Priority Port of Hay Point/Mackay

Evidence Base Report

2022

Queensland Government

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Acknowledgement of Country

The Department of Transport and Main Roads (TMR) acknowledges the Traditional Owners and Custodians of the land and waters of Queensland. We pay our respects to their ancestors and Elders, past, present and emerging and recognise the strength and resilience of Aboriginal Australia as the oldest living culture worldwide.

TMR respectfully acknowledges the sacred and enduring connection of First Nations people to Country and thanks them for caring and protecting it for thousands of generations.

TMR recognises the diversity of First Nations people throughout Queensland, their rich cultures, history, beliefs and contributions to our society as the first travellers of this land.

TMR actively supports participation of Aboriginal and Torres Strait Islander people across the department and is committed to reconciliation amongst all Australians.

We also acknowledge all Aboriginal and Torres Strait Islander people who call our regions home.

Acknowledgement

This report has been prepared in consultation with Jacobs, South Brisbane. Jacobs provided content material including data, analysis and maps for inclusion.

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List of acronyms and abbreviations

Acronyms / Abbreviation	Definition
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ASS	Acid sulfate soils
AUCHD	Australasian Underwater Cultural Heritage Database
Australian ICOMOS	Australian International Council on Monuments and Sites
BMA	BHP Mitsubishi Alliance
BoM	Bureau of Meteorology
CBD	Central Business District
CG	Coordinator-General
CHL	Commonwealth Heritage List
CHMP	Cultural Heritage Management Plan
CLR	Contaminated Land Register
CO_2	Carbon dioxide
CQC	Central Queensland Coast
CQCN	Central Queensland Coal Network
CWA	Country Women's Association
DA	Development assessment
DAF	Department of Agriculture and Fisheries
DBI	Dalrymple Bay Infrastructure
DBT	Dalrymple Bay Terminal
DEHP	Department of Environment and Heritage Protection
DEO	Desired environmental outcome
DES	Department of Environment and Science
DIWA	Directory of Important Wetlands in Australia
DMPA	Dredge Material Placement Area
DNA	Deoxyribonucleic acid
DNRME	Department of Natural Resources Mines and Energy
DOR	Department of Resources
DRO	Desired regional outcome
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning
DUKC	Dynamic Under Keel Clearance System
DWT	Deadweight tonnage
EA	Environmental authority
ED Act	*Economic Development Act 2012*
EDQ	Economic Development Queensland
EBR	Evidence Base Report
EIS	Environmental Impact Statement
EJ	Exajoules (1018 joules)
EMR	Environment Management Register
EP Act	*Environmental Protection Act 1994*
EPP (Air)	*Environmental Protection (Air) Policy 2008*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ERA	Environmentally relevant activity
FHA	Fish habitat area

Acronyms / Abbreviation	Definition
Fisheries Act	*Fisheries Act 1994*
GBR	Great Barrier Reef
GBRMP	Great Barrier Reef Coast Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GBRMP Act	*Great Barrier Reef Marine Park Act 1975* (Cth)
GBRWHA	Great Barrier Reef World Heritage Area
GIS	Global Information System
GRT	Gross registered tonnes
GVP	Gross value of production
ha	Hectares
HAT	Highest astronomical tide
HES	High ecological significance
HEV	High ecological value
HPCT	Hay Point Coal Terminal
HPV	High Productivity Vehicle
Hz	Hertz
IAR	Impact Assessment Report
IEA	International Energy Agency
ILUA	Indigenous Land Use Agreement
ILUP	Interim land use plan
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
kg/m	Kilograms per metre
km	Kilometres
km/h	Kilometres per hour
kt	Kilo tonnes
kV	KiloVolts
Land Act	*Land Act 1994*
LAT	Lowest astronomical tide
LGA	Local government area
LGIP	*Local Government Infrastructure Plan*
LOA	Length overall (vessel)
LTMDMP	*Long-term Maintenance Dredging Management Plan*
m	Metres
Mackay Planning Scheme	*Mackay Region Planning Scheme*
MARPOL	International Convention for the Prevention of Pollution from Ships 1973
MCU	Material Change of Use
MGR	Minister's Guidelines and Rules
MHWN	Mean High Water Neap
MHWS	Mean High Water Spring
MIW	Mackay, Isaac and Whitsunday
MLWN	Mean Low Water Neap
MLWS	Mean Low Water Spring
ml	Megalitres
mm	Millimetres
MNES	Matters of National Environmental Significance
MOF	Marine Offloading Facility
MP Act	*Marine Parks Act 2004*
MRC	Mackay Regional Council

Acronyms / Abbreviation	Definition
MSES	Matters of State Environmental Significance
MSQ	Maritime Safety Queensland
mt	Million tonnes
mtce	Million tonnes of coal equivalent
mtoe	Million tonnes of oil equivalent
mtpa	Million tonnes per annum
MTWA	Mackay District Turtle Watch Association
MVA	Megavolt amperes
NC Act	*Nature Conservation Act 1992*
NHL	National Heritage List
NQBP	North Queensland Bulk Ports Corporation Limited
OUV	Outstanding Universal Value
PAH	Polycyclic Aromatic Hydrocarbons
PAR	Photosynthetically Active Radiation
PASS	Potential acid sulfate soils
PBS	Performance Based Standards
PBS3A	Performance Based Standards Level 3A
P&E	Planning and Environment Analysis
PCQ	Ports Corporation Queensland
PCYC	Police Citizens Youth Club
PDA	Priority Development Area
Planning Act	*Planning Act 2016*
Planning Regulation	*Planning Regulation 2017*
PMM	Priority management measures
PMST	Protected Matters Search Tool
Ports Act	*Sustainable Ports Development Act 2015*
PSII	Photosystem II
QH Act	*Queensland Heritage Act 1992*
QHR	Queensland Heritage Register
QPWS	Queensland Parks and Wildlife Service
QTRIP	Queensland Transport and Roads Investment Program
QWSG	Queensland Wader Study Group
RAP	Reconciliation Action Plan
RCP	Representative concentrations pathways
RE	Regional Ecosystem
Reef 2050 Plan	*Reef 2050 Long-Term Sustainability Plan*
REZ	Renewable Energy Zone
RIDA	Regional Interests Development Approval
RIMRep	Reef 2050 Integrated Monitoring and Reporting Program
RLA	Rural Living Area
RLRPA	Regional Landscape and Rural Production Areas
RORO	Roll-on Roll-off
RNE	Register of the National Estate
RNTBC	Registered Native Title Body Corporate
RPI Act	*Regional Planning Interests Act 2014*
RPI Regulation	*Regional Planning Interests Regulation 2014*
SA2	Statistical Area Level 2
SARA	State Assessment and Referral Agency
SCA	Strategic Cropping Area

Acronyms / Abbreviation	Definition
SCL	Strategic Cropping Land
SDA	State Development Area
SDAP	State Development Assessment Provisions
SDPWO Act	*State Development and Public Works Organisation Act 1971*
SDS	Sustainable Development Scenario
SLR	Sea level rise
SPI	Standardised Precipitation Index
SPL	Strategic Port Land
SPP	*State Planning Policy 2017*
SSM	*Sustainable Sediment Management Assessment for Maintaining Navigational Infrastructure*
SPRP	State Planning Regulatory Provisions
State Party Report 2022	*State Party Report on the State of Conservation of Australia's Great Barrier Reef 2022*
STEPS	Stated Policies Scenario
TACC	Technical Advisory and Consultative Committee
TEC	Threatened Ecological Community
TIA	*Transport Infrastructure Act 1994*
TMR	Department of Transport and Main Roads
tph	Tonnes per hour
µg/m^3	Micrograms per cubic metre of air
UNCTAD	United Nations Council on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO Operational Guidelines	*Operational Guidelines for the Implementation of the World Heritage Convention*
USDA	United States Department of Agriculture
VLOC	Very large ore carrier
VM Act	*Vegetation Management Act 1999*
VTS	Vessel Traffic Services
Water Act	*Water Act 2000*
WoNS	Weeds of National Significance
WQIP	*2014–2021 Mackay Whitsunday Water Quality Improvement Plan*
WRB	Wave rider buoy

1.0 Executive Summary

In accordance with the *Sustainable Ports Development Act 2015* (Ports Act), the Queensland Government has advanced master planning for the priority ports of Gladstone (complete), Townsville (complete), Hay Point/Mackay and Abbot Point.

The priority ports operate adjacent to and within the Great Barrier Reef World Heritage Area (GBRWHA) which extends from the top of Cape York to the north of Bundaberg and was inscribed on the World Heritage List in 1981.

Through port master planning, the Queensland Government seeks to effectively manage the land and marine areas needed for the efficient development and operation of the priority ports, while ensuring that the Outstanding Universal Value (OUV) of the GBRWHA is an intrinsic consideration in priority port development, management and governance.

The evidence base material used to inform and support the development of the master plan and port overlay for the priority Port of Hay Point/Mackay comprises two comprehensive reports including this Evidence Base Report (EBR) and the Planning and Environment Analysis (P&E) Report.

Applying an evidence-based planning approach is in accordance with an action from the original *Reef 2050 Long-Term Sustainability Plan* (Reef 2050 Plan) to:

> 'Ensure Great Barrier Reef ports planning incorporates evidence-based measures to support protection, restoration and management of coastal ecosystems that contribute to Reef health and resilience (EHA25)'.

The EBR prepared for the priority Port of Hay Point/Mackay provides a desktop analysis of the most current information available to present economic, environmental, cultural heritage and social data within a defined study area for the port, including the OUV of the GBRWHA.

The study area covers a large land and marine area to understand all relevant considerations to support the potential growth and operation of the port and related activities.

The EBR was developed in consultation with key stakeholders including North Queensland Bulk Ports Corporation Limited (NQBP), Traditional Owners, local government, state agencies and external experts. The Traditional Owners surrounding the priority Port of Hay Point/Mackay are the Yuwibara peoples. The EBR identifies the current and proposed infrastructure, supply chain, and port development requirements to sustainably grow the port. It provides an outline of the existing regulatory framework and land use planning tools to inform the P&E report which provides an assessment of how impacts from development can be sustainably managed in the future.

The ports of Mackay and Hay Point make up the priority Port of Hay Point/Mackay based on their close proximity, complementary functions and existing trade synergies. The study area comprises two separate areas relevant to each location.

The Port of Hay Point is currently a single commodity coal export port, approximately 38 kilometres (km) south of Mackay and is located within the Mackay, Isaac and Whitsunday (MIW) region and the GBRWHA. The Hay Point area includes several small coastal communities of Louisa Creek, Salonika, Half Tide and Grasstree Beach and the rural residential communities of Timberlands, Fenechvale and Alligator Creek. Over half of the designated port limits is within the Great Barrier Reef Marine Park (GBRMP). The ports offshore infrastructure, including jetties and wharves, is located within the GBRWHA but outside of the GBRMP.

Hay Point is surrounded by several areas of environmental significance including Mount Hector Conservation Park, Lake Barfield and Sandringham Bay.

The Hay Point portion of the study area comprises the Port of Hay Point, Dudgeon Point and surrounding land and marine areas including all inshore islands, portions of the GBRMP and extends to the NQBP port limits. The western boundary extends to include relevant residential areas, and infrastructure supply chain corridors and beyond the Bruce Highway.

The Port of Mackay is a multi-commodity export and import port, located 5km north of the Mackay City Centre on Harbour Beach, north of the Pioneer River. It is approximately halfway between Brisbane and Cairns and is within the MIW region. The port is located within the GBRWHA and the boundary of the GBRMP is approximately 5km offshore.

Mackay is the largest city centre in the Mackay local government area (LGA) and home to 120,000 people. It produces more than a third of Australia's sugar and is a popular tourist destination providing access to the Whitsunday Islands. The port is surrounded by residential, commercial, industrial areas including the Mackay Marina, beaches, coastal dunes, melaleuca wetlands, rainforest and estuarine communities.

The Mackay portion of the study area comprises the Port of Mackay and surrounding land and marine areas including all inshore islands, portions of the GBRMP and extends to the NQBP port limits. The western boundary extends to include relevant residential areas, and infrastructure supply chain corridors to Mount Pleasant and Mackay township beyond the Bruce Highway. The area extends from Slade Point to just south of the Mackay Airport.

1.1 Environment

The Hay Point/Mackay study area supports an extensive and complex range of environmental values, particularly terrestrial Sarina Inlet, aquatic and marine ecological values. Residing within the GBRWHA, the study area also exhibits OUVs as listed by the International Union for Conservation of Nature (IUCN), Matters of National Environmental Significance (MNES) and Matters of State Environmental Significance (MSES).

The Sandringham Bay - Bakers Creek aggregation is a coastal plain with extensive shallow water and mudflats. These wetlands are home to internationally recognised roosting sites that provide habitat for shorebirds and migratory birds.

The Sarina Inlet Ince Bay Aggregation located south of Hay Point is a wetland of national importance supporting two Threatened Ecological Communities (TEC), 42 threatened species of flora and fauna and 66 migratory species. Habitats known to occur within the study area support the curlew sandpiper, great knot, eastern curlew, water mouse, loggerhead turtle, green turtle, lesser frigatebird, great frigatebird, humpback whale and Australian snubfin dolphin.

Other key environmental values include Bakers Creek, Mount Hector, Sandringham Bay and Yuwi Paree Toolkoon National Parks. 'Endangered' or 'Of Concern' regional ecosystems (REs) are present throughout the study area including mangroves, saltmarshes, saline grasslands and sedgelands, vegetated swamps and wetlands, coastal vine thickets and rainforests, tussock grasslands and a variety of eucalypt woodlands and forests.

An extensive network of minor waterways that feed into the larger waterways of Bakers Creek, Sandy Creek and Alligator Creek and several riverine and estuarine wetlands with high ecological significance (HES) are present in the study area. Catchments within the study area feed into the adjacent marine environment within the GBRWHA. Water quality within the marine environment is influenced by the coastal processes, agricultural activities and port operations. Groundwater within the study area is typically unsuitable for consumption by livestock or humans.

The primary air pollutant in the study area is dust. Noise pollution in the study area is generally associated with port activities, transportation, construction activities and urban areas. The visual amenity of this area includes coastal landscapes, port and transport infrastructure, conservation areas, beaches and rocky outcrops, undulating coastal lowlands, residential areas, agricultural areas and wetlands, all of which are valued by local communities.

1.2 Outstanding Universal Value

The local expression of OUV for the priority Port of Hay Point/Mackay includes shorebirds and migratory birds of international environmental significance, nesting and marine turtles, mangroves and humpback whales.

Shorebirds and migratory are identified as having a significant contribution to the local expression of OUV. Roosting sites at Sandringham Bay support up to 23,000 shorebirds each year during annual migration.

Nesting turtles and marine turtle rookeries provide a moderate contribution to the local expression of OUV. Flatback turtles are the dominant nesting species and observed on the northern Mackay beaches and green turtles are frequently observed at Bucasia Beach, Blacks Beach, North Harbour Beach and Salonika Beach.

Mangroves cover approximately 22 hectares (ha) within enclosed wetland areas which support 21 species of national importance. Vast mangrove forests can be found at Sandringham Bay, Hay Point peninsula, Sarina

Inlet, Slade Point, McCready's Creek and the Basset Basin in the Pioneer River. Both mangrove diversity and vast forests make a moderate contribution to the OUV of the area.

Humpback whales migrate along this stretch of coast annually between June and October and are considered to make a moderate contribution to the local expression of OUV. Female whales with calves can be observed within the port limits of the Port of Hay Point. Core aggregation and calving areas are located approximately 80km east of Mackay.

Both ports are supported by the regional economy driven by coal mining in the Bowen Basin, and the associated industries and resource exports. The area west of the Bruce Highway and south-west of the Hay Point is predominantly used for agricultural activities with the most important commodities based on value are cattle and sugar cane.

The content of the EBR was presented to the P&E development phase of the evidence base to be interpreted and assessed against the current regulatory framework to determine if any gaps or inconsistencies in the plan making and development assessment (DA) processes exist. The P&E report subsequently informed the development of the master plan and port overlay.

2.0 Introduction

In accordance with the Ports Act, the Queensland Government has advanced master planning for the priority ports of Gladstone (complete), Townsville (complete), Hay Point/Mackay, and Abbot Point. TMR is leading this work on behalf of the Queensland Government.

The priority ports operate adjacent to and within the GBRWHA which extends from the top of Cape York to the north of Bundaberg and was inscribed on the World Heritage List in 1981.

Through port master planning, the Queensland Government will effectively manage the land and marine areas needed for the efficient development and operation of the priority ports, while ensuring that the OUV of the GBRWHA is an intrinsic consideration in priority port development, management and governance.

Priority port master planning will assist the Queensland Government to:

- concentrate development in priority ports leading to more effective management of port development in the GBRWHA
- efficiently use existing port and supply chain infrastructure
- identify and protect land and infrastructure critical to the effective operation and future expansion of priority ports
- facilitate economic development and job creation in regional areas.

Through master planning of priority ports, Queensland will deliver on its key port-related actions under the Reef 2050 Plan.

In accordance with the Ports Act, master planning will deliver master plans and port overlays for the priority ports. Master plans are strategic documents that outline the long-term outlook for the priority ports within the master planned area. Port overlays are the statutory instruments that implement the master plan over the master planned area.

Throughout the master planning process, the Queensland Government has worked closely with port authorities, local government and other key stakeholders.

The *Priority Ports Master Planning Guideline 2020*[1] has been released by the Queensland Government to help the community and other stakeholders better understand priority port master planning, its process and matters considered when developing a master plan. This report has been prepared in accordance with the priority ports master planning guideline.

The master planning process for the priority Port of Hay Point/Mackay is presented in four parts, including:

- evidence base:
    - EBR documents environmental, social and cultural values, economic, infrastructure and supply chain descriptions, regulatory frameworks and land use, and port optimisation characteristics (this report)
    - P&E report analyses the data presented in the EBR to undertake a review and assessment of the scope and application of management measures across the regulatory framework in the context of priority port master planning. The analysis considered the application of the current regulatory framework in managing potential development impacts and the effect of applying proposed management measures in the master plan and port overlay.
- master plan
- port overlay.

[1] Department of Transport and Main Roads. (2020). *Priority ports master planning guideline.*

2.1 Evidence base

The objectives of the evidence base are to:

- inform the preparation of the master plan by analysing the economic, environmental, and social factors relevant to the priority port, including the OUV of the GBRWHA
- identify long-term infrastructure, supply chain, and port development requirements
- undertake an assessment of the regulatory framework to understand how impacts from development will be sustainably managed.

The evidence base provides the foundations for preparing the master plan and port overlay for the priority Port of Hay Point/Mackay in accordance with the Ports Act.

It responds to a key principle in the priority ports master planning guideline, evidence-based planning:

> '…master planning should maintain an objective, accountable, and transparent approach with a focus on understanding and applying the best available information relevant for future planning.'

This evidence base also responds to the Reef 2050 Plan's action:

> 'Ensure Great Barrier Reef ports planning incorporates evidence base measures to support protection, restoration and management of coast ecosystem that contribute to Reef health and resilience.'

2.2 Purpose of this report

This report collates, analyses and synthesises information identified through a desktop analysis relevant to the master planning process for the priority Port of Hay Point/Mackay and with the P&E report provides the evidence base for master planning. This information is used to support the analysis and to inform decision making, including the determination of proposed master planned area and associated precincts.

2.3 Methodology

This report has been prepared using a desktop analysis and stakeholder engagement through:

- an initial review of background information previously prepared for master planning for the priority Port of Hay Point/Mackay
- targeted consultation through meetings and follow up correspondence with key stakeholders including:
  - state agencies
  - NQBP
  - Mackay Regional Council (MRC).
- review and analysis of the most recent available data and information including:
  - legislation and policy relating to the Port of Hay Point and the Port of Mackay
  - planning instruments associated with the port and its precincts
  - existing and proposed land uses
  - existing and proposed infrastructure
  - environmental, social and cultural values.

3.0 Port Overview

3.1 Location context and study area

Port of Hay Point

Hay Point is an area located on the Central Queensland Coast (CQC), approximately 38km south of Mackay and 800km north of Brisbane. The Port of Hay Point is the key feature of this locality and a major hub for local employment. It is located within the GBRWHA which includes waters to the low water mark along the coastline in the region. The GBRMP covers over half of the designated port limits however the offshore port infrastructure, including jetties and wharves, is located within the GBRWHA but outside of the GBRMP. The port is surrounded by several areas of environmental significance including Mount Hector Conservation Park, Lake Barfield and Sandringham Bay.[2]

The Hay Point area includes several small coastal communities of Louisa Creek, Salonika, Half Tide and Grasstree Beach and the rural residential communities of Timberlands, Fenechvale and Alligator Creek. It is located within the MIW region and is home to 1348 people. The beach locations, in particular Salonika, attracts many visitors for many activities, including swimming and land-based fishing.

The region has one of the largest coal reserves in Australia. The regional economy is driven by coal mining in the Bowen Basin, and the associated industries and resource exports. The area west of the Bruce Highway and south-west of Hay Point is predominantly used for agricultural activities, with the most important commodities based on value being cattle and sugar cane.[3]

The study area is noted in **Figure 1** and it encompasses the Port of Hay Point and the land and marine areas surrounding the port to the western boundary. The study area's eastern boundary extends to include all inshore islands, portions of the GBRMP and extends to the seaward boundary of NQBP port limits. The western boundary extends to include relevant residential areas, and infrastructure supply chain corridors to Marion Eton Road beyond the Bruce Highway. The northern and southern boundaries of the study area have been informed by existing land uses, extending to cover the Peak Downs Highway (to the north) and Sarina Beach (to the south). The study area covers land and water and is deliberately extensive to ensure that sensitive land uses are considered as part of the evidence base.

The rationale for the study area was determined in consultation with NQBP and based on the following:

- port limits and Strategic Port Land (SPL)
- key existing infrastructure and supply chain corridors, including land and marine infrastructure
- key existing sensitive land uses including McEwens Beach, Louisa Creek, Half Tide, Salonika and Timberlands and Fenechvale
- key environmental, social and heritage values within the Hay Point areas including, Sandringham Bay and Bakers Creek Conservation Parks and Victor Island
- residential and rural land use in proximity to port related activities
- marine areas and urban/rural/tourism/commercial activities.

Key areas of reference include, GBRMP boundary, defined port limits, Hay Point Coal Terminal (HPCT), Dalrymple Bay Terminal (DBT), the Bruce Highway, Hay Point Road, Goonyella Rail System, existing local residential communities and environmental areas of Mount Hector, Sandringham Bay, Bakers Creek Conservation Park, Victor Island, Alligator Creek and wetland areas.

[2] North Queensland Bulk Ports Corporation Limited. (2010). *Port of Hay Point Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0014/3281/Port-of-Hay-Point-Land-Use-Plan.pdf

[3] Department of Agriculture, Water and the Environment. (2021). *About my region – Mackay - Isaac - Whitsunday Queensland, Australian Government.* Retrieved from https://www.agriculture.gov.au/abares/research-topics/aboutmyregion/qld-mackay#:~:text=The%20region%20covers%20a%20total,per%20cent%20of%20the%20region

Figure 1: Port of Hay Point Study Area

Port of Mackay

Mackay is located on the Queensland coast about halfway between Brisbane and Cairns. It is known as the sugar capital of Australia as the region produces more than a third of Australia's sugar. Mackay is the largest city centre in the Mackay LGA and is home to 120,000 people.

Mackay is a popular tourist destination and a gateway to the Whitsunday Islands in the central area of the Great Barrier Reef (GBR). The port is located within the GBRWHA and the boundary of the GBRMP is approximately 5km offshore. The port is surrounded by beaches, coastal dunes, Melaleuca wetlands, rainforest and estuarine communities that are considered of high environmental value.

The port is located just 5km north of the Mackay City Centre on Harbour Beach, north of the Pioneer River. It is situated between Slade Point to the north, East Point to the south and covers approximately 830ha of land and marine areas. The port is an integral part of the community. The centralised location enables a local workforce and community connections with various public infrastructure, recreational activities and other social values. The port is surrounded by residential, commercial and industrial areas and the adjacent Mackay Marina has residential and short-term accommodation and retail outlets.

Mining is the principal economic driver in the region and Mackay is home to supporting industries for the wider MIW region, including specialities in engineering, manufacturing and mining services. The industrial area of Paget, south of the port, is home to Australia's leading mining equipment technology and services hub and relies on connectivity to the port.

The region was initially settled as a sugar farming area and the industry now generates approximately 30% of the electricity supply. The good grazing land has seen an expansion in the beef industry to become one of the most valuable agricultural commodities in the region.[4]

[4] Department of Agriculture, Water and the Environment (2021), *About my region – Mackay - Isaac - Whitsunday Queensland, Australian Government*. Retrieved from https://www.agriculture.gov.au/abares/research-topics/aboutmyregion/qld-mackay#:~:text=The%20region%20covers%20a%20total,per%20cent%20of%20the%20region

The coastal regional community is expected to experience population growth over the next 18 years. Mackay City Centre is forecast to grow by approximately 3400 residents, while surrounding areas such as Mackay's Northern Beaches will grow by 10,673, Sarina and Beaches by 1889 and Andergrove Beaconsfield by 1795.[5]

The study area is noted in **Figure 2** and it encompasses the port and the land and marine areas surrounding the port to the western boundary. The study area's eastern boundary extends to include all inshore islands, portions of the GBRMP and extends to the seaward boundary of NQBP port limits. The western boundary extends to include relevant residential areas, and infrastructure supply chain corridors to Mount Pleasant and Mackay township beyond the Bruce Highway. The northern and southern boundaries of the study area have been informed by existing land uses, extending to cover Slade Point (to the north) and just south of the Mackay Airport (to the south). The study area covers land and water and is deliberately extensive to ensure that sensitive land uses are considered as part of the evidence base.

The rationale for the study area was determined in consultation with NQBP and based on the following:

- port limits and SPL
- key existing infrastructure and supply chain corridors, including land and marine infrastructure
- key existing sensitive land uses including: Mount Basset, North Mackay, Andergrove, Slade Point, McCready Creek and Mackay Harbour residential area
- key environmental, social and heritage values within the Mackay area include, Pioneer River, Slade Island, Slade Point Nature Reserve and the Keeleys Road Wetland area
- residential, commercial and industrial land use in proximity to port related activities
- marine areas and urban/rural/tourism/commercial activities
- key areas of reference include, GBRMP boundary, defined port limits, Mackay Marina, the Bruce Highway, port access road, road and rail network, existing local residential communities and environmental areas.

[5] Mackay Regional Council. (2019). *Mackay Regional Growth Profiles.* Retrieved from https://www.mackaygrowthprofiles.com.au/ 9

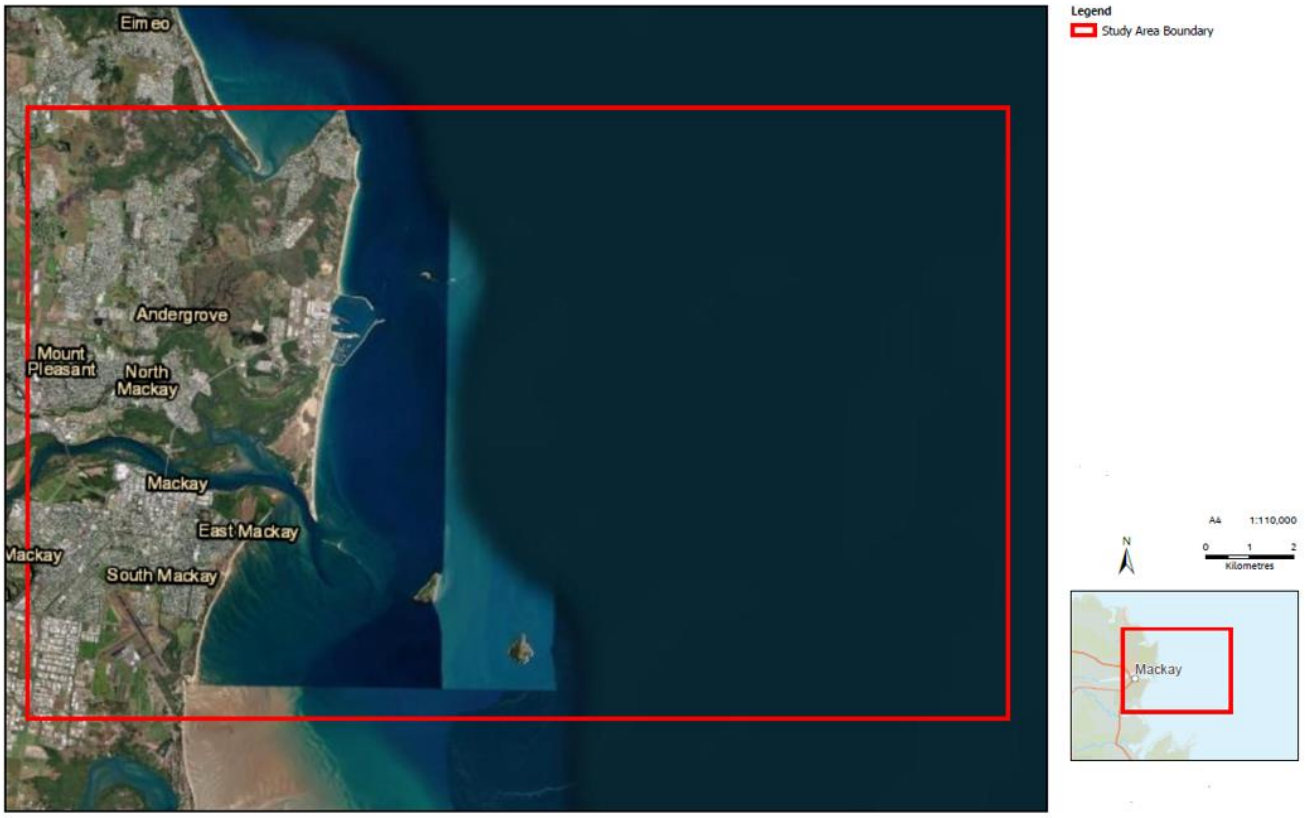

Figure 2: Port of Mackay Study Area

3.2 Port overview

Port of Hay Point

The port is a major economic hub for Queensland's coal resource sector. The port is a purpose-built facility originally constructed to service the Goonyella Coal Mine, approximately 200km west of Hay Point. NQBP is the port authority that manages the port.

The SPL at the Port of Hay Point is approximately 4100ha and covers two areas containing the DBT and Dudgeon Point. Louisa Creek runs in between both areas. Dudgeon Point has not been developed and includes 1400ha of land. The port's two coal terminals are DBT to the north and the HPCT located off SPL to the south.[6]

The port is serviced by rail via the Goonyella Rail System, linking the port to the Bowen Basin coalfields in Central Queensland, and by road via Hay Point Road, accessed off the Bruce Highway.

Figure 3 illustrates the Port of Hay Point.

[6] North Queensland Bulk Ports Corporation Limited. (2010). *Port of Hay Point Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0014/3281/Port-of-Hay-Point-Land-Use-Plan.pdf.

Figure 3: Port of Hay Point

Hay Point Coal Terminal

Coal was first shipped from HPCT in 1971 from a single loading berth. The initial stockyard capacity was 0.4 million tonnes per annum (mtpa), however over time, HPCT expanded to improve operations, both onshore and offshore. Following the most recent expansion in 2010, HPCT has an environmentally relevant activity (ERA) approval for annual throughput capacity of 69mtpa. Currently, HPCT's throughput has increased to 61mtpa.

HPCT is privately owned and operated by BHP Mitsubishi Alliance (BMA). All associated land areas in and around HPCT do not form part of SPL and is subsequently under the jurisdiction of MRC. The marine infrastructure is located on state leasehold tenure and within SPL.

Dalrymple Bay Terminal

The Queensland Government constructed DBT as the second coal terminal and operations commenced in 1983. DBT is a multi-user coal terminal owned by the Queensland Government and leased to Dalrymple Bay Infrastructure (DBI) on a 50-year lease to operate, maintain and develop the terminal. The annual capacity was initially 15mtpa, however this has expanded to 85mtpa.[7] All land and marine areas associated with the terminal are located on SPL and are under the jurisdiction of NQBP.

Half Tide Tug Harbour Marine Offloading Facility

The port includes the Half Tide Tug Harbour Marine Offloading Facility (MOF), which was built to provide safety to barges and is protected by breakwater. It provides an important area for offshore construction activities and for bringing in large infrastructure for the terminals. The facility enables local tugs to service the port, rather than traveling from the Port of Mackay. The tug harbour hosts community recreational facilities including a public boat ramp and trailer park.

Dudgeon Point

The Queensland Government approved the Dudgeon Point site for SPL in 2010 for the purposes of port handling activities.

In 2011, an Environmental Impact Statement (EIS) process was commenced to develop two coal export terminals and associated infrastructure (rail and offshore) at Dudgeon Point. The two terminals were proposed to have a combined design capacity of up to 180mtpa. The EIS process was cancelled in 2014 and remains a vacant site for development.

Port of Mackay

Over the years, the port has become a key industrial hub, with a strong network of services supporting a range of industries. NQBP is the port authority.

The SPL covers land and sea areas, supporting a diverse port operation. The port's SPL includes port operations, environmental buffer zones to the north and west of the port, offshore and onshore harbour access, boat ramps, tugs, and loading/unloading infrastructure. Areas adjacent to SPL include port support and logistics facilities, port-related commercial precincts, the Mackay Marina and Mount Basset Quarry being a primary source of construction material for the port. There is rail and road access to the port through the Port Access Corridor, which is reserved with capacity for future road development.

The port is a manmade harbour with four wharves protected by northern and southern breakwaters with onshore facilities to handle ships and cargo. The port was built to further develop the local sugar industry, with the first sugar shipment leaving the harbour in 1939. Initially the port was only equipped to export sugar in bags, but later expanded to load directly into ships, becoming one of the world's largest bulk sugar terminals. Construction of the port's tank farm to meet fuel import demands, a grain terminal, lift out shipyard and tug berth facilities were developed at the port.

The port harbour provides access to small craft with a tourist terminal, marina amenities and public access. The nearby Mackay Marina Village was constructed in the mid-1990s as a residential and tourism precinct including marina berths and a shipyard.

Figure 4 illustrates the Port of Mackay.

[7] Dalrymple Bay Infrastructure. (2020). *DBI-Annual-Report-2020*. https://investors.dbinfrastructure.com.au/FormBuilder/_Resource/_module/QffK5lpyyU-JL7Cq6IFs5Q/file/DBI-Annual-Report-2020.pdf

Figure 4: Port of Mackay

3.3 Current port function

Port of Hay Point

The port is one of the largest dedicated coal ports in the world and integral to exporting coal from mines in Central Queensland's Bowen Basin. It has distinct capabilities including purpose-built rail loading facilities, onshore stockpiling and offshore wharves serviced by conveyors out to deepwater berths that facilitate larger ships suited to coal export. The Goonyella Rail System provides direct port-rail integrated network to both HPCT and the DBT.

The port exports were the highest in Queensland for 2019–20. Annual throughput for both DBT and HPCT terminals in 2019–20 achieved 110.86mtpa, HPCT achieving 49.6mtpa (45%) and DBT recording 61.17mtpa (55%).[8] This represents 35% of Queensland's total exports and 50% of Queensland's coal exports.

As the world's largest metallurgical coal export facility, DBT plays a vital role in the global steel making supply chain. In 2020 calendar year, 82% of throughput was metallurgical coal, used to manufacture steel, while the remaining 18% was thermal coal.[9]

The peak throughput year for the port was in 2017–18 with 120.4mtpa exported, and the lowest throughput year was 2016–17 with 106.5mtpa. Throughput figures over the five years from 2015 to 2020 dropped 7.5mtpa representing a 6.3% decline.

[8] North Queensland Bulk Ports Corporation Limited. (2021). *Throughputs*. Retrieved from https/nqbp.com.au/trade/throughputs

[9] Dalrymple Bay Infrastructure. (2020). *DBI-Annual-Report-2020*. https://investors.dbinfrastructure.com.au/FormBuilder/_Resource/_module/QffK5lpyyU-JL7Cq6IFs5Q/file/DBI-Annual-Report-2020.pdf

Port of Mackay

The port is a multi-commodity port where the traded commodities support the agriculture and mining industries in the MIW region. The port is considered critical to the region's economic development and plays a supporting role for the nearby Port of Hay Point. The port services coastal and international shipping and recreational vessels.

The port is Queensland's fourth busiest multi-commodity port in terms of throughput. Its four wharves cater primarily for the export of sugar and grain and the import of petroleum products and the import and export of break-bulk cargo.

The dominant throughput is petroleum, imported to supply the region's mining and agricultural industries and the largest export commodity by weight is raw sugar. Key port operations now include bulk liquid loading, unloading and storage, storage and export of grain, sugar and sugar products, beef, general dry bulk and cargo storage and handling and tug berth facilities. Other commodities traded through the port include fertiliser, magnetite, sulphuric acid, tallow, scrap steel, ethanol and project cargo.

In 2019–20, the port had a throughput of 3.18 million tonnes (mt), an increase of approximately 9.2% compared to the previous financial year. The port's exports were approximately 1.18mt and its imports, predominately petroleum products, were approximately 1.99mt.[10]

[10] North Queensland Bulk Ports Corporation Limited. (2021). *Throughputs*. Retrieved from https/nqbp.com.au/trade/throughputs

4.0 Regulatory frameworks

4.1 Introduction

The regulatory framework provides the federal, state and local management measures for planning and development across the study area and underpins master planning considerations for the priority Port of Hay Point/Mackay.

The framework's hierarchy will require more detailed analysis to understand the relevance of measures at the federal, state and local government levels, regulatory controls across land and marine areas, land ownership and administrative powers. This will help identify the extent and level of risk and potential gaps in the regulatory framework, in the study area.

The current framework manages a range of values and impacts related to social values, transport and economic infrastructure, land use and development, areas of ecological significance, resource management, Indigenous and other cultural heritage values and port operations. Balancing social, environmental and economic considerations is an important element of the master planning process.

This section provides an overview of the existing regulatory framework affecting the study area including the scope of the legislation, relevant subordinate legislation and the nature of applicable management measures.

The threats, impacts and risks managed by regulatory frameworks is explored in more detail throughout the report.

Below provides the following sections:

- Commonwealth legislation – **Section 4.2**
- State legislation (Queensland) – **Section 4.3**
- Local government – **Section 4.4**
- Management measures overview – **Section 4.5**
- Summary – **Section 4.6.**

4.2 Commonwealth legislation

Information on the Commonwealth regulatory framework has been sourced using the Federal Register of Legislation and Administrative Arrangements Order – C2021Q00014 (amended 2 July 2021). In this context, management measures in the study area are applied either directly through Commonwealth legislation or on a lower order instrument that implements the Commonwealth law or its intent at the state or local level.

The Commonwealth legislation considered relevant to the study area and the master planning process is summarised below and listed in **Appendix A**.

4.2.1 *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth)

The Act provides for declarations to preserve and protect places, areas and objects of particular significance to Aboriginal and Torres Strait Islander people in accordance with Aboriginal tradition. Aboriginal tradition is taken to include traditions, observances, customs or beliefs relating to certain people, areas, objects or relationships.

4.2.2 *Biosecurity Act 2015* (Cth)

The Act seeks to manage diseases and pests that may cause harm to human, animal or plant health or the environment within the Australian territory (Australia and up to 12 nautical miles from the coastline including the airspace over, and coastal seas, of these areas). The scope of the Act includes risks related to biosecurity, contagions, human disease and ballast water and sediment.

The Act gives effect to Australia's international rights and obligations, including under the *International Health Regulations 2005*, the *World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures,* and the *Convention on Biological Diversity 1992*.

4.2.3 *Coastal Trading (Revitalising Australian Shipping) Act 2012* (Cth)

The Act seeks to promote a viable shipping industry that contributes to the broader Australian economy, facilitate the long-term growth of the Australian shipping industry, enhance the efficiency and reliability of Australian shipping as part of the national transport system, and ensure efficient movement of passengers and cargo between Australian ports.

4.2.4 *Environment Protection (Sea Dumping) Act 1981* (Cth)

The Act protects the environment by regulating dumping into the sea, incineration at sea and artificial reef placements. The scope of the Act includes permits to dump material and other objects at sea including dredged material, excavated material, artificial reefs, platforms, controlled materials and people for burial purposes.

4.2.5 *Environment Protection and Biodiversity Conservation Act 1999* (Cth)

The Act seeks to protect nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the Act as MNES.

The scope of the Act includes promoting environmental protection and biodiversity conservation informed by Indigenous peoples' knowledge of biodiversity and engagement with the community. The Act promotes ecologically sustainable development and provides for controlled actions, biodiversity plans, assessment pathways and bilateral agreements.

Development proposals having a significant impact on MNES are assessed through the controlled actions process in addition to any state and local development approvals. Examples of MNES that the Act applies to include national heritage places, wetlands of international importance, nationally threatened species and ecological communities, migratory species, Australian marine areas and the GBRMP.

4.2.6 *Great Barrier Reef Marine Park Act 1975* (Cth)

The Act manages the long-term protection and conservation of the environment, biodiversity and heritage values of the GBR region. The Act seeks the ecologically sustainable use of the GBR region for uses including recreational, economic and cultural activities, encourages collaboration and engagement with the community and industry, and facilitates Australia to meet its international responsibilities in relation to the environment and protection of World Heritage.

The Act establishes the Great Barrier Reef Marine Park Authority (GBRMPA) and provides for zoning plans, plans of management and regulation of the GBRMP. The *Great Barrier Reef Marine Park ZONING PLAN 2003* is the primary planning instrument for the conservation and management of the GBRMP. Regulating activities in the GBRMP is explored in more detail in **Section 5**.

4.2.7 *Marine Safety (Domestic Commercial Vessel) National Law Act 2012* (Cth)

The Act seeks to manage marine incidents, and standards relating to the operation, design, construction and equipping of domestic commercial vessels. A domestic commercial vessel is taken to be a vessel that is for use in connection with a commercial, governmental or research activity.

4.2.8 *Native Title Act 1993* (Cth)

The Act recognises and protects native title, provides a process for claims to native title in relation to land or waters, and provides for or permits the validation of past acts and intermediate period acts that were invalidated because of the existence of native title.

4.2.9 *Navigation Act 2012* (Cth)

The Act manages maritime safety including to promote the safety of life at sea and safe navigation, and the prevention of pollution of the marine environment. The scope of the Act includes the health and welfare of seafarers, aids to navigation, vessel safety, tonnage certificates and wrecks including their salvage.

4.2.10 *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cth)

The Act prohibits the carriage, transfer or discharge of certain oils, noxious substances, packaged harmful substances, sewage, garbage and air pollution. The scope of the Act includes the development of emergency plans, a duty to report incidents, record keeping and cleaning.

4.2.11 *Sea Installations Act 1987* (Cth)

The Act manages the operation of sea installations and the safety of the people using them and of the people, ships and aircraft near them. Sea installations are taken to be man-made structures used for an environment related activity such as business, tourism or recreation uses.

4.2.12 *Underwater Cultural Heritage Act 2018* (Cth)

The Act provides for the identification, protection and conservation of Australia's underwater cultural heritage that is recorded as being 75 years or older. This includes submerged Aboriginal and Torres Strait Islander heritage from three nautical miles out to the continental shelf. Different kinds of articles of underwater cultural heritage are, or can be, protected, depending on the kinds of articles, their heritage significance and their location. Some articles are, or can be, protected even if they have already been removed from those water. The scope of the Act includes declaration of articles, ownerships or areas, making the Underwater Cultural Heritage Rules, permit requirements, and prohibited and notifiable activities.

4.2.13 *Work Health and Safety Act 2011* (Cth)

Protection of people's health, safety and welfare. The scope of the Act includes health and safety duties, incident notification and consultation.

4.3 State legislation (Queensland)

Information on the state regulatory framework has been sourced using the Queensland Legislation Website and the Administrative Arrangements Order (No. 2) 2021, which was current at the time of writing. The head of power for most state interests is provided by this level of the legislative hierarchy and related instruments.

A summary of state legislation considered relevant to the study area and the master planning process is provided below and listed in **Appendix B**.

4.3.1 *Aboriginal Cultural Heritage Act 2003*

The Act's focus is the recognition, protection and conservation of Aboriginal cultural heritage. The scope of the Act includes management of activities that may harm Aboriginal cultural heritage and ensuring Aboriginal people are involved in processes for managing the recognition, protection and conservation of Aboriginal cultural heritage, including the development of cultural heritage management plans (CHMPs), cultural heritage studies and stop orders.

4.3.2 *Aboriginal Land Act 1991*

The Act promotes the recognition of the interests and responsibilities of Aboriginal people in relation to land and thereby to foster the capacity for self-development, and the self-reliance and cultural integrity, of the Aboriginal people of Queensland.

The Act provides for the process of applying for, and granting, the land in fee simple under the *Land Act 1994* (Cth) (Land Act), claims for claimable land and making, amending or repealing freehold instruments. The scope

of the Act includes appointing grantees of land, provision for leasing, transferring, selling or mortgaging land, and special provisions about prescribed a Deed of Grant in Trust land and prescribed reserve land.

4.3.3 *Biosecurity Act 2014*

The Act encompasses animal and plant diseases and pests, animal feed, fertilisers and other agricultural inputs. The Act establishes a framework to minimise biosecurity risk and help manage biosecurity issues or events.

The scope of the Act includes alignment with relevant national and international obligations and managing risks from pests and diseases on the natural and built environment, industry (including agriculture, tourism, service) and infrastructure sectors.

4.3.4 *Building Act 1975*

The Act includes building work, classifications and certifiers, fire safety, pool safety and sustainable housing. The Act provides for building development applications, building assessment provisions, and matters that a local government may designate for the Building Code of Australia or Queensland Development Code.

4.3.5 *Coastal Protection and Management Act 1995*

The Act seeks the protection and management of the coast through coordinated and integrated planning and decision making. The Act provides for the protection, conservation, rehabilitation and management of the coastal zone, including its resources and biological diversity, and ensure decisions about land use and development safeguard life and property from the threat of coastal hazards.

4.3.6 *Economic Development Act 2012*

The purpose of the Act is to facilitate economic development, and development for community purposes, in the state. The Act establishes the coordination of economic development and development for community purposes, and a development framework for priority development areas (PDAs). More specifically, the Act provides for the designation of PDAs and preparation of PDA development schemes. These mechanisms are discussed in more detail in the **Section 5.**

4.3.7 *Environmental Offsets Act 2014*

The purpose of the Act is to counterbalance the significant residual impacts of particular activities on prescribed environmental matters through the use of environmental offsets. The Act seeks to manage significant residual impacts of activities on matters of national, state or local environmental significance and to establish an environmental offsets framework. The Act includes provisions for offset conditions, environmental offsets policies, agreed delivery arrangements and environmental offset agreements. The Act cannot impose an offset condition on matters already assessed under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act).

4.3.8 *Environmental Protection Act 1994*

The Act seeks to protect the environment and manage ecologically sustainable development. The scope of the Act includes promoting environmental responsibility and involvement within the community, integrating environmental values into land use planning and management of natural resources, and ensuring all reasonable and practicable measures are taken to protect environmental values from all sources of environmental harm.

The Act provides for:

- the OUV of the GBR
- environmental offsets
- notifiable activities
- best practice environmental management
- environmental protection policies
- EIS

- environmental authorities and ERAs.

Environment includes ecosystems; natural and physical resources; qualities and characteristics that contribute to biological diversity, scientific value or interest, and amenity; and any related social, economic, aesthetic and cultural conditions.

4.3.9 *Fisheries Act 1994*

The purpose of the Act includes to provide for the use, conservation and enhancement of the community's fisheries resources and fish habitats in a way that seeks to apply and balance the principles of ecologically sustainable development. The Act seeks to promote ecologically sustainable development and access to fisheries resources in a way that maximises the potential economic, social and cultural benefits to the community.

The Act provides for the management, use, development and protection of fisheries resources and fish habitats, the management of aquaculture activities and helping to prevent shark attacks on humans in coastal waters of the state adjacent to coastal beaches used for bathing.

4.3.10 *Forestry Act 1959*

The Act's focus is to manage forest reservations, state forests, forest products and quarry material, and the property of the Crown on state forests, timber reserves and on other lands.

4.3.11 *Land Act 1994*

The scope of the Act is the administration and management of land (generally non-freehold land) including land that may become covered by water subject to tidal influence. The Act provides for allocating land for development in the context of the state's planning framework and balancing the economic, environmental, cultural and social opportunities and values of land, and Indigenous access and use agreements.

4.3.12 *Marine Parks Act 2004*

The purpose of the Act is to provide for conservation of the marine environment including marine parks. This is achieved by a comprehensive and integrated strategy that includes:

- the cooperative involvement of public authorities and other interested groups and persons, including members of Aboriginal and Torres Strait Islander communities
- the cooperative implementation of Australia's international responsibilities, and intergovernmental agreements and instruments
- a coordinated and integrated approach with other environment conservation legislation
- recognition of the cultural, economic, environmental and social relationships between marine parks and other areas, whether of water or land
- the provision of opportunities for public appreciation, understanding and enjoyment of the marine environment.

The Act provides for the application of zones and designation of areas, marine permits, access, and use requirements. The *Marine Parks (Great Barrier Reef Coast) Zoning Plan 2004* is made under the authority of this Act regulating activities in the GBRMP is explored in more detail in **Section 5.**

4.3.12 *Native Title (Queensland) Act 1993*

The Act provides for a national scheme for the recognition and protection of native title and for its coexistence with the existing land management systems. This Act seeks to ensure that Queensland law is consistent with standards set by the *Native Title Act 1993* (Cth) for future dealings affecting native title.

The Act includes provisions to validate past acts, and intermediate period acts, invalidated because of the existence of native title and to confirm certain rights including the ownership of natural resources and certain water and fishing access rights, and public access to and enjoyment of beaches and certain other places.

4.3.13 *Nature Conservation Act 1992*

The purpose of the *Nature Conservation Act 1992* (NC Act) is the conservation of nature. It encompasses the protection and management of native wildlife and its habitat, ecologically sustainability and recognition of the interest and involvement of Aboriginal and Torres Strait Islanders in nature and its conservation. The scope of the Act includes ecosystems, natural and physical resources, natural processes, biological diversity and integrity, and the intrinsic or scientific value of places.

4.3.15 *Planning Act 2016*

The purpose of the Act is to establish an efficient, effective, transparent, integrated, coordinated, and accountable system of land use planning, DA and related matters that facilitates the achievement of ecological sustainability.

The scope of the Act includes the:

- sustainable use of renewable and non-renewable natural resources
- Aboriginal and Torres Strait Islander knowledge, culture and tradition
- cultural heritage
- housing choice, diversity and affordability
- economic resilience and diversity
- coordinated infrastructure delivery
- built environment design, conservation and amenity
- minimising adverse environmental effects of development.

The Act establishes Queensland's plan making, DA and dispute resolution systems. The Act provides for:

- protecting or giving effect to state interests
- a hierarchy of planning instruments
- processes for plan making, DA and designations
- Ministerial powers to protect, or give effect to, relevant state interests
- designation of premises for development of infrastructure
- accepted, assessable and prohibited development
- development exempt from assessment and development that cannot be made assessable.

Queensland's planning system is explored in more detail in **Section 5.**

4.3.16 *Queensland Heritage Act 1992*

The object of the *Queensland Heritage Act 1992* (QH Act) is the conservation of Queensland's cultural heritage for the benefit of the community and future generations. The Act seeks to retain the cultural heritage significance of places and artefacts and provide the greatest sustainable benefit to the community consistent with the conservation of their cultural heritage significance. The scope of the Act includes local and state heritage places and state protected areas, archaeological artefacts, and underwater cultural heritage artefacts that are recorded as being 75 years or older and includes protection for submerged archaeology in internal waters.

4.3.17 *Regional Planning Interests Act 2014*

The Act's focus is to regulate activities on areas of the state that contribute, or are likely to contribute, to Queensland's economic, social and environmental prosperity. The Act seeks to manage the impact of resource activities and other regulated activities on areas of regional interest, and a process to assess and manage impacts. The Act provides for regional interest development approvals, exempt resource activities and exempt regulated activities.

Regional interest areas are defined in the Act as priority agricultural areas, priority living areas, strategic cropping areas (SCA) and strategic environmental areas. The Department of Resources (DOR) certifies the 'Trigger Map for Strategic Cropping Land' (SCL) for use under the Act.

The applicability of the Act is discussed further in **Section 5**.

4.3.18 *State Development and Public Works Organisation Act 1971*

The Act provides for state planning and development through a coordinated system of public works organisation and for environmental coordination. Under the Act, the Coordinator-General (CG) may declare a project to be a coordinated project for which an EIS or Impact Assessment Report (IAR) is required.

The Act provides for state development areas (SDAs), approved development schemes, and assessment and approval of particular coordinated projects under a Bilateral Agreement made under the EPBC Act. These mechanisms are discussed in more detail in **Section 5.**

4.3.19 *Sustainable Ports Development Act 2015*

The purpose of this Act is to provide for the protection of the GBRWHA through managing port-related development in and adjacent to the area. The purpose of the Act is achieved through prohibiting certain development and providing for master planning of the priority ports. To do this, the Act seeks to concentrate port development in the priority ports, recognise the diversity of the port network, and plan for the expansion of the port network and related supply chain and infrastructure capacity.

The Ports Act designates the following priority ports, Port of Abbot Point, Port of Gladstone, the ports of Hay Point/Mackay, and the Port of Townsville. The effect of the Act on regulating activities on land and in marine areas is explored further in **Section 5.**

4.3.20 *Transport Infrastructure Act 1994*

The Act seeks to facilitate effective integrated planning and efficient management of a system of transport infrastructure. For ports, the Act's focus is to establish a regime under which ports can be managed within an overall strategic framework. Similarly, to establish a regime under which waterways and public marine facilities can be effectively and efficiently managed. The Act provides for port land use plans, SPL and enforcement of activities on port land. These mechanisms are discussed in more detail in **Section 5.**

4.3.21 *Transport Operations (Marine Pollution) Act 1995*

The purpose of the Act is to protect Queensland's marine and coastal environment by minimising deliberate and negligent discharges of ship-sourced pollutants into coastal water. The Act achieves this primarily by giving effect to annexes of the *International Convention for the Prevention of Pollution from Ships 1973 (*MARPOL) that address pollution by oil, noxious liquid substances in bulk, harmful substances in packaged form, sewage and garbage.

4.3.22 *Transport Operations (Marine Safety) Act 1994*

The Act provides for marine safety and related marine operational issues and the operation and activities of ships. The Act seeks to balance its objectives with effectiveness and efficiency on the Queensland maritime industry.

Some Queensland waters need to be controlled to ensure safety. The Act allows areas of Queensland waters to be declared as pilotage areas and compulsory pilotage areas. Controls applied under the Act include requiring the use of a pilot by certain ships on entering, leaving or navigating within a compulsory pilotage area, and the appointment of harbour masters and providing powers to give directions about ships and their navigation. Harbour masters may, for example, direct ships to enter, leave or navigate in pilotage areas or anchor, berth or moor a ship in a pilotage area.

The Act does not generally overlap with the national law that applies to domestic commercial vessel safety and does not generally apply to a ship belonging to the Australian Defence Force or the naval, military or air forces of a foreign country.

4.3.23 *Transport Operations (Marine Safety – Domestic Commercial Vessel National Law Application) Act 2016*

The purpose of this Act is to apply the Commonwealth domestic commercial vessel national law as a law of the state.

4.3.24 *Transport Operations (Road Use Management) Act 1995*

This Act's objectives provide for the effective and efficient management of road use including vehicle use in public places and provides a scheme for managing the use of roads. The Act seeks to achieve an appropriate balance between safety, and the costs that regulation imposes on road users and the community.

The scope of the Act includes road use management strategies, road rules, performance standards for road users, access management and transportation of dangerous goods. In relation to dangerous goods, the Act provides for the classification of dangerous goods, determination of routes suitable for the transportation of dangerous goods, the licensing of vehicles and drivers transporting dangerous goods, and accreditation of people involved in transporting dangerous goods.

4.3.25 *Transport Planning and Coordination Act 1994*

The Act's objectives provide for the improvement of Queensland's economic, trade and regional development performance by achieving overall transport effectiveness and efficiency through strategic planning and management of transport resources.

The purpose of the Act is to provide guidance in respect of transport coordination plans, preparation and funding, including the coordination of strategic planning and operation of integrated transport systems in the state, and managing fund allocations relevant to transport coordination plans such as regional transport plans.

4.3.26 *Vegetation Management Act 1999*

The Act's purpose is to regulate vegetation clearing in a way that includes the conservation of remnant vegetation, avoids land degradation and loss of biodiversity, maintains ecological processes, reduces greenhouse gases and allows for sustainable land use. Vegetation is taken to be a native tree or plant, other than grass or non-woody herbage, a plant within a grassland RE prescribed under a regulation, or a mangrove. The scope of the Act defines development that is for a relevant purpose and classes of REs.

The Act provides for the development of a state policy for vegetation management, vegetation management maps and accepted development vegetation clearing code.

4.3.27 *Water Act 2000*

The Act's focus is the sustainable management of Queensland's water resources and quarry material, including water supply and demand management. The scope of the Act includes the planning, allocation and use of water, and the allocation of quarry material and riverine protection. The Act provides for the making of activity guidelines, designation of water regions, and establishment of water authorities.

Development applications made under the *Planning Act 2016* (Planning Act) involving levees, taking or interfering with water, or the removal of quarry material may be required to meet criteria set out in the Act or benefit from additional development rights under the Act.

4.3.28 *Work Health and Safety Act 2011*

The Act provides for a nationally consistent framework that protects the health and safety of workers and workplaces. The Act relies on the principle that people should be protected from harm to their health, safety and welfare from hazards and risks arising from work, substances or plant.

The Act provides for the definition of hazardous chemicals and sets out the requirements for safe handling and storage. A facility that stores chemicals may be determined a major hazard facility and require a licence to operate under this legislation. The requirements for safe handling and storage of chemicals are supported by the Worksafe Queensland's *Managing risks of hazardous chemicals in the workplace – Code of Practice 2021*.

Managing hazardous activities at the port is discussed in more detail in **Section 8**.

4.4 Local government

4.4.1 *Mackay Region Planning Scheme 2017*

The *Mackay Region Planning Scheme* (Mackay Planning Scheme) sets out MRC's intention for the future development in the planning scheme area over the next 20 years. The scheme seeks to advance state and regional strategies, including state planning policies and the MIW Regional Plan, through more detailed local responses, taking into account the local context.

The Mackay Planning Scheme provides for what development should occur, where, when and how development should occur, and what assessment process is required. The management measures provided by the planning scheme are described in more detail in **Section 5.**

4.5 Management measures – overview

An overview of the legislative instruments above is given in **Appendix A**. The table includes subordinate legislation relevant to the master plan process, the administering authority, an outline of management measures, and why this instrument is included in the evidence base.

4.6 Summary

This section has provided an overview of the regulatory context for the priority Port of Hay Point/Mackay and identifies the mechanisms at the federal, state and local government levels that represent the management measures for activities and impacts in and around the port.

This overview together with the topic-based sections in this report will support the planning and environment analysis of the regulatory framework. This analysis will lead to a better understanding of regulatory gaps or outdated policy direction that could compromise the long-term objectives for the priority Port of Hay Point/Mackay and contribute to the development of a master plan and port overlay.

5.0 Land use planning

5.1 Introduction

The federal, state and local regulatory frameworks manage a range of values and impacts affecting, and affected by, land use planning assessment and decision making within the study area. Balancing social, environmental and economic considerations in relation to planning and development is an important element of the master planning process.

This section provides a high-level overview of the land use planning management tools affecting plan making and DA within the priority Port of Hay Point/Mackay study area.

Land use planning is managed through a suite of statutory instruments, policies and rules. Within this framework, and under the Ports Act, a master plan for the priority Port of Hay Point/Mackay may influence decision making across plan making and DA processes.

The Ports Act is underpinned by the Queensland planning system which is established through the Planning Act, *Planning and Environment Court Act 2016* and *Regional Planning Interests Act 2014* (RPI Act). The Planning Act and RPI Act encompass state interests relevant to the study area and master planning process.

The *Transport Infrastructure Act 1994* (TIA), *State Development and Public Works Organisation Act 1971* (SDPWO Act) and *Economic Development Act 2012* (ED Act) also play an important role in land use planning in the study area and require plan making and DA under their own frameworks.

These legislative frameworks all have a potential role in the future planning and development of the priority port and wider study area. Some of these frameworks work closely with one another and others are more discrete, but all are affected by the instruments implemented under the Ports Act. **Figure 5** illustrates the legislation and key tools discussed further in this section.

Legislation and key land use planning tools	***Sustainable Ports Development Act 2015*** master planned area, master plan, priority port overlay			
	Planning framework (*Planning Act 2016*, State Planning Policy, State Development Assessment Provisions, *Regional Planning Interests Act 2014*, Regional Plan)	***Transport Infrastructure Act 1994*** (port notices, port development)	***State Development and Public Works Organisation Act 1971*** (coordinated projects, prescribed projects, State Development Areas)	***Economic Development Act 2012*** (Priority Development Areas)
Land use plan	Local planning instruments	Port land use plan	State Development Area development scheme	Priority Development Area development scheme
Development assessment process	Development assessment under the *Planning Act 2016*		Development assessment under the *State Development and Public Works Organisation Act 1971*	Development assessment under the *Economic Development Act 2012*

Figure 5: Land use planning frameworks

This section provides the following sections:

- Ports Act – **Section 5.2**
- Queensland's Planning Framework – an overview – **Section 5.3**
- Planning Act – **Section 5.4**
- RPI Act – **Section 5.5**
- TIA Act – **Section 5.6**
- SDPWO Act – **Section 5.7**
- ED Act – **Section 5.8**
- Land use management measures – **Section 5.9**
- Regulating activity in marine areas – **Section 5.10**
- Summary – **Section 5.11**.

5.2 Sustainable Ports Development Act 2015

The purpose of the Ports Act is to provide for the protection of the GBRWHA through managing port-related development in and adjacent to the area.

The purpose of the Ports Act is achieved by:

- prohibiting particular future development in the GBRWHA
- providing for the development of master plans that establish a long-term vision for the future development of priority ports consistent with the principles of ecologically sustainable development
- implementing master plans through port overlays that regulate development in and surrounding priority ports.

The purpose is to be achieved in a way that includes:

- long-term planning for priority ports to provide a strategic and coordinated approach to managing economic, environmental, cultural and social values in the GBRWHA
- concentrating port development in priority ports
- recognising the diverse functions of the port network, including trade, tourism and defence operations
- efficiently using port and supply chain infrastructure
- expanding port and supply chain capacity in a staged and incremental way to meet emerging demand for imports and exports
- identifying and protecting land and infrastructure critical to the effective operation of the port network.

The Ports Act identifies the ports of Hay Point and Mackay as one of four priority ports in Queensland.

5.2.1 Master planning

Under the Ports Act, a master plan is to be developed that sets out the long-term planning strategy for the priority Port of Hay Point/Mackay. The master plan must consider the principles of ecologically sustainable development and must include:

- the strategic vision, objectives and desired outcomes for the master planned area
- state interests affected, or likely to be affected, by current and future uses at the port
- an Environmental Management Framework
- any other matter prescribed by regulation.

The master plan will identify the priority port master planned area. A master planned area can extend beyond SPL but cannot include an area within a marine park or an area covered by tidal water that is outside port limits.

Figure 6 shows the priority port master planning process, consultation requirements, and port overlay process under the Ports Act.

Figure 6: Master planning process

5.2.2 Port overlay

The master plan will be implemented through the port overlay. The port overlay must:

- state the purpose of the overlay
- state how the priority management measures (PMM) in the master plan are to be achieved
- include any other matter prescribed by regulation.

The port overlay prevails to the extent of an inconsistency between a port overlay and a:

- planning instrument under the Planning Act
- land use plan made under the TIA.

The port overlay is a statutory instrument and applies to the whole master planned area. However, it cannot regulate development that is:

- assessable development and accepted development for a PDA under the ED Act.
- regulated development for SDAs under the SDPWO Act.

There are no SDAs in the study area but there are two PDAs (further details are provided in **Section 5.8.3**). Consideration must be given to the requirements of the port overlay when a PDA Development Scheme is made or amended.

The relationship between a potential port overlay and other land use planning instruments within the study area is summarised in **Table 1**.

Figure 7 outlines the function and implementation of the port overlay.

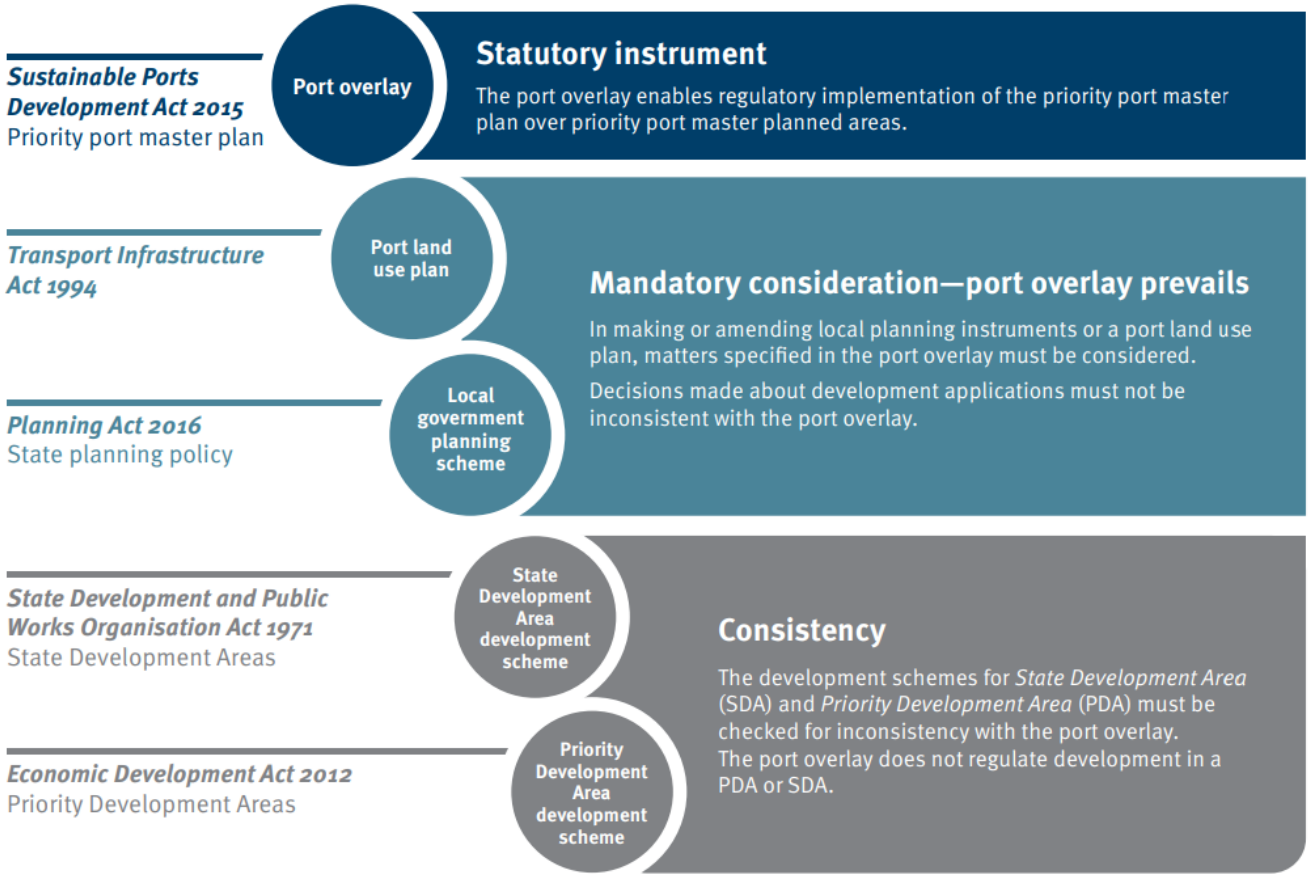

Figure 7: Implementation of the port overlay

5.2.2.1 Plan making

Under the Ports Act, the port overlay for the priority port may state matters to be considered by:

- NQBP in making or amending their land use plans
- MRC in making or amending their local planning scheme
- the Minister for Economic Development Queensland (EDQ) in making or amending the development scheme for the PDA, if the master planned area includes a PDA
- the CG in making or amending the development scheme for the SDA, if the master planned area includes a SDA.

5.2.2.2 Development assessment

The port overlay may include:

- categories of development (accepted development, assessable development requiring code or impact assessment, or prohibited development)
- assessment benchmarks
- matters an assessment manager must regard.

For development made assessable by the port overlay, a decision maker for an application under the Planning Act must:

- where stated in the overlay:
  - assess the development against applicable assessment benchmarks
  - have regard to other relevant assessment matters
- not make a decision that is inconsistent with the port overlay.

5.2.2.3 Marine parks and capital dredging

The study area includes a marine park which is affected by multiple definitions under the Ports Act:

- 'restricted area' means an area that is within the GBRWHA but outside the Commonwealth marine park
- 'Commonwealth marine park' means the GBRMP established under the *Great Barrier Reef Marine Park Act 1975* (Cth) (GBRMP Act)
- 'state marine park' means the GBR Coast Marine Park continued in existence under the *Marine Parks Act 2004* (MP Act)

The Ports Act provides that a master planned area cannot include a marine park. It also states that an assessment manager must refuse a port-related development application if the development is in:

- the state marine park
- a restricted area that is outside a port's existing port limits.

However, this does not apply for development that is or involves:

- dredging
- disposing or depositing of material generated from dredging activities.

An approving authority must not approve capital dredging related to a new or existing port facility if the dredging will be carried out within a restricted area unless the development is in a priority port's master planned area.

Table 1: Relationship between land use planning instruments and a port overlay in the study area

Legislation	Regulatory instrument within the master planned area	Relationship to the port overlay	Action for Development Assessment	Action for plan making
Planning Act	Local planning instruments for example, Mackay Planning Scheme	The planning scheme and the port overlay apply. The port overlay prevails to the extent of any inconsistency.	Where the port overlay makes development assessable and prescribes assessment benchmarks, the assessment manager must: • assess the development against the assessment benchmarks • have regard to matters specified. The assessment manager's decision must not be inconsistent with the port overlay.	MRC must consider the content of the port overlay when making or amending local planning instruments under the Planning Act.
Planning Act	Port of Mackay Land Use Plan	The land use plan and the port overlay apply. The port overlay prevails to the extent of any inconsistency.	Where the port overlay makes development assessable and prescribes assessment benchmarks, the assessment manager must: • assess the development against the assessment benchmarks • have regard to matters specified. The assessment manager's decision must not be inconsistent with the port overlay.	Not applicable.
Planning Act	*Planning Regulation 2017* (Planning Regulation)	The State Development Assessment Provisions (SDAP) and the port overlay apply.	Where the port overlay makes development assessable and prescribes assessment benchmarks, the assessment manager must: • assess the development against the assessment benchmarks • have regard to matters specified. The assessment manager's decision must not be inconsistent with the port overlay.	Not applicable.
TIA	Port of Mackay Land Use Plan Port of Hay Point Land Use Plan	The port overlay prevails to the extent of any inconsistency.	Not applicable.	NQBP must consider the content of the port overlay when making or amending the land use plan under the TIA.

Legislation	Regulatory instrument within the master planned area	Relationship to the port overlay	Action for Development Assessment	Action for plan making
ED Act	Mackay Waterfront PDA Development Scheme Andergrove PDA Development Scheme	The Minster for EDQ must consider but is not bound by a requirement under the port overlay.	The port overlay does not regulate development that is regulated by a development scheme.	The Minister for EDQ must consider whether the development schemes are inconsistent with the port overlay. Where there is an inconsistency, the Minister for EDQ must decide whether to amend a development scheme to remove the inconsistency. The Minister for EDQ must consider the content of the port overlay when making or amending a development scheme.

5.3 Queensland's planning framework—an overview

The Planning Act establishes Queensland's planning system and provides the framework for the state's plan making, DA and dispute resolution systems. Under the Planning Act, the Planning Minister is given powers that can be enacted in response to matters relating to state interests.

The relationship between the various components of the planning system covered in this section is illustrated in **Appendix C**. For the purpose of land use planning in the study area, local planning schemes and development applications are considered the primary tools under the planning framework delivering planning and development outcomes.

5.3.1 Legislative framework

The Planning Act seeks to establish an efficient and accountable system of land use planning and DA to lead to ecological sustainability which balances:

- the protection of ecological processes and natural systems at local, regional, state and national levels
- economic development
- the cultural, economic, physical and social wellbeing of Queenslanders.

The Planning Regulation prescribes matters dealt with, and instruments made, under the Planning Act.

5.3.2 State planning instruments

The state's interests are set out in the *State Planning Policy 2017* (SPP) and regional plans. These interests are delivered through local planning schemes.

The SPP is the primary state planning instrument in Queensland. It provides clear and comprehensive details of the policies needed to ensure that plan making and DA in Queensland is outcome focused, efficient, and accountable.

Seventeen state interests ensure that state interests are protected and delivered through local government processes (see **Table 2**). These state interests, interpreted and applied according to the guiding principles outlined in the SPP, describe the planning matters the state has decided must be properly considered and integrated into local plan making and DA decisions. The five guiding principles in the SPP seek to ensure a system that is:

- **outcome focused** – clearly focusing on the delivery of outcomes
- **integrated** – reinforcing the role of local planning schemes as the integrated, comprehensive statement of land use policy and development intentions for a local area
- **efficient** – supporting the efficient determination of appropriate development
- **positive** – enabling positive responses to change, challenges and opportunities
- **accountable** – promoting confidence in the planning system through plans and decisions that are transparent and accountable.

The SPP sits above regional plans and planning schemes in the hierarchy of planning instruments under the Planning Act. The SPP applies (to the extent relevant) to the following:

- making or amending a local planning instrument or regional plan
- designating premises for infrastructure
- local government assessment of a development application, if its planning scheme has not yet appropriately integrated the relevant SPP state interest policies
- an assessment manager or referral agency other than local government when assessing a development application.

Table 2: State Policy Planning themes and state interests

State Policy Planning theme	State interest	Statement
1. Planning for liveable communities and housing	1. Housing supply and diversity	Diverse, accessible and well-serviced housing, and land for housing, is provided and supports affordable housing outcomes.
	2. Liveable communities	Liveable, well-designed and serviced communities are delivered to support wellbeing and enhance quality of life.
2. Planning for economic growth	3. Agriculture	The resources that agriculture depends on are protected to support the long-term viability and growth of the agricultural sector.
	4. Development and construction	Employment needs, economic growth, and a strong development and construction sector are supported by facilitating a range of residential, commercial, retail, industrial and mixed-use development opportunities.
	5. Mining and extractive resources	Extractive resources are protected and mineral, coal, petroleum and gas resources are appropriately considered to support the productive use of resources, a strong mining and resource industry, economical supply of construction materials, and avoid land use conflicts where possible.
	6. Tourism	Tourism planning and development opportunities that are appropriate and sustainable are supported, and the social, cultural and natural values underpinning tourism developments are protected.
3. Planning for the environment and heritage	7. Biodiversity	Matters of environmental significance are valued and protected, and the health and resilience of biodiversity is maintained or enhanced to support ecological processes.
	8. Coastal environment	The coastal environment is protected and enhanced, while supporting opportunities for coastal-dependent development, compatible urban form, and maintaining appropriate public use of and access to, and along, state coastal land.
	9. Cultural heritage	The cultural heritage significance of heritage places and heritage areas, including places of Aboriginal and Torres Strait Islander cultural heritage, is conserved for the benefit of the community and future generations.
	10. Water quality	The environmental values and quality of Queensland waters are protected and enhanced.
4. Planning for safety and resilience to hazards	11. Emissions and hazardous activities	Community health and safety, and the natural and built environment, are protected from potential adverse impacts of emissions and hazardous activities. The operation of appropriately established industrial development, major infrastructure, and sport and recreation activities is ensured.
	12. Natural hazards, risk and resilience	The risks associated with natural hazards, including the projected impacts of climate change, are avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards.
5. Planning for infrastructure	13. Energy and water supply	The timely, safe, affordable and reliable provision and operation of electricity and water supply infrastructure is supported, and renewable energy development is enabled.
	14. Infrastructure integration	The benefits of past and ongoing investment in infrastructure and facilities are maximised through integrated land use planning.
	15. Transport infrastructure	The safe and efficient movement of people and goods is enabled, and land use patterns that encourage sustainable transport are supported.
	16. Strategic airports and aviation facilities	The operation of strategic airports and aviation facilities is protected, and the growth and development of Queensland's aviation industry is supported.

State Policy Planning theme	State interest	Statement
	17. Strategic ports	The operation of strategic ports and priority ports is protected and their growth and development is supported.

The online SPP interactive mapping system supports the application of the SPP state interests. The SPP interactive mapping system represents the spatial representation of the state's interests expressed in the SPP. A suite of SPP guidance material, including *Integrating state interests in a planning scheme: Guidance for local governments (November 2021 – VS 1.2*), aims to give a greater emphasis on providing up front certainty through planning schemes and reducing conflict during the DA process. The guidance material supports local government in its interpretation, integration and advancement of the strategic ports state interest when making or amending their planning scheme.

At the regional level, the state prepares regional plans to support economic growth, development and liveable communities while protecting natural resources and balancing state interests outlined in the SPP.

Regional plans set out integrated planning and DA policies about matters of state interest for particular regions. Regional plans form part of Queensland's regional planning framework, which is managed through the Planning Act, Planning Regulation, RPI Act and *Regional Planning Interests Regulation 2014* (RPI Regulation). The MIW Regional Plan applies in the study area.

5.3.2.1 Other statutory instruments

The Queensland Government is also responsible for statutory instruments that ensure the plan making and DA systems are consistent across Queensland. These are:

- **Minister's Guidelines and Rules (MGR)** – a statutory instrument that establishes how local planning instruments are to be made or amended.
- **DA Rules** – a standard assessment process to make sure development applications are assessed equitably. The DA Rules apply to all parties involved in the assessment process including the applicants, assessment managers and referral agencies.
- **SDAP** – set out the state's interest in DA and includes assessment benchmarks and other assessment matters. SDAP also provides the state's FastTrack5 framework, which is a streamlined assessment pathway for particular development proposals.

5.3.3 Local planning instruments

Local government prepares local planning instruments that guide growth and development in their LGA. Local planning instruments include:

- local planning schemes
- planning scheme policies
- a Local Government Infrastructure Plan (LGIP)
- temporary local planning instruments.

Figure 8 illustrates the Mackay Planning Scheme zoning.

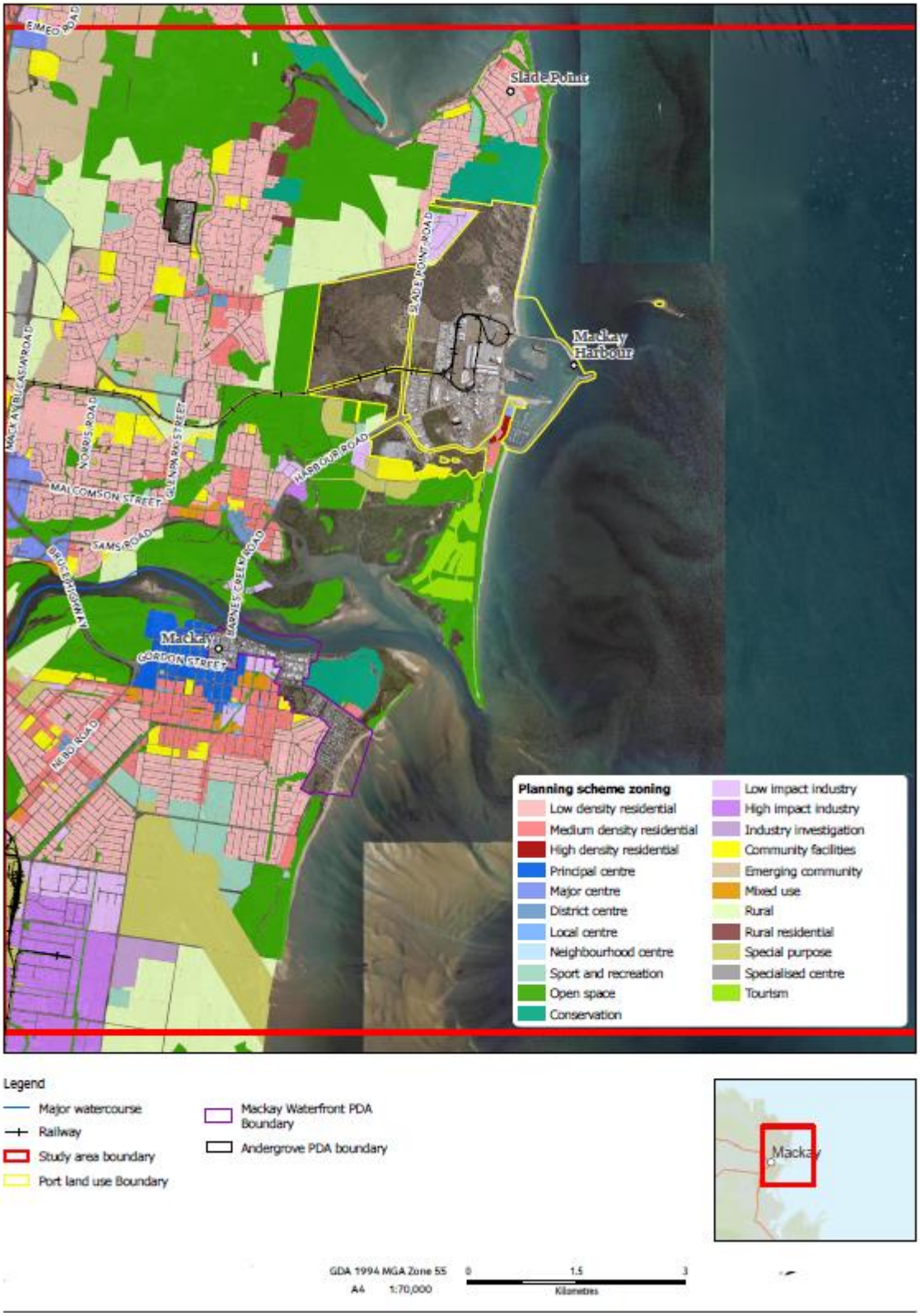

Figure 8: Mackay Regional Council Planning Scheme zoning

5.4 Planning Act 2016

The hierarchy of decision-making established under the planning framework seeks to ensure that local planning and development outcomes appropriately reflect with matters of state and regional interest.

5.4.1 Plan making

Queensland's performance-based planning system encourages and responds to change by allowing for innovation and flexibility in plan making.

A local planning scheme is the primary local planning instrument for regulating what, where and how new development should occur at the local level. It outlines planning and development aspirations, as well as infrastructure needs.

The Planning Act requires that all local governments review their planning schemes within 10 years of the current one being made or last reviewed. The MGR sets out the process for making or amending local planning instruments.

Local governments are required to address state and regional policy matters outlined in the SPP and relevant regional plan.

The Queensland Government carries out a state interest review of certain proposed planning schemes or planning scheme amendments to determine whether they appropriately integrate state planning instruments. The Planning Minister must approve a new local planning scheme and certain proposed planning scheme amendments before they can commence.

5.4.2 Development assessment

The Planning Act defines three categories of development, prohibited, acceptable and assessable. Assessable development is required to have a development approval (in the form of a development permit) before the development can occur.

The Planning Regulation, local planning scheme, temporary local planning instruments or variation approval identify which types of development require a development approval and which category of assessment will apply (either code or impact).

The DA Rules set out the standard process for making, assessing and deciding development applications. The Planning Regulation identifies which entity is the assessment manager, and where relevant, referral agency for all applications. Local governments are the assessment manager for a large proportion of development applications in Queensland. Local government in its capacity as assessment manager or referral agency will assess development applications against its local planning scheme. It will also refer to the SPP on certain matters where their local planning scheme does not appropriately integrate the SPP.

Where a development proposal may affect a state interest, the Planning Regulation may identify the state as the assessment manager or referral agency. The State Assessment and Referral Agency (SARA) provides a coordinated, whole-of-government approach to the state's assessment of development applications. SARA assesses development applications against SDAP where the Planning Regulation identifies SDAP as the assessment benchmarks.

The current SDAP is prescribed by the Planning Regulation. SDAP defines the state's interests in DA across 25 state codes (see **Table 3**) and includes the assessment benchmarks or matters SARA will assess a development application against. Guidance material and supporting information to help applicants address each of the state codes is listed in the reference section after each state code. The state interests managed under SARA are administered by the following state agencies:

- Department of Agriculture and Fisheries (DAF)
- Department of Education
- Department of Environment and Science (DES)
- Department of Housing and Public Works
- Department of Manufacturing, Regional Development and Water
- DOR

- Department of State Development, Infrastructure, Local Government and Planning (DSDILGP).

SARA has not issued any development permits for a Material Change of Use (MCU) relating to industrial or sensitive uses within the study area since commencement of the Ports Act.

For a small number of development applications, the Planning Regulation identifies entities other than the local government or SARA as an assessment manager or referral agency (for example, a private certifier or port authority) as well as assessment benchmarks or other assessment criteria other than the local planning scheme or SDAP (for example, the building assessment provisions or a port land use plan).

Table 3: State Development Assessment Provisions - State codes

State code	State interest
State code 1	Development in a state-controlled road environment
State code 2	Development in a railway environment
State code 3	Development in a busway environment
State code 4	Development in a light rail environment
State code 5	Development in a state-controlled transport tunnel environment
State code 6	Protection of state transport networks
State code 7	Maritime safety
State code 8	Coastal development and tidal works
State code 9	GBR wetland protection areas
State code 10	Taking or interfering with water
State code 11	Removal, destruction or damage of marine plants
State code 12	Development in a declared fish habitat area (FHA)
State code 13	Unexploded ordnance
State code 14	Queensland heritage
State code 15	Removal of quarry material from a watercourse or lake
State code 16	Native vegetation clearing
State code 17	Aquaculture
State code 18	Constructing or raising waterway barrier works in fish habitats
State code 19	Category 3 levees
State code 20	Referable dams
State code 21	Hazardous chemical facilities
State code 22	ERAs
State code 23	Wind farm development
State code 24	Urban design outcomes for significant projects (advice only)
State code 25	Development in South East Queensland koala habitat areas

5.4.3 State requirements under the *Planning Act 2016*

5.4.3.1 *State Planning Policy 2017*

The SPP outlines the guiding principles and state interests that underpin the delivery of local and regional plans and development that advance the social, economic and environmental needs of all Queenslanders. The SPP is a statutory instrument and must be appropriately integrated or considered when undertaking the activities to which the SPP applies.

The SPP identifies policy and planning outcomes for matters of state interest through a state interest statement, state interest policies and, where applicable, benchmarks for DA. The SPP does not include assessment benchmarks for development related to strategic ports or priority ports.

The SPP cites the ecological, economic, social and cultural value of the GBRWHA as being a key part of why the coastal environment is a matter of state interest. The SPP states that:

'Planning and development in the Great Barrier Reef catchments should support the commitments made by all levels of government to protect the outstanding universal value of the Great Barrier Reef from the impacts of development and climate change.'

The SPP specifically seeks to protect and enhance the coastal environment, while supporting opportunities for coastal-dependent development, compatible urban form, and maintaining appropriate public use of and access to, and along, state coastal land.

However, all state interests in the SPP are relevant to the values and potential development impacts across the wider study area. Of particular relevance is state interest 17 'strategic ports'. As the priority ports are located in MRC, the strategic ports state interest will be relevant to council when it makes or amends its planning scheme. The SPP recognises Queensland's ports as a major component of both the national and state supply chain due to their ability to provide critical connections with global markets and facilitate the import and export of goods and materials. The SPP aims to ensure development does not impact on the safe and efficient operation of the ports to support continued growth of the state's economy and Australia's national defence system. Through the policies included in state interest 17, the SPP also seeks to ensure that port operations do not result in unintended social and environmental impacts on communities close to ports (see **Table 4**).

A summary of key matters addressed by the other state interest policies relevant to the master planning process for the priority Port of Hay Point/Mackay is provided in **Appendix D**.

Table 4: State Interest 17: Strategic ports

Policy number	State interest policies
1	Strategic ports, and associated SPL and core port land, are identified
2	Development complements the role of a strategic port as an economic, freight and logistics hub, and enhances the economic opportunities that are available in proximity to a strategic port
3	Strategic ports are protected from development that may adversely affect the safety, viability or efficiency of existing and future port operations
4	Development is located and designed to mitigate adverse impacts on the development from environmental emissions generated by port operations
5	Key transport corridors (including freight corridors) linking strategic ports to the broader transport network are identified and protected
6	Statutory land use plans for strategic ports and the findings of planning and environmental investigations undertaken in relation to strategic ports are considered
7	For priority ports, development is also consistent with the requirements of priority port master plans and priority port overlays as these are approved under the Ports Act.

5.4.3.2 State Development Assessment Provisions

SDAP is a statutory instrument and identifies 25 state interests for DA purposes where the state is required to assess an application. SDAP is structured in a performance-based code format where applicants address performance criteria to demonstrate the extent to which their proposal appropriately manages any impacts on a matter of state interest, and/or protects a development from impacts of matters of state interest.

State codes that provide assessment criteria include a purpose statement and performance outcomes. Acceptable outcomes are given for some performance outcomes. A purpose statement defines the intent of each state code and is the highest order test of a state code that a development application will be assessed against. Development that is demonstrated to meet the purpose statement of a state code is taken to comply with that state code.

The Planning Regulation determines whether new development proposals are assessable by SARA against SDAP. Where assessment against SDAP is required, one or more state codes may apply. State codes are applied on the basis either of a development's location or the type of use being proposed. The following assumptions are made about the state codes that are most likely to be relevant for future development within the study area.

Some locational state codes are not applicable in the study area because the state interest is either not mapped or otherwise not applicable. These are state codes three (busways), four (light rail), five (transport tunnels), 13 (unexploded ordnance) and 25 (South East Queensland koala habitat). There are a number of Queensland heritage places mapped within the study area. However, these are in the urban area of Mackay to the south of the Pioneer River. It is therefore considered unlikely that state code 14 would be relevant in the assessment of port-related development.

Similarly, some use-based codes are unlikely to be called up for development in or around the priority Port of Hay Point/Mackay. These are state codes 19 (levees), 20 (referable dams) and 23 (wind farms). State code 24 (urban design) provides 'advice only' and is not considered further in this section.

The remaining 15 state codes could be required in the assessment of development proposals in the study area. These are highlighted below, and their purpose statements are provided in **Appendix E**.

5.4.3.2.1 Key locational state codes

- Coastal protection and maritime safety state interests are mapped within the study area and therefore, particularly for proposals closer to the coast, the following codes may apply to future development applications: state codes seven (maritime safety), eight (coastal development and tidal works), nine (wetlands), 10 (taking or interfering with water), 11 (marine plants) and, for the Mackay study area only, 12 (FHAs).
- Current and future road and rail state-controlled transport corridors are also mapped within the study area and therefore state codes one (roads), two (railways) and six (transport networks) may apply to certain development proposals depending on their location or scale.

5.4.3.2.2 Key use-based state codes

- Port or port-related development proposals are often industrial in nature meaning that state codes 21 (hazardous chemicals) and 22 (ERAs), may be relevant.
- Proposed new land uses may trigger assessment against state codes 15 (removing quarry material), 16 (vegetation clearing), 17 (aquaculture) or 18 (waterway barrier works).

5.4.4 *Mackay, Isaac and Whitsunday Regional Plan 2012*

The MIW Regional Plan provides the strategic framework for managing growth, change, land use and development in the region to 2031. It seeks to balance the recognised lifestyle values of the region with the establishment of a strong and diversified economy, while recognising that long-term regional prosperity is reliant on sound management of natural resources, the natural environment and the ongoing viability of the agricultural sector.

The MIW Regional Plan was published in 2012 under a previous planning framework. Some of the policy directions in the MIW Regional Plan and its constituent parts for example, parts D and E, are significantly outdated. There are currently no assessment benchmarks provided by the MIW Regional Plan. A commitment in the plan for a five to 10 yearly review indicates it will be reviewed in the near future.

5.4.4.1 Regional framework

The regional framework comprises a regional vision, strategic directions and regional narratives.

There are 10 strategic directions which outline the broad policy framework for the region and identify important aspects involved in planning for the region’s long-term development. The strategic directions are to be achieved through management of the region’s natural resources and environmental assets, and mechanisms that support a strong economy. The strategic directions support the regional vision and inform the principles and policies identified in the desired regional outcomes (DROs). The regional narrative reflects the existing settlement pattern.

Port of Hay Point

Located in the sub-region of Sarina, the Port of Hay Point is recognised as a major employer within the area. The regional narrative recognises that Sarina is the service hub for southern parts of the sub-region. Sarina’s town centre and main street, located on the Bruce Highway, is the focal point for retail activity in the community with higher level services provided in Mackay. Residential development near the port is not supported by the MIW Regional Plan due to the scale of activities at the port and the incompatibility of port activities with sensitive land uses.

Port of Mackay

While Mackay has been a focus for growth, economic attractors such as resource extraction and agricultural lands has resulted in growth further to the west.

The regional narrative recognises that Mackay will continue to provide higher order services in the future, as it has infrastructure capacity, diverse economies and available water and land supplies. The regional narrative also seeks to protect areas of significant ecological value, or areas subject to environmental constraints, from development pressures.

The Mackay sub-regional narrative focuses on maintaining and strengthening the city centre's role as a principal centre of the growing region, while maintaining and enhancing its distinct, diverse, attractive and sustainable urban environment, for people to live, work and play. Challenges for the Mackay urban area are to increase residential development south of the river to locate housing closer to employment opportunities and the efficient provision of infrastructure and service.

Residential development near the port is not supported by its regional plan due to the scale of activities at the port and the incompatibility of port activities with sensitive land uses.

5.4.4.2 Desired Regional Outcomes

The DROs are framed around the regional plan's 10 strategic directions. The DROs articulate the preferred direction for development and land use outcomes in the region. Each DRO is supported by a set of principles, policies and programs that are intended to manage the region's growth to 2031. The DRO principles are provided in **Appendix F**. The principles and policies guide state and local governments in the formulation of policies and planning documents, such as planning schemes.

The MIW Regional Plan was prepared prior to the release of the SPP in July 2017. The relationship between some of the MIW Regional Plan land use polices (DROs, principles and policies) and the state interest policies in the SPP is therefore outdated. The SPP guidance material *Integrating state interests in planning schemes – guidance for local government* supports local governments in their plan-making role by providing a table (see **Appendix G**) listing the:

- regional plan land use planning policies to be given effect through the local planning scheme
- primary state interest supported by the regional plan land use planning policies.

5.4.4.3 Regional land-use categories

The State Planning Regulatory Provisions (SPRP) are included in the MIW Regional Plan. The SPRP includes a regional land-use map that indicates areas which are to be protected as regional landscape and rural production areas (RLRPA) or rural living areas (RLA), and areas which are designated as Urban Footprint. These allocations have informed the current settlement pattern.

The RLRPA identifies land with regional landscape, rural production or other non-urban values. The RLA generally comprises rural residential locations under local planning instruments or other similar areas.

The Urban Footprint identifies land that is expected to meet the region’s projected urban development needs to 2031. The Urban Footprint is a representation of:

- large urban communities, other communities recognised as being affected by growth pressures, and other areas recognised as the preferred locations for future growth
- lands surrounded by existing or proposed urban development, but which may not be an appropriate location for development (for example, floodplains and conservation parks).

The SPRP are used to provide assessment benchmarks for certain development in the region, however these have been superseded and are no longer given effect under the Planning Regulation.

5.4.5 Local planning

5.4.5.1 Plan making

The Mackay Planning Scheme commenced on 9 November 2020. The scheme appropriately integrates all aspects of the SPP. The scheme, specifically the strategic framework, also appropriately advances the MIW Regional Plan.

5.4.5.1.1 Mackay Planning Scheme

The planning scheme includes:

- the strategic framework
- the LGIP
- tables of assessment
- zones
- local plans
- overlays
- development codes
- schedules and appendices (including definitions, mapping, notations, designations and planning scheme policies).

5.4.5.1.2 Strategic framework

The strategic framework sets out the policy intent for the planning scheme and comprises the strategic intent and eight themes (each with outcomes, elements and land use strategies).

The strategic intent for the region is provided through:

- the regional strategic vision
- growth management and urban consolidation
- a network of centres and industrial areas.

The regional strategic vision for the Mackay region as Central Queensland's agricultural and mining services hub is that it is sustainable, vibrant and prosperous. Its economy is underpinned by nearby coal mining, associated industries and resource exports, agricultural production, tourism development, the supply of household goods and retail activity, and a growing services sector and marine related activities.

The region provides a safe living environment; is resilient against natural hazards and climate change impacts and provides a diverse economy and range of employment opportunities. Sustainable growth management protects natural areas and supports a resilient natural environment for future generations. The appreciation, presentation and conservation of the land’s natural condition and cultural values is encouraged through land use planning.

The strategic intent specifically references the priority port stating:

> 'The ‘Priority Port’ of Hay Point and Mackay are developed as key regional economic infrastructure under the *Sustainable Ports Development Act 2015*. The Port of Mackay, including transport infrastructure corridors, is protected from incompatible development that limits its function as an export and import port in support of the regional economy. Mackay Marina performs an important leisure and tourism function. The Port of Hay Point, including transport infrastructure corridors, is appropriately buffered and protected from incompatible development enabling port development and export expansion.'

In relation to the network of industrial areas in the region, the strategic intent addresses industrial development at the port:

> 'High impact industrial areas are directed away from sensitive land uses to minimise the impacts on residents and the natural environment. Industrial areas are protected from encroachment by sensitive land uses and incompatible non-residential uses, which extend to the protection of industrial activity and operation of strategic ports. The built form of industrial areas provides high quality design outcomes that include landscaping and avoids buildings being visually overbearing.'

The policy intent of the Mackay Planning Scheme is established through the eight themes of the strategic framework. The Mackay Planning Scheme provides support for the role and growth of the priority port across these themes and more specifically under the themes of settlement pattern, transport, infrastructure and strong economy. A summary of the themes in this context is given in **Appendix H**.

5.4.5.1.2 Zone and overlay codes

SPL is not subject to a local planning instrument under the Planning Act. The Mackay Planning Scheme currently identifies SPL within the special purposes zone.

The detailed planning requirements set out in the planning scheme further support development of the priority port and protect it from encroachment by incompatible uses, as well as manage potential impacts from port-related development on adjoining land and sensitive land uses.

Development at the Port of Hay Point is largely constrained on three sides by environmental values and coastline. The planning scheme includes land near Hay Point in the township, rural residential, rural, open space and conservation zones (see **Figure 9**).

Opportunities for port-related development surrounding the Port of Mackay are constrained by established residential and industrial areas (see **Figure 10**). The planning scheme relies on almost all its zones to manage development proposals surrounding the Port of Mackay and Mackay Marina (the zones that are not in immediate proximity to the port are the principal, major, district and neighbourhood centre zones, specialised centre zone and township zones).

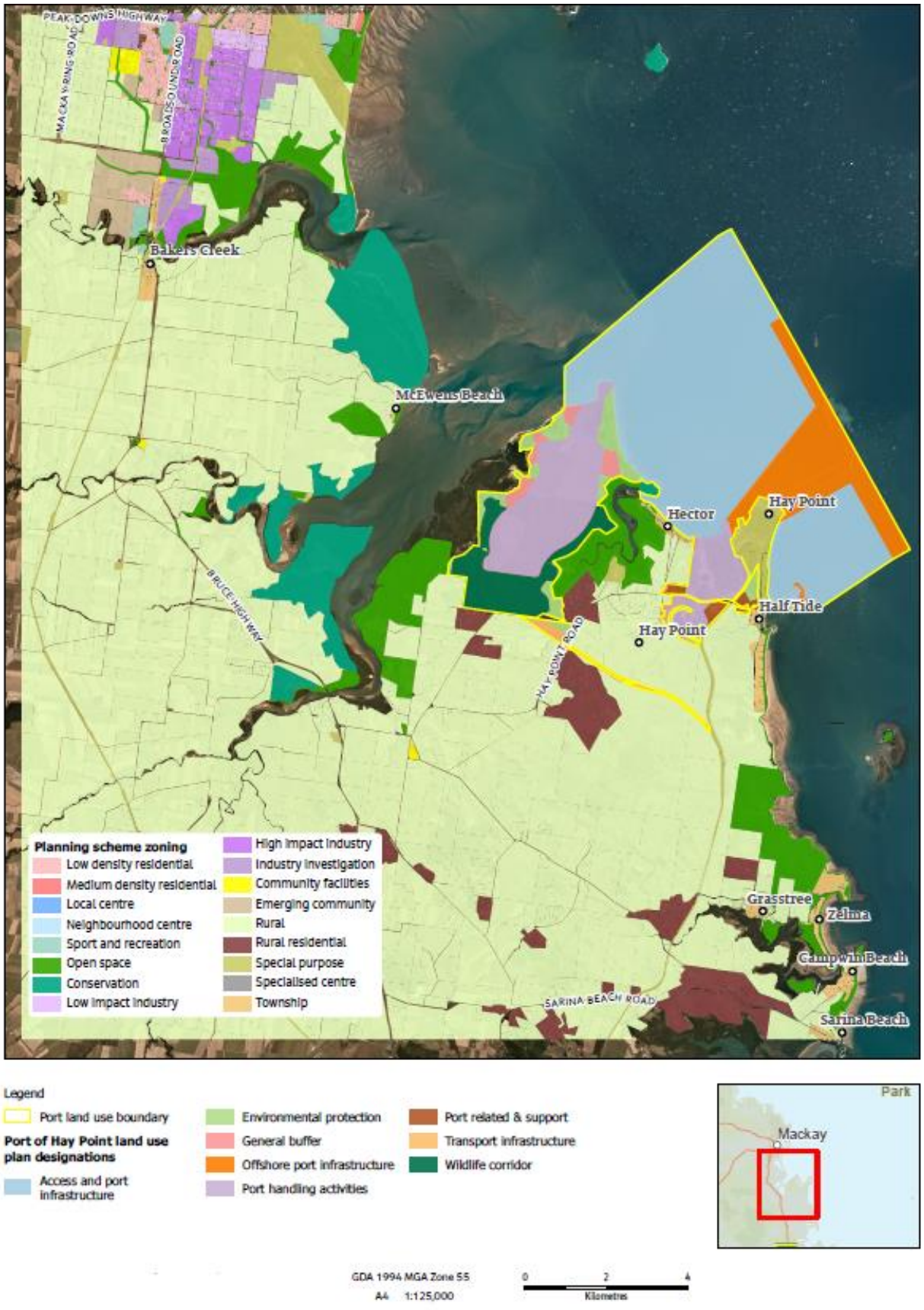

Figure 9: Planning scheme zoning in the Port of Hay Point

Figure 10: Planning scheme zoning in the Port of Mackay

The overlay codes provide an additional layer of assessment to manage specific risks across the study area. These relate to natural hazards, heritage, amenity and scenic values, biodiversity, the airport and extractive resources. Land around the port is affected by all overlays in the planning scheme,

Details of the planning scheme zones and overlays are provided in **Appendix I** and **Appendix J.**

5.4.5.1.3 Development codes

Development codes in the planning scheme may apply to the assessment of certain development proposals near SPL such as the Industry Activities Code, the Ship-Sourced Pollutants Reception Facilities in Marinas Code or the General Development Requirements Code.

5.4.5.1.4 Planning scheme policies

There are currently 14 planning scheme policies:

- Bushfire protection v.1.0
- Constructed lakes v1.0
- Cycleway facilities and pathway design v1.1
- Geometric road design v1.0
- Healthy waters v1.0
- Landscape v1.1
- Open space v1.1
- Pavement design v1.1
- Quality assurance requirements for design v1.0
- Site regrading v1.1
- Stormwater drainage design v1.1
- Structures - bridge design v1.1
- Subsurface drainage design v1.1
- Water and sewerage (Cairns Townsville Mackay Water Alliance) v1.0.

5.4.5.1.5 Local government infrastructure plans

LGIPs form part of a local government's planning scheme and identifies the local shared infrastructure needed to support planned urban development in the local community. The LGIP must be prepared in accordance with the Planning Act and the MGR.

LGIPs are required if a local government intends to levy infrastructure charges or impose development conditions for trunk infrastructure on development approvals.

Under the Planning Act, a local government may impose conditions about the provision of necessary trunk infrastructure. Where a development is out-of-sequence or inconsistent with the planning assumptions of the LGIP, or where a development is located outside the local government's priority infrastructure area, an applicant may be liable for extra costs imposed through an extra payment condition.

The MRC LGIP is incorporated into the current planning scheme and comprises:

- planning assumptions about future growth and urban development including the assumptions of demand for each trunk infrastructure network
- priority infrastructure area to accommodate growth to 2031
- desired standards of service for trunk infrastructure networks (water supply, sewerage, stormwater, transport, parks and land for community facilities)
- plans for existing and future trunk infrastructure.

Development for urban purposes is expected to align with the planning assumptions of the LGIP and should be appropriately sequenced.

If a local government has an LGIP in place, the local government is required to adopt an infrastructure charges resolution to levy infrastructure charges. *Mackay Regional Council - Adopted Charge Resolution 2020* took effect on 14 December 2020 and applies to the whole MRC area.

Future trunk infrastructure identified by the LGIP for Hay Point (**Figure 11**) and Mackay (**Figure 12**) as outlined within the planning scheme, including the estimated timing for delivery is listed in **Appendix K**. Only minor LGIP infrastructure is planned at the port.

Figure 11: Planned Trunk Infrastructure – Local Government Infrastructure Plan – Hay Point

Figure 12: Planned Trunk Infrastructure – Local Government Infrastructure Plan - Mackay

5.4.5.2 Planning scheme amendment package

MRC is proposing changes to a broad range of planning scheme provisions, to ensure the region continues to prosper and the Mackay Planning Scheme remains effective and contemporary. Amendments to the planning

scheme will ensure planning decisions continue to reflect principles and standards developed with community input.

The proposed amendment is following the major amendment process required in the MGR. MRC endorsed the amendment package to progress to State Interest Review 2022 and the package is currently with the Queensland Government for Ministerial approval prior to the commencement of public consultation.

Amendments are also proposed to Planning Scheme Policy – Bushfire, which follows the Planning Scheme Policy amendment process.

5.4.5.3 Development assessment

MRC has assessed a number of development applications for relating to MCU to industrial or sensitive uses within 5km of the port since commencement of the Ports Act (**Figure 13** and **Figure 14**).

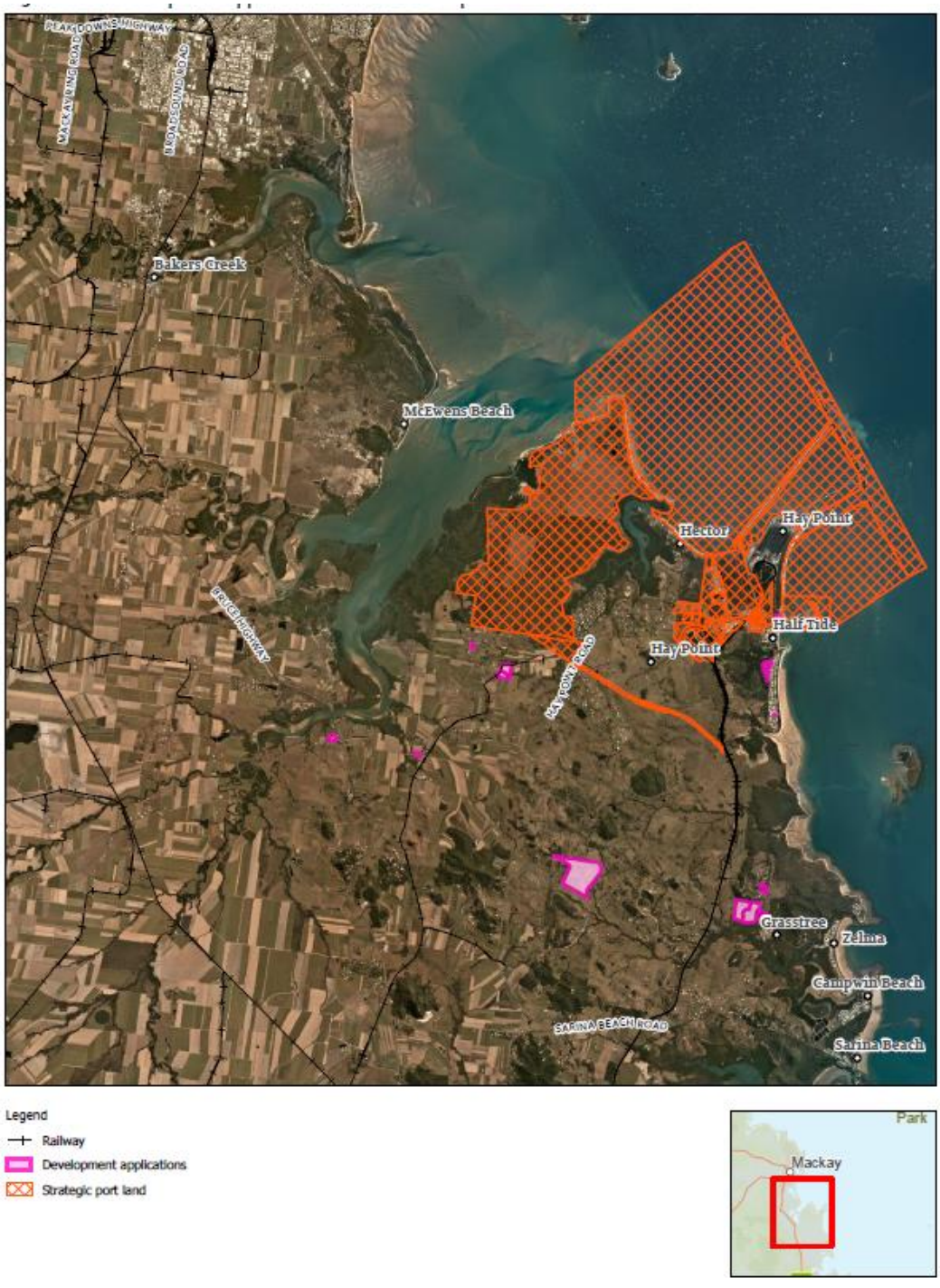

Figure 13: Mackay Regional Council Development Approvals within five kilometres of the Port of Hay Point

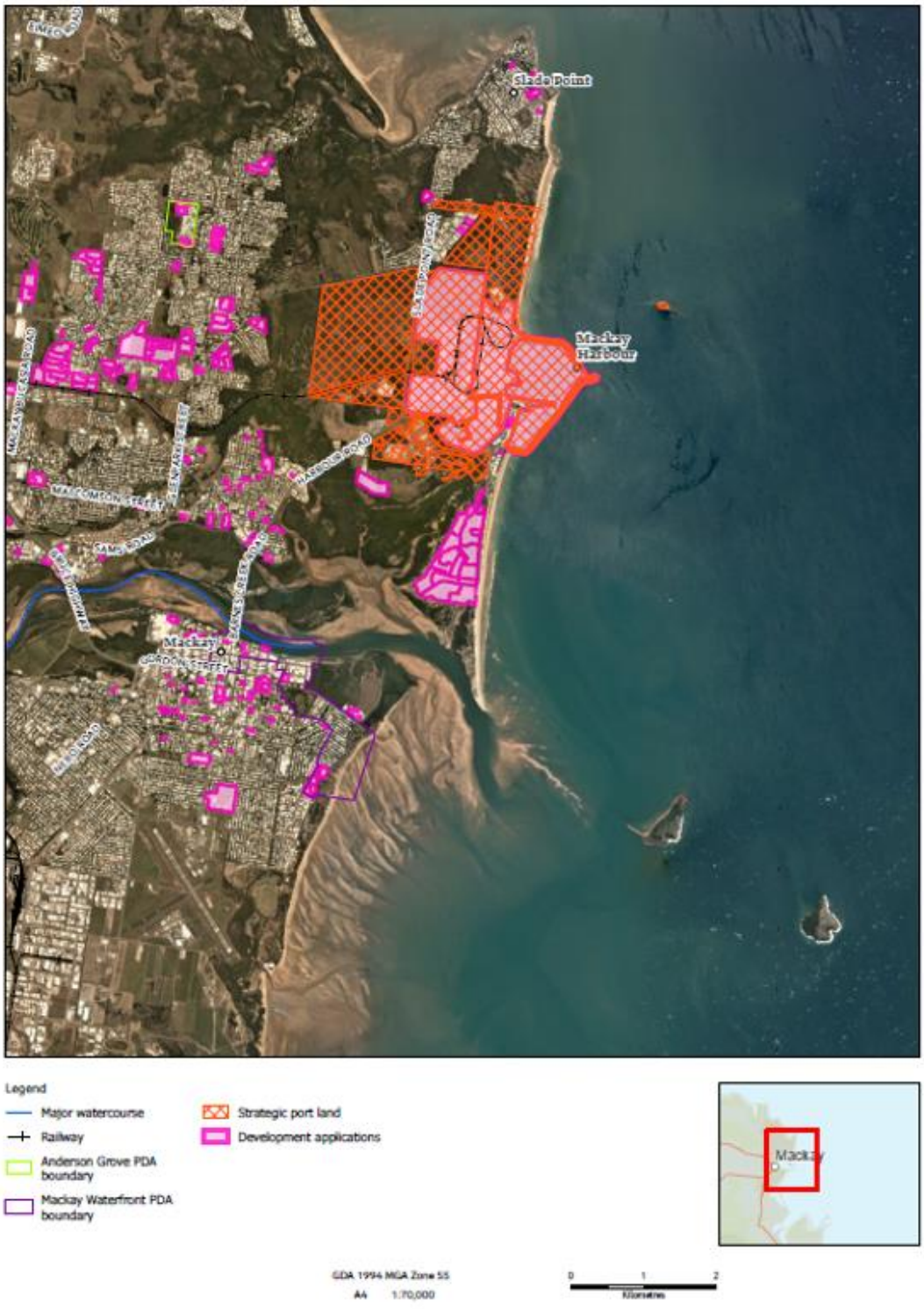

Figure 14: Mackay Regional Council Development Approvals within five kilometres of the Port of Mackay

Some development approvals for sensitive uses are close to industrial activities near each port, noted below:

Port of Hay Point

An extension to the Hay Point Hotel-Motel includes 15 additional one to two-bedroom cabins at 557 Grasstree Road, Sarina. No other development approvals are considered relevant to the port due to their use or proximity.

Port of Mackay

A retirement village located at Mackay Harbour (at 34-44 Mulherin Drive) was approved for 151 units by decision notice dated 16 February 2018 (DA-2017-79).

5.5 *Regional Planning Interests Act 2014*

The RPI Act and RPI Regulation work alongside the Planning Act and Planning Regulation to strike an appropriate balance between protecting priority land uses and delivering a diverse and prosperous economic future for our regions. The RPI Act also gives effect to the policies about matters of state interest in regional plans.

The RPI Act identifies and protects areas of regional interest throughout Queensland. Its aim is to:

- manage the impact of resource and regulated activities on areas of regional interest
- support these activities with other activities, such as highly productive agricultural activities
- assist in resolving land use conflict between activities which contribute to the state's economy.

There are four areas of regional interest identified for their contribution to Queensland's economic, social and environmental prosperity:

- priority living areas
- priority agricultural areas
- SCAs
- strategic environmental areas.

SCA is an area of regional interest because it includes land that is, or likely to be, highly suitable for cropping due to a combination of the land's soil, climate and landscape features.

The SCA consists of areas shown on the SCL trigger map as SCL. SCL is land that may be suitable for cropping because of a combination of the land's soil, climate and landscape features. There are areas of SCL mapped within the study area.

5.5.1 Development assessment

Under the RPI Act, a Regional Interests Development Approval (RIDA) is required to carry out a resource activity or regulated activity in an SCA (mapped as SCL). Resource activities relate to resource authorities defined under the RPI Act, such as certain petroleum authorities under the *Petroleum and Gas (Production and Safety) Act 2004* or a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the *Petroleum (Submerged Lands) Act 1982*. There are currently no regulated activities defined in relation to SCA in the study area.

DOR makes and certifies the SCL trigger map. Amendments can be made to the SCL trigger map because of a RIDA, or because a SCL map amendment application successfully demonstrates that a SCL area needs correcting.

5.6 *Transport Infrastructure Act 1994*

The TIA seeks to achieve the effective delivery of transport infrastructure. The scope of TIA's objectives include integrated planning and efficient management of public marine transport infrastructure and transport infrastructure relating to ports.

The TIA provides for the establishment of port authorities to manage and operate port facilities and services, as well as make land purposes consistent with the operation of its port. The *Transport Infrastructure (Ports) Regulation 2016* prescribes NQBP as the port authority for the priority Port of Hay Point/Mackay.

In relation to port development, the TIA sets out the process for the preparation and approval of land use plans. A land use plan is a statutory instrument and relates to port authority land that is on or near the interface between the land and the waters within the limits of the port.

5.6.1 Plan making

The TIA requires a port authority to review its land use plan at least every eight years. A land use plan must specify details of:

- the port authority's SPL
- land the port authority proposes to become SPL
- current and proposed uses of the land
- coordinate and integrate the core matters, which under the TIA are defined as land use and development, port facilities and valuable features
- identify desired environmental outcomes (DEOs) for the land
- include measures that will help achieve the DEOs.

Under the TIA, the Transport Minister may approve a land use plan if satisfied it meets a range of requirements set out in the TIA, including that the draft plan will not adversely affect state interests (as defined under the Planning Act, Schedule 2) and that if the port is in master planned area, it is consistent with the port overlay.

5.6.1.1 Land use plan

Port of Hay Point

The land use plan provides details of SPL for the Port of Hay Point, and development on SPL must comply with the requirements of the land use plan. A set of development guidelines for the land use plan support NQBP in its role as assessment manager for development applications.

The land use plan sets out DEOs that provide the overall vision for the priority Port of Hay Point. The DEOs address economic development, community wellbeing and ecological processes (see **Table 5**). All aspects of the land use plan are based on these DEOs and contribute to their achievement.

Table 5: Port of Hay Point Land Use Plan - Desired Environmental Outcomes

Component	Desired Environmental Outcomes
Economic development	• the future strategic intentions of the port will be documented, including the potential development of new port facilities at Dudgeon Point • capital will continue to be invested into the port facilities to maintain the port as a world class facility and to capitalise on the coal export opportunities in the Bowen Basin • the port will provide regional employment opportunities in its ongoing operations and management as well as during development and construction periods • the development of port related industries and activities in appropriate locations on SPL is facilitated • land will be retained and acquired that is strategic to the future operations and development of the port • port uses will be consolidated to provide cost effective infrastructure • NQBP will actively liaise with infrastructure providers and planners, including the MRC, DSDILGP, TMR, Queensland Rail and Ergon/Powerlink, regarding the provision of services and infrastructure to the port • sustainable technologies will be incorporated into port development to decrease long-term operating costs and reduce the environmental footprint.

Component	Desired Environmental Outcomes
Ecological processes	• protection of the port environment, including ecological values, is to be achieved through pro-active management • sustainable environmental management is to be promoted and incorporated into all aspects of port planning, development and operations at the port • the coastal environment and associated values are protected through responsible and ecologically sustainable development • development on port land does not significantly affect the environmental values of identified areas with high conservation significance including the GBRMP and adjacent Mount Hector Conservation Park • climate change assessment will form part of the design of projects on SPL, as appropriate • the potential cumulative impacts resulting from the development of the whole of the port (including individual terminals) are measured as part of assessments of major port expansions to ensure continued sustainability is provided. • buffer areas with aesthetic and conservation values are maintained between port facilities and areas adjoining the SPL.
Community wellbeing	• community amenity forms an essential part of design considerations and potential impacts from port development and operation • port operations prioritise the safety and security of all visitors and employees accessing port land • NQBP will work with MRC to ensure port operations are separated where possible from sensitive receiving environments (such as residential) • NQBP will continue to manage and protect Indigenous cultural heritage values on port land with Traditional Owner involvement • public boating access will continue to be allowed where consistent with safety and security regulations • multi-modal transport options will form part of future terminal planning • NQBP will continue to maintain and enhance its relationship with the community and MRC, to provide transparency for planning and development at the port.

The land use plan includes a land use plan designation map which establish the intent and preferred uses across the port's SPL (see **Figure 15**). The land use plan also identifies potential future SPL within the jurisdiction of MRC. These seven designations reflect the diversity of the port's operations and support its future growth:

- **Port Handling Activities** – land that is strategic to the existing and future operations and development of the port
- **Offshore Port Infrastructure** – essential structures or infrastructure for vessels accessing the port and the transfer of materials/goods for shipment
- **Access and Port Infrastructure** – areas are located below the high-water mark and currently provide access to port infrastructure for operational, maintenance and construction purposes
- **Port Related and Support** – within this designation is to accommodate activities that have a strong physical, operational or supporting role to the core operations in the port handling activities area
- **Transport Infrastructure** – land within this designation is to accommodate future transport corridors and infrastructure that provides access to the port
- **General Buffer** – represents a physical buffer to areas surrounding the port
- **Environmental Protection** – land that exhibits recognised ecological and/or cultural heritage values that are to be protected, managed and enhanced.

The details of each precinct are provided in **Appendix L**. The precincts respond to the intent of the local government planning scheme, NQBP objectives and the operational needs of the port.

The preferred uses described for each precinct is indicative and not intended as an exhaustive list. Specific development proposals are assessed on a case-by-case basis in accordance with the intent of the land use plan, its precincts, development guidelines and any applicable Memorandum of Understanding protocols for example, for land where NQBP does not manage planning and development.

Port of Mackay

The land use plan provides details of SPL for the Port of Mackay, and development on SPL must comply with the requirements of the land use plan. A set of development guidelines for the land use plan support NQBP in its role as assessment manager for development applications.

The land use plan sets out DEOs that provide the overall vision for the Port of Mackay. The DEOs address economic development, community wellbeing and ecological processes (see **Table 6**). All aspects of the land use plan are based on these DEOs and contribute to their achievement.

Table 6: Port of Mackay Land Use Plan – Desired Environmental Outcomes

Component	Desired Environmental Outcomes
Economic development	• the Port of Mackay is commercially viable and returns profits to the Queensland Government including taking advantage of the opportunity to add value to the traditional port business activity by realising the development opportunities of port land not required in the short-medium term • capital investment continues to be directed towards port facilities and will be used efficiently and effectively in future land use and development decision making • infrastructure and capabilities are provided to meet customer needs • land use planning responds to changes in user demands, regional factors and global markets • land is identified and will be available for the long-term needs of the port's operations • industrial, commercial and other port related industries and activities are accommodated at appropriate locations within SPL • the Port of Mackay contributes to the local, regional and state economy and provides employment opportunities locally and beyond.
Ecological processes	• NQBP is committed to managing and developing the Port of Mackay in an ecologically sustainable manner • NQBP will lead change by integrating environmental considerations into all aspects of strategic planning, business decision making and operations • operations will be undertaken in accordance with best practice and will incorporate energy efficiency principles and water sensitive design techniques • open space and environmental buffers identified will be managed for conservation • measures to manage ecological (such as cultural heritage, biodiversity and coastal resources), environmental (including water and air quality) and amenity (both visual and environmental, that is, noise emissions) considerations are developed and adopted as part of development approvals • environmental management plans are continually updated and implemented.
Community wellbeing	• NQBP will be a community and civic leader and operate in a socially responsible manner • port operations will be conducted in a safe and environmentally responsible manner • development will be responsible, sustainable and have regard to land uses and land use planning for surrounding lands • public access will continue to be provided to waterfront and buffer areas where it does not compromise safety, security, operational or environmental values of the port • land use planning undertaken on SPL will not exacerbate noise and other impacts on residents and the community • long-term development of the Port of Mackay is to ensure it becomes an integral and inseparable element of the economy and culture of the Mackay region • enhanced community engagement is to be fostered through visible planning and decision-making processes, while executing legal and statutory obligations • NQBP will continue to work with the MRC to ensure land use planning at the interface of SPL and non-SPL is compatible and does not result in adverse amenity issues and impacts on SPL.

The land use plan includes a precinct map for its SPL. The land use plan also identifies potential future SPL within the jurisdiction of MRC.

The land use precincts establish the intent and preferred uses across the port's SPL (see **Figure 16**).

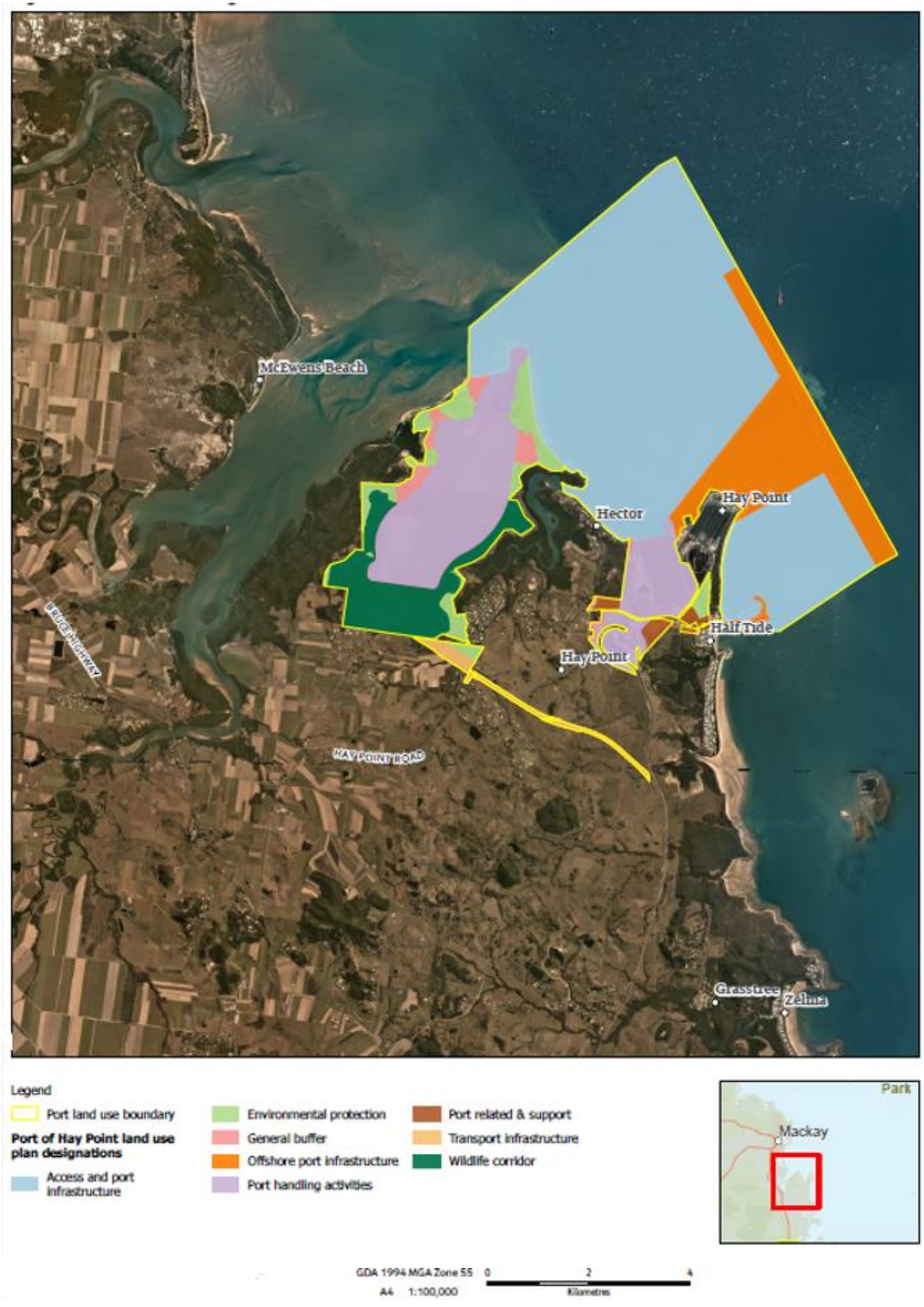

Figure 15: Land use plan precincts for the Port of Hay Point

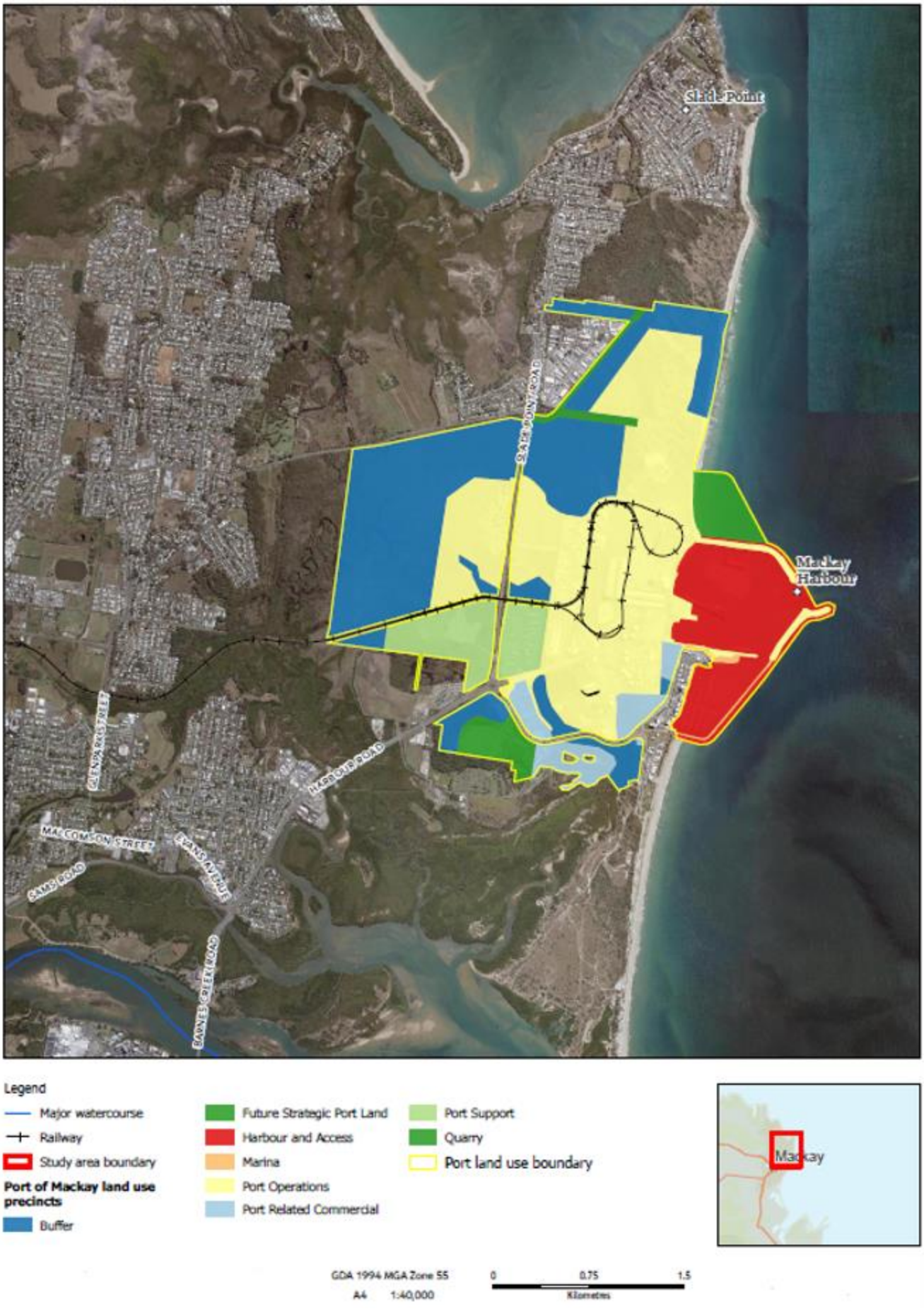

Figure 16: Land use plan precincts for the Port of Mackay

These seven precincts reflect the diversity of the port's operations and support its future growth.

- **Port Operations** – land for existing or future primary users and core port operations
- **Harbour and Access** – incorporates port limits including offshore areas and associated onshore land required for harbour operations
- **Port Support** – activities aligned with and complementary to the operations at the port
- **Port-related Commercial** – typically land along the primary access road (Ron Searle Drive and Mulherin Drive) into the Marina
- **Marina** – includes the limited onshore and harbour facilities around the Mackay Marina which is SPL and the marina basin
- **Quarry** – the existing quarry site
- **Buffer** – primarily includes lands to the north and west of the core port areas.

The details of each precinct are provided in **Appendix L**. The precincts respond to the intent of the local government planning scheme, NQBP objectives and the operational needs of the port.

The preferred uses described for each precinct is indicative and not intended as an exhaustive list. Specific development proposals are assessed on a case-by-case basis in accordance with the intent of the land use plan, its precincts, development guidelines and any applicable memorandum of understanding protocols for example, for land where NQBP does not manage planning and development.

5.6.1.2 *Sustainable Port Development Guidelines*

The *Sustainable Port Development Guidelines*[11] are a non-statutory component of the land use plan that provide a set of development codes and criteria for assessing development proposals on SPL. The development guidelines set out NQBP's port development approval process as well as objectives and requirements for:

- building design and visual amenity
- site layout, traffic management and parking
- sustainable design
- landscaping
- signage, lighting, fencing and security
- infrastructure and services
- environmental management
- heritage protection
- marine infrastructure and tidal works.

The development guidelines also identify works that are exempt from certain NQBP approvals.

5.6.2 Development assessment

Under the TIA, SPL is not subject to a local planning instrument under the Planning Act for example, the Mackay Planning Scheme. However, the Planning Regulation may require a development proposal on SPL or in SPL tidal waters to be assessed against a land use plan prepared under the TIA.

Development made assessable by the land use plan, or development that is a MCU inconsistent with the land use plan (and a priority port overlay does not state that the development is accepted development or prohibited development), is assessable development and must be made to the port authority as assessment manager.

A development application for prescribed assessable development within port limits on land below high-water mark, is required by the Planning Regulation to be made to MRC as assessment manager and referred to the

[11] North Queensland Bulk Ports Corporation Limited. (2018). *Sustainable Port Development Guidelines.* NQBP. Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0016/2680/Revision-3-Sustainable-Port-Development-Guidelines-20180312.pdf

Chief Executive Officer of the port authority as a referral agency. The Chief Executive Officer's assessment must be against the functions of a port authority set out in the TIA.

5.6.2.1 Development approvals

Port of Mackay

NQBP has issued four development approvals relating to industrial uses since the commencement of the Ports Act. Further details are provided in **Table 7**.

Table 7: Recent development permits on Strategic Port Land

Development	Reference Number	Decision Date	Property	Address
MCU – Fertiliser Batching Plant ERA 7(4)(a) – Chemical Manufacturing	PL/04/02/00015	11/03/2021	Lease B on RP886042 in 10SP258646	2 Presto Avenue Mackay Harbour QLD 4640
MCU – ERA (ERA 50(1)(a) Bulk material handling)	PL/04/02/00008	26/02/2019	63SP143358	Harbour Road Mackay Harbour QLD 4740
MCU – ERA (ERA 50(1)(a) and 50(2) Bulk material handling)	PL/04/02/00008	14/11/2018	58SP123751	George Bell Drive Mackay Harbour QLD 4740
MCU – Waste Management Facility ERA 62 waste transfer station operation ERA 58 regulated waste treatment	PL/04/02/00001	1/09/2016	10SP258646	103 Spiller Avenue Mackay Harbour QLD 4740

5.6.2.2 Port Notice and Port Development Approval

Under the TIA, a port authority may display or publish a port notice with the effect of controlling activities or conduct in its port area if it considers the port's operation may be affected, or damage may be caused to SPL or the environment. Purposes for controlling activities or conduct include to:

- maintain or improve the safe, secure or efficient operation of its port
- maintain fair or reasonable access to port facilities for users of its port
- move or moor ships within its port area
- manage controlled activities
- prevent damage to SPL
- prevent damage to the environment.

For the above list, the TIA defines controlled activities as being activities in relation to tug services, refuelling operations or certain works on ships.

If the port authority decides to regulate a controlled activity by issuing a port notice, the TIA provides the mechanism for the activity to require approval by the port authority. For the priority Port of Hay Point/Mackay, NQBP requires all works in the port area be approved through this port notice process. NQBP refers to this process as their port development approval process.

Where NQBP requires works to be assessed through the port development approval process as well as the DA process under the Planning Act, it will issue two approval documents. This is because the Planning Act requires conditions of a development approval to meet certain requirements that are different to the requirements NQBP may wish to apply under a port development approval in its capacity both as landowner and port authority for example, commercial, operational or security requirements. The NQBP port development approval process is described in more detail in their *Sustainable Port Development Guidelines*.

5.7 State Development and Public Works Organisation Act 1971

Under the SDPWO Act, the CG has wide-ranging powers to plan, deliver and coordinate large-scale projects, while ensuring their environmental impacts are properly managed. These powers include:

- declaring a project to be a coordinated project and coordinate the IAR of the project
- recommending the declaration of a project as a prescribed project
- recommending the declaration of a SDA and managing land use within the SDA
- acquisition of land or easements
- other measures the CG thinks are necessary.

5.7.1 Coordinated projects

Proponents of a project may apply to have it declared a coordinated project by the CG. Coordinated projects are generally large scale and may involve:

- complex approval requirements
- involving federal, state and local governments
- significant environmental effects, strategic significance to the locality, region or state, including for the infrastructure, economic and social benefits, capital investment or employment opportunities it may provide
- significant infrastructure requirements.

A declaration does not exempt the project proponent from requiring appropriate development approvals or from compliance with relevant planning and environment laws and planning instruments.

Coordinated projects require either an EIS or an IAR. An EIS is a rigorous and comprehensive IAR, involving whole-of-government coordination and public consultation. The IAR process is a more focused form of environmental assessment. The IAR can be used when the environmental effects of a project do not require assessment through the EIS process.

5.7.2 Prescribed projects

A prescribed project is one that is generally of economic and social significance to the state or part of the state. Public interest and potential environmental effects may be key factors in the decision to make a declaration.

If a prescribed project is considered to be 'critical or essential' for economic, social or environmental reasons to Queensland, it may be declared a 'critical infrastructure project'.

The purpose of declaring a prescribed project is to overcome any unreasonable delays in obtaining project approvals. The declaration enables the CG to intervene in the approvals process to ensure timely decision making for the prescribed project.

Declared prescribed projects may include:

- works a person is directed to undertake under the SDPWO Act
- a project in a SDA
- an infrastructure facility (as defined in the SDPWO Act)
- a coordinated project
- another project the State Development Minister considers is economically or socially significant to Queensland or the region in which the project is to be undertaken or affects an environmental interest of Queensland or a region.

5.7.3 State Development Areas

SDAs are clearly defined areas of land established by the Governor-in-Council to promote economic development in Queensland. Each SDA is subject to a development scheme which is a regulatory document that controls land-use and infrastructure planning and development in the SDA. There are no SDAs in the study area for the priority Port of Hay Point/Mackay.

5.7.4 Other powers of the Coordinator-General under the *State Development and Public Works Organisation Act 1971*

The CG may acquire land or easements for:

- authorised works
- works included in a program of works or approved development scheme
- works to be undertaken by a local body or a department of the Queensland Government
- purposes including establishment of industry, essential services or infrastructure corridors in SDAs
- a private infrastructure facility (such as a road, railway, bridge or other transport facility; electricity generation, transmission or distribution facilities; oil or gas storage, transmission or distribution facilities).

Other powers of the CG make provision for:

- authorisation to raise or lower the level of water in any body of water or take, divert or use the water in any body of water
- powers for works on foreshores and under waters.

5.8 *Economic Development Act 2012*

EDQ leads and delivers infrastructure and property projects for Queensland's economic benefit, and also drives a range of development projects. EDQ operates under the ED Act.

EDQ works to identify specific areas of land for development called PDAs. PDAs are parcels of land within Queensland identified for development to deliver significant benefits to the community. The Minister for EDQ may declare a PDA under the ED Act. Once a PDA is declared, EDQ may undertake the assessment of development applications within the PDA.

5.8.1 Plan making

When a PDA is declared, EDQ works closely with local government and other stakeholders to plan, assess and guide development within a PDA. Under the ED Act there are two types of development instruments:

- interim land use plan (ILUP)
- development scheme.

An ILUP is in place generally up to 12 months after the declaration of a PDA, until the overarching plan for the area (the development scheme) is approved by the Minister for EDQ.

A development scheme is a statutory instrument and may provide for any matter that Minister for EDQ considers will promote the proper and orderly planning, development and management of the PDA.

Under the ED Act, a development scheme must include:

- a land use plan regulating development
- a plan for infrastructure
- an implementation strategy to achieve the main purpose of the Act to the extent it is not achieved by the land use plan or the plan for infrastructure.

In preparing a development scheme, the Minister for EDQ must consider any relevant state interests and any applicable planning requirements under a planning instrument, assessment benchmarks prescribed by the Planning Regulation or assessment benchmarks made under another Act for the Planning Act.

Under the ED Act, if there is a conflict between the development scheme and a planning instrument, or assessment benchmarks prescribed by regulation under the Planning Act, the development scheme prevails to the extent of any inconsistency.

5.8.2 Development assessment

Under the ED Act, there is no statutory state agency referral process, and appeal rights for DA decisions are more limited than under the Planning Act. In place of the statutory referral process, the Minister for EDQ delegates are required to consider state interests when making a decision on a PDA development application.

All PDA development applications are assessed against the development scheme for the PDA, unless an ILUP is in place. A development scheme or ILUP may cite other standards and documents.

EDQ may seek advice from independent technical specialists, request additional information from the applicant and, in some instances, obtain local community feedback through notice of the application.

The Planning Regulation prohibits the Mackay Planning Scheme from making PDA-related development assessable under the Planning Act.

5.8.3 Priority development areas

There are no PDAs in the Port of Hay Point study area. There are two PDAs in the Port of Mackay study area.

5.8.3.1 Mackay Waterfront Priority Development Area

The Mackay Waterfront PDA was declared in 2018 for an area of 172ha at the request of MRC. It was created to facilitate the redevelopment of public spaces along the Pioneer River and Binnington Esplanade waterfronts, establish an innovation and knowledge-based industries precinct, and promote the city centre as a key business and investment hub. The PDA is near Mackay Airport, major road infrastructure (the Bruce Highway and Peak Downs Highway) and the diverse range of cultural and recreational facilities in the Mackay Central Business District (CBD). The PDA is approximately 3km south of SPL at the Port of Mackay and 10km north west of SPL at the Port of Hay Point.

The Mackay Waterfront PDA Development Scheme became effective on 24 May 2019 and regulates planning, carrying out, promoting, coordinating and controlling land development within the PDA.

MRC assesses development applications for this PDA. All development applications in the PDA are assessed against the development scheme under the ED Act. The assessment process takes 40 business days but may take longer if there is a requirement for additional information or public notice of the application.

There are nine state-listed and 50 local-listed heritage places identified in the PDA. These heritage places will be preserved and re-purposed with a range of uses that complement and enhance the existing character of the Mackay City Centre.

The development scheme identifies PDA accepted development, PDA assessable-permissible and PDA assessable-prohibited development. It sets out PDA-wide criteria for:

- built form and urban design
- diverse urban environment
- movement, access and transport network
- public realm
- community safety and development constraints
- infrastructure
- heritage.

The development scheme defines five precincts in the PDA (see **Figure 17**) each supported by a precinct development intent, development criteria, precinct framework plans and categories of assessment.

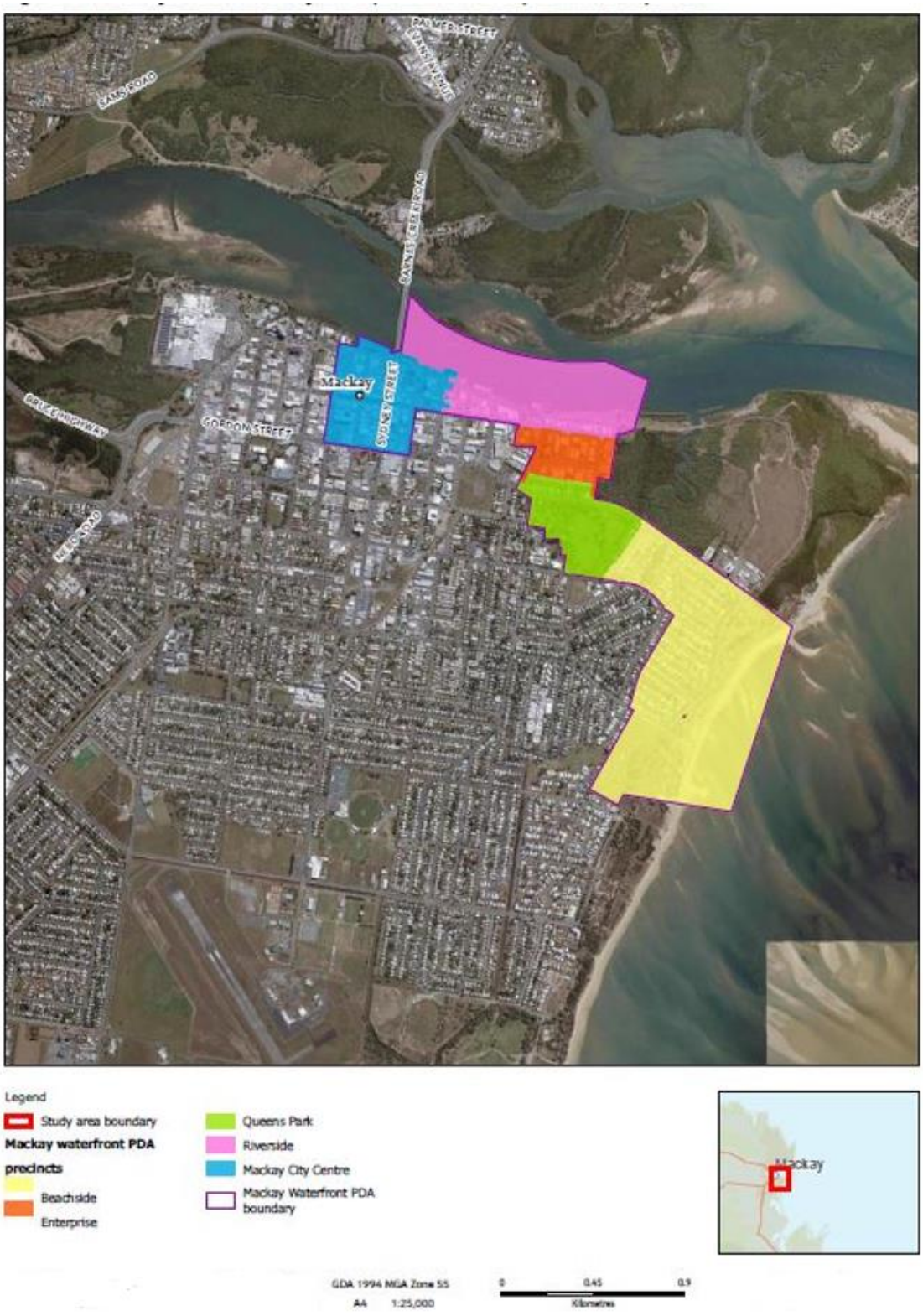

Figure 17: Mackay Waterfront Priority Development Area precincts

The five precincts are:

- **Mackay City Centre** – a vibrant, accessible and engaging place for people to live, learn, work and play, and is the primary business, administration and employment centre for the region
- **Riverside** – a new and distinctive waterfront destination on the southern bank of the Pioneer River, extending between Sydney Street and the River Street boat ramp
- **Enterprise** – the innovation and knowledge hub, providing opportunities for shared working spaces, labour skills training, technology and products, with links to tertiary education and other institutions

- **Queens Park** – a regional activity and amenity node, supported by a diverse range of high-density living options
- **Beachside** – a new and vibrant beachside destination along Binnington Esplanade, extending between East Gordon Street and Kippen Street.

5.8.3.2 Andergrove Priority Development Area

The Andergrove Mackay PDA was declared in 2010 for an area of 22ha. It is an infill site close to existing open space, schools, local amenities and residential areas and was created to facilitate its redevelopment as a residential community. The PDA is located near the suburb of Beaconsfield approximately 5km north of the Mackay CBD and 2km north west of SPL at the Port of Mackay.

All development applications within the PDA are assessed by EDQ. Development applications are assessed against the development scheme.

The PDA development requirements are expressed through PDA-wide development criteria, a structure and zoning plan, zone intent, and assessment tables. The PDA (see **Figure 18**) is made up of two zones with different attributes and redevelopment opportunities specific to their location. Each precinct has a zone development intent and level of assessment tables.

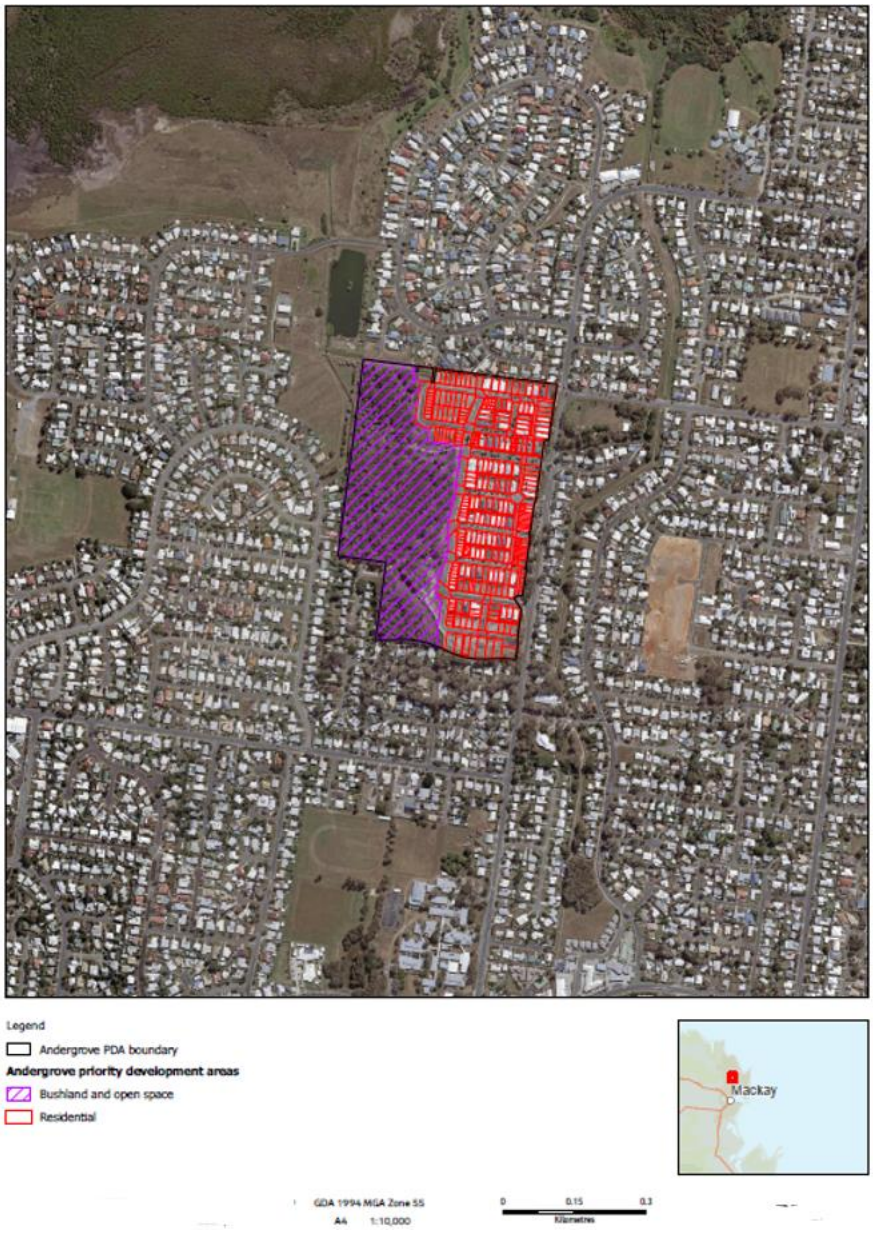

Figure 18: Andergrove Mackay Priority Development Area

The PDA now has approval for residential subdivision over multiple stages which commenced in 2011. The development is being delivered as the Woodlands Andergrove residential community comprising approximately

233 lots with up to 263 dwellings. The Woodlands Andergrove master plan includes 10ha of bushland reserve with walking and cycle paths throughout the community. EDQ and MRC are working with Mackay-based builder partners who are responsible for delivering the new homes Woodlands Andergrove.

5.9 Land use management measures

Regulatory instruments provide measures that manage potential impacts or values. This report has been based on a defined study area. For the purposes of this section, a more refined study area has been used to focus on potential impacts, threats and pressures more relevant in the context of port development.

A summary of the management measures relevant to land use planning is given in **Appendix M**.

5.10 Regulating activity in marine areas

5.10.1 Master planning in marine areas

The study area (see **Figure 19** and **Figure 20**) includes marine areas within port limits and a World Heritage Area protected by marine parks. Under the Ports Act, a master planned area for a priority port cannot include:

- an area covered by tidal water that is outside port limits
- an area within a marine park, even if the area is within port limits.

Only marine areas within port limits (or immediately adjoining port limits where the context is useful) are addressed below. Port limits are defined as part of the port area under the TIA. Managing activities within marine parks are discussed.

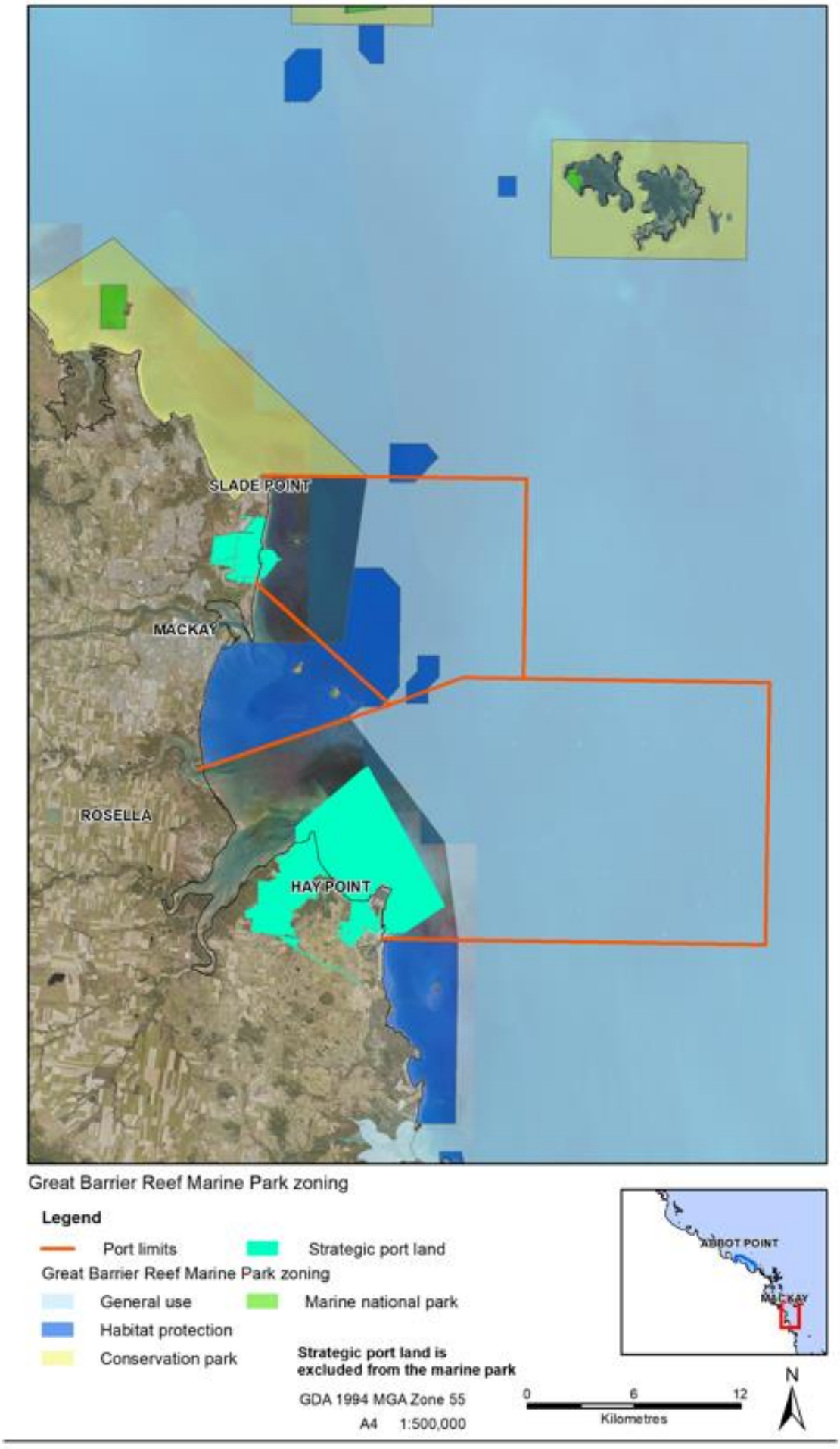

Figure 19: Port of Hay Point study area, Strategic Port Land, port limits, marine parks, Great Barrier Reef World Heritage Area boundary

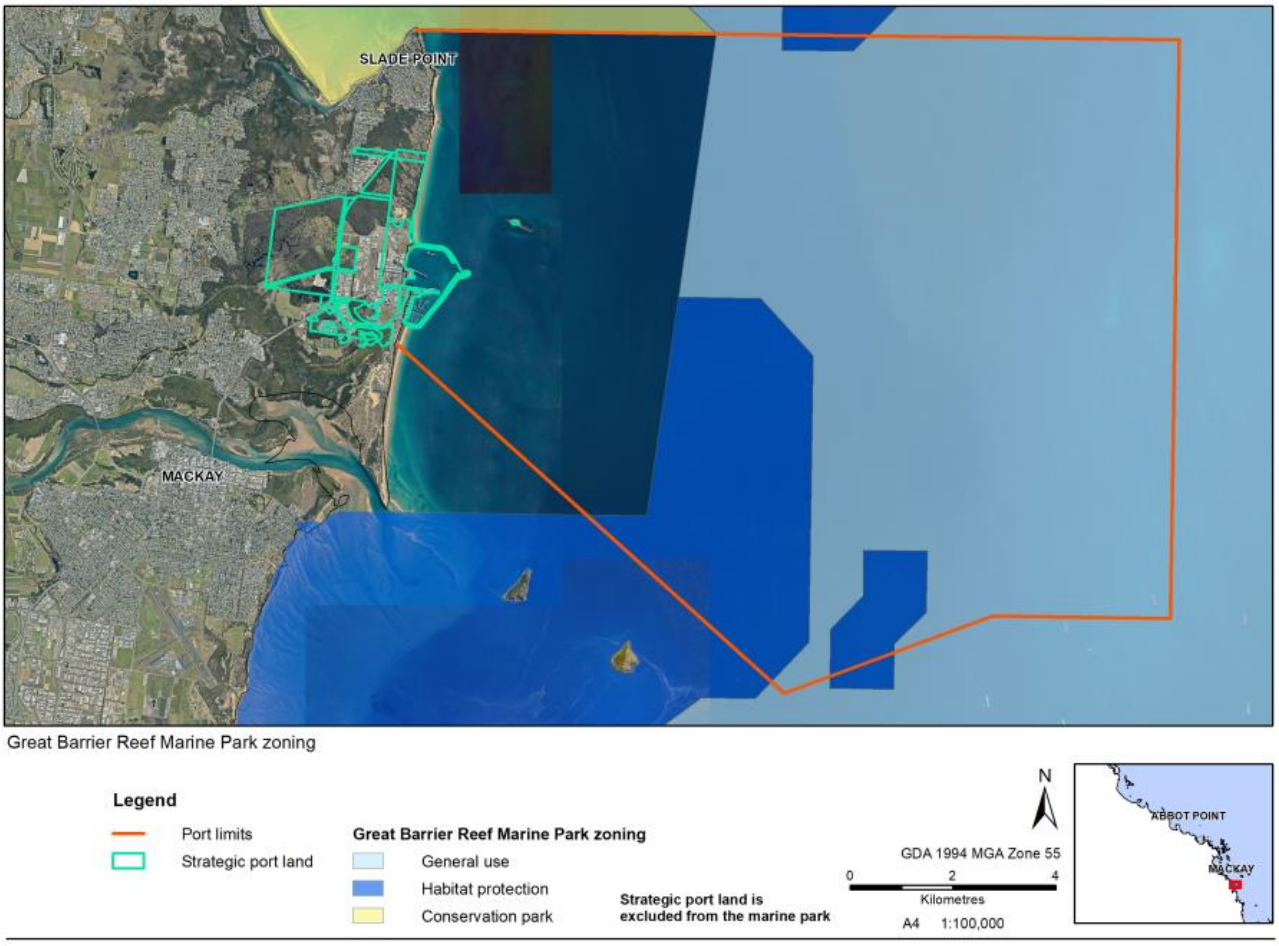

Figure 20: Port of Mackay study area, Strategic Port Land, port limits, marine parks, Great Barrier Reef World Heritage Area boundary

5.10.2 Marine areas

5.10.2.1 Port limits

Port limits are defined under the TIA. Port limits exclude land above the high-water mark but include navigable rivers or creeks flowing into the sea waters that are within the defined area of port limits. The Port of Mackay port area comprises SPL, port facilities and port limits.

5.10.2.2 Great Barrier Reef World Heritage Area

The GBR is the largest coral reef system in the world, extending over approximately 2300km from Cape York to just north of Bundaberg, and includes area from low water mark on the Queensland coast to beyond the edge of the continental shelf. It comprises deltaic reefs, ribbon reefs, lagoonal reefs, fringing reefs and planar reefs. It was declared a World Heritage Area in 1981 because of its OUV. This recognised the reef as being one of the most remarkable places on earth, as well as its global importance and its natural worth.

The GBRWHA is managed as a multiple-use area and uses include a range of commercial and recreational activities. The area is managed jointly by the Australian and Queensland Governments under the *Great Barrier Reef Intergovernmental Agreement 2015* and complementary legislation.

5.10.2.3 Marine parks

The *Great Barrier Reef Marine Park ZONING PLAN 2003* and the *Marine Parks (Great Barrier Reef Coast) Zoning Plan 2004* provide for ecologically sustainable recreational, commercial and research opportunities and continuation of traditional activities in the land and waters within the GBRMP and the GBR Coast Marine Park.

5.10.2.4 Outlook of the Great Barrier Reef

The delivery of the *Great Barrier Reef Outlook Report 2019*[12] is required under GBRMP Act and aims to provide a regular and reliable means of assessing reef health and management in an accountable and transparent way. The report is produced by the GBRMPA and updated every five years.

The first *Great Barrier Reef Outlook Report 2009*[13] identified the long-term challenges facing the reef, dominated by climate change over the next few decades. Emerging issues since the *Great Barrier Reef Outlook Report 2009* include proposed port expansions, increases in shipping activity, coastal development and intensification and changes in land use within the GBR catchment, population growth, the impacts from marine debris, illegal activities, and extreme weather events including floods and cyclones.

Key management actions being taken to reduce threats to the reef are outlined in the Reef 2050 Plan first published in 2015, and the *Great Barrier Reef Blueprint for Resilience*[14] .

The Reef 2050 Plan is Australia's overarching long-term strategy for protecting and managing the GBR to support its health and resilience. The plan is a key component of the Australian Government's response to the recommendations of the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Committee. The committee regularly reviews the state of conservation of all properties inscribed on the World Heritage List.

The *Great Barrier Reef Outlook Report 2019* is the third comprehensive report in the series and identifies the GBR region still faces significant pressures ranging in scale from local to global. The *Great Barrier Reef Outlook Report 2019* found that planning systems for ports had been subject to major reforms under the Reef 2050 Plan and shipping was one of the strongest areas of management effectiveness.

5.10.2.5 *Reef 2050 Long-Term Sustainability Plan*

The Reef 2050 Plan is implemented jointly by the Australian Government, GBRMPA and the Queensland Government. It builds upon, but does not replace, the existing statutory and management arrangements for the GBRWHA. The Reef 2050 Plan's new vision for the reef in 2050 is that the GBR is sustained as a living natural and cultural wonder of the world.

The Reef 2050 Plan was updated in 2021 and responds to the threats identified in the *Great Barrier Reef Outlook Report 2019*. The updated plan provides a greater focus on the importance of climate change action, water quality, fostering increased collaboration with Traditional Owners and continuing to ensure that effort and investment targets the right priorities and actions to support the health and resilience of the reef. It also focusses on addressing local and regional pressures over which people in Australia and Queensland have direct control such as land-based run-off, coastal development and direct human use of the reef. The updated plan is the result of the first five-yearly comprehensive review of the Reef 2050 Plan, carried out in close collaboration with stakeholders and the community.

The Reef 2050 Plan includes five work areas that seek to address key threats to the reef, reduce cumulative impacts and protect and conserve the reef goals, and achieve the objectives and longer-term 2050 outcomes and vision of the plan.

Reef 2050 Plan Work Area three: Reduce impacts from water-based activities

Work area three focuses on reducing direct impacts to the reef from water-based and island activities that occur in and adjacent to the GBRWHA. It seeks to protect the reef's OUV and ensure uses are ecologically sustainable while providing social, cultural and economic benefits.

This work area focuses on partnerships and collaboration with reef-dependent industries, working in partnership with Traditional Owners to manage sea country, sustainable management of commercial and recreational fisheries and prevention of new pest and disease incursions.

In relation to the Port of Mackay, the updated plan continues the integrated approach to ports management and shipping. Existing measures include restricting new port activities and development in and adjacent to the GBRWHA to within established ports and prohibiting transhipment of bulk materials outside port extents. Capital

[12] Great Barrier Reef Marine Park Authority. (2019) *Great Barrier Reef Outlook Report 2019*.
[13] Great Barrier Reef Marine Park Authority. (2009) *Great Barrier Reef Outlook Report 2009*.
[14] Great Barrier Reef Marine Park Authority. (2017) *Great Barrier Reef Blueprint for Resilience.*

dredging is restricted to four priority ports in Queensland and disposal of capital dredge material is prohibited in the GBRWHA and marine parks. The plan seeks to maintain these commitments and avoid, reduce and mitigate remaining impacts.

5.10.2.6 Shipping and port operations

Shipping activity throughout the GBR is a vital link in the production chain for many industries and services regional centres. Ports are important infrastructure for this shipping industry.

The *Navigation Act 2012* (Cth) requires all foreign vessels trading interstate on the Australian coast to be licensed or have a permit. The Australian Maritime Safety Authority conducts inspections to ensure that foreign vessels visiting Australian ports comply with the relevant international regulations, are seaworthy, do not pose a risk of pollution and provide a safe working environment.

Maritime Safety Queensland (MSQ) is responsible for monitoring and managing the safe movement of ships in Queensland waters including minimising vessel sourced waste and providing response to marine pollution. Under the *Transport Operations (Marine Pollution) Act 1995,* MSQ is both the statutory and combat agency for response to all ship sourced oil spills.

Under the TIA, pilotage areas have been gazetted around designated ports and maritime areas to ensure the safe and efficient movement of shipping. These areas encompass the approaches, main shipping channel and waters of the port.

The Harbour Master and the port authority have joint responsibility for managing the safe and efficient operation of the port including controlling traffic movement in the port, maintaining on-water safety distances and responding to any emergency situation.

Within port limits, some activities may require permits or other permission from the port authority or Harbour Master. For example, NQBP as the port authority is responsible for the management of dangerous goods in port, including the loading and unloading of ships alongside and movement across the wharf. Under the TIA, a port authority may for example impose a charge for the use of its port area including for goods or passengers loaded, unloaded or transhipped to or from a ship using port facilities in its port.

5.11 Summary

This section has provided an overview of the land use planning assessment and decision making within the study area. An overview of the statutory framework, policies and rules has also been summarised which will lead to a better understanding of the role legislative frameworks play in the future planning and development of the priority Port of Hay Point/Mackay and the wider study area.

6.0 Social

6.1 Introduction

The priority Port of Hay Point/Mackay is an important contributor to the social and economic fabric of the Sarina/Mackay region and Queensland, and a key contributor to the sense of identity and place for the nearby communities. Consideration of social and community factors in the development of the port master plan is critical to ensuring social values are appropriately protected from future port development and activities.

This section identifies and describes the social and socio-economic characteristics and values of the port and surrounding area. It provides an overview of policies and strategies relevant to the socio-economic environment of the study area, existing communities and social values, and potential impacts, threats and pressures from development and activities in the ports and surrounding area.

The analysis of social values in the study area involved consideration of both quantitative and qualitative data and information. It involved:

- review of relevant strategies, statutory instruments, and policies to identify regional and social objectives for communities in the study area and issues of community significance relevant to the ports and surrounding areas
- analysis of existing population and demographic data for local and regional communities, including data on cultural diversity, housing, employment and income, and relative socio-economic disadvantage, from the Australian Bureau of Statistics (ABS), the Queensland Government and MRC
- identifying and mapping social infrastructure in the study area, including education, health and medical services, community and cultural facilities, sport and recreation uses
- describing and mapping areas valued by local and regional communities and that contribute to the amenity of the study area
- identifying and describing potential impacts, threats and pressures from development and activities relating to the port.

6.1.1 Study area

Port of Hay Point

The study area for the review of social values is shown in **Figure 21** and includes the ABS Statistical Area Level 2 (SA2) geographies of:

- Sarina, which comprises communities north of Sarina Beach Road including Grasstree Beach, Campwin Beach, Hay Point, Alligator Creek, and extends south outside the study area to include the township of Sarina
- Walkerston-Eton, which includes the communities of McEwens Beach, Dunrock, Chelona, Sandiford, Balberra and Manbura, and west of the study area to Ben Mohr State Forest and Walkerston
- Ooralea-Bakers Creek, which includes Bakers Creek, part of Paget and land south of Peak Downs Highway and extends north of the study area to the Pioneer River.

The port is located within the MRC LGA. Population and demographic data for the LGA is also presented in **Section 6.3.2** to inform the identification of social values in the wider region.

Figure 21 illustrates the study boundary for the community values assessment.

Figure 21: Study area for community values - Port of Hay Point

The analysis of existing social values principally draws on information presented in the Queensland regional profiles available from the Queensland Government Statistician's Office website. The regional profiles present data and information from a range of sources including the ABS *2016 Census of Population and Housing* and other ABS datasets, as well as from various Queensland Government and Australian Government departments.

The 2021 Census of Australia's population was conducted on 10 August 2021. Data from the 2021 Census is due to be released from June 2022. While data from the 2016 Census is about five years old, it is the most comprehensive information currently available for Australia's population and demography.

Port of Mackay

The study area for the review of social values is shown in **Figure 22** and includes the ABS SA2 geographies of:

- Mackay Harbour, which includes the areas immediately surrounding the port
- Slade Point
- Andergrove-Beaconsfield
- North-Mackay, which includes suburbs such as Cremorne
- Mackay
- South Mackay, which includes the Mackay Airport
- East Mackay
- West Mackay.

The port is located within the MRC LGA. Population and demographic data for the LGA is also presented in **Section 6.3.2** to inform the identification of social values in the wider region.

Figure 22: Study area boundary at the Port of Mackay

The analysis of existing social values draws on information presented in the Queensland regional profiles available from the Queensland Government Statistician's Office website. The regional profiles present data and information from a range of sources including the ABS Census of Population and Housing 2016 and other ABS datasets, as well as from various Queensland Government and Australian Government departments.

The 2021 Census of Australia's population was conducted on 10 August 2021. Data from the 2021 Census is due to be released from June 2022. While data from the 2016 Census is about five years old, this is the most comprehensive information currently available for Australia's population and demography. Below provides an overview of the following sections:

- Social policy and strategic context – **Section 6.2**
- Existing communities and social values – **Section 6.3**
- Socio-economic profile – **Section 6.4**
- Potential impacts, threats and pressures – **Section 6.5**
- Summary – **Section 6.6.**

6.2 Social policy and strategic context

6.2.1 Queensland policies, strategies and legislation

The following section outlines the relevant policies, strategies and legislation that must be taken into consideration in master planning for the priority Port of Hay Point/Mackay.

6.2.1.1 *Mackay, Isaac, and Whitsunday Regional Plan 2012*

The MIW Regional Plan establishes a vision and direction for the MIW region to 2031. The plan also identifies the regional framework and DROs for the region.

As the pre-eminent plan for the region and a statutory instrument under the *Statutory Instruments Act 1992*, the MIW Regional Plan takes precedence over all local government land use planning instruments within the region.

The regional vision states that:

'The Mackay, Isaac and Whitsunday region is a vibrant, progressive region where the values of the community and industry are respected and in balance with the natural environment. The region's natural assets and abundant resources will be responsibly managed for the benefit of residents, visitors and future generations. It achieves its potential with a range of industries, employment and learning opportunities for everyone. The region has a resilient and inclusive community that respects and offers diversity and choice, and where residents and visitors enjoy a healthy, active and safe lifestyle.'[15]

The MIW Regional Plan provides strategies to inform future decision making which aim to:

- address regional economic, social and environmental issues
- identify strategic infrastructure and service needs and priorities
- support economic prosperity and employment values
- highlight and respond to climate change
- recognise environmental values
- support consolidated growth within established regional centres and townships
- focus on public, private and community sector responses to key regional issues
- align efforts across agencies and all levels of government.

The master planning process will enable several of the above strategies to be achieved at a more local scale within the MIW region. The master plan will promote economic prosperity for the master planned area which will

[15] Department of Local Government and Planning. (2012). *Mackay, Isaac and Whitsunday Regional Plan 2012*.

have flow-on effects to the wider MIW region. Strategic infrastructure and supply chain corridors to support the priority Port of Hay Point/Mackay will be identified to achieve the economic growth. PMMs may be adopted where necessary to maintain environmental values. Engagement with key stakeholders and the wider community will ensure that regional issues are addressed where relevant to the priority Port of Hay Point/Mackay.

6.2.2 Local government policies and strategies

6.2.2.1 *Local Government Act 2009*

The purpose of the *Local Government Act 2009* is to provide for the way in which local government is constituted and the nature and extent of its responsibilities and powers.[16] It also provides for a system of local government that is accountable, effective, efficient and sustainable. The *Local Government Act 2009* stipulates that councillors must deliver outcomes to the community that are in the public interest.

6.2.2.2 The *Mackay Region Planning Scheme 2017* – Version 3.1

The Mackay Planning Scheme sets MRC development intent for the next 20 years through advancing state and regional strategies (for example, SPPs and MIW Regional Plan) on a local scale. The Mackay Planning Scheme commenced on 24 July 2017, replacing the former individual planning schemes that were in effect for the previous LGAs of Mackay City Council, Mirani Shire Council and Sarina Shire Council.[17]

The Mackay Planning Scheme identifies that the existing Port of Hay Point plays a key role in the regional economy. The planning scheme seeks to protect the operation of the ports and associated transport corridors from incompatible development. The Mackay Planning Scheme ensures the appropriate buffer and protection between the surrounding uses allowing the port to develop and expand.

The Mackay Planning Scheme strategic framework sets the policy direction for the planning scheme and guides development intent across eight key themes.

6.2.2.2.1 Strategic framework – Infrastructure and supply chain

Regarding infrastructure and supply chain, the strategic framework seeks to ensure:

- the efficient movement, transfer and distribution of freight throughout the region
- road network connects to rail, sea and airports enabling efficient movement between residential, employment and recreational areas
- connection between major industrial areas and ports by the future Mackay Ring Road will avoid the movement of heavy vehicles through the central Mackay urban area
- rail infrastructure, including cane and coal rail corridors, are protected from the constraining effects of sensitive land uses by physical separation, or with acoustic screens to existing land uses
- transport corridors are protected from incompatible uses to enable their safe and efficient operation, including railway lines and cane rail, and access routes to sea and airports
- sensitive land uses and the operational efficiency of ports are protected through provision of appropriate offset buffers and corridors
- infrastructure at the ports serve the need of the local and regional economy and is protected from development that constrains safe and efficient port operations
- Mackay urban area provides support to the resource industry with appropriate access to commercial and industrial services, and air and seaports
- high impact activities, such as the abattoir at Bakers Creek, coal terminals and sugar mill ponds, are buffered to protect residents from impacts of noise, air and hazardous materials.

[16] *Local Government Act 2009* (Qld)
[17] Mackay Regional Council. (2017). *Mackay Region Planning Scheme 2017*.

6.3 Existing communities and social values

This section provides an overview of existing communities and social values, conditions and characteristics in the study area. It presents information and data relating to population and demography, education and employment, housing, community facilities and services, and valued by local and regional communities. Information is presented for the study area SA2s and the MRC LGA, with information on Queensland presented as a comparison.

6.3.1 Social profile

Port of Hay Point

Hay Point is located about 40km south of Mackay and 27km north of Sarina. Hay Point had a population of about 1348 people at the 2016 Census.[18] The area surrounding the port is largely rural, although several small beachside and rural residential communities are located immediately surrounding the port, including:

- Louisa Creek, located east of the port, adjacent to the DBT
- Half Tide and Salonika Beach, located south of the port and adjacent to HPCT
- Timberlands and Fenechvale, which are rural residential communities located west of the port.

Several other communities are within 5-10km of the port, including:

- Alligator Creek, located approximately 3.6km south west of the port, which had a population of about 791 people at the 2016 Census
- Grasstree Beach, which is a small coastal community located about 7.7km south of the port, which had a population of about 286 people at the 2016 Census
- Campwin Beach located south of Cabbage Tree Creek, about 9.7km south of the project, which had a population of about 517 people at the 2016 Census
- McEwens Beach, which had a population of about 202 people in 2016 and is located about 9km east of the port across Sandringham Bay
- Dunnroc, a small coastal village located east of the project next to McEwens Beach and had population of 75 people at the 2016 Census.[19]

Port of Mackay

The port is located 5km north of the Mackay City Centre within Mackay Harbour. Mackay Harbour accommodates a range of land uses, including heavy industrial uses, Mackay Marina, commercial uses, residential and visitor accommodation uses, and community uses. Apart from residential uses within Mackay Harbour, the closest residential community to the port is Slade Point, located just over 1km north of the port. Other nearby residential uses include:

- North Mackay, Andergrove, and Beaconsfield located about 3km east of the port
- Mackay, West Mackay, South Mackay and East Mackay, located south of the Pioneer River, just under 5km south-west of the port.

6.3.2 Population and age

Port of Hay Point

Table 8 presents information on the estimated resident population in the study area as at June 2020. The estimated residential population of the study area was 25,191 persons, of which 11,891 people, 47% of the study area's population lived in the Sarina SA2.[20] Ooralea-Bakers Creek SA2 has the smallest population in the

[18] Australian Bureau of Statistics. (2016). 2016 *Census QuickStats*, Hay Point (SSC313318).
[19] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Hay Point region*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on July 2021.
[20] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Hay Point region*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on July 2021

study area with 5233 residents. Combined, the study area represents approximately 21.4% of the estimated resident population in the Mackay LGA.

Population growth in the study area varied between the SA2s over the five and 10 years to 2020. Ooralea-Bakers Creek SA2 had relatively high average annual population growth between 2010 and 2020, growing at a rate of nearly double to Queensland average. More recently, average annual population growth in the Ooralea-Bakers Creek SA2 slowed to a level below the Queensland average, although this was still above the rate of population growth for the two other SA2s in the study area. Since 2010, the Walkerston-Eton SA2 has experienced a decline in population growth, with the rate of decline increasing between 2015 and 2020.

Table 8: Population and Growth – Port of Hay Point

Indicator	Sarina Statistical Area Level 2	Ooralea-Bakers Creek Statistical Area Level 2	Walkerston-Eton Statistical Area Level 2	Mackay Local Government Area	Queensland
Population					
Estimated resident population	11,891	5233	8067	117,902	5,176,186
Average annual growth rate (2010–20)	0.2%	2.9%	-0.5%	0.4%	1.6%
Average annual growth rate (2015–20)	0.1%	0.6%	-1.3%	-0.1%	1.6%
Population projections					
Projected population (2041)	17,224	8308	9888	158,280	7,161,661
Average annual growth rate 2016–41	1.5%	1.9%	0.6%	1.2%	1.6%

Source: Queensland Government Statistician's Office (2021).[21]

Population growth in the study area is projected to increase to approximately 25,420 people by 2041. The Sarina SA2 is expected to continue to comprise the largest population within this area. Average annual population growth in the Sarina and Ooralea-Bakers Creek SA2s is expected to be similar to or above the Queensland average until 2041. The population of the Walkerston-Eton SA2 is projected to increase to 9888 people by 2041, representing an average annual growth rate of 0.6%.

In June 2019, the Sarina SA2 and Walkerston-Eton SA2 had older populations with median ages above Queensland. At the same time, Ooralea-Bakers Creek SA2 had a younger population with a median age of 34.6 years, compared to 37.4 years in Queensland. The median age of Ooralea-Bakers Creek SA2 declined by 1.3 years between 2009 and 2019, while the Sarina and Walkerston-Eton SA2 increase by 4.8 years and 4.3 years, respectively. This is compared to an increase of 1.2 years in the median age of Queensland over this period.

The age profiles of the SA2s in the study area were varied. Compared to Queensland, all SA2s reported higher proportions of children aged 14 years, or under. Each SA2 had lower proportions of youth aged 15 to 24 years. The SA2s generally had proportions of people aged 25-64 years above the Queensland average, with the Ooralea-Bakers Creek SA2 having particularly high proportions of people in this age group. The Sarina SA2 had relatively high proportion of older people aged 65 years or older.

Between 2021 and 2041, the median age of Ooralea-Bakers Creek SA2 is projected to increase by 0.7 years to 34.5 years. This represents an increase in the median age of about 1.8%, well below the projected increase in the median age of Queensland, at 7.4% or 2.8 years. Walkerston-Eton SA2 is expected to experience the greatest increase in median age, with the median age of this SA2 is projected to be 45.1 years by 2041, representing an increase of 4.6 years (or 11.1%) between 2021 and 2041. **Table 9** presents information on the age profiles for the study area.

[21] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Hay Point region*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on July 2021

Table 9: Age Profile – Port of Hay Point

Indicator	Sarina Statistical Area Level 2	Ooralea-Bakers Creek Statistical Area Level 2	Walkerston-Eton Statistical Area Level 2	Mackay Local Government Area	Queensland
Estimated resident population					
Median age	42.2 years	34.6 years	39.8 years	37.9 years	37.4 years
Change in median age (2009–19)	4.8 years	-1.3 years	4.3 years	2.4 years	1.2 years
0–14 years	19.7%	21.5%	19.6%	21.0%	19.4%
15–24 years	11.3%	11.7%	12.4%	11.9%	13.0%
25–44 years	22.4%	31.1%	24.1%	26.1%	27.3%
45–64 years	29.8%	23.5%	28.9%	26.9%	24.6%
65 years or over	16.7%	12.2%	14.9%	14.0%	15.7%
Population projection					
Median age (2041)	43.2 years	34.5 years	45.1 years	39.8 years	40.7 years
Change (2021–41)	2.0 years	0.7 years	4.6 years	2.0 years	2.8 years

Source: Queensland Government Statistician's Office (2021).

Port of Mackay

Table 10 presents information on the estimated resident population in the study area as at June 2020. The ERP in the study area was 45,257 persons, of which 34% or 15,786 people lived in Andergrove-Beaconsfield SA2. Other SA2s with relatively large populations included North Mackay, South Mackay and West Mackay. Mackay Harbour had the smallest population, with 561 people.

Over the five and 10 years to 2020, all SA2s in the study area apart from Andergrove-Beaconsfield and Mackay Harbour, experienced a decline in the total population. Between 2010 and 2020, the average annual population growth rate in the Andergrove-Beaconsfield and Mackay Harbour SA2s was 0.7% and 0.5% respectively, well below the average annual rate of growth for Queensland (at 1.6%). Over the same period, the Slade Point SA2 reported the highest rate of population decline at -2.2% annually, followed by Mackay at -1.8% annually. Since 2020, the Mackay SA2 population increased the rate of decline (to -2.1%) while Slade Point SA2 slowed the rate of population decline.

The population in the study area is projected to increase to 51,854 people by 2041, representing an average annual growth rate of 0.5% from 2016. This is well below the projected rate of growth in Queensland over the same period. Mackay Harbour SA2 is expected to experience the largest average rate of population growth and the only SA2 with a projected rate of growth above Queensland, at 3.3% annually. However, this growth is from a relatively small residential population base. The average rate of growth in each of the other SA2s is projected to be less than 1% annually.

Table 10 summarises information on the estimated resident population and population projections for the study area.[22]

Table 10: Population and growth – Port of Mackay

Locality	Estimated resident population (as at 30 June 2020)			Projected population (as at 30 June 2041)	
	Estimated resident population	*Average annual growth (2010 - 2020)*	*Average annual growth (2015 - 2020)*	*Projected population*	*Average annual growth (2016 - 2041)*
Total study area	45,257	-0.70%	-0.60%	51,854	0.50%
Mackay Harbour SA2	565	0.50%	0.80%	1200	3.30%

[22] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Mackay SA2s*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on 2 June 2021..

Locality	Estimated resident population (as at 30 June 2020)		Projected population (as at 30 June 2041)		
Slade Point SA2	3188	-2.20%	-2.00%	3517	0.10%
Andergrove-Beaconsfield SA2	15,796	0.70%	0.70%	16,730	0.40%
East Mackay SA2	3545	-0.60%	-0.50%	4042	0.40%
Mackay SA2	3435	-1.80%	-2.10%	4653	0.90%
North Mackay SA2	6017	-1.40%	-1.30%	7269	0.70%
South Mackay SA2	6627	-1.30%	-1.20%	7256	0.20%
West Mackay SA2	6084	-0.90%	-1.20%	7187	0.50%
Mackay LGA	117,902	0.40%	-0.10%	158,280	1.20%
Queensland	5,176,186	1.60%	1.60%	7,161,661	1.60%

Source: Queensland Government Statistician's Office (2021)

The median age of the study area was 38.4 years at 30 June 2019, which is above the Queensland median, at 37.4 years (refer to **Table 11**). All SA2s in the study area, apart from Andergrove-Beaconsfield had median ages above the Queensland median. Mackay Harbour SA2 recorded the highest median age (at 47.8 years), followed by the Slade Point and East Mackay SA2s. Andergrove-Beaconsfield SA2 had the youngest median age within the study area, at 35.0 years. The median age of the study area increased by 3.5 years between 2009 and 2019, representing an increase of about 10%. This is compared to 1.2 years (3.3%) for Queensland. Slade Point SA2 recorded the largest increase in median age, at nine years, representing an increase of about 26.4%. The population of the North Mackay, South Mackay and Mackay SA2s each recorded an increase in median age above the study area as a whole.

In June 2019, the study area had an age profile similar to Queensland, with some variation across the study area SA2s. Compared with Queensland, Andergrove-Beaconsfield and Slade Point were the only SA2s with higher proportions of children aged 14 years or below. Andergrove-Beaconsfield also supports a proportion of working aged people aged 15-64 years higher than the Queensland average. Other SA2s with relatively high proportions of working aged people included Mackay Harbour SA2, which recorded the highest proportion of people in this group across the study area (at 71.7%) and Mackay SA2 (at 67.3%).

All SA2s, apart from Mackay Harbour, Andergrove-Beaconsfield, and Mackay, had proportions of older people aged 65 years or over above the Queensland average. North Mackay SA2 had the highest proportion of older people, with this group accounting for 18.4% of the SA2's population.

Table 11: Age Profile, 2019 – Port of Mackay

Locality	Median age		Age profile				
	Years	*Change (2009–19)*	*0-14 years*	*15-24 years*	*25-44 years*	*45-64 years*	*65 years or over*
Study area	38.4 years	3.5 years	19.50%	11.90%	26.70%	26.30%	15.70%
Mackay Harbour SA2	47.5 years	1.7 years	13.70%	7.10%	24.10%	40.50%	14.60%
Slade Point SA2	43.1 years	9.0 years	20.00%	12.40%	19.80%	31.80%	16.00%
Andergrove-Beaconsfield SA2	35.0 years	3.1 years	21.80%	13.30%	28.20%	23.60%	13.10%
East Mackay SA2	41.3 years	3.0 years	18.50%	11.40%	24.90%	28.50%	16.80%
Mackay SA2	37.8 years	3.8 years	18.00%	9.40%	32.60%	25.30%	14.70%
North Mackay SA2	40.5 years	5.5 years	17.70%	12.10%	25.30%	26.60%	18.40%
South Mackay SA2	40.4 years	4.7 years	18.10%	11.00%	26.80%	26.60%	17.50%
West Mackay SA2	40.6 years	2.3 years	18.40%	10.70%	25.80%	27.60%	17.60%
Mackay LGA	37.9 years	2.4 years	21.00%	11.90%	26.10%	26.90%	14.00%
Queensland	37.4 years	1.2 years	19.40%	13.00%	27.30%	24.60%	15.70%

Between 2021 and 2041, **Table 12** shows the population of the study area is expected to age more quickly compared with Queensland, with an increase in the median age projected to be four years, compared to 2.8 years in Queensland. Within the study area, West Mackay SA2 is expected to have the largest increase in median age (6.7 years), followed by Slade Point SA2 (at 3.9%). Mackay Harbour SA2 is projected to have the oldest population in the study area in 2041, at 53.6 years followed by West Mackay SA2, at 50.1 years.

Table 12: Project Age Profile, 2041 – Port of Mackay

Locality	Projected median age (2041)	Change (2021–41)
Study area	43.2 years	4.0 years
Mackay Harbour SA2	53.6 years	3.2 years
Slade Point SA2	45.8 years	3.9 years
Andergrove-Beaconsfield SA2	38.7 years	3.2 years
East Mackay SA2	46.4 years	3.7 years
Mackay SA2	41.4 years	2.9 years
North Mackay SA2	43.7 years	3.3 years
South Mackay SA2	42.9 years	2.9 years
West Mackay SA2	50.1 years	6.7 years
Mackay LGA	39.8 years	2.0 years
Queensland	40.7 years	2.8 years

Source: Queensland Government Statistician's Office (2021)

6.3.3 Families

Port of Hay Point

There was a total of 6786 families in the study area SA2s at the 2016 Census, of which about 46% were in the Sarina SA2 and 34% lived in the Walkerston-Eton SA2, as set out in **Table 13**.

Couple only families were the predominant family type in the Sarina SA2, with this group comprising 45.6% of families, compared to 39.4% in Queensland. The Sarina figure may reflect the more rural and regional nature of the Sarina SA2. The Ooralea-Bakers Creek and Walkerston-Eton SA2s both had proportions of couple families with children above the Queensland average, which is consistent with the younger age profiles of these SA2s and may reflect the proximity of these SA2s to the urban area of Mackay.

Table 13: Family composition (a), 2016 – Port of Hay Point

Locality	Couple family with no children	Couple family with children	One-parent family	Total(b)
Sarina SA2	45.6%	39.0%	14.4%	3119
Ooralea-Bakers Creek SA2	41.2%	44.5%	13.2%	1340
Walkerston-Eton SA2	42.2%	46.2%	10.5%	2327
Mackay LGA	40.3%	43.4%	15.1%	30,330
Queensland	39.4%	42.5%	16.5%	1,221,148

(a) Includes same-sex couple families.
(b) Includes other families
Source: Australian Bureau of Statistics. (2016)

Port of Mackay

There were 11,328 families in the study area at the 2016 Census, of which about 35.3% were in the Andergrove-Beaconsfield SA2. Couple-only families were generally the predominant family type in each of the

study area SA2s. The exception to this was the Andergrove-Beaconsfield SA2, which had a higher proportion of couple families with children. Andergrove-Beaconsfield SA2 also recorded a higher proportion of couple families with children than the Queensland average, Mackay Harbour had the highest proportion of couple only families.[23] These statistics are presented in **Table 14**.

The study area generally has relatively high proportions of one parent families, with all SA2s apart from Mackay Harbour and West Mackay recording proportions of this family type above the Queensland average.

Table 14: Family composition (a), 2016 – Port of Mackay

Statistical area	Couple family with no children	Couple family with children	One-parent family	Total[(b)]
Study area	39.80%	39.60%	18.80%	11,328
Mackay Harbour SA2	65.40%	21.80%	13.50%	133
Slade Point SA2	40.40%	37.10%	21.20%	911
Andergrove-Beaconsfield SA2	35.80%	44.50%	18.10%	3995
East Mackay SA2	40.90%	40.20%	17.20%	864
Mackay SA2	41.00%	34.70%	21.00%	727
North Mackay SA2	43.40%	33.40%	21.20%	1483
South Mackay SA2	40.80%	36.90%	20.20%	1754
West Mackay SA2	42.20%	41.1%%	15.60%	1461
Mackay LGA	40.30%	43.40%	15.10%	30,330
Queensland	39.40%	42.50%	16.50%	1,221,148

(a) Includes same-sex couple families
(b) Includes other families
Source: Queensland Government Statistician's Office (2021)

6.3.4 Indigenous population

Port of Hay Point

At the 2016 Census, there were 1130 people in the study area who identified as Aboriginal or Torres Strait Islander, this is summarised in **Table 15** The Sarina SA2 had a relatively high proportion of Indigenous people, with Aboriginal and Torres Strait Islander people comprising 6.1% of the SA2s total population. This is compared to 4.0% in Queensland.

The wider Mackay LGA also recorded relatively high proportions of Aboriginal and Torres Strait Islander people, with this group representing 5.1% of the LGA's population at the 2016 Census.[24]

Table 15 presents information on the Indigenous status of residents in the study area.

Table 15: Indigenous status, 2016 – Port of Hay Point

Locality	Number of people	Proportion of population
Sarina SA2	711	6.1%
Ooralea-Bakers Creek SA2	157	3.1%
Walkerston-Eton SA2	262	3.1%
Mackay LGA	5909	5.1%
Queensland	186,482	4.0%

Source: Queensland Government Statistician's Office (2021).

[23] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Mackay SA2s*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on 2 June 2021.
[24] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Hay Point region*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on July 2021.

Port of Mackay

At the 2016 Census, there were 2845 people in the study area that identified as Aboriginal or Torres Strait Islander, representing about 6.3% of the study area SA2's total population. All SA2s with the study area, apart from East Mackay, Mackay Harbour and West Mackay reported proportions of Indigenous people above the Queensland average.

The Slade Point SA2 had the highest proportion of Indigenous people, with Aboriginal or Torres Strait Islander people representing 12.3% of the SA2s population. Andergrove-Beaconsfield SA2 also had relatively high levels of Indigenous people. [25]

Table 16 presents information on the Indigenous status of residents in the study area.

Table 16: Indigenous status, 2016 – Port of Mackay

Locality	Number of people	Proportion of total population
Study area	2845	6.30%
Mackay Harbour SA2	4	0.80%
Slade Point SA2	412	12.30%
Andergrove-Beaconsfield SA2	1135	7.60%
East Mackay SA2	117	3.30%
Mackay SA2	207	5.70%
North Mackay SA2	377	6.30%
South Mackay SA2	409	6.10%
West Mackay SA2	184	3.00%
Mackay LGA	5909	5.10%
Queensland	186,482	4.00%

Source: Queensland Government Statistician's Office (2021).

6.3.5 Disadvantage

Port of Hay Point

The socio-economic indexes for areas produced by the ABS provide an indication of relative levels of socio-economic advantage and disadvantage. The index for relative socio-economic disadvantage is derived from variables such as income, educational attainment, unemployment and vehicle ownership. Lower quintile values generally represent areas of disadvantage while higher quintile indicate areas of least disadvantage.

Table 17 shows levels of socio-economic disadvantage in the study area relative to Queensland as a whole. In 2016, the Sarina SA2 displayed the highest levels of relative socio-economic disadvantage with 75% of the SA2's population within the bottom two quintiles and no one in the least disadvantaged quintile. The Walkerston-Eton SA2 displayed moderate levels of relative disadvantage, with 86.9% of the SA2's population in the third and fourth quintile. The Ooralea-Bakers Creek SA2 reported the highest proportion of people in the top two quintiles (61.7%), reflecting lower levels of relative socio-economic disadvantage.

Communities in the wider Mackay LGA generally displayed moderate levels of socio-economic disadvantage, with proportions of people in the bottom and top quintiles below the Queensland average. [26]

Table 17: Population by Index of Relative Socio-Economic Disadvantage quintiles (a) (%), 2016 – Port of Hay Point

Statistical Area	Quintile 1 (most disadvantaged)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (least disadvantaged)
Sarina SA2	21.7%	53.3%	20.3%	4.7%	0.0%

[25] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Mackay SA2s.* Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles.
[26] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Hay Point region*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on July 2021.

Statistical Area	Quintile 1 (most disadvantaged)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (least disadvantaged)
Ooralea-Bakers Creek SA2	4.9%	28.9%	4.6%	43.5%	18.2%
Walkerston-Eton SA2	3.5%	6.9%	43.7%	43.2%	2.7%
Mackay LGA	16.4%	30.3%	23.9%	23.7%	5.7%
Queensland	20.0%	20.0%	20.0%	20.0%	20.0%

Note: The quintiles are population based and derived at the Queensland level (state-based quintiles and not national based quintiles)

Source: Queensland Government Statistician's Office (2021).

Port of Mackay

The socio-economic indexes for areas produced by the ABS provide an indication of relative levels of socio-economic advantage and disadvantage. The index for relative socio-economic disadvantage is derived from variables such as income, educational attainment, unemployment, and vehicle ownership. Lower quintile values generally represent areas of disadvantage while higher quintile indicate areas of least disadvantage.

Levels of socio-economic disadvantage in the study area relative to Queensland as a whole are presented in **Table 18**.[27] In 2016, the study area displayed higher levels of relative disadvantage compared to Queensland, with 65.7% of the population within the bottom two quintiles and low proportions of the population in the highest quintile. The Mackay SA2 reported the highest levels of relative disadvantage, with 90% of the population in the bottom quintile. Slade Point SA2, North Mackay and South Mackay also displayed high levels of relative disadvantage with between 40% and 50% of each SA2s population in the bottom quintile.

The East Mackay SA2 and North Mackay SA2 had the highest proportion of population in quintile five, which represents the least disadvantage, however this was well below the Queensland average.

Table 18: Population by Index of Relative Socio-Economic Disadvantage quintiles (a) (%), 2016 – Port of Mackay

Locality	Quintile 1 (most disadvantaged)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (least disadvantaged)
Study area	31.10%	34.60%	22.20%	10.50%	1.50%
Mackay Harbour SA2	0.00%	0.00%	0.00%	100.00%	0.00%
Slade Point SA2	48.10%	34.20%	17.80%	0.00%	0.00%
Andergrove-Beaconsfield SA2	10.90%	43.70%	21.90%	22.70%	0.70%
East Mackay SA2	31.10%	0.00%	47.90%	13.40%	7.60%
Mackay SA2	89.90%	0.00%	10.10%	0.00%	0.00%
North Mackay SA2	42.00%	47.80%	5.00%	0.00%	5.30%
South Mackay SA2	44.60%	32.70%	22.80%	0.00%	0.00%
West Mackay SA2	13.30%	45.70%	35.60%	5.30%	0.00%
Mackay LGA	16.40%	30.30%	23.90%	23.70%	5.70%
Queensland	20.00%	20.00%	20.00%	20.00%	20.00%

Note: The quintiles are population based and derived at the Queensland level (state-based quintiles and not national based quintiles)

Source: Queensland Government Statistician's Office (2021)

[27] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Mackay SA2s.* Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles

6.4 Socio-economic profile

6.4.1 Income and employment

Port of Hay Point

Table 19 provides a summary of income and employment indicators for the study area.

At the 2016 Census, communities in Ooralea-Bakers Creek and Walkerston-Eton SA2s reported higher personal and household incomes compared to Queensland, while the Sarina SA2 generally reported median incomes similar to or below Queensland.

Compared to Queensland, the Sarina SA2 generally had higher proportions of individuals and families with lower incomes, while the Ooralea-Bakers Creek and Walkerston-Eton SA2s both reported proportions of lower income individuals and families below the Queensland average. At the same time, each of the SA2s recorded proportions of individuals earning $104,000 or more per year above the Queensland average, which is likely to reflect higher paying industries in the study area and wider region. Ooralea-Bakers Creek and Walkerston-Eton SA2s also reported relatively high proportions of families on higher incomes.

In the March quarter 2021, there were 14,292 people in the study area who were either working or looking for work. Unemployment rates in the study area were below the Queensland average, ranging from 2.8% in the Walkerston-Eton SA2 to 6.0% in Sarina SA2.

Consultation for the *Mackay Region Economic Development Strategy 2020–25*, identified concerns from some stakeholders about a lack of activities and opportunities for young people, leading to community issues and impacts on the future prosperity of the region.

Table 19: Income, 2016 – Port of Hay Point

Characteristic	Sarina Statistical Area Level 2	Ooralea - Bakers Creek Statistical Area Level 2	Walkerston – Eton Statistical Area Level 2	Mackay Local Government Area	Queensland
					Income
Median weekly personal income	$630	$813	$729	$698	$660
Median weekly household income	$1406	$1789	$1661	$1456	$1402
Personal income (less than $20,800 per year)	29.9%	25.2%	25.6%	27.3%	28.4%
Personal income ($104,000 or more per year)	9.5%	10.7%	9.4%	9.3%	7.1%
Family income (less than $33,800 per year)	11.4%	8.8%	7.8%	9.4%	9.4%
Family income ($156,000 or more per year)	13.9%	18.4%	17.1%	15.4%	15.3%
					Employment
Total labour	6252	3157	4883	66,373	2,714,310
Unemployment	6.0%	3.8%	2.8%	5.5%	7.3%

Source: Queensland Government Statistician's Office (2021). [28]

Unemployment in the study area between 2016 and 2021 is shown in **Figure 23**. The unemployment rate within the Sarina SA2 generally fluctuated compared to the Queensland average, with this generally above the Queensland average, apart from between the December 2017 quarter and March 2019 quarter, and June 2020 and March 2021. The unemployment rate in both the Ooralea-Bakers Creek and Walkerston-Eton SA2s was below the Queensland average for every quarter between March 2016 and March 2021.

[28] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Hay Point region*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on July 2021

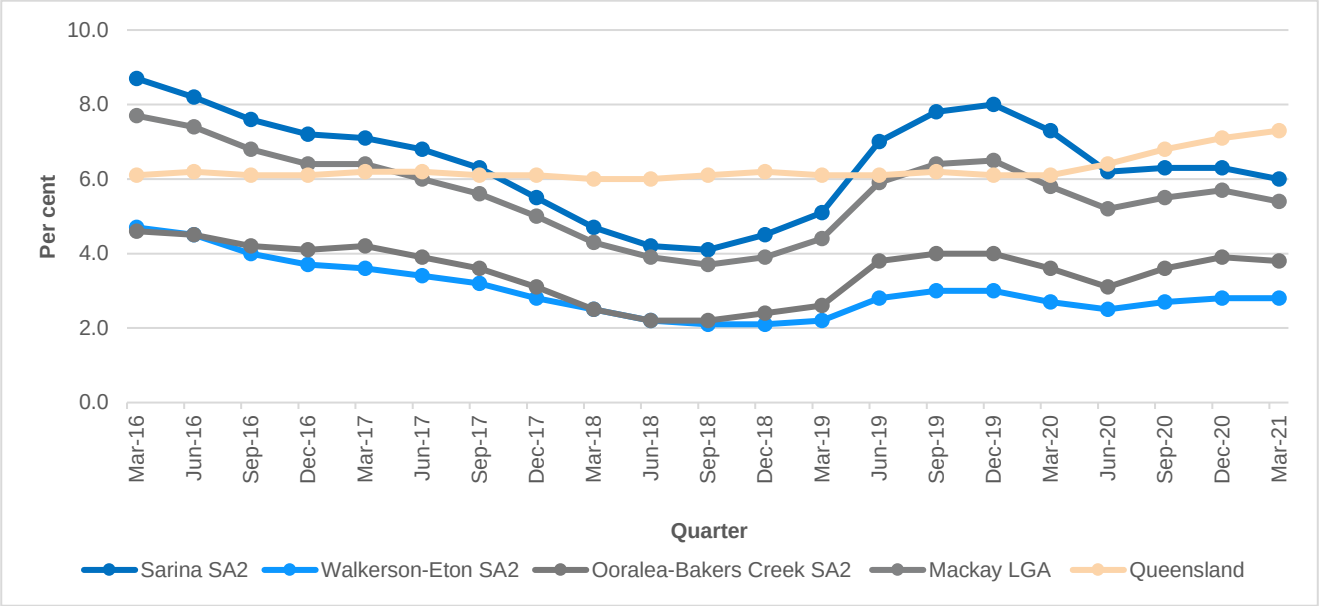

Figure 23: Unemployment, 2016–2021 – Port of Hay Point

The main industries of employment for residents in the study area at the 2016 Census are shown in **Table 20.**

Coal mining is the main industry of employment in the study area, with more than 10% of the population aged 15 years and over in each of the study area SA2s working in the industry. Agriculture is also an important industry for the Sarina and Walkerston-Eton SA2s, employing 5.5% and 7.5% of the population aged 15 years respectively. Food product manufacturing, preschool and school education, are also key industries ranking in the top five industries of employment for at least two of the SA2s.

Table 20: Main industries of employment – Port of Hay Point

Statistical area	Top five industries of employment (2016 Census)
Sarina SA2	Coal mining (11.6%) Rail transport (5.7%) Agriculture (5.5%) Preschool and school education (5.2%) Food product manufacturing (4.5%)
Ooralea-Bakers Creek SA2	Coal mining (11.5%) Food and beverage services (4.9%) Other store-based retailing (4.8%) Hospitals (4.7%) Food product manufacturing (4.1%)
Walkerston-Eton SA2	Coal mining (10.2%) Agriculture (7.5%) Professional, scientific and technical services (except computer system design and related services) (4.7%) Preschool and school education (4.7%) Construction services (4.4%)
Mackay LGA	Coal mining (10.6%) Preschool and school education (6.1%) Food and beverage services (5.0%) Other store-based retailing (4.8%) Construction services (4.5%)
Statistical area	Top five industries of employment (2016 Census)

Queensland	Preschool and school education (6.1%) Food and beverage services (5.9%) Construction services (5.2%) Professional, scientific and technical services (except computer system design and related services) (5.1%) Other store-based retailing (5.1%)

Source: Queensland Government Statistician's Office (2021). [29] [30]

Port of Mackay

At the 2016 Census, communities in the study area had higher personal incomes and lower household and family incomes on average, compared to Queensland.

All SA2s apart from Mackay, North Mackay and South Mackay reported median personal incomes above the Queensland average, with residents of Mackay Harbour SA2 reporting the highest median weekly personal income, at $1,178, nearly double the Queensland median. The study area also had proportions of low-income people earning less than $20,800 annually, below the Queensland average. The proportions of people earning higher incomes (more than $104,000 annually) were above the Queensland average. Within the study area, the Slade Point, South Mackay and North Mackay reported individuals with lower incomes above Queensland. Slade Point SA2 and South Mackay SA2 also had lower numbers of higher income individuals.

Median household incomes for the study area SA2s were generally below the Queensland median, apart from Mackay Harbour and Andergrove-Beaconsfield SA2s, which recorded a median household income above Queensland. Most of the study area SA2s also reported proportions of lower income households, earning less than $33,800 annually, above Queensland and proportions of higher income households (more than $156,000 annually) below Queensland. Mackay Harbour had the highest proportion of higher income households, with this group comprising about 33.8% of households in the SA2. This information is summarised in **Table 21**.

Table 21: Income, 2016 – Port of Mackay

Locality	Median weekly income		Annual personal income		Annual family income	
	Personal income	*Household income*	*Less than $20,800*	*$104,000 or more*	*less than $33,800*	*$156,000 or more*
Study area	Not Applicable (N/A)	N/A	27.50%	7.30%	10.60%	12.90%
Mackay Harbour SA2	$1178	$2204	15.50%	20.90%	5.30%	33.80%
Slade Point SA2	$623	$,258	29.80%	6.90%	11.70%	10.80%
Andergrove-Beaconsfield SA2	$687	$1434	28.40%	7.90%	9.50%	13.40%
East Mackay SA2	$709	$1335	24.40%	9.00%	9.50%	18.20%
Mackay SA2	$605	$976	26.90%	6.30%	13.10%	8.90%
North Mackay SA2	$603	$1105	28.10%	6.50%	12.50%	10.90%
South Mackay SA2	$643	$1170	29.00%	5.60%	12.50%	10.80%
West Mackay SA2	$690	$1270	25.40%	7.60%	8.50%	14.40%
Mackay LGA	$698	$1456	27.30%	9.30%	9.40%	15.40%
Queensland	$660	$1402	28.40%	7.10%	9.40%	15.30%

Source: Queensland Government Statistician's Office (2021)

In the March quarter 2021, there were 25,176 people in the study area either working or looking for work, as shown in **Table 22**. The unemployment rate of the study area is similar to Queensland, although the level of unemployment varies across the study area SA2s, ranging from a high of 16% in the Mackay SA2, to a low of 1.6% in Mackay Harbour. The SA2s of Slade Point, Mackay, North Mackay and South Mackay all recorded unemployment levels above Queensland at the March quarter 2021.

Table 22: Employment, March quarter 2021 – Port of Mackay

[29] Australian Government. (2021). *National Skills Commission, Small Area Labour Markets Australia, various editions*
[30] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Hay Point region*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on July 2021.

Locality	Labour force	Unemployment
Study area	25,176	7.50%
Mackay Harbour SA2	378	1.60%
Slade Point SA2	1746	9.10%
Andergrove-Beaconsfield SA2	8866	5.50%
East Mackay SA2	1953	6.50%
Mackay SA2	1982	16.80%
North Mackay SA2	3201	9.70%
South Mackay SA2	3726	7.10%
West Mackay SA2	3324	5.70%
Mackay LGA	66,373	5.40%
Queensland	2,714,310	7.30%

Source: Australian Government (2021)

Unemployment rates between 2016–21 for SA2s in the study area north of the Pioneer River are shown in **Figure 22**, with unemployment for SA2s south of the Pioneer River shown in **Figure 23**.

Communities north of the Pioneer River, North Mackay and Slade Point SA2 had levels of unemployment above the Queensland average for each quarter between March 2016 and March 2021. Mackay Harbour SA2 recorded unemployment rates below Queensland over the same period. Unemployment in the Andergrove-Beaconsfield SA2 fluctuated over the period from March 2016 to March 2021 relative to the Queensland average, with the SA2 recording levels of unemployment above Queensland between the March quarter 2016 and September quarter 2017, and again in the September and December quarters of 2019.

Communities south of the Pioneer River, the Mackay SA2 reported unemployment rates well above the Queensland average at each quarter between March 2016 and March 2021, with unemployment rates ranging from a low of 12.3% in the June and September quarters of 2018, to a high of 26% for the December quarter 2019.

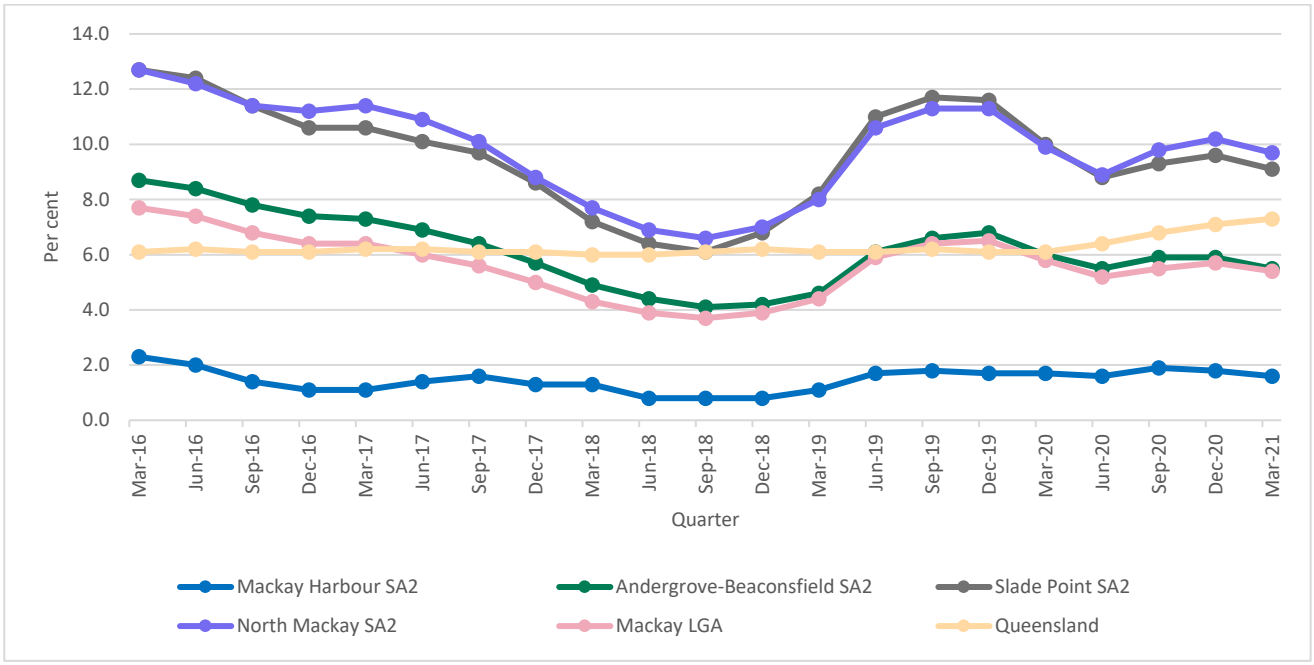

Figure 24: Unemployment, 2016-2021 (Statistical Area Level 2 north of the Pioneer River) – Port of Mackay

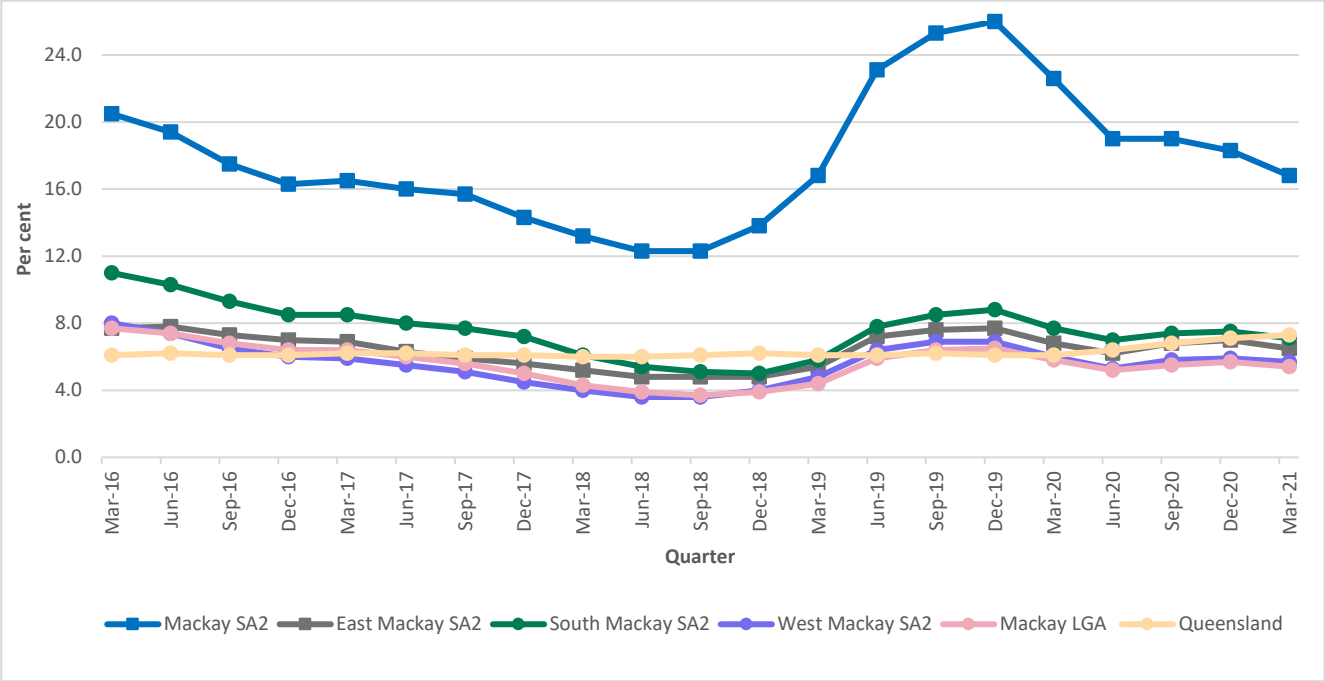

Figure 25: Unemployment, 2016-2021 (Statistical Area Level 2 south of the Pioneer River) – Port of Mackay

At the 2016 Census, the main industries of employment for residents in the entire study area were:

- coal mining (8.6%)
- food and beverage services (6.4%)
- preschool and school education (6.0%)
- other store-based retailing (5.1%)
- construction services (4.7%).

The main industries of employment of the study area SA2s are shown in **Table 23.**[31] Coal mining was ranked as the top industry of employment in all SA2s apart from Mackay and South Mackay, where it ranked as the second highest industry of employment. This reflects the role of Mackay as a major support centre for mining and resources within the wider region. The main industry of employment in the Mackay and South Mackay SA2 was 'food and beverage services'. This also ranked in the top five industries of employment for each of the other SA2s, which is likely to reflect the importance of tourism within the region.

Other industries important to communities in the study area regarding employment also include:

- hospitals and professional, scientific and technical services (except computer system design and related), within the Mackay and West Mackay SA2s
- construction services, within North Mackay, South Mackay and East Mackay SA2s
- retailing, including 'other store-based retailing' in Andergrove-Beaconsfield, East Mackay, North Mackay, and South Mackay, and food retailing in the Slade Point SA2.

Table 23: Main industries of employment, 2016 – Port of Mackay

Locality	Top five industries of employment (2016 Census)	Statistical area	Top five industries of employment (2016 Census)
Mackay Harbour SA2	Coal mining (11.2%) Food and beverage services (6.7%) Public administration (6.3%) Hospitals (6.3%) Preschool and school education (6.3%)	North Mackay SA2	Coal mining (8.0%) Food and beverage services (7.1%) Preschool and school education (6.7%) Other store-based retailing (5.3%) Construction services (5.0%)

[31] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Mackay SA2s.* Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles.

Locality	Top five industries of employment (2016 Census)	Statistical area	Top five industries of employment (2016 Census)
Slade Point SA2	Coal mining (10.0%) Preschool and school education (6.4%) Construction services (5.0%) Food and beverage services (5.0%) Food retailing (5.0%)	South Mackay SA2	Food and beverage services (7.8%) Coal mining (6.9%) Other store-based retailing (5.1%) Construction services (4.9%) Preschool and school education (4.5%)
Andergrove – Beaconsfield SA2	Coal mining (10.3%) Preschool and school education (6.4%) Other store-based retailing (5.7%) Food and beverage services (5.3%) Construction services (4.9%)	West Mackay SA2	Coal mining (7.2%) Preschool and school education (7.1%) Hospitals (6.5%) Food and beverage services (6.2%) Professional, scientific and technical services (except computer system design and related (4.2%)
East Mackay SA2	Coal mining (8.7%) Other store-based retailing (6.0%) Preschool and school education (5.7%) Food and beverage services (5.0%) Construction services (4.9%)	Mackay LGA	Coal mining (10.6%) Preschool and school education (6.1%) Food and beverage services (5.0%) Other store-based retailing (4.8%) Construction services (4.5%)
Mackay SA2	Food and beverage services (10.6%) Coal mining (6.2%) Hospitals (5.5%) Professional, scientific and technical services (except computer system design and related services) (4.6%) Preschool and school education (4.2%)	Queensland	Preschool and school education (6.1%) Food and beverage services (5.9%) Construction services (5.2%) Professional, scientific and technical services (except computer system design and related services) (5.1%) Other store-based retailing (5.1%)

6.4.2 Education and training (highest level of schooling and non-school qualifications)

Port of Hay Point

Table 24 presents information on education levels for people in the study area aged 15 years and over. Compared to Queensland, communities in the study area reported lower levels of education in the 2016 Census, with a higher proportion of people never attending school or only attending until to Year 8 or below. There was a higher percentage of people who achieved higher levels of secondary schooling, that is, Year 11 or Year 12 in the study area than the Queensland average.

In relation to higher education levels, the SA2s generally reported overall lower levels of people than the Queensland average with tertiary level qualifications such as a bachelor degree or higher and more people with a certificate level qualification.

Table 24: Education (%), 2016 – Port of Hay Point

Statistical Area	Did not go to school, or Year 8 or below	Year 11 or 12 or equivalent	Bachelor degree or higher	Certificate
Sarina SA2	7.7	42.3	6.0	27.2
Ooralea-Bakers Creek SA2	6.8	51.8	10.6	28.1
Walkerston-Eton SA2	6.9	44.7	7.3	28.2
Mackay LGA	6.4	49.5	10.6	26.7
Queensland	5.4	58.9	18.3	21.3

Source: Queensland Government Statistician's Office (2021).[32]

[32] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Hay Point region*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on July 2021

Port of Mackay

Compared with the Queensland average, communities within the study area reported lower levels of education attainment at the 2016 Census, with higher proportions of people who did not go to school or attended to Year 8 or below and lower proportions of people who achieved higher levels of secondary schooling, that is, Year 11 or Year 12. In relation to higher education levels, the SA2s generally reported overall lower levels of people with tertiary level qualifications. This was mainly due to lower proportions of people with a bachelor degree or higher with the proportions of people who had a certificate level qualification above the Queensland average in the study area SA2s.

Within the study area, people in Mackay Harbour SA2 had the highest levels of education, with relatively low proportions of people who did not go to school or attended to Year 8 or below, proportions of people who achieved Year 11 or Year 12 (or equivalent) similar to Queensland, and proportions of people with a bachelor degree or higher above Queensland. This is summarised in **Table 25**.

Table 25: Education, 2016 – Port of Mackay

Statistical Area	Did not go to school, or Year 8 or below	Year 11 or 12 or equivalent	Bachelor degree or higher	Certificate
Study area	7.40%	42.90%	11.30%	25.40%
Mackay Harbour SA2	1.50%	56.10%	23.90%	19.80%
Slade Point SA2	7.10%	48.00%	9.30%	26.30%
Andergrove-Beaconsfield SA2	6.50%	52.10%	9.80%	28.30%
East Mackay SA2	7.80%	49.60%	13.00%	23.60%
Mackay SA22	7.00%	49.40%	15.70%	19.40%
North Mackay SA2	8.40%	44.90%	10.00%	25.00%
South Mackay SA2	8.30%	47.50%	9.50%	26.20%
West Mackay SA2	8.20%	48.30%	14.30%	23.30%
Mackay LGA	6.40%	49.50%	10.60%	26.70%
Queensland	5.40%	58.90%	18.30%	21.30%

Source: Queensland Government Statistician's Office (2021)

6.4.3 Rental market and sale trends

Port of Hay Point

A total of 8554 private occupied dwellings were within the study area at the 2016 Census, of these 4018 dwellings (47%) were in the Sarina SA2, and 2839 dwellings (33%) were in the Walkerston-Eton SA2. Separate dwellings were the predominant dwelling type in the study area comprising more than 90% dwellings in each of the SA2s, well above the proportion of this dwelling type in Queensland (at 76.6%). The proportion of medium density dwellings such as semi-detached houses and apartments is below the Queensland average, although higher proportions of these dwellings were reported in both Ooralea-Bakers Creek and Sarina SA2. This reflects the proximity of Ooralea-Bakers Creek SA2 to Mackay and the larger size of the Sarina township. The Ooralea-Bakers Creek SA2 and Sarina SA2 had relatively high proportions of people living in caravans and cabins in the 2016 Census, reflecting that these SA2s as destinations for tourists and travellers within the region.

At the 2016 Census, there were 2052 occupied private, rented dwellings. These included dwellings being privately rented through a real estate agent, or from a person not in the same household, and dwellings rented through a state housing authority, housing co-op, church or other entity. The Sarina SA2 accounted for about half of rental houses (1002 dwellings) in the study area.

Information on median rental costs and sales prices for the study area are presented in **Table 26**. Median rent costs in the study area for the 12 months to 31 March 2021 were generally below Queensland for one- and two-bedroom dwellings, and similar to or above the Queensland medians for larger three- and four-bedroom dwellings. The SA2s of Ooralea-Bakers Creek and Walkerston-Eton generally had higher median rental costs, which may reflect the proximity of these areas of Mackay.

Median house sales in the study area for the 12 months ending 31 March 2021 were below Queensland in each of the SA2s. Median sale prices for both detached and attached dwellings were highest in the Ooralea-Bakers Creek SA2, which again is likely to reflect the proximity of this SA2 to the population centre of Mackay.

Table 26: Median rent by dwelling sales – Port of Hay Point

Residential Dwelling	Sarina Statistical Area Level 2	Ooralea - Bakers Creek Statistical Area Level 2	Walkerston – Eton Statistical Area Level 2	Mackay Local Government Area	Queensland
Median rent (12 months ending 31 March 2021) [33]					
1-bedroom flat/unit	n.a.	n.a.	n.a.	$280	$330
2-bedroom flat/unit	$230	$370	$325	$300	$400
3-bedroom house	$350	$405	$380	$395	$390
4-bedroom house	$400	$480	$440	$450	$460
Median sale price					
Detached dwellings	$365,000	$450,00	$384,000	$385,000	$510,000
Attached dwellings	$240,000	n.a.	n.a.	$245,000	$420,900
Total	$365,000	$440,000	$377,000	$370,000	$470,000

Source: Queensland Government Statistician's Office (2021).

Port of Mackay

The study area had a total of 16,951 occupied private dwellings at the 2016 Census; 32% of dwellings were in the Andergrove-Beaconsfield SA2 (5349 dwellings). North Mackay, South Mackay and West Mackay also had relatively high numbers of occupied private dwellings.

In the 2016 Census, separate houses were the predominant dwelling type for the study area, comprising of 73.4% of dwellings. Compared to Queensland, the study area had higher proportions of semi-detached dwellings, especially in Mackay, East Mackay and South Mackay. While the study area had lower proportions of flats, units and apartments than the Queensland average, these dwellings represented near 65% of residences in Mackay Harbour and nearly 30% in Mackay. In contrast, North Mackay also had higher proportions of flats, units and apartments than the Queensland average. While caravans and cabins accounted for only 1% of occupied private dwellings in the study area, consistent with the Queensland average, this was higher in Mackay Harbour at 8.3% reflective of the Mackay Harbour Caravan Park.

At the 2016 Census, 6547 dwellings were rented, representing 38.6% of occupied private dwellings. This was above the Queensland average and included dwellings being privately rented through a real estate agent, or from a person not in the same household, and dwellings rented through a state housing authority, housing co-op, church or other entity. All SA2s apart from Slade Point had proportions of dwellings being rented above the Queensland average, with the Mackay SA2 recording the highest proportion of rental households (at 64.2%). The predominance of rental households in the study area is likely to reflect the nature of the workforce, which includes workers who are employed by the mining and resources sector in the wider region and use Mackay as a base when off shift.

Median rent costs in the study area for the 12 months to 31 March 2021, were below the median rental costs for Queensland. Rental costs for smaller dwellings such as one- or two-bedroom flats or units were generally below Queensland in all SA2s, apart from Mackay, which reported median rental for one-bedroom dwellings above the Queensland median. In relation to larger dwellings, while most SA2s reported median rental costs below the Queensland average, Andergrove-Beaconsfield, East Mackay and West Mackay all reported median rents above Queensland. Median rental costs for the study area are presented in **Table 27**.

[33] Queensland Government Statistician's Office. (2021). *Queensland Regional Profiles: Resident Profile for Hay Point region*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on July 2021

Table 27: Median rent by dwelling type - 12 months ending 31 March 2021 – Port of Mackay

Locality	1-bedroom flat/unit	2-bedroom flat/unit	3-bedroom house	4-bedroom house
Study area	$255	$292	$373	$445
Mackay Harbour SA2	n.a.	n.a.	n.a.	n.a.
Slade Point SA2	n.a.	$230	$370	$445
Andergrove-Beaconsfield SA2	$248	$300	$383	$450
East Mackay SA2	$285	$300	$380	$480
Mackay SA2	$330	$305	$350	$440
North Mackay SA2	$238	$280	$360	$435
South Mackay SA2	$180	$290	$368	$440
West Mackay SA2	$250	$340	$400	$430
Mackay LGA	$278	$290	$380	$450
Queensland	$325	$390	$380	$450

Source: Queensland Government Statistician's Office (2021).

Median sale prices for detached, attached and total dwellings in the study area for the 12 months ending 31 December 2020 were below the Queensland median.

Within the study area, East Mackay and West Mackay SA2s generally reported median sale prices for detached dwellings that were above the study area as a whole, while Mackay Harbour report sale prices above the study area median for attached dwellings. In relation to total dwelling sales, all SA2s apart from Mackay and North Mackay recorded median sale prices above the study area average. Median residential dwelling sale prices for the study area is presented in **Table 28**.

Table 28: Residential dwelling median sale prices, 12 months ending 31 December 2020 – Port of Mackay

Locality	Detached dwellings	Attached dwellings	Total dwellings
Study area	$336,000	$246,850	$291,420
Mackay Harbour SA2	N/A	$360,000	$360,000
Slade Point SA2	$297,500	N/A	$295,000
Andergrove-Beaconsfield SA2	$365,000	$269,000	$359,000
East Mackay SA2	$410,000	$280,000	$397,000
Mackay SA2	$307,000	$210,000	$260,000
North Mackay SA2	$300,000	$190,000	$281,250
South Mackay SA2	$317,500	$194,000	$305,000
West Mackay SA2	$355,000	$225,000	$333,000
Mackay Local Government Area	$380,000	$228,000	$365,000
Queensland	$500,000	$415,000	$470,000

Source: Queensland Government Statistician's Office (2021).

6.4.4 Social infrastructure

Port of Hay Point

Social infrastructure includes community facilities, places, services and networks that contribute to community wellbeing and quality of life. **Table 29** and **Figure 26** highlights the local and district-level services, facilities and networks within the study area. The concentration of social infrastructure is located in Sarina and Mackay, which are the main centres for community access to services and facilities.

Port of Mackay

Social infrastructure includes community facilities, places, services and networks that contribute to community wellbeing and quality of life. **Table 30** and **Figure 27** summarise the local and district-level services, facilities and networks within the study area. Due to the supply of social infrastructure in the study area, the detailed analysis in this section has been refined to the SA2s north of the Pioneer River to only include Slade Point,

Mackay Harbour, North Mackay and Andergrove-Beaconsfield SA2s which are closest to the port. Any services that are not supplied in the described study area would be supplied by services south of Pioneer River.

6.4.5 Education

Port of Hay Point

There are numerous education facilities in the study area that address the community's early learning and primary education needs. There are fewer high schools in the study area that serve a wider catchment area and two higher education facilities: CQUniversity Mackay Ooralea and Mackay Engineering College.

Port of Mackay

There are 22 educational facilities across the study area, of which 15 schools and one higher education facility are located north of the Pioneer River, including:

- five state schools, including Andergrove State School, Slade Point State School, Beaconsfield State School, Fitzgerald State School and Mackay North State School
- three independent primary schools, including Mackillop Catholic Primary School, Mackay Christian College and Emmanuel Catholic Primary School
- two state high schools, including Mackay North State School and Pioneer State High School
- one independent high school, being Holy Spirit College
- two independent schools offering education for students in Prep to Year 12, including Whitsunday Anglican School and Carlisle Adventist College
- Mackay District Special School, which provides education for students in Prep to Year 12
- James Cook University-North Mackay campus.

There are also 27 regulated early childhood education and care services, including those run by Goodstart Early Learning, Police Citizens Youth Club (PCYC) and C&K Community Kindergartens.

6.4.6 Health and emergency services

Port of Hay Point

Within the study area, Sarina has the closest facility for health and emergency services to the Port of Hay Point. These include the Sarina Ambulance Service, Sarina Policy Station, and Sarina Hospital and Primary Health Care Centre, while there are volunteer Rural Fire Brigade representatives located in Grasstree Beach.[34] The Hay Point Port Procedures and Information for Shipping manual states that the local police are Sarina Police Station and hospital services are in either Mackay general or Sarina.[35]

Port of Mackay

The main public hospital that caters to the wider Mackay LGA and residents is the Mackay Base Hospital located just south of the Pioneer River. This hospital has staff and equipment to provide service for Aboriginal and Torres Strait Islander Health, oncology, dentistry, dietetics, emergencies, intensive care, medical imaging, mental health, orthopaedics, occupational therapy, surgeries, urology, women's health and special care.[36]

The medical services provided to communities north of the Pioneer River include the Mackay Private Hospital, Mackay Specialist Day Hospital and general practitioners are available throughout the area. Mackay Private Hospital is a medical, rehabilitation and mental health facility, with in and out-patient care.[37] Mackay Specialist Day Hospital provides for general surgery needs of the community.[38] There are five general practitioners in

[34] Rural Fire Brigade Association Qld. (2021). Mackay. Retrieved from https://www.rfbaq.org/mackay
[35] Department of Transport and Main Roads. (2019). *Port Procedures and Information for Shipping – Port of Hay Point*. Retrieved from https://www.publications.qld.gov.au/dataset/c9e7f224-162a-44bb-9bbe-8f356b6c0963/resource/9aae3caf-1e13-4809-8955-42926bc278c2/download/hay-point_ppm_master_june_2022.pdf
[36] State of Queensland. (2020). *Mackay Base Hospital*. Retrieved from https://www.mackay.health.qld.gov.au/your-hospitals/mackay-base-hospital/
[37] Aurora – Mackay Private Hospital. (n.d). *What We Do.* Retrieved from https://mackayprivate.com.au/about/what-we-do.
[38] Virtus Health. (2018). *Who we are*. Retrieved from https://www.msdh.com.au/our-hospital/who-we-are

North Mackay and one in Andergrove, as well as a range of other medical and health care services including dental services, mental health services, chiropractic, podiatry and dermatology services.

The study area offers a range of emergency services, including:

- Queensland Ambulance Stations, located at Beaconsfield
- Queensland Fire and Rescue Services, located at North Mackay
- Queensland Police Station and One Police Beat shopfront in Mackay.

6.4.7 Recreation

Port of Hay Point

The majority of residents surrounding the Port of Hay Point commute to Mackay for work, commercial, retail, sporting and recreation.[39] Areas surrounding the port support a range of nature-based recreational activities such as boating, fishing, snorkelling, diving, surfing, beach-based activities, walking and sightseeing. Limited sporting facilities are located in communities near the port such as Hector, Louisa Creek and Half Tide. These include Penn Road Park, tennis courts and cricket in Edmunds Avenue Park in Hector.

Half Tide Memorial park and O'Connel Park, the public maritime infrastructure at Half Tide Tug Harbour Boat Ramp and land-based fishing at Breakwater Esplanade in Half Tide. Salonika Beach to the south of the port is used by visitors for swimming and land-based fishing and there is a community centre (Hector Hall) in Louisa Creek.

Fishing and boating are also supported in the coastal towns in the study area with boat ramps provided in Grasstree Beach, Campwin Beach and Dunrock.[40] The boat ramp at Campwin Beach is amongst the six most used boat ramps in the Mackay region.[41] Camping and caravanning are popular recreational activities for locals and visitors. There is a caravan park immediately south of the port in Half Tide, as well as facilities in Bakers Creek, Alligator Creek and Sarina.

McEwens Beach offers a range of Council-owned parks that provide picnic tables, formal access to the beach and recreational fishing. It provides one of the three swimming enclosures in the Mackay region. Surrounding wetlands, Sandringham Bay and Bakers Creek are popular boating and fishing locations.[42] Sandringham Bay offers a 2km walking track which is ideal for birdwatching.[43]

Sport and recreational facilities at Ooralea are generally more established and include Mackay Aquatic and Recreation Complex at CQUniversity Mackay Ooralea, Mackay Turf Club, Mackay Leisure Centre, Blackspring golf course and parks that all provide spaces for the community to congregate.

Port of Mackay

The recreation opportunities surrounding the Port of Mackay reflect the coastal lifestyle enjoyed by residents and tourists. The coastline and established infrastructure at the port provides the opportunity for boating, access to diving, reef snorkelling and fishing. The beaches to the north and south of the port area are patrolled beaches enjoyed by the community for the scenic amenity, environmental education, preservation and walking trails. Harbour Beach offers locals and tourists a recreational fishing, a pet-friendly beach and is well used for community events such as the Mackay Harbour Beach Horse Races.[44] In the area around the port, there is an indoor Sports Arena, Mackay Surf Life Saving Club, Mulherin Park and the Melaleuca Golf Course. NQBP established the Port of Mackay's Southern Breakwater Trail, a 3.12km return walk which provides views of Mackay Marina and the port.[45]

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[39] Department of Local Government and Planning. (2012). *Mackay, Isaac and Whitsunday Regional Plan 2012*
[40] Mackay Regional Council. (n.d). *Boat Ramps.* Retrieved from https://www.mackay.qld.gov.au/facilities/fitness_and_health/boat_ramps.
[41] Mackay Regional Council. (2017). *Mackay Region Recreational Fishing Strategy 2017-2022*. Retrieved from https://www.mackay.qld.gov.au/__data/assets/pdf_file/0004/215419/Mackay_Fishing_Strategy_-_Final_219.7v3.pdf
[42] Mackay Regional Council. (2019). *McEwens Beach Local Coastal Plan*. Retrieved from: https://www.mackay.qld.gov.au/__data/assets/pdf_file/0019/246205/CB1009_McEwens_Beach_LCP_FINAL_29NOV19_lores.pdf
[43] Birdlife Mackay. (n.d). *Birdwatching Mackay and Pioneer Valley.* Retrieved from https://www.mackayregionalbotanicgardens.com.au/__data/assets/pdf_file/0010/244945/Birdwatching_Mackay_and_Pioneer_Valley_DL-for web only 002.pdf
[44] Mackay Regional Council. (2017). *Harbour Beach.* Retrieved from: https://www.mackayregion.com/harbour-beach
[45] NQBP. (2018). *Port of Mackay's Southern Breakwater Trial.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0025/37438/Mackay-Breakwater-10000-Steps-Fact-Sheet.pdf

The study area includes a range of recreational facilities providing formal and informal activities. These facilities include sports grounds, open space areas, squash centres, mixed martial arts, the Mackay RSL Bowls club, Girl Guides, gyms, soccer, touch fields. skate parks, national parks and reserves. Skate parks are located at multiple locations including Slade Park, John Breen Skate Park, Luke Payne Memorial Skate Park and Sugar Bowl Mackay. The key forms of recreation in the study area include water-based recreation such as fish, boating, sightseeing and occasionally surfing. Facilities located closest to the port include Mackay Marina, which provides public maritime infrastructure such as the boat ramp. The four-lane boat ramp and floating walkway is in the top six most used boat ramps in the Mackay LGA.[46] Local reserves, lookouts and beaches include the Slade Point Water Tower Walking Trail, Water Tower Lookout and the 6.3km Kommo Toera walking trail through Slade Point Reserve and Ram Chandra Park at Slade Point.

6.4.8 Other social infrastructure

Port of Hay Point

Other social infrastructure in the study area includes the Bakers Creek Community Hall and the Islamic Society of Mackay.

Table 29: Social Infrastructure – Port of Hay Point

Facility Type	Facilities	
Education	Sarina State School Alligator Creek State School Chelona State School Dundula State School Sarina State Highschool Mackay Engineering College QCUniversity Mackay Ooralea.	
Childcare	Birralee Child Care Association Chelona Hatchlings Playgroup.	Ooralea Education and Care Centre PCYC Alligator Creek.
Health, medical and emergency services	Eton Police Station Grasstree Rural Fire Brigade Mackay Ambulance Station.	Sarina Ambulance Service Sarina Hospital and Primary Health Care Centre.
Community facilities	Alligator Creek Water Pump Station Bakers Creek Community Hall Bakers Creek Water Treatment Plant.	Hector Hall, Louisa Creek Mackay Museum Mackay Visitor Information Centre.

[46] Mackay Regional Council. (2017). *Mackay Region Recreational Fishing Strategy 2017-2022*. Retrieved from https://www.mackay.qld.gov.au/__data/assets/pdf_file/0004/215419/Mackay_Fishing_Strategy_-_Final_219.7v3.pdf

Facility Type	Facilities	
Sport and recreation facilities	Abbott Park	Leisure Court Park
	Action Challenge	Mackay Aquatic and Recreation complex
	Bakers Creek AFL Field	Mackay Leisure Centre
	Bakers Creek Park	Mackay Turf Club
	Bernborough Avenue Park	McEwens Beach Reserve
	Black Springs Golf Course	Mount Hector Conservation Park
	Boundary Road East Park	Mulherin Park (Paget)
	Campwin Beach	Muller Park
	City Gates Park	O'Connell Park
	Dickens Avenue Park	Ooralea Racecourse
	Downing Street Park	Paradise Street Park
	Dunnrock Reserve	Pompey Street Reserve
	Etwell Park	Quota Park
	Field Street Park	Racecourse Mill and Refinery
	George Moore Park	Robb Drive Park
	Grasstree Beach	Salonika Beach
	Hay Point Caravan Park	Sarina Beach
	Hay Point Terminal Lookout from the Port Administration Building	Shield Park
		Tropical Caravan Park
	Hector Park.	Illawong Park.
Cultural facilities and places of worship	Islamic Society of Mackay.	

Figure 26: Social infrastructure of Hay Point

Port of Mackay

The study area has a number of places of worship including Saint Joseph's Catholic Church, Mackay Presbyterian Church, Northside and Seaforth Uniting Church, Mackay Church of Christ, Slade Point Christian Life Centre, Slade Point Roman Catholic Church, New Apostolic Church and North Mackay Seventh Day Adventist Church.

Table 30: Social infrastructure - Port of Mackay

Type	Facility	
Education	Andergrove State School Beaconsfield State School Carlisle Christian College CQUniversity - Mackay City Campus and Ooralea Campus Emmanuel Catholic Primary School Fitzgerald State School Holy Spirit College James Cook University- North Mackay Campus Mackay Central State School Mackay Christian College Mackay District Special School Mackay North State School Mackay Northern Beaches State High School Mackay State High School Mackay West State School.	Mackillop Catholic Primary School Mercy College Pioneer State High School QUT Mackay Renewable Biocommodities Pilot Plant Rural Training Queensland - Mackay Slade Point State School Saint Francis Xavier Primary School - Mackay Campus Saint Joseph's Catholic Primary School Saint Mary's Catholic Primary School - Mackay Campus Saint Patrick's College - Mackay Campus Victoria Park State School Whitsunday Anglican School.
Childcare	Adeona Mackay After School & Holiday Care Mackay Birralee Child Care Centre C&K Community Kindergarten - East Mackay, Beaconsfield, Mackay North, Slade Point, South Mackay Camp Australia - Mackay North State School Outside School Hours Care Carlisle Adventist Early Learning Centre Enhance Family Day Care - Blue River Goodstart Early Learning Andergrove, Mackay Bridge Road, Mackay Macalister Street, Mackay Shakespeare Street, Mount Pleasant, North Mackay Green Leaves Early Learning Mount Pleasant Hot Tots Educational Centre Kidzplay & Learning Centre Kidzplay & Learning Centre West Kookaburra Child Care Centre.	Mackay Child Care Centre Mackay Children and Family Centre Mackay Christian College Outside School Hours Care Mackay Christian College Pre-Prep Learning Centre Mackay Cubbie House Childcare and Educational Centre Mackay Family Day Care Scheme Mackay Kindergarten and Preschool My School Child Care - Slade Point Ooralea Education and Care Centre PCYC Mackay - School Age Care, Mackay West, Mackay, Fitzgerald, School Age Care Pioneer Community Kindergarten Saint Francis Xavier Catholic Kindergarten Saint Francis Xavier Early Years Outside School Hours Care Saint Joseph's Outside School Hours Care Whitsunday Anglican School Kindergarten.
Health, medical and emergency services	Blue Care Respite care Icon Cancer Centre Mackay Mackay Base Hospital Mackay Community Health Mackay Court House Mackay Police Station Mackay Policy Beat shopfront Mackay Private Hospital.	Mackay Specialist Day Hospital Mater Misericordiae Hospital Mater Private Hospital Mackay Wellington Street North Mackay and Mackay Fire Station Queensland Ambulance Service – North Mackay and South Mackay Slade point Neighbourhood Police Beat.
Community facilities	Andergrove Community Hall Beaconsfield Road Men's Shed Dudley Denny City Library Free Community Hall at Mackay Hotel Jubilee Community Centre Mackay Historical Society and Museum Andergrove Neighbourhood Centre Slade Point Community Hall and Mobile Library North Mackay and Slade Point post office Beaconsfield Road Men's Shed.	Post Office North Mackay, Mackay West, East Mackay Slade Point Community Hall Slade Point Mobile Library The Surf Club Mackay.

Type	Facility	
Sport and recreation facilities	Abbott park	Lions Soccer field
	Albatross Street Lookout	Mackay community garden
	Andergrove Caravan Park	Mackay Entertainment and Convention Centre
	Bluewater lagoon	Mackay Golf club
	Cremorne Park	Mackay Regional Botanic Gardens
	Cumberland Avenue Park	Mackay RSL Memorial Bowls
	Far beach	Melaleuca Golf Course
	Gannet Street Walkway	Orchid House
	Gillhams Park	Quota park
	Gooseponds park	Queens park
	Gooseponds walking trail	Ram Chandra park
	Illawong beach	Showground
	Jayel Rock Pool	Slade Point Rugby Club
	Kommo Toera Trail	Slade Point Tower Walking Trail
	Lamberts Beach	Sugar Bowl Skatepark
	Lamberts Beach	Tramontana Street Park
	Lamberts Lookout	Wetlands Andergrove
	Leisure Court Park.	Wren Street Park.
Cultural facilities and places of worship	Apostolic Church of Queensland	Northside Uniting Church
	Armitage Uniting Church	Salvation Army
	Christian City Church	Scots Presbyterian Church
	Christian Outreach Centre	Slade Point Christian Life Centre
	Church of Jesus Christ Of Latter-Day Saints	Slade Point Roman Catholic Church
	Church of The Nazarene	Saint Ambrose Anglican Church
	Holy Trinity Anglican Church	Saint Charles Anglican Church
	Iona West Uniting Church	Saint Francis Xavier Catholic Church
	Mackay Baptist Church	Saint Joseph’s Catholic Church
	Mackay Central Seventh-Day Adventist Church	Saint Mary’s Catholic Church
	Mackay Christian Family Church	Saint Patrick’s Catholic Church
	Mackay Church of Christ	Saint Pauls Lutheran Church
	New Hope Christian Community Church	Saint Pauls Uniting Church.
	North Mackay Seventh-Day Adventist Church.	

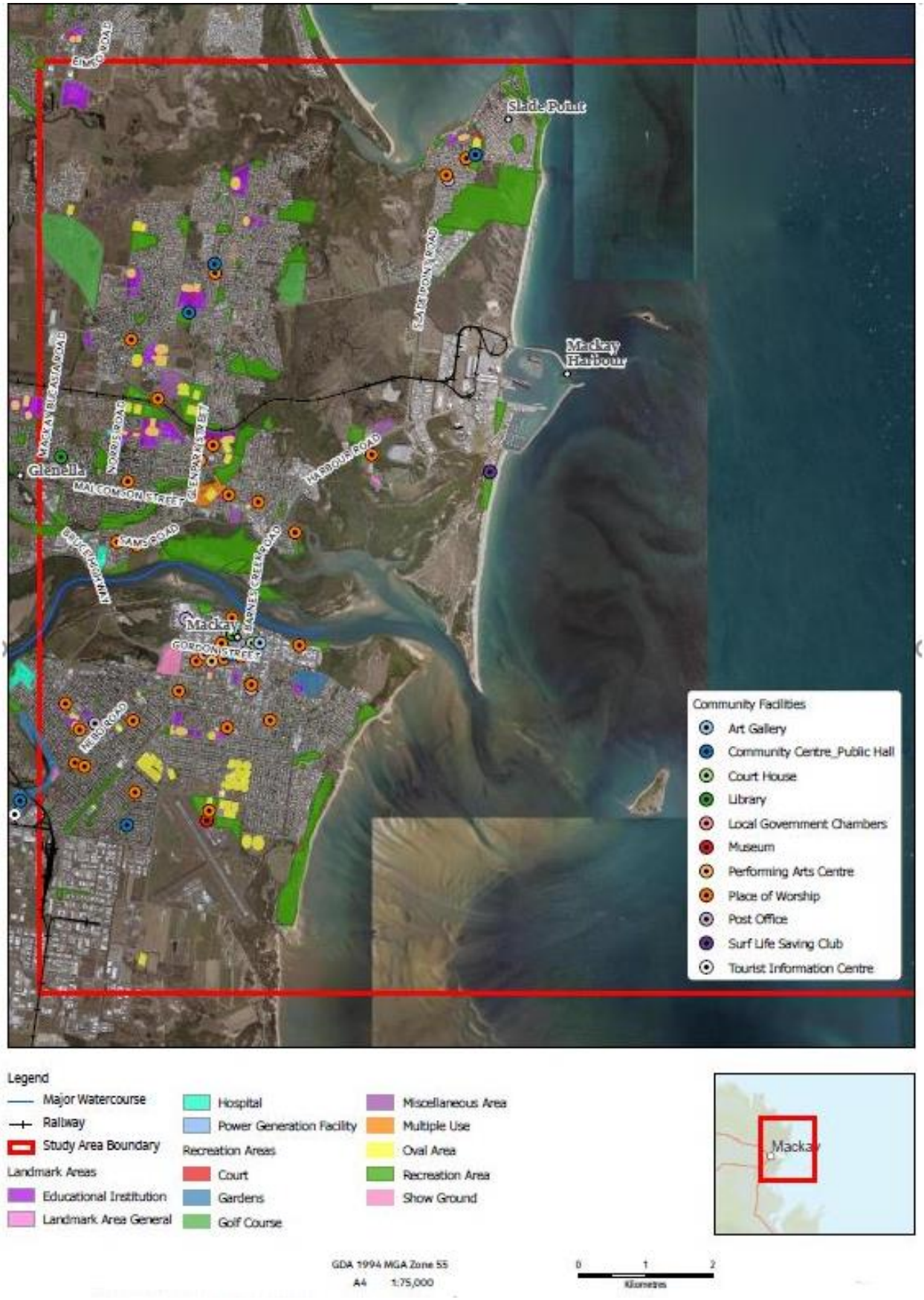

Figure 27: Social infrastructure Port of Mackay

6.4.10 Community values

Port of Hay Point

Community values represent both physical and intangible features of a region that are important to the community's quality of life and wellbeing such as open space, connectivity, services, sense of place and cohesion. The social infrastructure represents community value by aiding in social cohesion, identity and quality of life.

This section will highlight and map the community values centred around visual amenity within the port and surrounding areas, see **Figure 28**.

Port of Mackay

Community values represent both physical and intangible features of a region that are important to the community's quality of life and wellbeing such as open space, connectivity, services, sense of place and cohesion. The social infrastructure identified also contribute to community value through aiding in social cohesion, identity and quality of life.

This section highlights and maps the community values centred around visual amenity within the port and surrounding areas, see **Figure 29**. Identification of the key visual/amenity places in which hold value to the community is vital to ensure that the port development does not impact on the quality of life for residents.

Pioneer River, Slade Island, Slade Point Nature Reserve and the Keeleys Road Wetlands are considered the key areas of environment, social and cultural heritage value for the local community.[47]

6.4.11 Conservation areas

Port of Hay Point

The Port of Hay Point and the associated waters are contained within the GBRWHA, which is declared to have OUV. The GBRMP is regulated by the Australian Government under the GBRMP Act covering 344,400km^2 including the subsoil beneath the seabed (1000 metres (m) below) and the airspace above (915m high). It is a multiple-use marine park area that supports a range of communities and industries that depend on the reef for recreation or their livelihoods (including tourism, fishing, boating and shipping).

The GBR coastal zone is regulated by the state and includes areas adjacent to the GBR and includes Queensland coastal waters, islands and adjacent inland areas, 5km inland and 10m Australian Height Datum (AHD), whichever is further.

The conservation areas surrounding the port add ecological, scenic, recreational and economic value.[48] Bakers Creek Conservation Park supports cultural heritage and recreational values for the community. The park offers recreational fishing, crabbing, picnicking and bird-watching opportunities and provides history and heritage value of the Indigenous people.[49]

Sandringham Bay Conservation Park and Mount Hector Conservation Park are both places of scenic and environmental value. They attract local residents and visitors for marine and coastline activities.[50] Offshore locations such as Victor Island, Flat Top Island and Round Top Island are also key environmental, social and cultural heritage sites.[51]

Port of Mackay

The Port of Mackay is flanked by coastal beaches and conservation land to the north, south and west that hold great significance to the local community and Indigenous people. The open space areas of Keeleys Road

[47] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[48] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[49] Queensland Government. (2000). *Bakers Creek Conservation Park.* Retrieved from https://parks.des.qld.gov.au/__data/assets/pdf_file/0026/167813/bakers-creek-conservation-park-2000.pdf
[50] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[51] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*

Wetland, East Point, Slade Island and conservation areas of Slade Point Nature Reserve and Blacks Beach remain core to the environmental significance of the study area. The natural environments have been recorded as having Indigenous and non-Indigenous cultural heritage material, such as hunting and collection sites. Slade Point Nature Reserve north of the port, is one of the last coastal dunes and paperbark wetlands in the Mackay region.[52]

Off the coast of the port is Yuwi Paree Toolkoon National Park or more commonly known as Flat top and Round Top Islands which contain Commonwealth Heritage List (CHL) structures such as the Flat Top Island Lighthouse. The seas also contain shipwrecks, with a high number located to the north of the Pioneer River.[53]

There are many conservation-focussed community groups in Mackay, including the Friends of Morag McNichol Reserve, Birdlife Mackay, Mackay Conservation Group and the Mackay and District Turtle Watch Association (MTWA).[54] The MRC also conducted a Community Attitude Survey in 2018, which highlighted community concerns about environmental and beach foreshore protection.[55]

6.4.12 Beach areas/landscapes foreshores

Port of Hay Point

Cultural and heritage values have been identified in the coastal foreshores north-west and south of the port. The community enjoys the semi-rural lifestyle that the area provides through fishing, swimming, sailing and sightseeing.[56] Salonika Beach is a 2km stretch of sandy beach, ideal for swimming and water-based activities and provides a scenic outlook to Victor Island and the port.[57]

In April 2021, the MRC approved the name change of the northern section of Grendon Park near the Esplanade at Hay Point to Half Tide Beach Memorial Park. This name honours and symbolises the areas' military and cultural history.[58] As part of renaming the park, NQBP granted the Port of Hay Point Community Reference Group $5000 to purchase commemorative plaques for the Memorial Wall at the Half Tide Cenotaph.[59]

Port of Mackay

Harbour Beach, Lamberts Beach, Slade Bay, McCreadys Creek and Pioneer River are popular for their scenic amenity and environmental preservation. Lamberts Beach and North Harbour are the only two surf beaches in the Mackay region with occasional surf.[60]

6.4.13 Vistas/viewpoints

Port of Hay Point

As one of the largest coal-loading facilities in the world, tourists and visitors can view the port from a variety of nearby lookouts and beaches. The most notable lookout is the Port Administration building and the Hay Point Lookout.

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[52] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*.
[53] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*.
[54] Mackay Regional Council. (n.d). *Community Groups.* Retrieved from https://www.mackay.qld.gov.au/environment/for_the_community/community_groups
[55] Mackay Regional Council. (2018). *Community Survey.* Retrieved from https://www.mackay.qld.gov.au/about_council/your_council/mackay_regional_council_community_surveyIbid
[56] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[57] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[58] Mackay Regional Council. (2021*). New name adopted for Northern section of Grendon Park*. Retrieved from https://www.mackay.qld.gov.au/about_council/news_and_media/media_releases/new_name_adopted_for_northern_section_of_grendon_park
[59] North Queensland Bulk Ports Corporation Limited. (2020). *Mackay and Hay Point Communities will soon benefit from $5,000 sponsorships awarded by their local Port Community Reference Group (CRGs).* Retrieved from https://nqbp.com.au/about-us/news/articles/port-community-reference-groups-award-grants
[60] Mackay Regional Council. (2019). *Slade Point Local Coastal Plan.* Retrieved from: https://www.mackay.qld.gov.au/__data/assets/pdf_file/0004/239647/SLADE_POINT_Beach_Plan_WEB.pdf

The Hay Point Lookout is a public lookout located on an area of land east of the coal loaders. It is an area of remnant coastal vegetation, rainforest and nesting sites for 'Endangered' turtles. The boardwalk provides environmental education and recreation facilities while protecting the ecological values of the area.

Figure 28: Community value areas of the Port of Hay Point

Port of Mackay

The port is surrounded by natural scenic amenity, that provide relief from the industrial areas surrounding the port operations (refer to **Figure 29**). There are marine areas, islands, coastal hills, ridgelines and hillsides as

well as rivers, estuaries (Pioneer River and Bakers River) and wetlands that are both of environmental and scenic of value to residents and tourists.

There are specific lookouts in the study area such as the Lambert Beach Lookout which is a landmark pavilion in Slade Point that is one of the few places where residents in Mackay can see both sunrise and sunset and ideal for whale watching. The Pine Islet Lighthouse, located at Mackay Harbour was on the Queensland Heritage Register (QHR) and was relocated to the port in 1995, and at one point was the last kerosene powered lighthouse in Australia.[6162] Flat Top Island is also home to an iconic lighthouse, which was used to mark the entrance to the Pioneer River for shipping and port direction.[63]

[61] Mackay Regional Council. (2019). *Slade Point Local Coastal Plan.* Retrieved from: https://www.mackay.qld.gov.au/__data/assets/pdf_file/0004/239647/SLADE_POINT_Beach_Plan_WEB.pdf
[62] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*.
[63] Lighthouses of Australia Inc. (n.d). *Flat Top Island Lighthouse.* Retrieved from https://lighthouses.org.au/qld/flat-top-island-lighthouse/

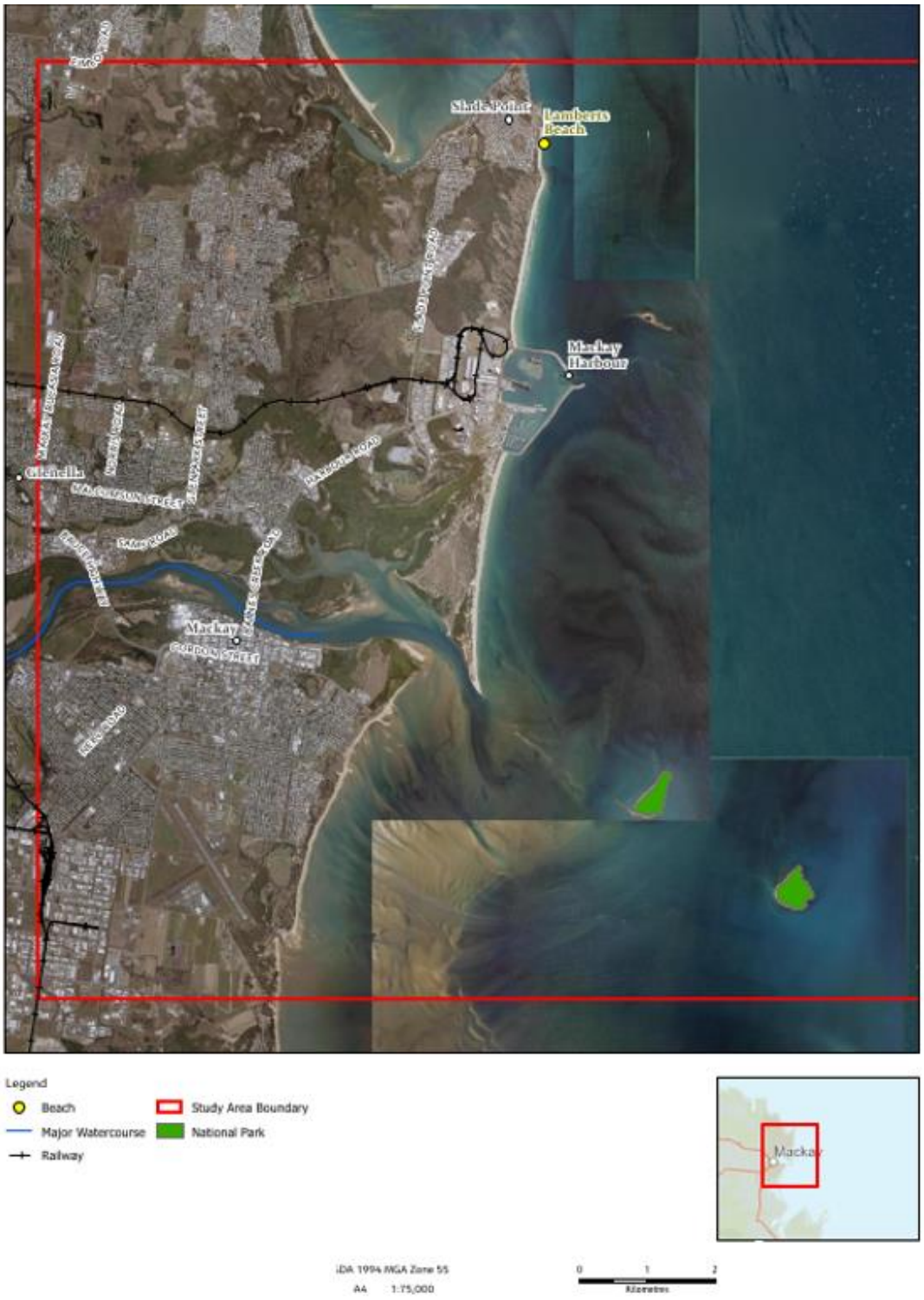

Figure 29: Community value areas at the Port of Mackay

6.5 Potential impacts, threats and pressure

Port of Hay Point

Potential impacts, threats and pressures on social values from development and activities in the port and surrounding area are summarised in **Table 31**, along with details on whether these impacts, threats and pressures are direct or indirect, and 'one off' or 'ongoing'.

Table 31: Potential impacts, threats and pressures on social values – Port of Hay Point

Social value	Potential impact/threat/pressure	Direct/indirect	One off/ongoing
Population and demography	Influx of workers to support construction activities within the port, resulting in an increase in the non-resident population and subsequent changes to the age profile and ratio of males and females in communities near the port (due to typical construction workforce demographics).	Direct	One off
	Increase in resident population due to people moving to surrounding communities to take up employment opportunities in ongoing port-related activities.	Indirect	Ongoing
	Population retention in the study area, including of younger people due to increased opportunities for local employment and training during port construction and operation activities.	Indirect	Ongoing
Employment and training	Employment generation associated with construction of future development and ongoing operation of port-related activities, supporting increased local employment opportunities and diversity, and associated social and economic outcomes (for example, increased personal and household incomes, upskilling of local workforce).	Direct/indirect	One off/ongoing
	Increased employment and training opportunities during construction of future development and ongoing operation of port-related activities for groups such as youth and Indigenous, supporting lower youth and Indigenous unemployment rates and increased economic and social outcomes.	Direct/indirect	One off/ongoing
	Employment opportunities within local and regional businesses that provide goods and services to support construction and port-related activities.	Indirect	Ongoing
	Demand for local workers during construction and ongoing port operations has potential to result in labour shortages in lower paid employment sectors.	Direct	Ongoing
Housing	Increased demand for housing by construction workers potentially resulting in higher rent prices and impacts on rental housing affordability and levels of housing stress for low and fixed-income households.	Direct	One off
	Increased demand for housing by workers of ongoing port-related activities potentially resulting in higher housing prices and impacts on housing affordability and housing stress for low and fixed-income households.	Indirect	Ongoing
	Increased demand for temporary accommodation options potentially impacting on the availability of short-term visitor accommodation for tourists.	Direct	One off
	Increased rental income for owners of investment properties due to increased demand for housing by construction workers and workers involved with ongoing port-related activities.	Direct	Ongoing
	Economic benefits for owners of temporary accommodation options due to increased use by construction workers.	Direct	One off
	Potential demand for new housing development to support the housing needs of future port-related workers.	Indirect	Ongoing
Social infrastructure	Influx of non-resident workers to support construction activities and ongoing operational port-related activities may increase demand for critical community services and facilities in local communities and centres such as Mackay and Sarina, impacting on access to these services for residents.	Indirect	Ongoing
	Increase in workers and their families moving surrounding communities in response to port-related employment opportunities increasing demand on services and facilities such as education, childcare facilities, family support services, and sporting facilities.	Indirect	Ongoing
	Increase in resident population due to people moving to local communities and centres such as Mackay and Sarina to take up employment opportunities in ongoing port-related activities.	Indirect	Ongoing

Social value	Potential impact/threat/pressure	Direct/indirect	One off/ongoing
	Improvements in community services and facilities due to an increase in people moving to surrounding communities and centres such as Mackay and Sarina in response to port-related employment opportunities (for example, increased demand for education facilities may support improvements in education facilities, classes available to students, and so on).	Indirect	Ongoing
Community values	Changes to community identify and social cohesion due to an influx of non-resident workers to support future construction activities and ongoing operational activities for the port.	Indirect	Ongoing
	Potential conflict between residents and non-resident workforce due to possible incidences of anti-social behaviour of non-resident workforce.	Indirect	Ongoing
	Potential for conflict and division between community members due to differences in opinion about perceived adverse impacts on environmental values relating to the GBR and project benefits.	Indirect	Ongoing
	Potential impacts on community values relating to environmental features such as the GBR, waters, national parks and conservation areas.	Indirect	Ongoing
	Potential impacts on recreational fishing areas within coastal and deep-sea waters surrounding the port due to changes in ongoing port operations and activities.	Indirect	Ongoing
	Increase in road safety risks due to increased construction traffic and port-related traffic, for example workers commuting to the port; delivery of construction materials, plant and equipment; increased heavy vehicle activities.	Direct	Ongoing
	Increased economic opportunities for local and regional communities, business and industry due to construction activities, port-related operations, and increase in local population (for example, increased spending on local supplies, goods and services by construction contractors, port-related businesses, and workers).	Direct/indirect	Ongoing
	Increased noise, dust, traffic and visual impacts from future construction related activities and ongoing port operations have potential to result in reduced amenity of surrounding residential communities.	Direct	Ongoing

Port of Mackay

Potential impacts, threats and pressures on social values in the study area from development and activities in the port and surrounding area are summarised in **Table 32**, along with details on whether these impacts, threats and pressures are direct or indirect, and 'one off' or 'ongoing'.

Table 32: Potential impacts, threats and pressures on social values – Port of Mackay

Social value	Potential impact/threat/pressure	Direct/ indirect	One off/ ongoing
Population and demography	Influx of workers to support construction activities within the port, resulting in an increase in the non-resident population and subsequent changes to the age profile and ratio of males and females (due to typical construction workforce demographics).	Direct	One off
	Increase in resident population due to people moving to the study area to take up employment opportunities in ongoing port-related activities.	Indirect	Ongoing
	Population retention in the study area, including of younger people due to increased opportunities for local employment and training during port construction and operation activities.	Indirect	Ongoing
Employment and training	Employment generation associated with construction of future development and ongoing operation of port-related activities, supporting increased local employment opportunities and diversity, and associated social and economic outcomes (for example, increased personal and household incomes, upskilling of local workforce).	Direct/ indirect	One off/ongoing

Social value	Potential impact/threat/pressure	Direct/ indirect	One off/ ongoing
	Increased employment and training opportunities during construction of future development and ongoing operation of port-related activities for groups such as youth and Indigenous, supporting lower youth and Indigenous unemployment rates and increased economic and social outcomes.	Direct/ indirect	One off/ongoing
	Employment opportunities within local and regional businesses that provide goods and services to support construction and port-related activities.	Indirect	Ongoing
	Demand for local workers during construction and ongoing port operations has potential to result in labour shortages in lower paid employment sectors and lead to wage disparity between workers in port-related activities and other industries.	Direct	Ongoing
Housing	Increased demand for housing by construction workers potentially resulting in higher rent prices and impacts on rental housing affordability and levels of housing stress for low and fixed-income households.	Direct	One off
	Increased demand for housing by workers of ongoing port-related activities potentially resulting in higher housing prices and impacts on housing affordability and housing stress for low and fixed-income households.	Indirect	Ongoing
	Increased demand for temporary accommodation options potentially impacting on the availability of short-term visitor accommodation for tourists.	Direct	One off
	Increased rental income for owners of investment properties due to increased demand for housing by construction workers and workers involved with ongoing port-related activities.	Direct	Ongoing
	Economic benefits for owners of temporary accommodation options due to increased use by construction workers.	Direct	One off
	Potential demand for new housing development to support the housing needs of future port-related workers.	Indirect	Ongoing
Social infrastructure	Influx of non-resident workers to support construction activities and ongoing operational port-related activities may increase demand for critical community services and facilities, impacting on access to these services for residents in some locations.	Indirect	Ongoing
	Increase in workers and their families moving to the study area in response to port-related employment opportunities increasing demand on services and facilities such as education, childcare facilities, family support services, and sporting facilities.	Indirect	Ongoing
	Increase in resident population due to people moving to the study area and surrounding communities to take up employment opportunities in ongoing port-related activities.	Indirect	Ongoing
	Improvements in community services and facilities due to an increase in people moving to the study area and surrounding communities in response to port-related employment opportunities (for example, increased demand for education facilities may support improvements in education facilities, classes available to students, and so on).	Indirect	Ongoing
Community values	Changes to community identify and social cohesion due to an influx of non-resident workers to support future construction activities and ongoing operational activities for the port.	Indirect	Ongoing
	Potential conflict between residents and non-resident workforce due to possible incidences of anti-social behaviour of non-resident workforce.	Indirect	Ongoing
	Potential for conflict and division between community members due to differences in opinion about perceived adverse impacts on environmental values relating to the GBR and project benefits.	Indirect	Ongoing
	Potential impacts on community values relating to environmental features such as the GBR, and natural environment such as waters, national parks and conservation areas. This may also impact on people using these natural assets for nature-based recreation activities such as fishing, boating and surfing.	Indirect	Ongoing
	Potential impacts on recreational fishing areas within coastal and deep-sea waters surrounding the port due to changes in ongoing port operations and activities.	Indirect	Ongoing
	Potential for noise and vibration, traffic nuisance and impacts on visual amenity during construction and operation phases of the port.	Direct	One off

Social value	Potential impact/threat/pressure	Direct/ indirect	One off/ ongoing
	Increase in road safety risks due to increased construction traffic and port-related traffic (for example, workers commuting to the port; delivery of construction materials, plant and equipment; increased heavy vehicle activities).	Direct	Ongoing
	Increased economic opportunities for local and regional communities, business and industry due to construction activities, port-related operations, and increase in local population (for example, increased spending on local supplies, goods and services by construction contractors, port-related businesses, and workers).	Direct/ indirect	Ongoing
	Introduction of new development and port-related infrastructure, impacting on the visual environment and views towards the port from surrounding land and waters.	Direct	Ongoing

6.6 Summary

Port of Hay Point

The Port of Hay Point has a long history and has played an important role in the social and economic fabric of the Mackay region. The port is surrounded by natural environments, rural communities and Indigenous heritage. This section of the report identifies and describes the social and socio-economic characteristics of the port and surrounding areas. This information will inform the master planning process in accordance with the Ports Act requirements.

The master planning process will be designed within an existing policy framework, that at a federal, state and local government level has stipulated the regional and social objectives, and issues of community significance to the port and surrounding areas. The frameworkestablished the importance of community cohesion and identity, Indigenous cultural heritage, recreational activities, environmental protection and economic sustainability.

The social profile of the port presents the historical and current demographic characteristics of Hay Point which incorporates the communities of Sarina, Ooralea-Bakers Creek, Walkerston-Eton SA2s. The study area had an estimated residential population of 25,191 people, mostly residing in Sarina. There are relatively low levels of unemployment compared to Queensland, with coal mining being the main industry of employment. The study area reported lower levels of education for primary, secondary and bachelor degree or higher, but had higher level of certificate attainment compared to Queensland.

The communities in the study area are supported by a range of social infrastructure that contributes to wellbeing and quality of life. The concentration of social infrastructure is supplied within Sarina. Within the boundaries of the study area the social infrastructure includes education, recreation and community facilities. There is no health or emergency services in the study area, these are sourced mainly from Mackay and Sarina. Community values are centred around conservation, recreation, visual amenity and the natural environment which all add to the lifestyles enjoyed by residents and tourists alike.

Port of Mackay

The Port of Mackay is an important part of the social and economic fabric of the Mackay region and Queensland and a key contributor to the sense of identity and place for the Mackay township and nearby communities. Consideration of social and community factors in the development of the port masterplan is critical to ensuring social values are appropriately protected from future port development and activities.

The master planning process will be designed within an existing policy framework, that at a federal, state and local government level has stipulated the regional and social objectives, and issues of community significance to the port and surrounding areas. The frameworks established the importance of community cohesion and identity, Indigenous cultural heritage, recreational activities, environmental protection and economic sustainability.

The social profile of the port presents the historical and current demographic characteristics of Mackay which incorporates the communities of Mackay Harbour, Slade Point, Andergrove-Beaconsfield and all suburbs surrounding the Mackay City Centre. This profile draws on data contained in the Queensland regional profiles, ABS Census of Population and Housing 2016 and other ABS datasets.

The study area had an estimated residential population of 45,257 people, 35% residing in the Andergrove-Beaconsfield area. Then median age in the study area in June 2019 was 38.4 years and projected to be 43.2 years by 2041.

Those identified as Aboriginal or Torres Strait Islander in the 2016 Census, represented 6.3% of the study area's total population. Slade Point had the highest proportion of Indigenous people representing 12.3% of the total Mackay population. Andergrove-Beaconsfield SA2 also had relatively high levels of Indigenous people.

The main industries of employment recorded the study area included coal mining (8.6%), food and beverage services (6.4%), preschool and school education (6.0%), other store-based retailing (5.1%) and construction services (4.7%) (Census, 2016), Coal mining was ranked as the top industry of employment in all SA2s apart from Mackay and South Mackay, where it ranked as the second highest industry of employment. This reflects the role of Mackay as a major support centre for mining and resources within the wider region.

Compared with the Queensland average, communities within the study area reported lower levels of education attainment at the 2016 Census, with higher proportions of people who did not go to school or attended to Year 8 or below and lower proportions of people who achieved higher levels of secondary schooling (Years 11 and 12). Within the study area, people in Mackay Harbour SA2 had the highest levels of education, with relatively low proportions of people who did not go to school or attended to Year 8 or below, similar to Queensland, and those with a bachelor degree or higher rated above the Queensland average.[64]

[64] Queensland Government Statistician's Office. (2021). *Queensland Treasury, Queensland Regional Profiles: Resident Profile for Mackay SA2s*. Retrieved from https://statistics.qgso.qld.gov.au/qld-regional-profiles on 2 June 2021.

7.0 Cultural heritage

7.1 Introduction

Legislation in Queensland protects all known heritage places and requires that proponents undertake detailed due diligence assessment prior to development in undisturbed land. Native title has been determined to exist over part of the study area.

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register identified eight known Aboriginal places within the study area.

Below provides a summary of the following sections:

- Aboriginal cultural heritage – **Section 7.2**
- Historical cultural heritage – **Section 7.3**
- Summary – **Section 7.4.**

7.2 Aboriginal cultural heritage

7.2.1 Commonwealth legislation and policy

7.2.1.1 *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth)

The purpose of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) is to ensure the preservation and protection of areas and objects in Australia and in Australian waters that are of particular significance to Aboriginal tradition.

It contains provisions for an Indigenous person or group to submit an application to the Australian Government seeking a declaration to protect an area or object of particular Indigenous significance, from specific threats of injury or desecration. The Australian Government would only seek to exercise its power after the relevant Indigenous party has exhausted all opportunities to preserve and protect the area or object through the relevant state or territory legislation.

7.2.1.2 *Environment Protection and Biodiversity Conservation Act 1999* (Cth)

The EPBC Act includes 'National Heritage' as a MNES and protects listed places to the fullest extent under the Australian Constitution. It also establishes the National Heritage List (NHL) and the CHL.

The only area of national or Commonwealth heritage existing within the study area is the GBRMP.

7.2.1.3 *Native Title Act 1993* (Cth)

The *Native Title Act 1993* (Cth) recognises and protects native title and provides that native title cannot be extinguished contrary to the Act. Aboriginal claimants may lodge an application for native title determination over an area of land and sea. The determination then details whether native title rights have been extinguished or are retained as either exclusive or non-exclusive right for the claimant party.

The *Native Title Act 1993* (Cth) also establishes processes for the negotiation of agreements between a Registered Native Title Body Corporate (RNTBC) and development proponents. These agreements are generally project specific.

7.2.2 Queensland Legislation and Policy

7.2.2.1 *Aboriginal Cultural Heritage Act 2003*

All Aboriginal cultural heritage in Queensland is protected under the *Aboriginal Cultural Heritage Act 2003* and penalty provisions apply for any unauthorised harm. Compliance with the Act can be achieved through application of the *Duty of Care Guidelines* (2004) or implementation of a CHMP.

Under Section 23(1) of the Act, a person carrying out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage (the cultural heritage duty of care). This applies whether places are recorded in an official register or not and whether or not they are located in, on or under private land.

A person who carries out an activity is taken to have complied with the cultural heritage duty of care in relation to Aboriginal cultural heritage if the person is acting in compliance with the guidelines.

The Act provides for development of CHMPs to address matters of cultural for proposed development. CHMPs are generally project specific documents developed between Aboriginal parties and a development proponent.

7.2.2.1.1 Duty of Care Guidelines

The *Duty of Care Guidelines* are gazetted in accordance with Section 28 of the *Aboriginal Cultural Heritage Act 2003* and allow for the protection and preservation of Aboriginal cultural heritage. It sets out a prescribed process to ensure that a person has exercised an appropriate level of due diligence prior to commencing an activity that may harm Aboriginal cultural heritage.

The guidelines recognise that it is unlikely that Aboriginal cultural heritage will be harmed where:

- the current or proposed activity is on an area previously subject to significant ground disturbance and the activity will impact only on the area subject to the previous disturbance or
- the impact of the current or proposed activity is unlikely to cause any additional harm to Aboriginal cultural heritage that which has already occurred.

This is not to say that a particular area may not continue to have importance under Aboriginal tradition or history, even though it has been subject to prior significant ground disturbance.

A person who carries out an activity is taken to have complied with the cultural heritage duty of care in relation to Aboriginal cultural heritage if the person is acting in compliance with the *Duty of Care Guidelines*.

In accordance with the *Aboriginal Cultural Heritage Act 2003*, a person undertaking an activity must take all reasonable and practicable measures to avoid harming Aboriginal cultural heritage. The following criteria must be considered for a person to have undertaken appropriate due diligence:

- the nature of the activity, and the likelihood of its causing harm to Aboriginal cultural heritage
- the nature of the Aboriginal cultural heritage likely to be harmed by the activity
- the extent to which the person consulted with Aboriginal parties about the carrying out of the activity, and the results of the consultation
- whether the person carried out a study or survey, of any type, of the area affected by the activity to find out the location and extent of the Aboriginal cultural heritage, and the extent of the study or survey
- whether the person searched the database and register for information about the area affected by the activity
- the extent to which the person complied with cultural heritage *Duty of Care Guidelines*
- the nature and extent of past uses in the area affected by the activity.

The *Duty of Care Guidelines* identifies five activities:

- Activities involving No Surface Disturbance (Category 1)
- Activities causing No Additional Surface Disturbance (Category 2)
- Developed Areas (Category 3)
- Areas previously subject to Significant Ground Disturbance (Category 4)
- Activities causing additional surface disturbance (Category 5).

Where proposed project activities may excavate, relocate, remove or harm Aboriginal cultural heritage entered on the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register in any of the below categories, there is generally a high risk that proposed project activities could harm Aboriginal cultural heritage. In these circumstances, the activity should not proceed without further cultural heritage assessment, including consultation with the Aboriginal party for the area.

7.2.2.2 *Native Title (Queensland) Act 1993*

The *Native Title (Queensland) Act 1993* ensures that Queensland legislation is consistent with the *Native Title Act 1993* (Cth) and to validate past Acts under Queensland law that may have been invalidated because of the existence of native title. The Act also serves to confirm existing rights that are not native title rights, such as land access and natural resource ownership.

7.2.3 Relevant database and register searches

7.2.3.1 Aboriginal and Torres Strait Islander Cultural Heritage Database and Register search

Port of Hay Point

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register (undertaken on 10 August 2021) identified eight known Aboriginal sites in the study area, noted in **Table 33**.

Table 33: Aboriginal places in the study area – Port of Hay Point

Site type	Number
Shell Midden(s)	1
Weir/Fish Trap	1
Burial(s)	1
Isolated Find	1
Contact Site	2
Historical Place	2
Total	8

This database and register search also identified the following cultural heritage parties for the study area (**Table 34**). These parties should be consulted during any Aboriginal cultural heritage investigations.

Table 34: Cultural heritage parties for the study area – Port of Hay Point

QC Ref Number	QUD Ref Number	Name	Contact Details
QCD2020/001 DET	QUD12/2019	Yuwibara people	Yuwi Aboriginal Corporation RNTBC PO Box 5463 Mackay MC QLD 4741

Port of Mackay

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register undertaken on 10 August 2021 identified 14 known Aboriginal sites within the study area, a summary of these sites is presented in **Table 35** and **Table 36**.

Table 35: Aboriginal places in the study area – Port of Mackay

Site type	Number
Burial(s)	1
Contact Site	1
Cultural Site	1
Shell Midden(s)	10
Weir/Fish Trap	1
Total	14

The Aboriginal and Torres Strait Islander Cultural Heritage Database and Register search also identified the following cultural heritage party for the study area (**Table 36**). This party should be consulted during any Aboriginal cultural heritage investigations.

Table 36: Cultural heritage party for the study area – Port of Mackay

QC Ref Number	QUD Ref Number	Name	Contact Details
QCD2020/001 DET	QUD12/2019	Yuwibara people	Yuwi Aboriginal Corporation RNTBC PO BOX 5463 MACKAY MC QLD 4741 Phone: 0400 162 258 Email: yuwicorpmackay@gmail.com

7.2.3.2 National Native Title Register

Port of Hay Point

A search of the National Native Title Tribunal's Native Title Vision tool, undertaken on 31 May 2021 indicated that there is a native title consent determination in place for some of the land at Hay Point. The Court found that the Traditional Owners of the Land are the Yuwibara people and that native title is held by them in part of the study area.

Port of Mackay

A search of the National Native Title Tribunal's Native Title Vision tool undertaken on 31 May 2021, indicated that there is a native title consent determination in place for some of the land at the Port of Mackay (**Figure 30**). The Court found that the Traditional Owners of the Land are the Yuwibara people and that native title is held by them in part of the study area.

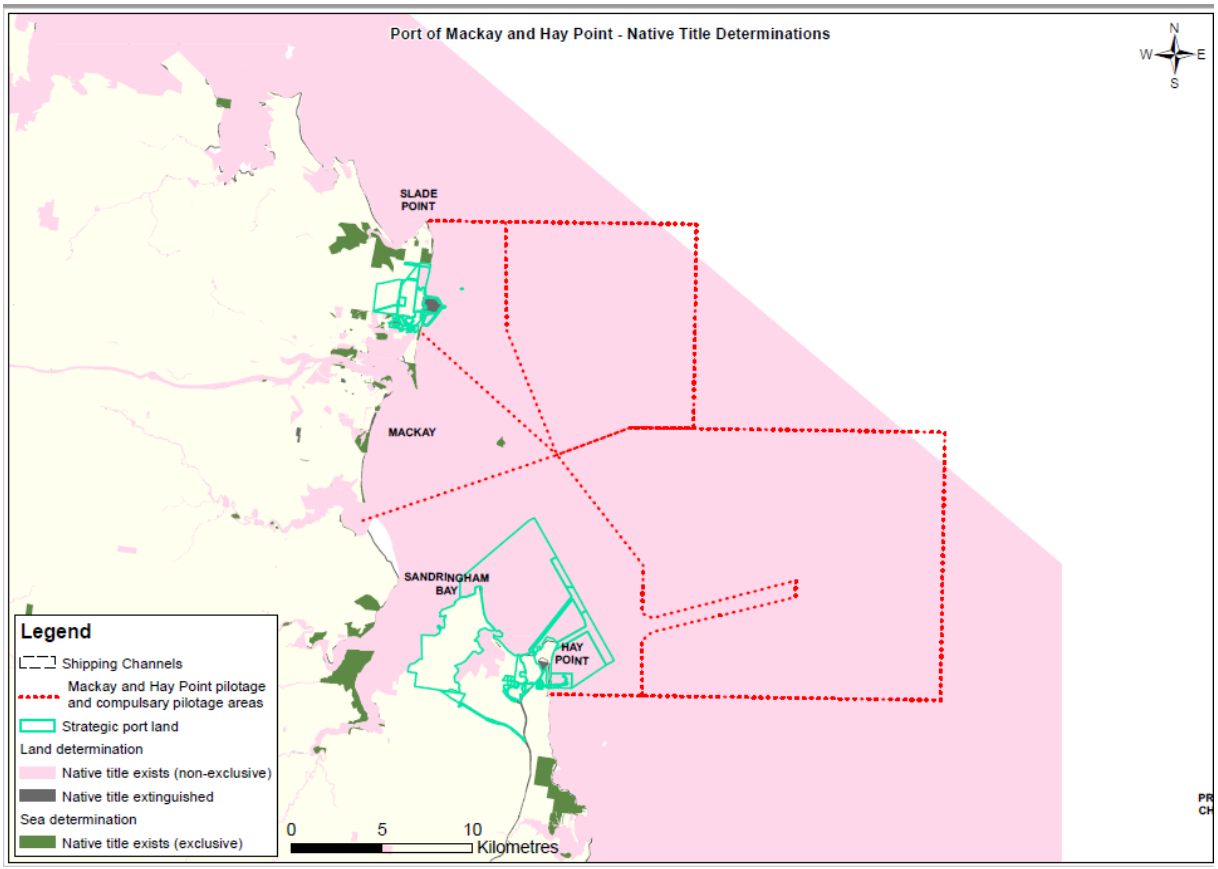

Figure 30: Map showing the Consent Determination of native title for the Yuwibarra people

7.2.4 Non-statutory databases

7.2.4.1 The National and Commonwealth Heritage Lists

A search of the study area was undertaken on 31 May 2021. There are no registered Aboriginal cultural heritage sites listed on the NHLs and CHLs within the study area. The GBR is the only natural heritage site listed on these registers.

7.2.4.2 Relevant Council local heritage lists

A search of the study area was undertaken on 31 May 2021. There are no Aboriginal places currently on MRC's heritage list within the study area.

7.2.4.3 Register of the National Estate

A search of the study area was undertaken on 31 May 2021. There are no registered Aboriginal cultural heritage sites listed on the Register of the National Estate (RNE) within the study area.

One natural heritage site is listed on this register being the GBR.

7.2.4.4 Places classified by the National Trust

A search of the study area was undertaken on 31 May 2021. There are no Aboriginal places currently classified by the National Trust within the study area.

7.2.4.5 Relevant Council Local Heritage Lists

A search of the study area was undertaken on 31 May 2021. There are no Aboriginal places currently on the MRC's Local Heritage Register within the study area.

7.2.5 Traditional Owner groups, ethnographic history, and Aboriginal Historical Land Use History

The earliest land use was by the local Aboriginal population. The descendants of these people are now known as the Yuwibarra people. The Yuwibarra people are the Registered Native Title owners of the Port of Hay Point and Port of Mackay area. A Consent Determination made on 25 February 2020 determined that the Yuwibarra people had non-exclusive native title rights to lands and waters of a largely coastal and riverine area between Midge Point and Cape Palmerston, within the MRC area (**Figure 28**). The Yuwibarra people are represented by the Yuwi Aboriginal Corporation RNTBC.

The activities undertaken by the Traditional Owners within the vicinity of the Port of Mackay area have contributed to the nature and character of the current landscape. Indigenous land use practices would have included food gathering, hunting of animals and farming practices such as use of fish traps.

The Yuwibarra people utilised the land and coastal waters across the priority Port of Hay Point/Mackay area and the surrounding landscape:

Port of Hay Point

Resources included local fauna and flora including kangaroo, koala, wallaby, witchetty grubs, goannas as well as coastal food such as oysters, fish, turtle and dugong. Baskets were woven from vines, stone axes were made and fixed with gum and over 130 plant species were used for food and medicine.[65]

Port of Mackay

Dugong hunting was undertaken along the coast using canoes that were 'made from three more or less diamond shaped pieces of ironbark or blue gum wood – one piece forming the floor of the canoe and the other two forming the sides – which were sealed with ti-tree bark'.[66] Food resources included kangaroo, koala, wallaby, witchetty grubs, goannas as well as coastal food such as oysters, fish, turtle and dugong. Baskets were woven from vines, stone axes were made and fixed with gum and over 130 plant species were used for food and medicine.[67]

7.2.6 Previous studies and known heritage values

Port of Hay Point

The findings of heritage studies undertaken in the Hay Point region are summarised below, noting many studies are unpublished or not available in full. The locations are discussed generally so that specific details regarding significant Indigenous cultural heritage sites are not published or made publicly available.

Previous studies confirmed there are several places of high cultural significance within the study area, including the former site of Bakers Creek Aboriginal Mission, Louise Creek, Dudgeon Point, Sandringham Bay, Mount Hector and the large lagoons along the coastline, such as at Dudgeon Point and west of Half Tide Beach near Hay Point. Items of note that were identified in these areas include extensive fish traps, shell middens, artefact scatters.[68] [69] Most of the middens are dominated by oysters and cockles and stone utilised in artefact scatters is mostly imported from further inland, with the exception of some stone sourced from beach shingles. The foredune area is also of significance from an archaeological perspective.

Much of this area has been cleared for grazing and other pastoral uses, which means that the integrity of the ground surface has been compromised, leading to a reduction in the likelihood that Indigenous sites are present in the area. Despite this, the above studies illustrate that Aboriginal people were certainly present over a long period of time, as cultural heritage material is present.

[65] Colliver, F.S. (1973) *Some Plant Foods of the Queensland Aboriginals - Archaeology Papers 2*.
[66] Department of Defence. (2008). *State of the Environment Report for Shoalwater Bay Training Area*.
[67] Colliver, F.S. (1973) *Some Plant Foods of the Queensland Aboriginals - Archaeology Papers* 2.
[68] Archaeo. (2004). *Dudgeon and Hay Point cultural heritage assessment Stage 1 and 2*
[69] Worley Parsons Consulting. (2012). *Dudgeon Point Coal Terminals Project Environmental Impact Statement Volume 2.* Report for North Queensland Bulk Ports Corporation Limited.

Port of Mackay

The findings of heritage studies undertaken in the Mackay region are summarised below.

GHD Pty Ltd[70] identified a number of heritage values surrounding the port:

- areas of scrub containing bush medicines, including the melaleuca wetlands and dune swales with vine thicket
- anecdotal evidence that the area was used for hunting during the historic period with reference to the melaleuca swamp and mangrove areas
- verbal advice of a previous find of a grindstone located within the area.

Although the assessment, undertaken with Aboriginal representatives, recorded areas of culturally significant resources and values, especially in areas with remnant native vegetation, no items of tangible heritage were identified.

As so little assessment has been undertaken in the study area, it is not possible to provide a detailed summary of the heritage values. What is known illustrates that Aboriginal people were certainly present in the study area over a long time period, and cultural heritage values remain present in spite of any development that may have impacted places already.

7.2.7 Current plans and agreements

7.2.7.1 North Queensland Bulk Ports Corporation Limited Reconciliation Action Plan

As the authority responsible for the Port of Hay Point and the Port of Mackay, NQBP has in place a Reconciliation Action Plan (RAP). A RAP is designed to encourage reconciliation between corporation and the Aboriginal and Torres Strait Islander peoples of Australia through the implementation of specific timely and measurable actions. The RAP requires NQBP to engage with the Traditional Owners of the port lands in a meaningful way when planning future development. This includes extensive consultation regarding the cultural heritage values of the area.

7.2.7.2 Indigenous Land Use Agreements

An Indigenous Land Use Agreement (ILUA) is a voluntary agreement between a native title group and other people or bodies about the use and management of land and waters. An ILUA can be made in areas where native title has been determined to exist over part of the area, a claim to native title has been made, or where no native title claim has been made. When registered, all parties are bound to the terms of the agreement, and the ILUA operates as a contract between the parties.

Port of Hay Point

The Yuwibara people are party to one ILUA with various parties regarding access to and management in accordance with the *Native Title Act 1993* (Cth).

Port of Mackay

The Yuwibara people are party to three ILUA's with various parties regarding access to and management of the Mackay area in accordance with the *Native Title Act 1993* (Cth).

7.2.7.3 *Sustainable Port Development Guidelines*

The NQBP's *Sustainable Port Development Guidelines 2018* provide standards and guidelines for sustainable development for the ports of Hay Point, Mackay, Abbot Point and Weipa. The development guidelines are intended to ensure that future development at the ports occurs in a controlled and sustainable manner and encourages the use of sustainable development principles and innovative design.

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[70] GHD. (2011). *Report for the Port of Mackay Constraints Analysis March 2011*. Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.

In relation to Indigenous cultural heritage, the development guidelines require that proponents undertake due diligence assessments of previously undeveloped areas and prepare a management plan if there are any identified significant or listed areas on the site, in order to protect those places. Further, if archaeological material is identified during site preparation work, the works must cease until the artefacts have been appropriately managed in accordance with the *Aboriginal Cultural Heritage Act 2003*.

7.2.7.4 *Traditional Owners of the Great Barrier Reef: The Next Generation of Reef 2050 Actions*

The *Traditional Owners of the Great Barrier Reef: The Next Generation of Reef 2050 Actions*[71] report was produced by a consortium, led by the Reef and Rainforest Research Centre to provide advice, based on extensive engagement with Traditional Owners, to support the commitments of the Reef 2050 Plan.

The report produced 10 statements/recommendations: [72]

7.2.7.4.1 Statement/Recommendation 1:

Resolve Sea Country Claims: those responsible for the management of the reef ensure, through collaboration between relevant federal and state agencies, that adequate resources are available to support the longer term, fair and efficient resolution of Sea Country Native Title claims across the GBR estate over the coming decade.

7.2.7.4.2 Statement/Recommendation 2:

Get the Foundations Right: formalising and supporting the foundational rights and responsibilities of Traditional Owners in Sea Country by enhancing the governance capacities of families, clans, tribes, sub-regions and regions.

7.2.7.4.3 Statement/Recommendation 3:

Normalise Rights-Based Agreement Making: embed policy, procedures and ongoing participation and support to mobilise long term approaches for co-governance and co-management through agreement making, implementation and monitoring across the GBR at regional, sub-regional, and local scales.

7.2.7.4.4 Statement/Recommendation 4:

Establish a GBR Traditional Owner Sea Country Alliance: resource and support Traditional Owners to establish a GBR-wide Sea Country Alliance and engagement framework as a basis for negotiating and implementing a Tripartite Agreement.

7.2.7.4.5 Statement/Recommendation 5:

Negotiate a GBR-Wide Tripartite Agreement: Australian and Queensland Governments (through Intergovernmental Agreement) to meet obligations for Free, Prior and Informed Consent (in accordance with United Nations Declaration on the rights of Indigenous Peoples) through the negotiation of a whole of GBR Tripartite Agreement with Traditional Owners.

7.2.7.4.6 Statement/Recommendation 6:

Establish a GBR Traditional Owner's Funding Facility: to underpin long term and sustainable support for achieving Traditional Owner aspirations (from local to regional scales), establish a GBR funding facility and support partnership arrangements to enable program delivery and investment leverage.

7.2.7.4.7 Statement/Recommendation 7:

Immediate Traditional Owner Co-design in Programs and Procurement: urgent interim action is required to ensure equitable and effective Traditional Owner involvement and influence in the co-design, procurement and delivery of all current programs and tenders of relevance to their reef-related aspirations (for example, GBR Foundation, Indigenous Advancement Strategy, Closing the Gap, and so on).

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[71] Department of Environment and Energy and Dale, A. et al.. (2020). *Traditional Owners of the Great Barrier Reef. The Next Generation of Reef 2050 Actions*.
[72] Department of Environment and Energy and Dale, A. et al. (2020). *Traditional Owners of the Great Barrier Reef. The Next Generation of Reef 2050 Actions*.

7.2.7.4.8 Statement/Recommendation 8:

Ensure Fit-For-Purpose Delivery Programs: through leveraging the Traditional Owner Funding Facility, establish stable delivery programs that particularly support social, cultural, environmental and economic aspirations (for example, country-based planning, meaningful jobs, infrastructure, and business development).

7.2.7.4.9 Statement/Recommendation 9:

Towards Research Partnerships: the GBR's leading research institutions jointly collaborate with Traditional Owners to plan and negotiate a long-term strategy for supporting their knowledge and research needs (for example, data sharing agreements, and so on).

7.2.7.4.10 Statement/Recommendation 10:

Traditional Owners Embedded in GBR Monitoring: embed Traditional Owners and cultural heritage in all aspects (for example, turtle and dugong) and scales (from GBR-wide to local) of GBR monitoring and evaluation, using culturally appropriate approaches (for example, Strong Country – Strong People Framework).

7.2.8 Summary of Aboriginal heritage value

Port of Hay Point

Legislation in Queensland protects all known heritage places and requires that proponents undertake detailed due diligence assessment prior to development in undisturbed land.

Native title has been determined to exist over part of the study area and one ILUA has been registered for development in this region.

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register identified eight known Aboriginal places within the study area. No heritage places were identified in other searches.

Very little previous work has been undertaken in the area, and the report of the single previous assessment was unavailable. What has been identified is that heritage values exist in the landscape, and that development to date has impacted places but that they are still present. Places identified as especially sensitive include Mount Hector, Dudgeon Point, Louisa Creek, and Sandringham Bay. The NQBP RAP requires consultation with Traditional Owners in the development of future plans, and this approach is in alignment with the recommendations of the *Traditional owners of the Great Barrier Reef: the next generation of Reef 2050 Actions*. The *Duty of Care Guidelines* also require cultural heritage assessments in much of the study area.

The previous limited work in the study area indicates that it is potentially rich with Indigenous cultural heritage values areas along the coastline and near fresh and estuarine waterbodies. These areas should be considered especially sensitive.

Port of Mackay

Legislation in Queensland protects all known heritage places and requires that proponents undertake detailed due diligence assessment prior to development in undisturbed land.

Native title has been determined to exist over part of the study area and three ILUA's has been registered for development in this region.

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register identified 14 known Aboriginal sites within the study area. No heritage places were identified in other searches.

The previous limited work in the study area indicates that it is potentially rich with Indigenous cultural heritage values along the coastline and near fresh and estuarine waterbodies that are considered especially sensitive for Aboriginal cultural heritage.

7.2.9 Impacts, threats and pressures

Visitors, development and natural processes may present impacts, threats and pressures to Aboriginal cultural heritage.

People visit the study area for tourism and leisure. Aboriginal archaeological sites are fragile and can be inadvertently damaged due to normal activities such as walking and digging. Especially at risk are the fish traps as visitors may unknowingly remove stones or cause damage. It is likely that some of these sites may have

already been impacted on through these activities. Many of these impacts can be mitigated through maintenance, signage and fencing.

All development works in previously undeveloped, or lightly developed areas have the potential to damage and destroy Aboriginal cultural heritage. It is extremely likely that some sites have already been impacted through these activities, especially during the initial construction of the Port and its associated infrastructure.

The natural action of wind, surf and storms can have a severe negative effect on coastal cultural heritage places, especially when those places are located in high energy environments such as tidal mudflats, mangrove stands and sand dunes. There is a high concentration of Aboriginal places in these environments in other parts of Queensland and any present in the current study area may be at risk, although many of these risks can be mitigated through maintenance and protection of places.

7.3 Historical cultural heritage

Historical cultural heritage values express the important elements of value systems and lifestyles that communities want to preserve for future generations. The QH Act is the principal legislation in Queensland established to provide for the protection and conservation of historical cultural heritage by protecting all places, items and areas entered in the QHR. Historical cultural heritage under the Act includes buildings, structures, cemeteries, archaeological sites, gardens, urban precincts and natural and landscape features relating to the occupation of the state by groups such as Europeans, Chinese, South Sea Islander and other peoples. Under the Act historical cultural heritage may also include places such as missions and other institutions, which have a heritage shared between these groups and Aboriginal or Torres Strait Islander peoples. In these instances, a place may be recognised as both historical and Aboriginal cultural heritage.

7.3.1 Commonwealth Legislation and policy

7.3.1.1 *Environment Protection and Biodiversity Conservation Act 1999* (Cth)

The EPBC Act includes 'National Heritage' as a MNES and protects listed places to the fullest extent under the Australian Constitution. It also establishes the NHL and the CHL. The following is a description of each of the heritage lists and the protection afforded places listed on them.

7.3.1.1.1 Commonwealth Heritage List

The CHL is a list of properties owned by the Australian Government that have been assessed as having significant heritage value. Any proposed actions on CHL places must be assessed for their impact on the heritage values of the place in accordance with Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies, noted in the Significant Impact Guidelines 1.2. The guidelines require the proponent to undertake a self-assessment process to decide if the action is likely to have a significant impact on the environment, including the heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the responsible Federal Minister for approval.

7.3.1.1.2 National Heritage List

The NHL is a list of places with outstanding heritage value to Australia, including places overseas. Any proposed actions on NHL places must be assessed for their impact on the heritage values of the place in accordance with MNES (Significant Impact Guidelines 1.1). The guidelines require the proponent to undertake a self-assessment process to decide if the action is likely to have a significant impact on a MNES, including the national heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the responsible Federal Minister for approval.

7.3.1.1.3 Register of the National Estate

The RNE was formerly compiled as a record of Australia's natural, cultural and Aboriginal heritage places worth keeping for the future. The RNE was frozen on 19 February 2007, which means that no new places have been added or removed since that time. From February 2012 all references to the RNE were removed from the EPBC Act. The RNE is maintained on a non-statutory basis as a publicly available archive. **Figure 31** and **Figure 32** illustrates the locations of historical heritage sites for the priority Port of Hay Point/Mackay.

Figure 31: Historical heritage in the study area of the Port of Hay Point

Figure 32: Historical heritage in the study area of the Port of Mackay

7.3.1.2 *Underwater Cultural Heritage Act 2018* (Cth)

The *Underwater Cultural Heritage Act 2018* (Cth) replaces the *Historic Shipwrecks Act 1976* (Cth). The Act protects all shipwrecks and associated relics that are at least 75 years old, regardless of whether their physical location is known, and broadens that protection to include sunken aircraft and other types of underwater cultural heritage. The Act aims to provide clarity to present and ongoing jurisdictional arrangements for protecting and managing Australia's underwater cultural heritage. **Figure 33** and **Figure 34** illustrates the locations of underwater cultural heritage for the priority Port of Hay Point/Mackay.

The *Underwater Cultural Heritage Act 2018* (Cth):

- recognises that human remains found within shipwrecks or sunken aircraft must be treated with respect and not as artefacts
- enables protection of Australia's underwater cultural heritage in waters outside of Australia from actions by Australians
- broadens protection to sunken aircraft and other underwater cultural heritage sites
- elevates the role of the public by recognising their role in promoting awareness, understanding, appreciation and appropriate use of Australia's underwater cultural heritage; modernises and strengthens the range of compliance and investigation powers, while adopting a graduated approach to enforcement
- continues the highly successful delegated framework for day-to-day management in collaboration with the Australian states and Northern Territory.

The Act brings Australian law fully into alignment with the *UNESCO 2001 Convention on the Protection of the Underwater Cultural Heritage*.

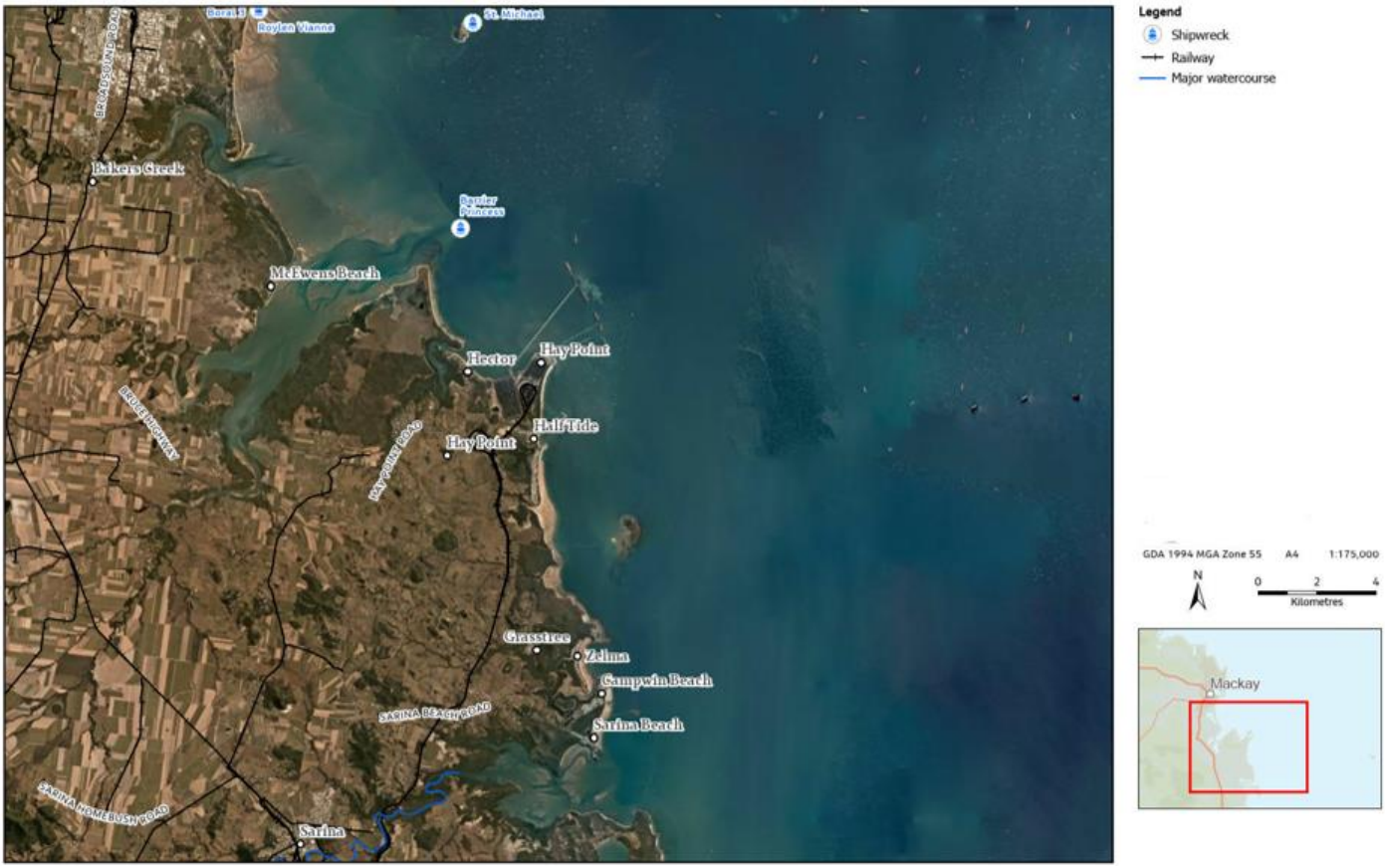

Figure 33: Underwater heritage in the study area for the Port of Hay Point

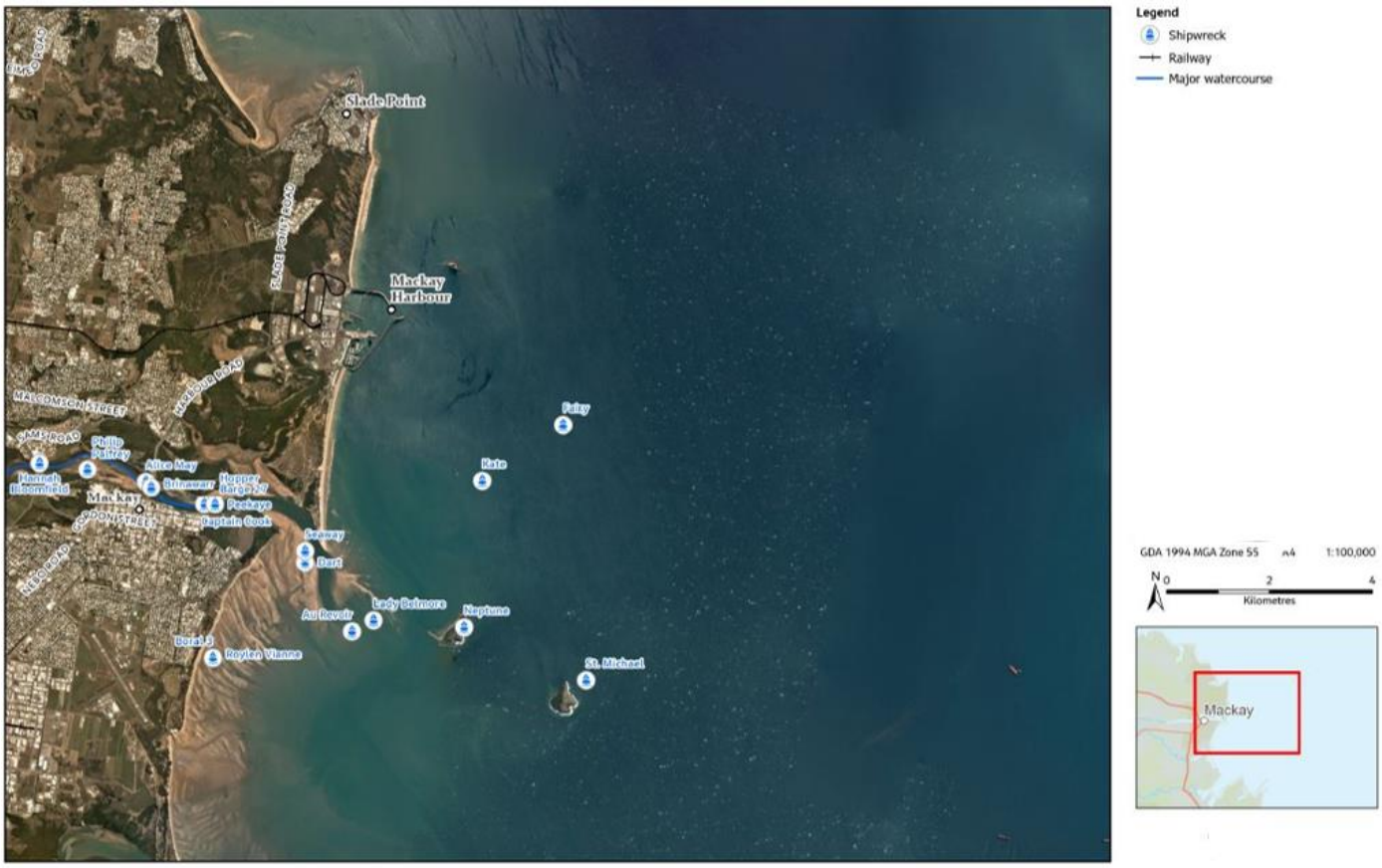

Figure 34: Underwater heritage in the study area for the Port of Mackay

7.3.1.3 The Burra Charter

The Burra Charter (The Australian National Committee of International Council on Monuments and Sites (ICOMOS) Charter for Places of Cultural Significance) was adopted by the Australian ICOMOS in 1979.[73] It is a set of principles that provides best practice standards for managing and conserving cultural heritage places. It defines the basic principles to be followed in site conservation at Australian heritage places. The Burra Charter was initially designed for the conservation and management of historical heritage, but subsequent revision has led to the inclusion of a broad definition of heritage place that include places of Indigenous and non-Indigenous places of cultural significance.

Under the Burra Charter 'conservation' it is defined as ‘all the processes of looking after a place so as to retain its cultural significance’. A ‘place’ is considered significant if it ‘possesses aesthetic, historic, scientific, social or spiritual value for past, present or future generations’. These values include Indigenous traditional values, laws and customs. The QH Act reflects these five stated values in the criteria used to assess cultural heritage significance. The Burra Charter is periodically updated to reflect developing understanding on the theory and practice relating to cultural heritage management and conservation and several practice notes are available to guide its use and application.

7.3.2 State Legislation and Policy

7.3.2.1 *Queensland Heritage Act 1992*

The QH Act provides for the protection and conservation of Queensland’s non-Indigenous historical cultural heritage and is administered by the DES. The QH Act establishes a framework for identifying and protecting heritage places by:

- establishing the Queensland Heritage Council as an independent statutory authority

[73] Australian National Committee of International Council on Monuments and Sites. (2013). *The Burra Charter: The Australian National Committee of International Council on Monuments and Sites Charter for Places of Cultural Significance 2013*..

- maintaining the QHR including state heritage places and archaeological places
- keeping local heritage registers including a process for local government to determine local heritage places
- regulating development of heritage places through the Planning Act.

7.3.2.1.1 Discovery of Archaeological Artefacts

Under Part 9 of the QH Act, a person must report to DES if they discover an archaeological artefact that is an important source of information about an aspect of Queensland's history. Archaeological artefacts include any relic or other remains located above, on or below the present land surface, or found in state waters, that relate to past human behaviour. Once a report has been made, the discovery cannot be disturbed for 20 working days, unless permission is given by the DES. DES assesses the discovery to determine if it is an important source of information about Queensland's history.

7.3.2.2 Queensland Heritage Register

The QHR is a list of places of cultural heritage significance to Queensland to be protected for present and future generations. There are three categories of Queensland Heritage Place in the QHR, including:

- State Heritage Place
- Archaeological Place
- Protected Area.

Under Part 6 of the QH Act, approval is required from DES for any proposed work or changes within the boundary of a place entered on the QHR. Depending upon the type of changes proposed, approval can be granted by one of the following:

- A **General Exemption Certificate** where no application is required. Most minor work and maintenance needed to keep a place in operational condition is approved under the General Exemption Certificate which applies to all places entered on the QHR
- An **Exemption Certificate** upon application direct to DES. Exemption Certificates are mostly used to approve simple projects or work that does not have a detrimental impact on the cultural heritage significance of a Queensland Heritage Place not covered by General Exemption
- A **Development Application** for works proposed to be undertaken by TMR that are not covered by the General Exemption Certificate or able to be covered by an Exemption Certificate, a Development by the State Application must be made. Development applications should include a heritage impact statement prepared in accordance with Section 4.0 of the Guidelines - SDAP, State Code 14: Queensland Heritage (DES 2017). Development proposals by the Queensland Government that involve a place on the QHR are reviewed by the Queensland Heritage Council.

Additionally, for a Protected Area, permits are required from DES in order to enter or undertake any activity within a Protected Area.

7.3.3 Relevant database and register searches

7.3.3.1 Queensland Heritage Register

Port of Hay Point

A search of the study area was undertaken on 10 August 2021. The Sugar Research Institute & Residence (602642) was registered as a historical heritage site listed on the QHR within the study area.

Port of Mackay

A search of the study area was undertaken on 10 August 2021. There are 18 registered cultural heritage sites listed on the QHR within the study area (**Figure 32**). They are:

602766 Mackay General Cemetery

602727 East Gordon Street Sewerage Works

602554 WH Paxton & Co. Offices and Warehouse (former)

650250 Mackay Memorial Swimming Centre

600667 World War I Cenotaph and Jubilee Park

601911 Mackay Central State School

602056 Mackay Technical College (former)

600672 Queensland National Bank and Bank residence (former)

602731 Mackay Masonic Temple

601111 Holy Trinity Church Complex

601107 Mackay Town Hall (former)

600673 Mackay Court House and Police Station

600671 Commonwealth Bank of Australia

602603 Pioneer Shire Council Building (former)

600669 Mackay Customs House

601281 Richmond Mill Ruins

7.3.3.2 National and Commonwealth Heritage Lists

Port of Hay Point

A search of the study area was undertaken on 10 August 2021. There are no historical heritage sites listed on the National, Commonwealth or World Heritage lists within the study area. One natural heritage site is listed on the NHL being the GBR.

Port of Mackay

A search of the study area was undertaken on 10 August 2021. There are no registered cultural heritage sites listed on the NHLs and CHLs within the study area.

One natural heritage site is listed on the NHL: the GBR.

7.3.3.3 National Shipwrecks Database

Port of Hay Point

A search of the study area was undertaken by Ilona Bartsch (Senior Archaeologist, Jacobs) on 10 August 2021. There are three historical heritage sites listed on the National Shipwrecks Database within the study area (**Figure 33**), including:

- Australasian Underwater Cultural Heritage Database (AUCHD) 2218 *Barrier Princess*
- AUCHD 3146 *St. Michael*
- AUCHD 3081 *Roylen Vianne*.

Port of Mackay

A search of the study area was undertaken on 10 August 2021. There are 14 registered cultural heritage sites listed on the National Shipwrecks Database within or adjacent to the study area (**Figure 34**). These are

2925 *Neptune*

2203 *Au Revoir*

2736 *Lady Belmore*

3081 *Roylen Vianne*

2488 *Fairy*

2704 *Kate*

2376 *Dart*

3114	*Seaway*
2978	*Peekaye*
2288	*Captain Cook*
2265	*Brinawarr*
2156	*Alice May*
2992	*Philip Palfrey*
3146	*St. Michael*
2581	*Hannah Bloomfield.*

7.3.3.4 Relevant Council Local Heritage Lists

Port of Hay Point

A search of the study area was undertaken on 31 May 2021. There are no registered historical heritage sites listed on the MRC Heritage Register within the study area.

Port of Mackay

A search of the study area was undertaken on 31 May 2021. There are 51 registered cultural heritage sites listed on the MRC Heritage List within the study area (**Figure 32**). They are:

ACB Building	99 Victoria Street, Mackay
Ambassador Hotel	2 Sydney Street, Mackay
AMP Building	10 Sydney Street, Mackay
Andrews	49 Sydney Street, Mackay
Andrews Building	11 Wood Street, Mackay
Armati's Pharmacy	110 Victoria Street, Mackay
Aroney's Building	84 Wood Street, Mackay
Blacks Building	75 Victoria Street, Mackay
Bourne Buildings	91-95 Victoria Street, Mackay
Chaseley House	7 Sydney Street, Mackay
Coleman's Building	47 Wood Street, Mackay
Comino's Building	7-9 Wood Street, Mackay
Comino's Store	14-20 Sydney Street, Mackay
Cook and Jackson	204 Victoria Street, Mackay
Croker and Sons	60 Victoria Street, Mackay
Cross Printery	41 Wood Street, Mackay
Country Women's Association (CWA) Hall	43 Gordon Street, Mackay
The Daily Mercury Building	36 Wood Street, Mackay
Dalrymple Building	84-104 Victoria Street, Mackay
Empire Cafe	66 Sydney Street, Mackay
Friendly Societies Dispensary	5 Sydney Street, Mackay
Grant's Building	121 Victoria Street, Mackay
Hamilton's Building	114 Victoria Street, Mackay
Lamberts Economic Stores	89 Victoria Street, Mackay

Mackay Spare Parts	21 Sydney Street, Mackay
McGuires Hotel	15 Wood Street, Mackay
McKeever's Building	22-24 Sydney Street, Mackay
National Bank of Australasia	33 Sydney Street, Mackay
Obst Tailor's Building	81 Wood Street, Mackay
Pair of Shops	29-31 Sydney Street, Mackay
Port Curtis Dairy	14A Victoria Streeet, Mackay
R.A.O.B Hall and Club	39-41 Victoria Street
Returned Services League Building	70 Sydney Street, Mackay
Salvation Army Citadel	50 Gregory Street, Mackay
Sharps Building	26-28 Sydney Street, Mackay
St Patrick's Church	12C River Street, Mackay
St Patrick's College	2 Gregory Street, Mackay
T&G Building	116 Victoria Street, Mackay
Taylor's Hotel	126 Wood Street, Mackay
Taylor's Building	164 Victoria Street, Mackay
The Australian Hotel	83 Victoria Street, Mackay
The Hotel Mackay	177 Victoria Street, Mackay
The Imperial Hotel	73 Victoria Street, Mackay
The Leichhardt Tree	10A River Street, Mackay
The Palace Hotel	82 Victoria Street, Mackay
The Paper Chain Building	8 Sydney Street, Mackay
The Post and Telegraph Offices	35 River Street, Mackay
The Railway Hotel	40 Tennyson Street, Mackay
Tilse Building	97 Victoria Street, Mackay
Wilkinson's Hotel	140 Victoria Street, Mackay
Williams Building	31 Wood Street, Mackay.

7.3.4 Non-statutory Databases

7.3.4.1 Places classified by the National Trust

Port of Hay Point

A search of the study area was undertaken on 10 August 2021. Mount Hector Environmental Park SAR 1/1) was listed as an historical heritage site on the National Trust Register within the study area. It is unclear if this place is listed for natural or cultural heritage values.

Port of Mackay

A search of the study area was undertaken on 10 August 2021. There are 29 cultural heritage sites listed on the National Trust Register of within to the study area (**Figure 32**). They are:

MAC 2/11	Mackay TAFE College
MAC 2/8	Old Richmond Mill Ruins
SAR 1/1	Mount Hector Environmental Park

MAC 1/489	Weeping Fig
MAC 1/498	Leichhardt Tree
MAC 1/488	Banyan Tree
MAC 1/490	Fig Tree
MAC 1/487	Hoop Pine
MAC 1/494	Rain Tree
MAC 2/1	Cape Hillsborough & Wedge Island National Park
MAC 2/2	Newry Islands National Parks
MAC 1/3	Shepherd's Anvil Stores
MAC 1/8	Saint Paul's Uniting Church
MAC 1/7	Commonwealth Bank
MAC 1/6	Mackay Customs House
MAC 1/5	Police Station and Court House Complex
MAC 1/10	Metway Bank Building (former)
MAC 1/9	National Australia Bank
MAC 1/12	Mackay War Memorial
MAC 1/17	Mackay Central State School
MAC 2/4	Mount Jukes National Park
MAC 2/5	Mount Blackwood National Park
MAC 2/6	Mount Mandurana National Park
MAC 1/25	Paxton and Company's Building
MAC 1/27	Mater Misericordiae Hospital
MAC 1/499	Jubilee Tree
MAC 1/355	Pioneer Shire Offices (former)
MAC 1/497	Butra yata palm/strangler fig
MAC 2/13	Selwyn House
MAC 2/15	Slade Point Dune and Wetlands Complex.

7.3.4.2 Register of the National Estate

Port of Hay Point

A search of the study area was undertaken on 10 August 2021. There are no historical heritage sites listed on the RNE within the study area.

Port of Mackay

A search of the study area was undertaken on 10 August 2021. There are four registered cultural heritage sites listed on the RNE within the study area (**Figure 32**). These are:

101515	Flat Top Island Lighthouse
101077	Mackay Central State School (indicative)
17514	Mackay Court House (former)
16129	Mackay War Memorial.

7.3.5 Known places and previous studies

Port of Hay Point

There are no known historical heritage places in the study area or in close proximity to the study area.

There are no publicly available historical heritage surveys or archaeological investigations in the Hay Point area. Very few heritage studies have previously been undertaken in the Hay Point region. There are, however, several more regional studies available which illustrate the type of historical heritage that may be present. The below summarises the available information in order to determine known heritage values in the study area.

Multiple previous reports provided by NQBP summarise an assessment by Converge[74] titled *Non-Indigenous Cultural Heritage Technical Report*. This report has not been able to be reviewed directly, as it is not publicly available but summaries of it in other reports indicate that it addresses much the same study area as the current report. These reports state that Converge identified 15 non-Indigenous cultural heritage sites showing evidence of early European settlement in the area including settlement and settlement patterns, pastoral and agricultural land management, small scale mining and the establishment of transport and communication networks. These places were identified as being of, at best, local significance. Also identified as places of interest were the sugar wharf at Louisa Creek and early evidence of gold mining activities throughout the Dudgeon Point hinterland. Stage 2 identified multiple heritage places in the study area. No further information was available on the nature or location of the places identified in Stage 2.

Worley Parsons Consulting prepared an EIS for the Dudgeon Point Coal Terminal project[75] which included surveys of and chapters on Indigenous and non-Indigenous cultural heritage in the study area. The non-Indigenous cultural heritage chapter involved a desktop assessment, consultation with landholders in the study area, and a field survey. The desktop assessment identified multiple historical heritage themes relevant to their project area; including places associated with early exploration of the region, the pastoral history of the area, the sugar industry and gold mining. Consultation was undertaken with local landholders in order to determine the most appropriate places for field assessment and the assessment identified six specific types of site that may be present:

- sites associated with a tramway from Plane Creek Sugar Mill to mouth of Louisa Creek (includes all associated tramway infrastructure remains, sleepers, signposts, loading hardstands, various surfaces, remnant machinery, tracks, ramps and roads)
- sites of former settlement and occupation ('squatters' homes, farm complexes, commercial initiatives, beach 'shacks'/holiday homes)
- sites and places relating to pastoral activities and stock management
- evidence of former gold mining activities
- telegraph poles and alignments
- survey trees.

Field assessment identified 15 sites which may have cultural heritage significance including a tramway bridge and signpost, the residences of important local figures, European fish trap, dams and mine workings. Multiple landholders also described sites of significance that were unable to be examined during this assessment. Parts of Dudgeon Point were therefore considered to have historical significance on at least a local level, especially the sites associated with the gold workings in the area.

Mr Howard Pearce produced a report on the *A cultural heritage overview of significant places in the defence of north Queensland during World War II* the report provided an overview of significant places in North Queensland associated with World War II[76]. He notes that the construction of the rail line to Mackay in 1924 assisted in the development of the region and that the suitability of the ports for exporting from the hinterland was the main economic driver for coastal North Queensland. A Bellman Hanger Warehouse is extant at Mackay airfield, but there are no World War II heritage places noted in the study area.

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[74] Worley Parsons Consulting. (2012). *Converge 2012 Non-Indigenous cultural heritage technical report*
[75] Worley Parsons Consulting. (2012). *Dudgeon Point Coal Terminals Project Environmental Impact Statement Volume 2.* North Queensland Bulk Ports Corporation Limited.
[76] Environmental Protection Agency and Pearce, H. (2009). World War II North Queensland: *A cultural heritage overview of significant places in the defence of north Queensland during World War II*.

The *Queensland Cultural Heritage Places Context Study*[77]produced by Mr Thom Blake identifies the historical places in each area of Queensland with the aim of developing a historical contest against which they, and new places, can be considered. The study also makes suggestions for a number of thematic studies that should be carried out in the future. Hay Point is discussed as becoming an important export port once rail lines were connected. Some of the first successful sugar production in Australia was undertaken in the Mackay district, with the first crop grown in 1865 at the pioneer plantation. By the 1920s there were eight sugar mills operating in the district, including one at Sarina. With its mill, Sarina became one of the main sugar production towns. Much of the sugar from the Sarina region, to the south of the study area, was shipped through Dudgeon Point, to the west of Hay Point within the study area

A number of places on various registers were identified within the study area. These are summarised in **Table 37.**

Table 37: Historical heritage places in the Port of Hay Point study area

Register	Register Number	Name of Place	Level of Significance	Reason for listing	Statutory Protection
QHR	602642	Sugar Research Institute and Residence	State	Education, research, scientific facility: Research station. Themes Exploiting, utilising and transforming the land: Agricultural activities	Yes
QHR	601080	Selwyn House	State	Religion/worship: Mission Themes 6.4 Building settlements, towns, cities and dwellings: Dwellings 8.1 Creating social and cultural institutions: Worshipping and religious institutions	Yes
AUCHD	2218	*Barrier Princess*	N/A	Unknown	Yes
AUCHD	3146	*St. Michael*	N/A	The *St Michael* is believed to have been wrecked near Round Top Island during November 1892. The *St Michael* was a lugger.	Yes
AUCHD	3081	*Roylen Vianne*	N/A	Unknown	Yes
National Trust	SAR 1/1	Mount Hector Environmental Park	N/A	Not Available	No

Port of Mackay

There are a large number of known historic heritage places in the study area listed on local, state and national registers. Most of these are associated with the Town of Mackay.

There are no publicly available historical heritage surveys or archaeological investigations of the area around the port. Very few heritage studies have previously been undertaken in the region. There are, however, several more regional studies available which illustrate the type of historical heritage that may be present. The below summarizes the available information in order to determine known heritage values in the study area.

Graeme Butler and Associates authored the *Mackay Region Pilot Heritage Study*[78]*,* a pilot heritage study for the Mackay region that included the current study area. This study was completed for the National Trust of Australia, documenting the range of historical places in the region and recommending future action. The report included an environmental history of the region from which key themes were drawn. The themes identified were,

[77] Blake, T. (2005). *Queensland Cultural Heritage Places Context Study*. Report to the Queensland Government.
[78] Graeme Butler & Associates. (1994). *Mackay Region Pilot Heritage Study*. Retrieved from https://www.mackay.qld.gov.au/__data/assets/pdf_file/0008/88604/Mackay_Region_Pilot_Heritage_Study_-_1994_Part_A.pdf.

the landscape, sugar, other industries, settlements and dwellings, cultural social and everyday life in the region, transport; and the peoples.

Wright et al. produced a *Heritage Context Study for the Mackay City Council Town Planning Review*[79]. This report was intended to build on the 1994 review by Graeme Butler and Associates (above), to discuss the development of town planning and the role of local government, and to provide context on architectural styles and character, design element, architects, builders, tradesmen, and source of materials. The report identified 14 heritage precincts ranging from residential streets, to CBD areas and the Railway Precinct.

Mr Pearce's report, *A cultural heritage overview of significant places in the defence of north Queensland during World War II* [80] produced an overview of significant places in North Queensland associated with World War II. He notes that the construction of the rail line to Mackay in 1924 assisted in developing the region and the export capability of the port. The hinterland area was the main economic driver for coastal North Queensland. A Bellman Hanger Warehouse is extant at Mackay airfield, but there is no World War II Heritage noted in the study area.

The *Queensland Cultural Heritage Places Context Study*[81] identifies the historical places in each area of Queensland with the aim of developing a historical context against which they, and new places, can be considered. The study also makes suggestions for a number of thematic studies that should be carried out in the future. Mackay is discussed as becoming an important export port once rail lines were connected. Some of the first successful sugar production in Australia was undertaken in the Mackay district, with the first crop grown in 1865 at the Pioneer Plantation.

[79] Wright, B., A. Jacobs and R. Dalton (1996). *Heritage Context Study for the Mackay City Council Town Planning Review*, Sander Turner and Ellick Architects Pty Ltd.
[80] Environmental Protection Agency and Pearce, H. (2009). WWII NQ: *A cultural heritage overview of significant places in the defence of north Queensland during World War II*.
[81] Blake, T. (2005) *Queensland Cultural Heritage Places Context Study*. Report to the Queensland Government.

A large number of places on various registers were identified within the study area. These are summarised in **Table 38**.

Table 38: Historical heritage places in the Port of Mackay study area

Register	Register Number	Name of Place	Level of Significance	Reason for listing
QHR	602766	Mackay General Cemetery	State	Burial ground: Cemetery—public Themes 1.2 Peopling places: Migration from outside and within 1.4 Peopling places: Family and marking the phases of life 6.3 Building settlements, towns, cities and dwellings: Developing urban services and amenities 8.2 Creating social and cultural institutions: Cultural activities
QHR	602727	East Gordon Street Sewerage Works	State	Utilities—drainage, sewerage, waste disposal: Sewerage system Utilities—water supply: Pumping station Theme 6.3 Building settlements, towns, cities and dwellings: Developing urban services and amenities
QHR	602554	WH Paxton & Co. Offices and Warehouse (former)	State	Retail, wholesale, services: Warehouse Themes 3.8 Developing secondary and tertiary industries: Marketing, retailing and service industries 5.4 Moving goods, people and information: Using shipping
QHR	650250	Mackay Memorial Swimming Centre	State	Recreation and Entertainment: Swimming pool/Baths - in-ground Themes 8.5 Creating social and cultural institutions: Sport and recreation 8.6 Creating social and cultural institutions: Commemorating significant events
QHR	600667	World War I Cenotaph and Jubilee Park	State	Monuments and memorials: Memorial/monument Parks/gardens/trees: Public park/reserve Theme 8.6 Creating social and cultural institutions: Commemorating significant events
QHR	601911	Mackay Central State School	State	Education, research, scientific facility: School—state Theme 9.1 Educating Queenslanders: Providing primary schooling
QHR	602056	Mackay Technical College (former)	State	Education, research, scientific facility: College—technical Themes 9.2 Educating Queenslanders: Providing secondary education 9.3 Educating Queenslanders: Educating adults 9.4 Educating Queenslanders: Providing tertiary education
QHR	600672	Queensland National Bank and Bank residence (former)	State	Commercial/financial/professional: Bank Themes 3.7 Developing secondary and tertiary industries: Financing 6.4 Building settlements, towns, cities and dwellings: Dwellings

Register	Register Number	Name of Place	Level of Significance	Reason for listing
QHR	602731	Mackay Masonic Temple	State	Social and community: Hall—masonic/lodge/friendly or benefit society Theme 8.3 Creating social and cultural institutions: Organisations and societies
QHR	601111	Holy Trinity Church Complex	State	Religion/worship: Religious precinct Themes 6.4 Building settlements, towns, cities and dwellings: Dwellings 8.1 Creating social and cultural institutions: Worshipping and religious institutions 8.2 Creating social and cultural institutions: Cultural activities 8.5 Creating social and cultural institutions: Sport and recreation
QHR	601107	Mackay Town Hall (former)	State	Government administration: Hall—town/city/shire/divisional board
				Theme
				7.4 Maintaining order: Local government
QHR	600673	Mackay Court House and Police Station	State	Law/order, immigration, customs, quarantine: Courthouse—magistrates/court of petty sessions
				Themes
				7.1 Maintaining order: Policing and maintaining law and order
				7.2 Maintaining order: Government and public administration
QHR	600671	Commonwealth Bank of Australia	State	Commercial/financial/professional: Bank Theme 3.7 Developing secondary and tertiary industries: Financing
QHR	602603	Pioneer Shire Council Building (former)	State	Government administration: Council chambers/offices (town/city/shire/divisional board) Theme 7.2 Maintaining order: Government and public administration
QHR	600669	Mackay Customs House	State	Law/order, immigration, customs, quarantine: Customs house Themes 5.4 Moving goods, people and information: Using shipping 7.3 Maintaining order: Customs and quarantine services
QHR	601281	Richmond Mill Ruins	State	Mining and mineral processing: Refinery Themes 3.1 Developing secondary and tertiary industries: Feeding Queenslanders 3.2 Developing secondary and tertiary industries: Developing manufacturing capacities
MRC Local Heritage Register	N/A	ACB Building	Local	ACB arrived in Mackay in 1923 trading in Keppel's buildings in Victoria street until a new two-storey building with roof top garden and café was opened in 1924. Constructed by the Queensland Construction Company, the building changed hands the following decade and during World War II Women's Emergency Legion. The ACB Building makes an important contribution to the streetscape. Above the awning original classical detailing is retained in the two bays including decorative accents on the skyline, dentils and pilasters.

Register	Register Number	Name of Place	Level of Significance	Reason for listing
MRC Local Heritage Register	N/A	Ambassador Hotel	Local	The Ambassador Hotel was built by the Guthrie Brothers in 1937, to a design by Townsville architect, M Joseph Gabriel Rooney. The hotel is important in demonstrating the interwar Art Deco building boom in Mackay. The Ambassador Hotel is a good, representative and intact example of an interwar Functionalist-style hotel with Art Deco detailing. While the building has undergone some alterations, it retains key features of the style. The building maintains a strong landmark presence and makes a strong contribution to the Sydney Street streetscape
MRC Local Heritage Register	N/A	AMP Building	Local	In 1924 a decision was made to construct a permanent district office for the AMP Society in Mackay. Two timber buildings were demolished in 1926, and a new two storey reinforced concrete building constructed by local builder, William Guthrie. It is historically important in demonstrating the building boom of the interwar period in Mackay
MRC Local Heritage Register	N/A	Andrew's Jewellers	Local	In 1927 local builder William Guthrie constructed a single storey masonry building comprising four shops on Sydney Street. The building is important in demonstrating the building boom of the interwar period in Mackay. The building at 49 Sydney Street remains largely intact above the awning, retaining its brick parapet and windows above the awning. One of the four tenancies also remains highly intact at ground level, with two panels of lead lighting remaining. The building is important in contributing to the low scale character of the Sydney Street streetscape.
MRC Local Heritage Register	N/A	Andrews Building	Local	The place is important for its association with the development of the region and the building is important in demonstrating building boom of the interwar period in Mackay. Andrews and McGuires buildings have aesthetic value, and demonstrate an eclectic mix of Classical, Mediterranean and Spanish Mission architectural characteristics which make a valuable contribution to the Wood Street streetscape.
MRC Local Heritage Register	N/A	Armati's Pharmacy	Local	The building was constructed by local contractors Gibson and Sutherland under the supervision of draftsman, John Kington, and to a design by architect, Frederic Herbert Faircloth. The building is also important in demonstrating building boom of the interwar period in Mackay. The building at 110 Victoria Street retains original classical detailing above the awning including broken pediment, dentils pilasters and modillions. The building is part of a larger group of buildings along Victoria Street that make an outstanding contribution to the streetscape.
MRC Local Heritage Register	N/A	Aroney's Building	Local	The building is significant historically for its association with the interwar redevelopment of Mackay and in providing evidence of the development and nature of Art Deco buildings in Mackay. Aroney's Building is a good representative example of a 1930s Art Deco building, demonstrating key features of the style. Aroney's is a two-storey building flanked on either side by single storey buildings. It is a strong feature in the Wood Street streetscape and significant as a landmark building in Mackay. The building has association with prominent architect, Roy Edwin Orchard, who was also responsible for the design of the Australian Hotel and a number of buildings entered in State heritage registers.
MRC Local Heritage Register	N/A	Blacks Building	Local	Blacks was established on this site in 1881. The current building was constructed in 1935 by William Guthrie to a design by prominent Mackay architect, H. V. M. Brown. The place is important for its association with the development of the region and the building is important in demonstrating building boom of the interwar period in Mackay. Blacks Building demonstrates an eclectic mix of Classical, Art Deco and Spanish Mission architectural characteristics which make a valuable contribution to the Victoria Street streetscape. The site has a special association with the Black family who occupied the site from 1881, and continued ownership of the site into the 1950s.

Register	Register Number	Name of Place	Level of Significance	Reason for listing
MRC Local Heritage Register	N/A	Bourne Buildings	Local	The buildings at 91-95 Victoria Street were constructed in 1923 by local builder, William Guthrie, and has historical importance as one of a number of buildings constructed in the booming interwar period in Mackay. The buildings at 91-95 Victoria Street make an important contribution to the streetscape. Above the awning original classical detailing is retained in the three bays including decorative accents on the skyline, dentils and pilasters.
MRC Local Heritage Register	N/A	Chaseley House	Local	Chaseley House was constructed in 1937 by builder, Archie McDonald to a design by notable Mackay architect, Harold Vivian Brown. The building is significant historically for its association with the interwar redevelopment of Mackay and in providing evidence of the development and nature of Art Deco buildings in Mackay. Chaseley House is a good, representative and intact example of an interwar functionalist style hotel with Art Deco detailing, retaining key features of the style. The building makes a strong contribution to the Sydney Street streetscape through the largely intact external form.
MRC Local Heritage Register	N/A	Coleman's Building	Local	Constructed in 1924 by notable Mackay builder, William Guthrie, the building was originally the establishment of high-class tailor, Laurie Coleman. The building is significant historically for its association with the interwar redevelopment of Mackay and in providing evidence of the development and nature of Art Deco buildings in Mackay. While the building has been subject to a degree of alteration, the original façade of the building above the awning retains Art deco detailing and is important in contributing to the streetscape values of Wood Street.
MRC Local Heritage Register	N/A	Comino's Building	Local	The building is significant historically for its association with the interwar redevelopment of Mackay and in providing evidence of the development and nature of Art Deco buildings in Mackay. Designed by Mackay Architect, Harold Vivian Marsh Brown, Cominos Building is a good representative example of a 1930s Art Deco shop, demonstrating key features of the style. The Cominos Building is important in retaining its largely intact external form as a two-storey interwar shop which makes a valuable contribution to the Wood Street streetscape. The place has a special association with the Cominos family who have conducted business in Mackay over a century.
MRC Local Heritage Register	N/A	Comino's Store	Local	Constructed in the late 19th century it forms one of the few surviving links with the Streetscape of the 1890s and is important in demonstrating the development of the Mackay region from the 19th century to the present day. Remains of an early coach house/stables has potential to yield information which will contribute to the history and development of Mackay. The original façade of the building above the awning is largely intact and is important in contributing to the streetscape values of Sydney Street. The place has a special association with the Comino family who have conducted business in the Street for over a century.
MRC Local Heritage Register	N/A	Cook and Jackson's Tyre Dealership	Local	Established in the 1930s, Cook and Jackson's were Mackay's leading tyre dealers for a number of decades. New premises were constructed in 1940 to a design by prominent Mackay Architect, Harold Brown. Cook and Jackson's is a single storey masonry building that represents the mid twentieth century low scale character of the Victoria Street streetscape.
MRC Local Heritage Register	N/A	Croker and Sons	Local	Constructed to accommodate the showroom, offices and workshops for motor and machinery agents, James Croker and Sons this building was of modern Spanish design when it opened in 1934. James Croker and Sons was established in Mackay in 1889, and as agents for the Adelaide Steamship Company Limited the firm controlled the shipment of the whole of the district's sugar output. With the introduction of the motor car, the firm branched out into the motor business, and was also later responsible for the establishment of Mackay's first ocean oil terminal, both of which had direct economic benefit to Mackay. The building has undergone alterations, however the awning and parapet form remain which contribute to the low scale character of this part of Victoria Street. Recent building refurbishment also indicates that there is potential for early building details and finishes to remain under modern cladding.

Register	Register Number	Name of Place	Level of Significance	Reason for listing
MRC Local Heritage Register	N/A	Cross Printery	Local	The Cross Printery was a well-known establishment that operated in a number of locations throughout Mackay from the 1920s through to 2016. The printery operated from the ground floor tenancy of the building from the 1930s. The building is significant historically for its association with the interwar redevelopment of Mackay and in providing evidence of the development and nature of Art Deco buildings in Mackay. While the building has been subject to a degree of alteration, the original façade of the building above the awning retains Art deco detailing and is important in contributing to the streetscape values of Wood Street.
MRC Local Heritage Register	N/A	CWA Hall	Local	The CWA is the largest women's association in Australia and the Mackay Branch is important in demonstrating the evolution of the association in responding to the isolation experienced by families in regional areas. The CWA Mackay Branch has a long association with the region, established in 1923, with its first permanent hall in Albert Street in 1928. The branch temporarily relocated to new premises at 55 Gordon Street in 1937 until a new hall officially opened in May 1938. The building has a special association with the local members of the CWA. The regional importance is demonstrated through the 1949 largest membership in Queensland.
MRC Local Heritage Register	N/A	The Daily Mercury Building	Local	The Daily Mercury is an integral part of the history of the Mackay region. It was the settlement's first newspaper and of the six newspapers that subsequently served Mackay during its first century, is the only survivor today. The building was purpose-built in 1922 by William Guthrie to a design by architect, F. H. Faircloth. The building had continuous use for over 60 years. When constructed, it was a good example of interwar free-classical architecture, but has since been subject to alterations diminishing architectural values. The building has a special association with the Daily Mercury who used it for over 60 years, as well as the community of Mackay and surrounding area and those who have been, and continue to be, part of the Daily Mercury, including the editors, reporters and administration staff, past and present.
MRC Local Heritage Register	N/A	Dalrymple Building	Local	The Dalrymple Buildings were constructed in 1917–1918 following the loss of earlier buildings on site due to a 1916 fire. The place is important for its historical association with David Hay Dalrymple, and in demonstrating building boom of the interwar period in Mackay. The building demonstrates key characteristics of the interwar Free Classical style of architecture and is a dominant form in the Victoria Street streetscape. The place is important for its special association with David Hay Dalrymple, the first mayor of Mackay 1869–1871, and member of the Legislative Assembly from 1888–1904.
MRC Local Heritage Register	N/A	Empire Cafe	Local	The Empire Café was first established opposite Town Hall c1924, but was replaced with the current single storey concrete building in 1940. Designed by Harold Brown and constructed by Archie McDonald of McDonalds Pty Ltd, the establishment was run by Mrs A Warhurst and Mrs M Gould for a number of decades. The building has historical importance in demonstrating building boom of the interwar period in Mackay. The Empire Cafe has been subject to a degree of alteration, however the original façade of the building above the awning retains Art deco detailing and is important in contributing to the streetscape values of Sydney Street.
MRC Local Heritage Register	N/A	Friendly Societies Dispensary	Local	The Friendly Society in Sydney Street was designed by prominent architect, H.V.M. Brown, and constructed by William Guthrie, and officially opened on the 22 June 1934. The place is important for its association with the development of the region and demonstrating building boom of the interwar period. The building is two-storey brick and render with a parapet displaying 'FRIENDLY SOCIETIES DISPENSARY ESTd 1915.' It makes an important contribution to the streetscape.

Register	Register Number	Name of Place	Level of Significance	Reason for listing
MRC Local Heritage Register	N/A	Grant's Building	Local	Grants Building was the 3rd to be constructed on the site. The building has historical importance for its association with the Grant family and in providing evidence of the nature and development of Art Deco buildings in Mackay. The building has been subject to a degree of alteration, the original façade of the building above the awning retains Art deco detailing and is important in contributing to the streetscape values of Victoria Street. The building has a special association with Alexander Grant and the Grant family, for over 82 years. Following the death of A. Grant Snr in 1932, the store continued its association, being run by subsequent generations until its closure in 1963.
MRC Local Heritage Register	N/A	Hamilton's Building	Local	Hamilton's Building was built by architect/builder Harry Hill for ironmonger, Robert Hamilton in 1912. It is important in demonstrating the success of Hamilton and the development of his business after arrival in the district in 1883, and the similar growth and success of Mackay. Hamilton's Building is one of the few to survive the fires that destroyed 15 buildings in this stretch in1915 and 1916, and is significant for its continued use as a commercial building for over a century. The building is a good example of Federation Free Style architecture demonstrating the following key attributes: use of Art Nouveau lettering; parapeted gable with non-pointed apex; curvilinear parapet feature; and use of classical features such as window pediments. While Hamilton's is a landmark building in its own right, it is part of a larger group that make an outstanding contribution to the streetscape.
MRC Local Heritage Register	N/A	Lamberts Economic Stores	Local	Lamberts Economic Store was established in 1887 by S. Lambert, and continued use in this location until relocation to Gregory Street in 1979. The building is important in providing physical evidence of a late 19th century department store, constructed at a time when department stores offering a wide range of goods and services were being established across Queensland. While the interior has been altered for use as a nightclub, and the ground floor shopfronts and awning have also undergone some alteration, the building retains a strong streetscape presence. The building demonstrates key characteristics of the Federation Free Classical style including: symmetrical façade; parapet concealing roof; cornice and pilasters; string course; and semicircular openings. The building has a special association with the Lambert family through 114 years of continuous ownership. Following the death of Samuel Lambert in 1911, the store was run by subsequent generations until its closure in 2001.
MRC Local Heritage Register	N/A	Mackay Spare Parts	Local	The building was constructed in the late 19th century and used as a Department Store. A fire in 1988 destroyed the building, and the facade is all that remains of the original construction. It is important in demonstrating the development of the Mackay region from the 19th century to the present day. While the building has been subject to a degree of alteration the original façade of the building above the awning has been retained and is important in contributing to the streetscape values of Sydney Street.
MRC Local Heritage Register	N/A	McGuires Hotel	Local	The original hotel was opened by Barney McGuire Senior in November 1882 and remained in the McGuire family for more than 70 years. The current Hotel was constructed in 1938 to a design by H.V.M. Brown. The building and the zoo, established to the rear of the Hotel, was widely used by US servicemen during WW2. The place is important for its association with the development of the region and the building is important in demonstrating building boom of the interwar period. It is important in demonstrating principal characteristics of a substantial two storey interwar masonry hotel in the Spanish Mission style. It retains a high degree of intactness, functioning as a hotel for over 80 years. Andrews and McGuires buildings have aesthetic value, demonstrating an eclectic mix of Classical, Mediterranean and Spanish Mission architecture which make a valuable contribution to the Wood Street streetscape. The hotel has a special association with the McGuire family who retained the place until the 1960s, for Mackay architect, H.V.M. Brown, and the community, as part of the social fabric of Mackay since the 1880s.

Register	Register Number	Name of Place	Level of Significance	Reason for listing
MRC Local Heritage Register	N/A	McKeever's Building	Local	The building replaced an earlier timber building, and was likely constructed in the interwar period and accommodated Frank McKeever, hairdresser and tobacconist. The building is important in demonstrating building boom of the interwar period in Mackay.
MRC Local Heritage Register	N/A	National Bank of Australia	Local	Construction of the former National Bank of Australia commenced in 1934, to a plan by architect L.L. Powell. Replacing a timber structure, it is important in demonstrating the inter war building boom. The bank is important in demonstrating the use of classical architectural elements, popular in interwar bank buildings. It has a special association with Brisbane architect L.L. Powell who made an important contribution to the built environment, designing or modifying numerous National Bank of Australia buildings. The aesthetic significance is demonstrated by the impressive, classically designed façade. It has undergone a degree of alteration, including a new parapet concealing original frieze and pediments, however the building retains imposing columns and loggia, contributing to its landmark street presence.
MRC Local Heritage Register	N/A	Obst Tailor's Building	Local	Stan Obst's building was constructed by local builder, William Guthrie in 1933 and was initially a piano shop and residence for the Balaam family before purchase by Obst prior to World War II. The Wood Street area was the centre of tailoring activity in the mid twentieth century. The Obst Store is the one remaining link to this past use within this precinct. The building is representative of the practice of combining a home and business, common at the time. It is also the only known remaining Mackay commercial outlet constructed with ripple iron walls; a typical construction material at the time and is indicative of the interwar availability of materials.
MRC Local Heritage Register	N/A	Pair of Shops	Local	The building possesses Classical architectural attributes including triangular pediments, pilasters and decorative accents on the skyline, and makes an important contribution to the Sydney Street streetscape.
MRC Local Heritage Register	N/A	Port Curtis Dairy	Local	The former Port Curtis Dairy Co Op Association Limited was one of the largest dairying co-operatives in Queensland. These buildings are a result of the 1930s amalgamation with the Mackay District Cooperative Butter Factory Association Limited. At its peak the factory had more than 240 suppliers. It is important in demonstrating the development of the dairy industry in Mackay. There are remains of a railway track in the vicinity of the buildings with potential to yield further information about the connection with the railway The former Port Curtis Dairy Co Op Association Limited comprises a large factory building with loading dock, and smaller building accommodating cold stores and railway siding. These buildings are important in demonstrating the principal characteristics of an early to mid-20th century dairy complex. The former Port Curtis Dairy Co-operative Association Limited was a major employer in the Mackay region for over 90 years and retains a strong association with those who worked there and their families. The place also has a special association with the Mackay Chamber of Commerce, and in particular Frank Rollinson, the manager of the factory from its opening in 1930 until his retirement in 1957.
MRC Local Heritage Register	N/A	R.A.O.B Hall and Club	Local	39 Victoria Street comprises the corner shop constructed by William Guthrie in 1936 to a H.V.M. Brown design. 41 Victoria Street is a single storey masonry building constructed in the 1930s. The buildings are significant in demonstrating the development and nature of interwar Art Deco buildings. 39 Victoria Street retains Art Deco detailing above its awning. 41 Victoria has a prominent parapet bearing the RAOB name and emblem. Both have a degree of aesthetic value in contributing to the low scale character of the streetscape. 41 Victoria Street has a special association with the R.A.O.B who acquired the site following loss of their hall in 1958. The RAOB have had a presence since 1931 when the Mackay Lodge No. 34 opened with a handful of members. By 1952 this number had grown to more than 150 and the order maintains a strong presence and special association with the region.

Register	Register Number	Name of Place	Level of Significance	Reason for listing
MRC Local Heritage Register	N/A	Returned Services League Building	Local	Is important is demonstrating the evolution of Queensland's history, as a memorial to the participation, and loss of, members of the community in World War I and later. The R.S.L. Hall has a special association with the Returned Services League and with other allied groups. It has a strong spiritual and social association with returned service personnel, and the general community, as a focal point for Anzac and Remembrance Day commemorations.
MRC Local Heritage Register	N/A	Salvation Army Citadel	Local	The building is of historical significance, due to age and use as the Methodist Church for 50 years. Post amalgamation with the Uniting Church, it was sold to the Salvation Army in 1983. The place has historical associations with both the Methodist Church and the Salvation Army and is important in demonstrating the interwar building boom following the destruction of the 1918 cyclone. The place is significant for its association with the Methodist Church who used this site from the 1880s through to the 1980s, and the Salvation Army who have had a presence in Mackay since 1886, and the Gregory Street site for over 30 years.
MRC Local Heritage Register	N/A	Sharps Building	Local	Originally part of a row of five shops built by Charles Porter for a Mackay merchant, to the design of architect, Otto Seidel. It was completed in February 1892 and is one of the earliest remaining buildings in Sydney Street. It forms one of the few surviving links with the Sydney Streetscape of the 1890's and is important in demonstrating the development of the Mackay region from the 19th century to the present day. While the building has been subject to a degree of alteration, original classical detailing is retained in the parapet above the awning with each of the two bays containing balustraded parapet with central arched head pediment flanked by ribbed pilasters. The building has important streetscape values.
MRC Local Heritage Register	N/A	St Patrick's Church	Local	Saint Patrick's Church was the fourth to be constructed on the site and was constructed in 1961-63. It was designed by prominent Mackay architect, Harold Brown in the Spanish Mission style, and is important in demonstrating the growth of the Catholic church in Mackay in the twentieth century. The building is positioned in a prominent location along River Street with significant views to the building from Gregory Street. The site of Saint Patrick's Church has had a special association with the Catholic community in the Mackay region as a centre of local worship, for over 150 years.
MRC Local Heritage Register	N/A	St Patrick's College	Local	Saint Patrick's College meets this criterion through historical significance for its continuous use as a school, it's construction was by William Guthrie to a plan by Brisbane architect J.P. Donohue, and in demonstrating the building boom of the interwar period in Mackay. The place is important for its association with the Christian Brothers and the Catholic Church. The building has undergone a degree of alteration in recent years, but maintains a strong presence on Gregory Street. The site of Saint Patrick's Convent has a special association with the Christian Brothers and the Catholic community of Mackay.
MRC Local Heritage Register	N/A	T&G Building	Local	The T&G Mutual Life Insurance Building, originally known as Woods Building, was constructed by Queensland Building and Engineering Company in 1937 following demolition of the earlier 1880s timber building on site which had fallen into disrepair. The building owner, George Charles Wood, commissioned ER Orchard, one of Australia's most notable Art Deco Architects, to design the building for the establishment of Mackay's first supermarket-style cash and carry store. The building is important in demonstrating the evolution of commerce in the region and its contribution to the development of Mackay as a regional centre. The T&G Building is a landmark building that makes an important contribution to the streetscape of Mackay

Register	Register Number	Name of Place	Level of Significance	Reason for listing
MRC Local Heritage Register	N/A	Taylor's Hotel	Local	Constructed in 1936 by, William Guthrie, it is historically important as one of a number of hotels constructed during the booming interwar period. The Taylor's Hotel is important in retaining its largely intact external form as a two-storey corner hotel. The hotel was constructed by prominent Mackay contractors, W. Guthrie and C. Porter and Co., and is reportedly the first reinforced concrete building to be constructed in Mackay. The hotel has strong associational links with the Taylor family who had significant interests in and impact on Mackay's economic and social fabric for much of the 20th century.
MRC Local Heritage Register	N/A	Taylor's Building	Local	Local builder, William Guthrie commenced construction on Taylor's Buildings in 1933, with the building officially opening by March 1934. The building was designed by Townsville architect, Joseph Gabriel Rooney. The building is historically important for its association with the Taylor Family, and in demonstrating the interwar building boom in Mackay. Taylor's Buildings is a single storey concrete building constructed to accommodate four individual tenancies. It retains original detailing above the parapet including Classical elements such as pilasters and pediment bearing the date of construction and Art Deco elements including horizontal parallel banding and stepped skyline. It makes a strong contribution to the Victoria Street streetscape.
MRC Local Heritage Register	N/A	The Australian Hotel	Local	Originally known as Diehm's Store, the Australian Hotel was opened by Captain George Dimmock on the current site in 1882. Damaged in the 1918 cyclone, it was subsequently rebuilt, and the current hotel was constructed by the Conway Family Estate in 1940. The Australian Hotel has historical significance for its continuous use as a hotel on the site for over 135 years. The current building is significant historically for its association with the interwar redevelopment of Mackay and in providing evidence of the development and nature of Art Deco buildings in Mackay. The Australian Hotel is a good, representative and intact example of an inter-war functionalist style hotel with Art Deco detailing. The Australian is important for its contribution to the townscape. The building has been designed to address the corner and ensure its landmark status. The streamlined design and Art Deco detailing enhance the aesthetic appeal of the place. The building has association with prominent 19th century architect, R.E. Orchard, who was responsible for a number of buildings on various state heritage registers.
MRC Local Heritage Register	N/A	The Hotel Mackay	Local	The Mackay Hotel was designed by H.V.M Brown and constructed by Barbat and Stronach. During World War II the place was taken over by US army personnel. The building is important in providing physical evidence of the interwar building boom and demonstrates the development of the region and its role accommodating soldiers during World War II. The hotel is architecturally significant as an interwar functionalist style hotel with Art Deco detailing. While it has undergone some alterations, it retains key features of the streamline modern style of Art Deco architecture. The hotel Is aesthetically significant because of its quality, intactness, setting and location context and the valuable contribution to the streetscape
MRC Local Heritage Register	N/A	The Imperial Hotel	Local	The Imperial Hotel was established in Mackay in 1884. The original timber building was replaced with the current building in four stages between 1940–1942. The building remained in use as a hotel until the 1990s and has historical significance for its continuous use as a hotel on the site for over a century. The Imperial Hotel is a good representative and intact example of an interwar functionalist style hotel retaining key features of Art Deco detailing. The building meets this criterion with intact external form and two storey Art Deco style. The building maintains a strong landmark presence and makes a strong contribution to the Victoria Street streetscapes.

Register	Register Number	Name of Place	Level of Significance	Reason for listing
MRC Local Heritage Register	N/A	The Leichhardt Tree	Local	The Leichhardt Tree, located on the Pioneer River bank near the intersection of River and Brisbane Streets is a familiar landmark. While not associated with early explorer, Ludwig Leichhardt, the tree dates back to the establishment of Mackay, and was used by early settlers to tie their boats to, and wharves and warehouses were constructed around it. The historical importance of the tree is also demonstrated by the dog-leg designed in the levee wall to avoid disturbing it. The tree has aesthetically significant qualities which have contributed to the townscape since European settlement. It is prominent in historical photographs and is a well-known landmark in the town
MRC Local Heritage Register	N/A	The Palace Hotel	Local	The first hotel dates back to 1884, becoming the Palace Hotel in 1905. A new building designed by Hall and Phillips was constructed by McDonald and Sons in 1937 using bricks from the Pindi Pindi brickworks. The hotel has historical significance for its continuous use as a hotel for over a century, and as physical evidence of the interwar building boom. The Palace Hotel is a good, representative and intact example of an interwar functionalist style hotel with Art Deco detailing. The Palace Hotel is important in retaining its largely intact external form as a two-storey corner hotel which makes a valuable contribution to the streetscape of Mackay. The Palace Hotel is likely the first concrete building in Mackay constructed with a cantilevered veranda, demonstrating a high degree of technical achievement. It is a striking example of Art Deco architecture, and one of the finest buildings of its type in the state.
MRC Local Heritage Register	N/A	The Paper Chain Building	Local	The building is a rare surviving two-storey 19th century timber building with veranda over the footpath. It is important in demonstrating the development of the Mackay CBD. The building maintains a strong landmark presence and makes a strong contribution to the Sydney Street streetscape.
MRC Local Heritage Register	N/A	The Post and Telegraph Offices	Local	The Post Office is historically significant as a design by the Colonial Architect in the 1870s. The building was not constructed until 1883 with the adjoining Telegraph Office constructed in 1887. The construction of such a prominent building by the Colonial Architect demonstrates the growth and importance of the Mackay region in the late 19th century. The building is architecturally significant as a substantial masonry building with remnant classical detailing typical of Government designed buildings of the period. It is a strong feature in the River Street streetscape and is significant as a landmark building in Mackay. The Mackay region was the primary centre for communication, by mail, telegraph or telephone since 1877. The Mackay Post Office has special associations with government architects, F. D. G. Stanley from 1872–1881, and George Connolly between 1881–1883 and 1885–1891.
MRC Local Heritage Register	N/A	The Railway Hotel	Local	Known as the Railway Hotel, Langfords was constructed opposite the Mackay Railway Station for R. H. Noble, in 1908. It has had continuous use as a hotel for over a century and is currently the oldest hotel operating in the Mackay CBD. In the late nineteenth and early 20th centuries, two-storey timber buildings were prevalent across the region. The interwar building boom replaced many wooden buildings with modern masonry. Langfords is a rare remaining two storey timber hotel in the CBD. While the building has undergone alterations, it retains principal characteristics of an early 20th century hotel, and remains a dominant feature in the streetscape.
MRC Local Heritage Register	N/A	Tilse’s Building	Local	Plans for the construction of a new brick building at 97 Victoria Street were made in 1923 when local businessman, Percy Tilse submitted a building application for a new commercial structure. Constructed by local builder, William Guthrie, Tilse’s building is important in demonstrating building boom of the interwar period in Mackay. The building has been subject to a degree of alteration however the classical parapet and original form of the building remains and is important in contributing to the streetscape values of Victoria Street. Percy Tilse was responsible for the construction of a number of buildings in Mackay during the interwar period including the establishment of a number of theatres in the region including the Strand Theatre on Nebo Road and the Princess Theatre opposite his business premises on Victoria Street.

Register	Register Number	Name of Place	Level of Significance	Reason for listing
MRC Local Heritage Register	N/A	Wilkinson's Hotel	Local	The current hotel was built by the Guthrie Brothers in 1938, to a design by Architect, Joseph Gabriel Rooney. The hotel has been known as Wilkinsons since 1938 and is important in demonstrating the interwar building boom in Mackay. Wilkinsons Hotel is important in retaining its largely intact external form as a two-storey corner hotel that contributes to the Victoria Street streetscape.
MRC Local Heritage Register	N/A	Williams Building	Local	The building was constructed in 1941 by W. Guthrie, to a design by prominent Mackay architect, H.V.M. Brown. The building is significant historically for its association with the interwar redevelopment of Mackay and in providing evidence of the development and nature of Art Deco buildings. While the building has been subject to a degree of alteration, the original façade of the building above the awning retains Art deco detailing and is important in contributing to the streetscape values of Wood Street.
National Trust	MAC 2/11	Mackay TAFE College	Not Applicable	Not Available
National Trust	MAC 2/8	Old Richmond Mill Ruins	Not Applicable	Not Available
National Trust	SAR 1/1	Mount Hector Environmental Park	Not Applicable	Not Available
National Trust	MAC 1/489	Weeping Fig	Not Applicable	Not Available
National Trust	MAC 1/498	Leichhardt Tree	Not Applicable	Not Available
National Trust	MAC 1/488	Banyan Tree	Not Applicable	Not Available
National Trust	MAC 1/490	Fig Tree	Not Applicable	Not Available
National Trust	MAC 1/487	Hoop Pine	Not Applicable	Not Available
National Trust	MAC 1/494	Rain Tree	Not Applicable	Not Available
National Trust	MAC 2/1	Cape Hillsborough & Wedge Island National Park	Not Applicable	Not Available
National Trust	MAC 2/2	Newry Islands National Parks	Not Applicable	Not Available
National Trust	MAC 1/3	Shepherd's Anvil Stores	Not Applicable	Not Available
National Trust	MAC 1/8	Saint Paul's Uniting Church	Not Applicable	Not Available
National Trust	MAC 1/7	Commonwealth Bank	Not Applicable	Not Available

Register	Register Number	Name of Place	Level of Significance	Reason for listing
National Trust	MAC 1/6	Mackay Customs House	Not Applicable	Not Available
National Trust	MAC 1/5	Police Station & Court House Complex	Not Applicable	Not Available
National Trust	MAC 1/10	Metway Bank Building (former)	Not Applicable	Not Available
National Trust	MAC 1/9	National Australia Bank	Not Applicable	Not Available
National Trust	MAC 1/12	Mackay War Memorial	Not Applicable	Not Available
National Trust	MAC 1/17	Mackay Central State School	Not Applicable	Not Available
National Trust	MAC 2/4	Mount Jukes National Park	Not Applicable	Not Available
National Trust	MAC 2/5	Mount Blackwood National Park	Not Applicable	Not Available
National Trust	MAC 2/6	Mount Mandurana National Park	Not Applicable	Not Available
National Trust	MAC 1/25	Paxton & Company's Building	Not Applicable	Not Available
National Trust	MAC 1/27	Mater Misericordiae Hospital	Not Applicable	Not Available
National Trust	MAC 1/499	Jubilee Tree	Not Applicable	Not Available
National Trust	MAC 1/355	Pioneer Shire Offices (former)	Not Applicable	Not Available
National Trust	MAC 1/497	Butra yata palm/strangler fig	Not Applicable	Not Available
National Trust	MAC 2/13	Selwyn House	Not Applicable	Not Available
National Trust	MAC 2/15	Slade Point Dune and Wetlands Complex	Not Applicable	Not Available

Register	Register Number	Name of Place	Level of Significance	Reason for listing
AUCHD	2925	*Neptune*	Not Applicable	The '*Neptune*' foundered at Flat Top Island anchorage on the 13th of September 1933. The vessel had been carrying 385 tons of sugar at the time. It was believed that the '*Neptune*', while under tow by the '*Tolga*', struck the propeller of the *'Lowanna*' causing the '*Neptune*' to sustain damage below. The '*Neptune*' foundered in five to six fathoms of water. The Marine Board concurred with the Mackay shipping inspector's report and found that no blame could be attached to the master of the '*Tolga*' or the '*Neptune*'. An attempt was made to tow the sunken vessel '*Neptune*' clear of shipping at Flat Top. However, the attempt was unsuccessful as the vessel appeared to have become cradled into the sandy bottom.
AUCHD	2203	*Au Revoir*	Not Applicable	The '*Au Revoir*' grounded on the port Mackay bar in early June 1884. The vessel was under the control of a pilot at the time. The '*Au Revoir*' was successfully towed off the bar once a portion of the cargo was offloaded. The vessel was towed into port Mackay to examine the extent of damage. The vessel has also been listed as lost when it broke its back in the Pioneer River, Queensland, in June 1884.
AUCHD	2736	*Lady Belmore*	Not Applicable	The '*Lady Belmore*' was wrecked when it went ashore off Mackay, near the entrance to the Pioneer River. The Marine Board found that although the captain was not at fault for the wreck, he was accused of not using all the means in his power to save the ship, or at least its furniture and stores. The vessel is listed in historical sources as both a labour and a brig.
AUCHD	3081	*Roylen Vianne*	Not Applicable	No Data Available
AUCHD	2488	*Fairy*	Not Applicable	The owner of the '*Fairy*' reported the vessel lost near Mackay in February 1876
AUCHD	2704	*Kate*	Not Applicable	The '*Kate*' was bound from Brisbane to Townsville when the vessel went missing during a hurricane. The vessel was last sighted by the '*You Yangs*' in mid-February. It was assumed that the '*Kate*' foundered off Mackay, on or around the 20 of February 1888.
AUCHD	2376	*Dart*	Not Applicable	The '*Dart*' was driven ashore at East Point Beach, Mackay, on 2 March 1911. No lives were lost. On the morning of 3 March 1911. the vessel had completely broken up, with wreckage strewn along the beach. The Marine Board concurred with the findings of the Shipping Inspector, who considered that the wreck was caused primarily by the mizzen carrying away; and secondarily by the carrying away of the rope attached to the port anchor. The '*Dart*' was originally a 19-tonne wooden ketch but was dismasted in 1909 and relisted as 14.9 tonnes
AUCHD	3114	*Seaway*	Not Applicable	No Data Available
AUCHD	2978	*Peekaye*	Not Applicable	No Data Available

Register	Register Number	Name of Place	Level of Significance	Reason for listing
AUCHD	2288	*Captain Cook*	Not Applicable	There are two conflicting histories for the wrecking of the '*Captain Cook*' but the same location for where the vessel was wrecked. According to the Sydney Morning Herald (24/11/1873:4) the '*Captain Cook*' was bound from Maryborough to Mackay with a cargo of timber when it grounded on a sandbank at port Mackay in November 1873. The '*Captain Cook*' later bilged and was abandoned. The captain was reported to have died. According to the Rockhampton Bulletin (28/11/1873:2) the '*Captain Cook*' left the wharf at Mackay and was proceeding down the river, bound for Maryborough when it was discovered that the vessel had sprung a leak. The vessel was immediately put back and beached on the sand, opposite the town. The leak was believed to have been caused when the vessel rested on a large piece of stone lying under the wharf where the vessel has been discharging its cargo, and as the vessel was old and its timbers not particularly sound. It was reported that the vessel was to be offered for sale with the hope the vessel could be repaired and made serviceable.
AUCHD	2265	*Brinawarr*	Not Applicable	The S.S. '*Brinawarr*' was driven into the Sydney Street bridge, Pioneer River, during a cyclone which swept the Mackay area in January 1918. The vessel was visible at the bridge for several days, but by 31 January 1918, had disappeared altogether. The '*Brinawarr*' foundered at the middle of the Sydney Street bridge, with only a few feet of its stern observable above the sand at low water. The marine superintendent and the inspector for the Adelaide Steamship Company inspected the principal damage to the company's vessel and considered the '*Brinawarr*' to be a total loss.
AUCHD	2156	*Alice May*	Not Applicable	The '*Alice May*' was sunk by a tidal wave in the Pioneer River, Mackay, on 21 January during a cyclone. No lives were lost. The vessel was described as a total loss. The Marine Board Inquiry found that the '*Alice May*' broke adrift from the Harbor Board's wharf and was carried by the cyclone and the tidal wave up the river and forced ashore high on the bank close to the north end of the Sydney Street Bridge. As the water receded, the forward part dropped down and the vessel broke in two about amidships. The Marine Board concluded that the wrecking of the '*Alice May*' was an accident caused by the cyclone accompanied by a tidal wave, some eight or 10 feet high, which carried the vessel away from its moorings. As such, no blame was attached to anyone
AUCHD	2992	*Philip Palfrey*	Not Applicable	The '*Philip Palfrey*' was carrying a cargo of sugar when the vessel grounded on the flats in the Pioneer River and the vessel's bottom bulged out and the cargo became submerged. The *'Philip Palfrey*' was refloated as the vessel was finally wrecked during a gale when it dragged its anchors and was driven ashore at Trial Bay, New South Wales, in 1898.
AUCHD	3146	*St. Michael*	Not Applicable	The '*St Michael*' is believed to have been wrecked near Round Top Island during November 1892. The '*St Michael*' was a lugger.
AUCHD	2581	*Hannah Bloomfield*	Not Applicable	There are three conflicting histories for the wrecking of the '*Hannah Bloomfield*'. (i) A '*Hannah Bloomfield*' capsized while attempting to cross the bar at port Mackay in 1890. The mail and registration papers were lost. (ii) A '*Hannah Bloomfield*' was lost on North Reef, near Cairns, in 1890. (iii) According to historical sources the wreck of a '*Hannah Bloomfield*' was located near Gavial Creek, Rockhampton in 1872 which may be confused with the '*Hannah Broomfield*'.
RNE	101515	Flat Top Island Lighthouse	Not Applicable	The lighthouse has some historical interest in that it was originally used as a lightering anchorage where cargo was transferred from the larger sailing ships to barges for transport up the Pioneer River to Mackay.

Register	Register Number	Name of Place	Level of Significance	Reason for listing
RNE	101077 (Indicative)	Mackay Central State School	Not Applicable	As a former intermediate school, it reflects an important development in Queensland education as it provided education at Year 6 and Year 7 which combined vocational training. As Intermediate Schools no longer exist, it is evidence of a former educational practice. An intact and characteristic example of the brick schools which were constructed in the 1930s. Evidence of the skill of the Department of Public Works during the 1930s, a period characterised by such substantial buildings as the Herston Medical School, the Turbot Street Dental College, courthouses and other government buildings. As evidence of the government policy to provide unemployment relief by a public works programme which included the construction of 30 brick schools throughout Queensland in the 1930s. As the only brick and stucco building in the Mackay region. For its landmark qualities. For its association with generations of school children in Mackay.
RNE	17514	Mackay Court House (former)	Not Applicable	Mackay Court House is significant as a government building designed in the interwar Georgian Revival style and is an excellent example of a substantial brick courthouse built in this idiom (Criterion D.2). The Court House is significant as a building designed and constructed as part of a Government initiated Works Scheme established during the 1930s depression. The scheme was created to generate employment throughout Queensland and the Mackay Court House is one of the results of this project (Criteria A.4 and D.2). Mackay Court House, through its architectural quality and design, forms a prominent marker in the streetscape, being situated on the corner of Victoria Street and Brisbane Street (Criterion F.1).
RNE	16129	Mackay War Memorial	Not Applicable	The Mackay War Memorial is historically significant as evidence of the impact of World War I on the community and for the documentary evidence it records of local participation in that War (Criterion A.4). The Memorial is a major regional War Memorial and is highly valued by the community as evidence of the public fashions and social attitudes of the time and as a continuing focus of the region's public rituals and National sentiment (Criterion G.1). This memorial has significance for its architectural excellence as the work of a well-known local architect and is a particularly good example of its type. It is reported as being of unique design in Queensland, having a bronze relief head of a soldier on the rear face of the pedestal (Criterion D.2).

7.3.6 Historical land use history

Port of Hay Point

The first overland expedition to the general area was led by John Mackay out of Uralla and he arrived in the Pioneer Valley in 1860. Mackay returned in 1862 with 1200 head of cattle to establish Green Mount Run. He was one of many, with six other stations being established by 1862.[82] South of the study area, the pastoralists John and Edmund Atherton and their brother-in-law Henry Bell were the first European settlers to reach the Sarina area in 1864.[83]

By the end of the 1860s, sugar cultivation was beginning to be the most important economic activity in the area for the European settlement. By 1875, 23 sugar mills had been built and a further 12 were constructed by 1890. By 1884, the European population of the Mackay area was 3000, many of whom were employed in the sugar industry. From the late 1880s there was a move towards government sponsored central mills that all plantations could use. The creation of centralised mills led to a vast improvement in rail and road transportation through the area.[84]

One of the primary outcomes of the cultivation of sugar was the importation of workers from the South Sea Islands where they could be brought in and indentured to work in sugar and cotton farms, often under poor conditions.[85]

The Plane Creek Mill Company was established in 1894 by a group of farmers including John and Edmund Atherton and Henry Bell, as sugar had become more important in the area. Sugar cane crushing began in 1896 and the production of industrial alcohol from the sugar by products began 1926. This mill is still in operation today under different ownership. A small town began developing and by 1904, there were stores, hotels, a police station, banks, butcheries and a post office. Sarina was gazetted as a town in 1907.[86]

The Port of Hay Point exported its first coal shipment in 1971 from a single loading berth from the HPCT. The terminal was established through a joint venture between Mitsubishi Development and Utah Development Company in 1969 to service the Goonyella and Peak Downs mine sites.[87] The Queensland Government constructed DBT as the second coal terminal and operations commenced in 1983. DBT is now a common user coal export facility owned by the Queensland Government and leased to DBI on a 50-year lease to operate, maintain and develop the terminal, while HPCT is owned and operated by BMA. Both terminals are dedicated coal export facilities.

There are known historical heritage places in the study area. Historical heritage places in the study area include shipwrecks, one place associated with the history of sugar production, and one place associated with early European colonisation. As the assessments to date appear to be focused on specific projects, rather than a systematic study of the wider area, it is likely that previously unidentified heritage places and historical archaeological sites are present in the study area. Previously unidentified heritage places in the study area are most likely to relate to the themes of sugar production or early pastoralism.

Port of Mackay

The Mackay area was first mapped by Europeans in 1770 when Captain James Cook passed close to the coastline. He named the geographical features of Cape Palmerston, Slade Point and Cape Hillsborough on this pass. The first overland expedition was led by John Mackay who arrived in the Pioneer Valley in 1860. It was considered the area would be well suited to agricultural development, and Mackay returned in 1862 with 1200 head of cattle to establish Green Mount Run. He was one of many, with six other stations being established in the same year. The Town of Mackay was surveyed in 1863, the same year the Port of Mackay was developed

[82] Wright, B., Jacobs, A., and Dalton, R. (1996) *Heritage Context Study for the Mackay City Council Town Planning Review*, Sander Turner and Ellick Architects Pty Ltd.
[83] Queensland Government. (2015). *Sarina*. Retrieved 1/07/2021 from https://www.qld.gov.au/firstnations/cultural-awareness-heritage-arts/community-histories/community-histories-s-t/community-histories-sarina.
[84] Mackay Regional Council. (2008). *Looking Back & Moving Forward: A brief history of Mackay Regional Council*. Mackay: Mackay Regional Council.
[85] Stanley, J. (1984). *The Foundation of a North Queensland Port Settlement 1861-1880*. Retrieved from https://espace.library.uq.edu.au/view/UQ:185623/THE20620_e1.pdf?dsi_version=dbc4c7397b1afb3511c7e5c7f55b7cfe
[86] Queensland Government. (2015). *Sarina*. Retrieved 1/07/2021 from https://www.qld.gov.au/firstnations/cultural-awareness-heritage-arts/community-histories/community-histories-s-t/community-histories-sarina.
[87] BHP. (2021). *BHP Celebrating 50 years at Goonyella Riverside Mine and Hay Point Coal Terminal*. Retrieved from https://www.bhp.com/news/articles/2021/11/celebrating-50-years-at-goonyella-riverside-mine-and-hay-point-coal-terminal

on the Pioneer River.[88] The Pioneer River was quickly found to be problematic for port services due to the tidal range and insufficient clearance for large vessels at low tide. Goods and people were loaded on to smaller vessels in the river before being transported to larger vessels at Flat Top Island, which was considered expensive and dangerous.[89]

By the end of the 1860s, sugar cultivation was becoming the most important economic activity and the area had 23 sugar mills by 1875. By 1884, the European population of the Mackay area was 3000, many of whom were employed in the sugar industry. From the late 1880s there was a move towards government sponsored central mills that all sugar farms could use, and these quickly became the norm. The creation of centralised mills led to a vast improvement in rail and road transportation through the area.[90]

The rapid growth in the cultivation of sugar was supported by the importation of workers from the South Sea Islands where they could be brought in and indentured to work in sugar and cotton plantations, often in poor conditions.[91]

The first bridge over the Pioneer River was constructed in 1877 and it was becoming apparent that the existing port on the river was insufficient. The first enquiry into the construction of a new port was undertaken in 1887, but no new port was constructed until 1937 due to lack of finance. The Mackay municipality was proclaimed a town in 1903 and a city in 1918. The town opened several new large public buildings in the years before World War I, including a new town hall and a state high school, along with several commercial premises and two private hospitals. However, a severe cyclone in 1918 killed 30 people and destroyed almost three quarters of the town's buildings.[92] This led to an interwar building boom that defines the town's appearance to this day.[93]

World War II caused an economic depression in Mackay as labour shortages curtailed sugar production, leading to the introduction of sugar rationing, but the downturn was short-lived as the new harbour facilities funnelled sugar, coal and other materials through the town. Mackay also became a popular stop for tourists visiting the southern GBR. The inner city retains a large number of heritage buildings and precincts, especially from the interwar period, with several of these are listed on state and national registers.[94] A large number of heritage buildings and precincts in the inner-city area from this period are listed on state and national registers.[95]

The first enquiry into a new port was undertaken in 1887, to enable further growth of the rapidly expanding sugar industry, however it was not until 1937 that construction commenced. The coastal rail link between Brisbane and North Queensland was opened in 1924 encouraging the development of Queensland ports to develop nearby mining, farming and agricultural activities.[96] During the 1930s, the Queensland Premier, William Forgan Smith who was the Member for Mackay, invested heavily in the Mackay region, funding the installation of a power station, power lines and a new base hospital. The Premier also secured finance for the new port through a state loan and local grant.[97] The new port consisted of two stone breakwaters to form a harbour made of rocks from the nearby Mount Bassett Quarry. The first sugar shipment left the harbour in 1939. During World War II, Mackay experienced an economic downturn as labour shortages curtailed sugar production, leading to the introduction of sugar rationing. However, the new port facilities ensured the downturn was short-lived, as sugar, coal and other materials were funnelled through the town.

In 1952 a second terminal was built, specifically for bulk sugar exports which reduced the labour-intensive methods of hand loading bagged sugar. When this terminal became functional in 1957, it was the largest sugar storage shed in the world.[98] Bulk storages for fertiliser and chemicals were constructed in the 1960s, and a bulk

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[88] Wright, B., Jacobs, A., and Dalton, R. (1996). *Heritage Context Study for the Mackay City Council Town Planning Review*, Sander Turner and Ellick Architects Pty Ltd.
[89] The Courier Mail. (2019). *Celebration: Port of Mackay turns 80*. www.couriermail.com.au/news/queensland/mackay/celebration-port-of-mackay-turns-80/news-story/e02af1ad717ea2fac28d9e727308023b
[90] Mackay Regional Council. (2008). *Looking Back & Moving Forward: A brief history of Mackay Regional Council*..
[91] Stanley, J. (1984). *The Foundation of a North Queensland Port Settlement 1861-1880*. Retrieved from https://espace.library.uq.edu.au/view/UQ:185623/THE20620_e1.pdf?dsi_version=dbc4c7397b1afb3511c7e5c7f55b7cfe
[92] Centre for the Government of Queensland. (2018). *Mackay*. Retrieved from https://queenslandplaces.com.au/mackay.
[93] Wright, B., Jacobs, A., and Dalton, R. (1996). *Heritage Context Study for the Mackay City Council Town Planning Review*, Sander Turner and Ellick Architects Pty Ltd.
[94] Centre for the Government of Queensland. (2018). *Mackay*. Retrieved from https://queenslandplaces.com.au/mackay.
[95] Centre for the Government of Queensland. (2018). *Mackay*. Retrieved from https://queenslandplaces.com.au/mackay.
[96] Environmental Protection Agency and Pearce, H. (2009). WWII NQ: *A cultural heritage overview of significant places in the defence of north Queensland during World War II.*
[97] Environmental Protection Agency and Pearce, H. (2009). WWII NQ: *A cultural heritage overview of significant places in the defence of north Queensland during World War II.*
[98] The Courier Mail. (2019). *Celebration: Port of Mackay turns 80*. www.couriermail.com.au/news/queensland/mackay/celebration-port-of-mackay-turns-80/news-story/e02af1ad717ea2fac28d9e727308023b

grain silo to handle produce railed from Clermont and Capella was opened in 1982. The port was expanded again in 1998 to construct a marina for residents and visitors to Mackay.[99]

7.3.7 Impacts, threats and pressures

Visitors, development and natural processes may present impacts, threats and pressures to Aboriginal cultural heritage.

People visit the beaches in the study area for tourism and leisure. Many historical heritage places see continuing use by the present-day community for a variety of purposes. This use is important as it keeps these places connected to the community, but care must be taken to ensure that modern use does not erase evidence of the heritage values of these buildings. Many of these impacts can be mitigated through proper planning and engagement with building owners.

Port of Hay Point

Ongoing development puts pressure on historical heritage places, as existing buildings are replaced with new ones or utilised for new purposes. Since 2012, no state-listed Queensland heritage places have been substantially destroyed or demolished through development.[100] While it is likely that some heritage places have already been impacted through development activities over the last century, the preservation and condition of these heritage values do not determine their significance. All future works managed through the planning system seek to minimise development impacts in an effort to actively protect value and significance for future generations.

The natural action of wind, surf and storms can have a negative effect on heritage places, even when those places comprise built heritage. Since 2012 five state-listed Queensland heritage places have been destroyed by cyclones, fire and hailstorms. Without upkeep of these places it is likely that they would suffer damage from the ongoing effects of time and weather.[101] All heritage places are at risk of ongoing wear and tear, although many of these risks can be mitigated through maintenance and protection of places. It is highly likely that these factors have already impacted sites.

Port of Mackay

The Town of Mackay is one of the regional centres in North Queensland and it remains an important port and a focus of social activity in the region. As it grows, it will likely do so in areas where heritage is known to be or is likely to be. The pressures from ongoing development and modernisation on historical heritage places can be intense, as existing buildings are replaced with new ones or utilised for new purposes. Since 2012, no Queensland heritage places have been substantially destroyed or demolished through development.[102] However, it is likely that some places have already been impacted through development activities over the last century. The existing impact cannot now be mitigated, but future works can minimise damage to these places thorough the planning process.

The natural action of wind, surf and storms can have a negative effect on heritage places, even when those places comprise built heritage. Since 2012, five Queensland heritage places have been destroyed by cyclones, fire and hailstorms.[103] Without upkeep of these places it is likely that they would suffer damage from the ongoing effects of time and weather. All heritage places are at risk of ongoing wear and tear, although many of these risks can be mitigated through maintenance and protection of places. It is likely that these factors have already impacted on sites.

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[99] Mackay Ports. (n.d.). *The History of Mackay Port, North Queensland, Australia*. Retrieved from https://www.mackayports.com/mackay.html
[100] Department of Environment and Science Queensland. (2020). *Queensland heritage places destroyed*. Retrieved 29.06.2021 from https://www.stateoftheenvironment.des.qld.gov.au/heritage/historic/queensland-heritage-places-destroyed.
[101] Department of Environment and Science Queensland. (2020). *Queensland heritage places destroyed*. Retrieved 29.06.2021 from https://www.stateoftheenvironment.des.qld.gov.au/heritage/historic/queensland-heritage-places-destroyed.
[102] Department of Environment and Science Queensland. (2020). *Queensland heritage places destroyed*. Retrieved 29.06.2021 from https://www.stateoftheenvironment.des.qld.gov.au/heritage/historic/queensland-heritage-places-destroyed.
[103] Department of Environment and Science Queensland. (2020). *Queensland heritage places destroyed*. Retrieved 29.06.2021 from https://www.stateoftheenvironment.des.qld.gov.au/heritage/historic/queensland-heritage-places-destroyed.

7.4 Summary

Legislation in Queensland protects all known heritage places and requires that proponents undertake detailed due diligence assessment prior to development. Include maritime assessment and due diligence.

Port of Hay Point

The previous limited work in the study area indicates that it is potentially rich with Indigenous cultural heritage values areas along the coastline and near fresh and estuarine waterbodies. These areas should be considered especially sensitive.

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register identified eight known Aboriginal places within the study area. There were no registered Aboriginal cultural heritage sites listed on the NHL and CHLs within the study area.

There are known historical heritage or archaeological places within the study area. Heritage values have been identified in the landscape and development to date has impacted places but they are still present. Places identified as especially sensitive include Mount Hector, Dudgeon Point, Louisa Creek, and Sandringham Bay.

It is possible there are previously unidentified historical heritage places within the study area relating to the history of pastoralism or mining.

Port of Mackay

There are 14 known Aboriginal cultural heritage sites within the study area. The Yuwibara people are party to three ILUAs with various parties regarding access to and management of the port area in accordance with the *Native Title Act 1993*.

Previous studies in the study area indicate that Indigenous cultural heritage values are present. Areas within 2km of the coast, fresh water, sand bars, or estuarine areas that have not been previously developed are considered to have high potential for scientific and social/cultural values, as are areas of remnant native vegetation.

There are numerous historical heritage places in the study area, associated with all phases of settlement and expansion of the town of Mackay from the early colonisation of the area through to World War II. All historical heritage places in the study area are close to, and associated with the development of, the Town of Mackay, particularly in the interwar period. These places illustrate the growth and changing nature of the town, from an early pastoral settlement, through decades of sugar and the destruction of the town in 1918, through to its modern tourism industry. It is possible that previously unidentified historical heritage places and historical archaeological sites are present in the study area, especially considering the local history of pastoralism and the importance of sugar cane production in the region.

The closest known historical heritage places to the study area are shipwrecks and places associated with Mackay in the south of the study area. It is possible there are previously unidentified historical heritage places within the study area relating to the history of pastoralism or military activity during World War II.

8.0 Environmental values

8.1 Introduction

A desktop assessment was undertaken to identify and collate existing information on the known ecological values of the environment within the project area and surrounding landscape. The Australian and Queensland Government environmental mapping, legislation, associated triggers and databases were reviewed as part of the ecological values assessment and are listed in **Table 39**. Where applicable, copies of these searches are provided in **Appendix N**.

This assessment was undertaken to identify key environmental values relevant to master planning. This included the review of existing available data, studies, and reporting:

- Australian and Queensland Government databases searches and relevant publications
- data and reporting associated with existing environmental studies and environmental values monitoring programs for the project area
- previous Port of Hay Point-specific reporting, including EIS level studies for project proposed for the port
- Jacobs (2016) Port of Hay Point Environmental Values Assessment. Revision 2. Prepared for NQBP
- previous Port of Mackay-specific reporting, including EIS level studies for project proposed for the port.

A large number of environmental studies, targeted research and monitoring investigations have been undertaken to investigate the terrestrial, aquatic and marine environment within and surrounding both ports. Most of the more recent investigations relate to proposed development within the port, ports master planning, strategic and future planning initiatives, or specific environmental studies.

A review of a range of spatial resources were used to develop maps and desktop searches undertaken to inform the environmental layers listed in **Table 39**.

Potential species, communities and protected areas within or nearby the study area were identified using the Commonwealth Protected Matters Search Tool (PMST) under the EPBC Act within the defined search area. Species or communities with a conservation status are identified using the following key legend:

- CR – Critically endangered
- E – Endangered
- V – Vulnerable.

The WildNet Records Species List database managed by the DES was also used to identify species, communities or protected areas and are port generated. Species or communities with a conservation status are identified using the following key legend:

- CR – Critically endangered
- E – Endangered
- V – Vulnerable
- SL – Special Least Concern.

REs under the *Vegetation Management Act 1999* (VM Act) are identified noting the conservation status by the following key legend:

- E – Endangered
- OC – Of Concern
- LC – Least Concern.

Table 39: Desktop searches undertaken for the study area

Search tool	Administrative body	Search details
EPBC Act PMST	Australian Department of Agriculture, Water and Energy	Accessed 09/06/2021. Search of project site using a polygon with the following coordinates. A multi-coordinate grid search was used to accommodate the entire project site and buffer area. -21.1655 149.1154, -21.1601 149.5038, -21.3873 149.5077, -21.3927 149.1187
Queensland Wildlife Online database search (WildNet)	DES	Accessed June 2021.
Atlas of Living Australia	Commonwealth Scientific and Industrial Research Organisation	Spatial search of project area and adjacent areas
Regulated Vegetation Map, v4.12	Queensland Department of Natural Resources Mines and Energy (DNRME)	Accessed 29/04/2021
Queensland Wetlands – Ecological Significance Mapping, v2	DES	Accessed May 2021
Flora Survey Trigger Area, v7.1	DNRME	Accessed 26/06/2021
Essential Habitat, v9.12	DNRME	Accessed 21/04/2021
Vegetation management RE mapping, v11.0	DNRME	Accessed 01/04/2021
Vegetation management wetlands mapping, v6.12	DNRME	Accessed 29/04/2021
Protected areas map, version 7.1	DES	Accessed 22/03/2021
Queensland Spatial Catalogue (QSpatial)	Queensland Government	Accessed throughout project

This section outlines the existing environment values within and surrounding the study area, relevant to the master planning process. As part of this analysis, a high-level description of the key potential impacts or threats to environmental values and identification of monitoring programs were undertaken.

Below provides an overview of the following sections:

- Landscape and visual amenity – **Section 8.2**
- Topography, soils and geology – **Section 8.3**
- Climatic Conditions – **Section 8.4**
- Terrestrial Environment – **Section 8.5**
- Wetlands – **Section 8.6**
- Aquatic ecosystems – Freshwater – **Section 8.7**

- Aquatic ecosystems – Estuarine and Marine – **Section 8.8**
- Biosecurity – **Section 8.9**
- Air quality – **Section 8.10**
- Noise emissions – **Section 8.11**
- Existing monitoring programs – **Section 8.12**
- Summary – **Section 8.13**.

8.2 Landscape and visual amenity

8.2.1 Existing environment

Scenic amenity is defined as 'a measure of the relative contribution of each place in the landscape to the collective appreciation of open space as viewed from places that are important to the public'.[104] Scenic amenity is a combination of two independent factors:

- scenic preference – a measure of the relative contribution of community preference for different landscapes
- visual exposure – a measure of relative visibility of different parts of the landscape.[105]

Port of Hay Point

The Hay Point study area (Hay Point) contains varied landscapes zones (refer to **Figure 35**) including:

- existing coal terminals (two existing terminals DBT and HPCT), existing coal stockpiles at DBT and HPCT, largely screened by a ridgeline and dense vegetation.
- Port of Hay Point lookout
- Half Tide Tug Harbour (tugboat mooring)
- Half Tide township
- Louisa Creek township
- Louisa Creek corridor
- Lake Barfield wetland
- Mount Hector and Sandringham Bay Conservation Parks
- undulating coastal lowlands
- vegetated foredunes
- beaches
- marine areas and islands
- agriculture and rural residential.[106] [107]

[104] Cardno. (2017). *Scenic Amenity Study: Whitsunday Region Scenic Amenity Study*. Prepared for Whitsunday Regional Council,
[105] Cardno. (2017). *Scenic Amenity Study: Whitsunday Region Scenic Amenity Study*. Prepared for Whitsunday Regional Council
[106] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[107] North Queensland Bulk Ports Corporation Limited. (2010). *Port of Hay Point Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0014/3281/Port-of-Hay-Point-Land-Use-Plan.pdf.

Figure 35: View south over Dudgeon Point to the Port of Hay Point

The beaches located to the north-west and south of the port offer scenic and recreational value to the local community and are used for fishing, swimming, sailing and tourism. The nearby conservation parks provide opportunity for visitors to experience remote pristine environments, and the marine islands offer natural scenic amenity values for coastal residents, local communities and visitors.[108]

Agriculture and rural residential developments dominate the south and south-west portions of the study area. These low-lying areas contain sugar cane farms and the rural residential developments of Timberlands and Fenechvale providing open space and low rolling hills.

Visual amenity of the area is enhanced by views from public places, public roads, thoroughfares, or residences and is highly valued by local communities.[109]

Port of Mackay

The Mackay study area (Mackay) contains a varied landscape zones (**Figure 36**) including:[110]

- marine areas and islands
- Mackay Harbour
- beaches to the north of the port including Blacks Beach, Slade Point, Lambert's Beach, North Harbour Beach and to the south at South Harbour Beach and East Point
- clubs and public spaces such as Mulherin Park and the Mackay Surf Life Saving Club
- undulating coastal lowlands
- vegetated foredunes
- rivers and estuaries of the Pioneer River and McCreadys Creek
- low lying wetlands and conservation areas such as Slade Point Nature Reserve and McCready Creek Reserve
- urban areas of Mackay
- rocky outcrops of Mount Bassett and Radio Hill

[108] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.
[109] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.
[110] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*

- port infrastructure, including artificial harbour enclosed by northern and southern breakwaters.[111] [112]

The study area contains largely urban and industrial areas, it also contains areas of natural scenic amenity, attractive to local communities and visitors. The islands provide natural vistas with scenic values for residents and visitors to the Mackay Harbour and coastline.

The Mackay Harbour provides the opportunity to experience the nearby reefs, diving and fishing activities. The beaches provide important recreational and scenic value for locals and tourists.

The coastal hills, ridgelines, rivers, wetlands and estuaries of the Pioneer River provide natural scenic amenity value to the regional landscape and provide for the preservation of the natural environment.[113]

Figure 36: View south from Slade Point Nature Reserve towards the Port of Mackay

8.2.2 Potential impacts and/or opportunities

The potential impacts on landscape and visual amenity from port activities, industrial development and coastal residential development are summarised below.

Port of Hay Point

- larger footprint at Hay Point increasing visual impact on nearby sensitive receptors
- increase in visual impact on nearby sensitive receptors at Mackay
- clearing of vegetation that screening
- increase in shipping activities in the GBRWHA impacting scenic experience of visitors.

[111] North Queensland Bulk Ports Corporation Limited. (2010). *Port of Hay Point Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0014/3281/Port-of-Hay-Point-Land-Use-Plan.pdf.
[112] North Queensland Bulk Ports Corporation Limited. (2010). *Port of Hay Point Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0014/3281/Port-of-Hay-Point-Land-Use-Plan.pdf.
[113] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*

8.3 Topography, soils and geology

8.3.1 Topography

Port of Hay Point

The topography at Hay Point (see **Figure 37**) is predominantly flat with the following key features:[114]

- several ridges at Dudgeon Point west of the existing port
- Louisa Creek west of the port
- sandy beaches and rocky outcrops
- Lake Barfield
- Victor Island
- flat cropping areas west and south west of the Bruce Highway and Sandringham Bay
- grazing areas south between the Bruce Highway and Grasstree Beach
- Dudgeon Point and Sandringham Bay north-west of the port
- Mount Griffiths lookout (reduced level 83m) and associated ridges extending south and south-west[115]
- Mount Hector Conservation Park located adjacent to the port at Dudgeon Point and west of Louisa Creek. Mount Hector is a vegetated coastal headland that supports a variety of vegetation communities.[116]

Several marine and estuarine environments include Sandringham Bay - Bakers Creek aggregation north-west of port listed on the Directory of Important Wetlands in Australia (DIWA). It is a low coastal plain with adjacent marine waters and extensive shallow water, subtidal and intertidal mudflats, from Far Beach to Dudgeon Point. The catchment includes several streams draining eastward from the elevated country in the north from Bakers, Rocky and MacLennan creeks and Connors Range in the south from Sandy, Bell, Alligator and Splitters creeks).[117]

Sandy Creek, Alligator Creek, Bakers Creek and Louisa Creek all support extensive mangrove communities. Lake Barfield, south of the existing port, is an artificial lake providing habitat for freshwater fauna and bird species. Victor Island to the south-east of Hay Point support small coral reef communities.

Most of this area has been cleared in the past for agriculture, residential activities or port activities, leaving some surrounding areas north-west of the port, dedicated to conservation. Examples include Bakers Creek Conservation Park, Sandringham Conservation Park and Mount Hector Conservation Park. Catchments in the area are typical of the Queensland coast where intensive agriculture such as sugar cane, is the dominant land use.

[114] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[115] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[116] North Queensland Bulk Ports Corporation Limited. (2009). *Port of Mackay Land Use Plan*. Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0015/3273/Port-of-Mackay-Land-Use-Plan-December-2009.pdf
[117] Department of Agriculture, Water and the Environment (DAWE). (2019). *Directory of Important Wetlands in Australia – Information sheet*. https://www.environment.gov.au/cgi-bin/wetlands/report.pl.

Figure 37: Topography of the Port of Hay Point

Port of Mackay

The topography of the study area is predominantly flat and low lying, except for Mount Basset which is located immediately south-west of the existing port area at an elevation of 32m.[118]

The following key topographical features are in the study area:

- Mount Basset outcrops and Radio Hill, south-west and south of the existing port respectively
- sand dunes to the north of the harbour
- low lying freshwater wetlands (seasonally inundated)
- old beach ridges west of Slade Point Road
- low lying grasslands to the west of Slade Point Road (seasonally inundated)
- low lying estuaries of upper Basset and Vines Creeks
- undulating residential areas of northern Mackay
- Pioneer River
- flat residential areas of Mackay south of Pioneer River (including Mackay Airport).

There are two wetland areas within the study area: the Slade Point wetland to the north of the existing port and Basset Basin wetland to the south and south-west of the port. Slade Point wetland supports a variety of coastal vegetation communities, and the Bassett Basin wetland is a declared FHA.[119]

There is a habitat corridor that links Slade Point Reserve in the north of the study area, to the Pioneer River in the south via an important flood pathway west of the port. This flood pathway carries water flowing north from the Pioneer River.[120] Mangroves cover the length of Basset Creek and 6km south of the port is Bakers Creek Conservation Park which contains approximately 25ha of tidal lands. The western and south-western portion of the study area has been highly modified and supports the urban, industrial, commercial and recreational uses of Mackay.

8.3.2 Soils

Port of Hay Point

Updated soil mapping[121] identifies the dominant soils in the study area (see **Figure 38**) as:

- chromosols and hydrosols within the existing port area and along McEwens Beach.
- dermasols south of the existing port area extending from Sarina Beach and Grasstree to the Bruce Highway and Alligator Creek.
- sodosols across the entire western portion of the study area and one small patch of kandosol in the far central western extent of the study area.[122]
- chromosols have sandy or loamy surface soils overlying a yellow, brown, red-brown or sometimes black clay subsoil, which is generally neutral to alkaline, while dermasols are red, brown, yellow, grey or black and have loam to clay textures. Sodosols are often alkaline, and with a sharp increase in texture with depth. Hydrosols are typically saturated with water for long periods of time and are generally grey (or greenish grey) in colour, which would explain these soils being located in patches along the coastline.[123]

[118] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[119] North Queensland Bulk Ports Corporation Limited. (2009). *Port of Mackay Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0015/3273/Port-of-Mackay-Land-Use-Plan-December-2009.pdf

[120] North Queensland Bulk Ports Corporation Limited. (2009). *Port of Mackay Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0015/3273/Port-of-Mackay-Land-Use-Plan-December-2009.pdf

[121] Bureau of Rural Sciences. (2019). *Digital Atlas of Australian Soils Bioregional Assessment Source Dataset*.
[122] Bureau of Rural Sciences. (2019). *Digital Atlas of Australian Soils Bioregional Assessment Source Dataset*
[123] Australian Government. (2021). *Geoscience Australia Portal*. Retrieved from https://portal.ga.gov.au/restore/38ed09a9-9e23-45eb-9016-dbe1dc92531d.

- kandosols are red, yellow and grey massive earths. They generally have a sandy to loam-surface soil, grading to porous sandy-clay subsoils with low fertility and poor water-holding capacity.[124]

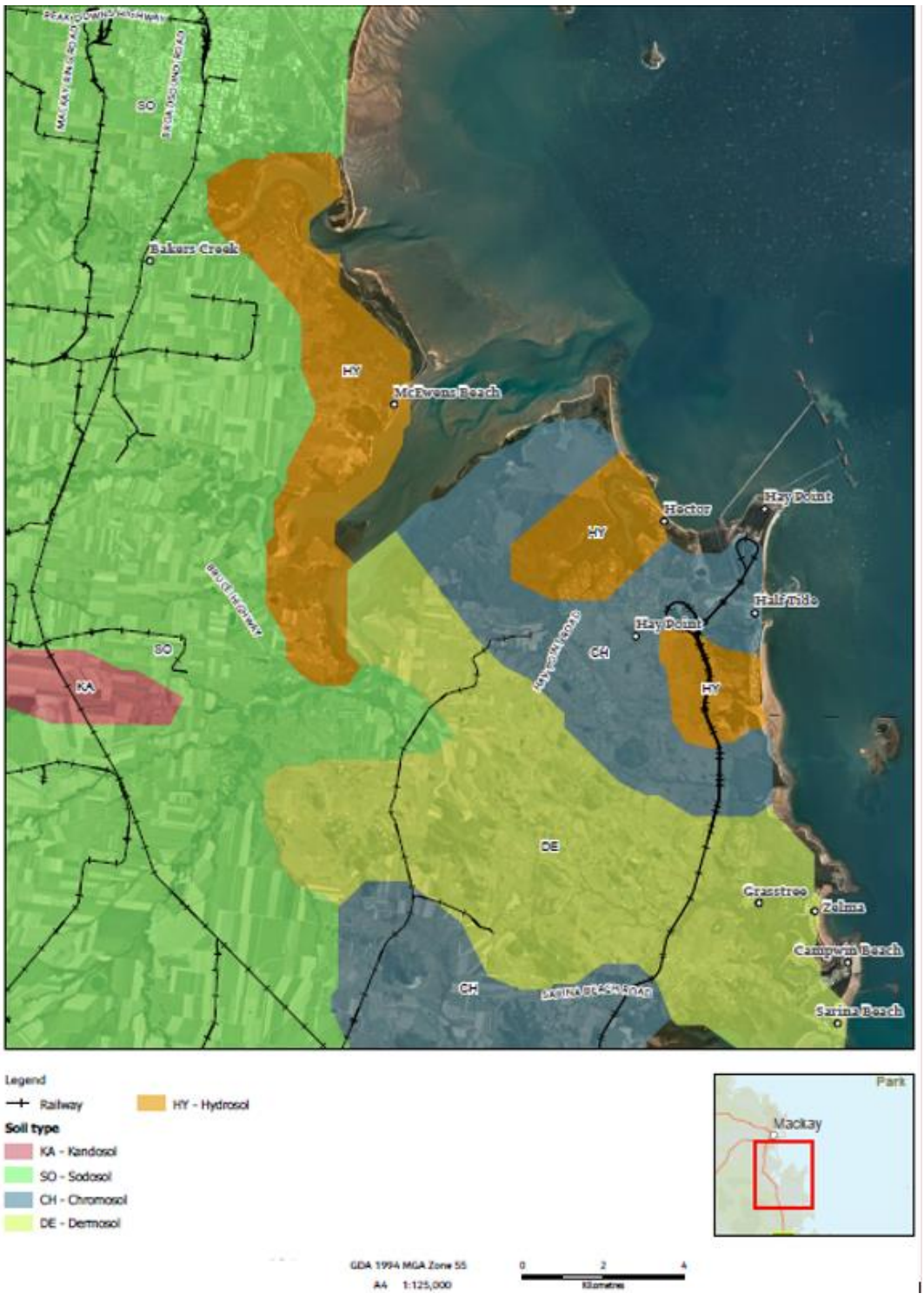

Figure 38: Soil types in the study area of the Port of Hay Point

Port of Mackay

Updated soil mapping identifies the predominant soils in the study area (see **Figure 39**) as:

- sodosols across the majority of the study area, predominantly the southern portion

[124] Queensland Government. (2016). *Common soil types*. Retrieved from https://www.qld.gov.au/environment/land/management/soil/soil-testing/types

- dermasols in the Mount Basset area and in the far west of the study area
- tenosols in the north-western portion of the existing port
- hydrosols at the northern extent of the study area in the McCready's Creek Reserve area.[125]

Sodosols are often alkaline, and with a sharp increase in texture with depth while dermasols are red, brown, yellow, grey, or black and have loam to clay textures. Tenosols generally have a low fertility and low water-holding capacity, while hydrosols are typically saturated with water for long periods of time and are generally grey (or greenish grey) in colour, which would explain these soils being located in patches along the coastline.[126] Hydrosols are often referred to as marine mud/sand and may be acid sulfate soils (ASS).

Soils underlying the existing Port of Mackay are typically Quaternary mud flats, mangrove swamps, tidal flats, estuaries and sand dunes. Mount Basset is a rocky outcrop that extends from the Quaternary soils beneath the port.[127]

[125] Bureau of Rural Sciences. (2019). *Digital Atlas of Australian Soils*. Bioregional Assessment Source Dataset.
[126] Commonwealth of Australia. (2021). *Geoscience Australia Portal*. Retrieved from https://portal.ga.gov.au/restore/38ed09a9-9e23-45eb-9016-dbe1dc92531d.
[127] North Queensland Bulk Ports Corporation Limited. (2020). *Port of Mackay – Port Development Opportunities and Constraints Assessment Confidential).*

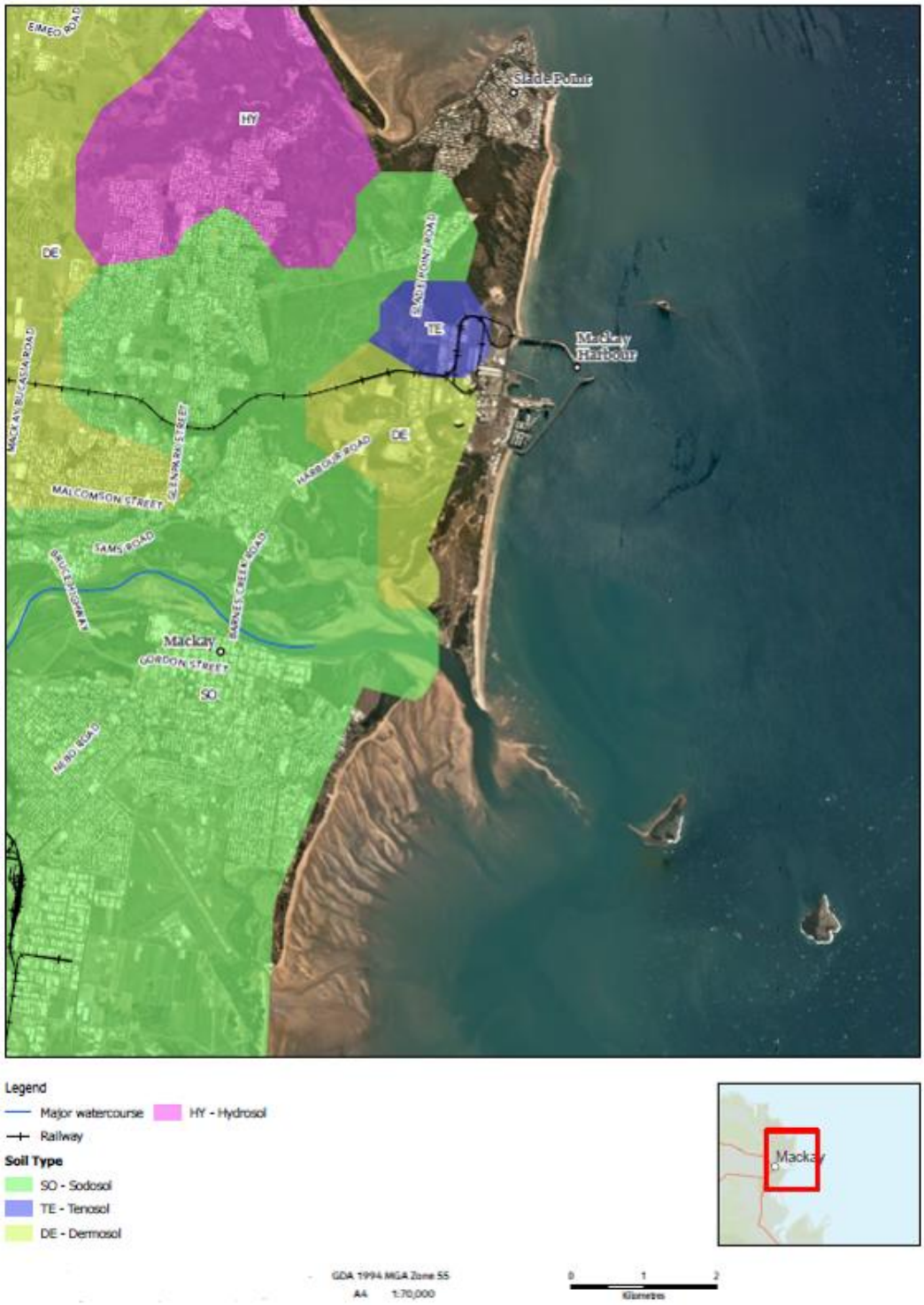

Figure 39: Soil types in the study area of the Port of Mackay

8.3.2.1 Acid Sulfate Soils

ASS are generally present in low-lying areas of both coastal and inland landscapes across Australia. These soils contain iron pyrites formed under specific conditions, (the presence of iron, sulphur and organic matter). The pyrites oxidise when exposed to air, and when combined with water, create sulphuric acid. The creation and leaching of sulphuric acid from the soil profile into the landscape may cause serious impacts to nearby watercourses and its ecosystem.[128]

The oxidation of potential acid sulfate (PASS) soils can result in several negative outcomes and has the potential to cause significant environmental and economic impacts such as fish kills, loss of biodiversity in

[128] Waratah Coal. (2011). *China First- Acid Sulphate Soils Assessment Vol 5- Appendices | Appendix 9- Acid Sulphate Soils Assessment E3 Consult*

wetlands and waterways, contamination of groundwater resources, loss of agricultural productivity, and corrosion of concrete and steel infrastructure.

Both actual ASS, and PASS have the potential to cause environmental harm if not correctly identified prior to development and construction activities. Legislation and polices that apply to ASS in Queensland include the *Environmental Protection Act 1994* (EP Act) and SPP.

ASS is managed in Queensland under the SPP,[129] emissions and hazardous facilities, with requirements for ASS to be reflected in local planning instruments. Key considerations in assessing development in ASS affected areas include:

- identifying areas with high probability of containing ASS
- providing preference to land uses that will avoid, or where avoidance is not practicable, minimise the disturbance of ASS
- including requirements for managing the disturbance of ASS to avoid or minimise the mobilisation and release of acid, iron or other contaminants.

A review was undertaken of the Mackay Planning Scheme ASS Overlay. For this assessment, areas have been classified as:

- high risk mapped as land at or below 5m AHD
- medium risk mapped as land above 5m AHD and below 20m AHD
- low risk if they have been mapped as others

A review of the Mackay Planning Scheme ASS overlayer confirmed that:

- majority of Port of Hay Point owned lots occur within area with a high risk of ASS occurrence (land at or below 5m AHD)
- all the Port of Mackay owned lots occur within area with high or medium risk of ASS occurrence. The whole study area also occurs within areas of a high or medium risk of ASS occurrence.

These areas broadly correlate with lower lying areas that fringe water courses and water bodies that were susceptible to inundation and sulfide formation during the last glacial maximum in the Holocene epoch.

The disturbance of the ground or lowering the groundwater table could yield negative environmental impact during excavation and should be managed under an ASS management plan.

Impacts due to the disturbance of ASS will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts attributable to project construction might include:

- excavation of significant volumes (greater than 1000m^3) of ASS and use for ‘cut and fill’ activities on site or off-site (within the project alignment) where they are prone to ready leaching releasing metals and acidity into the surrounding environment
- exposing actual ASS during excavation or drilling causing acid to leach into the surrounding environment
- exposing potential ASS during excavation allowing oxidation to create ASS
- surface runoff entering areas of exposed ASS, causing acid release into the surrounding environment
- acid leachate of ASS treatment sites released to the surrounding environment
- long-term open excavations and stockpiling of the ASS without any treatment where it is exposed to rainfall, causing acidic run-off to leach into the surrounding environment
- seepage of acidic soil pore water during loading activities and subsequent drainage into the surrounding environment.

Importantly, these impacts have the potential to cause significant environmental and economic impacts such as fish kills, loss of biodiversity in wetlands and waterways, contamination of groundwater resources, loss of agricultural productivity, and corrosion of concrete and steel infrastructure. This is not uncommon in coastal

[129] Department of Infrastructure, Local Government and Planning. (2017). *State Planning Policy*.

environments and environmental risks associated with these soils are commonly mitigated via appropriate management for this type of project.

To reduce the potential impacts to the surrounding environment, ASS investigations should be undertaken for any project within the study area, in accordance with the *National Acid Sulfate Soil Guidelines (2018)*, and a detailed ASS management plan should be developed, where required, to manage the existing and potential acidity for any associated waters (perched, seepage, stormwater, and so on) during construction.

In general, medium risk area located approximately 2km away from the coast associated with a higher elevation (land above 5m AHD and below 20m AHD). **Figure 40** and **Figure 41** below illustrates the ASS risk within the ports of Hay Point and Mackay study areas.

Under the Mackay Planning Scheme, development in areas known to contain, or potentially containing ASS, shall avoid disturbance or implements appropriate investigation and management techniques to minimise the release of acid and metal contaminants to:

- maintain ecological quality of the natural environment, particularly water quality
- protect human health and wellbeing
- minimise adverse effects on the built environment, particularly corrodible assets on the site and on surrounding sites.

The Port of Mackay study area displays a wide-ranging area of land that is at or below 5m AHD, with these areas are located along the coastlines and low-lying inland areas could potentially be ASS areas.

Figure 40: Acid sulfate soils in the study area of the Port of Hay Point

Figure 41: Acid sulfate soils in the study area of the Port of Mackay

8.3.2.2 Contaminated land

Contaminated land in Queensland is administered under the EP Act on a lot and plan basis. Individual lots are assessed on a case-by case basis due to the potential for contamination to be highly site-specific based upon individual site activities (for example, service station, heavy industry, and so on). Land contamination can occur because of poor environmental management and waste disposal practices or accidental spills in industrial, agricultural, or mining activities. In some cases, land was contaminated in the past by activities now known to be hazardous.

In accordance with the EP Act 1994, the Environment Management Register (EMR) and Contaminated Land Register (CLR) are the principal source of land use planning data for contaminated land in Queensland. The EMR and CLR are administered by the DES.

The EMR provides information on historic and current land uses, including whether the land has been, or is currently used for, a 'notifiable activity', or has been contaminated by a hazardous material. Notifiable activities are set out in Schedule 3 of the EP Act. Examples of notifiable activities include landfills, service stations, and petroleum or oil storages.

The CLR includes land which is proven (through investigation) to be contaminated land which is causing or has the potential to cause serious environmental harm. Land is recorded on the CLR when investigation shows it is contaminated and action needs to be taken to remediate or manage the land.

Based on the above desktop assessment, an EMR/CLR search was undertaken for lot/plans located within high-risk areas.

To assess contaminated land, the following areas have been classified as:

- high risk if they have been:
  - mapped as special purpose zone
  - mapped as high impact industry zone
  - mapped as industry investigation zone
  - existing petrol stations
  - existing or historical environmental authority (EA) locations
  - existing or historical enforcement register locations
  - existing key resources areas
  - identified notifiable activities from aerial images
- medium risk if they have been:
  - mapped as mixed-use zone
  - mapped as district centre zone
  - mapped as low impact industry zone
  - mapped as major centre zone
  - mapped as district centre zone
  - mapped as local centre zone.
- low risk if they have been mapped as all other zones.

The EP Act is a key element of Queensland’s environmental legal system. Its objective is to protect Queensland’s environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains ecological sustainability.

ERA that are prescribed activities are generally industrial or intensive animal industries with the potential to release emissions which impact on the environment and surrounding land uses.

Under the EP Act, ERA require an EA to be issued before any activity begins. An EA imposes conditions to reduce or avoid potential environmental impact and is administered by the DES.

There are 48 EA permits located within the port land use area, and another 115 EA permits located outside of the port land use area**.** A full list of the prescribed ERAs can be found in Schedule 2 of the *Environmental Protection Regulation 2019*.

A summary of the key legislation and policies relevant to hazardous facilities and activities at the port are shown in **Table 40**.

Table 40: Summary of key legislation and policies

Legislation	Application
EP Act	A key element of Queensland's environmental legal system. It provides a range of tools to ensure protecting Queensland's environment while allowing for development.
Environmental Protection Regulation 2019	Prescribes the detail for processes contained in the EP Act.
Petroleum and Gas (Production and Safety) Act 2004	Regulates the technical and safety aspects of gas production, transmission, distribution and use and deals with licensing of gas transmission pipelines.
Explosives Act 1999	Regulates the handling of, and access, explosives to protect public health and safety, property and the environment.
Mining and Quarrying Safety and Health Act 1999	Protects the safety and health of persons at mines and persons who may be affected by operations, and to require that the risk of injury or illness to any person resulting from operations is at an acceptable level.
Coal Mining Safety and Health Act 1999	Standards state ways of achieving an acceptable level of risk for people working in coal mines.
Work Health and Safety Act 2011	Sets out requirements and standards for building healthy and safe workplaces.
Planning Act	Establishes an efficient, effective, transparent, integrated, coordinated, and accountable system of land use planning, DA and related matters that facilitates the achievement of ecological sustainability.
SPP	Expresses the state's interests in land use planning and development. Including emissions and hazardous facilities.

Port of Hay Point

The desktop analysis revealed the following:

- no key resources areas within the study area.
- 11 fuel stations located within the study area (**Table 41**).

Table 41: Summary of fuel stations in the Port of Hay Point study area

Lot Plan	Site name	Address	Fuel type
3SP266886	Puma Balberra	Bruce Hwy	Unleaded, Premium Unleaded 98, Premium Diesel
102SP206825	Liberty Mackay Truckstop	1 Interlink Court	Diesel
11SP234298	Coles Express Mackay Broadsound Rd	1 Broadsound Rd	Unleaded, Diesel, LPG, Premium Unleaded 95, Premium Unleaded 98, e10
1RP741701	Sarina Beach Store	4 Sarina coast Road	Unleaded, Premium Unleaded 98, Premium Diesel
1SP103122	Caltex Crokers Mackay	5-7 Connors Road	Unleaded, Diesel, Premium Unleaded 98, Premium Diesel
1SP312217	Puma Racecourse	26256 Peak Downs Highway	Unleaded, Diesel, Premium Unleaded 98, e10
217CI804899	BP Mackay	324 Nebo Road	Unleaded, LPG, Premium Unleaded 95, Premium Unleaded 98, Premium Diesel

Lot Plan	Site name	Address	Fuel type
23SP206814	Pacific Petroleum Paget	15 Turbo Drive	Unleaded, Diesel, Premium Unleaded 95, e10
31SP261504	Caltex Paget	Corner Bruce Hwy and Empire Street	Unleaded, Diesel, LPG, Premium Unleaded 95, Premium Unleaded 98, e10, Premium Diesel
601SP248953	BP Paget	124 Diesel Drive	Unleaded, Diesel, Premium Unleaded 95, Premium Unleaded 98, Premium Diesel
803SP234312	Caltex/Woolworths Ooralea	Canecutters Road and Boundary Road	Unleaded, Premium Unleaded 98, e10, Premium Diesel

Port of Mackay

The desktop analysis over 300km^2 containing 26,337 land parcels, revealed 48 EA within the port land use area and 85 EA permitted sites outside of the port land use area. Eight EAs were located in key resource areas (**Table 42**) and 25 fuel stations (**Table 43**) were noted. A full list of the prescribed ERAs can be found in Schedule 2 of the *Environmental Protection Regulation 2019.*

Table 42 identifies lots to the north west being subject to a key resources transport route and its separation area.

Table 43 provides a summary of fuel stations in the study area.

Table 42: Summary of lot plan in key resources area – Port of Mackay

Lot Plan	Tenure	Parcel type
6SP255599	Freehold	Lot Type Parcel
5SP255599	Freehold	Lot Type Parcel
804SP309421	Freehold	Lot Type Parcel
2SP138968	Freehold	Lot Type Parcel
5SP232813	Freehold	Lot Type Parcel
4SP288922	Freehold	Lot Type Parcel
1SP141690	Freehold	Lot Type Parcel
1SP249146	Freehold	Lot Type Parcel

Table 43: Summary of fuel stations in Port of Mackay study area

Lot Plan	Site name	Address	Fuel type
217CI804899	BP Mackay	324 Nebo Road	Unleaded, LPG, Premium Unleaded 95, Premium Unleaded 98, Premium Diesel
391CI2909	BP Moss Marine	Harbour Road and Hamilton Street	Diesel, Premium Unleaded 95, e10
46SP317290	BP Northern Beaches	41-43 Arana Drive	Unleaded, Premium Unleaded 98, e10, Premium Diesel
8RP907377	BP Oak Street	Corner Oak Street and Tropical Avenue	Unleaded, Premium Unleaded 95, Premium Unleaded 98, Premium Diesel
601SP248953	BP Paget	124 Diesel Drive	Unleaded, Diesel, Premium Unleaded 95, Premium Unleaded 98, Premium Diesel
2SP137698	Caltex City Cabs	4 Tennyson Street	Unleaded, Premium Unleaded 98, e10, Premium Diesel
1SP103122	Caltex Crokers Mackay	5-7 Connors Road	Unleaded, Diesel, Premium Unleaded 98, Premium Diesel
1SP129626	Caltex Mackay	47 Beaconsfield Road	Unleaded, Diesel, Premium Unleaded 98, e10, Premium Diesel
1SP158456	Caltex Mackay	1 Bucasia Road	Unleaded, Premium Unleaded 98, e10, Premium Diesel
3RP710475, 4RP710475	Caltex Nebo Road Mackay West	153-155 Nebo Road	Unleaded, Premium Unleaded 95, Premium Unleaded 98, Premium Diesel
31SP261504	Caltex Paget	Corner Bruce Highway and Empire Street	Unleaded, Diesel, LPG, Premium Unleaded 95, Premium Unleaded 98, e10, Premium Diesel
1M91115, 2M91115, 3M91115	Caltex Starmart Norgate Star (Mackay)	78-80 Malcomson Street	Unleaded, Premium Unleaded 95, Premium Diesel
44SP247654	Caltex Woolworths Rural View	10 Eimeo Road	Unleaded, Premium Unleaded 95, Premium Unleaded 98, e10, Premium Diesel
2RP700706	Caltex/Woolworths Mackay (Canelands)	3 Mangrove Road	Unleaded, Premium Unleaded 98, e10, Premium Diesel
11SP234298	Coles Express Mackay Broadsound Road	1 Broadsound Road	Unleaded, Diesel, LPG, Premium Unleaded 95, Premium Unleaded 98, e10
2RP707006, 1RP707006	Coles Express Mackay Nebo Rd	Nebo Road and Bridge Road	Unleaded, Diesel, Premium Unleaded 95, Premium Unleaded 98
3RP901533	Coles Express Mackay North	2 Highway Plaza (Corner Bruce Highway and Hicks Road)	Unleaded, Diesel, Premium Unleaded 95, Premium Unleaded 98
102SP206825	Liberty Mackay Truckstop	1 Interlink Court	Diesel
1RP700942	Mackay City Fuel	114 Shakespeare Street	Unleaded, Diesel, Premium Unleaded 95
2SP114085	Mobil Slade Point	320 Slade Point Road	Unleaded, Diesel, Premium Unleaded 95
23SP206814	Pacific Petroleum Paget	15 Turbo Drive	Unleaded, Diesel, Premium Unleaded 95, e10
85RP743676	Puma Andergrove	166 Bedford Road	
1RP720698	Puma Mackay	Sydney Street and Alfred Street	Unleaded, Premium Unleaded 95, Premium Unleaded 98, Premium Diesel

Lot Plan	Site name	Address	Fuel type
1M91176, 2RP716621, 2RP729755, 1RP716621, 3RP733489, 4RP733489	Puma Mackay North	Evans Avenue	Unleaded, Premium Unleaded 98, Premium Diesel
1RP719281, 1RP715863	United Mackay	139 Sydney Street	Unleaded, Diesel, Premium Unleaded 95, Premium Unleaded 98, e10, e85

8.3.2.3 Environmental Management Register and Contaminated Land Register

In accordance with the EP Act, the EMR and CLR are the principal source of land use planning data for contaminated land in Queensland. The EMR and CLR are administered by the DES.

The EMR provides information on historic and current land uses, including whether the land has been, or is currently used for, a 'notifiable activity', or has been contaminated by a hazardous material. Notifiable activities are set out in Schedule 3 of the EP Act. Examples of notifiable activities include landfills, service stations, and petroleum or oil storages.

The CLR includes land which is proven (through investigation) to be contaminated land which is causing or has the potential to cause serious environmental harm. Land is recorded on the CLR when investigation shows it is contaminated and action needs to be taken to remediate or manage the land.

Based on the above desktop assessment, EMR/CLR searches were undertaken for land parcels located within high-risk areas. It should be noted that one land parcel was identified as being on the CLR (Lot 39 on CI2909). These are sites that are considered to currently pose a risk to human health or the environment and require active management. A list of EMR-listed land parcels within the study area and within the port land use area are located in **Appendices E** and **F**.

8.3.3 Planned hazardous activities

The tables below list the potential planned hazardous facilities and activities within 5km of the port.

Table 44: Mackay Regional Council development applications within five kilometres km of the Port of Hay Point

Application number	Decision date	Details	Property	Address
DA-2011-21	16/07/2016	Combined Application - Impact - Preliminary Approval under Section 242 affecting the planning scheme to regulate development as though it were code assessable for a Rural Tourist Facility and Reconfiguration of a Lot	2RP704491	557 Grasstree Road Sarina QLD (Mackay Regional)

Table 45: Mackay Regional Council development applications within five kilometres of the Port of Mackay

Development Application Number	Decision Date	Description	Property	Address
NQBP Authority				
PL/04/02/00015	01/03/2021	MCU for an ERA (ERA 7(4)(a) – Chemical Manufacturing)	Lease B on RP886042, 10SP258646	2 Presto Avenue Mackay Harbour QLD 4640
PL/04/02/00008	26/02/2019	MCU for ERA (ERA 50(1)(a) Bulk material handling)	63SP143358	Harbour Road Mackay Harbour QLD 4740
PL/04/02/00008	14/11/2018	MCU for ERA (ERA 50(1)(a) and 50(2) Bulk material handling)	58SP123751	George Bell Drive Mackay Harbour QLD 4740
PL/04/02/00001	01/09/2016	MCU for ERAs, ERA 62 waste transfer station operation and ERA 58 regulated waste treatment.	10SP258646	103 Spiller Avenue Mackay Harbour QLD 4740

8.3.4.1 Geology

Port of Hay Point

An updated search of the geoscience dataset identified the study area is underlain by Quaternary Alluvium in the low-lying and coastal areas and the Campwyn Volcanics in the south-eastern portion of the study area. Quaternary Alluvium is comprised of sand, silt, mud, clay and gravel including mud/sand and sandy mud estuarine channels and mangrove swamps and the Campwyn Volcanics mostly comprises volcaniclastic sandstone, siltstone, mudstone and limestone. In addition, Whitsunday volcanics are present at the mouth of Louisa Creek[130] as shown on **Figure 42**.

As a result of the geology and topography, the study area is not prone or vulnerable to erosion, except for exposed soils and cleared channels during periods of heavy rainfall.[131]

Port of Mackay

Development within the study area has predominantly occurred on coastal sand dunes. There are two main surface geology units present in the study area, primarily the Palaeozoic volcanic and sedimentary outcrops of the Campwyn beds at Slade Point, and the more recent Holocene coastal sediments in the intertidal areas of the study area.[132]

An updated search of the Geoscience dataset identified the study area is underlain by mostly volcanics and metamorphics consisting of quartz sand, mud, mangrove swamps, estuarine deposits as well as gravel and sand under existing port. There are some patches of quaternary alluvium in the western extents of the study area as well as Dolerite, Basalt and Whitsunday Volcanics in the Mount Basset area, as shown on **Figure 43**. Erosion is not an issue in the study due to the geology and topography of the coastal zone, except for areas where soils are exposed and channels are cleared during heavy rainfall events.[133] Offshore geological conditions include marine sediments (clay, silts and sand) with interspersed layers of reefs, and Campwyn volcanics.[134]

8.3.5 Potential impacts/threats

Potential impacts on the topography, soils and geology, from the port and other coastal industrial development, residential development is summarised below:

- soil erosion from vegetation clearing, earthworks and stockpiling
- disturbance of potential ASS during construction and or operational activities.

[130] Australian Government. (2021). *Geoscience Australia Portal*. Retrieved from https://portal.ga.gov.au/restore/38ed09a9-9e23-45eb-9016-dbe1dc92531d.
[131] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.
[132] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.
[133] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited
[134] North Queensland Bulk Ports Corporation Limited. (2020). *Port of Hay Point – Port Development Opportunities and Constraints Assessment (Confidential).*

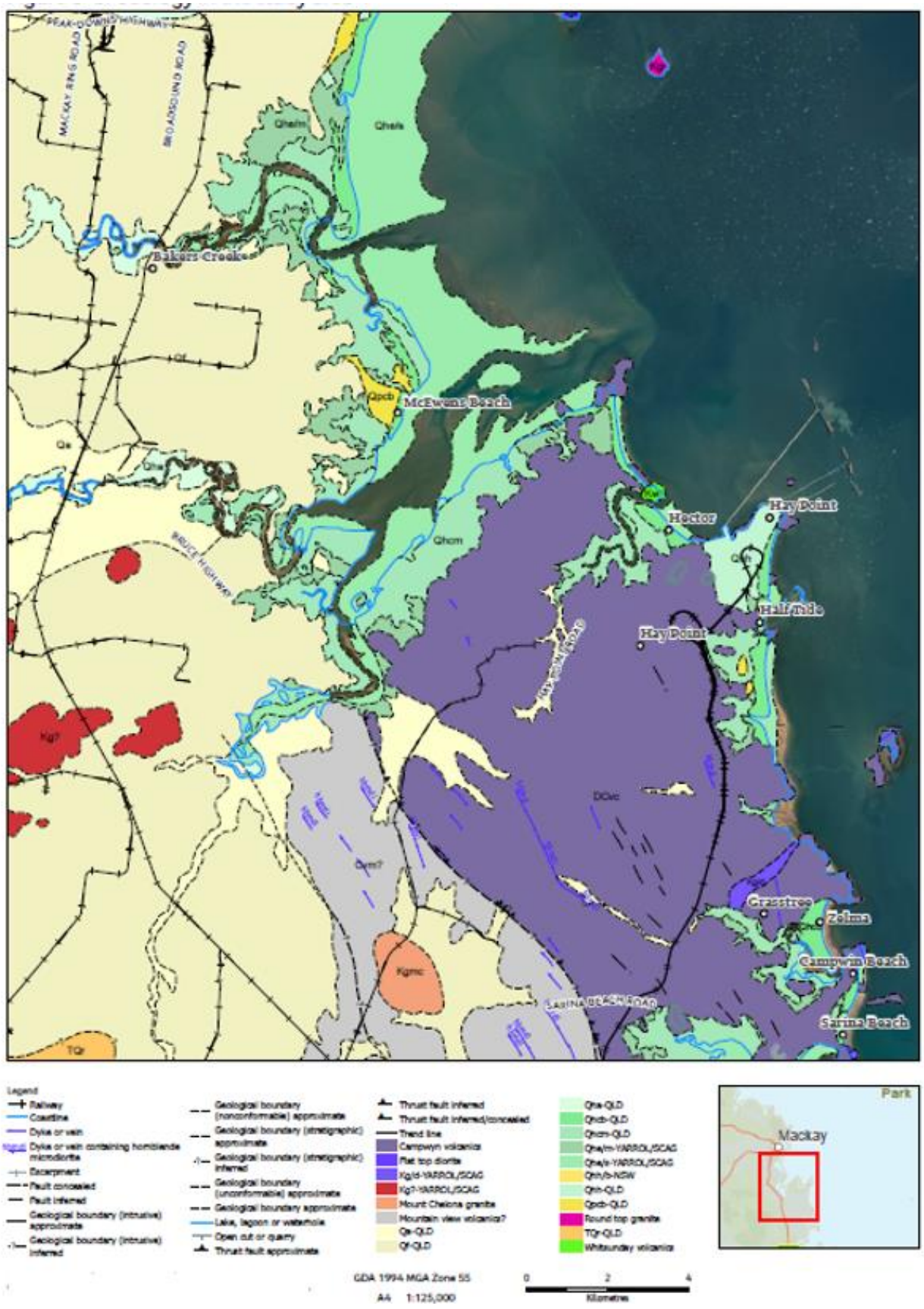

Figure 42: Geology within the Port of Hay Point study area

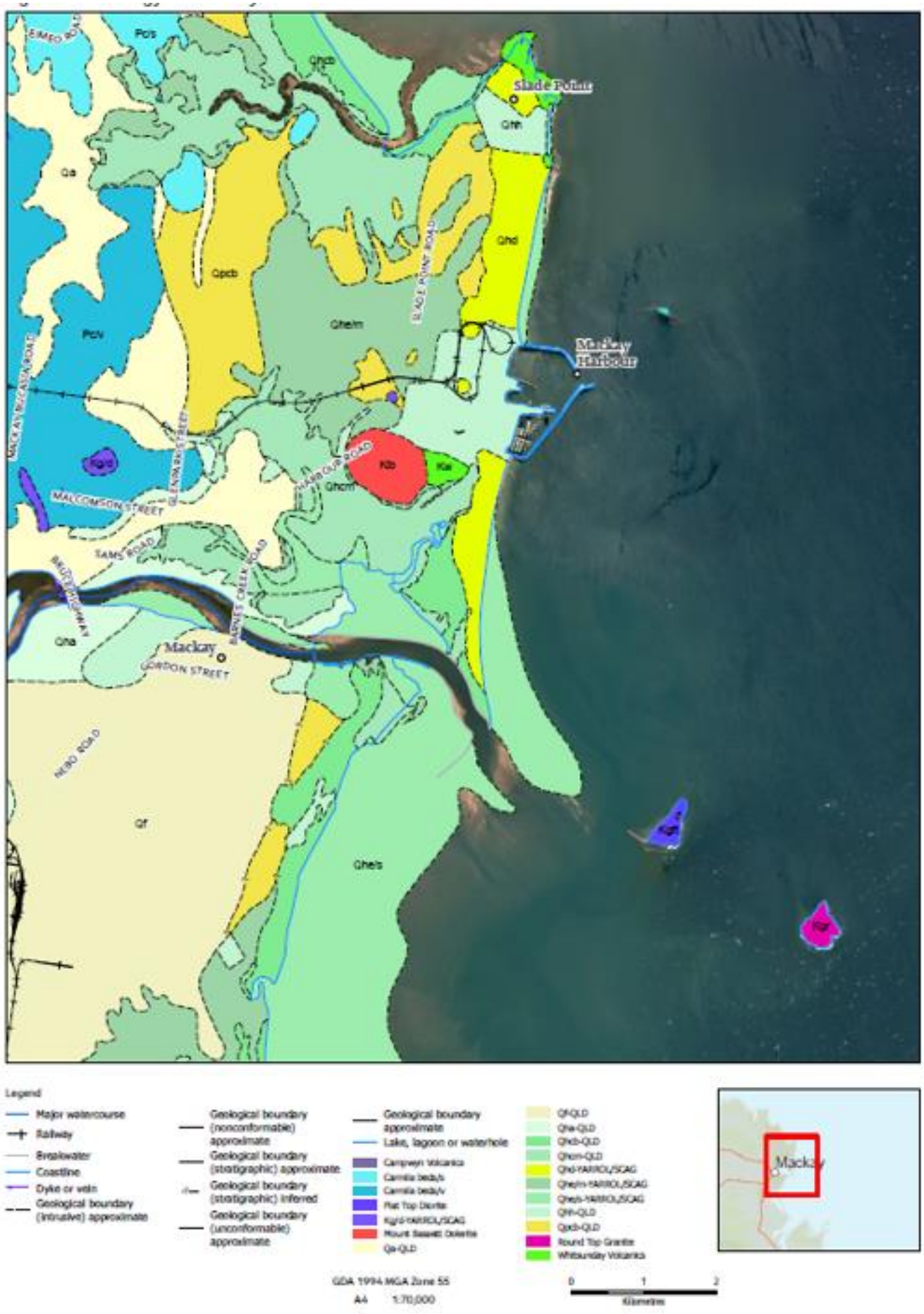

Figure 43: Geology within the Port of Mackay study area

8.4 Climatic condition

8.4.1 Climate

Port of Hay Point

As the Bureau of Meteorology (BoM) does not operate a meteorological station for Hay Point, the nearest meteorological station is located at Mackay Aero (BoM Station No. 033045) which is located approximately 16.5km from Hay Point (latitude 21.17ºS and longitude 149.18ºE). **Table 46** summarises the major climate statistics recorded at this location.[135]

Table 46: Monthly climate statistics at Mackay Aero

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
Mean Maximum temperature (ºC)	30.4	30.2	29.4	27.7	25.3	23.2	22.7	23.9	26.0	28.4	29.7	30.8	27.3
Mean minimum temperature (ºC)	23.1	23.3	22.1	19.6	15.7	12.9	11.4	12.0	14.8	18.3	20.5	22.3	18.0
Mean rainfall (mm)	306.4	331.3	259.5	164.9	87.1	60.3	33.4	31.2	23.6	34.4	77.3	138.5	1542.4
Mean 9:00 am wind speed kilometres per hour (km/h)	17.4	15.9	17.8	15.7	14.0	13.4	12.2	13.1	14.9	16.8	17.4	16.1	15.4
Mean 3:00 pm wind speed (km/h)	22.3	22.0	23.8	21.8	20.5	21.4	20.5	22.3	22.5	22.2	22.4	22.0	22.0

Source: BoM (2021).

Port of Mackay

The BoM operates a meteorological station at the Mackay meteorological office (BoM Station No. 033119). **Table 47** summarises the major climate statistics recorded at this location.

Table 47: Monthly climate statistics at Mackay Meteorological Office

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
Mean Maximum temperature (ºC)	30.2	29.7	28.7	26.8	24.2	22.0	21.4	22.7	25.4	27.7	29.3	30.3	26.5

[135] BoM (2021). *Climate statistics for Australian locations: Monthly climate statistics*. Retrieved from http://www.bom.gov.au/climate/averages/tables/cw_033045.shtml

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
Mean minimum temperature (ºC)	23.6	23.5	22.4	20.3	17.2	14.2	13.1	14.1	16.8	19.7	21.8	23.1	19.2
Mean rainfall (mm)	276.6	312.5	282.1	146.8	102.5	61.2	40.3	29.3	19.5	33.9	90.2	185.0	1595.1
Mean 9:00 am wind speed (km/h)	17.6	18.2	20.1	20.3	19.1	18.2	17.0	16.4	16.3	17.6	17.9	17.6	18.0
Mean 3:00 pm wind speed (km/h)	21.6	21.9	23.0	22.4	21.2	20.5	19.8	20.1	20.7	21.9	22.2	21.6	21.4

Source: BoM (2021).

8.4.2 Temperature

Port of Hay Point

The study area has a tropical climate with generally hot and humid summers, and mild, dry winters. The average summer temperatures between November and April are between 25°C and 30°C, while average winter temperatures between May to October are around 20°C.[136] The maximum day time temperatures for the summer months are typically 29°C to 30°C and 22°C to 24°C during the winter months.

Relative humidity in the study area for the majority of the year is over 70%, while in the summer months is generally over 80% relative humidity.[137]

Port of Mackay

The Mackay study area has a tropical climate with generally hot and humid summers, and mild, dry winters. The average summer temperatures between November and April are between 25°C and 30°C, while average winter temperatures between May to October are around 20°C.[138] The maximum day time temperatures for the summer months are typically 29°C to 30°C and 21°C to 24°C during the winter months.

Relative humidity in the study area for most of the year is over 70%, while in the summer months is generally over 80% relative humidity.[139]

8.4.3 Rainfall

Port of Hay Point

Hay Point experiences monsoonal rainfall trends. On average, Hay Point receives 1542 millimetres (mm) of rainfall each year.[140] The wet season occurs between January and March and the dry season is from June to October. Average rainfall in the wet season is between 250mm to 350mm each month, while average rainfall in the dry season is between 20mm to 60mm each month.

Port of Mackay

Mackay study area is located within a tropical climate and experiences monsoonal rainfall trends. According to the NQBP *2018 Environmental Risk Assessment*, on average, the Mackay region receive 1595mm of rainfall each year, which mostly falls between December and March while the winter months are quite dry in

[136] Aecom. (2021). *Port of Hay Point: Ambient Air, noise and Weather Monitoring, Validated Report 1 March 2021 – 31 March 2021, report No. DAT16900*.
[137] Ogge, M., Browne, B., and Hughes, T. (2021). *HeatWatch – Extreme heat in Mackay.* Retrieved from https://australiainstitute.org.au/wp-content/uploads/2020/12/P688-Heatwatch-Mackay-WEB_0.pdf(2019, August 24).
[138] Aecom. (2021). *Port of Hay Point: Ambient Air, noise and Weather Monitoring, Validated Report 1 March 2021 – 31 March 2021, report No. DAT16900*.
[139] Ogge, M., Browne, B., and Hughes, T. (2021). *HeatWatch – Extreme heat in Mackay.* Retrieved from https://australiainstitute.org.au/wp-content/uploads/2020/12/P688-Heatwatch-Mackay-WEB_0.pdf(2019, August 24)
[140] North Queensland Bulk Ports Corporation Limited. (2018). *Environmental Risk Assessment, Port of Hay Point.*

comparison (refer to **Table 47**). The wet season occurs between January and March and the dry season is from June to October. Average rainfall (**Figure 44**) in the wet season is around 346mm each month, while average rainfall in the dry season is between 20mm to 300mm each month.[141]

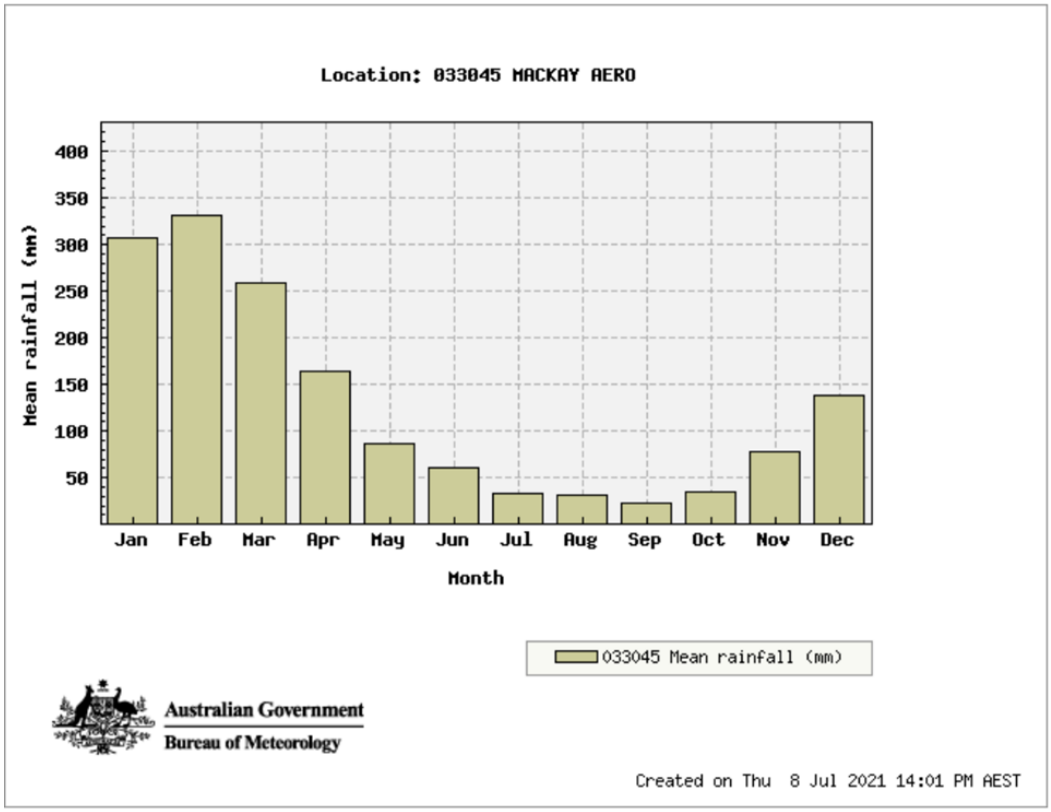

Figure 44: Average annual rainfall in Mackay Aero

8.4.4 Wind

Port of Hay Point

Hay Point lies in the trade wind belt for most of the year which results in dominant east to south-easterly winds. Winds during the summer months tend to be mostly from the east, while during the winter months winds tend to be from the south and south-east. Afternoon north-east sea breezes are common in the warmer months. Local wind direction and speeds at Hay Point are a key driver for waves and currents in the study area.[142]

Port of Mackay

The Mackay study area lies in the trade wind belt for most of the year which results in dominant east to south-easterly winds. Winds during the summer months tend to be more strongly from the east, while during the winter months winds tend to be more from the south and south-east. Afternoon north-east sea breezes are common in the warmer months. Local wind direction and speeds at Mackay are a key driver for waves and currents in the study area.[143]

Wind rose data as provided by the BoM (2021) shows the strong south and south-easterly winds that trend within the Mackay study area, shown in **Figure 45** and **Figure 46**.

[141] Bureau of Meteorology. (2021). *Climate statistics for Australian locations: Monthly climate statistics*. Retrieved from http://www.bom.gov.au/climate/averages/tables/cw_033045.shtml.
[142] North Queensland Bulk Ports Corporation Limited. (2018). *Environmental Risk Assessment, Port of Hay Point.*
[143] North Queensland Bulk Ports Corporation Limited. (2018). *Environmental Risk Assessment, Port of Hay Point.*

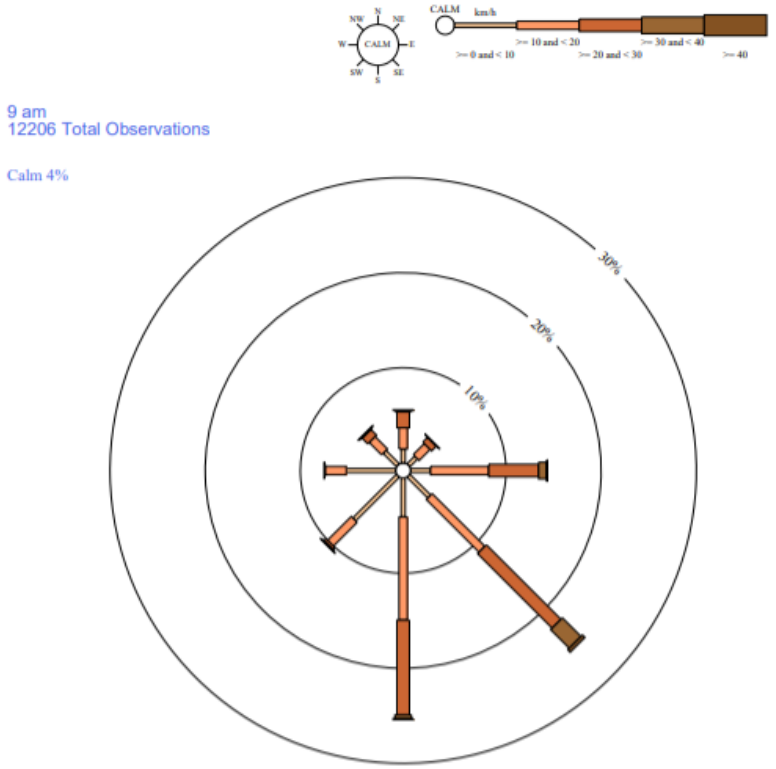

Figure 45: Wind direction versus speed (millimetres per hour) at 9am (3 May 1950 to 11 August 2020) Mackay Aero

Source: BoM (2021).

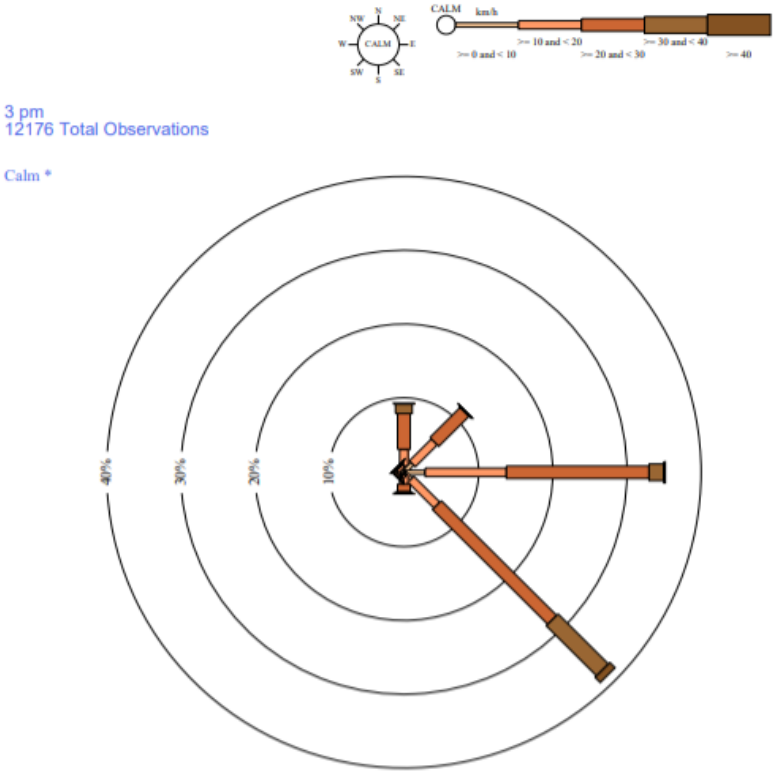

Figure 46: Wind direction versus speed (millimetres per hour) at 3pm (3 May 1950 to 11 August 2020) Mackay Aero

Source: BoM (2021).

8.4.5 Extreme events

Port of Hay Point

Severe weather can occur any time in the study area and cyclone season is officially from November to April. The Hay Point region is also exposed to severe local storms which can form with minimal warning and cause significant damage to the local maritime industry (for example, major destructive storm at Airlie Beach in February 2008). The Port of Hay Point is particularly exposed to the damaging winds and waves caused by cyclones and extreme weather events.[144]

Port of Mackay

Severe weather can occur any time in the study area and cyclone season is officially from November to April. The Mackay region is particularly exposed to risks posed by tropical cyclones and is also exposed to severe local storms which can form with minimal warning and cause significant damage to the local maritime industry (for example, the Airlie Beach storm in 2008 which devastated the community). Mackay is also particularly exposed to the damaging winds and waves caused by cyclones and extreme weather events.[145]

8.5 Terrestrial environment

8.5.1 General ecological description

Port of Hay Point

The Hay Point study area supports a diverse range of terrestrial, aquatic, intertidal and marine ecological values, protected at either the international, national or state level. The land-based component of the study area is located within the CQC bioregion; noted as being a discontinuous area centred upon the high rainfall coastal lowlands, hills and ranges from Yeppoon to the Whitsunday Coast.[146] This bioregion also includes some continental islands and at the date of reference access, it comprised an area of approximately 14,842.8km^2. Lower altitude parts of the CQC bioregion are characterised by savannah woodlands and semi-deciduous rainforests. A total of 7.4% of the CQC bioregion comprises wetlands, primarily estuarine wetlands (3.7%), but also, riverine, palustrine, lacustrine and artificial or highly modified wetland systems. Much of the wetland area is designated as GBR Wetland Protection Area.

The marine component of the Hay Point study area lies wholly within GBRWHA. The coastal marine designated area extends from Sarina Beach in the south to Far Beach in the north which aligns with Quota Park and Bridge Road on the mainland.

Key ecological values of the Hay Point study area include:

- important shorebird and migratory seabird populations that are present in intertidal wetland areas. A population of 23,000 migratory shorebirds roost annually at Sandringham Bay.
- the study area contains 22ha of high diversity mangrove forests, predominantly within enclosed wetland areas, but also some minor stands at Half Tide Beach and an extensive community at Louisa Creek.
- Sandringham Bay – Bakers Creek Aggregation, located north-west of the existing port, is listed on the DIWA. It is significant as it has large intertidal and shallow water habitats, extensive mangroves and diverse shoreline. The study area also supports HES wetlands associated with the GBR. Sarina Inlet - Ince Bay Aggregation is located predominantly south of the Hay Point study area and is a wetland that supports inshore coral reefs and subtidal and intertidal mudflats. Lake Barfield is also a freshwater wetland located south of HPCT.

[144] Department of Transport and Main Roads. (2019). *Port Procedures and Information for Shipping – Port of Hay Point*. Retrieved from https://www.publications.qld.gov.au/dataset/c9e7f224-162a-44bb-9bbe-8f356b6c0963/resource/9aae3caf-1e13-4809-8955-42926bc278c2/download/hay-point_ppm_master_june_2022.pdf
[145] Department of Transport and Main Roads. (2019). *Port Procedures and Information for Shipping – Port of Hay Point*. Retrieved from https://www.publications.qld.gov.au/dataset/c9e7f224-162a-44bb-9bbe-8f356b6c0963/resource/9aae3caf-1e13-4809-8955-42926bc278c2/download/hay-point_ppm_master_june_2022.pdf
[146] Department of Environment and Science. (2021). *Central Queensland Coast (CQC) bioregion*. Retrieved from https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/bioregion-central-queensland-coast-cqc/.

- ecologically important wildlife corridor that links Mount Hector and Dudgeon Point to Louisa Creek and Sandringham Bay which provide significance habitat and safe movement for fauna species inhabiting the area.
- inshore and fringing coral reefs are present in the study area and support a diverse range of soft corals, sea fans, ascidians and hydroids.
- low density seagrass meadows in the study area provide forage for dugongs, turtles and dolphins in the study area. An aggregation and calving area for humpback whales is located approximately 80km east of the study area, and low-density turtle nesting occurs on Hay Point Beach, Salonika Beach and Sarina Beach. Important habitat for dugongs is also located at Ince Bay, south of the study area,
- one TEC, the 'Critically Endangered' Littoral Rainforest and Coastal Vine Thickets of Eastern Australia is likely to be present within the study area.
- marine plants and waterways provide for fish passage over a large portion of the study area.

A more detailed description of the ecological values of the study area are provided in this section. A list of the ecological monitoring programs that are occurring within the study area is presented in **Section 8.12**.

Figure 47 below illustrates bird counting data undertaken in 2003 at the Port of Hay Point.

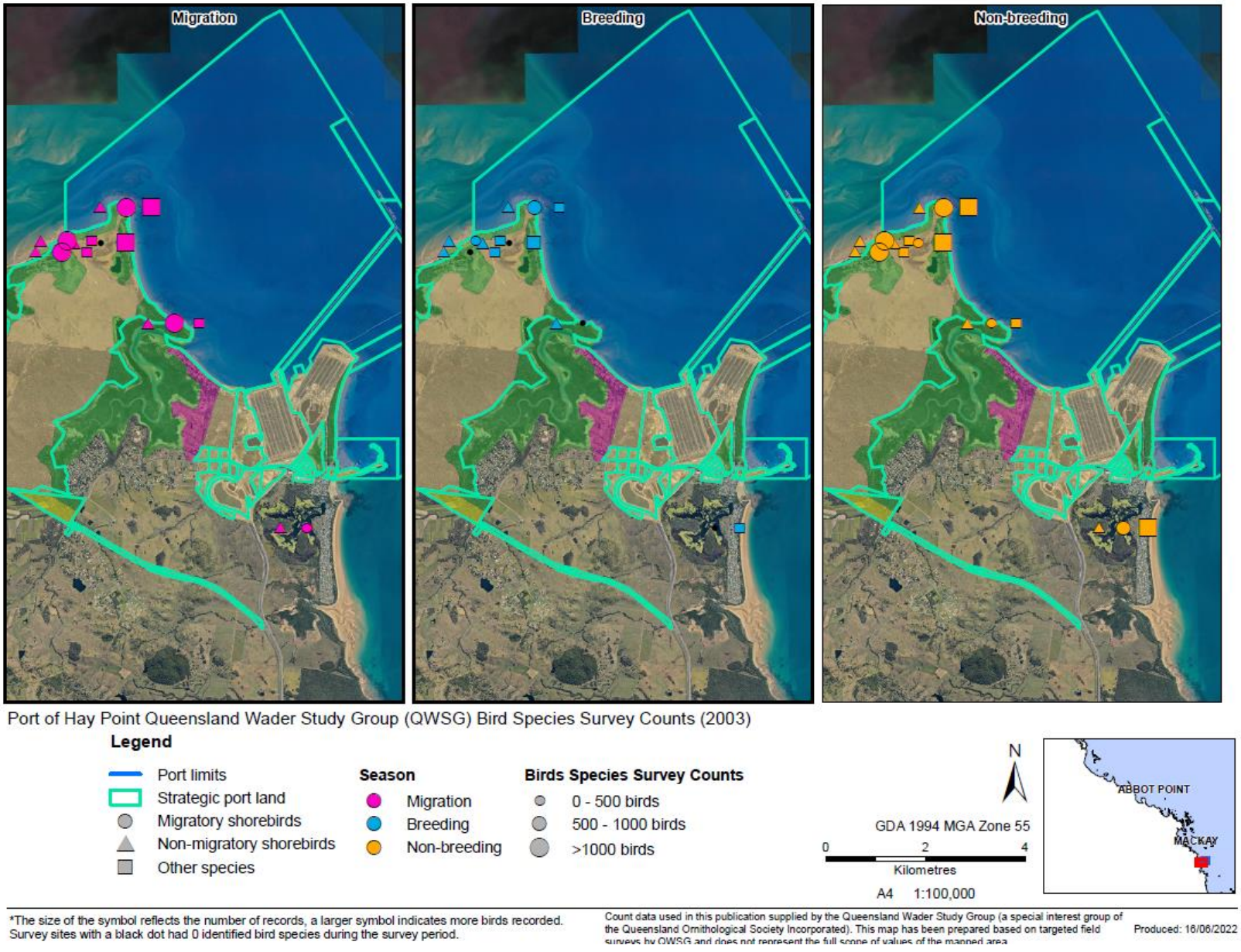

Figure 47: Migrating, breeding and non-breeding bird species at the Port of Hay Point

Port of Mackay

The Mackay study area supports a diverse range of terrestrial, aquatic and marine ecological values. The land-based component of the study area is located within the CQC bioregion; noted as being a discontinuous area centred upon the high rainfall coastal lowlands, hills and ranges from Yeppoon to the Whitsunday Coast.[147] This bioregion also includes some continental islands and at the date of desktop assessment, it comprised an area of approximately 14,842.8km^2. Lower altitude parts of the CQC bioregion are characterised by savannah woodlands and semi-deciduous rainforests. A total of 7.4% of the CQC bioregion comprises wetlands (3.7%), primarily estuarine wetlands but also, riverine, palustrine, lacustrine and artificial or highly modified wetland systems. Much of the wetland area is designated as GBR Wetland Protection Area.

The marine component of the Mackay study area lies wholly within GBRWHA. The coastal marine designated area extends from just north of Bakers Creek in the south to the tip of Slade Point in the north.

A more detailed description of the ecological values of the Mackay study area are provided further in this section.

Figure 48 below illustrates bird counting data undertaken in 2003 at the Port of Mackay.

[147] Department of Environment and Science. (2021). *Central Queensland Coast (CQC) bioregion.* Retrieved from https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/bioregion-central-queensland-coast-cqc/.

Figure 48: Migrating, breeding and non-breeding bird species at the Port of Mackay

8.5.2 Matters of national environmental significance

The EPBC Act, is the Australian Governments' Premier environmental legislation that protects Australia's MNES. The EPBC PMST was accessed on 9 June 2021 to generate a report for the study site to identify any MNES within the Port of Mackay project area. Key MNES are summarised as follows:

Port of Hay Point

- **Properties and places:** The study site is located wholly within a World Heritage Property and national heritage places (the GBR). The GBRMP within the study area includes regions zoned as habitat protection and general use. The areas zoned as habitat protection are noted under the IUCN as Category VI: protected area with sustainable use of natural resources.
- **Wetlands of international and national importance:** There are no Wetlands of International Importance within the study area, however there are two listed nationally important wetlands namely, the GBRMP and Sandringham Bay – Bakers Creek Aggregation. Sarina Inlet – Ince Bay Aggregation, located predominantly south of the study area is also listed as a nationally important wetlands.
- **Reserves:** There are four state reserves within the study area; Bakers Creek Conservation Park, Mount Hector Conservation Park and Sandringham Bay Conservation Park.
- **TEC and species:** Two TECs, 42 species and 66 migratory species are listed as MNES that occur or may occur within the study area. The TECs are presented in **Table 48**.

Table 48: Threatened Ecological Communities of conservation significance in the Port of Hay Point study area

Threatened Ecological Communities	Conservation status	Type of presence
Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland	Endangered	Community may occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area

Port of Mackay

- **Properties and places:** The study site is located wholly within a World Heritage Property and National Heritage Places (the GBR). The GBRMP within the Mackay study area includes regions zoned as habitat protection as well as general use. The areas zoned as habitat protection are noted under the IUCN Category VI: protected area with sustainable use of natural resources. Conservation Park Zones are considered Category IV: Habitat/species management area.
- **Australian land:** Two (2) Australian Defence properties are present within the Mackay study area: Mackay Training Depot and Komiatum Barracks.
- **Wetlands of international and national importance:** There are no Wetlands of International Importance within the Mackay study area, however there are two listed nationally important wetlands namely, the GBRMP and Sandringham Bay – Bakers Creek Aggregation.
- **Reserves**: There are two state reserves within the study area; June's Land Nature Refuge and Yuwi Paree Toolkoon National Park.
- **TECs and species**: Two TECs, 41 species and 65 migratory species are listed as MNES that occur or may occur within the study area. The TECs are presented in **Table 49**. Sections 8.5.3 and 8.5.4 describe known or potential, threatened flora and fauna species within the study area.

Table 49: Threatened Ecological Communities of conservation significance in the Port of Mackay study area

Threatened Ecological Communities	Conservation status	Type of presence
Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland	Endangered	may occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	likely to occur within area

8.5.3 Listed threatened terrestrial flora species

Port of Hay Point

The PMST search completed in May 2021, identified four EPBC Act listed flora species as potentially occurring within the study area. A search was also undertaken of the Queensland WildNet database to identify species that have previously been identified for the project area. Of the numerous flora species listed in the WildNet search, only one, *graptophyllum ilicifolium* (holly-leaved *graptophyllum*) was identified as 'Vulnerable'.

No species listed as 'Critically Endangered', 'Endangered' or 'Near Threatened' were identified from this search. The listing for holly-leaved *graptophyllum* was from one species that was identified over one hundred years ago. There have been no subsequent recordings. **Table 50** presents the threatened species of flora identified from the PMST and Queensland WildNet searches that are known or may potentially occur within the study area.

Of the threatened species identified from the database searches further investigation of recent studies for the study areas indicates that there is potential habitat for two of these species within the study area. These are the lesser swamp-orchid, which may occur within paperbark swamp forests on sandy soils within the area, and the black ironbox, which could potentially occur within the paperbark-eucalypt woodlands along watercourses within the study area.[148]

Table 50: Threatened flora known to be present/habitat present within the Port of Hay Point study area

Environment Protection and Biodiversity Conservation Act 1999 (Cth)	***Nature Conservation Act 1992***
V – Vulnerable E – Endangered CE – Critically Endangered	E – Endangered LC –Least Concern V – Vulnerable

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth	*Nature Conservation Act 1992*	Habitat	Species or species habitat present
Dichanthium setosum	Bluegrass	V	LC	Heavy soils (predominantly cracking clays or alluvium) in woodland or open woodland usually dominated by Acacia (brigalow) and/or Eucalyptus species.	Present
Eucalyptus raveretiana	Black ironbox	V	LC	Along watercourses and occasionally on river flats. In open forest or woodland communities. Preferred alluvial soils include sands, loams, light clays or cracking clays.	Present
Omphalea celata	-	V	V	Fragmented semi evergreen vine thicket or *araucarian microphyll* vine forest. Along watercourses in steep sided gorges and gullies. Frequently associated with *Eucalyptus raveretiana*	Present

[148] North Queensland Bulk Ports Corporation Limited. (2017). *Sustainable sediment management assessment for maintaining navigational infrastructure Port of Hay Point.*

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth	*Nature Conservation Act 1992*	Habitat	Species or species habitat present
Phaius australis	Lesser Swamp-orchid	E	E	Areas where soils are almost always damp, but not flooded for lengthy periods. Usually found in coastal habitats between swamps and forests.	Present
Graptophyllum ili cifolium	Holly-Leaved *Graptophyllum*	V	V	Areas of vegetation consisting of tall to very tall mixed *notophyll* forest. Grows along rocky drainage lines in a mix of predominately quartz and feldspar substrates.[149]	Present

Port of Mackay

The PMST search completed in May 2021, identified three EPBC Act listed flora species as potentially occurring within the study area. A search was also undertaken of the Queensland WildNet database to identify species that have previously been identified for the project area. **Table 51** presents the threatened species of flora identified from the PMST and Queensland WildNet searches that are known or may potentially occur within the study area. Only one, *graptophyllum ilicifolium* (holly-leaved *graptophyllum*) was identified as 'Vulnerable'.

No species listed as 'Critically Endangered', 'Endangered' or 'Near Threatened' were identified in this search. The listing for holly-leaved *graptophyllum* was from one species that was identified over one hundred years ago. There have been no subsequent recordings. Accordingly, it has not been listed in **Table 51** which presents the threatened species of flora identified from the PMST and Queensland WildNet searches that are known or may potentially occur within the study area.

A review of relevant reports for the study area revealed that there is potential for the minute orchid (*taeniophyllum muelleri*) to occur within the area. However no more recent studies have not reported this species to be present, nor do the species database searches.[150]

[149] Department of Environment and Science. (2019). *Species Profile – Graptophyllum ilicifolium (holly-leaved graptophyllum).* Retrieved from https://apps.des.qld.gov.au/species-search/details/?id=15851.
[150] North Queensland Bulk Ports Corporation Limited. (2017). *Sustainable sediment management assessment for maintaining navigational infrastructure Port of Hay Point.*

Table 51: Threatened flora known to be present/habitat present within the Port of Mackay study area

Environment Protection and Biodiversity Conservation Act 1999 (Cth)			*Nature Conservation Act (1992)*		
E – Endangered V – Vulnerable			E – Endangered LC – Least Concern V – Vulnerable		
Species	**Common name**	***Environment Protection and Biodiversity Conservation Act 1999* (Cth)**	***Nature Conservation Act 1992***	**Habitat**	**Species or species habitat present**
Eucalyptus raveretiana	Black Ironbox	V	LC	Along watercourses and occasionally on river flats. In open forest or woodland communities. Preferred alluvial soils include sands, loams, light clays or cracking clays.	Present
Omphalea celata	-	V	V	Fragmented semi-evergreen vine thicket or *araucarian microphyll* vine forest. Along watercourses in steep sided gorges and gullies. Frequently associated with *Eucalyptus raveretiana*.	Present
Phaius australis	Lesser Swamp-orchid	E	E	Areas where soils are almost always damp, but not flooded for lengthy periods. Usually found in coastal habitats between swamps and forests.	Present
Graptophyllum ilicifolium	Holly-Leaved *Graptophyllum*	V	V	Areas of vegetation consisting of tall to very tall mixed *notophyll* forest. Grows along rocky drainage lines in a mix of predominately quartz and feldspar substrates.[151]	Present

8.5.4 Listed threatened fauna species

8.5.4.1 Avifauna

Port of Hay Point

The PMST search completed in May 2021, identified 19 EPBC Act listed bird species as potentially occurring within the study area. Of these, seven species, their habitat or roosting areas are known to be present within the project area. Three species are classified as 'Critically Endangered' under the EPBC Act (curlew sandpiper, great knot, eastern curlew), while a further seven species are listed as 'Endangered' (red knot, lesser sand plover, southern giant petrel, star finch, southern black-throated finch, Australian painted snipe, buff-breasted button-quail). **Table 52** presents these species including their conservation status and potential for presence.

[151] Department of Environment and Science. (2019). *Species Profile – Graptophyllum ilicifolium (holly-leaved graptophyllum).* Retrieved from https://apps.des.qld.gov.au/species-search/details/?id=15851.

Table 52: Avifauna species of conservation significance present/habitat present within the Port of Hay Point study area

***Environment Protection and Biodiversity Conservation Act 1999* (Cth)**	***Nature Conservation Act (1992)***
E – Endangered CE – Critically Endangered V – Vulnerable	E – Endangered CR – Critically Endangered LC – Least Concern V – Vulnerable

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*	Species or species habitat present
Calidris canutusE	Red Knot, Knot	E	E	Species or species habitat known to occur
Calidris ferruginea	Curlew Sandpiper	CE	CR	Species or species habitat known to occur
Calidris tenuirostris	Great Knot	CE	CR	Roosting known to occur within area
Charadrius leschenaultii	Greater Sand Plover	V	V	Roosting known to occur within area
Charadrius mongolus	Lesser Sand Plover	E	E	Roosting known to occur within area
Erythrotriorchis radiatus	Red Goshawk	V	E	Species or species habitat likely to occur
Falco hypoleucos	Grey Falcon	V	V	Species or species habitat likely to occur
Fregetta grallaria grallaria	White-bellied Storm-Petrel (Tasman Sea), White-	V	LC	Species or species habitat likely to occur
Geophaps scripta scripta	Squatter Pigeon (southern)	V	V	Species or species habitat may occur
Hirundapus caudacutus	White-throated Needletail	V	V	Species or species habitat known to occur
Limosa lapponica baueri	Bar-tailed Godwit	V	V	Species or species habitat known to occur
Macronectes giganteus	Southern Giant-Petrel, Southern Giant Petrel	V	V	Species or species habitat may occur
Neochmia ruficauda ruficauda	Star Finch (eastern), Star Finch (southern)	E	E	Species or species habitat likely to occur
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	CE	E	Species or species habitat known to occur
Poephila cincta cincta	Southern Black-throated Finch	E	E	Species or species habitat may occur
Pterodroma neglecta neglecta	Kermadec Petrel (western)	V	LC	Foraging, feeding or related behaviour may occur within area
Rostratula australis	Australian Painted Snipe	E	E	Species or species habitat known to occur
Turnix olivii	Buff-breasted Button-quail	E	E	Species or species habitat may occur

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*	Species or species habitat present
Tyto novaehollandiae kimberli	Eastern Curlew, Far Eastern Curlew	V	V	Species or species habitat may occur

A recent field ecological investigation as part of NQBP's High-Risk Species Management Program, indicated that while the majority of the wetlands at Hay Point consist of intertidal wetlands and foreshores, some freshwater waterbodies are also present, which provide potential habitat for species listed as migratory or marine under the EPBC Act such as egrets (*ardea spp*) and the rainbow bee-eater (*merops ornatus*).[152] Also noted includes existing areas at Dudgeon Point where large emergent trees are still present and these provide suitable nesting sites for large raptors, such as the white-bellied sea-eagle (*haliaeetus leucogaster*), a listed Marine bird. The broader Mackay region is considered an important area for the water mouse (*xeromys myoides*), which inhabits mangrove communities dominated by the yellow mangrove (*ceriops tagal*) and the orange mangrove (*bruguiera spp*.).[153] Additionally, a previous survey by the Queensland Water Study Group have identified large numbers of birds of various species (greater than 1000) at Dudgeon Point.

The Sandringham Bay – Bakers Creek aggregation exhibits extensive intertidal and shallow water habitat and diverse shoreline and mangrove species. It is recognised as a nationally important area for shorebirds.[154]

Port of Mackay

The PMST search completed in May 2021, identified 19 EPBC Act listed bird species as potentially occurring within the study area. Of these, seven species, their habitat or roosting areas are known to be present within the project area. Three species are classified as 'Critically Endangered' under the EPBC Act (curlew sandpiper, great knot, eastern curlew), while a further seven species are listed as 'Endangered' (red knot knot, lesser sand plover, southern giant petrel, star finch, southern black-throated finch, Australian painted snipe, buff-breasted button-quail). The Mackay region, including Mackay Town Beach, is documented to provide important habitat areas for the great knot.[155] **Table 53** presents these species including their conservation status and potential for presence.

Table 53: Avifauna species of conservation significance present/habitat present within the Port of Mackay study area

***Environment Protection and Biodiversity Conservation Act 1999* (Cth)**	***Nature Conservation Act 1992***
E – Endangered CE – Critically Endangered V – Vulnerable	E – Endangered CR – Critically Endangered LC – Least Concern V – Vulnerable

Species	**Common name**	***Environment Protection and Biodiversity Conservation Act 1999* (Cth)**	***Nature Conservation Act 1992***	**Species or species habitat present**
Anthochaera phrygia	Regent Honeyeater	CE	CR	Species or species habitat known to occur within area

[152] North Queensland Bulk Ports Corporation Limited (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential).*.
[153] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.
[154] North Queensland Bulk Ports Corporation Limited (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential).*.
[155] Department of Agriculture, Water and the Environment. (n.d.). *Species Profile and Threats Database - Calidris tenuirostris — Great Knot*. https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=862. Accessed July 2021.

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*	Species or species habitat present
Calidris canutusE	Red Knot, Knot	E	E	Species or species habitat known to occur within area
Calidris ferruginea	Curlew Sandpiper	CE	CR	Species or species habitat known to occur within area
Calidris tenuirostris	Great Knot	CE	CR	Roosting known to occur within area
Charadrius leschenaultii	Greater Sand Plover	V	V	Roosting known to occur within area
Charadrius mongolus	Lesser Sand Plover	E	E	Roosting known to occur within area
Erythrotriorchis radiatus	Red Goshawk	V	E	Species or species habitat likely to occur within area
Falco hypoleucos	Grey Falcon	V	V	Species or species habitat likely to occur within area
Fregetta grallaria grallaria	White-bellied Storm-Petrel (Tasman Sea), White-	V	LC	Species or species habitat likely to occur within area
Geophaps scripta scripta	Squatter Pigeon (southern)	V	V	Species or species habitat may occur within area
Hirundapus caudacutus	White-throated Needletail	V	V	Species or species habitat known to occur within area
Limosa lapponica baueri	Bar-tailed Godwit	V	V	Species or species habitat known to occur within area
Macronectes giganteus	Southern Giant-Petrel, Southern Giant Petrel	V	V	Species or species habitat may occur within area
Neochmia ruficauda ruficauda	Star Finch (eastern), Star Finch (southern)	E	E	Species or species habitat likely to occur within area
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	CE	E	Species or species habitat known to occur within area
Poephila cincta cincta	Southern Black-throated Finch	E	E	Species or species habitat may occur within area
Pterodroma neglecta neglecta	Kermadec Petrel (western)	V	LC	Foraging, feeding or related behaviour may occur within area
Rostratula australis	Australian Painted Snipe	E	E	Species or species habitat known to occur within area
Turnix olivii	Buff-breasted Button-quail	E	E	Species or species habitat may occur within area

8.5.4.2 Mammals

Port of Hay Point

The PMST search also identified six terrestrial mammals with a conservation listing under the EPBC Act as occurring or potentially occurring within the study area. Of these, one species is classified as 'Endangered' (northern quoll) while the remainder are classified as 'Vulnerable' (ghost bat greater glider, koala, grey-headed flying-fox and water mouse). These species were also listed under the NC Act. **Table 54** presents the terrestrial mammal species including their conservation status and potential for presence.

A review of current literature indicates that the koala has previously been recorded within habitat at Dudgeon Point and the area is considered to support a small population.[156] The ghost bat is also considered to potentially be present in the study area, in particular the Dudgeon Point area. Additionally, the water mouse has previously been located in the broader region of Mackay only within communities dominated by yellow and orange

[156] Worley Parsons Consulting. (2013). *Maintenance dredging management plan - Port of Hay Point*. Report prepared for NQBP.

mangroves (*cerips tagal* and *bruguiera spp*.) as reported by Ball (2004).[157] However, the most recent record for this species referenced in the WildNet database search is from 1999 and no other studies have indicated more recent reportings. Worley Parsons (2013) suggests a broader habitat potential including within the saline grassland, saltmarsh, mangroves and margins of freshwater swamps close to the foredunes of Dudgeon Point and areas surrounding Hay Point.[158]

Species profiles for species listed as 'Endangered' are provided in **Appendix O**.

Table 54: Mammal species of conservation significance present/habitat present in the Port of Hay Point study area

***Environment Protection and Biodiversity Conservation Act 1999* (Cth)**	***Nature Conservation Act 1992***
E – Endangered V – Vulnerable	E – Endangered LC – Least Concern V – Vulnerable

Species	**Common name**	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*	**Species or species habitat previously detected in study area**
Dasyurus hallucatus	Northern Quoll	E	LC	Species or species habitat likely to occur
Macroderma gigas	Ghost Bat	V	E	Species or species habitat likely to occur
Petauroides volans	Greater Glider	V	V	Species or species habitat may occur
Phascolarctos cinereus	Koala	V	V	Species or species habitat known to occur
Pteropus poliocephalus	Grey-headed Flying-fox	V	LC	Foraging, feeding or related behaviour may occur within area
Xeromys myoides	Water Mouse	V	V	Species or species habitat known to occur

Port of Mackay

The PMST also identified six terrestrial mammals with a conservation listing under the EPBC Act as occurring or potentially occurring within the study area. Of these, one species is classified as 'Endangered' (northern quoll) while the remainder are classified as 'Vulnerable' (ghost bat greater glider, koala, grey-headed flying-fox, water mouse). Four of these species were also listed under the NC Act.

Three species are classified as 'Critically Endangered' under the EPBC Act (Curlew sandpiper, Great knot, eastern curlew), while a further seven species are listed as 'Endangered' (red knot knot, lesser sand plover, southern giant petrel, star finch, southern black-throated finch, Australian painted snipe, buff-breasted button-quail). **Table 55** lists these species including their conservation status and potential for presence.

[157] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[158] Worley Parsons Consulting. (2013). *Long-term Maintenance Dredging Management Plan - Port of Hay Point*. Report prepared for North Queensland Bulk Ports Corporation Limited.

A review of current literature indicates that there have not been any recordings of threatened mammals in the Port of Mackay land or surrounding areas, however habitat for the threatened false water rat occurs within the shallow wetland areas and mangroves within and adjacent to the assessment area.[159]

[159] VDM Consulting. (2012). *Ecological Assessment. Port of Mackay Flora and Fauna Survey.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited, as cited in North Queensland Bulk Port Corporation Limited. (2017). *Sustainable sediment management assessment for maintaining navigational infrastructure*.

Table 55: Terrestrial mammal species of conservation significance present/habitat present in Port of Mackay study area

Environment Protection and Biodiversity Conservation Act 1999 (Cth)	*Nature Conservation Act 1992*
E – Endangered V – Vulnerable	E – Endangered LC – Least Concern V – Vulnerable

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*	Species or species habitat previously detected in study area
Dasyurus hallucatus	Northern Quoll	E	LC	Species or species habitat likely to occur
Macroderma gigas	Ghost Bat	V	E	Species or species habitat likely to occur
Petauroides volans	Greater Glider	V	V	Species or species habitat may occur
Phascolarctos cinereus	Koala	V	V	Species or species habitat known to occur
Pteropus poliocephalus	Grey-headed Flying-fox	V	LC	Foraging, feeding or related behaviour may occur
Xeromys myoides	Water Mouse	V	V	Species or species habitat known to occur

8.5.4.3 Terrestrial reptiles

Two reptile species are listed as occurring or potentially occurring within the Port of Hay Point and Port of Mackay study areas, refer to **Table 56**. Both are classified as 'Vulnerable' under the EPBC Act and the NC Act.

Table 56: Reptile species of conservation significance present/habitat present within study area

Environment Protection and Biodiversity Conservation Act 1999 (Cth)	*Nature Conservation Act 1992*
V – Vulnerable	V – Vulnerable

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*	Species or species habitat present
Denisonia maculata	Ornamental Snake	V	V	Species or species habitat may occur
Egernia rugosa	Yakka Skink	V	V	Species or species habitat may occur

8.5.5 Listed migratory terrestrial species

Port of Hay Point

The intertidal areas, foreshores and beaches within the study area provide migratory shorebird habitat of international significance[160] , with the Mackay region being the fifth most important site for shorebirds in Queensland.[161] [162] The study area supports a diverse range of shorebird species including migratory species.

The Queensland Wader Study Group (QWSG) identified 18 different shorebird species utilising foraging and roosting habitat in the Mackay region (from Proserpine to Sarina). Shorebirds prefer tidal flat habitats for foraging and feeding, particularly for migratory shorebirds that use these areas to gain condition to allow inter-continental migration and breeding.[163]

The beach stone-curlew is a conservation significant species listed as 'Vulnerable' under the NC Act.[164] This species is likely to breed and nest within the study area and surrounds, and as they nest on beaches, eggs and chicks are particularly susceptible to disturbance to recreational uses of beaches. Key threats to shorebirds in the broader Mackay region and particularly the beach-stone curlew include, vehicles on beaches, people, dogs, horses using beaches; fishing boats, windsurfers and jet skis.

Six listed terrestrial migratory bird species are identified as potentially inhabiting the study area. Only one of these, *hirundapus caudacutus* (white-throated needletail), is of conservation significance. This species is listed as 'Vulnerable' under the EPBC Act.

Migratory shorebirds are internationally recognised migratory shorebird feeding habitats in the intertidal wetlands of Sandringham Bay-Bakers Creek Aggregation.[165]

Port of Mackay

Six listed terrestrial migratory bird species are identified as potentially inhabiting the study area. Only one of these, *hirundapus caudacutus* (white-throated needletail), is of conservation significance. This species is listed as 'Vulnerable' under the EPBC Act.

Seven listed migratory marine bird species potentially inhabit the study area. One of these; *macronectes giganteus* (southern giant petrel), has a conservation rating of 'Endangered' under this Act.

8.5.6 Matters of State Environmental Significance

MSES are natural values and areas protected under Queensland legislation, and include:

- Protected areas (including all classes of protected area except nature refuges and coordinated conservation areas) under the NC Act.
- Marine parks (including marine national parks, conservation park, scientific research, preservation and buffer zones) under the MP Act.
- Areas within declared FHAs under the *Fisheries Act 1994* (Fisheries Act).
- High conservation value wetlands under the EP Act, including wetlands assessed as containing ‘high or ‘very high’ values via a conservation assessment, or where a conservation assessment has not yet been completed, wetlands that intersect with areas shown in DIWA and high ecological value (HEV) waters (wetlands and waterways) declared under the *Environment Protection (Water) Policy 2009*.
- Threatened and special least concern fauna under the NC Act and *Nature Conservation (Wildlife) Regulation 2006*.

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[160] Reef Catchments (2013). *State of region report – riverine and freshwater wetlands.* Retrieved from http://reefcatchments.com.au/files/2014/09/3.3-Rivers.pdf .
[161] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[162] Reef Catchments (2013). *State of region report – riverine and freshwater wetlands.* Retrieved from http://reefcatchments.com.au/files/2014/09/3.3-Rivers.pdf
[163] Great Barrier Reef Marine Park Authority. (2011). *A vulnerability assessment for the Great Barrier Reef – Shorebirds*.
[164] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[165] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*

- Marine plants (growing on our adjacent to tidal land, defined by highest astronomical tide (HAT)) providing for fish passage under the Fisheries Act. Marine plants communities can be highly variable in their growth and distribution.
- Waterways that provide for fish passage under the Fisheries Act.
- High risk areas on the flora survey trigger mapping as described in the *Environmental Offsets Regulation 2014*.

Regulated vegetation under the VM Act including REs identified as 'Endangered', 'Of Concern', areas of essential habitat, and areas of REs associated with a wetland or watercourse.

Key MSES within the Port of Mackay and Port of Hay Point are listed below.

Port of Hay Point

- **Conservation areas:** The study area includes four discontinuous conservation areas; Sandringham Bay Conservation Park (IUCN III), Bakers Creek Conservation Park (IUCN III), Yuwi Paree Toolkoon National Park (protected area estates) (IUCN II) and Mount Hector Conservation Park (IUCN III)[166] and shown in **Figure 49**.
- **Wetland values:** There are numerous wetland values throughout the majority of the study area, as well as over half of the eastern portion of the marine component of the study area. This includes watercourses and drainage features generally terminating at the coast, declared HEV watercourses and wetlands (primarily in the vicinity of Alligator Creek and Bakers Creek Conservation Park) and HES wetlands (in small discontinuous locations along Alligator Creek and Bakers Creek and along coastal areas).
- **Essential habitat:** Essential habitat is defined in the VM Act as the habitat of 'Endangered', 'Vulnerable' or near-threatened wildlife (protected wildlife) prescribed under the NC Act.[167] Essential habitat is mapped over areas of vegetation that are likely to contain either: (a) three or more essential habitat factors or (b) the relevant species at any stage of its life cycle.
- **Marine Plants and Waterways:** A network of waterways containing marine plant species provide for fish passage across the areas surrounding the port includes Sandringham Bay – Bakers Creek Aggregation and the wetland area of Lake Barfield.

Port of Mackay

- **Conservation areas:** The study area includes part of the GBRMP at South Cumberland Islands which is listed as a highly protected area (IUCN II), Bassett Basin declared FHA (IUCN VI), Yuwi Paree Toolkoon National Park, which is part of the protected area estates (IUCN II) and June's Land Nature Refuge (protected area nature refuge)[168] as shown in **Figure 50**.
- **Wetland values:** There are numerous wetland values throughout much of the terrestrial component of the study area (excluding the residential and industrial areas), as well as approximately half of the marine component of the study area. This includes watercourses and drainage features, declared HEV waters and HES wetlands.
- **Essential habitat:** Essential habitat is defined in the VM Act as the habitat of 'Endangered', 'Vulnerable' or near-threatened wildlife (protected wildlife) prescribed under the NC Act.[169] Essential habitat is mapped over areas of vegetation that are likely to contain either: (a) three or more essential habitat factors or (b) the relevant species at any stage of its life cycle.
- **Marine Plants and Waterways:** A network of waterways containing marine plant species provide for fish passage across the areas surrounding the port includes the Bassett Basin FHA and the wetland area north-west of Mackay Harbour.

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[166] International Union for Conservation of Nature (IUCN). (2008). *Guidelines for Applying Protected Area Management Categories.* Retrieved from https://portals.iucn.org/library/node/30018.
[167] Department of Natural Resources, Mines and Energy. (2020). G*eneral guide to the vegetation clearing codes.* Retrieved from https://www.resources.qld.gov.au/__data/assets/pdf_file/0006/1447098/general-guide-vegetation-clearing-codes.pdf..
[168] International Union for Conservation of Nature (IUCN). (2008). Guidelines for Applying Protected Area Management Categories. Retrieved from https://portals.iucn.org/library/node/30018.
[169] Department of Natural Resources, Mines and Energy. (2020). G*eneral guide to the vegetation clearing codes.* Retrieved from https://www.resources.qld.gov.au/__data/assets/pdf_file/0006/1447098/general-guide-vegetation-clearing-codes.pdf.

Figure 49: Conservation areas within the Port of Hay Point study area

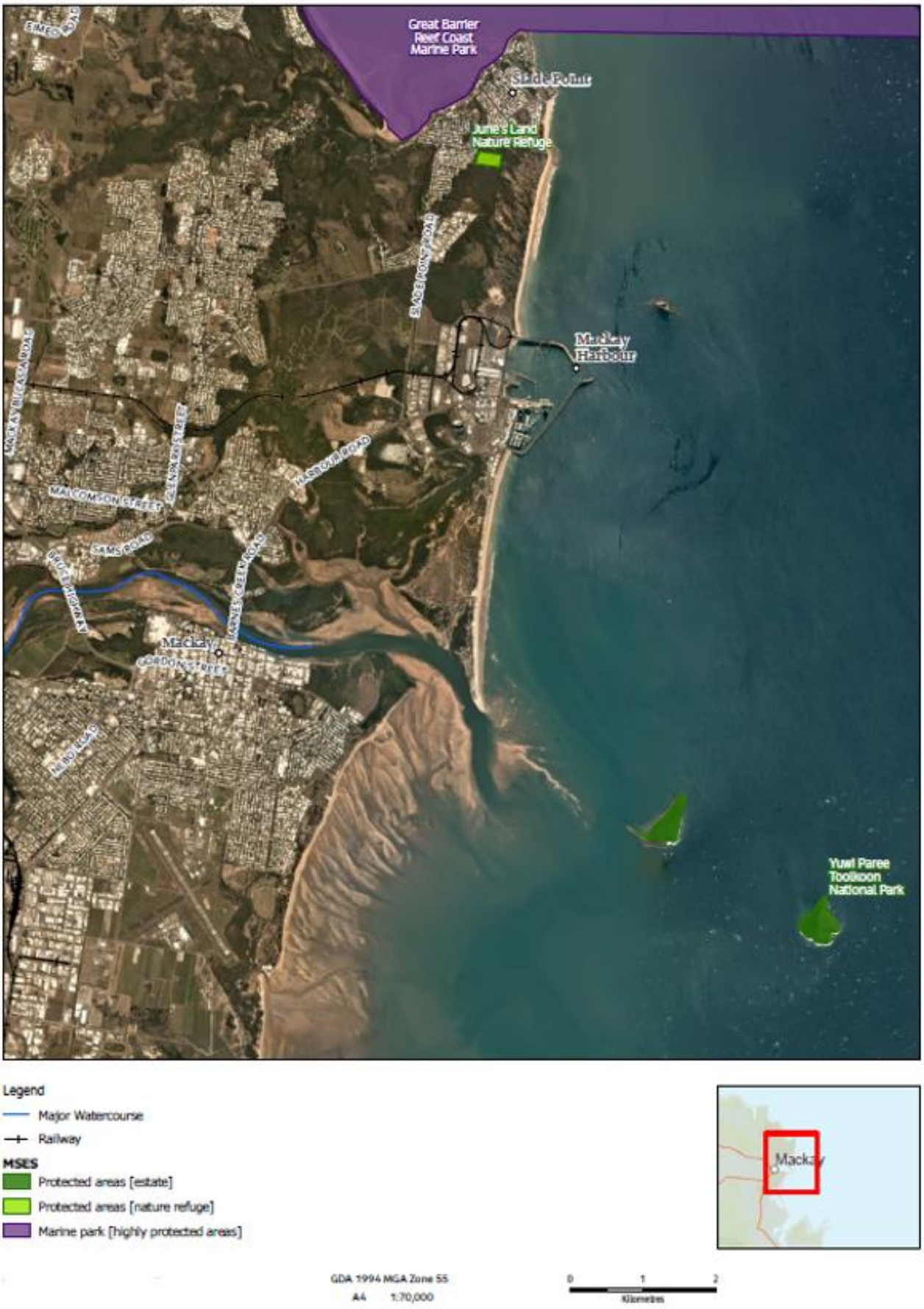

Figure 50: Conservation areas within the Port of Mackay study area

8.5.6.1 Regulated vegetation in Queensland

Port of Hay Point

A review of the Regulated Vegetation Management Map[170] (see **Figure 51**) indicates the presence in the study area of a complex mosaic of vegetation including Category B remnant vegetation classified as 'Endangered' or 'Of Concern', Category C high value regrowth vegetation classified as 'Endangered' or 'Of Concern' Category R (GBR riverine) and Essential Habitat for protected wildlife.

Within the Hay Point study area, large tracts of vegetation are designated as 'Endangered' or 'Vulnerable' essential habitat for wildlife. Mapping for these areas are particularly concentrated along the coastal fringes of the study area; Sarina, Campwin and Grasstree beaches in the south of the study area; west of the whole length of Pacific Drive, along Hay Point Road to the east of HPCT, to the west of DBT, fringing the full extent of Louisa, Alligator, Sandy and Bakers Creeks, as well as Bakers Creek Conservation Park and along the southern end of Mackay Airport.

- regulated vegetation – Large tracts of regulated Category B and small pockets of Category C vegetation which are both classified as 'Endangered' or ‘Of Concern’. Extensive mapped Category R (riverine) vegetation concentrated along watercourses, as well as essential habitat and areas designated 100m from a wetland.
- REs - are vegetation communities that are consistently associated with a particular combination of geology, landform and soil in a bioregion. There are over 80 mapped RE’s mapped throughout the study area, many of these are listed as ‘Of Concern’ or 'Endangered'.
- flora or fauna species – Species that are listed as threatened under the NC Act have been identified from a current search of the Queensland WildNet database.

[170] Department of Natural Resources, Mines and Energy. (2021). *Regulated Vegetation Map, v4.12*. Accessed 29/04/2021.

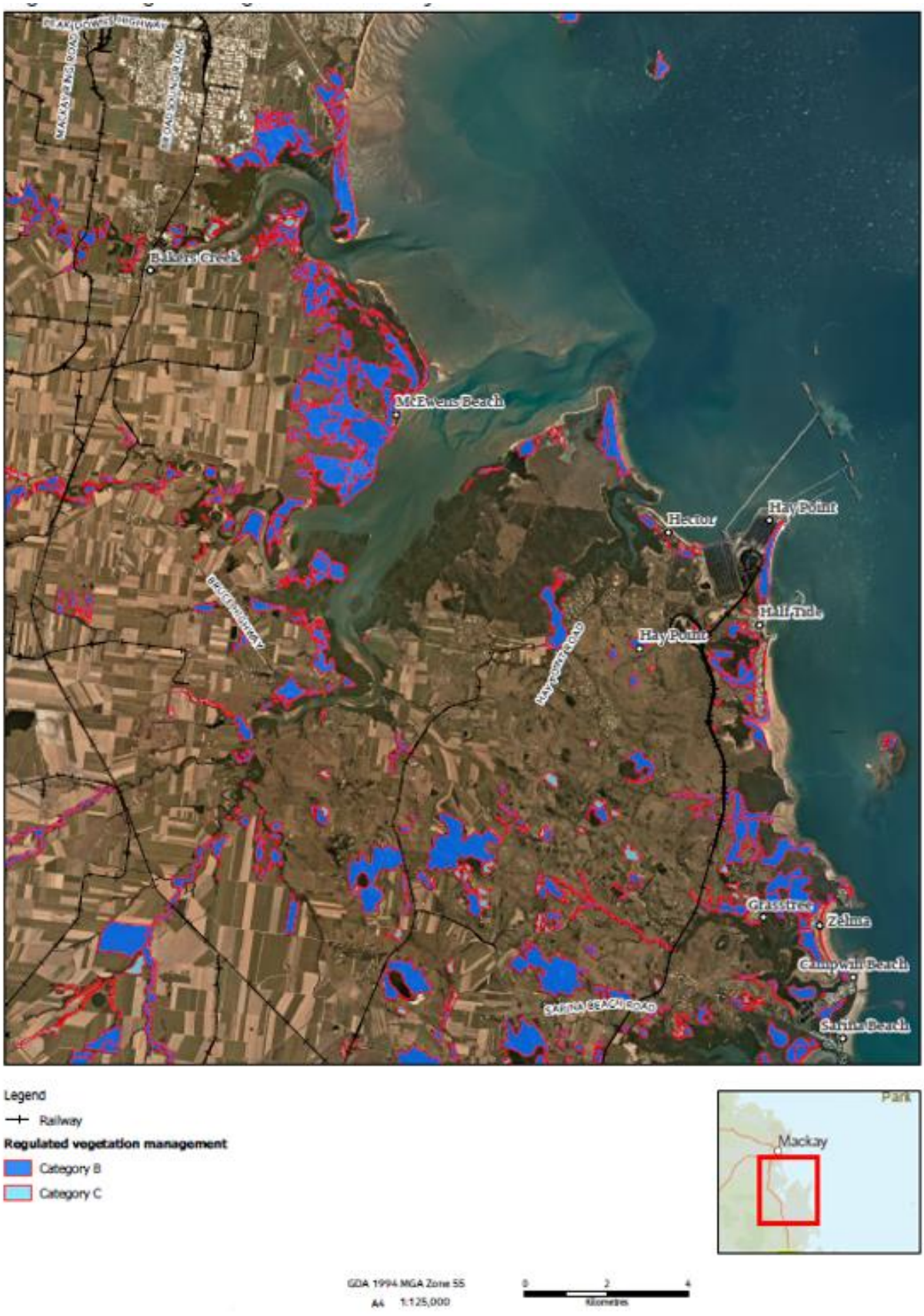

Figure 51: Regulated vegetation management in the study area of the Port of Hay Point

Port of Mackay

A review of the Regulated Vegetation Management Map[171] indicates the presence in the study area of primarily Category X area, where much of the land comprises residential development. Those land-based areas not dominated by built environment primarily comprise Category B remnant vegetation. Small pockets of Category C high value regrowth vegetation are present in small, isolated pockets, while Category R (GBR riverine) is classified along waterways (see **Figure 52**).

Within the Mackay study area, large tracts of vegetation are designated as 'Endangered' or 'Vulnerable' essential habitat for wildlife. Mapping for these areas is particularly concentrated around Pioneer River and in the vicinity of Slade Point to the north of the study, encircling Mackay Harbour and areas bordering the southern end of the Mackay Airport that are mapped as wildlife habitat, for 'Endangered' or 'Vulnerable' species.

- **Regulated vegetation**: Large patches of regulated Category B and small pockets of Category C vegetation which are both classified as 'Endangered' or 'Of Concern'. Category R (riverine) vegetation along some waterways, as well as essential habitat and areas designated 100m from a wetland.
- **REs** are vegetation communities that are consistently associated with a particular combination of geology, landform and soil in a bioregion. There are over 80 mapped REs mapped throughout the study area, many of these are listed as 'of concern' or 'Endangered'. See **Section 8.5.2.**
- **Flora or fauna species**: Species that are listed as threatened under the NC Act have been identified from a current search of the Queensland WildNet database. See **Sections 8.5.3** and S**ection 8.5.4**.

[171] Department of Natural Resources, Mines and Energy. (2021). *Regulated Vegetation Map, v4.12*. Accessed 29/04/2021.

Figure 52: Regulated vegetation management in the study area of the Port of Mackay

8.5.6.2 Threatened terrestrial vegetation communities and flora species

Port of Hay Point

The study area comprises a broad range of vegetation types, including eucalypt and casuarina dominated forests and woodlands, mangroves forests and open shrublands, saltmarshes, forblands, saline grasslands and sedgelands, vegetated swamps and wetlands, coastal vine thickets and rainforest and tussock grasslands.[172]

Assessment of the RE mapping for the terrestrial areas within the study area indicates there is 21% remnant vegetation communities remaining and 7% of high value regrowth.[173] These communities are interspersed in a mosaic of patches that remain after substantial land clearance has occurred for residential, agricultural, industrial and commercial developments. Clearance for corridor developments or widening of existing linear infrastructure has also occurred, including for the coal terminal rail line and loop. Within the port footprint further expansion has also necessitated vegetation clearance.

Terrestrial vegetation, particularly remnant vegetation, is critical for provision of habitat for native fauna and flora species and in particular species of conservation significance with limited remaining distribution or very specific types of habitat. Remnant vegetation also provides value in terms of provision of corridors for movement of wildlife between refuges, roosting, breeding and feeding areas and areas for temporary refuge for migratory species. These communities also provide more broader values to the environment such as regulating air quality, carbon sequestration and water and nutrient cycling.

Areas of remnant vegetation within the study area and particularly in the vicinity of the Port of Hay Point include:

- Mount Hector Conservation Park to the north of the mouth of Alligator Creek and Hector Park and surrounding vegetation verging along both sides of Alligator Creek, which primarily comprises ‘Least Concern’ REs.
- Sandringham Bay Conservation Park, which is located in isolated patches along Alligator Creek, as well as around Dunnrock and McEwens Beach, and Bakers Creek Conservation Park to the north of the mouth of Alligator Creek, which includes a mosaic of ‘Least Concern’, ‘Of Concern’ and 'Endangered' REs.
- bed and banks of Bakers Creek and north along the beach to Illawong Park and South Mackay Beach, which comprises predominately ‘Of Concern’ and ‘Least Concern’ REs. Patches of Category A, B or C 'Endangered' vegetation exist in discontinuous pockets and along watercourses in this vicinity.
- island listed as Yuwi Paree Toolkoon National Park, which comprises both ‘Of Concern’ and ‘Least Concern’ vegetation.
- Lake Barfield, west of the DBT rail loops, north-west and west of McEwens Beach, south and west of Dunnrock and isolated elevated areas south of Alligator Creek, which contain small patches of 'Endangered' RE.
- Hay Point to Half Tide and south of McEwens Beach contain ‘Of Concern’ REs.
- large tracts of remnant vegetation are present in the north of the study area along the coastal areas and inland from South Mackay Beach and bordering the southern end of Mackay Airport. These are generally dominated by least concern and of concern closed forest to open shrubland mangrove communities.
- intermittent areas through this northern region also comprises ‘Of Concern’ *sporobolis* dominated tussock grasslands on marine sediments, including large areas of land further inland towards residential areas. Further south along Bakers Creek and in particular Bakers Creek Conservation Park, the vegetation is dominated both *melaleuca viridiflora* woodland which is ‘Of Concern’ and ‘Least Concern’ mangrove communities.
- on both sides of Bakers Creek for the extent of the study area the remnant vegetation is dominated by mangrove communities listed as both ‘least concern’ and ‘of concern’. Small pockets of remnant

[172] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.
[173] Department of Resources. (2021). Vegetation management regional ecosystem mapping, v11.0. Retrieved from https://www.qld.gov.au/environment/plants-animals/plants/herbarium/mapping-ecosystems

'Endangered' vegetation communities interspersed throughout this area include Eucalyptus tereticornis dominated woodland, *E platyphylla* dominated woodland and *Melaleuca viridiflora* open forest.

- South of Bakers Creek along the coastline, Bakers Creek Conservation Park comprises much of the area extending to McEwens Beach. The conservation park comprises primarily consists of 'Least Concern' vegetation dominated by mangrove communities and 'Of Concern' sedgeland and tussock grasslands and samphire open forblands. There are substantial areas mapped as 'Endangered' REs primarily to the east of Bakers Creek Conservation Park and extending south inland form McEwens Beach and further south near Dunnrock. These communities include mainly *eucalyptus tereticornis* mixed woodland and tussock grassland dominated by *imperata cylindrica* with other grassland species potentially present.
- Large areas of remnant vegetation have been previously cleared from the eastern section of Dudgeon Point.[174] The remaining vegetation is predominantly listed as 'Least Concern' under the VM Act, however it provides important linkages and connectivity to Mount Hector Conservation Park and Sandringham Bay – Bakers Creek Aggregation.[175] Sandringham Bay Conservation Park affords protections to remnant areas of *melaleuca viridiflora* woodland and mangrove communities both listed as 'Endangered' under the VM Act.
- Much of the mapped remnant vegetation to the west of Hay Point and the port is listed as 'Least Concern' mixed eucalyptus woodland and mangrove woodlands. To the south, primarily along water courses and in small isolated patches, there are several different 'Endangered' RE communities comprising various dominated eucalyptus and corymbia communities.
- To the north of Hay Point and along the coastline east of the coal terminals, as well as on Victor Island (south of Hay Point), a 'Critically Endangered' TEC (littoral rainforest and coastal vine thickets of Eastern Australia), has previously been reported to occur.[176] This report further noted that this TEC was mapped at a size of approximately 33ha, as well as a small patch on Victor Islet (6.4 ha). Mapping generated from searches undertaken for this current EBR indicates that this TEC presents as a subdominant RE (8.2.2) in a composite RE of three communities namely: RE 8.2.6a/8.2.2/8.2.1 *melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage / semi-evergreen microphyll vine thicket to vine forest on coastal dunes / *casuarina equisetifolia* low woodland and/or sparse herbland to open scrub on foredunes and beaches. However, the Queensland conservation status of this RE under the NC Act is 'Of Concern'. It is reported that this TEC provides a buffer between the port and turtle nesting beaches to the south.[177]
- Also, located in the areas of the Port of Hay Point is Mount Hector Conservation Park, which primarily consists of remnant 'Least Concern' REs dominated by eucalypt/paperbark woodlands that are of important conservation value. The Broad leaf tea-tree TEC ('Endangered' under the EPBC Act and the NC Act) is mapped as RE 8.3.2, occurring west of the port and adjacent to Sandringham Bay Conservation Park and Dunrock. Vegetation communities within this conservation park provide rainforest fruits important as migratory feeding areas for rainforest pigeons.[178] The broad leaf tea-tree also provides connection between the terrestrial and marine environments and regulates overland flows, as well as providing spawning, recruitment and refuge areas for migratory and aquatic species, storage and source of nutrients, food source and as habitat.[179]
- At Louisa Creek, there are also isolated remnant patches of rainforest, littoral forest, lowland closed forest and coastal eucalypt open forest where it is reported to be relatively intact with there are almost no weeds present.[180] Although not contiguous, the vegetation from the tip of Hay Point east of the coal terminal,

[174] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[175] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[176] Adaptive Strategies. (2015). *Confidential. Abbot Point Master Planning, Supporting report – environmental, social and cultural heritage values*.
[177] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.
[178] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[179] Worley Parsons. (2013). *Long-term Maintenance Dredging Management Plan - Port of Hay Point*. Report prepared for North Queensland Bulk Ports Corporation Limited.
[180] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*

heading south in discrete large patches to Sarina Beach (where the study area terminates), is important for conservation and connectivity of vegetation, as well as habitat for listed flora and fauna species.

- The terrestrial vegetation communities within the study area provide a number of different habitat types, foraging and roosting opportunities for a variety of fauna species. Disturbance or degradation of the structure and/or condition of the terrestrial vegetation communities, as well as ongoing clearance of already isolated patches has the potential to directly affect the ability of these communities to provide the habitat values, connectivity and ecosystem functions listed above.

REs mapping[181] available for the study area indicates that Category A, B and C classified vegetation is present and potentially comprising over 80 'Endangered', 'Of Concern' and 'Least Concern' RE communities. Of these, 13 are 'Endangered' or have an 'Endangered' RE as the dominant community, and 51 are 'Of Concern' or have an 'Of Concern' RE as the dominant community. **Figure 53** shows the extent of mapped regulated vegetation and associated REs for the project site. The conservation status of these REs as referenced by the VM Act and a short RE description of their species composition is presented in **Appendix P**.

There are six REs that cover over 1% of the study area each. These are RE 8.1.1 (8.1% or 2830ha), RE 8.12.27b (3.9 or 1341ha), RE 8.12.22 (3.82 or 1,328ha), RE 8.3.5 (3.2% or 1,112ha), RE 8.3.2 (1.5% or 513ha) and RE 8.1.2 (1.4% or 483ha). The conservation status of the six most prolific RE types as referenced by the VM Act and a short RE description of their species composition and substrate type is presented in **Table 57**.

Table 57: Regional ecosystems mapped by Department of Natural Resources, Mines and Energy within Port of Hay Point study area

Vegetation Management Act 1999
E - Endangered
O – Of Concern
L – Least Concern

Regional Ecosystem	***Vegetation Management Act 1999*** Status	Vegetation Category	Regional Ecosystem Description
8.1.1	L	Category C	Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.1.2	L	Category C	Samphire open forbland on saltpans and plains adjacent to mangroves
8.12.22	L	Category A or B	*Eucalyptus drepanophylla* and/or *Corymbia clarksoniana* +/- *C. erythrophloia* +/- *E. platyphylla* +/- *E. exserta* +/- *C. trachyphloia* woodland on hills and ranges at low to moderate altitudes in drier areas
8.12.27b	E	Category A or B	*Corymbia tessellaris* and/or *Eucalyptus tereticornis* +/- *C. intermedia* +/- *C. clarksoniana* open forest with a secondary tree layer of *Livistona decora* on low hills on Mesozoic to Proterozoic igneous rocks
8.3.2	E	Category A or B	*Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage
8.3.5	O	Category A or B	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains

[181] Department of Resources. (2021). Vegetation management regional ecosystem mapping, v11.0. Retrieved from https://www.qld.gov.au/environment/plants-animals/plants/herbarium/mapping-ecosystems.

Note: Marine plants, including mangroves and samphire's are protected under the Fisheries Act and the VM Act conservation status does not prevail over their protection under the Fisheries Act and as MSES. Mangroves are specifically excluded as vegetation from the VM Act in **Section 8**(c), because these communities are protected under other state legislation.

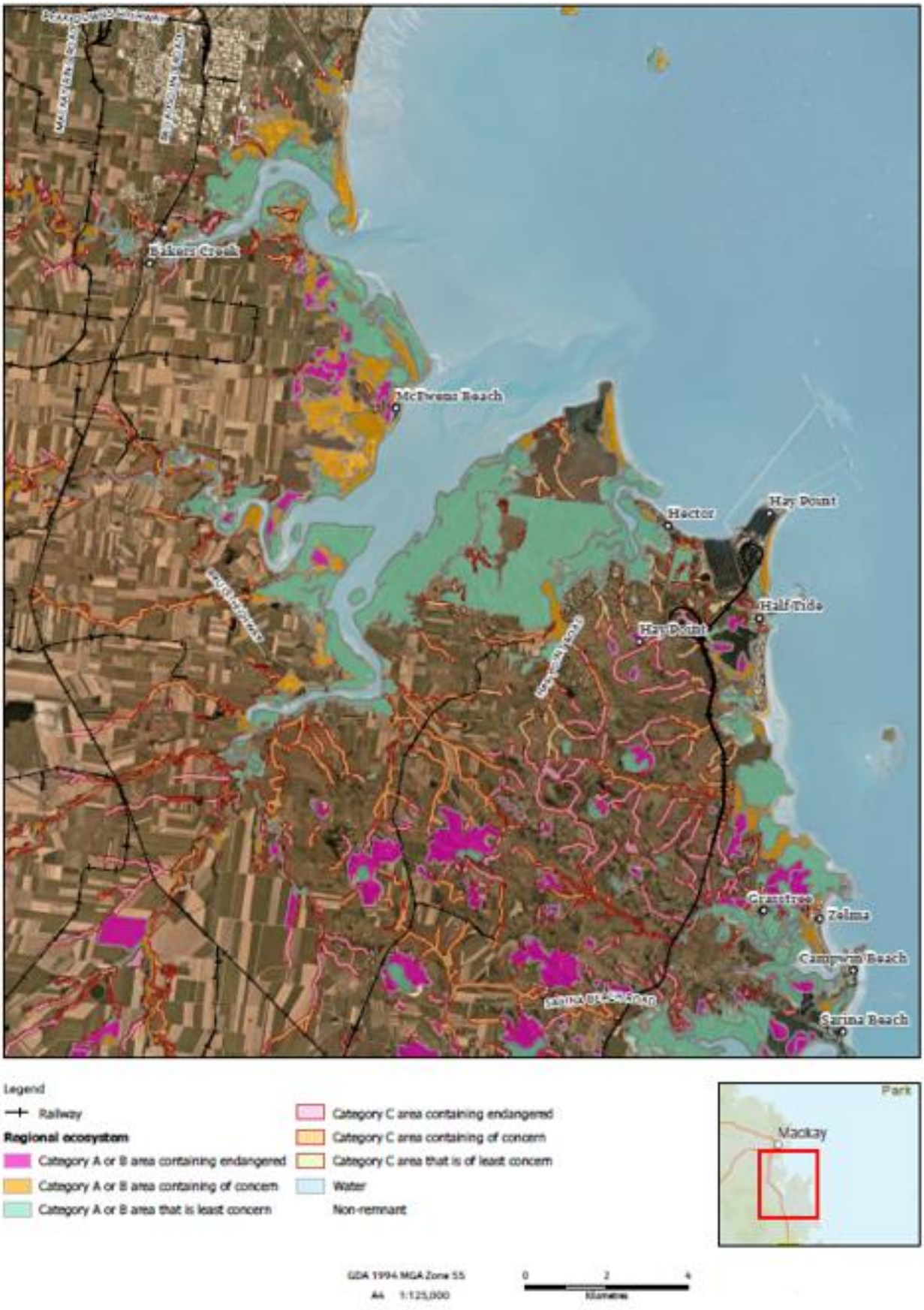

Figure 53: Regional ecosystems in the study area

Port of Mackay

The study area comprises a broad range of vegetation types, but is dominated by mangrove forests to open shrublands, particularly along waterways and estuaries. Other vegetation types inhabiting the study area include eucalyptus, corymbia, casuarina and banksia dominated forests and woodlands, saltmarshes, forblands, saline grasslands and sedgelands, vegetated swamps and wetlands. Coastal vine thickets and rainforest pockets only are present in very small patches. The vegetation communities within the area broadly include vegetation on coastal dunes, grassland and sedgelands, paperbark open forest, Moreton Bay ash forest, notophyll vine forest and estuarine vegetation including mangroves.

Assessment of the RE mapping for the terrestrial areas within the study area indicates there is approximately 29% remnant vegetation communities remaining and 4% high value regrowth.[182] These communities are mainly located along the watercourse, estuaries and around the Port of Mackay and Mackay Airport. Much of the study area is built up with residential communities and industrial areas and the City of Mackay.

Remnant patches of vegetation are discontinuous, but exhibit linkage between communities within the northern section to Pioneer Rover. Substantial land clearance, however, has occurred for residential, agricultural, industrial and commercial developments. Additionally, clearance for corridor developments and with expansion of the Mackay port area.

Terrestrial vegetation, particularly remnant vegetation, is critical for provision of habitat for native fauna and flora species and in particular species of conservation significance with limited remaining distribution or very specific types of habitat. Remnant vegetation also provides value in terms of provision of corridors for movement of wildlife between refuges, roosting, breeding and feeding areas and areas for temporary refuge for migratory species. As such, the vegetation linkages that currently exist from the northern end of the study area to Pioneer River are critical for fauna movement and to provide significant habitat for migratory species and shorebirds. Remaining vegetation communities also provide more broader values to the environment such as regulating air quality, carbon sequestration and water and nutrient cycling.

Areas of remnant vegetation within the study area and particularly in the vicinity of the Port of Mackay include:

- 'Of Concern' REs within Slade Point Nature Reserve along the coastal areas north of Mackay Harbour.
- 'Endangered' REs located in the north of the study area, due west of Mackay Harbour and at the tip of Slade Point nature Reserve.
- 'Of Concern' REs located west of the port and south along almost the full extent of Harbour Beach.
- 'Least Concern' REs located west of Slade Point, south-west of Mackay Harbour and along the northern banks of Pioneer River and the southern tip of the river mouth.
- patches of regrowth vegetation are interspersed throughout the study area, near Mackay Harbour and the Mackay city centre, as well as south of Mackay Airport.
- Littoral rainforest community listed as 'Critically Endangered' under the EPBC Act is mapped as occurring south of the port, behind the Mackay Surf Club, along Bassett Creek, and near East Point.[183]

Remnant vegetation is present in the south of the study area along the coastal areas, inland from South Mackay Beach and bordering the southern end of Mackay Airport. These are generally dominated by ‘Of Concern’ closed forest to open shrubland mangrove communities. Intermittent areas through this region also comprises ‘Of Concern’ *sporobolis* dominated tussock grasslands on marine sediments, including large areas of land further inland towards residential areas.

The tip of pioneer river in east Mackay is covered by a large area of vegetation mapped as ‘least concern’ mangrove forest community. Vegetation along Pioneer River on the northern bank in North Mackay east to Pioneer River mouth/Basset Basin area comprises a diverse range of mangrove species. ‘Of Concern’ samphire communities are present on salt pans adjacent to the mangrove communities.

Located to the west of the port is a large tract of remnant vegetation containing watercourses and wetlands of mixed ‘Least Concern’, ‘Of Concern’ and 'Endangered' vegetation. This vegetation extends west through

[182] Department of Resources. (2021). Vegetation management regional ecosystem mapping, v11.0. Retrieved from https://www.qld.gov.au/environment/plants-animals/plants/herbarium/mapping-ecosystems

[183] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.

residential areas along two watercourses in narrow corridors containing remnant vegetation that is significantly modified. Jacobs (2016) reports that this area includes the locally significant Keeleys Road wetlands, which contains a range of 'Endangered' and 'of concern' vegetation communities and has a high diversity of flora species.[184]

Current vegetation mapping shows that most of the vegetation to the west of the port is classified as essential habitat for threatened species. It provides connectivity for wildlife through from Slade Point to the mouth of Pioneer River, and inland along the estuarine mouth of the river, through Cremorne and almost to George Daniel Park.

The Australian 'Critically Endangered' TEC; littoral rainforest and coastal vine thickets of Eastern Australia, has previously been reported within the study area, including adjacent to, and north along the coastline from the port. However current mapping reflects this community in a broader composition of RE vegetation listed as 'of concern' under the VM Act; including 8.2.9/8.2.14/8.2.2.

Patches of mapped 'Endangered' vegetation under the VM Act include:

- *Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland
- *Sporobolus virginicus* tussock grassland on marine sediments
- *Corymbia tessellaris* and/or *Eucalyptus tereticornis* open forest, sometimes with other primary tree species and with a secondary tree layer of *Livistona decora*
- *Melaleuca* spp. and/or *Corymbia* spp. on open forest on dune sands mixed with alluvial material.

REs mapping available for the study area indicates that Category A, B and C classified vegetation is present and potentially comprising over 70 'Endangered', 'Of Concern' and 'Least Concern' RE communities. Of these, eight are 'Endangered' or have an 'Endangered' RE as the dominant community, and 48 are 'Of Concern' or have an 'Of Concern' RE as the dominant community. **Figure 54** shows the extent of mapped regulated vegetation and associated REs for the project site. The conservation status of these REs as referenced by the VM Act and a short RE description is presented in **Table 58**.

There are seven REs that cover over 1% of the study area each. This includes RE 8.1.1 (14.5% or 1112ha), 8.2.7 (2.35% or 181ha), 8.1.4 (2.22% or 170ha), 8.2.6 (1.66% or 127ha), 8.1.2 (1.47% or 113ha), 8.1.3 (1.32% or 102ha), 8.1.5 (1.01% or 78ha). The conservation status of the seven most prolific RE types as referenced by the VM Act and a short RE description of their species composition and substrate type is presented in **Table 58**.

Table 58: Regional ecosystems mapped by Department of Natural Resources, Mines and Energy within Port of Mackay study area

Vegetation Management Act 1999
E - Endangered O – Of Concern L – Least Concern

Regional Ecosystem	***Vegetation Management Act 1999* Act Status**	Vegetation Category	Regional Ecosystem Description
8.1.1	L	Category A or B	Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.1.2	L	Category A or B	Samphire open forbland on saltpans and plains adjacent to mangroves
8.1.3	O	Category A or B	*Sporobolus virginicus* tussock grassland on marine sediments
8.1.4	O	Category A or B	*Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland

[184] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.

Regional Ecosystem	*Vegetation Management Act 1999* Act Status	Vegetation Category	Regional Ecosystem Description
8.1.5	O	Category A or B	*Melaleuca* spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems
8.2.6a	O	Category A or B	*Corymbia tessellaris +/- Acacia leptocarpa +/- Allocasuarina littoralis +/- Banksia integrifolia* +/- rainforest species open forest on parallel dunes
8.2.7a	O	Category A or B	*Melaleuca* spp. and/or *Lophostemon suaveolens* and/or *Eucalyptus robusta* open forest in wetlands associated with parabolic dunes

Note: Marine plants, including mangroves and samphire's are protected under the Fisheries Act and the VM act conservation status does not prevail over their protection under the Fisheries Act and as MSES. Mangroves are specifically excluded as vegetation from the VM Act in section 8 (c), because these communities are protected under other state legislation.

Figure 54: Regional ecosystem mapping for the study area

8.5.6.3 Threatened terrestrial fauna and fauna habitat

Port of Hay Point

The following section addresses the threatened fauna and supporting habitat for these species within the study area. The study area supports a diverse range of fauna including several conservation significant species as

listed under the EPBC Act and the NC Act. Fauna present within the study area ranges across most faunal groups including birds, mammals and reptiles.

There are a number of vegetation communities that provide different habitat types to support the diversity of native terrestrial fauna species. Key habitats include:

- Forest and woodland habitat - including eucalyptus, corymbia, melaleuca, casuarina or mangrove dominated open forests to woodland communities, generally on alluvial plans and alluvial levees or along watercourses. This habitat typically presents as small, fragmented, remnant patches throughout the study area. Much of it is discontinuous except along watercourses and where some significant lengths of narrow vegetation corridors are still present.
- Grassland habitats – mainly sedgeland/tussock grasslands and forblands on saltpans, alluvial and old marine plains. Grassland habitat is also intermittent and in isolated patches through this study area.
- Rainforest habitats - Semi-evergreen microphyll vine thicket to vine forest on coastal dunes. Isolated and fragmented remnant rainforest habitats occur within the study area for example, Bakers Creek and Louisa Creek. These areas are small and are unlikely to support significant local populations of rainforest specialist species, however they are considered important temporary habitats for a wide variety of generalist species in transit.
- Modified habitat – modified habitat and previously cleared vegetation dominates the study area and is typically suited to generalist species, which are typically tolerant of disturbance.

The study area also includes National Parks, Conservation Parks, and Reserves, which generally correlate with the most extensive remnant patches of vegetation including Bakers Creek Conservation Park, Sandringham Bay Conservation Park, Yuwi Paree Toolkoon National Park. Several large tracts of vegetation that are not designated as protected areas also exist within the study area. These are mainly mapped as ‘essential habitat’ or ‘wildlife habitat’ areas. These remnant tracts of vegetation provide habitat for local terrestrial fauna assemblages, including potential habitat for conservation significant species which may be present. There is also an ecologically important wildlife corridor that links Mount Hector and Dudgeon Point to Louisa Creek and Sandringham Bay which provide significance habitat and safe movement for fauna species inhabiting the area.[185]

Essential habitat has been mapped within the study area however, the available mapping data layer does not identify those species that are dependent on or present within the habitat (see **Figure 55**). Additional MSES vegetation mapping is available that designates 'Endangered' or ‘Vulnerable’ wildlife habitat and this mapping largely reflects the mapped ‘essential habitat’ areas. This mapping provides lists of species that occur within the vegetation type that is mapped; however, it does not indicate if these species have actually been recorded in the area and a cross-reference to PMST and WildNet database searches indicted that many of these species have not previously been recoded within the study area.

[185] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential*.

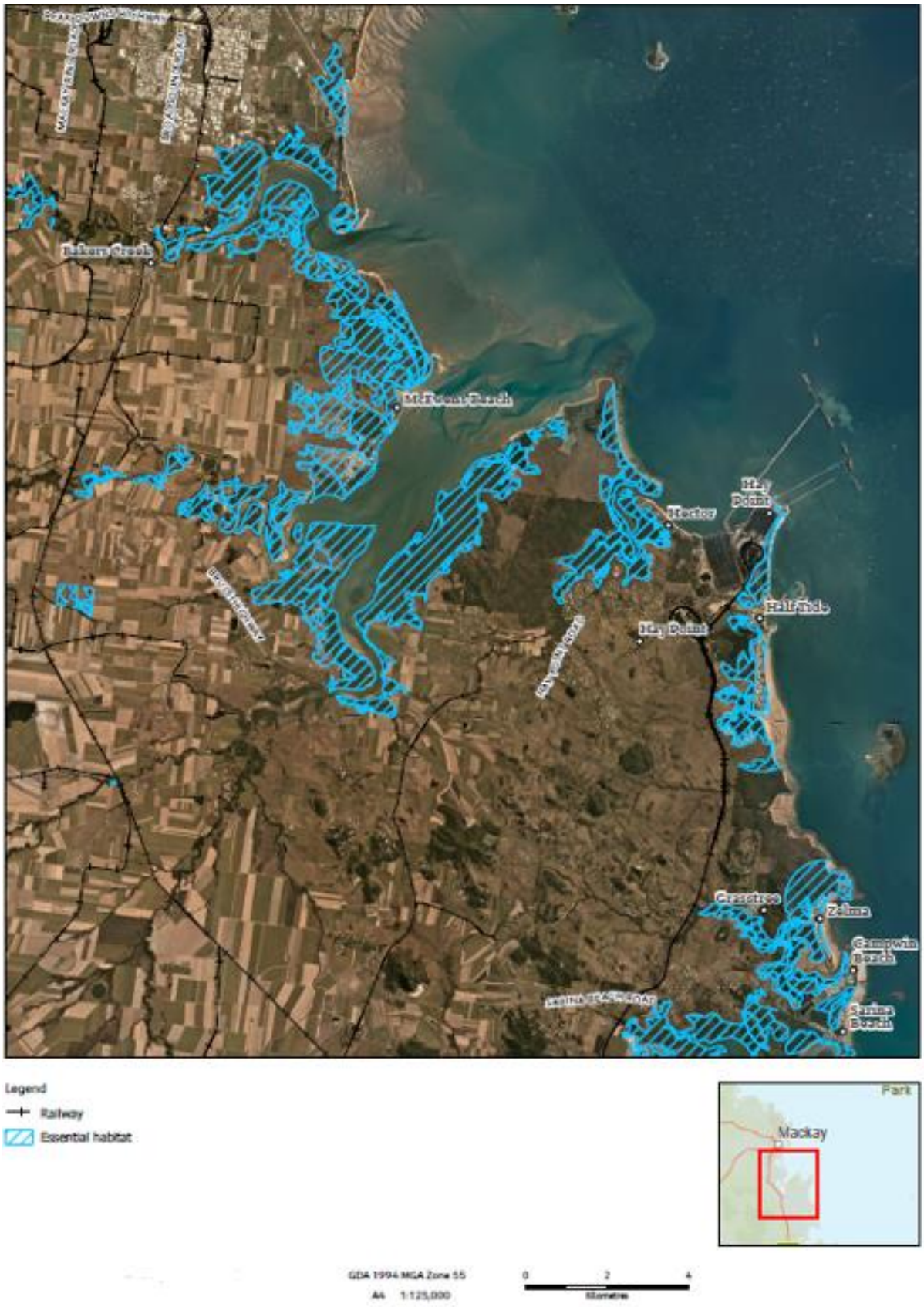

Figure 55: Distribution of mapped essential habitat within the Port of Hay Point study area

The areas of designated essential habitat and/or wildlife habitat are particularly concentrated along the coastal fringes of the study area; Sarina, Campwin and Grasstree Beaches in the south of the study area; west of the whole length of Pacific Drive, along Hay Point Road to the east of HPCT and to the west of DBT, fringing the full extent of Louisa, Alligator, Sandy and Bakers Creeks, as well as Bakers Creek Conservation Park and along the southern end of Mackay Airport. These wildlife habitat areas are documented to potentially provide habitat for 'Endangered' or ‘Vulnerable’ species including; *calyptorhynchus lathami* -glossy black cockatoo, *casuarius casuarius johnsonii* - cassowary (south), *crinia tinnula* -wallum froglet, *denisonia maculata* -ornamental snake,

taudactylus pleione -kroombit tinkerfrog, *litoria freycineti* -wallum rocketfrog, *litoria olongburensis* -wallum sedgefrog, *melaleuca irbyana, petaurus gracilis* -mahogany glider, *petrogale persephone* -Proserpine rock-wallaby, *phascolarctos cinereus* -koala (outside the South East Queensland Regional Plan), *pezoporus wallicus wallicus* -eastern ground parrot and *xeromys myoides*-water mouse. However, few of these species are listed in the PMST or WildNet searches for the study area and, while they use similar vegetation types in other geographic regions, some of these species do not have known distributions within the broader region of the study area.

Port of Mackay

This section addresses the threatened fauna and supporting habitat for these species within the Port of Mackay study area. The study area supports a diverse range of fauna including several conservation significant species as listed under the EPBC Act and the NC Act. Fauna present within the study area ranges across most faunal groups including birds, mammals, and reptiles.

This study area is substantially built up with a large portion of the City of Mackay present to the far west. Remnant vegetation is concentrated in the northern half of the study area from Pioneer River up to Slade Point. Some remnant vegetation also still exists around the Mackay Airport.

There are several vegetation communities that provide different habitat types to support the diversity of native terrestrial fauna species within the study area. The key habitats include:

- **Forest and woodland habitat**: dominated by mangrove closed forest to open shrubland on marine clay plains and in estuaries, particularly along Pioneer River. Also including eucalyptus, corymbia, melaleuca, casuarina forests to woodland communities, along watercourses, in tidal areas, wetlands and adjacent dune systems. This broad habitat typically presents as fragmented, remnant patches throughout the study area. Much of it is discontinuous except along watercourses and where some significant lengths of narrow vegetation corridors are still present. A parge portion of this study area comprises the residential suburbs of Mackay and limited areas of the remnant vegetated are protected. The study area is dominated by this RE type.
- **Grassland habitats**: mainly samphire forblands on saltpans and marine clays adjacent to mangrove communities. Also includes some sedgeland/tussock grasslands. Grassland habitat is intermittent and in isolated patches through this study area, generally adjacent the mangrove areas.
- **Rainforest habitats**: Very small and isolated patches remnant vegetation that includes rainforest species. Generally dominated by corymbia, melaleuca and banksia species but including rainforest species in open forest.
- **Modified habitat**: modified habitat and previously cleared vegetation dominates the study area and generally now forms cultivated lands. Most suited to generalist or invasive species, which are typically tolerant of disturbance.

The large tracts of vegetation remaining in the study area are not designated as protected areas. However, the majority of remnant vegetation is mapped as essential habitat and to a lesser extent, wildlife habitat. The only protected areas of vegetation are the two islands due east of Mackay Airport and south east of the Port of Mackay and Pioneer River. These are listed as Yuwi Paree Toolkoon National Park.

The remnant tracts of vegetation within the study area are not well linked, but provide habitat for local terrestrial fauna assemblages, including potential habitat for conservation significant species which may be present.

The available essential habitat mapping data layer (see **Figure 56**) does not identify those species that are dependent on or present within the habitat. As indicated previously, additional MSES vegetation mapping is available that designates ‘Endangered' or ‘Vulnerable’ wildlife habitat and this mapping largely reflects the mapped ‘essential habitat’ areas. This mapping provides lists of species that occur within the vegetation type that is mapped; however, it does not indicate if these species have actually been recorded in the area and a cross-reference to PMST and WildNet database searches indicted that many of these species have not previously been recorded within the study area.

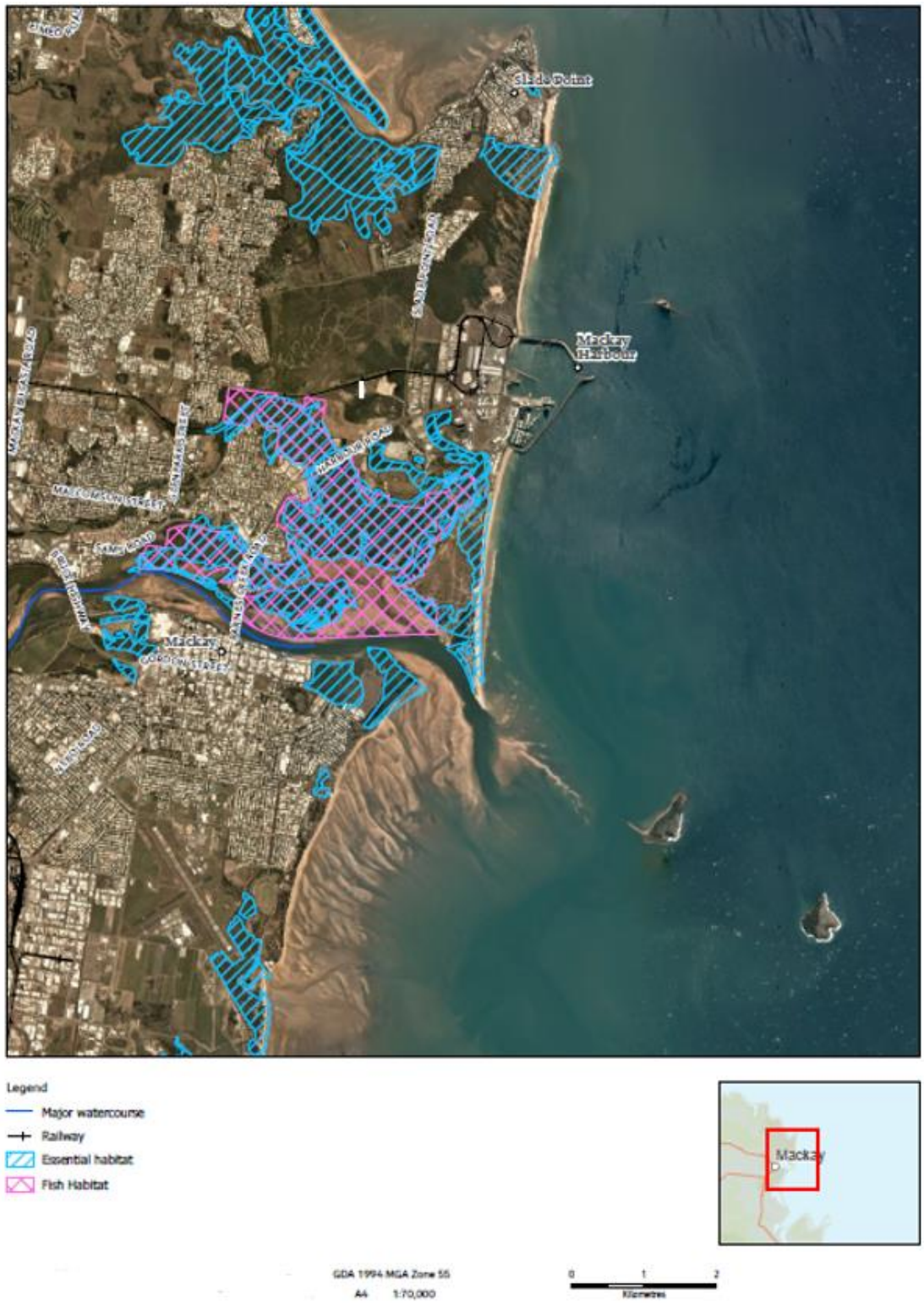

Figure 56: Essential habitat and fish habitat areas within the Port of Mackay study area

The areas of designated essential habitat and/or wildlife habitat are particularly concentrated along the coastal fringes of the study area and inland covering the majority of areas still supporting vegetation including; vegetated land inland from Illawong park and a small patch around east Mackay Beach, along both verges of Pioneer River including all vegetated land on both sides of the river mouth and north up to the port, all remnant vegetation encircling the Port of Mackay, land comprising Slade Point Nature Reserve up to Slade Point Beach and on both sides of Slade Bay extending inland along the river, and all vegetation along Blacks Beach Reserve and surrounding the suburb of Blacks Beach. These wildlife habitat areas are documented to potentially provide habitat for 'Endangered' or ‘Vulnerable’ species including:

calyptorhynchus lathami -glossy black cockatoo, *casuarius casuarius johnsonii* -cassowary (south), *crinia tinnula* -wallum froglet, *denisonia maculata* -ornamental snake, *taudactylus pleione* -kroombit tinkerfrog, *litoria freycineti* -wallum rocketfrog, *litoria olongburensis* -wallum sedgefrog, *melaleuca irbyana*, *petaurus gracilis* -mahogany Glider, *petrogale persephone* -Proserpine rock-wallaby, *phascolarctos cinereus* -koala (outside South East Queensland regional plan), *pezoporus wallicus wallicus* -eastern ground parrot and *xeromys myoides*-Water Mouse.

Few of these species are listed in the PMST or WildNet searches for the study area and, while they use similar vegetation types in other geographic regions, some of these species do not have known distributions within the broader region of the study area.

8.5.6.4 Habitat for Migratory Shorebirds

Port of Hay Point

There is no habitat for migratory shorebird within the Port of Hay point study area.

Port of Mackay

The intertidal areas, foreshores and beaches within the study area provide migratory shorebird habitat of international significance.[186] The Mackay region being the fifth most important site for shorebirds in Queensland.[187] Many beaches within the broader Mackay area have been recorded as turtle nesting beaches, with the most commonly recorded nesting species being the 'Vulnerable' flatback turtle (*natator depressus*).

The study area supports a diverse range of shorebird species including migratory species. Information on intertidal and migratory bird species known or considered likely to inhabit this region is provided.

The QWSG identified 18 different shorebird species utilising foraging and roosting habitat in the Mackay region (from Proserpine to Sarina). Shorebirds prefer tidal flat habitats for foraging and feeding, particularly for migratory shorebirds that use these areas to gain condition to allow inter-continental migration and breeding.[188]

The beach stone-curlew is a conservation significant species listed as 'Vulnerable' under the NC Act.[189] This species is likely to breed and nest within the study area and surrounds, and as they nest on beaches, eggs and chicks are particularly susceptible to disturbance to recreational uses of beaches. Key threats to shorebirds in the broader Mackay region and particularly the beach-stone curlew include, vehicles on beaches, people, dogs, horses using beaches, fishing boats, windsurfers and jet skis.[190]

8.5.7 Potential impacts and threats

Potential impacts on the terrestrial environment, from the port and other coastal industrial development, as well as from coastal residential development and resulting increased anthropogenic activities within the study area are summarised below:

Terrestrial vegetation communities include:

- reduction in extent and condition of remnant vegetation due to clearing and stormwater runoff
- increased pressures such as weeds and pests on remnant vegetation from new road construction, pedestrian and tracks and increased visitations from the local community and tourists.

Threatened flora and fauna:

- clearing of fauna habitat for residential development and/or industrial use leading to reduced species habitat and loss of species

[186] Reef Catchments. (2013). *State of the Region Report Mackay Whitsunday Isaac.* Retrieved from http://reefcatchments.com.au/nrm-plan-supporting-documents/
[187] A Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[188] Great Barrier Reef Marine Park Authority. (2011). *A vulnerability assessment for the Great Barrier Reef – Shorebirds.*.
[189] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[190] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*

- increased noise, light and human activity from residential development resulting in displacement of fauna species or whole populations
- direct mortality and/or injury to fauna from increased vehicle movements
- increased stormwater.

8.6 Wetlands

Port of Hay Point

The Queensland Wetland Program defines wetlands as:

- Wetlands are areas of permanent or periodic/intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed 6m.

To be a wetland, the area must have one or more of the following attributes:

- at least periodically the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle, or
- the substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers, or
- the substratum is not soil and is saturated with water or covered by water at some time.[191]

The GBRMP is identified as a nationally important wetland under DIWA. Wetlands in the surrounding catchment and estuarine marine receiving waters contribute to the ecological health of the GBR in many ways.

The wetlands in the study area occur in association with a suite of different vegetation communities including Mangrove forest and shrublands and Samphire open forblands, primarily around coastal areas. Some wetlands along streams further inland are associated with melaleuca or eucalyptus dominated woodlands. Wetlands are classified into lacustrine (lake), palustrine (marsh or swamp), and riverine or estuarine.[192] The study area contains mostly estuarine wetlands associated with the local rivers and bays.

Wetland protection areas, which are defined under the *Environmental Protection Regulation 2019*, include HES wetlands and a surrounding policy trigger area of up to 100m in urban areas and up to 500m outside of urban areas. HES wetlands within the GBR catchments provide the basis for DOR's concurrence agency role for development involving high impact earthworks within wetland protection areas under the Planning Regulation.

There are no internationally significant wetlands that are listed under the Ramsar Convention in close proximity to the study area. Several wetlands of national, state and local significance occur in the study area. A review of HES wetland mapping[193] indicates the presence of riverine and estuarine wetlands associated with the GBR. These mapped HES wetlands are generally within coastal areas, associated with the mouth or estuarine verges of Bakers Creek, Sandy Creek and Cabbage Tree Creek. Most are small and interspersed throughout the study area. There are a number of MSES wetlands present that are mapped as regulated vegetation areas and located within 100m from the defining bank of a wetland.[194] The majority of the HES wetlands mapped for the study area have an aquatic conservation score of high or very high and hydrological modification score of H1, which is defined as 'no obvious local hydrology/disturbance modification'.[195]

Wetland mapping sourced from Queensland Government[196] was interpreted for the study areas and is presented in **Figure 57**. Three nationally important wetlands are present within the study area:

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[191] Environmental Protection Agency. (1999). *Strategy for the Conservation and management of Queensland's wetlands*.

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[192] Department of Climate Change, Energy, the Environment and Water. (1993). *Directory of Important Wetlands in Australia*

[193] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential).*

[194] Department of Natural Resources, Mines and Energy. (2020) *MSES regulated vegetation wetlands mapping 100m from wetland v6.12*. Accessed on 29/04/2020.

[195] Environmental Protection Agency. (2005). Wetland Mapping and Classification Methodology, Overall Framework A Method to Provide Baseline Mapping and Classification for Wetlands in Queensland Version1.2. https://wetlandinfo.des.qld.gov.au/resources/static/pdf/facts-maps/mapping-method/p01769aa.pd.

[196] Department of Environment and Heritage Protection. (2014). *Wetland protection area - high ecological significance wetland.* Bioregional Assessment Source Dataset. Retrieved from http://data.bioregionalassessments.gov.au/dataset/3ea44427-c4c5-440e-87d7-9393ba7c33fb

- GBRMP.
- Sandringham Bay – Bakers Creek Aggregation, Sarina Inlet – Ince Bay Aggregation (the vast majority of this inlet is located outside the study area to the south).
- The Sandringham Bay – Bakers Creek Aggregation Wetland is located north-west of Hay Point and overlaps the north-western coastline of Dudgeon Point and extends north to Far Beach.[197] It is significant as it has large intertidal and shallow water habitats, extensive mangroves and diverse shoreline.[198]. Previous studies have reported that it also supports a number of important migratory shorebird roost sites.[199] Most of the aggregation is below 5m above sea level. It includes low coastal plains adjacent to marine waters, and also small areas of saline clay pans.
- The Sarina Inlet - Ince Bay Aggregation is located south of Hay Point and extends approximately 12km south to Ince Bay. Only the northern tip of this wetland falls within the study area. This wetland is primarily an estuarine system with a total area of 279.3km^2. It includes low coastal plains with adjacent small islets, inshore coral reef, extensive shallow water, subtidal and intertidal mudflats and associated marine waters.
- Lake Barfield is a freshwater wetland located south of HPCT, between the communities of Half Tide and Salonika Beach. It is not listed as a nationally or internationally important wetland. While freshwater wetlands are mapped, regulated and managed, intertidal and subtidal (estuarine and marine) wetlands are poorly characterised.

There has been extensive clearing in much of the wetland areas within the study area and while significant wetland areas are recognised within the study area, not all of these areas are protected from future development.[200] Current government mapping corroborates this with the majority of wetlands not currently protected. Key issues affecting the remaining wetlands for the study area include altered hydrological regimes, changes to water quality and disturbances such as introduction of weeds, pests and illegal dumping. Further deterioration and/or clearing of these areas have the potential to directly impact the health and resilience of the reef.[201]

[197] North Queensland Bulk Ports Corporation Ltd. (2017). *Sustainable sediment management assessment for maintaining navigational infrastructure Port of Hay Point.*.
[198] Department of Climate Change, Energy, the Environment and Water. (n.d). *Directory of Important Wetlands – Sandringham Bay – Bakers Creek Aggregation – Qld052*. Retrieved from https://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW&doiw_refcodelist=QLD052.
[199] Harding, S. and Milton, D. (2003). *Mackay Shorebird Plan Final Report.* Prepared for the QLD Wader Study Group
[200] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.
[201] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.

Figure 57: Mapped wetlands in the Port of Hay Point study area

Review of HES wetland mapping[202] indicates the presence of riverine and estuarine wetlands associated with the GBR. These mapped HES wetlands are generally within coastal areas, associated with the mouth or estuarine verges of Bakers Creek, Sandy Creek and Cabbage Tree Creek. Most are small and interspersed throughout the study area. There are a number of MSES wetlands present that are mapped as regulated vegetation areas and located within 100m from the defining bank of a wetland.[203] The majority of the HES

[202] Department of Environment and Science. (2021). *Queensland Wetlands – Ecological Significance Mapping* v2. Retrieved from https://environment.des.qld.gov.au/wildlife/wetlands/map-referrable-wetlands.
[203] Department of Natural Resources, Mines and Energy. (2020) *MSES regulated vegetation wetlands mapping 100m from wetland v6.12*

wetlands mapped for the study area have an aquatic conservation score of high or very high and hydrological modification score of H1 meaning the wetland is relatively natural (and not modified).[204]

A total of 31 listed migratory wetland species are either known to inhabit or visit these wetlands or have habitat or roosting sites suitable for their visitation within the project area (**Table 59**). 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 or a member of a listed migratory species.

Table 59: Migratory terrestrial, wetland and marine species of conservation significance present/habitat present in the Port of Hay Point study area

Environment Protection and Biodiversity Conservation Act 1999 (Cth)	***Nature Conservation Act 1992***
E – Endangered CE – Critically endangered V – Vulnerable	CR – Critically endangered E – Endangered SL – Special Least Concern V – Vulnerable LC – Least Concern

*Note that only the migratory marine bird species are shown in this table.

Species	**Common name**	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	*Nature Conservation Act 1992*	**Species/species habitat occurring or potentially occurring study area**
Migratory terrestrial species				
Cuculus optatus	Oriental Cuckoo, Horsfield's Cuckoo	-	-	Species or species habitat known to occur
Hirundapus caudacutus	White-throated needletail	V	V	Species or species habitat likely to occur
Monarcha melanopsis	Black-faced Monarch	-	-	Species or species habitat known to occur
Monarcha trivirgatus	Spectacled Monarch	-	-	Species or species habitat known to occur
Myiagra cyanoleuca	Satin Flycatcher	-	-	Species or species habitat known to occur
Rhipidura rufifrons	Rufous Fantail	-	-	Species or species habitat known to occur
Migratory marine birds*				
Anous stolidus	Common Noddy	-	-	Species or species habitat known to occur
Apus pacificus	Fork-tailed Swift	-	-	Species or species likely to occur

[204] Rollason, S. and Howell, S. (2012). *Aquatic Conservation Assessments (ACA), using AquaBAMM, for the nonriverine wetlands of the Great Barrier Reef catchment.* Version 1.3. Published by the Department of Environment and Resource Management

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	*Nature Conservation Act 1992*	Species/species habitat occurring or potentially occurring study area
Ardenna carneipes	Flesh-footed Shearwater	-	-	Species or species habitat may occur
Fregata ariel	Lesser Frigatebird	-	-	Species or species habitat known to occur
Fregata minor	Great Frigatebird	-	-	Species or species habitat known to occur
Sternula albifrons	Little Tern	-	-	Species or species habitat may occur
Macronectes giganteus	Southern giant petrel	E	E	Species or species habitat may occur
Migratory wetland species				
Actitis hypoleucos	Common Sandpiper	-	-	Species or species habitat known to occur
Arenaria interpres	Ruddy Turnstone	-	-	Roosting known to occur
Calidris acuminata	Sharp-tailed Sandpiper	-	-	Roosting known to occur
Calidris alba	Sanderling	-	-	Roosting known to occur
Calidris canutus	Red knot	E	E	Species of species habitat known to occur
Calidris ferruginea	Curlew Sandpiper	CE	CR	Species of species habitat known to occur
Calidris melanotos	Pectoral Sandpiper	-	-	Species or species habitat may occur within area
Calidris ruficollis	Red-necked Stint	-	-	Roosting known to occur
Calidris tenuirostris	Great knot	CE	CR	Roosting known to occur
Charadrius bicinctus	Double-banded Plover	-	-	Roosting known to occur
Charadrius leschenaultii	Greater Sand Plover	V	V	Roosting known to occur
Charadrius mongolus	Lesser Sand Plover	E	V	Roosting known to occur
Charadrius veredus	Oriental Plover	-	-	Roosting known to occur

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	*Nature Conservation Act 1992*	Species/species habitat occurring or potentially occurring study area
Gallinago hardwickii	Latham's Snipe	-	-	Species of species habitat known to occur
Gallinago megala	Swinhoe's Snipe	-	-	Roosting likely to occur
Gallinago stenura	Pin-tailed Snipe	-	-	Roosting likely to occur
Limicola falcinellus	Broad-billed Sandpiper	-	-	Roosting known to occur
Limosa lapponica	Bar-tailed Godwit	-	-	Species of species habitat known to occur
Limosa limosa	Black-tailed Godwit	-	-	Roosting known to occur
Numenius madagascariensis	Eastern curlew	CE	E	Species of species habitat known to occur
Numenius minutus	Little Curlew	-	-	Roosting known to occur
Numenius phaeopus	Whimbrel	-	-	Roosting known to occur
Pandion haliaetus	Osprey	-	-	Breeding known to occur
Pluvialis fulva	Pacific Golden Plover	-	-	Roosting known to occur
Pluvialis squatarola	Grey Plover	-	-	Roosting known to occur
Tringa brevipes	Grey-tailed Tattler	-	-	Roosting known to occur
Tringa glareola	Wood Sandpiper	-	-	Roosting known to occur
Tringa incana	Wandering Tattler	-	-	Roosting known to occur
Tringa nebularia	Common Greenshank	-	-	Species of species habitat known to occur
Tringa stagnatilis	Marsh Sandpiper	-	-	Roosting known to occur
Xenus cinereus	Terek Sandpiper	-	-	Roosting known to occur

Port of Mackay

The wetlands in the study area occur in association with a suite of different vegetation communities including Mangrove forest and shrublands and Samphire open forblands, primarily around coastal areas. Some wetlands along streams further inland are associated with melaleuca or eucalyptus dominated woodlands. Wetlands are

classified into *lacustrine* (lake), *palustrine* (marsh or swamp), and riverine or estuarine.[205] The study area contains mostly estuarine wetlands associated with the local rivers and bays.

Wetland protection areas, which are defined under the *Environmental Protection Regulation 2019*, include HES wetlands and a surrounding policy trigger area of up to 100m in urban areas and up to 500m outside of urban areas. HES wetlands within the GBR catchments provides the basis for the DOR's concurrence agency role for development involving high impact earthworks within wetland protection areas under the Planning Regulation.

There are no internationally significant Ramsar wetlands in close proximity to the study area. Several wetlands of national, state and local significance occur in the study area. A review of HES wetland mapping[206] indicates the presence of riverine and estuarine wetlands associated with the GBR. These mapped HES wetlands are generally within coastal areas, associated with the mouth or estuarine verges of Bakers Creek, Sandy Creek and Cabbage Tree Creek. Most are small and interspersed throughout the study area. There are a number of MSES wetlands present that are mapped as regulated vegetation areas and located within 100m from the defining bank of a wetland.[207] The majority of the HES wetlands mapped for the study area have an aquatic conservation score of high or very high and hydrological modification score of H1, which is defined as 'no obvious local hydrology/disturbance modification'.[208]

Wetland mapping sourced from Queensland Government[209] was interpreted for the study areas and is presented in **Figure 58**. Two nationally important wetlands are present within the study area and include:

- GBRMP
- Sandringham Bay – Bakers Creek Aggregation.

The Sandringham Bay – Bakers Creek Aggregation Wetland is located north-west of Hay Point and in the far south of the study area. It overlaps the north-western coastline of Dudgeon Point and extends north to Far Beach south of the study area.[210] It is significant as it has large intertidal and shallow water habitats, extensive mangroves and diverse shoreline. Previous studies have reported that it also supports a number of important migratory shorebird roost sites.[211][212] Most of the aggregation is below 5m above sea level. It includes low coastal plains adjacent to marine waters, and also small areas of saline clay pans.

There has been extensive clearing in much of the wetland areas within the study area and while significant wetland areas are recognised within the study area, not all of these areas are protected from future development. Current government mapping corroborates this with the majority of wetlands not currently protected. Key issues affecting the remaining wetlands for the study area include altered hydrological regimes, changes to water quality and disturbances such as introduction of weeds, pests and illegal dumping. Further deterioration and/or clearing of these areas have the potential to directly impact the health and resilience of the reef.[213]

[205] Department of Climate Change, Energy, the Environment and Water. (1993). *Directory of Important Wetlands in Australia*
[206] NQBP. (2020a). *Port of Hay Point – Port Development Opportunities and Constraints Assessment*. (Confidential).
[207] Department of Natural Resources, Mines and Energy. (2020) *MSES regulated vegetation wetlands mapping 100m from wetland v6.12*.
[208] Environmental Protection Agency. (2005). Wetland Mapping and Classification Methodology, Overall Framework A Method to Provide Baseline Mapping and Classification for Wetlands in Queensland Version1.2. https://wetlandinfo.des.qld.gov.au/resources/static/pdf/facts-maps/mapping-method/p01769aa.pdf
[209] Department of Environment and Heritage Protection. (2014). *Wetland protection area - high ecological significance wetland.* Bioregional Assessment Source Dataset. Retrieved from http://data.bioregionalassessments.gov.au/dataset/3ea44427-c4c5-440e-87d7-9393ba7c33fb.
[210] North Queensland Bulk Ports Corporation Ltd. (2017). *Sustainable sediment management assessment for maintaining navigational infrastructure Port of Hay Point.*
[211] Harding, S. and Milton, D. (2003). *Mackay Shorebird Plan Final Report*. Prepared for the QLD Wader Study Group Harding & Milton.

[212] International Union for Conservation of Nature (IUCN). (2008). Guidelines for Applying Protected Area Management Categories. Retrieved from https://portals.iucn.org/library/node/30018
[213] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd

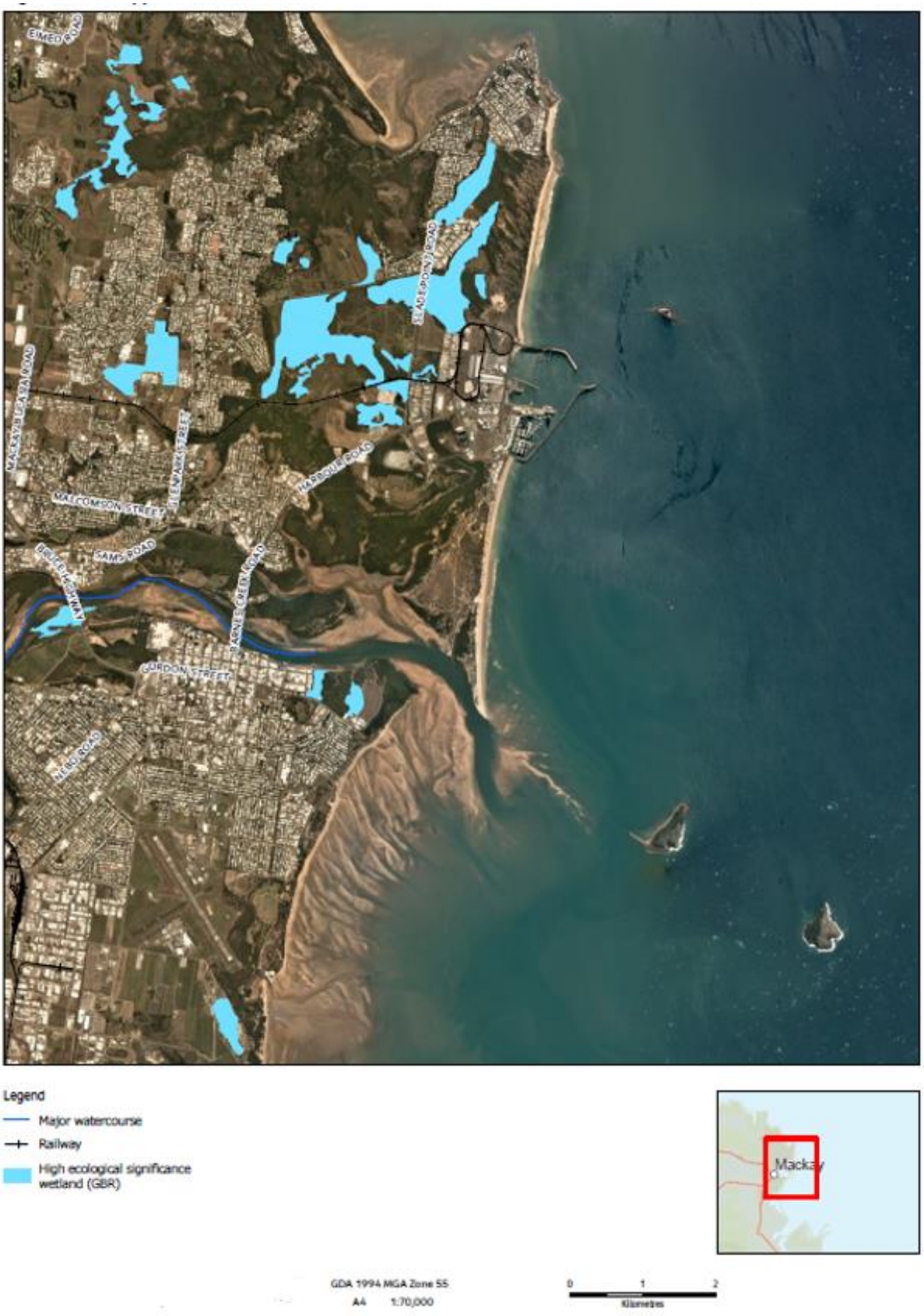


Figure 58: Wetlands in the Port of Mackay study area

A review of HES wetland mapping indicates the presence of riverine and estuarine wetlands associated with the GBR.[214] These mapped HES wetlands are generally within coastal areas, associated with the mouth or estuarine verges of the Pioneer River and McCreadys Creek. Most are concentrated within the northern portion of the study area, specifically west and north west of the existing port area. Many of these HES wetlands are listed as state significant (MSES).

Wetlands provide important ecosystem services in the study area including:

- capturing of overland flow
- recycling nutrients and sediment that would otherwise end up in the GBRWHA
- providing feeding and breeding grounds for fauna such as fish, prawns, birds and amphibians
- habitat for wetland flora species.

There are no wetlands within the study area that are listed under the Ramsar Convention, however many of the wetlands provide habitat and feeding/breeding grounds for migratory shorebirds and are internationally significant.

Wetlands located within the study area:

- Slade Point Nature Reserve, north of the existing port, which is a 73ha public reserve consisting of coastal dunes and paperbark wetlands.[215]
- McNichol Nature Reserve, west of Slade Point, which has significant habitat and conservation values.
- Keeleys Road Wetlands, state significant (MSES) wetlands located west of the existing port, contains 'Endangered' and 'Of Concern' vegetation communities and forms part of the habitat corridor that links Slade Point in the north with the Pioneer River in the south.
- Basset Basin FHA, south of the existing port, which is located within a wetland protection area
- Wetlands at the mouth of the Pioneer River
- Smaller wetlands such as Zamia Court Reserve, Gillhams Park and Sapphire Court Reserve, located south of Morag McNichol Reserve.[216]

The majority of wetlands in the study area are intertidal wetlands that are associated with mudflats, bays and the marine environment. Palustrine wetlands are primarily vegetated non-channel environments of less than 8ha and include environments such as billabongs, swamps, bogs and springs.[217] An example of a palustrine wetland in the study area is the Keeley Road wetlands located west of the existing port.

A total of 31 listed migratory shorebird species are either known to inhabit or visit these wetlands or have habitat or roosting sites suitable for their visitation within the project area and listed in **Table 60**.

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 or a member of a listed migratory species.

Table 60: Migratory terrestrial, wetland and marine species of conservation significance present/habitat present in the Port of Mackay study area

***Environment Protection and Biodiversity Conservation Act 1999* (Cth)**	***Nature Conservation Act 1992***
V – Vulnerable E – Endangered CE – Critically Endangered	V – Vulnerable E – Endangered CR – Critically endangered SL – Special least concern PE – Extinct in the wild

[214] Department of Environment and Science. (2021). *Queensland Wetlands – Ecological Significance Mapping v2.* Retrieved from https://environment.des.qld.gov.au/wildlife/wetlands/map-referrable-wetlands.
[215] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential).*
[216] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[217] Department of Environment and Science. (2021). *Wetland systems*. Retrieved from https://wetlandinfo.des.qld.gov.au/wetlands/what-are-wetlands/definitions-classification/system-definitions.html.

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*	Species/species habitat occurring or potentially occurring study area
Migratory terrestrial species				
Cuculus optatus	Oriental Cuckoo	-	-	Species or species habitat known to occur
Hirundapus caudacutus	White-throated needletail	V	V	Species or species habitat likely to occur
Monarcha melanopsis	Black-faced Monarch	-	-	Species or species habitat known to occur
Monarcha trivirgatus	Spectacled Monarch	-	-	Species or species habitat known to occur
Myiagra cyanoleuca	Satin Flycatcher	-	-	Species or species habitat known to occur
Rhipidura rufifrons	Rufous Fantail	-	-	Species or species habitat known to occur
Migratory marine birds*				
Anous stolidus	Common Noddy	-	-	Species or species habitat known to occur
Apus pacificus	Fork-tailed Swift	-	-	Species or species likely to occur
Ardenna carneipes	Flesh-footed Shearwater	-	-	Species or species habitat may occur
Fregata ariel	Lesser Frigatebird	-	-	Species or species habitat known to occur
Fregata minor	Great Frigatebird	-	-	Species or species habitat known to occur
Sternula albifrons	Little Tern	-	-	Species or species habitat may occur
Macronectes giganteus	Southern giant petrel	E	E	Species or species habitat may occur
Migratory shorebird species				
Actitis hypoleucos	Common Sandpiper	-	-	Species or species habitat known to occur
Arenaria interpres	Ruddy Turnstone	-	-	Roosting known to occur
Calidris acuminata	Sharp-tailed Sandpiper	-	-	Roosting known to occur
Calidris alba	Sanderling	-	-	Roosting known to occur
Calidris canutus	Red knot	E	E	Species of species habitat known to occur
Calidris ferruginea	Curlew Sandpiper	CE	CR	Species of species habitat known to occur
Calidris melanotos	Pectoral Sandpiper	-	-	Species or species habitat may occur
Calidris ruficollis	Red-necked Stint	-	-	Roosting known to occur
Calidris tenuirostris	Great knot	CE	CR	Roosting known to occur
Charadrius bicinctus	Double-banded Plover	-	-	Roosting known to occur
Charadrius leschenaultii	Greater Sand Plover	V	V	Roosting known to occur
Charadrius mongolus	Lesser Sand Plover	E	E	Roosting known to occur
Charadrius veredus	Oriental Plover	-	-	Roosting known to occur
Gallinago hardwickii	Latham's Snipe	-	-	Species of species habitat known to occur
Gallinago megala	Swinhoe's Snipe	-	-	Roosting likely to occur
Gallinago stenura	Pin-tailed Snipe	-	-	Roosting likely to occur
Limicola falcinellus	Broad-billed Sandpiper	-	-	Roosting known to occur

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*	Species/species habitat occurring or potentially occurring study area
Limosa lapponica	Bar-tailed Godwit	V	V	Species of species habitat known to occur
Limosa limosa	Black-tailed Godwit	-	-	Roosting known to occur
Numenius madagascariensis	Eastern curlew	CE	E	Species of species habitat known to occur
Numenius minutus	Little Curlew	-	-	Roosting known to occur
Numenius phaeopus	Whimbrel	-	-	Roosting known to occur
Pandion haliaetus	Osprey	-	-	Breeding known to occur
Pluvialis fulva	Pacific Golden Plover	-	-	Roosting known to occur
Pluvialis squatarola	Grey Plover	-	-	Roosting known to occur
Tringa brevipes	Grey-tailed Tattler	-	-	Roosting known to occur
Tringa glareola	Wood Sandpiper	-	-	Roosting known to occur
Tringa incana	Wandering Tattler	-	-	Roosting known to occur
Tringa nebularia	Common Greenshank	-	-	Species of species habitat known to occur
Tringa stagnatilis	Marsh Sandpiper	-	-	Roosting known to occur
Xenus cinereus	Terek Sandpiper	-	-	Roosting known to occur

8.7 Aquatic ecosystems – Freshwater

8.7.1 Surface water

Port of Hay Point

The land component of the study area comprises an extensive network of minor watercourses that feed into the larger waterways of Bakers Creek, Sandy Creek and Alligator Creek, as well as smaller waterways including Louisa Creek, Mick Ready Creek and Cabbage Tree Creek. The study area includes waterways regulated under the Fisheries Act (see **Figure 59**) and watercourses regulated under the *Water Act 2000* (Water Act) (see **Figure 60**). Waterways within the study areas are listed in **Table 61**.

Assessment of the waterway barrier works stream classification within the study area highlights the presence of a number of streams at risk of adverse impact of fish movement as a result of barrier works. There are numerous unnamed waterways providing for fish passage that are mapped within the study area. On ground assessments are required to determine the extent of waterways providing for fish passage as per the waterway definition under the Fisheries Act.

The study area includes a number of waterways that are likely to require assessment where the development proposed is waterway barrier works.[218] It should be noted that according to Section 5(4)(a)(i) of the Water Act, a watercourse is a reference to anywhere that is upstream of the downstream limit of the watercourse.

There is no boundary between fresh and tidal habitats. These habitats are intricately linked, and it is crucial that adequate fish passage is retained to allow for migrations between fresh and tidal waterways.

[218] Department of Agriculture, Fisheries and Forestry. (2021). *Guide for the determination of waterways using the spatial data layer Queensland waterways for waterway barrier works 2.0*. Retrieved from https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/1564508/QWWBW-Guide-to-determining-waterways.pdf.

Table 61: Waterways within the Port of Hay Point study area

Waterways named	Waterway providing for fish passage under the *Fisheries Act 1994* (Excluding tidal areas)	Downstream limits defined by *Water Act 2000*	Notes on condition of waterway
Bakers Creek	Yes	Yes – just west of study area although the creek continues through study area to coast	-
Sandy Creek	Yes	No – west of study area although the creek continues through the study area to the coast	Sandy Creek drains into Sandringham Bay. In 2013, reef catchments recorded the highest concentrations of the herbicide diuron in Sandy Creek of any waterways within the GBR lagoon. This herbicide has been associated with mangrove dieback in the region.[219]
Sandringham Creek	Yes	Yes – just west of the Bruce Highway. Creek continues through study area to coast	Reef catchments considered the condition of the broader Sandringham Bay area receiving waters in 2013 to be very poor. This is attributed to agricultural land use practices in the sub catchment and highly modified landscape.
Bell Creek	Yes	Yes – just east of Dawlish Road and west of Bruce Highway. Creek continues through study area to coast	-
Louisa Creek	Yes	No – unmapped watercourse	higher than guideline nutrient levels due to the area being surrounded by agricultural and grazing practices
Mick Ready Creek	Yes	No – unmapped watercourse	-
Alligator Creek	Yes	Yes – between Dawlish Road and Bruce Highway. Creek continues through study area to coast	-
Cabbage Tree Creek	Yes	Yes – just east of the railway line. Creek continues through study area to coast	-
Grendon Creek	Yes-	-	Creek not shown on any mapping but text below refers to it flowing through the existing coal terminal rail receival and settling pond areas. This is a DBT discharge point.

The study area is located within the Plane Basin of the Healthy Rivers to Reef Partnership MIW area. It has a report score card of 'moderate' due to the presence of pesticides in the water. Drainage networks within the study area have been highly modified, and most of the drainage from coal terminal operational areas discharge into intertidal wetlands through water storage and sedimentation ponds. The main waterbodies that receive discharges from within the coal terminal operations areas include Lake Barfield (a man-made lake) and Grendon Creek (which flows through the existing coal terminal rail receival and settling pond areas).

Watercourses and waterbodies within the study area support flora and fauna habitats but are also used widely for domestic and urban water supplies. A survey of water quality in the area in 2000 found the waterbodies met Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines, however surface

[219] North Queensland Bulk Ports Corporation Ltd. (2017). *Sustainable sediment management assessment for maintaining navigational infrastructure Port of Hay Point.*

water at Dudgeon Point and Louisa Creek were found to have higher than guideline nutrient levels due to the area being surrounded by agricultural and grazing practices, and the condition of the water quality in freshwater ecosystems at Sandringham Bay were considered to be poor due to high levels of nutrients and pesticides.

Water bodies at Dudgeon Point are largely artificial farm dams, and there is likelihood that there is a level of groundwater-surface water connectivity at Dudgeon Point. Stormwater from the existing coal terminals is collected and treated in sedimentation ponds to remove coal and sediments, then it is stored in large dams for reuse on site. Discharges of stormwater from the existing terminals is dependent on on-site reuse practices such as dust suppression, rainfall totals and storage volumes.

A recent study by Koskela Group looking at polycyclic aromatic hydrocarbons (PAH) and heavy metals in coal and the marine environment at Hay Point in 2020 concluded that:

> '…unburnt coal product shipped through the Port of Hay Point has a very low capacity to release priority contaminants such as metals and PAHs. All available lines of evidence indicate that the impact of unburnt coal in the marine environment at the Port of Hay Point is very low. Combustion engine emissions have been identified as the principal source of PAHs in the study area. Highest concentrations of carcinogenic PAHs correlate with PAH profiles of emissions from the public vehicle fleet rather than industrial activities.[220]'

[220] Koskela Group. (2020). *Impact Assessment of Unburnt Coal in the Marine Environment (North Queensland Bulk Ports).*

Figure 59: Waterways in the Port of Hay Point study area (*Fisheries Act 1994*)

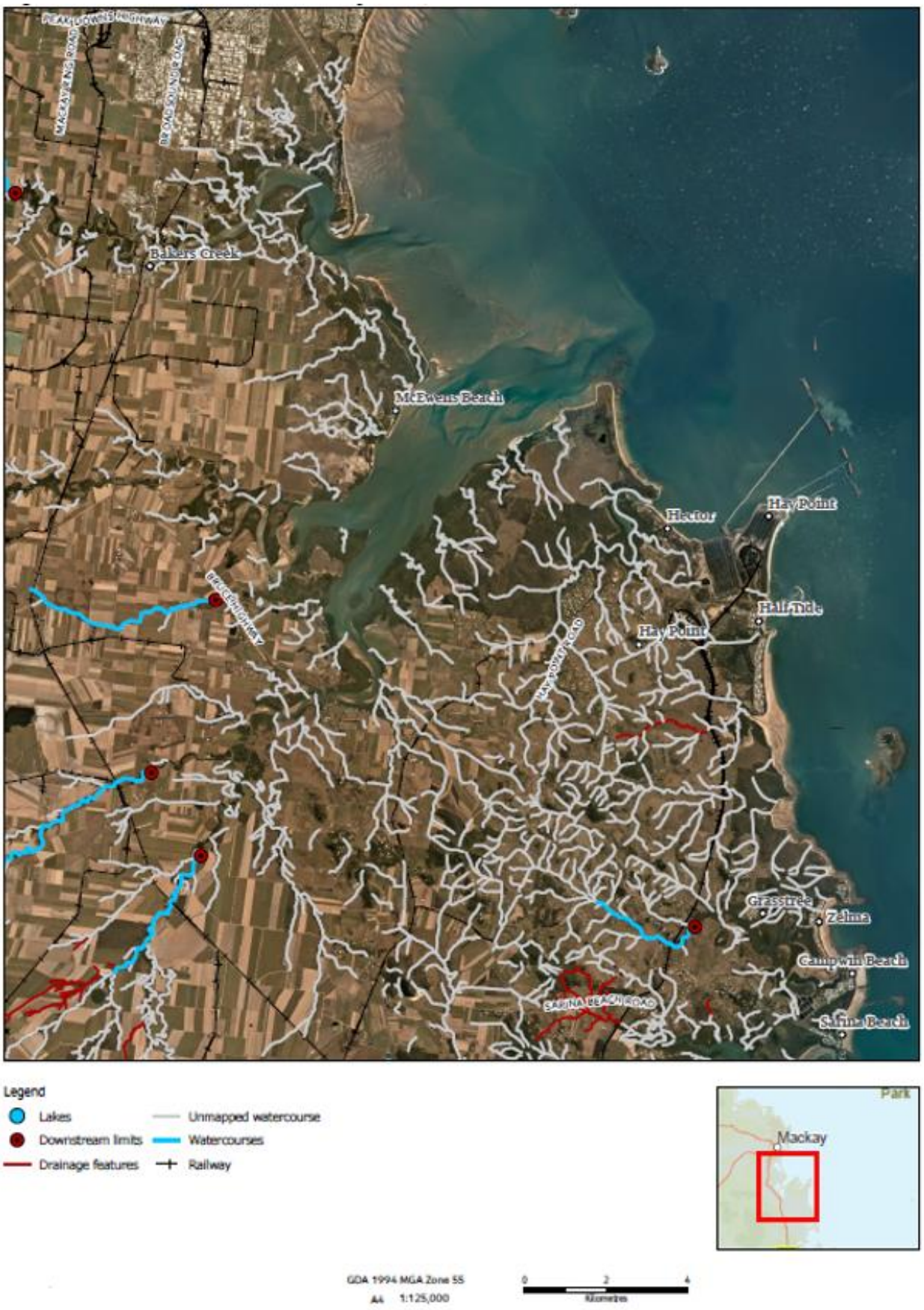


Figure 60: Watercourses in the Port of Hay Point study area (*Water Act 2000*)

Port of Mackay

The land component of the study area comprises an extensive network of minor watercourses that feed into the larger waterways of McCreadys Creek, Vines Creek, Basset Creek and the Pioneer River, as well as smaller waterways including Gooseponds Creek, Barnes Creek, Sandfly Creek and Bluewater Trail. The study area includes mapped waterways regulated under the Water Act and the Fisheries Act, as shown in **Figure 61**

identifies waterways under the Fisheries Act and **Figure 62** for watercourses under the Water Act. The condition of the waterways are noted in **Table 62**.[221]

Under the *Water Plan (Pioneer Valley) 2002*, there is approximately 130,425 megalitres (ml) of supplemented surface water entitlements, and approximately 18,480ml of unsupplemented surface water entitlements for various uses such as irrigation, agriculture, domestic, industrial and urban water supplies.

Assessment of the waterway barrier works stream classification within the Mackay study area highlights the presence of several streams at risk of adverse impact of fish movement as a result of barrier works. A large proportion of the waterways in the study area are tidal, there are a number of waterways and unnamed tributaries will generally require authorization where development that is waterway barrier works is proposed.[222] It should be noted that according to Section 5(4)(a)(i) of the Water Act, defines a watercourse as 'a reference to anywhere that is upstream of the downstream limit of the watercourse.'

Table 62: Waterways in the Port of Mackay study area

Waterway name	Risk rating under *Fisheries Act 1994*	Downstream limits defined by *Water Act 2000*	Notes condition of waterway
McCreadys Creek	2 – Amber (moderate)	No – unmapped watercourse	-
Vines Creek	4 – Purple (major)	No – unmapped watercourse	Tidal creek that supports productive estuarine communities. Creek is in good condition
Goosepond Creek	3 – Red (high)	Yes – in North Mackay, west of Harbour Road. Creek continues through study area to the coast	-
Barnes Creek	Tidal	No – unmapped watercourse	-
Pioneer River	Tidal	No – unmapped watercourse	Runs through city of Mackay
Basset Creek	4 – Purple (major)	No – unmapped watercourse	Tidal creek that has been modified and parts now exist as drainage channel. This has compromised the estuarine connectivity between Basset Creek and the melaleuca wetlands at the port.
Bluewater Trail	4 – Purple (major)	No – unmapped watercourse	-
Floodway Conservation Area (west of existing port)	2 – Amber (moderate)	No – unmapped watercourse	-
Sandfly Creek	4 – Purple (major)	No – unmapped watercourse	-

The northern portion of the study area falls within the O'Connell River Basin, while the southern portion falls within the Alligator Creek, Sandy Creek, Bakers Creek and Sarina Beaches sub catchments of the Pioneer Basin. These catchments are some of the most modified catchments along the Queensland east coast, with 50% of land being used for intensive agriculture such as sugar cane. Water quality in these catchments is poor due to the high levels of nutrients and pesticides from agricultural land uses.

Both river basins, which drain to the GBRWHA, are monitored under the Healthy Rivers to Reef Partnership MIW. The Pioneer River Basin was given a 'moderate' report card score in 2020, a result largely driven by the presence of pesticides in the water. In the same year, the O'Connell River Basin received a score of 'good'.[223] The O'Connell River Basin encompasses the O'Connell and Andromache rivers in the north and Saint Helens and Murray creeks to the south. Its distinctive characteristic is the number of protected areas it captures, including seven National Parks and 13 Conservation parks and State forests.[224]

[221] North Queensland Bulk Ports Corporation Ltd. (2009). *Port of Mackay Land Use Plan.* Retrieved from https://ngbp.com.au/__data/assets/pdf_file/0015/3273/Port-of-Mackay-Land-Use-Plan-December-2009.pdf
[222] Department of Agriculture, Fisheries and Forestry. (2021). *Guide for the determination of waterways using the spatial data layer Queensland waterways for waterway barrier works 2.0.* Retrieved from https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/1564508/QWWBW-Guide-to-determining-waterways.pdf.
[223] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential).*
[224] Healthy Rivers to Reef Partnership Mackay Whitsunday Isaac.(n.d.) *O'Connell River Basin.* Retrieved from https://healthyriverstoreef.org.au/oconnell-river-basin/

The Pioneer River is the major river which runs through the city of Mackay and the Basset Basin, an estuary of the Pioneer River, is located south of the port and provides important nurseries. The Basset Basin was declared a FHA in 1995 with a flexible management approach, and mangroves and associated wetlands make up 662ha of the FHA.

Natural drainage within the study area is highly modified as a result of port activities and urban development for the city of Mackay. Despite this, there are areas of natural coastal dunes and freshwater and estuarine wetlands surrounding the Port of Mackay, including the Basset Basin FHA which are protected within wetland protection areas.[225]

In 2015, Catchment Solutions was commissioned by NQBP, MRC and Reef Catchments Limited, to conduct the Mackay Urban Water Quality Monitoring Program. The aim of the program was to collect ongoing water quality data during high flow events (such as the wet seasons). In the 2020 monitoring year of the program, samples were taken from six sites surrounding the port between January to April. The results of the survey were:

Elevated electrical conductivity and elevated nutrients (notable Particulate Nitrogen and Particulate Phosphorus) in the port, thought to be a result of organic matter within the mangrove environment.

- elevated dissolved inorganic nitrogen increasing in downstream sites within Basset Creek catchment
- low concentrations of sediment, heavy metals and herbicides
- low hydrocarbon levels[226]
- waterways providing for fish habitat are MSES.

[225] North Queensland Bulk Ports Corporation Ltd. (2009). *Port of Mackay Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0015/3273/Port-of-Mackay-Land-Use-Plan-December-2009.pdf
[226] North Queensland Bulk Ports Corporation Ltd. (2020). *Port of Mackay – Port Development Opportunities and Constraints Assessment (Confidential*

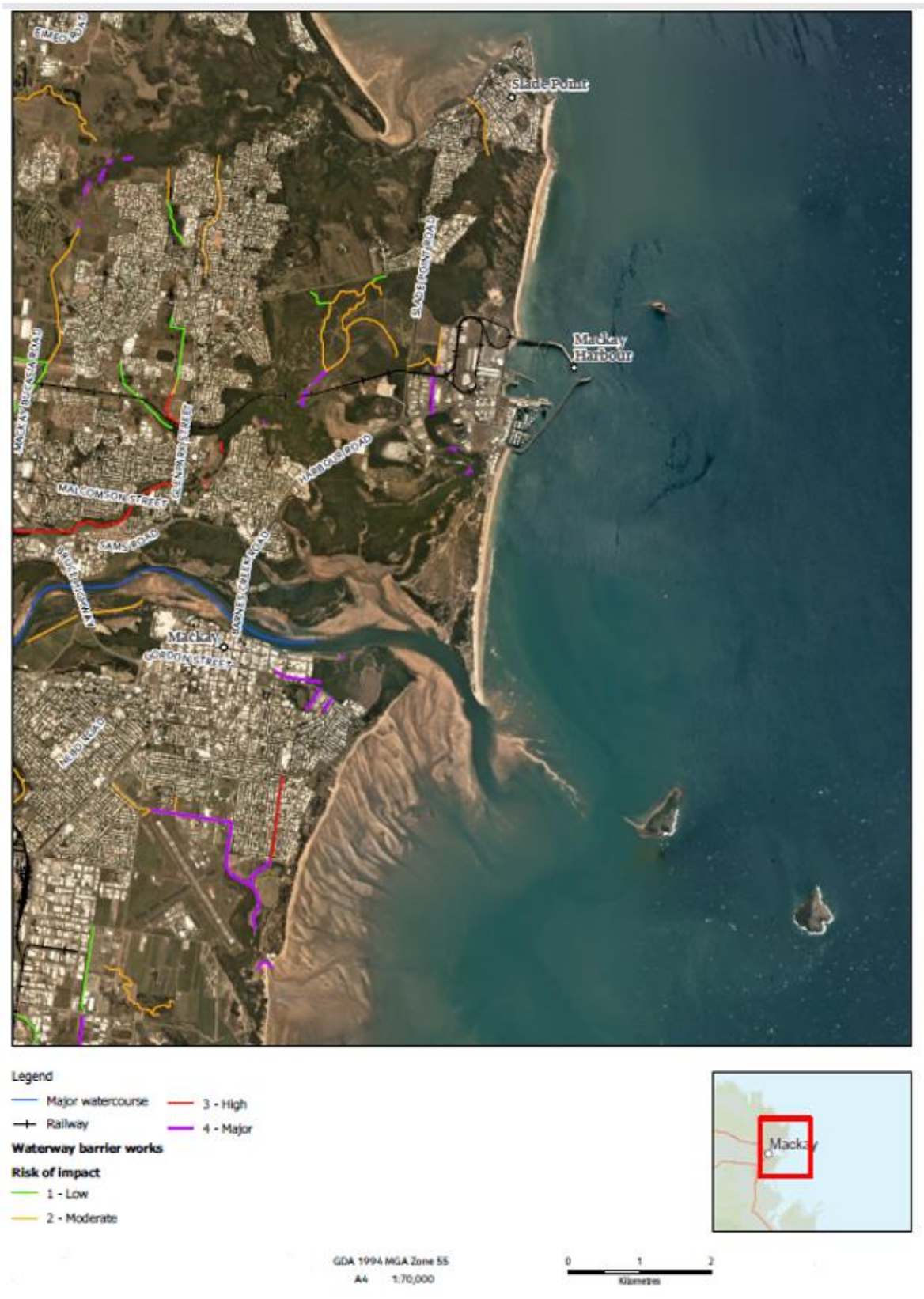


Figure 61: Waterways in the Port of Mackay study area (*Fisheries Act 1994*)

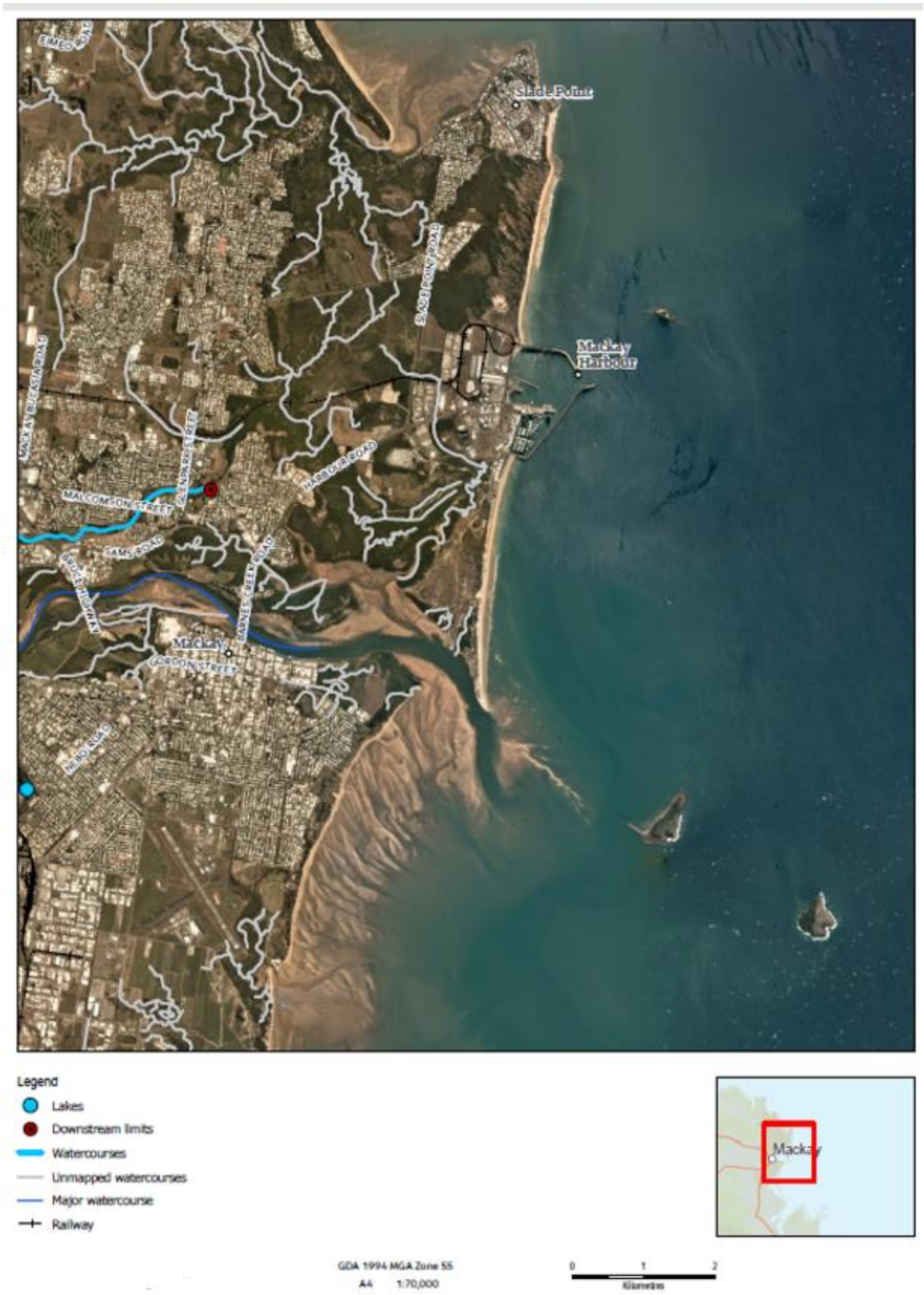


Figure 62: Watercourses in the Port of Mackay study area (*Water Act 2000*)

8.7.2 Groundwater

Port of Hay Point

Healthy groundwater is important in providing urban and rural water supply, as well as supporting a range of environmental values, such as groundwater dependent wetlands and ecosystems.

Groundwater is integral to wetland components and processes. Most wetlands are groundwater dependent ecosystems and to manage groundwater dependent ecosystems it is essential to know where they are, and the extent and nature of their dependence on groundwater.

The southern extent of the study area is within the Sarina sub-artesian declared underground water area managed under the *Water Regulation 2016*. The northern and western extents of the study area is within the *Water Plan (Pioneer Valley) 2002*. Groundwater in the study area is typically saline, pH neutral and mildly alkaline and not suitable for consumption by livestock or potable uses. The existing port has aquifer systems where the groundwater is generally shallow with low permeability.

Port of Mackay

Healthy groundwater is important in providing urban and rural water supply, as well as supporting a range of environmental values, such as groundwater dependent wetlands and ecosystems.

Groundwater is integral to wetland components and processes. Most wetlands are groundwater dependent ecosystems and to manage groundwater dependent ecosystems it is essential to know where they are, and the extent and nature of their dependence on groundwater.

The study area south of the existing port is located within the *Water Plan (Pioneer Valley)* area. Areas north of the existing port area and the suburb of Andergrove/Beaconsfield are not within a water resource plan area.

Under the Pioneer Valley water plan, there are approximately 60,816ml of groundwater entitlements for approximately 82,000ml per annum of groundwater has been allocated for irrigation, agriculture, urban, industrial and regional water supplies. Seawater intrusion into the aquifer system has caused many of the coastal bores to become too salty for human consumption or irrigation. Every five years, the extent of seawater intrusion is monitored by the Pioneer Valley Resource Operations Plan Amendment and reported under the Pioneer Valley Water Management Protocol.[227]

8.7.3 Potential impacts and threats

The potential impacts on freshwater aquatic ecosystems in the study area from the port, other coastal industrial development, as well as coastal residential development are summarised below:

Port of Hay Point

Water quality

- degraded surface water quality due to increased turbidity, sedimentation, increased salinity, increased nutrient levels, pesticides and chemicals
- indirect sedimentation and turbidity caused by dredge plumes and vegetation clearing
- direct deposition of dust causing increased turbidity, smothering of marine communities and transport of contaminants.

Waterways

- restriction of fish passage within and throughout waterways as a result of poorly designed infrastructure or land reclamation.

[227] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential).*

Hydrology

- indirect alterations to freshwater hydrology and changes to inflows due to construction activities, dredging or dredge material disposal.

Potential Acid Sulfate Soils

- changes in groundwater levels exposing PASS
- environmental harm from PASS in dredge material.

Pollution

- accidental release of contaminants into adjacent wetland ecosystems or surface water bodies.

Groundwater

- impacts to groundwater from significant earthworks, contamination or overuse during dry periods
- disruption of hydraulic connection between surface and groundwater and changes in groundwater levels or quantities within local aquifers, including potential seawater intrusion.

Wetlands

- extensive clearing for cultivation and development and construction of waterway barriers resulting in a changed hydrological regime and declining health/dieback of wetland communities
- temporary displacement of migratory birds during reclamation activities at the port
- ongoing operational impacts including noise, light, dust resulting in displacement of shorebirds from habitat
- encroachment of residential development and increased cultivation resulting in displacement of shorebirds from habitat
- disruption of the hydraulic connection between surface water and groundwater and changes in the groundwater levels or quantities within local aquifers, including potential seawater intrusion.

Port of Mackay

Water quality

- degraded surface water quality due to increased turbidity, sedimentation, increased salinity, increased nutrient levels, pesticides and chemicals

Potential Acid Sulfate Soils

- changes in groundwater levels exposing PASS
- environmental harm from PASS in dredge spoil

Groundwater

- impacts to groundwater from significant earthworks, contamination or overuse during dry periods
- disruption of hydraulic connection between surface and groundwater

Wetlands

- extensive clearing for cultivation and development and construction of waterway barriers resulting in a changed hydrological regime and declining health/dieback of wetland communities
- temporary displacement of migratory birds during reclamation activities at the port
- ongoing operational impacts including noise, light, dust resulting in displacement of shorebirds from habitat
- encroachment of residential development and increased cultivation resulting in displacement of shorebirds from habitat.

8.8 Aquatic ecosystems – Estuarine and marine

8.8.1 General ecological description

Port of Hay Point

The Port of Hay Point is located within the GBRWHA and adjacent to the GBRMP. The offshore port infrastructure including jetties, wharves and the tug harbour are excluded from the GBRWHA but extend into the GBRMP.

The marine environment adjacent to the study area contributes to the diversity of environmental values in the region and importantly the OUV of the GBRWHA. The catchments that feed into the marine environment in the study area are some of the most modified catchments along the Queensland coast, with over 50% of catchment areas used for intensive agriculture such as sugar cane.

Port of Mackay

The marine environment adjacent to the study area contributes to the diversity of environmental values in the region and importantly the OUV of the GBRWHA.

The catchments that feed into the marine environment in the study area are some of the most modified catchments along the Queensland coast, with over 50% of catchment areas used for intensive agriculture, predominantly sugar cane farming and grazing. As a result of these agricultural land uses, water quality pollutants in the catchments within the study area include nitrogen and phosphorus, suspended sediment and residual herbicides (such as ametryn, atrazine, diuron, hexazinone, and tebuthiuron).[228] Urban areas also contribute to the total particulate nutrient load of the water in the study area.

8.8.2 Marine water quality

Port of Hay Point

Water quality in the marine environment of the study area is influenced by wind driven currents and large tidal currents, which causes naturally turbid waters as a result of resuspending sediments in the water column. Water quality analysis in the area surrounding the existing port infrastructure indicates that offshore areas have lower levels of nitrogen, higher salinities and dissolved oxygen saturation and pH than inshore sites.[229]

In 2014, NQBP implemented an ambient marine water quality monitoring program at the port to develop a long-term water quality dataset that could be used to characterise marine water quality conditions in the port area.[230] The monitoring program extends for 60km from Slade Point in the north to Freshwater Point in the south. There are 13 sites that are used for monitoring in this area, aligning with key sensitive habitats such as coral and seagrasses. A summary of the results of this monitoring program to date includes:

- total and dissolved nitrogen have been detected above guideline levels possibly due to the catchment runoff from farming and urban development land use activities.
- heavy metals are within guideline levels except at Mackay Marina where copper and lead are above ANZECC guidelines.
- herbicide ‘diuron’ detected above guideline levels at most sites.
- sediment and turbidity data showing resuspension of sediment is common during dry periods.
- survey data from Dudgeon Point recently indicates that nutrient concentrations are above relevant guidelines for the region which could be a result of local land use runoff or remobilisation of coastal sediments.

[228] North Queensland Bulk Ports Corporation Ltd. (2009). *Port of Mackay Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0015/3273/Port-of-Mackay-Land-Use-Plan-December-2009.pdf
[229] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point*.
[230] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential*).

Port of Mackay

Water quality in the marine environment of the study area is influenced by wind driven currents and large tidal currents, which causes naturally turbid waters as a result of constantly resuspending sediments in the water column. Water quality analysis in the area surrounding the existing port infrastructure indicates that offshore areas have lower levels of nitrogen, higher salinities and dissolved oxygen saturation and pH than inshore sites.[231]

The study area is located directly adjacent the GBRWHA. The major urban centre of Mackay, which is within the study area, has a population of 176,000 people concentrated in the coastal zone. Water quality in the GBRWHA as a result of run off from urban and agricultural land practices has declined significantly over the past century. Increased sediment, nutrients and herbicides have caused fish kills, blue green algal blooms, changes in fish populations and pest species in the region, especially at inshore reefs such as Round Top Island and Flat Top Island. Monitoring at inshore sites that are influenced by the O'Connell and Pioneer Rivers showed some of the highest nitrogen and phosphorus levels of all regions surveyed. As a result, seagrass in the study area is considered the be at higher risk of adverse impacts compared to other regions.[232]

In 2014, NQBP[233] implemented an ambient marine water quality monitoring program to develop a long-term water quality dataset that could be used to characterise marine water quality conditions in the study area. The monitoring program extends for 60km from Slade Point in the north of the study area to Freshwater Point, approximately 30km south of the study area. There are 13 sites that are used for monitoring in this area, aligning with key sensitive habitats such as coral and seagrasses. A summary of the results of this monitoring program to date includes:

- total and dissolved nitrogen have been detected above guideline levels possibly due to the catchment runoff from farming and urban development land use activities.
- heavy metals are within guideline levels except at Mackay Marina where copper and lead are above ANZECC guidelines.
- herbicide 'diuron' has been detected above guideline levels at most sites
- continuous sediment and turbidity data showing resuspension of sediment is common during dry periods.

The *2014–2021 Mackay Whitsunday Water Quality Improvement Plan* (WQIP) identifies areas of HEV and risks to the marine environment from land-based pollutants and developed ecosystem health indictors such as riparian vegetation, fish community health, barriers to fish migration, and flow to monitor water quality changes.[234]

The WQIP used targeted implementation of a range of activities to improve water quality and ecosystem health such as installation of fishways, rehabilitation of in-stream habitat, improved management of riparian areas as well as improved on-farm management practices and technologies.

The WQIP identifies the risks to water quality in the study area, the pollutants of concern and identifies waterways with greatest ecological value to establish priority areas and management plans.

8.8.3 Coastal processes

8.8.3.1 Bathymetry

Port of Hay Point

Within the Hay Point port area, siltation and erosion have occurred in various areas since capital dredging commenced in 2006; however, the natural bed elevations are relatively stable.[235] The natural seabed depth at

[231] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*
[232] Reef catchments. (2014). *Draft Water Quality Improvement Mackay Whitsunday 2014-2021.* Retrieved from http://reefcatchments.com.au/files/2015/06/WATER-QUALITY-IMPROVEMENT-PLAN-MACKAY-WHITSUNDAY-ISAAC-2014-2021_DRAFT.pdf.
[233] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential).*
[234] Reef catchments. (2014). *Draft Water Quality Improvement Mackay Whitsunday 2014-2021.* Retrieved from http://reefcatchments.com.au/files/2015/06/WATER-QUALITY-IMPROVEMENT-PLAN-MACKAY-WHITSUNDAY-ISAAC-2014-2021_DRAFT.pdf
[235] North Queensland Bulk Ports Corporation Ltd. (2018). *Environmental Risk Assessment, Port of Hay Point.*

the Port of Hay Point ranges from approximately 12m below lowest astronomical tide (LAT) with a gradual slope of 2m to 3m over a 9km distance offshore to the end of the departure path. The designed navigational depth for the departure path and apron is -14.9m LAT and the berth area varies from -16.6m to -19.6m LAT.[236]

Port of Mackay

To the east of the port, the area is naturally deep, typically below 10m LAT and there is a shoal on the southern side of the port entrance and a subtidal rocky reef at Slade Islet. The depths on the inner shelf range in the study area range from 0m to 20m.

8.8.3.2 Tides

Port of Hay Point

Tides at Hay Point are semi-diurnal: two high tides and two low tides occur each day. The tidal planes for Hay Point, as published by MSQ[237] are presented in **Table 63**. This area experiences a very high tidal range with a peak of 7.14m which is primarily due to local tidal amplification at Broad Sound.[238]

Table 63: Hay Point tidal planes

Tidal Plane	Tidal Level (mean LAT)
HAT	7.14
Mean High Water Springs (MHWS)	5.80
Mean High Water Neaps (MHWN)	4.48
AHD	3.37
Mean Low Water Neaps (MLWN)	2.25
Mean Low Water Springs (MLWS)	0.94
LAT	3.34

Port of Mackay

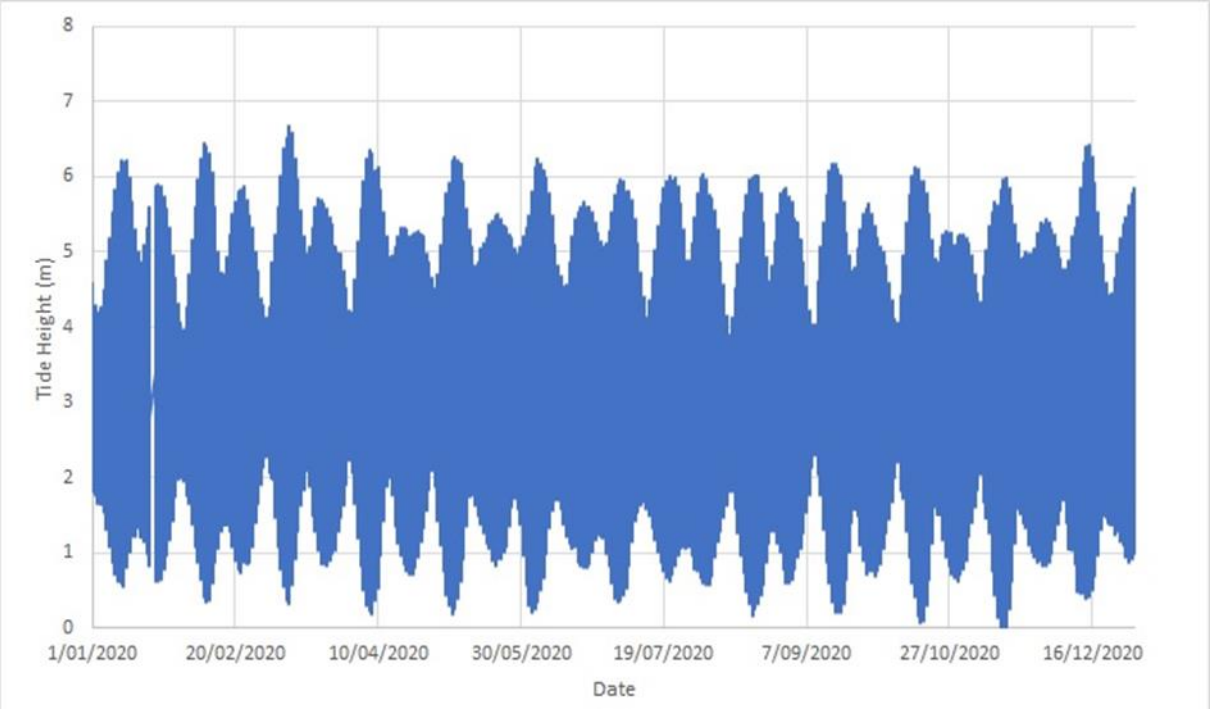
Tides at Mackay port are semi-diurnal: two high tides and two low tides occur each day. The tidal planes for the Port of Mackay, as published by MSQ, are listed in **Table 64**. This area experiences a very high tidal range with a peak of 6.58m. The tidal elevation records for 2020 are presented in **Figure 63**.

Table 64: Mackay port tidal planes

Tidal Plane	Tidal Level (mean LAT)
HAT	6.58
MHWS	5.29
MHWN	4.07
AHD	2.941
MLWN	1.96
MLWS	0.74

Source: Maritime Safety Queensland, 2021

[236] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point*.
[237] Maritime Safety Queensland. (2021) *Semidiurnal Tidal Planes 2021*. Retrieved from https://www.msq.qld.gov.au/Tides/Tidal-planes Accessed: 20/07/2021
[238] North Queensland Bulk Ports Corporation Ltd. (2018). *Environmental Risk Assessment, Port of Hay Point.*.



Source: Maritime Safety Queensland, 2021

Figure 63: Tidal elevation records recorded at Mackay

8.8.3.3 Currents

Port of Hay Point

Currents at Hay Point are influenced by the high tidal amplitude and wind.[239] Multiple previous studies have collected current data at Hay Point finding that the depth averaged current speeds vary between 0.2m per second and 0.5m per second (0.3m per second to 0.35m per second at the seabed) during spring and neap tides respectively.[240] Current directions vary, with the flood currents flowing to the south-southeast, the ebb current to the north-northwest and tidal induced currents flowing parallel to the coast.[241]

Port of Mackay

The large astronomical tides in this area drive the relatively high tidal currents in the area offshore of the port, while the tidal currents in the port are relatively low.[242] [243] A study established to measure hydrodynamics at the port found that peak tidal current speeds range from 0.3m per second to 0.8m per second. The direction of the flood current to the south-east is due to it being deflected by Slade Island and the port breakwaters.[244]

Within the GBR lagoon, regional scale circulation currents occur which are driven by complex interactions between oceanic inflows caused by the North Vanuatu Jet and local wind driven circulation.[245]

[239] Symonds, A. and Donald, J. (2016). *Hay Point Port: Bathymetric Analysis and Modelling*. Report for North Queensland Bulk Ports Corporation Ltd.
[240] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.
[241] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.
[242] Australian Government. (2021). *Geoscience Australia Portal*. Retrieved from https://portal.ga.gov.au/restore/38ed09a9-9e23-45eb-9016-dbe1dc92531d.
[243] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential*
[244] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential*
[245] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential*.

8.8.3.4 Waves

Port of Hay Point

Wave heights at Hay Point are proportional to the wind conditions in the lagoon area between the coast and the GBR. A wave rider buoy (WRB) at Hay Point provides a continuous measurement of parameters including significant wave height, maximum wave height, wave energy, wave direction and sea surface temperature. The significant wave height measured at the Hay Point WRB from January 2020 to May 2021[246] is shown in **Figure 64**. The plot shows that significant wave heights are typically less than 1.5m, with these wave heights only being exceeded during short duration (days) events. Over the 17-month duration shown there was only one event when the peak significant wave height exceeded 2m which was likely due to a storm event. During Tropical Cyclone Debbie in 2017, peak wave heights exceeded 3.5m at Hay Point.[247]

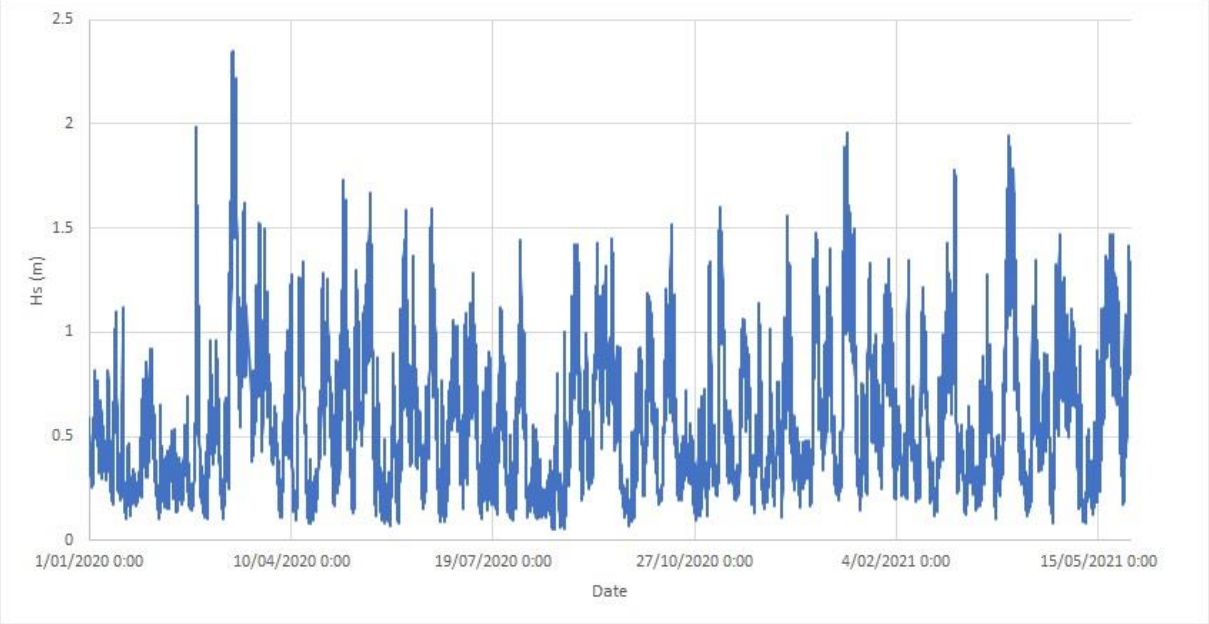


Figure 64: Measured wave height at the Hay Point wave rider buoy from January 2020 to May 2021

Port of Mackay

A WRB is located approximately 34km to the east-northeast of the Port of Mackay in 34m of water. This instrument provides a continuous measurement of parameters including significant wave height, maximum wave height, wave energy, wave direction and sea surface temperature. An analysis of the data from this WRB and the one located at Hay Point indicated that in the offshore environment, wave direction is predominantly from the east-south-east and significant wave height is less than 2.5m. In the nearshore environment wave direction is more variable and waves are typically from the east but also regularly occur from the east-north-east and east-south-east with a significant wave height of less than 1.5m the majority of the time.[248]

8.8.3.5 Sediment transport

Port of Hay Point

Sediment at Hay Point is composed of a thin (less than 300mm) upper layer of sand which overlays sands, clays and very stiff clays, interspersed with gravels, calcite nodules and decomposed bedrock.[249] Gravel content in the sediment increases with distance from shore.[250]

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[246] Queensland Government. (2021). *Coastal Data Systems – Waves* (Hay Point). Accessed 22/07/2021
[247] Royal Haskoning DHV. (2017). *Port of Hay Point Bathymetric Analysis Draft*. Report for North Queensland Bulk Ports Corporation Ltd
[248] North Queensland Bulk Ports Corporation Ltd (2020). *Port of Hay Point. Port Development Opportunities and Constraints Assessment – Final Report (Confidential*
[249] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.
[250] North Queensland Bulk Ports Corporation Ltd. (2017). *Sustainable sediment management assessment for maintaining navigational infrastructure Port of Hay Point*.

Prevailing currents and waves, which generate resuspension, create a highly active natural sediment transport mechanism at Hay Point.[251] Sediment in the central GBR is generally moving northwards within three defined sediment transportation processes including:

- littoral drift – along the surf zone
- nearshore turbidity – resuspension by waves, wind and tidal movements
- inner-shelf bedload transport – larger waves and stronger tidal currents resuspend larger particles.[252]

Port of Mackay

The Port of Mackay is an artificial harbour formed by rock breakwaters. Fine sediments occur within the harbour, transported there during flood tides. Sediments adjacent to the port are mainly composed of sand with areas of gravel, sand and mud with nearshore mud deposits near the mouth of the Pioneer River.[253] The silts and silty sands are deposited along much of this coastline by rivers and creeks including the Pioneer River. Strong tidal currents and waves result in the resuspension of finer sediments which are mobilised, leaving coarse sand and gravel.[254]

8.8.4 Marine Plants

Port of Hay Point

Marine plants include mangroves, seagrass, saltcouch, samphire (succulent) vegetation and adjacent plants such as melaleuca and casuarina. All marine plants are protected under the Fisheries Act as these habitats provide shelter, food and nursery areas for fish, especially estuarine dependent species. They are considered a vital natural resource that helps sustain fish for the future for commercial, traditional and recreational fishing.

Port of Mackay

Marine plants include mangroves, seagrass, saltcouch, samphire (succulent) vegetation and adjacent plants such as melaleuca and casuarina. All marine plants are protected under the Fisheries Act as these habitats provide shelter, food and nursery areas for fish, especially estuarine dependent species. They are considered a vital natural resource that helps sustain fish for the future for commercial, traditional and recreational fishing.

8.8.4.1 Mangroves and saltmarsh

Port of Hay Point

The study area contains a diverse range of intertidal habitats, including sandy beaches, exposed mud or sand flats, small rocky headlands, and mangrove-lined estuaries. Mangroves and intertidal areas provide significant habitat to various species of fish and crustaceans. Some of these species depend on mangroves at different stages of their lifecycle.[255] There is a 6m tidal variation within the study area which creates extensive foraging areas for a variety of species at low tide.[256] The mangrove communities provide important linkages between terrestrial and marine habitats, including seagrass meadows and mudflats. These habitats are critical for some fish species that live a portion of their lifecycle in freshwater and travel into marine areas to spawn.[257]

Mangroves provide protection to coastal zones by reducing the effects of storm surges and cyclonic events. Their extensive root system stabilises the shoreline, reduces erosion, and provides an effective wind break.[258] Mangroves and intertidal vegetation communities act as a water filter and provide separation between land and

[251] AECOM. (2016). *Port of Hay Point Sediment Dynamics*. Report prepared for North Queensland Bulk Ports.
[252] AECOM. (2016). *Port of Hay Point Sediment Dynamics*. Report prepared for North Queensland Bulk Ports.
[253] Jones, M. R. (1987). *Nearshore sediments and distribution patterns, Mackay Coast, Queensland*. Department of Mines Records Series, 1987/25 (unpublished)
[254] Jones, M. R. (1987). *Nearshore sediments and distribution patterns, Mackay Coast, Queensland*. Department of Mines Records Series, 1987/25 (unpublished)
[255] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Limited.
[256] Worley Parsons Consulting. (2013). *Long-term Maintenance Dredging Management Plan - Port of Hay Point*. Report prepared for North Queensland Bulk Ports Corporation Ltd.
[257] Worley Parsons Consulting. (2013). *Long-term Maintenance Dredging Management - Port of Hay Point*. Report prepared for North Queensland Bulk Ports Corporation Ltd.
[258] Worley Parsons Consulting. (2013). *Long-term Maintenance Dredging Management - Port of Hay Point*. Report prepared for North Queensland Bulk Ports Corporation Limited.

reef systems of GBR. Locally, mangroves are important sinks for suspended solids. Water is pumped in and out of mangrove systems with the tidal cycle, which causes the deposition of suspended solids within the mangroves, improving coastal water quality. Catchment runoff also flows through mangrove systems, which traps, processes, and stores sediment, organic matter, nutrients and pollutants (including metal and pesticides).[259]

The land component of the study area comprises an extensive network of minor watercourses that feed into the larger waterways of Bakers Creek, Sandy Creek and Alligator Creek, as well as smaller waterways including Louisa Creek, Mick Reedy Creek and Cabbage Tree Creek. The study area includes mapped waterways regulated under the Water Act and the Fisheries Act. Among these waterways there remain extensive tracts of remnant vegetation mapped as mangrove communities.

A review of current RE mapping indicates that approximately 2830ha of remnant mangrove forest (RE 8.1.1 - Mangrove closed forest to open shrubland of marine clay plains and estuaries) is mapped as remaining in the study area (see **Figure 65**).[260] This RE is classified as of 'Least Concern'. Additional composite RE communities mapped within the study area also contain mangroves although at very low densities and have not been included in this area calculation.

Of the 37 species of mangroves present within the GBRWHA, 21 occur in the Mackay region with the most common being the red mangrove (*rhizophora stylosa*), grey mangrove (*avicennia marina*) and yellow mangrove (*ceriops australis*).[261] Important areas of mangroves in the study area include:

- Sand Bay, listed as a wetland of national importance
- Slade Point and McCready's Creek
- Basset Basin, an estuary of the Pioneer River
- The Sandringham Bay – Bakers Creek Aggregation, listed as a wetland of national importance due to its mangrove diversity
- Hay Point Peninsula.

[259] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Corporation Environmental Values Assessment Revision 2*, unpublished report, prepared for NQBP, Brisbane.
[260] Department of Natural Resources, Mines and Energy. (2021). *Vegetation management regional ecosystem mapping, v11.0*. Accessed 01/04/2021.
[261] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Corporation Environmental Values Assessment Revision 2*, unpublished report, prepared for NQBP, Brisbane.

Figure 65: Areas of mangrove and salt couch – Port of Hay Point

The Sarina Inlet – Ince Bay Aggregation lies predominantly outside the study area but also has important areas of mangroves.[262]

Mangrove dieback has in the past been a concern for the communities within the study area. Significant mangrove dieback within the Sandringham Bay – Bakers Creek Aggregation was recorded in 2002, particularly impacting Grey mangrove. The use of photosystem II (PSII) herbicides, including diuron, within the catchment has been linked to this dieback.[263]

[262] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Corporation Environmental Values Assessment Revision 2*, unpublished report, prepared for NQBP, Brisbane.
[263] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*

Port of Mackay

The study area contains a diverse range of intertidal habitats, including sandy beaches, exposed mud or sand flats, small rocky headlands, and mangrove-lined estuaries. Mangroves and intertidal areas provide significant habitat to various species of fish and crustaceans. Some of these species depend on mangroves at different stages of their lifecycle.[264] There is a 6m tidal variation within the study area which creates extensive foraging areas for a variety of species at low tide.[265] The mangrove communities provide important linkages between terrestrial and marine habitats, including seagrass meadows and mudflats, which is critical for some fish species that live a portion of their lifecycle in freshwater, but travel into marine areas to spawn.[266]

Mangroves provide protection to coastal zones by reducing the effects of storm surges and cyclonic events. Their extensive root system stabilises the shoreline, reduces erosion, and provides an effective wind break.[267] Mangroves and intertidal vegetation communities act as a water filter and provide separation between land and reef systems of the GBR. Locally, mangroves are important sinks for suspended solids. Water is pumped in and out of mangrove systems with the tidal cycle, which causes the deposition of suspended solids within the mangroves, improving coastal water quality. Catchment runoff also flows through mangrove systems, which traps, processes, and stores sediment, organic matter, nutrients and pollutants (including metal and pesticides).[268]

The land component of the study area comprises an extensive network of minor watercourses that feed into the larger waterways of Pioneer River and Bakers Creek. The study area includes waterways regulated under the Water Act and the Fisheries Act. The broader Mackay region is considered an important area for the water mouse (*xeromys myoides*), which inhabits mangrove communities dominated by the yellow mangrove (*ceriops tagal*) and the orange mangrove (*bruguiera* spp.).[269] The Pioneer River system supports extensive mangrove communities that contain a diversity of mangrove species that are generally found throughout the Mackay region.[270] **Figure 66** is a representation of the areas of mangroves in the study area noting that marine plant communities can be highly variable in their growth and distribution and the figure should not be relied upon for the presence or absence of marine plants but is included as an indicator of extent of marine plant distribution within the study area.

Of the 37 species of mangroves present within the GBRWHA, 21 occur in the Mackay region with the most common being the red mangrove (*rhizophora stylosa*), grey mangrove (*avicennia marina*) and yellow mangrove (*eeriops australis*).[271]

Important areas of mangroves in the study area include[272]:

- Sand Bay (located 30km north of the study area), listed as a wetland of national importance
- Slade Point and McCready's Creek
- Basset Basin, an estuary of the Pioneer River
- The Sandringham Bay – Bakers Creek Aggregation, listed as a wetland of national importance due to its mangrove diversity

Mangrove dieback, particularly of the grey mangrove occurred throughout Pioneer River system and broader Mackay region. PSII herbicides, including diuron have been linked to the dieback.[273]

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[264] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Corporation Environmental Values Assessment Revision 2*, unpublished report, prepared for North Queensland Bulk Ports Corporation Ltd.
[265] Worley Parsons Consulting. (2013). *Long-term Maintenance Dredging Management - Port of Hay Point*. Report prepared for North Queensland Bulk Ports Corporation Ltd.
[266] Worley Parsons Consulting. (2013). *Long-term Maintenance Dredging Management - Port of Hay Point*. Report prepared for North Queensland Bulk Ports Corporation Ltd.
[267] Worley Parsons Consulting. (2013). *Long-term Maintenance Dredging Management - Port of Hay Point*. Report prepared for North Queensland Bulk Ports Corporation Ltd.
[268] Worley Parsons Consulting. (2013). *Long-term Maintenance Dredging Management - Port of Hay Point*. Report prepared for North Queensland Bulk Ports Corporation Ltd.
[269] Worley Parsons Consulting. (2013). *Long-term Maintenance Dredging Management - Port of Hay Point*. Report prepared for North Queensland Bulk Ports Corporation Ltd.
[270] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*
[271] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Corporation Environmental Values Assessment Revision 2*, unpublished report, prepared for NQBP, Brisbane.
[272] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Corporation Limited Environmental Values Assessment Revision 2*, unpublished report, prepared for NQBP, Brisbane.
[273] Bell and Duke. (2005). as reported in Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*

Figure 66: **Mapped mangrove habitat in the Mackay region**

8.8.4.2 Seagrass and macroalgae

Port of Hay Point

Seagrasses are extremely important to ecosystem function with a variety of food webs dependent upon decaying seagrass leaves and other components.[274] They are primary producers, and act to stabilise bottom

[274] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*.

sediments and are also an effective store for carbon.[275] Accordingly, seagrass meadows in the area could play a role in mitigating climate change given seagrass habitats are thought to be efficient in carbon sequestration. Seagrass is protected under the Fisheries Act and are MSES.

The larger species of seagrass play an important role in stabilising coastal sediments, reducing resuspension and erosion, particularly during storms. Seagrass meadows provide habitat for both resident and transient marine species and are particularly important as breeding and nursery habitat for a large number of invertebrate and fish species including prawns and other commercially important species. They are also the preferred food source of dugongs and green turtles.

Approximately half of the world's seagrass species inhabit the GBR.[276] Specifically, there are 15 species of seagrass that occur across the entire GBRWHA.[277] Key elements of survival for seagrass include: suitable light levels and sediment, appropriate salinity and temperature and nutrient ranges and minimal disturbance from natural and anthropogenic activities.

Common seagrass species in the Hay Point area include *halodule uninervis*, *halophila decipiens*, *halophila spinulosa* and *halophila uninervis*, which dominate shallow coastal meadows.

Deepwater seagrass meadows are present off the coast of Hay Point. These meadows are particularly variable, usually in low and medium densities, often occurring as small patches, during December and May.[278] These surveys also identified small patches of inshore seagrass adjacent to Dudgeon Point and Round Top island. Recent seagrass surveys for NQBP have also identified meadows within and adjacent to existing Dredge Material Placement Areas (DMPA).[279]

Seagrass surveys have been undertaken in the Mackay area periodically since 2001 and the Port of Mackay's *Long-Term Maintenance Dredging Management Plan* (LTMDMP) considers the risk to seagrass from maintenance dredging and placement activities to be low. Seagrass surveys conducted at Hay Point between 2004 and 2008 showed that a large-scale capital dredging program had a negative impact during the program; however, the low-density deepwater seagrass meadows recovered within 12 months of the cessation of the dredging program. This is in contrast to the 2019 surveys following periodic maintenance dredging at the port which did not appear to impact seagrass condition, suggesting that the management measures that have been implemented for dredging programs are achieving their objectives.

In 2015, NQBP introduced an annual ambient seagrass monitoring program that is conducted in the growing season between July and December. This program establishes long-term trends in seagrass distribution, cover and biomass.

The 2019 survey indicates that the overall seagrass condition in the broader Hay Point region has improved since the 2018 survey and seagrass communities in this area are now classified as 'good' to 'very good' in all monitoring locations. Biomass and area of coverage was found to be 'very high' in comparison to previous surveys.[280] This survey also noted that Hay Point offshore deep-water seagrasses had improved from 'poor' condition in 2018 to 'very good' condition in 2019 due to substantial increases in both biomass and seagrass meadow areas. Similarly, deep-water seagrass in the Mackay offshore monitoring area more than doubled in biomass and increased in area more than fourfold compared to the 2018 survey results. Coastal seagrass meadows at Dudgeon Point also improved from 'satisfactory' to 'good' condition and meadows at offshore Islands maintained their condition status as 'good'.

The improved seagrass condition considered to be likely due to two consecutive years with an absence of major storm and cyclone events.

[275] Australian Institute of Marine Science. (n.d). *A vulnerability assessment for the Great Barrier Reef*. Retrieved from https://www.gbrmpa.gov.au/__data/assets/pdf_file/0017/21743/VA-Seagrass-31-7-12.pdf. Accessed July 2021.
[276] Australian Institute of Marine Science. (n.d). *A vulnerability assessment for the Great Barrier Reef*. Retrieved from https://www.gbrmpa.gov.au/__data/assets/pdf_file/0017/21743/VA-Seagrass-31-7-12.pdf. Accessed July 2021.
[277] Australian Institute of Marine Science. (n.d). *A vulnerability assessment for the Great Barrier Reef*. Retrieved from https://www.gbrmpa.gov.au/__data/assets/pdf_file/0017/21743/VA-Seagrass-31-7-12.pdf. Accessed July 2021
[278] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*
[279] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*
[280] Yorke, P.H. and Rasheed, M.A. (2020). *Annual Seagrass Monitoring in the Mackay-Hay Point Region – 2019*, JCU Centre for Tropical Water & Aquatic Ecosystem Research Publication.

While seagrass communities in and adjacent to the Port of Hay Point are considered low density, ephemeral and spatially patchy, they do provide a small contribution to the maintenance of local habitat values for marine species including turtles and potentially dugong.[281]

Macroalgae communities in this region are considered to be variable in terms of density and frequency of occurrence with species observed including sargassum, udotea and caulerpa.[282] In the area surrounding the Port of Hay Point, macroalgae density is low (less than 1% to 5%),[283] while the seafloor offshore of the ports supports large areas of medium density algae (5-20%).[284]

Port of Mackay

Seagrasses are extremely important to ecosystem function with a variety of food webs dependent upon decaying seagrass leaves and other components.[285] They are primary producers, and act to stabilise bottom sediments and are also an effective store for carbon.[286] Accordingly, seagrass meadow areas could play a role in mitigating climate change given seagrass habitats are thought to be efficient in carbon sequestration. Seagrass is protected under the Fisheries Act and are MSES as inherent marine plants.

The larger species of seagrass play an important role in stabilising coastal sediments, reducing resuspension and erosion, particularly during storms. Seagrass meadows provide habitat for both resident and transient marine species and are particularly important as breeding and nursery habitat for a large number of invertebrate and fish species including prawns and other commercially important species. They are also the preferred food source of dugongs and green turtles.

Approximately half of the world's seagrass species inhabit the GBR.[287] There are 15 species of seagrass that occur across the entire GBRWHA.[288] Key element of survival include suitable light levels and sediment, appropriate salinity and temperature and nutrient ranges, minimal disturbance from natural and anthropogenic activities.

The WQIP states that seagrass meadows in the study area are naturally variable as a result of a variety of seasonal factors. Deepwater seagrasses are particularly transient and usually only occur between July and November. Two deepwater seagrass beds and one coastal seagrass bed have previously been observed in the waters offshore of the Port of Mackay, near the north-western shore of Round Top Island. A small area of seagrass has also been mapped within Slade Bay in the north of the study area.

Seagrass surveys have been undertaken in the Mackay area periodically since 2001 and the Port of Mackay LTMDMP considers the risk to seagrass from maintenance dredging and placement activities as low. The overall condition of the seagrass meadows in the Hay Point/Mackay region in 2020 was classified as 'satisfactory' which is a shift from their classification in 2019 of 'good'.[289] The Mackay offshore monitoring area recorded its largest area of deep-water seagrass in 2020 since sampling began in 2017, with the offshore islands (Keswick and Saint Bees) maintaining their overall 'good' condition for 2020.[290] The seagrass species

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[281] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[282] Adaptive Strategies. (2017). *North Queensland Bulk Port, Open Lines Consulting and RMC 2017, Port of Hay Point Sustainable Sediment Management Assessment for Navigational Maintenance (extract*). Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.
[283] Rasheed, M, Roder C, Thomas R. (2001). *Port of Mackay seagrass, algae and macro-invertebrate communities*, CRC Reef Research Centre Technical Report No. 43.
[284] Adaptive Strategies. (2017). *North Queensland Bulk Port, Open Lines Consulting and RMC 2017, Port of Hay Point Sustainable Sediment Management Assessment for Navigational Maintenance (extract*). Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.
[285] Adaptive Strategies. (2017). *North Queensland Bulk Port, Open Lines Consulting and RMC 2017, Port of Hay Point Sustainable Sediment Management Assessment for Navigational Maintenance (extract*). Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.
[286] Australian Institute of Marine Science. (n.d). *A vulnerability assessment for the Great Barrier Reef* Retrieved from https://www.gbrmpa.gov.au/__data/assets/pdf_file/0017/21743/VA-Seagrass-31-7-12.pdf. Accessed July 2021
[287] Adaptive Strategies. (2017). *North Queensland Bulk Port, Open Lines Consulting and RMC 2017, Port of Hay Point Sustainable Sediment Management Assessment for Navigational Maintenance (extract*). Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd
[288] Adaptive Strategies. (2017). *North Queensland Bulk Port, Open Lines Consulting and RMC 2017, Port of Hay Point Sustainable Sediment Management Assessment for Navigational Maintenance (extract*). Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.
[289] Yorke, P.H. and Rasheed, M.A. (2020). *Annual Seagrass Monitoring in the Mackay-Hay Point Region – 2019*, JCU Centre for Tropical Water & Aquatic Ecosystem Research Publication.
[290] Yorke, P.H. and Rasheed, M.A. (2020). *Annual Seagrass Monitoring in the Mackay-Hay Point Region – 2019*, JCU Centre for Tropical Water & Aquatic Ecosystem Research Publication.
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found in the monitoring meadows were typical of those found for coastal and offshore seagrasses in the Hay Point/Mackay region and more broadly in central Queensland. The deepwater assemblages were dominated by *Halophila decipiens* with *Halophila spinulosa* also occurring in the Mackay offshore monitoring area. *Halophila tricostata* and *Halophila spinulosa* dominated the two meadows at Keswick and Saint Bees Islands with smaller areas of *Halophila decipiens* and *Halophila ovalis*. The inshore meadows were dominated by *Halophila uninervis.*[291]

Macroalgae communities in this region are considered to be variable in terms of density and frequency of occurrence with species observed including *Sargassum*, *Udotea* and *Caulerpa.*[292] In the Mackay port study area, macroalgae communities are present in low density (less than 1% to 5%), however, a higher macroalgae cover occurs on the rocky reef areas surrounding Flat Top and Round Top Islands.[293] Benthic habitat assessments on the reefs (Round Top and Slade Rock) in the area indicate that over the past five years macroalgae coverage has increased on these reefs (17-50%), however, during the 2020 survey, the macroalgae cover had decreased (>13%), likely due to high water temperatures.[294]

8.8.5 Coral reefs

Port of Hay Point

There are several reefs in the waters offshore of Hay Point which are dominated by low to medium densities of sediment-tolerant hard coral species. Reefs within the study area include:

- Hay Reef
- Victor Islet
- Dudgeon Point.

Inshore coral reefs, such as those within the study area, contribute to the World Heritage values of the GBR and to the diversity of inshore waters, fisheries and tourism. Inshore turbid coral reefs communities are present at Hay Reef, which is located between the existing jetties at the HPCT. They are also present in shallow waters south of Dudgeon Point.

Fringing coral reefs are present on exposed rocky outcrops in waters off Victor Island and Round Top Island.[295] The corals that are common in the turbid marine environment found in the study area include (*genera montipora, acropora, pocillopora* and *turbinaria*) as well as a diverse range of soft corals, sea fans, ascidians and hydroids. These coral reef areas are important habitat for locally important fish and other marine species.

An ambient annual coral reef monitoring program has been undertaken in the Hay Point region since 2015. Monitoring sites have been established at Victor Islet within the Hay Point study area.

The coral community composition at the four monitoring locations is different and has been since the outset of monitoring.[296] The dominant genera/species at each of the monitoring sites from the most recent 2019-2020 survey are listed below:

- Victor Islet: *montipora* (50%) with *turbinaria* and *faviids*.

During the most recent survey (April 2020) the Mackay region reefs experienced a mass bleaching event which was consistent with broad-scale GBR surveys at the time that confirmed bleaching throughout the central and southern GBR at inshore and mid-shelf reefs.[297] There were four cyclonic weather events between 2010 and

[282] Yorke, P.H. and Rasheed, M.A. (2020). *Annual Seagrass Monitoring in the Mackay-Hay Point Region – 2019*, JCU Centre for Tropical Water & Aquatic Ecosystem Research Publication.
[292] Yorke, P.H. and Rasheed, M.A. (2020). *Annual Seagrass Monitoring in the Mackay-Hay Point Region – 2019*, JCU Centre for Tropical Water & Aquatic Ecosystem Research Publication.
[293] Rasheed, M, Roder C, Thomas R. (2001). *Port of Mackay seagrass, algae and macro-invertebrate communities*, CRC Reef Research Centre Technical Report No. 43.
[294] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication.
[295] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*.
[296] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[297] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication.

2015 in this region, two of which had major local impacts on hard coral cover. Then in March 2017, Tropical Cyclone Debbie severely impacted this area causing extensive physical damage to coral cover on the inshore reefs and since then there has been minimal recovery.[298]

While previous fringing reef surveys have suggested that there is rapid recovery of hard coral cover following cyclone events.[299] [300] This has not occurred on these fringing reefs and rather, declines in coral cover caused by extreme events have caused a permanent change in the community structure (**Table 65**).[301] [302]

Table 65: Grand mean coral cover at the three inshore monitoring sites – in the Port of Hay Point study area

Year	Grand mean coral cover
2016 (Prior to Tropical Cyclone Debbie in March 2017)	27.3%
2017 (Immediately following Tropical Cyclone Debbie)	22%
2018	21.%
2020	20.8%

Similarly, soft coral has been slow to recover following Tropical Cyclone Debbie and during the summer 2020 survey, soft coral cover was dramatically reduced on Round Top Island, probably due to bleaching mortality and was lowest ever recorded during the April 2020 survey.[303]

Over the past five years there has been an upward trend in macroalgal cover at the monitoring sites which may indicate a possible shift toward more algal dominated reef communities. During the 2020 survey, macroalgal cover at the inshore monitoring sites decreased which is likely related to the very high-water temperatures in this region in early 2020. A slow recovery of this macroalgal cover may provide opportunity for recovery of coral communities struggling from the impacts of cyclones.[304]

Port of Mackay

There are several reefs in the waters offshore of Mackay which are dominated by low to medium densities of sediment-tolerant hard coral species. Reefs within the study area include:

- Round Top Island
- Flat Top Island
- Slade Island
- Dangerous Reef
- Saint Bees Island
- Keswick Island.

Inshore coral reefs, such as those within the study area, contribute to the World Heritage values of the GBR and to the diversity of inshore waters, fisheries and tourism.

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[298] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication.
[299] Sato, Y., Bell, S.C., Nichols, C., Fry, K., Menendez, P. and Bourne, D.G. (2018). *Early phase dynamics in coral recovery following cyclone disturbance on the inshore Great Barrier Reef, Australia*. Coral Reefs, 1-13
[300] Ayling, A.M. and Ayling, A. L. (1995). *A preliminary survey of benthic communities on fringing reefs in the middle Cairns Section*. Unpublished report submitted to the Great Barrier Reef Marine Park Authority.

[301] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication.

[302] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication.

[303]Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication.

[304] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication.

The nearest coral and rocky reef habitats are at Slade Islet, Slade Point, Slade Rock and Dangerous Reef. The reefs at these locations consist of hard corals, sponges, bryozoans and soft corals.[305] These rocky and coral reef habitat areas are locally important to fish and other marine species.

Fringing coral reefs are present on exposed rocky outcrops in waters off Round Top Island and Flat Top Island.[306] The corals that are common in the turbid marine environment found in the study area include (*genera montipora*, *acropora*, *pocillopora* and *turbinaria*) as well as a diverse range of soft corals, sea fans, ascidians and hydroids. These coral reef areas are important habitat for locally important fish and other marine species.

An ambient annual coral reef monitoring program has been undertaken in the Hay Point/Mackay region since 2015. Monitoring sites have been established at Round Top Island, Victor Islet, Slade Islet and Keswick Island.

The coral community composition at the four monitoring locations is different and has been since the outset of monitoring.[307] The dominant species at each of the monitoring sites from the most recent 2019–2020 survey are listed below:

- Round Top Island: *turbinaria* (32%) with *montipora*, *siderastreids* and *faviids*
- Slade Islet: *montipora* (59%)
- Keswick Island: *acropora* (40%) with *montipora* and *poritids*.

During the most recent survey (April 2020) the Mackay region reefs were experiencing a mass bleaching event which was consistent with broad-scale GBR surveys at the time that confirmed bleaching throughout the central and southern GBR at inshore and mid-shelf reefs.[308] There were four cyclonic weather events between 2010 and 2015 in this region, two of which had major local impacts on hard coral cover. Then in March 2017, Tropical Cyclone Debbie severely impacted this area causing extensive physical damage to coral cover on the inshore reefs and since then there has been minimal recovery.[309]

While previous fringing reef surveys have suggested that there is rapid recovery of hard coral cover following cyclone events.[310] [311] This has not occurred on these fringing reefs and rather, declines in coral cover caused by extreme events have caused a permanent change in the community structure (**Table 66**).[312] [313]

Table 66: Grand mean coral cover at the three inshore monitoring sites in the Port of Mackay study area

Year	Grand mean coral cover
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2020	20.8%

Similarly, soft coral has been slow to recover following Tropical Cyclone Debbie and during the summer 2020 survey, soft coral cover was dramatically reduced on Round Top Island, probably due to bleaching mortality and was lowest ever recorded during the April 2020 survey.[314]

Over the past five years there has been an upward trend in macroalgal cover at the monitoring sites which may indicate a possible shift toward more algal dominated reef communities. During the 2020 survey, macroalgal cover at the inshore monitoring sites decreased which is likely related to the very high-water temperatures in

[305]North Queensland Bulk Ports Corporation Ltd. (2011). *Long Term Dredge Management Plan. Mackay Port 2012 -2022.*
[306] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*.
[307] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[308] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication.
[309] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication
[310] Sato, Y., Bell, S.C., Nichols, C., Fry, K., Menendez, P. and Bourne, D.G. (2018). *Early phase dynamics in coral recovery following cyclone disturbance on the inshore Great Barrier Reef, Australia*. Coral Reefs, 1-13
[311] Ayling, A.M. and Ayling, A. L. (1995). *A preliminary survey of benthic communities on fringing reefs in the middle Cairns Section*. Unpublished report submitted to the Great Barrier Reef Marine Park Authority.
[312] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication.
[313] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication
[314] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication

this region in early 2020. A slow recovery of this macroalgal cover may provide opportunity for recovery of coral communities struggling from the impacts of cyclones.[315]

8.8.6 Benthic macroinvertebrates

Port of Hay Point

The extent and density of mixed benthic macroinvertebrate assemblages (for example, hard and soft corals, echinoids, ascidians, bivalves and bryozoans) across the entire port area were surveyed in 2010.[316] The results indicated that the density and extent of benthic macroinvertebrate were very similar to the extent and density identified during baseline studies in 2004.

These previous studies identified two regions where a moderate density of benthic macroinvertebrates occurred, located within and due west of the DMPA. Those regions supporting moderate density cover, only comprised 4% of the total survey area. All other regions contained low density to open communities (covering 60% and 36% of area surveyed, respectively). The two regions of moderate density benthic macroinvertebrate contained patches of rubble and substrate with a diverse variety of erect and encrusting bryozoans and polychaete worms. One of these regions is located entirely within the boundaries of the existing DMPA and the other is due west (seaward) of existing DMPA.[317]

The remaining areas show low density to open communities contained mostly open substrate with scattered individuals and/or small and discontinuous but diverse patches containing varying combinations of erect and encrusting taxa. Taxa within those patches included bryozoans, polychaete worms, echinoids, gastropods, barnacles and bivalves. These faunae are common components of the macroinvertebrate inshore assemblages of northern Queensland.[318]

Port of Mackay

Sampling of benthic macroinvertebrates has previously been conducted within the Mackay port limits and concentrated in the harbour and dredge spoil disposal grounds. Low density community covered most of the survey area but there were significant areas of benthic macro-invertebrate communities with higher density found in proximity to the harbour and approach channels. The communities consisted of sponges, bryozoa, hydroids, *alcyonarians* and *ophiuroids*.[319]

8.8.7 Listed Fish Species

Port of Hay Point

A total of 33 listed marine fish species were identified from the PMST search as inhabiting or potentially inhabiting the study area. Of those listed, 24 are species of pipefish, three pipehorse, four seahorse and two ghostpipefish species (**Table 67**).

While not identified through the PMST or WildNet database searches, a report by NQBP reported that freshwater fish sampling within Louisa Creek, upstream of the assessment site, recorded nine species of fish, including the swamp eel, marbled eel, mosquito fish, empire dudgeon, spangled perch, eastern rainbow fish, guppy and the banded scat. No further information was provided for these species.[320]

Table 67: Listed fish species identified by the protected matters search tool search – Port of Hay Point

Species	Common name	Presence within study area
Acentronura tentaculata	Shortpouch Pygmy Pipehorse	Species or species habitat may occur within area

[315] Ayling, T., Ayling, A. and Chartrand, K.M. (2020). *Ports of Mackay and Hay Point Ambient Coral Monitoring Surveys: 2019-2020*. Centre for Tropical Water and Aquatic Ecosystem Research Publication
[316] Thomas, R. and Rasheed, M. (2010). *Port of Hay Point Seagrass, Algae and Benthic Macro-invertebrate Survey – October 2010*. (DEEDI, Cairns)
[317] Thomas, R. and Rasheed, M. (2010). *Port of Hay Point Seagrass, Algae and Benthic Macro-invertebrate Survey – October 2010*.
[318] Thomas, R. and Rasheed, M. (2010). *Port of Hay Point Seagrass, Algae and Benthic Macro-invertebrate Survey – October 2010*.
[319] Rasheed, M, Roder C, Thomas R. (2001). *Port of Mackay seagrass, algae and macro-invertebrate communities*, CRC Reef Research Centre Technical Report No. 43..
[320] North Queensland Bulk Ports Corporation Ltd. (2017). *Sustainable sediment management assessment for maintaining navigational infrastructure Port of Hay Point*.

Species	Common name	Presence within study area
Campichthys tryoni	Tryon's Pipefish	Species or species habitat may occur within area
Choeroichthys brachysoma	Pacific Short-Bodied Pipefish, Short-Bodied Pipefish	Species or species habitat may occur within area
Corythoichthys amplexus	Fijian Banded Pipefish, Brown-Banded Pipefish	Species or species habitat may occur within area
Corythoichthys flavofasciatus	Reticulate Pipefish, Yellow-Banded Pipefish, Network Pipefish	Species or species habitat may occur within area
Corythoichthys intestinalis	Australian Messmate Pipefish, Banded Pipefish	Species or species habitat may occur within area
Corythoichthys haematopterus	Reef-Top Pipefish	Species or species habitat may occur within area
Corythoichthys ocellatus	Orange-Spotted Pipefish, Ocellated Pipefish	Species or species habitat may occur within area
Corythoichthys paxtoni	Paxton's Pipefish	Species or species habitat may occur within area
Corythoichthys schultzi	Schultz's Pipefish	Species or species habitat may occur within area
Doryrhamphus excisus	Bluestripe Pipefish, Indian Blue-Stripe Pipefish, Pacific Blue-Stripe Pipefish	Species or species habitat may occur within area
Filicampus tigris	Tiger Pipefish	Species or species habitat may occur within area
Festucalex cinctus	Girdled Pipefish	Species or species habitat may occur within area
Halicampus dunckeri	Red-Hair Pipefish, Duncker's Pipefish	Species or species habitat may occur within area
Halicampus grayi	Mud Pipefish, Gray's Pipefish	Species or species habitat
Halicampus nitidus	Glittering Pipefish	Species or species habitat may occur within area
Halicampus spinirostris	Spiny-Snout Pipefish	Species or species habitat may occur within area
Hippichthys cyanospilos	Blue-Speckled Pipefish, Blue-Spotted Pipefish	Species or species habitat may occur within area
Hippichthys heptagonus	Madura Pipefish, Reticulated Freshwater Pipefish	Species or species habitat may occur within area
Hippichthys penicillus	Beady Pipefish, Steep-Nosed Pipefish	Species or species habitat may occur within area
Hippocampus bargibanti	Pygmy Seahorse	Species or species habitat may occur within area
Hippocampus kuda	Spotted Seahorse, Yellow Seahorse	Species or species habitat may occur within area
Hippocampus planifrons	Flat-Face Seahorse	Species or species habitat may occur within area
Hippocampus zebra	Zebra Seahorse	Species or species habitat may occur within area
Lissocampus runa	Javelin Pipefish	Species or species habitat may occur within area
Micrognathus andersonii	Anderson's Pipefish, Shortnose Pipefish	Species or species habitat may occur within area
Micrognathus brevirostris	Thorntail Pipefish, Thorn-Tailed Pipefish	Species or species habitat may occur within area
Nannocampus pictus	Painted Pipefish, Reef Pipefish	Species or species habitat may occur within area
Solegnathus hardwickii	Pallid Pipehorse, Hardwick's Pipehorse	Species or species habitat may occur within area
Solenostomus cyanopterus	Robust Ghostpipefish, Blue-Finned Ghost Pipefish	Species or species habitat may occur within area
Solenostomus paradoxus	Ornate Ghostpipefish, Harlequin Ghost Pipefish Ornate Ghost Pipefish	Species or species habitat may occur within area
Syngnathoides biaculeatus	Double-End Pipehorse, Double-Ended Pipehorse, Alligator Pipefish	Species or species habitat may occur within area
Trachyrhamphus bicoarctatus	Bentstick Pipefish, Bend Stick Pipefish, Short-Tailed Pipefish	Species or species habitat

Port of Mackay

A total of 33 listed marine fish species were identified from the PMST search as inhabiting or potentially inhabiting the study area. Of those listed, 24 are species of pipefish, three pipehorse, four seahorse and two ghostpipefish species (**Table 68**).

While not identified through the PMST or WildNet database searches, freshwater fish sampling within Louisa Creek, upstream of the assessment site, recorded nine species of fish, including the swamp eel, marbled eel, mosquito fish, empire gudgeon, spangled perch, eastern rainbow fish, guppy and the banded scat.[321]

Table 68: Listed fish species identified by the protected matters search tool search – Port of Mackay

Species	Common name	Presence within study area
Acentronura tentaculata	Shortpouch Pygmy Pipehorse	Species or species habitat may occur within area
Campichthys tryoni	Tryon's Pipefish	Species or species habitat may occur within area
Choeroichthys brachysoma	Pacific Short-Bodied Pipefish, Short-Bodied Pipefish	Species or species habitat may occur within area
Choeroichthys suillus	Pig-Snouted Pipefish	Species or species habitat may occur within area
Corythoichthys amplexus	Fijian Banded Pipefish, Brown-Banded Pipefish	Species or species habitat may occur within area
Corythoichthys haematopterus	Reef-Top Pipefish	Species or species habitat may occur within area
Corythoichthys flavofasciatus	Reticulate Pipefish, Yellow-Banded Pipefish, Network Pipefish	Species or species habitat may occur within area
Corythoichthys intestinalis	272Ustralian Messmate Pipefish, Banded Pipefish	Species or species habitat may occur within area
Corythoichthys ocellatus	Orange-Spotted Pipefish, Ocellated Pipefish	Species or species habitat may occur within area
Corythoichthys paxtoni	Paxton’s Pipefish	Species or species habitat may occur within area
Corythoichthys schultzi	Schultz’s Pipefish	Species or species habitat may occur within area
Cosmocapus darrosanus	D’arros Pipefish	Species or species habitat may occur within area
Doryrhamphus excisus	Bluestripe Pipefish, Indian Blue-Stripe Pipefish, Pacific Blue-Stripe Pipefish	Species or species habitat may occur within area
Filicampus tigris	Tiger Pipefish	Species or species habitat may occur within area
Festucalex cinctus	Girdled Pipefish	Species or species habitat may occur within area
Halicampus dunckeri	Red-Hair Pipefish, Duncker's Pipefish	Species or species habitat may occur within area
Halicampus grayi	Mud Pipefish, Gray's Pipefish	Species or species habitat
Halicampus nitidus	Glittering Pipefish	Species or species habitat may occur within area
Halicampus spinirostris	Spiny-Snout Pipefish	Species or species habitat may occur within area
Hippichthys cyanospilos	Blue-Speckled Pipefish, Blue-Spotted Pipefish	Species or species habitat may occur within area
Hippichthys heptagonus	Madura Pipefish, Reticulated Freshwater Pipefish	Species or species habitat may occur within area
Hippichthys penicillus	Beady Pipefish, Steep-Nosed Pipefish	Species or species habitat may occur within area
Hippocampus bargibanti	Pygmy Seahorse	Species or species habitat may occur within area

[321] North Queensland Bulk Ports Corporation Ltd. (2017). *Sustainable sediment management assessment for maintaining navigational infrastructure Port of Hay Point*.

Species	Common name	Presence within study area
Hippocampus kuda	Spotted Seahorse, Yellow Seahorse	Species or species habitat may occur within area
Hippocampus planifrons	Flat-Face Seahorse	Species or species habitat may occur within area
Hippocampus zebra	Zebra Seahorse	Species or species habitat may occur within area
Lissocampus runa	Javelin Pipefish	Species or species habitat may occur within area
Micrognathus andersonii	Anderson's Pipefish, Shortnose Pipefish	Species or species habitat may occur within area
Micrognathus brevirostris	Thorntail Pipefish, Thorn-Tailed Pipefish	Species or species habitat may occur within area
Nannocampus pictus	Painted Pipefish, Reef Pipefish	Species or species habitat may occur within area
Solegnathus hardwickii	Pallid Pipehorse, Hardwick's Pipehorse	Species or species habitat may occur within area
Solenostomus cyanopterus	Robust Ghostpipefish, Blue-Finned Ghost Pipefish	Species or species habitat may occur within area
Solenostomus paradoxus	Ornate Ghostpipefish, Harlequin Ghost Pipefish Ornate Ghost Pipefish	Species or species habitat may occur within area
Syngnathoides biaculeatus	Double-End Pipehorse, Double-Ended Pipehorse, Alligator Pipefish	Species or species habitat may occur within area
Trachyrhamphus bicoarctatus	Bentstick Pipefish, Bend Stick Pipefish, Short-Tailed Pipefish	Species or species habitat may occur within area
Trachyrhamphus longirostris	Straightstick Pipefish, Long-Nosed Pipefish, Straight Stick Pipefish	Species or species habitat may occur within area

8.8.8 Fish Habitat Areas

Port of Hay Point

A declared FHA is an area protected against physical disturbance from coastal development, while still allowing legal fishing. Listed as a MSES, FHAs ensure that development is undertaken in a manner that protects inshore and estuarine fish habitats (for example, vegetation, sand bars and rocky headlands), in order to facilitate sustainable local and regional fisheries.[322]

There are no declared FHAs in the Hay Point study area.

Fish abundance in the Hay Point area is reportedly low on the open sandy seabed areas and in the sparse seagrass when compared to other inshore areas in Queensland where seagrass is denser.[323] The diversity and abundance of fish is considerably higher in the reef habitats at Victor Islet where reef communities are dominated by typical inshore species including wrasses, damselfishes, angelfishes, butterflyfishes and snappers.[324]

Port of Mackay

A FHA is an area protected against physical disturbance from coastal development, while still allowing legal fishing. Listed as a MSES, FHAs ensure that development is undertaken in a manner that protects inshore and estuarine fish habitats (for example, vegetation, sand bars and rocky headlands) to facilitate sustainable local and regional fisheries.[325]

A declared FHA known as Basset Basin is located within the study area (**Figure 67**). The Bassett Basin declared FHA was originally gazetted in 1999, with its boundaries most recently updated in March 2008.

[322] Department of Environment and Science. (2020). *Declared fish habitat areas*. Retrieved from https://parks.des.qld.gov.au/management/managed-areas/fha. Accessed 5/6/2021.
[323] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd
[324] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd
[325] Department of Environment and Science. (2020). *Declared fish habitat areas*. Retrieved from https://parks.des.qld.gov.au/management/managed-areas/fha. Accessed 5/6/2021

Key habitat values for Bassett Basin declared FHA include open Rhizophora shrubland, sand bars and tidal channels; saltmarsh; undercut banks; melaleuca wetlands. Its fisheries values include: Barramundi; blue salmon; bream; estuary cod; flathead; grunter; mangrove jack; queenfish; whiting; mud crabs; tiger prawns; grey mackerel nursery. Key management features for Bassett Basin declared FHA include:

- Conservation and management of fish habitats in the Pioneer River and adjoining creeks
- protection of recreational, Indigenous and commercial fishing
- buffer zone between human influence and the tidal environment
- local educational resource.

The Basset Basin declared FHA provides habitat for Barramundi; blue salmon; bream; estuary cod; flathead; grunter; mangrove jack; queenfish; whiting; mud crabs; tiger prawns; grey mackerel nursery.[326]

[326] Department of Environment and Science. *Declared Fish Habitat Area summary – Bassett Basin*. Retrieved from https://parks.des.qld.gov.au/management/managed-areas/fha/area-plans/bassett. Accessed July 2021.

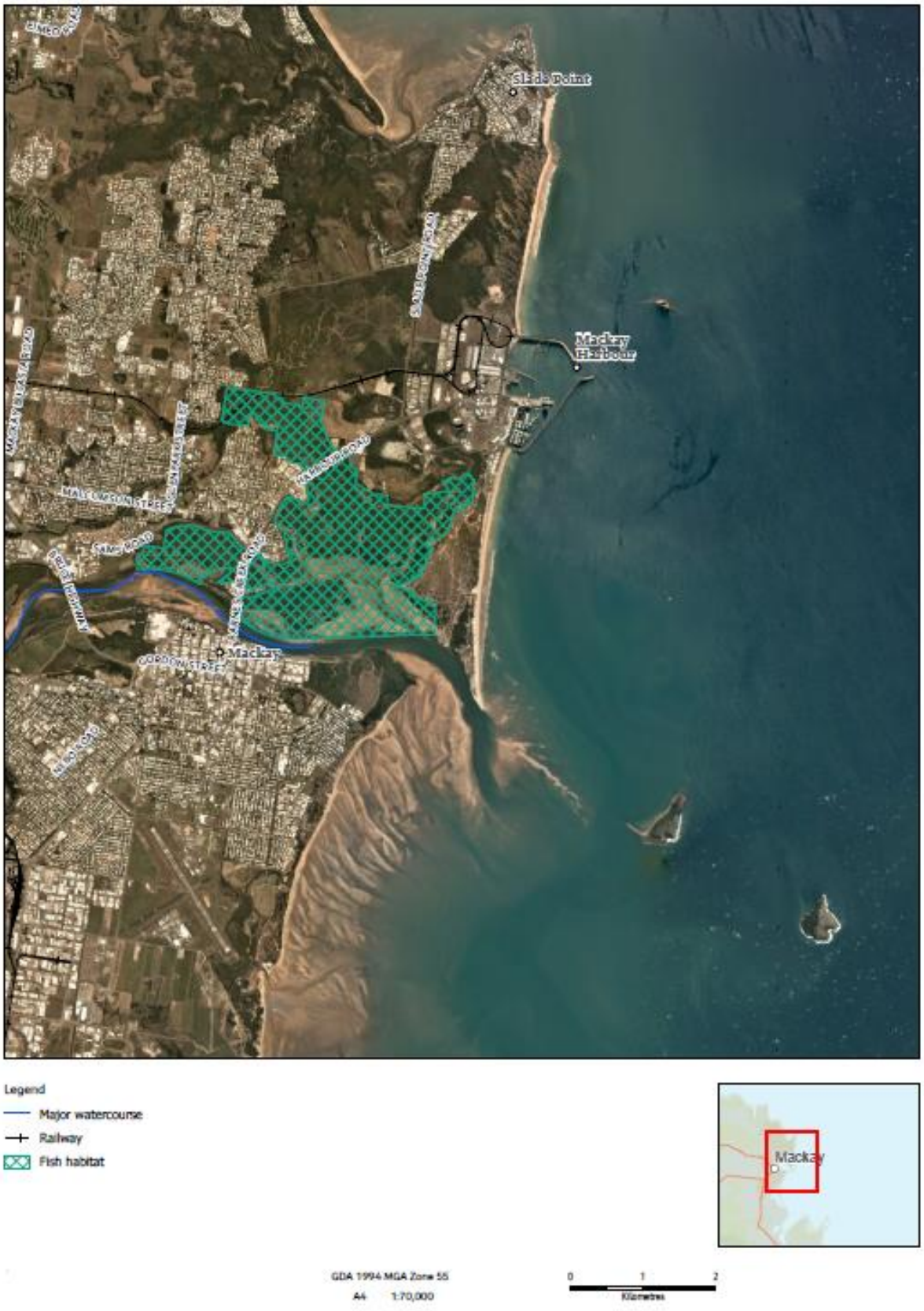

Figure 67: Fish habitat areas in the Mackay region

8.8.9 Benthic Fauna

Port of Hay Point

Benthic fauna includes animals and protozoans that live within (infauna) or on (epifauna) the seabed.[327] Infauna communities comprise mostly of polychaete worms, molluscs and small crustaceans, but can also include other groups. Benthic epifauna include macroinvertebrates such echinoids, sponges, ascidians, bivalves, byrozoans and crustaceans.

Benthic fauna are directly linked to the substrate in which they live and therefore are highly susceptible to any changes to this environment. For example, infauna community composition is significantly affected by sediment characteristics, and therefore by water quality factors such as turbidity, sedimentation rate and nutrient levels. As a result, climatic events such as cyclones and anthropogenic impacts including dredging in the vicinity of the ports are considered to significantly affect the composition and distribution of the infauna within a localised area.

The extent and density of benthic macroinvertebrate assemblages (for example, hard and soft corals, echinoids, ascidians, bivalves and bryozoans) across the entire port area have been most recently surveyed by Thomas et al (2010).[328] The results indicated that the density and extent of benthic macroinvertebrate were very similar to the extent and density identified during baseline studies in 2004.

These previous studies identified two regions where moderate density of benthic macroinvertebrates occurred, located within and due west of the DMPA. Those regions supporting moderate density cover, only comprise 4% of the total survey area. All other regions contained low density to open communities (covering 60% and 36% of area surveyed, respectively). The two regions of moderate density benthic macroinvertebrate contained patches of rubble and substrate with a diverse variety of erect and encrusting bryozoans and polychaete worms. One of these regions is located entirely within the boundaries of the existing DMPA[329] and the other is due west (seaward) of existing DMPA.

The remaining area show low density to open communities contained mostly open substrate with scattered individuals and/or small and discontinuous but diverse patches containing varying combinations of erect and encrusting taxa. Thomas et al. also noted that taxa within those patches included bryozoans, polychaete worms, echinoids, gastropods, barnacles and bivalves.[330] These faunae are common components of the macroinvertebrate inshore assemblages of northern Queensland.

BMA carried out post dredging surveys in October 2011 at the same sites indicate that assemblages were consistent with those observed pre-dredging, indicating resilience and/or recovery of invertebrate communities to dredging related influences.

Minimal research has been undertaken on benthic fauna within the GBR, and more specifically within the study area. Accordingly, the potential impacts from changing conditions and further development at the port are not well understood.

Port of Mackay

Benthic fauna include animals and protozoans that live within (infauna) or on (epifauna) the seabed.[331] Infauna communities comprise mostly of polychaete worms, molluscs and small crustaceans, but can also include other groups. Benthic epifauna include macroinvertebrates such echinoids, sponges, ascidians, bivalves, byrozoans and crustaceans.

Benthic fauna are directly linked to the substrate in which they live and therefore are highly susceptible to any changes to this environment. For example, Infauna community composition is significantly affected by sediment characteristics, and therefore by water quality factors such as turbidity, sedimentation rate and nutrient levels. As a result, climatic events such as cyclones and anthropogenic impacts including dredging in the vicinity of the ports are considered to significantly affect the composition and distribution of the infauna within a localised area.

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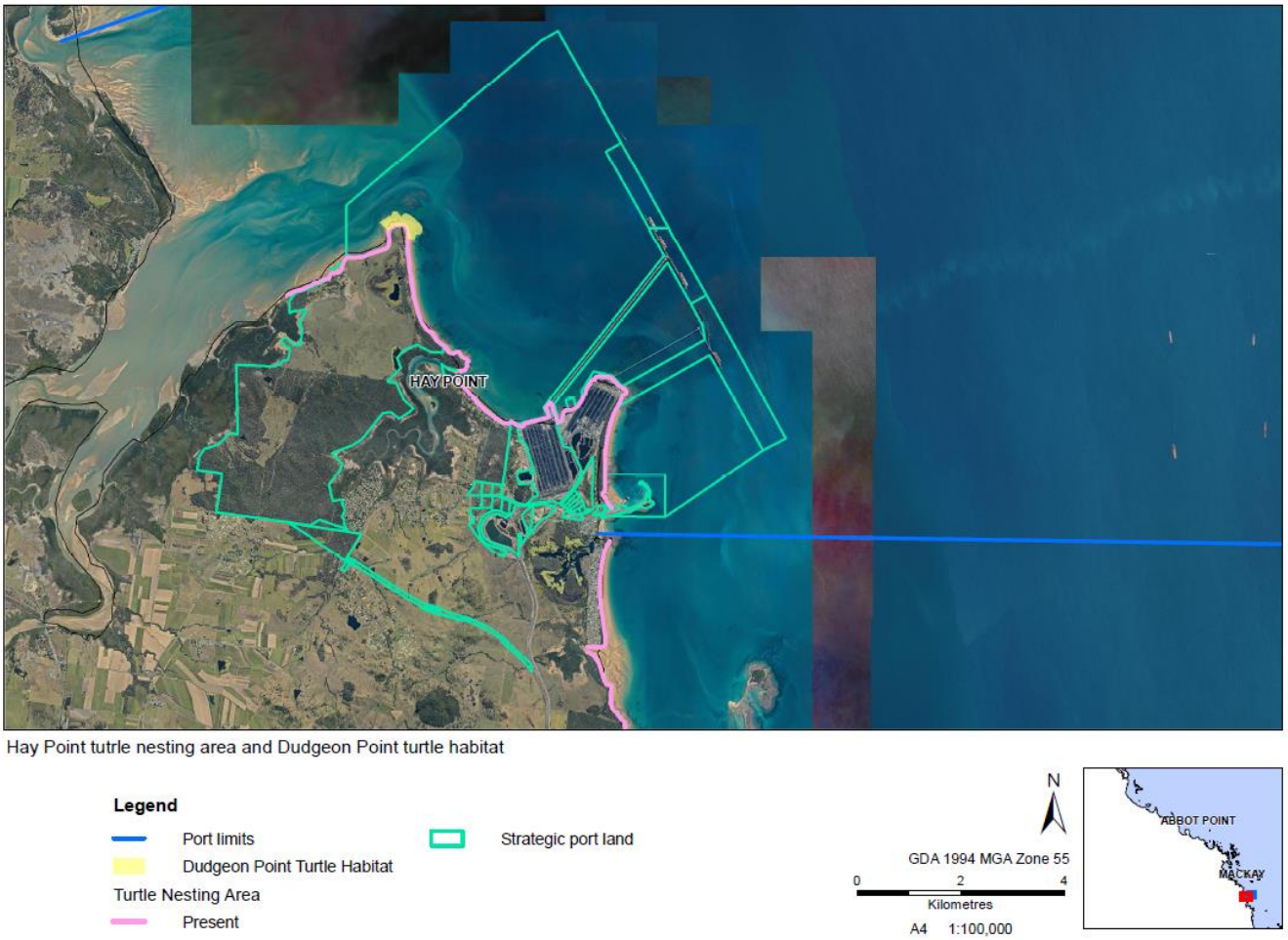
[327] Papenmeier, S et al. (2020). *Seafloor Geomorphology as Benthic Habitat (Second Edition), GeoHab Atlas of Seafloor Geomorphic Features and Benthic Habitats.* Retrieved from https://www.sciencedirect.com/science/article/pii/B9780128149607000257..
[328] Thomas, R. and Rasheed, M. (2010). *Port of Hay Point Seagrass, Algae and Benthic Macro-invertebrate Survey – October 2010*.
[329] Thomas, R. and Rasheed, M. (2010). *Port of Hay Point Seagrass, Algae and Benthic Macro-invertebrate Survey – October 2010*.
[330] Thomas, R. and Rasheed, M. (2010). *Port of Hay Point Seagrass, Algae and Benthic Macro-invertebrate Survey – October 2010*.
[331] Papenmeier, S et al. (2020). *Seafloor Geomorphology as Benthic Habitat (Second Edition), GeoHab Atlas of Seafloor Geomorphic Features and Benthic Habitats.* Retrieved from https://www.sciencedirect.com/science/article/pii/B9780128149607000257.

Minimal research has been undertaken on benthic fauna within the GBR, and more specifically within the study area. Accordingly, the potential impacts from changes conditions and further development at the port are not well understood.

8.8.10 Marine reptiles

Port of Hay Point

A total of 22 marine reptiles were identified from the PMST search as potentially inhabiting the study area and are presented in **Table 69**. Of these three are listed as 'Endangered' and three are listed as 'Vulnerable'. All six of these species have been observed in the offshore, intertidal, estuarine and shoreline habitats in the Hay Point Region (see **Figure 68**).[332]



Hay Point tutrle nesting area and Dudgeon Point turtle habitat

Figure 68: Turtle Nesting Area and Dudgeon Point Turtle Habitat – Port of Hay Point

Green turtles (*Chelonia mydas*) are the most frequently observed marine turtle in the study area and they have occasionally been recorded nesting on beaches between Dudgeon Point and Mount Hector Conservation Park as well as in low density within Hay Point port limits.[333] The inshore areas of Hay Point port have been observed to support a small foraging population of Green turtles which may be feeding on algal covered rocky substrates.[334]

Flatback turtles (*Natator depressus*) are the dominant nesting species in this region and nesting sites occur on the mainland beaches between November and April. Usually between 30-100 nesting turtles are recorded annually.[335] Haliday Bay north of Mackay is recognised as one of the most important Flatback turtle nesting

[332] Papenmeier, S et al. (2020). *Seafloor Geomorphology as Benthic Habitat (Second Edition), GeoHab Atlas of Seafloor Geomorphic Features and Benthic Habitats. Retrieved from* https://www.sciencedirect.com/science/article/pii/B9780128149607000257..
[333] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[334] Bell, I. (2003). *Turtle population dynamics in the Hay Point, Abbot Point and Lucinda Port Areas*.
[335] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*

beaches in the Mackay region.[336] Within the study area, Hay Point Beach and Salonika Beach are the most heavily used but nesting has also been observed on McEwans Beach, Louisa Beach, Ballykeel Beach and Far Beach.[337]

Leatherback turtles (*Dermochelys coriacea*) are not common in the area with only a single record from 1993. Similarly, while loggerhead turtles have been sighted, they appear to be only occasional visitors to the area.[338]

Table 69: Marine reptile species of conservation significance present / habitat present in the Port of Hay Point study area

Environment Protection and Biodiversity Conservation Act 1999 (Cth)	***Nature Conservation Act 1992***
E – Endangered V – Vulnerable	E – Endangered V – Vulnerable

Species	**Common name**	***Environment Protection and Biodiversity Conservation Act 1999 (Cth)***	***Nature Conservation Act 1992***	**Presence within study area**
Acalyptophis peronii	Horned Seasnake	-	-	Species or species habitat may occur within area
Aipysurus duboisii	Dubois' Seasnake	-	-	Species or species habitat may occur within area
Aipysurus eydouxii	Spine-tailed Seasnake	-	-	Species or species habitat may occur within area
Aipysurus laevis	Olive Seasnake	-	-	Species or species habitat may occur within area
Astrotia stokesii	Stokes' Seasnake	-	-	Species or species habitat may occur within area or species habitat
Caretta caretta	Loggerhead Turtle	E	E	Foraging, feeding behaviour known to occur within area
Chelonia mydas	Green Turtle	V	V	Breeding known to occur within area
Crocodylus porosus	Salt-water Crocodile, Estuarine Crocodile	-	-	Species or species habitat likely to occur within area
Dermochelys coriacea	Leatherback Turtle, Leathery Turtle, Luth	E	E	Breeding likely to occur within habitat
Disteira kingii	Spectacled Seasnake	-	-	Species or species habitat may occur within area
Disteira major	Olive-headed Seasnake	-	-	Species or species habitat
Emydocephalus annulatus	Turtle-headed Seasnake	-	-	Species or species habitat may occur within area

[336] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[337] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[338] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	*Nature Conservation Act 1992*	Presence within study area
Eretmochelys imbricata	Hawksbill Turtle	V	E	Species or species habitat known to occur within area
Hydrophis elegans	Elegant Seasnake	-	-	Species or species habitat may occur within area
Hydrophis mcdowelli	null	-	-	Species or species habitat
Hydrophis ornatus	Spotted Seasnake, Ornate Reef Seasnake	-	-	Species or species habitat may occur within area
Lapemis hardwickii	Spine-bellied Seasnake	-	-	Species or species habitat may occur within area
Laticauda colubrina	a sea krait	-	-	Species or species habitat may occur within area or species habitat
Laticauda laticaudata	a sea krait	-	-	Species or species habitat
Lepidochelys olivacea	Olive Ridley Turtle, Pacific Ridley Turtle	E	E	Breeding likely to occur within area
Natator depressus	Flatback Turtle	V	V	Breeding known to occur within area
Pelamis platurus	Yellow-bellied Seasnake	-	-	Species or species habitat may occur within area

Port of Mackay

A total of 22 marine reptiles were identified from the PMST search as potentially inhabiting the study area and are presented in **Table 70**. Of these three are listed as 'Endangered' and three are listed as 'Vulnerable'.

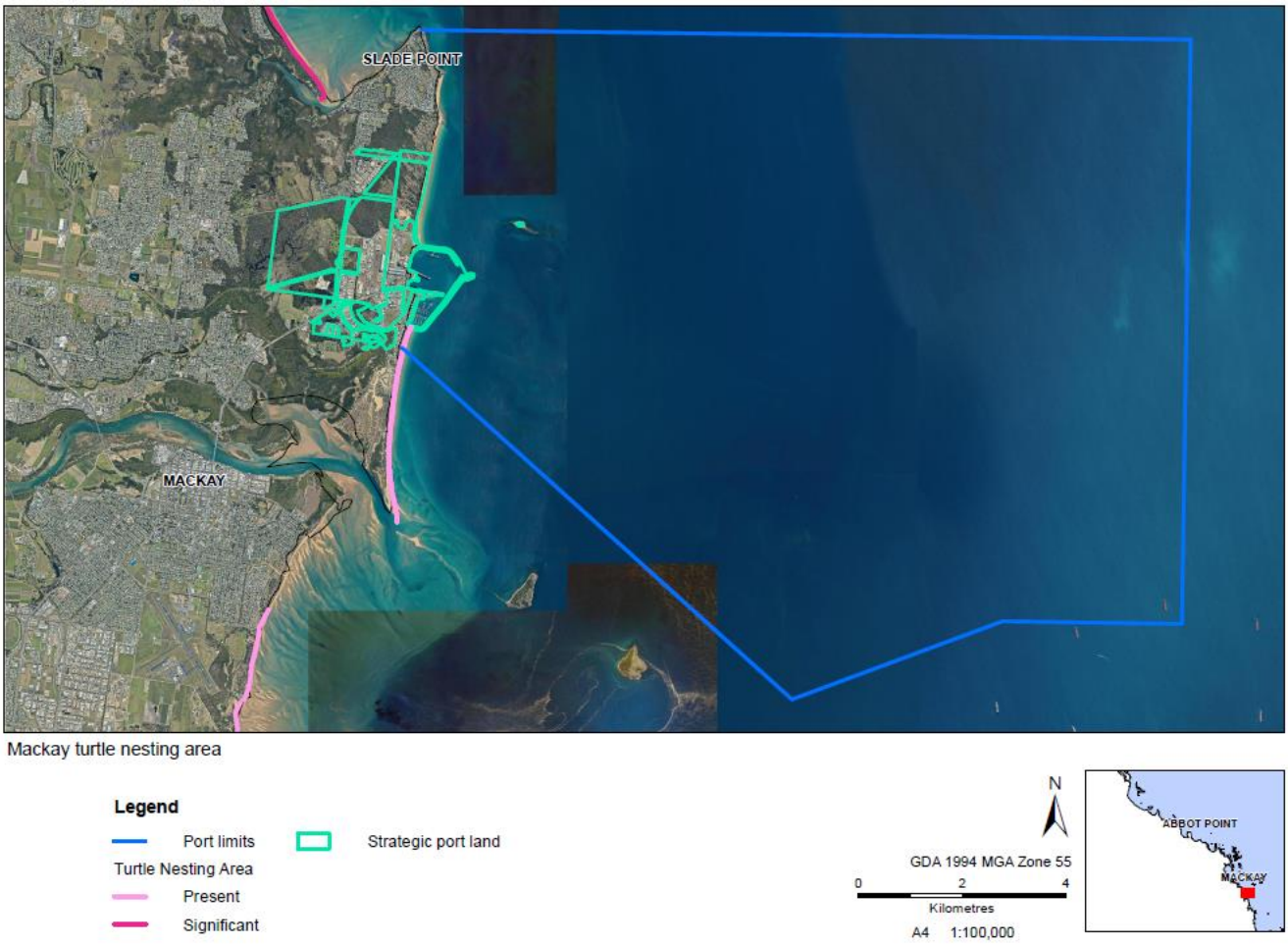


Figure 69: Turtle Nesting Area

Green turtles (*Chelonia mydas*) are the most frequently observed marine turtle in the study area.[339] Green turtle rookeries have been recorded at Bushy Islet (approximately 80km off the Mackay coast).[340] Low density (at least 10) green turtle nesting has been recorded by Mackay turtle watch on beaches in the Mackay region including Bucasia Beach, Blacks Beach, North Harbour Beach and Salonika Beach.[341]

Flatback turtles (*Natator depressus*) are the dominant nesting species in this region and nesting sites occur on the mainland beaches between November and April. Usually between 30-100 nesting turtles are recorded annually.[342] Haliday Bay north of Mackay is recognised as one of the most important flatback turtle nesting beaches in the Mackay region.[343]

Leatherback turtles (*Dermochelys coriacea*) are not common in the area with only a single record from 1993. Similarly, while loggerhead turtles have been sighted, they appear to be only occasional visitors to the area with some nesting at Bushy Islet, likely due to the Mackay region being at the northern extent of their range.[344]

[339] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[340] Limpus, C. (2008). *A biological review of Australian marine turtles*. 2. *Green turtle, Chelonia myda (Linnaeus*).
[341] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[342] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[343] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[344] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd

Table 70: Marine reptile species of conservation significance present/habitat present in the Port of Mackay study area

Environment Protection and Biodiversity Conservation Act 1999 (Cth)	*Nature Conservation Act 1992*
E – Endangered V – Vulnerable	E – Endangered V – Vulnerable

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	*Nature Conservation Act 1992*	Presence within study area
Acalyptophis peronii	Horned Seasnake	-	-	Species or species habitat may occur within area
Aipysurus duboisii	Dubois' Seasnake	-	-	Species or species habitat may occur within area
Aipysurus eydouxii	Spine-tailed Seasnake	-	-	Species or species habitat may occur within area
Aipysurus laevis	Olive Seasnake	-	-	Species or species habitat may occur within area
Astrotia stokesii	Stokes' Seasnake	-	-	Species or species habitat may occur within area or species habitat
Caretta caretta	Loggerhead Turtle	E	E	Foraging, feeding behaviour known to occur within area
Chelonia mydas	Green Turtle	V	V	Breeding known to occur within area
Crocodylus porosus	Salt-water Crocodile, Estuarine Crocodile	-	-	Species or species habitat likely to occur within area
Dermochelys coriacea	Leatherback Turtle, Leathery Turtle, Luth	E	E	Breeding likely to occur within habitat
Disteira kingii	Spectacled Seasnake	-	-	Species or species habitat may occur within area
Disteira major	Olive-headed Seasnake	-	-	Species or species habitat
Emydocephalus annulatus	Turtle-headed Seasnake	-	-	Species or species habitat may occur within area
Eretmochelys imbricata	Hawksbill Turtle	V	E	Species or species habitat known to occur within area
Hydrophis elegans	Elegant Seasnake	-	-	Species or species habitat may occur within area
Hydrophis mcdowelli	null	-	-	Species or species habitat
Hydrophis ornatus	Spotted Seasnake, Ornate Reef Seasnake	-	-	Species or species habitat may occur within area
Lapemis hardwickii	Spine-bellied Seasnake	-	-	Species or species habitat may occur within area
Laticauda colubrina	a sea krait	-	-	Species or species habitat may occur within area or species habitat
Laticauda laticaudata	a sea krait	-	-	Species or species habitat
Lepidochelys olivacea	Olive Ridley Turtle, Pacific Ridley Turtle	E	E	Breeding likely to occur within area
Natator depressus	Flatback Turtle	V	V	Breeding known to occur within area
Pelamis platurus	Yellow-bellied Seasnake	-	-	Species or species habitat may occur within area

8.8.11 Marine mammals

Port of Hay Point

The study area supports a range of marine mammal species, including species listed under the EPBC Act and the NC Act. These species are significant for their ecological, cultural, economic and tourism values.

Whales – A core aggregation and calving area for humpback whales is located approximately 80km east of Mackay. Humpback whales migrate through the study area annually between June and October (peak in August).[345] Females with calves have been observed within the Hay Point port limits[346] and use nearby offshore waters for resting during migration along the east coast. An aerial survey undertaken several years ago identified humpback whales offshore from Dudgeon Point.[347]

The sei whale (*balaenoptera musculus*) and fin whale (*balaenoptera physalus*) are occasionally observed at Hay Point. The study area is at the northern extent of the distribution for the blue whale (*balaenoptera musculus*) and southern right whale (*eubalaena australis*) and they are unlikely to occur in the inshore areas near the coast.[348]

Dolphins - Australian humpback dolphins (*sousa sahulensis*) occur in the waters off Hay Point.[349] Other dolphin species that occur in the waters off Hay Point include, spotted dolphin (*stenella attenuate*), Indian Ocean bottlenose dolphin (tursiops aduncus) and potentially the irrawaddy dolphin (*orcaellabrevirostris*). The Australian snubfin dolphin (*orcaella heinsohni*) may also occur in the riverine and estuarine areas of the bays and lagoons in the Hay Point study area (in shallow waters less than 20m deep).

Dugongs – Due to the low densities of seagrass in the study area, dugongs are not known to frequently forage in the area. However, the low-density seagrass meadows could be used by dugongs moving along the coast as transient foraging locations. Dugong Protection Areas at Llewellyn Bay and Ince Bay are located approximately 20km and 35km south of Hay Point respectively.[350] These areas have HEV with abundant seagrass. An aerial survey undertaken several years ago reportedly observed dugongs in the general vicinity of Dudgeon Point.[351]

Port of Mackay

The study area supports a range of marine fauna species, including species listed under the EPBC Act and the NC Act. Marine fauna includes marine megafauna that are considered as a significance part of the GBR's ecological, cultural and economic values.[352]

Whales: A core aggregation and calving area for humpback whales is located approximately 80km east of Mackay. Humpback whales migrate through the study area annually between June and October (peak in August)[353] and use nearby offshore waters for resting during migration along the east coast. The waters off Mackay (approximately 100km from the coast) have been identified as important wintering areas for Humpback whales, particularly in the inner reef lagoon.[354]

Dolphins: There is currently limited published information on local population estimates for dolphins in the Mackay region. The PMST search indicated that there are two species of dolphin that are known to occur in the study area. The Australian snubfin dolphin (*orcaella heinsohni*) is known to utilise habitat in the area. This species is primarily found in shallow waters close to the coast and in the proximity of river and creek mouths

[345] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd
[346] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd
[347] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd
[348] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.
[349] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[350] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[351] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[352] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[353] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[354] Smith, J. N., Grantham, H. S. Gales, N., Double, M.C., Noad, M. J. and Paton, D. (2012). *Identification of humpback whale breeding and calving habitat in the Great Barrier Reef*, Marine Ecology Progress Series, vol. 447, pp 259-272.

and seagrass beds.[355] While this species may utilise habitat in the study area, it is not expected to support an important resident population.[356] The PMST search indicated that the study area is a known breeding site for the Australian humpback dolphins (*sousa sahulensis*) however, studies confirming this are lacking. To the south of Mackay port, a study observed 40 individuals located in calm waters adjacent to the Port of Hay Point, though it is likely that they use a variety of areas throughout this region.[357]

Dugongs: Due to the low densities of seagrass in the study area, dugongs are not known to frequently forage in the area. However, the low-density seagrass meadows could be used by dugongs moving along the coast as transient foraging locations. Dugong Protection Areas at Llewellyn Bay and Ince Bay (20km south of the study area) are located approximately 40km and 50km south of the port respectively.[358] These areas have HEV with abundant seagrass.

It is noted that substantially less ecological investigations have been conducted in the Port of Mackay compared to the Port of Hay Point.

8.8.12 Migratory marine species

Port of Hay Point

A total of 21 migratory marine species (including four listed as 'Endangered' and seven 'Vulnerable' under the EPBC Act) are potentially likely to inhabit the Port of Hay Point study area (**Table 71**). The blue whale, leatherback turtle, olive ridley turtle and loggerhead turtle are all listed as 'Endangered' under the EPBC Act.

Six listed migratory marine bird species potentially inhabit the study area. One of these, *macronectes giganteus* (southern giant petrel), has a conservation rating of 'Endangered' under this act.

Table 71: Migratory marine species of conservation significance present / habitat present in the Port of Hay Point study area

Environment Protection and Biodiversity Conservation Act 1999 (Cth)	***Nature Conservation Act 1992***
E – Endangered CE – Critically Endangered V – Vulnerable	E – Endangered CR – Critically endangered LC – Least Concern V – Vulnerable

Species	**Common name**	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	*Nature Conservation Act 1992*	**Species or species habitat previously detected in study area**
Birds				
Anous stolidus	Common noddy	-	-	Species or species habitat known to occur within the area
Apus pacificus	Fork-tailed Swift	-	-	Species or species habitat likely to occur within area
Ardenna carneipes	Flesh-footed Shearwater	-	-	Species or species habitat may occur within area

[355] Parra, G.J. (2006). *Resource partitioning in sympatric delphinids: Space use and habitat preferences of Australian snubfin and Indo-Pacific humpback dolphins*. Journal of Animal Ecology. 75:862-874.
[356] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[357] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[358] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*

Species	**Common name**	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	*Nature Conservation Act 1992*	**Species or species habitat previously detected in study area**
Fregata ariel	Lesser Frigatebird	-	-	Species or species habitat known to occur within the area
Macronectes gigantus	Southern Giant-Petrel	E	-	Species or species habitat may occur within area
Sternula albifrons	Little Tern	-	-	Species or species habitat may occur within area
Mammals				
Balaenoptera edeni	Bryde's Whale	-	-	Species or species habitat may occur
Balaenoptera musculus	Blue Whale	E	LC	Species or species habitat may occur
Megaptera novaeangliae	Humpback Whale	V	-	Species or species habitat known to occur
Orcaella heinsohni	Australian Snubfin Dolphin	-	-	Species or species habitat known to occur
Orcinus orca	Killer Whale, Orca	-	-	Species or species habitat may occur
Sousa sahulensis	Australian Humpback Dolphin	-	-	Breeding known to occur
Dugong dugon	Dugong	-	-	Species or species habitat known to occur
Reptiles				
Chelonia mydas	Green Turtle	V	V	Species or species habitat may occur
Natator depressus	Flatback Turtle	V	V	Species or species habitat may occur
Dermochelys coriacea	Leatherback turtle	E	-	Breeding likely to occur within area
Eretmochelys imbricata	Hawksbill turtle	V	-	Breeding likely to occur within area
Lepidochelys olivacea	Olive Ridley turtle	E	-	Breeding likely to occur within area
Caretta caretta	Loggerhead turtle	E	-	Foraging, feeding or related behaviour known to occur
Crocodylus porosus	Salt-water Crocodile, Estuarine Crocodile	-	-	Species or species habitat likely to occur
Sharks and rays				
Carcharhinus longimanus	Oceanic Whitetip Shark	-	-	Species or species habitat may occur
Manta alfredi	Alfred manta	-	-	Species or species habitat likely to occur
Manta birostris	Giant Manta Ray	-	-	Species or species habitat likely to occur
Rhincodon typus	Whale Shark	V	-	Species or species habitat may occur
Carcharodon carcharias	Great White Shark	V	-	Species or species habitat likely to occur

Species	**Common name**	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	*Nature Conservation Act 1992*	**Species or species habitat previously detected in study area**
Anoxypristis cuspidata	Knifetooth Sawfish	-	-	Species or species habitat
Pristis zijsron	Green Sawfish	V	-	Breeding may occur

Port of Mackay

A total of 22 migratory marine species marine species (including four listed as 'Endangered' and seven 'Vulnerable' under the EPBC Act) are potentially likely to inhabit the Mackay port study area (**Table 72**). The blue whale, leatherback turtle, olive ridley turtle and loggerhead turtle are all listed as 'Endangered' under the EPBC Act. There are also two sharks (great white shark and whale shark) that are also listed as 'Vulnerable', as well as the green saw fish.

Table 72: Migratory marine species of conservation significance present / habitat present in the Port of Mackay study area

Environment Protection and Biodiversity Conservation Act 1999 (Cth)	***Nature Conservation Act 1992***
E – Endangered CE – Critically Endangered V – Vulnerable	E – Endangered CR – Critically endangered LC – Least Concern V – Vulnerable

Species	**Common name**	***Environment Protection and Biodiversity Conservation Act 1999 (Cth)***	***Nature Conservation Act 1992***	**Species or species habitat previously detected in study area**
Birds				
Anous stolidus	Common noddy	-	-	Species or species habitat known to occur within the area
Apus pacificus	Fork-tailed Swift	-	-	Species or species habitat likely to occur within area
Fregata minor	Great Frigatebird	-	-	Species or species habitat may occur within area
Fregata ariel	Lesser Frigatebird	-	-	Species or species habitat known to occur within the area
Macronectes gigantus	Southern Giant-Petrel	E	-	Species or species habitat may occur within area
Sternula albifrons	Little Tern	-	-	Species or species habitat may occur within area
Mammals				
Balaenoptera edeni	Bryde's Whale	-	-	Species or species habitat may occur
Balaenoptera musculus	Blue Whale	E	LC	Species or species habitat may occur
Megaptera novaeangliae	Humpback Whale	V	-	Species or species habitat known to occur
Orcaella heinsohni	Australian Snubfin Dolphin	-	-	Species or species habitat known to occur
Orcinus orca	Killer Whale, Orca	-	-	Species or species habitat may occur
Sousa sahulenis	Australian Humpback Dolphin	-	-	Breeding known to occur within area
Dugong dugon	Dugong	-	-	Species or species habitat known to occur

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	*Nature Conservation Act 1992*	Species or species habitat previously detected in study area
Reptiles				
Chelonia mydas	Green Turtle	V	V	Species or species habitat may occur
Natator depressus	Flatback Turtle	V	V	Species or species habitat may occur
Dermochelys coriacea	Leatherback turtle	E	-	Breeding likely to occur within area
Eretmochelys imbricata	Hawksbill turtle	V	-	Breeding likely to occur within area
Lepidochelys olivacea	Olive Ridley turtle	E	-	Breeding likely to occur within area
Caretta caretta	Loggerhead turtle	E	-	Foraging, feeding or related behaviour known to occur
Crocodylus porosus	Salt-water Crocodile, Estuarine Crocodile	-	-	Species or species habitat likely to occur
Sharks and rays				
Carcharhinus longimanus	Oceanic Whitetip Shark	-	-	Species or species habitat may occur
Manta alfredi	Alfred manta	-	-	Species or species habitat likely to occur
Manta birostris	Giant Manta Ray	-	-	Species or species habitat likely to occur
Rhincodon typus	Whale Shark	V	-	Species or species habitat may occur
Carcharodon carcharias	Great White Shark	V	-	Species or species habitat likely to occur
Anoxypristis uspidate	Knifetooth Sawfish	-	-	Species or species habitat
Pristis zijsron	Green Sawfish	V	-	Breeding may occur
Lamna nasus	Porbeagle	-	-	Species or species habitat may occur

8.8.13 Potential impacts and threats

Port of Hay Point

Potential impacts on the marine environment, from the port and other coastal industrial development, as well as from coastal residential development and resulting increased anthropogenic activities within the study area are summarised below:

Water quality

- vegetation clearing and dredging causing sedimentation and turbidity
- deposition of coal dust causing increased turbidity and smothering of marine communities
- stormwater runoff containing heavy metals, organics and other contaminants
- environmental harm from PASS present in dredge spoil

Coastal processes

- structures placed in the marine environment indirectly changes currents and waves that affect sediment movement
- offshore disposal of dredge spoil resulting in changes to seafloor topography and hydrology

Mangroves

- clearance of vegetation resulting in edge effects that reduce extent, condition and quality of mangrove and intertidal flora communities
- increased anthropogenic visitation resulting in damage to mangrove seedlings
- accumulation of sediment from dredge plumes in sensitive areas impacting light penetration
- clearing of mangroves as a result of increased coastal development activities including port expansion
- increased coastal development resulting in pollution and decreased water quality which may impact mangrove health
- direct loss through infrastructure and port reclamation activities
- destabilisation of foreshore sediments from increased wave action causing direct loss of mangroves and limitation of propagule recruitment

Seagrass

- increased turbidity due to dredging and placement of rock armour revetment walls resulting in reduced light penetration to seagrass beds causing mortality
- seagrass growth impeded by reduced water quality from surface water runoff containing chemicals and dust
- increased coastal development resulting in increased nutrient, sediment and pesticide loads resulting in seagrass habitat loss
- rising sea surface temperature above tolerance thresholds of seagrass resulting in degradation
- direct loss through port reclamation activities

Coral reefs

- physical damage and mortality due to maintenance dredging
- mortality and sub-lethal stress from sustained high turbidity and sedimentation following cyclones and flood events
- increased nutrient, sediment and pesticide loads from catchment runoff
- increased ocean acidification from anthropogenic carbon dioxide (CO_2) emissions resulting in decline of corals

Fish

- mortality and injury resulting from being trapped within reclamation areas
- surface water runoff, chemical spills and dust deposition resulting in reduced water quality that impacts fish communities
- reduction in breeding/feeding habitat due to increased turbidity and decreased water quality and reduced fish passage
- port linear infrastructure, upgrades, dredging and land reclamation that result in direct loss or impact to marine plants and waterways that provide fish passage

Marine megafauna

- increased edge effects by encroachment by residential/industrial development that affects nesting behaviour of turtles
- direct mortality or injury due to vessel strike
- increase in noise, vibration and lighting from ports activities resulting in disruption to migratory routes and behaviour

Coastal resources

- climate change resulting in increased water temperatures that increases the risk of coral bleaching

- rising concentration of CO_2 increases ocean acidification which affects health of plankton, molluscs, shellfish, coral
- vulnerability of coastal areas to sea level rise (SLR) as the inland migration of wetlands is blocked by growing populations and developments
- coastal areas are vulnerable to increases in intensity of storm surge and heavy rainfall with heavy runoff threatening the health of and quality of coastal waters

Port of Mackay

Potential impacts on the ecological environment, from the port and other coastal industrial development, as well as from coastal residential development and resulting increased anthropogenic activities within the study area are summarised below:

Threatened terrestrial flora and fauna

- direct clearing of fauna habitat
- ongoing indirect impacts from increased residential development and/or industrial use resulting in disturbance and displacement of individuals
- potential of souveniring of some flora species
- direct mortality and/or injury to fauna individuals
- increased stormwater discharges impacting important intertidal faunal species.

Vegetation Communities

- direct clearing of remnant vegetation
- indirect impacts from stormwater run-off
- increased edge effects leading to increased pressures of pests and weeds

Water quality

- vegetation clearing and dredging causing sedimentation and turbidity
- stormwater runoff containing heavy metals, organics and other contaminants
- environmental harm from PASS present in dredge spoil

Coastal processes

- structures placed in the marine environment indirectly changes currents and waves that affect sediment movement
- offshore disposal of dredge spoil resulting in changes to seafloor topography and hydrology

Mangroves

- clearance of vegetation resulting in edge effects that reduce extent, condition and quality of mangrove and intertidal flora communities
- increased anthropogenic visitation resulting in damage to mangrove seedlings
- accumulation of sediment from dredge plumes in sensitive areas impacting light penetration
- clearing of mangroves as a result of increased coastal development activities including port expansion
- increased coastal development resulting in pollution and decreased water quality which may impact mangrove health

Seagrass

- increased turbidity due to dredging and placement of rock armour revetment walls resulting in reduced light penetration to seagrass beds causing mortality
- seagrass growth impeded by reduced water quality from surface water runoff containing chemicals and dust

- increased coastal development resulting in increased nutrient, sediment and pesticide loads resulting in seagrass habitat loss
- rising sea surface temperature above tolerance thresholds of seagrass resulting in degradation
- direct loss through port reclamation activities

Coral reefs

- physical damage and mortality due to maintenance dredging
- mortality and sub-lethal stress from sustained high turbidity and sedimentation following cyclones and flood events
- increased nutrient, sediment and pesticide loads from catchment runoff
- increased ocean acidification from anthropogenic CO_2 emissions resulting in decline of corals

Fish

- mortality and injury resulting from being trapped within reclamation areas
- surface water runoff, chemical spills and dust deposition resulting in reduced water quality that impacts fish communities
- reduction in breeding/feeding habitat due to increased turbidity and decreased water quality
- port linear infrastructure, upgrades, dredging and land reclamation that result in direct loss or impact to marine plants and waterways that provide fish passage

Marine megafauna

- increased edge effects by encroachment by residential/industrial development that affects nesting behaviour of turtles
- direct mortality or injury due to vessel strike
- increase in noise, vibration and lighting from ports activities resulting in disruption to migratory routes and behaviour

Coastal resources

- climate change resulting in increased water temperatures that increases the risk of coral bleaching
- rising concentration of CO_2 increases ocean acidification which affects health of plankton, molluscs, shellfish, coral
- vulnerability of coastal areas to SLR as the inland migration of wetlands is blocked by growing populations and developments
- coastal areas are vulnerable to increases in intensity of storm surge and heavy rainfall with heavy runoff threatening the health of and quality of coastal waters

8.9 Biosecurity

8.9.1 Weeds

Port of Hay Point

A review of the PMST[359] generated for the study area indicated the Weeds of National Significance (WoNS), with further desktop investigations undertaken from the search of the Wildnet Database for potential species. [360] **Table 73** presents the weed species that have been highlighted as likely to occur within the study area.

Table 73: Weed species identified by the protected matters search tool as potentially occurring in the Port of Hay Point study area

Species	Common Name	Type of presence	Weed of National Significance (WoNS)
Annona glabra	Pond apple	Species or species habitat likely to occur	Present
Anredera cordifolia	Madiera vine	Species or species habitat likely to occur	Present
Asparagus aethiopicus	Asparagus fern	Species or species habitat likely to occur	Present
Asparagus plumosus	Climbing asparagus-fern	Species or species habitat likely to occur	Present
Cabomba caroliniana	Cabomba	Species or species habitat likely to occur	Present
Cryptostegia grandiflora	Rubber vine	Species or species habitat likely to occur	Present
Dolichandra unguis-cati	Cats claw vine	Species or species habitat likely to occur	Present
Eichhornia crassipes	Water hyacinth	Species or species habitat likely to occur	Present
Hymenachne amplexicaulis	Hymenachne	Species or species habitat likely to occur	Present
Jatropha gossypifolia	Cotton-leaved physic-nut	Species or species habitat likely to occur	Present
Lantana camara	Lantana	Species or species habitat likely to occur	Present
Parthenium hysterophorus	Parthenium weed	Species or species habitat likely to occur	Present
Salvinia molesta	Salvinia	Species or species habitat likely to occur	Present

Port of Mackay

A review of the PMST[361] generated for the study area indicated the WoNS, with further desktop investigation undertaken from the search of the Wildnet Database for potential species. [362] **Table 74** presents the weed species that have been highlighted as likely to occur within the study area.

Broad leaf pepper tree has been identified in the port and subject to priority treatment under NQBP's Weed Management Plan for the port.

[359] Australian Government. (2021). *Environment Protection and Biodiversity Conservation Act Protected Matters Report: Report for Hay Point Study Area*.
[360] Department of Sustainability, Environment, Water, Population and Communities. (2014). *Weeds of National Significance*. Accessed 25 August 2012.
[361] Australian Government. (2021). *Environment Protection and Biodiversity Conservation Act Protected Matters Report: Report for Hay Point Study Area*.
[362] Department of Sustainability, Environment, Water, Population and Communities. (2014). *Weeds of National Significance*. Accessed 25 August 2012

Table 74: Weed species identified by the protected matters search tool as potentially occurring in the Port of Mackay study area

Species	Common Name	Type of presence	Weed of National Significance (WoNS)
Annona glabra	Pond apple	likely	Present
Anredera cordifolia	Madiera vine	Species or species habitat likely to occur	Present
Asparagus aethiopicus	Asparagus fern	Species or species habitat likely to occur	Present
Asparagus plumosus	Climbing asparagus-fern	Species or species habitat likely to occur	Present
Cabomba caroliniana	Cabomba	Species or species habitat likely to occur	Present
Cryptostegia grandiflora	Rubber vine	Species or species habitat likely to occur	Present
Dolichandra unguis-cati	Cats claw vine	Species or species habitat likely to occur	Present
Eichhornia crassipes	Water hyacinth	Species or species habitat likely to occur	Present
Hymenachne amplexicaulis	Hymenachne	Species or species habitat likely to occur	Present
Jatropha gossypifolia	Cotton-leaved physic-nut	Species or species habitat likely to occur	Present
Lantana camara	Lantana	Species or species habitat likely to occur	Present
Parthenium hysterophorus	Parthenium weed	Species or species habitat likely to occur	Present
Salvinia molesta	Salvinia	Species or species habitat likely to occur	Present

8.9.2 Pests

Port of Hay Point

The PMST search undertaken in June 2021.[363] **Table 75** presents the species identified from the PMST search. Most of these species have been recorded to occur in the study area.

Table 75: Pest species identified by the protected matters search tool as potentially occurring in the Port of Hay Point study area

Species	Common Name	Type of presence
Birds		
Anas platyrhynchos	Mallard	Species or species habitat likely to occur
Columba livia	Rock pigeon	Species or species habitat likely to occur
Lonchura punctulata	Nutmeg mannikin	Species or species habitat likely to occur
Passer domesticus	House sparrow	Species or species habitat likely to occur
Pycnonotus jocosus	Red-whiskered bulbul	Species or species habitat likely to occur
Streptopelia chinensis	Spotted turtle-dove	Species or species habitat likely to occur
Sturnus vulgaris	Common starling	Species or species habitat likely to occur
Mammals		
Canis lupus familiaris	Domestic dog	Species or species habitat likely to occur
Felis catus	Cat	Species or species habitat likely to occur
Feral deer	Deer	Species or species habitat likely to occur

[363] Australian Government. (2021). *Environment Protection and Biodiversity Conservation Act Protected Matters Report: Report for Hay Point Study Area*..

Mus musculus	House mouse	Species or species habitat likely to occur
Oryctolagus cuniculus	Rabbit	Species or species habitat likely to occur
Rattus rattus	Black rat	Species or species habitat likely to occur
Sus scrofa	Pig	Species or species habitat likely to occur
Vulpes vulpes	Red fox	Species or species habitat likely to occur
Frogs and reptiles		
Rhinella marina	Cane toad	Species or species habitat likely to occur
Hemidactylus frenatus	Asian house gecko	Species or species habitat likely to occur
Ramphotyphlops braminus	Brahminy Blind Snake	Species or species habitat may occur

NQBP (and all Queensland GBR ports) are part of a voluntary pilot program in partnership with DAF which is looking to improve early detection of marine pest threats. The pilot program is based on environmental deoxyribonucleic acid (DNA) monitoring and analysis techniques, for targeted pest species. The program incorporates traditional biosecurity controls but will be reviewed and refined based on monitoring and analysis of DNA results.[364]

Port of Mackay

A PMST search was undertaken in June 2021.[365] **Table 76** presents the species identified from the PMST search. Most of these species have been recorded to occur in the study area.

Table 76: Pest species identified by the protected matters search tool as potentially occurring in the Port of Mackay study area

Species	Common Name	Type of presence
Birds		
Anas platyrhynchos	Mallard	Species or species habitat likely to occur
Columba livia	Rock pidgeon	Species or species habitat likely to occur
Lonchura punctulata	Nutmeg mannikin	Species or species habitat likely to occur
Passer domesticus	House sparrow	Species or species habitat likely to occur
Pycnonotus jocosus	Red-whiskered bulbul	Species or species habitat likely to occur
Streptopelia chinensis	Spotted turtle-dove	Species or species habitat likely to occur
Sturnus vulgaris	Common starling	Species or species habitat likely to occur
Mammals		
Canis lupus familiaris	Domestic dog	Species or species habitat likely to occur
Felis catus	Cat	Species or species habitat likely to occur
Feral deer	Deer	Species or species habitat likely to occur
Mus musculus	House mouse	Species or species habitat likely to occur
Oryctolagus cuniculus	Rabbit	Species or species habitat likely to occur
Rattus rattus	Black rat	Species or species habitat likely to occur

[364] Biosecurity Queensland. (2019). *Partnering to improve early detection of marine pest threats*. Retrieved from https://event.icebergevents.com.au/uploads/contentFiles/files/2019-PAWS/C1_Anita%20Ramage.pdf
[365] Australian Government. (2021). *Environment Protection and Biodiversity Conservation Act Protected Matters Report: Report for Hay Point Study Area*.

Species	Common Name	Type of presence
Sus scrofa	Pig	Species or species habitat likely to occur
Vulpes vulpes	Red fox	Species or species habitat likely to occur
Frogs and reptiles		
Rhinella marina	Cane toad	Species or species habitat likely to occur
Hemidactylus frenatus	Asian house gecko	Species or species habitat likely to occur
Ramphotyphlops braminus	Brahminy Blind Snake	Species or species habitat may occur

NQBP (and all Queensland GBR ports) are part of a voluntary pilot program in partnership with DAF which is looking to improve early detection of marine pest threats. The pilot program is based on environmental DNA monitoring and analysis techniques, for targeted pest species. The program incorporates traditional biosecurity controls but will be reviewed and refined based on monitoring and analysis of DNA results.[366]

8.9.3 Potential impacts and threats

Potential impacts associated with the port, coastal industrial development and residential development include the introduction or spread of pest and weed species resulting in reduced condition and/or quality of vegetation communities and fauna habitat.

8.10 Air quality

8.10.1 Existing environment

Port of Hay Point

A search of the National Pollutant Inventory for 2019–20 air quality data identified eight facilities within the study area that contribute a total of 34 substances as emissions:

- DBT
- BMA – HPCT
- Aurizon – Mackay (Paget) Rail Refuelling Facility
- Elgas Limited – Mackay AU120
- MRC – Mackay South Water Recycling Plant
- Mackay Sugar – Racecourse Sugar Mill and Refinery
- Thomas Borthwick and Sons
- Viva Energy Mackay Airport.

The substances emitted include: boron, beryllium, carbon monoxide, cadmium, ammonia, antimony, arsenic, chlorine and chromium and associated compounds. The sources of these emissions include water transport support services, meat and meat product manufacturing, water supply, sewerage and drainage services.[367]

The dominant air pollutant identified in a coal dust study conducted by the University of Queensland and NQBP in 2016, concluded that at all four-community air quality monitoring sites at Hay Point and Louisa Creek, dust of all fractions was from insect or plant matter, averaging between 75% and 95% of the dust by mass.

[366] Biosecurity Queensland. (2019). *Partnering to improve early detection of marine pest threats*. Retrieved from https://event.icebergevents.com.au/uploads/contentFiles/files/2019-PAWS/C1_Anita%20Ramage.pdf

[367] Department of the Environment and Energy. (2021). *National Pollutant Inventory 2020*. Retrieved from http://www.npi.gov.au/npidata/action/load/emission-by-substance-result/criteria/destination/ALL/source-type/INDUSTRY/subthreshold-data/Yes/substance-name/All/year/2020.

The port has dust control measures in place to reduce emissions where possible and include applying extra water to coal stockpiles, reducing stockpile heights during extreme weather and regular clean-up of coal spillages.[368]

Other air pollutants within the study area that are not derived from coal terminal operations may include:

- sand and fine dust from the wind erosion of beaches
- sea salt spray
- material from fires
- pollens and grass seeds
- emissions from agriculture operations, including cane burning and sugar mill processing.

Schedule 1 of the *Environmental Protection (Air) Policy 2008* (EPP (Air)) prescribes environmental values and air quality objectives consistent with the National Environment Protection (Ambient Air Quality) Measure. Since 1993, NQBP and the two coal terminal operators, have conducted a permanent community air quality monitoring program within the study area. Four monitoring stations are located both upwind and downwind of the existing coal terminals at Hay Point, and they monitor continuously for total suspended particulates, noise and meteorological conditions. Monthly reports from this program are made available on the NQBP website.

NQBP also commenced a dust monitoring program in 2013 at McEwens Beach which continuously measures PM_{10} and $PM_{2.5}$. NQBP provides monthly reports for this data on the website.[369]

Under the EPP (Air), the air quality goal for PM_{10} is 50 micrograms per Cubic Metre of Air ($\mu g/m^3$) daily and the air quality goal for $PM_{2.5}$ are 25$\mu g/m^3$ (daily) and 8$\mu g/m^3$ (yearly). For the year of 2020, the PM_{10} was recorded as either 'very good' or 'good'[370] for 98% of the calendar year.[371]

Port of Mackay

A search of the National Pollutant Inventory for 2019–20 air quality data identified facilities within the study area that contribute a total of 20 substances as emissions:

- Caltex Terminal Mackay
- Impact Fertilisers Mackay
- Aurizon – Mackay (Paget) Rail Refuelling Facility
- Mackay gas Turbine (Stanwell)
- Mackay Harbour Storage Facility (Wilmar Bioethanol)
- Puma Mackay Terminal (Puma Energy)
- Viva Energy Mackay Airport
- Viva Energy Mackay Terminal.

The substances emitted include: benzene, carbon monoxide, cumene, cyclohexane, ethanol, ethylbenzene, fluoride compounds, n-hexane, mercury and compounds, oxides of nitrogen. The sources of these emissions include mineral, metal and chemical wholesaling, electricity generation, rail freight transport and warehousing and storage services.[372]

The Port of Mackay is a multi-commodity import and export facility. The main export is agricultural goods such as grain and sugar, while imports include fuel, equipment and fertiliser for agriculture and mining.

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[368] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[369] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[370] NQBP. (2021). *Air Quality Monitoring*. https://nqbp.com.au/sustainability/air-quality
[371] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[372]Department of the Environment and Energy. (2021). *National Pollutant Inventory 2020*. Retrieved from http://www.npi.gov.au/npidata/action/load/emission-by-substance-result/criteria/destination/ALL/source-type/INDUSTRY/subthreshold-data/Yes/substance-name/All/year/2020..

There are many sensitive receptors and land uses within the study area which may be impacted by adverse air quality impacts:

- residential areas that directly adjoin Mackay Harbour – many of these areas are medium and high density
- low density townships such as Slade Point
- public areas and facilities such as the Mackay Marina and boat ramp, Old Mulherin Park and beaches immediately north and south of the existing port.

The Department of Environment and Heritage Protection (DEHP), now known as DES, established a regional air monitoring station in a light industrial area of West Mackay in 1997. This station was moved in 2012 to be closer to agricultural areas west of Mackay. The monitoring station determines air quality impacts on residential areas as a result of agricultural burning. The station measures PM_{10} and visibility (haze) continuously, publishing results daily on their website and providing an annual report.

NQBP also have had two long-term air quality monitoring stations established at the existing port since 2016; one located north of the port (northern station) and the other in the middle of the harbour (southern station). These stations measure PM_{10} (dust particles not visible to the naked eye).[373] The NQBP website publishes ongoing results from these monitoring stations. In 2020, a level of 'very good' or 'good' was recorded for 96% of the days of the year at Mackay's northern station and 'very good' or 'good' for 100% of days at the Mackay southern station.[374]

8.10.2 Potential impacts/threats

Port of Hay Point

Potential impacts on air quality in the study area from the port, other coastal industrial development, as well as coastal residential development are presented below:

- increased dust deposition on plants, fauna and water environments
- dust causing increased turbidity causing reduced light penetration for corals and seagrass
- nuisance impacts of dust settlement on nearby residential communities
- airborne dust particles causing an increase in respiratory illnesses in humans within study area
- dust in the atmosphere reducing natural scenic amenity of the study area

Port of Mackay

Potential impacts on air quality in the study area from the port, other coastal industrial development, as well as coastal residential development, are presented in **Appendix Q** and summarised below:

Dust

- increased dust deposition on plants, fauna and water environments including wetlands
- dust causing increased turbidity causing reduced light penetration for corals and seagrass[375] [376]
- nuisance impacts of dust settlement on nearby residential communities
- airborne dust particles causing an increase in respiratory illnesses in humans within study area
- dust in the atmosphere reducing natural scenic amenity of the study area.

[373] North Queensland Bulk Ports Corporation Ltd. (2020). *Port of Mackay – Port Development Opportunities and Constraints Assessment (Confidential)*.
[374] North Queensland Bulk Ports Corporation Ltd. (2020). *Air Quality Monitoring*. Retrieved from https://nqbp.com.au/sustainability/air-quality

[375] Advisian and Queensland Government. (2015). *Abbot Point Growth Gateway Project Environmental Impact Statement (Volume 2*).
[376] Katestone Environmental Pty Ltd. (2012). *Cumulative Assessment of Air Emissions at the Abbot Point Coal Terminals*. Prepared for Abbot Point Working Group.

Health

- airborne dust particles may cause increased respiratory illnesses in human populations located within the study area.

Visual Amenity

- dust in the atmosphere (producing haze) reduces natural scenic amenity of the study area.

Air Quality

- potential for dust and other air quality impacts on nearby sensitive receptors, including biological hazards Noise emissions.

8.11 Noise emissions

8.11.1 Existing environment

Port of Hay Point

Environmental values and acoustic quality objectives for sensitive receptors are prescribed in Schedule 1 of the *Environmental Protection (Noise) Policy 2019*.

The main sources of noise pollution in the study area are associated with port activities, transportation, construction activities and urban areas. Typical noise levels in the residential areas surrounding the existing port terminal are 47 adjusted decibels to 53 adjusted decibels. Any noise levels that are above these typical levels are dominated by coal terminal operational activities.[377]

Underwater noise generated from commercial and recreational shipping vessel movements in the port is usually periodic, however can have adverse effects on marine communities such as dolphins and whales.

Noise from traffic, port operations and other activities can reduce amenity for nearby residents and disturb shorebirds. Shorebird roosting and feeding areas are located north and south of the existing coal terminals at Hay Point, and although shorebirds can be particularly sensitive to noise, they are also often well habituated to noise occurring in the vicinity of operating ports.

A noise monitoring program, known as the Port of Hay Point ambient air, noise and weather monitoring program, has been in place in the study area since 1993, continuously monitoring noise in the surrounding community (including the nearby Louisa Creek, Half-Tide Beach and Salonika Beach residential areas).

The existing coal terminals have noise control measures in place to minimise impacts. Controls include:

- using low noise idlers on new conveyors
- attenuation of noise emissions through use of acoustic panels
- vegetation to separate noisy activities from sensitive receptors
- using low-noise equipment
- consulting with the community, including advising nearby residents of atypical noise events.

Port of Mackay

Schedule 1 of the *Environmental Protection (Noise) Policy 2019*, prescribes environmental values and acoustic quality objectives for sensitive receptors.[378]

There are several residential communities and sensitive receptors within the study area that have the potential to be adversely impacted by noise. The nearest sensitive receptor to the port and the Mackay Harbour (marina and residential apartments).

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[377] Jacobs. (2016). *Port of Hay Point North Queensland Bulk Ports Environmental Values Assessment Revision 2.* Unpublished report prepared for North Queensland Bulk Ports Corporation Ltd.
[378] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225..*

The main sources of noise pollution in the study area are associated with port and industrial activities, transportation, construction activities and urban areas. Underwater noise generated from commercial and recreational shipping vessel movements in the port is usually periodic, however can have adverse effects on marine communities such as dolphins and whales.

Noise from traffic, port operations and other activities can reduce amenity for nearby residents and disturb shorebirds. Shorebird roosting and feeding areas are located within the nearby wetlands of Slade Nature Reserve to the north of the existing port and Basset Basin to the south. There are also bird watching areas west and south of the port. Shorebirds can be particularly sensitive to noise, however they are also often well habituated to noise occurring in the vicinity of operating ports.

Noise monitoring at the port has been limited to date. Despite the proximity of residential and sensitive receptors, NQBP has not reported any noise complaints relating to noise and/or vibration from the Port of Mackay operations.[379]

NQBP's *Sustainable Port Development Guidelines (2018)* require noise and vibration management measures to be implemented for the port operations to minimise noise and vibration impacts to surrounding receptors.[380]

8.11.2 Potential impacts and/or opportunities

Port of Hay Point

Potential impacts of noise in the study area from the port, other coastal industrial development, as well as coastal residential development are summarised below:

- Increased noise generated from construction and operational activities at the port and other industrial areas:
  - Resulting in changed behaviours in some fauna species and fauna lifecycles.
  - Impacting on nearby residences and communities
- Regional scale noise pollution impacting wildlife behaviour
- Underwater noise and vibration impacts on marine fauna

Port of Mackay

The potential impacts of noise in the study area from the port, other coastal industrial development, as well as coastal residential development are summarised below:

- Changed behaviours in some fauna species and fauna lifecycles
- Impacting on nearby residences and communities.
- Underwater noise and vibration can cause behavioural or physiological changes in marine fauna.

8.12 Existing monitoring programs

Port of Hay Point

Existing monitoring programs relevant to the ports and surrounding areas are listed in **Table 77**. The table briefly describes the program, responsible entity, objectives, parameters, timeframe and longevity, spatial scope and outcomes for each program. [381]

[379] North Queensland Bulk Ports Corporation Ltd. (2020). *Port of Mackay – Port Development Opportunities and Constraints Assessment (Confidential)*.
[380] North Queensland Bulk Ports Corporation Ltd. (2020). *Port of Mackay – Port Development Opportunities and Constraints Assessment (Confidential)*.
[381] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*.

Table 77: Existing monitoring programs – Port of Hay Point

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe / longevity	Spatial scope	Outcomes
Water quality	Port of Mackay and Hay Point Ambient Marine Water Quality Monitoring Program (July 2014 to July 2015)	NQBP	To develop a long-term understanding of the marine water quality characteristics for the region	Water chemistry Sediment deposition and turbidity Light attenuation (PAR) River plumes	Annual July 2014 to 2015 Ongoing program	13 monitoring sites extending approx. 60km along Mackay coastline from Slade Point to Freshwater Point and offshore to Keswick Island	Report available on Queensland Government website.
Water quality	Department of Science, Information Technology and Innovation water quality data	DES	To collect baseline water quality data to contribute to an improvement in water quality entering the GBRWHA. Water quality data is collected through the GBR Catchment Loads Monitoring Program which tracks long term trends in water quality entering the GBR lagoon from priority catchments as part of the Paddock to Reef program.	Total suspended solids Nitrogen Phosphorus Pesticides	Annual Established 2009 Ongoing program	12 priority basins that discharge to the GBRWHA	Annual report available on Queensland Government website.
Water resources – marine environment	Reef 2050 Integrated Monitoring and Reporting Program (RIMRep) Strategy	GBRMPA	Coordinate and integrate existing monitoring, modelling and reporting programs across disciplines within the GBR. Objectives include: Enable early detection and trends and changes in Reef's environment, inform assessment of key threats and future risks and drive adaptive management. Inform the evaluation of management effectiveness Ensure investments are focused appropriately Inform regional stakeholders and national and international communities on whether Reef 2050 Plan is on track	To be determined	Annual 2015 to 2019 Ongoing program	GBRWHA and adjacent catchment.	Support Reef Managers track progress against the Reef 2050 Plan. Provide Reef Managers with more information to support management decisions. Drive better alignment between existing programs. Help to fill monitoring and modelling knowledge gaps. Results of program incorporated into five-yearly *Great Barrier Reef Outlook Report 2019*

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe / longevity	Spatial scope	Outcomes
Water resources – marine environment	Mackay Whitsunday Healthy Rivers to Reef Partnership	Reef Catchments Limited – partnership made up of 22 entities from community, industry, science, tourism and government	Overarching program established to help improve decision making about resource allocation and environmental management of the region	Freshwater indicators (water quality, fauna and habitat) Estuarine indicators Inshore indicators (water quality, coral, seagrass and fauna) Offshore indicators Indigenous cultural heritage assessment	Annual Established 2014 Ongoing program	Covers catchments of Don O'Connell, Proserpine and Plane basins, the urban area of Mackay, ports of Abbot Point and Hay Point, marinas and coastal marine environment	Report cards
Water resources – marine environment - Coral	NQBP Port of Mackay and Hay Point Ambient Coral Monitoring	NQBP	Ambient coral monitoring program to inform future port management activity for the Port of Mackay and Port of Hay Point	Coral monitoring surveys included: Diversity and abundance of benthic communities Percentage coral bleaching Percentage coral mortality Rates of sediment deposition on coral Rates of coral recruitment	Annual since 2010 Ongoing program Monitoring carried out twice yearly with annual reporting	Four locations: Keswick Island Round Top Island Victor Islet	Annual report
Water resources – marine environment - Coral	Port of Hay Point Apron Areas and Departure Path Capital Dredging – Benthic Survey of the Fringing Coral Reefs of Victor Islet, Round Top and Flat Top Islands (June 2005)	Ports Corporation Queensland (PCQ)	Assessment of the diversity, abundance and condition of these fringing reefs to determine likely sensitivity of habitats to effects of light attenuation and sediment deposition. Survey also acted as baseline survey for any future monitoring during and post dredging	Coral monitoring survey included Reef structure Species list Depth stratification Diversity and rank abundance	Once off 14-16 May 2005	Three locations Round Top Island Victor Islet	Report commissioned by NQBP Report provided publicly by NQBP on request

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe / longevity	Spatial scope	Outcomes
Water resources – marine environment - seagrasses	Annual Seagrass Monitoring in the Mackay-Hay Point Region – 2015	NQBP	Characterise the seagrass communities in the Port of Hay Point, including waters north of Round Top Island and coastal waters off Dudgeon Point Provide information to aid planning of possible port development that ensures marine environment is protected and minimally affected Provide current maps and results for seagrass community survey	Seagrass characteristics including: Seagrass percent cover Species composition Above-ground biomass Percent algal cover Depth below mean sea level Sediment type Time and position Spatial data input into Global Information System (GIS)	Annual October 2015 Ongoing program Part of annual seagrass survey monitoring	Navigation channel, berth pockets, dredged material placement area and adjoining areas.	Report available on NQBP website
Seagrass and benthic habitat	Port of Hay Point and Keswick Island Seagrass and Benthic Habitat: Baseline Survey – 2014	NQBP			Once off October/November 2014 Part of annual seagrass survey monitoring		Report available on NQBP website
Seagrass	Port of Hay Point Seagrass Survey (November 2011)	NQBP			November 2011 Part of annual seagrass survey monitoring		Report available on NQBP website.
Seagrass, algae and benthic communities	Port of Hay Point Seagrass, Algae and Benthic Macro-Invertebrate Survey (October 2010)	NQBP			October 2010 Part of annual seagrass survey monitoring		Report available on NQBP website.
Seagrass and algae	Deepwater seagrass dynamics in Hay Point (July 2004 to June 2008)	PCQ – now NQBP	Measuring variability of seagrass meadows and monitoring impacts of capital dredging Also, assessment of impacts of dredging on deepwater marine plants and their recovery	As above	July 2004 to 2008 Part of annual seagrass survey monitoring	As above	Report available on seagrass watch website
Seagrass and algae	Port of Hay Point seagrass, algae and benthic macro-invertebrate community survey (July 2004)	PCQ – now NQBP	To aid in planning for future port expansion that would have minimal impacts on sensitive fisheries and benthic habitats	As above	July 2004 Part of annual seagrass survey monitoring	As above	Report available on Queensland Government website

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe / longevity	Spatial scope	Outcomes
Air quality, noise and weather conditions	Port of Hay Point Ambient Air, Noise and Weather Monitoring	NQBP	Environmental monitoring program has been established to proactively monitor ambient air, noise and meteorological conditions in the community surrounding the Port of Hay Point	Air quality (PM_{10} and dust deposition) Noise levels Meteorological conditions	Monthly Established 1993 Ongoing program	Monitoring sites west and south of DBT and HPCT, and 2 baseline control sites at Grasstree beach	Reports available on NQBP website
Air quality - dust	McEwens Beach PM_{10} Solar BAM1020 and $PM_{2.5}$ Solar E-sampler – Ambient Air Quality Monitoring	NQBP	To monitoring air quality at McEwens Beach	$PM_{2.5}$ and PM_{10}	Monthly Established April 2013 Ongoing program	One monitoring site at McEwens Beach	Reports available on NQBP website
Air quality	Port of Hay Point Coal Dust Study	NQBP	To collect dust concentrations in the region surrounding the Port of Hay Point area	Total Suspended Particulates PM_{10} $PM_{2.5}$	Once-off October 2013 to January 2015	Four monitoring sites within Port of Hay Point	Factsheet available online
Fish	Qfish fisheries catch data	DAF	Collect long-term datasets of commercial fishing catch and effort to manage and report on the status of Queensland fisheries Provide data to undertake ecological and stock assessments of Queensland fisheries	Species catch Fishing effort Fishing method	Annual 1990 to present Ongoing program, no end date specified	Commercial fishery 30minute reporting grids: N24 O24 O25	Reports and survey database online
Marine fauna	DEHP StrandNet wildlife stranding database	DES	Collect long term datasets of marine megafauna strandings and deaths in Queensland waters against which future data can be compared to and to allow identification of trends	Reports of sick, injured, dying and dead marine fauna, including Cetaceans, Dugongs, marine turtles and Pinnipeds Incidental information on sharks, rays, seabirds and other marine animals	Continual with annual reporting 1996 to present Ongoing program	Queensland waters	Data can be requested from DEHP and provided by DEHP discretion. Strandings reports available on DEHP website.

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe / longevity	Spatial scope	Outcomes
Ecology - pests	Ballast water monitoring	DAF	Assess presence of pest species	Ballast water risk	All ships Ongoing government program	Ballast water management is a Government program. Inspection of dredges and sediment is a compulsory port program	Internal government data.
Ecology - pests	Invasive pest species	DAF	Ensure no pest species are introduced during dredging	Ecology pests Hull inspection Sediment testing	International dredges inspected for hull fouling sediment inspected for pest species prior to dredging projects Part of dredging works	Port area	Invasive pest species removed from vessels prior to commencements of dredging
Ecology - pests	Invasive Pest Species	NQBP	Early detection of fouling pest species	Pest species – foiling marine pests	Quarterly inspection of plates Ongoing long-term program (commenced prior to 2010)	Near port infrastructure	Reporting to government is by exception only (if pest species are found).
Indigenous cultural heritage	Dudgeon and Hay Point Cultural Heritage Assessment (Stages 1 and 2)	PCQ	To conduct a cultural heritage assessment for the Dudgeon and Hay Point study area which has designated for potential industrial development	Indigenous cultural heritage	Once-off Study area surveyed in April 2003 and March 2004	Dudgeon Point and Hay Point study area	Report not publicly available.
Cultural heritage	A Report of Desktop Research of the Cultural Heritage Values of the Proposed Dudgeon Point Rail Corridor, Mackay, Central Queensland	NQBP	To conduct a desktop cultural heritage assessment for the proposed rail corridor	Indigenous and non-Indigenous cultural heritage	Once-off Desktop study conducted in 2009 to 2010	Corridor between Hay Point Road and Goonyella-Hay Point rail line (4km)	Report not publicly available.

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe / longevity	Spatial scope	Outcomes
Baseline studies EIS	Dudgeon Point Coal Terminals Project – Baseline Environmental Studies	NQBP	To address the terms of reference for the EIS and collect sufficient environmental baseline information to conduct the impact assessment for the proposed coal terminal projects	Terrestrial ecology Marine ecology Water quality Marine sediment quality MNES Air quality Noise and vibration Cultural heritage Social values	Once-off 2012 and 2013	Dudgeon Point and adjoining terrestrial and marine areas	Report not publicly available.
Baseline studies EIS	DBT Expansion Stages 6 and 7 Draft EIS	PCQ	To address the terms of reference for the EIS and collect sufficient environmental baseline information to conduct the impact assessment for the proposed DBT expansion (Stages 6 and 7)	Terrestrial ecology Marine ecology Water quality Marine sediment quality MNES Air quality Noise and vibration Cultural heritage Social values	Once-off 2000	DBT site and adjoining terrestrial and marine areas	Draft EIS and technical reports available from NQBP request.

Port of Mackay

Existing monitoring programs relevant to the ports and surrounding areas are listed in **Table 78**. The table briefly describes the program, responsible entity, objectives, parameters, timeframe and longevity, spatial scope and outcomes for each program. [382]

[382] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*.

Table 78: Existing monitoring programs – Port of Mackay

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe/ longevity	Spatial scope	Outcomes
Water quality	Port of Mackay and Hay Point Ambient Marine Water Quality Monitoring Program (July 2014 to July 2015)	NQBP	To develop a long-term understanding of the marine water quality characteristics for the region	Water chemistry Sediment deposition and turbidity Light attenuation – Photosynthetically Active Radiation (PAR) River plumes	Annual July 2014 to 2015 Ongoing program	13 monitoring sites extending approx. 60km along Mackay coastline from Slade Point to Freshwater Point and offshore to Keswick Island	Report available on Queensland Government website.
Water quality	Department of Science, Information Technology and Innovation water quality data	DES	To collect baseline water quality data to contribute to an improvement in water quality entering the GBRWHA. Water quality data is collected through the GBR Catchment Loads Monitoring Program which tracks long term trends in water quality entering the GBR lagoon from priority catchments as part of the Paddock to Reef program.	Total suspended solids Nitrogen Phosphorus Pesticides	Annual Established 2009 Ongoing program	12 priority basins that discharge to the GBRWHA	Annual report available on Queensland Government website.
Water resources – marine environment	RIMRep	GBRMPA	Coordinate and integrate existing monitoring, modelling and reporting programs across disciplines within the GBR.	To be determined	Annual 2015 to 2019 Ongoing program	GBRWHA and adjacent catchment.	Support Reef Managers track progress against the Reef 2050 Plan. Provide reef managers with more information to support management decisions. Drive better alignment between existing programs. Help to fill monitoring and

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe/ longevity	Spatial scope	Outcomes
							modelling knowledge gaps. Results of program incorporated into five-yearly G*reat Barrier Reef Outlook Report 2019*
Water resources – marine environment	Mackay Whitsunday Healthy Rivers to Reef Partnership	Reef Catchments Limited - partnership made up of 22 entities from community, industry, science, tourism and government.	Overarching program established to help improve decision making about resource allocation and environmental management of the region	Freshwater indicators (water quality, fauna and habitat) Estuarine indicators Inshore indicators (water quality, coral, seagrass and fauna) Offshore indicators Indigenous cultural heritage assessment	Annual Established 2010 Ongoing program	Covers catchments of Don O'Connell, Proserpine and Plane basins, the urban area of Mackay, ports of Abbot Point and Hay point, marinas and coastal marine environment	Report cards.
Water resources – marine environment	NQBP Port of Mackay and Hay Point Ambient Coral Monitoring	NQBP	Ambient coral monitoring program to inform future port management activity for the Port of Mackay and Port of Hay Point since 2010	Coral monitoring surveys included: Diversity and abundance of benthic communities Percentage coral bleaching Percentage coral mortality Rates of sediment deposition on coral Rates of coral recruitment	Annual May 2015 to May 2016 Ongoing program Monitoring carried out twice yearly with annual reporting	Four locations: Keswick Island Slade Islet Round Top Island Victor Islet	Annual Report.
Water resources – marine environment - seagrasses	Annual Seagrass Monitoring in the Mackay-Hay Point Region – 2015	NQBP	Characterise the seagrass communities in the Port of Mackay, including waters north of Round Top Island	Seagrass characteristics including: Seagrass % cover Species composition	Annual October 2015 Ongoing program Part of annual seagrass survey monitoring	Navigation channel, berth pockets, dredged material placement area and adjoining areas.	Annual Report.

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe/ longevity	Spatial scope	Outcomes
			and coastal waters off Dudgeon Point Provide information to aid planning of possible port development that ensures marine environment is protected and minimally affected Provide current maps and results for seagrass community survey	Above-ground biomass % algal cover Depth below mean sea level Sediment type Time and position Spatial data input into GIS			
Macrobenthic infauna	Macrobenthic infauna monitoring study – Mackay port 2009	NQBP	To characterise microbenthic in faunal assemblages located within and adjacent to the spoil ground	Total abundance Species (taxa richness) Species (taxa) diversity Evenness	Once-off August 2009 Undertaken as required for maintenance dredging approval process	Within and adjoining spoil ground	Report.[383]
Water quality	Mackay Urban Water Quality Monitoring Program	Catchment Solutions	To collect baseline water quality data over a two-year period and contribute to an improved understanding of the relationship between the Mackay urban environment and water quality in the region	Sediments Nutrients Heavy Metals Hydrocarbons Herbicides	Annual reporting 2015 to 2017	18 sites of different land use managements	Catchment Solutions 2016
Marine turtles	Survey of marine turtle nesting distribution in Queensland 2000 and 2001	Queensland Parks and Wildlife Services (QPWS), MTWA and CQUniversity	To improve the understanding of marine turtles and their nesting area from Rockhampton to Mackay	Nesting beaches and turtle numbers (distribution and size)	Once-off aerial surveys over 12 months November 2000 to November 2001	Coastal areas and islands between Rockhampton and Mackay	Report[384]

[383] Worley Parsons Consulting. (2010). *Cairns Port Long Term Management Plan 2010-2020*.
[384] Limpus, C. (2008). *A Biological Review of Australian Marine Turtles. 2. Green turtle, Chelonia myda (Linnaeus)*, Environmental Protection Agency.

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe/ longevity	Spatial scope	Outcomes
Marine turtles	Mackay turtle watch nesting summary data	MTWA	Undertaken by the MTWA who collect data on nesting marine turtles, hatchlings and stranded marine animals	Marine turtles	Annual, as required by volunteers 2012 to 2016 Likely to be ongoing	Repulse Bay to Stanage Bay	Data on marine turtle numbers, tracks, nests and hatchings
Air quality and meteorological data	Queensland Government West Mackay hourly air quality (PM_{10}) and meteorological data	Queensland Government	Baseline air quality survey	PM_{10} Meteorological conditions	Continual with monthly reporting 1 January to 31 December 2013 Ongoing program	One monitoring site located at West Mackay	Excel data report.
Air quality	Mackay air quality monitoring	Queensland Government	Regional air quality monitoring	PM_{10} $PM_{2.5}$	Continual with monthly reporting Established 1997	5 monitoring sites in Queensland	Report.
Fish	Qfish fisheries catch data	DAF	Collect long-term datasets of commercial fishing catch and effort to manage and report on the status of Queensland fisheries Provide data to undertake ecological and stock assessments of Queensland fisheries	Species catch Fishing effort Fishing method	Annual 1990 to present Ongoing program, no end date specified	Commercial fishery 30minute reporting grids: N24 O24 O25	Report. Survey database.
Fish	Mackay Post Office Amateur Fishing Club Catches 1998-2013	Infish	To determine if there was any decline in fish catch rates of the club	Fish numbers and species	As required by volunteers 1998 to 2013	Mackay area from Sarina to Saint Helens Bay	Report.
Marine fauna	DEHP StrandNet wildlife stranding database	DES	Collect long term datasets of marine megafauna strandings and deaths in Queensland waters against which future data can be compared to and to allow identification of trends	Reports of sick, injured, dying and dead marine fauna, including Cetaceans, Dugongs, marine turtles and Pinnipeds Incidental information on sharks, rays, seabirds and other marine animals	Continual with annual reporting 1996 to present Ongoing program	Queensland waters	Data can be requested from DEHP and provided by DEHP discretion. Standings reports available on DEHP website.

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe/ longevity	Spatial scope	Outcomes
Ecology - pests	Ballast water monitoring	DAF	Assess presence of pest species	Ballast water risk	All ships Ongoing government program	Ballast water management is a Government program. Inspection of dredges and sediment is a compulsory port program	Internal government data.
Ecology - pests	Invasive pest species	DAF	Ensure no pest species are introduced during dredging	Ecology pests Hull inspection Sediment testing	International dredges inspected for hull fouling sediment inspected for pest species prior to dredging projects Part of dredging works	Port area	Invasive pest species removed from vessels prior to commencements of dredging
Ecology - pests	Invasive Pest Species	NQBP	Early detection of fouling pest species	Pest species – foiling marine pests	Quarterly inspection of plates Ongoing long-term program (commenced prior to 2010)	Near port infrastructure	Reporting to government by exception only.
Cultural heritage	A cultural heritage assessment of the Mackay Port Authority Seaport Lands	Environmental Protection Agency	To conduct a comprehensive assessment of the natural and cultural values of the remaining natural landscape of the Mackay Seaport Lands	Indigenous and non-Indigenous cultural heritage	Once-off 15 to 19 April 2002	Maritime and Port Authority Seaport Lands located approx. 6km from Mackay City and overs an area of 850ha of coastal land between Slade Point and East Point	Report not publicly available.

8.13 Summary

Port of Hay Point

The study area supports an extensive and complex range of environmental values, particularly terrestrial Sarina Inlet, aquatic and marine ecological values. Residing within the GBRWHA, the study area also exhibits OUVs as listed by the IUCN, MNES and of MSES.

At the national level, the study area includes two wetlands of national importance - the GBRMP and Sandringham Bay – Bakers Creek Aggregation. Sarina Inlet – Ince Bay Aggregation is a wetland of national importance and is predominantly located south of the study area. It also supports two Threatened Ecological Communities, 42 threatened species of flora and fauna and 66 migratory species. These include habitat known to occur within the study area which supports the curlew sandpiper, great knot, eastern curlew, water mouse, loggerhead turtle, green turtle, lesser frigatebird, great frigatebird, humpback whale, Australian snubfin dolphin.

At the state level, key values includes Bakers Creek, Mount Hector, Sandringham Bay and Yuwi Paree Toolkoon National Parks. A complex mosaic of ‘Endangered‘ or ‘Of Concern’ REs are also present throughout the study area comprising a diverse range of broad vegetation types, including mangroves, saltmarshes, saline grasslands and sedgelands, vegetated swamps and wetlands, coastal vine thickets and rainforests, tussock grasslands and a variety of eucalypt woodlands and forests.

The study area contains an extensive network of minor waterways that feed into the larger waterways of Bakers Creek, Sandy Creek and Alligator Creek. In addition to these waterways, the study area contains several riverine and estuarine wetlands with HES. The catchments within the study area feed into the adjacent marine environment, which falls within the GBRWHA. Water quality within the marine environment is influenced by the coastal processes in the study area, as well as land use activities such as agriculture (predominantly sugar cane farming and grazing) and port activities. Groundwater within the study area is typically unsuitable for consumption by livestock or humans.

The primary air pollutant in the study area is dust.

The main sources of noise pollution in the study area are associated with port activities, transportation, construction activities and urban areas. Noise from traffic, port operations and other activities can reduce amenity for nearby residents and disturb shorebirds. Underwater noise generated from commercial and recreational shipping vessel movements in the port can also have adverse effects on marine communities such as dolphins and whales.

The visual amenity of this area includes a varied coastal landscape with a mix of port and transport infrastructure, conservation areas, beaches and rocky outcrops, undulating coastal lowlands, residential areas, agricultural areas and wetlands, all of which are valued by local communities. The aesthetics of the environment, including the appearance of structures as well as agriculture are important values.

Port of Mackay

The study area supports a varied coastal and urban landscape. The topography is predominantly flat and low lying, except for Mount Basset which is located immediately south-west of the existing port area. It has a tropical climate with generally hot and humid summers, and mild, dry winters. It lies in the trade wind belt for most of the year which results in dominant east to south-easterly winds.

There are two wetland areas within the study area located at Slade Point to the north of the port and Basset Basin to the south and south-west of the port. Slade Point wetland supports a variety of coastal vegetation communities, and the Bassett Basin wetland is a declared FHA. There are no internationally significant (Ramsar) wetlands in close proximity to the study area.

The study area displays a wide-ranging area of land that is at or below 5m AHD. These areas are located along the coastline and low-lying inland areas which could potentially be ASS areas. The area also supports a diverse range of terrestrial, aquatic and marine ecological values. The marine area lies wholly within GBRWHA.

The PMST search identified three listed flora species as potentially occurring within the study area, none were listed as 'Critically Endangered', 'Endangered' or 'Near Threatened'. This search identified 19 listed bird species as potentially occurring within the study area. Three species were classified as 'Critically Endangered' including the curlew sandpiper, great knot and eastern curlew. A further seven species listed as 'Endangered' include the

red knot, lesser sand plover, southern giant petrel, star finch, southern black-throated finch, Australian painted snipe and buff-breasted button-quail.

Six terrestrial mammals with a conservation listing were identified. Of these, the northern quoll is classified as 'Endangered' and the remainder classified as 'Vulnerable' including the ghost bat greater glider, koala, grey-headed flying-fox, water mouse.

The study area includes large tracts of vegetation designated as 'Endangered' or ‘Vulnerable’ essential habitat for wildlife around the Pioneer River, Slade Point and at the southern end of the Mackay Airport. The only protected areas of vegetation are the two islands due east of Mackay Airport and south east of the Port of Mackay and Pioneer River. The Commonwealth ‘Critically Endangered’ TEC; Littoral Rainforest and Coastal Vine Thickets of Eastern Australia, has previously been reported within and around the study area.

The intertidal areas, foreshores and beaches within the study area provide migratory shorebird habitat of international significance. The Mackay region is the fifth most important site for shorebirds in Queensland. The northern portion of the study area falls within the O’Connell River Basin, while the southern portion falls within the Alligator Creek, Sandy Creek, Bakers Creek and Sarina Beaches sub catchments of the Pioneer Basin.

Marine plants in the study area include mangroves, seagrass, saltcouch, samphire (succulent) vegetation and adjacent plants such as melaleuca and casuarina. There are several reefs in the waters offshore of Mackay which are dominated by low to medium densities of sediment-tolerant hard coral species. Reefs within the study area include: Round Top Island; Flat Top Island; Slade Island; Dangerous Reef; Saint Bees Island; and Keswick Island.

A total of 33 listed marine fish species were identified from the PMST search as inhabiting or potentially inhabiting the study area. Of those listed, 24 are species of pipefish, three pipehorse, four seahorse and two ghostpipefish species. Twenty-two marine reptiles were identified as potentially inhabiting the study area. Of these, three are listed as 'Endangered' and three as 'Vulnerable'.

Green turtles are the most frequently observed marine turtle in the study area. Flatback turtles are the dominant nesting species in this region, occurring on the mainland beaches between November and April. Usually between 30-100 nesting turtles are recorded annually. Haliday Bay north of Mackay is recognised as one of the most important Flatback turtle nesting beaches in the Mackay region. The study area also supports a range of marine fauna species including dugongs, dolphins and whales.

The broad leaf pepper tree has been identified in the port and subject to priority treatment under NQBP’s Weed Management Plan for the port.

The DES established a regional air monitoring station in a light industrial area of West Mackay in 1997. This station was moved in 2012 to be closer to agricultural areas west of Mackay and measures PM_{10} and visibility (haze) continuously. NQBP also have had two long-term air quality monitoring stations established at the existing port since 2016; one located north of the port (northern station) and the other in the middle of the harbour (southern station). These stations measure PM_{10} (dust particles not visible to the naked eye). In 2020, a level of 'very good' or 'good' was recorded for 96% of the days of the year at Mackay’s northern station and 'very good' or 'good' for 100% of days at the Mackay southern station.

The main sources of noise pollution in the study area are associated with port and industrial activities, transportation, construction activities and urban areas. Underwater noise generated from commercial and recreational shipping vessel movements in the port is periodic.

Existing monitoring programs are listed and describe each program, responsible entity, objectives, parameters, timeframe and longevity, spatial scope and outcomes.

9.0 Outstanding Universal Value

9.1 Introduction

TMR, on behalf of the Queensland Government, is leading the master planning for the Port of Mackay in accordance with the Ports Act. Master planning is a priority under the Reef 2050 Plan and through this process, the Queensland Government will manage the land and marine areas needed for the efficient development and operation of the priority ports, while ensuring that the OUV of the GBRWHA is a fundamental consideration in priority port development, management and governance.

A key environmental value of the Port of Mackay master planning study area is the GBRWHA. The value specifically relates to the expression of a number of environmental and socioeconomic attributes and maintenance of integrity that which contribute to the integrity of the OUV of the GBRWHA, Mackay and its surrounds.

The key terrestrial and marine environmental values present within the Mackay study area have been identified based on the following key considerations:

- World Heritage attributes of OUV
- MNES
- MSES
- other notable environmental features.

Below provides the following sections:

- World Heritage – **Section 9.2**
- Assessment of presence of key attributes within the study area – **Section 9.3**
- Integrity – **Section 9.4**
- Expression of OUV – **Section 9.5**.
- Summary – **Section 9.6**.

9.2 World Heritage

9.2.1 Concept of Outstanding Universal Value

All World Heritage properties demonstrate OUV, which is generally the basis of their nomination and listing. The concept of OUV underpins the basis for the listing of properties on the World Heritage List, as well as the protection and management of these properties. OUV is defined in UNESCO's *Operational Guidelines for the Implementation of the World Heritage Convention* (UNESCO's Operational Guidelines).[385]

The definition states that OUV is *'cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity.'* For a World Heritage Property to be considered to have OUV, it must meet one or more of the ten World Heritage criteria listed in the UNESCO Operational Guidelines, meet the conditions of integrity and/or authenticity (noting that authenticity is not relevant to the GBR as a natural area) and have an adequate protection and management system in place.

9.2.2 Criteria for Assessing Outstanding Universal Value

For a property to be listed as a World Heritage, it must meet one or more of the following World Heritage criteria:

[385] United Nations Educational, Scientific and Cultural Organization. (2016). *Operational Guidelines for the Implementation of the World Heritage Convention*. World Heritage Committee.

- Criterion (i) represent a masterpiece of human creative genius
- Criterion (ii) exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscape design
- Criterion (iii) bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living, or which has disappeared
- Criterion (iv) be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history
- Criterion (v) be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become 'Vulnerable' under the impact of irreversible change
- Criterion (vi) be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The World Heritage Committee considers that this criterion should preferably be used in conjunction with other criteria)
- Criterion (vii) contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance
- Criterion (viii) be outstanding examples representing major stages of earth's history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features
- Criterion (ix) be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals
- Criterion (x) contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of OUV from the point of view of science or conservation.

The GBRWHA meets four of the natural World Heritage criteria: Criterion (vii), Criterion (viii), Criterion (ix) and Criterion (x).

9.2.3 Statement of Outstanding Universal Value

The OUV of a World Heritage Property is articulated in a Statement of OUV that is developed at the time of inscription; however, this was not the case for the GBR where a Statement of OUV was prepared retrospectively and adopted in 2012. The Statement of OUV describes the attributes of the property that contribute to its OUV and it provides the basis for the future protection and management of the property.[386] The Statement of OUV is also the benchmark against which the state of conservation of a World Heritage Property is assessed by the World Heritage Committee.

9.2.4 Integrity

All World Heritage properties are required to meet the conditions of integrity. This is defined by the UNESCO Operational Guidelines as 'a measure of the wholeness and intactness of the natural and/or cultural heritage and its features'. An assessment of the integrity of a property is required to determine the extent to which the property:

- includes all elements necessary to express its OUV
- is of adequate size to ensure the complete representation of the features and processes which convey the property's significance
- buffers from adverse effects of development and/or neglect.

[386] Australian Government. (2014). *Environment Protection and Biodiversity Conservation Act Referral Guidelines for the Outstanding Universal Value of the Great Barrier Reef World Heritage Area*.

For properties nominated under criteria (vii) - (x), such as the GBR, bio-physical processes and landform features should be relatively intact. However, it is recognised within the UNESCO Operational Guidelines that areas may not be entirely pristine and that natural areas are dynamic and to some extent involve interactions with people.

The Statement of OUV[387] concludes that in relation to integrity:

- the integrity of the GBR is 'enhanced by the unparalleled size and current good state of conservation across the area'.
- while a number of natural pressures occur (for example, cyclones and crown-of-thorns starfish outbreaks), given the scale of the GBR 'most habitats or species groups have the capacity to recover from disturbance or withstand ongoing pressures'.
- 'the property is largely intact and includes the fullest possible representation of marine ecological, physical and chemical processes from the coast to the deep abyssal waters enabling the key interdependent elements to exist in their natural relationships'.
- effective conservation programs are essential in areas adjacent to the GBR (for example, coastal catchments) given that some of the key processes of the Reef occur outside its boundaries.

9.2.5 Protection and Management

All World Heritage properties are required to be adequately managed to ensure that their OUV (including the conditions of integrity at the time of inscription) are sustained or enhanced over time.[388]

The UNESCO Operational Guidelines outline the requirements for effective management. This includes:

- appropriate legislative, regulatory and contractual measures
- boundaries for effective protection
- buffer zones
- appropriate management systems.

Finally, the UNESCO Operational Guidelines also provide for the sustainable use of World Heritage properties where that use does not adversely impact on the OUV of the property.

The Statement of OUV outlines the management arrangements that are in place for the GBRWHA. Responsibility for management is shared between the Commonwealth and Queensland Governments. Broadly these arrangements are:

- GBRMPA is an independent Australian Government agency and is responsible for protection and management of the GBRMP. They administer The GBRMP Act, which is a component of the broader environment portfolio.
- the Queensland Government is responsible for management of the GBRMP which is established under the MP Act. This area is contiguous with the GBRMP and covers the 'area between low and high-water marks and many of the waters within the jurisdictional limits of Queensland'. The Queensland Government is also responsible for management of most of the islands within the GBR. Both marine parks have consistent zoning and permitted activity schemes.
- the Australian Government is responsible for administration of the EPBC Act, which provides an overarching mechanism for protecting the World Heritage attributes from inappropriate development, including actions taken inside or outside which could impact on its heritage attributes.
- A range of other Australian and Queensland Government legislation provides protection for the World Heritage attributes of the GBR, for example, by addressing such matters as water quality, shipping management, sea dumping and fisheries management.

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[387] Great Barrier Reef Marine Park Authority. (2012). *Retrospective Statement of OUV adopted by the World Heritage Commission in July 2012*.
[388] Great Barrier Reef Marine Park Authority. (2012). *Retrospective Statement of OUV adopted by the World Heritage Commission in July 2012*.

- There are a range of non-statutory mechanisms in place that protect the World Heritage attributes for the GBR, for example. industry codes of practice, stewardship programs.

In addition to these broad governance arrangements, the Australian and Queensland Governments have introduced a number of administrative and guidance documents to help protect the GBR, these include:

9.2.5.1.1 Intergovernmental Agreement

In 2009, both the Australian and Queensland Governments signed the *Great Barrier Reef Intergovernmental Agreement,* formalising the approach to manage marine and land environments within the GBRWHA.

9.2.5.1.2 Great Barrier Reef Strategic Assessment

The Australian and Queensland Governments have completed two complimentary strategic assessments of the GBR region:

- GBR Coastal Zone Strategic Assessment July 2014 (Queensland Government)
- Region Strategic Assessment: Strategic assessment report July 2014 (GBRMPA)

Strategic assessments enable a 'big-picture' approach to environment and heritage protection that provides certainty in the long term, by determining suitable areas for protection, development and the type of development that should be allowed and the conditions under which such development may proceed.

9.2.5.1.3 *Reef 2050 Long-term Sustainability Plan*

Stemming from the outcomes of the strategic assessment a Reef 2050 Plan has been developed that targets areas of action and seeks to address gaps for future management of the GBRWHA.

9.2.5.1.4 *Environment Protection and Biodiversity Conservation Act Referral Guidelines*

The EPBC Act protects the World Heritage values of the GBRWHA from actions that have, will have or are likely to have a significant impact on those values. The protection and management of World Heritage properties should ensure that their values at the time of inscription are sustained and enhanced over time. This is done primarily through the protection of a property's OUV. These referral guidelines are intended to provide guidance to proponents on the need to refer an action to the Commonwealth Minister for the Environment and Energy for assessment and a decision.

9.2.5.1.5 *Great Barrier Reef Outlook Report 2019*

Produced every five years the *Great Barrier Reef Outlook Report 2019* provides an assessment and findings on the GBR's health, pressures and likely future condition.

9.2.5.2 Key Attributes of the Great Barrier Reef World Heritage Area

The Statement of OUV identifies the key features that contribute to the OUV of the GBRWHA. It is noted in the EPBC Act Referral Guidelines that features may not be expressed equally over the whole GBRWHA and that features can change over time.

9.2.6 Process for determining local representation of Outstanding Universal Value

To understand the integrity of the World Heritage Area at the Port of Hay Point/Mackay it is first necessary to understand how OUV is expressed locally. Using the methodology developed to determine the local expression of OUV,[389] an analysis has been undertaken to identify the presence and local expression of OUV within the priority Port of Hay Point/Mackay study area.

9.2.6.1 Presence of attributes

For those attributes that are present, an analysis was carried out to determine the location, extent and distribution of the attribute within the study area. This is accompanied, where possible, by information (spatial or

[389] Adaptive Strategies. (2021). *Method for identifying the local expression of Outstanding Universal Value within the Great Barrier Reef World Heritage Area*.

contextual) on the distribution and occurrence more broadly within the GBRWHA or adjacent coastal areas. The following terms and definitions have been used as a means of classifying the presence of attributes:

- **Minor presence**: These attributes occur in low abundance or across a small area (relative to the nature of the attributes broader presence within the GBRWHA). Noting that a low abundant attribute that is rare within the GBRWHA may still be important. Temporary fluctuations or seasonal variation were considered.
- **Moderate presence**: These attributes occur in moderate abundance or across a moderately large area (relative to the nature of the attribute across the GBRWHA).
- **Significant presence**: These attributes are present in significant abundances or represent significant examples of the relevant attribute (relative to the nature of the attribute across the GBRWHA).

9.2.6.2 Attribute contribution to Outstanding Universal Value

Port of Hay Point

The attributes within the Hay Point Master Plan Area that contribute to the OUV of the GBRWHA were identified using a desktop analysis and stakeholder engagement as outlined in the following methodology.

- a review of the background information previously prepared for master planning for the priority Port of Hay Point
- targeted consultation was undertaken through meetings and follow up correspondence with key stakeholders including:
  - State agencies
  - NQBP
  - MRC
- a review and analysis of all available data/documentation relevant to the OUV of the study area was undertaken including:
  - legislation and policy relating to the Port of Hay Point
  - planning instruments associated with the port and its precincts
  - existing and proposed land uses
  - existing and proposed infrastructure
  - environmental, social and cultural values.

An analysis was completed to determine the level of contribution of local environmental attributes to the OUV of the World Heritage Area and was based on three levels:

- **Minor contribution (Min):** The attribute is present; however, it occurs in low abundance or singularly and is:
  - not essential to the sustainability of the attribute (for example, substantial breeding population)
  - not recognised as a key feature of the GBRWHA
  - not included in the retrospective statement of OUV
  - not iconic, unique or a high-quality example of the attribute.
- **Moderate contribution (Mod):** The attribute occurs in moderate abundance or across a moderately large area but is not the prime occurrence or representation of the attribute within the GBRWHA. The attribute does however represent a feature for which the GBR was listed as World Heritage.
- **Significant contribution (Sig**): The attribute represents locally important examples of the attribute relative to the nature of the attribute across the GBRWHA. Such an attribute may be specifically referred to within the retrospective statement of OUV for the GBRWHA or defined by other legislation, planning instrument or values assessment (for example, the *Great Barrier Reef Outlook Report 2019*). The

occurrence of the attribute locally is a prime example of the features mentioned in the retrospective statement of OUV.[390]

Port of Mackay

The attributes within the Mackay Master Plan Area that contribute to the OUV of the GBRWHA were identified using a desktop analysis and stakeholder engagement as outlined in the following methodology.

- a review of background information previously prepared for master planning for the Port of Mackay
- targeted consultation was undertaken through meetings and follow up correspondence with key stakeholders including:
  - State agencies
  - NQBP
  - MRC.
- a review and analysis of all available data/documentation relevant to the OUV of the study area was undertaken including:
  - legislation and policy relating to the Port of Mackay
  - planning instruments associated with the port and its precincts
  - existing and proposed land uses
  - existing and proposed infrastructure
  - environmental, social and cultural values.

An analysis was completed to determine the level of contribution of local environmental attributes to the OUV of the World Heritage Area and was based on three levels:

- **Minor contribution (Min):** The attribute is present however it occurs in low abundance or singularly and is:
  - not essential to the sustainability of the attribute (for example, substantial breeding population)
  - not recognised as a key feature of the GBRWHA
  - not included in the retrospective statement of OUV
  - not iconic, unique or a high-quality example of the attribute.
- **Moderate contribution (Mod):** The attribute occurs in moderate abundance or across a moderately large area but is not the prime occurrence or representation of the attribute within the GBRWHA. The attribute does however represent a feature for which the GBR was listed as World Heritage.
- **Significant contribution (Sig):** The attribute represents locally important examples of the attribute relative to the nature of the attribute across the GBRWHA. Such an attribute may be specifically referred to within the retrospective statement of OUV for the GBRWHA or defined by other legislation, planning instrument or values assessment (for example, GBR Outlook report). The occurrence of the attribute locally is a prime example of the features mentioned in the retrospective statement of OUV.[391]

[390] Adaptive Strategies. (2021). *Method for identifying the local expression of Outstanding Universal Value within the Great Barrier Reef World Heritage Area.*
[391] Adaptive Strategies. (2021). *Method for identifying the local expression of Outstanding Universal Value within the Great Barrier Reef World Heritage Area.*

9.3 Assessment of presence of key attributes within the study area

9.3.1 Great Barrier Reef World Heritage Area attributes expressed

Port of Hay Point

The Port of Hay Point is an existing coal port located adjacent to the GBRMP and within the GBRWHA and contains numerous environmental, cultural and social values. **Table 79** shows a summary of the attributes contributing to the GBRWHA's OUV, and whether they are absent or present in the study area.

Table 79: Key features of Outstanding Universal Value for the Great Barrier Reef World Heritage Area and their presence in the Port of Hay Point study area

Table legend	
	Absent
	Present

Natural beauty and natural phenomena	Major stages of Earths evolutionary history	Ecological and biological processes	Habitat for conservation of biodiversity
Superlative natural beauty above and below the water	Continental shelf	Significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes	Diversity supporting marine and terrestrial species (global conservation significance)
String of reef structures along the coast	Flat-topped hills of eroded limestone	Cross-shelf, longshore and vertical connectivity	Coral reefs (400 species of corals in 60 genera)
Mosaic patterns of reefs, islands and coral cays that produce an unparalleled aerial panorama of seascapes	Continental islands	Coral reefs, sand banks and coral cays	Diversity of mangroves
Green vegetated islands	Coral cays	Beds of *halimeda* algae	Diversity of seagrass
Spectacular sandy beaches	New phases of coral growth	Evolution of hard corals	Dugong
Azure waters	Old massive corals	Other fauna, including microfauna	Species of whales
Vast mangrove forests	Coral reef ecosystem	Over 4000 species of molluscs and over 1500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans	Species of dolphins
Vegetated mountains	Inshore fringing reefs, mid-shelf reefs, and exposed outer reefs	Vegetation of the cays and continental islands	Humpback whale calving
Lush rainforest gullies	Processes of geological and geomorphic evolution	Important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation	Marine turtles
Breeding colonies of seabirds and marine turtles	Unique and varied seascapes and landscapes		Green turtle breeding
Green turtle breeding	Continental slope		Marine turtle rookeries
Over-wintering butterflies	Deep oceanic waters		242 species of birds

Natural beauty and natural phenomena	Major stages of Earths evolutionary history	Ecological and biological processes	Habitat for conservation of biodiversity
Hard and soft corals	Abyssal plains		22 seabird species breeding (cays and some continental islands have globally significant breeding sites)
Thousands of species of reef fish			Plant species and diversity and endemism*
Coral spawning			Coral cays
Migrating whales			
Nesting turtles			
Significant spawning aggregations of many fish species			

*species being unique to a defined geographic location

Port of Mackay

The Port of Mackay is an existing port located within the GBRWHA and contains numerous environmental, cultural and social values. **Table 80** shows a summary of the attributes contributing to the GBRWHA's OUV, and whether they are absent or present in the study area.

Table 80: Key features of Outstanding Universal Value for the Great Barrier Reef World Heritage Area and their presence in the Port of Mackay study area

Table legend	
	Absent
	Present

Natural beauty and natural phenomena	Major stages of Earths evolutionary history	Ecological and biological processes	Habitat for conservation of biodiversity
Superlative natural beauty above and below the water	Continental shelf	Significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes	Diversity supporting marine and terrestrial species (global conservation significance)
String of reef structures along the coast	Flat-topped hills of eroded limestone	Cross-shelf, longshore and vertical connectivity	Coral reefs (400 species of corals in 60 genera)
Mosaic patterns of reefs, islands and coral cays that produce an unparalleled aerial panorama of seascapes	Continental islands	Coral reefs, sand banks and coral cays	Diversity of mangroves
Green vegetated islands	Coral cays	Beds of *halimeda* algae	Diversity of seagrass
Spectacular sandy beaches	New phases of coral growth	Evolution of hard corals	Dugong
Azure waters	Old massive corals	Other fauna, including microfauna	Species of whales

Natural beauty and natural phenomena	Major stages of Earths evolutionary history	Ecological and biological processes	Habitat for conservation of biodiversity
Vast mangrove forests	Coral reef ecosystem	Over 4000 species of molluscs and over 1500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans	Species of dolphins
Vegetated mountains	Inshore fringing reefs, mid-shelf reefs, and exposed outer reefs	Vegetation of the cays and continental islands	Humpback whale calving
Lush rainforest gullies	Processes of geological and geomorphic evolution	Important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation	Marine turtles
Breeding colonies of seabirds and marine turtles	Unique and varied seascapes and landscapes		Green turtle breeding
Green turtle breeding	Continental slope		Marine turtle rookeries
Over-wintering butterflies	Deep oceanic waters		242 species of birds
Hard and soft corals	Abyssal plains		22 seabird species breeding (cays and some continental islands have globally significant breeding sites)
Thousands of species of reef fish			Plant species and diversity and endemism*
Coral spawning			Coral cays
Migrating whales			
Nesting turtles			
Significant spawning aggregations of many fish species			

*species being unique to a defined geographic location

9.3.2 Outstanding Universal Value attributes

In the following sections, for attributes that have been assessed as present at the Port of Hay Point/Mackay, an analysis was carried out to assign the level of presence (minor, moderate, significant) within the study area and surrounds.

9.3.2.1 Criterion vii

Port of Hay Point

Criterion vii: Contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.

Table 81 identifies the key attributes that contribute to the OUV of natural beauty and natural phenomena (Criterion vii) of the GBRWHA. Details of each attribute's presence within, or adjacent to the Hay Point master planning study area are provided below.

Table 81: Key attributes contributing the natural beauty and natural phenomena of the Great Barrier Reef World Heritage Area – Port of Hay Point study area

Natural beauty and natural phenomena (Criterion vii)	Presence within or adjacent to the Hay Point master planning study area	Description of the presence within or adjacent to the Hay Point master planning study area
Superlative natural beauty above and below the water	Minor presence	Large aggregations of shorebirds, when they are present, may be considered a superlative natural phenomenon Ocean and island vistas
String of reef structures along the coast	Not present	
Mosaic patterns of reefs, islands and coral cays that produce an unparalleled aerial panorama of seascapes	Not present	
Green vegetated islands	Minor presence	There is one island present within or adjacent to the study area with varying degrees and types of vegetation. • Round Top Island (Yuwi Paree- Toolkoon National Park) • Victor Island RE mapping indicates that remnant vegetation communities are present on Victor Island.
Spectacular sandy beaches	Not present	
Azure waters	Not present	

Natural beauty and natural phenomena (Criterion vii)	Presence within or adjacent to the Hay Point master planning study area	Description of the presence within or adjacent to the Hay Point master planning study area
Vast mangrove forests	Minor presence	Mangroves provide valuable environmental benefits including coastal erosion protection, breeding habitat for many species of fish and they act as filters for nutrients, sediments and pollutants assisting in the maintenance of coastal water quality. Important areas of mangrove forests in the study area include: • Sand Bay, listed as a wetland of national importance • The Sandringham Bay – Bakers Creek Aggregation, listed as a wetland of national importance due to its mangrove diversity • 22ha at Hay Point Peninsula • Sarina Inlet – Ince Bay Aggregation (predominantly south of the study area) The *Great Barrier Reef Outlook Report 2019* identified a newly described hybrid *bruguiera x dungarra* from the Cape York to Fitzroy regions.
Vegetated mountains	Not present	
Lush rainforest gullies	Not present	
Breeding colonies of seabirds and marine turtles	Minor presence	Areas at Dudgeon Point where large emergent trees are present and provide suitable nesting sites for large raptors such as the white-bellied sea eagle (*haliaeetus leucogaster*). Occasional nesting by green turtles on beaches between Dudgeon Point and Mount Hector Conservation Park as well as in low density within Hay Point port limits. Low level nesting by flatback turtles, the dominant nesting species, on mainland beaches between November and April with between 30 and 100 nesting turtles recorded annually.
Green turtle breeding	Minor presence	Green turtles are the most frequently observed marine turtle in the study area but are only occasionally recorded nesting on beaches between Dudgeon Point and Mount Hector Conservation Park as well as in low density within Hay Point port limits.
Over-wintering butterflies	Not present	
Hard and soft corals	Minor presence	There are several reefs in the waters offshore of Hay Point which are dominated by low to medium densities of sediment-tolerant hard coral species. Reefs within the study area include: • Hay Reef • Victor Islet • Round Top Island • Dudgeon Point The coral composition is monitored annually at Hay Point includes: • Round Top Island: *turbinaria* (32%) with *montipora*, *siderastreids* and *faviids* • Victor Islet: *montipora* (50%) with *turbinaria* and *faviids* There has been minimal recovery of the inshore reefs in this area since Tropical Cyclone Debbie in 2017.

Natural beauty and natural phenomena (Criterion vii)	Presence within or adjacent to the Hay Point master planning study area	Description of the presence within or adjacent to the Hay Point master planning study area
Thousands of species of reef fish	Minor presence	The inshore and fringing reefs in the Hay Point study area and surrounds support reef fish communities. The fish communities at Victor Reef and Round Top Reef have previously been described as having low species diversity and low abundance with 71 individual fish species recorded.[392] The reef fish communities in this region are comprised of typical inshore fishes including wrasses, damselfishes, angelfishes, butterflyfishes and snapper. [393]
Coral spawning	Minor presence	Low density of corals in and adjacent to the study area at Hay Point. The size and density of inshore reefs does not result in the mass spawning events more commonly associated with mid shelf and outer reefs. Spawning in this area occurs after the full moon in November.
Migrating whales	Moderate presence	A core aggregation and calving area for humpback whales is located approximately 80km east of Mackay. Humpback whales migrate through the study area annually between June and October (peak in August). Females with calves have been observed within the Hay Point port limits and use nearby offshore waters for resting during migration along the east coast. An aerial survey undertaken several years ago identified humpback whales offshore from Dudgeon Point.
Nesting turtles	Moderate presence	Occasional nesting by green turtles and low level nesting by flatback turtles at Hay Point.
Significant spawning aggregations of many fish species	Not present	

Port of Mackay

Table 82 identifies the key attributes that contribute to the OUV of natural beauty and natural phenomena (Criterion vii) of the GBRWHA. Details of each attribute's presence within, or adjacent to the Mackay port master planning study area are provided below.

Table 82: Key attributes contributing the natural beauty and natural phenomena of the Great Barrier Reef World Heritage Area – Port of Mackay study area

Natural beauty and natural phenomena (Criterion vii)	Presence within or adjacent to the Mackay port master planning study area	Description of the presence within or adjacent to the Mackay port master planning study area
Superlative natural beauty above and below the water	Minor presence	Large aggregations of shorebirds, when they are present, may be considered a superlative natural phenomenon Ocean and island vistas
String of reef structures along the coast	Not present	

[392] GHD. (2005). *Port of Hay Point Apron Area and Departure Path Capital Dredging Draft Environmental Impact Statement, Appendix E Benthic Survey of Fringing Coral Reefs of Victor Islet, Round Top and Flat Top Islands*, Prepared for Ports Corporation of Queensland June 2005.
[393] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*

Natural beauty and natural phenomena (Criterion vii)	Presence within or adjacent to the Mackay port master planning study area	Description of the presence within or adjacent to the Mackay port master planning study area
Mosaic patterns of reefs, islands and coral cays that produce an unparalleled aerial panorama of seascapes	Not present	
Green vegetated islands	Minor presence	There are four islands present within or adjacent to the study area with varying degrees and types of vegetation. • Flat Top Island (Yuwi Paree-Toolkoon National Park) • Round Top Island (Yuwi Paree- Toolkoon National Park) • Keswick Island • Saint Bees Island RE mapping indicates that remnant vegetation communities are present on Flat Top Island and Round Top Island. The vegetation communities on Round Top are listed as of Least Concern and Concern and are likely to be similar on Flat Top Island.
Spectacular sandy beaches	Not present	
Azure waters	Not present	
Vast mangrove forests	Moderate presence	Mangroves provide valuable environmental benefits including coastal erosion protection, breeding habitat for many species of fish and they act as filters for nutrients, sediments and pollutants assisting in the maintenance of coastal water quality. Important areas of mangrove forests in the study area include: • Sand Bay, listed as a wetland of national importance • Slade Point and McCready's Creek • Basset Basin, an estuary of the Pioneer River The *Great Barrier Reef Outlook Report 2019* identified a newly described hybrid *bruguiera x dungarra* from the Cape York to Fitzroy regions.
Vegetated mountains	Not present	
Lush rainforest gullies	Not present	
Breeding colonies of seabirds and marine turtles	Minor presence	Flatback turtles are the dominant nesting species in this region with nesting sites on mainland beaches between November and April and between 30 – 100 nesting turtles observed annually. Green turtles also nest in this region but in low density. Eshelby Island, 1200km north west of Mackay and Bushy Islet, 90km east of Mackay are recognised as regionally important breeding site for seabirds within the Whitsunday region.[394]

[394] Turner, M. (2002). *Coastal Bird Monitoring Strategy for the Great Barrier Reef World Heritage Area*. Great Barrier Reef Marine Park Authority.

Natural beauty and natural phenomena (Criterion vii)	Presence within or adjacent to the Mackay port master planning study area	Description of the presence within or adjacent to the Mackay port master planning study area
Green turtle breeding	Minor presence	Green turtles are the most frequently observed marine turtle in the study area but are only occasionally recorded nesting on beaches in low density. Minor rookeries have been recorded at Bushy Islet, 80km off the Mackay coast.[395] Mackay Turtle watch surveys have identified at least 10 turtles per season on beaches in the Mackay region including Bucasia Beach, Blacks Beach, North Harbour Beach and Salonika Beach between 2012 and 2016.[396]
Over-wintering butterflies	Not present	
Hard and soft corals	Minor presence	There are several reefs in the waters offshore of Mackay port which are dominated by low to medium densities of sediment-tolerant hard coral species. Reefs within the study area are located at: • Round Top Island • Flat Top Island • Taroba Rocks • Slade Island • Dangerous Reef • Keswick Island • Saint Bees Island The coral composition at four reefs monitored annually at Hay Point port and Mackay port includes: • Round Top Island: turbinaria (32%) with montipora, siderastreids and faviids • Victor Islet: *montipora* (50%) with *turbinaria* and *faviids* • Slade Islet: *montipora* (59%) • Keswick Island: *acropora* (40%) with *montipora* and *poritids*. There has been minimal recovery of the inshore reefs in this area since Tropical Cyclone Debbie in 2017.
Thousands of species of reef fish	Minor presence	The inshore and fringing reefs in the Mackay port study area and surrounds support reef fish communities. The fish communities at Round Top Reef and Flat Top Reef have previously been described as having low species diversity and low abundance with 71 individual fish species recorded.[397] The reef fish communities in this region are comprised of typical inshore fishes including wrasses, damselfishes, angelfishes, butterflyfishes and snapper.[398]

[395] Limpus, C. (2008). *A biological review of Australian marine turtles. 2. Green turtle, Chelonia myda (Linnaeus)*, Environmental Protection Agency.
[396] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[397] GHD. (2005). *Port of Hay Point Apron Area and Departure Path Capital Dredging Draft Environmental Impact Statement*, Appendix E Benthic Survey of Fringing Coral Reefs of Victor Islet, Round Top and Flat Top Islands, Prepared for Ports Corporation of Queensland.
[398] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*

Natural beauty and natural phenomena (Criterion vii)	Presence within or adjacent to the Mackay port master planning study area	Description of the presence within or adjacent to the Mackay port master planning study area
Coral spawning	Minor presence	Low density of corals in and adjacent to the study area at Mackay port. The size and density of inshore reefs does not result in the mass spawning events more commonly associated with mid shelf and outer reefs. Spawning in this area occurs after the full moon in November.
Migrating whales	Moderate presence	A core aggregation and calving area for humpback whales is located approximately 80km east of Mackay. Humpback whales migrate through the study area annually between June and October (peak in August) and use nearby offshore waters for resting during migration along the east coast. The waters off Mackay (approximately 100km from the coast) have been identified as important wintering areas for humpback whales, particularly in the inner reef lagoon.
Nesting turtles	Moderate presence	Occasional nesting by green turtles on beaches in the Mackay region with at least 10 individuals observed annually between 2012 and 2016. Low level nesting by flatback turtles in the Mackay port study area.
Significant spawning aggregations of many fish species	Not present	

9.3.2.2 Criterion viii

Criterion viii: Be outstanding examples representing major stages of Earth's history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features.

Port of Hay Point

Table 83 identifies the key attributes that contribute to the OUV of the major stages of the Earth's evolutionary history (Criterion viii) of the GBRWHA. Details of each attribute's presence within, or adjacent to the Hay Point master planning study area are provided below.

Table 83: Key attributes contributing to the major stages of Earth's evolutionary history of the Great Barrier Reef World Heritage Area – Port of Hay Point study area

Major stages of the Earth's evolutionary history (Criterion viii)	Presence within or adjacent to the Hay Point master planning area	Description of the presence within or adjacent to the Hay Point master planning study area
Continental shelf	Not present	
Flat-topped hills of eroded limestone	Not present	
Continental islands	Minor presence	Continental islands adjacent to the study area include Keswick Island, Saint Bees Island and Prudhoe Island.
Coral cays	Not present	
New phases of coral growth	Not present	
Old massive corals	Not present	

Major stages of the Earth's evolutionary history (Criterion viii)	Presence within or adjacent to the Hay Point master planning area	Description of the presence within or adjacent to the Hay Point master planning study area
Coral reef ecosystem	Minor presence	Fringing coral reefs specifically, are found on exposed rocky outcrops in the waters off the following islands: • Victor Island • Round Top Island[399] Inshore turbid coral reefs communities are present at Hay Reef, which is located between the existing jetties at the Hay Point terminal. They are also present in shallow waters south of Dudgeon Point. The corals that are common in the turbid marine environment found in the study area include *montipora, acropora*, *pocillopora* and *turbinaria*, as well as a diverse range of soft corals, sea fans, ascidians and hydroids. These coral reef areas are important habitat for locally important fish and other marine species.[400]
Inshore fringing reefs, mid-shelf reefs, and exposed outer reefs	Minor presence	
Processes of geological and geomorphic evolution	Not present	
Unique and varied seascapes and landscapes	Minor presence	A variety of seascapes and landscapes exist in the Port of Mackay area and surrounds that are well represented in other areas of the GBR region coastal areas. These include wetlands, mangroves, sand beaches, mudflats, open water, coastal islands.
Continental slope	Not present	
Deep oceanic waters	Not present	
Abyssal plains	Not present	

Port of Mackay

Table 84 identifies the key attributes that contribute to the OUV of the major stages of the Earth's evolutionary history (Criterion viii) of the GBRWHA. Details of each attribute's presence within, or adjacent to the Mackay port master planning study area are provided below.

Table 84: Key attributes contributing to the major stages of Earth's evolutionary history of the Great Barrier Reef World Heritage Area – Port of Mackay study area

Major stages of the Earth's evolutionary history (Criterion viii)	Presence within or adjacent to the Mackay Port master planning area	Description of the presence within or adjacent to the Mackay port master planning study area
Continental shelf	Not present	
Flat-topped hills of eroded limestone	Not present	

[399] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[400] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*

Major stages of the Earth's evolutionary history (Criterion viii)	Presence within or adjacent to the Mackay Port master planning area	Description of the presence within or adjacent to the Mackay port master planning study area
Continental islands	Minor presence	Continental islands adjacent to the study area include: • Round Top Island • Flat Top Island • Taroba Rocks • Slade Island • Keswick Island • Saint Bees Island
Coral cays	Not present	
New phases of coral growth	Not present	
Old massive corals	Not present	
Coral reef ecosystem	Minor presence	Fringing coral reefs specifically, are found on exposed rocky outcrops in the waters off the following islands: • Keswick Island • Saint Bees Island • Round Top Island • Flat Top Island[401] Inshore turbid coral reefs communities are present at Slade Rock, Dangerous Reef, Downward Patches and Taroba Rocks. The corals that are common in the turbid marine environment found in the study area include *montipora, Acropora*, *pocillopora* and *turbinaria*, as well as a diverse range of soft corals, sea fans, ascidians and hydroids. These coral reef areas are important habitat for locally important fish and other marine species.[402]
Inshore fringing reefs, mid-shelf reefs, and exposed outer reefs	Minor presence	
Processes of geological and geomorphic evolution	Not present	
Unique and varied seascapes and landscapes	Minor presence	A variety of seascapes and landscapes exist in the Port of Mackay area and surrounds that are well represented in other areas of the GBR region coastal areas. These include wetlands, mangroves, sand beaches, mudflats, open water, coastal islands.
Continental slope	Not present	
Deep oceanic waters	Not present	
Abyssal plains	Not present	

[401] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225.*
[402] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*

9.3.2.3 Criterion ix

Criterion ix: Be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.

Port of Hay Point

Table 85 identifies the key attributes that contribute to the OUV of ecological and biological processes (Criterion ix) of the GBRWHA. Details of each attribute's presence within, or adjacent to the Hay Point master planning study area are provided below.

Table 85: Attributes that contribute to the Outstanding Universal Value of ecological and biological processes of the Great Barrier Reef World Heritage Area – Port of Hay Point study area

Ecological and biological processes (Criterion ix)	Presence within or adjacent to the Hay Point master planning area	Description of the presence within or adjacent to the Hay Point master planning study area
Significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes	Minor presence	Fringing reefs are present at Victor Island, Round Top Island and inshore turbid reefs at Hay Point and Dudgeon Point.
Cross-shelf, longshore and vertical connectivity	Minor presence	The offshore areas at the Port of Mackay form part of the larger longshore connections within the GBR lagoon
Coral reefs, sand banks and coral cays	Minor presence	There are several reefs in the waters offshore of Hay Point which are dominated by low to medium densities of sediment-tolerant hard coral species. Reefs within the study area include: • Hay Reef • Victor Islet • Round Top Island • Dudgeon Point
Beds of *Halimeda* algae	Minor presence	Macroalgae communities in this region are considered to be variable in terms of density and frequency of occurrence with species observed including *sargassum*, *udotea* and *caulerp*a. In the area surrounding Hay Point [ort, macroalgae density is low (less than 1% to 5%), while the seafloor offshore of the ports supports large areas of medium density algae (5-20%).
Evolution of hard corals	Not present	
Other fauna, including microfauna	Not present	

Ecological and biological processes (Criterion ix)	Presence within or adjacent to the Hay Point master planning area	Description of the presence within or adjacent to the Hay Point master planning study area
Over 4000 species of molluscs and over 1500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans	Minor presence	Moderate density macroinvertebrate communities located in and due west of the DMPA at Hay Point. These communities contained patches of rubble and substrate with a diverse variety of erect and encrusting bryozoans and polychaete worms. The majority of the surveyed area has low density to open communities containing mostly open substrate with scattered individuals and/or small and discontinuous but diverse patches containing varying combinations of erect and encrusting taxa. Taxa within those patches included bryozoans, polychaete worms, echinoids, gastropods, barnacles and bivalves. These faunae are common components of the macroinvertebrate inshore assemblages of northern Queensland
Vegetation of the cays and continental islands	Minor presence	Two islands present within the study area with varying degrees and types of vegetation: • Victor Island • Round Top Island (Yuwi Paree- Toolkoon National ParkVictor Island) RE mapping indicates that remnant vegetation communities are present on Victor Island.
Important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation	Minor presence	The study area contains estuarine wetlands associated with the local rivers and bays which provide breeding habitat for resident shorebird species. The Mackay region is recognized as the fifth most important site for shorebirds in Queensland. Eighteen different shorebird species utilise habitats in the Mackay regions for foraging and roosting. These birds are likely contributing to the ecological processes in the study area.

Port of Mackay

Table 86 identifies the key attributes that contribute to the OUV of ecological and biological processes (Criterion ix) of the GBRWHA. Details of each attribute's presence within, or adjacent to the Mackay port master planning study area are provided below.

Table 86: Key attributes contributing to the ecological and biological processes of the Great Barrier Reef World Heritage Area – Port of Mackay study area

Ecological and biological processes (Criterion ix)	Presence within or adjacent to the Mackay port master planning area	Description of the presence within or adjacent to the Mackay port master planning study area
Significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes	Minor presence	Fringing reefs are present at Round Top Island, Flat Top Island, Keswick Island and Saint Bees Island and inshore turbid reefs including Slade Rock, Dangerous Reef and Downward Patches.
Cross-shelf, longshore and vertical connectivity	Minor presence	The offshore areas at the Port of Mackay form part of the larger longshore connections within the GBR lagoon

Ecological and biological processes (Criterion ix)	Presence within or adjacent to the Mackay port master planning area	Description of the presence within or adjacent to the Mackay port master planning study area
Coral reefs, sand banks and coral cays	Minor presence	There are several reefs in the waters offshore of Mackay port which are dominated by low to medium densities of sediment-tolerant hard coral species. Reefs within the study area include: • Round Top Island • Flat Top Island • Taroba Rocks • Keswick Island • Saint Bees Island
Beds of *Halimeda* algae	Minor presence	Macroalgae communities in this region are considered to be variable in terms of density and frequency of occurrence with species observed including *sargassum*, *udotea* and *caulerpa*. In the area surrounding Mackay port macroalgae density is low (less than 1% to 5%), however it is higher on the rocky reefs in the area (17-50%). During the 2020 survey, macroalgae cover was reduced to less than 13% on these inshore reefs, likely due to high water temperatures.
Evolution of hard corals	Not present	
Other fauna, including microfauna	Not present	
Over 4000 species of molluscs and over 1500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans	Minor presence	Macroinvertebrate communities within the Mackay port limits are generally low density with some areas of significant benthic macro-invertebrate communities found in proximity to the harbour and approach channels. The communities consisted of sponges, bryozoa, hydroids, alcyonarians and ophiuroids.
Vegetation of the cays and continental islands	Minor presence	There are five islands present within or adjacent to the study area with varying degrees and types of vegetation. • Flat Top Island (Yuwi Paree-Toolkoon National Park) • Round Top Island (Yuwi Paree- Toolkoon National Park) • Slade Island • Keswick Island • Saint Bees Island RE mapping indicates that remnant vegetation communities are present on Flat Top Island and Round Top Island The vegetation communities on Round Top are listed as of Least Concern and Concern and are likely to be similar on Flat Top Island.
Important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation	Minor presence	The study area contains estuarine wetlands associated with the local rivers and bays which provide breeding habitat for resident shorebird species. The Mackay region is recognized as the fifth most important site for shorebirds in Queensland. Eighteen different shorebird species utilise habitats in the Mackay regions for foraging and roosting. These birds are likely contributing to the ecological processes in the study area.

9.3.2.4 Criterion x

Criterion x: Contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of OUV from the point of view of science or conservation

Port of Hay Point

Table 87 identifies the key attributes that contribute to the OUV of conservation of biodiversity (Criterion x) of the GBRWHA. Details of each attribute's presence within, or adjacent to the Hay Point master planning study area are provided below.

Table 87: Key attributes contributing to habitats for conservation of biodiversity of the Great Barrier Reef World Heritage Area – Port of Hay Point study area

Habitats for conservation of biodiversity (Criterion x)	Presence within or adjacent to the Hay Point master planning area	Description of the presence within or adjacent to the Hay Point master planning study area
Diversity supporting marine and terrestrial species (global conservation significance)	Moderate presence	Nationally important wetlands in the study area include the Sandringham bay – Bakers Creek Aggregation and the Sarina Inlet – Ince Bay Aggregation (predominantly south of the study area). A total of 31 listed migratory wetland species are either known to inhabit or visit these wetlands, or have habitat or roosting sites suitable for their visitation within the project area There is the additional moderate presence of whales, dolphins and flatback turtle nesting.
Coral reefs (400 species of corals in 60 genera)	Minor presence	There are several reefs in the waters offshore of Hay Point which are dominated by low to medium densities of sediment-tolerant hard coral species. Reefs within the study area include: • Hay Reef • Victor Islet • Round Top Island • Dudgeon Point Ambient annual coral monitoring at Round Top Island and Victor Islet indicates that the dominant species in the study area are *turbinaria* and *montipora*.

Habitats for conservation of biodiversity (Criterion x)	Presence within or adjacent to the Hay Point master planning area	Description of the presence within or adjacent to the Hay Point master planning study area
Diversity of mangroves	Minor presence	21 of the 37 species of mangroves present within the GBRWHA occur in the Mackay region. The most common species include the red mangrove (*rhizophora stylosa*), grey mangrove (*avicennia marina*) and yellow mangrove (*ceriops australis*). Important areas of mangroves in the study area include: • Sand Bay, listed as a wetland of national importance • The Sandringham Bay – Bakers Creek Aggregation, listed as a wetland of national importance due to its mangrove diversity • Hay Point Peninsula • Sarina Inlet – Ince Bay Aggregation (predominantly south of the study area). Mangrove dieback within the Sandringham Bay – Bakers Creek Aggregation was recorded in 2002 which has been linked to herbicide use in the catchment. The *Great Barrier Reef Outlook Report 2019* identified a newly described hybrid *bruguiera x dungarra* from the Cape York to Fitzroy regions.
Diversity of seagrass	Minor presence	Common seagrass species at Hay Point include: • *halophila decipiens* • *halophila ovalis* • *halophila spinulosa* • *halodule uninervis.* Seagrass at Hay Point is present: • in deepwater seagrass meadows which are particularly variable, usually in low and medium densities, often occurring as small patches, during December and May. • Inshore seagrass adjacent to Dudgeon Point and Round Top Islands • Adjacent to existing DMPAs. The most recent survey in 2019 indicates that overall seagrass condition in the broader Hay Point region is classified as good to very good. While seagrass communities in and adjacent to the Port of Hay Point are considered low density, ephemeral and spatially patchy, they do provide a small contribution to the maintenance of local habitat values for marine species including turtles and potentially dugong.
Dugong	Minor presence	The study area has low density seagrass therefore it is not recognised as a site where dugong frequently forage. However, the meadows could be used for foraging by dugong as they move between Dugong Protection Areas at Llewelyn Bay and Ince Bay (predominantly south of the study area).

Habitats for conservation of biodiversity (Criterion x)	Presence within or adjacent to the Hay Point master planning area	Description of the presence within or adjacent to the Hay Point master planning study area
Species of whales	Moderate presence	Humpback whales migrate through the study area annually between June and October (peak in August). Females with calves have been observed within the Hay Point port limits and use nearby offshore waters for resting during migration along the east coast. There is a core aggregation and calving area for humpback whales located approximately 80km east of Mackay. The sei whale (*balaenoptera musculus*) and fin whale (*balaenoptera physalus*) are occasionally observed at Hay Point.
Species of dolphins	Minor presence	A number of species of dolphins occur in the waters off Hay Point. The most prevalent species is the Australian humpback dolphin (*sousa sahulensis*) and others include the spotted dolphin (*stenella attenuate*), Indian Ocean bottlenose dolphin (*tursiops aduncus*), Australian humpback dolphin (*sousa sahulensis*) and potentially the irrawaddy dolphin (*orcaellabrevirostris*). The Australian snubfin dolphin (*orcaella heinsohni*) may also occur in the riverine and estuarine areas of the bays and lagoons in the Hay Point study area.
Humpback whale calving	Not present	
Marine turtles	Minor presence	All six species of marine turtles that are found in Queensland waters have been recorded in the Hay Point study area.[403] Specifically, loggerhead turtles forage in the area and green turtles are the most recorded turtle in the study area. The inshore areas of the port support a population of resident green turtles that forage on the algae covered reefs and deep-water seagrass. Low density flatback turtle nesting has also been observed within the port on Hay Point Beach and Salonika Beach and at Dudgeon Point between the months of November and April. Usually between 30-100 nesting turtles are recorded annually.[404] The species of marine turtles present in the study area include: • Leatherback turtle • Hawksbill turtle • Olive ridley turtle • Flatback Turtles forage in the waters off Hay Point.[405] Peripheral flatback turtle rookeries Hay Point Beach, Salonika Beach and Sarina Beach.
Green turtle breeding	Minor presence	
Marine turtle rookeries	Moderate presence	
242 species of birds	Significant presence	

[403] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*
[404] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*
[405] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point*.

Habitats for conservation of biodiversity (Criterion x)	Presence within or adjacent to the Hay Point master planning area	Description of the presence within or adjacent to the Hay Point master planning study area
22 seabird species breeding	Minor presence	The study area contains estuarine wetlands associated with the local rivers and bays which provide breeding habitat for resident shorebird species. The Mackay region is recognized as the fifth most important site for shorebirds in Queensland. Eighteen different shorebird species utilise habitats in the Mackay regions for foraging and roosting. The following protected areas contain shorebird habitat[406]: • Bakers Creek Conservation Park • Sandringham Bay Conservation Park • Mount Hector Conservation Park A PMST search identified 19 EPBC Act listed bird species that are known to or likely to occur in the study area. Nine species had habitat or roosting areas that were known to occur within the project area and include the red knot, curlew sandpiper, great knot, greater sand plover, lesser sand plover, white-throated needletail, bart-tailed godwit, eastern curlew, Australian painted snipe. A total of 31 listed migratory wetland species are either known to inhabit or visit the wetlands in the study area, or have habitat or roosting sites suitable for their visitation within the study area. Areas at Dudgeon Point where large emergent trees are present and provide suitable nesting sites for large raptors such as the white-bellied sea eagle (*haliaeetus leucogaster*).
Plant species and diversity and endemism (species being unique to a defined geographic location)	Minor presence	One TEC, the 'Critically Endangered' littoral rainforest and coastal vine thickets of Eastern Australia is likely to be present within the study area. The PMST and Queensland WildNET search identified five EPBC listed flora species as potentially occurring within the study area and includes bluegrass (*dichanthium setosum*), black ironbox (*eucalyptus raveretiana*), an evergreen vine thicket (*omphalea celata*), lesser swamp orchid (*phaius australis*), holly-leaved *graptophyllum* (*graptophyllum ilicifolium*).
Coral cays	Not present	

Port of Mackay

Table 88 identifies the key attributes that contribute to the OUV of conservation of biodiversity (Criterion x) of the GBRWHA. Details of each attribute's presence within, or adjacent to the Mackay port master planning study area are provided below.

[406] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*

Table 88: Key attributes contributing to habitats for conservation of biodiversity of the Great Barrier Reef World Heritage Area – Port of Mackay study area

Habitats for conservation of biodiversity (Criterion x)	Presence within or adjacent to the Mackay port master planning area	Description of the presence within or adjacent to the Mackay port master planning study area
Diversity supporting marine and terrestrial species (global conservation significance)	Moderate presence	There are no internationally important wetlands in the study area but there are two nationally important wetlands including The GBRMP and Sandringham Bay – Bakers Creek Aggregation. State significant wetlands within the study area include the Keeleys Road wetlands to the east of the port of Mackay. Locally significant wetlands include those at the mouth of the Pioneer River. A total of 31 listed migratory shorebird species are either known to inhabit or visit these wetlands, or have habitat or roosting sites suitable for their visitation within the project area There is the additional moderate presence of whales and flatback turtle nesting.
Coral reefs (400 species of corals in 60 genera)	Minor presence	There are several reefs in the waters offshore of Mackay port which are dominated by low to medium densities of sediment-tolerant hard coral species. Reefs within the study area include: • Round Top Island • Flat Top Island • Slade Island • Taroba Rocks • Keswick Island • Saint Bees Island Ambient annual coral monitoring at Round Top Island, Slade Islet and Keswick Island indicates that the dominant species in the study area are *turbinaria* and *montipora* and also *acropora* at Keswick Island.
Diversity of mangroves	Moderate presence	21 of the 37 species of mangroves present within the GBRWHA occur in the Mackay region. The most common species include the red mangrove (*rhizophora stylosa*), grey mangrove (*avicennia marina*) and yellow mangrove (*ceriops australis*). Important areas of mangroves in the study area include: • Sand Bay, listed as a wetland of national importance • Slade Point and McCready's Creek • Basset Basin, an estuary of the Pioneer River • The Sandringham Bay – Bakers Creek Aggregation, listed as a wetland of national importance due to its mangrove diversity Mangrove dieback within the Sandringham Bay – Bakers Creek Aggregation was recorded in 2002 which has been linked to herbicide use in the catchment. The *Great Barrier Reef Outlook Report 2019* identified a newly described hybrid *bruguiera x dungarra* from the Cape York to Fitzroy regions.

Habitats for conservation of biodiversity (Criterion x)	Presence within or adjacent to the Mackay port master planning area	Description of the presence within or adjacent to the Mackay port master planning study area
Diversity of seagrass	Minor presence	Common seagrass species within the Mackay port study area include: • halophila decipiens • halophila tricostata • halophila spinulosa • halodule uninervis. • halodule ovalis The most recent survey in 2020 indicates that overall seagrass condition in the broader Hay Point/Mackay region was satisfactory. While seagrass communities in and adjacent to the Mackay port are considered low density, ephemeral and spatially patchy, they do provide a small contribution to the maintenance of local habitat values for marine species including turtles and potentially dugong.
Dugong	Minor presence	The study area has low density seagrass therefore it is not recognised as a site where dugong frequently forage. However, the meadows could be used for foraging by dugong as they move between Dugong Protection Areas at Llewelyn Bay and Ince Bay.
Species of whales	Moderate presence	A core aggregation and calving area for humpback whales is located approximately 80km east of Mackay. Humpback whales migrate through the study area annually between June and October (peak in August) and use nearby offshore waters for resting during migration along the east coast. The waters off Mackay (approximately 100km from the coast) have been identified as important wintering areas for humpback whales, particularly in the inner reef lagoon.
Species of dolphins	Minor presence	Limited published information exists on local population estimates for dolphins in the Mackay region. The PMST search indicated two species of dolphin are known to occur in the project area, the Australian snubfin dolphin (*orcaella heinsohni*) and the Australian humpback dolphins (*dousa sahulensis*). The study area provides suitable habitat for the Australian snubfin dolphin with shallow coastal waters, river and creek mouths and seagrass beds. While suitable habitat is provided in the study area, it is unlikely to support important resident populations. Australian humpback dolphins are known to occur south of the site adjacent to the Port of Hay Point and they are likely to use a variety of areas throughout this region.
Humpback whale calving	Not present	

Habitats for conservation of biodiversity (Criterion x)	Presence within or adjacent to the Mackay port master planning area	Description of the presence within or adjacent to the Mackay port master planning study area
Marine turtles	Minor presence	Green turtles (*chelonia mydas*) are the most frequently observed marine turtle in the study area and have been recorded at Bushy Islet (approximately 80km off the Mackay coast). Low density (at least 10) green turtle nesting has been recorded by Mackay Turtle watch on beaches in the Mackay region including Bucasia Beach, Blacks Beach, North Harbour Beach and Salonika Beach. Flatback turtles (*natator depressus*) are the dominant nesting species in this region and nesting sites occur on the mainland beaches between November and April. Usually between 30-100 nesting turtles are recorded annually. Haliday Bay north of Mackay is recognised as one of the most important flatback turtle nesting beaches in the Mackay region. Leatherback turtles (*dermochelys coriacea*) are not common in the area with only a single record from 1993. Similarly, while loggerhead turtles have been sighted, they appear to be only occasional visitors to the area with some nesting at Bushy Islet, likely due to the Mackay region being at the northern extent of their range
Green turtle breeding	Minor presence	Green turtles are the most frequently observed marine turtle in the study area but are only occasionally recorded nesting on beaches in low density. Minor rookeries have been recorded at Bushy Islet, 80km off the Mackay coast.[407] Mackay turtle watch surveys have identified at least 10 turtles per season on beaches in the Mackay region including Bucasia Beach, Blacks Beach, North Harbour Beach and Salonika Beach between 2012 and 2016.[408]
Marine turtle rookeries	Moderate presence	Green turtle rookeries have been recorded at Bushy Islet (approximately 80km off the Mackay coast).[409]
242 species of birds	Significant presence	There is significant habitat for shorebird and migratory birds which vary from year to year. There are internationally recognised roosting sites at Sandringham Bay that supports up to 23,000 shorebirds each year during annual migration. Estuarine wetlands associated with the local rivers and bays which provide breeding habitat for resident shorebird species. The Mackay region is recognized as the fifth most important site for shorebirds in Queensland. Eighteen different shorebird species utilise habitats in the Mackay regions for foraging and roosting.
22 seabird species breeding	Minor presence	Eshelby Island, 1200km north west of Mackay and Bushy Islet, 90km east of Mackay are recognised as regionally important breeding site for seabirds within the Whitsunday region

[407] Limpus, C. (2008). *A Biological Review of Australian Marine Turtles. 2. Green turtle, Chelonia myda (Linnaeus)*, Environmental Protection Agency.
[408] Aurecon and Department of State Development. (2017). *Confidential Priority Port of Hay Point/Mackay: Phase 1 – Environmental, social and cultural values and economic description Rev 4, Reference 225225*
[409] Limpus, C. (2008). *A Biological Review of Australian Marine Turtles. 2. Green turtle, Chelonia myda (Linnaeus)*, Environmental Protection Agency.

9.3.3 Summary of local attributes of the Outstanding Universal Value

Port of Hay Point

The locally expressed OUV attributes within the Hay Point master planned area and their contribution classifications relative to the OUV across the entire GBRWHA are presented in **Table 89**. A summary of the environmental values determined to be key contributors to the local expression of OUV of the GBRWHA are also included in **Table 89**. The contribution classifications have been colour-coded (green = minimum (Min), orange = moderate (Mod), red = significant (Sig)) and applied to the relevant attributes.

Table 89: Local attributes that contribute to the Outstanding Universal Value of the Great Barrier Reef World Heritage Area – Port of Hay Point study area

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
Corals	Coral reefs (400 species of corals in 60 genera)				Min	There is a minor contribution to OUV from corals due to the low coral cover and low coral diversity at reefs within and adjacent to the area. The nearest significant coral reef ecosystems to Hay Point are over 20km distance. The inshore reefs of the region are relatively small and limited in extent in comparison to other inshore reefs. They have relatively low diversity and low cover. Inshore reefs have persisted over time, despite the climatic fluctuations driven mainly by cyclonic disturbances. As these reefs are relatively isolated from other systems, they tend to be regenerative. More notable examples of reef ecosystems are present in the GBRWHA, such as the Whitsundays and Dry Tropics. The size and density of inshore reefs are not the result of mass spawning events more commonly associated with mid shelf and outer reefs. Local spawning is important for the ongoing presence of inshore reefs, but it is not the result of the mass spawning phenomenon important for reef persistence across the wider WHA.	Reefs present in the waters offshore waters include Flat Top Island, Keswick Island and St Bees Island, Hay Reef, Victor Islet, Victor Island, Round Top Island and Dudgeon Point. Fringing reefs are present at Victor Island and Round Top Island. Inshore turbid coral reefs communities are present at Hay Reef, which is located between the existing jetties at the Hay Point terminal, Taroba Rocks, Slade Island/Slade Rock, Dangerous Reef and Downward patches. They are also present in shallow waters south of Dudgeon Point. Common corals in the turbid marine environment include *montipora, acropora, pocillopora* and *turbinaria*, as well as a diverse range of soft corals, sea fans, ascidians and hydroids. These coral reef areas are important habitat for locally important fish and other marine species.
	Coral reef ecosystem		Min				
	Inshore fringing reefs, mid-shelf reefs, and exposed outer reefs		Min				
	Hard and soft corals	Min					
	Coral reefs, sand banks and coral cays			Min			
	Coral spawning	Min					
Mangroves	Diversity of mangroves				Mod		

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
	Vast mangrove forests	Mod				There is a minor contribution to OUV from mangroves as the study area supports 21 species that are present in wetlands of national importance. The *Great Barrier Reef Outlook Report 2019* lists the diversity and abundance of mangrove species across the whole GBR as very good with a stable trend. The *State Party Report on the State of Conservation of Australia's Great Barrier Reef 2022*[410] (State Party Report 2022) reviews remote sensing-based canopy cover from 2018-2020 which indicates general stability of mangrove forests in the reef has probably continued. The remnant mangrove forests mapped in the area considered to be well represented in areas off the GBR region.	The Hay Point area has 22ha of mangroves within enclosed wetland areas. There are 21 species present in wetlands of national importance. Minor stands of mangroves can be found at Half Tide Beach and an extensive community at Louisa Creek. The most common species include the red mangrove (*rhizophora stylosa*), grey mangrove (*avicennia marina*) and yellow mangrove (*ceriops australis*).
Seagrass and macroalgae	Beds of *Halimeda* algae			Min		There is a minor contribution to OUV from seagrass and macroalgae. The *Great Barrier Reef Outlook Report 2019* states that seagrass has a poor condition, with a stable trend. *Halimeda* banks condition is listed as very good, with no consistent trend. Current observations from the State Party Report 2022 are that seagrass is covering. Most seagrass species in the GBRWHA are widely distributed and there are more notable examples such as Barrow Point to Lookout Point and Dunk Island. However, meadows located in the study area provide foraging habitat for species of turtles and dolphins and nursery habitat for a diversity of fish species. In 2011 seagrass meadows covered 115.7ha. However, they are low density,	Macroalgae communities in this region are considered to be variable in terms of density and frequency of occurrence with species observed including *sargassum, udotea* and *caulerpa*. In the area surrounding Hay Point port, macroalgae density is low (less than 1% to 5%), while the seafloor offshore of both ports supports large areas of medium density algae (5-20%). Meadows provide foraging habitat for species of turtles and dolphins and nursery habitat for a diversity of fish species. There are seagrass habitats off Hay Point in shallow water and in mid-shelf deeper water, containing four species of seagrass: *halpphila decipiens*
	Diversity of seagrass				Min		

[410] Department of Climate Change, Energy, the Environment and Water. (2022). *State Report on the State of Conservation of Australia's Great Barrier Reef 2022.* Retrieved from https://www.dcceew.gov.au/sites/default/files/documents/gbr-state-party-report.pdf

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
						patchy and ephemeral communities. They are not considered to be particularly notable or important, but they do provide a small contribution to the local populations of marine species.[411]	*halophila ovalis* *halophila spinulosa* *halodule uninervis.* Deepwater seagrass meadows are also present but are low and medium densities.
Marine Turtles	Marine turtles				Min	There is a minor contribution to OUV from marine turtles and green turtle breeding as localised populations are not significant comparative to other areas of the GBR, such as Raine Island, Peak Island, Duck Island and Avoid Island. A moderate contribution of Nesting and Flatback turtles nesting on beaches within the study area. The *Great Barrier Reef Outlook Report 2019* identifies that there is flatback turtle nesting around Mackay, and that Mackay is a hotspot for elevated light which impacts on the success of nesting. Low density flatback turtle been observed within the port on Hay Point Beach and Salonika Beach and at Dudgeon Point between the months of November and April. Usually between 30-100 nesting turtles are recorded annually.[412]	Species of marine turtles present include: • Green turtle • Loggerhead turtle (occasional sightings) • Leatherback turtle • Hawksbill turtle • Olive ridley turtle • Flatback turtle. The inshore areas of the port support a population of resident Green turtles that forage on the algae covered reefs and deep-water seagrass. Green turtles (*chelonia mydas*) are the most frequently observed marine turtle, with nesting recorded by Mackay Turtle watch on beaches in the Mackay region including Bucasia Beach, Blacks Beach, North Harbour Beach and Salonika Beach. Low density flatback turtle nesting has been observed within the port on Hay Point Beach and Salonika Beach and at Dudgeon Point and Mount Hector
	Green turtle breeding	Min			Min		
	Nesting turtles	Mod					
	Marine turtle rookeries				Mod		

[411] Limpus, C. (2008). *A Biological Review of Australian Marine Turtles. 2. Green turtle, Chelonia myda (Linnaeus)*, Environmental Protection Agency.
[412] Limpus, C. (2008). *A Biological Review of Australian Marine Turtles. 2. Green turtle, Chelonia myda (Linnaeus)*, Environmental Protection Agency.

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
							Conservation Area between the months of November and April. Flatback turtles (*natator depressus*) are the dominant nesting species in this region and nesting sites occur on the mainland beaches between November and April. Haliday Bay north of Mackay is recognised as one of the most important flatback turtle nesting beaches in the Mackay region. There are peripheral flatback turtle rookeries at Hay Point Beach, Salonika Beach and Sarina Beach. Green turtles have been recorded at Bushy Islet (approximately 80km off the Mackay coast).
Marine Mammals	Migrating whales	Mod				There is a moderate contribution to OUV for whales due to a core aggregation and calving areas for migrating humpback whales located approximately 80km east of Mackay. Waters off Mackay are important wintering areas for humpback whales. The *Great Barrier Reef Outlook Report 2019* notes that humpback whales have recovered strongly across the reef, with a good condition and stable trend.	Humpback whales migrate through the project area annually between June and October (peak in August).[413] Females with calves have been observed within the Hay Point port limits.[414] Core aggregation and calving areas for migrating Humpback whales are located approximately 80km east of Mackay. The waters off Mackay (approximately 100km from the coast) have been identified as important wintering areas for Humpback whales, particularly in the inner reef lagoon. Humpback Whales *(megaptera novaeangliae)* are the most prevalent in this area. The sei whale (*balaenoptera musculus*) and fin whale (*balaenoptera physalus*) are occasionally observed.
	Species of whales				Mod		

[413] Limpus, C. (2008). *A Biological Review of Australian Marine Turtles. 2. Green turtle, Chelonia myda (Linnaeus)*, Environmental Protection Agency.
[414] Limpus, C. (2008). *A Biological Review of Australian Marine Turtles. 2. Green turtle, Chelonia myda (Linnaeus)*, Environmental Protection Agency.

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
	Dugong				Min	There is a minor contribution from dugong due to the low-density seagrass meadows in the study area that they may use for foraging while transiting between dugong protection areas north and south of the study area. There are more notable examples of dugong habitat/population numbers such as at Hinchinbrook Island, Cleveland Bay, Shoalwater Bay and Upstart Bay. The *Great Barrier Reef Outlook Report 2019* states that there is high-quality evidence and high level of consensus on dugong data across the reef.	There are low density seagrass meadows that dugongs may use for foraging while transiting between dugong protection areas north and south of the port.
	Species of dolphins				Mod	There is moderate contribution from dolphins due to the several species of dolphin that utilise the study area. The *Great Barrier Reef Outlook Report 2019* recognises that data on dolphins is very limited.	A number of species of dolphins occur in the waters off Hay Point. The most prevalent species is the Australia humpback dolphin (*sousa sahulensis*) and others include the spotted dolphin (*stenella attenuate*), Indian Ocean bottlenose dolphin (*tursiops aduncus*), Australian humpback dolphin (*sousa sahulensis*) and potentially the irrawaddy dolphin (*orcaellabrevirostris*). The Australian snubfin dolphin (*orcaella heinsohni*) may also occur in the riverine and estuarine areas of the bays and lagoons.
Landscapes and seascapes	Green vegetated islands	Min				There is a minor contribution to OUV from landscapes and seascapes as these features are not specifically recognised in key reference documents as being notable or iconic. Other areas of the GBR represent more prime examples of these attributes such as Hinchinbrook Island and Curtis Island. There are islands in and adjacent to the master planned area that are protected under legislation,	Vegetated islands include Round Top Island and Flat Top Island (Yuwi Paree-Toolkoon National Park), Slade Island, Keswick Island, Victor Island and Saint Bees Island. These islands include varying degrees of vegetation, some with remnant areas.
	Continental islands		Min				Continental islands include Keswick Island, Saint Bees Island and Prudhoe Island.
	Vegetation of the cays and continental islands			Min			

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
	Unique and varied seascapes and landscapes		Min			recognising their importance to local ecosystems.	There is a variety of seascapes and landscapes that are well represented across the GBRWHA including beaches, coastal dunes, river deltas, wetlands, mangroves, sand beaches, mudflats, open water, coastal islands and coral reefs.
	Significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes			Min			
	Superlative natural beauty	Mod				There is a moderate contribution to OUV from superlative natural beauty based on the large aggregations of shorebirds, which may be considered a superlative natural phenomenon. Ocean and island vistas within and surrounding the study area also contribute to this rating, noting there are more iconic locations in the GBRWHA such as the Whitsundays.	Large aggregations of shorebirds, seabirds and migratory birds at Sandringham Bay, Dudgeon Point and other estuarine wetland areas. Ocean and island vistas
Species diversity	Over 4000 species of molluscs and over 1500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans			Min		There is a minor contribution to OUV from species diversity due to the diversity of marine and terrestrial flora and fauna habitats which include coral reefs, mangroves, seagrass, macroalgae, wetlands, continental islands, intertidal areas and beaches. While there are a number of species protected under legislation and the diversity is important locally, this is not considered to represent a notable presence of species diversity within the GBRWHA, comparative to other areas. The master planned area does not represent an area of habitat critical to the survival of these species.	There are diverse marine and terrestrial habitats including coral reefs, mangroves, seagrass, macroalgae, wetlands, continental islands, intertidal areas and beaches. These support a range of invertebrate and macroinvertebrate species.
	Thousands of species of reef fish	Min					The inshore and fringing reefs support reef fish communities. The reef fish communities in this region are comprised of typical inshore fishes including wrasses, damselfishes, angelfishes, butterflyfishes and snapper.
	Diversity supporting marine and terrestrial species (global conservation significance)				Mod	There is a moderate contribution to diversity supporting marine and terrestrial species (global conservation significance). There are species of global significance recognised by the IUCN and national/state legislation present in the master planned	Nationally important wetlands in the study area include the Sandringham bay – Bakers Creek Aggregation and the Sarina Inlet – Ince Bay Aggregation (predominantly south of the study area).

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
						area. The diversity of these species is important locally however the marine, intertidal and terrestrial habitats are not considered to be unique, and the habitat resources available are represented in other areas. Wetlands areas are recognised as being internally important for a diverse range of shorebirds and migratory birds, as well as supporting other species.	A total of 31 listed migratory wetland species are either known to inhabit or visit these wetlands, or have habitat or roosting sites suitable for their visitation within the project area There is the additional moderate presence of whales, dolphins and flatback turtle nesting. State significant wetlands within the study area include the Keeleys Road wetlands to the east of the Port of Mackay. Locally significant wetlands include those at the mouth of the Pioneer River.
	Plant species and diversity and endemism (species being unique to a defined geographic location)				Min	There is a minor contribution to plant species diversity and endemism. While there is remnant vegetation and threatened flora species protected under legislation in the master planned area, the vegetation and habitats of the Mackay region are similar to the major vegetation types in other parts of Central Queensland. Therefore, these not considered to be critical to the sustainability of species diversity within the GBRWHA.	One TEC, the 'Critically Endangered' littoral rainforest and coastal vine thickets of Eastern Australia is likely to be present within the study area. Listed flora species includes bluegrass (*dichanthium setosum*), black ironbox (*eucalyptus raveretiana*), an evergreen vine thicket (*omphalea celata*), lesser swamp orchid (*phaius australis*), holly-leaved graptophyllum (*graptophyllum ilicifolium*).
	Important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation			Min		There is a minor contribution to OUV as the environments relevant to the ecological role of birds in seed dispersal are limited and sparse in the area.	The seed dispersal role played by birds is important in terrestrial environments and particularly to help maintain biological and genetic diversity between vegetated islands and the mainland. The Imperial pigeon for instance migrates daily as flocks from the islands to the mainland rainforests to eat fruit, returning to the islands at dusk.
	Breeding colonies of seabirds and marine turtles	Min				Seabirds known to breed and nest within the GBRWHA typically nest on relatively remote islands, preferentially utilising coral cay islands over islands relevant to the master planned area. While species are	There is significant habitat for shorebird and migratory birds which vary from year to year. There are internationally recognised roosting sites at Sandringham Bay that supports up to
	22 seabirds species breeding				Min		

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
						protected under legislation and listed under international migratory agreements, the master planned area is not considered critical habitat, with relatively low numbers recorded. Highly notable seabird breeding colonies within the GBRWHA include Raine Island, Michaelmas Cay, islands of the Capricorn-Bunker Group and cays of the Swain Reefs.	23,000 shorebirds each year during annual migration.[415] Estuarine wetlands associated with the local rivers and bays which provide breeding habitat for resident shorebird species. The Mackay region is recognised as the fifth most important site for shorebirds in Queensland. Eighteen different shorebird species utilise habitats in the Mackay regions for foraging and roosting. There are areas at Dudgeon Point where large emergent trees are present and provide suitable nesting sites for large raptors such as the white-bellied sea eagle (*haliaeetus leucogaster*). Eshelby Island, 1200km north west of Mackay and Bushy Islet, 90km east of Mackay are recognised as regionally important breeding site for seabirds within the Whitsunday region.
	242 species of birds				Sig	The Mackay region is recognised as an important shorebird area, with nationally and internationally important habitat for multiple species, particularly the Sandringham Bay and Bakers Creek intertidal wetland aggregation. Species present in the area are listed under legislation and international migratory agreements. Pioneer River to McEwens Beach and Notch Point are specifically listed in the *Great Barrier Reef Outlook Report 2014* as providing important habitat for shorebirds. The *Great Barrier Reef Outlook Report 2019* that the Mackay area has been losing large numbers of multiple shorebird species. Coastal development and human disturbance are identified as some of the key threats to shorebird populations that could have important cumulative impacts at a species level. The report notes that multiple potential impacts highlight the importance of protecting habitat in the region and catchment.	
Coastal Processes	Cross-shelf, longshore and vertical connectivity			Min		There is a minor contribution to OUV from coastal processes at Hay Point with the offshore areas forming part of the larger	Offshore areas form part of the larger longshore connections with GBR lagoon

[415] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
						longshore connections within the GBR lagoon.	Intertidal and estuarine habitats connecting terrestrial and marine habitats

Port of Mackay

The locally expressed OUV attributes within the Mackay port master planned area and their contribution classifications relative to the OUV across the entire GBRWHA are presented in **Table 90**. A summary of the environmental values determined to be key contributors to the local expression of OUV of the GBRWHA are also included in **Table 90**. The contribution classifications have been colour-coded (green = minimum (Min), orange = moderate (Mod), red = significant (Sig)) and applied to the relevant attributes.

Table 90: Local attributes of the Outstanding Universal Value of the Great Barrier Reef World Heritage Area – Port of Mackay study area

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
Corals	Coral reefs (400 species of corals in 60 genera)				Min	There is a minor contribution to OUV from corals due to the low coral cover and low coral diversity at reefs within and adjacent to the area. The nearest significant coral reef ecosystems to Hay Point are over 20km distance. The inshore reefs of the region are relatively small and limited in extent in comparison to other inshore reefs. They have relatively low diversity and low cover. They have persisted over time with fluctuations driven mainly by cyclonic disturbances. As the reefs are relatively isolated from other systems they tend to be regenerative. More notable examples of reef ecosystems are present in the GBRWHA, such as the Whitsundays and Dry Tropics. Inshore reefs have persisted over time, despite the climatic fluctuations driven mainly by cyclonic disturbances. As these	Reefs present in the waters offshore waters include Flat Top Island, Keswick Island and Saint Bees Island, Hay Reef, Victor Islet, Victor Island, Round Top Island and Dudgeon Point. Fringing reefs are present at Victor Island and Round Top Island. Inshore turbid coral reefs communities are present at Hay Reef, which is located between the existing jetties at the Hay Point terminal, Taroba Rocks, Slade Island/Slade Rock, Dangerous Reef and Downward patches. They are also present in shallow waters south of Dudgeon Point. Common corals in the turbid marine environment include *montipora, acropora, pocillopora* and *turbinaria*, as well as a diverse range of soft corals, sea fans, ascidians and hydroids. These coral reef areas are important habitat for locally important fish and other marine species.
	Coral reef ecosystem		Min				
	Inshore fringing reefs, mid-shelf reefs, and exposed outer reefs		Min				
	Hard and soft corals	Min					
	Coral reefs, sand banks and coral cays			Min			
	Coral spawning	Min					

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
						reefs are relatively isolated from other systems, they tend to be regenerative. The size and density of inshore reefs are not the result of mass spawning events more commonly associated with mid shelf and outer reefs. Local spawning is important for the ongoing presence of inshore reefs, but it is not the result of the mass spawning phenomenon important for reef persistence across the wider World Heritage Area.	
Mangroves	Diversity of mangroves				Mod	There is a <u>minor contribution</u> to OUV from mangroves as the study area supports 21 species that are present in wetlands of national importance. The *Great Barrier Reef Outlook Report 2019* lists the diversity and abundance of mangrove species across the whole GBR as very good with a stable trend. The State Party Report 2022 reviews remote sensing-based canopy cover from 2018-2020 which indicates general stability of mangrove forests in the reef has probably continued. The remnant mangrove forests mapped in the area considered to be well represented in areas off the GBR region.	The Hay Point area has 22ha of mangroves within enclosed wetland areas. There are 21 species present in wetlands of national importance. Minor stands of mangroves can be found at Half Tide Beach and an extensive community at Louisa Creek. The most common species include the red mangrove (*rhizophora stylosa*), grey mangrove (*avicennia marina*) and yellow mangrove (*ceriops australis*).
	Vast mangrove forests	Mod					
Seagrass and macroalgae	Beds of *Halimeda* algae			Min		There is <u>a minor contribution</u> to OUV from seagrass and macroalgae. The *Great Barrier Reef Outlook Report 2019* states that seagrass has a poor condition, with a stable trend. *Halimeda* banks condition is listed as very good, with no consistent trend. Current observations from the State Party Report 2022 are that seagrass is covering.	Macroalgae communities in this region are considered to be variable in terms of density and frequency of occurrence with species observed including sargassum, udotea and caulerpa. In the area surrounding Hay Point port, macroalgae density is low (less than 1% to 5%), while the seafloor offshore of both ports supports large areas of medium density algae (5-20%).

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
	Diversity of seagrass				Min	Most seagrass species in the GBRWHA are widely distributed and there are more notable examples such as Barrow Point to Lookout Point and Dunk Island. However, meadows located in the study area provide foraging habitat for species of turtles and dolphins and nursery habitat for a diversity of fish species. In 2011 seagrass meadows covered 115.7ha. However, they are low density, patchy and ephemeral communities. They are not considered to be particularly notable or important, but they do provide a small contribution to the local populations of marine species.[416]	Meadows provide foraging habitat for species of turtles and dolphins and nursery habitat for a diversity of fish species. There are seagrass habitats off Hay Point in shallow water and in mid-shelf deeper water, containing four species of seagrass: *halophila decipiens* *halophila ovalis* *halophila spinulosa* *halodule uninervis.* Deepwater seagrass meadows are also present but are low and medium densities.
Marine Turtles	Marine turtles				Min	There is a minor contribution to OUV from marine turtles and green turtle breeding as localised populations are not significant comparative to other areas of the GBR, such as Raine Island, Peak Island, Duck Island and Avoid Island. A moderate contribution of nesting and flatback turtles nesting on beaches within the study area. The *Great Barrier Reef Outlook Report 2019* identifies that there is flatback turtle nesting around Mackay, and that Mackay is a hotspot for elevated light which impacts on the success of nesting. Low density Flatback Turtle been observed within the port on Hay Point Beach and Salonika Beach and at Dudgeon Point between the months of November and April. Usually between 30-	Species of marine turtles present include: • Green turtle • Loggerhead turtle (occasional sightings) • Leatherback turtle • Hawksbill turtle • Olive ridley turtle • Flatback turtle. The inshore areas of the port support a population of resident green turtles that forage on the algae covered reefs and deep-water seagrass. Green turtles (*chelonia mydas*) are the most frequently observed marine turtle, with nesting recorded by Mackay Turtle watch on beaches in the Mackay region including Bucasia Beach, Blacks Beach,
	Green turtle breeding	Min			Min		
	Nesting turtles	Mod					
	Marine turtle rookeries				Mod		

[416] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
						100 nesting turtles are recorded annually.[417]	North Harbour Beach and Salonika Beach. Low density flatback turtle nesting has been observed within the port on Hay Point Beach and Salonika Beach and at Dudgeon Point and Mount Hector Conservation Area between the months of November and April. Flatback turtles (*natator depressus*) are the dominant nesting species in this region and nesting sites occur on the mainland beaches between November and April. Haliday Bay north of Mackay is recognised as one of the most important flatback turtle nesting beaches in the Mackay region. There are peripheral flatback turtle rookeries at Hay Point Beach, Salonika Beach and Sarina Beach. Green turtles have been recorded at Bushy Islet (approximately 80km off the Mackay coast).
Marine Mammals	Migrating whales	Mod				There is a moderate contribution to OUV for whales due to a core aggregation and calving areas for migrating Humpback whales located approximately 80km east of Mackay. Waters off Mackay are important wintering areas for Humpback whales. The *Great Barrier Reef Outlook Report 2019*) notes that humpback whales have recovered strongly across the reef, with a good condition and stable trend.	Humpback whales migrate through the project area annually between June and October (peak in August).[418] Females with calves have been observed within the Hay Point port limits.[419] Core aggregation and calving areas for migrating humpback whales are located approximately 80km east of Mackay. The waters off Mackay (approximately 100km from the coast) have been identified as important wintering areas
	Species of whales				Mod		

[417] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[418] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.
[419] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
							for humpback whales, particularly in the inner reef lagoon. Humpback whales *(megaptera novaeangliae)* are the most prevalent in this area. The sei whale (*balaenoptera musculus*) and fin whale (*balaenoptera physalus*) are occasionally observed.
	Dugong				Min	There is a minor contribution from dugong due to the low-density seagrass meadows in the study area that they may use for foraging while transiting between dugong protection areas north and south of the study area. There are more notable examples of dugong habitat/population numbers such as at Hinchinbrook Island, Cleveland Bay, Shoalwater Bay and Upstart Bay. The *Great Barrier Reef Outlook Report 2019* states that there is high-quality evidence and high level of consensus on dugong data across the reef.	There are low density seagrass meadows that dugongs may use for foraging while transiting between dugong protection areas north and south of the port.
	Species of dolphins				Mod	There is moderate contribution from dolphins due to the several species of dolphin that utilise the study area. The *Great Barrier Reef Outlook Report 2019* recognises that data on dolphins is very limited.	A number of species of dolphins occur in the waters off Hay Point. The most prevalent species is the Australian humpback dolphin (*sousa sahulensis*) and others include the spotted dolphin (*stenella attenuate*), Indian Ocean bottlenose dolphin (*tursiops aduncus*), and potentially the irrawaddy dolphin (*orcaellabrevirostris*). The Australian snubfin dolphin (*orcaella heinsohni*) may also occur in the riverine and estuarine areas of the bays and lagoons.
Landscapes and seascapes	Green vegetated islands	Min				There is a minor contribution to OUV from landscapes and seascapes as these features are not specifically recognised in key reference documents as being notable or iconic. Other areas of the GBR	Vegetated islands include Round Top Island and Flat Top Island (Yuwi Paree-Toolkoon National Park), Slade Island, Keswick Island, Victor Island and St Bees Island. These islands include

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
						represent more prime examples of these attributes such as Hinchinbrook Island and Curtis Island. There are islands in and adjacent to the master planned area that are protected under legislation, recognising their importance to local ecosystems.	varying degrees of vegetation, some with remnant areas.
	Continental islands		Min				Continental islands include Keswick Island, St Bees Island and Prudhoe Island.
	Vegetation of the cays and continental islands			Min			
	Unique and varied seascapes and landscapes		Min				There is a variety of seascapes and landscapes that are well represented across the GBRWHA including beaches, coastal dunes, river deltas, wetlands, mangroves, sand beaches, mudflats, open water, coastal islands and coral reefs.
	Significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes			Min			
	Superlative natural beauty	Mod				There is a moderate contribution to OUV from superlative natural beauty based on the large aggregations of shorebirds, which may be considered a superlative natural phenomenon. Ocean and island vistas within and surrounding the study area also contribute to this rating, noting there are more iconic locations in the GBRWHA such as the Whitsundays.	Large aggregations of shorebirds, seabirds and migratory birds at Sandringham Bay, Dudgeon Point and other estuarine wetland areas. Ocean and island vistas
Species diversity	Over 4000 species of molluscs and over 1500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans			Min		There is a minor contribution to OUV from species diversity due to the diversity of marine and terrestrial flora and fauna habitats which include coral reefs, mangroves, seagrass, macroalgae, wetlands, continental islands, intertidal areas and beaches. While there are a number of species protected under legislation and the diversity is important locally, this is not considered to represent a notable presence of species diversity within the GBRWHA, comparative to other areas. The master planned area does not represent an area of habitat critical to the survival of these species.	There are diverse marine and terrestrial habitats including coral reefs, mangroves, seagrass, macroalgae, wetlands, continental islands, intertidal areas and beaches. These support a range of invertebrate and macroinvertebrate species.
	Thousands of species of reef fish	Min					The inshore and fringing reefs support reef fish communities. The reef fish communities in this region are comprised of typical inshore fishes including wrasses, damselfishes, angelfishes, butterflyfishes and snapper.

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
	Diversity supporting marine and terrestrial species (global conservation significance)				Mod	There is a moderate contribution to diversity supporting marine and terrestrial species (global conservation significance). There are species of global significance recognised by the IUCN and national/state legislation present in the master planned area. The diversity of these species is important locally however the marine, intertidal and terrestrial habitats are not considered to be unique, and the habitat resources available are represented in other areas. Wetlands areas are recognised as being internally important for a diverse range of shorebirds and migratory birds, as well as supporting other species.	Nationally important wetlands in the study area include the Sandringham bay – Bakers Creek Aggregation and the Sarina Inlet – Ince Bay Aggregation (predominantly south of the study area). A total of 31 listed migratory wetland species are either known to inhabit or visit these wetlands, or have habitat or roosting sites suitable for their visitation within the project area There is the additional moderate presence of whales, dolphins and flatback turtle nesting. State significant wetlands within the study area include the Keeleys Road wetlands to the east of the Port of Mackay. Locally significant wetlands include those at the mouth of the Pioneer River.
	Plant species and diversity and endemism (species being unique to a defined geographic location)				Min	There is a minor contribution to plant species diversity and endemism. While there is remnant vegetation and threatened flora species protected under legislation in the master planned area, the vegetation and habitats of the Mackay region are similar to the major vegetation types in other parts of Central Queensland. Therefore, these not considered to be critical to the sustainability of species diversity within the GBRWHA.	One TEC, the 'Critically Endangered' littoral rainforest and coastal vine thickets of Eastern Australia is likely to be present within the study area. Listed flora species includes bluegrass (*dichanthium setosum*), black ironbox (*eucalyptus raveretiana*), an evergreen vine thicket (*omphalea celata*), lesser swamp orchid (*phaius australis*), holly-Leaved graptophyllum (*graptophyllum ilicifolium*).
	Important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation			Min		There is a minor contribution to OUV as the environments relevant to the ecological role of birds in seed dispersal are limited and sparse in the area.	The seed dispersal role played by birds is important in terrestrial environments and particularly to help maintain biological and genetic diversity between vegetated islands and the mainland. The Imperial pigeon for instance migrates

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
							daily as flocks from the islands to the mainland rainforests to eat fruit, returning to the islands at dusk.
	Breeding colonies of seabirds and marine turtles	Min				Seabirds known to breed and nest within the GBRWHA typically nest on relatively remote islands, preferentially utilising coral cay islands over islands relevant to the master planned area. While species are protected under legislation and listed under international migratory agreements, the master planned area is not considered critical habitat, with relatively low numbers recorded. Highly notable seabird breeding colonies within the GBRWHA include Raine Island, Michaelmas Cay, islands of the Capricorn-Bunker Group and cays of the Swain Reefs.	There is significant habitat for shorebird and migratory birds which vary from year to year. There are internationally recognised roosting sites at Sandringham Bay that supports up to 23,000 shorebirds each year during annual migration[420]. Estuarine wetlands associated with the local rivers and bays which provide breeding habitat for resident shorebird species. The Mackay region is recognised as the fifth most important site for shorebirds in Queensland. Eighteen different shorebird species utilise habitats in the Mackay regions for foraging and roosting. There are areas at Dudgeon Point where large emergent trees are present and provide suitable nesting sites for large raptors such as the white-bellied sea eagle (*haliaeetus leucogaster*). Eshelby Island, 1200km north west of Mackay and Bushy Islet, 90km east of Mackay are recognised as regionally important breeding site for seabirds within the Whitsunday region.
	22 seabirds species breeding				Min		
	242 species of birds				Sig	The Mackay region is recognised as an important shorebird area, with nationally and internationally important habitat for multiple species, particularly the Sandringham Bay and Bakers Creek intertidal wetland aggregation. Species present in the area are listed under legislation and international migratory agreements. Pioneer River to McEwens Beach and Notch Point are specifically listed in the *Great Barrier Reef Outlook Report* 2014 as providing important habitat for shorebirds. The *Great Barrier Reef Outlook Report 2019* that the Mackay area has been losing large numbers of multiple shorebird species. Coastal development and human disturbance are identified as some of the key threats to shorebird	

[420] Eco Logical Australia. (2018). *Port of Hay Point Maintenance Dredging Environmental Risk Assessment Report*. Prepared for North Queensland Bulk Ports Corporation Ltd.

Category	Local Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
						populations that could have important cumulative impacts at a species level. The report notes that multiple potential impacts highlight the importance of protecting habitat in the region and catchment.	
Coastal Processes	Cross-shelf, longshore and vertical connectivity			Min		There is a minor contribution to OUV from coastal processes at Hay Point with the offshore areas forming part of the larger longshore connections within the GBR lagoon.	Offshore areas form part of the larger longshore connections with GBR lagoon Intertidal and estuarine habitats connecting terrestrial and marine habitats

9.4 Integrity

Integrity of the GBRWHA is also a key aspect of the Statement of OUV for the property. The statement recognises that:

'The ecological integrity of the Great Barrier Reef is enhanced by the unparalleled size and good state of conservation across the property. At the time of inscription, it was felt that to include virtually the entire Great Barrier Reef within the property was the only way to ensure the integrity of the coral reef ecosystems in all their diversity.'

The components of integrity include wholeness, intactness and threats.[421]

Port of Hay Point

The potential for the integrity of the World Heritage Area to be altered or lost locally due to the proposed priority port master planning outcomes is considered low. The basis for this is outlined in **Table 91**.

Table 91: Elements to express Outstanding Universal Value and relevance to the Hay Point master planning study area

Integrity (Wholeness, intactness and threats)	Relevant to the Hay Point master planning study area
Unparalleled size	The GBRWHA is 348,000km^2 and the coastal and offshore areas of the Hay Point study area represents a minor fraction of this area. The future development of Hay Point will not lead to a decrease in the overall size of the World Heritage Area.
Scale of the GBR ecosystem	The reef ecosystem is extremely large and complex, it is made up of a large number of different but connected ecosystems from coral reefs and lagoons to islands, beaches and mangrove areas. The Sandringham Bay – Bakers creek Aggregation and Sarina Inlet – Ince Bay Aggregation (predominantly south of the study area) wetlands represent important components of this ecosystem.
Integrity of the coral reef ecosystem in all their diversity	The nearest significant coral reef ecosystems to Hay Point are over 20km distance. The fringing reef systems around Victor Reef and Round Top Island represent a minor contribution to these ecosystems. Future development at Hay Point is unlikely to impact or affect these systems in any way.
Property is largely intact and includes the fullest possible representation of marine ecological, physical and chemical processes enabling key interdependent attributes to exist in their natural relationships	The Hay Point study area represents a minor fraction of the property and has been an industrial port for at least 10 years before the inception of the World Heritage Area. The future development of Hay Point will not alter this situation or place any of the individual attributes at risk.
Key ecological, physical and chemical processes essential for long-term conservation of marine and island ecosystems and their associated biodiversity occur outside property's boundaries	The Sandringham Bay – Bakers Creek Aggregation and Sarina Inlet – Ince Bay Aggregation (predominantly south of the study area) represent important and valuable components of the RE. Whilst not directly within the GBRWHA, these wetlands proximity allows connectivity between the wetland and the World Heritage Area. This helps ensure that the ecological functions within the World Heritage Area continue to exist and function effectively.
Good state of conservation across the property	With the exception of shipping and loading operations, all industrial activities at Hay Point occur outside of the GBRMP. The integrity and status of this protected area will not be altered by future development.

Port of Mackay

In 2021, UNESCO recommended that the GBR's World Heritage status be downgraded, and it be listed as an 'Endangered' World Heritage Site. However, following consultation with the Australian Government, this decision was not implemented and in 2022, the Australian Government will be required to report on the GBR's status to UNESCO. The potential for the integrity of the World Heritage Area to be altered or lost locally due to

[421] Australian Government. (2014). *Environment Protection and Biodiversity Conservation Act Referral Guidelines for the Outstanding Universal Value of the Great Barrier Reef World Heritage Area.*

the proposed priority port master planning outcomes is considered extremely low. The basis for this is outlined in **Table 92**.

Table 92: Elements to express Outstanding Universal Value and relevance to the Mackay port master planning study area

Integrity (Wholeness, intactness and threats)	Relevant to the Mackay port master planning study area
Unparalleled size	The GBRWHA is 348,000km^2 and the coastal and offshore areas of the Mackay port study area represents a minor fraction of this area. The future development of Mackay port will not lead to a decrease in the overall size of the World Heritage Area.
Scale of the GBR ecosystem	The reef ecosystem is extremely large and complex, it is made up of a large number of different but connected ecosystems from coral reefs and lagoons to islands, beaches and mangrove areas. The Sandringham Bay – Bakers creek Aggregation wetland represents important components of this ecosystem
Integrity of the coral reef ecosystem in all their diversity	The nearest significant coral reef ecosystems to Mackay port are over 20km distance. The fringing reef systems around Flat Top Reef, Round Top Reef, Slade Island Reef represent a minor contribution to these ecosystems. Future development at Mackay port is unlikely to impact or affect these systems in any way.
Property is largely intact and includes the fullest possible representation of marine ecological, physical and chemical processes enabling key interdependent attributes to exist in their natural relationships	The Mackay port study area represents a minor fraction of the property and has been an industrial port for at least 10 years before the inception of the World Heritage Area. The future development of Mackay port will not alter this situation or place any of the individual attributes at risk.
Key ecological, physical and chemical processes essential for long-term conservation of marine and island ecosystems and their associated biodiversity occur outside property's boundaries	The Sandringham Bay – Bakers Creek Aggregation and Sarina Inlet – Ince Bay Aggregation represent important and valuable components of the RE. While not directly within the GBRWHA, these wetlands proximity allows connectivity between the wetland and the World Heritage Area. This helps ensure that the ecological functions within the World Heritage Area continue to exist and function effectively
Good state of conservation across the property	With the exception of shipping and loading operations, all industrial activities at Mackay port occur outside of the GBRMP. The integrity and status of this protected area will not be altered by future development.

9.5 Expression of Outstanding Universal Value

Port of Hay Point

The evaluation of key attributes expressed within and surrounding the Hay Point study area has determined that there is one attribute that provides a significant contribution, eight that provide a moderate contribution and five that provide a minimum contribution. These attributes are summarised as follows:

- Significant Contribution:
  - shorebirds and migratory birds
- Moderate Contribution:
  - diversity of mangroves and vast mangrove forests
  - nesting turtles and marine turtle rookeries
  - migrating and species of whales
  - species of dolphins
  - superlative natural beauty
  - diversity supporting marine and terrestrial species (global conservation significance)
- Minor Contribution
  - coral including reefs, reef ecosystems, inshore fringing reefs, mid-shelf reefs, exposed outer reefs, hard and soft corals, sand banks, coral cays, and spawning

- seagrass diversity and beds of *halimeda* algae
- marine turtles and green turtle breeding
- dugong
- landscapes and seascapes, including:
    - continental islands green vegetated islands
    - vegetation of the cays and continental islands,
    - unique and varied seascapes and landscapes
    - significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes
- species diversity of molluscs, fish, sponges, anemones, marine worms and crustaceans, thousands of species of reef fish
- plant species, diversity and endemism
- important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation
- breeding colonies of seabirds and marine turtles
- seabirds

Port of Mackay

The evaluation of key attributes expressed within and surrounding the Mackay port study area has determined that there is one attribute that provides a significant contribution, seven that provide a moderate contribution and three that provide a minimum contribution. These attributes are summarised as follows:

- Significant Contribution
    - shorebirds and migratory birds
- Moderate Contribution
    - diversity of mangroves and vast mangrove forests
    - nesting turtles and marine turtle rookeries
    - migrating and species of whales
    - species of dolphins
    - superlative natural beauty
    - diversity supporting marine and terrestrial species (global conservation significance)
- Minor Contribution
    - coral including reefs, reef ecosystems, inshore fringing reefs, mid-shelf reefs, exposed outer reefs, hard and soft corals, sand banks, coral cays, and spawning
    - seagrass diversity and beds of *halimeda* algae
    - marine turtles and green turtle breeding
    - dugong
    - landscapes and seascapes, including:
        - continental islands green vegetated islands
        - vegetation of the cays and continental islands,
        - unique and varied seascapes and landscapes
        - significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes

- species diversity of molluscs, fish, sponges, anemones, marine worms and crustaceans, thousands of species of reef fish
- plant species, diversity and endemism
- important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation
- breeding colonies of seabirds and marine turtles
- seabirds
- cross-shelf, longshore and vertical connectivity

9.6 Summary

The findings indicate that the OUV of the GBRWHA is expressed within the Hay Point/Mackay area through the significant populations of shorebirds and migratory birds.

A moderate contribution is provided by mangroves, nesting turtles and marine turtle rookeries, migrating and species of whales, species of dolphins, superlative natural beauty and diversity supporting marine and terrestrial species.

A minor contribution is provided by a range of marine species and other ecosystem-related attributes.

10.0 Climate change and natural hazards

10.1 Introduction

The Port of Hay Point/Mackay is located in the Whitsunday and it's hinterland and Mackay region (the region), specifically under Mackay council management zone. Historically, both areas have a warm and tropical climate with an average annual rainfall of 680mm, and a tropical cyclone season between December and April.[422] . Below provides the following sections:

- Overview of relevant policies and strategies – **Section 10.2**
- Climate change hazard maps – **Section 10.3**
- Known or potential natural hazards and risk and resilience factors – **Section 10.4**
- Summary – **Section 10.5.**

10.2 Overview of relevant policies and strategies

A detailed review of literature and documents relevant to the climate change and natural hazard in Queensland and the region was conducted. The literature and documents were reviewed according to their relevance to infrastructure and ports operation. **Table 93** shows main climate change and natural disaster policies and strategies in the areas and their overall relevance to the port's operation. However, it should be noted that climate change policies and strategies normally are developed on a broad scale (such as regional and local scales), unless developed specifically for the port site.

Table 93: Reviewed policies and plans and the overall relevance to the port

Policy /Strategy	Potential relevance to the port
Pathways to a climate resilient Queensland: Queensland Climate Adaptation Strategy: 2017–2030[423]	Shows the Queensland Government's directions in addressing climate-related risks, with potential influence on informing the port's climate resilience strategies in the future
SPP[424]	A main state level planning instrument that influences the port's future development, and related restrictions and opportunities related to climate change and natural hazards
Built Environment and Infrastructure Sector Adaptation Plan 2017[425]	Shows the specific climate change adaptation actions for infrastructure such as ports
Queensland Strategy for Disaster Resilience 2017[426]	State level strategy to respond to natural hazards that could impact the ports operation, and infrastructures and future development of natural hazard strategy
Mackay Local Disaster Management Plan 2012[427]	Addresses local disaster management responses that could inform future development of disaster responses for the port
Mackay Climate Change Adaptation Policy 2018[428]	Local level adaptation plan, informing the port's authorities about local adaptation strategies
Reef 2050 Plan[429]	Shows federal level regulation and frameworks that the ports need to consider in regard to impacting coral reefs
Sustainability Review 2015-17, NQBP[430]	Influence NQBP sustainability policy development and responses to climate change risks and opportunities

[422] Department of Environment and Science. (2019). *Climate change in the Whitsunday, Hinterland and Mackay region*
[423] Department of Environment, and Heritage Protection. (2017). *Pathways to a climate resilient Queensland: Queensland Climate Adaptation Strategy, 2017–2030*. .
[424] Department of Infrastructure, Local Government and Planning. (2017). *State Planning Policy*.
[425] Department of Environment and Heritage Protection and Dibbs Barker. (2017). *Built environment and infrastructure sector adaptation plan*
[426] Queensland Government. (2017). *Queensland Strategy for Disaster Resilience*.
[427] Mackay Regional Council. (2012). *Mackay Local Disaster Management Plan*
[428] Mackay Regional Council. (2018). *Climate Change Adaptation Policy*.
[429] Australian Government. (2018). *Reef 2050 Long-Term Sustainability Plan*.
[430] North Queensland Bulk Ports Corporation Ltd. (2015). *Sustainability Review October 2015 – June 2017*

10.2.1 Assumptions and scenarios

The region mainly falls into the Wet Tropic Natural Resource Management sub-cluster[431] (**Figure 70**). This sub-cluster encompasses low-lying coastal areas, inland plains and subcoastal range. It also contains globally important savannas, GBRWHAs, and a large area of the GBR catchment.

Figure 70: Wet Tropic Natural Resource Management sub-cluster

Historically, the region has had a warm and tropical climate with an average temperature of 27°C in summer and 17°C in winter. The average rainfall is 689mm per year, which is mainly distributed between November and April. The region's climate is influenced by geographical variables (topography, vegetation etc.) and global climatic phenomena such as El Niño and the Southern Oscillation. Also, the region's climate is influenced by tropical cyclones which occur between December to April.[432]

Climate change is already influencing the region, and impacting its multiple land uses differently. Data shows that in the past few years, the region has been getting warmer, rainfall has become less frequent but more intense, cyclones have become more catastrophic, storm tide has been influencing larger coastal areas, and

[431] Climate Change in Australia. (n.d.). *About Wet Tropics*. Retrieved from www.climatechangeinaustralia.gov.au/en/overview/impacts-and-adaptation/wet-tropics/
[432] Department of Environment and Science. (2019). *Climate change in the Whitsunday, Hinterland and Mackay region*

erosion has become more severe.[433] In general, climate change impacts society, ecosystems and infrastructure in two different ways:

- increasing the likelihood and severity of natural hazards. These hazards are normally rapid and episodic (happen from time to time) and create short to medium-term catastrophic impacts (for example, bushfire, flooding and storm surge events).
- creating new hazard factors that are normally incremental and cause medium to long-term impacts (such as seal level rise, saltwater intrusion, ocean acidification).

The port, its infrastructure and operations, are likely to be impacted by climate change-induced hazards in the future.

Climate change impacts are projected according to multiple 'scenarios'. Scenarios are used as a basis for assessing risk of crossing identifiable thresholds and represent the assumptions about greenhouse gases concentrations in the atmosphere for different future timeframes. These scenarios are called Representative Concentrations Pathways (RCP), ranging from RCP 2.6 (the lowest concentrations scenario), to RCP 8.5 (the highest concentration scenario).

RCPs has been used in the *Intergovernmental Panel on Climate Change* (IPCC) *Report* (2014) to refer to the concentrations of greenhouse gases that result in total radioactive forcing increasing by a target amount by 2100, relative to pre-industrial levels. The RCP number refers to the radiation level in watts per square metre.

The change in temperature predicted under these scenarios is presented below in **Table 94:**[434]

Table 94: Change in Temperature (°C) by 2100

Representative Concentration Pathways	Change in Temperature (^{0}C) by 2100
RCP 2.6	1.6
RCP 4.5	2.4
RCP 6.0	2.8
RCP 8.5	4.3

RCP 2.6 represents a pathway where greenhouse gas emissions are strongly reduced. RCP 8.5 is a pathway where greenhouse gas emissions continue to grow unmitigated – a 'do nothing' approach. RCP 4.5 and RCP 6.0 are pathways that represent medium stabilisation pathways. With greenhouse gas reduction measures now proposed by major world economies, RCP 4.5 and RCP 6.0 appear the most likely scenarios to be achieved.

Figure 71 illustrates the RCPs and how they potentially impact Australia's climatic and environmental variables. This figure shows different scenarios of change according to multiple RCPs. For example, under RCP 8.5 (a future with no emission reduction strategy applied) climate hazards will be more extreme; therefore, require expensive adaptation options (such as building seawalls). However, as emissions are reduced (from top to bottom), hazards become less destructive and adaptation option become less expensive.

For this project, available national, state and regional information, accessible via online search were attained and used. This information projects changes in the climatic variables (such as temperature, rainfall, and so on) under RCPs 4.5 and 8.5, and for 2030, 2050 and 2090 timeframes.

[433] Department of Environment and Science. (2018). *Queensland State of the Environment 2017*.
[434] Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*.

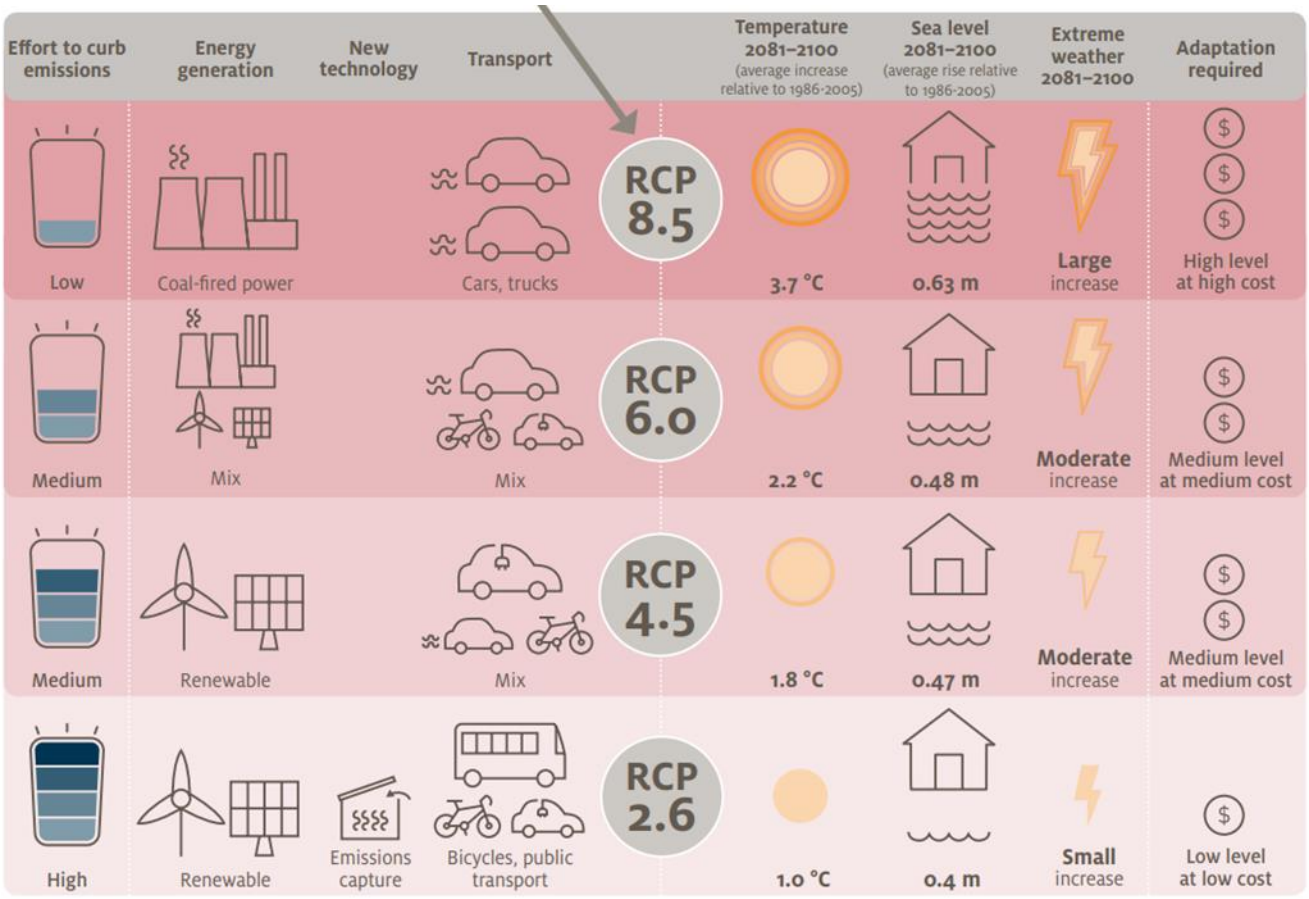


Figure 71: Representative Concentrations Pathway scenarios and their impact on Australia's climatic and environmental values

10.2.2 Interrelationship between climate change and natural hazards

The review of the existing literature suggests a relationship between the ongoing climate change and the likelihood and severity of natural hazards in the short and long term. For example, the SPP indicates that the ongoing climate change is projected to amplify the frequency and severity of natural hazards across the state.[435] The policy indicates five major natural hazards including bushfire, flood, landslide, storm tide and inundation, and erosion. *QCoast 2100 Report* indicated that the ongoing climate change triggers more severe coastal hazards (such as inundation and storm surge and SLR) which could expose larger areas of the state's coasts.[436]

The Taskforce on Climate Financial Disclosure defines two different, but interrelated, risks to organisations (such as ports) [437] including:

- Physical climate-risks: these are risks that result from the physical effects of climate change and natural hazards on the condition, function and operating life of assets, infrastructure, people, food production systems and/or natural environments (see **Table 95** for some examples of physical risks).
- Transitional risks: mandatory or voluntary transitions to a low or zero carbon economy challenges 'business as usual'. Transitional climate change risks arise due to changes in regulatory systems and stakeholder values that require corporations to take address greenhouse gas emissions and build climate resilience into their business model and operations[438] (see **Table 96** for some examples of climate transition risk).

[435] Department of Infrastructure, Local Government and Planning. (2017). *State Planning Policy*.
[436] Queensland Government and LGAQ. (2016). *QCoast 2100, Developing a Coastal Hazard Adaptation Strategy: Minimum Standards and Guideline for Queensland Local Governments*.
[437] Task Force on Climate-Related Financial Disclosures. (2017). *Recommendations of the Task Force on Climate related Financial Disclosures*. Retrieved from https://assets.bbhub.io/company/sites/60/2021/10/FINAL-2017-TCFD-Report.pdf.
[438] Task Force on Climate-Related Financial Disclosures. (2017). *Recommendations of the Task Force on Climate related Financial Disclosures*. Retrieved from https://assets.bbhub.io/company/sites/60/2021/10/FINAL-2017-TCFD-Report.pdf

Table 95: Climate change induced and natural hazards and potential impacts on port infrastructure/operation

Potential climate change and natural hazards	Potential risks/impacts on port infrastructure and operation
More frequent fluvial and pluvial flooding due to heavier and more intense rainfall (increased probability of extreme and rare rainfall event) More frequent coastal hazard (flooding, inundation and storm surge) due to SLR and changes in the climatic variables (such as wind speed and stronger cyclones)	Damage or loss of assets and infrastructure (i.e. road networks) More pressure on critical infrastructure (i.e. stormwater, sewerage) Increased operation and maintenance costs (i.e. clean up after flooding) Insurance risk (Loss of access to insurance due to reduction of insurance coverage) Supply chain risk (Disruption of access to production inputs and roads).
Extended dry season and more exposure to drought due to changes in rainfall patterns	Delivering essential water requirement for operation
Increased bushfire risk due to extended bushfire season (drier and hotter weather)	Damage or loss of assets and relevant infrastructure (i.e. road networks) Insurance risk Increased operation and maintenance costs (i.e. mending damaged assets, clean up after bushfire) Supply chain risk (Disruption of access to production inputs and roads).
Warmer temperature and more frequent heatwave	Health and wellbeing problems for port staff Increased operation and maintenance coast (i.e. more energy consumption)
Less frequent but more intense and disruptive storm (including cyclones) due to change in the global and local ocean and climatic variables (such as El Niño, weather and water surface temperature, wind speed etc.)	Damage or loss of assets and relevant infrastructure (i.e. road networks) Increased operation and maintenance costs (i.e. mending damaged assets, clean up after storm surge) Insurance risk (Loss of access to insurance due to reduction of insurance coverage) Supply chain risk (Disruption of access to production inputs and roads).
More exposure to land erosion and land slide due to intense rainfall and flooding events	Change of sediment transport pattern and change of coastal landform and water depth Supply chain risk (Disruption of access to production inputs and roads).

Table 96: Potential transition risk to port operation and financial situation

Risks	Potential business impacts
Legal and policy risks: Changes in Greenhouse Gas emissions pricing Enhanced emissions-reporting obligations Mandates on and regulation of existing products and services Exposure to litigation	Increased operating costs (for example, higher compliance costs, increased insurance premiums) Write-offs, asset impairment, and early retirement of existing assets due to policy changes Increased costs and/or reduced demand for products and services resulting from fines and judgments
Technological risks: Substitution of existing products and services with lower emissions options Costs to transition to lower emissions technology	Write-offs and early retirement of existing assets Reduced demand for products and services Costs to adopt/deploy new practices and processes
Market risks: Changing customer behaviour Uncertainty in market signals Increased cost of raw materials	Reduced demand for goods and services due to shift in consumer preferences Abrupt and unexpected shifts in energy costs – Change in revenue mix and sources, resulting in decreased revenues Re-pricing of assets (for example, fossil fuel reserves, land valuations, securities valuations)

Risks	Potential business impacts
Reputation: Shifts in consumer preferences Stigmatization of sector Increased stakeholder concern or negative stakeholder feedback	Reduced revenue from decreased demand for goods/services Reduced revenue from negative impacts on workforce management and planning (for example, employee attraction and retention) Reduction in capital availability

10.2.3 Existing and planned responses climate change

A variety of state and local scale adaptation and hazard mitigation responses apply to the region and could potentially influence the port's operations. Some of these documents include, but not limited to:

- *Pathways to a climate resilient Queensland: Queensland Climate Adaptation Strategy: 2017–2030*[439]
- SPP [440]
- *Built Environment and Infrastructure Sector Adaptation Plan 2017*[441]
- *QCoast 2100, Developing a Coastal Hazard Adaptation Strategy: Minimum: Standards and Guideline for Queensland Local Governments 2016*[442]
- *Queensland Strategy for Disaster Resilience 2017*[443]
- Reef 2050 Plan[444]
- *Mackay Local Disaster Management Plan 2012*[445]
- *Mackay Climate Change Adaptation Policy 2018.*[446]

In general, these responses encompass a range of statutory and non-statutory instruments. For example, in respect to coastal areas, *Coastal Protection and Management Act 1995* is the key legislation for ensuring that coastal natural values and economic interests are protected across Queensland. Another major response to climate change includes *Queensland Climate Adaptation Strategy.*[447] The strategy highlights the state's plan to adapt to climate change and its impacts. The *Climate Adaptation Strategy* encompass the following response areas:

- developing government's adaptation action plan
- facilitating industry-led sector adaptation plans
- supporting local governments and regions to adapt
- establishing Queensland Climate Resilient Councils
- improving community capacity and resilience.

Other key planning or management tools that contain responses to climate change and hazards are shown in **Table 97**.

Table 97: Other responses to climate change and hazards in the key documents

[439] Department of Environment, and Heritage Protection. (2017). *Pathways to a climate resilient Queensland: Queensland Climate Adaptation Strategy, 2017–2030*. Retrieved from https://www.qld.gov.au/__data/assets/pdf_file/0017/67301/qld-climate-adaptation-strategy.pdf.
[440] Department of Infrastructure, Local Government and Planning. (2017). *State Planning Policy*
[441] Department of Environment and Heritage Protection and Dibbs Barker. (2017). *Built environment and infrastructure sector adaptation plan*
[442] Queensland Government and LGAQ. (2016). *QCoast 2100, Developing a Coastal Hazard Adaptation Strategy: Minimum Standards and Guideline for Queensland Local Governments*.
[443] Queensland Government. (2017). *Queensland Strategy for Disaster Resilience*.
[444] Australian Government. (2018). *Reef 2050 Long-Term Sustainability Plan*.
[445] Mackay Regional Council. (2012). *Mackay Local Disaster Management Plan*
[446] Mackay Regional Council. (2018). *Climate Change Adaptation Policy*
[447] Department of Environment, and Heritage Protection. (2017). *Pathways to a climate resilient Queensland: Queensland Climate Adaptation Strategy, 2017–2030*. Retrieved from https://www.qld.gov.au/__data/assets/pdf_file/0017/67301/qld-climate-adaptation-strategy.pdf

Key response tool/instrument	Description
Shoreline erosion management plans	Prepared by councils in collaboration by Queensland Government to protect coastal area against erosion
Coastal Management District	Supported by the *Coastal Protection and Management Act 1995* to respond to coastal vulnerability
Coastal Management Plans	Non-statutory guidelines for coastal management
Natural Disaster Relief and Recovery Arrangements	A joint venture by the Australian and Queensland Governments to support communities affected by natural hazards (remedial response)
QCoast 2100	A mutual partnership between the Queensland Government and Local Government Association of Queensland. The program aims to assist coastal communities with delivering responses to climate change hazards (preventive)
Queensland Strategy for Disaster Resilience	Aims to enhances the State resilience against all hazards (such as floods, bushfires, cyclones, severe storms, storm surges, landslips, tsunamis, earthquakes, oil spills, droughts and extreme heat events)
Drought and Climate Adaptation Program	Aims to establish producers for better management of drought and climate impacts (https://www.longpaddock.qld.gov.au/dcap/)
MRC climate change adaptation policy	Highlights the council's position regarding climate change adaptation
Sustainability review 2015-17, NQBP	Indicates climate change risks and opportunities (physical and transition) to the port's assets and infrastructure

Most of the responses focused on strategies/actions to avoid hazard prone areas or mitigate and adapt to the existing and potential hazards/risks. For example, the SPP identifies natural hazard, risk and resilience as significant state interest, which needed to be included in the short- and long-term infrastructure planning (including strategic ports). In this regard, Part E of the policy ensures: 'Planning for infrastructure indicate that infrastructure is appropriately designed and located (including considering the projected impacts of climate change)'.

QCoast 2100 provide an eight-step methodology for developing local adaptation response to Queensland's coastal climate change and hazards issues. These steps include:

- plan stakeholder communication and engagement during the project's lifecycle
- scoping coastal hazards for the project area
- identify existing and potential coastal hazards
- identify key exposed assets/properties
- conduct risk assessment exposed areas/assets
- develop potential adaptation options
- evaluate social/economic aspect of adaptation options
- development implementation strategies, review and monitor.

QCoast 2100 disputes the conventional static responses to climate change and natural hazards in most organisations, and advocates for developing more dynamic, flexible and adaptive *Coastal Hazard Adaptation Strategy*. Adaptive Management Framework, [448] as referred in the *QCoast 2100*, is constant cyclic procedure of planning, implementation, monitoring and responding (**Figure 72**). This process that allows integration of new information and knowledge into the planning/management cycle as they arise.

[448] Queensland Government and LGAQ. (2016). *QCoast 2100, Developing a Coastal Hazard Adaptation Strategy: Minimum Standards and Guideline for Queensland Local Governments.*

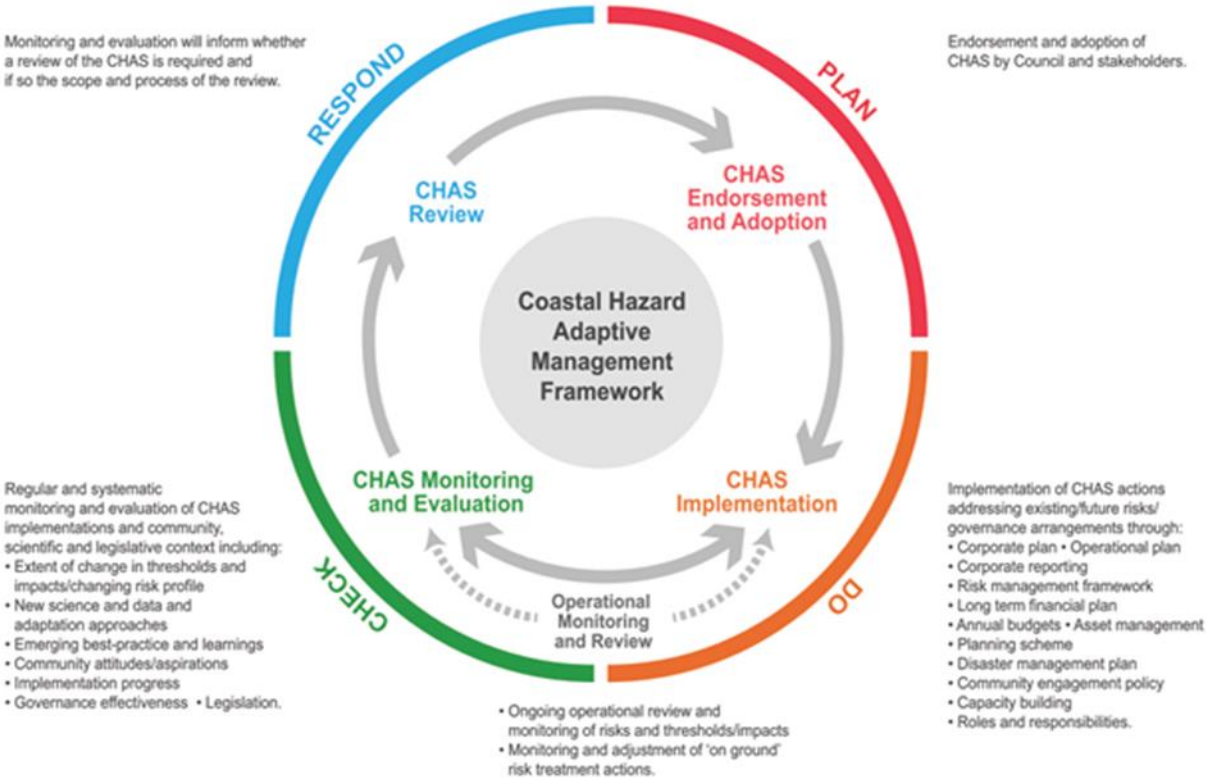


Figure 72: Adaptive management framework for continuous improvement

Furthermore, *Queensland State of the Environment Report 2017*[449] provides a number of management responses to climate change. These responses, which are aimed to be developed in collaboration with industries and private section, include:

- emission reduction to zero greenhouse gas mission by 2050
- carbon farming and carbon offsetting plans
- developing sector adaptation plans - identifying and prioritising adaptation responses required by each Sector (adaptation plan already completed for infrastructure sector
- building community capacity and resilience
- Queensland Strategy for Disaster Resilience
- Drought and Climate Adaptation Program
- State planning framework, including guidelines to address the impacts of climate change.

MRC developed climate change adaptation policy to respond to climate change impacts on the region's environmental and social systems as well as infrastructures.

NQBP's 'sustainability review' addresses the vulnerability of NQBP's assets and infrastructure to climate change risks and hazards; therefore, the Board developed some broad climate change responses (commitments) including:

- facilitate discussion on climate change risks, opportunities and boundaries to inform and align future NQBP climate change actions and investments
- shape a relevant and consistent climate change dialogue with stakeholders
- identify actions for NQBP to strengthen its climate change resilience within a broader sustainability mandate

[449] Department of Environment and Science. (2018). *Queensland State of the Environment 2017*.

- assessing current operations and planned developments and infrastructure for each port to understand climate vulnerability
- identifying steps to mitigate and adapt to the risk
- sharing information and learnings with stakeholders and taking the lead in the port sector.

10.3 Climate change hazard maps

This section provides climate change implications for the port and its surrounding areas according to RCP 4.5 and RCP 8.5, and for 2030, 2050 and 2090 timeframes. To identify climate change hazard, the projections database provided by the Queensland Government in the 'Future Climate Change Dashboard'[450] was used as the main source of information. SLR information was mainly adopted from CoastAdapt tool. It should be noted that all the changes are compared against baseline data (average value of that variable between 1986–2005).

10.3.1 Annual mean temperature

The analysis of the annual mean temperature data suggests a warmer climate for the region in the future. By 2030 the annual mean temperature is projected to rise by 0.79°C under RCP 4.5 and by 0.87°C under RCP 8.5. By 2050, the region's annual mean temperature increases by 1.2°C and 1.6°C under RCPs 4.5 and 8.5 respectively. In a longer term (by 2090) a hotter weather is projected for the region with an annual mean temperature of 3.5°C under the higher emission scenario.

Figure 73 and **Figure 74** show the mean temperature rise under RCPs 4.5 for 2030, 2050 and 2090 periods.

[450] Queensland Government. (n.d.). *The Queensland Future Climate Dashboard.* Retrieved from https://longpaddock.qld.gov.au/qld-future-climate/dashboard/

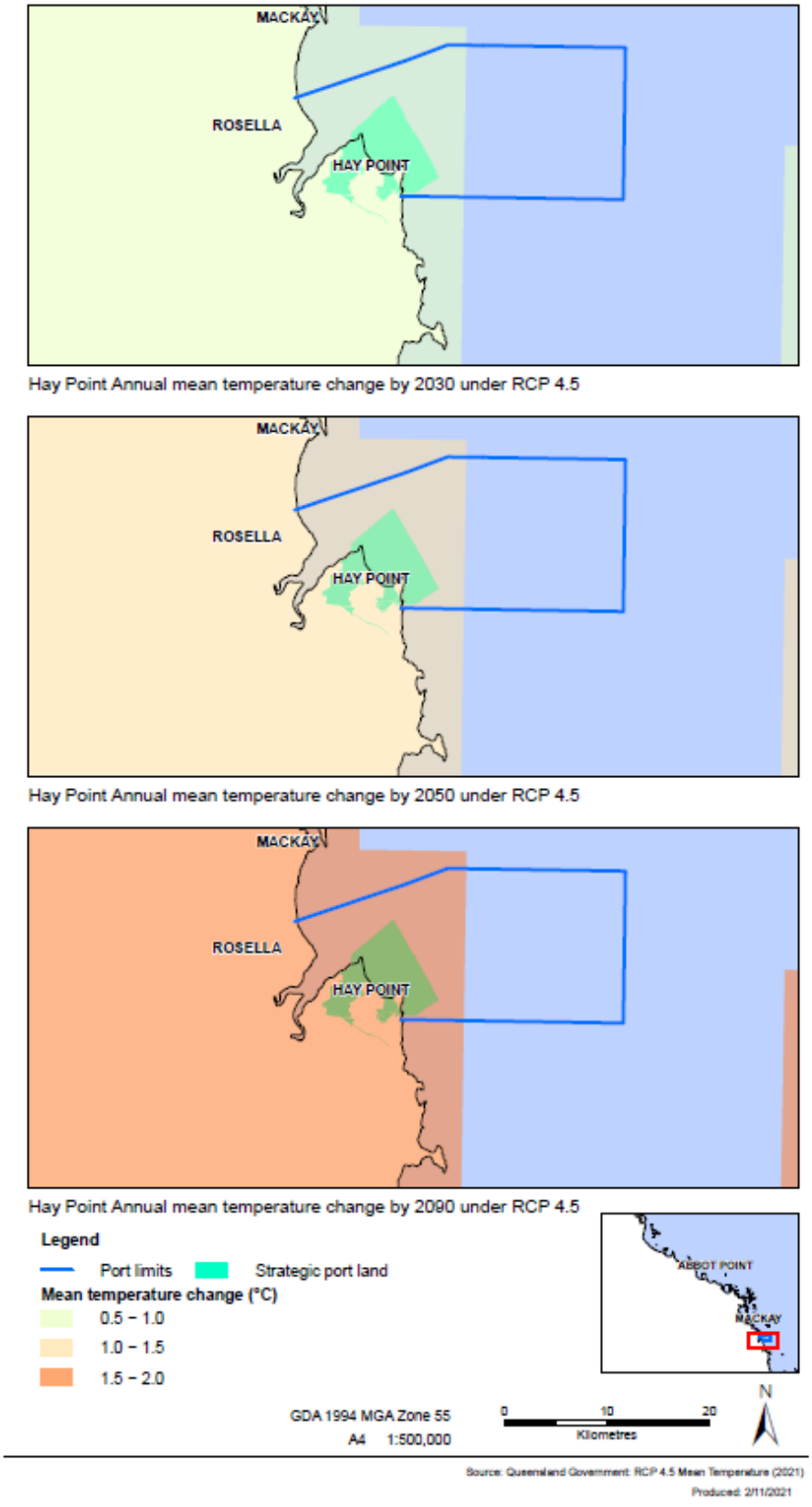


Figure 73: Annual mean temperature rise from 2030 to 2090 under Representative Concentrations Pathway 4.5 of the Port of Hay Point

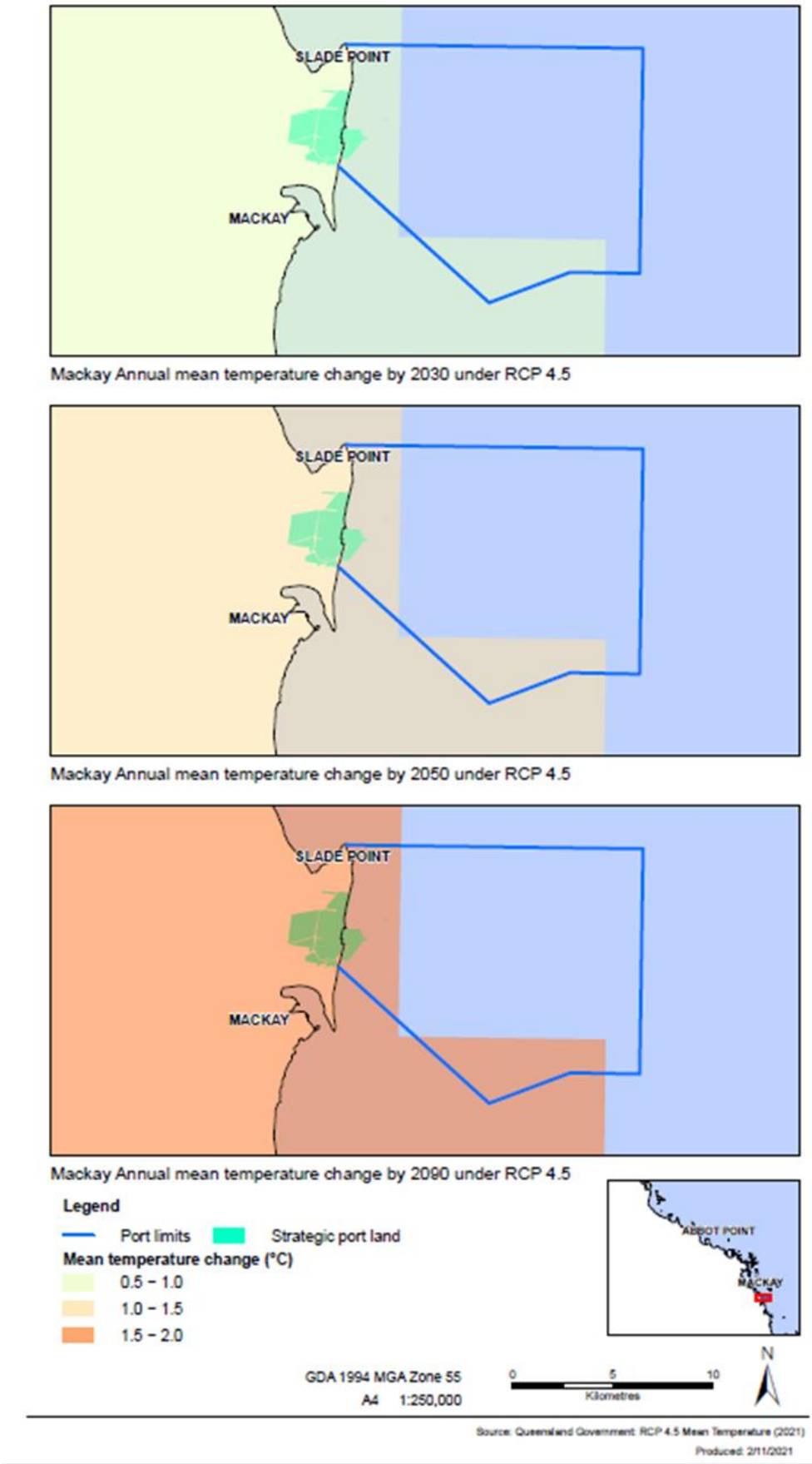
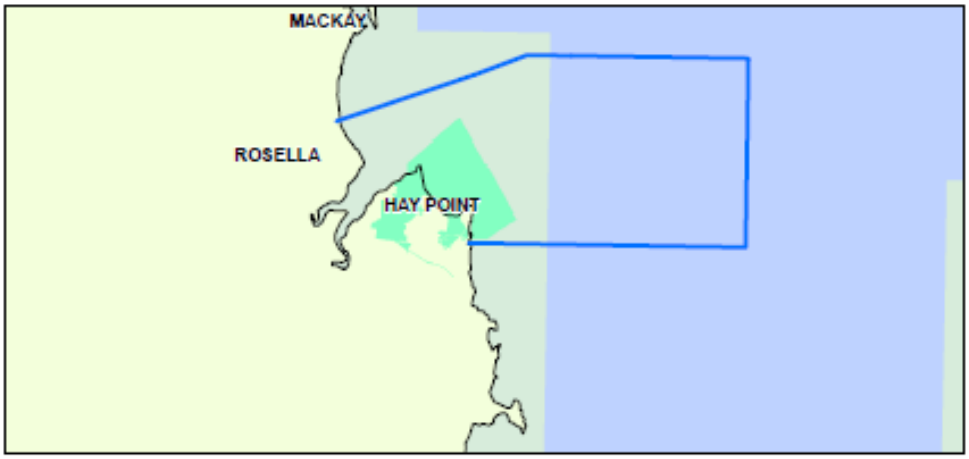
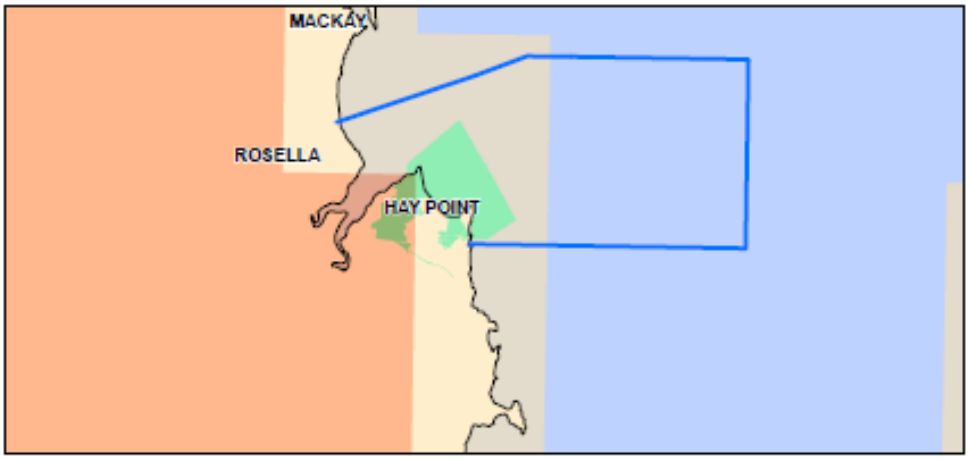


Figure 74: Annual mean temperature rise from 2030 to 2090 under Representative Concentrations Pathway 4.5 of the Port of Mackay

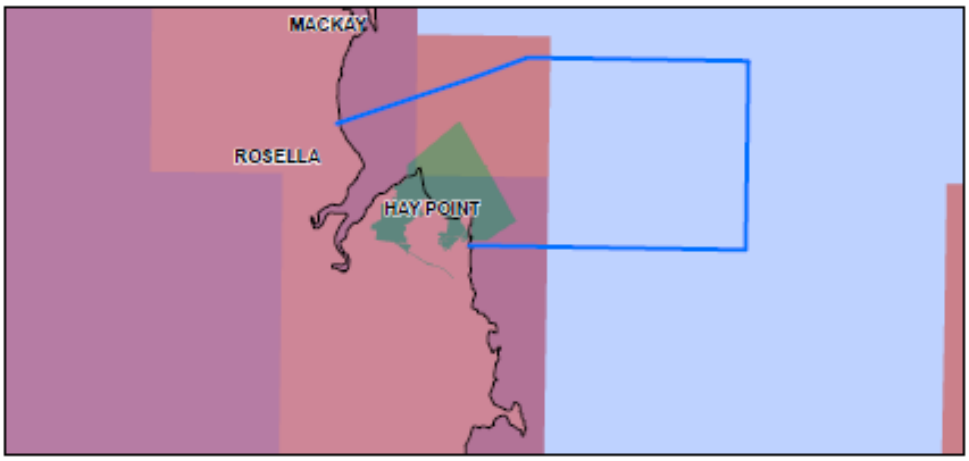
Figure 74 demonstrates the anticipated temperature rise applying RCP 4.5. This RCP is based on a projected 2.4C temperature increase to 2100. RCP 4.5 is considered a medium stabilisation pathway and one of the most likely scenarios to be achieved.



Hay Point annual mean temperature change by 2030 under RCP 8.5



Hay Point annual mean temperature change by 2050 under RCP 8.5



Hay Point annual mean temperature change by 2090 under RCP 8.5

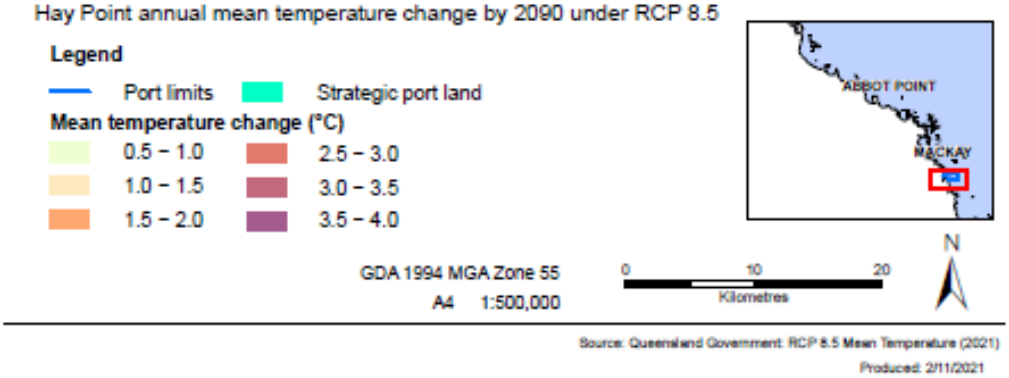


Figure 75: Annual mean temperature rise from 2030 to 2090 under Representative Concentrations Pathway 8.5 for the Port of Hay Point

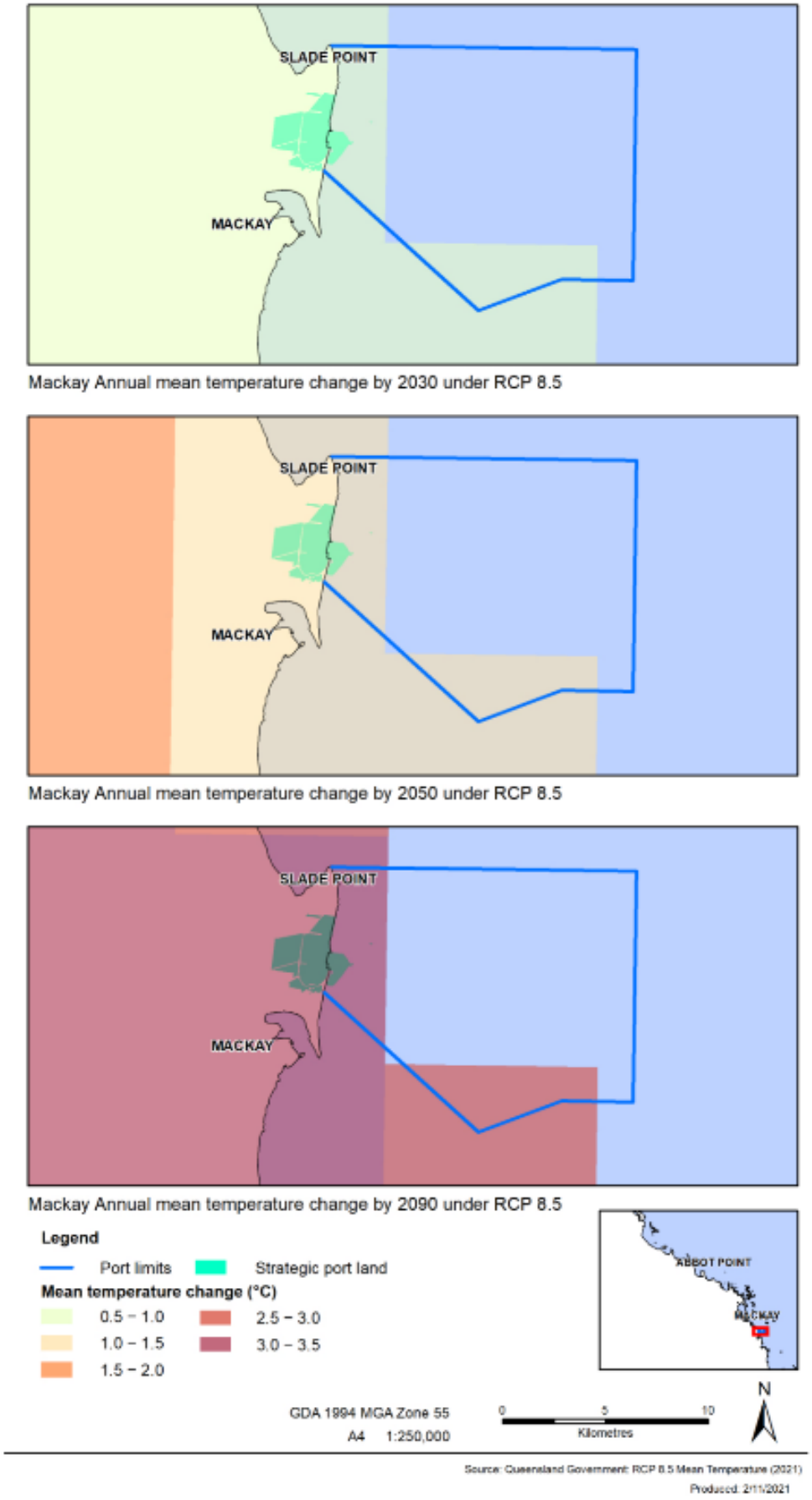


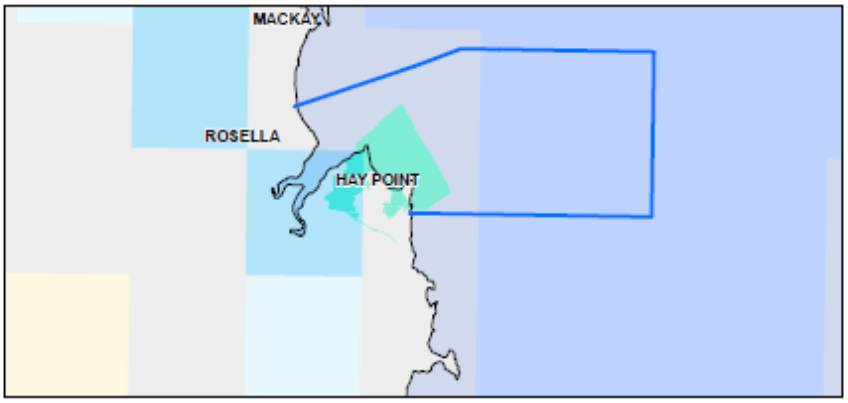
Figure 76: Annual mean temperature rise from 2030 to 2090 under Representative Concentrations Pathway 8.5 for the Port of Mackay

Figure 75 and **Figure 76** demonstrates the anticipated temperature rise applying RCP 8.5. This RCP is based on a projected 4.3C temperature increase to 2100. RCP 8.5 represents a scenario where greenhouse gas emissions continue to rise unmitigated 'do nothing approach'.

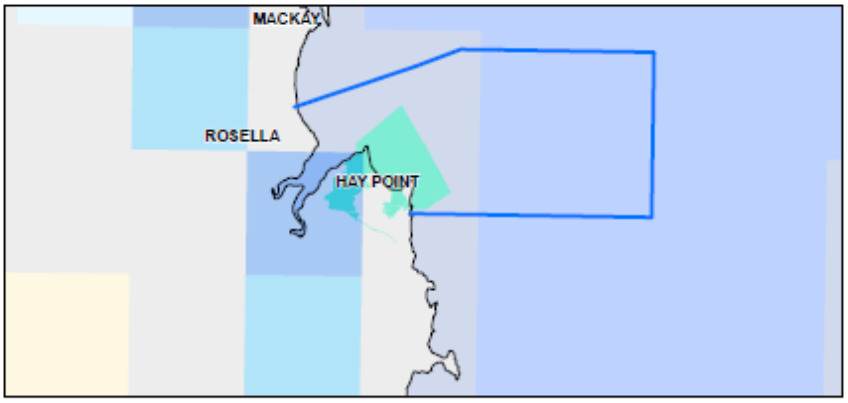
10.3.2 Annual mean rainfall change

The analysis of data shows an overall decline in the annual mean rainfall across the region in the future. For example, by 2030 annual mean rainfall decreases by three per cent from the baseline average under RCP 4.5. However, under higher emission scenario, the uncertainty of projected rainfall change is greater, with annual rainfall change between 18% increase to a 26% decrease.

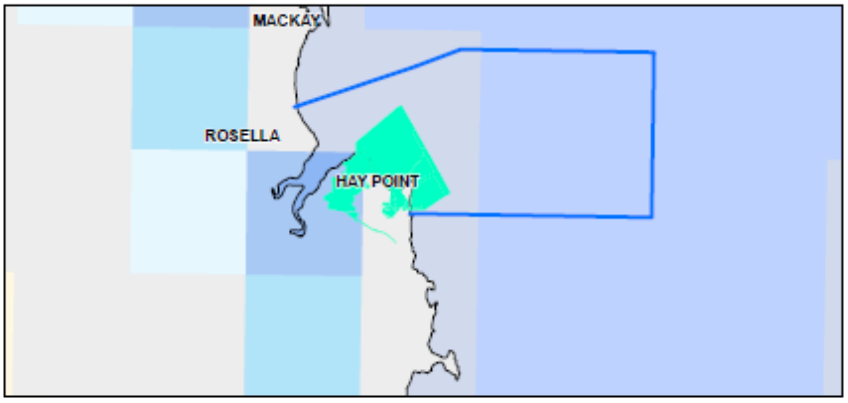
Figure 77 and **Figure 78** show the annual mean rainfall change under RCPs 4.5 and 8.5 for 2030, 2050 and 2090 periods for the region area.



Hay Point annual mean rainfall change by 2030 under RCP 4.5



Hay Point annual mean rainfall change by 2050 under RCP 4.5



Hay Point annual mean rainfall change by 2090 under RCP 4.5

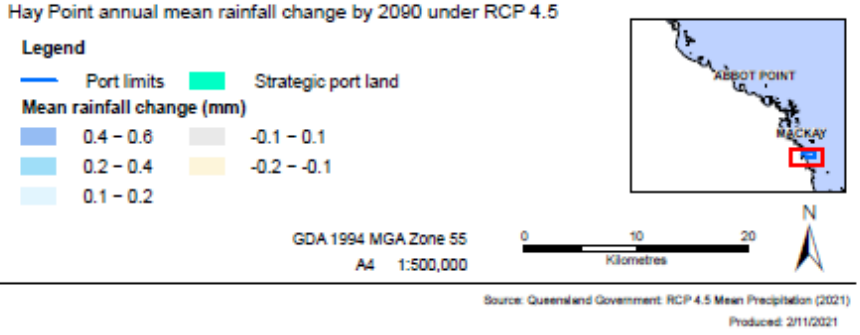


Figure 77: Hay Point annual mean rainfall change from 2030 to 2090 (Representative Concentrations Pathway 4.5)

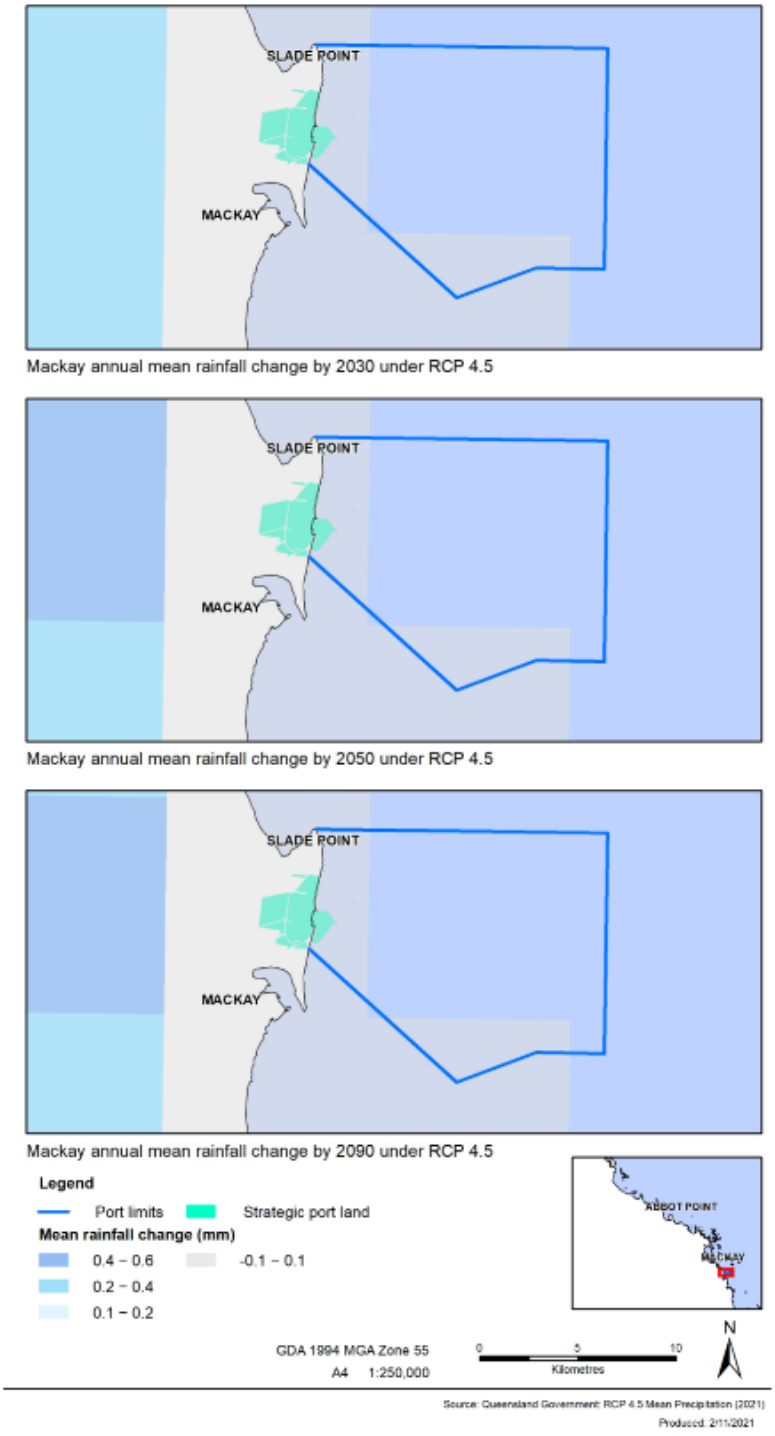
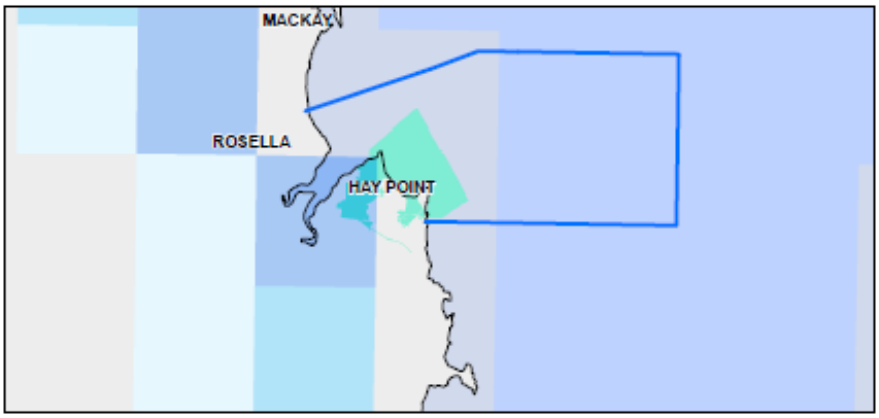
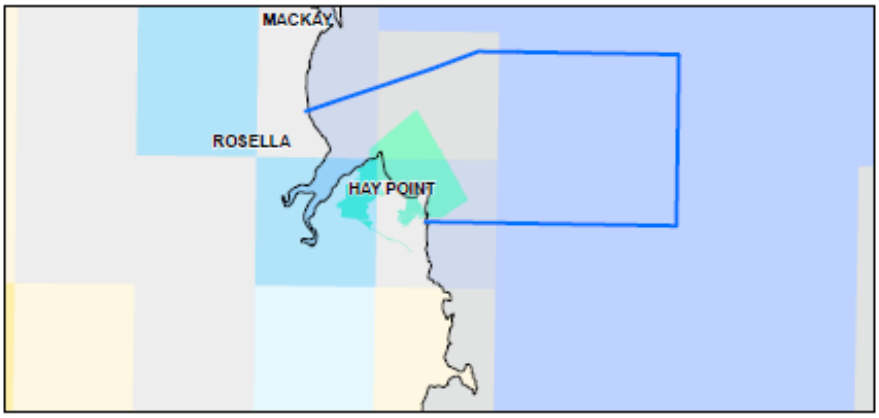


Figure 78: Mackay annual mean rainfall change from 2030 to 2090 (Representative Concentrations Pathway 4.5)

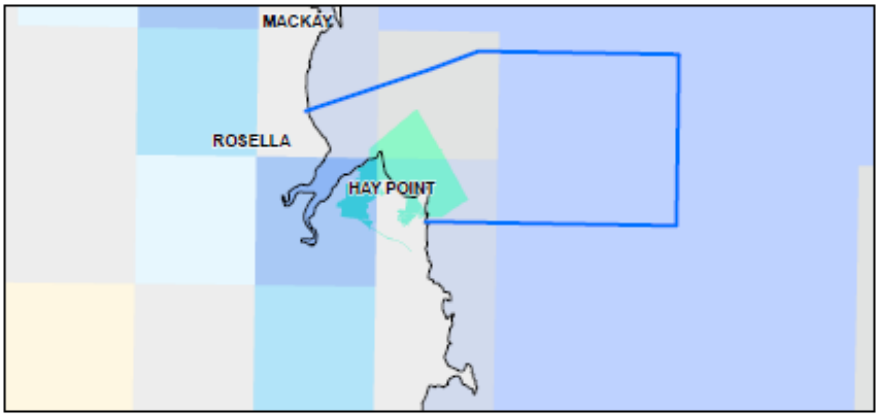
Figure 77 and **Figure 78** demonstrates the anticipated mean average annual rainfall applying RCP 4.5, being considered a most likely scenario to be achieved.



Hay Point annual mean rainfall change by 2030 under RCP 8.5



Hay Point annual mean rainfall change by 2050 under RCP 8.5



Hay Point annual mean rainfall change by 2090 under RCP 8.5

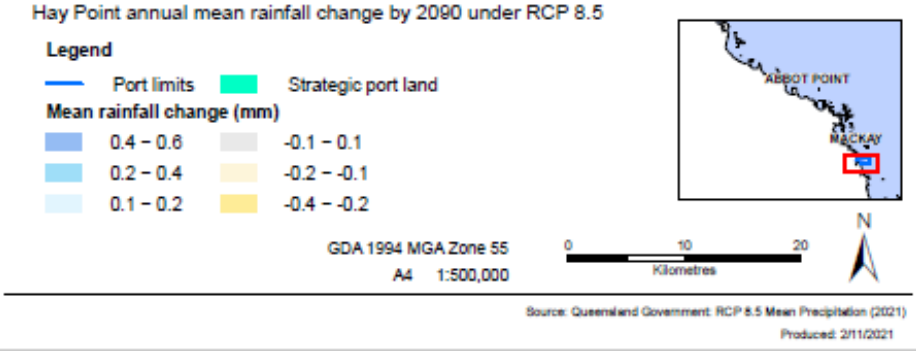


Figure 79: Hay Point annual mean rainfall change from 2030 to 2090 (Representative Concentrations Pathway 8.5)

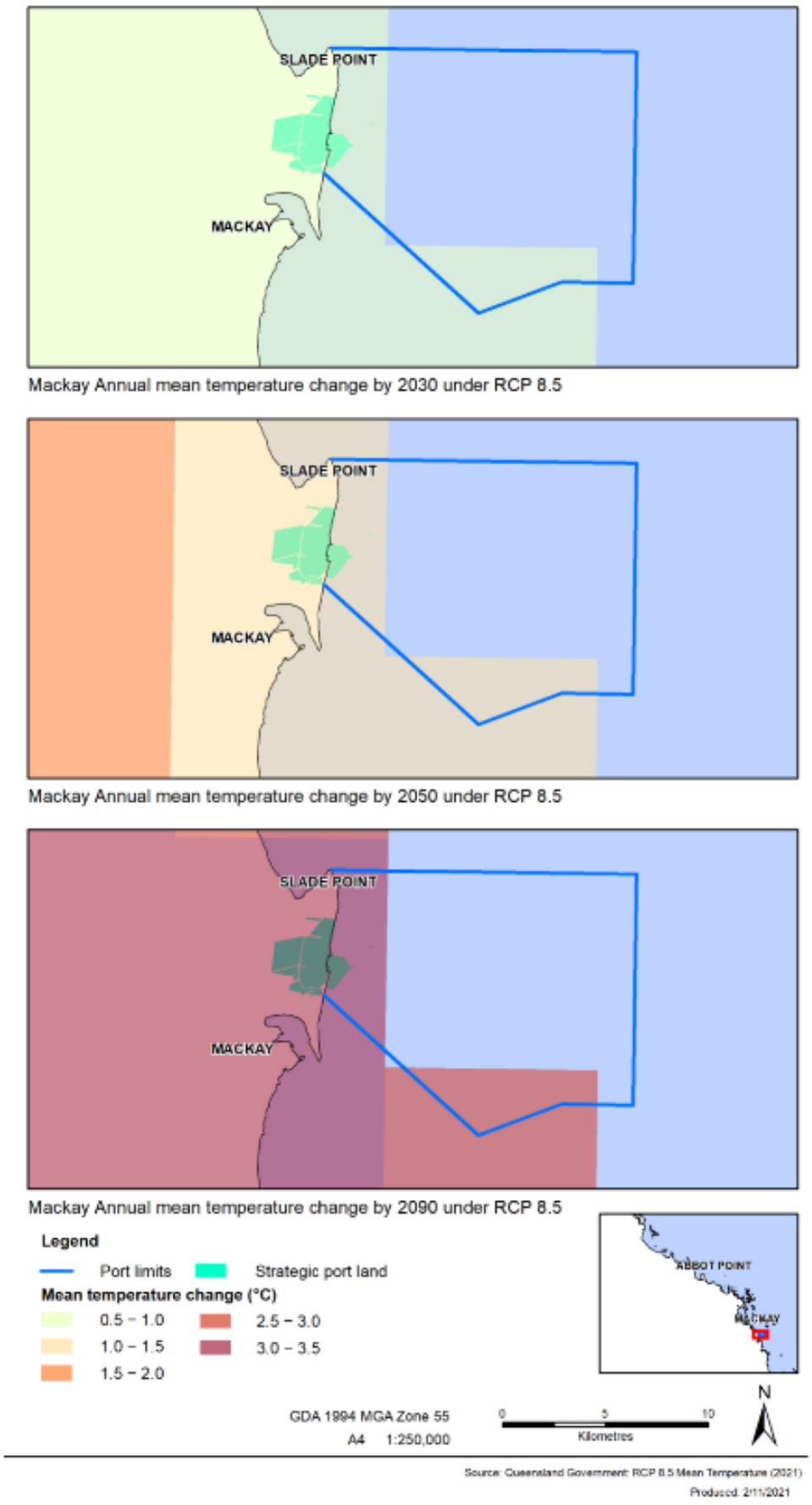


Figure 80: Mackay annual mean rainfall change from 2030 to 2090 (Representative Concentrations Pathway 8.5)

Figure 79 and **Figure 80** demonstrates the anticipated mean average annual rainfall applying RCP 8.5, where greenhouse gas emissions continue to rise unmitigated.

10.3.3 Hot days and Heatwave (bushfire risk)

Future changes in the number of hot days, and heatwave duration and frequency were selected as indicators of future bushfire hazard in the region. Data shows that the region is likely to experience more hot and extreme hot days (very hot days) in the future. Under RCP 8.5 scenario, the port is likely to be exposed to 4.7 more extreme hot days by 2090. Also, both heatwave duration and frequency are projected to increase in the port regions under both RCPs and for the three timeframes.

By 2030 and under RCP 4.5, the heatwave duration and frequency are likely to rise by 0.94 and 2.2 more days respectively for July to June period.

By the end of the century, heatwaves are expected to be 21 days longer and 35 days more frequent under high RCP.

This information indicates an increased risk of bushfire in the port's region in the future.

Figure 81 and **Figure 82** show the duration of heatwaves under RCPs 4.5 and 8.5 for 2030, 2050 and 2090 periods for the region area.

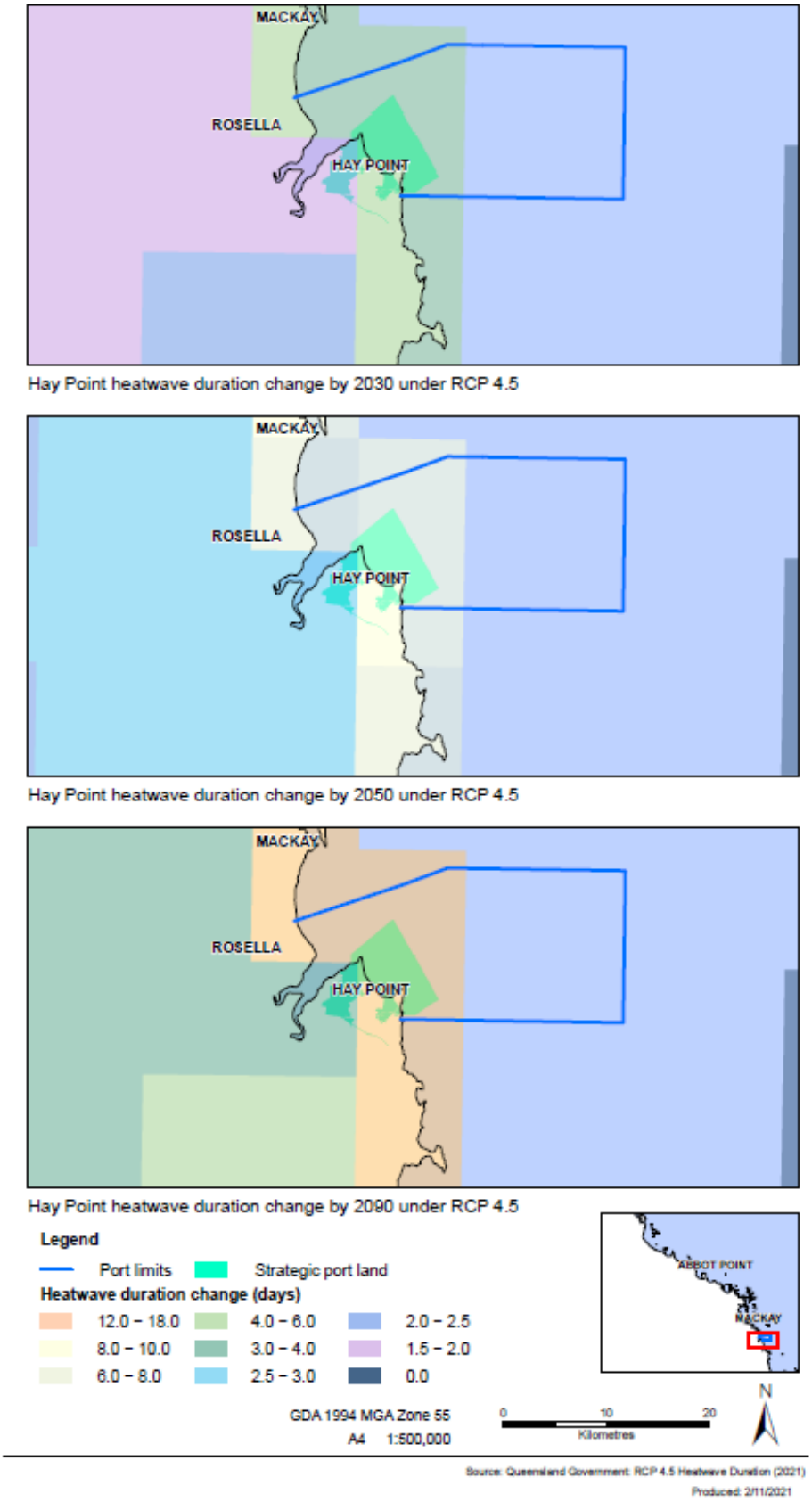


Figure 81: Hay Point heatwave duration change from 2030 to 2090 (Representative Concentrations Pathway 4.5)

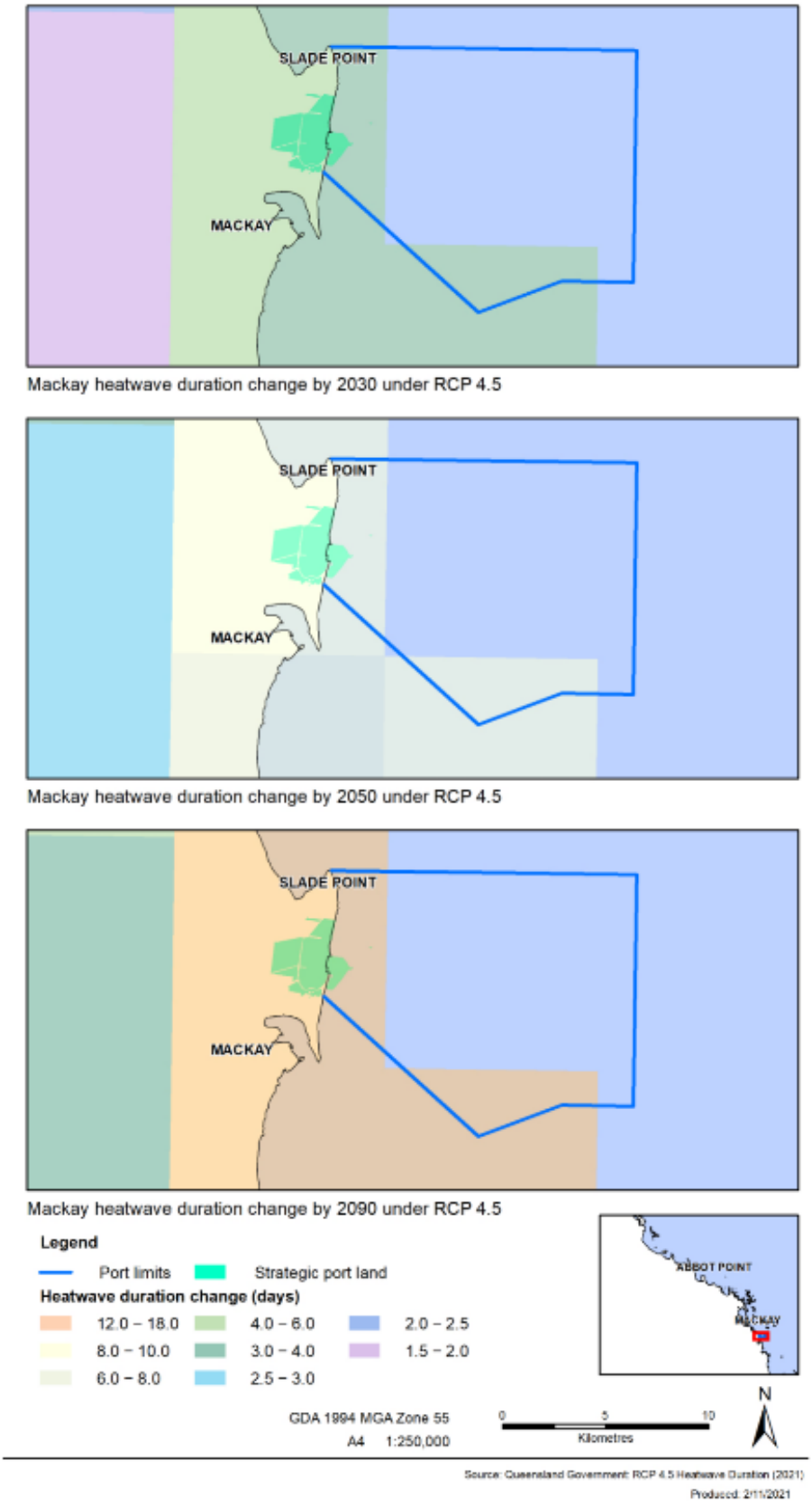
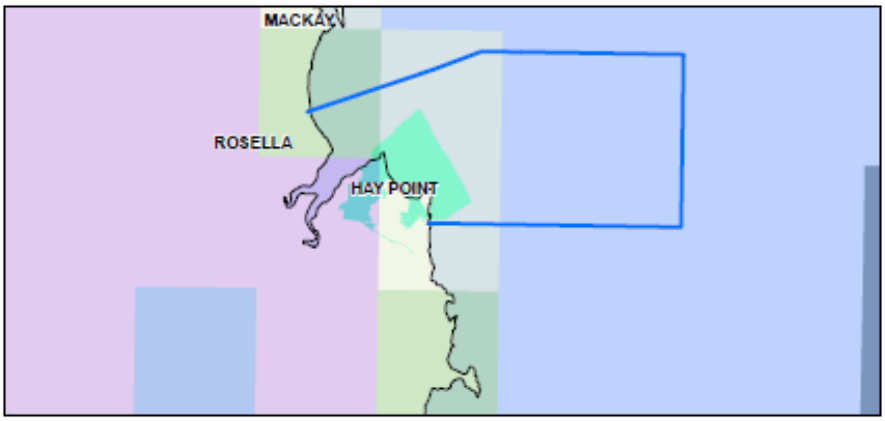
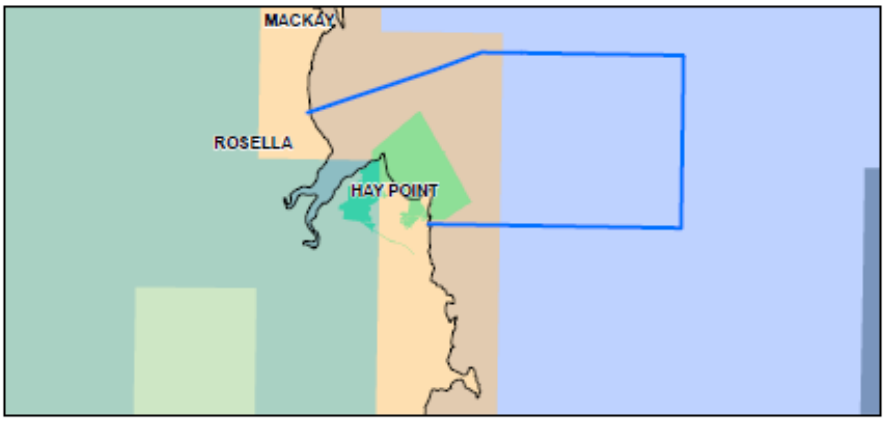


Figure 82: Mackay heatwave duration change from 2030 to 2090 (Representative Concentrations Pathway 4.5)

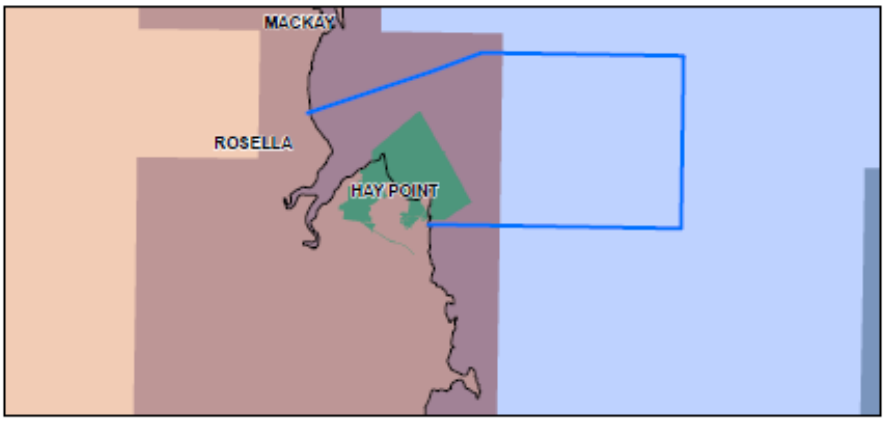
Figure 82 demonstrates the anticipated change in heatwave duration applying RCP 4.5, being considered a most likely scenario to be achieved.



Hay Point heatwave duration change by 2030 under RCP 8.5



Hay Point heatwave duration change by 2050 under RCP 8.5



Hay Point heatwave duration change by 2090 under RCP 8.5

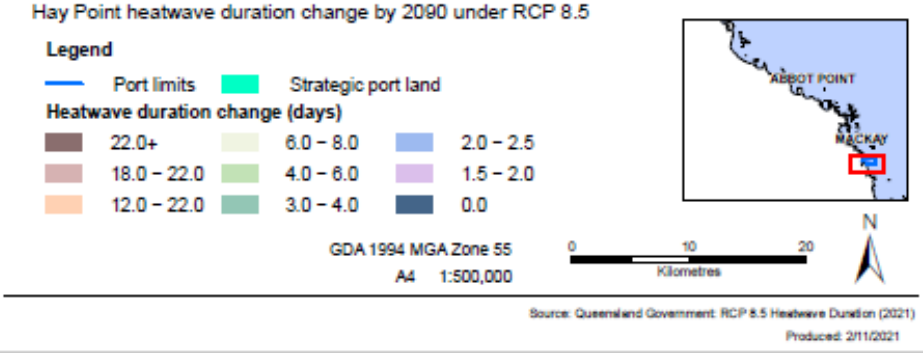


Figure 83: Hay Point heatwave duration change from 2030 to 2090 (Representative Concentrations Pathway 8.5)

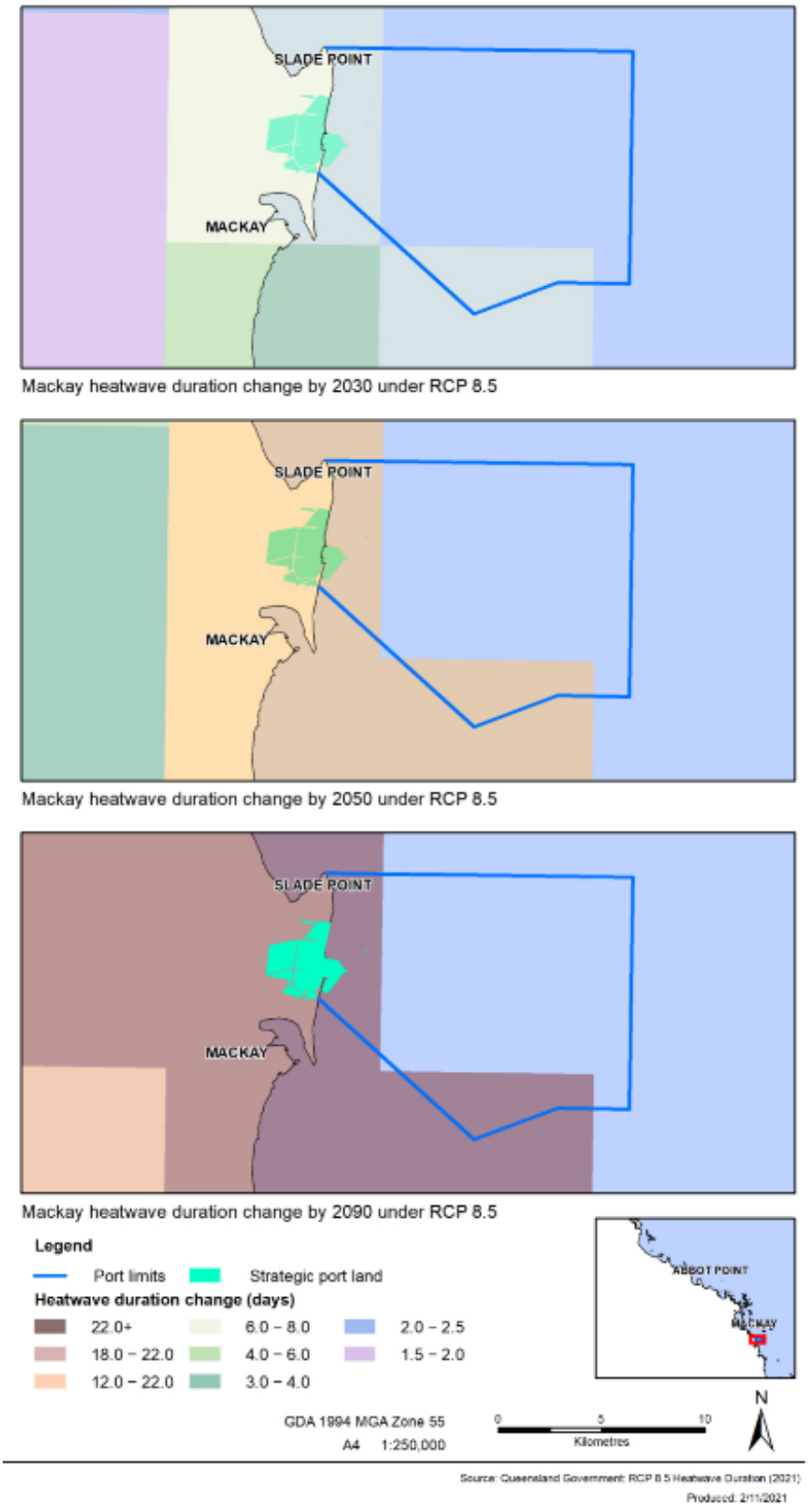


Figure 84: Mackay heatwave duration change from 2030 to 2090 (Representative Concentrations Pathway 8.5)

Figure 83 and **Figure 84** demonstrates the anticipated change in heatwave duration applying RCP 8.5, being considered a most likely scenario to be achieved.

10.3.4 Duration of drought

Drought severity and duration is presented by standardised precipitation index (SPI). SPI is a simple indictor of drought (and also of very wet conditions) and is based on the accrued precipitation for a certain period (12 months in this case), compared with the long-term average precipitation for that period. This precipitation difference (or anomaly) is 'standardised' by dividing by the long-term standard deviation of precipitation for that period.

As the data shows drought is likely to be more severe, frequent and longer in the future of the region. For example, extreme drought is likely to increase meaningfully by the end of the century. Drought is projected to last longer in the area. **Figure 85**, **Figure 86**, **Figure 87** and **Figure 88** show the duration of heatwaves under RCPs 4.5 and 8.5 for 2030, 2050 and 2090 periods for the region.

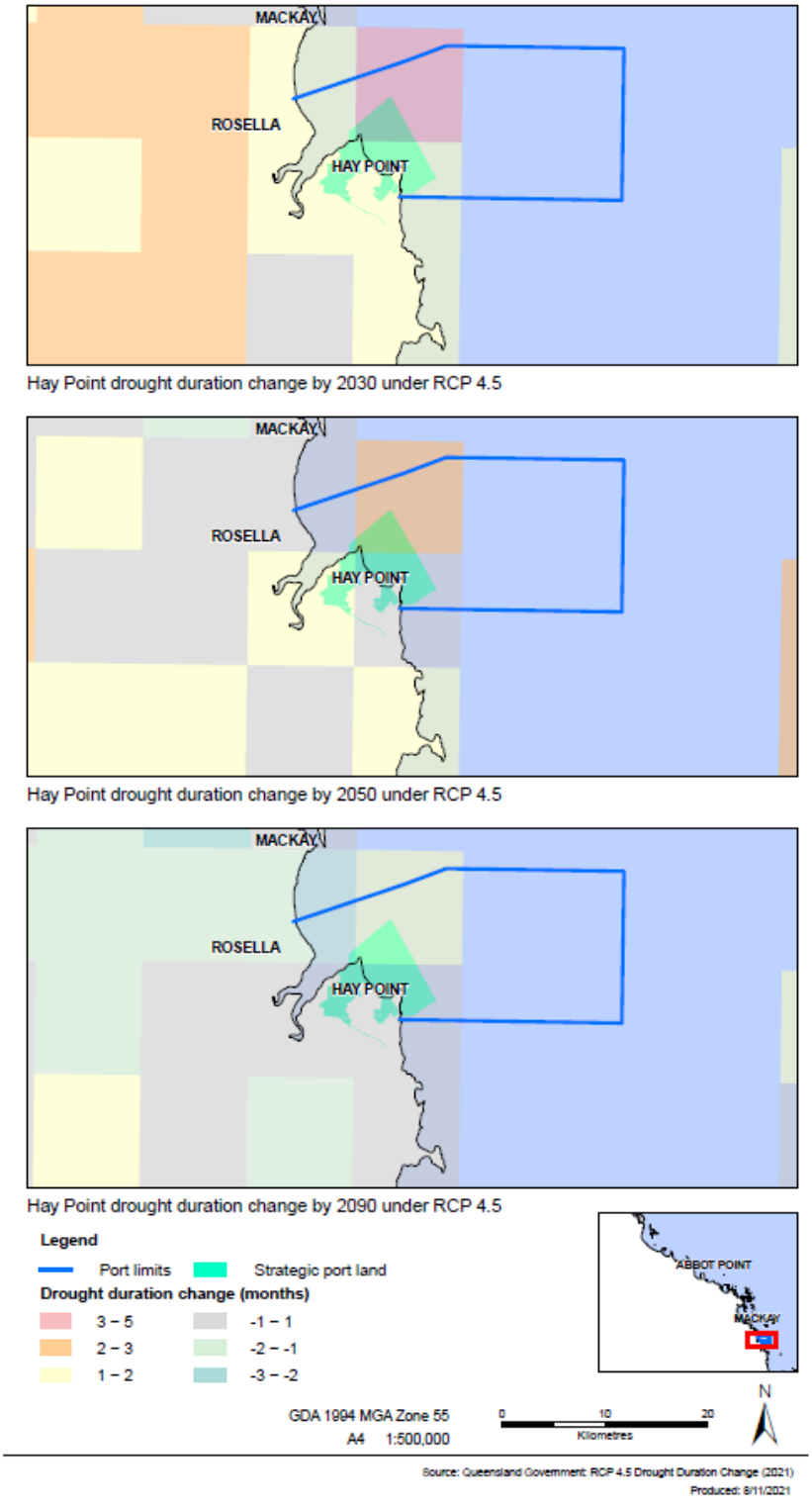


Figure 85: Hay Point drought duration change from 2030 to 2090 (Representative Concentrations Pathway 4.5)

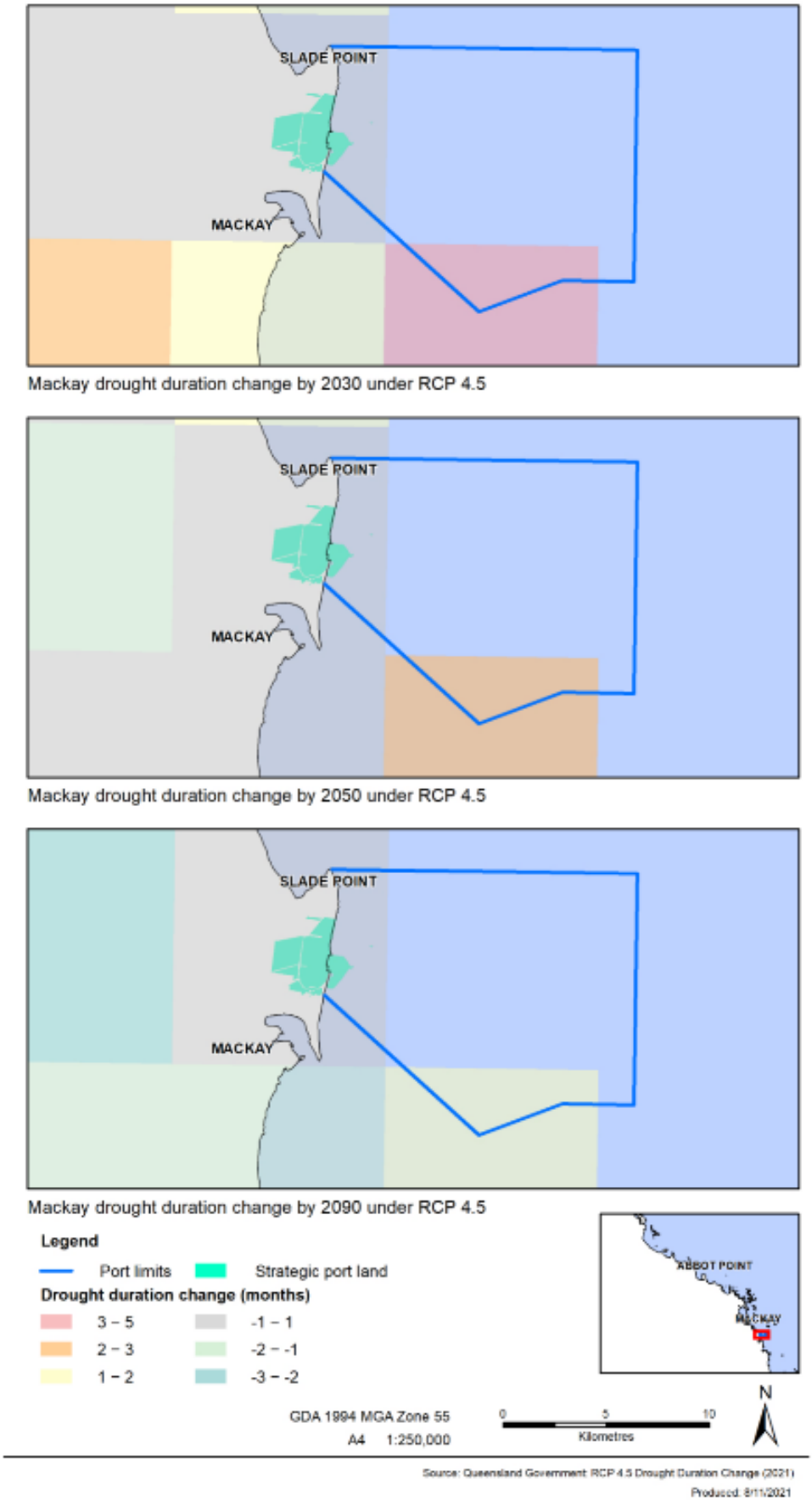


Figure 86: Mackay drought duration change from 2030 to 2090 (Representative Concentrations Pathway 4.5)

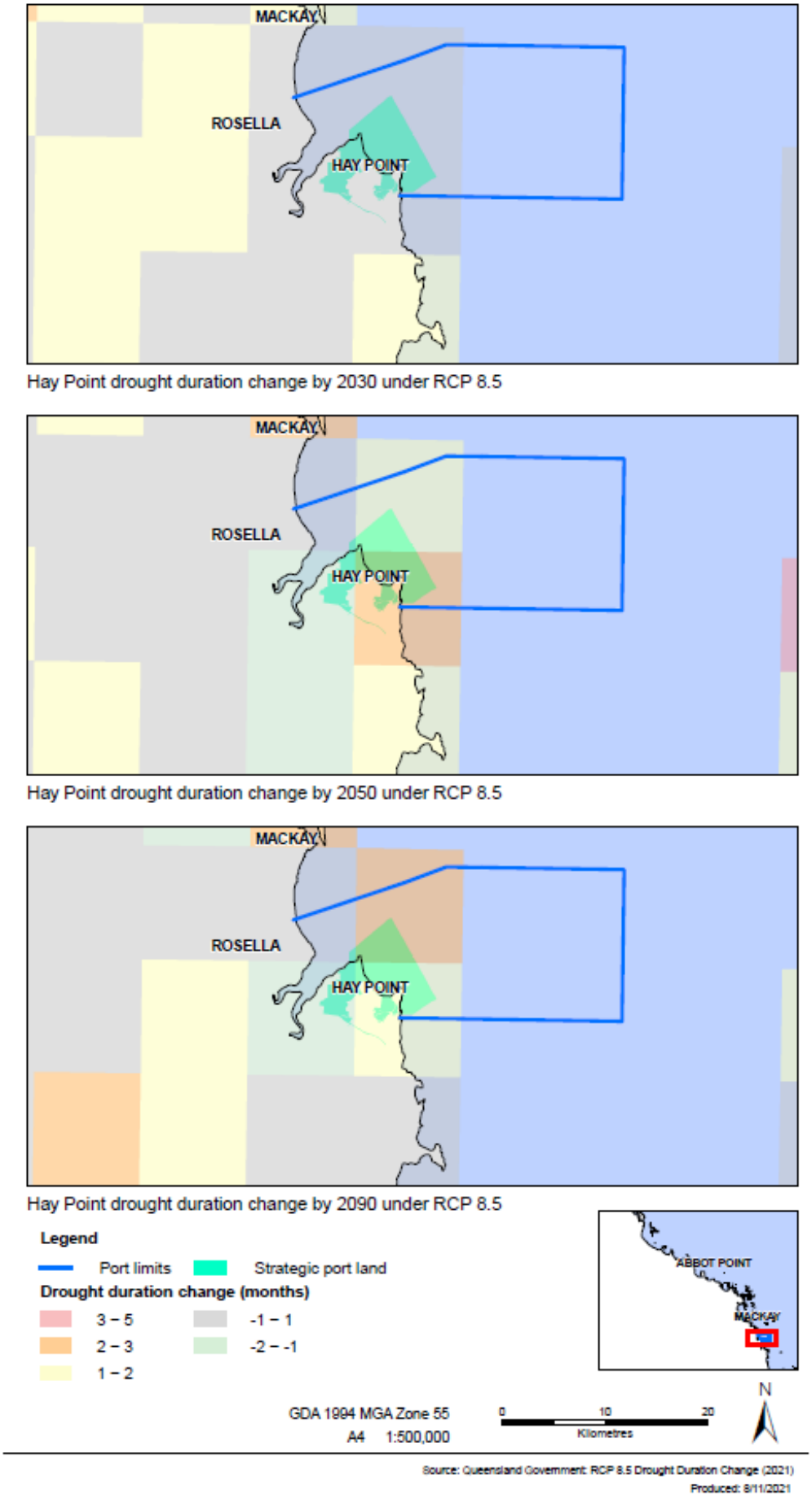


Figure 87: Hay Point drought duration change from 2030 to 2090 (Representative Concentrations Pathway 8.5)

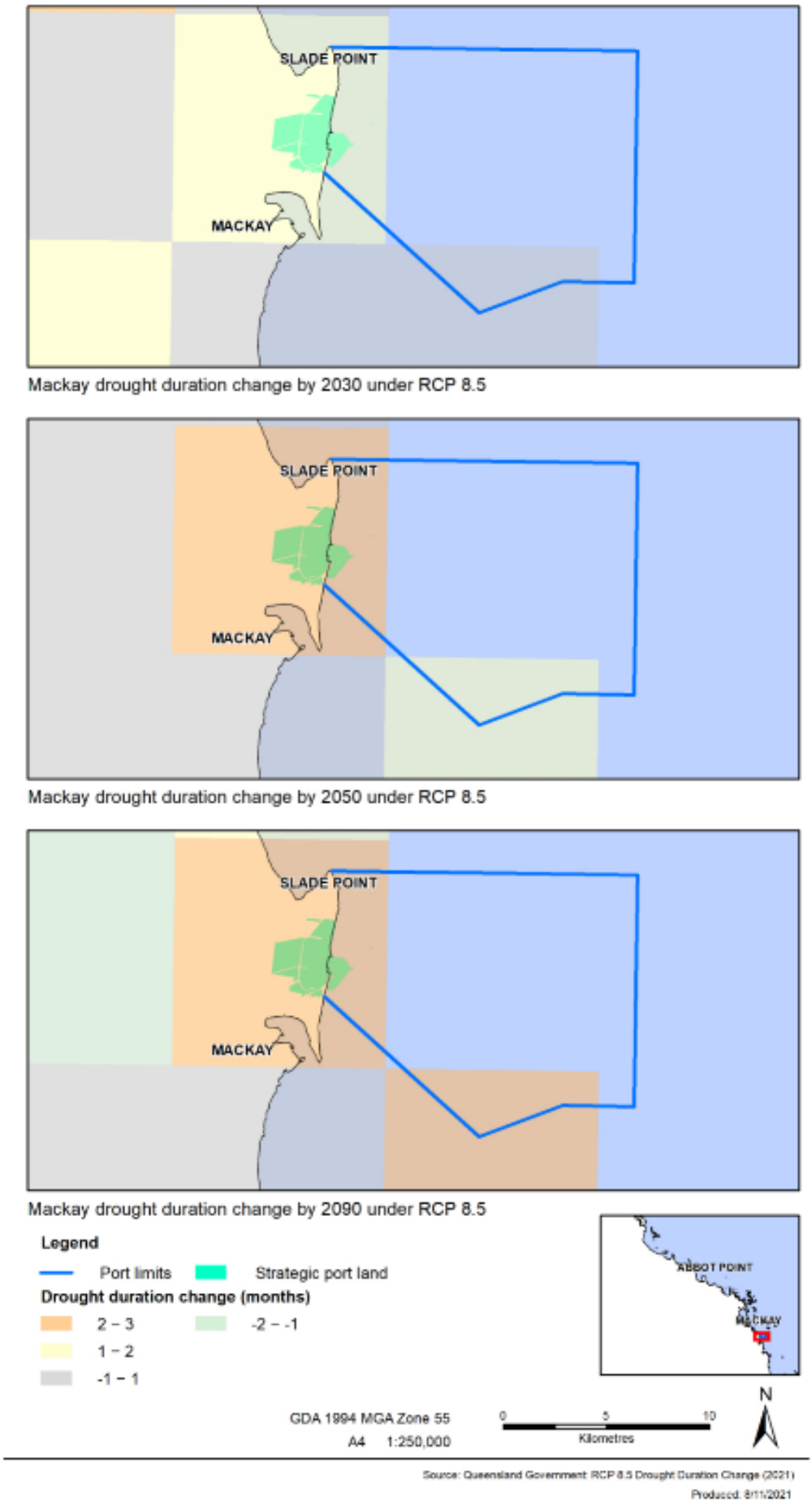


Figure 88: Mackay drought duration change from 2030 to 2090 (Representative Concentrations Pathway 8.5)

10.3.5 Sea level rise and coastal flooding

Port of Hay Point

Data shows that the region's sea levels are likely to continue to rise by 0.8m[451] by the end of the century and under RCP 8.5 (compared with 1986 to 2005 average level) (see **Table 98**). This indicates that more coastal area in the port region is expected to be impacted by coastal hazards such as coastal inundation and flooding and storm surge (tide) (see **Figure 89**).

Table 98: Sea level rise projections for the region

Timeframe	RCP 4.5	RCP8.5
2030	0.13 (0.09-0.17)	0.14(0.09-0.18)
2050	0.23 (0.16-0.31)	0.26 (0.18-0.35)
2090	0.47 (0.30-0.64)	0.64 (0.44-0.87)

SLR impacts on the port's area include:

- Increased coastal erosion and inundation and its impacts on coastal infrastructure
- Increased coastal erosion rate that threaten the port's assets and infrastructures
- Higher storm surges that will affect the port's infrastructure
- Threats to economically significant industries and infrastructure including ports.

Port of Mackay

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Table 99: Sea level rise projections for the region

Timeframe	**RCP 4.5**
2030	0.13 (0.09-0.17)
2050	0.23 (0.16-0.31)
2090	0.47 (0.30-0.64)

SLR impacts on the port's area include:

- Increased coastal erosion and inundation and its impacts on coastal infrastructure
- Increased coastal erosion rate that threaten the port's assets and infrastructures
- Higher storm surges that will affect the port's infrastructure,
- Threats to economically significant industries and infrastructure including ports.

[451] Commonwealth Scientific and Industrial Research Organisation and Bureau of Meteorology. (2015). *Climate Change in Australia: Information for Australia's Natural Resource Management Regions*: *Technical Report*.

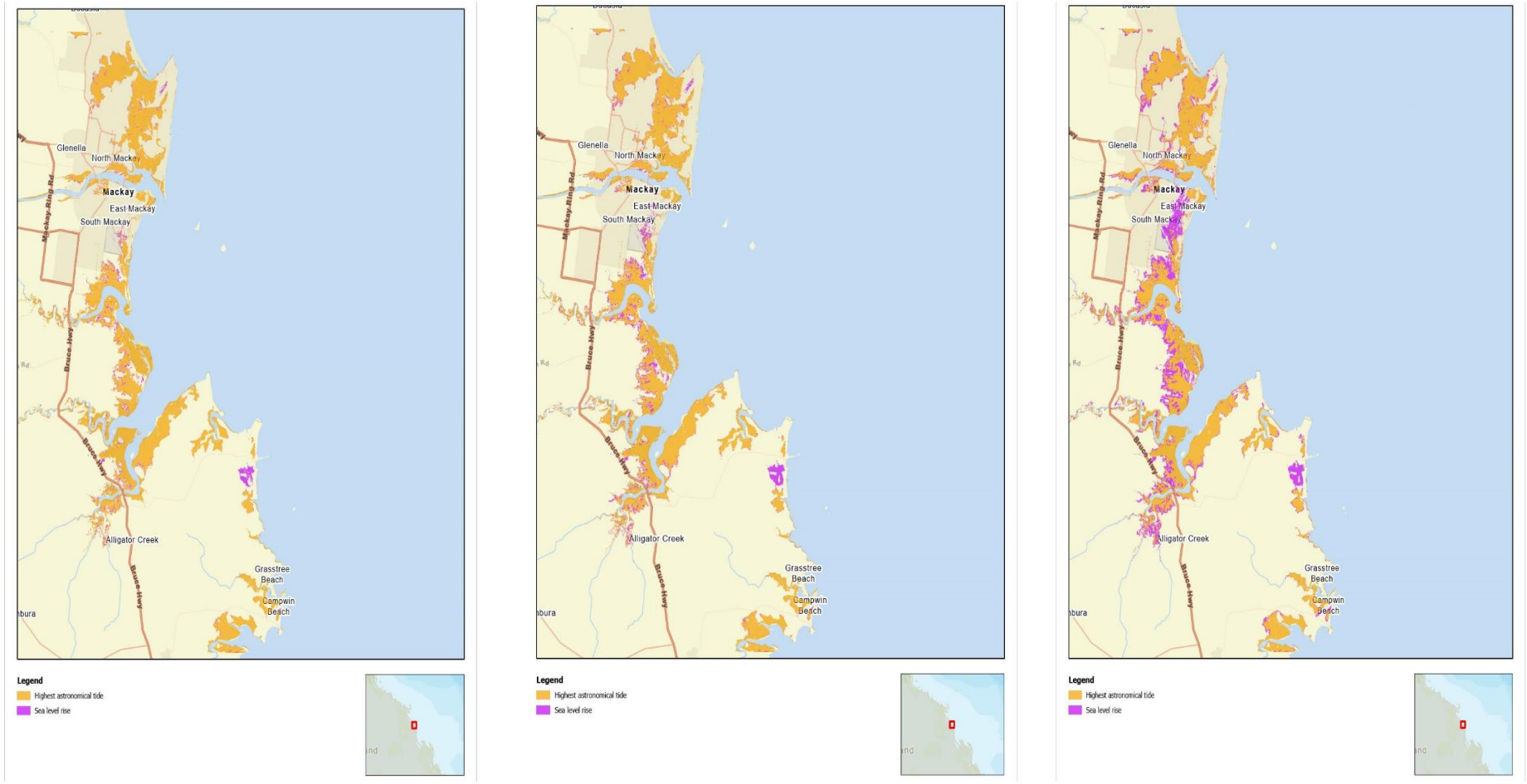

Figure 89: Sea level rise and highest astronomical tide under Representative Concentrations Pathway 8.5 for 2030, 2050 and 2090

10.4 Known or potential natural hazards and risk and resilience factors

The Port of Hay Point/Mackay and surrounding areas are located in a multi-hazard zone including bushfire, flooding, landslide, erosion, and storm tide and inundation. The port's immediate zone is in a high and medium hazard area for storm tide and inundation. Bushfire, coastal erosion, flooding and landslide are other natural hazards threatening the port's operation (see **Figure 90** to **Figure 97**).

The risk and resilience factors include:

Resilience factors:

- the GBR works as natural protection against more severe storm tide, inundation and erosion
- NQBP's intention to address climate change hazard and associated risks
- existing (or development of) climate change mitigation and adaptation tools by the state and local councils such as Whitsunday climate change adaptation and mitigation policies, MIW Regional Resilience Strategy
- availability and accessibility of climate change and natural hazards information.

Risk factors (please refer to **Table 95** and **Table 96** for more detailed risk factors):

- coral bleaching and deterioration of the GBR as natural protection option against coastal hazard
- flooding and inundation by seasonal hurricanes
- cascading effects (synergic impacts of multiple hazard factors, such as flood and inundation) and cumulating effects (scaffolding risk of incremental hazard factors over time, such as erosion and SLR and landslide)
- nature of port's operation: coal storage could exacerbate the risk to port's assets and infrastructure during bushfire.

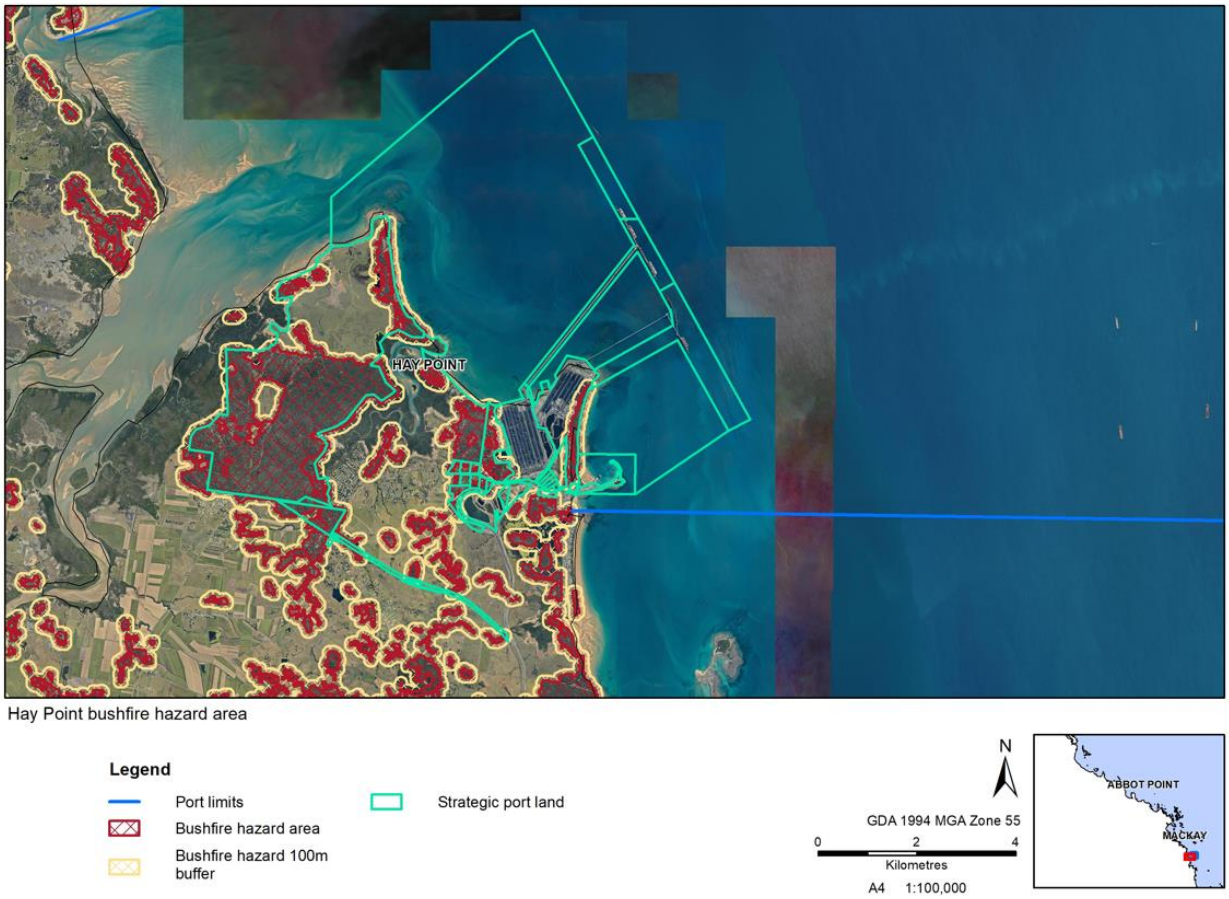

Figure 90: Port of Hay Point Bushfire Hazard (2021)

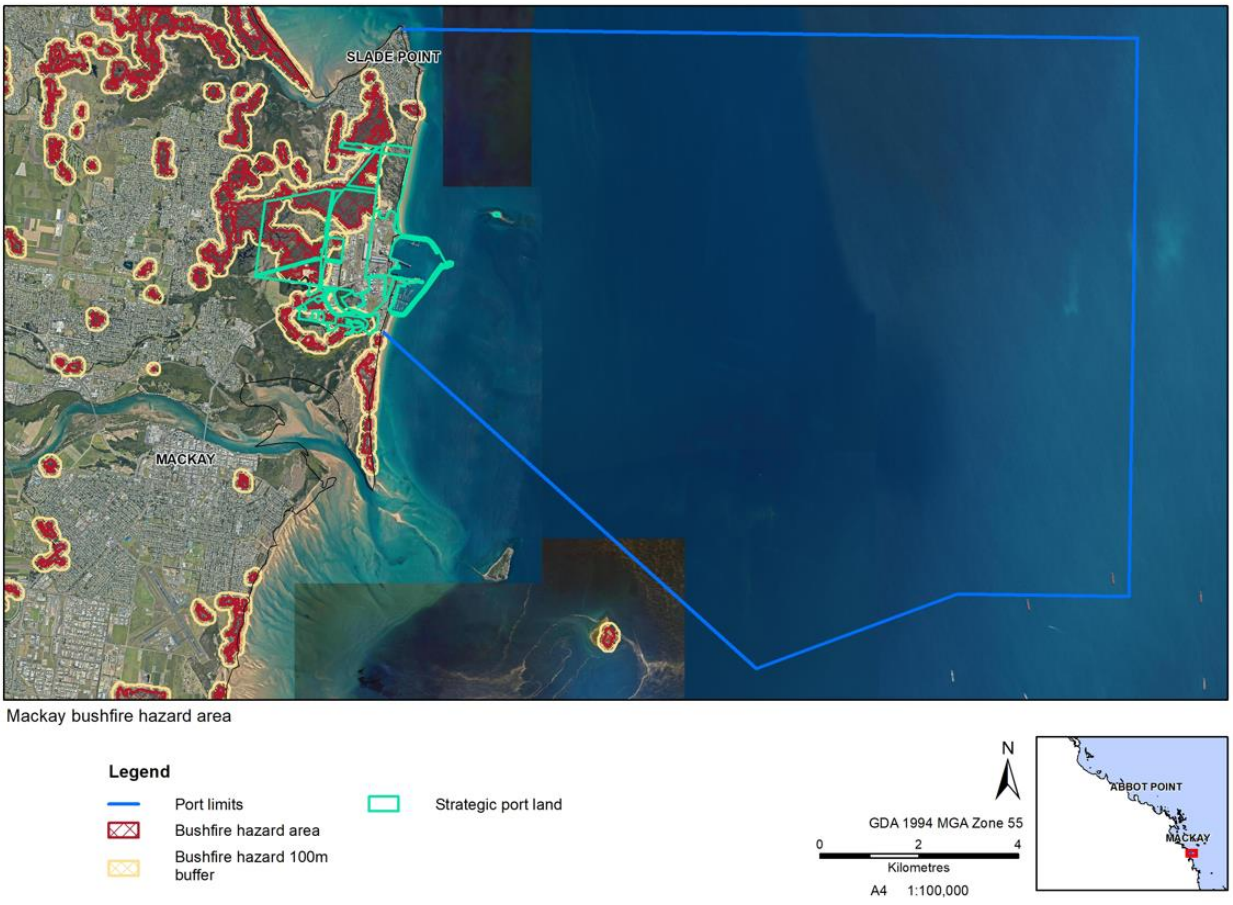

Figure 91: Port of Mackay Point Bushfire hazard (2021)

Coastal Erosion Prone Area

Flood Area Q100 and Q500

Landslide Area

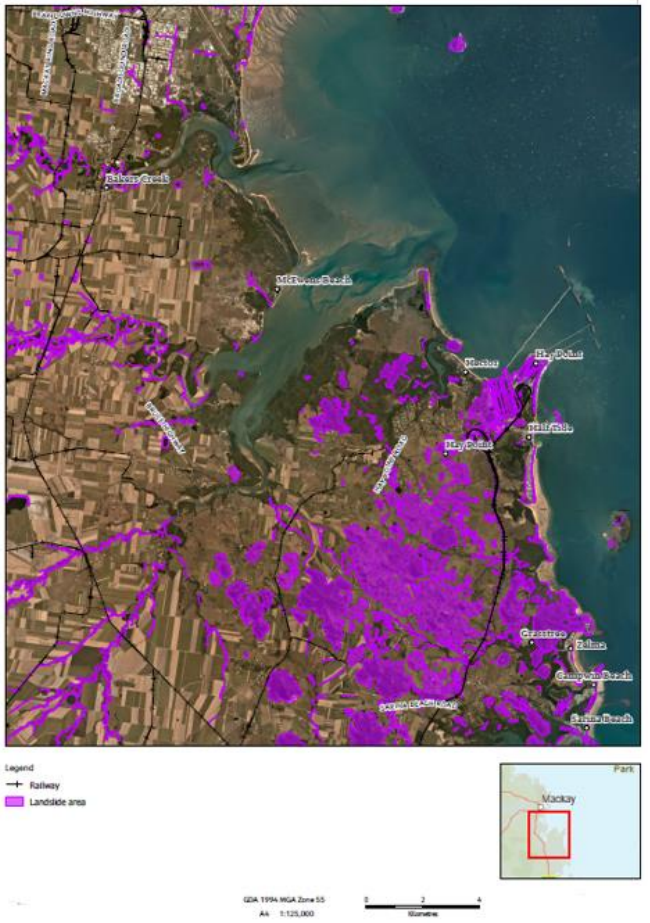

Figure 92: Port of Hay Point Coastal Erosion (2016), Flooding and Landslide Areas (2021)

Coastal Erosion Prone Area

Flood Area Q100 and Q500

Landslide Area

Figure 93: Port of Mackay Coastal Erosion (2016), Flooding and Landslide Areas (2021)

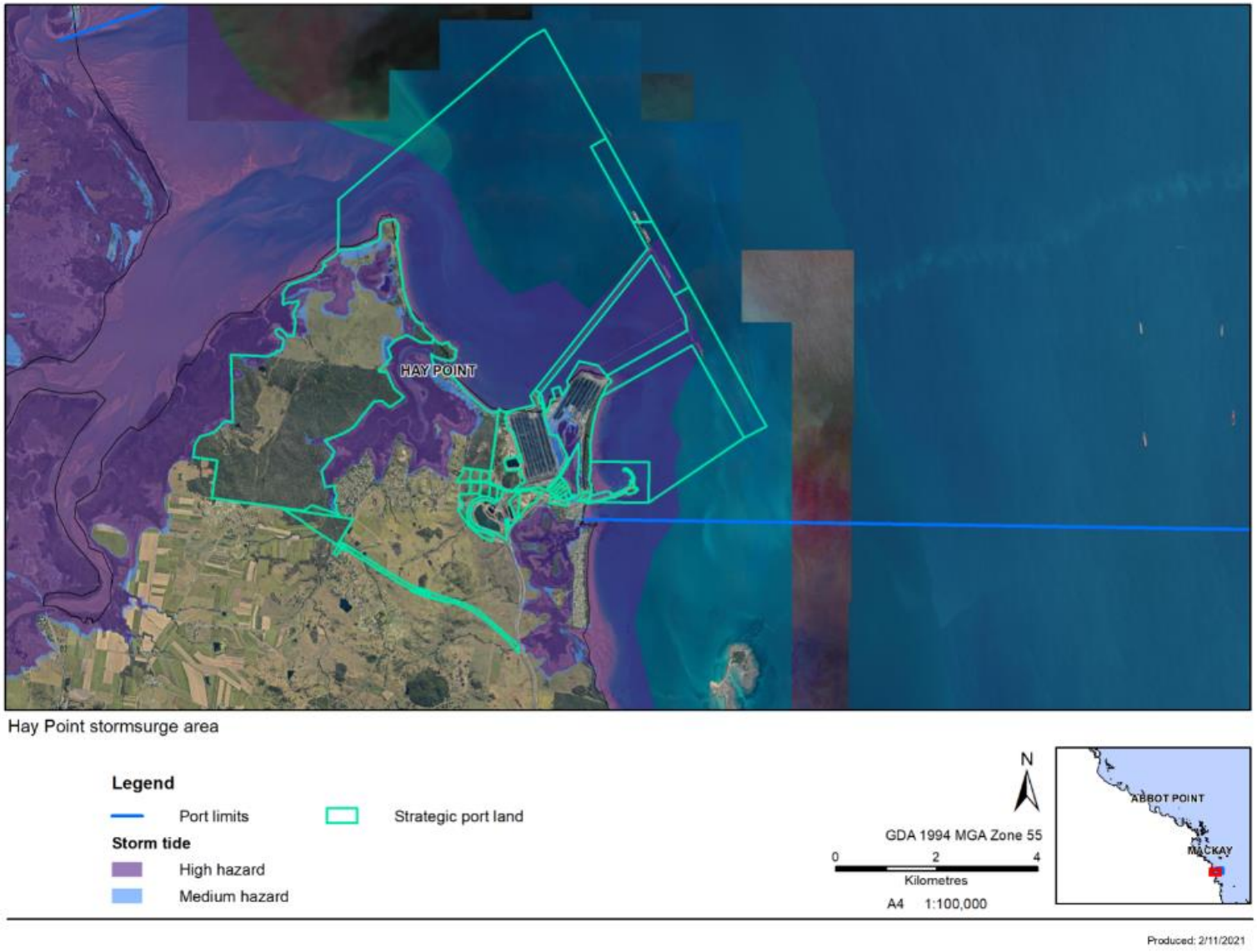

Figure 94: Port of Hay Point Storm Surge (tide) inundation hazard (2015)

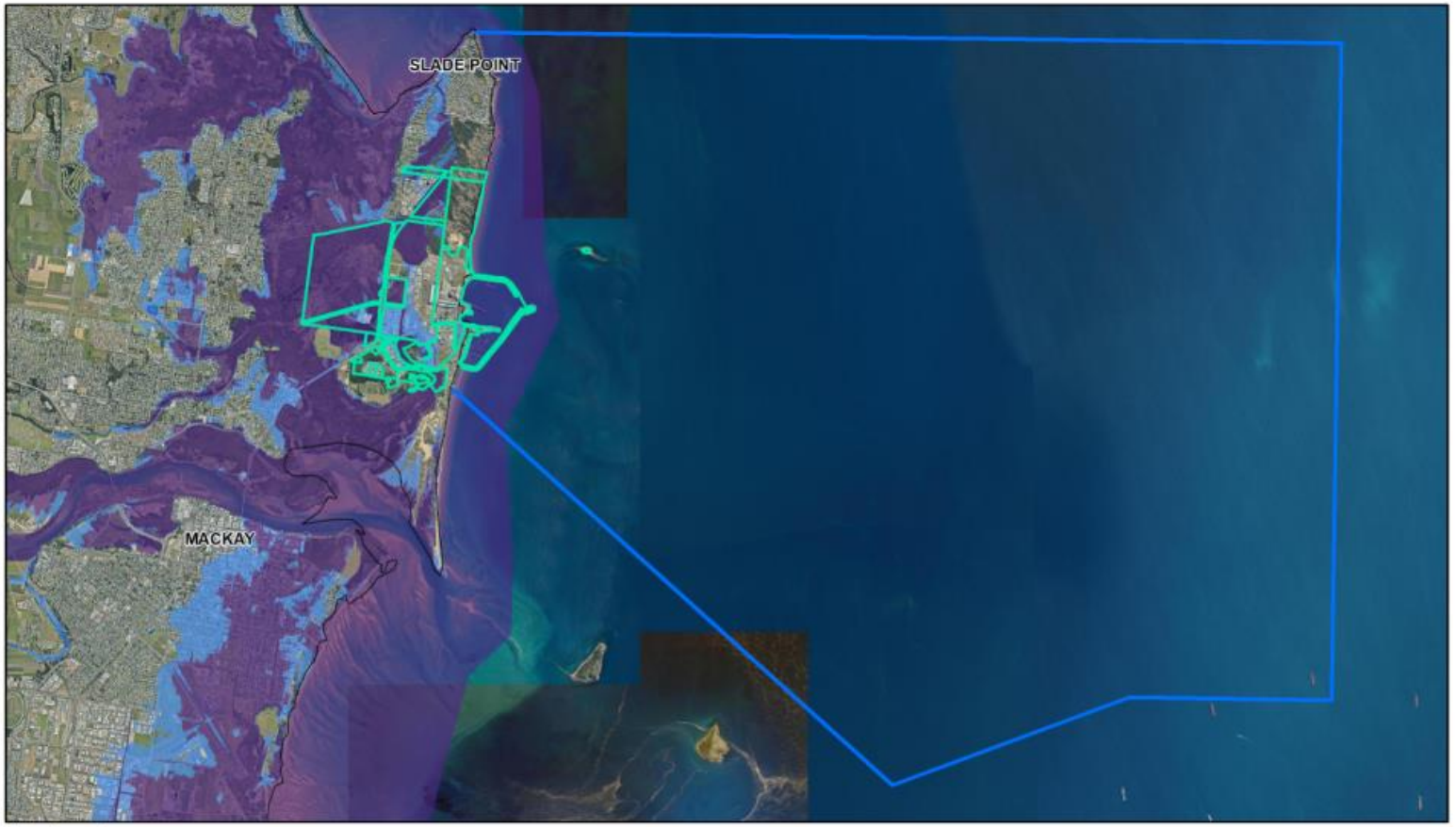

Figure 95: Port of Mackay Storm Surge (tide) inundation hazard (2015)

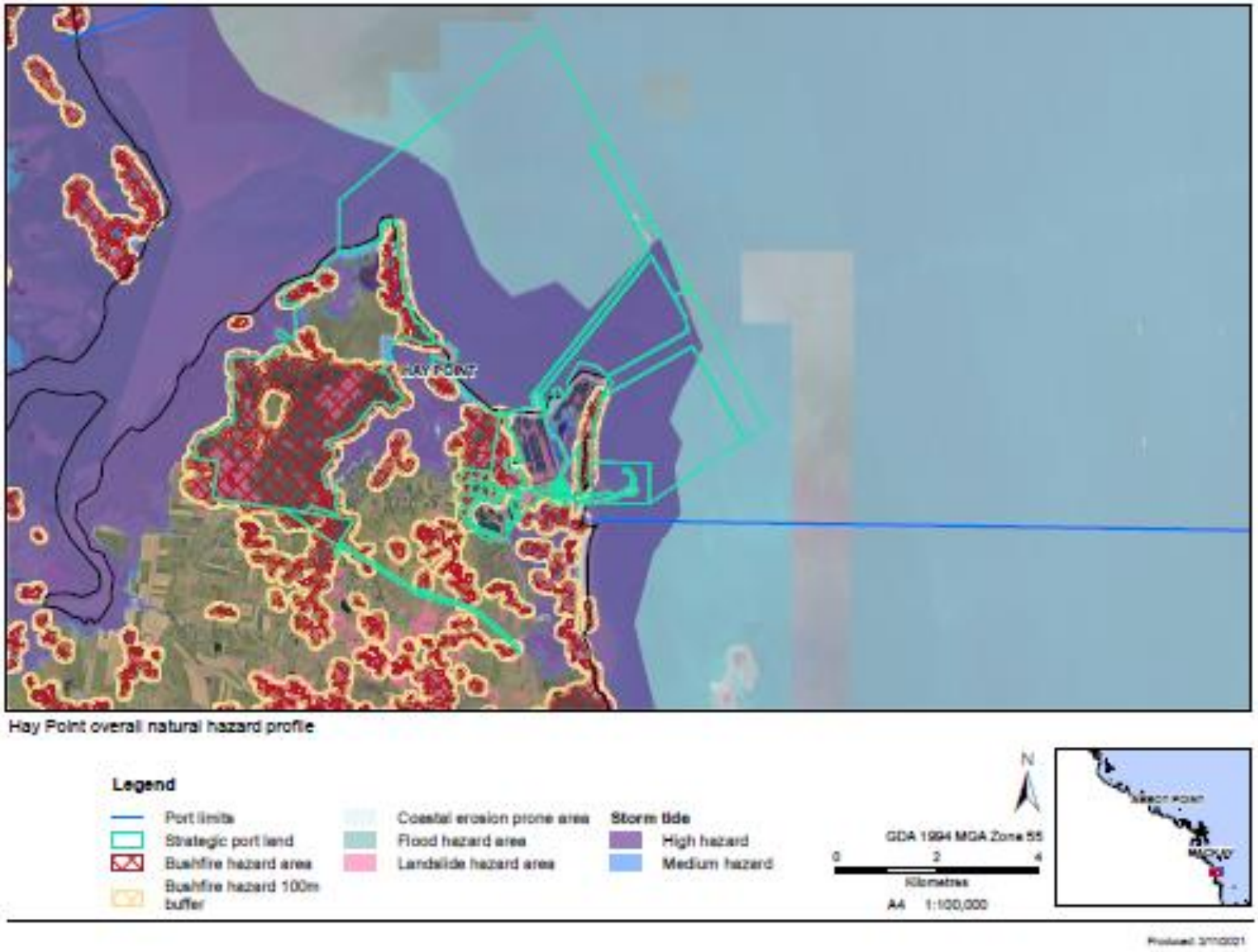

Figure 96: Port of Hay Point Overall natural hazard risk profile

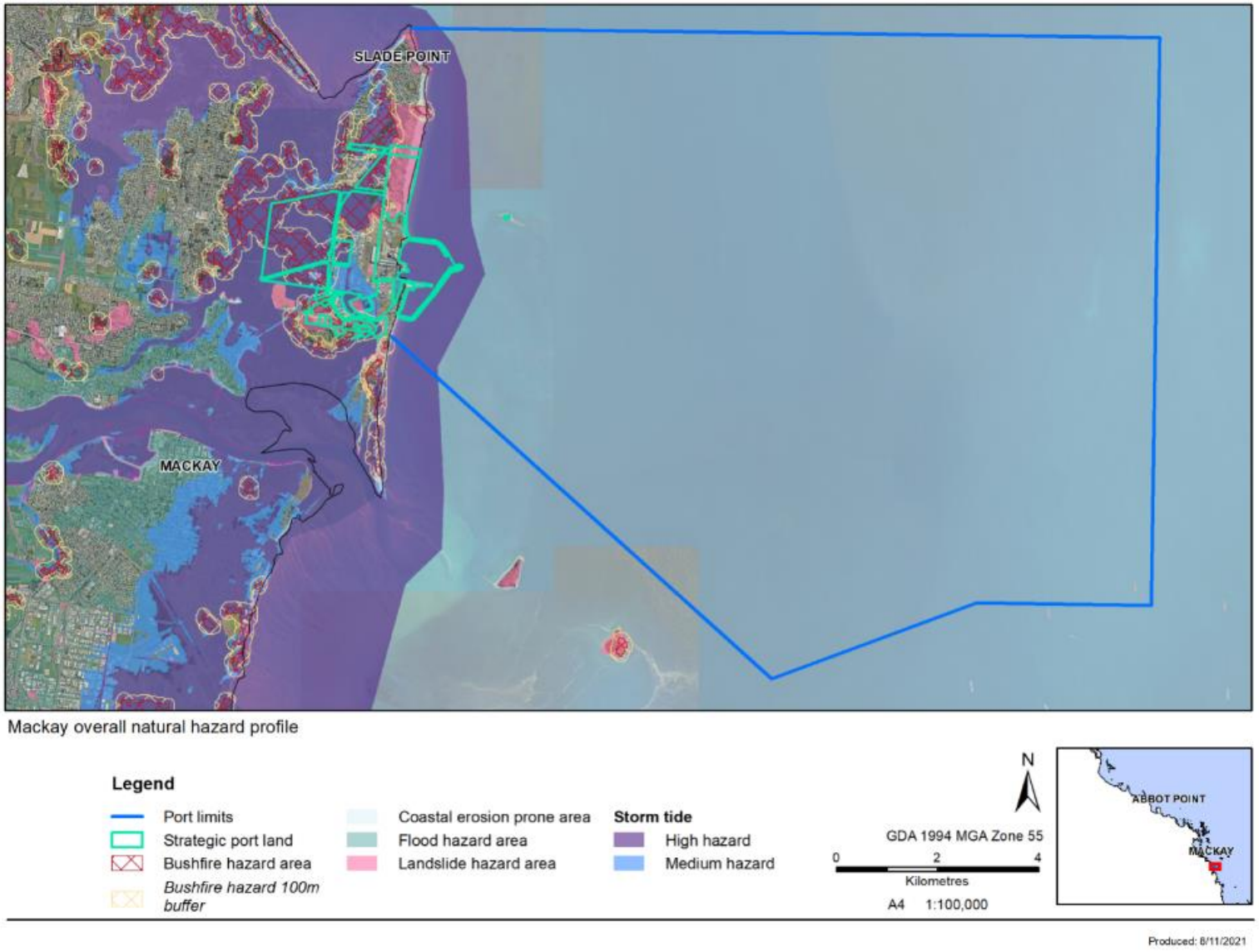

Figure 97: Port of Mackay Overall natural hazard risk profile

10.5 Summary

The ports and its surrounding areas are already being impacted by climate change-induced hazards

Climate change induced hazards are projected to continue to impact the port's assets, infrastructures and operation in the future. These hazards include, but are not limited to:

- warming temperature and more frequent and longer heatwaves, which increase bushfire risks
- less frequent but more intense rainfall, which increase the chance of flash flooding, erosion and landslide
- more frequent and longer drought periods, which impacts water availability and quality
- SLR and associated hazards, which increase the chance coastal inundation, erosion.

The ports are located in a multi-hazard zone for natural hazards including bushfire, coastal inundation and erosion, landslide, and flood. The future intensity and severity of natural hazards are very likely to increase due to climate change.

RCPs 4.5 and 8.5, developed by the IPCC report, have been used to project climate change-induced hazards and their influence on the region (and the port's operations) in different timeframes, including 2030, 2050 and 2090. Data shows that climate change has already influenced the area, and is impacting its social, ecological, and built environments. In the past few years, the region's temperature has been increased, rainfall has become less frequent but more intense, cyclones have become more catastrophic, storm tides have been influencing larger coastal areas, and erosion has become more severe in the port area. Climate change projections suggest that these trends (changes in the climatic conditions) will continue and threaten the port's assets, infrastructure, and operation significantly.

A review of the literature suggests a clear relationship between the region's climate change impacts and natural hazards, where the first exacerbates the likelihood, intensity and frequency of the latter. In this respect, it is projected that the region will experience, for example, more frequent and more intense bushfire due to warming temperature and increases in duration and frequency of heatwaves. Flooding and coastal inundation, landslide and coastal erosion are expected to increase in the future because of more intense rainfall, SLR, and its associated impacts such as storm surge. The review also indicated the existence of some mitigation and adaptation tools in the region's planning and policy sphere (for example, the Queensland Government and MRC mitigation and adaptation plans and policies).

11.0 Infrastructure

11.1 Introduction

This section identifies and describes the infrastructure networks, their characteristics and how they relate to the Port of Hay Point/Mackay and surrounding areas. This section is divided into two parts: land-based and marine-based infrastructure. Both existing and future (planned and approved) infrastructure is detailed to provide an overview of the operation of the port and associated supply chain interdependencies. Below provides the following sections:

- Land-based infrastructure – **Section 11.1**
- Marine infrastructure – **Section 11.3**
- Projects – **Section 11.4**
- New Industries – Hydrogen – **Section 11.5**
- Summary – **Section 11.6.**

Port of Hay Point

The Port of Hay Point is one of the largest coal export ports in the world, located approximately 38km south of Mackay and is managed by NQBP. There are two coal terminals in the port: DBT and HPCT. There are a number of small local communities adjacent to the port and coal terminals.

Strategic port planning, environmental management, infrastructure development, pilotage, security, quarantine waste facilities and dredging requirements is managed by NQBP. The two coal terminals of DBT and HPCT are operated independently with their own management and workforce. The port services coal mines in Central Queensland's Bowen Basin via an integrated rail-port network, the Goonyella Rail System.

The port has a Tug Harbour located adjacent to HPCT at Half Tide. A MOF with a fenced equipment laydown area is located at the Tug Harbour, together with a public boat ramp.

Considerable onsite infrastructure at the Port of Hay Point exists to support the export of up to 61mtpa through HPCT and a further 84mtpa through the DBT. Several key land infrastructure components at the port include rail and road infrastructure to support the supply chain from the mines to the port; high voltage electricity; potable water and dams for storage; and industrial water supply.

Port of Mackay

As Queensland's fourth largest multi-commodity port by throughput, the Port of Mackay is located 5km north of the city of Mackay. The port is one the major servicing centres for Central Queensland mining and agricultural industries. It operates 24 hours a day, seven days a week and extends over 800ha of land and water. The Port is also managed by NQBP, who operate and maintain the common user wharves. Port services provided by NQBP include environmental management, security, marine pilotage and port dredging.

The Mackay region is the largest sugar producing area in Australia and the port hosts one of the world's largest bulk sugar terminals. It also supports the nearby Bowen Basin and Galilee Basin Coalfields. Adjacent to the port is the Mackay Marina (privately owned) which features a residential and tourist precinct, major marine amenities, 479 marina berths and lift out shipyard.

The four wharves in the Port of Mackay are located within the sheltered waters of the harbour. The primary commodities traded through the port include fuel, sugar (raw and refined), grain, magnetite, fertiliser, scrap metal and tallow.

11.2 Land-based infrastructure

11.2.1 Existing road networks

Port of Hay Point

The Bruce Highway which connects Brisbane to Far North Queensland is the major north-south road in the port area. It forms part of the National Land Transport Network and is therefore considered under the *National Land Transport Act 2014* (Cth), to be a nationally significant major road link. The Bruce Highway is an approved B-double 25m route and higher mass limit route. The port itself is accessed via Hay Point Road which runs east of the Bruce Highway and is considered an arterial road. As part of the wider supply chain to support mining operations in the Bowen and Galilee Basins, the Inland Highway (Gregory Development Road) and Flinders Highway are essential links in the region's road network.

The Queensland Transport and Roads Investment Program (QTRIP) for 2021–22 to 2024–25 noted the following road infrastructure of interest to the Mackay and Hay Point area:

- Completed in 2020–21:
  - planning for the replacement of Alligator Creek bridge near Hay Point Road on the Bruce Highway
  - construction of the new highway, part of the Mackay Ring Road (Stage 1) project.
- To be completed in 2021–22 and beyond:
  - continue construction of additional lanes on the Bruce Highway between Ron Camm Bridge and Mackay Ring Road (Stage1) (part of the Mackay Northern Access Upgrade project)
  - commence construction of the Walkerston Bypass on the Peak Downs Highway west of Mackay
  - commence construction of the connection between Mackay Ring Road to Bald Hill Road, part of the Mackay Ring Road (Stage 1) project
  - Inland Freight Route (Gregory Development Road section) – improved pavement condition, bridges, safety, capacity and flood immunity
  - various works on the Flinders Highway (Townsville - Charters Towers) including wide-centre line treatments, accelerations lanes, overtaking lanes.'

Major roads within the vicinity of the port that are a necessary component of the wider supply chain are described in **Table 100**.

Table 100: State-controlled roads – Port of Hay Point study area

Road	Description	Comments
State-controlled roads		
Bruce Highway	Two lane undivided carriageway, 100km/h	Approved B-doubles (25m)
		National highway
		One tonne mass transfer network
		11,020 annual average daily traffic south of Munbura Road (2018)
Hay Point Road	Two lane undivided carriageway, 100km/h	4345 annual average daily traffic just east of Bruce Highway (2018)

The existing road infrastructure network is provided in **Figure 98**.

Figure 98: Existing road infrastructure network

Port of Mackay

Road infrastructure is critical to the port to provide a direct link with the major highway network. The Bruce Highway, which connects Brisbane to Far North Queensland, is the major north-south road that runs through the study area. It forms part of the National Land Transport Network and is therefore considered under the *National Land Transport Act 2014* (Cth), to be a nationally significant major road link. The Bruce Highway is an approved B-double 25m route and higher mass limit route. The route to the port continues from the Bruce Highway along

Sams Road, Joint Levee Road and then Harbour Road through to the Port of Mackay. Slade Point Road is also classified as a B-double 23m route.

The only state-controlled road in the vicinity of the port is Mackay-Slade Point Road (comprising Harbour Road and Slade Point Road). **Table 101** provides information about the Mackay-Slade Point Road and other local government roads.

Table 101: State-controlled and local government roads - Port of Mackay study area

Road	Description	Comments
State-controlled roads		
Harbour Road	Four lane divided carriageway, 80km/h	Approved B-doubles (25m)
		Designated principal cycle route
		12,977 vehicles per day, 11.9% heavy vehicles (October 2017)
Slade Point Road	Two lane undivided carriageway, 100km/h	Approved B-doubles (25m) between Harbour Road and Gudyara Road)
		Approved B-Doubles (23m) between Gudyara Road and David Muir Street
		Principal cycle route
		8988 vehicles per day, 5.4% heavy vehicles (October 2017)
Harbour Road/Slade Point Road Roundabout	Four way intersection, primarily two lane roundabout	Approved B-doubles (25m)
Slade Point Road/Gudyara Road T-intersection	Give way signs	Approved B-doubles (25m) from Slade Point Road turning right into Gudyara Road
		Road geometry has been designed for future operation of PBS3A vehicles
Local government roads		
Ron Searle Drive	Traffic distributor, two lane undivided carriageway, 60km/h	Approved B-doubles (25m) between Harbour Road and Mount Bassett Quarry access
		Principal cycle route
		5022 vehicle per day, 4.5% heavy vehicles (October 2017)
Mulherin Drive	Major collector, two lane carriageway with median parking	
East Point Road	Major collector, two lane undivided carriageway	
Breakwater Access Road (excluding the actual breakwater)	Two lane undivided carriageway with kerbside parallel parking	Principal cycle route

There are no approved road train routes within the immediate port vicinity. However, recently a number of projects have been completed that may improve access to the Port of Mackay for Type 1 road trains (36.5m in length) or equivalent Performance Based Standards Level 3A (PBS3A) vehicles. These projects include:[452]

- Gudyara Road (Northern Access Road) by NQBP – secondary access to the Port of Mackay on Slade Point Road (opened in February 2020).
- Road Network Access Study by NQBP – report on infrastructure upgrades and investment required to enable PBS3A vehicles direct access from the Port of Mackay to the greater western regions (completed in May 2020). Note that this is just a study and not a project – there is no funding available at the time of writing.

[452] North Queensland Bulk Ports Corporation Ltd. (2021). *Port of Mackay Transport Master Planning*.

- Mackay Ring Road Stage 1 by TMR – improved link from the south to the northern suburbs to reduce traffic through Mackay (opened in September 2020). The business case for Stage 2 of the Mackay Ring Road (also referred to as the Port Access Road) is currently being undertaken by TMR.
- Eton Range Realignment by TMR – Existing range crossing upgraded to improve safety and efficiency (opened in October 2020).
- Walkerston Bypass by TMR – two lane rural highway to connect Peak Downs Highway west of Walkerston to the Mackay Ring Road near Paget (construction to commence in 2021). This project is listed as a priority project in the infrastructure priority list.[453]

The QTRIP for 2021–22 to 2024–25 noted the following road infrastructure of interest to the Port of Mackay area:

- Completed in 2020–21:
  - complete construction of the Mackay Ring Road (Stage 1) project
- To be undertaken in 2021–22:
  - continuation of construction of additional lanes on the Bruce Highway between Ron Camm Bridge and Mackay Ring Road (Stage1) (part of the Mackay Northern Access Upgrade project)
  - commence construction of the connection between Mackay Ring Road to Bald Hill Road, part of the Mackay Ring Road (Stage 1) project

The existing road infrastructure network is provided in **Figure 99** and **Figure 100**.[454]

[453] Infrastructure Australia. (2021). *Infrastructure Priority List.*
[454] Department of Transport and Main Roads. (2021). *Queensland Transport and Road Investment Program 2021-22 to 2024-25*.

Figure 99: Road Infrastructure networks

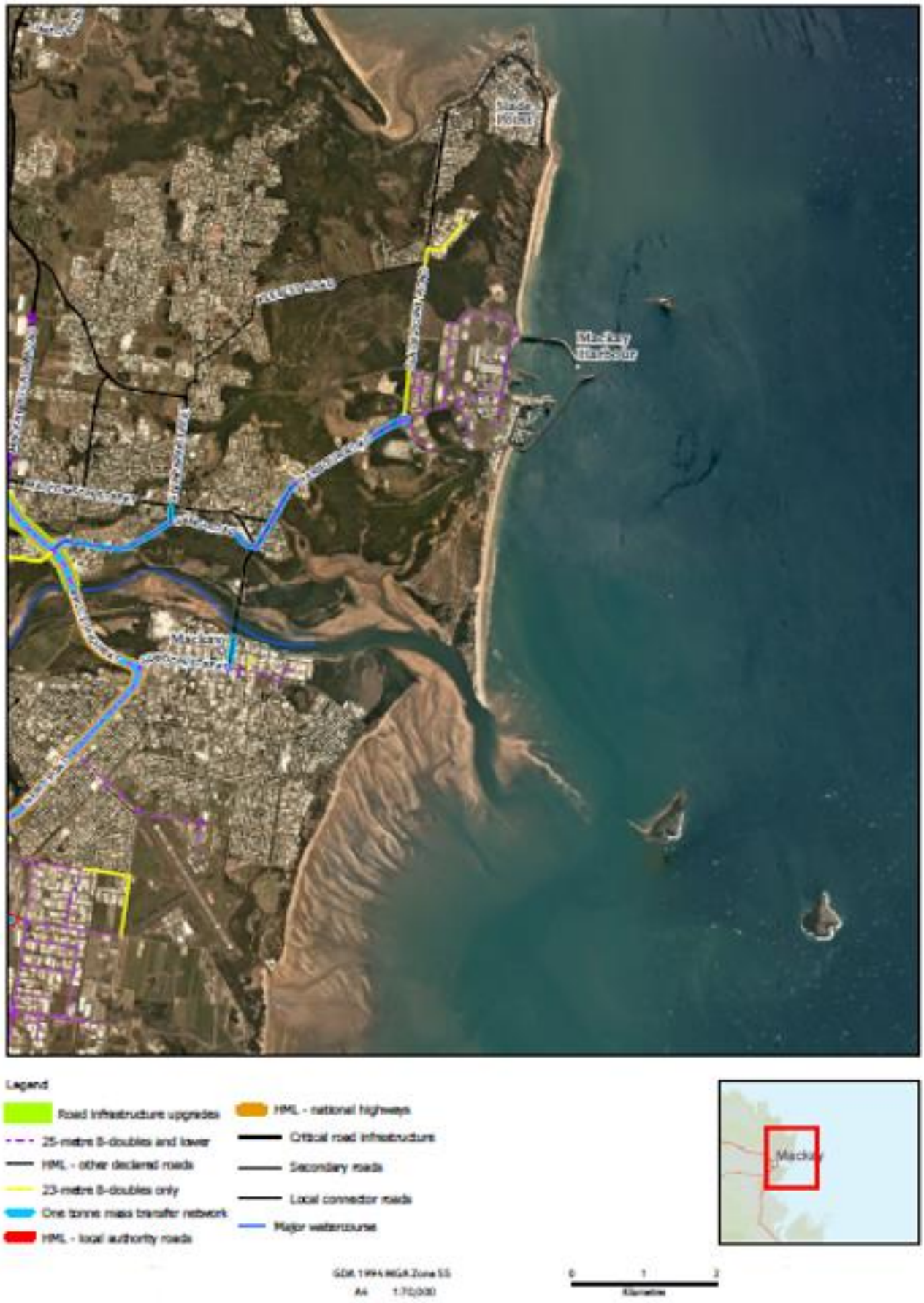

Figure 100: Queensland Transport and Roads Investment Program road infrastructure of interest to Mackay

11.2.2 Existing rail network

Port of Hay Point

The rail line that leads to the Port of Hay Point is part of the Goonyella Rail System, which is owned by Aurizon and services the Bowen Basin in Central Queensland. The Goonyella Rail System is narrow gauge 1067mm and electrified by an autotransformer system with the overhead line equipment operating at 25 kiloVolts (kV) 50 Hertz (Hz). The track on the main trunk route from Hay Point to North Goonyella is generally 60 kilograms per metre (kg/m) rail with concrete sleepers, with bridges allowing passage of 106 tonne wagons at 80km/h.

In addition to servicing Hay Point, the system also provides a connection to the North Coast Line at Yukan and the Central line via Gregory to Burngrove (Blackwater System). The Goonyella Rail System is bi-directional duplicated track with crossovers between Dalrymple Junction and Wotonga with the remainder of the track being duplication between Coppabella and Ingsan. The junction for the Peak Downs, Saraji, Norwich Park, Lake Vermont, German Creek and Oaky Creek line is at Coppabella, whilst the junction for the Blair Athol line is at Wotonga.

This line services 24 mines from North Goonyella through to Hay Point, and also provides a connection to the Newlands System which services the Port of Abbot Point. The Goonyella Rail System is operated by remote control signalling with train movements controlled from Rockhampton.

The rail line has two separate loops at the port end, with one dual unloading balloon at the HPCT and one triple unloading balloon set further back at DBT. Between Hay Point and Coppabella, the track structure is 53kg/m and 60kg/m rail on concrete sleepers. The maximum speed for trains between the balloon loops at Hay Point/Dalrymple Bay and Dalrymple Junction is 60km/h. The speed increases to 80km/h for block trains and 100km/h for freight trains from Dalrymple Junction to Coppabella. The maximum grade that an up train (westbound) will encounter is one in 45 while a down train (eastbound) is one in 66.[455]

The Port of Hay Point rail infrastructure network is provided in **Figure 101**.

[455] Aurizon. (2017). *Goonyella System Information Pack*.

Figure 101: Rail System to the Port of Hay Point

Port of Mackay

The rail line that leads to the Port of Mackay is part of the North Coast Line, which is owned by Queensland Rail. The North Coast Line is narrow gauge 1067mm wide. This line connects Brisbane through to Cairns. This rail line overpasses Slade Point Road roughly between Harbour Road and Gudyara Road. The overpass is made of pre-stressed concrete design class T44 with a total length of approximately 60m. The bridge is approved for use by B-doubles (25m).

Just west of the direct port access (west of Slade Point Road), the rail changes from the North Coast Line to the Mackay Harbour Line. The rail line has a large loop at the Port of Mackay, with a smaller loop attached at the north-east segment. The north-eastern segment is a grain terminal (operated by GrainCorp) while the southern portion of the main loop is the sugar terminal (used by Sugar Terminals Limited). Grain trains are approximately 650m in length with approximately 70 trains per year accessing the port. Sugar Terminals Limited advised that sugar trains are approximately 730m in length with two trains per day from June to December, and no trains from January to May.

There are two level crossings on Spiller Avenue. The separation between stop lines is less than 30m and access to the Holcim Readymix Sales factory is provided between the level crossings.[456]

The rail infrastructure network is provided in **Figure 102**.

Figure 102: Rail System to the Port of Mackay

[456] North Queensland Bulk Ports Corporation Ltd. (2021). *Port of Mackay Transport Master Planning*

11.2.3 Existing water, power and sewage infrastructure

Port of Hay Point

There is an existing potable water main that travels towards the port from the Bruce Highway along Hay Point Road-Bally Keel Road and largely through undeveloped land until it meets a water reservoir on Mount Griffith Reserve Road. The water mains then follow Mount Griffith Reserve Road and Hay Point Road through to Valroy Street where it travels south away from the port along the coastline. There is no existing sewer or stormwater assets at the Port of Hay Point.[457]

Supplementary industrial water is stored at the port's Wentzel Road Dam and pumped as needed to the individual terminals. The dam is located around 12km west of the port off the Bruce Highway. The water pipeline from the dam largely follows the Bruce Highway and Hay Point Road to the port.

Hay Point port is supplied by Powerlink[458] from the Alligator Creek substation providing 132kV and Ergon Energy[459] from the Louisa Creek bulk supply substation providing 132kV/33kV. The Alligator Creek substation is located approximately 10km west of Hay Point and the Louisa Creek bulk supply substation is located approximately 2km west of Hay Point. The capacity of the Louisa Creek Bulk supply substation according to the Ergon Energy substation forecast is summarized in **Table 102**.

Table 102: Louisa Creek bulk supply substation capacity – Port of Hay Point

Substation	Summer Normal Cyclic Capacity	Winter Normal Cyclic Capacity
Louisa Creek	175.8 Megavolt amperes (MVA)	185.2MVA

The Louisa Creek substation currently meets the required security standard and there are no planned upgrades or replacements according to the Ergon Energy *Distribution Annual Planning Report 2020*.[460]

Powerlink has proposed a full replacement of the 132kV secondary systems at Alligator Creek substation to maintain supply reliability to the zone. Powerlink has also proposed line refit works on the associated 132kV transmission line between Nebo substation to the south and the Eton Tee (to the west of Alligator Creek substation) to supplement this proposed upgrade. However, these projects are only proposed and not yet committed projects.

Assets at the port itself are summarised in **Table 103**.

Table 103: Utility assets at the Port of Hay Point

Service/Operator	Asset description	Comment
Powerlink	Powerlink substation Other substation Optic fibre	All three assets are located close to the coal terminal rail loop on the western side
Aurizon	Signalling and Telecommunications	Underground cables near Hay Point Road crossing, beginning of Dalrymple rail loop and beginning of coal terminal rail loop
NBN	Cables	Various cables throughout search area

[457] Dial Before You Dig Search. (2021). [Utility assets at the Port of Mackay) Retrieved 29 June 2021, from Dial Before You Dig website
[458] Powerlink Queensland. (2020). *Transmission Annual planning Report 2020.* Retrieved from https://www.powerlink.com.au/sites/default/files/2020-10/Transmission%20Annual%20Planning%20Report%202020%20-%20Full%20report.pdf
[459] Ergon Energy. (2020). *Distribution Annual Planning Report 2020.*
[460] Ergon Energy. (2020). *Distribution Annual Planning Report 2020.*

Service/Operator	Asset description	Comment
Ergon Energy (smaller search area)	High voltage poles and cables Low voltage poles and cables Communication poles and cables Substations (pole mounted and zone) Connector points Communication pit	Various poles throughout site Multiple sub stations Most assets are located outside of the main port itself

Figure 103: Electrical supply to the Port of Hay Point

Port of Mackay

An existing sewer pump station is located on Mulherin Drive opposite the Mackay Marina, as well as another existing pump station on Spiller Avenue just north of the rail line. These pumps connect through to the existing trunk mains.

At the same location on Mulherin Drive, there is also an existing water pump station. There is a second existing water pump station on Slade Point Road close to the intersection with Harbour Road. A water reservoir exists on Mount Bassett Drive. These three items connect into the existing water mains.

There is a culvert at Aspley Creek on Keeleys Road that is scheduled for a drainage upgrade in 2027. According to available LGIP information and information sourced from MRC, there are no stormwater assets at the port.[461]

Power to the port is supplied by Powerlink[462] from the Mackay port substation providing 132kV and Ergon Energy[463] from the Mount Bassett substation providing 33/11kV. The Mackay port substation is located approximately 1km west of the port on the corner of Norris Road and Beaconsfield Road. The capacity of the Mount Bassett substation is summarised in **Table 104**, which is located on the corner of Harbour Road and Slade Point Road.

Table 104: Substation capacity – Port of Mackay

Substation	Summer Normal Cyclic Capacity	Winter Normal Cyclic Capacity
Mount Bassett	39MVA	42MVA

The Mount Bassett Substation currently meets the required security standard and there are no planned upgrades or replacements according the Ergon Energy *Distribution Annual Planning Report 2020*.

Utility assets at the Port of Mackay are summarised in Table 105.[464]

Table 105: Summary of Utility Assets – Port of Mackay

Service/Operator	Asset description	Comment
APA	63-110mm High Density Polyethylene – Liquified Petroleum Gas	Within core onshore port area
Australian Terminal operations Management	Pipeline asset	Within core onshore port area
Optus cables	Optus underground cables/conduits Optus fibre in other utility conduit	Various locations – primarily follows core road network
AARNet	AARNet Fibre Optic Assets	Minor amount on south western corner of search area
NBN	Communications and electricity	Various cables throughout search area
Ergon Energy	High voltage poles and cables Low voltage poles and cables Communication poles and cables Communications joint and pits Connector points Pedestals (distribution cabinet, normal and cross road pillars) Sub stations (pole mounted)	Various locations Majority of assets are located outside of the immediate port area

[461] *LGIP Trunk Infrastructure Network*
[462] Powerlink Queensland. (2020). *Transmission Annual planning Report 2020.* Retrieved from https://www.powerlink.com.au/sites/default/files/2020-10/Transmission%20Annual%20Planning%20Report%202020%20-%20Full%20report.pdf
[463] Ergon Energy. (2020). *Distribution Annual Planning Report 2020.*
[464] *Dial Before You Dig Search. (2021). [Utility assets at the Port of Mackay) Retrieved 29 June, 2021, from Dial Before You Dig website.*

Figure 104: Electrical supply to the Port of Mackay

11.2.4 Planned infrastructure networks

Port of Hay Point

The QTRIP for 2021–22 to 2024–25 noted that in 2020–21 the planning for the replacement of Alligator Creek bridge near Hay Point Road on the Bruce Highway was completed. **Figure 105** shows existing and planned road infrastructure upgrades.[465]

Figure 105: Existing and planned road infrastructure upgrades

[465] Department of Transport and Main Roads. (2021). *Queensland Transport and Road Investment Program 2021-22 to 2024-25*.

Port of Mackay

Mackay Port Access Road (from Bruce Highway to Mackay-Slade Point Road) is listed in the 2021–22 to 2024–25 QTRIP to receive funding to construct two new road lanes. This is shown in **Figure 106**.[466]

Other landside planned works in the next five years include:

- upgrades of Middle Breakwater Road, Ken White Avenue and Hamilton Drive
- expansion of port laydown areas
- port water and power network improvements.

11.2.5 On-shore coal handling infrastructure

The Port of Mackay does not have any coal handling infrastructure.

In the Port of Hay Point, both DBT and HPCT operate out of the port. DBT is a common-user facility with a capacity of 84mtpa. It is operated by DBT Pty Ltd. Its key onshore infrastructure is comprised of:

- three rail loops and unloading stations
- seven-yard machines for stacking and/or reclaiming coal on the stockpiles
- seven stockpile rows, each approximately 1100m in length, plus one row at half this length. Maximum designed volumetric yard capacity is 2.3mt
- three outloading conveyor systems.

HPCT is owned and operated by BMA, which is the largest coal producer in Australia. The terminal has a capacity of 61mtpa. Onshore infrastructure includes:

- two rail loops and unloading stations
- five-yard machines for stacking and/or reclaiming coal on the stockpiles
- seven stockpile rows
- three outloading conveyor systems.

Both terminals have extensive computer-controlled water spray systems for suppression of dust from coal stockpiles. The terminals have large dams within their terminal footprint to collect and recycle stormwater for industrial use on their site.

11.2.6 Port support infrastructure

Port of Hay Point

A number of services are provided by NQBP to port users, including strategic planning, environmental management, maintenance dredging of the port's departure path and port security. Infrastructure provided by NQBP includes:

- a quarantine waste treatment facility for the treatment of foreign waste off ships using the port
- a helipad for use for the transfer of marine pilots to and from ships by helicopter
- offices for MSQ's Vessel Traffic Services (VTS) operations
- a visitor's centre and port look-out
- significant land holdings for equipment laydown to support terminal maintenance and expansion activities
- an industrial water supply from Wenztel Dam
- laydown land and hardstand area to support port maintenance and expansion works
- a MOF at the Half Tide Tug Harbour.

[466] Department of Transport and Main Roads. (2021). *Queensland Transport and Road Investment Program 2021-22 to 2024-25*.

Port of Mackay

The onshore areas of the port service a number of industries including the following bulk facilities:

- Queensland Sugar Limited is responsible for managing Sugar Terminals Limited's bulk raw sugar terminal with 737,000 tonnes raw sugar storage capacity in four large sheds.
- Sugar Australia Company Limited is responsible for the transport and storage of refined sugar and its terminal has 44,000 tonnes capacity.
- GrainCorp operates the grain terminal consisting of a 32,000 tonnes storage capacity in 8 silos and 48,000 tonnes storage capacity on two concrete pads.
- separate bulk fertiliser is stored in facilities operated by Impact Fertilisers and Incitec Pivot Limited.
- Viva Energy Group, Ampol Australia, BP Australia Petroleum, Chevron Australia Downstream Fuels Proprietary Limited and Pioneer Energy Limited have separate tank terminals for bulk petroleum products, predominately diesel for the regional mines. Wilmar Bioethanol also has a tank terminal for ethanol products.
- Martin and Robson, and Tasmania Mines Proprietary Limited maintain bulk storage facilities for magnetite.
- Thomas Borthwick and Sons - tallow terminal - has two storage tanks of 550 tonnes capacity each.
- Mackay Sugar Limited — bulk molasses terminal - consists of a 50,000 tonnes molasses storage bladder located on the Sugar Terminals Limited lease site.

The port has significant landholdings that accommodate a range of commercial industries, plus land available for equipment laydown or future development.

11.2.7 Infrastructure relationships

The efficient operation of the priority Port of Hay Point/Mackay relies on various elements of supporting infrastructure and transportation corridors to support supply chains. This includes the consideration of transport corridor routes, access to the ports and wharves, berth utilisation and product compatibility. Each piece of infrastructure provides an important role in the movement of freight across Queensland.

Given the transport limitations of large freight vehicles of all modes, it is essential for freight infrastructure to be interconnected to maximise efficiency of the wider network. More specifically, the effective operation of the priority port relies on various elements of supporting infrastructure and transportation corridors to support supply chains. This includes the consideration of transport corridor routes, access to the ports and wharves, berth utilisation and product combability, as well as regulatory access arrangements and commercial relationships.

Road improvements for supply chains are also important for access to mining areas that use the priority port, with consideration needed for coastal shipping containers, break-bulk cargo relevance and the importance of ensuring export modes meet the requirements of the receiving port.

Large road trains and other on-road freight vehicles are restricted to roads which can accommodate their size and load. The efficient operation of the Port of Mackay is heavily reliant on the supporting transport infrastructure provided by the railway line, Harbour Road (arterial), the Bruce Highway and the Peak Downs Highway.

There are opportunities for an intermodal facility in the central area of the Port of Mackay adjacent to the rail network that could improve the efficiency of the road and rail systems operating out of this port.

Figure 106: Local government future trunk infrastructure

11.2.8 Infrastructure and Transport Plans

A number of national and state infrastructure plans are in place to ensure the ongoing support and development of supply chain infrastructure in the area.

The *Australian Infrastructure Plan 2016* highlights a national freight and supply chain strategy to nationally map significant strategic supply chains and their connections across ports, airports, rail and coastal shipping. The plan also stated that freight rail reforms are delivering effective infrastructure that will play an important role in

the movement of goods between ports and inland freight terminals[467]. The *National Ports Strategy 2011*[468] also supports this intent specifically through listing improving landside efficiency, reliability, security and safety of container ports as a priority. This works to support the overall strategy's objective of improving the efficiency of port-related freight movements across infrastructure networks.

At a more local level, the *Queensland Freight Action Plan 2020–22*[469] also details a plan to meet key challenges including building effective partnerships and unlocking economic opportunity through system productivity.

The *State Infrastructure Plan 2016*[470] provides the policy context for infrastructure planning in Queensland. It identifies the need for the Queensland Government to work with the private sector to plan and prioritise infrastructure projects that will support economic growth. The plan recognises the role that reliable supply chains play in regional Queensland's economic success and in particular the ability to untap coal reserves in the Galilee Basin will have significant economic benefits for centres such as Mackay.

The *State Infrastructure Plan 2016* represents the state's strategic directions for infrastructure through setting out a set of 'objectives' and 'directions' for infrastructure planning Queensland. These are considered in the context of a number of identified challenges facing the state. This strategic framework is set out in **Figure 107**. Directly relevant to infrastructure planning to support the Port of Hay Point/Mackay are:

- **Challenge**: Domestic Economy. Shifting global demand is altering the economic base Queensland has historically relied upon, risking job growth and revenue to fund public services. This challenge identifies the need to direct resources towards Queensland most competitive export-oriented industries.
- **Objective**: Infrastructure that connects our communities and markets. This objective recognises the role that infrastructure linkages play in the operation of efficient markets.

[467] Infrastructure Australia. (2016). *Australian Infrastructure Plan.*
[468] Infrastructure Australia. (2011). *National Ports Strategy.* Retrieved from https://www.infrastructureaustralia.gov.au/sites/default/files/2019-06/COAG-National_Ports_Strategy.pdf
[469] Department of Transport and Main Roads. (2020). *Queensland Freight Action Plan 2020-2022*
[470] Department of Infrastructure, Local Government and Planning. (2016). *State Infrastructure Plan.*

Figure 107: State Infrastructure Plan challenges, objectives and directions

The *Mackay Isaac Whitsunday Regional Transport Plan 2018*[471] recognises the relationship between effective supply chains and economic development. One key objective included in the plan is: Facilitate supply chains that efficiently link producers, distributors and consumers on an integrated network. More specifically, the plan includes the following actions to support this objective:

- investigate rail network upgrades to improve port connectivity
- work with DSDILGP and the region's ports to create port master plans that optimise supply chains, meet transport servicing requirements and protect the region's natural assets.

11.2.9 Infrastructure requirements

The *National Freight and Supply Chain Strategy National Action Plan 2019* listed two key, relevant outcomes:

- improve landside access to major freight gateways
- develop Northern Australia's freight infrastructure.

Specific aims to support these outcomes include improving all weather access to export gateways and increasing freight flows through trade gateways by better coordinating operators in port supply chains.[472]

The *Queensland Hydrogen Strategy 2019–24* acknowledges that Queensland is well positioned to capitalise on the growing hydrogen industry due to its access to significant renewable resources, gas pipeline infrastructure and established ports.[473]

Other planning instruments such as the Mackay Planning Scheme contain requirements to ensure that development demonstrates that it has access or is able to provide access to an appropriate level of infrastructure to support the use. Where a development is unable to demonstrate this infrastructure requirements or contributions may be set as a condition of approval. Further information on planning requirements including infrastructure can be found in **Section 5**.

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[471] Department of Transport and Main Roads. (2018). *Mackay Isaac Whitsunday Regional Transport Plan 2018*. Retrieved from https://www.tmr.qld.gov.au/-/media/aboutus/corpinfo/Publications/regionaltransportplans/Mackay-Whitsunday-Regional-Transport-Plan-FINAL.pdf?la=en

[472] Department of Infrastructure, Transport, Cities and Regional Development. (2019). *National Freight and Supply Chain Strategy National Action Plan*.

[473] Department of State Development, Manufacturing, Infrastructure and Planning. (2019). *Queensland Hydrogen Industry Strategy 2019-24.*

The Port of Hay Point with its focus on coal is heavily dependent on the rail network for efficient supply of product for export. Coal mining in the Bowen Basin is in turn also heavily dependent on the road network for construction and operations, particularly the Peak Downs Highway from Mackay. Large projects such as those for which an environmental impact assessment is required are needed to address infrastructure requirements as part of the approval process, see **Section 4**. The *Port of Hay Point Land Use Plan* notes that the prospect of export of other bulk materials through the port will be investigated as the opportunity arises, such investigations will need to consider the land infrastructure requirements.[474]

Other industrial developments in the region may create further demand for additional land side port infrastructure in the Port of Mackay. For example, Queensland University of Technology Renewable Biocommodities Pilot Plant is converting cellulosic biomass into renewable transport fuels in Mackay.[475]

11.3 Marine infrastructure

Port of Hay Point

The port was established to export coal from the northern and central Bowen Basin coal fields. In the 2020–21 year, the Port of Hay Point exported 98.3 million tonnes of coal equivalent (mtce) with 1076 ship visits in the year.

The marine facilities at both DBT and HPCT include access trestles extending from the shoreline to the offshore berths (see **Figure 108**). The berths are considered as offshore berths in that they are not protected by natural features or artificial breakwaters. The foreshore areas are protected by seawalls/revetment structures.

The Half Tide Tug Harbour provides a tug service for both terminals. This is formed by a causeway extending from the beach to the Highwater Islet and a breakwater extending to the north of the islet. It contains a public boat ramp and a MOF.

[474] North Queensland Bulk Ports Corporation Ltd. (2010). *Port of Hay Point Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0014/3281/Port-of-Hay-Point-Land-Use-Plan.pdf
[475] Department of Industry, Science, Energy and Resources. (2015). *Our North, Our Future: White Paper on Developing Northern Australia*.

Figure 108: Port of Hay Point Marine Facilities

Port of Mackay

The port is Queensland's fourth busiest multi-commodity port in terms of cargo throughput. It comprises four wharves (**Figure 109**) catering primarily for the export of sugar and sugar product and grain, as well as the import of petroleum products and the import and export of break-bulk cargo. In the 2020–21 year, the Port of Mackay handled 213 ship visits and shipped 3.2mt of goods.

Mackay Harbour is also popular with recreational marine vessels. The Mackay Marina Village is a residential and tourist precinct commenced over 17 years ago which includes a 479-berth marina and a shipyard. The Mackay Marina is separate to port operations and is not NQBP infrastructure.

Figure 109: Port of Mackay Marine Facilities

11.3.1 Existing coastal infrastructure (breakwaters and reclaimed areas)

Port of Hay Point

As the main berths at Hay Point are offshore berths, there are no protective breakwaters. The onshore facilities of both the DBT and HPCT have foreshores protected by revetment walls consisting of either armour rock or concrete armour units. The areas that are protected by such coastal structures have been filled above the original natural surface levels of the foreshore.

The tug harbour is located within a rock breakwater extending northwards from Highwater Islet. The natural causeway connecting Highwater Islet to the beach at Half Tide has been raised using rockfill. This causeway has three rock groynes on its southern side to prevent the movement of smaller rock sizes from the southern face of the causeway towards the beach at Half Tide.

The Tug Harbour's public boat ramp and the port's MOF are located on the northern side of the causeway. The area between the boat ramp and the original shoreline on the northern side of the causeway was reclaimed using dredged material from the Tug Harbour contained within a rockfill perimeter bund. This area is used for car parking for the public boat ramp and a temporary storage laydown area to support construction activities associated with the port.

Rock used for foreshore protection and the harbour were sourced from a number of locations including:

- Mount Griffiths Quarry located immediately to the west of the DBT. This quarry is now used as a water storage for DBT. Reject material from this quarry has been stockpiled along the western boundary of DBT immediately to the north of the quarry. Some reject material was used to construct a sports field immediately to the north of the Half Tide township.
- Mount Chelona located near Sarina.
- commercial quarries located north of Mackay at Habana.

Port of Mackay

The port has been established on the natural coastline to the north of the mouth of the Pioneer River by the construction of two breakwaters to form a protected harbour. A dedicated boat harbour has been created by constructing a new breakwater to the south of the original southern breakwater and modifying the head of the original southern breakwater. The original harbour is dedicated to commercial cargo operations while the marina services tourist vessels, and recreational vessels. A quarry at Mount Basset immediately behind the port was used as the source of armour rock for the construction of the original breakwaters.

11.3.1.1 Cargo handling infrastructure

Port of Hay Point

Infrastructure at the port consists of purpose-built rail in-loading facilities, onshore stockyards and offshore jetties leading to wharves. The offshore wharves are serviced by conveyor systems which run the coal from the stockyard to the wharves situated between 2.2km (HPCT) and 3.8km (DBT) out to sea and allow loading in deepwater. DBT has four offshore berths and serviced by an offshore jetty. HPCT wharf has three offshore berths.

Port of Mackay

NQBP's *Port of Mackay Operations Manual*[476] provides details of the berths, wharf structures and handling systems.

Berths are primarily dedicated to a specific trade, however this does not preclude a berth being used for a different use depending on its availability and suitability. An example of this is the use of bulk commodity export berths to receive general break-bulk cargo or naval ships.

11.3.1.2 Berths

Port of Hay Point

There are seven berths in total across both terminals, four at DBT and three at HPCT. Details for each berth are shown in **Table 106** below.

[476] North Queensland Bulk Ports Corporation Limited. (2020). *Port of Mackay Operations Manual*. Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0009/32103/Port-Operations-Manual-Port-of-Mackay-2020-2021.pdf.

Table 106: Hay Point Berth Information

Berth	Design Depth	Berth Face Length	Berth Pocket Dimensions	Maximum Air Draft at Lowest Astronomical Tide	Maximum Deadweight Tonnage	Maximum Fender Load
Hay Point 1	16.6m	203.6m	342.9 x 60.96 x 16.6m	27.8m	180,000 tonnes	150,000 tonnes
Hay Point 2	16.7m	188.7m	365.7 x 60.96 x 16.7m	24.3m	200,000 tonnes	180,000 tonnes
Hay Point 3	19.0m	252.0m	460.0 x 70.0 x 19m	30.9m	220,000 tonnes	180,000 tonnes
Dalrymple Bay 1 and 2	19.6m	843m (combined)	838.0 x 65.0 x 19.6m	31.14m	220,000 tonnes	220,000 tonnes
Dalrymple Bay 3 and 4	19.0m	843m (combined)	890.0 x 65.0 x 19.0m	31.14m	220,000 tonnes	220,000 tonnes

- depths are subject to change, consult the Queensland notices to mariners for latest information
- the actual air draft must take into account the vessel's draft and the tide height
- terminal approval is required for deadweight tonnage (DWT) in excess of these figures on a case-by-case basis
- fender design based on the Port of Hay Point maximum displacement berthing limit.

Port of Mackay

A summary of the four operational berths and the small craft harbour berths is provided in **Table 107** below.

Table 107: Port of Mackay Berth information

Berth	Berth Design Depth mCD	Berth Pocket (m)	Wharf Face (m)	Wharf Width (m)	Wharf Height Above LAT	Wharf Approach Trestle Width (between kerbs) (m)	Max Vessel LOA	Comments
M1	10.6	210 x 35	123.6	17.68 (between kerbs)	9.44	8.53	210	Petroleum by flexible hose to 200mm pipeline at 350 tonnes per hour (tph) Tallow by 150mm pipeline at 250tph Ethanol by flexible hose to 200mm pipeline at 200tph storage General and break-bulk cargoes (main wharf used for such cargoes)
M3	13.0	200 x 35	230	12.6	9.0		225	Bulk raw sugar by rail mounted gantry at 2000tph Petroleum (diesel) by rail mounted loading arm to 400mm pipeline at 3011tph Bunkers — 400mm at 335tph
M4	10.6	200 x 35	139.4	18.3	9.1	7.41		Bulk refined sugar by fixed ship loader at 500tph Liquid chemicals by flexible hose to 200mm pipeline at 250tph General and break-bulk cargoes Roll-on Roll-Off (RORO) Bulk molasses by flexible hose to 254mm pipeline at 250tph
M5	12.5	270 x 40	165	20	9.8	5.09	230	Bulk fertiliser (grabs and hoppers) Iron concentrates (magnetite) — grabs Bulk grain by rail mounted gantry at 1000tph - 116m ship loader travel range Petroleum - 2 x 200mm diameter flexible hoses connected to 400mm pipeline at 1673tph Scrap metal grabs General and break-bulk cargoes
Small Craft Harbour (Mackay Marina)	0.5	Various					50	Tourist terminal — major marina amenities — public boat ramp Channel depth 4.5m Unleaded and diesel fuel, water and power available

11.3.1.3 Shiploaders

Port of Hay Point

The HPCT and DBT berths are serviced by rail mounted shiploaders to load vessels with coal at the berth. The shiploaders are summarised in **Table 108**[477] and **Table 109**.

Table 108: Hay Point Coal Terminal shiploader summary

Item	Unit	Berth 1 Shiploader	Berth 2 Shiploader	Berth 3 Shiploader
Type		Travelling gantry with luffing boom	Travelling gantry with shuttling boom	Travelling gantry with luffing boom
Design loading rate	tph	6000	6000	8400
Length of travel	m	189	191	238
Boom operating range	relative to horizontal	+16º to -0º	N/A	+12º to -5º
Maximum outreach from fender line	m	26.5	29	33.5
Height above Datum at + 12 º luff (airdraft)	m	23	24	30.897
Long travel speed	m/min	Variable 3 to 30	Variable 3 to 30	Variable 0 to 12 with boom conveyor belt running

Table 109: Dalrymple Bay Terminal Shiploader Summary

Item	Unit	Shiploader 1	Shiploader 2	Shiploader 3
Type		Travelling gantry with luffing boom	Travelling gantry with luffing boom	Travelling gantry with luffing boom
Design loading rate	tph	7200	7600	8650
Length of travel	m	622	633	633
Boom operating range	relative to horizontal	+12º to -4º	+12º to -6º	+12º to -6º
Maximum outreach from fender line	m	34.0	35.5	35.5
Height above Datum at + 12 º luff (airdraft)	m	28.5	28.5	28.5

Port of Mackay

There are three operational shiploaders in the Port of Mackay located on wharf 3 (Mackay Bulk Sugar), Wharf 4 (Sugar Australia) and Wharf 5 (Graincorp) which are summarised in **Table 110** below:

Table 110: Mackay Wharf shiploader summary

Item	Unit	Wharf 3 Shiploader[478]	Wharf 4 Shiploader[479]	Wharf 5 Shiploader[480]
Type		Travelling gantry with luffing boom	Fixed position with boom travel and telescopic extension	Travelling gantry with luffing boom

[477] Dalrymple Bay Terminal. (2021). *Terminal Information Booklet PR0043*
[478] Queensland Sugar Limited. (2014). As reported in North Queensland Bulk Port Corporation Limited. (n.d.). *Berths and Wharf Capability*. Retrieved from https:// nqbp.com.au/trade/berths-and-wharf-capability
[479] Sugar Australia. (2014). As reported in North Queensland Bulk Port Corporation Limited. (n.d.). *Berths and Wharf Capability*. Retrieved from https:// nqbp.com.au/trade/berths-and-wharf-capability
[480] GrainCorp. (2014). As reported in North Queensland Bulk Port Corporation Limited. (n.d.). *Berths and Wharf Capability*. Retrieved from https:// nqbp.com.au/trade/berths-and-wharf-capability

Item	Unit	Wharf 3 Shiploader[478]	Wharf 4 Shiploader[479]	Wharf 5 Shiploader[480]
Design loading rate	tph	2400	500	1000
Length of travel	m	186	-	116
Boom operating range	relative to horizontal	+14° to -7°	N/A	+12° to -5°
Maximum outreach from fender line	m	10.5	10	19 or 32 with trimmer
Height above Datum at + 12 ° luff (airdraft)	m	18.8	27.5	27.5
Long travel speed	m/min	-	2	3 to 30

11.3.1.4 Half Tide Tug Harbour and Marine Offloading Facility

The Half Tide Tug Harbour is located south of the main berthing facilities at Hay Point and approximately 14km from the intersection of the Bruce Highway and Hay Point Road. It accommodates the tugs that service DBT and HPCT vessels and provides shelter for six tugs and two-line boats. The MOF and adjacent equipment laydown area are located on land in the Tug Harbour.

A public boat ramp with car-trailer park is located in the Tug Harbour precinct (see **Figure 110**).

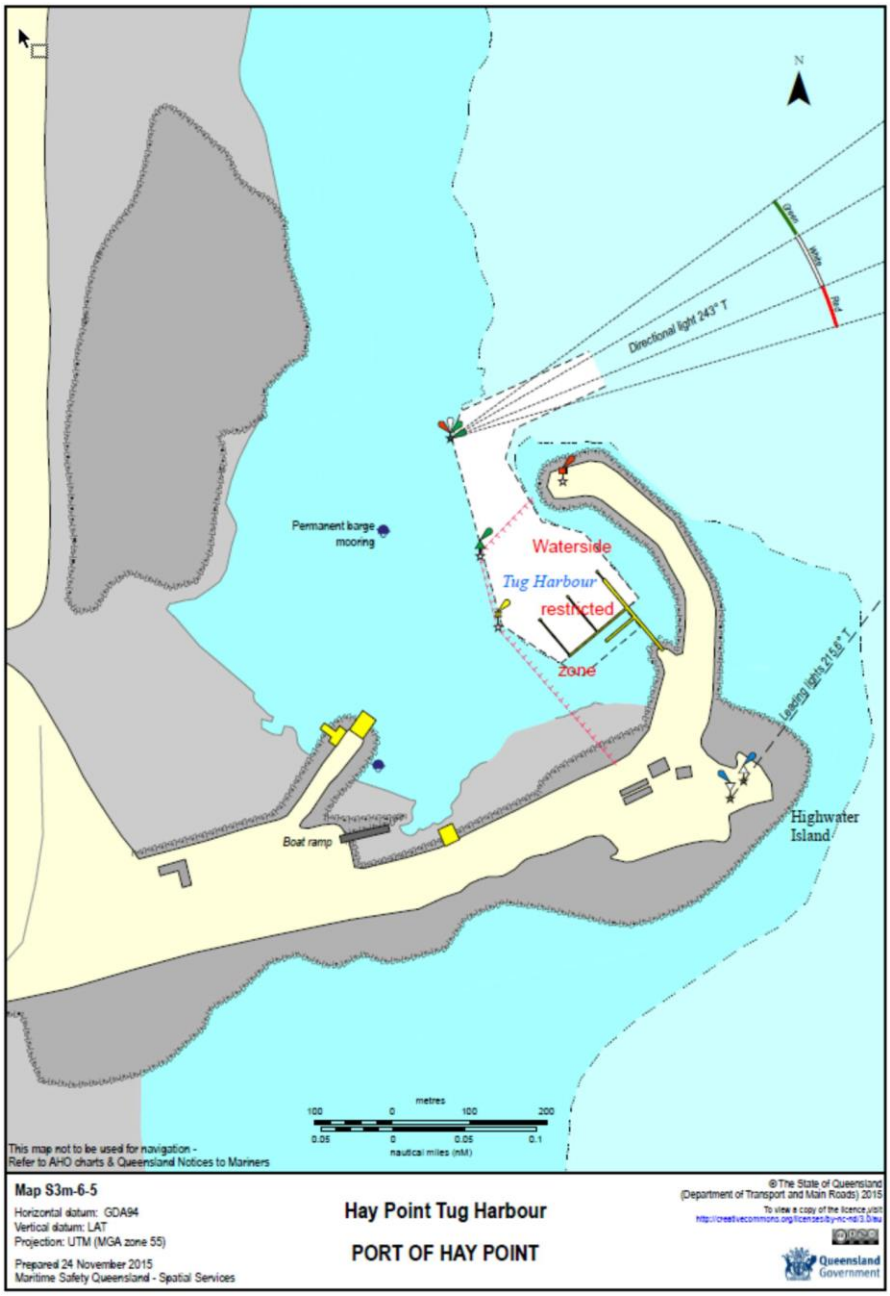

Figure 110: Hay Point Tug Harbour

11.3.1.5 Mackay Marina

The Mackay Harbour accommodates recreational marine vessels in the inner harbour (small craft harbour) which includes a 479-berth marina, mega yacht berths and a shipyard facility (65tonne travel lift). The Mackay Marina Village was developed as a residential and tourist precinct over 17 years ago. The small craft harbour also contains a tourist terminal, marina amenities and a public boat ramp and car-trailer park. Currently the small craft facility also accommodates the tugs and pilot boats that service the port.

11.3.1.6 Terminal Operations

In the Port of Hay Point, the two coal terminals are operated by independent operators, each with their own offshore berths and tug operators. DBT is the multi-user facility that services a number of mines in the Bowen Basin. There are seven offshore berths/wharves in the port. Only coal is currently exported through the two terminals.

In the Port of Mackay, the four wharves cater for the export of sugar, sugar products and grain, as well as the import of petroleum products and the import and export of break-bulk cargo. The terminal operations support the handling of the following products:

- fuel
- sugar and grain
- magnetite
- ethanol
- molasses
- cement
- fertiliser
- scrap metal
- containers
- RORO cargo.

11.3.2 Infrastructure in the planning or development phase

In the Port of Mackay, construction of a new tug berth facility to accommodate two tugs and two pilot boats commenced in February 2021. This project will enable the relocation of the port tugs from Mackay Marina to the port operational section of the harbour. Cost of the facility is $8.5million.

In the Port of Hay Point, projects in the planning phase include:

- HPCT Berth 1 Upgrade
- Half Tide Tug Harbour – Refurbishment and additional berths
- DBT 8X project[481] Phase 1 - Installation of a new shiploader including the construction of a new conveyor and support structure behind Berth 3. This project would not proceed until there is sufficient industry demand to warrant further expansion.

A number of reconfigurations, refurbishment and sustainment projects are planned and ongoing in the Port of Mackay over the next five years:

- Replacement of Wharf 5 Western Approaches in Wharf 4 and Wharf 5
- Deck improvements for Wharf 1 and Wharf 3
- Fender upgrades for Wharf 1 and Wharf 3

[481] Dalrymple Bay Infrastructure and Sprott Planning. (2020). *Dalrymple Bay Terminal 8X Project EPBC Referral*.

- Realignment of Middle Breakwater fuel pipelines.

11.3.3 Navigation

MSQ has jurisdiction over the safe movement of all shipping in the state. There is compulsory port pilotage in both ports of Hay Point and Mackay. The VTS is the principal mechanism by which the Regional Harbour Master manages safe and efficient movement of vessel traffic approaching, departing and operating within the Hay Point pilotage area.

In the Port of Hay Point which only exports coal, arriving ships are in ballast and the natural bathymetry of the site allows vessels to access the offshore berths without being restricted to a designated channel. Loaded vessels have significantly increased drafts which generally requires them to follow the dredged departure path. The departure path has a design depth of 14.7m below LAT for ship departures to deeper waters.

The Port of Hay Point has a Dynamic Underkeel Clearance System (DUKC) which is used to determine the tidal window for vessels to depart or to determine the maximum draft that a vessel may sail at for a particular tide.

In the Port of Mackay, there are four operational berths and associated loading/unloading facilities, ranging between -10.6 and -13m LAT. Some shipping movements are tidally dependent. The Harbour has an interior turning basin of 500m in diameter with a bed level of -8.6m LAT. The entrance width through the breakwaters is 183m.[482] The Port of Mackay has not yet utilised a DUKC system.

11.3.4 Maximum Vessel Size

There are no restrictions on vessel length for the Port of Hay Point. A departure path is established with at least design depth of 14.7m below port datum (LAT). The maximum draft for transit is 12.2m, vessels with a draft greater than 10m will be advised of the required tidal window by the pilotage company.

In the Port of Mackay, the maximum vessel size is 230m and 32.3m beam depending on the destination berth. However, vessels greater than 200m length overall (vessel) (LOA) will only be accepted on a case-by-case basis with the exception of LR1 Tankers and RORO vessels. This will be at the discretion of the Regional Harbour Master. Vessels are limited to having a maximum berthing displacement of not more than 55,000mt (*Port Procedures and Information for Shipping – Port of Mackay*).[483]

In the Mackay Marina, the maximum size of vessel is 50m LOA and 20m beam (*Port Procedures and Information for Shipping – Port of Mackay*).[484] Vessels which have a draft greater than 3m are also subject to berth limitations in Mackay Marina.

11.3.5 Tugs and Pilotage

Port of Hay Point

All vessel movements to and from berths in the Port of Hay Point utilise a minimum of two tugs. The port is currently serviced by five tugs and two-line boats which are accommodated in the Half Tide Tug Harbour.

NQBP provides marine pilotage services for the port, with most pilot transfers to and from ships via helicopter with a pilot launch utilised for all other occasions. Each terminal has its own towage arrangement in place.

The port has a compulsory pilotage area where port pilots must be used.

Port of Mackay

NQBP provides marine pilotage services, with most transfers to and from ships via pilot launch, with helicopter transfer by exception.

Maximum draft for transit is 12.2m vessels with a draft greater than 10m will be advised of the required tidal window by the pilotage company. As demand and conditions dictate, up to two tugs will be deployed to service vessels entering and leaving the Port of Mackay. There are two *Azimuth Stern Drive* 54 tonne bollard pull tugs

[482] Adaptive Strategies. (2018). *Port of Mackay Long-term Maintenance Dredging Management Plan.*
[483] Department of Transport and Main Roads. (2019) *Port Procedures and Information for Shipping – Port of Mackay*.
[484] Department of Transport and Main Roads. (2019) *Port Procedures and Information for Shipping – Port of Mackay*.

available for towage stationed in Mackay. Currently the tugs are berthed in Mackay Marina but will be relocated to the main harbour when new tug facilities are completed.

Outside both ports, there are sections of the GBR where compulsory pilotage for merchant vessels 70m in length and over and all oil, gas and chemical tankers irrespective of size:

- Torres Strait
- Great North East Channel
- Inner Route between Torres Strait and Cairns Roads
- Hydrographer's Passage off Mackay
- Whitsunday Passage north of Mackay.

Tides

Port of Hay Point

The mean spring tide range is about 4.9m and the mean neap tide range is about 2.3m (*Port Procedures and Information for Shipping - Port Hay Point*). .[485] Tides are affected by prevailing winds and currents at Hay Point can be very strong.

Hay Point is a standard port in the Queensland Tide Tables. A summary of the key tidal planes is provided in **Table 111**. [486]

Table 111: Hay Point Tidal Plane Summary

Tidal Plane	Tide Level
HAT	7.14m
MHWS	5.78m
MHWN	4.46m
MLWN	2.22m
MLWS	0.90m
LAT	0.00m

Datum for tide levels is LAT.

Port of Mackay

The mean spring tide range is 4.56m while the mean neap range is 2.12m. Note that the flood tide sets to the south and the ebb tide to the north across the harbour entrance. The maximum strength of the tidal flow is 2.5 knots at spring tides and tidal flows inside the harbour are negligible (*Port Procedures and Information for Shipping – Port of Mackay*).[487]

The Port of Mackay is a standard port in the Queensland Tide Tables. A summary of the key tidal planes is provided in **Table 112**.[488]

Table 112: Mackay Outer Harbour Tidal Plane Summary

Tidal Plane	Tide Level
HAT	6.6m
MHWS	5.3m
MHWN	4.1m
MLWN	2.0m
MLWS	0.7m
LAT	0.0m

[485] Department of Transport and Main Roads. (2019). *Port Procedures and Information for Shipping – Port of Hay Point*.
[486] Department of Transport and Main Roads. (2019). *Port Procedures and Information for Shipping – Port of Hay Point*.
[487] Department of Transport and Main Roads. (2019) *Port Procedures and Information for Shipping – Port of Mackay*.
[488] North Queensland Bulk Ports Corporation Ltd. (2020). *Port of Mackay Operations Manual*

Datum for tide levels is LAT.

11.3.6 Anchorages

Port of Hay Point

Vessels calling at the port from overseas ports navigate the GBR via charted passages. Coastal vessels also follow courses within the GBR. The *Port Procedures and Information for Shipping – Hay Point*[489] specify anchorage locations, pilot boarding locations and departure channels.

There are 59 gazetted offshore anchorages at Hay Point and 43 gazetted 'inner port' anchorages, totalling 102 anchorages. Navigation channels and anchorages in the vicinity of the port are shown in **Figure 111**. Navigation aids for the port are shown on relevant charts. They include both onshore and offshore marks.

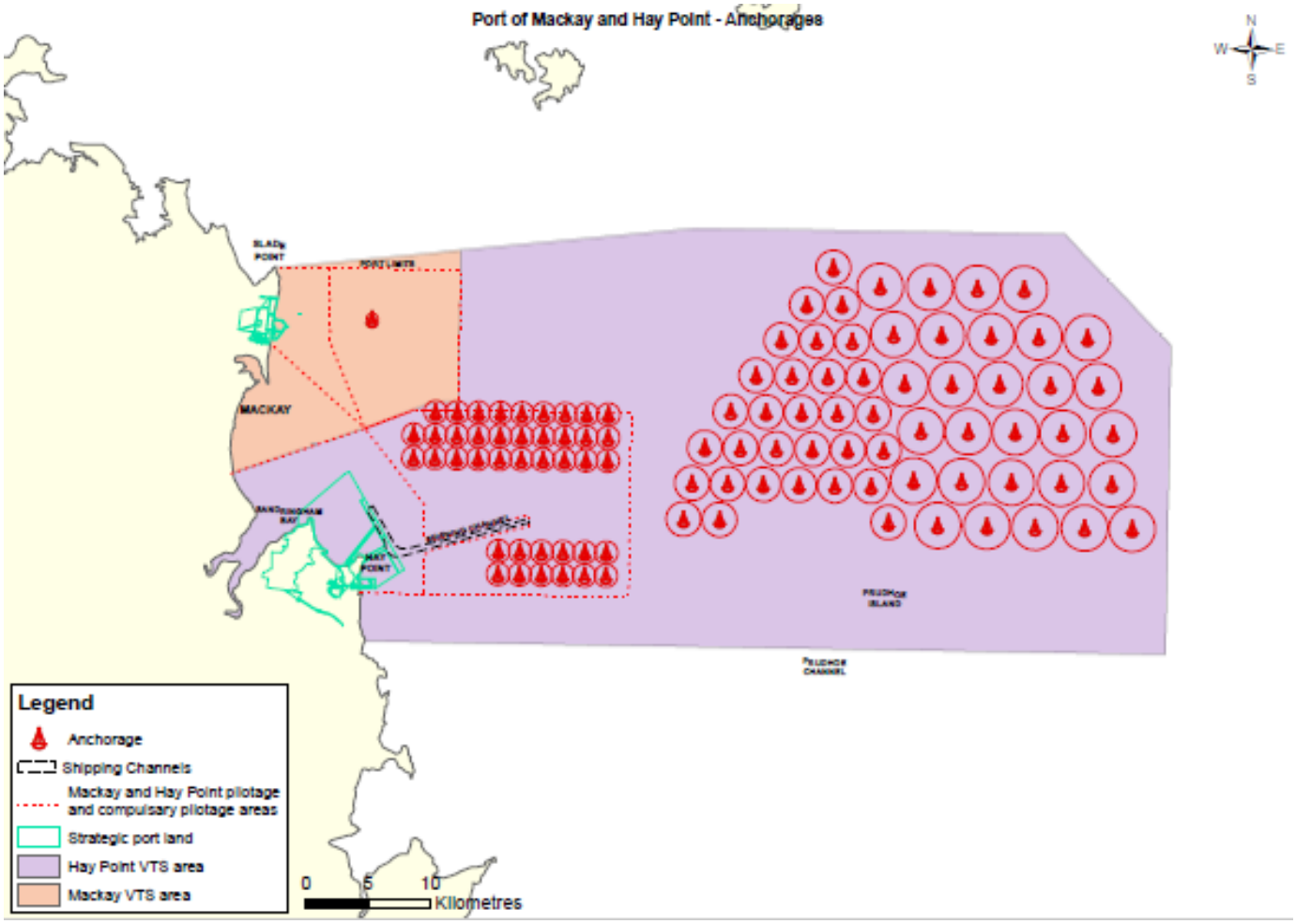

Figure 111: Map of the Port of Hay Point showing anchorages and navigation channels

Port of Mackay

Vessels calling at the Port of Mackay from overseas ports navigate the GBR via charted passages. Coastal vessels follow courses within the GBR.

The Port Procedures and Information for Shipping – Port of Mackay[490] specifies anchorage locations, pilot boarding locations and departure channels. Ships are only to anchor in a position that is clear of the sea leads and outside the prohibited anchorage area. A dedicated anchorage (M1) has been declared in position 21°06'S, 149°18'E. Anchorages and prohibited anchorage areas in the vicinity of the port are shown in **Figure 112**.

[489] Department of Transport and Main Roads. (2019). *Port Procedures and Information for Shipping – Port of Hay Point*
[490] Department of Transport and Main Roads. (2019) *Port Procedures and Information for Shipping – Port of Mackay*.

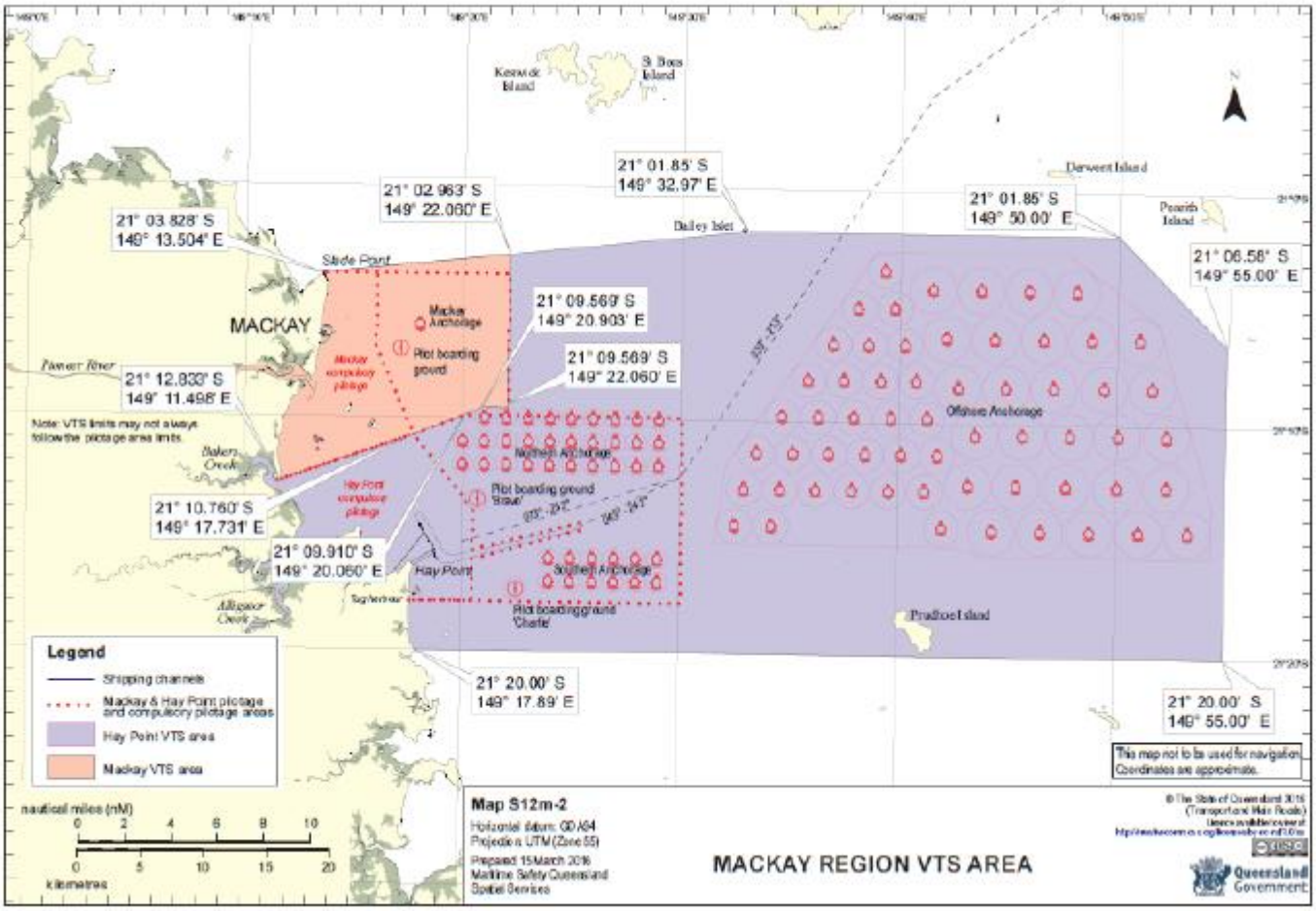

Figure 112: Map of the Port of Mackay showing anchorage and prohibited zones

11.3.7 Navigational Aids

Port of Hay Point

The port has four fixed navigation aids which mark out the Hay Point departure channel. There are navigation lights mounted on the wharves and dolphins at both terminals and a light mounted on the Port Administration building, Mount Griffiths Light. The Hay Point channel #2 fairway beacon is fitted with a Racon radar beacon, tide gauge, tide board and an electronic weather station.

The port has a system of virtual navigation beacons which was installed to aid the safe pilotage and navigation of deep draft vessels departing via the shipping channel. The virtual beacons broadcast on the Automatic Identification System, adopted by the International Association of Lighthouse Authorities and the International Maritime Organisation (IMO). A 'virtual navigation beacon signal' will appear on vessels fitted with Automatic Identification System receivers and will indicate four virtual beacon positions within the port.

Port of Mackay

Navigation aids for the port are shown on relevant charts. There are four sets of land based leading lights, the outer harbour sea leads, the outer harbour entrance leads one and two and the Mackay Marina entrance leads. The harbour entrance is also marked with breakwater lights on the end of the breakwaters including Forgan Smith Point light, Bagley Point light and Main Breakwater light.

11.3.8 Dredging Works

Port of Hay Point

Dredging activities are undertaken to maintain seabed depths that allow for safe navigation, movement, loading and transit of vessels trading at the port. Dredging has been undertaken in the following areas:

- HPCT berths (berth pockets)
- DBT berths (berth pockets)
- apron areas (vessel manoeuvring areas) seaward of the berths
- departure Path.

The *Port of Hay Point Long-term Maintenance Dredging Management Plan* (LTMDMP) [491] was developed in accordance with the TMR's *Maintenance Dredging Strategy*. The LTMDMP outlines the overall strategy for managing dredging operations, the nature of the material to be dredged, summarises historic dredging campaigns, and likely future dredging requirements. Some of the key information has been summarised in the sections below.

Port of Mackay

Dredging activities are undertaken to maintain seabed depths that allow for safe navigation, movement, loading and transit of vessels trading at the port. Dredging has been undertaken in the following areas:

- berths (berth pockets)
- harbour swing basin (vessel manoeuvring areas)
- harbour entrance channel.

The Port of Mackay LTMDMP [492] was developed in accordance with TMR's *Maintenance Dredging Strategy*. The LTMDMP discusses the overall strategy for managing dredging operations, the nature of the material to be dredged, summarises historic dredging campaigns, and likely future dredging requirements. Some of the key information has been summarised in the sections below.

11.3.9 Requirement for Dredging

Port of Hay Point

Specific areas of the seabed in the port have been deepened to allow for safe navigation, movement, loading and transit of the vessels trading at the port. Accretion of seabed sediments results in ‘high spots’ or ‘high areas’ within the navigational areas. This could result in reduced ‘declared’ depths, which can affect the operation and efficiency of the port.

Deposition at Hay Point typically occurs following resuspension of existing bed sediments during specific events such as higher energy waves from cyclones and storm events. Extreme events that result in strong winds and large waves, such as tropical cyclones, have the potential to result in relatively large changes to the seabed bathymetry. Some of these events can result in erosion across the Hay Point area such as Tropical Cyclone Dylan (January 2014); however other events can cause significant deposition such as Tropical Cyclone Debbie (March 2017) which resulted in the deposition of approximately 350,000m^3 of sediment in the Port of Hay Point. The variation from cyclone to cyclone highlights how difficult it is to predict potential future sedimentation at the Port of Hay Point.

Laboratory testing of dredge material has consistently shown that the sediment in the Hay Point area is suitable for ocean placement with very low levels of contamination and bioavailability as per the *National Assessment Guidelines for Dredging*.[493]

[491] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*
[492] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*
[493]Department of Climate Change, Energy, the Environment and Water. (2009). *National Assessment Guidelines for Dredging*.

Port of Mackay

Port navigational areas, including shipping channels, aprons, swing basin and berth pockets, are areas that have been deepened to allow the safe navigation, movement, loading and transit of ships trading at the port. Accretion of seabed sediments results in 'high spots' or 'high areas' within the navigational areas, above which safe navigational depths are enforced by the Regional Harbour Master. This can result in reduced 'declared' depths, which can affect the operation and efficiency of the port.

The majority of the sedimentation which occurs within the Port of Mackay is due to fine-grained sediment being imported into the Harbour as suspended load during the flood tide. This is natural sediment which has been resuspended from the seabed within the adjacent nearshore coastal region around Mackay due to wave action and tidal currents. The tidal currents in the area result in some of the suspended sediment from the adjacent coastal region being transported into the Harbour during the flood tide. Due to the relatively low ebb tidal currents in the Harbour and at the entrance to the Harbour, combined with the fact the Harbour is sheltered from wave action, it is expected that much of the suspended sediment transported into the Harbour will settle out and be deposited.[494] Bathymetric analysis has shown that the largest volume of historical sedimentation at the Port of Mackay occurred in the swing basin, but that the majority of the sedimentation above design depths accumulates in the berths, as the propeller wash from vessels limits longer term accumulation in the swing basin.

Laboratory testing has consistently shown that the sediment is suitable for ocean disposal with very low levels of contamination and bioavailability as per the *National Assessment Guidelines for Dredging*.[495] Laboratory analysis in late 2018[496] confirmed these previous findings.

11.3.10 Previous Dredging Campaigns

Port of Hay Point

Sedimentation at the port varies from year to year depending on the frequency and severity of significant storm events of tropical cyclones in a particular year with maintenance dredging frequency and magnitude adjusted to suit. **Table 113** provides a summary of the historical dredging campaigns between 2004 and 2017. [497] It should be noted the dataset does not capture the dredging campaign which was undertaken to remove the sedimentation after Tropical Cyclone Debbie in 2017.

Table 113: Historical Port of Hay Point dredging volumes (2004–2017)

Year	Maintenance dredging volumes(m^3)	Capital dredging volumes (m^3)
2004	98,900	0
2005	0	400,000
2006	0	9,000,000
2007	0	0
2008	192,294	0
2009	0	0
2010	216,070	0
2011	0	275,000
2012	0	0
2013	0	0
2014	0	0

[494] Adaptive Strategies. (2018). *Port of Mackay Long-term Maintenance Dredging Management Plan*
[495] Department of Climate Change, Energy, the Environment and Water. (2009). *National Assessment Guidelines for Dredging*.
[496] Advisian. (2018). *Maintenance Dredging Sediment Characteristic Report, Port of Mackay.* Report prepared for North Queensland Bulk Ports.
[497] Adaptive Strategies. (2018). *Long-term Maintenance Dredging Management Plan, 2018-2043 Port of Hay Point.*

Year	Maintenance dredging volumes(m^3)	Capital dredging volumes (m^3)
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	0	353,740[498]

Port of Mackay

Table 114 provides a summary of the historical dredging campaigns between 2000 and 2018.[499] It should be noted that over/insurance dredging is currently adopted at the port to ensure that the declared depths are achieved based on the dredging tolerance and to ensure that natural sedimentation does not result in the seabed becoming shallower than the declared depths soon after the dredging.

Table 114: Historical Port of Mackay dredging volumes (2000–2018)

Year	Maintenance dredging volumes (m^3)	Capital dredging volumes (m^3)
2000	47,872	0
2001	44,200	0
2002	44,098	0
2003	46,736	0
2004	4,760	118,000
2005	0	0
2006	520	0
2007	0	106,000
2008	3,406	0
2009	0	0
2010	0	0
2011	0	0
2012	0	0
2013	0	98,381
2014	0	0
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	0	0
2020	140,000[500]	0

[498] Port and Coastal Solutions. (2019). *Port of Hay Point, 2019 Maintenance Dredging Performance of Environmental Monitoring.* Report Prepared for North Queensland Bulk Ports Corporation Ltd.
[499] Adaptive Strategies. (2018). *Port of Mackay Long-term Maintenance Dredging Management Plan.*
[500] North Queensland Bulk Ports Corporation Ltd. (2020). *Port of Mackay Maintenance Dredging Project Fact Sheet.*

11.3.11 Maintenance Dredging

Port of Hay Point

An assessment was undertaken of the historic siltation in the channel, apron and berths at the port.[501] [502] Total siltation volumes above the design depth over the next 20 years was predicted to be between 885,000m^3 and 1,129,000m^3, depending on the occurrence of tropical cyclones.

Given the varying rates of accumulation across the port, it can be expected that dredging of critical areas will be needed approximately every three years if designed depths and port efficiency is to be maintained. Depending on cyclones, volumes may vary between 200,000m^3 and 250,000m^3 if no sedimentation reduction measures are adopted.

The *Port of Hay Point Sustainable Sediment Management Assessment for Maintaining Navigational Infrastructure* (SSM) report was undertaken by NQBP from 2015 to 2017. This was a research project to investigate the most sustainable way to manage accumulated sediment in and around the port.

Based on the work of the SSM report, a clear preferred 25-year maintenance dredging strategy was established that involves:

- use of operational measures to extend periods between maintenance dredging campaigns
- use of traditional dredging in the short term (12 months) to restore navigational areas to safe design depths
- use of traditional dredging to maintain navigational areas at safe design depths – every 3-5 years in a volume of between 200,000 and 250,000m^3
- placement of dredged material at sea – preferably at the existing DMPA
- commitment to a detailed investigation into mangrove restoration in Sandringham Bay with the intention of executing, if feasible, a restoration program in the next 10 years.

This strategy was developed in consultation with the Technical Advisory and Consultative Committee (TACC) for the Port of Hay Point, including representatives from Australian, Queensland and local governments, port users and community interest groups.

Port of Mackay

Port and Coastal Solutions[503] has conducted an extensive bathymetric analysis of historical hydrographic survey data of the Port of Mackay and sediment movements to better understand sedimentation rates and bathymetric changes in the navigational areas of the port. The bathymetric analysis it is possible to estimate the future sedimentation within the Port of Mackay and therefore estimate the future sediment management requirements.

Based on the bathymetric analysis, the annual average sedimentation within the port is expected to be 25,000 m^3, with potential increases in the order of 40,000 to 60,000m^3 due to a tropical cyclone. However, as the annual average takes into consideration the years when tropical cyclones have occurred (three years out of the nine considered), the value of 25,000m^3 per year can be adopted as a long-term average sedimentation including tropical cyclones. Therefore, the sedimentation over five years is predicted to be 125,000m^3, over ten years it is 250,000m^3 and over 20 years it is 500,000m^3.[504].

A SSM Project was undertaken for the Port of Mackay which was based on the framework of the Hay Point SSM.[505]The purpose of the SSM report was to investigate the most sustainable way to manage accumulated sediment in and around the Port of Mackay.

Based on the work of the SSM report, a clear preferred 25-year maintenance dredging strategy was established that involves:

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[501] Royal Haskoning DHV. (2016a) *Hay Point Port – Bathymetric Analysis and Modelling*. Report Prepared for North Queensland Bulk Ports Corporation Ltd
[502] Royal Haskoning DHV. (2016b) *Hay Point Bathymetric Analysis Predictive Model.* Report prepared for North Queensland Bulk Ports Corporation Ltd
[503] Port and Coastal Solutions. (2019). *Port of Hay Point, 2019 Maintenance Dredging Performance of Environmental Monitoring.* Report Prepared for North Queensland Bulk Ports Corporation Limited.
[504] Adaptive Strategies. (2018). *Port of Mackay Long-term Maintenance Dredging Management Plan.*
[505] Adaptive Strategies. (2017). *Port of Hay Point Sustainable Sediment Management Assessment for Navigational Maintenance Report*

- Use of operational measures to extend periods between maintenance dredging programs.

Use of traditional dredging to maintain navigational areas at safe design depths — approximately every 3-5 years in a volume of between 75,000 and 125,000m^3.

Placement of dredged material at sea — at the existing DMPAs.

Commitment to a detailed investigation into mangrove restoration or creation in Sandringham Bay with the intention of executing, if feasible, a restoration/creation program in the next 10 years (in association with the work underway for the Port of Hay Point).

The strategy was developed in consultation with the TACC for the Port of Mackay which includes representatives from Australian, Queensland and local governments, port users and community interest groups.

11.4 Projects

There are no major terminal or port expansions approved for either the Port of Hay Point or Port of Mackay.

In the Port of Hay Point, options for further expanding the common user terminal DBT, when industry demand warrants it, has been identified in DBIs *Dalrymple Bay Infrastructure Management Master Plan 2021*. However, there is no commitment to proceed with approvals at the current time.

11.5 New Industries - Hydrogen

In the past few years, there has been significant interest worldwide in the use of hydrogen, both as a clean fuel or as an energy source to integrate hydrogen into future energy markets as a zero-greenhouse gas emitter. Hydrogen can be produced by a number of different technologies, but the principal low emission method in the future is likely to be through the use of electricity to split water (H_2O) into hydrogen and oxygen through an electrolysis process. The hydrogen can then be used in a gaseous form as a fuel or liquefied under high pressures and low temperatures for storage and transportation to its end user. When hydrogen is subsequently burnt as a fuel, the only emission product is water. If hydrogen is produced using renewable energy, such as solar or wind power, then there are no greenhouse gas emissions.

The priority Port of Hay Point/Mackay has the capability for production of significant volumes of hydrogen for export, with both the Hay Point and Mackay areas each having their own unique advantages.

The key advantages of the Port of Hay Point are:

- access to solar or wind power generated in regional Renewable Energy Zones (REZs) or potentially generated on site
- significant areas of industrial land area available for production facilities, with the land being well distanced from any residential area
- Hay Point has an existing deep-water port for the export of product overseas
- a highly skilled regional workforce.

The key advantages of the Port of Mackay are:

- access to solar or wind power generated in regional REZs
- industrial land area available for production facilities at the port
- the Port of Mackay has an existing sheltered harbour and capacity to handle more shipping
- there is a highly skilled regional workforce.

A recent study by Advisian for the Queensland Government indicated significant potential for generation of hydrogen for export at Mackay, although a development at Hay Point would offer potential to export much larger volumes of hydrogen. The study highlighted the following infrastructure needs for hydrogen production at the Port of Hay Point/Mackay:

Port of Hay Point

- **Electricity:** There are several REZs that could supply power to a hydrogen production facility at Hay Point. The largest local power source would be the Barcaldine REZ, Isaac REZ and Fitzroy REZ. Grid stability is poor in the region and would need significant improvement. Current electricity networks would need to be significantly upgraded. There is potential to supplement the external power supply with electricity generation at Dudgeon Point through wind and tidal energy. New land easements would be required to accommodate this transmission system.
- **Water:** As hydrogen is created by splitting water molecules, water is a major process input. Mirani Weir on the Pioneer River may potentially supply water to the project. Some investment for new water infrastructure (pumping stations and pipeline) would be required. There would still be a need for a significant supplement of fresh water created by desalination of seawater. A desalination plant would be required on site and the concentrated brine discharged to the ocean or used for other purposes.
- **Land Availability:** There is significant industrial land available at the port with the greenfield site of Dudgeon Point having around 1400ha of land zoned for port industry use. The land is well distanced from any large residential areas and is close to port facilities. As a greenfield site, investment for roads and other site infrastructure would be required.
- **Port Facilities:** The port is a natural deep-water port with multiple existing offshore berths. It could accommodate large ships for export of liquefied hydrogen without new navigational channels. There may be spare capacity in the existing shipping berths to accommodate hydrogen exports or a new offshore berth may be required. The only disadvantage is that any new offshore berth would likely need to be a significant length of jetty to reach the natural deepwater, limiting its potential for pumping liquefied hydrogen.

Port of Mackay

- **Electricity:** There are several REZs that could supply power to a hydrogen production facility at Mackay. The largest local source would be the Barcaldine REZ, with power from the Isaac REZ and Fitzroy also possible. Grid stability is poor in the region and would need significant improvement. Electricity networks also would need to be significantly upgraded. New land easements would be required to accommodate the new transmission system required.
- **Water:** Hydrogen is created by splitting water molecules and water is consequently a major process input. There is the possibility of water supplied from the Mirani Weir on the nearby Pioneer River and pumping distances to Mackay would be relatively short. Even if some fresh water was supplied, there would still need to be a significant volume of fresh water created by desalination of seawater. A desalination plant would be required on site and the concentrated brine discharged to the ocean or used for other purposes.
- **Land Availability:** There is vacant industrial land available at the Port of Mackay sufficient for hydrogen production.
- **Port Facilities:** The Port of Mackay has a sheltered harbour, with spare berthing capacity. The limited water depth however would restrict the size of ships that could be used for the export of liquefied hydrogen.

11.6 Summary

Port of Hay Point

There is significant onsite infrastructure at the Port of Hay Point to support the export of up to 61mtpa through HPCT and a further 84mtpa through DBT. To assist the port in its successful operation and export of resources, several key land infrastructure components are necessary:

- coal is transported to the port solely by rail through the Goonyella Rail System.
- the road network, via the Bruce Highway and Hay Point Road, supports the port operation by providing access for workers and for the transport of materials for the terminals' operations, maintenance or expansion activities. The regional road network is critical to the wider supply chain to support both the construction and operations of mines in the Bowen and Galilee Basins.
- Powerlink supplies electricity from the Alligator Creek Substation (132kV) and Ergon Energy supplies electricity from the Louisa Creek Bulk Supply Substation (132kV/33kV).

- potable drinking water is supplied by MRC.
- each of the terminals capture stormwater within their dams and recycles the water for industrial use, such as dust suppression/ wash down. In dry periods, additional water may be required to supplement the site water, and accordingly the port has a large water storage dam at Wenzel's Road (around 12km from the port off the Bruce Highway) with a dedicated pipeline to the two terminals at the port to provide a supplementary industrial water source.
- additional facilities supplied by NBQP include a helicopter landing facility, quarantine waste treatment facility, quarry and laydown and hardstand areas.
- Marine infrastructure includes a MOF at the Half Tide Tug Harbour, offshore wharves, berths, ship-loaders, tugs, pilotage, anchorages, fixed navigational aids and Departure Path.
- Hydrogen as a new industry could be accommodated at the port. There is both land and marine capacity to support this industry. The high volume of electricity and water supply can also be accommodated via significant electricity network upgrades or new wind energy; and additional infrastructure developing a desalination plant.

Future planning and approvals of new infrastructure would need to be in accordance with the land use planning and regulation frameworks.

Port of Mackay

There is a large amount of onsite infrastructure at the Port of Mackay to support the movements of both importation and exportation of goods. To assist the port in its successful operation, several key land infrastructure components are necessary:

- goods are delivered and collected from the port via Mackay Harbour rail line which connects to Queensland Rail's North Coast Line. The rail line has a grain terminal (used by GrainCorp) and a main loop primarily used by the sugar terminal (used by Sugar Terminals Limited).
- the road network further supports the operation of the port, primarily by providing a connection for workers and also for the movement of cargo.
- Powerlink supplies electricity from the 132kV Mackay port substation (132kV), and Ergon Energy supplies electricity from the Mount Bassett substation (33/11kV).
- water and sewage assets are supplied by MRC. The port itself includes four operational berths plus a marina for small craft. The four operational berths cater for the export of sugar, sugar products and grain, as well as the import of petroleum products and the import and export of break-bulk cargo.
- hydrogen as a new industry could be accommodated at the port. There is both land and marine capacity to support this industry. The high volume of electricity and water supply can also be accommodated via significant electricity network upgrades or new wind energy; and additional infrastructure developing a desalination plant.

Future planning and approvals of new infrastructure would need to be in accordance with the land use planning and regulation frameworks.

12. Economic

12.1 Introduction

A desktop analysis of the relevant economic factors for the Port of Hay Point and the Port of Mackay aims to guide priority port master planning and draw attention to role the ports play in the economic resilience of the region and the state.

Below provides the following sections:

- Economic profile – **Section 12.2**
- Economic relationships and functions between the priority ports of Abbot Point and Hay Point/Mackay – **Section 12.3**
- Global trade trends – **Section 12.4**
- Economic development strategies and plans – **Section 12.5**
- Global shipping trends – **Section 12.6**
- Summary – **Section 12.7**.

Port of Hay Point

The Port of Hay Point is a single-commodity coal port critical for the economic performance of the state and its mining and export industries. The Port of Hay Point's export performance is also vital to economies of other nations dependent on steelmaking and energy coal resources. With increasing effort by the Queensland Government to diversify the state's trade into 'new' commodities including hydrogen, gas and new minerals sourced from the Bowen Basin, there is growing potential to expand the role of the port to harness new global export opportunities.

Economic factors provide insight into throughput tonnage trends which assist with gauging future opportunities for the port, associated industries and the region. This leads to better informed planning for infrastructure optimisation and developments that aligns to the goal of meeting long term needs of customers in a cost-effective way. Understanding the economic context of ports can assist investment decision making for port infrastructure and related landside supply chains such as enhanced rail facilities and upgraded roads supporting high productivity freight vehicles and sea-based infrastructure requirements.

Port of Mackay

The Port of Mackay is a multi-commodity port that supports the economic resilience of Central Queensland. Trade at the port primarily consists of petroleum product imports (53% of total throughput in 2019–20) and exports of raw and refined sugar (33% of total throughput in 2019–20). While the port plays a vital role for the local community at Mackay it also represents a critical transport nod for the minefields in the Bowen Basin through imports such as petroleum and mining equipment.

Economic factors provide insight into throughput tonnage trends which assist with gauging future opportunities for the port, associated industries and the region. This leads to better informed planning for infrastructure optimisation and developments that aligns to the goal of meeting long term needs of customers in a cost-effective way. Understanding the economic context of ports can assist investment decision making for port infrastructure and related landside supply chains such as upgraded roads supporting High Productivity Vehicles (HPVs) and sea-based infrastructure requirements.

12.2 Economic profile

The economic profile of the Port of Mackay is related to its trade performance. Two reports provide insights on this front:

- TMR, *Trade and Statistics for Queensland Ports, Throughput Statistics for the Five years ending 30 June 2020*[506]
- NQBP's – *Leading the Transition to Sustainable Port Trade Annual Report 2019–20*.[507]

12.2.1 Trade and Statistics for Queensland Ports

The *Trade and Statistics for Queensland Ports, Throughput statistics for the five years ending 30 June 2020*[508] provides:

- trade statistics by port, including details of imports and exports and summary vessel statistics by length and gross tonnage
- trade statistics by commodity, including details of imports and exports through Queensland's ports by commodity group.

With regard to the Port of Hay Point the report states:

- the port's terminals, DBT and HPCT, provide export facilities for coal mines in the Bowen Basin, serviced via an integrated port-rail network
- the port of Hay Point exports where the highest of all other state trading ports for 2019–20 representing 35% of Queensland's total exports
- the ports throughput in 2019–20 was 110.9mt
- DBT has four shipping berths and handled 55% of the port's total 2019–20 throughput
- HPCT has three shipping berths and handled 45% of the port's total 2019–20 throughput
- coal export figures are variable from year-to-year:
  - throughput figures over the five years from 2015 to 2020 dropped 7.5mt representing a 6.3% decline
  - the peak throughput year was 2017–18 with 120.4mt exported
  - the lowest throughput year was 2016–17 with 106.5mt.

More recent data in this series is available on the NQBP website at https://nqbp.com.au/trade/throughputs.

With regard to the Port of Mackay the report states:

- The total throughput for the port was variable from year-to-year but presents an overall growth trend from 2,830,000 tonnes in 2015–16 to 3,177,893 tonnes in 2019–20. This comprised a decline in export throughput and growth in imports over this period.
- Export statistics for the port show a trend between the 2015-16 and 2019–20 financial year of a decline in total exports from 1,267,043 tonnes in 2015–16 to 1,184,937 tonnes in 2019–20. This was driven primarily by a decline in grain exports from 139,550 tonnes to 77,105 tonnes.
- The port's primary export commodity was raw sugar, which was variable from year-to-year with exports varying from a maximum of 821,713 tonnes in 2020–21 to a minimum of 594,636 tonnes in 2017–18. Refined sugar exports were smaller than raw sugar and generally steady between a range of 250,000 tonnes to 280,000 tonnes per year. This report did not separate raw and refined sugar commodities, as done in statistics released by NQBP.
- Import statistics for the port showed growth from 1,562,421 tonnes in 2015–16 to 1,992,956 tonnes in 2019–20. This primarily consisted of growth in petroleum product throughput from 1,380,251 tonnes in 2015–16. NQBP reported further growth in 2019–20 to 1,678,742 tonnes in 2019–20.

[506]Department of Transport and Main Roads. (2020). *Trade Statistics for Queensland Ports*. Retrieved from https://www.tmr.qld.gov.au/-/media/busind/Transport-sectors/Ports/Trade-statistics/Master-data-Trade-Statistics-2018-2019.xlsx?la=en
[507] North Queensland Bulk Ports Corporation Limited. (2020). *Leading the Transition to Sustainable Port Trade Annual Report 2019-20*. Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0030/35859/NQBP-Annual-Report-2019-20_FINAL.pdf.
[508] Department of Transport and Main Roads. (2020). *Trade Statistics for Queensland Ports*. Retrieved from https://www.tmr.qld.gov.au/-/media/busind/Transport-sectors/Ports/Trade-statistics/Master-data-Trade-Statistics-2018-2019.xlsx?la=en

12.2.2 North Queensland Bulk Ports Corporation Ltd Annual Report 2019–20

The NQBP Annual Report 2019–20 provides a summary of the major projects and achievements of NQBP, and the organisation's financial and non-financial performance for the 2019–20 financial year. [509]

The annual report contains a statement from NQBP's Chair and Chief Executive Officer, a summary of the highlights for each of NQBP's ports, summarises the organisation's performance against its strategic objectives, and provides a series of financial statements.

It reports trade performance in line with the state's trade statistics report and further details of the export trade of the Port of Hay Point:

- the Port of Hay Point had an annual throughput of 110.86mt in 2019–20, continuing a long-term trend of trade volume growth year-on-year over the previous 10-years (26.3% greater than in 2010–11, which had a throughput of 87.8mt)
- the port had 1147 vessel calls in 2019–20, continuing a long-term annual growth trend (28.6% greater than in 2010–11 – 892 vessel calls)
- most coal exported from the port was metallurgical coal at 94.0mt in 2019–20 (85% of total throughput), compared to 16.82mt of thermal coal (15% of total throughput).

It reports trade performance in line with the state's trade statistics report and further details of the trade of the Port of Mackay:

- The port is a regional transport hub focussed on the import of petroleum products (53% of total throughput in 2019–20) and the export of raw and refined sugar (33% of total throughput), which collectively comprised 86% of total throughput at the port in 2019–20.
- The port had an annual throughput of 3.18mt in 2019–20 with 195 vessel calls – broadly in line with 10-year averages. The sugar trade returned to normal volumes in this year, with drought conditions continuing to suppress grain trade.
- 2019–20 highlights include completion of Gudyara Road as a second access route to the port, which unlocking future land development opportunities.

The annual report highlights NQBP's business and infrastructure planning within the context of the changing landscape surrounding NQBP's key trade commodities. The annual report notes that industries presently supported by NQBP ports (such as coal mining and associated industries) will continue to trade and form NQBP's core business while NQBP trade transition takes place in line with the transition of the global energy market.

12.3 Economic relationships between the priority Ports of Abbot Point and Hay Point/Mackay

Port of Hay Point

The Port of Hay Point is a single-commodity port exporting thermal and metallurgical coal from coal mines in the northern Bowen Basin. The Port of Mackay as a multi-cargo port imports petroleum, magnetite, and other commodities such as machinery which support coal mining operations inland. Consequently, a relationship exists between imports to the Port of Mackay and the exports from the ports of Hay Point and Abbot Point.

Supporting this relationship are landside supply chains. Rail transports high-volume goods such as mining products, while road generally transports palletised goods. Neither road nor rail modes can suitably meet all requirements of the other. The supply chains exist purely through demand for the transportation of imports and exports to and from the ports.

[509] North Queensland Bulk Ports Corporation Limited. (2020). *Leading the Transition to Sustainable Port Trade Annual Report 2019-20*. Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0030/35859/NQBP-Annual-Report-2019-20_FINAL.pdf

The vast bulk of imports through the Port of Mackay are moved by road to coal mines, including petroleum products, magnetite and machinery.

While connected by high quality rail systems, in practice there are few operating linkages between the ports of Abbot Point and Hay Point because coal exports are directed to the closest coal export port to minimise landside transport costs. These interconnected rail systems are Aurizon's Central Queensland Coal Network (CQCN) (**Figure 12.1**) and are made up of four components:

- Newlands Rail System – non-electrified line from Abbot Point to North Goonyella
- Goonyella Rail System – electrified system connecting Hay Point to Coppabella with spurs to Hail Creek, North Goonyella, Blair Athol, and Gregory
- Blackwater System – electrified system connecting Gladstone to Blackwater with spurs to Gregory, Minerva, and Rolleston
- Moura System – electrified line connecting Gladstone to Moura.

These systems are connected in an effect to create a central 'spine' running north-south along the Bowen Basin, each feeding one of the ports of Abbot Point, Hay Point, and Gladstone. They operate to provide greater flexibility to exporters, providing access to three potential export terminals via three main rail routes. Closure of rail lines due to flooding from adverse weather occurs from time to time and can last for several weeks. Other coal transport and export port options can be useful in such circumstances.

The Queensland Government has acknowledged the importance of landside supply chains through investments under the QTRIP for 2021-22 to 2024-25.

Similarly, electricity, water and other utilities are essential for production and manufacturing activities. An increase in their reliability and decrease in price in turn would contribute to increased production and port throughput.'

Port of Mackay

The Port of Mackay is a general multi-commodity port, and a number of the traded commodities are inputs to coal mining activities central to the coal export roles at the Port of Abbot Point and Hay Point. In particular, these include:

- petroleum, which makes up 58% of the port's throughput, where approximately 90% of imported volume is transported to coal mines by road
- magnetite, all of which is used for coal washing and is also transported by road
- break bulk, which is predominantly mining and agricultural machinery, moved to use locations by road, much requiring Oversize Overmass vehicle loads.

Landside supply chains have a strong economic relationship with landside activities and exist purely as a product of a demand for the transportation of imported and exported goods to and from the port. This in turn is a consequence of economic policies that promote the development of import and export activities through the port.

There is a limited interrelationship between rail and road-based landside supply chains. Rail transports high-volume goods such as mining products, while road generally transports palletised goods and neither mode can suitably meet all requirements of the other. However, a relationship exists in weather patterns in that seasonal flooding would be likely to temporarily suspend both rail and road-based supply chains.

Similarly, electricity, water and other utilities are essential for production and manufacturing activities. An increase in their reliability and decrease in price in turn would contribute to increased production competitiveness, which is likely to lead to increases in production and port throughput.

12.3.1 Landside supply chains

Port of Hay Point

Considerable onsite infrastructure at the Port of Hay Point exists to support the export of coal as currently the only commodity, through the HPCT and the DBT. If a hydrogen facility were to be developed as a new industry at the port, there is both land and marine capacity to do so.

Several key land infrastructure components at the port include rail and road infrastructure to support the supply chain from the mines to the port; electricity; potable water and dams for storage; and water pipelines.

Coal is transported to the port solely by rail through the Goonyella Rail System. The port itself is accessed via Hay Point Road which runs east of the Bruce Highway and is considered an arterial road. As part of the wider supply chain to support mining operations in the Bowen and Galilee Basins, the Inland Highway (Gregory Development Road) and Flinders Highway are essential links in the region's road network.

The efficient operation of the port relies on various elements of supporting infrastructure and transportation corridors to support supply chains.

Additional facilities supplied by NBQP include a helicopter landing facility, quarantine waste treatment facility, quarry and laydown and hardstand areas.

Port of Mackay

The supply chain for imports at the port is quite different from those of coal exports from Abbot Point and Hay Point, even though these imports directly service coal mining activities.

The vast bulk of imports through the port is moved by road to coal mines, including petroleum products, magnetite and machinery. These movements are primarily on the Peak Downs Highway and key connecting roads throughout the Northern Bowen and Galilee Basins including the Suttor and Bowen Developmental Roads.

The vast majority of export freight movements through the port, including raw and refined sugar and grain, are moved by road.

By comparison, much greater volumes of export coal are moved to the ports of Abbot Point and Hay Point entirely by rail.

Movements from agricultural areas along the coast are via the Bruce Highway. East-west movements from agricultural areas in the Bowen region are facilitated by the Peak Downs Highway and key connecting roads including the Fitzroy Developmental Road.

The Bruce Highway is limited to B-double vehicles. This appears unlikely to change into the future.

The Peak Downs Highway is limited to AB-triple PBS3A road trains except for a section of the highway between the outskirts of Mackay and top of Eaton Range, which is limited to B-doubles due to steep grades, and requires vehicles to separate at the top or bottom of the Eaton Range make two journeys along this segment.

A map of key roads and key mining and agricultural areas throughout the Bowen region[510] is shown in **Figure 113** below.

[510] Department of Transport and Main Roads. (2018). *Mackay Isaac Whitsunday Regional Transport Plan 2018*. Retrieved from https://www.tmr.qld.gov.au/-/media/aboutus/corpinfo/Publications/regionaltransportplans/Mackay-Whitsunday-Regional-Transport-Plan-FINAL.pdf?la=en

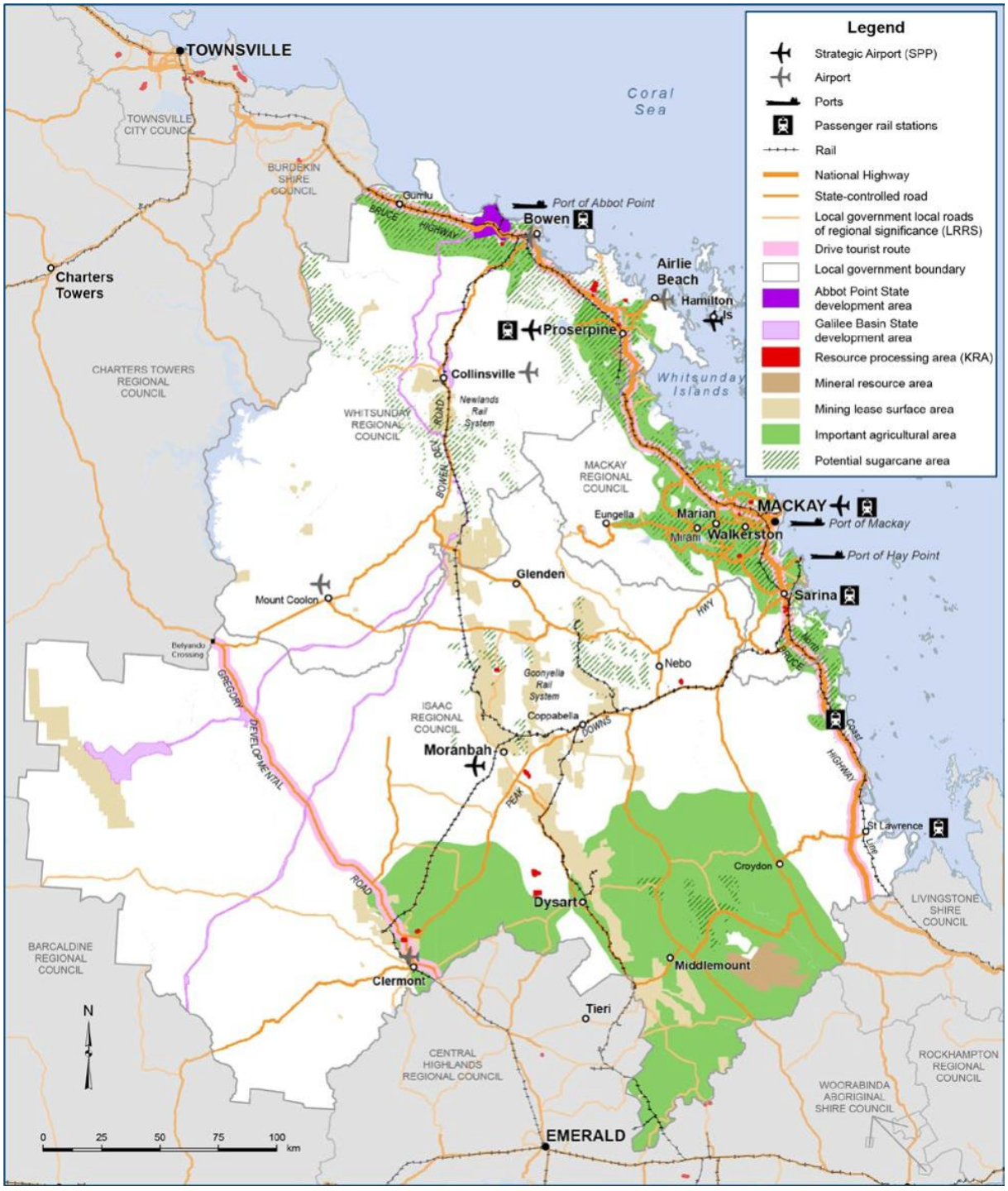

Figure 113: Key roads and key mining and agricultural areas

12.4 Global trade trends

Port of Hay Point

As Queensland's largest coal port, the metallurgical and thermal coal trade trends, issues and outlook are considered separately, as they are not identical.

For each type of coal, the analysis sets out factors and views that support continued growth in coal exports, followed by alternative factors and views suggesting declining volumes.

Port of Mackay

The port exports sugar, grain and other commodities and imports supports petroleum and mining equipment to support the coal mining operation in the Bowen Basin. As a result, the port's future is linked with the demand for coal, both metallurgical and thermal.

12.4.1 Trade trends and volumes – Metallurgical coal

Metallurgical coal is primarily used to make steel, with 780kg of metallurgical coal typically being required to manufacture one tonne of steel in a blast furnace. Metallurgical coal is of higher quality than thermal coal as it contains more carbon and less ash and moisture and is typically priced 50% higher per tonne than thermal coal.

Metallurgical coal represented 1100mt of the 7605mt total global coal consumption in 2019 (14.5%). Thirty-two per cent of this demand was met through imports (352mt), of which 88% was seaborne (310mt).

According to the International Energy Agency's (IEA) *Coal 2020*,[511] global consumption of thermal and metallurgical coal was 7605mt in 2019. Trade accounted for 19% of global coal consumption (1445mt) in 2019, representing its highest volume ever. The balance, referred to as domestic demand, was sourced and consumed within the same country. Of the 1445mt of coal traded, 92% (1331mt) was seaborne. Seaborne trade accounts for around 17.5% of overall coal consumption and the IEA notes that seaborne export forecasts are not necessarily aligned with that of overall coal demand, which is dominated by domestically sourced coal.

The structure of the global trade of metallurgical coal has evolved in recent years. Historically, Japan, Korea, and Europe accounted for most coal imports and operated in a largely separated 'Atlantic system' and 'Pacific system'. This has shifted in recent years with the trade market increasingly focusing on Asia. Coal imports to Europe have dropped primarily due to lower demand.

According to the Office of the Chief Economist's *Resources and Energy Quarterly June 2021*,[512] Australia is the world's largest exporter of metallurgical coal by volume and exported 177mt in 2019-20, which represented 54% of the world's total exports. Twenty-nine per cent of Australia's metallurgical coal exports in 2019–20 went to China, 21% to India, 16% to Japan, 12% to South Korea, and 10% to the European Union.

12.4.1.1 Factors suggesting continued growth – metallurgical coal

The Minerals Council of Australia, a mining industry association, forecasts in *Commodity Outlook 2030* that seaborne metallurgical coal trade will have grown by 23.7% over 2019 levels by 2030. This is expected to be driven by rapid development in India and southeast Asia as coal reserves in these nations are not suited to metallurgical uses.[513] Demand in China, Japan, and South Korea are expected to grow or remain steady to 2030 and decline gradually thereafter as adoption of alternative steel manufacturing processes starts to affect demand beyond 2030.

The IEA's long-term outlooks for metallurgical coal trade depend heavily on the rate and magnitude of transition to alternative steel manufacturing processes. Under Stated Policies Scenario[514] (STEPS) metallurgical coal is expected to grow by 16.7% to 2040 from 2019 levels. This is attributed to a rising scarcity of metallurgical coal due to the limited number of projects at an advanced stage of development. Under this scenario, international demand (particularly India and China) would support Queensland's metallurgical coal exports for the coming two decades.

Australian exports of metallurgical coal have been limited by China's informal import restrictions of Australian coal and efforts to diversify their supply chains, which has increased competition between individual Australian producers for access to non-China markets. This has primarily favoured larger producers with lower overall costs.

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[511] International Energy Agency. (2020). *Coal 2020*. IEA. Retrieved from https://www.iea.org/reports/coal-2020
[512] Department of Industry, Science, Energy and Resources Office of the Chief Economist. (2021). *Resources and Energy Quarterly June 2021*. Retrieved from https://publications.industry.gov.au/publications/resourcesandenergyquarterlyjune2021/index.html https://publications.industry.gov.au/publications/resourcesandenergyquarterlymarch2021/index.html
[513] Minerals Council of Australia. (2021). *Commodity Outlook 2030*. Retrieved from https://www.minerals.org.au/sites/default/files/Commodity%20Outlook%202030.pdf
[514] STEPS is an IEA forecast scenario that reflects the impact of all existing and announced policy intentions and targets 'insofar as they are backed up by detailed measures for their realisation'

India has also stated intention to diversify its metallurgical coal supply chain and prioritise imports from Russia, Mongolia, and the US to reduce vulnerabilities in their supply chain which in previous years have been exposed by flooding of Queensland coalfields.

The Office of the Chief Economist's *Resources and Energy Quarterly March 2021* forecasts Australian metallurgical coal exports to increase from 172mt in 2020 to 191mt in 2023 and plateau thereafter (**Table 115**).[515] The *Resources and Energy Quarterly* also note this increase and expect it is likely to remain strong thereafter as demand is largely tied to the demand for steel.

The IEA note in *Coal 2020* that coal export forecasts are not necessarily aligned with overall production due to their differing market drivers.[516]

Table 115: Medium-term Australian metallurgical coal export forecast

	2020	2021f	2022f	2023f	2024f	2025f	2026f
Australian annual metallurgical coal exports (mtpa)	172	179	185	191	192	191	191

12.4.1.2 Factors suggesting declining volumes – metallurgical coal

The IEA's Sustainable Development Scenario[517] (SDS) forecasts a 22.6% decline in international metallurgical coal trade by 2040 on 2019 levels due to a rapid increase of steel scrap recycling and more efficient use of steel in construction, and adoption of alternative steelmaking processes that do not use metallurgical coal.

The IEA forecasts in *Coal 2020* that global metallurgical coal exports will decrease from 352mt in 2018 to 332mt in 2021 and 308mt in 2025.

The IEA in *Coal 2020* forecasts that Australia's total thermal and metallurgical coal production will reduce from 429mt in 2019 to 381mt in 2030 under STEPS and 241mt under SDS, and that Australia's medium-term metallurgical coal exports will decline from 180mt in 2021 to 163mt in 2025 under their sole forecast scenario.

92mtpa of 'more advanced' coal export projects were identified worldwide across both metallurgical and thermal coal. Seventy percent of these are metallurgical or combined metallurgical and thermal coal projects (64mtpa), of which Australia accounts for 44% (28mtpa). These projects are listed in **Table 116**.[518]

Table 116: **Metallurgical coal export projects in 'more advanced' stage of development December 2020**

Project	Company	Location	Proposed start-up	Proposed full capacity (mtpa)	Resource
Aquila project	Anglo-American / Mitsui	Bundoora, Queensland	2022	3.5	Metallurgical
Byerwen Stage 2	QCoal/JFE Steel	Suttor, Queensland	2021	7	Thermal and metallurgical
Curragh Extension	Coronado Global	Blackwater, Queensland	2023	3	Thermal and metallurgical
Olive Downs Stage 1	Pembroke Resources	Moranbah, Queensland	2022	4.5	Metallurgical
United-Wambo	Glencore and Peabody	Warkworth, New South Wales	2020	6.5	Thermal and metallurgical
Winton-Fairhill	Futura Resources	Wyuna, Queensland	2021	3	Metallurgical

[515] Department of Industry, Science, Energy and Resources Office of the Chief Economist. (2021). *Resources and Energy Quarterly March 2021*. Retrieved from https://publications.industry.gov.au/publications/resourcesandenergyquarterlymarch2021/index.html
[516] International Energy Agency. (2020). *Coal 2020*. IEA. Retrieved from https://www.iea.org/reports/coal-2020
[517] SDS is an IEA forecast scenario where 'a surge in clean energy policies and investments sees the energy system achieve its sustainability objectives in full, including the Paris Agreement'
[518] International Energy Agency. (2020). *Coal 2020*. Retrieved from https://www.iea.org/reports/coal-2020

There were 40mtpa of 'more-advanced' metallurgical coal export projects that were identified globally. Of these, 11mtpa are located in Australia and 10mtpa in Russia. The remainder of projects are located in the United States (6mtpa), Mongolia (3mtpa), Indonesia (2mtpa), South Africa (2mtpa), and Canada (2mtpa).[519]

By contrast, there are 217mtpa of 'less advanced' metallurgical coal export projects identified worldwide, 34% (74mtpa) which are located in Australia. There are a further 164mtpa of 'less advanced' combined thermal and metallurgical coal export projects worldwide, of which 80% (132mtpa) are located in Australia.

The disparity in the capacity of coal export projects between the 'more advanced' and 'less advanced' stages of development is partially attributed by the IEA to difficulty in attracting investment for coal projects leading to many projects failing to advance beyond the 'less developed' phase.

Queensland Treasury's *A Study of Long-Term Global Coal Demand* [520] undertook an analysis of IEA's World Energy Outlook from the perspective of Queensland coal industry. The report found that the long-term prospects for metallurgical coal exports are highly uncertain and highlights the following key challenges for the coal industry:

- General demand uncertainty – with forecasts ranging from modest increases over the coming decades, through a flat outlook, to steep declines.
- The increasing difficulty in attracting investment and funding and approvals for new projects will impact production (and therefore exports) just as much as demand-side forces. The report notes this supply-side dimension is almost impossible to predict.
- Similarly, decisions by key players in the coal supply chain such as banks, insurance companies, and other key service providers to exit the coal industry entirely can negatively impact the deliverability of otherwise-viable projects.
- The decisions of third parties to exit the coal industry is fed by various forms of community activism whose future scale and impact again are impossible to predict.

The report expects that these key uncertainties will first push out the 'smaller players' as they have more difficulty in overcoming these obstacles and leave coal mining activities to multinational diversified or state-backed mining groups.

12.4.1.3 Supply chain diversification by Australian metallurgical coal customers

The Chief Economist's *Resources and Energy Quarterly* (2021)[521] identifies that Australia's relative dominance over the metallurgical coal supply chain has contributed to efforts in key present and future export markets in China and India to diversify away from Australian metallurgical coal to reduce perceived supply chain vulnerabilities.

For example, India has stated intentions to diversify metallurgical coal supply chain sources and prioritise imports from Russia, Mongolia, and the United States to reduce vulnerabilities in their supply chain which have been exposed by flooding of Queensland coalfields experienced in recent years.

Australian exports of metallurgical coal have also been limited in recent years by China's informal import restrictions of Australian coal and efforts to diversify their supply chains, which has led to increased competition between individual Australian producers for access to non-Chinese markets. This has primarily favoured larger and more diversified producers with lower production costs.

The Chief Economist's report notes that these forces add an additional dimension of complexity to Australian metallurgical coal export forecasts.

12.4.1.4 Long-term threat – Transition of steel production processes

Alternative steelmaking technologies are expected to become more prominent as they are further developed and utilised. The identified reports have conflicting views on rate of this transition (which range from years to

[519] International Energy Agency. (2020). *Coal 2020*. Retrieved from https://www.iea.org/reports/coal-2020
[520] Queensland Treasury. (2020). *A Study of Long-Term Global Coal Demand*. Queensland Government. Retrieved from https://s3.treasury.qld.gov.au/files/A-Study-of-Long-Term-Global-Coal-Demand.pdf
[521] Department of Industry, Science, Energy and Resources Office of the Chief Economist. (2021). *Resources and Energy Quarterly June 2021*. Retrieved from https://publications.industry.gov.au/publications/resourcesandenergyquarterlyjune2021/index.html

decades) but largely agree they will increase over time as the technologies are further developed and deployed on a national scale.

Specific technologies identified in the Queensland Treasury report on *A Study of Long-Term Global Coal Demand*[522] include electric arc furnaces (which use no metallurgical coal), hydrogen-based processes, and steel production processes that uses gasified thermal coal and gas-based production method, the latter two of which are already being used in several projects in China and India.

The Queensland Treasury report ultimately concludes that India will increasingly become the key export market for Australian metallurgical coal in the long-term. The extent to which this growth will offset the decline in demand from other nations driven by adoption of alternative production processes, and the rate of this production transition, are not yet clear. This is identified as the primary underlying driver behind metallurgical coal's conflicting demand forecasts

12.4.2 Trade trends and volumes – Thermal coal

Thermal coal is primarily used in electricity generation and accounted for 38% of all power generated globally in 2018.

Thermal coal made up 6505mt of the 7605mt of total global coal consumption in 2019 (85.5%). The 17% (1093mt) of this demand was met through imports, of which 94% (1012mt) was seaborne. The majority of this seaborne trade activity took place in the Asia Pacific region.[523]

According to the Office of the Chief Economist's *Resources and Energy Quarterly June 2021*, Australia is the world's second largest exporter of thermal coal by volume (second to Indonesia at 390mt) and exported 200mt in 2019-20.[524] This accounted for 75-80% of Australis' thermal coal production. Thirty-one per cent of Australia's thermal coal exports in 2019-20 were to China, 21% to India 15% to Japan, 12% to South Korea, and 8% to Taiwan. Lower-grade 5500 kilocalories/kilograms coal is typically exported to China and India, while higher-grade 6000 kilocalories/kilograms coal is typically exported to Japan.

Similar to metallurgical coal, thermal coal exports have been limited by China's informal import restrictions, with producers making efforts to diversify to Indian and South Asian markets.

12.4.2.1 Factors suggesting continued growth – thermal coal

The Minerals Council of Australia, forecasts in *Commodity Outlook 2030* that global seaborne thermal coal trade will grow by 23% by 2030 over 2019 levels. This is expected to be driven primarily by developing Asian economies where cheap electricity will be in demand for supporting expansion of heavy industry.[525]

The Minerals Council report notes that their forecast for seaborne thermal coal demand is not necessarily the same as that of overall thermal coal consumption (which they note is expected to largely decline by 2040) as the majority of thermal coal production is used to service domestic demand and is not exported.

Australian thermal coal exports are forecasted in the *Resources and Energy Quarterly March 2021*[526] to increase from 200mt in 2020 to 213mt in 2023 and likely follow downwards trend in the long-term, however the magnitude of this change and its precise timings are not certain. [527] The report noted the core short-term uncertainties of China's informal import restrictions on Australian coal and the outcome of ongoing supply issues in Indonesia.

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[522] Queensland Treasury. (2020). *A Study of Long-Term Global Coal Demand*. Queensland Government. Retrieved from https://s3.treasury.qld.gov.au/files/A-Study-of-Long-Term-Global-Coal-Demand.pdf

[523] International Energy Agency. (2020). *Coal 2020*. Retrieved from https://www.iea.org/reports/coal-2020

[524] Department of Industry, Science, Energy and Resources Office of the Chief Economist. (2021). *Resources and Energy Quarterly June 2021*. Retrieved from https://publications.industry.gov.au/publications/resourcesandenergyquarterlyjune2021/index.html

[525] Minerals Council of Australia. (2021). *Commodity Outlook 2030*. Retrieved from https://www.minerals.org.au/sites/default/files/Commodity%20Outlook%202030.pdf

[526] Department of Industry, Science, Energy and Resources Office of the Chief Economist. (2021). *Resources and Energy Quarterly March 2021*. Retrieved from https://publications.industry.gov.au/publications/resourcesandenergyquarterlymarch2021/index.html

[527] Department of Industry, Science, Energy and Resources Office of the Chief Economist. (2021). *Resources and Energy Quarterly March 2021*. Australian Government. Retrieved from https://publications.industry.gov.au/publications/resourcesandenergyquarterlymarch2021/index.html

Table 117: Medium-term Australian thermal coal export forecast

	2020	2021f	2022f	2023f	2024f	2025f	2026f
Australian annual thermal coal exports (mtpa)	199	218	227	230	232	231	231

Note: 'f' above is 'forecast.

12.4.2.2 Factors suggesting declining volumes – thermal coal

There has been a trend over recent years for nations to favour domestic production of thermal coal over imports where possible as a means of supporting domestic industry and reduce reliance on overseas suppliers for critical resources. For example, India's state-owned coal producer Coal India Limited is aiming to replace thermal coal imports with domestic production, and the government mandated Coal India Limited replace 100mt of imports with domestic production in 2020–21.[528]

Low coal prices in 2020 combined with high labour costs compared with other coal exports meant many thermal coal mines have been operating at a loss and have reduced output or in some cases have been 'mothballed'.[529]

Consequentially, the IEA forecasts in *Coal 2020* that global thermal coal exports will decrease from 1081mt in 2018 to 991mt in 2021 and 963mt in 2025. Australia's total coal production is forecast to reduce from 429mt in 2019 to 381 in 2030 under STEPS, and 241mt under SDS. Australia's medium-term thermal coal exports are expected to remain flat from 208mt in 2018 to 205mt in 2021 and 208mt in 2025 under their sole forecast scenario.

The Queensland Treasury's *A Study of Long-Term Coal Demand* undertook an analysis of IEA's World Energy Outlook from the perspective of Queensland coal industry. The report found that thermal coal trade is expected to decline by 15.5% by 2040 from 2019 levels under STEPS, and by 77.1% under SDS. This structural decline will be driven by a transition in energy generation sources in key export markets of China, Japan, South Korea, and India.

The IEA's *Coal 2020*[530] provides a list of all known coal export mining projects worldwide as of December 2020. Projects are classified into 'more advanced' and 'less advanced' stages of development and whether they are seeking to extract and export metallurgical coal, thermal coal, or both.

There was 92mtpa of 'more advanced' coal export projects were identified worldwide across both metallurgical and thermal coal. Fifty-seven per cent of these are thermal or combined thermal and export coal projects (52mtpa), of which 54% (28mtpa) are based in Australia. These projects are listed in Table 118.

Table 118: Thermal coal export projects in a 'more advanced' stage of development as of December 2020

Project	Company	Location	Earliest proposed start-up	Proposed full capacity (mtpa)	Resource
Byerwen Stage 2	QCoal/JFE Steel	Suttor, Queensland	2021	7	Thermal and metallurgical
Cambey Downs	Yancoal Australia	Hookswood, Queensland	2020	0.7	Thermal
Carmichael	Adani	Belyando, Queensland	2021	10	Thermal
Curragh Extension	Coronado Global	Blackwater, Queensland	2023	3	Thermal and metallurgical
Mandalong Southern Extension	Centennial Coal	Mandalong, New South Wales	2022+	Unknown	Thermal
United-Wambo	Glencore and Peabody	Warkworth, New South Wales	2020	6.5	Thermal and metallurgical

[528] International Energy Agency. (2020). *Coal 2020*. Retrieved from https://www.iea.org/reports/coal-2020
[529] International Energy Agency. (2020). *Coal 2020*. Retrieved from https://www.iea.org/reports/coal-2020
[530] International Energy Agency. (2020). *Coal 2020*. Retrieved from https://www.iea.org/reports/coal-2020

There were 28mtpa of ‘more-advanced’ thermal coal export projects were identified globally. Of these, 14mtpa were located in South Africa, 11mtpa in Australia, and 4mtpa in Russia.

Of the 831mtpa of ‘less advanced’ coal export projects identified worldwide, 74% (614mtpa) are thermal or combined thermal and metallurgical coal projects. 75% (463mtpa) of these projects are based in Australia.

Establishment of new thermal coal production faces similar challenges to that of metallurgical coal but often to a more severe extent. These include difficulties in thermal coal projects securing funding and investment, trend of third parties removing themselves from the thermal coal supply chain and community activism. This leads to many projects being held indefinitely in this less advanced stage.

The Queensland Treasury’s *A Study of Long-Term Coal Demand* notes that irrespective of the pace and magnitude of decline in thermal export coal demand, there is little likelihood of significant production increases in Central Queensland, including significant up-front costs amid a highly uncertain and transitioning market, associated difficulty in securing financing and investment, decisions by key players to cease involvement in the coal supply chain, and community activism. This forecast is likely to impact the long-term trade and associated supply chains at the Port of Hay Point.

The long term and structural challenges facing thermal coal have been manifest in the decisions by large mining groups including Anglo American, BMA, Rio Tinto, and South32 to exit the thermal coal business in its entirety in recent years.

12.4.3 Trade trends and volumes – Petroleum

Approximately 90% of petroleum imported by volume is transferred to coal mines across the region by road, meaning that the outlook for petroleum imports at the Port of Mackay are driven by issues and trends concerning the production and export of metallurgical and thermal coal.

12.4.4 Trade trends and volumes – Sugar

Sugar volumes have been stable to trending slightly lower, which is expected to continue, based on areas planted, water availability and international competition. Sugar exports are generally forecast to remain steady, with international price competition the largest challenge.

Over 80% of Australian sugar is exported as raw sugar, making Australia the second largest sugar exporting country, second to Brazil.

Sugar Australia Company Limited operates two sugar refineries in Australia, with the Racecourse Refinery in Mackay, completed in 1994, the larger, producing around 380,000tpa from a facility with nameplate capacity around 450,000tpa. Limited raw sugar supply from sugar millers is the main reason for less than maximum output. The Racecourse Refinery is supplied direct from sugar mills in the crushing season (July-November) and from raw sugar held at the Port of Mackay in the non-crushing season. Attempts to use imported raw sugar in the non-crushing season some years ago were not successful. Both Wilmar Sugar Proprietary Limited and Mackay Sugar Limited have equity in Sugar Australia Company Limited and supply the Racecourse Refinery from mills in the Mackay region.

Australia’s domestic sugar market is generally driven by population and consumer tastes and consumes around 15-20% of production.

According to a report published by the United States Department of Agriculture (USDA) Foreign Agricultural Service, Central Queensland accounts for approximately 25.1% of Australia’s total sugar production. The region typically receives good rainfall with many areas achieving good yields with no irrigation, and some only using partial irrigation leading into the wet season. The typical growing period between harvests for sugar cane in this region is 12 months, with harvest occurring around May and processing taking place from June to November.

There are five sugar mills in central Queensland – three operated by Mackay Sugar Limited, and two by Wilmar Sugar Proprietary Limited. There is also one sugar refinery, operated under a joint venture between Mackay Sugar Limited and Willmar Sugar Proprietary Limited.

Since the 2019 season there have been two sugar marketers operating in the Mackay region – Queensland Sugar Limited, and Queensland Commodity Services (owned by Mackay Sugar Limited). Cane sugar growers

typically engage with a marketer under a three-year forward pricing contract to ensure medium-term price certainty.[531]

According to analysis undertaken by the USDA, raw sugar production in Australia does not vary greatly from year-to-year and is closely correlated to the area of sugar cane harvested. Production has varied within an approximate band of 4.2mt to 5.1mt over the 10 years to 2020–21.

Mackay Sugar Limited has been experiencing challenges in recent years and in July 2019 was taken over by Nordzucker, a German sugar beet processor. This has reportedly provided some increased grower confidence in the region and a consequential increase in sugar cane harvest area is expected, which should lead to increased production.

There is a positive outlook for raw sugar production in Australia in the short-term, with the USDA forecasting total production to be 4.4mt in 2021–22, up from 4.335mt in 2020–21. Comparatively, the Queensland Government in AgTrends 2020-21[532] forecasts a lesser (albeit still growing) production of 4.1-4.2 in 2020–21, up from 4.08mt in 2019–20.

According to USDA analysis, approximately 76% of Australia's total sugar production is exported, with raw sugar comprising 95% of all sugar exports. Major importers of Australian raw sugar are (in descending order) Indonesia, South Korea, and Japan, who collectively represent 80% of all Australian raw sugar exports by tonnage. Singapore account for approximately 85% of Australia's refined sugar exports by tonnage, which for 2021–22 are estimated by the USDA to be roughly in line with 2020–21 levels at 135,000mt.

The USDA forecasts a positive outlook Australian raw sugar exports in the short-term, growing to 3.4mt in 2021–22, up from 3.2mt in 2020-21. This increase is attributed to increased sugar cane production and increased international economic activity.

12.4.5 Trade trends and volumes – Grain

GrainCorp's half year 2021 financial results presentation (May 2021) forecasts 'high global demand for Australian grain and oilseeds' and a 'reduction in [grain] export volumes due to supply chain constraints and a corresponding increase to carry-out grain.' The presentation reports a positive outlook for the financial year of 2022 winter crop due to a good sub-soil moisture and positive rainfall outlook. GrainCorp expects to handle 33-34mt of grain in the 12 months to November 2021

By comparison, GrainCorp handled 14.2mt of grain in the 12 months to November 2020, of which 4.2mt were receivals and 1.3mt were bulk and container exports, reflecting poor seasonal conditions in much of eastern Australia.

The Australian Export Grains Innovation Centre forecasts that the annual production of grain in Australia will grow from 49mt in 2017–18 to 54.6mt in 2030,[533] driven by improvements in crop yield.

The Australian Export Grains Innovation Centre forecasts that the surplus of grain available for export will increase by 2.4-2.77mt in 2030 over 2017–18 levels.[534] The primary sources of this additional exported grain will be from Western Australia and South Australia, with almost all of the additional grain production in eastern Australia being used to satisfy increased demand within the domestic market to service increased demand from Australia's expected population growth.

12.4.6 Trade trends and volumes – Magnetite

Magnetite is imported for use in coal washing and demand is expected to remain proportional to coal export volumes. Similar to petroleum, the outlook for this commodity at the Port of Mackay is driven by the key issues and trends concerning metallurgical and thermal coal.

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[531] Queensland Cane Growers Organisation. (2020). *Annual Report 2019/20*. Retrieved from http://www.canegrowers.com.au/icms_docs/321340_canegrowers-annual-report-2019-20.pdf
[532] Department of Agriculture and Fisheries. (2020). *Queensland AgTrends 2020-2021*. Retrieved from https://www.publications.qld.gov.au/dataset/83d36400-85ee-48d3-a05d-2c6aabc8f109/resource/0e8e2b36-a33d-47a5-bc1d-c30cbd672e76/download/qld-agtrends-2020-21.pdf
[533] Australian Export Grains Innovation Centre. (2018). *Australia's Grain Outlook 2030.* Department of Primary Industries and Grains Research and Development Corporation. Retrieved from https://aegic.org.au/wp-
[534] Australian Export Grains Innovation Centre. (2018). *Australia's Grain Outlook 2030.* Department of Primary Industries and Grains Research and Development Corporation. Retrieved from https://aegic.org.au/wp-

12.4.7 Trade trends and volumes – Other commodities

Port of Hay Point

There is an increasing effort by the Queensland Government to develop gas field and 'new economy minerals' in Bowen and the North West Mineral Province that have potential to generate trade in supporting commodities and new export commodities for the port.

DSDILGP's *New Economy Minerals*[535] identifies substantial deposits of rare earth metals including copper, lead, zinc, nickel, cobalt, gold, graphite, silver, phosphate, and vanadium in Queensland across 'large areas of under-explored land with high prospectively for the discovery of 'Tier 1 projects'. The report establishes the following initiatives to develop these 'new economy minerals', including:

- $5 million to re-examine old mine tailings and core samples for rare earth minerals
- $9 million to develop better geological information to help industry identify new projects
- $14.8 million to continue investigating feasibility of the CopperString project to connect the North West Minerals Province to the National Electricity Market
- $10 million of exploration grants over four years
- $500 million over five years to boost mineral freight exports on the Mount Isa Line
- $27.12 million Geological Survey of Queensland Strategic Resources Exploration Program aimed at expanding resources exploration and development for gas and other minerals in North West Queensland. Includes funding exploration, mineral geophysics, mineral geochemistry, mineral synthesis, and the Geoscience Data Modernisation Program.

Most of these resources are located in the North West Mineral Province (which contains approximately 75% of Queensland's total metalliferous resources) and are exported through the Port of Townsville due to its proximity to the Mount Isa-Townsville railway line and Flinders Highway.

The report identifies specific gold, silver, copper, lead, and zinc opportunities in and around Bowen including:

- Active silver and gold mines at Mount Wright, Ravenswood, Pajungo, Wirralee, and Twin Hills (closed)
- Silver, gold, and copper mine at Mount Carlton
- Identified Silver and gold resources at Mount Coolon and Belyando
- Identified Zinc, copper, lead, gold, and silver resources at Waterloo, Liontown, and Thalanga.

The Queensland Government is supporting development of the Bowen gas fields through construction of the Bowen Basin Pipeline, which will connect the Bowen gas fields around Moranbah to the east coast gas market and export facilities at Gladstone. Development of the Bowen gas fields is unlikely to directly affect the port but has potential to generate new supporting trades.

Port of Mackay

Other commodities handled at the Port of Mackay include:

- break bulk, which is predominantly mining related equipment
- fertiliser, as inputs to agriculture
- scrap metal
- ethanol
- tallow
- motor vehicles.

[535] Department of State Development, Infrastructure, Local Government and Planning. (2020). *New Economy Minerals: Investment opportunities in Queensland's minerals provinces*.

12.4.8 Commodities outlook

Notable potential impacts, threats, and pressures on the port from the above commodity trends include:

- A long-term decline in coal mining activity in the region has the potential to pose a significant indirect and ongoing impact to port trade by reducing petroleum, magnetite and break-bulk import volumes.
- Long-term sugar exports are expected to remain generally steady with some year-to-year variations. This is expected to have a minimal ongoing direct impact to port trade from the current situation
- Grain exports at the port are not expected to experience a significant increase, with most additional production in the region remaining within the domestic market. This is expected to have a minimal ongoing direct impact to the port from the current situation.
- Current trade in other commodities is minor and is not expected to have a material impact on the port.

12.5 Economic development strategies and plans

12.5.1 Australian Government

12.5.1.1 Developing Northern Australia

Developing Northern Australia[536] is a white paper setting out the Australian Government's 'priorities to drive growth in Australia's north' over the 20-years from publication in June 2015.

The white paper provides a 20-year plan to grow Northern Australia across six themes:

- simpler land arrangements to support investment
- developing the north's water resources
- business, trade and investment gateway
- infrastructure to support growth
- the northern workforce
- good governance for Northern Australia.

The white paper provides two, five, 10-, and 20-year implementation plans to deliver on the paper's objective.

The white paper seeks to promote Northern Australia as a trade and investment gateway to Asia by attracting greater business and educational links with Australia's regional partners, promoting dedicated research and development measures, providing a more streamlined regulatory environment, and increasing access to the Entrepreneurs' Infrastructure Programme.

It establishes the $5 billion Northern Australian Infrastructure Facility to provide concessional loans for major infrastructure works

The white paper pledges to work with Indigenous communities, businesses and jurisdictions to simplify land arrangements, including making native title simpler, and reducing the regulatory burden on pastoral leases.

The white paper seeks to support employment growth through the Industry Skills Fund, the Remote Jobs and Communities Programme, and accelerating Designated Area Migration Agreements, expanding the Seasonal Worker Programme, and allowing some backpackers to apply for a second 12-month visa if they work in tourism or agriculture in Northern Australia.

12.5.1.1.1 Port trade outlook implications, influences, impacts and threats

- General support for port development as facilitators of trade
- Northern Australian Infrastructure Facility to provide loans for infrastructure development, which could include landside logistics facilities improving port linkages and port developments

[536] Department of Industry, Science, Energy and Resources. (2015, June). *Our North, Our Future: White Paper on Developing Northern Australia*. Retrieved from https://www.industry.gov.au/sites/default/files/June%202018/document/pdf/nawp-fullreport.pdf?acsf_files_redirect

- No specific or immediately implementable implications apparent.

12.5.1.2 Australia's Long-Term Emissions Reduction Plan

Australia's Long-Term Emissions Reduction Plan[537] outlines Australia's pathway to net zero emissions by 2050.

The plan is based on five key principles:

- technology not taxes
- expand choices, not mandates
- drive down the cost of a range of new energy technologies
- keep energy prices down with affordable and reliable power
- be accountable for progress.

The plan proposes:

'… more than 100,000 new jobs could be created in industries including critical minerals, clean hydrogen, renewable energy, green steel and alumina, many in Australia's regions. Australia's export-oriented sectors are projected to grow significantly in aggregate, with the value of Australian exports more than tripling between 2020 and 2050. [538]'

12.5.1.2.1 Port trade outlook implications, influences, impacts and threats

- General support for port development as facilitators of trade, for new and existing export industries.
- No specific or immediately implementable implications apparent.

12.5.2 Queensland Government

12.5.2.1 Queensland Climate Action Plan

The Queensland Government has set targets[539] to support emissions reduction: 50% renewable energy target by 2030; 30% emissions reduction below 2005 levels by 2030, and zero emissions by 2050.

The plan sets out the priority sectors for action over the next decade to achieve zero net emissions by 2050, power Queensland with 50% renewable energy by 2030 and reduce greenhouse gas emissions by at least 30% below 2005 levels by 2030.

Climate actions provides the strong foundation needed for Queensland to meet its targets, attract investment, and create more jobs in the future economy.

12.5.2.1.1 Port trade outlook implications, influences, impacts and threats

- Potential for future port trade enhancement from development in new industries.

12.5.2.2 A Study of the Long-Term Global Coal Demand

A Study of Long-Term Global Coal Demand[540] examines the long-term demand for Queensland coal considering the global coal industry and IEA World Energy Outlook, and implications for Queensland's production and export activities.

The study conducts an analysis of the IEA's 2019 World Energy Outlook and other sources of information to discuss potential implications for Queensland's metallurgical and thermal coal industries up to 2040.

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[537] Australian Government. (2021). *Australia's, Long-term Emissions Reduction Plan: A Whole-of-economy Plan to achieve net zero emissions by 2050.* Commonwealth of Australia.
[538] Australian Government. (2021). *Australia's Long Term Emissions Reduction Plan: A whole of economy plan to achieve net zero emissions by 2050.* Retrieved from https://www.industry.gov.au/sites/default/files/October%202021/document/australias-long-term-emissions-reduction-plan.pdf
[539] Queensland Government. (2020). *Queensland Climate Action*. Retrieved from https://www.des.qld.gov.au/climateaction
[540] Queensland Treasury. (2020). *A Study of Long-Term Global Coal Demand*. Queensland Government. Retrieved from https://s3.treasury.qld.gov.au/files/A-Study-of-Long-Term-Global-Coal-Demand.pdf

Under the IEA's main STEPS, which includes the effect of in-force policies and policies announced in official targets and plans, the total global trade in thermal coal is expected to decrease by 15.5%, and trade in metallurgical coal is expected in increase by 16.3%.

Under the IEA's SDS which reflects the potential outcome if global policies were to align with the United Nations Sustainable Development Goals, the total global trade in thermal coal is expected to decrease by 77.1%, and trade in metallurgical coal is expected in decrease by 22.6%.

The IEA highlighted that the long-term outlook for coal demand is uncertain and long-term outcomes could viably arrive at any point between the STEPS and SDSs.

12.5.2.2.1 Port trade outlook implications, influences, impacts and threats

The long-term demand for coal exports has implications for the Port of Mackay due to its role in supporting coal mines in the northern Bowen Basin with imports of petroleum and mining equipment.

Queensland's future coal demand is expected to be driven by demand for coal in key Asian economies. Future exports of metallurgical coal are particularly dependent on demand from China and India.

Queensland's coal industry has several key advantages over other jurisdictions including its geographic proximity to Asia and the relative quality of its coal to alternatives. Therefore:

'…under the IEA's STEPS scenario, it is likely that international demand will support Queensland's coal exports over the two decades to 2040, with the long-term outlook for metallurgical coal likely to be more favourable than for thermal coal.'[541]

The report noted that there is a significant degree of uncertainty given the long-term nature of the outlook and rate of change in the global energy market.

12.5.2.3 Strategic Blueprint for Queensland's North West Minerals Province

The *Strategic Blueprint for Queensland's North West Minerals Province:*[542]

'…provides a platform on which the Queensland Government will collaborate with other levels of government, business, industry, and communities to support a smooth transition to a stronger and more diversified economy in the longer term.'

While exports from the North West Mineral Province are focused on the Port of Townsville, key recommendations of the Blueprint include future development of new geological databases and more targeted approaches to exploration, and initiating gas exploration to investigate North West Mineral Province's gas potential which may open new markets and opportunities in other areas of the state.

12.5.2.3.1 Port trade outlook implications, influences, impacts and threats

Port of Hay Point

- General ongoing support from the Queensland Government for developing and supporting the minerals industry.

Port of Mackay

The *Strategic Blueprint for Queensland's North West Minerals Province* 'provides a platform on which the Queensland Government will collaborate with other levels of government, business, industry, and communities to support a smooth transition to a stronger and more diversified economy in the longer term' in the North West Mineral Province, centred on Mount Isa.[543]

The blueprint builds on existing initiatives and provides $39 million over four years as part of the 2017–18 State Budget for new measures and is focused on three key strategic priorities:

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[541] Queensland Treasury. (2020). *A Study of Long-Term Global Coal Demand*. Queensland Government. Retrieved from https://s3.treasury.qld.gov.au/files/A-Study-of-Long-Term-Global-Coal-Demand.pdf
[542] Department of State Development, Infrastructure, Local Government and Planning. (2017). *A Strategic Blueprint for Queensland's North west Minerals Province: Supporting strong and prosperous regional communities*.
[543] Department of State Development, Infrastructure, Local Government and Planning. (2017). *A Strategic Blueprint for Queensland's North west Minerals Province: Supporting strong and prosperous regional communities*.

- facilitating continued resources sector development
- diversifying the regional economy and creating employment opportunities
- working with businesses and communities to deliver integrated and appropriate services.

The blueprint provided the following key recommendations:

- Facilitate exploitation of the next generation of large mineral deposits by delivering minerals and natural gas geoscience exploration programs, assist small exploration companies in accessing geological data and attracting investment, and initiating gas exploration in frontier and greenfield gas basins.
- Develop a long-term regional economic diversification strategy for North West Queensland focusing on identifying opportunities to increase agricultural production, support tourism development in regional Queensland, and build entrepreneurial capacity for existing and emerging sectors.

12.5.2.3.2 Port trade outlook implications, influences, impacts and threats

- No specific or immediately implementable implications apparent but planning at the port should remain open to the needs of possible new export trades and supporting import commodities they may demand.
- The North West Minerals Province tends to be focused on the Port of Townsville, through the linkages of the Mount Isa rail line and Flinders Highway.

12.5.2.4 *Queensland Hydrogen Industry Strategy 2019–2024*

The *Queensland Hydrogen Industry Strategy*[544] defines a strategy for developing 'an economically sustainable and competitive hydrogen industry that creates economic growth, opportunities for new export markets, highly skilled jobs, an supports the transition to a low-emission economy.'

The strategy sets actions within five focus areas that address challenges to developing a hydrogen industry, which were identified through consultations with industry, researchers, and the public and include:

- supporting innovation in industry and manufacturing
- facilitating private sector investment
- ensuring an effective policy framework for sustainable development that provides flexibility and certainty
- building community awareness and confidence in hydrogen
- facilitating skills development to ensure the workforce is adequately skilled to produce, handle, and use hydrogen.

The strategy recommended the following actions relevant to developing a hydrogen industry in Queensland:

- ensure investment programs are responsible to hydrogen industry development opportunities and support competitive production, storage, transport and use.
- assist private sector proponents with information on developing hydrogen projects, provide project and investment facilitation services, promote investment opportunities to international partners, and deliver the Hydrogen Industry Development Fund to facilitate private sector investment.
- support demonstration projects to showcase the applications of hydrogen.

12.5.2.4.1 Port trade outlook implications, influences, impacts and threats

Port of Hay Point

- Potential for future port trade enhancement from development in new industries. (Further information on hydrogen's implications for the Port of Hay Point in **Section 11.5**).

[544] State Development, Infrastructure, Local Government and Planning. (2019). *Queensland Hydrogen Industry Strategy 2019-2024*. . Retrieved from https://www.statedevelopment.qld.gov.au/__data/assets/pdf_file/0018/12195/queensland-hydrogen-strategy.pdf

Port of Mackay:

- No specific or immediately implementable implications apparent but remain open to the needs of possible new export trades and supporting import commodities they may demand.

12.5.2.5 Queensland Biofutures 10-Year Roadmap and Action Plan

Port of Hay Point:

The *Queensland Biofutures 10-year Roadmap and Action Plan*[545] sets out a vision for Queensland's bioproduct and biotechnology industry in 2026. It defines how the state will realise associated opportunities for growth and aims to provide assurance for existing operations and future investments.

The report identifies specific opportunities at Wilmar's bioethanol plant at Sarina, about 40km south of Mackay, Australia's largest producer of molasses-based ethanol with capacity to produce 60 million litres of ethanol per year, and the Mackay Renewable Biocommodities Pilot Plant, 'a pilot-scale research and development biorefinery for the conversion of cellulosic biomass into bioethanol and other high-value commodities'.

The report specifically identifies sugarcane bagasse as a potential feedstock for producing succinic acid in the Whitsunday region and recommends strong government leadership to create and maintain an attractive investment environment for the biofutures industry.

12.5.2.5.1 Port trade outlook implications, influences, impacts and threats

- Port development planning should remain open to the needs of possible new export trades and supporting import commodities they may demand.

Port of Mackay:

- The *Queensland Biofutures: 10-Year Roadmap and Action Plan* document sets out a vision for Queensland's bioproduct and biotechnology industry in 2026. It defines how the state will realise associated opportunities for growth and aims to provide assurance for existing operations and future investments.
- The document defines 'biofutures', discusses key industry drivers and the global context, the Queensland Government's vision for the state's biotechnology and bioproduct industry, and discusses strengths, weaknesses, opportunities, challenges and associated actions.
- The report identifies specific opportunities at the Wilmar Bioethanol (Sarina), which is Australia's largest producer of molasses-based ethanol and has the capacity to provide 60 million litres of ethanol per year, and the Mackay Renewable Biocommodities Pilot Plant, 'a pilot-scale research and development biorefinery for the conversion of cellulosic biomass into bioethanol and other high-value commodities'.
- The report specifically identifies sugarcane bagasse as a potential feedstock for producing succinic acid in the Whitsunday region.
- A selection of recommended actions includes:
  - providing direct support for biofutures industry initiatives using various development fund and grant programs and providing broad industry development support
  - identify and promote investment opportunities using marketing and communications campaigns and various initiatives to encourage investment
  - provide strong government leadership to create and maintain an attractive investment environment through strong government sectoral focus, establishing Queensland Biofutures, and investigate policy and development opportunities.

[545] Department of State Development, Infrastructure, Local Government and Planning. (2016). *Queensland Biofutures: 10-Year Roadmap and Action Plan,* Edition 2. Retrieved from https://www.statedevelopment.qld.gov.au/__data/assets/pdf_file/0017/13337/biofutures-10yr-roadmap-actionplan.pdf

12.5.2.6.2 Port trade outlook implications, influences, impacts and threats

- No specific or immediately implementable implications apparent but planning at the port should remain open to the needs of possible new export trades and supporting import commodities they may demand.

12.5.2.6 *Queensland Space Industry Strategy*

The *Queensland Space Industry Strategy 2020–2025*[546] outlines Queensland's five-year strategy to develop a space industry. It builds on the *Queensland Aerospace 10-Year Roadmap and Action Plan 2018–2028*[547] to provide actions more targeted to growing a space industry.

The strategy defines the vision, opportunity and potential benefits for the wider Queensland economy, explores Queensland's existing space-related industry, and discusses Queensland's the key strengths with respect to developing a space industry (these being its favourable location for hosting launch activities and ground stations), and Queensland's existing space-enabled industries (including geoscience, advanced manufacturing and robotics).

The strategy also summarises key growth opportunities for Queensland's 'space economy', industry-wide challenges, and key actions.

The overarching vision of the strategy is that '..By 2025, Queensland's space industry will be recognised as a leading centre in Australasia for launch activities, ground systems, Earth observation, niche manufacturing, and robotics and automation.'

Key recommended actions include:

- Promoting development of supporting capabilities in infrastructure (including development of common user space-related infrastructure, development of a data analytics and commercialization hub, and development of a ground station in Queensland), workforce capability, and commercial capability (including leveraging the Defence and Aerospace Industry Development Fund, supporting organisations seeking to enter the space supply chain, and support industry's involvement in international space missions.)
- Growing Queensland's industry by working to connect Queensland's space industry to international and domestic market opportunities and develop downstream space-enabled industries.

12.5.2.6.1 Port trade outlook implications, influences, impacts and threats

- No specific or immediately implementable implications apparent but remain open to the needs of possible new export trades and supporting import commodities they may demand.

12.5.2.7 State of Queensland Agriculture Report

Port of Hay Point

The *Queensland AgTrends 2020–21 Report*[548] was developed in response to industry consultation for the Queensland agricultural strategy and collates and analyses data for use by the agricultural industry for the purposes of making investment decisions and planning for the future.

The report provides a range of metrics across the agricultural production process for Queensland's key agricultural industries including forestry and commercial fisheries including resource availability, productivity, markets, and production costs.

The report reiterates the Queensland Government's objective of doubling agricultural production from 2014 to 2040 and highlights opportunities in key export markets such as China, India, and Indonesia but caveats that seasonal variability remains a major challenge facing Queensland agriculture.

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[546] Department of State Development, Infrastructure, Local Government and Planning. (2020). *Queensland Space Industry Strategy 2020-2025*.
[547] Department of State Development, Infrastructure, Local Government and Planning. (2018). *Queensland Aerospace 10-Year Roadmap and Action Plan 2018-2028*.
[548] Department of Agriculture, Fisheries and Forestry. (2020). *AgTrends 2020-21: Forecasts and trends in Queensland agricultural, fisheries and forestry production.* Queensland Government. Retrieved from https://www.publications.qld.gov.au/dataset/queensland-agtrends/resource/0e8e2b36-a33d-47a5-bc1d-c30cbd672e76

12.5.2.7.1 Port trade outlook implications, influences, impacts and threats

- No specific implications apparent but remain open to the needs of possible new export trades and supporting import commodities they may demand.

Port of Mackay

The *Queensland AgTrends 2020–21 Report*[549] was developed in response to industry consultation for the Queensland agricultural strategy and collates and analyses data for use by the agricultural industry for the purposes of making investment decisions and planning for the future.

The report provides a range of metrics across the agricultural production process for Queensland's key agricultural industries including forestry and commercial fisheries including resource availability, productivity, markets, and production costs.

Data is provided from a range sources including government, investment institutions, and industry organisations.

The report reiterates the Queensland Government's objective of doubling agricultural production from 2014 to 2040 and highlights opportunities in key export markets such as China, India, and Indonesia but caveats that seasonal variability remains a major challenge facing Queensland agriculture.

The available data shows sugar export markets are highly global, with Asia, Europe, and the United States of America historically being key markets. Korea had consistently been Queensland's single largest buyer, however at the time of publication China was noted as being an 'extremely rapidly emerging market'.

The report found that the harvested cane area had been declining consistently in Queensland between 2000 and 2014, with the Organisation for Economic Cooperation and Development and the United Nations' Food and Agriculture Organization expecting the global sugar market to remain relatively balanced over the medium-term

Available data found that the wheat export market was highly focused on Asia. Export of Australian Prime Hard quality wheat, suitable for noodle-making (of which Queensland is one of the two prime growth regions in Australia) was primarily driven by Korea and China, with some exports also being sent to the United States of America and Italy.

The report found that wheat exports were increasingly consisting bagged and containerized quality wheats such as high-protein wheats (exported to the Middle East for flat breads) and Australian Prime Hard wheat (exported to Asia for noodle making).

The report noted that domestic suppliers need to understand the wheat varieties and differing needs and trends of their respective export markets.

12.5.2.7.2 Port trade outlook implications, influences, impacts and threats

- Queensland's agricultural demand will be linked to key economies in North-East and South-East Asia, in particular China and India.
- The report noted that there is a significant degree of uncertainty due to the seasonal nature of agricultural production, however the medium-term change in planation area and production was expected to be largely flat or declining slightly.

12.5.2.8 Queensland AgTrends

Port of Mackay

Queensland AgTrends 2020–21[550] aims 'to help industry improve its competitiveness and plan for the future' by publishing data on industry performance, consumer behaviour, and social and demographic trends'

[549] Department of Agriculture, Fisheries and Forestry. (2020). *AgTrends 2020-21: Forecasts and trends in Queensland agricultural, fisheries and forestry production.* Queensland Government. Retrieved from https://www.publications.qld.gov.au/dataset/queensland-agtrends/resource/0e8e2b36-a33d-47a5-bc1d-c30cbd672e76

[550] Department of Agriculture, Fisheries and Forestry. (2020). *AgTrends 2020-21: Forecasts and trends in Queensland agricultural, fisheries and forestry production.* Queensland Government. Retrieved from https://www.publications.qld.gov.au/dataset/queensland-agtrends/resource/0e8e2b36-a33d-47a5-bc1d-c30cbd672e76

Data tracked includes gross value of production (GVP) of Queensland's primary industries, GVP at the farm gate, climate outlook, and primary industry forecasts by commodity.

According to the update the GVP for sugar for 2019–20 was forecasted to be $1.06 billion – 16% lower than the average for the previous five years due to drought conditions and low international sugar prices.

The GVP for grain sorghum for 2019–20 was forecast to be $101 million – 68% lower than the average for the previous five years. This is due to drought conditions, which led to the lowest area sown on record of 130,000ha (67% below the 10-year average), and a total production estimate of 325,000 tonnes (the lowest on record and 75% below the 10-year average). None of the 2019-20 production was expected to be exported in 2020.

The GVP for chickpeas for 2019–20 was forecast to be $133 million – 64% lower than the average for the previous five years. Approximately 80% of the total 154,000ha of crop was planted in central Queensland. India was not purchasing new chickpea imports at the time of publication, limiting export demand

The GVP for wheat was forecasted to be $246 million – 18% lower than the average for the previous five years. This is due to dry conditions in autumn to early winter in central Queensland, and drought conditions in southern Queensland. This led to a production estimate of 580,000 tonnes (56% below the 10-year average of 1.33mt).

12.5.2.8.1 Port trade outlook implications, influences, impacts and threats

- The export of sugar (24% of total port throughput in 2018-19), and to a lesser extent grains are important trades for the port. The export trade outlook for the port is aligned with the outlook for these two commodities, which is dependent on seasonal conditions and in recent years has been heavily impacted by very dry conditions throughout Queensland.

12.5.2.9 Advancing Queensland's Priorities

Our Future State: Advancing Queensland's Priorities[551] outlines the Queensland Government's high-level priorities following the 2017 State Election.

The document outlines the six core priorities (job creation, early childhood, health, community safety, protecting the GBR, and improving ease of use of government services) and a series of measurable goals.

Specific goals include:

- Creating 60,000 jobs per year through State Budget initiatives from 2018–19 to 2020–21
- Increase private sector investment in Queensland by 15% by 2020–21
- Reduce Queensland's net greenhouse gas emissions by 30% from 2018 levels by 2030
- Improve the quality of water flowing into the GBR lagoon through a 60% reduction in anthropogenic end-of-catchment dissolved inorganic nitrogen loads by 2025, and a 25% reduction in anthropogenic end-of-catchment sediment loads.

12.5.2.9.1 Port trade outlook implications, influences, impacts and threats

- Potential for port trade enhancement from development in areas adjacent to ports, including SDAs in some cases

12.5.2.10 Queensland's Economic Recovery Plan

Queensland's *Economic Recovery Plan*[552] defines the Queensland Government's plan for long-term recovery from the COVID-19 pandemic, developed following extensive business, industry, regional, and community stakeholders.

The plan describes a range of recovery and support initiatives within the 2021–22 State Budget as part of a broader $14.2 billion funding for 'recovery initiatives'. Examples of these initiatives include targeted support measures for industry and small business, cost of living relief measures for households, and infrastructure projects.

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[551] Queensland Government. (2018). *Our Future State: Advancing Queensland's Priorities. Queensland Government.* Retrieved from https://cabinet.qld.gov.au/documents/2018/Mar/OFSAQP/Attachments/Priorities.PDF
[552] Queensland Government. (2021). *Queensland's COVID-19 Economic Recovery Plan: 2021-22 budget update*. Queensland Government. Retrieved from https://budget.qld.gov.au/files/Budget_2021-22_Covid_Economic_Recovery_Plan.pdf

Relevant economic measures included in the 2021–22 State Budget are:

- $140 million funding for businesses to employ staff who were previously unemployed
- $100 million for the Business Investment Fund, which seeks to 'invest in small-to-medium businesses that have significant growth potential'
- $25 million in new grants and programs to support small businesses
- $3.34 billion to support industry and job-creation, including the $2 billion *Queensland Renewable Energy and Hydrogen Jobs Fund*
- $100 million to 'grow the waste management and resource recovery sector'
- $200 million for minor infrastructure works and maintenance in regional Queensland
- $9 billion of funding for capital works in areas outside of Greater Brisbane
- $270 million for the *Queensland Reef Water Quality Program*
- $71 million for the *Drought Assistance and Reform Package*
- $200 million per year for upgrade of priority sections of the Bruce Highway including prioritising upgrades between Gladstone and Proserpine.

12.5.2.10.1 Port trade outlook implications, influences, impacts and threats

Port of Hay Point

- Potential for future port trade enhancement from development in new industries.

Port of Mackay

- Potential for port trade enhancement from development in areas adjacent to ports and in major links to ports including the Bruce Highway.

12.5.2.11 Mackay-Whitsunday Regional Economic Recovery

The *Mackay-Whitsunday Regional Economic Recovery Action Plan*[553] defines the Queensland Government's plan for long-term recovery of the Mackay-Whitsunday region from the COVID-19 pandemic, developed following extensive business, industry, regional, and community stakeholders.

The plan describes a range of recovery and support initiatives within the 2021–22 State Budget. Examples of these initiatives include targeted support measures for industry and small business, cost of living relief measures for households, and infrastructure projects.

Relevant economic measures included in the 2021–22 State Budget include:

- $37 million to widen the Bruce Highway (Mackay-Proserpine), Hamden-Kattabum upgrade
- $102.4 million to widen the Bruce Highway (Mackay-Proserpine) between Ron Camm Bridge and Mackay Ring Road
- $497.4 million to construct Mackay Ring Road
- $10 million to continue panning works for enhancements to Teemburra Dam to meet future extreme weather events
- $39.9 million to replace the Nebo Substation
- $1 million to develop a business case for a Future Foods BioHub in Mackay to manufacture alternative food products for new export markets
- support for the Olive Downs coal mine – a recently approved metallurgical coal mine located 40km south-east of Moranbah with a 79-year expected lifespan that will export an estimated 15mtpa by rail to the DBT.

[553] Queensland Government. (2021). *Mackay-Whitsunday Regional Recovery Action Plan*. Retrieved from https://www.covid19.qld.gov.au/data/assets/pdf_file/0022/140377/mackay-whitsunday-action-plan.pdf

12.5.2.11.1 Port trade outlook implications, influences, impacts and threats

- No specific or immediately implementable implications apparent but remain open to the needs of possible new export trades and supporting import commodities they may demand.
- Potential for port trade enhancement from development in areas adjacent to ports.

12.5.2.12 State Infrastructure Plan

The *State Infrastructure Plan*[554] 'sets a clear vision to guide infrastructure investment and provides a cohesive model for infrastructure planning and delivery which integrates with land use and economic planning' and 'coordinates infrastructure planning across Queensland Government agencies'.

The *State Infrastructure Plan* provides a framework to guide the planning and prioritisation of infrastructure investment and delivery by:

- setting a strategic direction and promoting innovation in planning and delivering infrastructure
- identifying the anticipated service needs and infrastructure investment opportunities
- developing a program of investment
- providing a framework for improved coordination between public and private infrastructure

The *State Infrastructure Plan* provides a framework for the infrastructure options assessment process and highlights a preference (in descending order of preference) for non-build (policy options), better use (demand management), improve existing (upgrade options), and new construction works.

The plan highlights that multiple options may be used in conjunction, such as a demand management and improve existing as a means of delaying new infrastructure works or combining policy reform with new infrastructure to minimise the scope and cost of new capital works.

12.5.2.12.1 Port trade outlook implications, influences, impacts and threats

- No specific or immediately implementable implications apparent but remain open to the framework's implications for new capital works at the port.

12.5.3 Local Government

12.5.3.1 *Mackay Economic Development Strategy 2020–2025*

The *Mackay Region Economic Development Strategy 2020–2025*[555] 'provides a strategic framework and action plan to deliver a coordinated regional approach to economic development and sustainable economic growth'

The strategy explores the current situation, Mackay's 'vision for the future', Mackay's principles for economic development, key identified growth opportunities, a development strategy across six key pillars (Economic Development Framework, Advocacy and Leadership, Investment Attraction, Industry Development, and Workforce and Skills Development), and lists a set of actions and monitoring processes.

Key relevant actions within the strategy include:

- invest in the public realm and activation of the city centre and other parts of the region (including the Waterfront PDA and Northern Beaches)
- deliver the MIW *Digital Infrastructure Strategy* to support the region's digital growth
- attend industry exhibitions and other events, and work with industry partners to identify growth opportunities, and proactively identify and engage with prospective businesses and investors.
- work with other bodies and organisations to expand foreign direct investment activities in Mackay
- support operation of, and future stages of the Resources Centre of Excellence

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[554] Department of Infrastructure, Local Government and Planning. (2016). *State Infrastructure Plan Part A: Strategy.* Retrieved from https://www.statedevelopment.qld.gov.au/__data/assets/pdf_file/0020/31727/sip-part-a.pdf
[555] Mackay Regional Council. (2020). *Mackay Region Economic Development Strategy 2020-2025.* Mackay Regional Council. Retrieved from https://www.mackay.qld.gov.au/__data/assets/pdf_file/0016/245302/MRC_-_ED_Strategy.pdf

- support establishment of the MIW Small-Medium Enterprise Mining Equipment Technical Services Export Hub
- work with organisations to develop industry capabilities in the defence, aerospace, automation, and robotics sectors
- work with industry and government to investigate development of a Biofutures Hub
- work with industry to remove barriers to developing alternative crops and further expand aquaculture production
- work with Mackay Tourism to develop more commissionable tourism products and 'shovel-ready' projects

12.5.3.1.1 Port trade outlook implications, influences, impacts and threats

- No specific or immediately implementable implications apparent but remain open to the needs of possible new export trades and supporting import commodities they may demand.
- Potential for port trade enhancement from development in areas adjacent to ports

12.5.4 Other

- The Port of Mackay Access road project will improve connectivity between the Port of Mackay and Bruce Highway. Mackay Ring Road Stage 2 includes construction of an 8.2km highway from the Bruce Highway North intersection to Harbour Road intersection suitable for HPVs. Stage 2 of the project would see removal of all signalised intersections between the Port of Mackay and Peak Downs Highway
- Associated projects on the Eton Range section of the Peak Downs Highway would enable Performance Based Standards (PBS) registered vehicles to class 3A to make direct trips between the port and Bowen Basin coal mines and similar nearly destinations, with substantial efficiency and safety gains.

12.5.4.1.1 Port trade outlook implications, influences, impacts and threats

- Improved heavy vehicle access to the port including HPVs, increasing the catchment area of the port against competitor ports.
- The report's business performance summary reiterates trade statistics listed in 7.4.2.1. Approximately 99% of NQBP's total throughput across all ports are coal exports (142.7mt) and Bauxite exports (19.7mt) and are attributable to the Metallurgy (128.6mt) (metallurgical coal + bauxite + magnetite) and Energy (35.6mt) (thermal coal + fuel) industries.
- Of the 142.7mt of coal exported, 108.9mt was metallurgical coal and 33.8mt thermal coal.
- The Port of Mackay had an annual throughput of 3.18mt in 2019–20 with 195 vessel calls – broadly in line with 10-year averages. The sugar trade returned to normal volumes in this year, with drought conditions continuing to suppress grain trade.
- 2019-20 highlights include completion of Gudyara Road as a second access route to the port, which 'unlocking future land development opportunities'.

12.5.4.1.2 Port trade outlook implications, influences, impacts and threats

- The annual report highlights the need for NQBP to develop business and infrastructure plans aligned with the changing landscape surrounding NQBP's key trade commodities. Initiatives include unlocking land for future development opportunities, such as a biofutures precinct at the Port of Mackay facilitated by the Gudyara Road development
- However, the annual report notes that industries that are presently supported by NQBP ports (such as coal mining and associated industries) will continue to trade in the near-term and form NQBP's core business while the global energy transition and NQBP trade transition takes place.

12.5.4.1 International Energy Agency – World Energy Outlook 2020

The *International Energy Agency World Energy Outlook 2020*[556] provides a comprehensive view of how the global energy system could develop in the coming decades', with a key focus on the next 10 years and impact of the COVID-19 pandemic on the energy sector and near-term actions to accelerate clean energy transitions.

The report was published in October 2020 and assesses the demand for various energy sources in 2020 compared to previous years and explores several different possible energy demand scenarios, primarily focusing on the 10 years to 2030.

The report found that global energy demand was expected to drop by 5% in 2020, and energy investment by 18%. However, this varied significantly by fuel – coal experienced a 7% decline in demand, while demand for renewables increased 1%.

The report highlights the significant degree of uncertainty surrounding energy futures, and that it is too early to make any judgement on whether the COVID-19 pandemic will represents a setback for the broader clean energy transition or a catalyst that accelerates the rate of change, however all scenarios modelled by the IEA predict that 'COVID-19 has catalysed a structural decline in coal demand' that will never return to pre-crisis levels.

This is attributed to coal use for power generation being heavily affected by decreased electricity demand, its use in industry being affected by lower economic activity, and coal phase-out policies and growing competition from renewables and natural gas leading to the retirement of significant amounts of coal-fired capacity.

The report explores four key energy demand scenarios:

- STEPS – COVID-19 is brought under control in 2021 with the global economy returning to pre-crisis levels in that same year. This scenario reflects all announced policy intentions and targets that are backed by detailed measures
- Delayed Response Scenario – Same policy assumptions as STEPS except the global economy does not return to its pre-COVID-19 size until 2023.
- SDS – A surge in clean energy policies and investment sees the energy system achieve its sustainability objectives, including the Paris Agreement that would see global net zero by 2070. Same economic assumptions as in STEPS
- Net Zero Emissions by 2020 – extends the SDS to model what is required to achieve global net-zero emissions by 2050.

The IEA predicts that global coal demand, which was approximately 5000mtce in 2020, will decline in a broadly linear manner to 4750mtce in 2040 under STEPS (the strongest demand scenario for coal), 4200mtce in 2040 under delayed response scenario, and 1800mtce under SDS.

Coal demand is expected to increase in developing countries in Asia, however the IEA expects this will not be enough to offset large structural declines in demand from developed countries – in particular the European Union and the United States of America.

The IEA predicts that the global supply of low-carbon fuel in 2040 will be dominated by solid biomass under all scenarios, which is expected to have a global supply of 856 million tonnes of oil equivalent (mtoe) in 2040 under STEPS, and 1012 under SDS, compared to 530mtoe in 2020.

- There will be a small amount of trade in liquid biofuels (241mtoe in 2040 under STEPS, and 358mtoe under SDS, compared to 97mtoe in 2020).
- There will be some production of Biogases (144mtoe in 2040 under STEPS, and 221mtoe under SDS, compared to 4mtoe in 2020).
- Future supply of low-carbon hydrogen is highly uncertain but is expected to be relatively minor in all scenarios (10mtoe under STEPS in 2040, and 215mtoe under SDS).

[556] International Energy Agency. (2020). *World Energy Outlook 2020.* IEA. Retrieved from https://www.iea.org/reports/world-energy-outlook-2020

12.5.4.1.1 Port trade outlook implications, influences, impacts and threats

- The report noted a significant degree of uncertainty surrounding global energy demand into the future, however all scenarios modelled forecasted that global coal demand will not return to pre-COVID-19 levels, and that expected growth in demand from developing economies in Asia will not be enough to offset large declines in demand from developed economies (particularly the European Union and the United States of America).
- Potential for future port trade enhancement from development in new industries.

Port of Mackay:

- Coal dominates exports through NQBP ports and is Queensland's largest export commodity, which has substantial implications for the Port of Mackay as most commodities handled are either directly or indirectly related to coal mining activity.

12.5.4.2 BP Statistical Review of World Energy 2021

The *BP Statistical Review of World Energy 2021*[557] provides detailed statistics related to global energy production and demand.

Provides tables of key statistics related to energy reserves, production, and consumption by commodity and country.

According to the review, primary energy consumption fell by 4.5% in 2020, driven primarily by oil, natural gas, and coal, and partially offset by growth in wind, solar, and hydroelectricity production.

Coal consumption fell by 6.2 exajoules (EJ) (or 4.2%) in 2020, led primarily by the US and India. Coal consumption across Organisation for Economic Cooperation and Development nations fell to the lowest level in the available data series (which began in 1965).

China and Malaysia had some growth (0.5EJ and 0.2EJ respectively), though this was not sufficient to offset declines in other nations.

Coal production had declined by 8.3EJ (5.2%), driven primarily by large declines in the US, Indonesia, and Colombia. China had some production growth (1.1EJ), though again this was not sufficient to offset declines in other nations.

Renewable energy production (including biofuels and excluding hydro) rose by 9.7% (2.9EJ) in 2020, driven primarily by solar (1.3EJ) and wind (1.5EJ). China was the largest individual contributor to renewables growth (1EJ), followed by Europe (0.7EJ) and the US (0.4EJ).

12.5.4.2.1 Port trade outlook implications, influences, impacts and threats

- Reiterates the IEA's forecast of a decline in demand for coal in 2020, combined with strong growth in renewable energy production.
- Potential for future port trade enhancement from development in new industries.

12.6 Global shipping trends

12.6.1 Shipping trends

The United Nations Conference on Trade and Development (UNCTAD) in the *Review of Maritime Transport 2020*[558] projects that the volume of international maritime trade fell by 4.1% in 2020 due to supply chain disruptions, demand contractions and broader global economic uncertainty.

[557] BP. (2021). *Statistical Review of World Energy 2021*. Retrieved from https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf
[558] United Nations Conference on Trade and Development. (2020). *Review of Maritime Transport 2020*. United Nations. Retrieved from https://unctad.org/system/files/official-document/rmt2020_en.pdf

Challenges within the industry experienced throughout the pandemic have unfolded against the existing trend of elevated global trade tensions and policy uncertainty that has restricted the growth in global trade volumes and has driven a change in trade flows away from China towards other South East Asian economies.

The report noted a continuation of the overall trend towards 'fewer and larger ports experiencing more ship calls from bigger vessels'. This is expected to bring performance and connectivity benefits to the industry by reducing the overall time a vessel spends in port and helps carriers to generate economies of scale benefits (though the UNCATD notes these benefits are realized mostly by carriers and are not usually passed on). This trend often leads to a 'increase in demand for trucks, yard space, and intermodal connections, dredging, and larger cranes' in the ports that are classified as 'winners' of this trend.

The report noted that dry and liquid bulk freight rates have been highly volatile throughout the pandemic due to significant demand and supply imbalances. This is especially apparent for larger vessel types.

Efforts to reduce greenhouse gas emissions from international shipping remains a key long-term trend that includes initiatives to improve ship energy efficiency and adoption of alternative fuels. The report notes that the trend of newer, larger, and more efficient vessels replacing older less-efficient vessels has limited the growth of total CO_2 emissions from shipping activities while growing total global fleet tonnage.

The UNCTAD report notes that environmental efficiency improvements realized to date, including implementation of the IMO sulphur cap on 1 January 2020, will not be sufficient to meet the IMO target of reducing total annual greenhouse gas emissions by 50% from 2008 levels by 2050, with achievement of these targets requiring 'radical changes to propulsion and fuel technologies'.

Stakeholders consulted during production of the UNCTAD report identified the following key trends shaping the shipping industry that have emerged from lessons learnt throughout the pandemic:

- Maritime transport policy agendas and business planning will have a greater focus on resilience-building and enhanced risk-management and contingency planning.
- The slowdown of globalisation through increased 'onshoring' of supply chains and increased redundancy within supply chains will see a shift from the historic focus on 'just-in-time' supply chains to resilient supply chains. Initiatives specifically identified include:
  - diversification away from single country-centric sourcing towards diverse sourcing, routing and distribution channels
  - increased investment in warehousing and storage to ensure larger inventories can be maintained.
  - increased focus on developing onshore capabilities
  - an increased focus on digitization following the pandemic's demonstrated that first-movers in technological uptake (such as online platforms and electronic trade documentation) have proven more resilient to unexpected external events.
  - as a consequence of increased digitisation, cybersecurity is becoming a major concern in light of increased frequency of cyberattacks. This risk is expected to grow as the shipping sector become more digitised due to its economic importance.
  - the UNCTAD expects that the pandemic will drive stakeholders to explore new business opportunities to improve business resilience. It was noted that some shipping lines and port operators have been exploring opportunities in the inland logistics supply chain to become 'end-to-end logistics service providers'.

12.6.2 Global vessel size trends

There has been significant growth in the capacity of the global bulk carrier merchant fleet. **Figure 114** shows data from the UNCTAD on the carrying capacity of the global fleet, which has grown from 181.9 million DWT[559] in 1980, to 913.0 million DWT in 2021.[560]

[559] Deadweight Tonnes – a measure of the carrying capacity of a ship. It includes cargo, fuel, water, crew, provisions etc. For bulk cargo vessels, DWT is only marginally greater than the mass of the maximum cargo that can be carried.
[560] UNCTAD. (2021). *UNCTADSTAT – Merchant Fleet by flag of registration and type of ship, annual*. Retrieved from https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=93

Most of this growth has occurred in the last 10 years, when the global fleet increased by 67% from 547.2 million DWT to 913.0 million DWT.

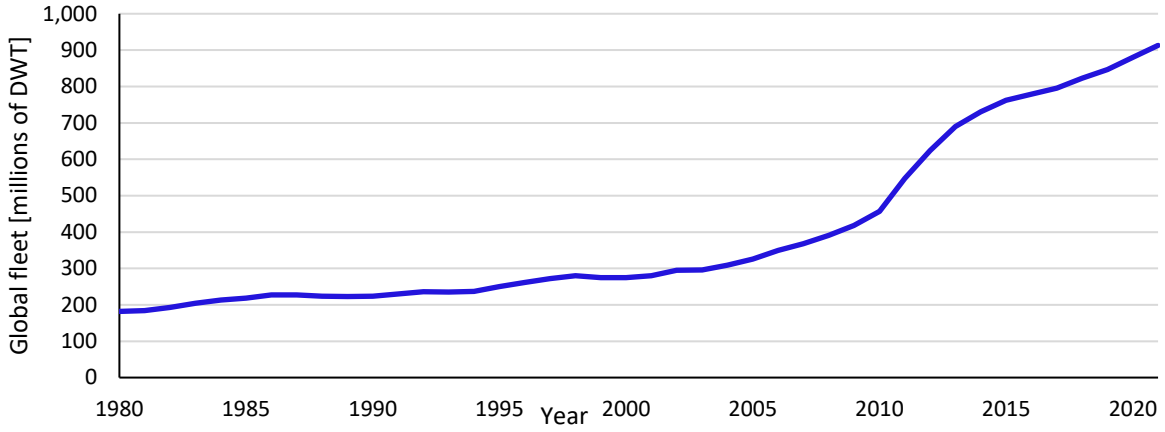

Figure 114: Size of Global Bulk Carrier Merchant Fleet in Deadweight Tonnes

This has been met with a comparatively smaller growth in the total number of bulk merchant vessels in the global fleet (**Figure 115**), from 8228 in 2011 (the first year for which data is available) to 12,325 in 2021, representing a 50% increase.[561]

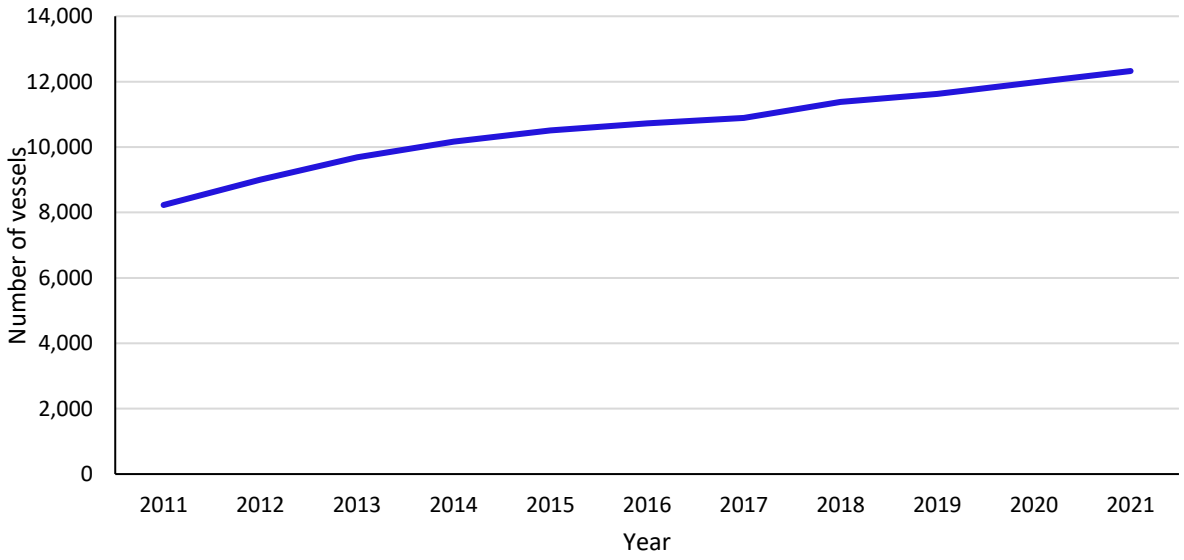

Figure 115: Number of vessels in global bulk carrier merchant fleet

The average bulk vessel size has increased by 11.4% from 66,504 DWT in 2011 to 74,080 in 2021 (**Figure 116**) as new bulk vessels have tended to be larger than those that they replace.

[561] *UNCTADSTAT – Merchant Fleet by flag of registration and type of ship, annual*. UNCTAD. Retrieved from https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=93

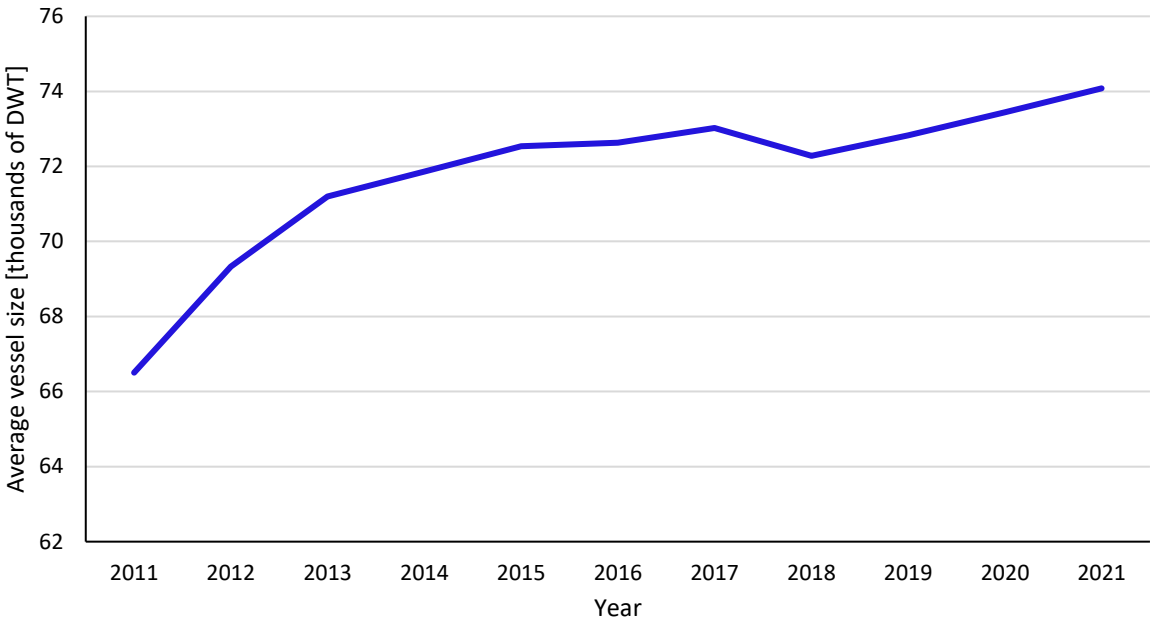

Figure 116: Average bulk carrier vessel deadweight tonnes across the entire global merchant fleet

12.6.3 Vessels and throughput

Port of Hay Point

The Port of Hay Point solely services dry bulk vessels. A summary of coal throughput and vessel statistics for the eight years to 2019–20 are provided in **Table 119** and shows strong historic growth in number of annual vessel visits, slower growth recently in coal throughput, and declining average tonnes per vessel, which are likely due to the preferences of purchases and what they are able to process in a single shipment.

Table 119: Hay Point coal throughput and vessel visits

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Coal exports (mtpa)	82.884	96.540	108.308	114.978	115.768	106.455	120.439	118.317	110.863	98.323
Vessel visits	809	883	1024	1087	1133	1062	1176	1195	1147	-
Average kilo tonnes (kt) coal /vessel	102.452	109.332	105.770	105.776	102.178	100.240	102.414	99.010	96.655	-

Over the fortnight on 8 and 22 July 2021, the port saw 66 vessel visits, comprising one Supramax vessel, 28 Panamax, 12 Neo-Panamax, 21 Capsize, and four Very Large Ore Carrier (VLOC)-class vessels. **Appendix R** shows a comprehensive list of vessel visits and classes over this period. The median sized vessel to call at the port over this period was a Neo-Panamax vessel with 229.96m LOA, 14.52m summer draft, 38m beam, and 92,589 DWT.

12.6.3.1 Relevance to port planning

A long-term global trend towards larger average vessel sizes, seen in UNCTAD's global merchant fleet data, is not expected to have a material long-term impact on the port given its existing capability to accommodate vessels up to a VLOC class.

Port of Mackay

The Port of Mackay[562] primarily services tanker and bulk carrier vessels, with period visits from other vessels types such as vehicle carriers and general cargo vessels.

A summary of vessel statistics for the four years to 2019–20 are provided in **Table 120**. The number of vessels over 30,000 gross registered tonnes (GRT) calling at Mackay increased by 113% over the five years to 2019–20, while the number of vessel visits between 20,001 and 30,000GRT decreased by 10% over the same period, showing an overall trend towards larger vessels. [563]

Table 120: Vessel sizes at the Port of Mackay

Financial Year	2015-16	2016-17	2017-18	2018-19	2019-20
<10,000 GRT	18	18	27	24	18
10,001 – 20,000 GRT	24	26	48	33	39
20,001 – 30,000 GRT	99	94	80	85	90
>30,000 GRT	23	17	30	46	49
Total	164	155	185	188	196

The median or 'typical' vessel of each class to call at the Port of Mackay over the fortnight 5 July 2021 to 19 July 2021 inclusive were:

- Tanker vessels (five vessel calls) – MR2 vessel with 182.7m LOA and 50,000DWT.
- Bulk carriers (five vessel calls) – Handymax vessel with 177.9m LOA and 33,990DWT.
- Vehicle carrier (one vessel call) – Handymax vessel with 179.5m LOA and 12,490DWT.

A summary of throughput and vessel statistics for the eight years to 2019–20 are provided in **Table 121** and shows a decline in annual vessel visits from 2011–12 to 2016–17 recovering in the following years, total throughput varying from year-to-year with an overall growth trend, and average tonnes per vessel varying from year-to-year with an overall growth trend.[564]

Table 121: Mackay annual throughput and vessel visits

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Total throughput (mtpa)	2.713	3.270	3.074	2.900	2.829	2.907	3.008	2,911	3,178	3,182
Vessel visits	216	209	223	173	164	155	185	188	196	-
Average kt per vessel	12.560	15.646	13.785	16.763	17.250	18.755	16.260	15.484	16.214	-

12.6.4 Ship size limitations at the Port of Mackay

The maximum vessel size able to be accommodated at the Port of Mackay is 230m LOA with a 32.2m beam and maximum berthing displacement of 55,000mt depending on berth.

However, vessels with LOA greater than 200m are only accepted on a case-by-case basis at the direction of the Regional Harbour Master.

Each berth at the Port of Mackay has the following size limits:

- M1 – Bulk liquids, tallow, ethanol, general cargo, break-bulk, and larger cargo – maximum allowed vessel LOA of 210m with a 10.6m berth design depth
- M3 – Bulk sugar – maximum LOA of 225m with a 13m berth design depth

[562]Maritime Safety Queensland. (2021). *Ship Movements*. Retrieved from https://qships.tmr.qld.gov.au/webx/
[563] Department of Transport and Main Roads. (2020). *Trade Statistics for Queensland Ports*. Retrieved from https://www.tmr.qld.gov.au/-/media/busind/Transport-sectors/Ports/Trade-statistics/Master-data-Trade-Statistics-2018-2019.xlsx?la=en
[564] North Queensland Bulk Ports Corporation. (2020). *Annual reports 2011/12 to 2019/20*. Retrieved from https://nqbp.com.au/about-us/publications

- M5 – Grain, fertilizer, magnetite, break-bulk, and general cargo – maximum LOA of 230m with a 12.5m berth design depth
- Mackay Marina – maximum LOA of 50m with a 3.5m berth design depth.

The port also has the following conditions of trip to ensure safe handling of vessels within the channels and swing basin:

- Vessels 'be ballasted loaded to have an even keel or trimmed by the stern with not more than 2.5m stern trim and the propeller fully submerged'
- Vessels trimmed by the heads or listing are not permitted
- Ships should be suitable trimmed and able to be put to sea at 24 hours' notice – especially during cyclone season (1 November to 30 April).
- Cement, as an input to underground mine stabilisation and general construction
- Ethanol, as a sugar refining by product used for fuel and as an industrial ingredient
- Molasses, which is a by-product from sugar refining used for stockfeed and as a bakery and food ingredient
- Tallow, a by-product from animal meat processing
- Commodities handled in the past but not recently include molasses, machinery (now classified as break bulk), steel, sulphuric acid and motor vehicles.

12.6.5 Relevance to port planning

A long-term global trend towards larger average vessel sizes, seen in UNCTAD's global merchant fleet data and Port of Mackay vessel visit statistics, has the potential to pose an ongoing impact to the port by:

- increasing the average size of vessels calling at the port
- increasing the number of vessels calling that operate near or at the port's vessel size limits
- increasing the potential that a vessel could exceed Mackay's size restrictions and bypass the port entirely.

12.7 Summary

Port of Hay Point

Coal exports make up all of the Port of Hay Point's trade. It has two coal export terminals. Exports are variable from year-to-year but showed an overall growth trend from 82.9mt in 2011–12 to 98.3mt in 2020–21.

Strong historic growth in the number of vessel visits has been evident at the port, increasing from 809 in 2011–12 to 1147 in 2019–20. Most coal exported from the port was metallurgical coal at 94.0mt in 2019–20 (85% of total throughput), compared to 16.82mt of thermal coal (15% of total throughput). The long-term outlook for coal is uncertain. Most commentators forecast a more pessimistic outlook for thermal coal than for metallurgical coal.

The longer-term threat to metallurgical coal exports comes from the transition of steel production processes to technologies which do not require as much/any metallurgical coal. Specific technologies identified include, electric arc furnaces (which use no metallurgical coal), hydrogen-based processes, production from gasified thermal coal and gas-based production. Queensland Treasury's *A Study of Long-Term Global Coal Demand*[565] concludes that India will increasingly become the key export market for Australian metallurgical coal in the long term. The extent to which this growth will offset the decline in demand from other nations driven by adoption of alternative production processes, and the rate of this production transition, are not yet clear. This is identified as the primary underlying driver behind metallurgical coal's conflicting demand forecasts.

[565] Queensland Treasury. (2020). *A Study of Long-Term Global Coal Demand*. Queensland Government. Retrieved from https://s3.treasury.qld.gov.au/files/A-Study-of-Long-Term-Global-Coal-Demand.pdf

The Queensland Treasury's *A Study of Long-Term Global Coal Demand* notes a decline in thermal export coal demand with little likelihood of a significant production increase in Central Queensland due to significant up-front costs amid a highly uncertain and transitioning market, associated difficulty in securing financing and investment, decisions by key players to cease involvement in the coal supply chain and community activism.

The long term and structural challenges facing thermal coal have been manifest in the decisions by large mining groups including Anglo American, BHP, Rio Tinto, and South32 to exit the thermal coal business in its entirety in recent years.

Port development outlook

The trend is towards fewer and larger ports experiencing more ship calls from bigger vessel. More efficient loading and unloading equipment will also assist to reduce the time each vessel spends in port. These factors generate economies of scale benefits.

However, the shift to larger vessels has led to an increase in demand for deeper channels, larger berths and greater capacity landside infrastructure at the ports.

Like major coal exporting ports worldwide, the port will be impacted by longer term demand trends from coal exporters in assessing any increases in port capacity and will have the opportunity to seek repositioning and repurposing of existing infrastructure to support emerging regional industries.

International sentiments concerning thermal coal in the context of climate change and renewable energy alternatives could have a substantial impact in the short to medium term.

Demand for metallurgical coal is likely to remain in the medium term due to a lack of alternatives for steel making and likely ongoing strong demand for steel.

Climate change may increase the proportion of poor seasons for grain, from increased drought and potential for greater impact from pests, diseases and possibly fire.

Port of Mackay

The Port of Mackay is a multi-commodity port. Trade at the port primarily consists of petroleum product imports (53% of total throughput in 2019–20) and exports of raw and refined sugar (33% of total throughput in 2019–20).

Total throughput for the port was variable from year-to-year but presents an overall growth trend from 2,713,000 tonnes in 2011–12 to 3,177,893 in 2019–20. This comprised a decline in export throughput and growth in imports over this period.

The peak throughput year was 2012–13 (3.270mt) and the lowest throughput year was 2011–12 with 2.713mt.

The port services a mix of tanker, bulk carrier, and vehicle carrier vessels. It has seen a variable number of annual vessel visits, declining 216 in 2011–12 to 155 in 2016–17 and increasing to 196 in 2019–20.

The maximum vessel size able to be accommodated at the Port of Mackay is 230m LOA with a 32.2m beam and maximum berthing displacement of 55,000mt depending on berth. However, vessels with LOA greater than 200m are only accepted on a case-by-case basis at the direction of the Regional Harbour Master.

Port development outlook

There is increasing effort by the Queensland Government to develop gas fields and 'new economy minerals' in Bowen and the North West Minerals Province that have potential to generate trade in supporting commodities for the port.

The trend is towards fewer and larger ports experiencing more ship calls from bigger vessel. More efficient loading and unloading equipment will also assist to reduce the time each vessel spends in port. These factors generate economies of scale benefits.

However, the shift to larger vessels has led to an increase in demand for deeper channels, larger berths and greater capacity landside infrastructure at the ports.

The Port of Mackay needs to consider longer-term demand trends from commodities related to coal mining activities and agricultural production in assessing any increases in port capacity.

The port is vulnerable to any downturn in coal mining and from seasonal factors affecting grain, sugar and value added products from sugar such as molasses and ethanol.

International sentiments concerning thermal coal in the context of climate change and renewable energy alternatives could have a substantial impact in the short to medium term.

Demand for metallurgical coal is likely to remain in the medium term due to a lack of alternatives for steel making and likely ongoing strong demand for steel.

The outlook for sugar appears stable, but challenges exist in international price competition.

Climate change may increase the proportion of poor seasons for grain, from increased drought and potential for greater impact from pests, diseases and possibly fire.

13.0 Port optimisation and forward planning

13.1 Introduction

Forward planning by a port authority or infrastructure lessee or owner is vital to make the best, most efficient use of the land and assets available. Continual development at the port is required to best serve current markets/customers and future markets not currently being accommodated.

Port master planning will consider the development of new infrastructure and expansion of existing infrastructure where required and prioritising the optimisation of existing infrastructure to adapt to changing markets and shipping trends. This process aims to minimise capital and operational expenditure while meeting market demand and providing quality of service for users/customers.

This section focusses on industry practices for forward planning, with an emphasis on optimisation, and site-specific considerations, relating to the characteristics of the port and existing infrastructure. Comments are provided on the planning and optimisation measures already in place and areas where further optimisation could potentially be achieved.

Local and national strategic plans exist for the port, including specific planning documents. There are new and growing industries, outside of those currently served by the port, which could justify development and expansion, including hydrogen and other renewable energy production. The continued optimisation of existing port facilities to handle existing cargo in the safest and most efficient way possible is a priority.

A number of upgrade projects have been recently completed or are in progress that will optimise operations and expand capability allowing for capture of new and additional cargo volumes.

13.2 International, national, state, and local policy, documents

Planning and optimisation should be undertaken in alignment with international, national, state, and local policy. Relevant documents include:

- *National Ports Strategy*, 2011[566]
- *Leading Practice: Port Sustainability Strategy Development Guide – Approaches and Future Opportunities 2020*[567]
- *Leading Practice: Port Master Planning – Approaches and Future Opportunities 2013*[568]
- *Leading Practice: Port and Supply Chain Protection – Current Practice and Future Opportunities 2014*[569]
- *North East Shipping Management Plan*[570]
- QTRIP[571]
- Reef VTS[572]
- NQBP related business documents and strategies
- *Sustainable Port Development Guidelines*.[573]

[566] Infrastructure Australia. (2011). *National Ports Strategy.* Retrieved from https://www.infrastructureaustralia.gov.au/sites/default/files/2019-06/COAG-National_Ports_Strategy.pdf
[567] Ports Australia. (2020). *Leading Practice: Port Sustainability Strategy Development Guide – Approaches and Future Opportunities 2020*.
[568] Ports Australia. (2013). *Leading Practice: Port Master Planning – Approaches and Future Opportunities August 2013.*
[569] Ports Australia. (2020). *Leading Practice: Port and Supply Chain Protection – Current Practice and Future Opportunities 2014.*
[570] Australian Maritime Safety Authority. (2014). *North East Shipping Management Plan. Australian Government.*
[571] Department of Transport and Main Roads. (2021). *Queensland Transport and Road Investment Program 2021-22 to 2024-25*.
[572] Australian Maritime Safety Authority. (2022). *Great Barrier Reef and Torres Strait Reef Vessel Traffic Service: User Guide - 2022*. Australian Government.
[573] North Queensland Bulk Ports Corporation Limited. (2018). *Sustainable Port Development Guidelines.* NQBP. Retrieved fromhttps://nqbp.com.au/__data/assets/pdf_file/0016/2680/Revision-3-Sustainable-Port-Development-Guidelines-20180312.pdf

National, state, and local infrastructure planning strategies as well as approved infrastructure projects for the site are described in **Section 11**. Future planning and approvals of new infrastructure would need to be in accordance with the regulatory frameworks.

NQBP planning documents include the *Land Use Plan for the Port of Mackay*[574] which aims to achieve sustainable and carefully planned development that will meet future demand and support and grow the local and national economy. The plan provides a framework and processes for forward planning and highlights some of the key consideration and desired outcomes for development. Land use designations and proposed uses are provided which will be an input into the master planning process.

13.3 Key approaches, principles, and operations relating to port optimisation and forward planning

Port optimisation is typically a process of further developing or upgrading existing infrastructure to improve operational efficiency or to make changes to serve a different purpose or market need. Port optimisation should be carefully planned and form part of the overall port master planning process.

This planning process will involve:

- Market analysis and forecasting to understand what is and will be needed from the port infrastructure.
- existing conditions analysis to assess the existing infrastructure with respect to condition, functionality, and opportunities/constraints impacting potential upgrades and expansion.
- strategic planning and port zoning to derive a clear plan for the future layout and function of the port.
- legislation, stakeholder engagement and approvals to ensure the proposed measures are feasible and aligned with goals and objectives of key stakeholders before optimisation measures are put into practice.

Optimisation can relate to the physical infrastructure at the port, including fixed infrastructure and cargo handling equipment, but also the management and processes used to operate the port such as automation, software, and technology. Every aspect of how the cargo moves through the port, from arrival, handling, storage, and departure can be optimised to facilitate the most effective and efficient process which will in turn reduce costs and improve service.

Optimisation of physical infrastructure can involve strengthening of structures, marine navigation improvements, new cargo handling equipment, adjusting handling systems, changing procedures, or potentially the reconfiguration of berths and yard areas to improve operations or to cater for new operations.

Processes may be optimised through use of new software and technology to better manage labour, plan for maintenance, and to reduce operational downtime.

Some of the key considerations which are currently being discussed and incorporated in master planning and optimisation of port terminals globally include:

- changing markets and demand, such as changes in energy sources and growth of tourism industries.
- identifying and packaging land and infrastructure in a form that is of interest, and in a way that the information is accessible for new entries and expansions (easier investment decisions and pathways).
- automation and modernization of ship berthing, cargo handling, and road/rail gate processes.
- improved software and the use of Artificial Intelligence for onsite operations but also related to the road/rail/ship transport outside of the port and better managing and predicting arrivals.
- resiliency of ports in relation to water levels and environmental conditions, ensuring that existing infrastructure is protected and new infrastructure is designed with consideration for future conditions.
- wider adoption of digital twin, discrete event and element simulations, and real time monitoring and data collection that assist the calibration of models. Digital twin technology can use real time data to better

[574] North Queensland Bulk Ports Corporation Limited. (2009). *Port of Mackay Land Use Plan.* Retrieved from https://nqbp.com.au/__data/assets/pdf_file/0015/3273/Port-of-Mackay-Land-Use-Plan-December-2009.pdf

manage operations/processes and to create simulations to test optimisation scenarios and see outcomes without risking impact to real operations.

- asset management and GIS allowing ports to better monitor condition of assets and to plan for required improvements/upgrades and associated costs.

13.4 Existing and planned port optimisation and forward planning

An overview of the different areas of potential optimisation within a port are given in the subsections below, together with a site-specific summary of implemented optimisation/forward planning measures and areas for further investigation that could identify additional opportunities.

The Port of Mackay is a multi-use port serving a large number of different industries and customers. Unlike neighbouring ports such as Abbot Point and Hay Point which primarily handle a single cargo (coal) with a small number of users/customers, the mixed-use nature of facilities gives a great deal of opportunity for optimisation, but also adds complexities to the master planning process with a large number of stakeholders with whom early engagement will be key.

13.4.1 Terminal optimisation

Port of Mackay

A $4 million contract in May 2022 was awarded to upgrade the western approach deck to Wharf 5 at the port to enable its removal and replacement. NQBP is also investing more than $4 million over three separate projects in 2022 to improve the water network across the Port of Mackay.

The construction of a new tug facility inside the port for its critical towage operation has recently been completed. This facility will accommodate up to two tugs including a gangway and floating pontoon which can accommodate bigger and more powerful tugs.

Other improvements include an upgrade to Wharf 4 expanding cargo capacity and an extension to Wharf 1 improving its capacity to handle longer break-bulk capacity. The western revetment inside the port was established and street lights upgraded in the southern breakwater. Maintenance dredging competed in 2020 to maintain efficient operations of the port was the first maintenance dredging taken place at the port since 2013.

Port of Hay Point

DBT is leased by DBI from the Queensland Government. As part of its lease arrangements, DBI is required to regularly publish a Master Plan for the terminal. DBI recently published its latest report entitled *Master Plan 2021 - Expansion Opportunities at Dalrymple Bay Terminal*.[575] This report analyses expected future supply and demand considerations and outlines an incremental expansion pathway for DBT that has included optimisation of existing infrastructure, while identifying critical environmental issues relevant to the expansion projects.

For its HPCT, BMA ensures it is operated and managed to optimise terminal performance, but as a privately owned terminal, it is not required to publicly report on these activities.

13.4.2 Navigation

Port of Hay Point

Existing navigation channels and turning basins can be widened, deepened, or realigned to cater for increasing ship sizes or different ship types for new cargo types. This will typically involve capital dredging and addition of new aids to navigation such as channel markers and leading/range lights.

The *Port of Hay Point Long-term Maintenance Dredging Management Plan*[576] discusses the overall strategy for managing dredging operations, the nature of the material to be dredged, summarises historic dredging

[575] Dalrymple Bay Infrastructure. (2022). *Master Plan 2021 Expansion Opportunities at Dalrymple Bay Terminal*.
[576] Adaptive Strategies. (2018). *Port of Mackay Long-term Maintenance Dredging Management Plan.*

campaigns, and likely future dredging requirements. Key information is summarised in **Section 11** under Infrastructure and includes details of historic maintenance dredging, highlighting the issues associated with accretion of seabed sediments, particularly in storm events, resulting in 'high spots' or 'high areas'. It has been estimated that maintenance dredging in critical areas of the port will be needed approximately every three years.

The Port of Hay Point SSM report was undertaken by NQBP from 2015 to 2017. This report recommended a 25-year maintenance dredging strategy to help minimise constraints and delays to operations.

Major expansion projects will likely require capital dredging for berth pockets and possibly for improvements to channels, and updates to overall maintenance dredging strategies will be required. While no new berths are currently approved, expansion is feasible.

New industries, such as hydrogen, would involve new berths with specific navigation requirements. Note that capital dredging campaigns will typically involve community and agency engagement through a TACC has been established for the port to ensure the environmental risks are adequately managed.

Major expansion may require capital dredging to deepen the existing berths and provide deeper channels for access to accommodate larger, deeper draft ships, although sedimentation and maintenance dredging costs would need to be considered to determine feasibility. Note that this approach may need simultaneous upgrades to other infrastructure elements to realise the operational benefits, such as strengthening of the jetty structures, providing ship loaders suiting the larger vessels, and having landside storage and rail capacity to suit larger parcel shipments. The DBT 8X project would involve such measures although marine works are not proposed.

In the port, larger ships depart through a dredged channel. Due to the depth requirements of larger ships when fully loaded, departures can be tidally limited, or cargo sizes limited to meet available water depths for their assigned departure window. A deeper channel would improve port efficiency, but this may be problematic with the existing channel being partly located in the GBRMP.

Deepening or expanding the berths at the Tug Harbour and MOF located to the south of the coal jetties is another possibility. Upgrades to the MOF and expansion of the tug facility could be investigated particularly if new facilities to enable hydrogen export are required and lead to increased vessel traffic. Such an expansion would likely require additional tugs.

Optimisation is achieved through regular surveys of the existing channels and berth pockets, and careful planning of required maintenance dredging so that sedimentation and the dredging activity itself has no impact on berth availability or allowable vessel draft. Existing plans show appropriate planning and management of this aspect of the port operations. Plans should be reviewed and updated regularly as required to maintain an accurate schedule for future maintenance dredging particularly with the introduction of new facilities. Where possible, dredge material should be reused in concurrent projects in order to minimise disposal costs.

The port uses a DUKC system at the port. A DUKC system allows the port to optimise channel access for deeper draft vessels using real-time modelling of tides and water conditions. OMC International reports that a DUKC system can allow large ships to safely sail up to 1m deeper allowing them to carry more than 15,000 extra tonnes of bulk product like coal.[577] The Port of Hay Point was the first port in the world to implement a DUKC system as part of its ongoing port optimization activities. It has been in operation since 1993.

Port of Mackay

Existing navigation channels and turning basins can be widened, deepened, or realigned to cater for increasing ship sizes or different ship types for new cargo types. This will typically involve capital dredging and addition of new aids to navigation such as channel markers and leading/range lights.

The port is contained within rock breakwaters with dredged berths and swing basin within the harbour. The navigation path outside of the harbour for the most part uses natural water depth with the harbour entrance being dredged to maintain navigable depths.

The *Port of Mackay Long-term Maintenance Dredging Management Plan*[578], discusses the overall strategy for managing dredging operations, the nature of the material to be dredged, summarises historic dredging campaigns, and likely future dredging requirements. Key information is summarised in the infrastructure

[577] OMC International. (n.d.). *The DUKC Story*. Retrieved from https://omcinternational.com/about/dukcstory/
[578] Adaptive Strategies. (2018). *Port of Mackay Long-term Maintenance Dredging Management Plan.*

Section 11 and includes measurements of historic maintenance dredging highlighting efforts undertaken recently to better understand sedimentation rates and bathymetric changes in the navigational areas of the port. This analysis helps to estimate the future sedimentation within the port and therefore estimate the future sediment management requirements.

A SSM report[579] has been undertaken for the port to investigate the most sustainable way to manage accumulated sediment in and around the port. This report recommended a 25-year maintenance dredging strategy to help minimise constraints and delays to operations.

The majority of historic maintenance dredging has been inside the harbour, at the berths, swing basin, and harbour entrance. Some capital dredging projects have been completed in the last 20 years.

Major expansion projects, either inside or outside the harbour, would likely require capital dredging for berth pockets, manoeuvring areas, and new approach channels. While no new berths are currently approved, expansion of existing infrastructure is possible, although space for new berths is limited.

Major expansion may require capital dredging to deepen the existing berths and provide deeper channels for access to accommodate larger, deeper draft ships, although sedimentation and maintenance dredging cost would need to be considered to determine feasibility. Note that this approach may need simultaneous upgrades to other infrastructure elements to realise the operational benefits, such as strengthening of the jetty and quay structures, tug size, providing handling equipment suiting larger vessels, and having landside space available to suit cargo demand.

For maintenance dredging, optimisation is achieved through regular surveys of the existing dredged areas, and careful planning to ensure that sedimentation and the dredging activity itself has no impact on berth availability or allowable vessel draft. As noted earlier, detailed planning for maintenance dredging has already been undertaken by NQBP and there is a good understanding of historic and future activity. Plans will need to be reviewed and updated regularly to maintain an accurate schedule for future maintenance dredging. Where possible, dredge material should be reused in concurrent projects in order to minimise disposal costs and ensure use of this resource.

In terms of management processes and tools used for navigation, there is potential to adopt the use of DUKC as shipping frequency increases, similar to that used at the Port of Hay Point.

13.4.3 Coastal structures

Port of Hay Point

Coastal structures such as breakwaters can provide protection for ships during approach, berthing, and mooring. In general, apart from the safety benefits, the use of breakwaters provides easier and quicker manoeuvring of ships, however, breakwaters are not practical (other than for the Tug Harbour) due to the natural deepwater in the port.

The coal jetties are located in open water with no artificial protection, although the foreshore at the abutment of the access trestle to the berths has a rock revetment to protect the abutment from wave attack and prevent coastal erosion. The Tug Harbour and MOF located to the south has rock breakwaters and revetments at the shore and on the sides of the MOF approach. For each of these elements, the key function is to protect the shoreline and the marine structures to ensure the facilities can operate in a broader range of weather conditions.

Optimisation in relation to these protection structures primarily involves asset management rather than design changes, including planning for inspection, condition assessment and repairs when required. While storm damage is sometimes unavoidable, having a process in place for sourcing materials and undertaking quick repairs will help to minimise risk of damage to the protected structures and subsequent impact to the cargo handling operations. To increase capacity of the harbour, extending the breakwater could be investigated.

[579] Adaptive Strategies. (2018). *Port of Mackay Long-term Maintenance Dredging Management Plan.*

Port of Mackay

Coastal structures such as breakwaters provide protection to ships during approach, berthing, and mooring. The Port of Mackay already has an effective protected harbour, however there may be potential to provide extra rock wall protection at the Harbour entrance to further improve ship safety during adverse weather conditions.

Optimisation in relation to these protection structures primarily involves asset management rather than design changes, including planning for inspection, condition assessment and repairs when required. While storm damage is sometimes unavoidable, having a process in place for sourcing materials and undertaking quick repairs will help to minimise risk of damage to the protected structures and subsequent impact to the cargo handling operations.

The port has significant spare shipping capacity and an expansion of the harbour is unlikely to be justified during the life of the Master Plan.

13.4.4 Berths

Port of Hay Point

Existing berths can be optimised through expansion, structural changes, changes to cargo handling equipment, or through reconfiguration. Modifications such as strengthening, upgrades to bollards/hooks and fenders, and berth deepening can allow existing berths to accommodate larger ships. Aligned with this is consideration for resiliency and maximising operational life of the facilities, with a focus on climate change and future design conditions.

The type and position of a berth can be a constraint for certain cargo types. For example, offshore jetties connected to the shore by an approach trestle would be suitable for the transfer of liquid and dry bulk cargo, but not best suited for the ship to shore transfer of container of break bulk cargo due to the lack of protection from wave action and working space at the berth.

The coal berths encompass pile structures to support ship loaders, conveyors and access roadway as well as piled berthing and breasting dolphins. Optimisation of the function of the berths can either be in the form of upgrades to increase functionality (such as accommodating larger ships) or through improvements in asset management and maintenance to ensure that the current function is maintained for as long as possible, while minimizing impacts or risk of impacts to the ship to shore handling operation.

Berth upgrades and deepening for larger ships may be feasible and can be explored for a particular market need. New berths and associated marine structures will be needed for new facilities and should be designed to suit the required operation, cargo type and design vessel.

For all existing structures, focus should be on protective measures including regular above and below water inspections, proactive protection/treatment of structural members, and resolving damage issues quickly when identified. The same applies to the MOF ramps and tug facility structures.

Port of Mackay

Existing berths can be optimised through expansion, structural changes, changes to cargo handling equipment, or through reconfiguration. Modifications such as strengthening, upgrades to bollard and fenders, and berth deepening can allow exiting berths to accommodate larger ships. Aligned with this is consideration for resiliency and maximising operational life of the facilities, with a focus on climate change and future design conditions.

The four operational berths are all piled structures but have varying configuration and topside equipment to suit cargo handling need. Wharves at each of the berths are all multi-purpose to some extent but have limitations such as size, access, presence of permanent handling equipment, and other obstructions. There are means of optimising specific cargo handling activities but any changes need to consider impacts to other cargo functions. For example, installation of liquid bulk loading arms on Wharf 1 to replace hose operations would benefit petroleum operations but could obstruct access for mobile cranes for breakbulk.

A number of refurbishment and sustainment projects are planned over the next few years such as the Wharf 5 approaches replacement and the middle breakwater pipeline realignment. Recently work was completed on upgrades to Wharf 1 to provide wider access for long project cargo. Wharf 4 has undergone deck upgrades to improve access and increase load capacity. These projects should enable the port to capture future additional cargo for rail, pipeline, or renewables projects.

It is understood that a new tug berth facility is planned adjacent to Wharf 5 including a floating pontoon to accommodate two tugs. This will enable the relocation of the tug berths from the small craft harbour to the main harbour and allow for expansion of leisure craft capacity. The small craft marina itself at the south of the harbour encompasses pontoons and berths for leisure craft as well as pontoons for tug mooring and is not part of port operations.

For each of the berths, upgrades and deepening for larger ships may be feasible and could be explored for a particular market need if required. New berths and associated marine structures will be needed for new facilities and should be designed to suit the required operation, cargo type, and design vessel.

For all existing structures and facilities, focus needs to be on upgrades where feasible, but also maintenance and protective measures including regular above and below water inspections, proactive protection/treatment of structural members, and resolving damage issues quickly when identified.

13.4.5 Cargo handling equipment

Port of Hay Point

Optimisation of cargo handling equipment and processes may involve the installation of newer equipment with quicker and safer material handling. In the event that the function of an existing facility is to be changed for a new cargo, from dry bulk to liquid bulk cargo for example, material handling equipment can be replaced altogether to make use of existing berth infrastructure for a different purpose.

The limited alternative market opportunities identified coupled with the nature of the infrastructure used for bulk coal transport means that the use of the existing coal jetties for a different cargo/purpose is unlikely. The jetties could be used for additional similar cargo types if capacity was available, but this would likely require separate agreements and cleaning of handling systems between products. It is difficult to see this as an effective expansion path unless the primary coal export volumes are in substantial decline.

The existing cargo handling equipment at both coal facilities includes the ship loaders at the berths, the conveyor systems running along the berth and back to shore along the access trestle, stacker reclaimers at the landside stockpiles, and the conveyors and transfer stations for the rail operation. Assuming no major changes to ship and parcel size, the available means of optimising the operation is to improve cargo handling speed and efficiency.

To identify what changes can be made to improve speed and efficiency, an in-depth review of each of the handling processes and interfaces would be required to understand what elements are limiting and where the bottlenecks exist. For example, improving the productivity of the ship loaders may have no impact on the speed of transport if the conveyor speed is limiting. This is a key area where Digital Twin and other modelling may identify opportunities. This type of optimisation is regularly undertaken at both DBT and HPCT.

At DBT, a number of measures/improvements to the infrastructure and operational processes are already approved as part of the DBT 8X project, including improved outloading optimisation through augmented yard machinery controls to increase reclaim rate, the addition of an inner rail loop, rail receival dump station and in-loading conveyor, and the installation of a new shiploader.

For all facilities, regular inspection, condition assessment and planned maintenance/cleaning is undertaken as part of a well-maintained asset management system. Planned and unplanned downtime for equipment can be a significant constraint on the cargo handling process and minimising the downtime and subsequent impacts should be a priority.

Port of Mackay

Optimisation of cargo handling equipment and processes may involve the installation of newer equipment with quicker and safer material handling. In the event that the function of an existing facility is to be changed for a new cargo, from dry bulk to liquid bulk cargo for example, material handling equipment can be replaced altogether to make use of existing berth infrastructure for a different purpose.

The Port of Mackay unlike the neighbouring Ports of Hay Point and Mackay, has the existing infrastructure and functionality to capture alternative cargo and new customers without the need for new greenfield expansion. However, there are many ways in which existing berths can be maintained and optimised.

Wharves 3, 4, and 5 each have a ship loader for exporting sugar or grain, and conveyors run out to the wharves from landside silos and storage sheds. Wharves 1, 3, 4, and 5 also have pipelines of various sizes which

connect to tank farms located towards the south of the port. Assuming no major changes to ship and parcel size, the available means of optimising the operation is to improve cargo handling speed and efficiency, maintain existing infrastructure to reduce downtime and operational costs, and to prolong operational life of the infrastructure. As berth occupancy increases, reducing vessel call time becomes a priority and upgrades could be feasible to achieve this.

To identify what changes can be made to improve speed and efficiency of each different cargo type/operation, an in-depth review of each of the handling processes and interfaces is required to understand what elements are limiting and where the bottlenecks exist. This is a key area where Digital Twin and other modelling may identify opportunities. All parts of the process must be assessed together since independent improvements may alone provide no benefit. For example, increasing pipeline size could provide ability to unload tankers quicker, but the ships pumps may limit speed of unloading.

For all facilities, regular inspection, condition assessment and planned maintenance/cleaning should be undertaken as part of a well-maintained asset management system. Planned and unplanned downtime for equipment can be a significant constraint on the cargo handling process and minimizing the downtime and subsequent impacts should be a priority.

13.4.6 Cargo storage

Port of Hay Point

The layout of the onshore yard areas is typically arranged to suit the specific cargo being handled and the nature of the cargo. A change in cargo type will typically require a change to the physical infrastructure within the yard such as pavement, presence of material handling equipment, and provision of utilities such as lighting and power. In the case of additional similar dry bulk products, new infrastructure would be required for the new product (or partial replacement of existing infrastructure) and the handling and cleaning systems (including wastewater treatment) will need to be upgraded for the combined purpose.

With the primary cargo type unlikely to change in the short to mid-term, changes to the overall storage yard/stockpile layout is unlikely. However, there may be an opportunity to review the use of the surrounding yard areas not part of the main stockpiles, to make small improvements to the overall port operation.

Optimisation of stockpile operation has already been undertaken by the operators of both coal terminals in the port and this is an ongoing task to ensure continued maximum efficiency. As noted with other elements, this needs to be assessed in conjunction with upstream and downstream parts of the operational processes to determine whether increased capacity is needed.

Port of Mackay

The layout of the onshore yard areas is typically arranged to suit the specific cargo being handled and the nature of the cargo. A change in cargo type will typically require a change to the physical infrastructure within the yard such as pavement, presence of material handling equipment, and provision of utilities such as lighting and power.

At the port, the yard storage areas have distinct uses due to the nature of the infrastructure required to store the cargo. Silos and sheds for sugar, grain, fertiliser and other cargo are located towards the north of the port, close to Wharves 3, 4, and 5. Petroleum tank storage is located to the south of the port behind the small craft marina. A number of areas exist within the port which could be used for expansion of tank farms, silo and shed storage, or paved staging for project cargo and other materials able to be stored outside, however distance to the existing wharves may limit their practical use. Future needs and allocation of land will need to form part of the master planning process.

As noted with other elements, the need for additional storage capacity and yard space should be assessed in conjunction with upstream and downstream parts of the operational processes to first understand whether increased capacity is required.

For all facilities, regular inspection, condition assessment and planned maintenance/cleaning should be undertaken as part of a well-maintained asset management system. Planned and unplanned downtime for the storage tanks/silos, buildings, and associated handling equipment can be a significant constraint on the cargo handling process and minimising the downtime and subsequent impacts should be a priority.

13.4.7 Landside transport links

Port of Hay Point

The port has rail and road connections, but the primary cargo being coal arriving by rail for export, it is the rail infrastructure that has a major impact on the port's operations. The rail line that leads to the port is part of the Goonyella Rail System, which is owned by Aurizon and services the Bowen Basin in Central Queensland.

The port, rail and mines all form part of an integrated network- delays or inefficiencies in any part of the network can affect the capacity of the whole system. As the owner of the rail system, Aurizon already seeks to optimise the rail component. Aurizon's *Network Technical Strategy 2016*[580] is designed to deliver improved productivity and efficiency in the CQCN. The Aurizon *Network Development Plan 2019*[581] notes that a concept study is being undertaken looking at increasing the capacity of the Goonyella Rail System, with demand scenarios up to 165mpta.

Should a broader cargo mix be considered, the arrangement of port gates and transfer zones related to the arrival/departure of cargo varies for different cargo types.

Port of Mackay

The port has rail and road connections to the industries located inland. The rail infrastructure in particular will have a major impact on the port's operations. Maintenance and improvements to the rail infrastructure could provide some efficiencies and increase in speed of turnaround for individual trains, however, a key factor is the train arrival schedule which is not controlled by the port and is unlikely to change significantly from the current operations.

As severe weather events impact rail networks in northern Queensland, planning rail infrastructure flood immunity and efficiencies will benefit trade growth at the port.[582]

The arrangement of port gates and transfer zones related to the arrival/departure of cargo inland varies for different cargo types. For cargo arriving/departing by road, including petroleum tankers, measures can be taken to optimise gate processes and data collection through the use of automated equipment and software. For dry bulk and container cargo arriving/departing via rail, intermodal rail yards and the process by which cargo is moved between rail cars and stored can be optimised to make better use of existing land and to increase overall throughput capacity.

The supporting road network is key to many of the industries at the port. Construction is currently ongoing on improvements to the Mackay Ring Road with planning in progress for improvements to the Mackay Port Access Road. The *Mackay Isaac Whitsunday Regional Transport Plan 2018*,[583] gives further details of planned improvements which will feature an 8.2km two-lane highway to provide a route with no signals/intersections between the Peak Downs Highway and the port.

13.4.8 Operations and maintenance systems

Digital technology and software are key parts of the cargo handling operation, both in terms of managing the handling process from end to end and for running an effective asset management system which allows the operator/owner to maintain an efficient process and reduce life cycle costs.

With operating system capability improving and the use of Artificial Intelligence/smart technology developing quickly, the current management processes and operating systems are something that should be reviewed regularly together with products available on the market to identify early on where some of these technologies could help. Areas that could be assisted by this technology include: cargo storage and tracking, real time information, berth and equipment scheduling, quality management, and automation. Management and planning

[580] Aurizon. (2016). *Network Technical Strategy 2016*.
[581] Aurizon. (2019). *Network Development Plan 2019 – Aurizon Network*.
[582] Department of Transport and Main Roads. (2018). *Mackay Isaac Whitsunday Regional Transport Plan 2018*. Retrieved from https://www.tmr.qld.gov.au/-/media/aboutus/corpinfo/Publications/regionaltransportplans/Mackay-Whitsunday-Regional-Transport-Plan-FINAL.pdf?la=en
[583] Department of Transport and Main Roads. (2018). *Mackay Isaac Whitsunday Regional Transport Plan 2018*. Retrieved from https://www.tmr.qld.gov.au/-/media/aboutus/corpinfo/Publications/regionaltransportplans/Mackay-Whitsunday-Regional-Transport-Plan-FINAL.pdf?la=en

of operations is particularly important at the port where there are a large number of facilities, cargo types, and users. Simulation and Digital Twin work on amendments and optimisation changes are also valuable.

Use of digital systems may also help to create more efficient use of utilities and services supporting the Port operation, including minimizing energy and water usage and reuse of water where feasible. There should also be a focus on ensuring supply and redundancy.

13.4.9 New market opportunities

Port of Hay Point

Hydrogen export is an industry that local and national government have been investing in significantly with the aim of establishing Queensland as a world leader in renewable energy exports. NQBP and other partners are understood to have signed a Memorandum of Understanding (MOU) for the development of a hydrogen export facility at Hay Point. A key consideration is the supply of services such as power and water to support the facility including sewerage links to the port. It is noted that the port is fed by two substations, Powerlink and Ergon, with full replacement planned for the Powerlink substation. Additional demand and required upgrades would need to be investigated for a new facility.

Port of Mackay

The recently completed extension to Wharf 1 will allow the port to attract new markets and cargo types. This includes rail, pipelines and renewables projects.

13.5 Summary

While major projects provide step change increases in capacity and handling capability, ports globally are focusing on ways of optimising existing infrastructure and processes to improve current operations and to offset and minimise capital investment. This is being achieved through proactive asset management to manage risk, investing in maintenance and improvements to increase design life, and the use of new technology and software to aid almost every aspect of the port. This can have a significant financial benefit as well as improve the quality and efficiency of the service being provided.

Port of Hay Point

Significant port optimisation activities have already been undertaken in the port and will continue in conjunction with forward planning, to ensure the maximum possible efficiency is achieved in a cost-effective way.

Port of Mackay

Review of future market opportunities has shown that there are new and growing industries, outside of those currently served by the port, which could justify future development and expansion. The port is well placed to attract and accommodate smaller volumes of similar or new cargo types without major expansion or upgrades. The continued optimisation of existing port facilities to handle existing cargo in the safest and most efficient way possible is a priority.

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15. Appendix

15.1 Appendix A: Commonwealth framework

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)	*Aboriginal and Torres Strait Islander Heritage Protection Regulations 1984* (Cth)	The Act provides for the making of declarations to preserve and protect places, areas and objects of particular significance to Aboriginal and Torres Strait Islander people in accordance with Aboriginal tradition. Aboriginal tradition is taken to include traditions, observances, customs or beliefs relating to certain people, areas, objects or relationships.	Heritage	Declarations of areas and objects Compliance and enforcement Operational registrations, licences, approvals	Department of Agriculture, Water and the Environment The Attorney-General's Department
Biosecurity Act 2015 (Cth)	*Biosecurity Regulation 2016* (Cth) *Biosecurity (Human Health) Regulation 2016* (Cth)	Diseases and pests that may cause harm to human, animal or plant health or the environment within the Australian territory (Australia and up to 12 nautical miles from the coastline including the airspace over, and coastal seas, of these areas). The scope of the Act includes risks related to biosecurity, contagions, human disease and – ballast water and sediment. The Act gives effect to Australia's international rights and obligations, including under the International Health Regulations 2005, the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and the Convention on Biological Diversity 1992 (Biodiversity Convention).	Environment (biosecurity)	Administration and governance Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	Department of Agriculture, Water and the Environment
Coastal Trading (Revitalising Australian Shipping) Act 2012 (Cth)	*Coastal Trading (Revitalising Australian Shipping) Regulation 2012* (Cth)	Coastal trading in Australia. The Act seeks to promote a viable shipping industry that contributes to the broader Australian economy, facilitate the long-term growth of the Australian shipping industry, enhances the efficiency and reliability of Australian shipping as part of the national transport system, and ensures efficient movement of passengers and cargo between Australian ports.	Economic	Compliance and enforcement Operational registrations, permissions or limitations	Department of Infrastructure, Transport, Regional Development and Communications and the Arts
Environment Protection (Sea	*Environment Protection (Sea Dumping)*	Protection of the environment by regulating dumping into the sea, incineration at sea and artificial reef placements. The scope of the Act includes applications to dump	Environment (marine)	Compliance and enforcement	Department of Agriculture, Water

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
Dumping) Act 1981 (Cth)	*Regulations 1983* (Cth)	material and other objects at the sea including dredged material, excavated material, artificial reefs, platforms, controlled materials and people for burial purposes.		Operational registrations, permissions or limitations	and the Environment
EPBC Act	*Environment Protection and Biodiversity Conservation Regulations 2000* (Cth)	Protection of nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the Act as MNES. The scope of the Act includes promoting environmental protection and biodiversity conservation informed by Indigenous peoples' knowledge of biodiversity and engagement with the community. The Act promotes ecologically sustainable development and provides for controlled actions, biodiversity plans, assessment pathways and bilateral agreements. Development proposals having a significant impact on MNES needs approval under the Act in addition to any state and local development approvals. Examples of MNES that the Act applies to include national heritage places, wetlands of international importance, nationally threatened species and ecological communities, migratory species, Australian marine areas and the GBRMP.	Environment (protection)	Declaration of places or World Heritage value or wetlands of international importance Compliance and enforcement DA Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	Department of Agriculture, Water and the Environment
Great Barrier Reef Marine Park Act 1975 (Cth)	*Great Barrier Reef Marine Park Regulations 2019* (Cth)	Long-term protection and conservation of the environment, biodiversity and heritage values of the GBR region. The Act seeks the ecologically sustainable use of the GBR region for uses including recreational, economic and cultural activities, encourages collaboration and engagement with the community and industry, and facilitates Australia to meet its international responsibilities in relation to the environment and protection of World Heritage. The Act establishes the GBRMPA and provides for zoning plans, plans of management and regulation of the GBRMP.	Environment (GBR)	Administration and governance Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	Department of Agriculture, Water and the Environment
Marine Safety (Domestic Commercial Vessel) National Law Act 2012 (Cth)	N/A	Marine incidents, and standards relating to the operation, design, construction and equipping of domestic commercial vessels. A domestic commercial vessel is taken to be a vessel that is for use in connection with a commercial, governmental or research activity.	Safety (marine)	Compliance and enforcement Standards, guidelines or reporting requirements	Department of Infrastructure, Transport, Regional Development and

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
					Communications and the Arts
Native Title Act 1993 (Cth)	*Native Title (Indigenous Land Use Agreements) Regulations 1999* (Cth)	Native title in relation to land or waters. The Act recognises and protects native title, provides a process for claims to native title, and provides for or permits the validation of past acts, and intermediate period acts, invalidated because of the existence of native title.	Native title	Compliance and enforcement Operational registrations, permissions or limitations	The Attorney-General's Department Department of the Prime Minister and Cabinet
Navigation Act 2012 (Cth)	*Navigation Regulation 2013* (Cth)	Maritime safety including to promote the safety of life at sea and safe navigation, and the prevention of pollution of the marine environment. The scope of the Act includes the health and welfare of seafarers, aids to navigation, vessel safety, tonnage certificates and wrecks including their salvage.	Safety (marine) Environment (marine)	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	Department of Infrastructure, Transport, Regional Development and Communications and the Arts
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cth)	N/A	Protection of the sea from pollution. The Act prohibits the carriage, transfer or discharge of certain oils, noxious substances, packaged harmful substances, sewage, garbage and air pollution. The scope of the Act includes the development of emergency plans, a duty to report incidents, record keeping and cleaning.	Environment (sea and air)	Compliance and enforcement	Department of Infrastructure, Transport, Regional Development and Communications and the Arts
Sea Installations Act 1987 (Cth)	*Sea Installations Regulations 2018* (Cth)	Operation of sea installations and the safety of the people using them and of the people, ships and aircraft near them. Sea installations are taken to be man-made structures used for an environment related activity such as business, tourism or recreation uses.	Safety (sea)	Compliance and enforcement Operational registrations, permissions or limitations	Department of Agriculture, Water and the Environment
Underwater Cultural Heritage Act 2018 (Cth)	*Underwater Cultural Heritage Act 2018* (Cth) *(Protected Zones) Declaration Instrument 2019* (Cth) *Underwater Cultural Heritage Rules 2018* (Cth)	Underwater cultural heritage. Different kinds of articles of underwater cultural heritage are, or can be, protected, depending on the kinds of articles, their heritage significance and their location. Some articles are, or can be, protected even if they have already been removed from those water. The Act provides for the identification, protection and conservation of Australia's underwater cultural heritage that is recorded as being 75 years or older. This includes submerged Aboriginal and Torres Strait Islander heritage from 3nm out to the continental shelf. The scope of the Act includes declaration of articles, ownerships or areas, making the Underwater Cultural	Heritage (underwater)	Declaration of protected articles or zones Compliance and enforcement Operational registrations, permissions or limitations	Department of Agriculture, Water and the Environment

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		Heritage Rules, permit requirements, and prohibited and notifiable activities.			
Work Health and Safety Act 2011 (Cth)	Various regulations and codes of practice	Protection of people's health, safety and welfare. The scope of the Act includes health and safety duties, incident notification and consultation.	Safety (Workplace Health and Safety)	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	The Attorney-General's Department

15.2 Appendix B: State Government Framework

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
Aboriginal Cultural Heritage Act 2003	N/A	Focus—recognition, protection and conservation of Aboriginal cultural heritage. The scope of the Act includes management of activities that may harm Aboriginal cultural heritage and ensuring Aboriginal people are involved in processes for managing the recognition, protection and conservation of Aboriginal cultural heritage including the development of CHMPs, cultural heritage studies and stop orders.	Heritage	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DOR
Aboriginal Land Act 1991	*Aboriginal Land Regulation 2011*	Focus—recognition of the interests and responsibilities of Aboriginal people in relation to land and thereby to foster the capacity for self-development, and the self-reliance and cultural integrity, of the Aboriginal people of Queensland. The Act provides for the process of applying for, and granting, the land in fee simple under the *Land Act 1994*, claims for claimable land and making, amending or repealing freehold instrument. The scope of the Act	Aboriginal land	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DOR

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		includes appointing grantees of land, provision for leasing, transferring, selling or mortgaging land, and special provisions about prescribed Deed of Grant in Trust land and prescribed reserve land.			
Biosecurity Act 2014 (Qld)	*Biosecurity Regulation 2016*	Focus—animal and plant diseases and pests, animal feed, fertilisers and other agricultural inputs. The Act establishes a framework to minimise biosecurity risk and help manage biosecurity issues or events. The scope of the Act includes alignment with relevant national and international obligations, and managing risks from pests and diseases on the natural and built environment, industry including agriculture, tourism, service and infrastructure sectors.	Environment (biosecurity)	Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DAF
Building Act 1975	*Building Regulation 2021*	Focus—building work, classifications and certifiers, fire safety, pool safety and sustainable housing. The Act provides for building development applications, building assessment provisions, and matters that a local government may designate for the Building Code of Australia or Queensland Development Code.	Planning and development (building work)	Designation of transport noise corridors DA Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	Department of Energy and Public Works
Coastal Protection and Management Act 1995	*Coastal Protection and Management Regulation 2017*	Focus—protection and management of the coast through coordinated and integrated planning and decision-making. The Act provides for the protection, conservation, rehabilitation and management of the coastal zone, including its resources and biological diversity, and ensure decisions about	Environment (coastal areas)	Declaration of coastal management districts Declaration of erosion prone areas Compliance and enforcement DA	DES

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		land use and development safeguard life and property from the threat of coastal hazards.		Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	
Economic Development Act 2012	*Economic Development Regulation 2013*	Focus—coordinating economic development and development for community purposes, and a development framework for PDAs. The Act provides for PDAs and related land use plans, development schemes and infrastructure agreements.	Planning and development (PDAs)	Declaration of PDAs Compliance and enforcement DA Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DSDILGP
Environmental Offsets Act 2014	*Environmental Offsets Regulation 2014*	Focus—to counterbalance significant residual impacts of activities on matters of national, State or local environmental significance and to establish an environmental offsets framework. The Act sets out a process for offset conditions, environmental offsets policies, agreed delivery arrangements and environmental offset agreements. The Act cannot impose an offset condition on matters already assessed under the EPBC Act.	Planning and development (offsets)	Compliance and enforcement DA Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES
EP Act	*Environmental Protection Regulation 2019* *Environmental Protection (Air) Policy 2019*	Focus—environment and ecological sustainable development. The scope of the Act includes promoting environmental responsibility and involvement within the community, integrating environmental values into land use planning and management of natural resources, and ensuring all	Environment	Compliance and enforcement DA Operational registrations, permissions or limitations	DES

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
	Environmental Protection (Noise) Policy 2019 *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*	reasonable and practicable measures are taken to protect environmental values from all sources of environmental harm. The Act provides for: • the OUV of the GBR • environmental offsets • notifiable activities • best practice environmental management • environmental protection policies • environmental impact statements • environmental authorities and ERAs Environment includes ecosystems; natural and physical resources; qualities and characteristics that contribute to biological diversity, scientific value or interest, and amenity; and any related social, economic, aesthetic and cultural conditions.		Standards, guidelines or reporting requirements	
Fisheries Act 1994	*Fisheries Declaration 2019* *Fisheries (General) Regulation 2019*	Focus—fisheries resources and fish habitats. The scope of the Act includes management, use, development and protection of fisheries resources and fish habitats, the management of aquaculture activities and helping to prevent shark attacks s on humans in coastal waters of the state adjacent to coastal beaches used for bathing. The Act seeks to promote ecologically sustainable development and access to fisheries resources in a way that	Fisheries	Declaration of FHAs Compliance and enforcement DA Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES DAF

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		maximises the potential economic, social and cultural benefits to the community.			
Forestry Act 1959	*Forestry Regulation 2015* *Forestry (State Forests) Regulation 1987*	Focus—forest reservations, State forests, forest products and quarry material, and the property of the Crown on State forests, timber reserves and on other lands.	Environment (state forests)	Declaration of a state forest Compliance and enforcement DA Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES DAF
Land Act 1994	*Land Regulation 2020*	Focus—administration and management of land (generally non-freehold land) including land that may become covered by water subject to tidal influence. The Act provides for allocating land for development in the context of the State's planning framework and balancing the economic, environmental, cultural and social opportunities and values of land, and Indigenous access and use agreements.	Land management	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DOR
MP Act	*Marine Parks (Declaration) Regulation 2006* *Marine Parks (Great Barrier Reef Coast) Zoning Plan 2004* *Marine Parks Regulation 2017*	Focus—marine parks and the conservation of the marine environment including the recognition of the cultural, economic, environmental and social relationships between marine parks and other areas, whether of water or land. The purpose of the Act is achieved through a cooperative and coordinated approach towards Australia's international responsibilities, intergovernmental agreements and instruments, as well as Acts or other laws of the Commonwealth and other	Environment (marine parks)	Declaration of marine parks Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		states involving conservation of the marine environment. Application of the Australian zoning plan under the *Great Barrier Reef Marine Park ZONING PLAN 2003* and designation of shipping areas within the marine park worked out by extending an Australian shipping area that is at low water to the landward boundary of the marine park.			
Native Title (Queensland) Act 1993	N/A	Focus—the Australian Government has proposed legislation to provide a national scheme for the recognition and protection of native title and for its coexistence with the existing land management systems. This Act seeks to ensure that Queensland law is consistent with standards set by the *Native Title Act 1993* (Cth) for future dealings affecting native title. The Act includes provisions to validate past acts, and intermediate period acts, invalidated because of the existence of native title and to confirm certain rights including the ownership of natural resources and certain water and fishing access rights, and public access to and enjoyment of beaches and certain other places.	Native title	Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DOR
NC Act	*Nature Conservation (Protected Areas Management) Regulation 2017* *Nature Conservation (Protected Areas) Regulation 1994*	Focus—conservation of nature including the protection and management of native wildlife and its habitat, ecologically sustainability and recognition of the interest and involvement of Aboriginal and Torres Strait Islanders in nature and its conservation. The scope of the Act includes ecosystems, natural and	Environment (conservation)	Protection of wildlife Declaration of protected areas Compliance and enforcement DA Plan making Operational registrations,	DES

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		physical resources, natural processes, biological diversity and integrity, and the intrinsic or scientific value of places.		permissions or limitations Standards, guidelines or reporting requirements	
Planning Act 2016	*Planning Regulation 2017*	Focus—land use planning and DA to facilitate the achievement of ecological sustainability. The scope of the act includes the: • sustainable use of renewable and non-renewable natural resources • Aboriginal and Torres Strait Islander knowledge, culture and tradition • cultural heritage • housing choice, diversity and affordability • economic resilience and diversity • coordinated infrastructure delivery • built environment design, conservation and amenity • minimising adverse environmental effects of development. The Act establishes Queensland's plan making, DA and dispute resolution systems. The Act provides for: • protecting or giving effect to state interests • a hierarchy of planning instruments • processes for plan making, DA and designations	Planning and development	Declaration of premises for development of infrastructure Compliance and enforcement DA Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DSDILGP Department of Energy and Public Works

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		• Ministerial powers to protect, or give effect to, relevant state interests • designation of premises for development of infrastructure • accepted, assessable and prohibited development • development exempt from assessment and development that cannot be made assessable • assessment managers and referral agencies.			
Queensland Heritage Act 1992	*Queensland Heritage Regulation 2015*	Focus—conservation of Queensland's cultural heritage for the benefit of the community and future generations. The Act seeks to retain the cultural heritage significance of places and artefacts and provide the greatest sustainable benefit to the community consistent with the conservation of their cultural heritage significance. The scope of the Act includes local and State heritage places and State protected areas, archaeological artefacts, and underwater cultural heritage artefacts that are recorded as being 75 years or older and includes protection for submerged archaeology in internal waters.	Heritage	Declaration of protected areas Compliance and enforcement DA Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES
RPI Act	RPI Regulation	Focus—regulated activities on areas of the State that contribute, or are likely to contribute, to Queensland's economic, social and environmental prosperity. The Act seeks to manage the impact of resource activities and other regulated activities on areas of regional interest, and a process to assess and manage impacts. The Act provides for RIDAs, exempt resource	Planning and development	Compliance and enforcement DA Operational registrations, permissions or limitations	DSDILGP DAF

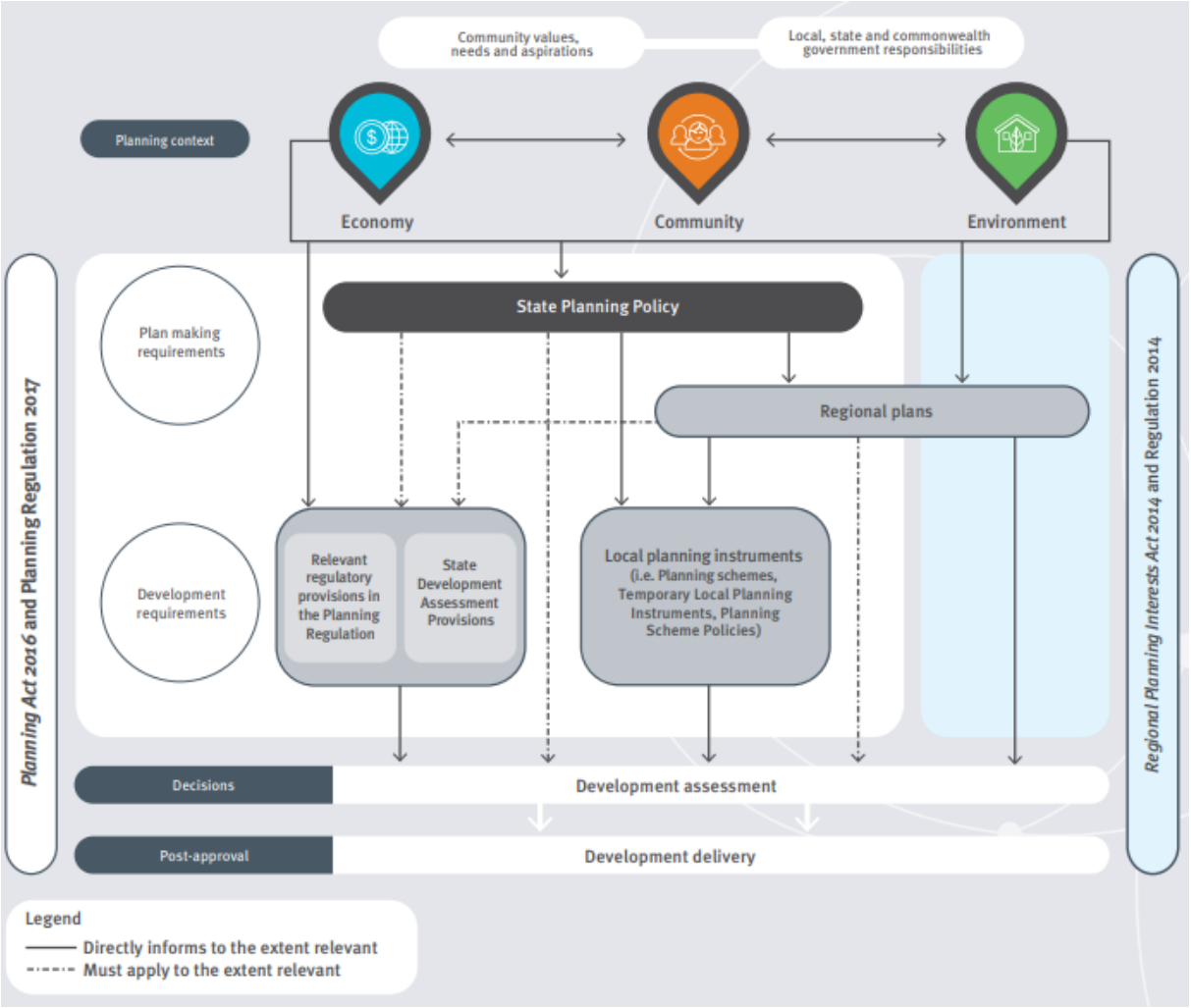
Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		activities and exempt regulated activities. Regional interest areas are defined in the Act as priority agricultural areas, priority living areas, SCAs and strategic environmental areas. DOR certifies the 'Trigger Map for Strategic Cropping Land' for use under the Act.			
SDPWO Act	*State Development and Public Works Organisation Regulation 2020*	Focus—State planning and development through a coordinated system of public works organisation and for environmental coordination. Under the Act, the CG may declare a project to be a coordinated project for which an environmental impact statement or IAR is required. The Act provides for SDAs, approved development schemes, and assessment and approval of particular coordinated projects under Bilateral Agreement made under the EPBC Act.	Planning and development	Declaration of coordinated projects Compliance and enforcement DA Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DSDILGP
Ports Act	*Sustainable Ports Development Regulation 2018*	Focus—protection of the GBRWHA through managing port-related development in and adjacent to the area. The purpose of the Act is achieved through prohibiting certain development and providing for master planning of the priority ports. To do this, the Act seeks to concentrate port development in the priority ports, recognise the diversity of the port network, and plan for the expansion of the port network and related supply chain and infrastructure capacity. The Ports Act designates the following priority ports: Port of Abbot Point, Port	Priority ports	Designation as a priority port DA Plan making Master planning	TMR

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		of Gladstone, port of Hay/Mackay, and the Port of Townsville.			
TIA	*Transport Infrastructure (Ports) Regulation 2016* *Transport Infrastructure (Public Marine Facilities) Regulation 2011* *Transport Infrastructure (Waterways Management) Regulation 2012*	Focus—effective integrated planning and efficient management of a system of transport infrastructure. For ports, the Act's focus is to establish a regime under which ports can be managed within an overall strategic framework. Similarly, to establish a regime under which waterways and public marine facilities can be effectively and efficiently managed.	Infrastructure (transport)	Port declaration and land management Compliance and enforcement DA Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	TMR
Transport Operations (Marine Pollution) Act 1995	*Transport Operations (Marine Pollution) Regulation 2018*	Focus—protect Queensland's marine and coastal environment by minimising deliberate and negligent discharges of ship-sourced pollutants into coastal water. The Act achieves this primarily by giving effect to annexes of MARPOL that address pollution by oil, noxious liquid substances in bulk, harmful substances in packaged form, sewage and garbage.	Environment (pollution)	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	TMR
Transport Operations (Marine Safety) Act 1994	*Transport Operations (Marine Safety) Regulation 2016*	Focus—marine safety and related marine operational issues and the operation and activities of ships. The Act seeks to balance its objectives with effectiveness and efficiency on the Queensland maritime industry. It does not generally overlap with the national law thar applies to domestic commercial vessel safety.	Safety (marine)	Declaration of pilotage areas Appointment of harbour masters Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	TMR

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
Transport Operations (Marine Safety– Domestic Commercial Vessel National Law Application) Act 2016	N/A	Focus—applies the Commonwealth domestic commercial vessel national law as a law of the state.	Safety (domestic commercial vessels)	Compliance and enforcement Operational registrations, permissions or limitations	TMR
Transport Operations (Road Use Management) Act 1995	*Transport Operations (Road Use Management – Road Rules) Regulation 2009*	This Act's objectives provide for the effective and efficient management of road use including vehicle use in public places and provides a scheme for managing the use of roads. The Act seeks to achieve an appropriate balance between safety, and the costs that regulation imposes on road users and the community. The Act provides for road use management strategies, road rules, access management and performance standards for road users.	Infrastructure (transport)	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	TMR
Transport Planning and Coordination Act 1994	*Transport Planning and Coordination Regulation 2017*	Focus – applies to strategy, planning and transport resources relevant to the port. Head of power to making regional transport plans i.e., MIW Regional Transport Plan which recognises the relationship between effective supply chains and economic development. Development of integrated transport plans complement regional planning and transport plans.	Infrastructure (transport)	Compliance and enforcement DA Plan making	TMR
Vegetation Management Act 1999	*Vegetation Management Regulation 2012*	Focus—to regulate vegetation clearing. The Act provides for the development of a state policy for vegetation management, vegetation management maps and accepted development vegetation clearing code. The scope of the Act defines development that is for a relevant purpose and classes of REs.	Environment (vegetation)	Declaration of areas of high nature conservation value or vulnerable to land degradation Compliance and enforcement DA Operational registrations,	DOR

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		Vegetation is taken to be a native tree or plant, other than grass or non-woody herbage, a plant within a grassland RE prescribed under a regulation, or a mangrove.		permissions or limitations Standards, guidelines or reporting requirements	
Water Act 2000	*Water Regulation 2016* *Water Plan (Pioneer Valley) 2002* *Statutory water planning*	Focus—sustainable management of Queensland's water resources and quarry material, including water supply and demand management. The Act provides for the planning, allocation and use of water, and the allocation of quarry material and riverine protection. The scope of the Act includes making of activity guidelines, designation of water regions, and establishment of water authorities. Development application made under the Planning Act involving levees, taking or interfering with water, or the removal of quarry material may be required to meet criteria set out in the Act or benefit from additional development rights under the Act.	Water management	Compliance and enforcement DA Operational registrations, permissions or limitations Standards, guidelines or reporting requirements Allocations and entitlements Water licensing	DES Department of Regional Development, Manufacturing and Water
Work Health and Safety Act 2011	*Work Health and Safety Regulation 2011*	Focus—protecting health and safety of workers and workplaces. The Act relies on the principle that people should be protected from harm to their health, safety and welfare from hazards and risks arising from work, substances or plant.	Safety (major hazard facilities)	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	Department of Education

15.3 Appendix C: State Planning System (State Planning Policy)



15.4 Appendix D: State interest and key policy matters (State Planning Policy)

15.4.1 Port of Hay Point

State interest	Summary of key relevant policy matters
1. Housing supply and diversity	Related values mapped within the study area: nil • diverse, affordable and comprehensive range of housing options in accessible and well-serviced locations
2. Liveable communities	Related values mapped within the study area: nil • a mix of land uses that meet the diverse demographic, social, cultural, economic and lifestyle needs of the community • consolidating urban development in and around existing settlements • higher density development in accessible and well-serviced locations efficient use of established infrastructure and services value and nurture local landscape character and the natural environment • maintain or enhance opportunities for public access and use of the natural environment • connected pedestrian, cycling and public transport infrastructure networks
3. Agriculture	Related values mapped within the study area: important agricultural areas, agricultural land classification class A and B • support agriculture development opportunities in important agricultural areas • protect agricultural land classification class A and B land • fisheries resources (long-term fisheries productivity, sustainability and accessibility) are protected from development • protect existing and proposed agricultural land uses from impacts of incompatible uses
4. Development and construction	Related values mapped within the study area: nil • a sufficient supply of suitable land for residential, retail, commercial, industrial and mixed-use development with appropriate infrastructure • public benefit outcomes on state-owned land are achieved

State interest	Summary of key relevant policy matters
5. Mining and extractive resources	Related values mapped within the study area: nil • the importance of areas identified as having valuable minerals, coal, petroleum and gas resources, and areas of mining and resource tenures are considered and opportunities for mutually beneficial co-existence between uses is facilitated.
6. Tourism	Related values mapped within the study area: nil • existing and potential opportunities, localities or areas appropriate for tourism development are protected • sustainable tourism development is facilitated • infrastructure to support and enable tourism development is planned
7. Biodiversity	Related values mapped within the study area: MSES – protected areas, wildlife habitat, regulated vegetation, HES wetlands and value waters • development avoids or minimises adverse impacts on matters of national, state or local interest • ecological processes and connectivity are maintained or enhanced
8. Coastal environment	Related values mapped within the study area: coastal management district • coastal processes and coastal resources are protected including in the GBR catchment (through infill development, conserving the natural state of landforms, wetlands and native vegetation in the coastal management district, maintaining or enhancing the scenic amenity and aesthetic values of important natural coastal landscapes, views and vistas) • marine infrastructure avoids adverse impacts on coastal resources and processes • reclamation of land under tidal water is avoided other than where related to strategic ports, priority ports or boat harbours in accordance with a statutory land use plan or master plan • areas adjoining tidal water is preferably limited to coastal-dependent development • public safety and coastal resources are protected or enhanced
9. Cultural heritage	Related values mapped within the study area: nil • matters of Aboriginal cultural heritage and Torres Strait Islander cultural heritage are appropriately conserved and considered
10. Water quality	Related values mapped within the study area: HEV water areas, climatic regions - stormwater management design objectives

State interest	Summary of key relevant policy matters
	• development facilitates the protection or enhancement of environmental values and the achievement of water quality objectives for Queensland waters • development avoids adverse impacts on environmental values of receiving waters • development achieves the applicable stormwater management design objectives
11. Emissions and hazardous activities	Related values mapped within the study area: nil • protect sensitive land uses and the natural environment from adverse impacts of emissions from industrial development, major gas, waste and sewerage infrastructure, and sport and recreation activities • the health and safety risks to communities and individuals are protected from risks associated with hazardous materials, prescribed hazardous chemicals, dangerous goods, and flammable or combustible substances • prescribed hazardous chemicals stored are located to minimise the risk of flood inundation and dispersion • people and property are protected from the risk of adverse impacts from previous land uses • protect industrial development, major infrastructure, and sport and recreation from encroachment that would compromise their ability • to function safely and effectively • mitigation of adverse impacts from emissions and hazardous activities • natural and built environment, and human health are protected from potential adverse impacts from acid sulfate soils
12. Natural hazards, risk and resilience	Related values mapped within the study area: flood hazard area, bushfire prone area, erosion prone area, storm tide inundation area • development avoids natural hazards areas or otherwise mitigates risk to people and property • development in natural hazard areas does not increase risk associated with the hazard • public safety and the environment are protected from risks associated with the storage of hazardous materials and their release as a result of a natural hazard • development maintains or enhances the protective function of landforms and vegetation that can mitigate risks associated with the natural hazard • functionality of community infrastructure is not adversely impacted from a natural hazard event

State interest	Summary of key relevant policy matters
13. Energy and water supply	• Related values mapped within the study area: land uses and the natural environment are protected from adverse impacts of major electricity infrastructure • the development and supply of renewable energy at the regional, local and individual scale is enabled.
14. Infrastructure integration	Related values mapped within the study area: nil • development achieves a high level of integration with infrastructure planning • development is located to enable the cost-effective delivery of state and local infrastructure to service development • the ability of infrastructure and associated services to operate safely and efficiently is protected from development.
15. Transport infrastructure	Related values mapped within the study area: state-controlled road, railway corridor [Transport noise corridors (road and railway)], development is located to enable cost-effective delivery of new transport infrastructure to service development • development is not adversely affected environmental emissions generated by transport infrastructure • development is compatible with, or supports the most efficient use of, state transport infrastructure • the safety and efficiency of state transport infrastructure, corridors and networks are not adversely affected by development.
16. Strategic airports and aviation facilities	Related values mapped within the study area: obstacle limitation surface area, obstacle limitation surface contours, wildlife hazard buffer zone 13 km, • the safety, efficiency and operational integrity of strategic airports are protected • development does not increase risks to aircraft safety and public safety • development is not adversely affected by noise generated by aircraft • development supports the economic importance of the strategic airport • the functioning of aviation facilities is protected • key transport corridors (passenger and freight) linking strategic airports to the broader transport network are identified and protected.
17. Strategic ports	Related values mapped within the study area: strategic ports. (see **Table 4** for state interest 17—Strategic ports)

15.4.2 Port of Mackay

State interest	Summary of key relevant policy matters
1. Housing supply and diversity	Related values mapped within the study area: nil • diverse, affordable and comprehensive range of housing options in accessible and well-serviced locations.
2. Liveable communities	Related values mapped within the study area: nil • a mix of land uses that meet the diverse demographic, social, cultural, economic and lifestyle needs of the community • consolidating urban development in and around existing settlements • higher density development in accessible and well-serviced locations efficient use of established infrastructure and services value and nurture local landscape character and the natural environment • maintain or enhance opportunities for public access and use of the natural environment • connected pedestrian, cycling and public transport infrastructure networks.
3. Agriculture	Related values mapped within the study area: important agricultural areas, agricultural land classification class A and B, stock route network • support agriculture development opportunities in important agricultural areas • protect agricultural land classification class A and B land • fisheries resources (long-term fisheries productivity, sustainability and accessibility) are protected from development • protect existing and proposed agricultural land uses from impacts of incompatible uses • protect the stock route network's primary use for moving stock on foot, and other uses and values.
4. Development and construction	Related values mapped within the study area: PDAs • a sufficient supply of suitable land for residential, retail, commercial, industrial and mixed-use development with appropriate infrastructure • PDAs are supported by compatible and complementary land uses and services on surrounding land • public benefit outcomes on state-owned land are achieved.
5. Mining and extractive resources	Related values mapped within the study area: key resource areas and transport routes • Key Resource Areas are protected (resource availability, from impacts of incompatible uses, ongoing use of haulage routes.

State interest	Summary of key relevant policy matters
6. Tourism	Related values mapped within the study area: nil • existing and potential opportunities, localities or areas appropriate for tourism development are protected • sustainable tourism development is facilitated • infrastructure to support and enable tourism development is planned.
7. Biodiversity	Related values mapped within the study area: MSES – protected areas, marine park, declared FHAs, wildlife habitat, regulated vegetation, wetlands, watercourses • development avoids or minimises adverse impacts on matters of national, state or local interest • ecological processes and connectivity are maintained or enhanced.
8. Coastal environment	Related values mapped within the study area: coastal management district • coastal processes and coastal resources are protected including in the GBR catchment (through infill development, conserving the natural state of landforms, wetlands and native vegetation in the coastal management district, maintaining or enhancing the scenic amenity and aesthetic values of important natural coastal landscapes, views and vistas) • marine infrastructure avoids adverse impacts on coastal resources and processes • reclamation of land under tidal water is avoided other than where related to strategic ports, priority ports or boat harbours in accordance with a statutory land use plan or master plan • areas adjoining tidal water is preferably limited to coastal-dependent development • public safety and coastal resources are protected or enhanced.
9. Cultural heritage	Related values mapped within the study area: state heritage place • matters of Aboriginal cultural heritage and Torres Strait Islander cultural heritage are appropriately conserved and considered • avoid adverse impacts on the cultural heritage significance of World Heritage properties, state heritage places and local heritage places and areas.
10. Water quality	Related values mapped within the study area: HEV water areas, climatic regions - stormwater management design objectives • development facilitates the protection or enhancement of environmental values and the achievement of water quality objectives for Queensland waters

State interest	Summary of key relevant policy matters
	• development avoids adverse impacts on environmental values of receiving waters • development achieves the applicable stormwater management design objectives.
11. Emissions and hazardous activities	Related values mapped within the study area: nil • protect sensitive land uses and the natural environment from adverse impacts of emissions from industrial development, major gas, waste and sewerage infrastructure, and sport and recreation activities • the health and safety risks to communities and individuals are protected from risks associated with hazardous materials, prescribed hazardous chemicals, dangerous goods, and flammable or combustible substances • prescribed hazardous chemicals stored are located to minimise the risk of flood inundation and dispersion • people and property are protected from the risk of adverse impacts from previous land uses • protect industrial development, major infrastructure, and sport and recreation from encroachment that would compromise their ability • to function safely and effectively • mitigation of adverse impacts from emissions and hazardous activities • natural and built environment, and human health are protected from potential adverse impacts from ASS
12. Natural hazards, risk and resilience	Related values mapped within the study area: flood hazard area, bushfire prone area, erosion prone area, storm tide inundation area • development avoids natural hazards areas or otherwise mitigates risk to people and property • development in natural hazard areas does not increase risk associated with the hazard • public safety and the environment are protected from risks associated with the storage of hazardous materials and their release as a result of a natural hazard • development maintains or enhances the protective function of landforms and vegetation that can mitigate risks associated with the natural hazard. • functionality of community infrastructure is not adversely impacted from a natural hazard event
13. Energy and water supply	Related values mapped within the study area: electricity substation (Powerlink and Ergon Energy), major electricity infrastructure (Powerlink and Ergon Energy)

State interest	Summary of key relevant policy matters
	• the integrity, and the efficient delivery and functioning of the major electricity infrastructure locations and corridors are protected • major electricity infrastructure and electricity substations are protected from encroachment by sensitive land uses • land uses and the natural environment are protected from adverse impacts of major electricity infrastructure • the development and supply of renewable energy at the regional, local and individual scale is enabled.
14. Infrastructure integration	Related values mapped within the study area: nil • development achieves a high level of integration with infrastructure planning • development is located to enable the cost-effective delivery of state and local infrastructure to service development • the ability of infrastructure and associated services to operate safely and efficiently is protected from development.
15. Transport infrastructure	Related values mapped within the study area: [Transport noise corridors (road and railway)], current and future state-controlled road corridors, railway corridor, public passenger transport facility, active transport corridors • development is located to enable cost-effective delivery of new transport infrastructure to service development • development achieves a high level of integration with transport infrastructure and supports public passenger transport and active transport as attractive alternatives to private transport. • development is not adversely affected environmental emissions generated by transport infrastructure • development is compatible with, or supports the most efficient use of, state transport infrastructure • the safety and efficiency of state transport infrastructure, corridors and networks are not adversely affected by development.
16. Strategic airports and aviation facilities	Related values mapped within the study area: aviation facility, wildlife hazard buffer zone, lighting area buffer, light restriction zone, public safety area, obstacle limitation surface area, Australian Noise Exposure Forecast contours • the safety, efficiency and operational integrity of strategic airports are protected • development does not increase risks to aircraft safety and public safety. • development is not adversely affected by noise generated by aircraft • development supports the economic importance of the strategic airport • the functioning of aviation facilities is protected

State interest	Summary of key relevant policy matters
	• key transport corridors (passenger and freight) linking strategic airports to the broader transport network are identified and protected.
17. Strategic ports	Related values mapped within the study area: strategic ports. (see **Table 4** for state interest 17—Strategic ports)

15.5 Appendix E: State Development Assessment Provisions (Relevant state codes and purpose statements)

15.5.1 Port of Hay Point

State code	Purpose statement
State code 1: Development in a state-controlled road environment	The purpose of this code is to protect the safety, function and efficiency of state-controlled roads, future state-controlled roads, road transport infrastructure, active transport infrastructure and public passenger services on state-controlled roads from adverse impacts of development. The code is intended to protect the safety of people using, and living or working near, state-controlled roads. Specifically, this code seeks to ensure development: 1. does not increase the likelihood or frequency of accidents, fatalities or serious injury for users of a state-controlled road 2. does not adversely impact the structural integrity or physical condition of state-controlled roads, road transport infrastructure, public passenger transport infrastructure or active transport infrastructure 3. does not adversely impact the function and efficiency of state-controlled roads or future state-controlled roads 4. does not adversely impact the state's ability to plan, construct, maintain, upgrade or operate state-controlled roads, future state-controlled roads or road transport infrastructure 5. does not significantly increase the cost to the state to plan, construct, upgrade or maintain state-controlled roads, future state-controlled roads or road transport infrastructure 6. maintains or improves access to public passenger transport infrastructure or active transport infrastructure 7. does not adversely impact the state's ability to operate public passenger services on state-controlled roads

	8. protects community amenity from significant adverse impacts of environmental emissions generated by road transport infrastructure or vehicles using state-controlled roads.
State code 2: Development in a railway environment	The purpose of the code is to protect railway corridors, future railway corridors, rail transport infrastructure and other rail infrastructure from adverse impacts of development. The purpose of this code is also to protect the safety of people using, and living and working near, railways. Specifically, this code seeks to ensure development: 1. does not result in an increase in the likelihood or frequency of accidents, fatalities or serious injury for users of a railway 2. does not adversely impact the structural integrity or physical condition of railways, rail transport infrastructure or other rail infrastructure within a railway corridor 3. does not compromise the operating performance of railway corridors 4. does not adversely impact the state's ability to plan, construct, maintain, upgrade or operate railway corridors, future railway corridors and associated rail transport infrastructure or other rail infrastructure 5. does not significantly increase the cost to the state to plan, construct, maintain, upgrade or operate railway corridors, future railway corridors, rail transport infrastructure or other rail infrastructure 6. does not compromise pedestrian or cycle access to public passenger transport infrastructure or active transport infrastructure associated with railways 7. protects the community from significant adverse impacts resulting from environmental emissions generated by a railway.
State code 6: Protection of state transport networks	The purpose of this code is to: 1. protect state transport infrastructure, public passenger transport infrastructure, active transport infrastructure and public passenger services from the adverse impacts of development 2. maintain the operating performance of the transport network 3. ensure development enables safe and convenient access to public passenger transport. Specifically, this code seeks to ensure development: 1. does not create a safety hazard for users of state transport infrastructure or public passenger services by increasing the likelihood or frequency of a fatality or serious injury 2. does not result in a worsening of the physical condition or operating performance of the state transport network

	3. does not compromise the state's ability to cost-effectively construct, operate and maintain state transport infrastructure 4. provides public passenger transport infrastructure to enable development to be serviced by public passenger transport 5. provides safe and direct access to public passenger transport infrastructure or active transport infrastructure, including access by cycling and walking.
State code 7: Maritime safety	The purpose of the code is to protect the safety of people using, and living or working near, navigable waterways Specifically, this code seeks to ensure the construction and operation of the development does not compromise the: 1. viable operation of aids to navigation 2. safe operation of vessels in navigable waterways.
State code 8: Coastal development and tidal works	The purpose of this code is to ensure that development is designed and located to: 1. protect life, buildings and infrastructure from the impacts of coastal erosion 2. maintain coastal processes 3. conserve coastal resources 4. maintain appropriate public use of, and access to and along, state coastal land 5. account for the projected impacts of climate change 6. avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 7. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided. In addition to the above, the purpose of this code is to ensure that development involving operational works which is not assessed by local government is designed and located to protect life and property from the impacts of storm tide inundation.
State code 9: GBR wetland protection areas	The purpose of this code is to ensure that development involving high impact earthworks in a wetland protection area: 1. is located outside of a wetland 2. does not have an unacceptable impact on wetland environmental values 3. is designed and located to avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 4. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.

State code 10: Taking or interfering with water	The purpose of this code is to ensure sustainable management of water by ensuring that development: 1. maintains: a. natural ecosystem processes b. riverine environments c. underground water systems d. physical integrity of watercourses. 2. does not result in an adverse impact on: a. connectivity between underground water and water in a watercourse, lake or spring b. property of others c. the water security of other users and their access to the water resource 3. minimises the volume of overland flow water taken, consistent with the development 4. minimises the take of contaminated agricultural run-off water 5. in the Queensland Murray Darling Basin, allows for the capture of contaminated agricultural run-off water and release of water when an acceptable water quality is achieved.
State code 11: Removal, destruction or damage of marine plants	The purpose of this code is to ensure that development which involves the removal, destruction or damage of marine plants and fish habitat: 1. maintains the extent, distribution, diversity and condition of marine plant communities and protects the ecological functions to which they contribute 2. maintains the health and productivity of fisheries resources and fish habitat 3. minimises impacts on the management, use, development and protection of fisheries resources and fish habitat 4. is designed and located to avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 5. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.
State code 15: Removal of quarry material from a	The purpose of the code is to provide for the removal of quarry material from a watercourse or lake in a way that ensures the sustainable management of water resources and quarry material and is undertaken in a way to maintain natural environments and processes.

watercourse or lake	
State code 16: Native vegetation clearing	The purpose of this code is to ensure development: 1. avoids clearing, or where avoidance is not reasonably possible, minimises clearing to: a. conserve vegetation b. avoid land degradation c. avoid the loss of biodiversity d. maintain ecological processes. 2. minimises contributions to greenhouse gas emissions 3. for vegetation retention purposes, is undertaken in a manner that retains or regenerates vegetation by sustainably managing the impacts of the clearing on REs, biodiversity and ecological processes over time 4. is consistent with any notice requiring compliance on the land subject to the development application unless a better environmental outcome can be achieved 5. is consistent with vegetation management requirements for particular regulated areas unless a better environmental outcome can be achieved 6. avoids impacts on vegetation and minimises and mitigates impacts on vegetation where avoidance is not possible 7. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided (where appropriate). An offset is not appropriate for acceptable significant residual impacts on a connectivity area unless the clearing is for development that is a coordinated project, natural channel diversion or contaminants removal.
State code 17: Aquaculture	The purpose of this code is to ensure aquaculture industry development and practices are ecologically sustainable. The code ensures that development: 1. maintains the health and productivity of fisheries resources, fish habitat and the natural environment 2. maintains commercial, recreational, and Indigenous fishing access 3. manages the health and productivity of aquaculture fisheries resources.
State code 18: Constructing or raising waterway	The purpose of this code is to ensure that development involving the constructing or raising of waterway barrier works in a fish habitat: 1. maintains fish movement and connectivity throughout waterways and within and between fish habitats

barrier works in fish habitats	2. maintains the health and productivity of fisheries resources and fish habitat 3. maintains the community and fishing sectors' use of the area and access to fisheries resources 4. provides adequate fish passage including a fish way, if necessary 5. avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 6. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.
State code 21: Hazardous chemical facilities	The development is designed and sited, so far as reasonably practicable, to ensure: 1. human health and safety, and the built environment are protected from off-site risks resulting from physical or chemical hazards 2. hazardous chemical facilities are protected from: a. off-site hazard scenarios at existing hazardous chemical facilities b. natural hazards.
State code 22: ERAs	The purpose of the code is to ensure that ERAs: 1. are located and designed to avoid or mitigate environmental harm on environmental values of the natural environment, adjacent sensitive land uses and sensitive receptors 2. are designed and located to avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 3. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.

15.5.2 Port of Mackay

State code	Purpose statement
State code 1: Development in a state-controlled road environment	The purpose of this code is to protect the safety, function and efficiency of state-controlled roads, future state-controlled roads, road transport infrastructure, active transport infrastructure and public passenger services on state-controlled roads from adverse impacts of development. The code is intended to protect the safety of people using, and living or working near, state-controlled roads. Specifically, this code seeks to ensure development: 1. does not increase the likelihood or frequency of accidents, fatalities or serious injury for users of a state-controlled road 2. does not adversely impact the structural integrity or physical condition of state-controlled roads, road transport infrastructure, public passenger transport infrastructure or active transport infrastructure 3. does not adversely impact the function and efficiency of state-controlled roads or future state-controlled roads 4. does not adversely impact the state's ability to plan, construct, maintain, upgrade or operate state-controlled roads, future state-controlled roads or road transport infrastructure 5. does not significantly increase the cost to the state to plan, construct, upgrade or maintain state-controlled roads, future state-controlled roads or road transport infrastructure 6. maintains or improves access to public passenger transport infrastructure or active transport infrastructure 7. does not adversely impact the state's ability to operate public passenger services on state-controlled roads 8. protects community amenity from significant adverse impacts of environmental emissions generated by road transport infrastructure or vehicles using state-controlled roads.
State code 2: Development in a railway environment	The purpose of the code is to protect railway corridors, future railway corridors, rail transport infrastructure and other rail infrastructure from adverse impacts of development. The purpose of this code is also to protect the safety of people using, and living and working near, railways. Specifically, this code seeks to ensure development: 1. does not result in an increase in the likelihood or frequency of accidents, fatalities or serious injury for users of a railway 2. does not adversely impact the structural integrity or physical condition of railways, rail transport infrastructure or other rail infrastructure within a railway corridor 3. does not compromise the operating performance of railway corridors

	4. does not adversely impact the state's ability to plan, construct, maintain, upgrade or operate railway corridors, future railway corridors and associated rail transport infrastructure or other rail infrastructure 5. does not significantly increase the cost to the state to plan, construct, maintain, upgrade or operate railway corridors, future railway corridors, rail transport infrastructure or other rail infrastructure 6. does not compromise pedestrian or cycle access to public passenger transport infrastructure or active transport infrastructure associated with railways 7. protects the community from significant adverse impacts resulting from environmental emissions generated by a railway.
State code 6: Protection of state transport networks	The purpose of this code is to: 1. protect state transport infrastructure, public passenger transport infrastructure, active transport infrastructure and public passenger services from the adverse impacts of development 2. maintain the operating performance of the transport network 3. ensure development enables safe and convenient access to public passenger transport. Specifically, this code seeks to ensure development: 1. does not create a safety hazard for users of state transport infrastructure or public passenger services by increasing the likelihood or frequency of a fatality or serious injury 2. does not result in a worsening of the physical condition or operating performance of the state transport network 3. does not compromise the state's ability to cost-effectively construct, operate and maintain state transport infrastructure 4. provides public passenger transport infrastructure to enable development to be serviced by public passenger transport 5. provides safe and direct access to public passenger transport infrastructure or active transport infrastructure, including access by cycling and walking.
State code 7: Maritime safety	The purpose of the code is to protect the safety of people using, and living or working near, navigable waterways. Specifically, this code seeks to ensure the construction and operation of the development does not compromise the: 1. viable operation of aids to navigation 2. safe operation of vessels in navigable waterways.

State code 8: Coastal development and tidal works	The purpose of this code is to ensure that development is designed and located to: 1. protect life, buildings and infrastructure from the impacts of coastal erosion 2. maintain coastal processes 3. conserve coastal resources 4. maintain appropriate public use of, and access to and along, state coastal land 5. account for the projected impacts of climate change 6. avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 7. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided. In addition to the above, the purpose of this code is to ensure that development involving operational works which is not assessed by local government is designed and located to protect life and property from the impacts of storm tide inundation.
State code 9: GBR wetland protection areas	The purpose of this code is to ensure that development involving high impact earthworks in a wetland protection area: 1. is located outside of a wetland 2. does not have an unacceptable impact on wetland environmental values 3. is designed and located to avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 4. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.
State code 10: Taking or interfering with water	The purpose of this code is to ensure sustainable management of water by ensuring that development: 1. maintains: a. natural ecosystem processes b. riverine environments c. underground water systems d. physical integrity of watercourses. 2. does not result in an adverse impact on: a. connectivity between underground water and water in a watercourse, lake or spring

	b. property of others c. the water security of other users and their access to the water resource. 3. minimises the volume of overland flow water taken, consistent with the development 4. minimises the take of contaminated agricultural run-off water 5. in the Queensland Murray Darling Basin, allows for the capture of contaminated agricultural run-off water and release of water when an acceptable water quality is achieved.
State code 11: Removal, destruction or damage of marine plants	The purpose of this code is to ensure that development which involves the removal, destruction or damage of marine plants and fish habitat: 1. maintains the extent, distribution, diversity and condition of marine plant communities and protects the ecological functions to which they contribute 2. maintains the health and productivity of fisheries resources and fish habitat 3. minimises impacts on the management, use, development and protection of fisheries resources and fish habitat 4. is designed and located to avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 5. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.
State code 12: Development in a declared FHA	The purpose of the code is to ensure development in a declared FHA: 1. is limited to prescribed development purposes 2. maintains the natural condition of fish habitat and natural processes in management A areas 3. maintains the current fish habitat values and functions of management B areas 4. maintains the community and fishing sector's use of the area and access to fisheries resources 5. is designed and located to avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 6. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.
State code 15: Removal of quarry material from a	The purpose of the code is to provide for the removal of quarry material from a watercourse or lake in a way that ensures the sustainable management of water resources and quarry material and is undertaken in a way to maintain natural environments and processes.

watercourse or lake	
State code 16: Native vegetation clearing	The purpose of this code is to ensure development: 1. avoids clearing, or where avoidance is not reasonably possible, minimises clearing to: a. conserve vegetation b. avoid land degradation c. avoid the loss of biodiversity d. maintain ecological processes. 2. minimises contributions to greenhouse gas emissions 3. for vegetation retention purposes, is undertaken in a manner that retains or regenerates vegetation by sustainably managing the impacts of the clearing on REs, biodiversity and ecological processes over time 4. is consistent with any notice requiring compliance on the land subject to the development application unless a better environmental outcome can be achieved 5. is consistent with vegetation management requirements for particular regulated areas unless a better environmental outcome can be achieved 6. avoids impacts on vegetation and minimises and mitigates impacts on vegetation where avoidance is not possible 7. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided (where appropriate). An offset is not appropriate for acceptable significant residual impacts on a connectivity area unless the clearing is for development that is a coordinated project, natural channel diversion or contaminants removal.
State code 17: Aquaculture	The purpose of this code is to ensure aquaculture industry development and practices are ecologically sustainable. The code ensures that development: 1. maintains the health and productivity of fisheries resources, fish habitat and the natural environment 2. maintains commercial, recreational, and Indigenous fishing access 3. manages the health and productivity of aquaculture fisheries resources.
State code 18: Constructing or raising waterway	The purpose of this code is to ensure that development involving the constructing or raising of waterway barrier works in a fish habitat: 1. maintains fish movement and connectivity throughout waterways and within and between fish habitats

barrier works in fish habitats	2. maintains the health and productivity of fisheries resources and fish habitat 3. maintains the community and fishing sectors' use of the area and access to fisheries resources 4. provides adequate fish passage including a fish way, if necessary 5. avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 6. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.
State code 21: Hazardous chemical facilities	The development is designed and sited, so far as reasonably practicable, to ensure: 1. human health and safety, and the built environment are protected from off-site risks resulting from physical or chemical hazards 2. hazardous chemical facilities are protected from: a. off-site hazard scenarios at existing hazardous chemical facilities b. natural hazards.
State code 22: ERAs	The purpose of the code is to ensure that ERAs: 1. are located and designed to avoid or mitigate environmental harm on environmental values of the natural environment, adjacent sensitive land uses and sensitive receptors 2. are designed and located to avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 3. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.

15.6 Appendix F: Regional Plan (Desired Regional Outcomes)

Title	Desired Regional Outcomes and principles
1. Sustainability, climate change and natural hazards	The region grows and changes in a sustainable manner generating prosperity, maintaining and enhancing quality of life, minimising the use of resources, providing high levels of environmental protection, reducing greenhouse gas emissions, and increasing resilience to natural hazards and the anticipated effects of climate change. **Principles** 1.1 Sustainability: Decision-making supports ecologically sustainable development

Title	Desired Regional Outcomes and principles
	1.2 Climate change: The generation of greenhouse gases is reduced through land-use planning and development design, and long-term climate change impacts are considered in planning decisions 1.3 Natural hazards: The resilience of communities, development, essential infrastructure, natural environments and economic sectors to recognised hazards, including the anticipated effects of climate change, is increased.
2. Regional landscapes	Environmental, economic, social and cultural values of the regional landscape are identified and secured to meet community needs and achieve ecological sustainability. **Principles** 2.1 Regional landscape values: Manage and enhance the values of the regional landscape to optimise their ability to contribute to the region's liveability, lifestyle, health and economy. 2.2 Regional landscape areas: Optimise multiple community benefits through coordinated planning, management and investment in regional landscape areas. 2.3 Green space network: An integrated green space network caters for a range of community and environmental needs.
3. Environment	A healthy and resilient natural environment supports the region's rich biodiversity and ecosystem services, which contribute to the economic development and social and cultural identity of the region. **Principles** 3.1 Biodiversity: The region's natural assets, biodiversity values and ecological services are protected, managed and enhanced to improve their resilience to the anticipated effects of climate change and other threats. 3.2 Water quality, waterway health and wetlands: The ecological health, environmental values and water quality of coastal, surface, ground waters and wetlands are protected. 3.3 Coastal environment: Coastal resources are managed while protecting human life and property from the hazards of natural fluctuations in coastal processes. 3.4 Air quality and noise: The environment is protected to maintain the health and wellbeing of the community and the natural environment through effective management of air quality and noise.
4. Natural resource management	Regional natural resources and primary production areas continue to provide cultural, social, economic and environmental values to the region, while being protected, managed, enhanced and used sustainably.

Title	Desired Regional Outcomes and principles
	Principles 4.1 Natural resource management: The management and use of natural resources enhance community, economic and landscape values. 4.2 Ecosystem-dependent economic resource: Ecosystems are sustainably managed, ensuring their cultural, social, economic and environmental services and values are protected. 4.3 Mineral and extractive industries: Mineral, petroleum and extractive resources are managed for current and future use, and their extraction, processing, transport and downstream value-adding continue to contribute to the economy. 4.4 Planning and managing agricultural land: The region's agricultural production areas are protected and sustainably managed to ensure their continuing contribution to the economy, and to mitigate the anticipated effects of climate change. 4.5 Regional water supply planning: Water, as a valuable and finite regional resource, is planned and managed on a total water cycle basis. 4.6 Total water cycle management: Water is recognised as a valuable and finite resource which is managed on a total water cycle basis.
5. Strong communities	The region has vibrant, inclusive, safe, active and healthy communities, where a range of social services are accessible by all, and where unique cultural heritage and diversity is acknowledged, valued and celebrated. **Principles** 5.1 Social planning: Social planning is incorporated into planning processes to manage and respond to changing communities, and support community wellbeing and quality of life. 5.2 Addressing social and locational disadvantage: Social and locational disadvantage in communities is recognised and addressed. 5.3 Healthy and safe communities: Quality of life is enhanced by offering healthy and safe environments that promote active living and healthy lifestyles, and provide accessible health services. 5.4 Community engagement, capacity building and identity: Strong, connected and functional communities exist as a result of grassroots community development, engagement and participation, and maintaining and improving a community's sense of shared identity. 5.5 Strengthening resource communities: The long-term viability of resource communities is sustained by enhancing liveability, providing diverse housing and employment options and accommodating the needs of the resource sector. 5.6 Engaging Aboriginal and Torres Strait Islander people: Traditional Owners and Elders are actively engaged in planning and development processes, and their connectivity with Country is understood, considered and respected.

Title	Desired Regional Outcomes and principles
	5.7 Aboriginal and Torres Strait Islander social and economic equity: Aboriginal and Torres Strait Islander people have equitable access to opportunities that promote a high standard of living, good economic prospects and general wellbeing.
6. Strong economy	A thriving regional economy that is sustainable, resilient and robust, and advances the prosperity and liveability of communities across the region. **Principles** 6.1 Economic leadership and coordination: Strong economic leadership attracts, coordinates and drives regional economic development, innovation and investment. 6.2 Integrated economic, land-use and infrastructure planning: Suitable land, infrastructure and facilities are available and managed to enable sustainable economic and employment growth in the region. 6.3 Resilient and sustainable economy: The economy grows through increasing levels of human-capital, knowledge-capital and natural-capital and is resilient to external factors through multiple strong industry sectors that provide diverse employment opportunities. 6.4 Primary industries: Maintain existing and expand sustainable and economically viable primary industries, and diversify opportunities in the region. 6.5 Resource sector: Manage mining and extractive resources to maximise economic opportunities and other community benefits, while minimising negative environmental and social impacts for present and future generations. 6.6 Tourism: Continue to develop the region's distinctive and sustainable tourist destinations, which offer a diverse range of activities and unique experiences to attract domestic and international visitors.
7. Managing growth	An efficient and sustainable settlement pattern that supports the efficient use and delivery of urban land and infrastructure, housing choice and affordability and well-planned development areas to accommodate further growth. **Principles** 7.1 Efficient use of land: Land and infrastructure are used efficiently, taking into account costs of servicing, projected demand on/from existing urban infrastructure and employment. 7.2 Planning for growth: DAs and Identified Growth Areas are secured for delivering medium and long-term growth opportunities, and catering for projected demand requires comprehensive planning and infrastructure delivery.

Title	Desired Regional Outcomes and principles
	7.3 Rural residential development: Rural residential development is planned to ensure efficient delivery of services and infrastructure, preventing further fragmentation of agricultural land, and avoiding loss of areas with biodiversity and landscape values. 7.4 Housing choice and affordability: Housing meets the needs of the community, considering all lifecycle stages, varying demands, and economic circumstances.
8. Urban form	The towns and cities of the region are accessible and build on their heritage, character and liveability through designs that respond to the natural environment and the provision of high-quality urban green space. **Principles** 8.1 Urban form: The form of the region's cities and towns responds to local climate, character and identity, and supports compact, accessible, active and healthy communities. 8.2 Heritage, arts and cultural development: The region's unique heritage places and experiences are identified, protected and valued, with further opportunities for arts and cultural development provided. 8.3 Centres: Regional centres and towns are the focal point for the provision of retail, commercial and community services, economic growth and diversity. 8.4 Rural communities: Rural communities benefit from growth and are serviced by appropriate levels of infrastructure and support services.
9. Infrastructure	The region's communities have access to well-planned, coordinated, accessible, sustainable and reliable infrastructure. **Principles** 9.1 Infrastructure planning: Efficient, well-planned infrastructure supports population growth, economic opportunities and service provision in a sustainable manner. 9.2 Protecting key sites and corridors: Current and future infrastructure sites and corridors are identified, protected and managed. 9.3 Energy: Energy is reliably provided to support growth in an economically and ecologically sustainable manner. 9.4 Information and communication technology: All communities in the region are provided with modern, reliable, accessible and affordable information and communication services. 9.5 Waste and recycling: The region's waste is minimised, re-used or recycled, and promotes energy recovery. 9.6 Sewerage: The provision and management of sewage treatment infrastructure is planned, timed and managed, and is protected from encroachment by incompatible development.

Title	Desired Regional Outcomes and principles
	9.7 Social infrastructure: Social infrastructure is planned and located, accessible, adaptable and responsive to demographic change.
10. Transport	An integrated and efficient transport system and network that supports and responds to growth consistent with the intended settlement pattern, economic development and community needs. **Principles** 10.1 Integrated transport and land use: Provide highly connected transport networks to facilitate strong links within and between communities and activity centres to enable high levels of accessibility, route and mode choice. 10.2 Efficient, accessible and safe transport: An efficient, sustainable and integrated transport system exists for the region that is safe and accessible. 10.3 Freight: The efficient and effective movement of freight supports regional growth.

15.7 Appendix G: Guidelines for local government 2021 (State Planning Policy)

State interest	Regional plan land use planning policy alignment
Housing supply and diversity	Regional Policy – Strong communities • Principle 5.1.1, Land use policies 5.1.2, 5.1.3, 5.1.4 and 5.1.5 • Principle 5.5.1, Land use policies 5.5.2, 5.5.3, 5.5.4, 5.5.5, 5.5.6, 5.5.7 and 5.5.8 Regional Policy – Managing growth • Principle 7.3.1, Land use policies 7.3.2, 7.3.3, 7.3.4, 7.3.5, 7.3.6 and 7.3.7 • Principle 7.4.1, Land use policies 7.4.2, 7.4.3, 7.4.4, 7.4.5, 7.4.6, 7.4.7 and 7.4.8 Regional Policy – Urban form • Principle 8.4.1, Land use policies 8.4.2, 8.4.3, 8.4.4, 8.4.5, 8.4.6, 8.4.7, 8.4.8, 8.4.9 and 8.4.10
Liveable communities	Regional Policy – Regional landscapes • Principle 2.1.1, Land use policy 2.1.2

State interest	Regional plan land use planning policy alignment
	Regional Policy – Strong communities • Principle 5.2.1, Land use policies 5.2.2, 5.2.3, 5.2.4 and 5.2.5 • Principle 5.3.1, Land use policies 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7 and 5.3.8 • Principle 5.4.1, Land use policies 5.4.2, 5.4.3, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8 and 5.4.9 Regional Policy – Urban form • Principle 8.1.1, Land use policies 8.1.2, 8.1.3, 8.1.4, 8.1.5, 8.1.6, 8.1.7, 8.1.8, 8.1.9, 8.1.10, 8.1.11 and 8.1.12 Regional Policy – Infrastructure planning • Principle 9.4.1, Land use policy 9.4.2 • Principle 9.7.1, Land use policies 9.7.2, 9.7.3, 9.7.4 and 9.7.5
Agriculture	Regional Policy – Natural resource management • Principle 4.1.1, Land use policies 4.1.2 and 4.1.3 • Principle 4.4.1, Land use policies 4.4.2, 4.4.3, 4.4.4, 4.4.5, 4.4.6, 4.4.7, 4.4.8 and 4.4.9 Regional Policy – Strong economy • Principle 6.4.1, Land use policies 6.4.2, 6.4.3, 6.4.4, 6.4.5 and 6.4.6
Development and construction	Regional Policy – Strong economy • Principle 6.1.1, Land use policies 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.1.6, 6.1.6, 6.1.7, 6.1.8, 6.1.9, 6.1.10, 6.1.11, 6.1.12 and 6.1.13 • Principle 6.2.1, Land use policies 6.2.3, 6.2.4, 6.2.5, 6.2.6, 6.2.7, 6.2.8 and 6.2.9 • Principle 6.3.1, Land use policies 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.6, 6.3.7, 6.3.8, 6.3.9, 6.3.10, 6.3.11, 6.3.12, 6.3.13 and 6.3.14 Regional Policy – Managing growth • Principle 7.1.1, Land use policies 7.1.2, 7.1.3, 7.1.4, 7.1.5, 7.1.6, 7.1.7, 7.1.8, 7.1.9, 7.1.10, 7.1.11 and 7.1.12 Regional Policy – Urban form • Principle 8.3.1, Land use policies 8.3.2, 8.3.3, 8.3.4, 8.3.5, 8.3.6, 8.3.7, 8.3.8 and 8.3.9

State interest	Regional plan land use planning policy alignment
Mining and extractive resources	Regional Policy – Natural resource management • Principle 4.3.1, Land use policies 4.3.2, 4.3.3, 4.3.4 and 4.3.5 Regional Policy – Strong economy • Principle 6.5.1, Land use policies 6.5.2, 6.5.3, 6.5.4, 6.5.5 and 6.5.6
Tourism	Regional Policy – Strong economy • Principle 6.6.2, Land use policies 6.6.2, 6.6.3, 6.6.4, 6.6.5, 6.6.6, 6.6.7, 6.6.8, 6.6.9, 6.6.10, 6.6.11, 6.6.12 and 6.6.13
Biodiversity	Regional Policy – Sustainability, climate change and natural hazards • Principle 1.1.1, Land use policy 1.1.2 Regional Policy – Regional landscapes • Principle 2.2.1, Land use policies 2.2.2 and 2.2.3 • Principle 2.3.1, Land use policies 2.3.2, 2.3.3 and 2.3.4 Regional Policy – Environment • Principle 3.1.1, Land use policies 3.1.2, 3.1.3 and 3.1.4 Regional Policy – Natural resource management • Principle 4.2.1, Land use policies 4.2.2, 4.2.3, 4.2.4, 4.2.5 and 4.2.6
Coastal environment	Regional Policy – Environment • Principle 3.3.1, Land use policies 3.3.2, 3.3.3, 3.3.4, 3.3.5 and 3.3.6
Cultural heritage	Regional Policy – Strong communities • Principle 5.6.1, Land use policies 5.6.2, 5.6.3, 5.6.4, 5.6.5, 5.6.6, 5.6.7, 5.6.8, 5.6.9 and 5.6.10 • Principle 5.7.1, Land use policies 5.7.3, 5.7.4, 5.7.5, 5.7.6 and 5.7.7 Regional Policy – Urban form • Principle 8.2.1, Land use policies 8.2.2, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.2.7, 8.2.8 and 8.2.9

State interest	Regional plan land use planning policy alignment
Water quality	Regional Policy – Environment • Principle 3.2.1, Land use policies 3.2.2, 3.2.3, 3.2.4, 3.2.5 and 3.2.6
Emissions and hazardous activities	Regional Policy – Sustainability, climate change and natural hazards • Principle 1.2.1, Land use policies 1.2.2, 1.2.3, 1.2.4, 1.2.5 and 1.2.6 Regional Policy - Environment • Principle 3.4.1, Land use policies 3.4.2, 3.4.3 and 3.4.4 Regional Policy – Infrastructure planning • Principle 9.5.1, Land use policies 9.5.2, 9.5.3, 9.5.4 and 9.5.5 • Principle 9.6.1, Land use policies 9.6.2, 9.6.3, 9.6.4, 9.6.5, 9.6.6 and 9.6.7
Natural hazards, risk and resilience	Regional Policy – Sustainability, climate change and natural hazards • Principle 1.3.1, Land use policies 1.3.2, 1.3.3, 1.3.4, 1.3.5 and 1.3.6
Energy and water supply	Regional Policy – Natural resource management • Principle 4.5.1, Land use policies 4.5.2, 4.5.3, 4.5.4, 4.5.5 and 4.5.6 • Principle 4.6.1, Land use policies 4.6.2, 4.6.3, 4.6.4, 4.6.5 and 4.6.6 Regional Policy – Infrastructure planning • Principle 9.3.1, Land use policies 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6 and 9.3.7
Infrastructure integration	Regional Policy – Managing growth • Principle 7.2.1, Land use policies 7.2.2, 7.2.3 and 7.2.4 Regional Policy – Infrastructure planning • Principle 9.1.1, Land use policies 9.1.3, 9.1.4, 9.1.5 and 9.1.6 • Principle 9.2.1, Land use policies 9.2.2, 9.2.3 and 9.2.4

State interest	Regional plan land use planning policy alignment
Transport infrastructure	Regional Policy – Transport • Principle 10.1.1, Land use policies 10.1.2, 10.1.3, 10.1.4, 10.1.5, 10.1.6, 10.1.7, 10.1.8, 10.1.9, 10.1.10, 10.1.11, 10.1.12 and 10.1.13 • Principle 10.2.1, Land use policies 10.2.2, 10.2.3, 10.2.4, 10.2.5, 10.2.6, 10.2.7, 10.2.8, 10.2.9, 10.2.10 and 10.2.11
Strategic airports and aviation facilities	Regional Policy – Transport • Principle 10.3.1, Land use policies 10.3.2, 10.3.3, 10.3.4 and 10.3.5
Strategic ports	N/A

15.8 Appendix H: Mackay Planning Scheme (Themes and key considerations)

Theme	Key outcomes
1. Settlement pattern	Under this theme, development should: • be located and designed to maximise the economically efficient extension and safe operation of infrastructure • avoid adverse impacts on areas of environmental significance • avoid areas of medium and high-risk flood hazard • protect amenity to mitigate conflict between sensitive uses and high impact activities • not adversely impact the functions of coastal foreshores and riverine esplanades for example, in enabling natural processes and ecosystems.
2. Natural environment and regional landscapes	This strategic outcome seeks to protect vegetation communities and core habitat areas, the natural linkages between the hinterland and coast along riparian corridors, and water and ecological processes that support the GBR, including the coastal habitat and island ecology. Areas of environmental significance are protected and conserved, and aesthetic and amenity values are protected and enhanced including land and seascapes. Development should avoid detrimental impacts on groundwater, saltwater intrusion and ASS and avoid areas subject to high risk of natural hazards impacts.

3. Strong communities	This theme seeks to protect and enhance cultural and heritage places and buildings. The liveability of the region should be supported by the provision of open space, recreation facilities and community connection, and a range of social facilities and community services.
4. Natural resource management	The Mackay region's natural resources and agricultural production land are protected including extractive resources and minerals, fresh water, air, natural inland and coastal forests, island habitats, and native plants and animal species. Best practice management practices are to be implemented to ensure water resources and water quality are protected.
5. Transport	This strategic outcome seeks an integrated, efficient and safe transport system with a road network that facilitates efficient and safe movement throughout the region. Freight is to be moved, transferred and distributed efficiently throughout the region by appropriate transport modes. At the specific outcome level: • development should support linkages between the high-impact industrial area of Paget and potential future high-impact industrial area of Rosella to the ports of Mackay and Hay Point and associated support industries • existing and future transport corridors, such as the major road and rail networks, future Mackay Ring Road (bypass road), the Bowen Basin Service Link and road-widening projects, should be protected from incompatible uses • the rail system should enable the movement of passengers and bulky goods and connects to the north coast rail line as well as the ports of Mackay and Hay Point.
6. Infrastructure	Future development for urban purposes includes and incorporates a strategy for the delivery of economically efficient infrastructure. Development proposals must address urban infrastructure (including trunk infrastructure) necessary to service the development, efficient stormwater system, waste management systems and recycling, and information and communications technology networks. In relation to the development of the ports, the infrastructure theme seeks to protect the efficient operation of strategic sea port infrastructure and provides for specific outcomes to protect the: • ports from development that constrains port operations, including residential development in close proximity to strategic sea ports • access routes to the ports to ensure operational efficiency. The related land use strategies are that: • development of SPL occurs in terms of any applicable land use plan • sensitive land uses and the operational efficiency of ports are protected through provision of appropriate buffers and corridors.
7. Strong economy	The strategic framework highlights the role of the ports in supporting the resource industry and states that the priority port of Hay Point and Mackay is developed as key infrastructure in support of the regional and state economy.

	Specific outcomes seeks to ensure that high and low impact industrial land is appropriately located to serve the needs of the economy, is well connected to the transport network and avoids impacts on the natural environment and amenity of sensitive uses. High impact activity areas are to be buffered from sensitive uses and the health, wellbeing, amenity and the safety of communities are to be protected from the impacts of air, noise and odour emissions, and from the impacts of hazardous materials. The Port of Mackay, including transport infrastructure corridors, is to be protected from incompatible development that limits its function as an export and import port that supports the regional economy. Mackay Marina, adjacent to the port, performs an important leisure and tourism function. Access to tourism attractions and localities is supported through specific outcomes and they should be supported by appropriate transport infrastructure, (such as jetty landings, safe harbours and barge landings) to enable residents and tourists to experience the region's high value landscape character and environmentally important areas.
8. Sustainability, climate change and natural hazards.	Under this theme, development should avoid areas of high risk from natural hazards. The design and location of community infrastructure and services should minimise the risk of failure during a natural hazard. Development should promote sustainable water and energy use.

15.9 Appendix I: Mackay Planning Scheme (Zone codes and precincts (Planning Scheme)

Zones	Zone/Precinct intent	Intended uses
Community Facilities Zone	The purpose of the Community Facilities Zone is to provide for community-related uses, activities and facilities, whether publicly or privately owned. The purpose of the zone code is to enrich community wellbeing and liveability by providing for a diverse range of social, cultural, education and other community orientated pursuits in accessible, safe and attractive facilities, predominantly located in urban areas.	The predominant form of development within the zone is community activities and other community-oriented uses. Preferred land uses include educational establishments, hospitals, transport and telecommunications networks and utility installations.
Conservation Zone	The purpose of the Conservation Zone is to provide for the management, protection and restoration of areas	Preferred development in the zone is undeveloped natural habitat areas and environment facilities and a limited range of low intensity accommodation activities and other small-scale buildings and infrastructure may be appropriate.

Zones	Zone/Precinct intent	Intended uses
	that supports biological diversity, ecological integrity, naturally occurring landforms and coastal processes.	
District Centre Zone	The purpose of the District Centre Zone is to provide for a large variety of uses and activities to service a district of the LGA. It provides for a range of centre activities, community activities, multiple dwelling activities and other compatible uses that form compact, vibrant, attractive and pedestrian orientated multi-purpose centres and activity nodes serving the surrounding district.	Preferred uses include administrative, business, community, cultural, entertainment, professional, residential or retail uses or activities. District centres contain centre activities, community activities, and residential development.
Emerging Communities Zone	The purpose of the Community Zone is to identify land that is intended for a future urban purpose, protect this land from incompatible uses, and provide for the timely conversation of non-urban land to urban land.	Until land is developed for urban purposes, the predominant form of development within the zone should be low-intensity, low impacting rural uses with limited built form and infrastructure.
High Density Residential Zone	The purpose of the High-Density Residential Zone is to provide for high density multiple dwellings, and community uses, small-scale services, facilities and infrastructure to support local residents. It provides for medium-high and high intensity residential development that has a strong connection to a regionally significant activity, amenity and/or tourism/recreation node.	The preferred land use within the zone is high density residential development. It also accommodates short-term accommodation on some sites. Other acceptable development may include a limited range of small-scale and low intensity non-residential uses if appropriate.
High Impact Industry Zone	The purpose of the High Impact Industry Zone is to provide for high impact industry and other uses and activities that support industry activities and do not compromise the future use of premises for industry activities. It provides for large scale, medium and high impact industrial development, which make a	The preferred use for this zone is large scale, medium and high impact industrial development and other complementary industrial activities. The most appropriate activities within this zone are defined as high impact industry, i.e. the use of premises for an industrial activity; that is the manufacturing, producing, processing, repairing, altering, recycling, storing, distributing, transferring or treating of products. Examples include abattoirs, concrete batching plants, boiler making and engineering and metal foundry.

Zones	Zone/Precinct intent	Intended uses
	significant contribution to the region's economy and employment base.	
Industry Investigation Zone	The purpose of the Industry Investigation Zone is to identify and protect land that may be suitable for industry activities, subject to further planning and investigation.	Until land is developed for industrial purposes, the predominant form of development within the zone is low-intensity rural uses with limited built form and infrastructure.
Local Centre Zone	The purpose of the Local Centre Zone is to provide for a limited a limited variety of commercial, community and retail activities to service local residents; and other uses and activities that integrate with, and enhance, the local centre.	Preferred uses include centre activities, community activities, residential development, and in some areas tourism and port oriented activities (at Mackay marina local centre).
Low Density Residential Zone	The purpose of the Low Density Residential Zone is to provide for a variety of low density dwelling types.	Preferred uses include low density residential development such as dwelling houses and appropriately located multiple dwelling activities. A limited range of small-scale and low-intensity non-residential uses may be appropriate in some circumstances.
Low Impact Industry Zone	The purpose of the Low Impact Industry Zone is to provide for service industry and low impact industry, and other uses that support industry activities or compromise the future use of premises for industry activities.	The preferred land use within the zone is low impact industrial development and other complementary activities. A limited range of small-scale non-industrial uses may be appropriate.
Major Centre Zone	The purpose of the Major Centre Zone is to provide for a large variety of uses and activities to service a part of the LGA.	Preferred uses should be a diverse range of compatible uses including centre activities, community activities and residential development.
Medium Density Residential Zone	The purpose of the Medium Density Residential Zone is to provide for medium density multiple dwellings and community uses, and small-scale services, facilities and infrastructure to support local residents.	The preferred use is low-medium and medium density residential development. A limited range of small-scale and low intensity non-residential uses may be appropriate. Some zone precincts also support short-term accommodation.

Zones	Zone/Precinct intent	Intended uses
Mixed Use Zone	The purpose of the Mixed-Use Zone is to provide for a variety of uses and activities.	Preferred uses vary depending on the zone precincts but can include business, residential, retail, service industry, tourist accommodation or low impact industrial uses or activities.
Neighbourhood Centre Zone	The purpose of the Neighbourhood Centre Zone is to provide for a small variety of uses and activities to service local residents and other small scale uses and activities that directly support local residents such as community services, convenience shops or offices.	Preferred uses include centre activities (convenience stores, limited specialty stores, boutique cafes and personal services), and service stations.
Open Space Zone	The purpose of the Open Space Zone is to provide for facilities and infrastructure that supports and is required by park users. It enriches community wellbeing and liveability by providing for a diverse range of recreation activities and environmental functions, and relief from 'built-up' urban areas,	Preferred uses include park, access and stormwater infrastructure and environmental facilities, undeveloped space and informal/irregular outdoor sport and recreation activities.
Principal Centre Zone	The purpose of the Principal Centre Zone is to provide for a large variety of uses and activities to form the core of an urban area and service the LGA. It provides for the region's most intensely development multi-purpose centre and activity hub.	The principal centre (Mackay City Centre) accommodates a diverse range of compatible uses. These include: • centre activities - a full range of comparison, weekly and convenience services, regional headquarter offices, government agency offices, professional and service businesses, entertainment and leisure services • community activities • major exhibition/event and sport facilities • residential development; high density residential development and major short-term accommodation developments.
Rural Zone	The purpose of the Rural Zone is to provide for rural uses and activities, other uses, character and environment features, and to maintain the capacity of land for rural uses and activities by protecting and managing significant natural resources and processes.	The preferred use within the zone is rural activities. Other acceptable activities may include residential uses limited to those supporting rural activities, intensive rural activities, extractive industry, and other activities requiring a location outside urban areas. A limited range of small-scale tourism developments based on rural activities or landscapes may be appropriate.

Zones	Zone/Precinct intent	Intended uses
Rural Residential Zone	The purpose of the Rural Residential Zone is to provide for residential uses and activities on large lots, including lots for which the local government has not provided infrastructure and services.	Preferred uses include low intensity residential development such as dwelling houses. Other acceptable activities may include a limited range of small-scale agricultural activities.
Special Purpose Zone	The purpose of the Special Purpose Zone is to provide for public facilities and infrastructure that are publicly or privately owned or operated, and ensure that incompatible uses do not encroach on the public facilities and infrastructure.	Preferred uses include utility installation, major electricity infrastructure and substation.
Specialised Centre Zone	The purpose of the Specialised Centre Zone is to provide for 1 or more specialised uses.	Specialised uses can include conference centres, entertainment centres, education and research facilities or university campuses. The Showrooms and hardware precinct specifically accommodates large bulky goods showrooms, hardware stores and outdoor business activities.
Sport and Recreation Zone	The purpose of the Sport and Recreation Zone is to provide for a variety of cultural, educational, recreation and sporting uses and activities that require built infrastructure and facilities and infrastructure to support those uses and activities.	Preferred uses within the zone is recreation activities and other sport and recreation orientated uses, such as clubhouses, gymnasiums, swimming pools or tennis courts. Development should accommodate multiple sports and recreation activities where possible.
Tourism Zone	The purpose of the Tourism Zone is to provide for tourist activities, facilities and places in coastal, environmental, rural and urban areas.	The predominant form of development within the zone is resort complex and complementary leisure and environmental uses.
Township Zone	The purpose of the Township Zone is to provide for small to medium size urban precincts in rural or coastal areas, a variety of uses and activities to service local residents, tourist attractions and short-term accommodation.	Preferred uses within the zone include low intensity residential development, tourist accommodation activities, small-scale and low intensity uses.

15.10 Appendix J: Mackay Planning Scheme (Overlay codes)

Applicable to Port of Hay Point	Applicable Port of Mackay	Overlay	Purpose and overall outcomes
Yes	Yes	ASS Overlay Code	1. The purpose of the ASS Overlay Code is to ensure that development in areas known to contain, or potentially containing ASS, avoids the disturbance of ASS or minimises the release of acid and metal contaminants. 2. The purpose of the code will be achieved through the following overall outcomes: a. development in areas known to contain, or potentially containing acid sulfate soils, avoids disturbance or implements appropriate investigation and management techniques to minimise the release of acid and metal contaminants to: i. maintain ecological quality of the natural environment, particularly water quality ii. protect human health and wellbeing iii. minimise adverse effects on the built environment, particularly corrodible assets on the site and on surrounding sites.
Yes	Yes	Agricultural Land Overlay Code	1. The purpose of the Agricultural Land Overlay is to ensure development on or near agricultural land1 maintains the productive capacity of the land for agricultural purposes. 2. The purpose of the code will be achieved through the following overall outcomes: a. development that fragments, alienates or diminishes the productive capacity of agricultural land for agricultural purposes is avoided b. agricultural activities on agricultural land is protected and promoted c. the full productive capacity of agricultural land for agricultural purposes is not compromised by the location of sensitive land uses that will prevent or constrain current or future farming operations.
Yes	Yes	Airport Environs Overlay Code	1. The purpose of the Airport Environs Overlay Code is to: a. ensure development maintains the safety, efficiency and operational integrity of Mackay Airport and associated aviation facilities

Applicable to Port of Hay Point	Applicable Port of Mackay	Overlay	Purpose and overall outcomes
			b. minimise safety risks and maintain the amenity of development in close proximity to Mackay Airport. 2. The purpose of the code will be achieved through the following overall outcomes: a. safety risks for aircraft approaching and departing from Mackay Airport are minimised through ensuring that: i. development and associated activities is limited and avoids increasing public safety risks within the airport public safety areas ii. inappropriate development such as buildings, structures and other obstructions avoid being located within close proximity to aviation facilities to maintain and not compromise their operation iii. development and associated activities do not create incompatible intrusions, or compromise aircraft safety, in operational airspace iv. development does not generate air emissions, attract wildlife and include inappropriate lighting that compromises aircraft safety b. development in close proximity to Mackay Airport is compatible with forecast levels of aircraft noise within the 20 Australian Noise Exposure Forecast contour and greater.
Yes	Yes	Biodiversity Overlay Code	1. The purpose of the Biodiversity Overlay Code is to ensure that development maintains the ecological integrity of significant vegetation and wildlife habitat areas, natural waterways and natural wetlands. 2. The purpose of the code will be achieved through the following overall outcomes: a. the ecological integrity and functionality of environmentally significant vegetation and wildlife habitat areas, waterways and wetlands is maintained by ensuring that development: i. retains elements of ecological importance

Applicable to Port of Hay Point	Applicable Port of Mackay	Overlay	Purpose and overall outcomes
			ii. effectively mitigates potential environmental, amenity, hydrologic and access impacts b. where relevant, the ecological integrity and functionality of environmentally significant vegetation and wildlife habitat areas, waterways and wetlands is improved through rehabilitation measures and enhancing regional ecological connectivity
Yes	Yes	Bushfire Hazard Overlay Code	1. The purpose of the Bushfire Hazard Overlay Code is to ensure that development in areas subject to bushfire hazard is located and designed to minimise the risk of harm to people and property. 2. The purpose of the code will be achieved through the following overall outcomes: a. development in bushfire hazard areas is located and designed so that: i. damage from bushfire events is minimised ii. it avoids areas with a very high, high and medium risk bushfire hazard iii. accessibility and equipment is provided for fire fighting vehicles iv. safe evacuation during bushfire events can be facilitated b. public safety and the environment are not adversely affected by the inappropriate storage of hazardous materials.
Yes	Yes	Extractive Resources and High Impact Activities Overlay Code	1. The purpose of the Extractive Resources and High Impact Activities Overlay Code is to minimise potential conflicts between existing and future significant extractive resource areas and high impact activities and sensitive land uses. 2. The purpose of the code will be achieved through the following overall outcomes: a. the operation and full productive capacity of significant existing extractive industries including key resource areas transport routes is not compromised by the location of sensitive land uses that prevents or severely constrains the current extraction of resources

Applicable to Port of Hay Point	Applicable Port of Mackay	Overlay	Purpose and overall outcomes
			b. realisation of the full productive capacity of potential extractive resource areas is not compromised by the location of sensitive land uses c. the operation of existing and future high impact activities is not compromised by the nearby location of sensitive land uses d. adverse impacts from extractive industries and high impact activities on sensitive land uses are avoided.
Yes	Yes	Flood and Coastal Hazards Overlay Code	1. The purpose of the Flood and Coastal Hazards Overlay Code is to ensure that development in areas subject to inundation in riverine and local flood events and/or located in coastal hazard area, is planned, designed and constructed to minimise risk of hazards to people and property. 2. The purpose of the code will be achieved through the following overall outcomes: a. development in flood and coastal hazard areas: i. is avoided due to the nature of the use or the severity of the hazard ii. achieves acceptable ground levels and floor levels so that damage from flood events is minimised iii. minimises exposure of communities to the risk of adverse flood and coastal hazard impacts iv. is designed to protect communities, infrastructure and coastal ecosystems from adverse flood and coastal hazard impacts, whilst not unduly burdening disaster management plans v. minimises removal of natural process that mitigate risks associated with flood and coastal hazards b. development involving important community activities and essential utility services maintain their function during flood and coastal hazard events

Applicable to Port of Hay Point	Applicable Port of Mackay	Overlay	Purpose and overall outcomes
			c. development in flood and coastal hazard areas is located and designed so that it does not worsen impacts on surrounding sites d. public safety and the environment are not adversely affected by the inappropriate storage of hazardous materials.
No	Yes	Heritage and Neighbourhood Character Overlay Code	1. The purpose of the Heritage and Neighbourhood Character Overlay Code is to maintain the heritage value of: a. sites containing a local heritage place b. the traditional building character of neighbourhood character areas. 2. The purpose of the code will be achieved through the following overall outcomes: a. the heritage value of sites containing a local heritage place is maintained through adaptive reuse and sensitive new development b. new development on sites containing a local heritage place and adjoining sites maintain the heritage value and visual prominence of heritage elements c. new development within neighbourhood character areas is sympathetic to the traditional building character of the area prior to 1950 including cottages, bungalows and Queenslanders featuring: i. high set or low stumps ii. pitched, iron sheeted roofs iii. stucco iv. timber construction (weather board, cladding and the like) v. verandas d. demolition of local heritage places is avoided.

Applicable to Port of Hay Point	Applicable Port of Mackay	Overlay	Purpose and overall outcomes
Yes	Yes	Landscape Character and Image Corridor Overlay Code	1. The purpose of the Landscape Character and Image Corridor Overlay Code is to maintain and enhance the visual amenity of the region provided by landscape character areas and experienced from image corridors. 2. The purpose of the code will be achieved through the following overall outcomes: a. development in landscape character areas is sensitively located and designed so that landscape character attributes are maintained b. development adjacent to image corridors enhances the region's visual amenity by providing high quality-built form and landscaping outcomes.
		Landslide Hazard Overlay Code	1. The purpose of the Landslide Hazard Overlay Code is to ensure that development: a. on steep land is responsive to site constraints and limited to those areas where risk is low b. on steep land is adequately protected from landslide hazard and does not increase the extent or severity of landslide hazard risk c. maintains the safety of people, property and hazardous materials (manufactured or stored in bulk) from the risk of landslide. 2. The purpose of the code will be achieved through the following overall outcomes: a. development on steep land is avoided or located and designed so that the level of landslide hazard risk is minimised b. development does not result in increased landslide hazard risk for adjoining and nearby sites c. reconfigured lots on steep land provide a usable and accessible building envelope.
Yes	Yes	Regional Infrastructure Overlay Code	1. The purpose of the Regional Infrastructure Overlay Code is to maintain the operational efficiency and reliability of infrastructure, public safety and a high level of amenity for adjoining and nearby sensitive land uses.

Applicable to Port of Hay Point	Applicable Port of Mackay	Overlay	Purpose and overall outcomes
			2. The purpose of the code will be achieved through the following overall outcomes: a. development maintains the economic integrity, operational efficiency and reliability of infrastructure by avoiding incompatible development in close proximity to infrastructure elements and corridors of regional significance b. development within, adjoining and near regional infrastructure elements and corridors maintains public safety c. adjoining and nearby sensitive land uses are located, orientated and designed to achieve high levels and visual and general amenity.

15.11 Appendix K: Local Government Infrastructure Plan (Future planned infrastructure)

15.11.1 Port of Hay Point

Type	Reference no.	Trunk infrastructure	Estimated timing
Sewer Infrastructure	S-MS-P-1	Pumping Station Upgrade - SPS-Temples Lane SPS Augmentation (Stage 1)	2026
Sewer Infrastructure	S-MS-P-4	Pumping Station Upgrade - SPS-Connors Road SPS Augmentation	2031
Sewer Infrastructure	S-MS-P-3	Pumping Station Upgrade - SPS - Schmidtkes Rd SPS upgrade (Stage 2)	2026
Stormwater Future Infrastructure	BAK-1	Bakers Creek Catchment - Ooralea (Culverts - Bound3 a,b,c,e,f)	2018
Stormwater Future Infrastructure	BAK-3	Bakers Creek Catchment - Ooralea (Culverts - Cowleys 1 a,b)	2018
Stormwater Future Infrastructure	BAK-4	Bakers Creek Catchment - Ooralea (Culverts - Cowleys 7 a,b,e,f)	2019
Stormwater Future Infrastructure	BAK-5	Bakers Creek Catchment - Ooralea (Culverts - Cowleys 8 a,b,f)	2018

Type	Reference no.	Trunk infrastructure	Estimated timing
Stormwater Future Infrastructure	BAK-6	Bakers Creek Catchment - Ooralea (Culverts - Cowrail a,c,d,f,g)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-7	Bakers Creek Catchment - Ooralea (Culverts - Main 1 a,b,e,f)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-8	Bakers Creek Catchment - Ooralea (Culverts - Schmid3 a,b,c,e,f,g)	2017
Stormwater Future Infrastructure	BAK-12	Bakers Creek Catchment - Ooralea (Land Acq and Wetland - Ooralea Wetland)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-21	Bakers Creek Catchment - Ooralea (Land Acquisition and Wetland - School Wetland)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-23	Bakers Creek Catchment - Ooralea (Stotts 4 a,b,c,e,f)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-24	Bakers Creek Catchment - Ooralea (Sugar Rail 6 a,c,d,f)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-25	Bakers Creek Catchment - Ooralea (Sugar Rail 7 a,c,d,f)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-32	Bakers Creek Catchment - Ooralea - Ferris Gully - Culvert W Leg CQU Drain BR02	2017
Stormwater Future Infrastructure	SM-2	South Mackay Main Drainage - BCSMMD Boundary Road Culvert - Report RPT0083 - Upgrade on South Mackay Main Drain	2022
Stormwater Future Lines	SM-1	South Mackay Main Drainage - BCSMMD Channel Augmentation - Report RPT0083 - Boundary Road to Farrellys Lane	Beyond LGIP horizon
Stormwater Future Lines	BAK-15	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - 1650 to 3250)	2031
Stormwater Future Lines	BAK-16	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - 500 to 1350)	2031
Stormwater Future Lines	BAK-19	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - East of Connors)	2016

Type	Reference no.	Trunk infrastructure	Estimated timing
Stormwater Future Lines	BAK-26	Bakers Creek Catchment (Land acquisition - Ferris Gully - 3350 to 4300)	2017
Stormwater Future Lines	BAK-17	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - 4300 to 4700)	2017
Stormwater Future Lines	BAK-9	Bakers Creek Catchment - Ooralea (Land acq and drain construct - Cowleys Drain)	Beyond LGIP horizon
Stormwater Future Lines	BAK-10	Bakers Creek Catchment - Ooralea (Land acq and drain construct - Cowleys Drain)	Beyond LGIP horizon
Stormwater Future Lines	BAK-13	Bakers Creek Catchment - Ooralea (Land Acquisition - Cowleys Levee)	Beyond LGIP horizon
Stormwater Future Lines	BAK-14	Bakers Creek Catchment - Ooralea (Land Acquisition - East Link Drain - Eld 500 to Eld 1750)	Beyond LGIP horizon
Stormwater Future Lines	BAK-11	Bakers Creek Catchment - Ooralea (Land acq and drainage study)	Beyond LGIP horizon
Stormwater Future Lines	BAK-20	Bakers Creek Catchment - Ooralea (Land acquisition and drain construct - School Gully BCKR Reach A1-6 Detention Basin)	Beyond LGIP horizon
Stormwater Future Lines	BAK-22	Bakers Creek Catchment - Ooralea (Ring Road Drain - Land and Drain - MRR C Drain)	Beyond LGIP horizon
Stormwater Future Lines	BAK-27	Bakers Creek Catchment (Milton Street Trunk Drainage South of Football)	2030
Stormwater Future Lines	SHE-1	Shellgrit Creek (Absolon Street Drainage Study) - Case 3a Stages 1 and 2	2027
Stormwater Future Lines	BAK-28	Bakers Creek Catchment - Ooralea (Ferris Gully - East Link Drain (0 to 260))	2016
Stormwater Future Lines	BAK-29	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - 350 to 1350)	2016
Stormwater Future Lines	BAK-30	Bakers Creek Catchment - Ooralea - Ferris Gully - Connecting Drain BR01-BR02	2018
Stormwater Future Lines	BAK-31	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - 350 to 1350) - Second Stage	2031
Stormwater Future Lines	SHE-9	South Mackay Levee	2021

Type	Reference no.	Trunk infrastructure	Estimated timing
Stormwater Future Lines	SHE-2	Shellgrit Creek - Absolon Street Drainage Study - Case 3b1	2027
Transport Future Intersections	22	Milton and Boundary Road East	2018
Transport Future Intersections	49	Archibald and Central Park Drive	2029
Transport Future Intersections	43	Stockroute/Connors Intersection	Beyond LGIP horizon
Transport Future Intersections	1064	Milton/Farrellys Intersection	Beyond LGIP horizon
Transport Future Intersections	1063	Milton/New Road Intersection	Beyond LGIP horizon
Transport Future Intersections	19	Milton/Archibald Intersection	2020
Transport Future Lines	24	Milton Street - Boundary Road to Farrellys South	Beyond LGIP horizon
Transport Future Lines	23	Milton Street - Boundary Road to Farrellys North	Beyond LGIP horizon
Transport Future Lines	15	Paradise Street - Archibald to Bridge	Beyond LGIP horizon
Transport Future Lines	6	Connors Road - Farrellys to Boundary (Ult)	Beyond LGIP horizon
Transport Future Lines	5	Interim Stockroute Road Construction - Broadsound to Diesel	2019
Transport Future Lines	1030	Boundary Road West - Bernborough Avenue to Rainlover Street	2022
Transport Future Lines	25	East Boundary Road - Connors Road - Success Street	2027

Type	Reference no.	Trunk infrastructure	Estimated timing
Transport Future Lines	77	Schmidtkes Road - Canecutters to Cowleys	Beyond LGIP horizon
Transport Future Lines	98	Connors Road - At Farrelly Road - slip lane and Farrelly extra lane	2024
Transport Future Lines	10	Archibald/Paradise Free left Arc Para, widen Connor South	Beyond LGIP horizon
Transport Future Lines	1034	Archibald Street - Overpass Duplication	Beyond LGIP horizon
Transport Future Lines	1035	Boundary Road West - Cowleys to Bernborough Avenue	2021
Transport Future Lines	5a	Stockroute Road - Diesel Drive to Connors Road	Beyond LGIP horizon

15.11.2 Port of Mackay

Type	Ref no	Trunk infrastructure	Est. timing
Sewer Infrastructure	S-MS-P-1	Pumping Station Upgrade - SPS-Temples Lane SPS Augmentation (Stage 1)	2022–26
Sewer Infrastructure	S-MS-P-4	Pumping Station Upgrade - SPS-Connors Road SPS Augmentation	2027–31
Sewer Infrastructure	S-MS-P-3	Pumping Station Upgrade - SPS - Schmidtkes Road SPS upgrade (Stage 2)	2022–26
Stormwater Future Infrastructure	BAK-1	Bakers Creek Catchment - Ooralea (Culverts - Bound3 a,b,c,e,f)	2018
Stormwater Future Infrastructure	BAK-3	Bakers Creek Catchment - Ooralea (Culverts - Cowleys 1 a,b)	2018
Stormwater Future Infrastructure	BAK-4	Bakers Creek Catchment - Ooralea (Culverts - Cowleys 7 a,b,e,f)	2019
Stormwater Future Infrastructure	BAK-5	Bakers Creek Catchment - Ooralea (Culverts - Cowleys 8 a,b,f)	2018
Stormwater Future Infrastructure	BAK-6	Bakers Creek Catchment - Ooralea (Culverts - Cowrail a,c,d,f,g)	Beyond LGIP horizon

Type	Ref no	Trunk infrastructure	Est. timing
Stormwater Future Infrastructure	BAK-7	Bakers Creek Catchment - Ooralea (Culverts - Main 1 a,b,e,f)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-8	Bakers Creek Catchment - Ooralea (Culverts - Schmid3 a,b,c,e,f,g)	2017
Stormwater Future Infrastructure	BAK-12	Bakers Creek Catchment - Ooralea (Land Acq and Wetland - Ooralea Wetland)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-21	Bakers Creek Catchment - Ooralea (Land Acquisition and Wetland - School Wetland)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-23	Bakers Creek Catchment - Ooralea (Stotts 4 a,b,c,e,f)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-24	Bakers Creek Catchment - Ooralea (Sugar Rail 6 a,c,d,f)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-25	Bakers Creek Catchment - Ooralea (Sugar Rail 7 a,c,d,f)	Beyond LGIP horizon
Stormwater Future Infrastructure	BAK-32	Bakers Creek Catchment - Ooralea - Ferris Gully - Culvert W Leg CQU Drain BR02	2017
Stormwater Future Infrastructure	SM-2	South Mackay Main Drainage - BCSMMD Boundary Road Culvert - Report RPT0083 - Upgrade on South Mackay Main Drain	2022
Stormwater Future Lines	SM-1	South Mackay Main Drainage - BCSMMD Channel Augmentation - Report RPT0083 - Boundary Road to Farrellys Lane	Beyond LGIP horizon
Stormwater Future Lines	BAK-15	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - 1650 to 3250)	2031
Stormwater Future Lines	BAK-16	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - 500 to 1350)	2031
Stormwater Future Lines	BAK-19	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - East of Connors)	2016

Type	Ref no	Trunk infrastructure	Est. timing
Stormwater Future Lines	BAK-26	Bakers Creek Catchment (Land acquisition - Ferris Gully - 3350 to 4300)	2017
Stormwater Future Lines	BAK-17	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - 4300 to 4700)	2017
Stormwater Future Lines	BAK-9	Bakers Creek Catchment - Ooralea (Land acq & drain construct - Cowleys Drain)	Beyond LGIP horizon
Stormwater Future Lines	BAK-10	Bakers Creek Catchment - Ooralea (Land acq & drain construct - Cowleys Drain)	Beyond LGIP horizon
Stormwater Future Lines	BAK-13	Bakers Creek Catchment - Ooralea (Land Acquisition - Cowleys Levee)	Beyond LGIP horizon
Stormwater Future Lines	BAK-14	Bakers Creek Catchment - Ooralea (Land Acquisition - East Link Drain - Eld 500 to Eld 1750)	Beyond LGIP horizon
Stormwater Future Lines	BAK-11	Bakers Creek Catchment - Ooralea (Land acq and drainage study)	Beyond LGIP horizon
Stormwater Future Lines	BAK-20	Bakers Creek Catchment - Ooralea (Land acquisition and drain construct - School Gully BCKR Reach A1-6 Detention Basin)	Beyond LGIP horizon
Stormwater Future Lines	BAK-22	Bakers Creek Catchment - Ooralea (Ring Road Drain - Land and Drain - MRR C Drain)	Beyond LGIP horizon
Stormwater Future Lines	BAK-27	Bakers Creek Catchment (Milton Street Trunk Drainage South of Football)	2030
Stormwater Future Lines	SHE-1	Shellgrit Creek (Absolon Street Drainage Study) - Case 3a Stages 1 and 2	2027
Stormwater Future Lines	BAK-28	Bakers Creek Catchment - Ooralea (Ferris Gully - East Link Drain (0 to 260))	2016

Type	Ref no	Trunk infrastructure	Est. timing
Stormwater Future Lines	BAK-29	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - 350 to 1350)	2016
Stormwater Future Lines	BAK-30	Bakers Creek Catchment - Ooralea - Ferris Gully - Connecting Drain BR01-BR02	2018
Stormwater Future Lines	BAK-31	Bakers Creek Catchment - Ooralea (Land Acquisition - Ferris Gully - 350 to 1350) - Second Stage	2031
Stormwater Future Lines	SHE-9	South Mackay Levee	2021
Stormwater Future Lines	SHE-2	Shellgrit Creek - Absolon Street Drainage Study - Case 3b1	2027
Transport Future Intersections	22	Milton and Boundary Road East	2016–21
Transport Future Intersections	49	Archibald and Central Park Drive	2027–31
Transport Future Intersections	19	Milton/Archibald Intersection	2016–21
Transport Future Lines	5	Interim Stockroute Road Construction - Broadsound to Diesel	2016–21
Transport Future Lines	1030	Boundary Road West - Bernborough Avenue to Rainlover Street	2022–26
Transport Future Lines	25	East Boundary Road - Connors Road - Success Street	2027–31
Transport Future Lines	77	Schmidtkes Road - Canecutters to Cowleys	Beyond LGIP horizon
Transport Future Lines	98	Connors Road - At Farrelly Road - slip lane and Farrelly extra lane	2022–26
Transport Future Lines	1035	Boundary Road West - Cowleys to Bernborough Avenue	2016–21

15.12 Appendix L: Priority Port of Hay Point/Mackay Port Land Use Plan (Precinct details)

15.12.1 Port of Hay Point (precinct details)

Precinct	Intent	Preferred land uses
Port handling activities	This area represents land that is strategic to the existing and future operations and development of the port. It provides for the core commercial business of the Port of Hay Point and is intended to cater for the future extension of these core port activities. The designation includes areas utilised for the loading/unloading, stockpiling, and transfer of commodities. It also includes areas for land access, transport corridors (both rail and road) and port related offices.	Uses that facilitate the expansion, improvement or maintenance of Port Handling Activities are compatible including (as summarised): • storage and processing areas • port related offices • ancillary services • port services • quarantine waste facilities • transportation.
Offshore port infrastructure	These areas are located offshore and include essential structures or infrastructure for vessels accessing the port and the transfer of materials/goods for shipment. New infrastructure must relate to the key activities being undertaken at the port. The designation allows for infrastructure such as dredge channels, swing basins and navigational aids or equipment that are important for protecting the function, commercial viability and safety of the port.	• Wharfage/docking facilities • Tug facilities • Loading/unloading infrastructure • Temporary construction laydown areas • Navigational equipment or aids • Tidal works including dredge channels and swing basins • Geotechnical • Investigations and surveys • Reclamation
Access and port infrastructure	These areas are located below the high-water mark and currently provide access to port infrastructure for operational, maintenance and construction purposes. The	• Navigational equipment or aids • Tidal works including dredge channels and • Swing basins

Precinct	Intent	Preferred land uses
	designation allows for the development of infrastructure such as jetties, tug facilities and dredge channels that relate to the key activities being undertaken at the port.	• Wharfage/ docking facilities • Loading/ unloading infrastructure • Jetties • Tug facilities • Recreational and leisure facilities (ie fishing and sailing) except near shipping or structures • Geotechnical • Investigations and surveys • Reclamation for port related activities or foreshore development
Port related and support	Land within this designation is to accommodate activities that have a strong physical, operational or supporting role to the core operations in the Port Handling Activities area. The designation includes activities that contribute to port efficiency by shortening the supply chain or providing logistical benefits.	• Port services including, customs, port pilotage, Australian Quarantine Inspection Service, and shipping agents • Quarantine waste facilities • Port related offices • Warehouse/ storage of goods or material • Port related light/medium industry, including engineering works and concrete batching plants • Temporary activities associated with port use or construction including lay down areas construction offices, and contractor parking • Temporary accommodation camp for construction • Extractive industry • Utilities, including electrical, water and sewerage infrastructure
Transport infrastructure	Land within this designation is to accommodate future transport corridors and infrastructure that provides access to the port.	• Future transport corridors (road and rail) and associated infrastructure

Precinct	Intent	Preferred land uses
		• Utilities, including electrical transmission and water transfer infrastructure • Short term storage areas during construction
General buffer	These areas represent a physical buffer to areas surrounding the port. The retention of buffer areas in a largely undeveloped state is essential to the future viability of the port in order to minimise impacts of commercial port operations on adjoining land uses. The Wildlife Corridor overlay sits within the General buffer designation and affects area where it has been determined that the establishment of a wildlife corridor is essential to provide habitat linkages for native fauna to environmental areas.	Uses complementary to the attributes of the land, including for example: • Park/ open space • Vegetated areas • Utilities, including telecommunications, electrical, water and sewerage infrastructure • Access corridors (vehicular and rail)
Environmental protection	These areas designate land that exhibits recognised ecological and/ or cultural heritage values that are to be protected, managed and enhanced. Development or activities that conflict with the conservation of these values is inappropriate. Development that provides access to coastal areas/ beaches and other significant natural and cultural features may be acceptable.	• Environmental and cultural areas • Buffer • Boardwalks

15.12.2 Port of Mackay (precinct details)

Precinct	Intent	Preferred land uses
Port operations	This precinct includes land that represents the core or primary operations at the Port of Mackay including those related to: • activities requiring direct or convenient waterfront access • bulk cargo storage or terminals • slipways and other infrastructure • NQBP port operations; and	• ancillary administrative operations • bulk cargo terminals and storage • Harbour Master • loading facilities • NQBP port operations • processing operations • slipways, wharves/berths and jetties

Precinct	Intent	Preferred land uses
	• trade transport and logistics (wharves, loading facilities, rail, berthing facilities, stockpiling and storage). This land typically includes onshore lands immediately adjacent to the waterfront (including road or other transport access) and includes the existing port users and operators as well as land for future potential expansions of these uses or new industries particularly in the area onshore from the proposed future reclamation area (see Future SPL area 4 in **Figure 4**). This precinct has the potential to accommodate: • a common user bulk terminal catering for bulk product import/export on land to the north of the existing grain and sugar terminals • consolidation of lands in the existing industrial areas for prospective primary port users.	• storage and stockpiling of sugar, grain, primary products, mineral products as well as other products whether open air or under partial cover or fully enclosed • storage of bulk liquids (including flammable or dangerous goods) • storage of containers and other general cargo • trade related and transport and logistic operations • tug operations.
Harbour and access	This precinct includes predominantly offshore lands (and some associated onshore land) necessary for safe and efficient shipping movement and navigation. It includes the swing basin area to the north of the Marina, loading facilities, wharves and the northern breakwater. In the future it may also include any necessary navigational channels or shipping areas. The area includes land adjoining the Marina that is currently and will continue in the future to be for working harbour activities including tank storage.	• boat ramps, slipways, berths and jetties, docking facilities • tug facilities • loading and unloading infrastructure • maritime support facilities including vessel refuelling/ servicing and repairs / waste management • marina for recreational, commercial and fishing vessels • vessel lift-out facilities • dredging • navigational aids and infrastructure (including breakwater walls)

Precinct	Intent	Preferred land uses
		• channels and swing basins, and • for the southern portion, or the 'working harbour', development directly associated with this ongoing function
Port support	This precinct will provide land for existing and future port related industries and activities that support the core or primary operations at the Port of Mackay. Activities do not necessarily require waterfront access or harbour access but are seen as important to the function, commercial viability and safety of the port. The precinct also includes those uses important to the transport logistics chain. While not traditionally seen as core or primary port activities, these uses are emerging as essential support facilities and operations for the port. They also support the requirement of port authorities to be commercially viable operations and may include 'interim' uses (with short or long term tenure arrangements) that can be replaced over time by core port operations or business.	• intermodal transfer terminal • light and medium impact industries, particularly those that promote or demonstrate best practice and latest technology in sustainable development including water re-use, recycling, low power consumption, high tech IT/data transfer systems, etc • maintenance operations particularly those associated with transport logistics and harbour activities • transport and logistics, and • warehouse and storage facilities. It is noted that heavy, noxious or hazardous industries are not supported in this precinct
Port-related commercial	This precinct has a number of functions. Like the Port Support precinct, land will accommodate a range of activities and development that support and complement the port activities. Although activities that locate in this precinct are not 'core' port related uses, they are considered to be emerging as essential supporting facilities to the port operations and support the existing Marina development. They provide financial support to the port authority's requirement to be commercially viable. At certain locations (for example the area located to the west of the marina), development on this land provides a transition or buffer to more intense port users and	• commercial premises with some nexus to the port operations, boating, harbour operations or transport and logistics, such as: - tourism and charter operators - retail uses related to chandlery, boat sales and similar - storage facilities

Precinct	Intent	Preferred land uses
	activities. Activities in this precinct therefore also provide a 'transitioning' role from more intense, visually intrusive or industrial type activities to other incompatible or sensitive development (such as residential or tourism) on non-SPL. The nature, form and density of development will also be cognisant of any existing public open space/ recreational attributes of the land (for example, Old Mulherin Park). Mulherin Park's recreational and social value as an open space, is respected in this Land Use Plan and any future development within this land use precinct (or adjoining) will need to respond and be sympathetic to these values. Activities that support the tourism industry and marina operations are also appropriate at some locations. Development in this precinct, particularly at high profile locations along Ron Searle and Mulherin Drives will also contribute to the visual amenity and character of the link road between Mackay CBD and the Marina. Development in this precinct, where highly visible, must provide quality design outcomes to create a pleasant 'entry statement' and 'gateway' to the Marina and Mackay CBD. It is not intended that this precinct will compete with the Mackay CBD in terms of commercial and retail development. The scale, range and quantum of commercial and related uses will complement the Mackay City Centre's hierarchy. It should also have regard to the nearby Marina and residential development in this locality and where appropriate, provide complementary and compatible land uses. Presently, the land at Mount Bassett and in particular Radar Hill provides the port with an important buffer to any potential residential development to the south. It is possible that an appropriate land use that preserves the buffering role could be established here, subject to further assessment.	- cafes/ takeaway food stores servicing harbour visitors and/ or port businesses - bait and tackle sales (associated with boating/ harbour/tourism operations) - a service station. • car parking • professional offices with a nexus to the port (operations, boating, harbour operations, or transport and logistics) • shipyards, and • parkland/recreational areas.
Marina	The marina provides a focus for water based recreational and tourist activities. SPL includes the breakwater and a portion of land along the esplanade intended to preserve public access to the marina and other public places including the public esplanade.	• boat moorings • fish handling and associated uses • open space

Precinct	Intent	Preferred land uses
	This area has been identified in a separate land use precinct because of the unique function and role that is has within the port area.	• public promenade, and • work associated with the marina basin.
Quarry	The quarry provides a prime source of rock material used in maintenance of the existing harbour walls and in the ongoing maintenance of all port infrastructure (including roads). It is intended that this use will continue to operate (from time to time) to support this need. It will be important that planning for future land use activities in the vicinity of the quarry fully consider the long-term function of the quarry. The quarry is a key strategic asset of the Port of Mackay.	• extractive industry, and • some limited range of recreational/sporting activities where the use does not interfere with, or would be adversely affected by the quarry (such as a pistol club)
Buffer	The Buffer Precinct may have multiple functions and includes land with diverse values and development. The buffer precinct may include land: • with high environmental or ecological values • subject to inundation or flooding • with conservation values • having limited development potential as it provides a transition between areas of possible incompatibility. Future development is possible on areas within this precinct. However, some lands are recognised as having ecological or other environmental values or attributes that may severely constrain or limit future development potential. Any future activities must be consistent with the values and functions of the area and positively contribute to those values or functions. The boundaries of the port operations (development) lands have been defined along the catchment boundaries of Basset and Vines Creeks. This provides a boundary or limit to the port's developable area. Area A Land to the west of Slade Point Road is affected by flooding and inundation and also has some ecological values.	• board walks and interpretative centres • eco-café and/or tourism, information or visitor facility • low impact (visual, aesthetic, environmental) activities • open space and conservation areas, and • uses complementary to the values of the precinct, sub-area or ecological values of the area

Precinct	Intent	Preferred land uses
	Area B Land to east of Slade Point Road and north of the port is identified as having conservation and ecological values and development will be highly restricted in this area to only those activities that complement those aforementioned values. Land is held by the port authority in order to maintain an alternative access to the north eastern extent of the proposed Kommo Toera extension trail and also the north harbour beach area.	

15.13 Appendix M: Land use planning management measures

Regulatory instruments	DA	Plan making	Other
SPP	Yes	Yes	
SDAP v3.0	Yes		
MIW Regional Plan 2012	Yes	Yes	
Mackay Planning Scheme 2017 v3.1	Yes		
RPI Act	Yes		
Port of Hay Point Land Use Plan 2010	Yes		
Port of Mackay Land Use Plan 2009	Yes		
Great Barrier Reef Marine Park ZONING PLAN 2003			Operational permits

15.13.1 State Policy Planning

Management measures	Value/Impact
State interest statements (higher order intent for plan making and DA)	**Climate change and natural hazards** **Cultural heritage**

Management measures	Value/Impact
	Economic **Environmental values** **Hazardous activities and contaminated land** **Infrastructure** **OUV** **Social**
Part E: State interest policies (to guide plan making)	**Climate change and natural hazards** – impacts of climate change, risk management, and community safety and resilience **Cultural heritage** – cultural, natural and built environments of international, national, state and local significance **Economic** - economic growth, agriculture, construction, extractive resources, tourism **Environmental values** – biodiversity, coastal environment, water quality, ecological processes, MNES, MSES, Matters of Local Environmental Significance **Hazardous activities and contaminated land** – emissions, hazardous activities **Infrastructure** - energy and water supply, infrastructure integration, transport infrastructure, strategic airports and aviation facilities, strategic ports **OUV** – GBRWHA **Social** - housing supply and diversity, liveable communities, access, safety, amenity
Part E: Assessment benchmarks (to inform DA)	**Climate change and natural hazards** – safety, risk and resilience, bushfire, flood, landslide, storm tide inundation, and erosion prone areas outside the coastal management district **Economic** – key resource areas, extractive resources, safety **Environmental values** – water quality, stormwater management, wastewater, erosion prone areas within a coastal management district **Infrastructure** – strategic airports and aviation facilities, safety, emissions and amenity **Social** – safety, amenity, emissions, design

15.13.2 State Development Assessment Provisions v3.0

Management measures	Value/Impact
State code 1: Development in a state-controlled road environment	**Infrastructure** - State transport corridors (if near a state-controlled road or future state-controlled road), road network including safety, performance and maintenance **Social** - safety, access, amenity, emissions
State code 2: Development in a railway environment	**Infrastructure** - State transport corridors (if near a railway corridor or future railway corridor), rail network including safety, performance and maintenance **Social** - safety, access, amenity, emissions
State code 5: Development in a state-controlled transport tunnel environment	**Infrastructure** - State-controlled transport tunnels for roads/rail including safety, performance and maintenance **Social** - safety, access, amenity, emissions
State code 6: Protection of state transport networks	**Infrastructure** - State transport infrastructure including safety, performance and maintenance **Social** - safety, access, amenity, emissions
State code 7: Maritime safety	**Infrastructure** - navigable waterways, maritime safety
State code 8: Coastal development and tidal works	**Climate change and natural hazards** - storm tide events, erosion control **Environmental values** - coastal management district, erosion prone areas, coastal processes, coastal protection, water quality, MSES, offsets **Infrastructure** - dredging, dredged material, reclamation **OUV** - GBRWHA **Social** - safety, access, amenity
State code 9: GBR wetland protection areas	**Environmental values** - wetland protection areas, wetland environmental values, land degradation, water quality, MSES, offsets **OUV** - GBRWHA
State code 10: Taking or interfering with water	**Environmental values** - sustainable water management, taking or interfering with water, land degradation, riverine ecosystems, underground water including coal seam gas water, overland flow water including contaminated agricultural run-off water
State code 11: Removal, destruction or damage of marine plants	**Environmental values** - marine plants, fisheries resources, fish habitats, dredging, dredged material, erosion control, MSES, offsets **OUV** - GBRWHA **Economic** - commercial fishing and related infrastructure, services and facilities, recreational fishing

Management measures	Value/Impact
	Social - access
State code 12: Development in a declared FHA	**Economic** - commercial fishing and related infrastructure, services and facilities, aquaculture, recreational fishing **Environmental values** - declared FHAs, fisheries resources, fish habitats, fish passage, marine plants, dredging, dredged material, erosion control, water quality, MSES, offsets **OUV** - GBRWHA **Social** - access, awareness
State code 14: Queensland heritage	**Cultural heritage** - state heritage places
State code 15: Removal of quarry material from a watercourse or lake	**Environmental values** - removal of quarry material, sustainable water resource management, natural ecosystem processes, watercourses and lakes **Infrastructure** - safety, physical integrity, operation **Social** - access
State code 16: Native vegetation clearing	**Environmental values** - native vegetation clearing, greenhouse gases, land degradation, biodiversity, ecological processes, pest control, water quality, aquatic and terrestrial habitats, MSES, offsets **Social** - safety
State code 17: Aquaculture	**Economic** – land-based and tidal aquaculture, commercial fishing and related infrastructure, services and facilities, aquaculture **Environmental values** – fisheries resources, fish habitats, biosecurity, marine parks, inland catchments **Social** – access
State code 18: Constructing or raising waterway barrier works in fish habitats	**Economic** - commercial fishing and related infrastructure, services and facilities, aquaculture, recreational fishing **Environmental values** - waterway barrier works, fisheries resources, fish habitat, fish movement and connectivity, marine plants, pest control, MSES, offsets
State code 19: Category 3 levees	**Climate change and natural hazards** - flooding **Social** - safety
State code 20: Referable dams	**Infrastructure** - design and risk management **Social** - safety
State code 21: Hazardous chemical facilities	**Climate change and natural hazards** - hazardous materials, natural hazards **Hazardous activities and contaminated land** - risk management, hazardous chemicals **Social** - safety

Management measures	Value/Impact
State code 22: ERAs	**Climate change and natural hazards** - flooding **Environmental values** - emissions, water quality, contaminants, MSES, offsets **Hazardous activities and contaminated land** - hazardous materials **Social** - safety, amenity
State code 23: Wind farm development	**Environmental values** - emissions, water quality, ecological processes **Infrastructure** - access, safety and operations **Social** - safety, amenity
State code 24: Urban design outcomes for significant projects	**Climate change and natural hazards** - response to climatic conditions **Environmental values** - natural systems and processes **Social** - adaptation, innovation, function, design

15.13.3Mackay, Isaac and Whitsunday Regional Plan

Management measures	Value/Impact
Regional vision (higher order intent for the region's log-term future)	**Climate change and natural hazards** **Cultural heritage** **Economic** **Environmental values** **Hazardous activities and contaminated land** **Infrastructure** **OUV** **Social**
DRO – Sustainability, climate change and natural hazards	**Climate change and natural hazards** – greenhouse gases, impacts, risk management, emissions, resilience **Environmental values** – ecologically sustainable development, conserving biological diversity and ecological integrity **Social** – building design
DRO – Regional landscapes	**Environmental values** – flora and fauna, ecosystems, sustainable management practices, green space network, scenic amenity
DRO – Environment	**Environmental values** – biodiversity, water quality, waterway health, wetlands, coastal processes, emissions

Management measures	Value/Impact
	OUV – GBRWHA
DRO – Natural resource management	**Economic** – agriculture, rural industry, extractive industries, **Infrastructure** – regional water supply
DRO – Strong communities	**Social** – disadvantage, health, safety, access and equity
DRO – Strong economy	**Economic** – primary industries, resource sector, tourism
DRO – Managing growth	**Social** – housing choice and affordability, settlement pattern
DRO – Urban form	**Social** – urban form, arts, cultural development, centres and rural communities
DRO – Infrastructure	**Infrastructure** – key sites and corridors, energy, information communication technology, waste and recycling, sewerage, social infrastructure
DRO – Transport	**Infrastructure** – efficient, accessible and safe transport networks, stock routes, freight, active transport

15.13.4 Mackay Regional Planning Scheme (2017) v3.1

Management measures* (*based on focused study area)	**Value/Impact**
Strategic intent (higher order strategic outcome to guide development)	**Climate change and natural hazards** – risk management, resilience **Cultural heritage** – Indigenous cultural heritage **Economic** – economic growth, mining, centres, ports, industry, tourism, agriculture, key resource areass **Environmental values** – ecological systems, resilience, landscape values, flora and fauna **Hazardous activities and contaminated land** – risk managements, emissions **Infrastructure** – airports, priority ports, freight, transport networks, utilities, social and community facilities **Social** – settlement pattern, lifestyle, liveable communities and housing, safety, access, amenity, buffers to sensitive uses
Local Centre Zone	**Economic** – centres networks and activity nodes **Environmental values** – high value ecological features **Infrastructure** – urban services, facilities and transport networks **Social** – safety, access, amenity, design
Low Density Residential Zone	**Environmental values** – high value ecological features **Infrastructure** – urban services, facilities and transport networks

Management measures* (*based on focused study area)	**Value/Impact**
	Social – housing, safety, access, amenity, design
Low Impact Industry Zone	**Economic** – industrial activities, non-industrial activities **Environmental values** – high value ecological features **Infrastructure** – urban services, facilities and transport networks **Social** – safety, access, amenity, design
Medium Density Residential Zone	**Economic** – short term accommodation, non-residential uses **Environmental values** – high value ecological features **Infrastructure** – urban services, facilities and transport networks **Social** – access, amenity, recreation
Mixed Use Zone	**Cultural heritage** – heritage buildings **Economic** – commercial, residential, service industry, tourist accommodation, low impact industrial **Environmental values** – high value ecological features, landscape character **Infrastructure** – urban services, facilities and transport networks **Social** – transitional function, access, amenity, design
Open Space Zone	**Economic** – recreation, sport, community facilities **Environmental values** – ecological integrity, biological diversity, landscape character, native vegetation, water sensitive design, foreshores **Infrastructure** –community facilities and infrastructure, urban infrastructure networks, **Social** – undeveloped open space, parks, recreation activities, access, amenity, design
Principal Centre Zone	**Cultural heritage** – heritage buildings **Economic** – commercial, community, cultural, education, entertainment, residential **Environmental values** – high value ecological features **Infrastructure** – urban services, facilities and transport networks **Social** – public realm, access, amenity
Special Purpose Zone (note: does not apply to any SPL, airport land or PDA land that may be captured within the special purpose zone mapping)	**Economic** – public facilities and infrastructure, long distance passenger terminals **Environmental values** – high value ecological features

Management measures* (*based on focused study area)	**Value/Impact**
	Infrastructure – utilities, major electricity infrastructure, transport networks **Social** – access, amenity, design
ASS Overlay Code	**Climate change and natural hazards** – acid sulfate soils **Environmental values** – ecological quality, natural environment, drainage waters, contaminants **Social** – built environment, human health and wellbeing
Agricultural Land Overlay Code	**Economic** – productive capacity, agriculture **Social** – buffers and amenity
Airport Environs Overlay Code	**Infrastructure** – emissions, safety, efficiency and operational integrity **Social** – safety, buffers and amenity
Biodiversity Overlay Code	**Environmental values** – ecological integrity, function, vegetation, habitat, waterways and wetlands, rehabilitation, connectivity **Social** – access and amenity
Bushfire Hazard Overlay Code	**Climate change and natural hazards –** risk management **Hazardous activities and contaminated land** – storage of material, risk management **Infrastructure** – evacuation routes **Social** – safety, access
Extractive Resources and High Impact Activities Overlay Code	**Economic –** key resource areass, separation distances, productive capacity **Infrastructure –** transport networks **Social –** safety, buffers and amenity
Flood and Coastal Hazards Overlay Code	**Climate change and natural hazards –** risk management **Environmental values –** coastal ecosystems, natural processes **Infrastructure –** utilities, transport networks, community infrastructure **Social –** safety
Heritage and Neighbourhood Character Overlay Code	• **Cultural heritage** – local heritage places, traditional character, design, reuse
Landscape Character and Image Corridor Overlay Code	**Environmental values** – landscape character, visual amenity

Management measures* (*based on focused study area)	**Value/Impact**
Landslide Hazard Overlay Code	**Climate change and natural hazards –** risk management **Environmental values** – natural processes, function **Hazardous activities and contaminated land** – storage of material **Infrastructure** – community infrastructure and facilities **Social** – safety
Regional Infrastructure Overlay Code	**Infrastructure** – operational efficiency and reliability of infrastructure, economic integrity **Social** – safety, amenity
Use and development codes (various)	**Economic, Environmental values, Infrastructure and Social:** • caretaker's accommodation, dwelling unit and rural workers accommodation • centre activities • childcare centre • community activities • dwelling house • extractive industry • home based business • industry activities • intensive rural activities • market and roadside stall • multiple dwelling activities • nature-based tourism • outdoor business activities • parking station • recreation activities • sales office • service station and car wash • ship-sourced pollutants reception in marinas • short-term accommodation • telecommunications facility • tourist park and relocatable home park development requirements • healthy waters • reconfiguring a lot.

15.13.5 *Regional Interests Planning Act 2014*

Management measures	Value/Impact
SCA	• **Economic** – cropping land

15.13.6 *Port of Hay Point Land Use Plan 2010*

Management measures	Value/Impact
DEO – economic development (higher order strategic outcome to guide development)	• **Economic** – new port facilities, coal export opportunities • **Infrastructure** – port, road, rail and utilities • **Social** – employment opportunities
DEO – community wellbeing (higher order strategic outcome to guide development)	• **Cultural heritage** – Indigenous cultural heritage values • **Environment values** – emissions • **Infrastructure** – port safety and security, buffers to sensitive uses, multi-modal transport options • **Social** – amenity
DEO - environment (higher order strategic outcome to guide development)	• **Climate change and natural hazards** – risk management, design • **Cultural heritage** – Indigenous cultural heritage values • **Environment values** – ecology, sustainable environmental management, coastal environment, conservation values, buffers • **Social** – amenity
Port handling activities designation (indicative uses and principles to guide development)	• **Economic** – current/ future port operations, trade and industries, core commercial business, loading/unloading, stockpiling, and transfer of commodities, tourism, amenity • **Environmental values** – best practice management and sensitive environmental area interface • **Infrastructure** – road and rail corridors, safety
Offshore port infrastructure designation (indicative uses and principles to guide development)	• **Infrastructure** – port structures, equipment and infrastructure, port marine and navigational safety
Access and port infrastructure designation (indicative uses and principles to guide development)	• **Economic –** public recreational boating • **Infrastructure** – access for operational, maintenance and construction purposes, navigational safety
Port related and support designation (indicative uses and principles to guide development)	• **Economic** – port efficiency, supply chains, logistics, industrial activities, commercial viability of the port • **Social** – amenity and buffers
Transport infrastructure designation (indicative uses and principles to guide development)	• **Economic** – port efficiency, supply chains, logistics, trade capacity of the port • **Infrastructure** – transport networks, safety and efficiency

Management measures	Value/Impact
	• **Social** - open space, amenity, emissions
General buffer designation (indicative uses and principles to guide development) and wildlife corridor overlay	• **Environmental values** – native vegetation • **Infrastructure** – services, utilities and transport • **Social –** buffers, amenity, design
Environment protection designation (indicative uses and principles to guide development)	• **Cultural heritage** – Indigenous cultural heritage features and values • **Environmental values** – conservation, ecological and scenic values, coastal areas
Development guidelines (non-statutory)	• **Climate change and natural hazards –** climate change • **Cultural heritage** – Indigenous cultural heritage values • **Environmental values** – sustainable building design and visual amenity, best practice management • **Hazardous activities and contaminated land** – minimizing impacts • **Infrastructure** – efficient and safe operation, supporting services

15.13.7 *Port of Mackay Land Use Plan 2009*

Management measures	Value/Impact
DEO – economic development (higher order strategic outcome to guide development)	• **Economic** – industrial, commercial and other port related industries and activities, regional factors, global trade • **Infrastructure** – demand management • **Social** – employment opportunities
DEO – ecological processes (higher order strategic outcome to guide development)	• **Climate change and natural hazards –** climate change, energy efficiency, water sensitive design • **Environment values** – ecological sustainability, biodiversity, coastal resources, emissions, air and water quality • **Social** – amenity
DEO – community wellbeing (higher order strategic outcome to guide development)	• **Cultural heritage** – cultural values • **Economic** – port economy and integration • **Environmental values** – scenic and sensitive receiving environments • **Infrastructure** – port safety, operations, security • **Social** – access, amenity
Port operations precinct (intent and indicative uses)	• **Economic** – industry, core port operations and activities including logistics, storage and slipways • **Environmental values** – future reclamation area • **Infrastructure** – safe operation of port and harbour

Management measures	Value/Impact
Harbour and access precinct (intent and indicative uses)	• **Economic** – nexus with Marina, port function and operations • **Infrastructure** – safe and efficient movement and navigation across offshore lands, navigational channels and shipping areas
Port support precinct (intent and indicative uses)	• **Economic** – support activities without waterfront access, logistics and supply chains, commercial viability of the port
Port related commercial precinct (intent and indicative uses)	• **Economic** – support and complementary activities to the port, Marina and tourism • **Social** – interface with sensitive uses, amenity
Marina precinct (intent and indicative uses)	• **Economic** – water-based recreation and tourist activities • **Infrastructure** – esplanade, breakwater, marina • **Social** – access
Quarry precinct (intent and indicative uses)	• **Economic** – extractive industry, nexus with port maintenance, sport and recreation
Buffer precinct (intent and indicative uses)	• **Climate change and natural hazards –** inundation, flooding • **Economic** – recreation, tourism, education • **Environmental values** – conservation values, high environmental or ecological values • **Social** – buffer, visual amenity, access
Future SPL (indicative intent)	• **Economic** - industry • **Environmental values** – connectivity, conservation, reclamation • **Infrastructure** – road, rail, intermodal terminal • **Social** – buffer, visual amenity, access
Development guidelines (non-statutory)	• **Climate change and natural hazards –** climate change • **Cultural heritage –** Indigenous cultural heritage values • **Environmental values –** sustainable building design and visual amenity, best practice management • **Hazardous activities and contaminated land –** minimizing impacts • **Infrastructure –** efficient and safe operation, supporting services

15.13.8 *Great Barrier Reef Marine Park ZONING PLAN 2003*

Management measures	Value/Impact
General use zone	• **Economic** – Fishing, aquaculture, research, tourism
Habitat protection zone	• **Environmental values** – Sensitive habitats
Conservation park zone (yellow)	• **Economic** – fishing, limited extractive use
Marine national park zone (green)	• **Environmental values** – sensitive areas
Commonwealth islands zone	• **Economic** – low impact activities • **Environmental values** – island environments

15.14 Appendix N: Ecological database searches Hay Point

Environment Protection and Biodiversity Conservation Act 1999 (Cth)	*Nature Conservation Act 1992*
EX – Extinct V – Vulnerable E – Endangered CE – Critically endangered	V – Vulnerable E – Endangered CR - Critically endangered SL – Special least concern PE – Extinct in the wild

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*
Pandion cristatus	Eastern Osprey	/	SL
Apus pacificus	Fork-tailed Swift	/	SL
Hirundapus caudacutus	White-throated Needletail	V	V
Esacus magnirostris	Beach Stone-curlew	/	V
Charadrius bicinctus	Double-banded Plover	/	SL
Charadrius leschenaultii	Greater Sand Plover	V	V
Charadrius mongolus	Lesser Sand Plover	E	E
Pluvialis fulva	Pacific Golden Plover	/	SL

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*
Pluvialis squatarola	Grey plover	/	SL
Cuculus optatus	Oriental Cuckoo	/	SL
Fregata ariel	Lesser Frigatebird	/	SL
Fregata minor	Great Frigatebird	/	SL
Glareola maldivarum	Oriental Pratincole	/	SL
Hirundo rustica	Barn Swallow	/	SL
Anous stolidus	Common Noddy	/	SL
Chlidonias leucopterus	White-winged Black Tern	/	SL
Gelochelidon nilotica	Gull-billed Tern	/	SL
Hydroprogne caspia	Caspian Tern	/	SL
Onychoprion anaethetus	Bridled Tern	/	SL
Sterna dougallii	Roseate Tern	/	SL
Sterna hirundo	Common Tern	/	SL
Sterna sumatrana	Black-Naped Tern	/	SL
Sternula albifrons	Little tern	/	SL
Sternula nereis exsul	New Caledonian Fairy tern sea grass	/	E
Thalasseus bergii	Crested tern	/	SL
Anthochaera phrygia	Regent Honeyeater	CE	CR
Monarcha melanopsis	Black-Faced Monarch	/	SL
Myiagra cyanoleuca	Satin Flycatcher	/	SL
Symposiachrus trivirgatus	Spectacled Monarch	/	SL
Ardenna tenuirostris	Short-Tailed Shearwater	/	SL
Rhipidura rufifrons	Rufous Fantail	/	SL
Rostratula australis	Australian Painted Snipe	E	E
Actitis hypoleucos	Common Sandpiper	/	SL
Arenaria interpres	Ruddy Turnstone	/	SL
Calidris acuminata	Sharp-Tailed Sandpiper	/	SL
Calidris alba	Sanderling	/	SL
Calidris canutus	Red Knot	E	E
Calidris falcinellus	Broad-Billed Sandpiper	/	SL

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*
Calidris ferruginea	Curlew Sandpiper	CE	CR
Calidris ruficollis	Red-Necked Stint	/	SL
Calidris tenuirostris	Great Knot	CE	CR
Gallinago hardwickii	Latham's Snipe	/	SL
Limnodromus semipalmatus	Asian Dowitcher	/	SL
Limosa lapponica baueri	Western Alaskan Bar-Tailed Godwit	V	V
Limosa limosa	Black-Tailed Godwit	/	SL
Numenius madagascariensis	Eastern Curlew	CE	E
Numenius minutus	Little Curlew	/	SL
Numenius phaeopus	Whimbrel	/	SL
Tringa brevipes	Grey-Tailed Tattler	/	SL
Tringa incana	Wandering Tattler	/	SL
Tringa nebularia	Common Greenshank	/	SL
Tringa stagnatilis	Marsh Sandpiper	/	SL
Xenus cinereus	Terek Sandpiper	/	SL
Sula dactylatra	Masked Booby	/	SL
Sula leucogaster	Brown Booby	/	SL
Plegadis falcinellus	Glossy Ibis	/	SL

Amphibia Wildnet conservation significant species list within study area

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*
Adelotus brevis	Tusked Frog	/	V

Reptilia Wildnet conservation significant species list within study area

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*
Chelonia mydas	Green Turtle	V	V
Natator depressus	Flatback Turtle	V	V
Crocodylus porosus	Estuarine Crocodile	/	V

Equisetopsida Wildnet conservation significant species list within study area

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*
Graptophyllum ilicifolium	Holly-Leaved *Graptophyllum*	V	V
Eucalyptus raveretiana	Black Ironbox	V	C

Chondrichthyes Wildnet conservation significant species list within study area

Species	Common name	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	*Nature Conservation Act 1992*
Carcharodon carcharias	White Shark	V	/

15.15 Appendix O: Species Profiles – Hay Point

15.15.1 Avifauna

Calidris canutus (Red Knot)

The Red Knot is a migratory species that is listed as 'Endangered' under the EPBC Act and the NC Act. Although the Red Knot is not a globally threatened species, Australian populations have shown are significant decline.[584] The Red Knot breeds in the northern hemisphere and then migrates to Australasia for winter.[585] During its non-breeding season, the species mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours.[586] The Red Knot can sometimes occur in shallow pools on exposed rock platforms or coral reefs.[587] The species often forage near edge of water on intertidal mudflats or sandflats exposed by low tide.[588] Commonly, the Red Knot will roost on sandy beaches, spits and islets, mudflats and in shallow saline ponds of saltworks.[589]

Calidris ferruginea (Curlew Sandpiper)

The Curlew Sandpiper is migratory shorebird that is listed as 'Critically Endangered' under the EPBC and the NC Act. The species occur largely around coasts and in smaller numbers in inland areas.[590] The Curlew Sandpiper are commonly found on intertidal mudflats in sheltered coastal areas.[591] In Queensland, there are scattered records of the species in the Gulf of Carpentaria and widespread records along the coast south of Cairns.[592] The Curlew Sandpiper does not breed in Australia, but instead breed in the northern hemisphere and migrate south for winter.[593]

Calidris tenuirostris (Great Knot)

The Great Knot is listed as 'Critically Endangered' under the EPBC Act and the NC Act. The species has been recorded around the entirety of the Australian coastline with the greatest numbers found in northern Western Australia and the Northern Territory.[594] In Queensland, the Great Knot is known to inhabit the Broad Sound-Shoalwater Bay area as well as the Mackay and Moreton Bay region.[595] The Great Knot prefers sheltered coastal habitats with large intertidal mudflats or sandflats.[596] The species is also occasionally found on exposed

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[584] Minton, C. (2002). *Personal communication*. Australasian Wader Studies Group.
[585] Threatened Species Scientific Committee. (2016). *Conservation Advice Calidris canutus Red knot.* Retrieved from 855 - Conservation Advice Calidris canutus- Red knot - approved 5 May 2016 (environment.gov.au).
[586] Higgins, P. and Davies, S. (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Oxford University Press; Department of Agriculture, Water and the Environment. (n.d). *Calidris canutus* – Red Knot, Knot Species Profile and Threats Database. Retrieved from Calidris canutus — Red Knot, Knot (environment.gov.au).
[587] Higgins, P. and Davies, S. (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Oxford University Press; Department of Agriculture, Water and the Environment. (n.d). *Calidris canutus* – Red Knot, Knot Species Profile and Threats Database. Retrieved from Calidris canutus — Red Knot, Knot (environment.gov.au).
[588] Threatened Species Scientific Committee. (2016). *Conservation Advice Calidris canutus Red knot.* Retrieved from 855 - Conservation Advice Calidris canutus- Red knot - approved 5 May 2016 (environment.gov.au); Department of Agriculture, Water and the Environment. (n.d). *Calidris canutus* – Red Knot, Knot Species Profile and Threats Database. Retrieved from Calidris canutus — Red Knot, Knot (environment.gov.au).
[589] Department of Agriculture, Water and the Environment. (n.d*). Calidris canutus – Red Knot, Knot Species Profile and Threats Database.* Retrieved from Calidris canutus — Red Knot, Knot (environment.gov.au); Higgins, P. and Davies, S. (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Oxford University Press.
[590] Department of Agriculture, Water and the Environment. *Calidris ferruginea* Species Profile and Threats Database. Retrieved from Calidris ferruginea — Curlew Sandpiper (environment.gov.au).
[591] Higgins, P., and Davies, S. (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Oxford University Press.
[592] Department of Environment. (2015). *Conservation Advice Calidris ferruginea curlew sandpiper.* Retrieved from Conservation Advice Calidris ferruginea curlew sandpiper (environment.gov.au).
[593] Department of Environment. (2015). *Conservation Advice Calidris ferruginea curlew sandpiper.* Retrieved from Conservation Advice Calidris ferruginea curlew sandpiper (environment.gov.au).
[594] Garnett, S., Szabo, J. and Dutson, G. (2011). *The Action Plan for Australian Birds 2010*. CSIRO Publishing. Retrieved from http://birdsindanger.net/taxatable.
[595] Threatened Species Scientific Committee. (2016). *Conservation Advice Calidris tenuirostris great knot*. Retrieved from 862 - Conservation Advice Calidris tenuirostris Great knot - 5 May 2016 (environment.gov.au).
[596] Department of Agriculture, Water and the Environment. (n.d.). *Calidris tenuirostris – Great Knot* Species Profile and Threats Database. Retrieved from Calidris tenuirostris — Great Knot (environment.gov.au).

reefs, rock platforms, shorelines with mangrove vegetation, ponds in saltworks, coastal swamps, and non-tidal lagoons.[597]The Great Knot typically roosts in large groups often at the waters' edge or in shallow water that is close to feeding grounds.[598]The species breeds in the northern hemisphere and migrates south along the East Asian-Australasian Flyway for winter.[599]

Neochima ruficauda ruficauda (Star Finch (Eastern) Star Finch (Southern))

Both the Star Finch (Eastern) and Star Finch (Southern) are sedentary species listed under the EPBC Act and NC Act as 'Endangered'. Although there are limited records, the Star Finch (eastern) is known to occur in Central Queensland.[600] The area of occupancy and the occurrence of the Star Finch (eastern) is suspected to be declining.[601] The main cause of the decline is due to habitat degradation as a result of overgrazing and trampling by livestock.[602] The Star Finch (eastern) occurs mainly in grasslands and grassy woodlands located near bodies of fresh water, and in cleared or suburban areas.[603]

Numenius madagascariensis (Eastern Curlew, Far Eastern Curlew)

The Eastern and Far Eastern Curlew are listed as 'Critically Endangered' under the EPBC Act and 'Endangered' under the NC Act. The species are Australia's largest shorebird and long-haul flyer.[604] In Australia, the population is located along the coast, in all states.[605] The species breed in the Northern Hemisphere and migrate to Australia during the winter.[606] The Eastern Curlew commonly inhabit sheltered coasts such as estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats.[607]

Poephila cincta cincta (Southern Black Throated Finch)

The Black-throated Finch (southern) is listed as 'Endangered' under the EPBC Act and NC Act. The species inhabits open woodlands and forests across a range of *Eucalyptus, Corymbia, Acacia* and *Melaleuca.*[608] The habitat requirements of the species are water, grass seeds and trees for nesting.[609] The species occurs predominately in coastal northern and central Queensland.[610]

Turnix olivii (Buff-breasted Button-quail)

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[597] Department of Agriculture, Water and the Environment. (n.d.). *Calidris tenuirostris – Great Knot* Species Profile and Threats Database. Retrieved from Calidris tenuirostris — Great Knot (environment.gov.au).
[598] Department of Agriculture, Water and the Environment. (n.d.). *Calidris tenuirostris – Great Knot* Species Profile and Threats Database. Retrieved from Calidris tenuirostris — Great Knot (environment.gov.au).
[599] Threatened Species Scientific Committee. (2016). *Conservation Advice Calidris tenuirostris* great knot. Retrieved from 862 - Conservation Advice Calidris tenuirostris Great knot - 5 May 2016 (environment.gov.au).
[600] Department of Agriculture, Water and the Environment. (n.d.). *Neochima ruficauda ruficauda* – Star Finch (eastern), Star Finch (southern) Species Profile and Threats Database (n.d). Retrieved from Neochmia ruficauda ruficauda — Star Finch (eastern), Star Finch (southern) (environment.gov.au); Department of the Environment, Water, Heritage and the Arts. (2008).Approved Conservation Advice for *Neochmia ruficauda ruficauda* (Star Finch (eastern)). Retrieved from 26027 - Approved Conservation Advice for Neochmia ruficauda ruficauda (Star Finch (eastern)) (environment.gov.au).
[601] Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Retrieved from http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html.
[602] Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Retrieved from http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html.
[603] Department of Agriculture, Water and the Environment. (n.d.). *Neochima ruficauda ruficauda – Star Finch (eastern), Star Finch (southern) Species Profile and Threats Database*. Retrieved from Neochmia ruficauda ruficauda — Star Finch (eastern), Star Finch (southern) (environment.gov.au).
[604] Department of Agriculture, Water and the Environment. (n.d). *Numenius madagascariensis – Eastern Curlew, Far Eastern Curlew Species Profile and Threats Database*. Retrieved from Numenius madagascariensis — Eastern Curlew, Far Eastern Curlew (environment.gov.au).
[605] Department of Environment. (2015). *Conservation Advice Numenius* madagascariensis. Retrieved from Conservation Advice Numenius madagascariensis eastern curlew (environment.gov.au).
[606] Department of Environment. (2015). *Conservation Advice Numenius* madagascariensis. Retrieved from Conservation Advice Numenius madagascariensis eastern curlew (environment.gov.au).
[607] Department of Environment. (2015). *Conservation Advice Numenius* madagascariensis. Retrieved from Conservation Advice Numenius madagascariensis eastern curlew (environment.gov.au).
[608] Department of Agriculture, Water and the Environment. (n.d.). *Poephila cincta cincta – Southern Black-throated Finch Species Profile and Threats Database.* Retrieved from Poephila cincta cincta — Southern Black-throated Finch (environment.gov.au).
[609] Department of Agriculture, Water and the Environment. (n.d.). *Poephila cincta cincta – Southern Black-throated Finch Species Profile and Threats Database.* Retrieved from Poephila cincta cincta — Southern Black-throated Finch (environment.gov.au).
[610] Department of Agriculture, Water and the Environment, Threatened Species Scientific Committee. (2005). *Commonwealth Listing Advice on Southern Black-throated Finch (Poephila cincta cincta).* Southern Black-throated Finch (Poephila cincta cincta) | .

The Buff-breasted Button-quail is an 'Endangered' species under both the EPBC Act and the NC Act. The species is endemic to Australia and typically occurs in North-eastern Queensland.[611] Although records of the occurrence and occupancy of the species are limited, it is suspected that the species has continued to decline.[612] The Buff-breasted Button-quail commonly occurs in patches of short and sparse grassland, on a terrain of small stones, and sometimes in open glades amongst *Melaleuca, Acacia, Alphitonia* or *Tristania* and in rainforest or open *Eucalyptus* woodland.[613]

15.15.2 Mammals

Dasyurus hallucatus (Northern Quoll)

The Northern Quoll is listed as 'Endangered' under the EPBC but as of 'least concern' under the NC Act. The species is known to occur across Queensland, Northern Territory and Western Australia.[614] In Queensland, the species extends along the coast and is mostly prevalent in central coast and Northern Queensland.[615] The species is highly fragmented across Queensland with noted reductions in the species' distribution.[616] Majority of these reductions can be attributed the large presence of cane toads in Queensland, as well as habitat loss and predation following fire.[617] The Northern Quoll occupies a diverse range of habitats, including rocky areas, eucalypt forests and woodlands, rainforests, sandy lowlands and beaches, shrublands, grasslands and desert.[618] Additionally, the species is known to occupy non-rocky, lowland habitats such as beach scrub communities.[619]

15.15.3 Marine Mammals

Balaenoptera musculus (Blue Whale)

The Blue Whale is listed as 'Endangered' under the EPBC Act. In Australian waters, Blue Whale sightings are widespread and occur around the continent at various times of the year.[620] The Blue Whale is commonly found at higher latitudes and migrates to lower latitudes for feeding, breeding, and calving during summer.[621]

Dermochelys coriacea (Leatherback Turtle)

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[611] Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Retrieved from http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html.
[612] Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Retrieved from .http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html.
[613] Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Retrieved from .http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html; Department of Agriculture, Water and the Environment. (n.d.). *Turnix olivii – Buff-breasted Button-quail Species Profile and Threats Database.* Retrieved from Turnix olivii — Buff-breasted Button-quail (environment.gov.au).
[614] Department of Agriculture, Water and the Environment.(n.d). *Dasyurus hallucatus – Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wimini [Martu] Species Profile and Threats Database.* Retrieved from Dasyurus hallucatus — Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] (environment.gov.au).
[615] Department of Agriculture, Water and the Environment.(n.d). *Dasyurus hallucatus – Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wimini [Martu] Species Profile and Threats Database.* Retrieved from Dasyurus hallucatus — Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] (environment.gov.au).
[616] Woinarski, Jet al. (2008). Surviving the toads: patterns of persistence of the northern quoll Dasyurus hallucatus in Queensland. *Report submitted to the Natural Heritage Trust Strategic Reserve Program*.
[617] Department of Agriculture, Water and the Environment , Threatened Species Scientific Committee. (2005*). Commonwealth Listing Advice on Northern Quoll (Dasyurus hallucatus).* Retrieved from Northern Quoll (Dasyurus hallucatus) | Department of Agriculture, Water and the Environment.
[618] Department of Agriculture, Water and the Environment, Threatened Species Scientific Committee. (2005*). Commonwealth Listing Advice on Northern Quoll (Dasyurus hallucatus).* Retrieved from Northern Quoll (Dasyurus hallucatus) | Department of Agriculture, Water and the Environment.
[619] Department of Agriculture, Water and the Environment.(n.d). *Dasyurus hallucatus – Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wimini [Martu] Species Profile and Threats Database.* Retrieved from Dasyurus hallucatus — Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] (environment.gov.au)
[620] Department of the Environment and Heritage. (2005). *Australian National Guidelines for Whale and Dolphin Watching*. Retrieved from http://www.environment.gov.au/resource/australian-national-guidelines-whale-and-dolphin-watching-2005.
[621] Department of Agriculture, Water and the Environment. (n.d). *Balaenoptera musculus* – Blue Whale Species Profile and Threats Database. Retrieved from Balaenoptera musculus — Blue Whale (environment.gov.au).

The Leatherback Turtle is a migratory marine species listed under the EPBC Act and NC Act as 'Endangered'. The species are found in pelagic marine tropical, subtropical and temperate waters.[622] The Leatherback Turtle is commonly reported along coastal water in eastern Queensland.[623] Scattered, isolated nesting occurs in southern Queensland. [624] The species has a long lifespan and is slow breeding. Due to commercial capture, predation, and ingestion of marine debris, the species population rate is declining.[625]

Lepidochelys olivacea (Olive Ridley Turtle)

The Olive Ridley Turtle is a migratory marine species listed as 'Endangered' under the EPBC Act. Some low density nesting occurs along the Northern Territory and Queensland coastlines.[626] The Olive Ridley Turtle nests on sandy beaches which enables hatchlings to disperse into offshore currents.[627] Foraging habitats range in depth however Olive Ridley Turtles commonly prefer shallow benthic habitats.[628]

Caretta caretta (Loggerhead turtle)

The Loggerhead Turtle is a migratory marine species listed as 'Endangered' under the EPBC Act. The species occurs in the waters of coral and rocky reefs, seagrass beds and muddy bays through eastern, northern, and western Australia. [629] Nesting is commonly concentrated along the coastline of Western Australia and southern Queensland including the mainland south-east coast, the islands of the Capricorn-Bunker groups of the southern GBR, the islands of the Swain reefs and Busy Island off Mackay.[630] The Loggerhead Turtle nest on open, sandy beaches and forage in benthic habitats.[631]

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[622] Department of the Environment, Water, Heritage and the Arts. (2008). *Approved Conservation Advice for Dermochelys coriacea (Leatherback Turtle).* Retrieved from Approved conservation advice for Dermochelys coriacea (Leatherback Turtle) (environment.gov.au).
[623] Department of Agriculture, Water and the Environment. (n.d). *Dermochelys coriacea – Leatherback Turtle, Leathery Turtle, Luth Species Profile and Threats Database.* Retrieved from Dermochelys coriacea — Leatherback Turtle, Leathery Turtle, Luth (environment.gov.au).
[624] Department of Agriculture, Water and the Environment. (n.d). *Dermochelys coriacea – Leatherback Turtle, Leathery Turtle, Luth Species Profile and Threats Database.* Retrieved from Dermochelys coriacea — Leatherback Turtle, Leathery Turtle, Luth (environment.gov.au)
[625] Department of the environment, Water, Heritage and the Arts. (2008). *Approved Conservation Advice for Dermochelys coriacea (Leatherback Turtle).* Retrieved from Approved conservation advice for Dermochelys coriacea (Leatherback Turtle) (environment.gov.au).
[626] Department of Agriculture, Water and the Environment. (n.d). *Lepidochelys olivacea – Olive Ridley Turtle, Pacific Ridley Turtle Species Profile and Threats Database.* Retrieved from Lepidochelys olivacea — Olive Ridley Turtle, Pacific Ridley Turtle (environment.gov.au).
[627] Department of Agriculture, Water and the Environment. (n.d). *Lepidochelys olivacea – Olive Ridley Turtle, Pacific Ridley Turtle Species Profile and Threats Database.* Retrieved from Lepidochelys olivacea — Olive Ridley Turtle, Pacific Ridley Turtle (environment.gov.au).
[628] Department of Agriculture, Water and the Environment. (n.d). *Lepidochelys olivacea – Olive Ridley Turtle, Pacific Ridley Turtle Species Profile and Threats Database.* Retrieved from Lepidochelys olivacea — Olive Ridley Turtle, Pacific Ridley Turtle (environment.gov.au).
[629] Department of Agriculture, Water and the Environment.(n.d). *Caretta caretta - Loggerhead Turtle Species Profile and Threats Database.* Retrieved from Caretta caretta — Loggerhead Turtle (environment.gov.au).
[630] Department of Agriculture, Water and the Environment.(n.d). *Caretta caretta - Loggerhead Turtle Species Profile and Threats Database.* Retrieved from Caretta caretta — Loggerhead Turtle (environment.gov.au).
[631] Department of Agriculture, Water and the Environment.(n.d). *Caretta caretta - Loggerhead Turtle Species Profile and Threats Database.* Retrieved from Caretta caretta — Loggerhead Turtle (environment.gov.au).

15.16 Appendix P: Regional ecosystem descriptions – Hay Point

L – Least concern	O – Of concern	E - Endangered

Regional Ecosystem	*Vegetation Management Act* Status	Vegetation Category	Regional Ecosystem Description
8.1.1	L	Cat C	Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.1.1/8.1.2	L/L	Cat C	Mangrove closed forest to open shrubland of marine clay plains and estuaries / Samphire open forbland on saltpans and plains adjacent to mangroves
8.1.1/8.1.2/8.1.5	L/L/O	Cat A or B	Mangrove closed forest to open shrubland of marine clay plains and estuaries / Samphire open forbland on saltpans and plains adjacent to mangroves / Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems
8.1.1/8.1.3/8.1.2	L/O/L	Cat A or B	Mangrove closed forest to open shrubland of marine clay plains and estuaries / *Sporobolus virginicus* tussock grassland on marine sediments / Samphire open forbland on saltpans and plains adjacent to mangroves
8.1.1/8.1.4	L/O	Cat C	Mangrove closed forest to open shrubland of marine clay plains and estuaries / *Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland
8.1.1/8.1.4/8.1.5	L/O/O	Cat A or B	Mangrove closed forest to open shrubland of marine clay plains and estuaries / *Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland / Melaleuca spp. and/or *Eucalyptus tereticornis* and/or Corymbia tessellaris woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems
8.1.1/8.1.5	L/O	Cat C	Mangrove closed forest to open shrubland of marine clay plains and estuaries/ Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems
8.1.2	L	Cat C	Samphire open forbland on saltpans and plains adjacent to mangroves
8.1.2/8.1.1	L/L	Cat A or B	Samphire open forbland on saltpans and plains adjacent to mangroves **/** Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.1.2/8.1.3	L/O	Cat A or B	Samphire open forbland on saltpans and plains adjacent to mangroves / *Sporobolus virginicus* tussock grassland on marine sediments
8.1.2/8.1.3/8.1.5	L/O/O	Cat C	Samphire open forbland on saltpans and plains adjacent to mangroves / *Sporobolus virginicus* tussock grassland on marine sediments / Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems
8.1.3	O	Cat A or B	*Sporobolus virginicus* tussock grassland on marine sediments

Regional Ecosystem	*Vegetation Management Act* Status	Vegetation Category	Regional Ecosystem Description
8.1.3/8.1.1	O/L	Cat C	*Sporobolus virginicus* tussock grassland on marine sediments / Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.1.3/8.1.2	O/L	Cat A or B	*Sporobolus virginicus* tussock grassland on marine sediments / Samphire open forbland on saltpans and plains adjacent to mangroves
8.1.3/8.1.2/8.1.5/8.1.1	O/L/O/L	Cat C	*Sporobolus virginicus* tussock grassland on marine sediments / Samphire open forbland on saltpans and plains adjacent to mangroves / Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems / Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.1.3/8.1.2/8.3.13a	O/L/O	Cat C	*Sporobolus virginicus* tussock grassland on marine sediments / Samphire open forbland on saltpans and plains adjacent to mangroves / *Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas
8.1.3/8.1.2/8.3.13a/8.1.1	O/L/O/L	Cat C	*Sporobolus virginicus* tussock grassland on marine sediments / Samphire open forbland on saltpans and plains adjacent to mangroves / *Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas / Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.1.3/8.1.4	O/O	Cat A or B	*Sporobolus virginicus* tussock grassland on marine sediments / *Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland
8.1.3/8.1.4/8.3.13a	O/O/O	Cat A or B	*Sporobolus virginicus* tussock grassland on marine sediments/ *Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland / *Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas
8.1.3/8.1.5/8.1.1	O/O/L	Cat A or B	*Sporobolus virginicus* tussock grassland on marine sediments / Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems / Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.1.3/8.3.13a/8.1.4	O/O/O	Cat A or B	*Sporobolus virginicus* tussock grassland on marine sediments / *Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas / *Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland
8.1.4	O	Cat C	*Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland
8.1.4/8.1.3	O/O	Cat C	*Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland / *Sporobolus virginicus* tussock grassland on marine sediments
8.1.4/8.1.5	O/O	Cat A or B	*Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland / Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems
8.1.4/8.1.5/8.1.1	O/O/L	Cat A or B	*Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland / Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground

Regional Ecosystem	*Vegetation Management Act* Status	Vegetation Category	Regional Ecosystem Description
			stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems / Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.1.5	O	Cat A or B	Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems
8.1.5/8.1.1	O/L	Cat C	Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems / Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.1.5/8.1.1/8.1.3	O/L/O	Cat A or B	Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems / Mangrove closed forest to open shrubland of marine clay plains and estuaries / *Sporobolus virginicus* tussock grassland on marine sediments
8.1.5/8.1.1/8.1.4	O/L/O	Cat A or B	Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems / Mangrove closed forest to open shrubland of marine clay plains and estuaries / *Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland
8.11.4	E	Cat C	*Eucalyptus platyphylla* and/or *Corymbia clarksoniana* and/or *Corymbia intermedia* and/or *Corymbia tessellaris* woodland on low undulating areas on metamorphosed sediments
8.12.11a/8.2.2	L/O	Cat A or B	Semi-evergreen microphyll vine thicket +/- *Araucaria cunninghamii* on islands and coastal headlands on Mesozoic to Proterozoic igneous rocks and Tertiary volcanics / Semi-evergreen microphyll vine thicket to vine forest on coastal dunes
8.12.12	L	Cat A or B	*Eucalyptus tereticornis* and/or *Corymbia spp*. and/or *Eucalyptus platyphylla* and/or *Lophostemon suaveolens* woodland to open forest on hill slopes on Mesozoic to Proterozoic igneous rocks
8.12.12a	L	Cat A or B	*Eucalyptus tereticornis* and/or *Corymbia spp*. and/or *Eucalyptus platyphylla* and/or *Lophostemon suaveolens* woodland to open forest on hill slopes on Mesozoic to Proterozoic igneous rocks
8.12.12d	L	Cat A or B	*Eucalyptus tereticornis* and/or *Corymbia spp*. and/or *Eucalyptus platyphylla* and/or *Lophostemon suaveolens* woodland to open forest on hill slopes on Mesozoic to Proterozoic igneous rocks
8.12.12d/8.12.27b	L/E	Cat A or B	*Eucalyptus tereticornis* and/or *Corymbia spp*. and/or *Eucalyptus platyphylla* and/or *Lophostemon suaveolens* woodland to open forest on hill slopes on Mesozoic to Proterozoic igneous rocks / *Corymbia tessellaris* and/or *Eucalyptus tereticornis* +/- *Corymbia intermedia* +/- *Corymbia clarksoniana* open forest with a secondary tree layer of Livistona decora on low hills on Mesozoic to Proterozoic igneous rocks
8.12.13a	O	Cat A or B	Tussock grassland, or *Xanthorrhoea latifolia* shrubland, including areas recently colonised by *Timonius* timon var. *timon* shrubland, on slopes of islands and headlands, on Mesozoic to Proterozoic igneous rocks and Tertiary acid to intermediate volcanics

Regional Ecosystem	*Vegetation Management Act* Status	Vegetation Category	Regional Ecosystem Description
8.12.13a/8.12.3a	O/L	Cat A or B	Tussock grassland, or *Xanthorrhoea latifolia* shrubland, including areas recently colonised by *Timonius timon var. timon* shrubland, on slopes of islands and headlands, on Mesozoic to Proterozoic igneous rocks and Tertiary acid to intermediate volcanics / Evergreen to semi-evergreen, notophyll to microphyll, vine forest to vine thicket of foothills and uplands on Mesozoic to Proterozoic igneous rocks
8.12.22	L	Cat A or B	*Eucalyptus drepanophylla* and/or *Corymbia clarksoniana* +/- *Corymbia erythrophloia* +/- *Eucalyptus platyphylla* +/- *Eucalyptus exserta* +/- *Corymbia trachyphloia* woodland on hills and ranges at low to moderate altitudes in drier areas
8.12.22/8.2.1	L/O	Cat A or B	*Eucalyptus drepanophylla* and/or *Corymbia clarksoniana* +/- *Corymbia erythrophloia* +/- *Eucalyptus platyphylla* +/- *Eucalyptus exserta* +/- *Corymbia trachyphloia* woodland on hills and ranges at low to moderate altitudes in drier areas / *Casuarina equisetifolia* low woodland and/or sparse herbland to open scrub on foredunes and beaches
8.12.27	E	Cat A or B	*Corymbia tessellaris* and/or *Eucalyptus tereticornis* +/- *Corymbia intermedia* +/- *Corymbia clarksoniana* open forest with a secondary tree layer of Livistona decora on low hills on Mesozoic to Proterozoic igneous rocks
8.12.27b	E	Cat A or B	*Corymbia tessellaris* and/or *Eucalyptus tereticornis* +/- *Corymbia intermedia* +/- *Corymbia clarksoniana* open forest with a secondary tree layer of Livistona decora on low hills on Mesozoic to Proterozoic igneous rocks
8.12.27b/8.12.3a	E/L	Cat A or B / contains E	*Corymbia tessellaris* and/or *Eucalyptus tereticornis* +/- *Corymbia intermedia* +/- *Corymbia clarksoniana* open forest with a secondary tree layer of Livistona decora on low hills on Mesozoic to Proterozoic igneous rocks / Evergreen to semi-evergreen, notophyll to microphyll, vine forest to vine thicket of foothills and uplands on Mesozoic to Proterozoic igneous rocks
8.12.3a	L	Cat A or B	Evergreen to semi-evergreen, notophyll to microphyll, vine forest to vine thicket of foothills and uplands on Mesozoic to Proterozoic igneous rocks
8.12.3c	L	Cat A or B	Evergreen to semi-evergreen, notophyll to microphyll, vine forest to vine thicket of foothills and uplands on Mesozoic to Proterozoic igneous rocks
8.12.6	L	Cat A or B	*Eucalyptus drepanophylla* +/- *Eucalyptus platyphylla* +/- *Corymbia clarksoniana* woodland to open forest on low to medium hills on Mesozoic to Proterozoic igneous rocks.
8.2.1	O	Cat A or B	*Casuarina equisetifolia* low woodland and/or sparse herbland to open scrub on foredunes and beaches
8.2.1/8.2.6	O/O	Cat A or B	*Casuarina equisetifolia* low woodland and/or sparse herbland to open scrub on foredunes and beaches / Melaleuca viridiflora woodland on seasonally inundated alluvial plains with impeded drainage
8.2.1/8.2.6a	O/O	Cat A or B	*Casuarina equisetifolia* low woodland and/or sparse herbland to open scrub on foredunes and beaches / *Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage
8.2.13a	E	Cat A or B	Melaleuca spp. and/or *Corymbia spp*. and/or *Lophostemon suaveolens* and/or Acacia spp. open forest on dune sands mixed with alluvial material +/- marine sediments
8.2.6a	O	Cat A or B	*Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage
8.2.6a/8.2.1	O/O	Cat A or B	*Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage / *Casuarina equisetifolia* low woodland and/or sparse herbland to open scrub on foredunes and beaches

Regional Ecosystem	*Vegetation Management Act* Status	Vegetation Category	Regional Ecosystem Description
8.2.6a/8.2.11/8.2.1	O/O/O	Cat A or B	*Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage / Melaleuca spp. Open forest in parallel dune swales / *Casuarina equisetifolia* low woodland and/or sparse herbland to open scrub on foredunes and beaches
8.2.6a/8.2.2/8.2.1	O/O/O	Cat A or B	*Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage / Semi-evergreen microphyll vine thicket to vine forest on coastal dunes / *Casuarina equisetifolia* low woodland and/or sparse herbland to open scrub on foredunes and beaches
8.3.11	E	Cat C	*Melaleuca viridiflora var. attenuata* open forest in broad drainage areas
8.3.12	E	Cat C	*Imperata cylindrica* and/or *Sorghum nitidum forma aristatum* and/or *Ischaemum australe* tussock grassland on alluvial and old marine plains
8.3.12/8.1.4/8.3.13c	E/O/O	Cat A or B	*Imperata cylindrica* and/or *Sorghum nitidum forma aristatum* and/or *Ischaemum australe* tussock grassland on alluvial and old marine plains / *Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland / *Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas
8.3.12/8.3.13a/8.3.13c	O/E	Cat A or B	*Imperata cylindrica* and/or *Sorghum nitidum forma aristatum* and/or *Ischaemum australe* tussock grassland on alluvial and old marine plains / *Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas / *Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas
8.3.13a	O	Cat A or B	*Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas
8.3.13a/8.1.1/8.1.4	O/L/O	Cat A or B	*Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas / Mangrove closed forest to open shrubland of marine clay plains and estuaries / *Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland
8.3.13a/8.1.2	O/L	Cat A or B	*Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas / Samphire open forbland on saltpans and plains adjacent to mangroves
8.3.13a/8.1.4	O/O	Cat A or B	*Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas / *Schoenoplectus subulatus* and/or *Eleocharis dulcis* sedgeland or *Paspalum vaginatum* tussock grassland
8.3.13c	O	Cat A or B	*Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas
8.3.15	O	Cat A or B	Open water in river channels, waterholes and lagoons, and exposed stream beds and bars
8.3.1a	O	Cat A or B	Semi-deciduous to evergreen notophyll to mesophyll vine forest, +/- sclerophyll emergents, fringing or in the vicinity of watercourses
8.3.1a/8.3.3a	O/L	Cat C	Semi-deciduous to evergreen notophyll to mesophyll vine forest, +/- sclerophyll emergents, fringing or in the vicinity of watercourses / *Melaleuca leucadendra* and/or *Melaleuca fluviatilis* and/or *Casuarina cunninghamiana* +/- *Syncarpia glomulifera* open forest on creek banks

Regional Ecosystem	*Vegetation Management Act* Status	Vegetation Category	Regional Ecosystem Description
8.3.2	E	Cat A or B	*Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage
8.3.2/8.3.11	E/E	Cat C	*Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage / *Melaleuca viridiflora var. attenuata* open forest in broad drainage areas
8.3.2/8.3.1a	E/O	Cat C	*Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage / Semi-deciduous to evergreen notophyll to mesophyll vine forest, +/- sclerophyll emergents, fringing or in the vicinity of watercourses
8.3.2/8.3.5	E/O	Cat C	*Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage / *Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains
8.3.3a	L	Cat A or B	*Melaleuca leucadendra* and/or *Melaleuca fluviatilis* and/or *Casuarina cunninghamiana* +/- *Syncarpia glomulifera* open forest on creek banks
8.3.3a/8.3.1a	L/O	Cat A or B	*Melaleuca leucadendra* and/or *Melaleuca fluviatilis* and/or *Casuarina cunninghamiana* +/- *Syncarpia glomulifera* open forest on creek banks / Semi-deciduous to evergreen notophyll to mesophyll vine forest, +/- sclerophyll emergents, fringing or in the vicinity of watercourses
8.3.5	O	Cat A or B	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains
8.3.5/8.3.12/8.3.2	O/E/E	Cat A or B	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains / *Imperata cylindrica* and/or *Sorghum nitidum forma aristatum* and/or *Ischaemum australe* tussock grassland on alluvial and old marine plains / *Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage
8.3.5/8.3.13a	O/O	Cat A or B	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains / *Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas
8.3.5/8.3.2	O/E	Cat A or B	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains / *Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage
8.3.5/8.3.2/8.1.5	O/E/O	Cat C	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains / *Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage / Melaleuca spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems
8.3.5/8.3.2/8.3.11	O/E/E	Cat A or B	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains / *Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage / *Melaleuca viridiflora var. attenuata* open forest in broad drainage areas
8.3.5/8.3.2/8.3.3a	O/E/L	Cat C	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains / *Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage / *Melaleuca leucadendra* and/or *Melaleuca fluviatilis* and/or *Casuarina cunninghamiana* +/- *Syncarpia glomulifera* open forest on creek banks

Regional Ecosystem	*Vegetation Management Act* Status	Vegetation Category	Regional Ecosystem Description
8.3.5/8.3.3a	O/L	Cat C	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains / *Melaleuca leucadendra* and/or *Melaleuca fluviatilis* and/or *Casuarina cunninghamiana* +/- *Syncarpia glomulifera* open forest on creek banks
8.3.5/8.3.6a/8.3.2	O/O/E	Cat C	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains / *Eucalyptus tereticornis* and/or *Corymbia intermedia* (or *Corymbia clarksoniana*) and/or *Corymbia tessellaris* +/- *Lophostemon suaveolens* open forest on alluvial levees and lower terraces / *Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage
8.3.5/8.3.6a/8.3.3a	O/O/L	Cat A or B	*Eucalyptus platyphylla* and/or *Lophostemon suaveolens* and/or *Corymbia clarksoniana* woodland on alluvial plains / *Eucalyptus tereticornis* and/or *Corymbia intermedia* (or *Corymbia clarksoniana*) and/or *Corymbia tessellaris* +/- *Lophostemon suaveolens* open forest on alluvial levees and lower terraces / *Melaleuca leucadendra* and/or *Melaleuca fluviatilis* and/or *Casuarina cunninghamiana* +/- *Syncarpia glomulifera* open forest on creek banks
8.3.6a	O	Cat C	*Eucalyptus tereticornis* and/or *Corymbia intermedia* (or *Corymbia clarksoniana*) and/or *Corymbia tessellaris* +/- *Lophostemon suaveolens* open forest on alluvial levees and lower terraces
8.3.6a/8.3.13a	O/O	Cat C	*Eucalyptus tereticornis* and/or *Corymbia intermedia* (or *Corymbia clarksoniana*) and/or *Corymbia tessellaris* +/- *Lophostemon suaveolens* open forest on alluvial levees and lower terraces / *Eucalyptus tereticornis* and/or *Corymbia tessellaris* and/or Melaleuca spp. woodland on alluvial and marine plains, often adjacent to estuarine areas
8.5.1b	E	Cat C	*Corymbia clarksoniana* and/or *Corymbia intermedia* open forest on Tertiary sand plains and rises including small areas of shale (mainly subregion 6)

15.17 Appendix Q: Impacts and Threats

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
Topography, soils and geology				
Soil	Indirect impact on soils through soil erosion from clearing of vegetation, earthworks and stockpiling, and stormwater runoff during operation.	✓		No
PASS	Direct disturbance of PASS during construction and/or operational activities.	✓	✓	As required through an environmental approval to manage possible future ongoing impacts.
Terrestrial environment				
Vegetation communities	Direct clearing of remnant vegetation in unprotected areas, particularly for residential or industrial coastal development, resulting in reduction of extent and condition of remnant vegetation communities, particularly those of conservation significance.	✓		No
	Indirect impacts to remnant vegetation from stormwater runoff from increased built up areas. This results in changed localised conditions (for example. elevated nutrients, changed hydrological regime), and potentially decline in geographic extent and relative health of remnant vegetation communities, particularly those of conservation significance	✓		No
	Increased edge effects from construction of new roads and pedestrian tracks, leading to increased pressures such as pests and weeds ingression into remnant vegetation communities.	✓		Land Management of Weeds by NQBP
	Increased visitations by local community and potentially tourists using newly formed tracks or ad hoc tracks and along watercourse banks, leading to increased pressures such as pests and weeds ingression into remnant vegetation communities.	✓		Land Management of Weeds by NQBP
	Direct clearing of fauna habitat, primarily for residential development or industrial use leading to reduction of specific species habitat, in some	✓		No

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
Threatened flora and fauna	cases to below population sustainability level and resulting in decline/loss of species from localised area.			
	Ongoing indirect impacts from increased residential and industrial activity (for example . increased noise, light and human activity), resulting in disturbance and potentially displacement of individuals of threatened fauna species, and in some cases displacement of whole populations.	✓		No
	Potential for souveniring of some flora species of conservation significance, particularly epiphytic species in rainforest remnant vegetation.	✓		No
	Direct mortality and/or injury to terrestrial fauna individuals as a result of new/expanded traffic routes and therefore increased vehicle movements.	✓		No
	Increased edge effects and/or direct loss of important foraging/roosting habitat for shorebirds due to encroachment of industrial development and Port expansion.	✓		No
	Disruption to shorebird species from recreational vehicles driving though important habitat (for example. along beaches). Increase in other recreational activities such as windsurfing and jet skis in close proximity to important habitats.	✓		No
	Disruption to shorebird species from uncontrolled anthropogenic related access (including by dogs and horses) to important habitat, including habitat used for nesting.	✓		No
	Reduced intertidal fauna habitat condition and/or quality from increased levels of waste materials from pollution and declining in water quality from stormwater run-off.	✓		No
	Disruption to intertidal fauna behaviour and/or life-cycle due to Increased potential for human interaction resulting from expansion in industrial and residential development including expansion of the port. This can be directly linked to increases in in noise, vibration and light.	✓		No
	Direct mortality and/or injury to intertidal fauna from Increased boating activity including recreational, commercial and tourism boating.	✓		No

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
	Direct impact and loss from port activities such as reclamation resulting in complete loss of intertidal areas and associated habitat values	✓		No
Biosecurity				
Weeds and pest species	Introduction or spread of pest and *weed* species, resulting in reduced condition and/or quality of marine vegetation communities and/or fauna habitat	✓		Land Management of Weeds by NQBP
Aquatic ecosystems – freshwater				
Surface water quality	Indirect changes in surface water quality, or surface water quality degradation, as a result of increased turbidity, sedimentation, increased salinity, increased nutrient levels and the release of pesticides and chemicals into the environment.	✓		DES water quality data by Department of Science, Information Technology and Innovation
Hydrology	Indirect alterations to freshwater hydrology and changes to inflows as a result of construction activities, dredging or dredge spoil disposal.	✓		No
	Offshore disposal of dredge spoil resulting in changed topography of the seafloor and therefore hydrology	✓		Monitoring under the LTMDMP 2018-2043 NQBP.
Water quality	Indirect sedimentation and turbidity as a result of dredge plumes and vegetation clearing leading to topsoil runoff into waterways.	✓		Ambient WQ Monitoring Program
	Impacts to water quality from stormwater runoff that contains heavy metals, organics and other contaminants from port activities and surrounding urban, industrial and agricultural areas	✓		Ambient WQ Monitoring Program
	Direct deposition of dust (including coal dust) onto the marine environment may cause increased turbidity, smothering of marine communities/ species and transport of contaminants. A 2016 coal dust study noted that it is unlikely that coal dust would contribute to increased turbidity, smothering or transport of contaminants. A further study by the Koskella Group in 2020 identified that unburnt coal has a very low capacity to release metals or PAH contaminants.	✓		Ambient WQ Monitoring Program
Potential acid sulfate soils	Changes in groundwater levels can indirectly expose PASS which, once activated, can be transported through surface or ground water sources.	✓		Ambient WQ Monitoring Program

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
	Environmental harm from ASS present in dredge spoil	✓		Monitoring under the LTMDMP 2018-2043.
Pollution	Accidental release of contaminants, such as fuels and chemicals, into adjacent wetland ecosystems or surface water bodies. Indirect impacts from the release of contaminants or turbid water pose a risk to aquatic habitats and water quality.	✓	✓	Ambient WQ Monitoring Program
Groundwater	Groundwater impacts as a result of significant earthworks, contamination or overuse during dry periods. Indirect degradation of groundwater sources can impact on streamflow, springs and groundwater dependent ecosystems.	✓		DES Water Quality Data Monitoring.
	Disruption of the hydraulic connection between surface water and groundwater and changes in the groundwater levels or quantities within local aquifers, including potential seawater intrusion.	✓		No
Wetlands	Indirect impacts to wetlands from stormwater runoff	✓		RIMRep
	Extensive clearing for cultivation or residential development upstream or immediately adjacent wetland, resulting in changes to hydrological regime and potentially declining health / dieback of wetland floral species and communities.	✓	✓	No
	Construction of waterway barriers, resulting in changed wetland hydrological regime and potentially declining health / dieback of riverine and freshwater wetland communities.	✓	✓	No
	Low-level impacts from fishing, recreation and grazing to wetlands.	✓		No
	Invasion of pasture species from surrounding cultivation into wetland communities' habitat.	✓		No
	Indirect impacts to wetlands from stormwater runoff	✓		RIMRep
Aquatic ecosystems – marine and estuarine				
Water quality	Indirect sedimentation and turbidity as a result of dredge plumes and vegetation clearing leading to topsoil runoff into waterways.	✓		RIMRep
	Direct deposition of dust (including coal dust) onto the marine environment causing increased turbidity, smothering of marine communities/ species and transport of contaminants.	✓		RIMRep

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
	Impacts to water quality from stormwater runoff that contains heavy metals, organics and other contaminants from port activities and surrounding urban, industrial and agricultural areas	✓		RIMRep
	Environmental harm from ASS present in dredge spoil	✓		Monitoring under the LTMDMP 2018-2043.
Coastal processes	Any structure that is placed in the marine environment has the potential to indirectly change currents and waves, which in turn affects the movement of sediment in the marine environment[632].	✓		RIMRep
	Offshore disposal of dredge spoil resulting in changed topography of the seafloor and therefore hydrology	✓		Monitoring under the LTMDMP 2018-2043 NQBP.
Mangroves and intertidal flora	Reduced extent, condition and/or quality of mangrove and intertidal flora communities due to indirect edge effects caused by clearance of vegetation in adjacent or nearby areas.	✓		No
	Damage to mangrove seedlings and other intertidal flora species from increased anthropogenic visitation in mangrove communities and intertidal areas.	✓		No
	Suspended sediment from dredge plumes accummulate in sensitive areas including beaches and intertidal areas, potentially impacting light penetration and thereby affecting germination rates as well as relative health of existing intertidal flora populations.	✓		No
	Changes to coastal processes resulting in erosion and accretion of sediments, thereby potentially impacting the nature and extent of germination and development of some flora communities.	✓		No
	Potential for inadvertent clearing of mangrove, saltmarsh and other intertidal communities as a result of increased coastal development activities in the study area. It is noted that the Sandringham Bay – Bakers Creek and Sarina Inlet – Ince Bay Aggregations, and most other mangroves in the study area, are largely protected from direct		✓	No

[632] GHD. (2012). *Abbot Point Cumulative Impact Assessment: Coastal processes and Hydrodynamics Technical Report, August 2012, Abbot Point Working Group.* (Confidential).

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
	impacts such as planned clearance, however inadvertent clearance is still a limited risk.			
	Changes in localised conditions and potential loss of habitat due to increased aquaculture development, resulting in relative health decline / dieback and therefore reduction in extent of mangrove communities and other intertidal flora species. It is noted that only some dieback of mangroves has occurred, but this is due to isolated flooding.	✓		No
	Increased coastal development, including urban, tourism and infrastructure, resulting in the physical removal of mangroves, changes to localised hydrological regime and potential loss of connectivity between communities.	✓		No
	Increased coastal development may potentially result in pollution and decreased water quality, increased levels of nutrients, pesticides and sediments from urban and agricultural development in upper catchments, which in turn may indirectly impact mangrove ecosystems in the lower catchments.	✓		No
	Climatic change resulting in SLR and increased storm intensity and frequency has the potential to alter mangrove ecosystems in terms of relative distribution, health and species composition.	✓		No
	Direct impact and loss from port activities such as reclamation resulting in complete loss of intertidal areas and associated habitat values		✓	No
	Increased coastal development or development in upstream catchments, resulting in increased stormwater discharges at point locations, potentially impacting important intertidal faunal species such as the Grapsid crabs. These crabs help process leaf litter and aerate soils in mangrove communities and reported decline of their populations in some mangrove communities within the study area there has been likely linked to stormwater discharge.	✓		No
Intertidal fauna	Increased edge effects and/or direct loss of important foraging/roosting habitat for shorebirds due to encroachment of industrial development and port expansion.	✓		No
	Disruption to shorebird species from recreational vehicles driving though important habitat (for example along beaches). Increase in	✓		No

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
	other recreational activities such as windsurfing and jet skis in close proximity to important habitats.			
	Disruption to shorebird species from uncontrolled anthropogenic related access (including by dogs and horses) to important habitat, including habitat used for nesting.	✓		No
	Reduced intertidal fauna habitat condition and/or quality from increased levels of waste materials from pollution and declining in water quality from stormwater run-off.	✓		Mackay-Whitsunday Healthy Rivers to Reef Partnership (MWRRP)
	Disruption to intertidal fauna behaviour and/or life-cycle due to Increased potential for human interaction resulting from expansion in industrial and residential development including expansion of the port. This can be directly linked to increases in in noise, vibration and light.		✓	Mackay-Whitsunday Healthy Rivers to Reef Partnership (MWRRP)
	Direct mortality and/or injury to intertidal fauna from Increased boating activity including recreational, commercial and tourism boating movement to and from port.	✓		DEHP StrandNet wildlife stranding database
Seagrass	Reduction in light penetration to seagrass beds as a result of increased turbidity during dredging works/release of tailwater, resulting in reduced growth rates and dieback of the seagrass communities.		✓	NQBP and TropWater Long-term Seagrass Monitoring Program
	Increase in localised turbidity plumes from placement of rock armour revetment walls at ports terminals and/or from seepage of turbid water through the reclamation wall, resulting in dieback of seagrass beds in localised areas.	✓	✓	NQBP and TropWater Long-term Seagrass Monitoring Program
	Operational impacts such as surface water runoff, chemical spills, increased dust deposition resulting in impact to water quality/nutrient levels and therefore impeding seagrass growth in nearby areas.	✓		NQBP and TropWater Long-term Seagrass Monitoring Program
	Increased coastal development resulting in increased nutrient, sediment and pesticide loads from residential runoff, resulting in seagrass meadow habitat loss and modification.	✓		NQBP and TropWater Long-term Seagrass Monitoring Program
	Increased storm intensity and frequency as a result of climate change, resulting in seagrass dieback and reduced time between these events for regeneration.	✓		NQBP and TropWater Long-term Seagrass Monitoring Program

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
	Rising sea surface temperatures and sea level rise, sometimes to temperatures above the tolerance threshold of seagrass, resulting in 'burning' and degradation of seagrass meadows, and in some case, seagrass meadows dieback.	✓		NQBP and TropWater Long-term Seagrass Monitoring Program
	Increased nutrient, sediment and pesticide loads from land-based sources/runoff from catchment leading declining water quality and therefore reduced natural resilience of reefs to these disturbances.	✓		NQBP and TropWater Long-term Seagrass Monitoring Program
	Direct impact and loss from port activities such as reclamation resulting in complete loss of intertidal areas and associated habitat values	✓		NQBP and TropWater Long-term Seagrass Monitoring Program
Coral reefs	Indirect impacts on coral reefs from capital and maintenance dredging resulting in physical damage /dieback of corals.	✓	✓	NQBP and TropWater Coral Monitoring Survey
	Sustained high turbidity and sediment deposition after a cyclone or flood event, resulting in damage or dieback of corals.		✓	NQBP and TropWater Coral Monitoring Survey
	Reduced recovery time of coral reefs from climatic events such as cyclones or floods as a result in climate change (for example increased in frequency of events).	✓		NQBP and TropWater Coral Monitoring Survey
	Increased nutrient, sediment and pesticide loads from land-based sources/runoff from catchment leading to reduced natural resilience of coral reefs to these disturbances.	✓		NQBP and TropWater Coral Monitoring Survey
	Increased ocean acidification from anthropogenic CO_2 emissions resulting in a decline in corals and other reef organisms appropriately producing calcium carbonate skeletons and shells, which in turn reduced resilience of these organisms.	✓		NQBP and TropWater Coral Monitoring Survey
Fish	Mortality and/or injury as a result of becoming trapped within the reclamation area of a new ports precinct.	✓	✓	No
	Increase in localised turbidity plumes from placement of rock armouring resulting in reduced habitat areas for fish.	✓	✓	No
	Operational impacts such as surface water runoff, chemical spills and increase in dust deposition, resulting in reduced water quality, which in turns impacts fish communities inhabiting these areas.	✓		Port of Mackay and Hay Point Ambient Marine Water Quality Monitoring Program

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
	Degradation and/or contamination of water quality from operational waste, which in turn impacts fish communities inhabiting these areas.	✓		Mackay-Whitsunday Healthy Rivers to Reef Partnership
	Reduction in breeding/feeding habitat due to increased sedimentation and decreased water quality from dredge plumes.		✓	Mackay-Whitsunday Healthy Rivers to Reef Partnership
	Direct impact and loss from port activities such as reclamation resulting in complete loss of intertidal areas and associated habitat values	✓	✓	No
	Port linear infrastructure, upgrades, maintenance, dredging and land reclamation resulting in direct loss or impact to marine plant and waterways that provide fish passage	✓		No
Megafauna	Increased edge effects from encroachment by residential/industrial development on important nesting habitat for marine turtles, resulting in disruption to nesting behaviour.	✓		Ambient water quality monitoring program by NQBP and TropWater as well as QPWS and MTWA
	Direct mortality and/or injury as a result of vessel strike and/or dredging activity on marine megafauna individuals.	✓		DES StrandNet Wildlife stranding database.
	Increase in noise and vibration as a result of ports activities including shipping movements, resulting in disruption to behaviour, migratory routes and lifecycle of megafauna species.	✓		No
	Mortality and/or injury as a result of becoming trapped within ports reclamation area when under construction.		✓	DES StrandNet Wildlife stranding database.
	Increase in lighting from ports activities, resulting in disruption to behaviour/life-cycle of marine megafauna species.	✓		No
	Increase in lighting from ports activities, resulting in disruption to turtle hatchlings ability to disperse to coastal waters after hatching.	✓		Ambient water quality monitoring program by NQBP and TropWater as well as QPWS and MTWA
Estuarine and marine flora and fauna	Increase in dust and other air quality pollutants affecting adjacent marine vegetation communities as a result of ports and other coastal industrial activities, reducing the condition and quality of these species/communities.	✓		Mackay-Whitsunday Healthy Rivers to Reef Partnership

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
	Increased edge effects on adjacent marine vegetation communities and/or fauna habitat as a result of encroachment from residential and industrial coastal development, thereby reducing the condition and/or quality of these species/communities.	✓		Mackay-Whitsunday Healthy Rivers to Reef Partnership
	Direct mortality and/or injury to marine fauna from increased vessel strikes.	✓		DES StrandNet Wildlife stranding database.
	Increase in noise, vibration and light from ports and other coastal industries, resulting in disruption to behaviour/life-cycle of marine fauna.	✓		Port of Hay Point Ambient Air, Noise and Weather Monitoring
	Direct impact and loss from port activities such as reclamation resulting in complete loss of intertidal areas and associated habitat values	✓		No
Migratory shorebirds and waterbird habitat	Temporary displacement of migratory birds during reclamation activities at port, including increased noise, light and dust deposition.		✓	No
	Ongoing operational impacts such as increased noise, light and dust deposition, resulting in displacement of migratory and shorebirds from nearby habitat.	✓		No
	Indirect impacts on a habitat of migratory birds and shorebirds from stormwater runoff.	✓		No
	Indirect impact from encroachment of residential development and increased cultivation in adjacent or nearby areas to habitat, resulting in displacement of migratory and shorebirds.	✓		No
	Indirect impact from recreational fisheries or boating activities in habitat that supports migratory bird species or shorebirds.	✓		Qfish fisheries catch data.
	Construction of barriers due to development, resulting in changed hydrological regime and potentially declining health and reduction of migratory shorebird habitat resulting in displacement of migratory shorebirds.	✓		No
Coastal resources	Climate change resulting in increased coastal water temperatures increase: • the risk of coral bleaching and rising concentrations of CO_2 and	✓		Ambient Coral Monitoring Program

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
	• ocean acidification which affects the health of many marine species including plankton, molluscs, shellfish and corals.			
	Growing populations and development along the coast increase the vulnerability of coastal areas to sea level rise as the inland migration of wetlands can be blocked and changes in sediment delivery to coastal areas can accelerate erosion.	✓		No
	Coastal areas are vulnerable to increases in intensity of storm surge and heavy precipitation. Storm surges can destroy habitat and heavier rainfall in coastal areas could increase runoff and flooding which threatens the health and quality of coastal waters.	✓		No
Dust	Increased dust deposition on plants, fauna and water environments, as a result of earthworks, clearing and grubbing, disturbance of the soil and dust from existing facilities and rail operations. Some impacts of fine coal dust on biota would include: • changed physiochemical characteristic of marine and freshwater habitats • smothering of benthic communities • increased turbidity causing reduced light penetration for corals and seagrasses.	✓		Port of Hay Point Ambient Air, Noise and Weather Monitoring
	Nuisance impacts of dust settling on nearby houses and vehicles.	✓		No
Health	Airborne dust particles may cause increased respiratory illnesses in human populations located within the study area.	✓		No
Visual amenity	Dust in the atmosphere (producing haze) reduces natural scenic amenity of the study area.	✓		No
Noise	Increased noise generated from construction and operational activities at the port and other industrial areas, resulting in changed behaviours in some fauna species and potentially impacting fauna lifecycles. At high risk of impacts is migratory shorebirds.	✓		Port of Hay Point Ambient Air, Noise and Weather Monitoring
	Increased noise generated from construction and operational activities at the port and other industrial areas impacting on nearby residences and communities.	✓		Port of Hay Point Ambient Air, Noise and Weather Monitoring

Environment Value	Potential Impact/Threat	Ongoing impact	One off impact	Current monitoring program
	Noise pollution at a regional scale, as a result of construction and shipping noise, has the potential to impact wildlife behaviour.	✓		Port of Hay Point Ambient Air, Noise and Weather Monitoring
Underwater noise	Underwater noise and vibration impacts on marine fauna, particularly marine megafauna, such as behavioural or physiological changes resulting from offshore development and dredging.	✓		No
Visual impact footprint	Intensification of existing port activities and larger footprint increasing visual impact on nearby sensitive receptors.	✓		No
Vegetation screening	Clearing of vegetation which currently screens existing port operations from viewers.	✓	✓	No
Shipping activities	Increase in shipping activities in the GBRWHA impacting scenic experience of tourist cruise ships and recreational boat users.	✓		No

15.18 Appendix R: Vessel calls

Vessel calls at Port of Hay Point in 8-22 July 2021

Name	LOA	Summer Draft	GRT	DWT	Beam	Class
China Pride	292.00	18.30	91,373	177,856	45.05	Capesize
Artemis I	228.95	14.45	44,071	82,000	32.31	Panamax
Navios Libertas	225.00	14.22	40,914	75,511	32.24	Panamax
Ocean Road	225.00	14.14	40,341	75,051	32.25	Panamax
Solar Majesty	292.00	18.30	94,481	180,516	45.59	Capesize
Chorus	228.99	14.43	43,012	82,181	32.29	Panamax
HL Balikpapan	255.24	14.52	63,993	114,531	43.05	Neo-Panamax
Western Marine	255.00	14.52	63,624	114,583	43.05	Neo-Panamax
Pan Bona	291.80	18.25	92,353	175,401	45.03	Capesize
Cape Lily	291.98	18.24	92,752	181,303	45.00	Capesize
New Future	292.00	18.18	93,245	182,598	45.00	Capesize
White Rose	289.00	17.92	89,097	171,827	45.05	Capesize
Star Iris	225.00	14.00	40,092	76,466	32.30	Panamax
Indego Ace	229.00	14.40	43,068	81,786	32.29	Panamax
Builder	229.00	14.50	44,289	81,541	32.30	Panamax
Hakuyo	235.00	13.06	50,888	92,418	43.00	Neo-Panamax
Frontier Lodestar	291.98	18.24	92,752	181,338	45.00	Capesize
Maera	225.00	14.20	41,342	75,403	32.30	Panamax
The Evolution	229.93	13.82	48,025	88,270	38.03	Neo-Panamax
Ulusoy-11	229.00	14.62	43,717	79,422	32.30	Panamax
Marielena	224.90	14.41	42,747	81,354	32.30	Panamax
Aquatonika	291.96	18.22	93,789	179,004	45.02	Capesize
FPMC B 103	253.54	13.60	62,272	106,668	43.00	Neo-Panamax
Cape Green	299.99	18.43	107,054	209,869	50.06	VLOC
Star Lambda	229.00	14.45	43,301	81,272	32.30	Panamax
Ocean Creation	299.70	18.23	106,352	207,935	50.05	VLOC
Marine Vision	289.00	17.80	87,927	171,810	45.05	Capesize
Explorer Asia	229.00	14.45	43,968	81,093	32.30	Panamax
Malindi	292.00	18.30	91,739	177,987	45.05	Capesize
HL Shikoku	291.90	18.24	92,725	181,502	45.00	Capesize
Argonaut	229.00	14.47	44,074	81,117	32.30	Panamax
HL Success	292.00	18.22	93,432	179,156	45.05	Capesize
Buenos Aires	229.00	14.60	44,475	83,366	32.26	Panamax
Camellia Island	299.00	13.52	47,109	84,854	38.00	Neo-Panamax
Star Flame	229.00	14.45	43,827	80,671	32.28	Panamax
Great Aspiration	229.20	14.90	51,130	93,412	38.04	Neo-Panamax
Metis Horizon	299.99	18.33	108,901	207,839	50.00	VLOC
Pan Mutiara	229.00	14.47	44,003	81,177	32.30	Panamax
Nian Feng Hai	291.95	18.20	91,205	1,777,878	45.05	Capesize

Pan Mutiara	229.00	14.47	44,003	81,177	32.30	Panamax
Nian Feng Hai	291.95	18.20	91,205	177,878	45.05	Capesize
Crystal Tiger	291.98	18.19	92,756	181,569	45.00	Capesize
Corona Royal	229.98	13.90	49,762	88,887	38.03	Neo-Panamax
Yangtze Xing Zhong	229.00	14.50	45,271	81,622	32.30	Panamax
HL Shikoku	291.90	18.24	92,725	181,502	45.00	Capesize
Aquavita Sea	229.00	14.51	43,968	81,600	32.26	Panamax
Star Markella	228.99	14.43	43,168	82,574	32.29	Panamax
Double Delight	234.98	14.47	50,616	95,522	38.00	Neo-Panamax
Oriental Frontier	224.89	13.95	39,052	74,366	32.24	Panamax
Clemens Oldendorff	229.20	14.90	51,195	92,759	38.04	Neo-Panamax
Hanton Trader II	199.90	13.30	36,278	63,800	32.30	Panamax
Ototachibana	300.00	18.23	106,323	207,964	50.06	VLOC
Atrotos Heracles	228.99	14.43	43,007	81,922	32.29	Panamax
Flag Tom	229.20	14.90	51,255	93,268	38.04	Neo-Panamax
CSSC Tai Yuan	229.00	14.50	44,196	81,595	32.26	Panamax
Leo Iris	228.99	14.43	43,040	81,820	32.29	Panamax
Cymona Progress	228.99	14.43	43,089	81,918	32.29	Panamax
Sakura Angel	249.98	12.87	57,239	99,623	43.00	Neo-Panamax
Lowlands Sunrise	291.98	18.24	92,752	181,458	45.00	Capesize
Maran Vision	289.00	17.80	87,927	171,810	45.05	Capesize
Houyu	189.90	12.53	30,816	55,471	32.26	Supramax
Vela Star	229.00	14.56	44,146	83,651	32.26	Panamax
HL Baltimore	289.00	17.97	88,541	177,489	45.00	Capesize
Frontier Wave	289.98	18.03	91,424	174,707	45.00	Capesize
IANTHE	292.00	18.20	94,008	180,018	45.05	Capesize
Rikke	228.99	14.43	43,066	81,895	32.29	Panamax
Average	**254.48**	**15.73**	**63,156**	**121,755**	**38.85**	**Capesize**
Median	**229.96**	**14.52**	**50,752**	**92,589**	**38.04**	**Neo-Panamax**

Name	DWT	LOA	Beam	Summer Draft
Handysize	15-35,000	130-150	–	–
Handymax	35-50,000	150-200	–	–
Supramax	50-65,000	Up to 199	–	–
Panamax	65-80,000	Up to 275	Up to 32.2	Up to 12.04
Neo-Panamax	80-120,000	Up to 366	Up to 49	Up to 15.2
Capesize	120-180,000	Unlimited	Unlimited	Unlimited
VLOC	>180,000	Unlimited	Unlimited	Unlimited