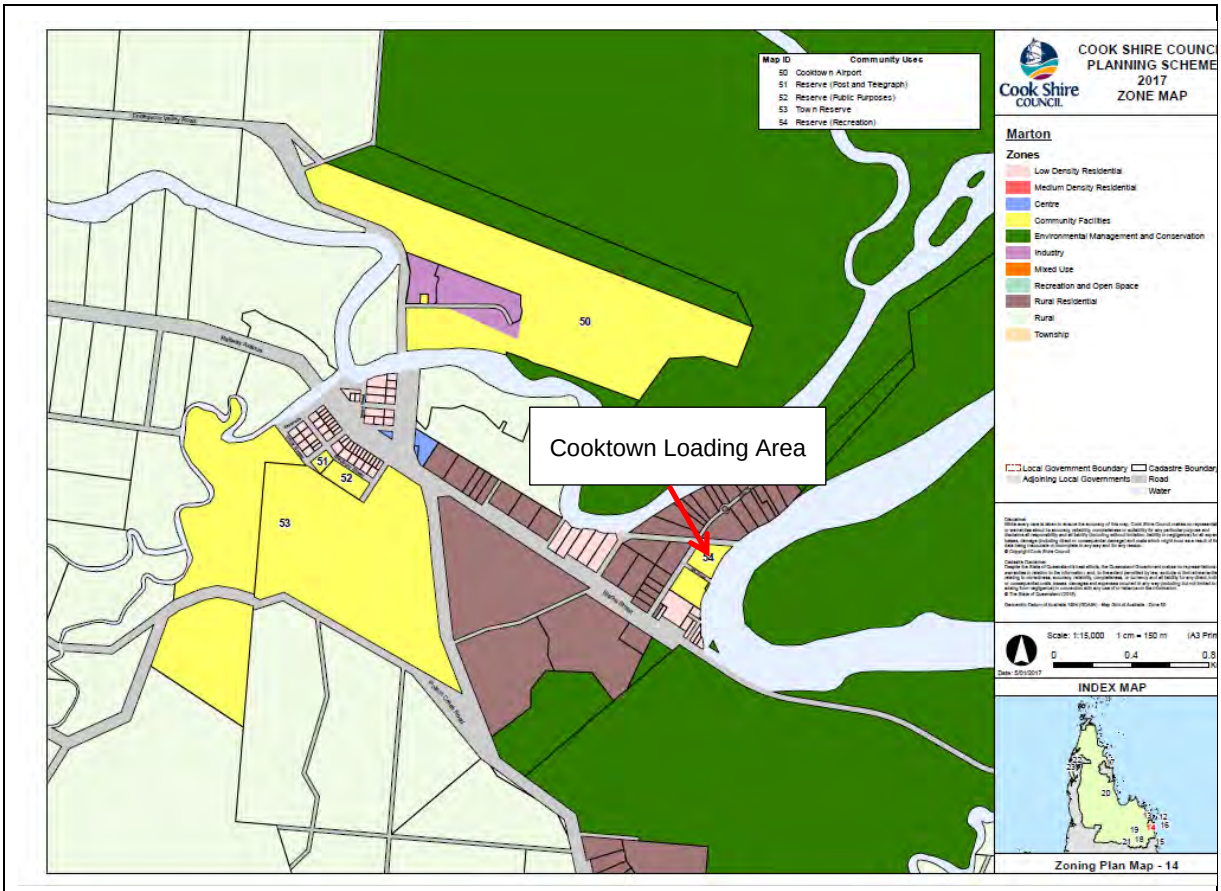


Figure 8-8 Zoning plan – Marton.

Source: Cook Shire Council Planning Scheme 2017.

The proposed use of the boat ramp and adjacent land is not inconsistent with these adjacent uses, although potential impacts on amenity issues will need to be assessed. Discussions with DNMRE reveal that the tenure of the reserve upon which the Cooktown loading infrastructure is proposed to be built will need to be changed with the support of the CSC. This will involve freeholding and leasing arrangements.

8.1.4 Key Local Land Uses

a) Mining Area & Nob Point Loading Area

Local land uses as reported on Queensland Globe are predominantly defined as 'other minimal use' while the adjacent marine area is used for nature conservation.

The ML and Nob Point loading area are currently undeveloped and the adjacent coastal areas are used by local people for recreation (especially at Elim Beach where a camping ground and some residences are located). This is 5.4 km line of sight from the proposed mine (8.4 km by road).

The beach around Nob Point is regularly used by local fishermen (especially at low tide when it is trafficable by vehicle) and there are several beach shacks and shelters along the foreshore. See **Photo 8-1**.

Photo 8-1 Typical beach shack just south of ML.

19 December 2019.

According to the Planning Scheme, Hope Vale as a township was originally established as a mission in 1886 by the Lutheran Church, known as the Cape Bedford Mission at Elim Beach. The mission population included Aboriginal people from the local Warra clans as well as other Aboriginal people from around Australia who were moved there as part of government policies of the day.

Elim Beach lies some 5 km north of the ML and it and Cape Bedford 6 km to the east are well recognised landmarks of the shire.

Further north (39 km from the ML) is the Cape Flattery mine. Founded in 1967, the mine was purchased by Mitsubishi in 1977 and in 1987 a deep water jetty was constructed. Cape Flattery Silica Mines employs over 80 people and is a global exporter of silica sand, with the highest production of silica sand for any mine in the world.

In terms of consistency between the GSSP and intended future uses, the Planning Scheme of the Hope Vale Aboriginal Shire Council states:

> Whilst Hope Vale Council will continue to be the dominant employer in the Shire, opportunities are emerging for the community to benefit from the bounty of the land through mining, plantations and agriculture; bringing potential for investment, economic diversity and employment.

The ML & Nob Point loading area are within the *Rural* designation on the Strategic Framework for which relevant aspirations are:

- provision of balanced and viable growth options for the residents of Hope Vale
- identification, celebration and conservation of Hope Vale's cultural and historical heritage.
- development that balances the characteristics of the region with the needs and aspirations of the community
- recognition and protection of the Cape York natural landscape across the Shire and its special places like Cape Bedford and the coloured sands at Elim Beach
- continuation and protection of public access and use of Elim Beach for everyone
- preservation and management of the unique characteristics of the landscape and its natural resources
- protection and safety of residents and visitors by restricting development intensification in areas of risk of natural hazards and climate change

- creation of economic prosperity with opportunities for generations of Hope Vale residents present and future.

No additional (new) uses are expected to take place. The land is owned and controlled by Hope Vale Congress and, as partners in the GSSP, they are unlikely to permit any inconsistent activities.

b) Cooktown Loading

Road Transport Corridor

Land use adjacent to the (Cooktown) Road Transport Corridor is varied and includes:

- open space
- agriculture
- rural residential
- urban uses at Hope Vale and Cooktown
- the Cooktown airport.

The proposed use of the Road Transport Corridor is not inconsistent with these adjacent uses, although potential impacts on amenity and safety will need to be assessed.

c) Cooktown Loading Area

Land use at the Cooktown loading area is as shown on **Figure 8-9**. This shows that (also referring to Section **Figure 8-8**):

- land use of the Cooktown loading area is classed as nature conservation (although it is zoned *Community Facilities*)
- adjacent land is predominantly residential large (zoned *Rural Residential*).

Figure 8-9 Land use adjacent to the Cooktown loading area.

Source: Queensland Globe.

The proposed use of the boat ramp and adjacent land is not inconsistent with these adjacent uses providing that suitable buffers are in place.

8.1.5 Landscape and Visual Amenity

This section applies to the mining area only. Refer also to **Section 8.5.14** for further details of landscape features.

a) Coastal Dune Characterisation

Vegetation development within the dune system is influenced by a number of factors including dune age, soil development, rainfall patterns, aspect, exposure to prevailing winds and frequency of fire (Pye 1982, Sloss 2012). Dune morphology in the vicinity of the ML is complex and depends on the interaction between prevailing winds, sediment supply and local geomorphology. **Figure 8-10** is a schematic of a typical dune system and shows the main features that occur within the ML. Note that this schematic is south-facing.

As the boundary of the ML is approximately 300 m from the shoreline, most dunes in the early stages of development are located outside of the ML boundary. Within the ML, the dunes comprise moderately stable to stable systems. The coastal wetland between the ML and the beach forms a buffer to the erosive coastal winds and allows development of more stable vegetation communities closer to the coast.

At the south-eastern boundary of the ML, foredune-blowout complexes are present on the landward side of the coastal wetland. Where blow-outs have developed, they are devoid of vegetation, while the trailing arms and slip face are vegetated with a low heath community.

Inland of the foredunes, older blow outs have stabilised over time due to the development of, and subsequent protection from, incipient foredunes which have formed across the entrance to the blow-out. In these areas, woodlands dominated by *Acacia* spp. have established due to reduced sand transport and development of improved soil conditions in the lower valleys.

Relatively stable large parabolic dunes occur further inland and extend in a SE-NW direction. The tallest of these supports an *Acacia* spp. dominated woodland, possibly as a result of fire events on the dune crest and more sheltered, south-west facing slopes.

The large, established parabolic dune present in the west of the ML contains the tall heath / littoral rainforest community) while the lower slopes are mostly vegetated by a low heath community.

The intra-dune wetland in the north of the ML has formed within a deflation trough between a low (c. 20 m AHD), elongate, parabolic dune. These features are common throughout the wider dune system and occupy lower depressions between major dunes. Most, including the wetland present, are shallow and are dry during the May-October season. The interaction of surface water, groundwater and other abiotic processes is likely to evolve as the development of the dunes progresses over time.

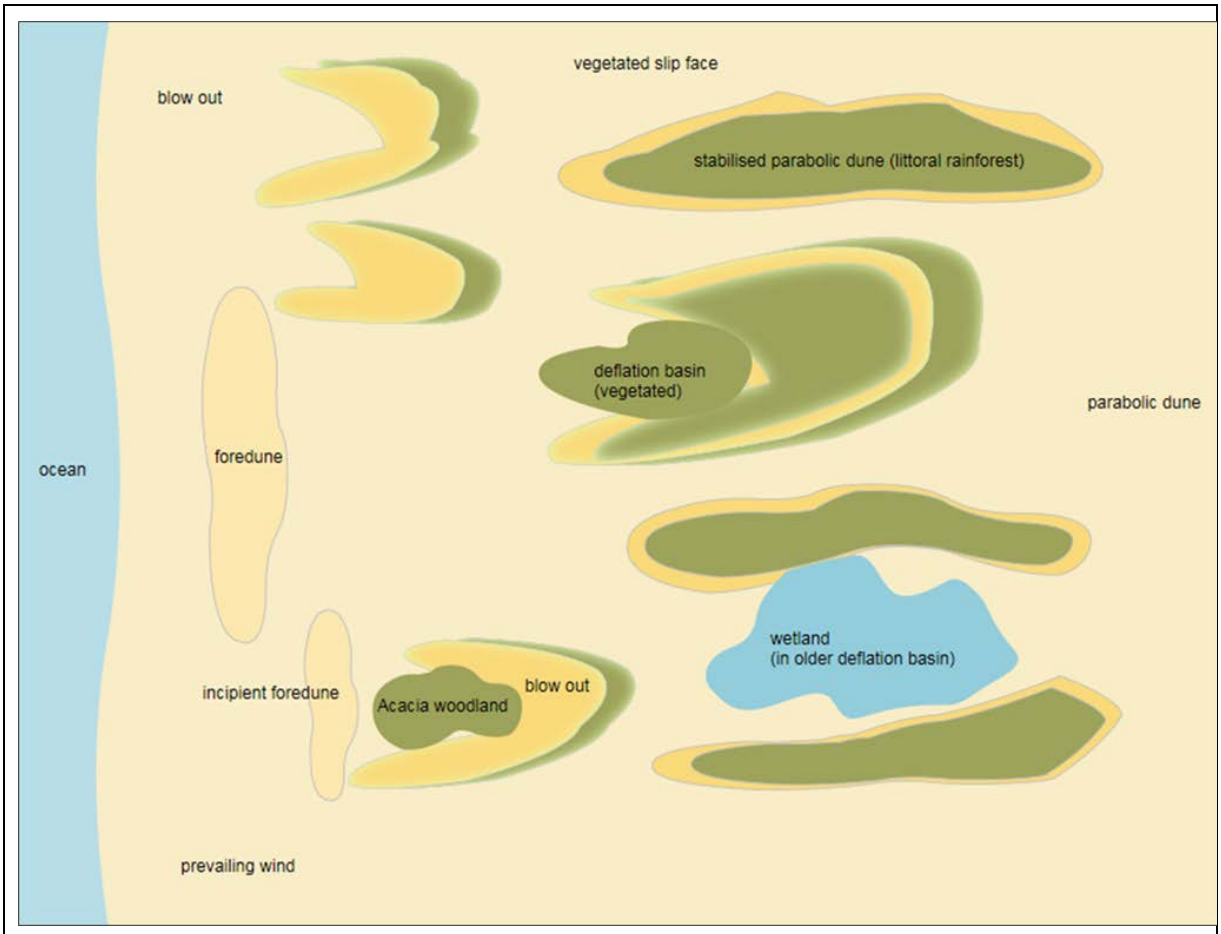


Figure 8-10 Schematic of typical features of a dune system.

Source: Biotropica Australia (2019b) (Figure 1). Note that this schematic is south-facing.

b) Planning Considerations

The Hope Vale Planning Scheme 2014 Landscape Heritage Overlay Map does not identify the ML as having mappable landscape values.

However, according to the Port of Cape Flattery – Environmental Management Plan (Ports North 2014), the Cape Flattery-Cape Bedford area in general has natural conservation significance because it contains Gegenwalle (Counter-wall) dunes and extensive areas of large elongate parabolic dunes. Due to low development of the area, a large component of the dune field is of high wilderness quality. Dune lakes in the region contain a unique faunal assemblage.

The area is largely in its natural state, with signs of human intervention being limited to the network of tracks that surround it to the north-east and south-west, isolated beach shacks, and recent exploration tracks. The natural landscape consists of windswept dunes covered with remnant vegetation.

Figure 8-11 shows an extract from Google Earth where the dune system is very evident, while **Photo 8-2** and **Photo 8-3** show some local views.

Figure 8-11 Google Earth view of ML and Cape Bedford.

Photo 8-2 Drone view south across proposed ML area to Nob Point.

Photo 8-3 Detail of dune vegetation (*Xanthostemon arenarius* habitat at north of the ML).

Photo 8-4 View looking north towards proposed ML from Nob Point.

19 December 2019. Note that this view is foreshortened due to the use of a telephoto lens.

When viewed from the ocean (the shipping channel is 1.5 km south-east at its closest to Nob Point and 4.5 km south-east of the ML) there would be no current visible signs of disturbance. The nearest signs of human impact are at Cape Flattery (40 km north) and Cooktown (17.5 km south).

8.1.6 Existing Resource Tenures

Refer **Section 7.2.17**.

8.1.7 Stock Routes

Refer **Section 7.4.9j)**.

8.1.8 Strategic Cropping Land

There is no mapped Strategic Cropping Land in the vicinity of the GSSP (the closest is the Wet Tropics bioregion (i.e. south of Daintree)).

8.1.9 Subsidence

No subsidence has been observed in the ML and none is likely from non-mining activities. Excavation of product will involve changes to the land form and the design will ensure that all slopes are stable.

8.1.10 Contaminated Land and Notifiable Activities

Searches have yet to be undertaken of the Environmental Management Register (EMR) and the Contaminated Lands Register (CLR). The following is relevant:

- The EMR lists land that has been, or is being used for the purpose of a notifiable activity that has been reported to Department of Environment and Science. Notifiable activities are those that have been identified as likely to cause land contamination and are listed in Schedule 3 of the EP Act. Under the EP Act, landowners and local government must inform the department that land has been or is being used for a notifiable activity. Sites on the EMR in most circumstances pose a 'low risk' to human health or the environment under their current land use. Entry on the EMR does not mean that the land must be remediated or that the current land use must stop.
- The CLR is a register of proven contaminated land (risk sites) that cause or may cause serious environmental harm. Land is recorded on the CLR when a scientific investigation shows that the land is contaminated and that action needs to be taken to remediate or manage the land (for example, technical measures to prevent migration of contaminants or full removal and off-site treatment) to prevent serious environmental harm or other adverse public health risks.

Under the *Planning Act 2016* (Qld), when a development application is made for a material change of use or reconfiguration of a lot recorded on the EMR or CLR, a site investigation and, where necessary, remediation are required.

Based on the lack of historical use or occupation of the ML, it is highly unlikely that any contaminated land will be encountered. However, relevant searches will be undertaken of all affected lands including the proposed Cooktown loading area on the foreshore of the Endeavour River.

8.1.11 Native Title

List registered native title claimants over lands impacted by the project and provide the current status of any claims that have not been finalised.

Hopevale Congress Aboriginal Corporation (Hopevale Congress) RNTBC is the representative body of all native title holders encompassing an area of some 110 000 hectares (Lot 35 SP232620) and includes all of EPM 17795. Native title was determined in 1997 and the former Deed of Grant in Trust was converted to Aboriginal Freehold land under the ALA in December 2011.

Diatreme executed a Compensation and Conduct Agreement (CCA) with Hopevale Congress (see **Section 2.2**) in January 2017 – thereby facilitating access to the land for exploration activity.

Diatreme executed a Cultural Heritage Agreement (CHA) with Hopevale Congress in June 2017 covering a protocol for cultural heritage surveys prior to on-ground exploration activity. Refer to **Section 8.11.1**.

Diatreme is currently (April 2020) negotiating a Mining Project Agreement (MPA) with Hopevale Congress. This is expected to be finalised by August 2020.

Further investigations will be undertaken on native title as part of the ML process. In addition, native title implications associated with the two loading areas will be investigated during the EIS and in respect of Operational Works applications.

8.1.12 Litter

The shoreline sporadically has relatively high levels of litter present (refer **Photo 8-5**). This appears to be largely flotsam and jetsam washed in from the ocean, rather than a result of high intensity usage of the area. It is collected routinely by community groups. This waste can be harmful to marine life including species that utilise the beach environment. Turtles, marine mammals and sea birds can be severely injured or die from entanglement in marine debris (DoEE 2019c). A study in 2015 found that almost 90% of seabirds have ingested plastic (Wilcox 2015).

However, the impact of the material that is washed up on the shore is relatively localised and does not impact on the ecological integrity of the area which has high ecological value and is relatively unimpaired by stresses imposed by anthropogenic activity. The natural ecological processes appear intact and self-sustaining and the ecosystem structure and function seem to evolve with the ongoing development and shaping of the dune system.

Photo 8-5 Litter on beach / strand.

Source: Biotropica Australia (2019b) (Plate 8).

8.2 REHABILITATION

Outline the preferred rehabilitation strategy.

Provide information on how the proponent plans to comply with the Queensland Government's Mined land rehabilitation policy.

8.2.1 Outline of Strategy

Rehabilitation will be undertaken progressively as areas which have been used for mining or services are no longer required. Rehabilitation will commence in the third year of operations and will continue for the life of the operation. At the completion of operations and decommissioning of the mining and processing equipment all remaining areas in disturbed condition will be rehabilitated.

The rehabilitation process will include:

- Shaping the surface of the disturbed areas with earthmoving equipment to remove any abrupt features and create a land surface suitable for spreading soil and seed, and removing features that may be prone to wind erosion.
- Covering the shaped surface with subsoil that was removed when area was originally cleared for mining activities.
- Covering the subsoil with topsoil and remnants of vegetation that were removed from the surface when the area was cleared.
- Spreading seed on the topsoil and providing wind protection where necessary to minimise wind damage to the surface of the soil.
- Where necessary planting seedlings of specific species that do not germinate as desired. A plant nursery will be used to produce seedlings of specific species from seed collected before vegetation clearing commences.

The final elevation of the rehabilitated surface will be lower than the original surface in areas that have been mined. While the average reduction in elevation will be similar to the metres of sand removed for processing, reforming will take place to create as natural as possible landform.

8.2.2 Compliance with Mined Land Rehabilitation Policy

Progressive rehabilitation and closure plan (PRC plan) requirements for resource activities took effect from 1 November 2019 (PRC plan start date) to implement key elements of the Queensland Government's Mined Land Rehabilitation Policy.

Under this policy (DES 2019e), land disturbed by mining activities will be rehabilitated progressively as it becomes available, to minimise the risks of environmental impacts and reduce cumulative areas of disturbed land.

The progress and outcomes of progressive rehabilitation activities will be monitored and reported on to demonstrate how successful they have been in achieving progress towards the approved post-mining landform, and to inform corrective action where required.

To provide certainty about the outcomes and timing of rehabilitation, all site-specific mines will prepare a Progressive Rehabilitation and Closure Plan (PRCP). The plan will include binding, time-based milestones for actions that achieve progressive rehabilitation and will ultimately support the transition to the mine site's future use.

8.3 WATER

8.3.1 Water Quality

With reference to the Environmental Protection (Water) Policy 2009 and section 9 the EP Act, identify the environmental values of surface waters within the proposed project area and immediately downstream that may be affected by the proposed project, including any human uses and cultural values of water.

Provide information about:

- *relevant water quality objectives applicable to the environmental values*
- *general chemical, physical and biological characteristics of surface waters and groundwater*
- *potentially impacted potential discharges (controlled, uncontrolled, seepage, irrigation)*
- *potential run-off from disturbed acid sulfate soils*
- *potential impacts of dredging, bed levelling, and/or the potential impacts of shipping and offshore transhipping operations on the marine environment.*

Illustrate using appropriate maps at a suitable scale.

a) Terrestrial Waters

The project is within the Endeavour Basin of the Eastern Cape York water quality region. There are no major waterway features within the ML; rather, it forms part of a stretch of coastal dunes that drain towards a series of minor unnamed creeks. The ML is bounded to the north (Deep Creek) while Alligator Creek runs between the main mining areas and the mine infrastructure area. The upstream catchments of these waterways are mostly undeveloped, suggesting that existing water quality is likely to be high. Based on Queensland Government mapping, there are several small palustrine wetland features located in or adjacent to the ML, including a low-lying wetland within the pipeline corridor.

See **Figure 8-12** for the location of waters in the vicinity of the trial mine area.

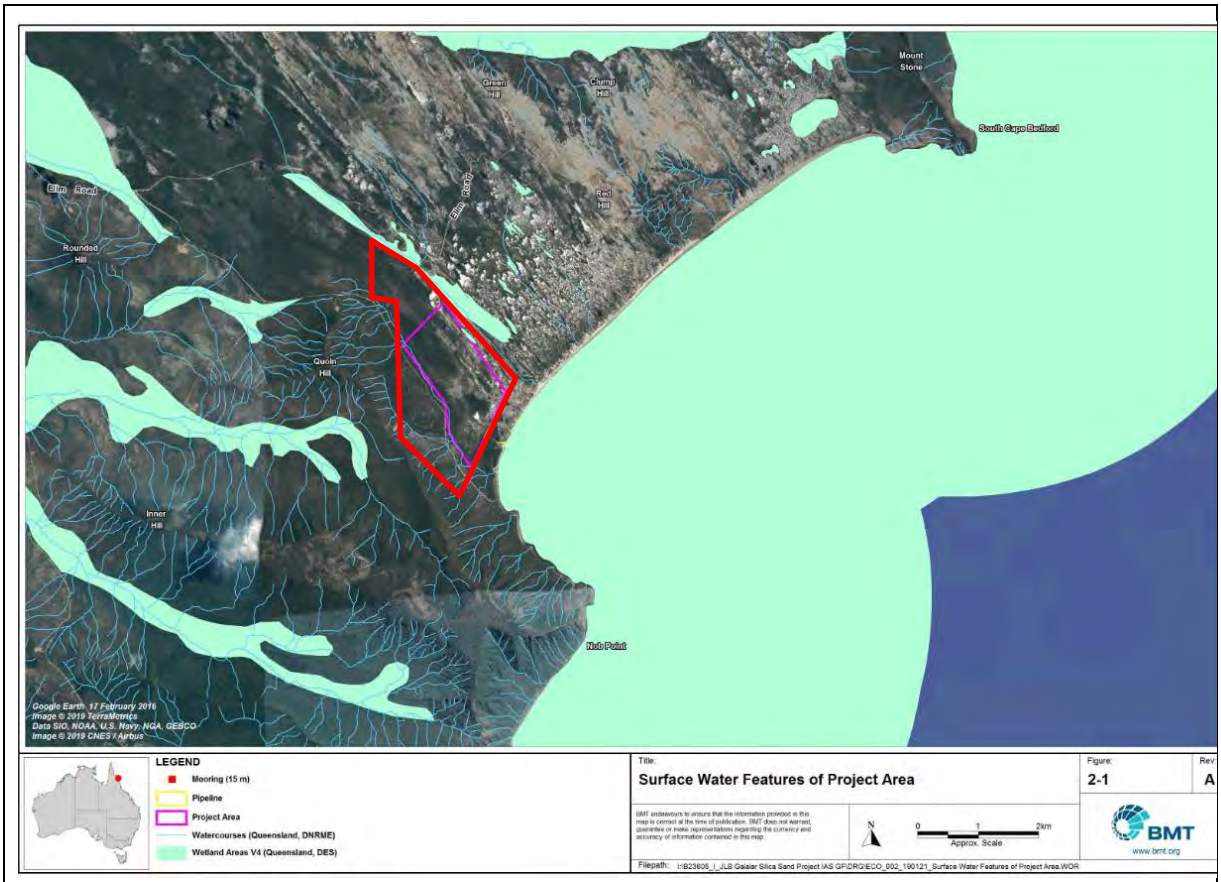


Figure 8-12 Surface water features of the ML.

Source: BMT (2019) Figure 2-1 (ML added).

There are no scheduled environmental values (EVs) or water quality objectives (WQOs) for surface or ground water under the Environmental Protection (Water) Policy 2009 for the Eastern Cape York region, although draft EVs have been proposed under the draft water quality improvement plan (WQIP) (Cape York Natural Resource Management (CYNRM) 2016). Due to the relatively undisturbed nature of the catchment, the intention for these waters is maintain or improve their existing quality.

Baseline monitoring is proposed to quantify the surface water resource and associated water quality as part of the EIS study.

b) Groundwater

As noted in **Section 7.3.13**, Harrington and Cook (2014) describe the groundwater resources present in the ML as having low salinity (between 1 and 30% of the area with salinity >1500 mg/L).

Baseline monitoring is proposed to quantify the groundwater resource and associated water levels and quality.

c) Marine Waters

The marine waters are part of a stretch of open coastal waters. These waters are considered to be in good condition due to higher quality of freshwater discharge comparative to areas more developed areas to the south (CYNRM 2016; Howley Environmental Consulting 2015). However, they are in the zone of influence of the Endeavour River and therefore may experience periods of higher turbidity and terrigenous inputs following large flood events (Waterhouse *et al.* 2016). The marine waters have been assessed as having a low relative risk index, indicating a higher level of resilience to environmental changes (Cape York NRM 2016).

Additional to the draft Water Quality Improvement Plan, marine waters within the GBRMP are subject to the GBR Water Quality Guidelines – 2010 Revised Version (GBRMPA 2009). These guidelines describe the concentrations and trigger values for sediment, nutrients and pesticides that have been established as necessary for the protection and maintenance of marine species and ecosystem health of the Great Barrier Reef. Both guidelines identify the marine waters offshore from the ML as being 'open coastal waters'.

The environmental values of the marine waters of the GBRMP are defined by the GBR Water Quality Guidelines and draft WQIP to include:

- aquatic ecosystems
- primary industries and human consumption (fishing)
- recreation and aesthetics
- cultural and spiritual values.

All areas outside of the river discharge reaches under the GBR Water Quality Guidelines are assigned an aquatic ecosystem value, as well as a high ecological value condition. In recognition of the relatively undeveloped Cape York Natural Resource Management catchments all Marine Park waters adjacent to these catchments are assigned a high ecological value (HEV) (see **Figure 8-13**).

The management intent for waters with high ecological value aquatic ecosystems is to maintain the natural values of the ecosystems, including biotic, physical form, riparian vegetation, flow and physicochemical water quality attributes. For high ecological value water bodies, a guideline concentration that is protective of 99 per cent of species is ideal.

Based on the above description from the Guidelines, the receiving marine waters immediately adjacent to the mine site, barge ramp, and Nob Point Transhipment Anchorage are considered to be of HEV. The Cooktown Harbour area and Endeavour River may reflect slightly more modified aquatic ecosystem values, despite being in a Conservation Park Zone of the Great Barrier Reef Coast Marine Park.

Figure 8-13 Marine waters adjacent to the GSSP.

Source: Draft East Cape York WQIP (CYNRM 2016).

d) Potential Impacts to Water Quality

While the design of the mine is at an early stage and the proposed hydrogeological studies have not yet commenced, the intent is that water quality (surface and groundwater) will be protected by the following initiatives:

- the sandy soils are highly permeable and are expected to result in little surface runoff
- extensive use will be made of erosion and sedimentation control techniques to reduce erosion and capture any sediments prior to discharge
- the silica processing methodology (**Section 7.2.3**) does not use harmful chemicals and processing ponds will be lined as necessary due to the highly permeable nature of existing soils and to avoid contaminating any groundwaters
- runoff from impervious surfaces other than roofs will be collected and conveyed to local watercourses after sediment is removed through stormwater controls.

Other initiatives will be explored in the hydrogeological and associated groundwater studies.

e) Potential Run-off from Disturbed Acid Sulfate Soils

Subject to confirmation through soil sampling, it is unlikely that acid sulfate soil / potential acid sulfate soil (ASS / PASS) will occur in any areas to be developed owing to the sandy nature of the soil and geological conditions. Well-established techniques for managing potential impacts to water quality can be applied if soil investigations indicate any ASS or PASS on the site or in adjacent areas where works associated with the project are proposed.

f) Potential Impacts

Dredging

No dredging is proposed for the proposed barge ramp at Nob Point (Nob Point loading) or required to establish the CLA in the Endeavour River (Cooktown loading). As such, the project will not need to involve the placement of dredge material at sea or on land.

Clean rock fill (from terrestrial quarry sources) will be used to construct the proposed barge ramp at Nob Point.

Bed Levelling

No bed levelling is proposed offshore (Nob Point loading) or in the Endeavour River (Cooktown loading). See **Section 7.4.9m)**.

Transhipping

Transhipping is proposed at several alternative locations:

- Nob Point Loading::
  - offshore of Nob Point
  - in the Port of Cape Flattery
  - in the Port of Cooktown (either north near Indian Head or south near the town).
- **Cooktown Loading:** in the Port of Cooktown (south near the town) or just outside the port.

Impacts arising from transhipment of silica (i.e. potential loss of product at sea, loose, in skips, or bagged) are expected to be minimal as the material is chemically and physically benign. Any spillage at either of the transhipment sites would be likely to have little impact due to depth.

Seabed conditions and benthic ecology communities at several of these sites have been investigated (see **Section 8.6.2**) and none contains corals or seagrass. It is proposed to undertake a detailed risk assessment during the EIS to investigate possible loading and transhipping impacts.

Shipping

As part of the process that resulted in the GBR Strategic Assessment (GBRMPA 2014a) and Outlook Report (GBRMPA 2014b), it was noted that a number of specific impacts of shipping required 'increased attention', including:

- the regulation of shipping traffic including 'boat parks' where numbers of large ships wait at anchor for cargo
- the provision of compulsory and voluntary ship reporting and pilotage
- emergency and pollution response preparedness
- assurance of ship safety
- threats from invasive species imported in ballast waters.

AMSA (2014) includes an assessment of the impacts of shipping and refers extensively to the strategic assessment. It also provides a more detailed assessment of known and potential shipping impacts on MNES and OUV and concludes that:

> Even when operated safely, and in accordance with all legal requirements, shipping may still have an impact on the environment from operational and other routine impacts such as exhaust gas

emissions and anchoring. The cumulative effect of these impacts may accumulate in time or interact with other impacts to place additional pressures on an already stressed environment. (p ix)

The management plan includes a number of recommendations and a work program under the following themes:

- Ship safety protective measures.
- Navigation safety protective measures.
- Environment protection measures.
- Preparedness and response protective measures.
- Stakeholder engagement.

The promulgation of the Northeast Shipping Management Plan by the AMSA as well as other measures will seek to address the additional risk of marine traffic in and around the GBR.

Diatreme will be bound by the legislation that pertains at the time. In addition, it is planned to develop local management measures and plans to minimise impacts on marine animals during navigation outside of the recognised shipping channel and during loading and unloading operations. These measures and plans will be developed as part of the EIS.

For both transhipment options, the proposed mooring anchorages are located to the west of the existing North-South shipping channel. As such, the vessel will not need to traverse areas with known islands or reefs to access the anchorages.

8.3.2 Water Resources

With regard to water resources, describe the following:

- existing watercourses, waterbodies, estuaries and the coast
- existing users of surface and groundwater resources
- existing groundwater supply facilities (e.g. bores, wells, or excavations)
- general requirements of section 126A of the EP Act
- general requirements of Chapter 3 of the Water Act 2000 in regards to the underground water
- management framework; such as proposed monitoring, assessment and making good impacts that result from resource operations
- if any approval or allocation that would be needed under the Water Act 2000, specifically address whether or not the proposed project would take water from, or affect recharge to, aquifers of the Great Artesian Basin
- proposed impoundment, extraction, discharge, injection, use or loss of surface water or groundwater
- significant diversion or interception of overland flow, including the effects of subsidence
- options for supplying water to the proposed project
- proposed on-site storage and treatment requirements for waste water from accommodation and/or offices and workshops
- outline the likely: nature, type, geology/stratigraphy, depth to, and thickness of the aquifers; their transmissivity; and value as water supply sources.

Illustrate using appropriate maps at a suitable scale.

a) Existing Watercourses, Waterbodies, Estuaries and the Coast

Mining Area

The land is intersected by a number of small coastal streams which are largely unnamed. The exception is Deep Creek, a 1st order stream that runs in a south-easterly direction along the northern boundary of the ML to the coast. The southern part of the ML contains Alligator Creek, a 3rd order stream that drains the swales between the dunes. Refer **Figure 7-27**.

As previously described, there are two wetlands within or adjacent to the ML that are mapped as having HES. These are shown later on **Figure 8-21**.

Immediately adjacent to the mining area is the Coral Sea and the GBR lagoon.

Nob Point Loading

Immediately adjacent to Nob Point is the Coral Sea and the GBR lagoon.

Cooktown Loading

The CLA is located on the banks of the Endeavour River which at the site is considered to be an estuary (based on DAF (2013) Waterway Barrier Works mapping).

b) Existing Users of Surface and Groundwater Resources

There are no existing nearby users of surface and groundwater resources. The three registered bores in the vicinity have been found by recent inspections to be all inoperational. Refer to **Figure 7-32**.

c) Existing Groundwater Supply Facilities (e.g. Bores, Wells, or Excavations)

There are no existing groundwater supply facilities.

d) General Requirements of Section 126A of the EP Act

Section 126A of the EP Act requires that attention is given to

- (a) any proposed exercise of underground water rights during the period in which resource activities will be carried out under the relevant tenure;
- (b) the areas in which underground water rights are proposed to be exercised; (c) for each aquifer affected, or likely to be affected, by the exercise of underground water rights—
  - (i) a description of the aquifer; and
  - (ii) an analysis of the movement of underground water to and from the aquifer, including how the aquifer interacts with other aquifers and surface water; and
  - (iii) a description of the area of the aquifer where the water level is predicted to decline because of the exercise of underground water rights; and
  - (iv) the predicted quantities of water to be taken or interfered with because of the exercise of underground water rights during the period in which resource activities are carried out;
- (d) the environmental values that will, or may, be affected by the exercise of underground water rights and the nature and extent of the impacts on the environmental values;
- (e) any impacts on the quality of groundwater that will, or may, happen because of the exercise of underground water rights during or after the period in which resource activities are carried out;

- (f) strategies for avoiding, mitigating or managing the predicted impacts on the environmental values stated for paragraph (d) or the impacts on the quality of groundwater mentioned in paragraph (e).

These issues are proposed to be addressed in the hydrogeological studies.

e) General Requirements of Chapter 3 of the Water Act 2000

The purpose of Chapter 3 of the Water Act is to provide for the management of impacts on underground water caused by the exercise of underground water rights by resource tenure holders.

These issues are proposed to be addressed in the hydrogeological studies.

f) Management Framework

Management actions are proposed to be addressed in the hydrogeological studies.

g) Approval or Allocation under the Water Act

Extraction of groundwater is proposed such that an approval to take will be required. Information needs are proposed to be addressed in the hydrogeological studies.

h) Proposed Impoundment, Extraction etc. of Surface Water or Groundwater

The hydrogeological studies will include the development of a concept design for groundwater extraction.

i) Significant Diversion or Interception of Overland Flow

No significant diversion or interception of overland flow is proposed.

j) Options for Supplying Water to the Proposed Project

The estimated water requirement for the mine and site facilities (e.g. workshop, ablution block, and staff kitchen) is 500 ML/a (average of 15.8 L/s). This supply is expected to be obtained from groundwater bores close to the mine site. Exploration drilling has intersected the main water table in sand below the mineral resource and while there has so far been no hydrogeological investigation of the water table to determine the potential yield from bores, the geology and rainfall is similar to Cape Flattery where that silica mine obtains a suitable water supply for a mining operation in excess of 2 million tonnes per year.

Water recycling dams will be used to minimise the requirement from water bores. Most of the water losses on the site will result from seepage into the ground from dams, product stockpiles, and by-product stockpiles.

The only water lost from the site will be small quantities lost as evaporation and moisture transported from the site in the product. Water bores and spears close to the operations will effectively be able to recycle a large proportion of the water that seeps into the ground if this is found to be sustainable.

Diatreme has discussed the project and its water requirements with the allocated Manager for Water Planning at the Cairns office of the DNRME. The relevant water management area is the Endeavour River catchment which is included in the Cape York Water Planning process. The Water Management Protocol for the Cape York Water Plan became operational in October 2019.

The Endeavour River catchment has surplus water allocation that is not currently being utilised. The project is expected to be able to obtain the necessary water from various sources including purchasing

existing allocations or negotiating with freehold landholders who are expected to receive allocations in the coming months.

All issues associated with local groundwater will be addressed in the proposed hydrogeology study.

k) On-Site Storage and Treatment of Waste Water

A small commercial sewerage package plant will be installed adjacent to the Workshop for handling Workshop and Office sewage.

l) Geology/Stratigraphy etc. of Aquifers

What little is known about groundwater is described in **Section 7.3.13**.

All issues associated with local groundwater will be addressed in the proposed hydrogeology study.

8.4 FLOODING AND REGULATED STRUCTURES

Describe the history of flooding onsite and in proximity to the site. *Outline the proposed purpose of all dams or levees proposed on the project site. Show their locations on appropriately scaled maps.*

8.4.1 Mining Area and Nob Point Loading Area

Owing to the highly effective drainage capacity of the sandy soils, flooding in the ML is limited to the southern part of the site that contains Alligator Creek that drains the swales between the dunes. Refer **Figure 7-27**.

Figure 8-14 below shows the flood hazard overlay from the Planning Scheme with the ML superimposed. This figure shows that flooding is only of concern to the west of the ML and that this is in another catchment.

Figure 8-14 Flood Overlay showing ML.

Source: Hope Vale Aboriginal Shire Council Planning Scheme (2014).

8.4.2 Cooktown Loading Area

With respect to the CLA, **Figure 8-15** below shows the Flood and Other Coastal Hazards Overlay of the Cook Shire Planning Scheme with the CLA location indicated. This figure shows that flooding is not of concern and that extreme water level will be dominated by storm tide.

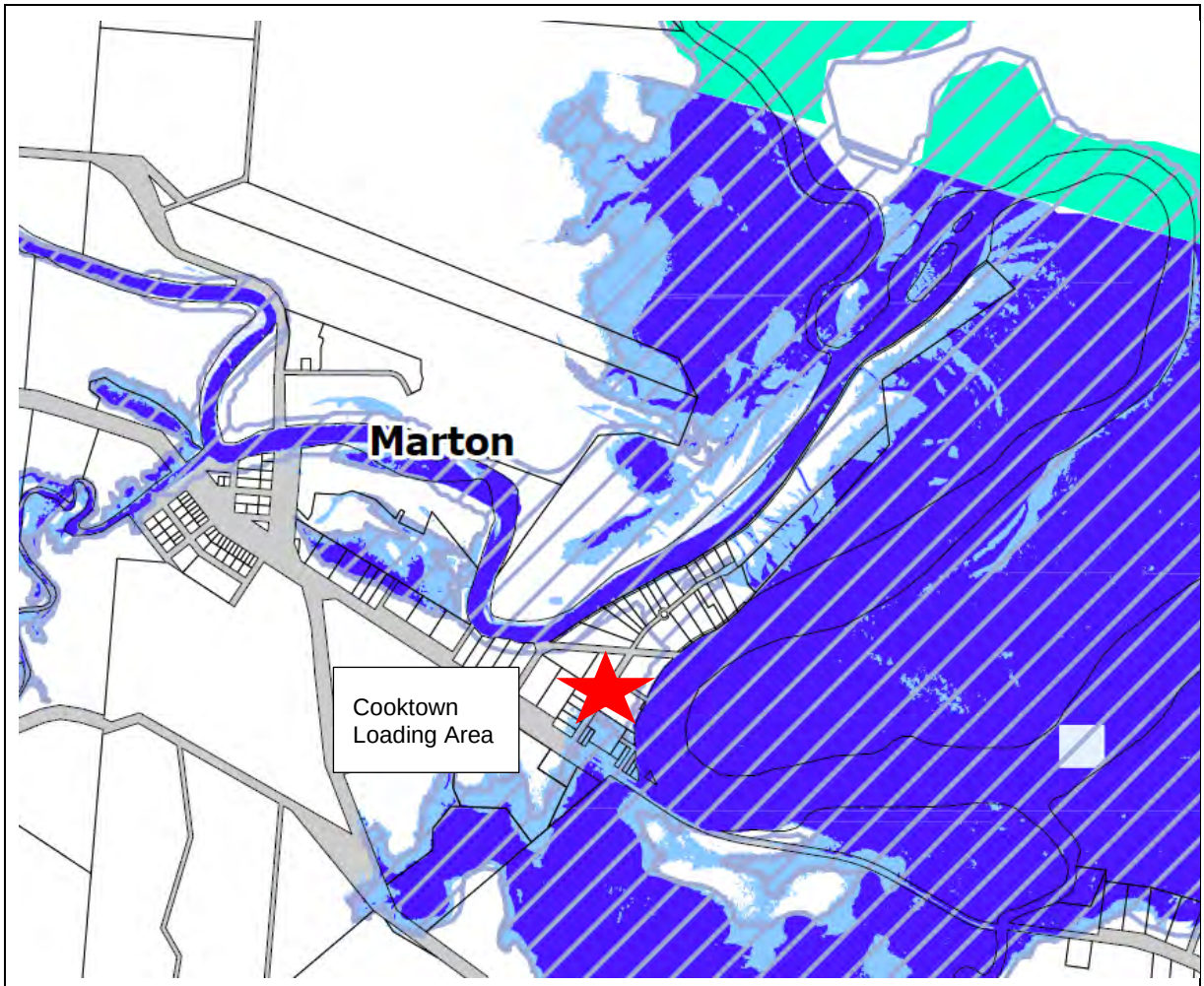


Figure 8-15 Flood and Other Coastal Hazards Overlay showing CLA.

Source: Cook Shire Council Planning Scheme (2017).

Other than possible culvert upgrades where the access road from Hope Vale floods, no flood mitigation work is proposed on the ML or in adjacent works areas.

8.5 FLORA AND FAUNA

Provide information about aquatic and terrestrial ecosystems, biodiversity and environmental values to be expected on the proposed project's site and in its vicinity. Include the following aspects:

- *identification of all significant and listed threatened species and ecological communities under the Nature Conservation Act 1992 and the EPBC Act, including matters of state environmental significance (MSES) and matters of national environmental significance (MNES)*
- *terrestrial and aquatic ecosystems (including groundwater-dependent ecosystems)*
- *estuarine and marine plants and fauna and the marine environment (particularly the Great Barrier Reef Marine Park)*
- *potential habitat of threatened, near-threatened or special least-concern species*
- *integrity of landscapes and places (including wilderness, areas of high conservation value and similar places, connectivity of habitats and ecosystems)*
- *weeds and pest animals.*

Illustrate using appropriate maps where possible.

8.5.1 Terminology

Considerable material included below is based on the wet season and dry season ecological surveys (Biotropica Australia 2019a, b) which were undertaken in January and August 2019 respectively and a supplementary wet season survey undertaken in January 2020 (Biotropica Australia 2020b). Because the project has evolved over this time (usually due to the findings of that work), those reports use varying terminologies to describe various parts of the project.

This has been rationalised and, in the following discussion, the following terms are used whenever relevant:

- Mining Area – all development within the Mining Lease area (including the mine area, ancillary infrastructure area and buffers) and is the area subject to direct impacts as a result of the mine.
- Mining Study Area (MSA) – the Mining Area plus a buffer area to allow for the consideration of indirect impacts.
- Cooktown Loading Area (CLA or Cooktown Loading Area) – this consists of 93BS202 and adjacent area.
- Nob Point Project Area (NPPA) – this is a combination of the Nob Point Loading Area (NPLA), and the Nob Point Transport Corridor (NPTC) that connects it with the Mining Area.
- Nob Point Study Area (NPSA) – the NPPA plus a buffer which extends to the marine interface.
- Project Area is a combination of the Mining Area, the Nob Point Project Area and the Cooktown Loading Area.

a) Nomenclature

As noted in **Section 7.1.4**, several flora and fauna studies have been undertaken since 2018 and during this time the size and shape of the proposed mining area has changed, largely as a result of these studies. For this reason, there has been an evolution of terminology used to describe the area where the surveys have been undertaken.

Table 8-3 below summarises nomenclature used in describing the GSSP in this IAS (some terms have already been introduced). Refer also **Figure 8-16**.

Further clarification is provided in the detailed description of flora and fauna in **Section 8.5**.

Table 8-3 Summary of project nomenclature

ITEM	NAME (ACRONYM)
Mine – 2018 and 2019 surveys	
Mine area proposed in December 2018 and used in 2019 wet season and 2019 dry season studies as the Project Area. Includes mine, ancillary infrastructure and small buffer area	Trial mine area Orange polygon on **Figure 8-16**
Trial mine area (2018 and 2019 surveys)	Trial mine area
Mining area (IAS/EIS)	Mining area
Mining Lease	
Mining Lease area (as applied for December 2019) Larger area than trial mine area and based on wet season and dry season survey and modelling constraints	Mainlining Area, Mining Lease (ML) Red polygon on **Figure 8-16**

Source: Study team compilation.

Figure 8-16 Trial mine area to November 2019 (wet and dry season surveys) and ML (January2020).

8.5.2 Remnant Native Vegetation

Mining Area

Wet season (2019, 2020) and dry season (2019) surveys and associated mapping shows that there are seven broad vegetation communities recorded within the ML, and a Beach/strand community recorded between the ML and the ocean (surveyed in the 2019 wet season only). These are (acronyms in brackets are as mapped on **Figure 8-17**).

- Acacia-dominated transitional community (ATC)
- Eucalypt woodland (EWL)
- Heath / dwarf heath (H/DH)
- Littoral rainforest (LRF)
- Melaleuca woodland (MWL)
- Riparian forest (RipF)
- Wetland (WET).

A small mangrove community was located in the 2020 wet season survey between the NPPA and the ocean (e.g. within the NPSA). This is outside the area of likely impact.

Nob Point

The NPSA contains four of these communities:

- Eucalypt woodland (EWL)
- Heath / dwarf heath (H/DH)
- Mangrove (MAN)
- Riparian forest (RipF).

Refer **Figure 8-17**.

Cooktown Loading Area

At the CLA a single Eucalypt woodland / mangrove community was identified.

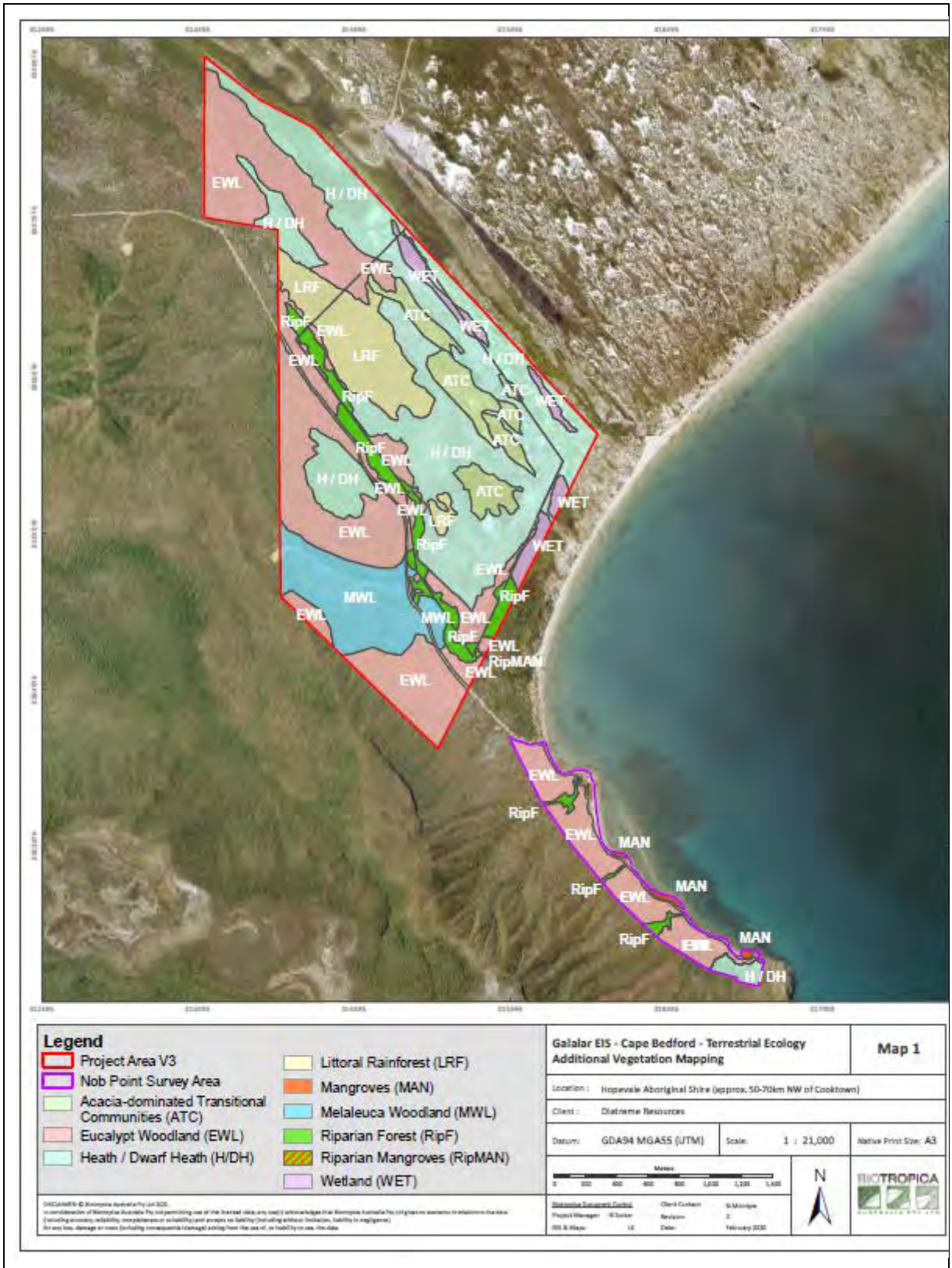


Figure 8-17 Remnant vegetation (field mapping).

Source: Biotropica Australia (2020b) Map 1.

Comprehensive lists of plant species recorded in the MSA, NPSA and CLA are provided in Appendix 5 of Biotropica Australia (2020b).

8.5.3 Matters of State Environmental Significance

a) Introduction

Matters of State Environmental Significance (MSES) for planning / values assessment purposes are established under the under the Planning Act via the State Planning Policy (SPP). MSES include values that are protected under Queensland legislation such as:

- Nature Conservation Act 1992
- Marine Parks Act 2004
- Fisheries Act 1994
- Environmental Protection Act 1994
- Regional Planning Interest Act 2014
- Vegetation Management Act 1999.

Although not necessarily relevant in terms of approvals, MSES serve as a good summary of values, most of which are afforded protection under one of the above pieces of Queensland legislation. MSES and their potential applicability to the ML (in terms of presence) are listed below. Whether or not these MSES trigger approvals depends on the legislative framework. Light grey text is used when the MSES is not applicable. Note that a discussion on marine park zoning is provided in **Section 8.6.2e)** with respect to offshore components.

Table 8-4 MSES and their potential applicability

MATTERS OF STATE ENVIRONMENTAL SIGNIFICANCE	MA	NPPA	CLA
SPP 2017			
State Conservation Areas			
MSES A - Protected Area under *Nature Conservation Act 1992* (All classes except coordinated conservation areas)	No	No	No
MSES B – Highly protected zones under *Marine Parks Act 2014* Note that a discussion on marine park zoning is provided in **Section 8.6.2c)** with respect to offshore components.	No	No (general Use zone – GUZ)	Yes (the CLA is adjacent to the Conservation Park Zone - CPZ)
MSES C – Declared fish habitat areas A and B under *Fisheries Regulation 2008*	No	No	No
MSES D – Strategic Environmental Areas (Designated Precinct) under *Regional Planning Interests Regulation 2014* (Offsets not required in an urban area)	No	No	No

(Continued over)

Wetlands and Waterways			

MATTERS OF STATE ENVIRONMENTAL SIGNIFICANCE	MA	NPPA	CLA
MSES E – WPA or 'High Ecological Significance' Wetlands shown on map of Referable Wetlands under Environmental Protection Regulation 2008	Yes	No	No
MSES F – High Ecological Value (HEV) Waters (Wetlands & Waterways) under Environmental Protection (Water) Policy 2009	Yes	No	No
Offsets			
MSES G – Legally secured offset areas as defined under the *Environmental Offsets Act 2014*	No	No	No
Threatened Flora and Fauna			
MSES H – Threatened wildlife under the *Nature Conservation Act 1992* and special least concern animals under the *Nature Conservation (Wildlife) Regulation 2006*.	Yes	No	No
MSES I – Marine plants under the *Fisheries Act 1994*	Yes	No (only in adjacent NPSA)	Yes
MSES J – Waterways that provide for fish passage under the *Fisheries Act 1994*	Yes	Yes	Yes
MSES K – high risk area on flora survey trigger map under the Nature Conservation Act 1992 and/or the Environmental Offsets Regulation 2014	Yes (part)	No	No
MSES L - Regulated Vegetation under the *Vegetation Management Act 1999* that is:			
i. Category B areas on RVM that are 'endangered' and 'of concern' regional ecosystems	Yes	No	No
ii. Category C areas on RVM that are 'endangered' and 'of concern' regional ecosystems	No	No	No
iii. Category R areas on RVM	No	No	No
iv. Essential Habitat on the essential habitat map for wildlife prescribed as 'endangered' or 'vulnerable' under the Nature Conservation Act 1992	No	No	No
v. Category A, B, C or R areas on RVM that are within a defined distance from a watercourse identified on vegetation management watercourse and drainage map	Yes	Yes	Yes
vi. Category A, B, C or R areas on RVM that are located within a wetland or within 100 m from a wetland identified on vegetation management wetlands map	Yes	No	No

MATTERS OF STATE ENVIRONMENTAL SIGNIFICANCE	MA	NPPA	CLA
Additional MSES defined under the *Offsets Regulation 2014*			
Connectivity areas – applies to the extent the ecosystem contains remnant vegetation and if the ecosystem contains an area of land that is required for ecosystem functioning	No	No	No

Source: Biotropica Australia (2019a, 2019c, 2020b).

Relevant MSES are further discussed below. As the purposes of this report is to provide initial advice on project values and impacts, any species listed under the NC Act that are also discussed in relation to the EPBC Act are noted. Detailed assessment of each species under each level of relevant legislation will be assessed as part of the EIS process.

b) MSES B – Highly protected zones under Marine Parks Act 2014

CLA

The Cooktown Loading Area is adjacent to the Great Barrier Reef Coast Marine Park (Conservation Park Zone). Refer **Section 8.6.2e)**.

c) MSES E – High Ecological Significance Wetlands

MSA

There are two wetlands mapped as having High Ecological Significance (HES) (under the Environmental Protection Regulation 2008) that will require consideration. One is located partially within the MSA and crosses the north-eastern boundary of the ML Area. The other mapped HES wetlands is located approximately 90 m outside of and to the south-east of the ML.

The location of the two mapped wetlands was confirmed during the wet season field survey completed by Biotropica Australia (2019a). However, both wetlands were surveyed as being larger in area than the mapping shows. During the survey, an additional wetland that is likely to meet the definition of a HES wetland was also recorded (refer **Figure 8-21**). This wetland is located approximately 10 m outside of, and to the east of the MSA.

d) MSES H – Threatened Wildlife

See **Section 8.5.6**, **Section 8.5.7**, and **Section 8.5.8**.

e) MSES I – Marine Plants

Refer to **Section 8.5.11**.

f) MSES J – Waterways for Fish Passage

All freshwater fish migrate at some point during their life cycle. Migration enables fish to:

- move between feeding and breeding areas, which are often in different habitats
- move from waterway channels to floodplains during high-flow events
- locate mates and suitable habitats along the course of a river
- find refuge (e.g. permanent water) during dry seasons or droughts, and then disperse from refuge areas after rainfall events.

Management Framework

According to the Accepted Development Requirements (ADR) introduced on 3 July 2017 (DAF 2017), waterway barrier works may inhibit the free movement of fish along waterways and onto floodplains, injure fish and affect fish health and habitat. The ADR were prepared under the *Planning Act 2016* (Qld) (Planning Act) and the *Fisheries Act 1994* (Qld) (Fisheries Act) and specify the requirements for development to be 'accepted development'.

Fish passage is an essential requirement for the survival and productivity of many species of Queensland fish. Reducing fish's access to habitat reduces fisheries productivity. Some species must move into different habitats for breeding or rearing of young, or to access critical habitats for food and protection.

Waterway Classification System

According to the Guide for the determination of waterways using the spatial data layer *Queensland waterways for waterway barrier works* (DAFF 2013):

> The definition of a waterway under the Fisheries Act is broad and a Queensland-wide data layer has been developed to better delineate this. The spatial data layer *Queensland Waterways for Waterway Barrier Works* shows the furthest extent of the Fisheries Act interest in barrier works on waterways. On the data layer, these waterways are depicted as a coloured stream network from the upstream limit, downstream to the tidal or wetland conclusion.
>
> Streams that are not coloured on the data layer are not considered waterways [although if there are features on the ground that appear to be waterway like (bed, banks, fish present) a determination should be obtained from DAF]. Waterway barrier works on these streams do not require approvals or assessment under the Fisheries Act. However barrier works within freshwater wetlands are subject to other state and federal legislation.

This layer determines whether or not approval for Waterway Barrier Works (WWBW) is required under the Fisheries Act and the Planning Act. Works within the ML are not subject to this legislation but impacts need to be assessed for the EIS and EA application.

MSA / ML

Figure 8-18 below shows mapped waterways in the ML area.

Under this mapping what is locally known as Alligator Creek that is located between the ML boundary and the road to the south of the boundary, and at times lies within the ML itself. Alligator Creek commences in the drainage lines approximately 800 m north of the ML where it is freshwater, and transitions to a tidal creek for the eastern section. Alligator Creek is mapped as having a 'high' risk of impact due to WWBW, meaning that the creek has high values for fish passage. No fish surveys were undertaken for this report. However, the tidal part of the creek is unmodified and displays high aquatic habitat value. Although relatively short in length, the availability of good quality instream and bank

vegetation, and the presence of freshwater and tidal waters, provides high quality habitat for fish species. Studies of aquatic fauna will be undertaken for the EIS.

Alligator Creek is within the riparian forest buffer and should remain largely unaffected. The existing road from Hope Vale crosses this waterway and its tributaries in several locations, one of which is mapped as amber ('moderate' risk) and the remainder are green ('low' risk).

In the north-west corner of the ML there is a small creek marked as having 'low' risk of impact with respect to WWBW. This 'creek' is approximately 600 m in length and is contained entirely within the sand dune system, isolated from the ocean or any other water sources. This creek should more correctly be defined as a drainage line and has no value to fish passage.

Figure 8-18 Waterways mapped for fish passage risk.

Source: DAFF (2013).

The road to Nob Point crosses several green ('low' risk) streams.

CLA

The marine component of the CLA is located within the Endeavour River which is a 'major' impact waterway. It is also mapped as an Estuary. The proposed piling works do not constitute a risk to the fish passage values of this waterway.

g) MSES K – High Risk Area on Flora Survey Map

MSA

The Protected Plants flora survey trigger map shows high risk areas for protected plants and is used to determine flora survey and clearing permit requirements. The MSA has a small amount of 'high risk' area on the north-western boundary. The staging plan shows that this is not expected to be mined in the first 15 years of operation.

h) MSES L – Regulated Vegetation

MSES L (i) Category B areas that are 'of concern' regional ecosystems

MSA

The entire MSA is mapped as Category B remnant vegetation. This status was confirmed during the wet season survey. The majority of the MSA is mapped as 'of concern' regional ecosystems (either dominant or sub-dominant) (refer **Figure 8-21**). However, the wet season survey showed that the RE mapping within the MSA was incorrect, and large extents should more correctly be mapped as 'least concern' REs. There is one RE which remains undetermined.

As only those REs that are categorised as endangered or of concern are MSES, this mapping must be finalised before an impact assessment can be completed.

MSES L (iv) Essential Habitat on the essential habitat map for wildlife prescribed as 'endangered' or 'vulnerable' under the Nature Conservation Act 1992

CLA

Approximately three-quarters of the BPA is mapped under the VM Act as Essential Habitat (refer Appendix 1 – Map 15 of Biotropica Australia (2019b)). However, current mapping appears to be misaligned and it is concluded that approximately 1.15 ha of the 1.32 ha BPA contains Regulated Vegetation, including Essential Habitat.

MSES L (v) Category A, B, C or R areas that are within a defined distance from a watercourse

MSA

While three watercourses were mapped under the VM Act as being present within the MSA at the time of the wet season survey, only one (the creek on the southern boundary of the MSA) was confirmed during the survey. The VM Act watercourse mapping has been amended and as a result, the two 'missing' watercourses depicted in the previous version (V2.0), were removed from the current version (V3.0) (refer Biotropica Australia (2019b) Map 11).

CLA

The Endeavour River, a 6th order stream, is directly adjacent to the BPA. For non-coastal bioregions, including the Cape York Peninsula Bioregion, the defining distance from a watercourse which MSES L (v) applies is 100 m. Therefore, approximately half of the BPA falls within the defining distance.

Approximately three-quarters of the BPA is mapped as Category B vegetation, however, ground surveys suggest the mapping is inaccurate and the Category B vegetation extends further towards Slaughter Yard Road.

MSES L (vi) – Category A, B, C or R areas that are located within a wetland or within 100 m from a wetland

Since the wet season survey, the wetland mapping has been amended and as a result there is an increase in extent of the 100 m buffer into the ML (refer Biotropica Australia (2019b) Map 11).

i) Marine MSES

There are no spatially-defined marine MSES values in the vicinity of the ML, noting that the HEV designation of coastal waters identified for the East Cape York region are in draft form and not yet formally adopted (but are being considered regardless as part of the project baseline).

However, the Cape Bedford area potentially supports habitat for a range of endangered, vulnerable and near threatened (EVNT) and special least concern (SLC) marine wildlife, noting that all EPBC listed threatened and migratory species are also MSES except for the blue, Bryde's and killer whales, and all species of sharks and rays.

8.5.4 Matters of National Environmental Significance

a) Overview

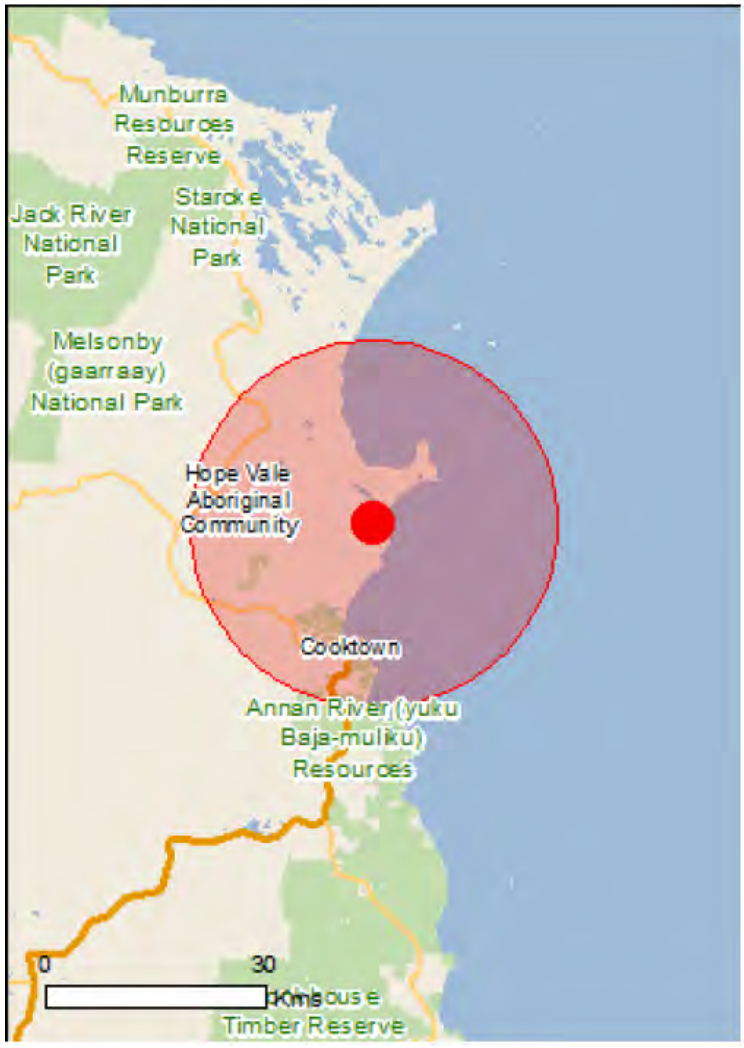
The *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) protects Matters of National Environmental Significance – variously referred to as 'matters of NES' and 'MNES'. The nine MNES protected under the EPBC Act (controlling provisions) are:

- world heritage properties
- national heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

Under the EPBC Act, actions that have, or are likely to have, a significant impact on an MNES require approval from the Australian Government Minister for the Environment (the Minister). The Minister will decide whether assessment and approval is required under the EPBC Act.

It is the responsibility of the person or body undertaking 'the action' to ensure that approval is sought if the impact is likely to be 'significant'. Significant Impact Guidelines exist (for example, Department of the Environment 2013) and projects likely to involve significant impacts are referred to the Minister for a determination.

Searches using the EPBC Act Protected Matters Search Tool (PMST) were undertaken for a search area that includes the terrestrial and marine components of the study as detailed below. See **Figure 8-19** for details of the search area.



Search area 25 km buffer from -15.3248 145.2758.

This covers the MSA and CCLA.

Figure 8-19 EPBC Act Protected Matters search area (terrestrial).

Source: EPBC Act Protected Matters Search Tool accessed 9 February 2020. See **Append1x B**.

b) Details

Table 8-5 lists the MNES (and their section references under the EPBC Act) as identified by the above searches. Relevance to the Mine / Nob Point Study Area and Cooktown Study Area is indicated in the final two columns.

Table 8-5 MNES and applicability

MATTER	DETAILS	NOTES	Mine / Nob Point Study Area	Cooktown Study Area
World Heritage properties (sections 12 & 15A)	Great Barrier Reef World Heritage Area (GBRWHA)	Lies seaward of low water adjacent to the EPM. Note that the EPM specifically excludes the GBRWHA.	✓	✓
National Heritage places (sections 15B & 15C)	Great Barrier Reef National Heritage Place (GBRNHP)	As above.	✓	✓
Listed threatened species and communities (sections 18 & 18A)	1 threatened ecological community: Littoral Rainforest (LRF) – a critically endangered ecological community	Mapped as covering some 30 ha of the project area (note that field studies have confirmed the actual extent).	✓	
	47 listed threatened species	Includes species identified as occurring in the project area or likely to be present or overfly.	✓	✓
Listed migratory species (sections 20 & 20A)	45		✓	✓
Commonwealth marine areas (sections 23 & 24A)	1	The CMA stretches from 3 to 200 nautical miles from the coast.	~	~
Great Barrier Reef Marine Park (sections 24B & 24C).	Great Barrier Reef Marine Park (GBRMP)	Lies seaward of low water adjacent to the EPM.	✓	✓

Source: Study team compilation.

~ indicates adjacent

c) Significance Assessment

A detailed self-assessment as required under the EPBC Act has been undertaken and documented in Environment North *et al.* (2020). **Table 8-6** below is extracted from that report and provides a summary of potential impacts on MNES and their significance.]

Table 8-6 Summary of potential impacts on MNES

MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE	IMPACT AND SIGNIFICANCE
World Heritage properties (sections 12 & 15A)	The Great Barrier Reef World Heritage Area lies immediately offshore from low water. Potential impacts are: • impacts from land-based activities (e.g. runoff) • impacts on landscape and visual amenity • direct and indirect impacts marine habitat from marine work • transhipping • coastal shipping. Self-assessment concludes that there will be some localised impacts (particularly for the Nob Point option for marine habitat and visual amenity) that will need to be further minimised or reduced as far as practicable through siting, design and management planning measures. Following application of these measures, these impacts are unlikely to represent significant impacts that affect the OUV of the WHA. However, the loss of visual amenity (OUV) arising from the mine and the Nob Point infrastructure could meet the significant impact test.
National Heritage places (sections 15B & 15C)	Great Barrier Reef National Heritage Place. As per GBRWHA above.

(Continued over)

MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE	IMPACT AND SIGNIFICANCE	
Listed threatened species and communities (sections 18 & 18A)	**Terrestrial species:** Three flora species and three listed and migratory fauna species were recorded within the Project Areas while two listed and migratory fauna species were recorded within the littoral zones outside of the Project Areas. The construction of the Project will involve clearing of native vegetation at various locations within the Project Areas. A constraints analysis based on extensive ecological surveys was used to delineate listed threatened communities and the habitats of listed threatened species and appropriate buffers. The comprehensive self-assessment of all terrestrial issues (Biotropica Australia 2020b) found that in most cases, project planning was able to avoid such areas to the extent such that there no significant impacts are expected. All directly impacted habitats are sufficiently protected and buffered such that no significant impacts are expected to occur. **Marine species:** Marine components of the Project have a very small footprint and will involve little disturbance to the marine environment. In addition, loading and shipping operations are low-impact. Based on the desktop assessment of affected species and rapid field habitat assessment (marine) survey (BMT 2020), significant impacts on listed threatened marine species are not expected. **Terrestrial communities:** Littoral Rainforest (LRF) (CE) was located in the mining area. The larger of the mapped areas will be avoided and suitably buffered to ensure that no significant impact occurs. The small (2.6 ha) outlier cannot be practically avoided. Self-assessment concludes that the loss of the 2.6 ha patch will involve a significant impact. See below.	
Listed threatened species and communities (sections 18 & 18A) (cont.)		Ground-truthed TCE (LRF) extent within ML. The larger polygon and a 100 m buffer will be preserved while the smaller polygon (2.6 ha) will be cleared.

MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE	IMPACT AND SIGNIFICANCE
Listed migratory species (sections 20 & 20A)	**Terrestrial Species.** Four migratory only fauna species were recorded within the littoral zones outside of the Project Areas and two fauna species and several migratory species may potentially occur (but have not been recorded). Self-assessment concludes that no significant impacts will occur to any of these species or the many additional species that may occasional overfly the site or utilise its resources.
	Marine Species. Based on BMT (2020), significant impacts on listed migratory marine species are not expected.
Commonwealth marine areas (sections 23 & 24A)	The CMA stretches from 3 to 200 nautical miles from the coast. Potential impacts are restricted to coastal shipping. Self-assessment concludes that no significant impacts will occur.
Great Barrier Reef Marine Park (sections 24B & 24C)	The Great Barrier Reef Marine Park Area lies immediately offshore from low water. As per GBRWHA above.

Source: Environment North *et al.* (2020) Table 4-31.

V = Vulnerable, C = Critically Endangered

In summary, a rigorous self-assessment reveals that there is likely to be a significant impact on a TCE (LRF) and that this impact is unavoidable if the resource is to be efficiently utilised. In all other cases (possibly with the exception of visual amenity) there will not be any significant impact on any MNES. This situation is based on:

- avoidance measures already incorporated in to the design of the project
- absence of any impacting process that would place the identified values at significant risk
- adoption of a regime that seeks to further reduce impacts by management.

The recommended measures are outlined in the following chapter.

8.5.5 Environmentally Sensitive Areas

Maps of Environmentally Sensitive Areas (ESAs) relevant to mining activities are available from the Department of Environment and Science. **Table 8-7** below provides an assessment of all ESAs. See also **Figure 8-20**.

Table 8-7 Environmentally Sensitive Areas

ENVIRONMENTALLY SENSITIVE AREA	NOB POINTLOADING	COOKTOWN LOADING
Category A		
(a) any of the following under the *Nature Conservation Act 1992*—		
(i) a national park (scientific);	No.	No.
(ii) a national park;	No.	No.
(iii) a national park (Aboriginal land);	No.	No.
(iv) a national park (Torres Strait Islander land);	No.	No.
(v) a national park (Cape York Peninsula Aboriginal land);	No.	No.
(vi) a conservation park;	No.	No.
(vii) a special wildlife reserve;	No.	No.
(viii) a forest reserve;	No.	No.
(b) the wet tropics area under *the Wet Tropics World Heritage Protection and Management Act 1993*;	No.	No.
(c) the Great Barrier Reef Region under *the Great Barrier Reef Marine Park Act 1975* (Cwlth);	Yes. The NPLA and all transhipment anchorages are within the GBR region.	Yes. The Cooktown Transhipment Anchorage (Inner and Outer) are within the GBR region.
(d) a marine park under the *Marine Parks Act 2004*, other than a part of the park that is a general use zone under that Act.	No.	The CLA is adjacent to the Conservation Park (Yellow) Zone (CPZ). Depending on location, the Cooktown Transhipment Anchorage could be in the CPZ or the GUZ.
Category B		
(a) any of the following areas under *the Nature Conservation Act 1992*—		
(i) a coordinated conservation area;	No.	No.
(ii) an area of critical habitat or major interest identified under a conservation plan;	No.	No.
(iii) an area subject to an interim conservation order;	No.	No.

(Continued over)

Category B (cont).	

ENVIRONMENTALLY SENSITIVE AREA	NOB POINTLOADING	COOKTOWN LOADING
(b) an area subject to the following conventions to which Australia is a signatory—		
(i) the 'Convention on the Conservation of Migratory Species of Wild Animals' (Bonn, 23 June 1979);	No.	No.
(ii) the 'Convention on Wetlands of International Importance, especially as Waterfowl Habitat' (Ramsar, Iran, 2 February 1971);	No.	No.
(iii) the 'Convention Concerning the Protection of the World Cultural and Natural Heritage' (Paris, 23 November 1972);	No.	No.
(c) a zone of a marine park under *the Marine Parks Act 2004* that is within a general use zone of the marine park under that Act;	Yes.	Yes.
(d) an area to the seaward side of the highest astronomical tide;	Yes.	Yes.
(e) the following under the *Queensland Heritage Act 1992*—		
(i) a place of cultural heritage significance;	No.	No.
(ii) a Queensland heritage place, unless there is an exemption certificate issued under that Act;	No.	No.
(f) an area recorded in the Aboriginal Cultural Heritage Register established under *the Aboriginal Cultural Heritage Act 2003*, section 46, other than the area known as the 'Stanbroke Pastoral Development Schedule 19 Holding', leased under the Land Act 1994 by lease number PH 13/5398;	No.	No.
(g) a feature protection area, State forest park or scientific area under the *Forestry Act 1959*;	No.	No.
(h) a declared fish habitat area under the *Fisheries Act 1994*;	No.	No.
(i) a place in which a marine plant under *the Fisheries Act 1994* is situated;	Yes (at the NPLA).	Yes (at the CLA).
(j) an endangered regional ecosystem identified in the database known as the 'Regional ecosystem description database' published on the department's website.	No.	No.

Source: Study team compilation.

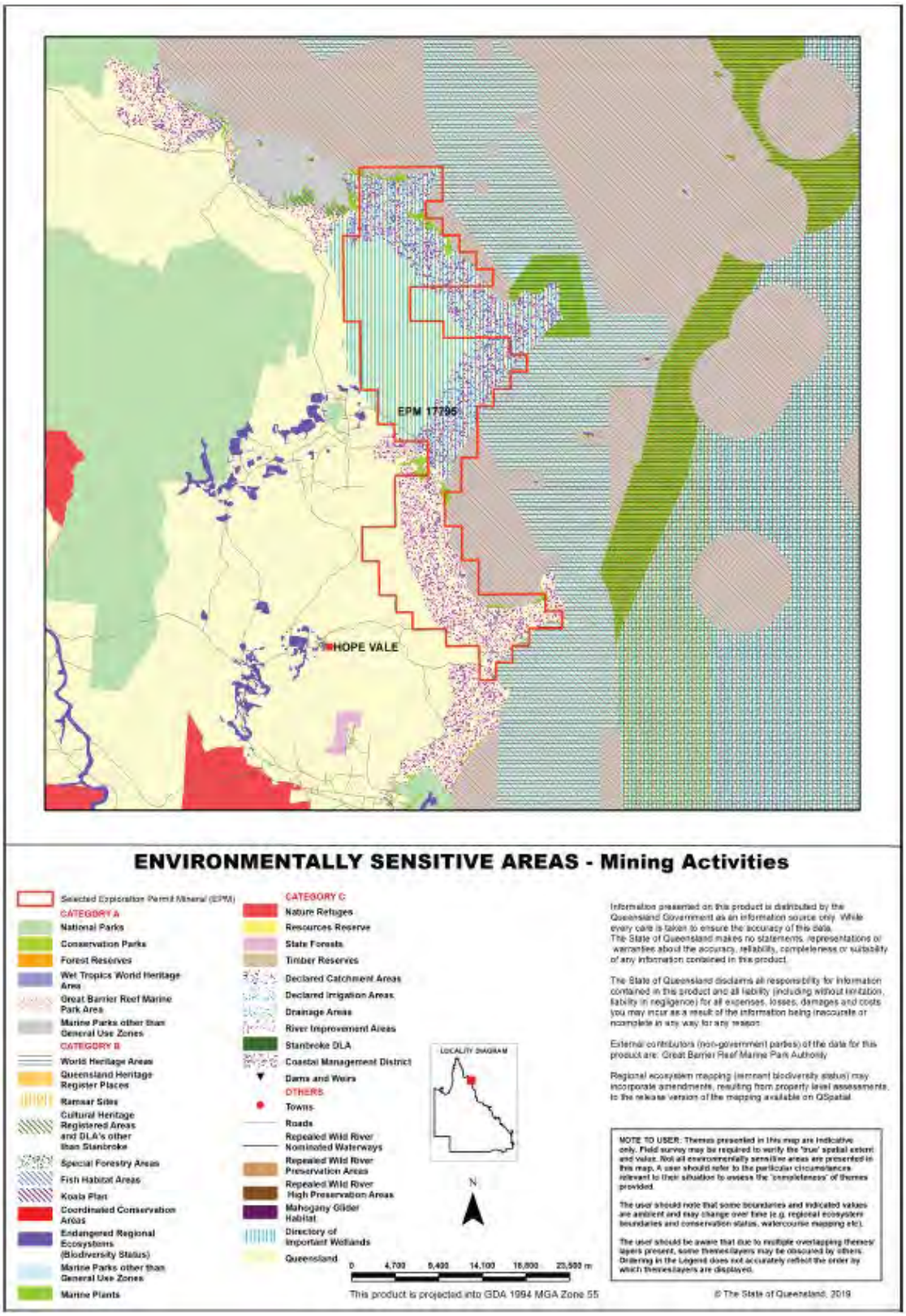


Figure 8-20 Environmentally Sensitive Areas.

Source: Department of Environment and Science.

8.5.6 Listed Threatened Terrestrial Flora Species

Prior to each of the wet season and dry season and follow-up wet season surveys, searches of the EPBC PMST and NC Act Wildlife Online were conducted on potential threatened fauna species, with the results being listed in Appendix 1 of Biotropica Australia (2019a), Appendix 3 of Biotropica Australia (2019b), and Appendix 9 of Biotropica Australia (2020b) respectively.

a) MSA

Table 8-8 below lists likely and observed listed threatened flora species which are considered likely to occur in the MSA. This includes species which were returned by the EPBC PMST and NC Act Wildlife Online searches as well as additional species considered likely to occur based on habitat or substrate availability and species distribution, refined by knowledge and experience of the flora assemblage of the MSA.

There has been no change in the species likelihood to occur since wet season surveys (refer Biotropica 2019a).

Of the listed flora species returned by the PMST and Wildlife Online searches on the MSA, three were recorded during the dry season survey; (*Acacia solenota* – Vulnerable NC Act), (*Myrmecodia beccarii* (ant plant) – Vulnerable EPBC Act & NC Act) and *Xanthostemon arenarius* (Near Threatened NC Act).

A complete list of flora recorded at the MSA during the dry season and wet season is provided as Appendix 5 of Biotropica Australia (2020b).

b) NPSA

Table 8-9 below lists likely and observed listed threatened flora species which are considered likely to occur in the NPSA.

Table 8-8 Likely and observed listed threatened flora species – MSA

SCIENTIFIC NAME	COMMON NAME	HABITAT DESCRIPTION	RANGE & RECORDS
Acacia solenota (NC Act – V)	-	*Acacia solenota* is restricted to dense heathland on sand dunes, often in association with *Corymbia intermedia* (pink bloodwood) (DEWHA, 2008). The key threat to this species is listed as sand mining, although it is noted that has been reported to regenerate prolifically after sand mining (Landsberg & Clarkson, 2004).	*Acacia solenota* occurs in a narrow band extending approximately 50 km north from Cooktown to Cape Flattery. Observed.
Dendrobium johannis (EPBC Act – V, NC Act – V)	Chocolate tea-tree orchid	*Dendrobium johannis* occurs in open humid habitats, close to swamps, in pockets of monsoon forest, and in open woodlands. *D. johannis* may occur within the riparian forest, tall littoral rainforest and heath and low/ dwarf heath communities within the MSA. This species flowers between March and July and the flowers are required to identify the species.	*Dendrobium johannis* has been recorded from across Cape York from Cairns, west to Kowanyama and through to the tip of Cape York Peninsula with small distinct populations on Melville Island and near Darwin. May occur within the riparian forest, tall littoral rainforest and heath and low/ dwarf heath communities within the MSA.
Dendrobium bigibbum (EPBC Act – V, NC Act – V)	Cooktown orchid	*Dendrobium bigibbum* occurs in stunted coastal scrub, streambank vegetation, monsoon thickets and open habitats such as gullies in open forests and woodlands, growing on rocks and trees. The species may occur within the MSA riparian forest community only. The species flowers between February and July and the flowers are required to identify the species.	*Dendrobium bigibbum* has been recorded from along the east coast and inland areas of Cape York, from Atherton to Lockhart River and west to Mount Mulgrave. The species may occur within the MSA riparian forest community only.

SCIENTIFIC NAME	COMMON NAME	HABITAT DESCRIPTION	RANGE & RECORDS
Myrmecodia beccarii (EPBC Act – V, NC Act – V)	Ant plant	*Myrmecodia beccarii* is mainly found in coastal woodlands, swamps and mangroves. Habitat suitable for this species (such as riparian forest) is likely to be available within the margins of the MSA and in the surrounding landscape.	*Myrmecodia beccarii* has been recorded from the coastal lowlands between the tip of Cape York in the north, to Ingham in the south. Herbarium records documenting the distribution are few and this is considered likely due to the difficulty in specimen preparation of the species (Forster, 2000). Given Biotropica has a strong local knowledge of the species, it is likely that the plant is more common than indicated by herbarium records. The species is locally common when present. Observed at many locations.
Xanthostemon arenarius (NC Act – NT)	-	*Xanthostemon arenarius* occurs in rainforest and other closed forests on coastal dunes, and as such suitable habitat exists within the MSA. Previous surveys within the dune communities at Cape Bedford have estimated that there are approximately 167 individuals per hectare within the littoral rainforest community (Biotropica Australia 2018). The species is also known to occur in the heath communities, however its density in this habitat is considered significantly lower.	In Queensland, *Xanthostemon arenarius* is recorded on the east coast and nearby inland areas from Townsville to the tip of the Cape. Observed.

Source: Biotropica Australia (2019b) (Table 5) and Biotropica Australia (2020b) (Table 5).

Table 8-9 Likely and observed listed threatened flora species – NPSA

SCIENTIFIC NAME	COMMON NAME	HABITAT DESCRIPTION	RANGE & RECORDS
Acacia solenota (NC Act – V)	-	*Acacia solenota* is restricted to dense heathland on sand dunes, often in association with *Corymbia intermedia* (pink bloodwood) (DEWHA, 2008). The key threat to this species is listed as sand mining, although it is noted that has been reported to regenerate prolifically after sand mining (Landsberg & Clarkson, 2004).	*Acacia solenota* occurs in a narrow band extending approximately 50km north from Cooktown to Cape Flattery. Observed.

Source: Biotropica Australia (2020b) (Table 8).

c) CLA

None of the species returned from the searches as having the potential to occur were observed or are considered likely to occur within the CLA, due to either lack of suitable substrate or habitat factors.

8.5.7 Listed Threatened Terrestrial Fauna Species

As for flora, searches were conducted on potential threatened and Special Least Concern (SLC) fauna species that may be present within the each area using the EPBC PMST and NC Act Wildlife Online searches as well as additional species considered likely to occur based on habitat availability and species distribution, refined by knowledge and experience of the fauna assemblage of the MSA gained from several field surveys. The results are listed in Appendix 1 of Biotropica Australia (2019a), Appendix 3 of Biotropica Australia (2019b), and Appendix 9 of Biotropica Australia (2020b) respectively.

It has been determined that other fauna species returned by online searches are unlikely to occur for the reasons shown in Appendix 5 of Biotropica Australia (2019b).

Note that these searches were conducted for both EPBC Act and NC Act species and the results are presented for both.

Note that for the purposes of this assessment crocodiles and coastal birds are listed as terrestrial fauna.

a) MSA

Table 8-10 lists and describes likely and observed listed threatened fauna species relevant to the MSA. There has been no change in the species likelihood to occur since wet season surveys (refer Biotropica 2019a). Note that references in this table are detailed in Biotropica Australia (2019b).

b) NPSA

Table 8-11 below lists the threatened fauna species which are considered likely to occur within the NPSA. This includes species which were returned by the EPBC PMST and NC Act Wildlife Online searches as well as additional species considered likely to occur based on habitat availability and species distribution, refined by knowledge and experience of the fauna assemblage of the NPPA. It has been determined that other fauna species returned by online searches are unlikely to occur for the reasons detailed in Biotropica Australia (2020b).

c) CLA

Table 8-12 lists and describes likely relevant to the CLA. None were observed but those listed are considered likely to occur.

Table 8-10 Likely and observed listed threatened fauna species – MSA

SCIENTIFIC NAME	COMMON NAME	HABITAT DESCRIPTION	RANGE & RECORDS
Charadrius leschenaultii (EPBC Act – V, MWS) (NC Act – V)	Greater sand plover	The species is almost entirely coastal, inhabiting littoral and estuarine habitats, including the entire east coast of Australia. They usually forage in soft substrate near the edge of water on intertidal mudflats or sandflats exposed by low tide. At high tide they may feed at nearby lakes sewage ponds and floodwaters (DoEE, 2019 SPRAT). Breeding does not occur within Australia.	*C. leschenaultii* is migratory, breeding in central Asia and moving to the south-western Pacific Ocean during the non-breeding season, and is one of the first migratory waders to return to return to north west Australia (arriving in late July). They move south along the east coast between September and November and return north on the return trip in late March. *C. leschenaultii* occurs in coastal areas of all states, but is especially common in north-west Australia between North West Cape and Roebuck Bay in West Australia. The closest ALA record is less than 500m from the MSA. The species was recorded within the MSA during recent wet season surveys.
Charadrius mongolus mongolus (EPBC Act – E, MMS) (NC Act – E)	Lesser sand plover, large sand plover	In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometime occurs in short saltmarsh or among mangroves. The species also inhabits saltworks and near-coastal saltpans, brackish swamps and sandy or silt islands in river beds (DoEE, 2019 SPRAT)	The Lesser Sand-plover breeds in central and north eastern Asia, migrating further south for winter. In Australia the species is found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10162 The closest ALA records are approximately 6km NNE (Elim Beach). The species was recorded within the MSA during recent wet season surveys.

SCIENTIFIC NAME	COMMON NAME	HABITAT DESCRIPTION	RANGE & RECORDS
Crocodylus porosus (EPBC Act – MMS) (NC Act – V)	Estuarine (saltwater) crocodile	This species inhabits estuaries, coastal floodplains, channels, billabongs, swamps and tidal rivers, as well as offshore islands (ML 2007, Webb *et al* 1987) up to 150 km inland from the coast (Webb *et al*. 1983). Nesting generally occurs during the wet season, between November and May. Courtship occurs 4 to 6 weeks before nesting and continues through the nesting period. Preferred nesting habitat includes elevated, isolated freshwater swamps that do not experience the influence of tidal movements. Floating rafts of vegetation also provide important nesting habitat. Incubation time varies between 65 and 114 days (Webb *et al.* 1987).	The species occurs throughout the northern parts of Western Australia, the Northern Territory and Queensland (north of Rockhampton. Estuarine crocodiles are considered highly likely to occur within the MSA. Anecdotal evidence (S Hillhouse pers. comm. 9 January 2019) is that there is a resident crocodile in the wetland near the beach.
Ctenotus rawlinsoni (NC Act – V)	Cape heath Ctenotus	Endemic. Confined to heaths on white coastal sands in vicinity of Cape Bedford and Cape Flattery (Wilson 2005).	The closest ALA record is approximately 10 km NE (Cape Bedford).
Hipposideros diadema (NC Act – NT)	Diadem leaf-nose bat	This species occurs in a variety of habitat types including lowland rainforest, Melaleuca forests, eucalypt woodland, deciduous vine thickets, and open woodland. Roosts have been recorded in caves and disused mines, preferring those with large chambers, high domed ceilings and multiple entrances as well as buildings and culverts (Hourigan 2011b).	The species is distributed along the north-east Queensland coast between Townsville and Cape York Peninsula and west to Chillagoe, with records from iron Range, Hinchinbrook Island, Cape Melville, Chillagoe, Cairns and Coen (Tate 1952, Myroniuk 1988, Pavey 1998). Located in dry season survey (Anabat records).
Hirundapus caudacutus (EPBC Act – V, MTS) NC Act – SLC)	White-throated needletail	The white throated needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground.	According to ALA the species is common on the east coast from the Torres Straits to Tasmania. They also occur via scattered records in every state and territory, as far as Perth. Closest ALA record is approximately 13 km south-west of MSA. Could possibly occur.

SCIENTIFIC NAME	COMMON NAME	HABITAT DESCRIPTION	RANGE & RECORDS
Hypochrysops apollo apollo (NC Act – V)	Apollo jewel butterfly (Wet tropics subspecies	The predominant habitat is coastal Melaleuca woodland, extending into nearby mangrove forest (Curtis & Dennis 2012).	The subspecies is found in scattered populations in coastal habitats from Cardwell to Cooktown (Valentine and Johnson 2012). The closest ALA record is approximately 23 km SW (between the Endeavour and Annan Rivers). The species is considered likely to occur, due to Ant plant presence.
Saccolaimus saccolaimus nudicluniatus (EPBC Act – V) (NC Act – E)	Bare-rumped sheathtail bat	The bare-rumped sheathtail bat occurs mostly in lowland areas, typically in a range of woodland, forest and open environments. In Australia, all confirmed roosting records are from long deep tree hollows in Eucalypts.	Based on SPRAT the species is known across the coastal and inland areas of northern Australia from Cardwell to Broome. Closest ALA record is approximately 39 km south-west of MSA. Located in dry season survey (Anabat records).
Taphozous australis (NC Act – NT)	Coastal sheath-tail bat	The Coastal sheath-tail bat is a large insectivorous bat with records along a narrow band of the north-Queensland coast, between Shoalwater bay and Cape York. The bat inhabits dune scrub, mangroves, Melaleuca swamp, coastal heathlands, open Eucalypt forest and grasslands	The species is distributed in a narrow band along the north-east Queensland coast from Shoalwater Bay to the tip of Cape York, and adjacent coastal islands. The range extends no more than a few kilometres inland (Hourigan 2011a). Located in dry season survey (Anabat records).

Source: Biotropica Australia (2020b) (Table 6).

Table 8-11 Likely and observed listed threatened fauna species – NPSA

SCIENTIFIC NAME	COMMON NAME	HABITAT DESCRIPTION	RANGE & RECORDS
Charadrius leschenaultii (EPBC Act – V, MWS) (NC Act – V)	Greater sand plover	The species is almost entirely coastal, inhabiting littoral and estuarine habitats, including the entire east coast of Australia. They usually forage in soft substrate near the edge of water on intertidal mudflats or sandflats exposed by low tide. At high tide they may feed at nearby lakes sewage ponds and floodwaters (DoEE, 2019 SPRAT). Breeding does not occur within Australia.	*C. leschenaultii* is migratory, breeding in central Asia and moving to the south-western Pacific Ocean during the non-breeding season, and is one of the first migratory waders to return to return to north west Australia (arriving in late July). They move south along the east coast between September and November and return north on the return trip in late March. *C. leschenaultii* occurs in coastal areas of all states, but is especially common in north-west Australia between North West Cape and Roebuck Bay in West Australia. The closest ALA record is less than 500 m from the MSA. The species was recorded within the MSA during recent wet season surveys and is likely to occur in the NPSA
Charadrius mongolus mongolus (EPBC Act – E, MMS) (NC Act – E)	Lesser sand plover, large sand plover	In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometime occurs in short saltmarsh or among mangroves. The species also inhabits saltworks and near-coastal saltpans, brackish swamps and sandy or silt islands in river beds (DoEE, 2019 SPRAT)	The Lesser Sand-plover breeds in central and north eastern Asia, migrating further south for winter. In Australia the species is found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10162 The closest ALA records are approximately 6 km NNE (Elim Beach). The species was recorded within the NPSA during recent wet season surveys.

SCIENTIFIC NAME	COMMON NAME	HABITAT DESCRIPTION	RANGE & RECORDS
Crocodylus porosus (NC Act – V)	Estuarine (saltwater) crocodile	This species inhabits estuaries, coastal floodplains, channels, billabongs, swamps and tidal rivers, as well as offshore islands (EPA 2007, Webb *et al* 1987) up to 150 km inland from the coast (Webb *et al*. 1983). Nesting generally occurs during the wet season, between November and May. Courtship occurs 4 to 6 weeks before nesting and continues through the nesting period. Preferred nesting habitat includes elevated, isolated freshwater swamps that do not experience the influence of tidal movements. Floating rafts of vegetation also provide important nesting habitat. Incubation time varies between 65 and 114 days (Webb *et al.* 1987).	The species occurs throughout the northern parts of Western Australia, the Northern Territory and Queensland (north of Rockhampton. The species was recorded within the NPSA during the recent wet season survey.
Hirundapus caudacutus (EPBC Act – V, MTS) NC Act – SLC)	White throated needletail	The white throated needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground.	According to ALA the species is common on the east coast from the Torres Straits to Tasmania. They also occur via scattered records in every state and territory, as far as Perth. Closest ALA record is approximately 13 km south-west of MSA. The species has been recorded within the wetland community of the MSA during previous surveys, and is considered likely to forage within the NPSA.
Saccolaimus saccolaimus nudicluniatus (EPBC Act – V) (NC Act – E)	Bare-rumped sheathtail bat	The bare-rumped sheathtail bat occurs mostly in lowland areas, typically in a range of woodland, forest and open environments. In Australia, all confirmed roosting records are from long deep tree hollows in Eucalypts.	Based on SPRAT the species is known across the coastal and inland areas of northern Australia from Cardwell to Broome. Closest ALA record is approximately 39 km south-west of MSA. The species has been recorded in the littoral rainforest, eucalypt woodland, riparian forest, heath / dwarf heath communities in the Mining Area during previous surveys and is considered likely that the species is roosting in the riparian vegetation within both the MSA and NPSA.

Source: Biotropica Australia (2020b) (Table 6) and DoEE 2019, and ALA 2019.

Table 8-12 Likely and observed listed threatened fauna species – CLA

SCIENTIFIC NAME	COMMON NAME	HABITAT DESCRIPTION	RANGE & RECORDS
Crocodylus porosus (EPBC Act – MMS) (NC Act – V)	Estuarine (saltwater) crocodile	This species inhabits estuaries, coastal floodplains, channels, billabongs, swamps and tidal rivers, as well as offshore islands (ML 2007, Webb *et al* 1987) up to 150 km inland from the coast (Webb *et al.* 1983). Nesting generally occurs during the wet season, between November and May. Courtship occurs 4 to 6 weeks before nesting and continues through the nesting period. Preferred nesting habitat includes elevated, isolated freshwater swamps that do not experience the influence of tidal movements. Floating rafts of vegetation also provide important nesting habitat. Incubation time varies between 65 and 114 days (Webb *et al.* 1987).	The species occurs throughout the northern parts of Western Australia, the Northern Territory and Queensland (north of Rockhampton. Likely to occur but not observed.
Hirundapus caudacutus (EPBC Act – V, MTS) (NC Act – SLC)	White-throated needletail	The white throated needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground.	According to ALA, the species is common on the east coast from the Torres Straits to Tasmania. They also occur via scattered records in every State and Territory, as far as Perth. Closest ALA record is approximately 500 m south of CLA. Likely to occur but not observed.
Lygisaurus tanneri (syn. Carlia tanneri) (NC Act – V)	Endeavour River litter skink	Endemic. Found in riverine and monsoon forests.	Endemic. Riverine and monsoon forests between Endeavour River and the Starcke Wilderness behind Cape Flattery (Wilson 2005). The closest ALA record is approximately 1 km NE of the CLA. Likely to occur but not observed.

SCIENTIFIC NAME	COMMON NAME	HABITAT DESCRIPTION	RANGE & RECORDS
Mesembriomys gouldii rattoides (EPBC Act – V)	Black-footed tree-rat (NQ subspecies)	These nocturnal rodent dens mostly in tree hollows, but occasionally in dense foliage (notably Pandanus spp.). It occurs in Eucalypt forests and woodlands which contain abundant hollows and a moderately dense understorey of shrubs. Its diet comprises mostly Pandanus fruits but also seeds, invertebrates, flowers and grass.	Based on SPRAT, the species occurs from Cape York Peninsula to west of Townsville. According to ALA the species occurs inland from Mt Garnet to Mount Molloy with lower numbers in the Cooktown and Coen areas. Closest ALA record is approximately 1.5 km south-east of CLA. Likely to occur but not observed.
Numenius madagascariensis (EPBC Act – CE, MWS) (NC Act – E)	Eastern curlew	This species is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons.	Based on SPRAT the species is common around the coast of Australia with lower numbers inland. There is a record of the species within the CLA. Likely to occur but not observed.

Source: Biotropica Australia (2019b) (Table 6) and Biotropica Australia (2020b) (Table 9) with additional comments.

8.5.8 Listed Terrestrial Migratory Species

a) MSA

In total, four listed migratory species were recorded across the MSA during the wet season survey as described below:

- White-throated needle tail (*Hirundapus caudacutus*) was recorded flying above the wetland community. The species is a listed migratory species under the EPBC Act.
- Satin flycatcher (*Myiagra cyanoleuca*) was recorded within the riparian rainforest community. The species is listed as a migratory species under the EPBC Act.
- Pacific golden plover (*Pluvialis fulva*) was recorded only once within the beach / strand community. The species is listed as a migratory species under the NC Act.
- Greater sand plover (*Charadrius leschenaultii*) was recorded only once within the beach / strand community. The species is listed as Vulnerable and is a migratory species under the EPBC Act

No listed migratory bird species were recorded across the MSA during the dry season survey.

In total, 31 migratory bird species were returned from desktop searches carried out for the MSA (refer Biotropica Australia (2019b) Appendix 4). Of the migratory species returned by the searches as potentially occurring, only the migratory terrestrial birds (refer **Table 8-13**) are considered as possibly occurring within the ML.

Of the eight migratory terrestrial species returned by searches as potentially occurring within the MSA two (*Hirundapus caudacutus* and *Myiagra cyanoleuca)* had been recorded within the MSA during the wet season survey. There is suitable habitat within the MSA for the remaining six species to occur

Both EPBC-listed and NC Act-listed migratory birds were grouped into species with similar habitat requirements, with the likelihood of occurrence being assessed for each group.

Table 8-13 shows the likelihood of occurrence of migratory birds within the MSA.

Table 8-13 Migratory birds – likely occurrence – MSA

GROUPING	RELEVANT SPECIES	LIKELY OCCURRENCE
Migratory Terrestrial Species (Non-coastal species)	*Cuculus optatus* (oriental cuckoo) * *Hirundapus caudacutus* (white-throated needle-tail) *Hirundo rustica* (barn swallow) *Monarcha frater* (black-winged monarch) *Monarcha melanopsis* (black-faced monarch) *Monarcha trivirgatus* (spectacled monarch) **Myiagra cyanoleuca* (satin flycatcher) *Rhipidura rufifrons* (rufous fantail)	Unlikely within Mining Area. Likely within MSA, where there is some foraging and roosting habitat available. **H. caudacutus* and *M. cyanoleuca* have been recorded within the MSA during previous surveys. The species likelihood for this group has changed since dry season surveys (refer Biotropica 2019c), due to revised survey extents.
Migratory Marine Species (Seabirds)	*Anous stolidus* (common noddy) *Apus pacificus* (fork-tailed swift) *Fregata ariel (*lesser frigatebird) *Fregata minor (*great frigatebird) *Gelochelidon nilotica* (gull-billed tern) *Hydroprogne caspia* (Caspian tern) *Sterna sumatrana* (black-nape tern) *Sternula albifrons* (little tern) *Thalasseus bergii* (crested tern)	Unlikely. The swift may forage/passage-by in summer in front of storm fronts or bush fires. The terns may access the beach for resources but rarely penetrate substantially further inland. The MSA does not support roosting or breeding habitat for these species. The species likelihood for this group has not changed since dry season surveys (refer Biotropica 2020b).
Migratory Wetland Species (Shorebirds and coastal raptors)	*Actitis hypoleucos* (common sandpiper) *Calidris acuminata* (sharp-tailed sandpiper) *Calidris canutus* (red knot) *Calidris ferruginea* (curlew sandpiper) *Calidris melanotos* (pectoral sandpiper) **Charadrius leschenaultii* (greater sand plover) **Charadrius mongolus* (lesser sand plover) *Gallinago hardwickii* (Latham's snipe) *Limosa lapponica baueri* (bar-tailed godwit (baueri)) *Limosa lapponica menzbieri* (bar-tailed godwit (menzbieri)) *Numenius madagascariensis* (eastern curlew) **Numenius phaeopus* (Whimbrel) *Pandion cristatus* (eastern osprey) **Pluvialis fulva* (pacific golden plover) *Tringa brevipes* (Grey-tailed tattler)	Unlikely within Mining Area. Likely within MSA, where there is some foraging and roosting habitat available. **C. leschenaultii, C. mongolus, N. phaeopus* and *P. fulva* were recorded within the MSA during recent wet season surveys. The species likelihood for this group has changed since dry season surveys (refer Biotropica 2019c, due to revised survey extents.

Source: Biotropica Australia (2020b) (Table 4).

Of the migratory species returned by the searches as potentially occurring, only the migratory terrestrial birds are considered to possibly occur within the MSA.

b) NPSA

Both EPBC-listed and NC Act-listed migratory birds were grouped into species with similar habitat requirements, with the likelihood of occurrence being assessed for each group.

Table 8-14 shows the likelihood of occurrence of migratory birds within the NPSA.

Table 8-14 Migratory birds - likely occurrence - NPSA

GROUPING	RELEVANT SPECIES	LIKELY OCCURRENCE
Migratory Terrestrial Species (Non-coastal species)	*Cuculus optatus* (oriental cuckoo) *Hirundapus caudacutus* (white-throated needle-tail) *Hirundo rustica* (barn swallow) *Monarcha frater* (black-winged monarch) *Monarcha melanopsis* (black-faced monarch) *Monarcha trivirgatus* (spectacled monarch) *Myiagra cyanoleuca* (satin flycatcher) *Rhipidura rufifrons* (rufous fantail)	Unlikely within NPPA. Likely within NPSA, where there is some foraging and roosting habitat available.
Migratory Marine Species (Seabirds)	*Anous stolidus* (common noddy) *Apus pacificus* (fork-tailed swift) *Fregata ariel (*lesser frigatebird) *Fregata minor (*great frigatebird) *Gelochelidon nilotica* (gull-billed tern) *Hydroprogne caspia* (Caspian tern) *Sterna sumatrana* (black-nape tern) *Sternula albifrons* (little tern) *Thalasseus bergii* (crested tern)	Unlikely. The swift may forage/passage-by in summer in front of storm fronts or bush fires. The terns may access the beach for resources but rarely penetrate substantially further inland. The NPSA does not support roosting or breeding habitat for these species.

(Continued over)

GROUPING	RELEVANT SPECIES	LIKELY OCCURRENCE
Migratory Wetland Species (Shorebirds and coastal raptors)	*Actitis hypoleucos* (common sandpiper) *Calidris acuminata* (sharp-tailed sandpiper) *Calidris canutus* (red knot) *Calidris ferruginea* (curlew sandpiper) *Calidris melanotos* (pectoral sandpiper) *Charadrius leschenaultii* (greater sand plover) **Charadrius mongolus* (lesser sand plover) *Gallinago hardwickii* (Latham's snipe) *Limosa lapponica baueri* (bar-tailed godwit (baueri)) *Limosa lapponica menzbieri* (bar-tailed godwit (menzbieri)) *Numenius madagascariensis* (eastern curlew) **Numenius phaeopus* (Whimbrel) *Pandion cristatus* (eastern osprey) **Pluvialis fulva* (pacific golden plover) **Tringa brevipes* (grey-tailed tattler)	Unlikely within NPPA. Likely within NPSA, where there is some foraging and roosting habitat available. **C. mongolus, N. phaeopus, P. fulva* and *T. brevipes* were recorded within the NPSA during recent wet season surveys.

Source: Biotropica Australia (2020b) (Table 7).

Of the migratory species returned by the searches as potentially occurring, both the migratory terrestrial birds and migratory wetland birds are considered to likely occur within the NPSA.

c) CLA

Table 8-15 shows the likelihood of occurrence of migratory birds within the CLA.

Table 8-15 Migratory birds – likely occurrence – CLA

GROUPING	RELEVANT SPECIES	LIKELY OCCURRENCE
Migratory Terrestrial Species (Non-coastal species)	*Cecropis daurica* (red-rump swallow) *Cuculus optatus* (oriental cuckoo) *Hirundapus caudacutus* (white-throated needle-tail) *Hirundo rustica* (barn swallow) *Monarcha frater* (black-winged monarch) *Monarcha melanopsis* (black-faced monarch) *Monarcha trivirgatus* (spectacled monarch) *Myiagra cyanoleuca* (satin flycatcher) *Rhipidura rufifrons* (rufous fantail)	Likely Some foraging and roosting habitat for these species occurs within the CLA. There has been a change in the group's likelihood to occur since dry season surveys (refer Biotropica 2020b), due to greater understanding of habitat within the site.

GROUPING	RELEVANT SPECIES	LIKELY OCCURRENCE
Migratory Marine Species (Seabirds)	*Anous stolidus* (common noddy) *Apus pacificus* (fork-tailed swift) *Fregata ariel (*lesser frigatebird) *Fregata minor (*great frigatebird) *Sternula albifrons* (little tern)	Unlikely. Only the swift may forage/passage-by in summer in front of storm fronts. There has been no change in the group's likelihood to occur since dry season surveys (refer Biotropica 2020b).
Migratory Wetland Species (Shorebirds and coastal raptors)	*Actitis hypoleucos* (common sandpiper) *Calidris acuminata* (sharp-tailed sandpiper) *Calidris canutus* (red knot) *Calidris ferruginea* (curlew sandpiper) *Calidris melanotos* (pectoral sandpiper) *Gallinago hardwickii* (Latham's snipe) *Limosa lapponica baueri* (bar-tailed godwit (baueri)) *Limosa lapponica menzbieri* (bar-tailed godwit (menzbieri)) *Numenius madagascariensis* (eastern curlew) *Pandion cristatus* (eastern osprey) *Tringa nebularia* (common greenshank)	Likely Some foraging and roosting habitat for these species occurs within the CLA. There has been a change in the group's likelihood to occur since dry season surveys (refer Biotropica 2020b), due to greater understanding of habitat within the site.

Source: Biotropica Australia (2020b) (Table 10).

Of the migratory species returned by the searches as potentially occurring, only the migratory terrestrial and migratory wetland birds are considered as possibly occurring within the BSPA.

8.5.9 Listed Threatened Ecological Communities

a) MSA

Littoral Rainforest (LRF) is listed under the EPBC Act as a critically endangered ecological community. The LRF within the ML corresponds directly with RE 3.2.12b (refer Table 8 of Biotropica Australia 2019a).

The area of LRF within the ML was originally delineated during wet season surveys. However, dry season surveys identified an additional area of LRF, south-east of the original patch. Due to the density of vegetation, only the south-eastern and north-eastern extent of the additional patch were ground-truthed during the survey, the remaining extent was determined, post-survey, using aerial imagery of the MSA to identify the canopy signature of the littoral rainforest community. Technical considerations relevant to mapping this community are described in detail in Biotropica Australia (2020a). Relevant mapping from that report is shown on **Figure 8-17**.

b) NPSA

There are no threatened ecological communities present within the NPSA.

c) CLA

There are no threatened ecological communities present within the CLA.

8.5.10 Terrestrial and Aquatic Ecosystems

a) Terrestrial Ecosystems

MSA & NPSA

Since previous dry season surveys the original mining lease proposal has expanded in area and on that basis, additional survey work has been completed in areas not previously traversed. All additional areas of vegetation have now been characterised and delineated. In total 10 different regional ecosystems are present within the Mining Area.

These are mapped below on **Figure 8-21**.

CLA

REs mapped as occurring within the CLA are shown on refer **Figure 8-22**.

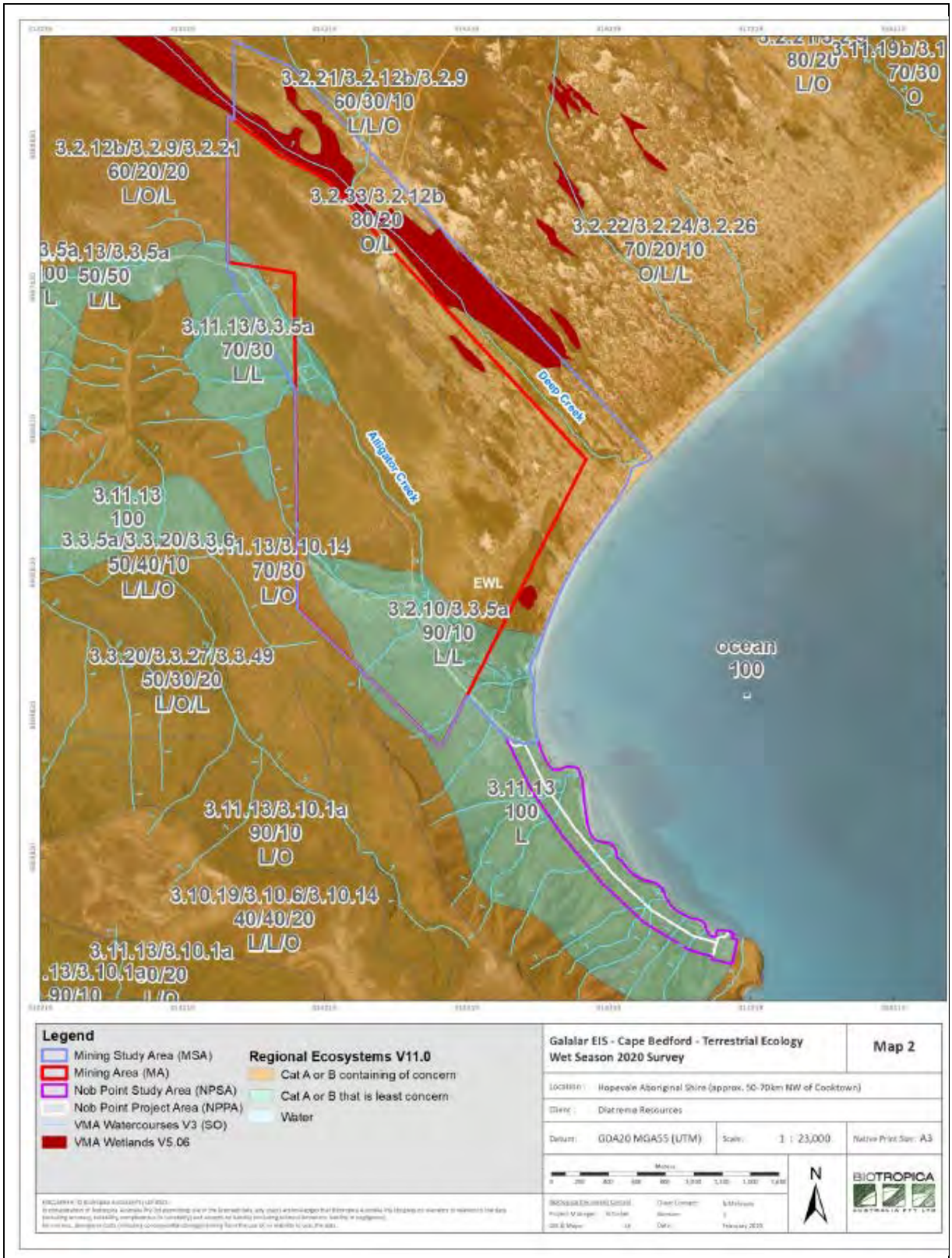


Figure 8-21 Remnant vegetation (RE mapping).

Source: Biotropica Australia (2020b) (Map 2).

Figure 8-22 Vegetation communities in and adjacent to the CLA (Queensland Government mapping).

Source: Biotropica Australia (2020b) (Map 3).

b) Groundwater Dependent Ecosystems

Groundwater dependent ecosystems (GDEs) include

- ecosystems that may rely on the surface expression of groundwater, including surface water ecosystems that may have a groundwater component, such as rivers, wetlands and springs, and
- ecosystems that may rely on the subsurface presence of groundwater (Sinclair Knight Merz 2011a, b).

The National Atlas of Groundwater Dependent Ecosystems (GDE Atlas) presents the current knowledge of GDEs across Australia, and shows known GDEs as well as ecosystems that potentially use groundwater.

Desktop interrogation of the BOM GDE Atlas for the Endeavour River Basin is shown in the dry season report. **Figure 8-23** below has been extracted from the dry season report and indicates that all terrestrial ecosystems within the MSA are GDEs. Mapping indicates that small areas of aquatic ecosystems dependent on GDEs are potentially present along the north-east margin and the (eastern) ocean frontage.

Comprehensive hydrogeological surveys are currently being planned to fully document and understand the potential risks to groundwater-dependent ecosystems. The associated study will also produce a detailed management plan and monitoring program to mitigate and adverse impacts on surface water and groundwater.

Figure 8-23 Mapped groundwater dependent ecosystems.

Source: Biotropica Australia (2019b) Map 12 based on the BOM GDE Atlas. Note that the ML boundary has changed since this figure was produced.

c) Marine Ecosystems

Refer to following discussion and **Section 8.6.2**.

8.5.11 Marine Plants

a) MSA

There is no mapping of marine plants in or adjacent to the MSA that is publicly available. Section 8 of the *Fisheries Act 1994* gives the following definition of a marine plant.

'Marine plant' includes the following:

- A plant (a 'tidal plant') that usually grows on, or adjacent to tidal land, whether it is living or dead, standing or fallen;
- The material of a tidal plant, or other plant material on tidal land;
- A plant, or material of a plant, prescribed under a regulation or management plan to be a marine plant.

The DPI & F Fish Habitat Management Operational Policy FHMOP001 (2007) gives guidance in relation to the determination of 'adjacent' in the above definition. (Note: the *Fisheries Act 1994* does not define 'adjacent' as it relates to marine plants. In the absence of a definition, this policy describes the application of 'adjacent' in terms of when a marine plant development permit application would be required for disturbance of plants in or adjacent to the tidal zone).

The Policy states that 'High fisheries significance plants are plants that usually grow on or adjacent to tidal land (that have a capacity for connectivity, for example, via seasonal flows during the wet season) and are known to contribute to fisheries productivity. Plants that usually grow on tidal lands include all true mangroves, seagrasses, marine algae, salt couch and samphires. These types of plants would normally occur where there is some tidal influence. These are protected marine plants regardless of their location. Plants that usually grow adjacent to tidal lands include Melaleuca and Casuarina species. These plants are of value to fisheries productivity, in particular, where Melaleuca swamps adjacent to tidal areas are either permanently or periodically tidally connected.

Mangroves

Dry season surveys aimed to delineate the area of marine plants within the ML. The majority of the vegetation within the ML is not tidally influenced and would not contain marine plants. However, in the southern tip of the ML, a fringing mangrove community containing marine plants was present. Surveys identified the limit of tidal influence within Alligator Creek and the extent of marine plants present within the ML has been delineated (refer Biotropica Australia (2019b) Appendix 1 – Map 6), and covers a total area of 0.05 ha.

Seagrass

Refer **Section 8.6.2**.

b) CLA

The majority of the vegetation within the CLA is not tidally influenced and would not contain marine plants. However, a narrow strip of mangrove vegetation which would be considered marine plants, is present at the east of the site, bordering the Endeavour River. This total area of marine is likely to vary depending on tides, however a total area of 0.06 ha has been estimated to contain marine plants within the CLA (refer to Biotropica Australia (2019b) Appendix 1 – Map 14).

8.5.12 Potential Habitat of Threatened, Near-Threatened or Special Least-Concern Species

This has been discussed earlier in this chapter.

8.5.13 Estuarine Fauna

Estuarine fauna will undoubtedly exist in the Endeavour River. Studies are proposed to investigate these fauna species and possible impacts.

8.5.14 Integrity of Landscapes and Places

a) Wilderness

The assessment of wilderness on Cape York Peninsula was undertaken for the Cape York Peninsula Land Use Strategy (CYPLUS) as part of an overall Australia-wide development of a National Wilderness Inventory. According to Environment Science & Services (NQ) (1994), the Inventory considers wilderness to be part of a spectrum of remote and natural conditions varying in quality from pristine to urban.

Four indicators were used to estimate the quality of wilderness across the natural landscape:

- remoteness from settlement
- remoteness from access
- apparent naturalness
- biophysical naturalness.

Analysis of Cape York Peninsula using these four indicators produces a graded assessment of wilderness quality. The key findings of this analysis were that Cape York Peninsula:

- Is internationally significant as it is a significant wilderness area within the Australian biogeographic realm.
- Is one of Australia's few biogeographic regions where a majority of the region is of high to very high wilderness quality.
- Has the largest area of high quality wilderness in eastern Australia and the only large areas of high wilderness quality on the east coast.
- Has coastal landscapes of high wilderness quality (which in eastern Australia are largely restricted to Cape York Peninsula).
- Is unique in Australia in containing areas of high and very high wilderness quality that encapsulates large areas of diverse ecosystems (i.e. woodland, forest, closed forest, heaths, riparian vegetation, coastal wetlands and freshwater wetlands).
- Contains the largest areas in Australia of heathlands, riparian vegetation and tropical rainforest that are of high wilderness quality.
- Has large areas of high quality wilderness that are of importance in a national context for the maintenance of ecosystem processes.

- Is characterised by the presence of river catchments in high quality wilderness areas that are now rare in Australia (i.e. Jardine, Jackson, Olive and Holroyd Rivers).
- Is characterised by the absence of extinctions of either plants or vertebrate fauna.
- Provides areas of wilderness that are the stronghold of several bird species that were originally widely but sparsely dispersed across Australia. These species include the Pied Oyster Catcher, Sooty Oyster Catcher, Black Necked Stork, and possibly the Red Goshawk.

A total of 126 sites were identified as having regional or greater conservation significance. Of these:

- four of these were regarded as having **international** conservation significance and this includes the Cape Bedford-Cape Flattery Dunefield
- fourteen of the sites were recognised as having **national** conservation significance and this includes the Indian Head-Cape Bedford Hodgkinson Formation exposures (i.e. the ML).

b) Likely Visual Impacts

In terms of visual impacts, 3-D images were produced of the mining area before and after development (based on the 15 year production cycle described in **Section 7.2.7b)** with no attempt to soften the surfaces). These are shown on **Figure 8-24** and **Figure 8-25** respectively.

Figure 8-26 shows a Google Earth cross section through the ML from coast (left) to western limit of ML and beyond to the nearest ridge.

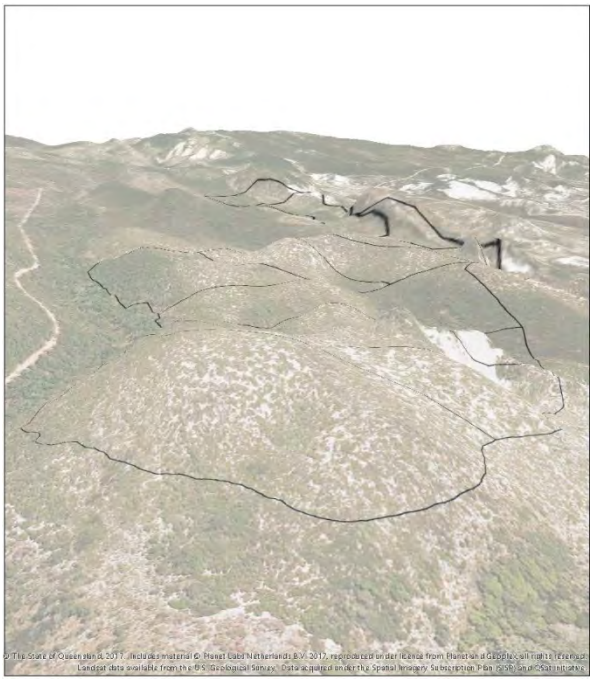


Figure 8-24 Mining Area: before development.

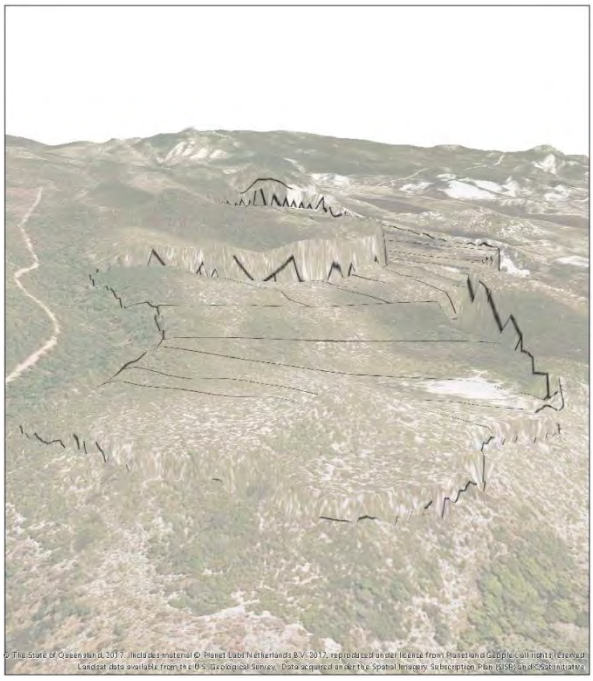


Figure 8-25 Mining Area: after development.

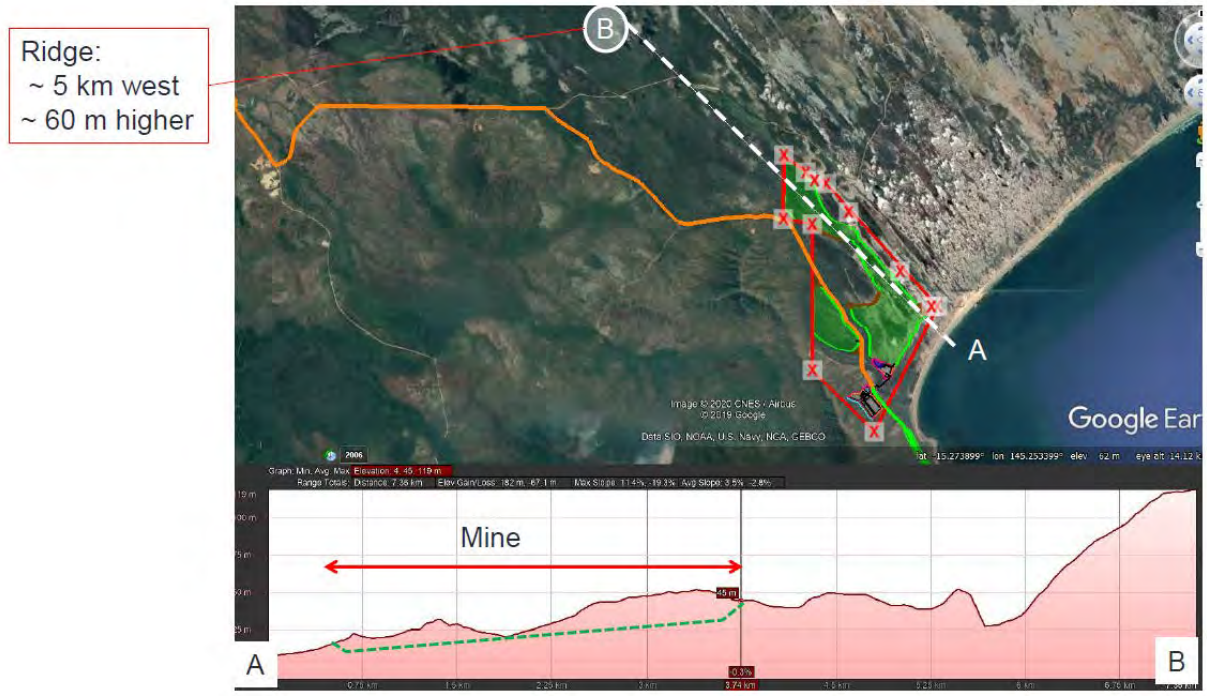


Figure 8-26 Cross section through ML from coast (left) to western limit of ML.

Note that the ridge line shown on these images is 4.85 km to the west and 60 m higher than the natural surface at the edge of the mined area. This means that mining will not change the silhouette of the landform. As noted, the 3-D images above do not include any attempt to soften the surfaces (which is what will occur in practice).

As already noted, the ML will be sequentially mined and rehabilitated. Disturbance will vary from year to year, from 3.2 ha to 13.5 ha per annum and averaging just under 6 ha per annum. Due to the lag between mining and rehabilitation it is possible that up to 16 ha may be exposed at any one time. As the rehabilitation (which will be designed to re-create original vegetation communities) progresses, the signs of mining will gradually disappear.

c) Areas of High Conservation Value

Areas of high conservation value are the dunefields themselves as described above and the adjacent GBRWHA.

d) Connectivity of Habitats and Ecosystems

The MSA is currently well connected to adjacent parts of the dunefield and to the adjacent marine areas.

8.5.15 Pest Flora

a) MSA

The majority of the MSA contains a pristine, weed free environment. Only surveys along the beach / strand community recorded exotic species. In total, three exotic species have been recorded within the general area. **Table 8-16** below details the exotic flora species recorded.

Only one species, Singapore daisy (*Sphagneticola trilobata*) is listed as a Category 3 Restricted Matter under the Biosecurity Act. The species was recorded along the beach / strand community.

Table 8-16 Pest flora recorded in the MSA

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE	STATUS		
			WONS[1]	STATE {QLD}[2]	REG-IONAL[3]
Macroptilium atropurpureum	Siratro	R	-	-	
Sphagneticola trilobata	Singapore daisy	R	-	Cat 3	Cat 3
Stachytarpheta jamaicensis	Light blue snake weed	R	-		Cat 4

Source: Biotropica Australia (2019a) Table 18.

1 Listed under the schedule for WoNS (Weeds of National Significance) by the Commonwealth government. This list is available via the Australian Weeds Committee (http://weeds.ala.org.au/WoNS/).
2 Listed as Restricted Matter under Queensland's Biosecurity Act 2014.
3 Listed as a priority weeds under the Far North Queensland Regional Organisation of Councils Regional Pest Management Plan, 2004

No additional weed species were recorded during the 2019 dry season and 2020 wet season surveys.

b) NPSA

The NPSA, like the MSA is a relatively pristine, almost weed free environment. Several exotic species were recorded along the existing access track towards Nob Point, however only one listed weed species was recorded *Sporobolus jacquemontii* (American rat's tail grass), which was relatively common on the intersection with Alligator Creek Road and the Nob Point access track. The species is listed as a Category 3 restricted matter species under the Queensland's *Biosecurity Act 2014*.

c) CLA

The majority of the CLA represents a weed free environment. In total, 11 exotic species were recorded within the CLA, mostly on the forest / road boundary. **Table 8-17** below details the exotic flora species recorded, none of which are listed under Commonwealth or State schedules.

Table 8-17 Pest flora recorded within the CLA

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE	STATUS	
			WONS[1]	STATE {QLD}[2]
*Achyranthes aspera**	Devil's horsewhip	R	-	-
*Cleome viscosa**	Spider flower	R	-	-
*Gomphrena celosioides**	Gomphrena weed	R	-	-
*Lantana camara**	Lantana	R	-	-
*Macroptilium atropurpureum**	Siratro	R	-	-
*Mangifera indica**	Mango	R	-	-
*Melinis repens**	Red natal grass	O	-	-
*Mimosa pudica**	Sensitive weed	O	-	-
*Rottboellia cochinchinensis**	Itch grass	R	-	-
*Stachytarpheta jamaicensis**	Light-blue snake weed	R	-	-
*Stylosanthes scabra**	Shrubby stylo	R	-	-

Source: Biotropica Australia (2019b) Table 21.

1 Listed under the schedule for WoNS (Weeds of National Significance) by the Commonwealth government. This list is available via the Australian Weeds Committee (http://weeds.ala.org.au/WoNS/).

2 Listed as Restricted Matter under Queensland's *Biosecurity Act 2014*.

No additional weed species were recorded during the 2019 dry season and 2020 wet season surveys.

8.5.16 Pest Fauna

a) MSA

During the wet season survey only one pest fauna species was recorded, feral pig *(Sus scrofa*). The species was recorded within the riparian rainforest site by the motion sensing camera. Evidence of both cattle (*Bos taurus*) and wild horses (*Equus ferus caballus*) were also present throughout the area, and both are commonly observed throughout the Cape Bedford environment.

During dry season surveys no pest species were recorded within the MSA, however there was evidence of feral cattle (*Bos taurus*) and brumbies (*Equus ferus caballus*). Both are commonly observed in the Cape Bedford/Hopevale area.

b) NPSA

During the recent wet season survey no pest species were recorded within the NPSA, however there was evidence of feral cattle (*Bos taurus*) and brumbies (*Equus ferus caballus*). Both are commonly observed in the Cape Bedford/Hopevale area.

c) CLA

During dry season surveys no pest species were recorded within the CLA. However, given the proximity to developed (rural-residential) areas, the more common suite of pest fauna, including *cane toad* (*Bufo marinus*), Indian mynah (*Acridotheres tristis*), and feral cat (*Felis catus*) are potentially present within or adjacent to the CLA.

There have been no changes is the pest fauna present within the CLA since dry season surveys (Biotropica 2019b).

8.6 COASTAL ENVIRONMENT

The coastal environment is taken to include estuarine, littoral and marine environmental values, and the amenity of important natural coastal landscapes, views and vistas.

Identify any potential development for the proposed project outside a mining or petroleum lease that would be assessable development within the coastal zone requiring approval under the Planning Act 2016.

Provide details of the existing coastal zone that would potentially be impacted by the proposed project.

Describe and illustrate any proposed works in the coastal zone. Address and illustrate where possible, the following matters:

- *overview of the existing estuarine, littoral and marine environmental values, including water quality,*
- *benthos, aquatic flora and fauna, mangrove areas, salt marsh, and amenity, that may be impacted by construction or operation of the proposed project*
- *state or Commonwealth marine parks in the region of the proposed project's site*
- *marine plants and any fish habitat areas protected under the Fisheries Act 1994*
- *existing residential, commercial or recreational uses of the coastal zone that may be impacted by construction or operation of the proposed project*
- *capital dredging or bed levelling for navigation channels, berths, swing basins and/or harbours*
- *maintenance dredging or bed levelling for navigation channels, berths, swing basins or harbours*
- *excavations on or near the shore*
- *potential impacts of shipping and offshore transhipping operations on the marine environment*
- *potential disturbance of acid sulfate soils*
- *proposed disposal or placement options for dredged or excavated material*
- *any proposed jetties, bunds, harbour walls, groynes, channel markers, or other infrastructure, to be built in waters*
- *proposed buildings and infrastructure to be built on the shore or on land close to the shore*
- *any proposals to undertake transhipping of material in state waters or the Commonwealth marine area.*

8.6.1 Assessable Development under the Planning Act (outside ML)

Subject to future agency advice and investigations, coastal development outside the ML that would be assessable development under the *Planning Act 2016* (Qld) (Planning Act) includes the project components described below.

a) Nob Point Loading

Development Permit for the NPLA:

- operational work that is prescribed tidal works or work in a coastal management district
- operational work for clearing native vegetation (to the extent present)
- operational work for constructing or raising waterway barrier works
- operational work that is the removal, destruction or damage of a marine plant (to the extent present).

Note that for both export cases, a marine park permit (under Commonwealth and Queensland legislation) will be required for works below the high water mark in the declared GBR Coast Marine Park.

b) Cooktown Loading

Development Permit for the CLA:

- operational work that is prescribed tidal works or work in a coastal management district
- operational work for clearing native vegetation (to the extent present)
- operational work that is the removal, destruction or damage of a marine plant.

Road Transport Corridor:

- operational work for constructing or raising waterway barrier works.

8.6.2 Works in the Coastal Zone

a) Overview

Desktop Review

All aspects of the proposed action (built infrastructure, barge operations, transhipment operations) that occur below low water mark are contained within the Great Barrier Reef World Heritage Area (GBRWHA).

The marine area between Cape Flattery and Cooktown is a non-reef marine bioregion, based on the GBR Bioregion Scheme published by the GBR Marine Park Authority (GBRMPA). This scheme maps the area as a 'NA1 Coastal Strip', characterised as:

> Sand rather than mud, low carbonate and low nutrient. Dry tropic influence from land. Very dense seagrass in places – some areas important for dugong and turtle feeding. Boundaries of bioregion along the coast match changes in shoreline type.

Various public mapping was accessed prior to field surveys (see below) including the GBRMP Map 4, SeaMap Australia and Navionics Australia to search for known mapped sensitive receptors.

SeaMap layers including Coles *et al.* (2014) did not show any inshore seagrass meadows over the areas of interest. The closest meadow was mapped at the mouth of the Endeavour River. Seagrass

meadows at Archer Point south of Cooktown were monitored by Seagrass Watch volunteers between 2003 and 2010, but no data were available for Nob Point or the Endeavour River.

GBRMPA and SeaMap mapping did not show any inshore reefs interacting with any of the proposed areas of interest. The closest reef receptor site was mapped as being the Blackbird Patches, located 1.5 km south of the proposed Cooktown transhipment anchorage (TSA). These were visible on SeaMap, Navionics, and GBRMP Map 4. Navionics also showed a shipwreck south-west of the Nob Point TSA. No other features of interest or reefs were mapped on these platforms.

Targeted Field Survey

A marine ecology field survey was undertaken by BMT in late January 2020. Areas of interest as part of the survey included the following:

- three barge anchorage areas and a TSA at Nob Point
- the barge ramp footprint at Nob Point (i.e. Sub-options 1a and 1b)and transit paths between the barge anchorages and TSA
- beaches between the proposed loading area and the sand extraction areas
- an alternative approach line north of the proposed loading area
- a TSA located offshore from Cooktown (focussing on the deeper site outside of port limits)
- a barge ramp footprint located upstream from the Ida Street ramp providing access to the Endeavour River, Cooktown.

The extent and condition of reef, invertebrate, seagrass and macroalgal communities was mapped using sidescan sonar (SSS) and ground-truthed using video transects. This was done at all areas of interest except for the beaches (which were visually surveyed for evidence of turtle nesting). SSS (455 KHz) was collected from a 50 m swath range either side of the vessel, from survey lines separated by approximately 50 m, providing full acoustic cover of the areas of interest.

Ground-truthing consisted of drop-camera transects performed using a high-definition video camera with accessory 1800 lumen lighting. Transects were generally 2-5 minutes in length depending on the extent of habitat that was being investigated. Cover of seagrass, hard coral and macroalgae were estimated across the duration of the video transect.

Areas of reef and seagrass were digitised based on SSS and ground-truthing. These polygons were compared to reef areas visible from remote sensing imagery to check the accuracy of each method. The extent of acoustic survey and ground-truthing effort are shown on **Figure 8-27**.

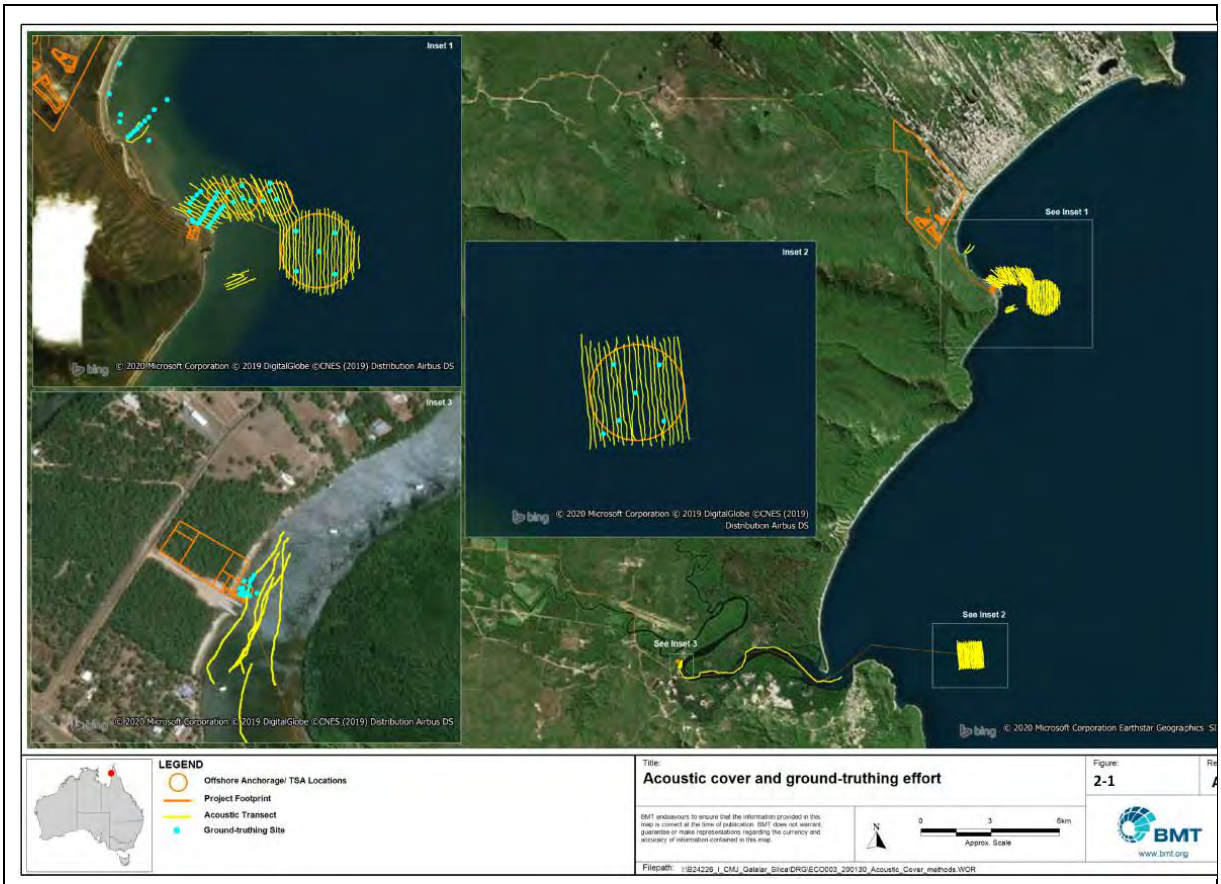


Figure 8-27 Acoustic cover and ground-truthing effort.

Source: BMT (2020) Figure 2-1.

A vessel-based search for potential turtle nesting tracks on beaches was conducted by motoring slowly between the tip of Nob Point and Alligator Creek, beyond the northern extent of the proposed sand extraction area.

b) ML and Nob Point – Marine Ecology Survey Results

The potential barge ramp site at Nob Point contained 0.28 ha of inshore reef habitat, and 0.26 ha of moderate to dense seagrass habitat (20-40% cover). The interaction of the project footprint with mapped marine habitats is shown on **Figure 8-28**.

This figure maps the area of seagrass and reef habitat detected on SSS and remote sensing imagery with high confidence. Areas of reef outside of the SSS area are digitised with a dotted line to demarcate lower confidence in extent. Seagrass could not reliably be detected with remote sensing and therefore, mapped extent is limited to areas of SSS with appropriate ground-truthing.

The reef in its present state is heavily colonized with macroalgae, primarily by Sargassum. However, there are occasional large to very large (1-3m diameter) *Porites* and *Montipora* coral heads still living that support small patches of higher-diversity fish life (**Photo 8-6** and **Photo 8-7**).

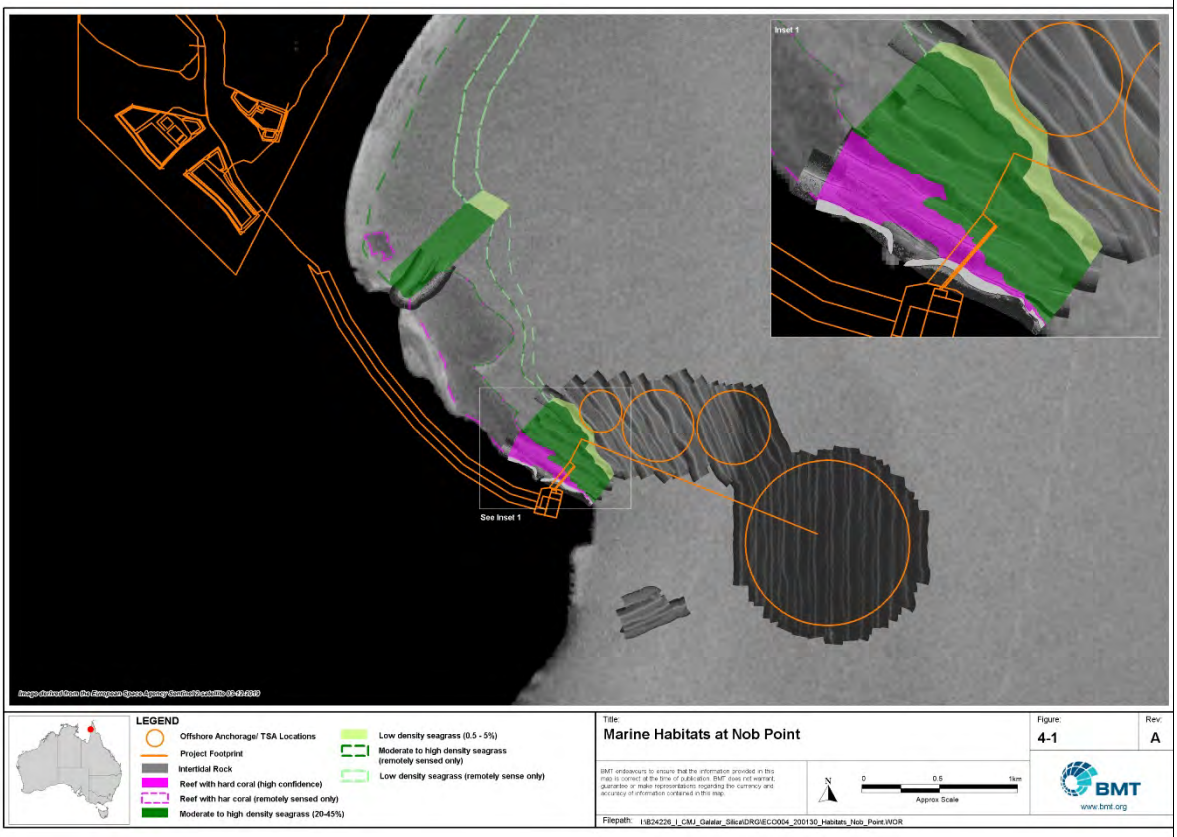


Figure 8-28 Marine Habitat at Nob Point.

Source: BMT (2020) Figure 4-1.

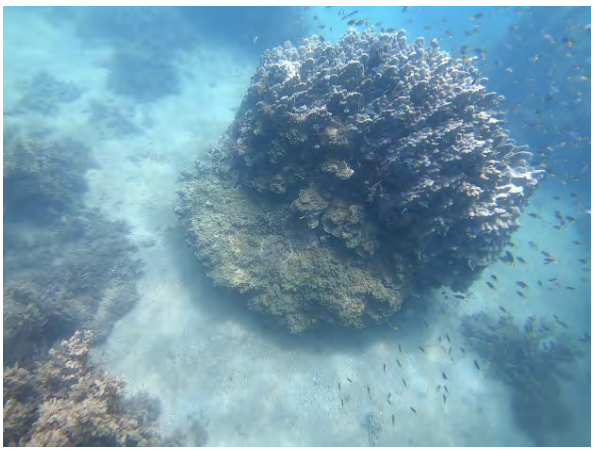


Photo 8-6 Image of observed Marine Habitat (Reef) at Nob Point.

Source: BMT (2020).

Photo 8-7 Image of observed Marine Habitat (Seagrass) at Nob Point.

Source: BMT (2020).

Based on the morphology of the reef, it appears to be an inshore fringing reef composed of calcium carbonate, becoming terrigenous (land-derived rock) in the intertidal zone. The boulder size and shape supporting macroalgae is consistent with deceased coral heads, rather than that of the terrigenous rock along the shoreline.

The reef north of the proposed barge load out typically has 1-10% living coral cover with living coral cover highest in the north-western extent of the reef. The reef west of the alternative approach line is relatively low-profile and contains very little living coral cover.

Seagrass communities consisting of *Halodule* spp. and *Halophila* spp. were present along the deeper margin of the reef at Nob Point and extensively throughout the shallow sandy expanses to a depth of approximately 7 m. Meadow cover varied from <1% to 45%. The highest density meadows were composed of *Halodule* spp., while species of *Halophila* constituted much smaller percentage cover and were less frequently observed. Dugong feeding trails were observed in seagrass meadows at Nob Point.

The offshore anchorages largely did not contain sensitive receptor habitat such as hard corals or seagrasses. The smallest anchorage site contains some low-density seagrass along its south-western margin. Some of the transects through the offshore anchorages contained <1% cover of small ascidians and soft corals. At the Nob Point TSA, the benthos had a higher mud content, was relatively bioturbated and provided habitat for white burrowing gobies. Despite being situated in the marine park, the TSA site does not provide key ecological values that contribute to the GBR heritage or conservation values as it does not support significant benthic habitat features (e.g. reef, seagrass).

Dry season and wet season surveys undertaken by Biotropica in 2019 and 2020 respectively aimed to delineate an area of mangroves within or adjacent to the ML. The majority of the vegetation within the ML is not tidally influenced and would not contain marine plants. However, in the southern tip of the ML, a fringing mangrove community containing marine plants was present. Surveys identified the limit of tidal influence within the southern creek and the extent of marine plants present within the ML has been delineated and covers a total area of 0.05 ha. Mangroves are also present in the NPSA. Refer **Figure 8-17**.

c) Endeavour River and Cooktown Harbour – Marine Ecology Survey Results

A narrow strip of mangrove vegetation is present at the east of the CLA site, bordering the Endeavour River. This total area of marine plants is likely to vary depending on tides, however a total area of 0.06 ha has been estimated to contain marine plants (refer **Figure 8-22**).

In the subtidal zone, the CLA barge ramp site on the Endeavour River was relatively unconstrained from a marine ecology perspective. The site sits along the outside meander of the river and experiences strong currents from river flow and tidal conditions. No seagrass was observed in the site footprint or adjacent to it. Benthos within the site footprint consisted of coarse sands and rock without any colonial organisms. The area of interest is relatively flat and featureless as shown on **Figure 8-29**.

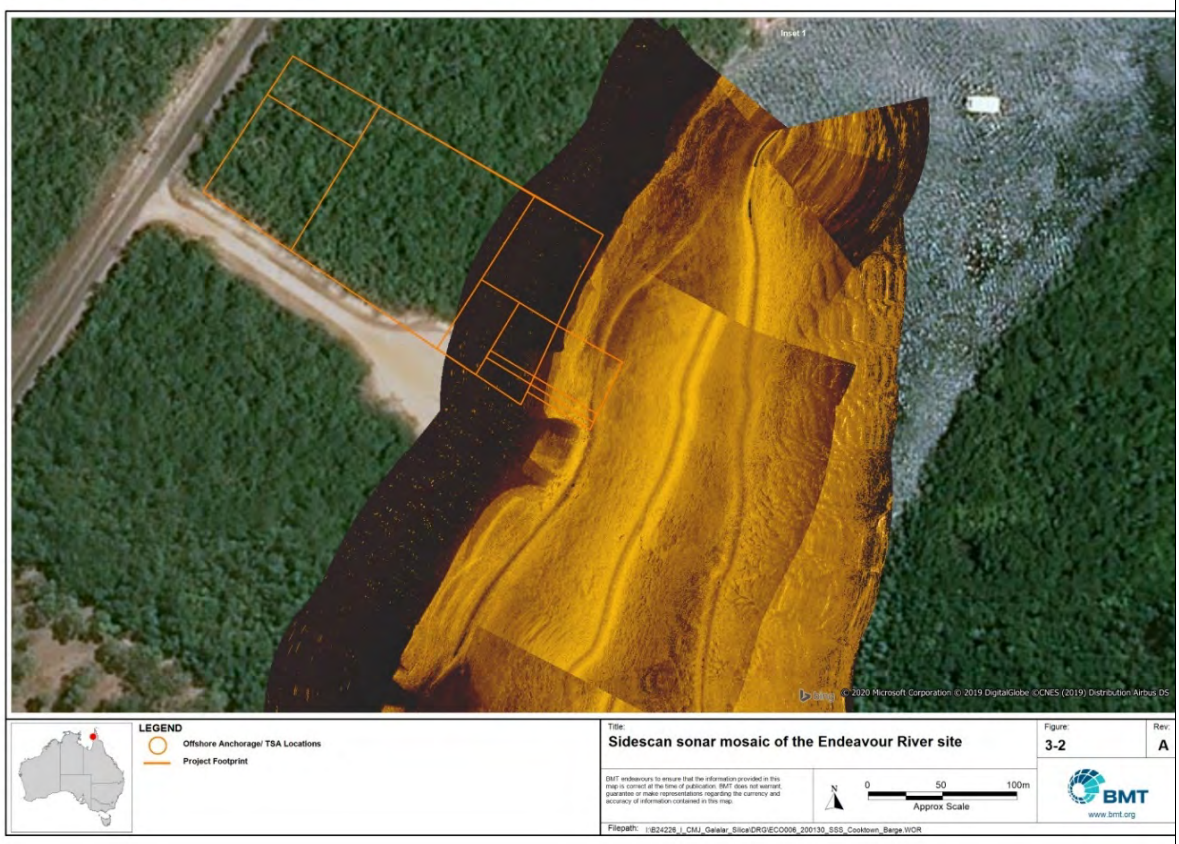


Figure 8-29 Marine Habitat in the Endeavour River at the proposed CLA.

Source: BMT (2020) Figure 3-2.

The offshore TSA at Cooktown did not contain any sensitive receptor habitat such as hard corals or seagrasses. The south-western margin of the Cooktown TSA had a higher mud content, making the SSS mosaic somewhat darker in this area. Similar to the Nob Point TSA, the benthos was relatively bioturbated (had burrows) and provided habitat for white burrowing gobies.

Based on the above, despite being situated in the Marine Park, the offshore TSA at Cooktown Harbour does not provide key ecological values that contribute to the GBR heritage or conservation values as it does not support significant benthic habitat features (e.g. reef, seagrass).

d) Amenity

As noted in **Section 8.6.2i)**, recreational fishers make some use of the coastline and Endeavour River estuary. Any impacts on their use will be considered as part of the social impact assessment of the EIS.

e) State or Commonwealth Marine Parks

Nearby marine parks are:

- Great Barrier Reef Coast Marine Park (Queensland)
- Great Barrier Reef Marine Park (Commonwealth).

These parks have a joint zoning plan. **Figure 8-30** shows the GBRMP Zoning Plan map for the area from Cape Bedford to Cooktown.

The GBRMP boundary generally follows the coast at low water and usually excludes state tidal lands and waters. The GBRCMP general extends from high water to low water along most of the FNQ coast and into rivers (e.g. the Endeavour River).

The Great Barrier Reef Coast Marine Park is a state marine park that runs the full length of the GBRMP but differs in its boundary. It provides protection for Queensland tidal lands and tidal waters. The Great Barrier Reef Coast Marine Park is managed under provisions in the *Queensland Marine Parks Act 2004* and sub-ordinate *Marine Parks (Great Barrier Reef Coast) Zoning Plan 2004*. The Great Barrier Reef Coast Marine Park (GBRCMP) adopts similar zoning and management objectives to the GBRMP, although some Queensland-specific provisions apply. Any permit for works in either park is considered jointly by state and Commonwealth agencies and would be addressed in the EIS process.

The marine park zoning applicable to each of the project components is shown in **Table 8-18**. Note that the EPM specifically excludes the GBRCMP.

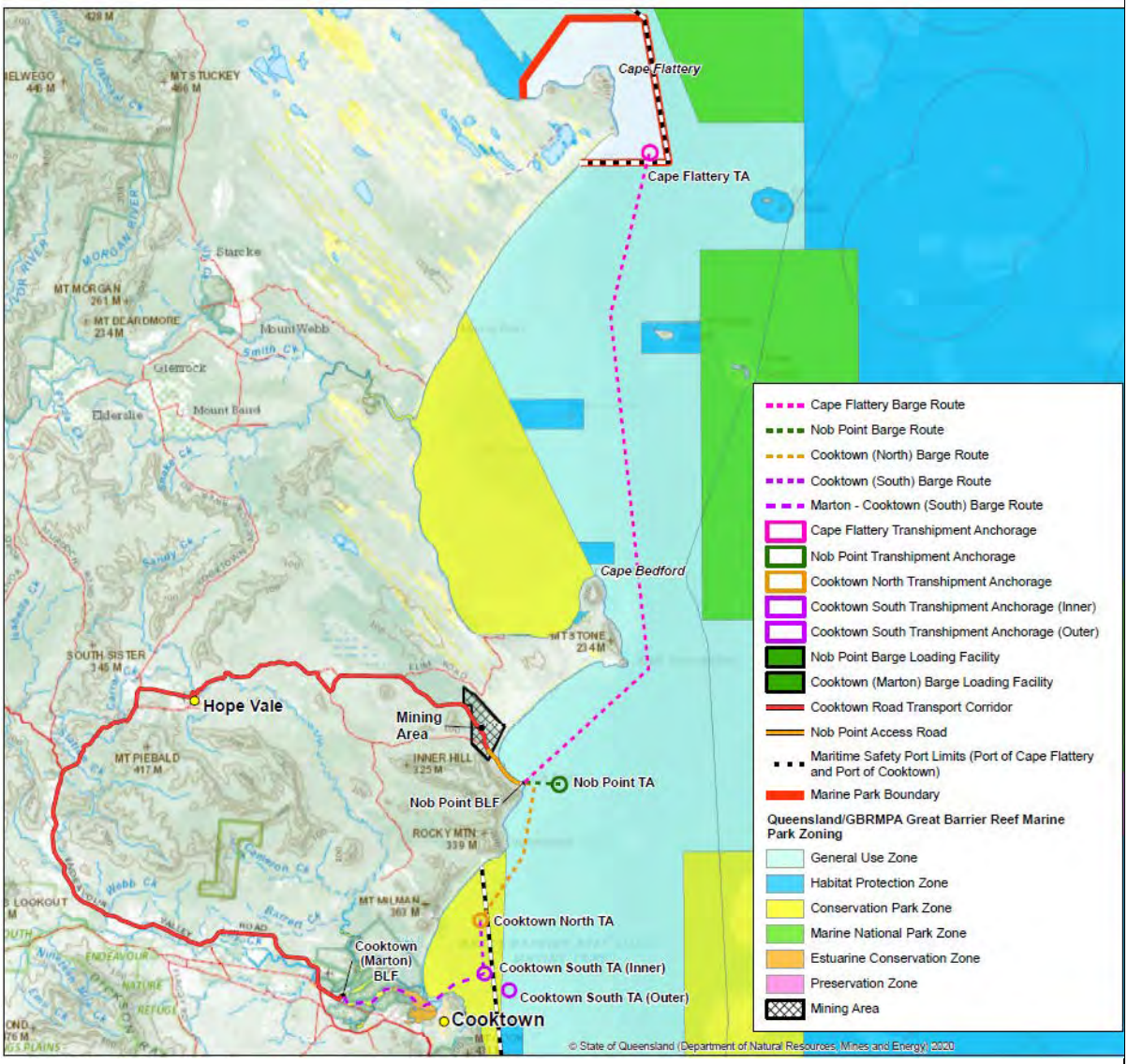


Figure 8-30 Export options showing Great Barrier Reef Marine Park – Zoning Map (GBRMP and GBRCMP).

Table 8-18 Relevant Marine Park Zoning

PROJECT ELEMENT	GBRMP	GBRCMP
Mine		
Mining area & associated infrastructure	Adjacent to GUZ	Adjacent to GUZ
Nob Point Loading Options		
Nob Point Road Transport Corridor	Adjacent to GUZ	Adjacent to GUZ
Nob Point Loading Area	GUZ	GUZ
Barge route opposite Nob Point	GUZ	GUZ
Nob Point Transhipment Anchorage	GUZ	GUZ
Cape Flattery Transhipment Anchorage	In exclusion area	In exclusion area
Cooktown (North) Transhipment Anchorage	CPZ	CPZ
Cooktown Loading		
Road Transport Corridor (mining area to Cooktown via Hope Vale)	N/A (Terrestrial area)	N/A (Terrestrial area)
Cooktown Loading Area	N/A	Adjacent to CPZ
Barge route in Endeavour River	Marine Park is seaward of mouth of Endeavour River GUZ CPZ	CPZ ECZ GUZ
Cooktown Transhipment Anchorage	CPZ – Inner GUZ – Outer	CPZ – Inner GUZ – Outer

Source: Study team compilation. GUZ = General Use (Light Blue) Zone (GBRMP, GBRCMP);
CPZ = Conservation Park (Yellow) Zone (GBRMP, GBRCMP);
ECZ = Estuarine Conservation (Brown) Zone (GBRCMP)

f) World Heritage Areas

In the vicinity of the GSSP the Great Barrier Reef World Heritage Area lies offshore of low water between Cape Flattery and Cooktown (i.e. includes the Endeavour River estuary to upstream of the CLA).

g) Marine Plants

Nob Point Loading Area

As noted in **Section 8.5.11**, marine plants exist in a narrow band off the coast at Nob Point and along the beach to the north.

Cooktown Loading Area

As noted in **Section 8.5.11**, marine plants are known to occur at the CLA as a narrow riparian fringe. There will be a need to clear small areas for construction of the infrastructure and in association with construction of piles in the Endeavour River. Further surveys of this area for mangroves and seagrass are proposed.

h) Fish Habitat Areas

As indicated in **Table 8-5**, there are no Fish Habitat Areas (FHAs) that will be affected by the project (either loading option).

i) Existing Affected Land Uses of the Coastal Zone

Parts of the coastal zone near the mining area are used by local people for recreation (especially at Elim Beach where a camping ground and some residences are located). This is 5.4 km line of sight from the proposed mine (8.4 km by road).

The beach around Nob Point is regularly used by local fishermen (especially at low tide when it is trafficable by vehicle) and there are several beach shacks and shelters along the foreshore.

Recreational fishers and boaters use the Marton Boat Ramp and carpark and the Endeavour River seaward of the boat ramp while private and commercial ships and boats use the Port of Cooktown (pile moorings and pontoons).

j) Capital Dredging or Bed Levelling

Nob Point Loading

No capital dredging or bed levelling is proposed at the NPLA. **Figure 8-31** below shows the depth profile obtained by a recent bathymetric survey between the shore and the -3.5 m (LAT) contour. This survey suggests that the waters are suitable for the establishment of a low intrusion barge ramp without the need for dredging.

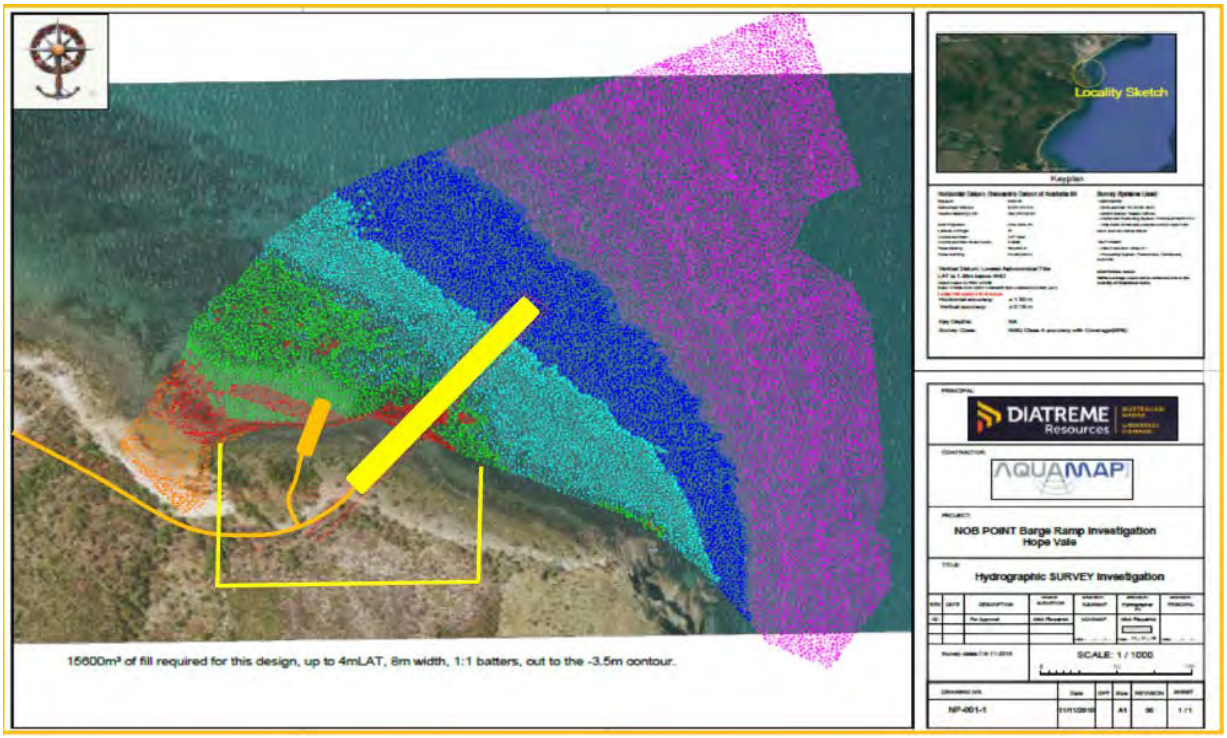


Figure 8-31 Bathymetric survey at Nob Point.

Cooktown Loading

No capital dredging or bed levelling is proposed at the CLA. Although the existing channel in the Endeavour River to the Cooktown Anchorage is shallow in places, the barging operation will be scheduled for loaded barges to travel at high tide.

k) Maintenance Dredging or Bed Levelling

No maintenance dredging or bed levelling would be needed to maintain either loading option.

l) Excavations on or Near the Shore

Nob Point Loading

No excavations on or near the shore are proposed (other than some minor benching at Nob Point – to be confined in the EIS).

Cooktown Loading

No excavations on or near the shore are proposed.

m) Impacts of Offshore Transhipping Operations

Transhipping has been discussed in **Section 8.3.1f)**.

n) Impacts Shipping Operations

Shipping has been discussed in **Section 8.3.1f)**.

o) Potential Disturbance of Acid Sulfate Soils

No fieldwork has been undertaken on the presence of acid sulfate soil / potential acid sulfate soil (ASS / PASS) for either the Nob Point Loading Area or Cooktown Loading Area.

However, if these soils are present there are appropriate management techniques available to suitably deal with these if encountered during construction.

p) Disposal or Placement Options for Dredged or Excavated Material

Nob Point Loading Area

As no dredging or excavation is required there is no need for disposal of material.

Cooktown Loading Area

As no dredging or excavation is required there is no need for disposal of material.

q) Proposed Infrastructure in Marine Environment

Nob Point Loading Area

As previously noted, infrastructure in the marine environment at the Nob Point Loading Area will consist of one of the following:

- on-ground barge ramp and barge mooring piles (Option 1a)
- elevated barge ramp and barge mooring piles (Option 1b)
- barge mooring piles (Option 2).

Cooktown Loading Area

As previously noted, infrastructure in the marine environment at the Cooktown Loading Area will consist of mooring piles in the Endeavour River.

r) Proposed Infrastructure Adjacent to Marine Environment

Nob Point Loading Area

Minor roadworks and land-based earthworks will be required to access the Nob Point Loading Area. Product stockpiling will also be required (depends on transfer mode).

Cooktown Loading Area

Infrastructure will be required at the Cooktown Loading Area to be located on approximately 1 ha of land beside the Marton boat ramp at Ida Street on the Endeavour River.

This will include equipment for loading bulk silica product onto the barge and a hardstand large enough to store 25,000 tonnes of product.

s) Proposed Transhipping

Transhipping has been discussed in **Section 8.3.1f)**.

8.7 AIR QUALITY

Provide information about air emissions, including: • *an indicative emission inventory* • *potential point and fugitive sources* • *potential to impact on environmental values including human health* • *potential cumulative impacts.*

8.7.1 Emission Inventory

No emission inventory has been prepared at this time. However, few emissions are expected from the proposed operation (mining, treatment, and ancillary infrastructure). Reference to the nearby Cape Flattery project gives an indication of air emissions from a much larger project.

A search of the National Pollutant Inventory (NPI) database from 1999 to 2017 shows that data has been recorded at Cape Flattery since 1999. **Table 8-19** below provides data from the 2016/17 report.

Table 8-19 2016/2017 report for Cape Flattery Silica Mines Pty Ltd

SUBSTANCE	AIR TOTAL (kg)	AIR FUGITIVE (kg)	AIR POINT (kg)	LAND (kg)	WATER (kg)	TOTAL (kg)
Carbon monoxide	75350	5126	70225			75350
Cumene (1-methylethylbenzene)	3.1		3.1	0.0		3.1
Lead & compounds	0.000018		0.000018			0.000018
Oxides of Nitrogen	168618	11356	157262			168618
Particulate Matter 10.0 um	9540	1357	8184			9540
Particulate Matter 2.5 um	9098	919	8179			9098
Polycyclic aromatic hydrocarbons (B[a]Peq)	0.52	0.52	0.00	0.00		0.52
Sulfur dioxide	93	8	85			93
Total Volatile Organic Compounds	8231	1375	6856			8231
Xylenes (individual or mixed isomers)	17.98		18	0		18

Source: http://www.npi.gov.au/npidata/action/load/emission-by-individual-facility-result/criteria/state/QLD/year/2017/jurisdiction-facility/Q020CFS001 accessed 23 January 2019.

This is annual flux data that is not suitable for comparison with concentration limits shown in the EPP (Air). The nearest ambient air monitoring station operated by the former Department of Science, Information Technology and Innovation (DSITI) was in Earlville in western Cairns in the 1990s, and more recently DSITI has monitored at three stations in Townsville, (Townsville Coast Guard, Townsville Port, Pimlico).

8.7.2 Air Quality

a) Mining Area & Nob Point Loading Area

No Queensland Government air quality monitoring data exists for the Cape Bedford area. Despite the lack of data, it can be stated that the Cape Bedford area is extremely remote and, due to the absence of nearby development of any type, is likely to have excellent air quality.

It is relevant to note that the EMP for the nearby Cape Flattery project (which is substantially larger than the GSSP) states that (Ports North 2014):

> The remote location of Cape Flattery and the activities associated with sand mining has not necessitated any surveys of noise or air quality by PN. CFSM annually monitor air, noise and water quality at the mine site and the port. (p27)

b) Cooktown Road Transport Corridor

Current air quality along the Road Transport Corridor is not known. However, due to low traffic volumes and the rural setting it is expected to be high.

c) Cooktown Loading Area

Current air quality is not known. However, due to low traffic volumes and the rural setting it is expected to be high.

8.8 NOISE AND VIBRATION

Provide information about noise and vibration sources, including:

- *potential emission sources*
- *potential impacts on the receiving environment including sensitive receptors*
- *potential cumulative impacts.*

8.8.1 Potential Emission Sources

a) Nob Point Loading Area

Potential emission sources are:

- establishment and operation of the mine and ancillary infrastructure (as above)
- establishment and operation of the Nob Point Loading Area.

Neither of these is expected to involve potentially significant emissions.

b) Cooktown Loading Area

Potential emission sources are:

- establishment and operation of the mine and ancillary infrastructure
- upgrading, use, and maintenance of the Road Transport Corridor
- establishment and operation of the Cooktown Loading Area.

Of these, it is expected that the only potentially significant emissions could arise from the use of the Road Transport Corridor or possibly barging in the Endeavour River.

8.8.2 Potential Impacts on the Receiving Environment Including Sensitive Receptors

It is standard practice in assessments of public amenity (noise and vibration and air quality) to consider 'sensitive receptors'.

Sensitive receptors are defined under the EPP (Noise) as 'an area or place where noise is measured'. These are usually associated with what is referred to in State Planning Policy (2017) as a 'sensitive land use'. These are defined under the Planning Regulation 2017 '*a caretakers' accommodation, child care centre, community care centre, community residence, detention facility, dual occupancy, dwelling house, dwelling unit, educational establishment, health care services, hospital, hotel, multiple dwelling, non-resident workforce accommodation, relocatable home park, residential care facility, resort complex, retirement facility, rooming accommodation, rural workers accommodation, short-term accommodation or tourist park'.*

It should be noted that potential underwater noise impacts from operations on the marine environment will be assessed as part of the marine ecology assessment.

a) Mining Area

The nearest sensitive receptor to the ML is the Elim Beach Campground located 4.4 km north of the mine (line of sight).

Due to the remote location of the mining area it is not likely that there will be any significant on amenity from noise emissions.

It is relevant to note that the EMP for the nearby Cape Flattery project (which is substantially larger than the GSSP) states that (Ports North 2014):

> The remote location of Cape Flattery and the activities associated with sand mining has not necessitated any surveys of noise or air quality by PN. CFSM annually monitor air, noise and water quality at the mine site and the port. (p27)

It continues:

> Noise levels from the activity are not considered to cause nuisance because of the distance from the closest neighbours. No noise controls are recommended or required for the activity.
>
> All noise complaints shall be recorded and reported to the mine operator as soon as practical.
>
> Mitigation measures will be developed as required to address complaints received. (p27)

b) Nob Point Loading

As for the mining area above, due to the remote location of the Nob Point Loading Area, it is not likely that there will be any significant on amenity from noise emissions.

c) Cooktown Loading

Road Transport Corridor

Road transport is expected to involve nine side-tipping double road trains with 50 t loads. The trucks will operate 12 hours per day and mainly during daylight to minimise noise and light impacts.

Sensitive receptors along the road corridor have not been evaluated, but would include a number of residences in the Hope Vale and Marton areas, as well as rural properties along the route.

The impact of the associated noise emissions will be evaluated in the EIS.

Cooktown Loading Area

Sensitive receptors adjacent to the Cooktown Loading Area have not been evaluated, but would include a number of nearby residences in the Marton area.

The impact of the associated noise emissions will be evaluated in the EIS.

8.8.3 Potential Cumulative Impacts

The only potential cumulative noise impacts that are possible are those related to the extra traffic on the Road Transport Corridor and possibly at the Cooktown Loading Area. This will be assessed in the EIS.

8.9 WASTE MANAGEMENT

Provide information about waste management, including:

- *expected waste streams (type, quantity, state (liquid, solid, gaseous), hazard, toxicity)*
- *how these wastes could disperse in the environment*
- *their potential impact on environmental values*
- *the likely geochemistry of all waste rock, including spoil, tailings and rejects and assess the potential risks associated with this waste stream*
- *the proposed quantity, quality and location of all potential discharges of water and contaminants by the proposed project, including treated wastewater and sewage.*
- *existing and proposed sewage infrastructure relevant to environmentally relevant activity (ERA) 63 CSG water management salt management criteria.*

8.9.1 Type and Quantity of Waste

Solid Waste

Only small quantities of solid waste will be generated and this will be limited to the Workshop / Office. Solid waste will be sorted into recyclable and general waste, stored locally, and regularly returned to Hope Vale for handling via the municipal disposal system.

Liquid Waste

A small commercial sewerage package plant will be installed adjacent to the Workshop for handling Workshop and Office sewage. Discharge from this plant will be licensed.

Gaseous Waste

Gaseous waste will be limited to diesel exhaust gas from earthmoving equipment, trucks, vehicles and tugs / barges / ships.

Hazard, Toxicity

Chemicals used will be limited to diesel fuel and small quantities of laboratory chemicals and flocculant. While there are not expected to be any significant risks, this will be a matter investigated in the EIS.

8.9.2 Dispersal in the Environment

There will be no dispersal of hazardous or toxic substances in the environment. Accidental loss of silica product during loading and unloading operations is expected to be minimal and will not result in impacts on the seabed but will be considered nonetheless as part of the EIS.

8.9.3 Potential Impact on Environmental Values

It is expected that the proposed mining and processing operation will generate little in the way of waste and will have limited impact on environmental values.

8.9.4 Geochemistry of Waste Rock etc.

The only mining 'waste' is a heavy mineral enriched sand that will be produced by the processing plant and stockpiled for later processing to extract the heavy mineral. This processing will occur when there is sufficient heavy mineral for a shipment.

8.10 HAZARD AND RISK, AND HEALTH AND SAFETY

Provide information about potential risks to people and property including:

- *hazards*
- *hazardous substances*
- *wildlife hazards*
- *accidents/ catastrophic events (e.g., fire or spills)*
- *natural catastrophic events (e.g. cyclones, storm tide inundation, bushfires)*
- *potential risks that the project may pose to off-site receptors.*

8.10.1 Introduction

The national standard for risk management is AS/NZS ISO 31000:2009 Risk management—Principles and guidelines ('the national standard'). The need for a consistent approach to risk management is stated early in the document:

> Although the practice of risk management has been developed over time and within many sectors to meet diverse needs, the adoption of consistent processes within a comprehensive framework helps ensure that risk is managed effectively, efficiently and coherently across an organization. The generic approach described in this Standard provides the principles and guidelines for managing any form of risk in a systematic, transparent and credible manner and within any scope and context. (p iv)

The standard specifies the detailed framework that is proposed to be used throughout the EIS. Of interest is that the definition of risk has changed from that used in the now superseded version of the standard from 'the chance of something happening that will have an impact on objectives' to 'the effect of uncertainty on objectives'.

This current definition is explained by the following notes as documented in the national standard:

- An effect is a deviation from the expected — positive and/or negative.
- Objectives can have different aspects (such as financial, health and safety, and environmental goals) and can apply at different levels (such as strategic, organisation-wide, project, product and process).
- Risk is often characterised by reference to potential events and consequences, or a combination of these.
- Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence.

It should be noted that the national standard does not define 'hazard'. This is commonly taken to be 'a source of potential harm or a situation with a potential to cause loss'.

The publication Natural Hazards in Australia – Identifying Risk Analysis Requirements produced by Geoscience Australia (Middelmann 2007) provides a national context for risk analysis of natural hazards and defines important terminology for many of the issues dealt with in this chapter. Although produced before AS/NZS ISO 31000 was released, the publication includes a useful definition of 'risk' and 'hazard' that is still relevant.

> Risk is defined by the risk management standard AS / NZS 4360:2004 [superseded] as (p4): 'the chance of something happening that will have an impact on objectives' [under AS/NZS ISO 31000 this has been redefined as 'the effect of uncertainty on objectives']. A risk is often specified in terms of an event or circumstance and the consequences that may flow from it. Risk is measured in terms of a combination of the consequences of an event and their likelihood.
>
> 'Likelihood' describes how often a hazard is likely to occur, and is commonly referred to as the probability or frequency of an event. 'Consequence' describes the effect or impact of a hazard on a community. Both likelihood and consequence may be expressed using either descriptive words (i.e. qualitative measures) or numerical values (i.e. quantitative measures) to communicate the magnitude of the potential impact (AS / NZS 4360:2004).
>
> Risk in disaster management has been described … as the probability of a loss, which depends on three factors: hazard, exposure and vulnerability.
>
> - A 'hazard' refers to a single event or series of events which is characterised by a certain magnitude and likelihood of occurrence.
> - 'Exposure' refers to the elements that are subject to the impact of a specific hazard, such as houses on a floodplain.
> - 'Vulnerability' is the degree to which the exposed elements will suffer a loss from the impact of a hazard. […]. That is, risk is the interaction between likelihood and consequence. (p33)

The central concepts of likelihood and consequence remain and are inherent in the methodology proposed for the EIS. The technical studies will address likely risk and hazards, such as:

- natural hazards e.g. cyclones, flood, fire, earthquake
- geo-environmental hazards (e.g. unexploded ordnances, contaminated land, acid sulphate soils)
- biological and animal hazards e.g. crocodiles, biting insects
- hazardous goods storage and movement
- construction risks
- operational risks
- occupational risk (working over water, moving vehicles, security incidents, health and safety risk)
- other (pandemic, counter-terrorism, security incidents).

8.10.2 Natural Hazards

Key natural hazards are described below.

a) Cyclones

Tropical cyclones pose a considerable threat to Far North Queensland with a cyclone affecting the region to some extent almost every year. Cyclones can approach the shore from any direction although as the map below shows, most major cyclones approach from the Coral Sea to the north-east.

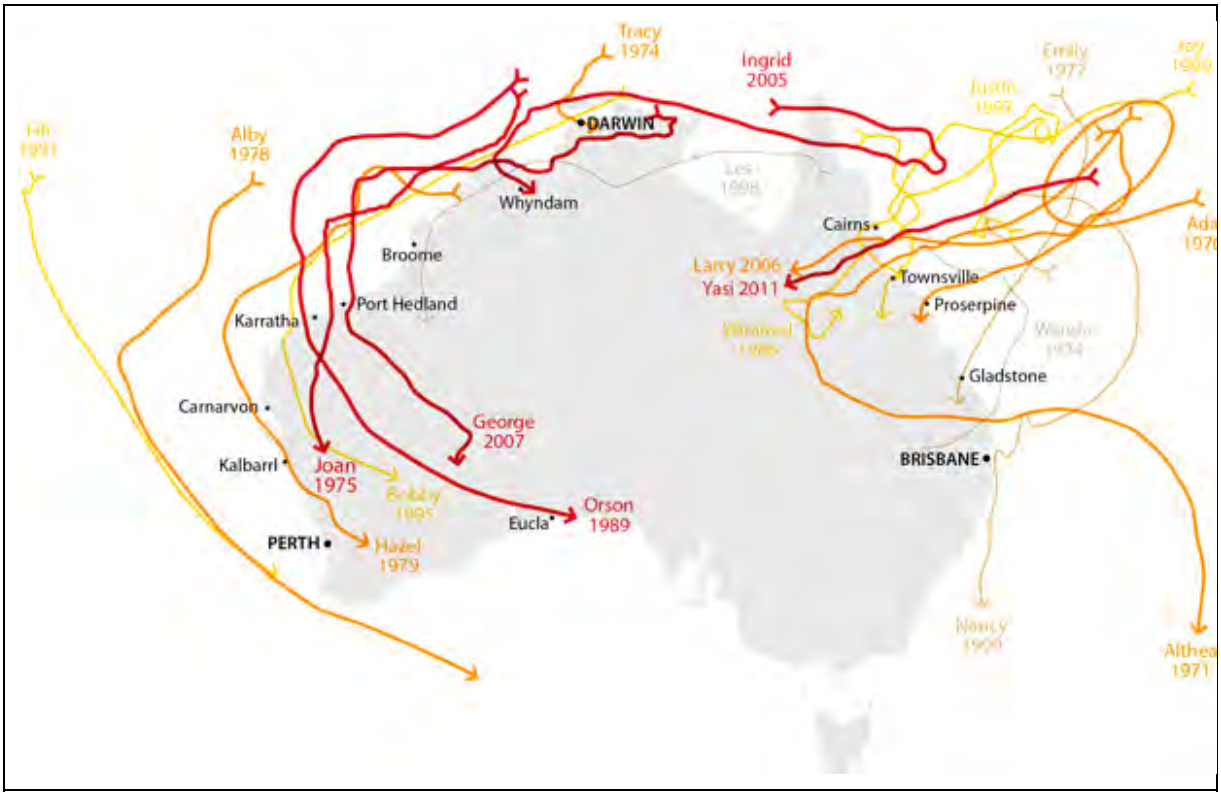


Figure 8-32 Cyclone paths of tropical storms that have crossed the country.

Source: https://www.australiangeographic.com.au/topics/science-environment/2011/08/cyclone-tracking-australias-worst-storms/ accessed 23 January 2019.

The main effects of a cyclone are:

- strong winds
- elevated water level (see below for a discussion on the components of elevated water level)
- flooding once the cyclone is over, although the two effects are not always a feature of the same event.

In terms of wind, gusts in excess of 90 km / h are common around the centre and, in the most severe cyclones, gusts can exceed 280 km / h. These very destructive winds can cause extensive property damage and are a risk to human life.

Given its location in Far North Queensland, the effects of a major cyclone on the project will be assessed as part of the EIS, including consideration as part of concept designs and as part of proposed emergency management procedures for mining operations and export/mooring operations.

b) Storm Tide

When a cyclone approaches the coast, the resulting water level is a result of the following factors:

- astronomical tide at the time (e.g. low, high, incoming, outgoing)
- storm surge (the increase in sea level due to low air pressure)
- wave set-up (the increase is sea level due to cyclonic winds creating larger waves)
- wave run-up (the increase in sea level due to waves breaking on a sloping shore).

A common term in disaster management is 'storm tide'. This is the combined effect of storm surge, astronomical tide, and wave set-up. It does not represent the maximum water level from a particular event as it excludes wave set-up and wave run-up.

Mining Area & Nob Point Loading Area

There is no available storm tide hazard data for the region north of Cooktown, so the default value of 2 m above HAT is adopted as the projected storm tide inundation level (as per notes on the erosion prone area plan – HVS 3a). This provides a height of 3.6 m to 3.72 m above AHD.

Site data reveals that all of the ML is above this level.

The proposed barge ramp (Sub-option 1a or 1b) will be designed to withstand an appropriate storm tide design event. Should Sub-option 2 proceed, a crawler crane would be used so that it could be moved to shelter in the case of very severe weather (e.g. a cyclone).

Cooktown Loading Area

Queensland Globe provides information on storm tide at Cooktown. Mapping shows that the CLA is in the Medium Hazard category.

c) Coastal Erosion

Mining Area

The erosion prone area map for the Hopevale local government area (ref HVS 3A) is shown on **Figure 8-33**. Adjacent to the ML, the erosion prone area width sits between two beach compartment segments so is between 125 m and 155 m measured from the seaward toe of the frontal dune.

The ML lies at least 400 m west of the frontal dune and thus is unlikely to be affected by coastal erosion including with higher sea states from future sea level rise at 2100.

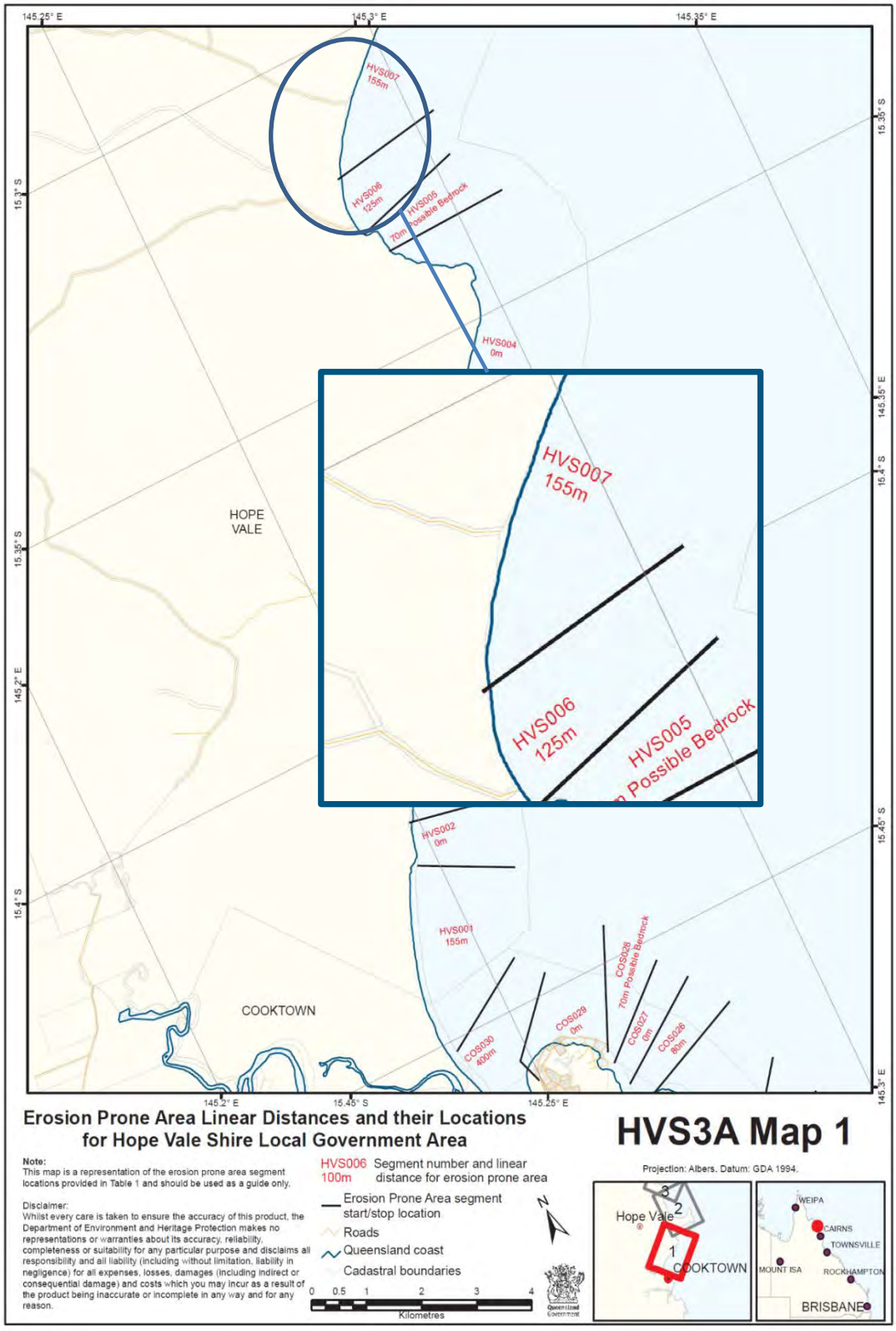


Figure 8-33 Erosion prone area calculations for study area.

Nob Point Loading

The Queensland Globe mapping is easier to interpret in the vicinity of the Nob Point Transport Corridor. See **Figure 8-34** below. The area from the southern boundary of the mapping and extending south to Indian Head involves rocky headlands with no erosion risk.

Figure 8-34 Erosion prone area adjacent to the Nob Point Transport Corridor.

Source: Queensland Globe.

Cooktown Loading

Mapping (**Figure 8-36**) shows that the CLA is outside the mapped erosion prone area but the fringing mangroves are within the 40 m buffer to HAT.

d) Coastal Management District

Mapped areas and adjacent State coastal waters (including up to the tidal extent of rivers, creeks and streams) are contained within the coastal management district (CMD) declared under the CPM Act. The coastal management district is the area where the Queensland Government has approval powers

under the Planning Act for various forms of development including changes of use of land and operational works.

Mining Area

Queensland Globe mapping shows that most of the ML is within the CMD.

Nob Point Loading Area & Cooktown Loading Area

Queensland Globe mapping shows that loading facilities at both Nob Point and the Endeavour River would be located within the CMD.

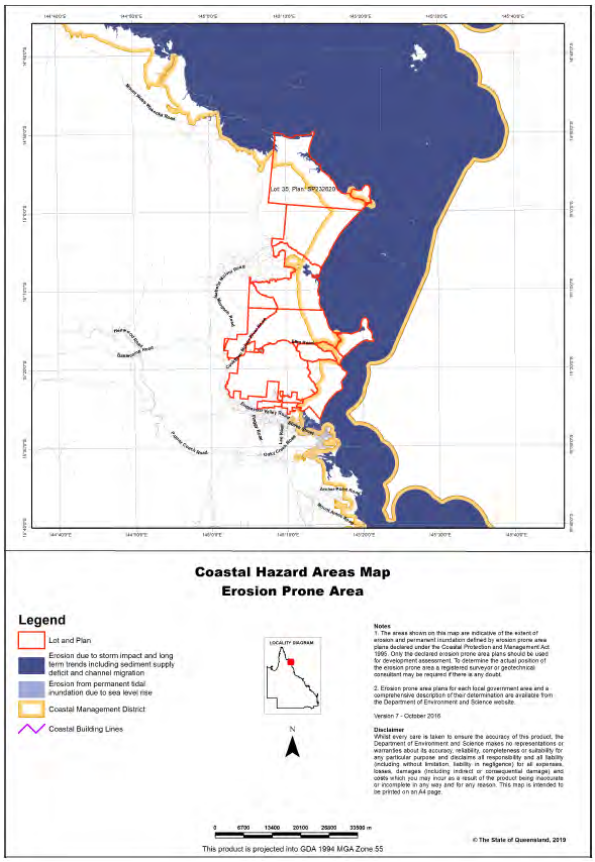


Figure 8-35 Coastal hazards – erosion prone area.

Source: DES at https://apps.des.qld.gov.au/map-request/coastal-hazards/ accessed 28 November 2019.

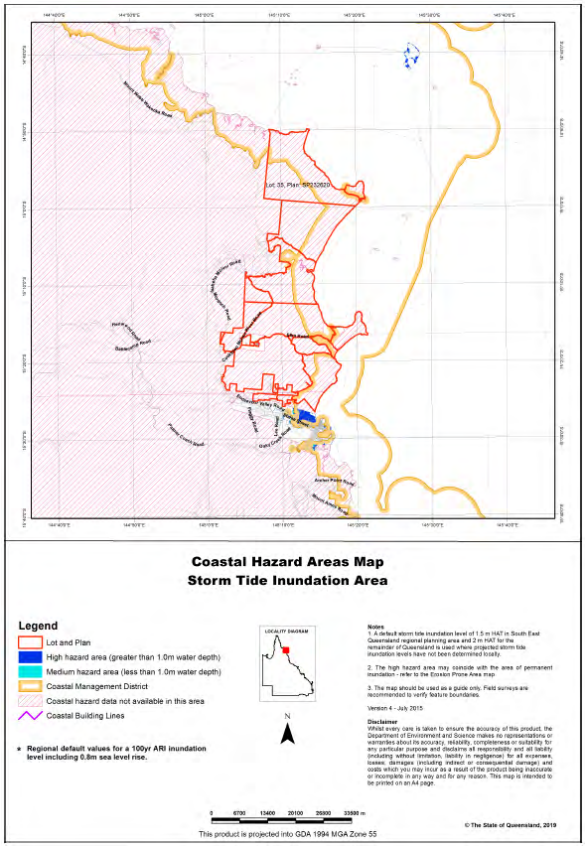


Figure 8-36 Coastal hazards – storm tide inundation area.

Source: DES at https://apps.des.qld.gov.au/map-request/coastal-hazards/ accessed 28 November 2019.

e) Bushfires

It is evident from the ecological surveys that fire plays a significant role in determining the vegetation communities. Fire tends to favour sclerophyll communities over littoral rainforest, for instance. During the December 2019 reconnaissance survey, there was evidence of recent wildfires in several patches of the ML. Local advice is that fires result from lightning strikes.

However, bushfire is not expected to significantly affect mining operations.

f) Management Plans

Management plans for all hazards will be developed as part of the EIS.

8.10.3 Hazardous Substances

There will be no hazardous substances. Refer **Section 8.9**.

8.10.4 Wildlife Hazards

Wildlife hazards are expected to be present at all sites and include crocodiles, mosquitos, and sand flies.

Management plans for wildlife hazards will be developed as part of the EIS.

8.10.5 Accidents/ Catastrophic Events

Accidents and catastrophic events will be considered as part of the hazard and risk assessment undertaken for the project. Mitigation will likely take the form of emergency management and evacuation plans and procedures.

8.10.6 Potential Risks to off-site Receptors

In addition to hazards etc. being a risk to the project, there is the potential for the project to pose risks to off-site receptors. These have not been evaluated at this time. However, due to the benign nature of the product and the processing operations, the risk is likely to be low.

These risks will be assessed in the EIS.

8.11 CULTURAL HERITAGE

Provide information about potential impacts to:

- *Aboriginal and Torres Strait Islander cultural heritage*
- *non-Indigenous cultural heritage.*

8.11.1 Aboriginal and Torres Strait Islander Cultural Heritage

a) Overview

Diatreme commissioned a cultural heritage assessment (Archaeo 2017) to guide the 2017 and 2018 exploration programs. Specifically, it was designed to reduce impacts from ground disturbance arising from hand auger drilling, air-core drilling, and track clearing. In addition to specifying minimum-impact exploration techniques, it also established exclusion zones based on a cultural heritage risk assessment process. While it is not a full cultural heritage assessment of the GSSP, the network of identified exclusion zones are considered to be hard constraints to project planning.

The scope of the work was:

- Accurately identify, map and record the location of heritage values and artefacts within the project area (and areas of significance in close proximity that have a bearing upon the cultural landscape).
- In consultation with Thiithaarr Warra, provide recommendations regarding the significance and management of any heritage values and artefacts identified within the project area.
- Develop and document practical management/conservation strategies for the project area and for the heritage values and artefacts identified within the project area, inclusive of practical guidance on relevant implementation strategies.
- Compile site survey data into a Cultural Heritage Field Assessment Report in accordance with Schedule 2 of the Aboriginal Cultural Heritage Agreement (ACHA) developed by Congress and Diatreme.

The project areas for the cultural heritage study (described below as the cultural heritage project area) is shown bounded by blue lines on **Figure 8-37**) below.

b) Findings and Recommendations

The scope of the investigation recognised that the cultural heritage record is both fragile and non-renewable, and any major disturbance of the environment poses a threat to this valuable cultural resource. It was noted that the landscape is relatively dynamic and it is likely that, through time, dunes have been blown to the northwest by the prevailing south-east winds. This may have alternately exposed and covered Aboriginal cultural heritage sites. Fieldwork found that Deep Creek (Thalgaar) bisects the western side of the cultural heritage project area. This corridor forms a swamp within the northern part of the project area draining to the sea to the south. This area was identified as an Exclusion Zone as described below.

Additional consultation during the field assessment identified and further defined additional Exclusion Zones where no disturbance should occur. Approximate boundaries for these areas were mapped – (coloured aqua on **Figure 8-37**). A strategy for the ongoing management of any exploration activities in the vicinity of these Exclusion Zones is set out in the report (Recommendation 2).

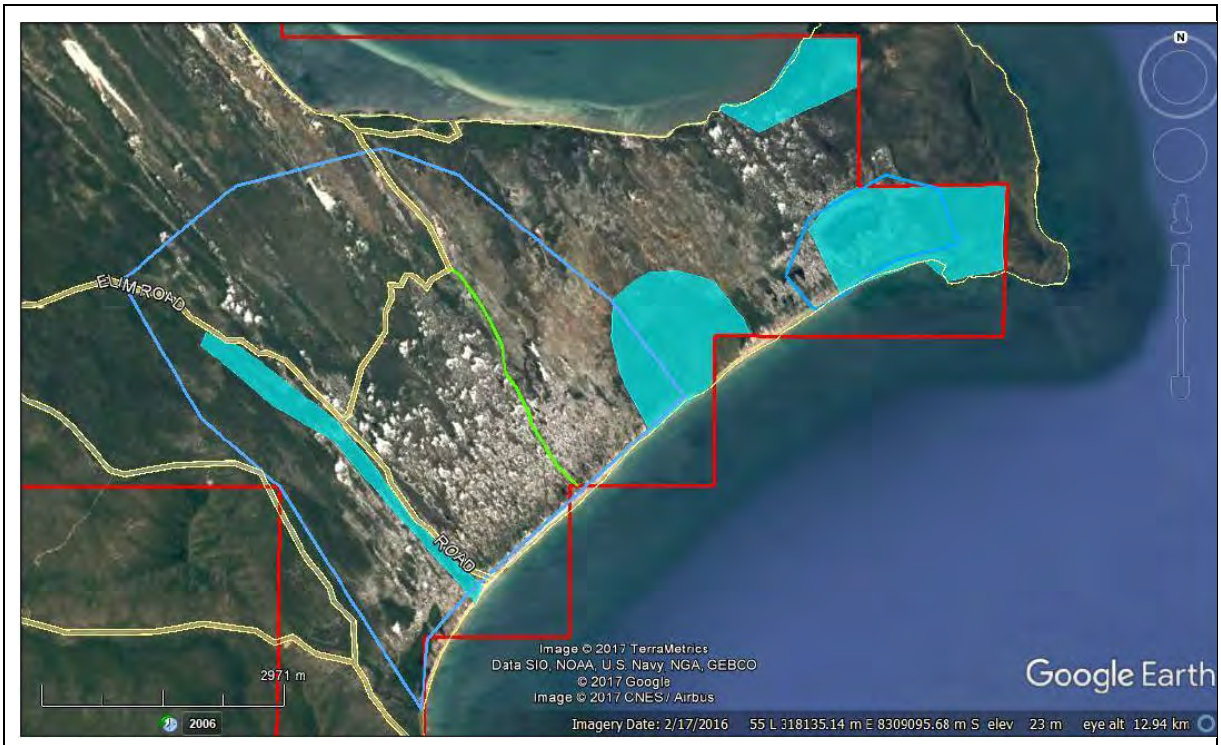


Figure 8-37 Areas of non-tangible Exclusion Zones.

Source: Archaeo (2017) Figure 5. Blue polygons denote the cultural heritage project area. Aqua shaded areas denote Exclusion Zones.

Overall findings are as follows:

- No tangible sites of Aboriginal cultural heritage were identified during the cultural heritage assessment.
- It was considered that those parts of the cultural heritage project area assessed during the field assessment possessed some potential for further currently unidentified Aboriginal cultural heritage to be present.
- Exclusion Zones are considered to be hard constraints to project planning. No development or ground disturbing activities should be undertaken within these areas. Further definition of these areas will be required should future exploration activities be proposed for areas in close proximity to the Exclusion Zones.
- Other recommendations apply to protocols to be observed for archaeological finds, clearing of new exploration tracks, and monitoring in general.

c) Impacts and Mitigation

The impact of the mine and the overall Galalar Silica Sand Project was not considered in the study, although the Exclusion Zones are considered to be hard constraints to project planning (i.e. mitigation by design).

While the mine is located within the cultural heritage project area and clear of the Exclusion Zones, some points are relevant:

- In fine-tuning the mine layout, a greater buffer between the mine and Deep Creek should be considered.
- The Archaeo study considered that those parts of the cultural heritage project area assessed during the field assessment possessed some potential for further currently unidentified Aboriginal cultural heritage to be present.
- Parts of the Project Area are outside the cultural heritage project area and will need to be surveyed.

d) Further Studies

The cultural heritage work was undertaken for the exploration campaigns and will need to be expanded and updated for the development phase in the EIS.

8.11.2 Non-Indigenous Cultural Heritage

The Archaeo study did not include an assessment of non-Aboriginal cultural heritage values.

Although not relevant to the ML, the Hope Vale Aboriginal Shire Planning Scheme (2014) (Planning Scheme) provides useful data regarding planning matters and cultural heritage / historic values that are important to Council and the community. The Planning Scheme shows that there are no mapped non-indigenous cultural heritage sites in the vicinity of the Project Area. However, under 3.3.4 Cultural and historical heritage it is stated:

- (d) Places and sites of significance such as Elim Beach, the coloured sands (just north of Elim Beach) and Cape Bedford are recognised and development protects their significance.

Other relevant Planning Scheme references are:

- Hope Vale township is nestled in a wide expansive valley shaped like a bowl, amongst flat topped ranges, coastal dunes and the beautiful coloured sands' beaches to the east. **Elim Beach and Cape Bedford** are some 30 minutes' drive from Hope Vale township, via unsealed and sandy roads.
- Hope Vale as a township was originally established as a mission in 1886 by the Lutheran Church, known as the **Cape Bedford Mission at Elim Beach**. The mission population included Aboriginal people from the local Warra clans as well as other Aboriginal people from around Australia who were moved there as part of government policies of the day.
- Strategic intent:
  - (d) recognition and protection of the Cape York natural landscape across the Shire and its special places like Cape Bedford and the coloured sands at Elim Beach.
  - (e) continuation and protection of public access and use of Elim Beach for everyone.
- Socially strong and healthy communities:
  - (g) Public access for all is provided to all foreshore areas; especially areas such as Elim Beach, the Coloured Sands and Cape Bedford.

Photo 8-8 View of Cape Bedford from Elim Beach.

Source: Hope Vale Aboriginal Shire Council Planning Scheme (2014).

8.12 SOCIAL

Provide information on potential social impacts in line with the Strong and Sustainable Resource Communities Act 2017 and the Coordinator-General's Social Impact assessment guideline. Include beneficial and adverse impacts on communities and economies.

8.12.1 Key Social Indicators

As noted below, the formal social assessment is yet to commence. However, some preliminary findings on key social indicators have already been identified by the Economic Study that is underway (Cummings Economics in preparation). Some key social indicators are summarised below. Other indicators with more of an economic focus are discussed in **Section 8.13**.

a) Hope Vale

At the heart of the Hope Vale community are the descendants of the original Aboriginal language group of people, the Guugu Yimithirr.

The community's involvement with the project is through Hopevale Congress of Clans, representing the traditional owners of the area in which the mining lease and the proposed Nob Point barge landing site is located.

Age Structure

2016 Census data indicates that as with most Aboriginal communities, median age is low at 26 with a high proportion under 20 years old and low proportion 65 plus.

Population Size & Growth

The 2016 Census recorded an estimated residential population 'usual place of residence' of 976 composed of 897 (92%) Aboriginal and Torres Strait Islander.

Estimated residential population is just over 1000.

Australian Bureau of Statistics (ABS) data indicates that this population grew strongly between 2005 and about 2011, but has tended to dip and then recover to just over 1000 since.

Transport & Communication

Number of dwellings without motor vehicles is relatively high at 32% (cf Qld 6%), and without internet connection at 38% (cf Qld 14%).

Education

The level of education and training is relatively low, with all indicators being well below state averages.

Cultural Background

Some 69% recorded they spoke the traditional language of the area (Guugu Yimithirr) at home.

Only 6% indicated they had no religion (cf Qld 29%), and 78% indicated they were Lutheran.

b) Cooktown

Cooktown is named after Lt James Cook who repaired his ship on the banks of the Endeavour River in 1770 after it was damaged off Cape Tribulation during his great voyage of discovery up the east coast of Australia.

The town throughout its history has been the administrative centre for Cook Shire covering most of the central and northern peninsula area with a substantial amount of its population of the area living in Aboriginal communities or in the general community.

Age Structure

Median age is 44, indicating an older population typical of most rural areas. The population has a higher proportion of people aged 65 plus.

Population Size & Growth

Estimated residential population is not available for the Cooktown State Suburb.

Population growth for Cook Shire has risen strongly from 3636 in 2001 to 2011, declined for several years to 2014, and then recovered to 4445 by 2018.

Transport and Communications

Number of households without a motor vehicle is low at 7.9%, but above the state average of 6.0%. Some 26% of dwellings do not have an internet connection (cf Qld 14%).

Education

Proportion with university degree levels of education is lower than the state average, but otherwise highest level of education reached is about the state average.

Cultural Background

Cooktown State Suburb has a relatively high Aboriginal and Torres Strait population at 14.5% compared with state average of 4.0%. Apart from that, ancestry distribution is not very different from the Queensland population overall.

Regarding religion, ABS data reveals a relatively high ‘Not stated’ and the Hope Vale’s Lutheran Mission influence is evident, probably mainly through the 14.5% Aboriginal population. Apart from that, the proportions are generally in line with the wider Queensland population.

8.12.2 Social Impact Assessment

A Social Impact Assessment (SIA) will be undertaken during the EIS as required by the *Strong and Sustainable Resource Communities Act 2017* (Qld) (SSRC Act). The intent of the SSRC Act is to ensure that ‘residents of communities near large resource projects benefit from the construction and operation of the projects’. Under that Act, any project subject to an EIS under the EP Act is a ‘large project’.

The Social Impact Assessment Guideline—March 2018 notes that the SIA must address the following key matters:

- community and stakeholder engagement
- workforce management
- housing and accommodation
- local business and industry procurement
- health and community well-being.

The following discussion outlines an initial response to the guidelines under these headings.

a) Community and Stakeholder Engagement

Aboriginal Party & Hope Vale Community

Under the CCA, all communication between Diatreme and the Aboriginal Party must be through Congress. This includes consultation with members of the 13 clans and, at Congresses' request, the broader Hope Vale community. This situation therefore covers all social and economic issues associated with most of the most-affected host community.

Congress has already commenced a consultation program with the broader community and has appointed local consultation specialists. This involves informal 'back street' communication and several public meetings necessary under the CCA but broadened to be more inclusive. This is a Congress initiative.

'Affected' and 'Interested' Persons

Refer **Chapter 6**.

Local Government

Hope Vale Aboriginal Shire Council (HVASC) and Cook Shire Council (CSC) are mentioned in **Section 6.1.2** as interested persons and will be consulted with accordingly.

Other Stakeholders

Consultation is also planned on infrastructure, tenure, and general community issues during the conduct of the EIS. This has already commenced.

General Community

Under the EIS process the 'general community' has the opportunity to participate via submissions as described in **Section 5.3**. These include:

- the mining lease application
- the EPBC Act referral
- development of the EIS ToR
- the draft EIS
- the Environmental Authority application
- relevant Operational Works applications.

This required consultation will form part of the overall strategy which is being developed to integrate all of this consultation in terms of:

- information to be provided and mechanisms for dissemination
- opportunity to comment and mechanisms for this
- maintenance of an issues register
- analysis of issues
- a response-to-issues strategy.

There are social issues that arise outside the Hope Vale area and these will involve interested persons as above (principally associated with the road transport component of the Cooktown Export (Trucking) Option and these and other transport issues (such as conflict with other users of the Endeavour River) will be addressed in the EIS transport study.

The proposed SIA will collect these issues together and include an analysis and management strategy as required to mitigate impacts.

b) Workforce Management

As noted above, Congress owns the Nambal organisation which is currently a quarrying and earthworks company that routinely operates gravel pits and a hard rock quarry serving local roadworks and construction projects. The company recently supplied road-building material for TMR's Endeavour Valley Road and routinely sells to local councils.

For the GSSP, Nambal will construct / upgrade local roads and participate in the mining process. Accordingly many of the workers will be engaged by Nambal from the local catchment.

The guideline's requirement for 'adoption of a recruitment hierarchy, prioritising recruitment from local and regional communities first, then recruitment of workers to the regional community' may not be relevant under these circumstances.

The Cairns office of DATSIP will be consulted as discussed in the 12 February whole-of-government meeting.

c) Housing and Accommodation

The project is not FIFO and no accommodation will be supplied (other than possibly for a night watchman).

Nambal already employs a core staff of 6-10 local residents and is expected to gear up when the work starts. There is high unemployment in Hope Vale and it is unlikely that many new people will come to town to work on the project other than a few specialists and of course contractors for routine maintenance. These will be temporary workers using temporary accommodation (possibly Hope Vale but more likely Cooktown which is only a 35 minute drive away and has better accommodation).

d) Local Business and Industry Procurement

Given the small size of the project and its nature, little will be required in the way of local business and industry procurement.

However, the issue will be addressed in the proposed SIA with input from the Economic Study that is already underway.

e) Health and Community Well-Being

The economic benefits of the project are being documented in the Economic Study and will be used to assess this issue.

However, as noted above, the economic and social impacts on the local community are largely being managed by Congress. All external issues are being addressed in the various technical studies.

The proposed SIA will collect these issues together and include an analysis and management strategy.

8.12.3 Benefits as Identified by Hope Vale Congress

No formal social impact assessment has been undertaken. However, in a letter to the Minister for Transport and Main Roads dated 28 October 2019, Congress noted the following:

> We understand you appreciate the regional significance that development of this type can bring, particularly where local community (Congress) has negotiated a direct equity stake (12.5% ownership) in the Galalar Project. These direct benefits include:
>
> 1) 75 jobs in construction and 60-65 long term direct employment opportunities
> 2) All jobs sourced from Hopevale and Cooktown communities - Drive in and out.
> 3) Congress contracting opportunity on mine site (earthmoving)
> 4) Revenue from any loading facility management and use.
> 5) Long term potential for additional traffic and benefit from facility usage.
> 6) Minimal activity near community residential areas
> 7) Further spin off contracts in training and mine supply of fuels and consumables.
> 8) Ownership by Congress with profits to be reinvested in other economic, social, cultural and environmental initiatives.
>
> There are also future unrelated benefits associated with a loading facility (barge ramp) at Nob Point.
>
> Hope Vale Charitable Trust owned, and associated with Hope Vale Congress, Nambal Resources and Quarries Pty Ltd employ 6 permanent and 9 casual Hope Vale community members and have current contracts with the Shires of Hope Vale and Cook as well as your Department on the Peninsula Developmental Road (PDR). Nambal Resources has recently purchased the quarry at Mount Amos (the most northerly source of hard rock on the Cape).
>
> As the PDR advances northward it is likely that this material will be required. The cost of transporting material by barge is significantly less than by road. For example: Cost per tonne to Seisia would be around $16 per tonne by barge as opposed to $160 per tonne by road.

8.12.4 Closing the Gap

On 20 December 2007, the Council of Australian Governments (COAG), which includes the leaders of federal, state and territory, and local governments, committed to 'closing the gap' in life expectancy between Aboriginal and Torres Strait Islander and non-Indigenous Australians. This included the following key targets:

- close the life expectancy gap within a generation (by 2031)
- halve the gap in mortality rates for Indigenous children under 5 within a decade (by 2018)
- ensuring that 95% of all Indigenous 4-year-olds are enrolled in early childhood education (by 2025)

- close the gap between Indigenous and non-Indigenous school attendance within 5 years (by 2018)
- halve the gap for Indigenous students in reading, writing and numeracy within a decade (by 2018)
- halve the gap for Indigenous people aged 20-24 in Year 12 attainment or equivalent attainment rates by 2020, and
- halve the gap in employment outcomes between Indigenous and non-Indigenous Australians within a decade (by 2018).

The relevance to the GSSP is that the project includes a partnership with Hopevale Congress that includes (see **Section 2.2**) Congress receiving royalties, a share of profits, work for its earthmoving / mining / road maintenance body, and most likely work for many of its member families.

These commitments all directly support the employment target and indirectly will support education and health outcomes. The EIS will investigate the extent to which the 'gaps' could be closed or partially closed as a result of the GSSP.

8.12.5 Accommodation and Housing

Describe the capacity of existing accommodation to house the project's construction and operational workforces

As noted in **Section 8.12.2c)**, the project does not require construction of accommodation or housing. Employees and contractors will predominantly be sourced from the towns of Hope Vale and Cooktown. Specialist professional services will use rental accommodation or short term accommodation at Cooktown or Cairns.

8.13 ECONOMIC

Identify the potential adverse and beneficial economic impacts (DSD 2017) of the proposed project on the local and regional area and the state. *Identify potential impacts to agricultural activities, recreational, commercial or Aboriginal and Torres Strait Islander fisheries potentially impacted by the proposed project (if applicable).*

8.13.1 Employment and Incomes

The following figures have been derived from the Economic Study (Cummings Economics in preparation) that is currently underway. Final data will be presented in the EIS.

a) Hope Vale

ABS data reveals the high importance of government services in *Public Administration & Safety* and *Education & Health Services* 54% (cf Qld 29%). *Other Services* was also very high. The 26 employed in *Mining* indicate the influence of Cape Flattery silica mine. At the time of the Census, employment was low in *Agriculture* but with a few in *Construction*.

High *Community & Personal Service* workers reflects the strong role of local government in employment and relatively low skill levels with high proportion of *Labourers* and *Machinery Operators & Drivers*.

Median weekly incomes are well below state levels. However, the low level of incomes is offset by low costs of housing. Some 96% of the population live in separate dwellings with 75% three or more

bedrooms. Some 86% of dwellings were rented. Median rents of $105 a week contrasts with state median of $330.

Hope Vale has a very high unemployment rate (39% cf state average of 8%).

b) Cooktown

ABS data reveals Cooktown's strong role as a local government centre and in provision of other government, health, education and safety, accounting for 37% of employment compared with Queensland overall at 29%. The area was high in *Construction* at 13.2% (cf Qld 9%), *Accommodation & Food Services* at 10.5% (cf Qld 7%) and *Agriculture* at 13% (cf Qld 3%).

Median incomes are lower than state averages by about 10 – 15%. However, this is in part offset by housing costs being lower.

Cooktown State Suburb has above state averages percent of separate houses 81% (cf Qld 77%) and dwellings owned outright at 31% (cf Qld 28%). It has a relatively high proportion renting at 41% (cf Qld 34%) and low owned with mortgage at 24% (cf Qld 34%).

The relatively high rental properties can be attributed to the structure of employment with a relatively high proportion in local government/ government employment.

Cooktown has a low unemployment rate (4% cf state average of 8%).

8.13.2 Economic Impacts

The formal economic assessment is still in preparation. However, some preliminary findings are summarised below.

a) Estimated Impacts at Regional Level

Gross Regional Product:

- Construction Phase: Addition to Gross Regional Product including 'flow-on' about $19 m or 0.12% and total workforce including 'flow-on' of about 110 positions over a full year or about 0.09% of regional workforce.
- Operational Phase: Impact on Gross Regional Product including 'flow-on', Cooktown Loading $36.5 m (0.2%), Nob Point Loading $20.4 m (0.13%), and total employment including 'flow-on' Cooktown Loading 130 (0.11%) and Nob Point Loading 90 (0.08%).

In addition, there will be a very substantial gross operating surplus that will flow into the economy through expenditure of royalties to the Queensland Government $0.675 m, Hope Vale community $0.8 m and company tax to the Commonwealth and profits distributed to shareholders including 12.5% to Hope Vale community.

b) Impacts on Hope Vale

It is estimated that disposable incomes in the Hope Vale community total about $16m per annum and that the project will directly bring into the community in additional disposable income (including through royalties/ shareholder returns), about Cooktown Loading $6.2 m and Nob Point Loading $10.9 m. This would in part replace welfare income making the impact less. On the other hand, there would be some modest 'flow-on' effects from the additional direct expenditure involved.

Indications are that overall benefit to the community will be to raise disposable incomes by at least 25 - 30% for Cooktown Loading and 45 - 50% Nob Point Loading.

Saving in welfare payments and additional income tax receipts through additional employment probably of the order of $2 m pa and large company tax receipts of the order of $10 - $16 m pa.

The project introduces a new economic entity that compares with the largest entity in community, the Council. The Council has an annual turnover of about $20 m pa and employees of 67 permanent and 20 casual, cf Cooktown Loading $40 m (61 jobs), Nob Point Loading $24 m (45 jobs).

It should be noted that on commencement, the GSSP will be on par with HVASC as the largest single employer in the immediate Cooktown/Hopevale region.

c) Other Matters

There are unlikely to be any adverse economic impacts on agricultural activities or fishing (recreational, commercial, or Aboriginal and Torres Strait Islander fisheries). The Cooktown Export (Trucking) Option will involve some adverse impacts on shire roads and the SCR. It is expected that there will be maintenance agreements in place to deal with these.

8.14 TRANSPORT

Provide information about:

- *likely transport requirements, including workforce, inputs and outputs, during the construction, operational and decommissioning phases of the proposed project*
- *potential impacts to the existing transport infrastructure (roads, rail level crossings, port, and / or maritime operations).*

Transport requirements have been described in **Section 7.2.11** and preceding sections.

As noted above, road transport for Cooktown loading will involve wear and tear on the road network. Marine works at either Nob Point (Nob Point loading) or Marton (Cooktown loading) will involve new, bespoke infrastructure and activities will not impinge on other users.

Land transport staffing requirements for Cooktown loading are estimated as follows:

- nine truck drivers and two loader operators
- CLA- transhipping component will require approximately 25 personnel.

For Nob Point loading, staffing will be much reduced (to be confirmed during the EIS).

Barge movements in the Endeavour River have the potential to impact on general river users and this will require management. Detailed discussions are planned with the Harbour Master on this issue during the EIS.

9 MEASURES TO AVOID OR REDUCE IMPACTS

9.1 PROCESS / FRAMEWORK

As part of the EIS process, each technical study will identify values and threats to these values and will investigate measure that are needed to protect the values from the threats. These actions will be collected together into a set of formal environmental management strategies and converted at a later date (i.e. post-approval) to a number of management plans for progressing this work.

A strategy can be defined as 'a set of coordinated actions designed to achieve a specific goal and meet identified objectives'. Using this definition, each strategy to be developed will include clear statements of:

- goals
- objectives that clarify the goal
- tasks that when undertaken will serve to meet the objectives (design, construction, and maintenance/operation)
- interaction with other strategies (identified interactions and cases of multiple objectives)
- maintenance needs
- resources and budget.

9.2 ENVIRONMENTAL MANAGEMENT TOPICS

Strategy topics (elements) are likely to include all areas where there are significant values that warrant protection. These are expected to include (in no particular order):

- terrestrial biodiversity
- marine biodiversity
- indigenous cultural heritage
- surface water quality
- groundwater and groundwater quality
- waste
- energy
- greenhouse gas emissions
- sustainability
- vessel mooring
- visual amenity
- coastal shipping (including ballast water)
- barging (Endeavour River for Cooktown loading only)
- hazards and emergencies
- closure/decommissioning.

A Social Impact Management Plan (SIMP) is required to be developed as a condition of approval.

9.3 MANAGEMENT BY PROJECT PHASE

An overall management framework will be developed for all future phases of the project, namely:

- planning
- further design refinement for the Nob Point option to minimise impacts on subtidal seagrass and coral communities including investigation of a piled gantry structure instead of a barge ramp.
- detailed design
- construction, via:
  - a Construction EMP for Terrestrial Works (the EA process will require a Site Based Management Plan including an Erosion and Sedimentation Control Plan)
  - a Construction EMP for Marine Works (address seasonal timing of work to avoid important lifecycle periods, reduce impacts from marine piling and similar issues)
  - SIMP
- operation (via a number of Environmental Management Plans to be established during the EIS process) – some of these have already been canvassed and include:
  - Operational EMP for Terrestrial Works
  - Operational EMP for Marine Works including a Loading, Vessel Mooring, Barge Operation, and Transhipping EMP and Marine Megafauna Management Plan
  - Cyclone Preparation and Mitigation Plan
  - Social Impact Management Plan
- closure/decommissioning.

This framework will be expanded on in the EIS. In the following sections an outline is provided on the specific environmental management needs identified at a (mostly) desktop level and from knowledge gained on other relevant projects by the study team. These measures cover the full project scope (i.e. planning, detailed design, construction, and operation).

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11 GLOSSARY, ACRONYMS AND ABBREVIATIONS

11.1 GLOSSARY

TERM	MEANING
Attritioning	Removing surface impurities from grains of sand by vigorous agitation of slurry
Classifiers	Separate fine particles from coarse particles
Handysize	*Handysize* is a naval architecture term for smaller bulk carriers or oil tanker with deadweight of up to 50,000 tonnes (typically 35,000 t), although there is no official definition in terms of exact tonnages
JORC Code	Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves
Maiden Indicated Resource	The second Mineral Resource estimate for the project that has reached the JORC Code classification 'Indicated'
Maiden Inferred Resource	The first Mineral Resource estimate for the project that has reached the JORC Code classification 'Inferred'
Operational land	The land on which the project is to be carried out
Proved Ore Reserve	This is the highest quality standard for Ore Reserve estimates under the JORC Code and can only be developed from a Measured Mineral Resource estimate
Transfer Mode	A term developed for this project to describe the ways by which the product could be transferred to barges – includes bulk, in skips, or in bags
Transhipment	Vessel-to-vessel transfers of bulk or contained materials
Transhipping	See 'transhipment' – the terms are interchangeable'

11.2 ACRONYMS AND ABBREVIATIONS

TERM	MEANING
ABS	Australian Bureau of Statistics
ACH Act	*Aboriginal Cultural Heritage Act 2003 (Qld)*
ADR	Accepted Development Requirements (under the *Fisheries Act 1994* (Qld)
AHD	Australian Height Datum
ALA	*Aboriginal Land Act 1991* (Qld)
ALA	Atlas of Living Australia
ASX	Australian Stock Exchange
Bt	Billion tonnes (10^9)
CCA	Compensation and Conduct Agreement
CE	Critically Endangered
CFSM	Cape Flattery Silica Mine
CHA	Cultural Heritage Agreement
CHFA	Cultural Heritage Field Assessment
CHMA	Cultural Heritage Management Agreement
CLA	Cooktown Loading Area (at Marton)
CMD	Coastal Management District
CPM Act	*Coastal Protection and Management Act 1995 (Qld)*
CPZ	Conservation Park (Yellow) Zone (GBRMP, GBRCMP)
CSIRO	Commonwealth Scientific and Industrial Research Organization
CYNRM	Cape York Natural Resource Management
CYPLUS	Cape York Peninsula Land Use Strategy
CYRP	Cape York Regional Plan
DAF	Department of Agriculture and Fisheries (formerly DPI)
DAWE	Department of Agriculture, Water and the Environment (formerly DoEE)
DEM	Digital Elevation Model
DES	Department of Environment and Science (formerly EHP)
DEWHA	Department of the Environment, Water, Heritage and the Arts

TERM	MEANING
DNRME	Department of Natural Resources, Mines and Energy
DoC	Duty of Care (Guidelines) under the ACH Act
DoEE	(former) Department of the Environment and Energy (Commonwealth) – now DAWE
DSDIP	Department of State Development, Infrastructure and Planning
DSM	Digital Surface Model
DTM	Digital Terrain Model
E	Endangered
EA	Environmental Authority (under the EP Act)
ECZ	Estuarine Conservation (Brown) Zone (GBRCMP)
EHP	[Department of] Environment and Heritage Protection (formerly part of the former DERM). Since December 2017 Department of Environment and Science (DES)
EIS	Environmental Impact Statement
EO Act	*Environmental Offsets Act 2014* (Qld)
EP Act	*Environmental Protection Act 1994* (Qld)
EPBC Act	*Environment and Biodiversity Conservation Act 1999* (Commonwealth)
EPM	Exploration Permit for Mineral/Coal
ERA	Environmentally Relevant Activity (under the EP Act)
EVNT species	Endangered Vulnerable or Near Threatened species (under the NC Act and EPBC Act)
GBO	General Biosecurity Obligation (under the *Biosecurity Act 2014* (Qld))
GBR	Great Barrier Reef
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
GDE	Groundwater dependent ecosystem
GED	General Environmental Duty (under the EP Act)
GSSP	Galalar Silica Sand Project (this project)
GUZ	General Use (Light Blue) Zone (GBRMP and GBRCMP)
HAT	Highest Astronomical Tide

TERM	MEANING
HES	High Ecological Significance
HVASC	Hope Vale Aboriginal Shire Council
HVCAC	Hope Vale Congress Aboriginal Corporation (Congress)
IAS	Initial Advice Statement (under the EP Act) (this document)
IRR	Internal Rate of Return
LAT	Lowest astronomical tide
LRF	Littoral rainforest
LTSP	Long-Term Sustainability Plan (under Reef 2050)
LTSP	Long Term Sustainability Plan (for the GBR)
MHWN	Mean High Water Neap (tide)
ML	Mining lease under the MR Act
MLA	Mining lease application for the GSSP
MLWN	Mean Low Water Neap (tide)
MLWS	Mean Low Water Spring (tide)
MMB	Migratory Marine Birds
MMS	Migratory Marine Species
MNES	Matters of National Environmental Significance (under the EPBC Act)
MPA	Mining Project Agreement
MPP	Marine Parks Permit
MR Act	*Mineral Resources Act 1989* (Qld)
MSA	Mining Study Area, also described as the ML
MSES	Matters of State Environmental Significance (under the SPP (Planning Act) and EO Act)
MSL	Mean Sea Level
MSQ	Maritime Safety Queensland
Mt	Million tonnes (10^6)
Mtpa	Million tonnes per annum
MTS	Migratory Terrestrial Species
MWHS	Mean High Water Spring (tide)

TERM	MEANING
MWS	Migratory Wetlands Species
NC Act	*Nature Conservation Act 1992* (Qld)
NPLA	Nob Point Loading Area
NPPA	Nob Point Project Area
NPSA	Nob Point Study Area – the NPPA with a buffer that extends to the marine interface
NPV	Net Present Value
NT	Near Threatened
PAA	Priority Agricultural Area (under RPI Act)
PLA	Priority Living Area (under RPI Act)
PMST	Commonwealth EPBC Protected Matters Search Tool (under the EPBC Act)
PPCP	Protected Plant Clearing Permit (under the NC Act)
QPWS	Queensland Parks and Wildlife Service (part of DES)
RE	Regional Ecosystems
RNTBC	Registered Native Title Body Corporate
S	Special Least Concern
SCR	State Controlled Road
SEA	Strategic Environmental Area (under RPI Act)
SIA	Social Impact Assessment
SLC	Special Least Concern
SPD Act	*Sustainable Ports Development Act 2015* (Qld)
SPP	State Planning Policy (under the Planning Act)
SPRAT	Species Profile and Threats Database
SSRC Act	*Strong and Sustainable Resource Communities Act 2017* (Qld)
TEC	Threatened ecological community
TI Act	*Transport Infrastructure Act 1994* (Qld)
V	Vulnerable
VM Act	*Vegetation Management Act 1999* (Qld)
WHA	World Heritage Area

TERM	MEANING
WQIP	Water Quality Improvement Plan
WWBW	Waterway Barrier Works

MAPS

COPIES OF THE FOLLOWING KEY MAPS USED IN BODY OF TEXT:

FIGURE 7-9 LAYOUT OF ML

FIGURE 7-10 LAYOUT OF MINING ML – DETAIL OF ANCILLARY INFRASTRUCTURE

FIGURE 7-13 EXPORT OPTIONS

FIGURE 7-21 COOKTOWN (TRUCKING) EXPORT OPTION

250 m 750 m 1250 m 1750 m

Alligator Ck

Deep Ck

Proposed Water Bores
(Subject to Hydrogeology)

Quoin Hill

ML Posts

West Nob Point
Extraction

East Nob Point
Extraction

LEGEND

- Mining Lease Boundary
- 10m Contour
- Mapped Watercourse
- Ancillary Area Boundary
- Infrastructure & Stockpiling
- Extraction Boundary
- Access Tracks
- Cooktown Access Route
- Nob Point Access Route
- Water Storage
- Sediment Basin
- Catch Drain
- Diversion Drain
- Topsoil Stockpiles

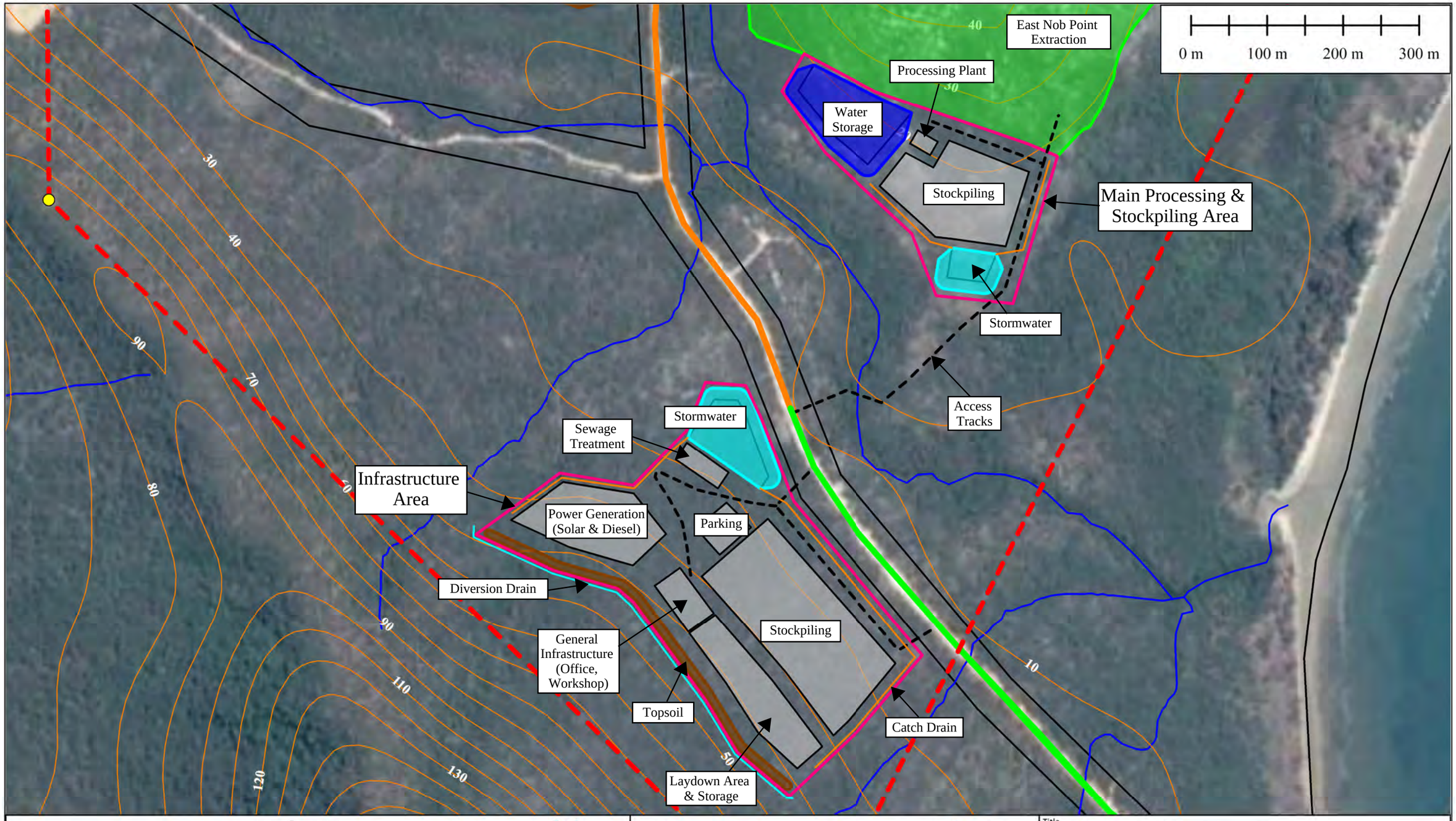
Aerial Photo: Google Earth 08/02/2013, Elevation: 10m Contours QLD Globe, Property Boundary: Qspatial

N

AUSROCKS
CONSULTING MINING ENGINEERS
Ausrocks Pty Ltd
PO Box 359
Virginia BC, QLD 4014
Phone: (07) 3265 3399
www.ausrocks.com.au
ABN: 64 056 939 014

Title: Galalar Silica Sand Project
Mining Lease Layout Plan

Project No	AUQ00201	Drawing No	GSSP_MLLP01
Drawn	CM	Checked	DB
Scale	1:25,000 (A3)	Datum	GDA94
Date	07/02/2020	Status	Version 2



LEGEND

- Mining Lease Boundary
- 10m Contour
- Mapped Watercourse
- Ancillary Area Boundary
- Infrastructure & Stockpiling
- Extraction Boundary
- Access Tracks
- Cooktown Access Route
- Nob Point Access Route
- Water Storage
- Sediment Basin
- Catch Drain
- Diversion Drain
- Topsoil Stockpiles

N

Aerial Photo: Google Earth 08/02/2013, Elevation: 10m Contours Qspatial, Property Boundary: Qspatial

AUSROCKS CONSULTING MINING ENGINEERS
Ausrocks Pty Ltd
PO Box 359
Virginia BC, QLD 4014
Phone: (07) 3265 3399
www.ausrocks.com.au
ABN: 64 056 939 014

Title: Galalar Silica Sand Project
Plant & Infrastructure Layout Plan

Project No	AUQ00201	Drawing No	GSSP_PILP01
Drawn	CM	Checked	DB
Scale	1:5,000 (A3)	Datum	GDA94
Date	07/02/2020	Status	Version 2

DIATREME Resources

HOPE VALE CONGRESS ABORIGINAL CORPORATION RNTBC

Galalar Silica Sand Project

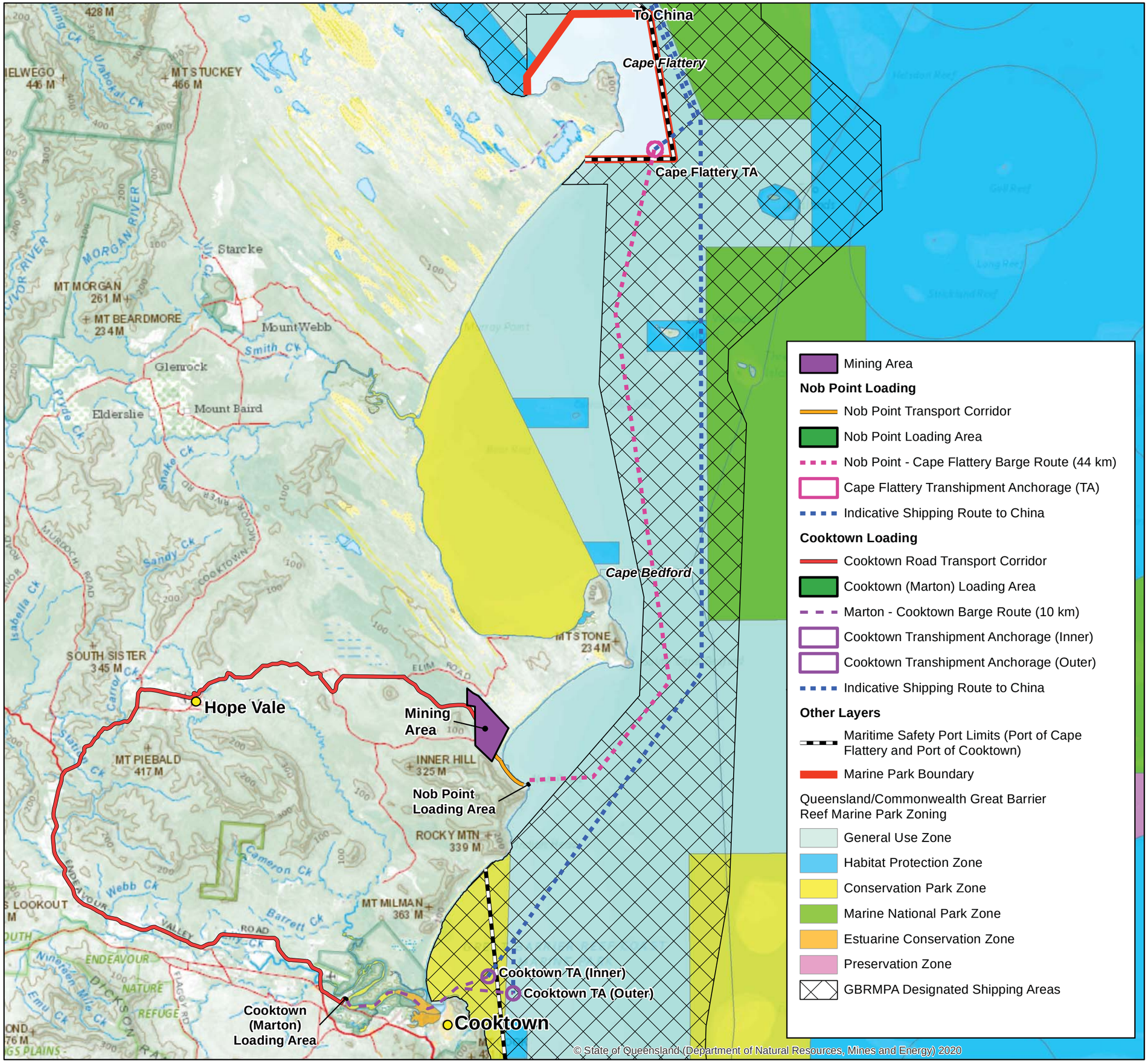
Initial Advice Statement

Export Options

Date Produced: 26/05/2020
Projection: MGA94 Zone 55
Scale at A3 Size 1:225,000

0 2.5 5 10 km

ENVIRONMENT NORTH
ENVIRONMENTAL MANAGERS & PLANNERS



Mining Area

Nob Point Loading

- Nob Point Transport Corridor
- Nob Point Loading Area
- Nob Point - Cape Flattery Barge Route (44 km)
- Cape Flattery Transhipment Anchorage (TA)
- Indicative Shipping Route to China

Cooktown Loading

- Cooktown Road Transport Corridor
- Cooktown (Marton) Loading Area
- Marton - Cooktown Barge Route (10 km)
- Cooktown Transhipment Anchorage (Inner)
- Cooktown Transhipment Anchorage (Outer)
- Indicative Shipping Route to China

Other Layers

- Maritime Safety Port Limits (Port of Cape Flattery and Port of Cooktown)
- Marine Park Boundary

Queensland/Commonwealth Great Barrier Reef Marine Park Zoning

- General Use Zone
- Habitat Protection Zone
- Conservation Park Zone
- Marine National Park Zone
- Estuarine Conservation Zone
- Preservation Zone
- GBRMPA Designated Shipping Areas

DIATREME Resources

HOPE VALE CONGRESS ABORIGINAL CORPORATION

Galalar Silica Sand Project

Initial Advice Statement

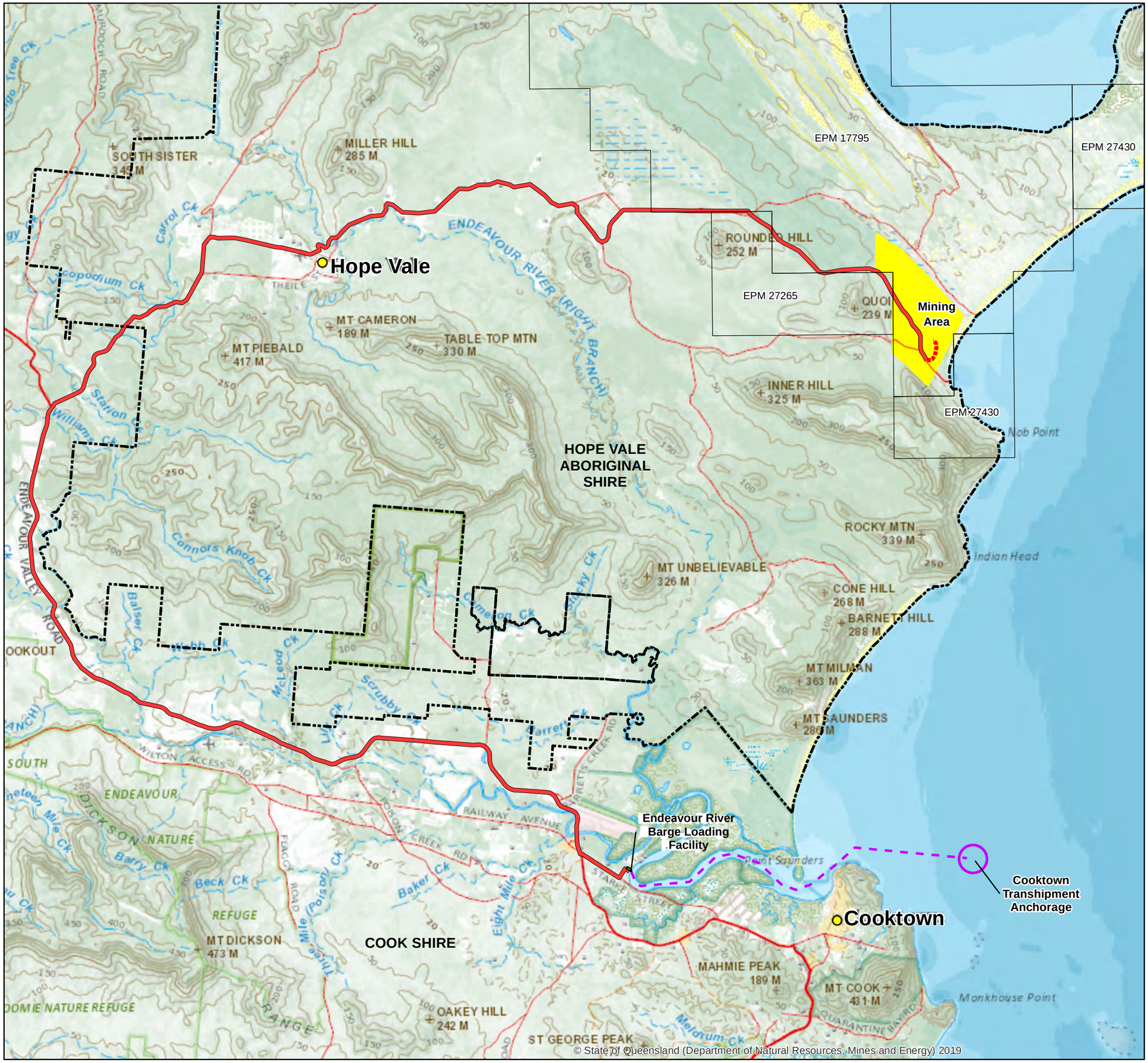
Mine and Cooktown (Trucking) Export Option

Date Produced: 17/12/2019
Projection: MGA94 Zone 55 Scale at A3 Size 1:110,000

0 1.5 3 6 km

- Exploration Permits Minerals
- Local Government Areas
- Site Access Road
- Mining Area
- Barge Loading Facility
- Road Transport Corridor
- Barge Route
- Transhipment Anchorage

ENVIRONMENT NORTH ENVIRONMENTAL MANAGERS & PLANNERS



APPENDIX A

AFFECTED AND INTERESTED PERSONS (CONFIDENTIAL)

APPENDIX B
EPBC ACT PROTECTED MATTERS SEARCH

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

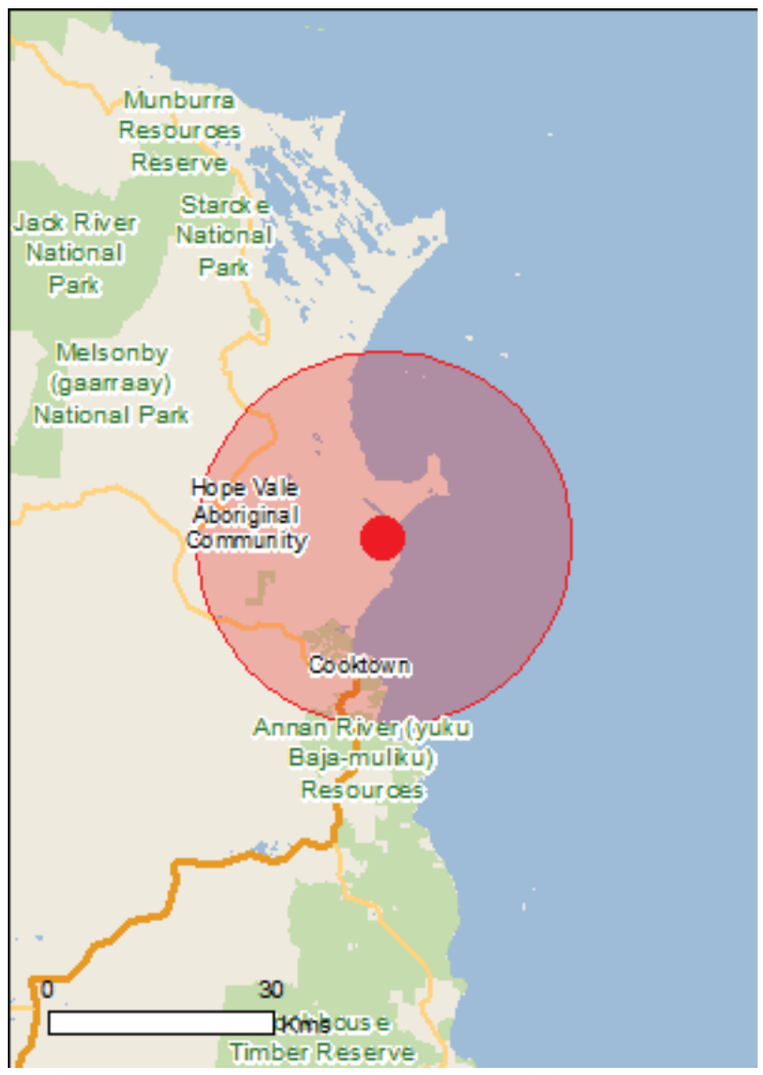
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 09/02/20 16:53:30

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 25.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	14
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	46
Listed Migratory Species:	45

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	102
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	9
Regional Forest Agreements:	None
Invasive Species:	23
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
Great Barrier Reef	QLD	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Natural		
Great Barrier Reef	QLD	Listed place

Great Barrier Reef Marine Park [Resource Information]

Type	Zone	IUCN
Conservation Park	CP-15-4021	IV
Conservation Park	CP-15-4022	IV
Conservation Park	CP-15-4020	IV
General Use	GU-11-6002	VI
Habitat Protection	HP-15-5115	VI
Habitat Protection	HP-15-5116	VI
Habitat Protection	HP-15-5117	VI
Habitat Protection	HP-15-5379	VI
Habitat Protection	HP-15-5119	VI
Habitat Protection	HP-15-5118	VI
Habitat Protection	HP-13-5080	VI
Marine National Park	MNP-15-1040	II
Marine National Park	MNP-15-1033	II
Marine National Park	MNP-15-1035	II

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Fregetta grallaria grallaria		
White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri		
Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri		
Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Probosciger aterrimus macgillivrayi		
Palm Cockatoo (Australian) [67033]	Vulnerable	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Turnix olivii		
Buff-breasted Button-quail [59293]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli		
Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area
Frogs		
Litoria dayi		
Australian Lace-lid, Lace-eyed Tree Frog, Day's Big-eyed Treefrog [86707]	Vulnerable	Species or species habitat likely to occur within area
Litoria rheocola		
Common Mistfrog [1802]	Endangered	Species or species habitat likely to occur within area
Mammals		
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Dasyurus hallucatus		
Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Dasyurus maculatus gracilis		
Spotted-tailed Quoll (North Queensland), Yarri [64475]	Endangered	Species or species habitat may occur within area
Hipposideros semoni		
Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe-bat [180]	Vulnerable	Species or species habitat may occur within area
Macroderma gigas		
Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Mesembriomys gouldii rattoides		
Black-footed Tree-rat (north Queensland), Shaggy Rabbit-rat [87620]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Pteropus conspicillatus		
Spectacled Flying-fox [185]	Endangered	Species or species habitat known to occur within area
Rhinolophus robertsi		
Large-eared Horseshoe Bat, Greater Large-eared Horseshoe Bat [87639]	Vulnerable	Species or species habitat likely to occur within area
Saccolaimus saccolaimus nudicluniatus		
Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat known to occur within area
Xeromys myoides		
Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat may occur within area
Plants		
Acriopsis emarginata		
Pale Chandelier Orchid [83928]	Vulnerable	Species or species habitat may occur within area
Bruguiera hainesii		
Haines's Orange Mangrove [88756]	Critically Endangered	Species or species habitat likely to occur within area
Cajanus mareebensis		
[8635]	Endangered	Species or species habitat may occur within area
Cyclophyllum costatum		
a shrub [82770]	Vulnerable	Species or species habitat likely to occur within area
Dendrobium johannis		
Chocolate Tea Tree Orchid [13585]	Vulnerable	Species or species habitat known to occur within area
Myrmecodia beccarii		
Ant Plant [11852]	Vulnerable	Species or species habitat known to occur within area
Phaius pictus		
[22564]	Vulnerable	Species or species habitat may occur within area
Phlegmariurus dalhousieanus		
BlueTassel-fern [86550]	Endangered	Species or species habitat likely to occur within area
Vappodes phalaenopsis		
Cooktown Orchid [78894]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Egernia rugosa		
Yakka Skink [1420]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Foraging, feeding or related behaviour known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur

Name	Threatened	Type of Presence within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Foraging, feeding or related behaviour known to occur within area
Migratory Terrestrial Species		
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Monarcha frater Black-winged Monarch [607]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Foraging, feeding or related behaviour known to occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
Hirundo daurica Red-rumped Swallow [59480]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha frater Black-winged Monarch [607]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Bulbonaricus davaoensis Davao Pughead Pipefish [66190]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys cinctus Barred Short-bodied Pipefish, Girdled Pipefish [66195]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Choeroichthys sculptus Sculptured Pipefish [66197]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Corythoichthys paxtoni Paxton's Pipefish [66204]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Cosmocampus maxweberi Maxweber's Pipefish [66209]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Festucalex gibbsi Gibbs' Pipefish [66215]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus macrorhynchus Whiskered Pipefish, Ornate Pipefish [66222]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Halicampus mataafae Samoan Pipefish [66223]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippichthys spicifer Belly-barred Pipefish, Banded Freshwater Pipefish [66232]		Species or species habitat may occur within area
Hippocampus bargibanti Pygmy Seahorse [66721]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus zebra Zebra Seahorse [66241]		Species or species habitat may occur within area
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Micrognathus natans Offshore Pipefish [66256]		Species or species habitat may occur within area
Microphis brachyurus Short-tail Pipefish, Short-tailed River Pipefish [66257]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Nannocampus pictus Painted Pipefish, Reef Pipefish [66263]		Species or species habitat may occur within area
Phoxocampus diacanthus Pale-blotched Pipefish, Spined Pipefish [66266]		Species or species habitat may occur within area
Siokunichthys breviceps Softcoral Pipefish, Soft-coral Pipefish [66270]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Laticauda colubrina a sea krait [1092]		Species or species habitat may occur within area
Laticauda laticaudata a sea krait [1093]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Foraging, feeding or related behaviour known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Annan River (Yuku Baja-Muliku)	QLD
Annan River (Yuku Baja-Muliku)	QLD
Annan River Area B	QLD
Endeavour River	QLD
Endeavour River	QLD
Keatings Lagoon	QLD
Mount Cook	QLD
South Endeavour	QLD
South Endeavour Station	QLD

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Plants		
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area
Annona glabra Pond Apple, Pond-apple Tree, Alligator Apple, Bullock's Heart, Cherimoya, Monkey Apple, Bobwood, Corkwood [6311]		Species or species habitat likely to occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Reptiles		

Name	Status	Type of Presence
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Lepidodactylus lugubris Mourning Gecko [1712]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat may occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Cape Flattery Dune Lakes	QLD
Great Barrier Reef Marine Park	QLD

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-15.3248 145.2758

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

APPENDIX C

WILDLIFE ON LINE SEARCH

Queensland Government

Wildlife Online Extract

Search Criteria:	Species List for a Specified Point
	Species: All
	Type: All
	Status: Rare and threatened species
	Records: All
	Date: All
	Latitude: -15.3248
	Longitude: 145.2758
	Distance: 25
	Email: gemmahorner@biotropica.com.au
	Date submitted: Wednesday 28 Aug 2019 11:16:40
	Date extracted: Wednesday 28 Aug 2019 11:20:18

The number of records retrieved = 33

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Accipitridae	*Erythrotriorchis radiatus*	red goshawk		E	V	6/3
animals	birds	Burhinidae	*Esacus magnirostris*	beach stone-curlew		V		11/1
animals	birds	Casuariidae	*Casuarius casuarius johnsonii (southern population)*	southern cassowary (southern population)		E	E	4/2
animals	birds	Charadriidae	*Charadrius leschenaultii*	greater sand plover		V	V	5
animals	birds	Charadriidae	*Charadrius mongolus*	lesser sand plover		E	E	6
animals	birds	Psittacidae	*Cyclopsitta diophthalma macleayana*	Macleay's fig-parrot		V		1
animals	birds	Scolopacidae	*Limosa lapponica baueri*	Western Alaskan bar-tailed godwit		V	V	7
animals	birds	Scolopacidae	*Calidris ferruginea*	curlew sandpiper		E	CE	4
animals	birds	Scolopacidae	*Calidris canutus*	red knot		E	E	1
animals	birds	Scolopacidae	*Calidris tenuirostris*	great knot		E	CE	2
animals	birds	Scolopacidae	*Numenius madagascariensis*	eastern curlew		E	CE	11
animals	birds	Turnicidae	*Turnix olivii*	buff-breasted button-quail		E	E	3/2
animals	insects	Lycaenidae	*Hypochrysops apollo apollo*	Apollo jewel (Wet Tropics subspecies)		V		2
animals	mammals	Dasyuridae	*Dasyurus maculatus gracilis*	spotted-tailed quoll (northern subspecies)		E	E	1
animals	mammals	Emballonuridae	*Saccolaimus saccolaimus nudicluniatus*	bare-rumped sheathtail bat		E	V	2/1
animals	mammals	Hipposideridae	*Hipposideros semoni*	Semon`s leaf-nosed bat		E	V	2/1
animals	mammals	Hipposideridae	*Hipposideros diadema reginae*	diadem leaf-nosed bat		NT		1
animals	mammals	Megadermatidae	*Macroderma gigas*	ghost bat		E	V	1
animals	mammals	Rhinolophidae	*Rhinolophus philippinensis*	greater large-eared horseshoe bat		E	V	1
animals	reptiles	Crocodylidae	*Crocodylus porosus*	estuarine crocodile		V		8
animals	reptiles	Scincidae	*Ctenotus rawlinsoni*	Cape heath ctenotus		V		7/1
animals	reptiles	Scincidae	*Lygisaurus tanneri*	Endeavour River litter-skink		V		3/3
animals	reptiles	Scincidae	*Lerista ingrami*	Ingram's lerista		V		2/2
plants	land plants	Arecaceae	*Livistona concinna*			NT		9/8
plants	land plants	Hemerocallidaceae	*Dianella incollata*			NT		1/1
plants	land plants	Mimosaceae	*Acacia solenota*			V		6/6
plants	land plants	Mimosaceae	*Acacia guymeri*			V		2/2
plants	land plants	Myrtaceae	*Xanthostemon arenarius*			NT		3/3
plants	land plants	Orchidaceae	*Habenaria xanthantha*			NT		1/1
plants	land plants	Orchidaceae	*Eulophia zollingeri*			V		1/1
plants	land plants	Rubiaceae	*Myrmecodia beccarii*			V	V	14/3
plants	land plants	Rubiaceae	*Randia audasii*			NT		1/1
plants	land plants	Stackhousiaceae	*Stackhousia sp. (McIvor River J.R.Clarkson 5201)*			E		3/3

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.