

# Middle Arm Sustainable Development Precinct Referral Report

## Referral Report

Prepared for assessment under the *Environment Protection Act 2019*

January 2022

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Acronyms	Full form
AAPA	Aboriginal Areas Protection Authority
ABS	Australian Bureau of Statistics
ACM	Asbestos Containing Material
ASS	Acid Sulfate Soils
BCF	Burrell Creek Formation
BCH	Benthic Communities and Habitats
BOM	Bureau Of Meteorology
CEMP	Construction Environment Management Plan
CoAs	Classes of Action
DENR	The Department of Environment and Natural Resources (Northern Territory) – Formerly DLRM (Now DEPWS)
DEPWS	The Department of Environment, Parks and Water Security
DIPL	The Department of Industry, Planning and Logistics

Acronyms	Full form
DMG	Dredge Material Ground
DRLUP	Darwin Regional Land Use Plan
EIS	Environmental Impact Statement
<i>EP Act</i>	<i>Environmental Protection Act 2019 (NT)</i>
<i>EPBC Act</i>	<i>Environment Protection and Biodiversity Conservation Act (1999) (Commonwealth)</i>
ESCP	Erosion And Sediment Control Plan
IAP2	International Association for Public Participation
IA	Infrastructure Australia
IS	Infrastructure Sustainability
ISCA	Infrastructure Sustainability Council of Australia
LDC	Land Development Corporation
MASDP	Middle Arm Sustainable Development Precinct
MCA	Multi Criteria Analysis
MNES	Matters of National Environmental Significance
NPI	National Pollutant Inventory
NT	Northern Territory
NTG	Northern Territory Government
PMST	Protected Matter Search Tool
PSI	Preliminary Site Investigation
SAA	Strategic Assessment Area
SIA	Social Impact Assessment
SEA	Strategic Environmental Assessment
SLR	SLR Consulting Australia
SOF	Sustainable Outcomes Framework
SOR	Statement of Reasons
TOR	Terms of Reference
<i>TPWC Act</i>	<i>Territory Parks And Wildlife Conservation Act (1976) (Northern Territory)</i>
ZoHI	Zone of High Impact
ZoMI	Zone of Moderate Impact

Glossary of Key Terms	Description
Classes of Action (CoAs)	This is how development is described and grouped in the Program. This terminology comes from the <i>EPBC Act</i> . CoAs are discussed in detail below.
DIPL	Throughout this paper DIPL is assumed to be the proponent, approval holder and ultimate organisation that will administer the precinct wide activities at MASDP. We understand that a dedicated agency may be set up in the future to do some or all of these roles, however until this is decided, we refer to DIPL as the proponent.
East Arm	The eastern arm of the Darwin Harbour is located to the north of the MASDP.
Environment	The term 'environment' is used in its broadest sense and consistent with the themes and factors set out by the NT EPA. Therefore, 'environmental values' or 'requirements', is encompassing of biodiversity, air, water, cultural and social factors.
Environmental Impact Statement (EIS)	Commonly names an Impact Assessment Report (IAR) under the Environmental Protection and Biodiversity Conservation Act (EPBC Act). The document will assess the impact of implementing the Program on protected matters.
Environmental values	Incorporates environmental, social, cultural, and economic values.
Greater Darwin region	Geographic area that extends from the city of Darwin in the north to the future City of Weddell, including the City of Palmerston and associated suburbs in the Litchfield Council Area.
Impacts	Are positive and negative consequences of an action (policy, program, project or class of projects)
MASDP Program (or the Program or Draft Program)	Defines the scope of future construction, operation and environmental management of the MASDP. It is what DIPL is seeking approval for and will then need to implement to enable development.
Middle Arm Peninsula	The Peninsula (land area) located between the Middle arm (water area) and East arm (water area) of the Darwin Harbour. A part of the Peninsula is the location of the proposed construction and operation of the MASDP.
Outcomes framework (or the sustainable outcomes framework)	The Program will include a framework which sets objectives and outcomes to be delivered at MASDP. The framework includes a hierarchy of vision, objectives, outcomes, commitments and actions. The outcomes framework is discussed in detail below.
Protected matters	This term is used in its broadest sense to encompass all the values that are protected under relevant NT or Commonwealth legislation and therefore subject to assessment and approval. These may include biodiversity, air, water, cultural and social factors.
Severity of impacts	The degree of impact on an environmental value.
Strategic Assessment	Assessment of a group of proposed actions that has the potential to have a significant impact on the environment or will meet a referral trigger under the <i>EP Act</i> .
Strategic Assessment Agreement	Legal agreement between the Commonwealth Minister of Environment and a NTG Minister (as delegated).
Strategic assessment area (SAA)	The geographic area covered by the strategic environmental assessment that has the potential to be directly and/or indirectly impacted by the proposal, which includes the Middle Arm Peninsula, Darwin Harbour and surrounding areas.
Strategic Proposal	Under the <i>EP Act</i> , means a policy, program, plan or methodology. In the case of MASDP it is a Program.
Sustainability	DIPL has adopted the Infrastructure Australia (IA 2021) outcomes-focused understanding of sustainability, i.e. <i>meeting the needs of the present without compromising the ability of future generations to meet their own needs</i> .

Glossary of Key Terms	Description
Sustainability components	Components of a project, across which sustainable outcomes will be delivered including economic, environmental, social and cultural and governance. This is the approach of IA and is in line with global best practice.
Sustainable development	Sustainable development refers to the network and system, equipment and assets designed to meet the population's essential service needs, while adhering to sustainability principles. This results in infrastructure that is planned, designed, procured, constructed and operated to optimise social, economic, environmental and governance outcomes over an asset's life (IA 2021)
The Peninsula	Is referring to the Middle Arm Peninsula, see Middle Arm Peninsula description above in table.
The Precinct	Is referring to the Middle Arm Sustainable Development Precinct (MASDP).

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## Publication Statement

This referral report, the draft Middle Arm Sustainable Development Precinct (MASDP) Program and the Terms of Reference (TOR) and Statement of Reasons has been prepared by EcOz Environmental Consultants (EcOz) and 2rog Consulting (2rog) on behalf of the Department of Infrastructure, Planning and Logistics (DIPL). A listing of the key consultants, their qualifications and experience in the environmental field are provided below.

Name	Company	Qualifications	Experience
Ailsa Kerswell	2rog	Bachelor of Science (Hons) PhD Marine Biology Doctor of Philosophy	20+ years
Jeff Richardson	EcOz	Bachelor of Science (Hons) EIANZ Board member Project Management	20+ years
Kylie Welch	EcOz	Bachelor of Science (Hons) Master Social Science (Environment & Planning) Certificate in Engagement –International Assoc, for Public Participation Certified Environmental Practitioner (EIANZ CEnvP 975)	20+ years
Britanny Crescentino	EcOz	Bachelor of Environmental Science	5 years

Inputs as part of a peer review process from relevant technical specialists have been provided throughout the development of this referral report, the draft MASDP Program and TOR. A listing of the key technical specialists, their qualifications and experience in the environmental field are provided below.

Name	Company	Specialist area	Qualifications	Experience
Andrew Balch	Air Environment	Air Quality	Bachelor of Science Certified Air Quality Professional – Clean Air Society of Australia and New Zealand.	15+ years
Natalie Fries	GHD Pty Ltd	Land	Bachelor of Environmental Science Australian Institute of Project Management Certified Professional Project Manager	18 years
Paul Priebbenow	GHD Pty Ltd	Land Water – Surface water	Bachelor of Engineering (Civil) Registered Professional Engineer of Queensland	34+ years
Glen Ewers	EcOz	Land - Ecology	Bachelor of Science Bachelor of Law (Environment) Diploma of Arts (Environmental Studies) Graduate Certificate in Ornithology	15+ years
Martin Budd	Royal HaskoningDHV	Marine	Bachelor of Science Doctor of Philosophy Cert IV Work Health Safety	25+ years
Ian Baxter	SEAPEN Marine Environmental Services	Marine	Bachelor of Science (Zoology) Master of Science (Marine Biology) Certified Environmental Practitioner (EIANZ)	35+ years
Andrew Costen	SLR Consulting	Marine – Benthic Habitat Communities	Bachelor of Science (Hons) Certified Environmental Practitioner (EIANZ)	25+ years
Luke Kidd	Royal HaskoningDHV	Marine – Coastal Processes and Quality	Master of Environmental Science Bachelor of Engineering, Environmental	19+ years
Lachlan Barnes	SLR Consulting	Marine – Fish species	Bachelor of Science (Hons) PhD	18+ years

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Name	Company	Specialist area	Qualifications	Experience
Anthony Bougher	EcOz	Marine – Intertidal Mangroves	Bachelor of Science (Environmental Science)	25+ years
Ben Keys	Earth Sea Pty Ltd	People and Heritage	Bachelor of Archaeology (Hons)	10+ years
Jane Munday	True North Strategic Communication	Social Impact Assessment	PhD (social and cultural impact assessment), MBA, GAICD, Bachelor of Arts (Psychology); Certificates in social impact assessment (IAIA), public participation and advanced community engagement (IAP2).	25+ years

## Executive summary

This document provides supporting information to the Referral Form submitted to the Northern Territory Environment Protection Authority (NT EPA) for the *Middle Arm Sustainable Development Precinct (MASDP)*. The supporting information has been prepared by the Department of Infrastructure, Planning and Logistics (DIPL) to inform the NT EPA's decision to accept the referral of the MASDP as a Strategic Proposal, and an assessment of potentially significant impacts via a Strategic Environmental Assessment (SEA) approach. DIPL is proposing the SEA approach be adopted for the MASDP environmental assessment and approvals processes under both the *EP Act* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*<sup>1</sup>. The SEA approach focuses on the assessment and approval of 'a policy, program, plan or methodology', rather than seeking approval for individual projects. DIPL is seeking approval for the precinct-wide Program for the construction and operation of a new 'development ready' sustainable precinct with a focus on low emission petrochemicals, renewable hydrogen, carbon capture storage and minerals processing. The proposed MASDP is located on the Middle Arm Peninsula approximately 3km southwest from the City of Palmerston and 13km southeast of the City of Darwin on land currently zoned Development, Future Development and Conservation under the NT Planning Scheme (NTPS).

## Environmental approvals process

The submission of this referral formally commences the environmental approvals process under the *EP Act*, and includes the standalone draft of the MASDP Program. The next step is the development of the Environmental Impact Statement (EIS), which is the proposed assessment tool. The EIS will assess the impact of implementing the Program on the environmental factors, including Matters of National Environmental Significance (MNES), and will inform the Environment Minister's decision-making. During the SEA phase, the EIS allows regulators and other stakeholders to gauge the acceptability of impacts, understand how negative impacts will be avoided and managed into the future and positive impacts enhanced and promoted. Therefore, throughout the SEA process, two documents are always relevant – the MASDP Program and the environmental impact assessment documents (i.e. referral/EIS/Supplementary EIS).

The framework for the EIS has been provided as a draft EIS terms of reference (TOR) with this document. The Draft EIS TOR have been developed in accordance with NT EPA's guidance *Terms of reference template for a proponent initiated EIS referral* (NT EPA 2021) and aligned to the endorsement criteria for the *EPBC Act*.

## Program overview

The MASDP Program sets out the future development within the MASDP, as well as measures to deliver sustainability outcomes across economic, environmental, social and cultural and governance settings. The purpose of the MASDP Program is to:

- Deliver sustainable economic outcomes, including growing productivity, whilst considering issues around equitable access to opportunities and efficiently using financial resources
- Deliver sustainable environmental outcomes including protecting environmental values by reducing pollution, balancing resource consumption, conserving natural ecosystems and resources, and supporting climate mitigation and adaptation
- Deliver sustainable social outcomes including consideration of access and wellbeing to contribute to improved quality of life
- Deliver sustainable governance outcomes including building trust in governance and institutions through transparent, accountable and inclusive decision-making.

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<sup>1</sup> Strategic assessment is provided for under section 49 of the *EP Act* and Part 10 of the *EPBC Act*

The MASDP Program is being developed based on three, equally important parts, all of which are supported by a Program-wide outcomes framework. The core parts of the MASDP Program are:

- **Development Plan** – defines the scope of development allowed under the Program, including future industrial development and common-user enabling infrastructure
- **Sustainability Outcomes Framework (SOF)** – delivers a best practice approach to embedding sustainability principles into the implementation of the Program. Sets outcomes across all four sustainability components (environmental, economic, social and cultural and governance) and includes specific commitments for how outcomes will be delivered. It also includes measures to avoid and minimise negative impacts and enhance positive opportunities
- **Implementation and Assurance Plan** – sets out how the Program will be implemented, including mechanisms for all stakeholders to have confidence that the implementation is effective and adaptive. It includes governance arrangements.

The Draft MASDP Program provided with this referral report includes the key concepts and outline of the full MASDP Program to be submitted along with the draft EIS. This full MASDP Program will include the best available evidence provided from site specific technical studies to allow impact assessment to be conducted. The full MASDP Program will be made available for public review and comments, as per the requirements of the *EP Act*.

## Environmental factors potentially significantly impacted

A self-assessment of the strategic proposal for the MASDP was undertaken using the pre-referral screening tool. The strategic proposal triggered a referral based on the type, scale and hazardous nature of the action i.e., an industrial precinct development focused on low emission petrochemicals, renewable hydrogen, carbon capture and storage and minerals processing. The self-assessment identified 12 of the environmental factors that have the potential to be significantly impacted by the strategic proposal. A summary of the environmental factors that may be potentially significantly impacted and why is provided in Table 1.

Table 1: Summary table of NT EPA environmental factors and potentially significantly impacted by the strategic proposal

NT EPA Environmental Factor	Environmental values and sensitivities	Potential significant impact (yes, no, uncertain)	Brief explanation of potential significant impact
Landforms	No distinctive geological or anthropogenic landforms	No	N/A
Terrestrial environmental quality	Soil quality	Yes	Soil quality may be significantly impacted through land clearing over the term of the Program; erosion; leaks and spills of hazardous materials and/or disturbance of contaminated soils.
Terrestrial ecosystems	<ul style="list-style-type: none"> <li>Threatened species</li> <li>Migratory shorebirds</li> <li>Significant vegetation communities</li> </ul>	Yes	Threatened species, and sensitive and significant vegetation, will be impacted by vegetation clearing of approximately 1,500ha on the Middle Arm Peninsula. A conservation offset for residual impacts to threatened species is being developed.
Hydrological processes	No permanent surface waterbodies present, only minor ephemeral drainage lines that direct overland rainwater flow into Darwin Harbour	Yes	Direct disturbance from 1,500ha of land clearing and operations will result in alteration of hydrological flows and may impact freshwater discharge into the Darwin Harbour.
Inland water environmental quality	Groundwater quality and the biophysical values that they support.	Yes	Direct disturbance from land clearing, construction and operations (such as seepage from disturbed acid sulfate soils, leaks of hazardous materials) may result in impacts to groundwater quality.
Aquatic ecosystems	No significant aquatic ecosystems present	No	N/A
Coastal processes	Coastal processes support a functioning harbour including ecological partitioning and flushing	Yes	Changes to the physiology of Darwin Harbour seabed from dredging, marine infrastructure construction and shipping operations may result in impacts to hydrodynamics and indirect impacts to water quality and sediment deposition.
Marine environmental quality	Darwin Harbour Integrated Report Card 2021 'Very Good' water quality in proposed area of influence from dredging activities.	Yes	Significant impacts to marine water and sediment quality in Darwin Harbour may occur due to dredging and shipping operations.
Marine ecosystems	<ul style="list-style-type: none"> <li>Threatened species</li> <li>Non-listed fish</li> <li>Mangroves</li> <li>Benthic communities</li> </ul>	Yes	Significant impacts to marine ecosystems and threatened species may occur due to disturbance of habitat during dredging, marine infrastructure construction and shipping operations.
Air quality	Darwin air quality is generally good quality	Yes	There is the potential for significant impact to air quality through industries establishing in the precinct and shipping operations.
Atmospheric processes	NT GHG emissions are comparatively low compared to other Australian jurisdictions	Yes	Significant impact to achieving NT greenhouse gas emissions targets may occur due to land clearing, dredging construction, industrial and shipping operations.
Community and economy	People and communities likely to experience positive and negative impacts from the MASDP	Yes	The activities proposed under the Program have the potential to significantly impact communities, including Aboriginal people, both adversely and beneficially.
Culture and heritage	<ul style="list-style-type: none"> <li>Aboriginal sacred sites</li> <li>Heritage values including European and Aboriginal (terrestrial and maritime)</li> <li>Cultural values and land uses</li> </ul>	Yes	Sacred sites and cultural and heritage sites may be impacted during dredging, land clearing, shipping and industrial operations.
Human health	MASDP is 3km from the City of Palmerston	Uncertain	Significant adverse impacts to human health may occur from, major hazardous facilities, operations, and shipping.

## Consideration of key principles under the *EP Act*

Section 8 of this referral report provides details of how DIPL has considered and will consider, throughout the development of the Program, the application of the principles of environment protection and management (Part 2 of the *EP Act*) and the general duty of proponents provided for under Section 43 of the *EP Act*. These have been considered during the decision-making phase of the early planning and feasibility phases of the development of the Program.

## Residual impact statement

Preliminary assessment of threatened species values has identified the requirement for an offset for Black-footed Tree-rat (*Mesembriomys gouldii gouldii*). Biodiversity offset studies are being undertaken as part of the EIS to inform the suitability of offset locations to inform decision-making purposes. At this point of the SEA no other significant residual impacts have been identified.

## Key conclusions

A strategic proposal and assessment of potentially significant impacts via a SEA approach is the preferred approach for environmental approvals of the MASDP under the *EP Act* and *EPBC Act*. The EIS will provide an assessment of the impacts of implementing the Program on the environmental factors to enable the NT EPA to determine if the strategic proposal has the potential to significantly impact the environment. The full Program will be developed throughout this process. The approach will enable a streamlined process under both Acts to achieve an environmental approval.

Preliminary assessment of the NT EPA environmental factors identified 12 factors that have the potential to be significantly impacted by the strategic proposal and that require further assessment in the EIS. The impact assessment in the EIS will include the best available evidence from site specific technical studies.

# 1 Introduction

The Northern Territory Government (NTG) is proposing to construct and operate a new industrial precinct at Middle Arm, Darwin Harbour – the Middle Arm Sustainable Development Precinct (MASDP). The MASDP is a whole of NTG Project led by the Department of Infrastructure, Planning and Logistics (DIPL), the Proponent. The proposal involves development of approximately 1,500 ha of land on Middle Arm Peninsula, including landside and marine enabling infrastructure. Establishment of a ‘development ready’ sustainable precinct is planned to attract industries, with a focus on low emission petrochemicals, renewable hydrogen, carbon capture and storage and minerals processing. The proposal is being referred for assessment and approval under the NT *Environment Protection Act (EP Act) 2019*. A standalone, but aligned process is also being undertaken concurrently to address the requirements of the Commonwealth *Environment Assessment and Biodiversity Conservation Act (EPBC Act) 1999*.

The MASDP is being proposed in response to the NTG’s vision for a world-class gas production, manufacturing and services hub by 2030 (see [NT Gas Strategy – Five Point Plan](#)). The Middle Arm Peninsula is already home to a globally significant liquefied natural gas (LNG) export hub, with the Santos-led Darwin LNG and INPEX-led Ichthys LNG onshore processing facilities currently operational. Further development of Middle Arm Peninsula has been identified as providing critical growth opportunities for the Territory that align with the objectives articulated in the Territory Economic Reconstruction Commission report (TERC 2020).

The Middle Arm Peninsula is located within Darwin Harbour, approximately 7 km by road from the City of Palmerston, and 8 km across the harbour from the Darwin Central Business District. The Darwin Regional Land Use Plan [[Available here](#)] designates land on Middle Arm Peninsula as Strategic Industry, and identifies potential for the area to support a deep water port and associated strategic industry. The remaining parts of the Middle Arm Peninsula are designated Mangrove/Conservation zoning. The MASDP proposal includes development across land currently zoned Development, Future Development and Conservation under the NT Planning Scheme (NTPS). The Conservation land will need to be rezoned to facilitate the development.

The MASDP is being referred to the NT Environmental Protection Authority (NT EPA) as a Strategic Proposal (EIS). It is proposed that a Strategic Environmental Assessment (SEA) <sup>2</sup> approach be adopted, as a distinct process from the more widely known individual project level environmental impact assessment. The SEA approach offers the potential to deal with cumulative impacts from multiple projects over time, and to look for opportunities to achieve environmental protection and planning outcomes at the precinct-wide scale, which would not otherwise be possible. The SEA approach will also establish environmental protection and management outcomes from the outset, providing the NT community, regulators (NT and Commonwealth) and developers with greater certainty over future development and the environmental protection requirements that will need to be met for the development to go-ahead. Detailed information about the various environmental assessment and approvals pathways considered and reasoning for undertaking a SEA are provided in the Draft MASDP Program, which accompanies this document.

The strategic assessment area (SAA) and regional context of the MASDP is shown in Figure 1-1. An overview of the Middle Arm Peninsula and potential MASDP disturbance footprint is shown in Figure 1-2.

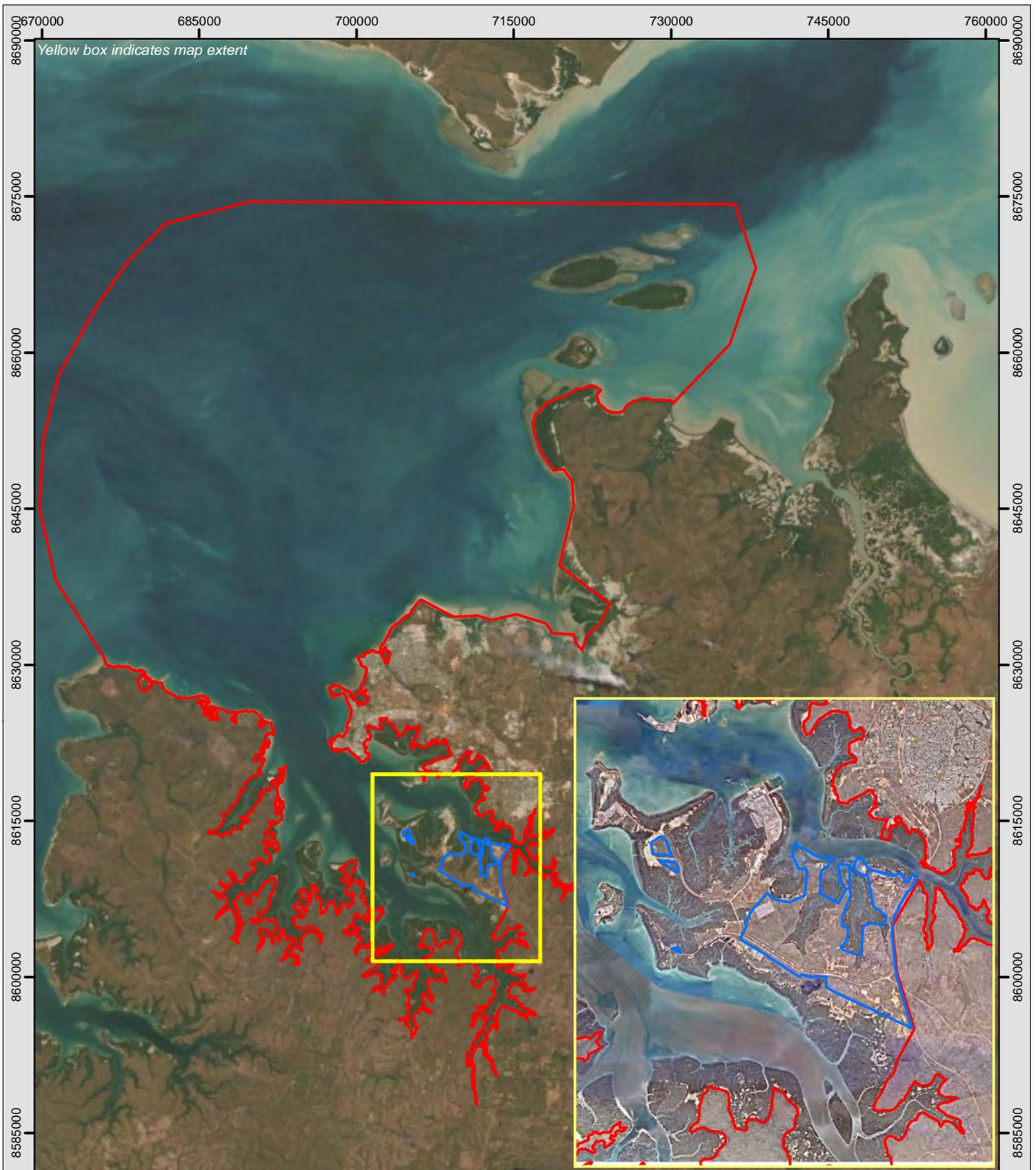
This referral provides an overview of the proposed MASDP Program, and preliminary assessment of the environmental values and potential impacts that will require further consideration throughout the SEA process. The information contained in this referral has been used to inform the draft EIS Terms of Reference (TOR) and Statement of Reasons (SOR) which accompany this referral. This referral is designed to inform the NT EPA’s assessment of the potential for the proposal to have a significant impact on the environment and finalisation of the EIS TOR.

Additionally, DIPL has had initial discussions with the Commonwealth Environment Assessments Department of Agriculture, Water and the Environment. A ‘letter of intent’ was forwarded to them on 31<sup>st</sup> August 2021, to indicate DIPL’s commitment to the Part 10 strategic assessment pathway under the *EPBC Act*.

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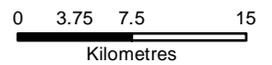
<sup>2</sup> Strategic assessment is provided for under section 49 of the *EP Act* and Part 10 of the *EPBC Act*

The NTG (represented by DIPL) will enter into a 'Strategic Assessment Agreement' with the Commonwealth under section 146 of the *EPBC Act*, in order to progress a strategic environmental assessment. DIPL will work collaboratively with the NT and Commonwealth regulators to establish a stream-lined and concurrent assessment process that meets the requirements of both the NT *EP Act* and *EPBC Act*.



**Legend**

- ▭ Marine Component of the indicative strategic assessment area
- ▭ Land Component of the indicative strategic assessment area



**MAP INFORMATION**  
 Scale: 1:500,000 @ A4  
 Projection: GDA 1994 MGA Zone 52  
 Date Saved: 15/12/2021  
 Client: DH  
 Mapper: DC  
**DATA SOURCE**  
 Topographic data: Geoscience Aust.  
 Project data: Client  
 Imagery: ESRI

**Figure 1-1. Map of indicative strategic assessment area and regional context**



Path: Z:\01 EcOz\_Documents\04 EcOz Vantage GIS\EZ21155 - MASDP Referral\01 Project Files\Potential disturbance footprint for the MASDP.mxd

**Figure 1-2. Map of indicative disturbance footprint of MASDP**

## 1.1 Site Alternatives

Feasibility studies and concept design is being used to understand site alternatives for the MASDP. Option assessment is being implemented by DIPL to realise cost and schedule efficiencies and to avoid potential impacts to environmental values.

Avoidance is the most effective mitigation measure in the mitigation hierarchy. Technical specialists have been engaged in the feasibility phase to identify environmental values and development constraints. The subsequent sections in this referral report summarises the approach for implementing avoidance of environmental values. The options assessment process will be ongoing throughout the planning phase and environmental assessment process.

### 1.1.1 Site selection

A planning phase desktop assessment was prepared by DIPL, to assist in the site selection for a 'sustainable development precinct'. The desktop assessment used a multi-criteria analysis (MCA) process, including the following criteria:

- General site information
  - Land tenure
  - Land ownership
- Regulatory
  - NT Planning Scheme and Darwin Regional Land Use Plan (DRLUP)
  - Heritage sites under the *Heritage Act*
- Physical constraints to the development
  - Storm surge inundation (1% and 0.1% AEP)
  - Seasonal waterlogging potential
  - Land units / land form / acid sulfate soils (ASS)
  - Threatened / significant flora and fauna
- Infrastructure costs and feasibility
  - Marine access and port potential
  - Services / utilities
- Land use constraints

A preliminary desktop assessment identified six alternative precinct locations. This was reduced to five sites prior to the detailed desktop assessment (DIPL 2020). The MCA was based on the physical factors used by the Western Australian Government to assess the Ashburton North Strategic Industrial Area development, south of Onslow, Western Australia.

The MCA identified the Middle Arm Peninsula and surrounding areas as the most appropriate location for the sustainable precinct development, based on the following factors: (DIPL 2020)

- The area aligned with the regional planning frameworks
- Has existing LNG processing operations as feed stock
- Direct access to Darwin Harbour Port for direct transportation into international shipping routes

An additional MCA was undertaken for the Middle Arm Peninsula and surrounding area to determine the most suitable location to be developed. A summary of the Middle Arm Peninsula marine port site selection multi-criteria assessment is provided in the section below.

### 1.1.1.1 Marine export facilities site selection

A preliminary desktop MCA of the Middle Arm Peninsula identified seven alternative sites for the development of the marine export facilities. In addition to the limitations and considerations listed above the MCA was based on the following factors:

- Developable area size
- Separation from sensitive receptors
- Direct water access
- High-level relative development cost
- The marine export facilities development, including:
  - Constructability
  - Functionality
  - Operational safety
  - High level environmental impacts,
  - Capital cost
  - Maintenance and operational

The combination MCAs identified the area shown in Figure 1-2 for the location of the marine export facilities was the most appropriate to develop for the project. Additional area obtained through the option of land reclamation works (infilling) will allow the development to provide regular shaped developable parcels of land if decided this is the preferred option.

## 1.2 Enabling infrastructure

Feasibility studies and concept design of the marine and land-based enabling infrastructure is currently underway. An industry study has been developed to drive the type, scope and scale of the enabling infrastructure (GHD and Wood 2021). Currently industry scenarios are under consideration by DIPL. The process has included inputs from technical design studies by specialists in selected fields, and these will continue to evolve as the design is further refined. Concept design and feasibility studies that are in progress, and that are informed by the industry building blocks scenarios assessment, include:

- Dredging program options (expected quantity of spoil to be produced, and depth and width impacts)
- Vessel traffic assessment
- Vessel profiling and berth occupancy assessment (based on industry scenarios)
- Marine facilities concept layout assessment
- Marine sub-sea constraints assessment
- Product and module corridor planning
- Earthworks and stormwater drainage assessment
- Civil infrastructure – such as potable water, wastewater, drainage and electrical structures etc.
- MASDP concept layout options
- Coastal protection revetment options
- Seawater intake strategy infrastructure requirements
- Wastewater (i.e., sewerage, seawater cooling water and industrial) strategy including collection, treatment, transfer and discharge system infrastructure requirements and site servicing strategy

- Desalination plant and associated servicing strategy.

## 2 Overview of the MASDP Program

The MASDP is being referred to the NT EPA under Section 49 of the *EP Act* as a Strategic Proposal and is expected to be assessed via a strategic assessment under the *EP Act*. Impacts of the Precinct on MNES will also be assessed via a strategic assessment under Part 10 of the *EPBC Act*. As noted, both the Commonwealth *EPBC Act* and the NT *EP Act* offer pathways for SEA and these will be adopted concurrently for the environmental assessment and approval for MASDP.

The strategic assessment approach focuses on the assessment and approval of ‘a policy, program, plan or methodology’, rather than individual projects that fall within the scope of the wider strategic proposal. Therefore, rather than seeking approval for individual projects, DIPL is seeking approval for the MASDP Program.

The MASDP Program sets out the scope of future development within the Precinct, as well as measures to deliver sustainability outcomes across economic, environmental, social and cultural and governance settings. The MASDP Program is being developed based on three, equally important parts, all of which are supported by a Program-wide sustainability outcomes framework (SOF). The core parts of the MASDP Program are:

- **Development Plan** – defines the scope of development allowed under the Program, including future industrial development and common-user enabling infrastructure
- **Sustainability Outcomes Framework (SOF)** – delivers a best practise approach to embedding sustainability principles into the implementation of the Program. Sets measurable outcomes across all four sustainability components (environmental, economic, social and cultural and governance) and includes specific commitments for how outcomes will be delivered. Includes measures to avoid and minimise negative impacts and enhance positive opportunities
- **Implementation and Assurance Plan** – sets out how the Program will be implemented, including mechanisms for all stakeholders to have confidence that the implementation is transparent, effective and adaptive. It includes governance arrangements.

The MASDP Program is a key document being developed as part of the SEA and approval package. The other is this referral and the Environmental Impact Statement (EIS), which is the proposed assessment tool. The EIS will assess the impact of implementing the Program on environmental factors and will inform the Environment Minister’s decision making. During the SEA phase, the EIS allows regulators and other stakeholders to gauge the acceptability of impacts and understand how negative impacts will be avoided and managed into the future and positive impacts enhanced and promoted. Therefore, and throughout the SEA process, two documents are always relevant – the MASDP Program and the environmental impact assessment documents (i.e. referral/EIS/SEIS). The relationship between the Program and the EIS is shown in Figure 2-1.

The purpose of this section is to provide a high-level overview of the MASDP Program in order to introduce the key concepts and also provide context for the information presented in the following sections. The standalone Draft MASDP Program is provided along with this report.

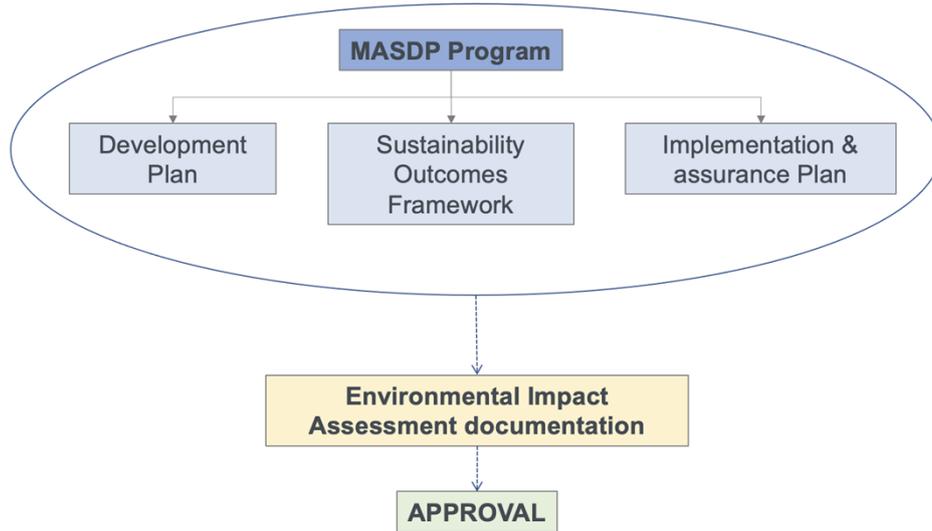


Figure 2-1. Parts of the MASDP Program and relationship with SEA process and environmental approval

## 2.1 Alignment with sustainability principles

The NTG is committed to MASDP being a world-class, sustainable, industrial precinct. In order to achieve this vision, a number of overarching principles are guiding Precinct design. These include:

- Increasing self-sufficiency in supply chains and manufacturing capacity to provide opportunity to grow local manufacturing
- Circular economy principles, whereby the Precinct operates as an integrated system where wastes from one operation can become inputs for another
- Maximising the use of shared infrastructure
- Targeting low emissions proponents, including initiatives that support decarbonisation and contribute to achieving net zero emissions
- Efficient water use, including reuse and recycle where possible
- Supporting or driving the development of other regional conservation initiatives and ensuring MASDP precinct planning is well-aligned and integrated (e.g., Darwin Harbour Dredge Management Strategy).
- Using an outcomes-based framework for measuring social, cultural, environmental and economic impact in accordance with:
  - Infrastructure Australia’s sustainability principles
  - Infrastructure Australia’s Australian Infrastructure Plan and Assessment Framework (2021)
  - Infrastructure Sustainability Council of Australia (ISCA) sustainability guidelines.

The purpose of the MASDP Program is to set out how the vision and these principles will be implemented, in order to demonstrate a best practice, sustainable approach to delivering outcomes. The Program adopts the ISCA framework including four core components of sustainability – economic, environmental, social and cultural and governance. As a sustainable Precinct, MASDP will deliver outcomes that are balanced across each component.

The standalone Draft MASDP Program provides details of what each sustainability component entails and includes examples of how sustainability outcomes are delivered via the Program. In some instances, development of the Precinct itself and implementation of the Program as a whole are important elements of achieving sustainable outcomes.

The MASDP Program seeks to:

- Deliver sustainable economic outcomes including growing productivity, whilst considering issues around equitable access to opportunities and efficiently using financial resources
- Deliver sustainable environmental outcomes including protecting environmental values by reducing pollution, balancing resource consumption, conserving natural ecosystems and resources, and supporting climate mitigation and adaptation
- Deliver sustainable social and cultural outcomes including consideration of access and well-being to contribute to improved quality of life
- Deliver sustainable governance outcomes including building trust in governance and institutions through transparent, accountable and inclusive decision-making.

## 2.2 Outcomes framework

The MASDP Program will be based around an outcomes framework, which reframes the requirements of the approval holder towards delivering pre-defined outcomes rather than specifically defining the allowable impacts. This allows a more flexible approach to development, while also providing certainty about what the outcomes will be. It also aligns well with the vision of MASDP as a sustainable precinct, with outcomes across all components of sustainability (economic, environmental, social and cultural and governance) able to be included inside the Program’s outcomes framework.

The outcomes framework provides top-down and bottom-up linkages between the overall vision for MASDP and the very specific actions or measures that will be implemented to achieve the outcomes. This is represented in Figure 2-2, which provides the current draft outcomes framework for MASDP.

The outcomes and associated commitments within the outcomes framework are ultimately what is approved and must be implemented under the strategic approval. This provides a different framing of commitments and impacts to a standard single project assessment. Rather than having specific impacts approved, the Program will set outcomes and commitments that must be achieved under the strategic approval. By meeting these outcomes and commitments, the MASDP Program ensures the impacts from development have been appropriately accounted for and that the sustainability objectives for MASDP are being delivered.

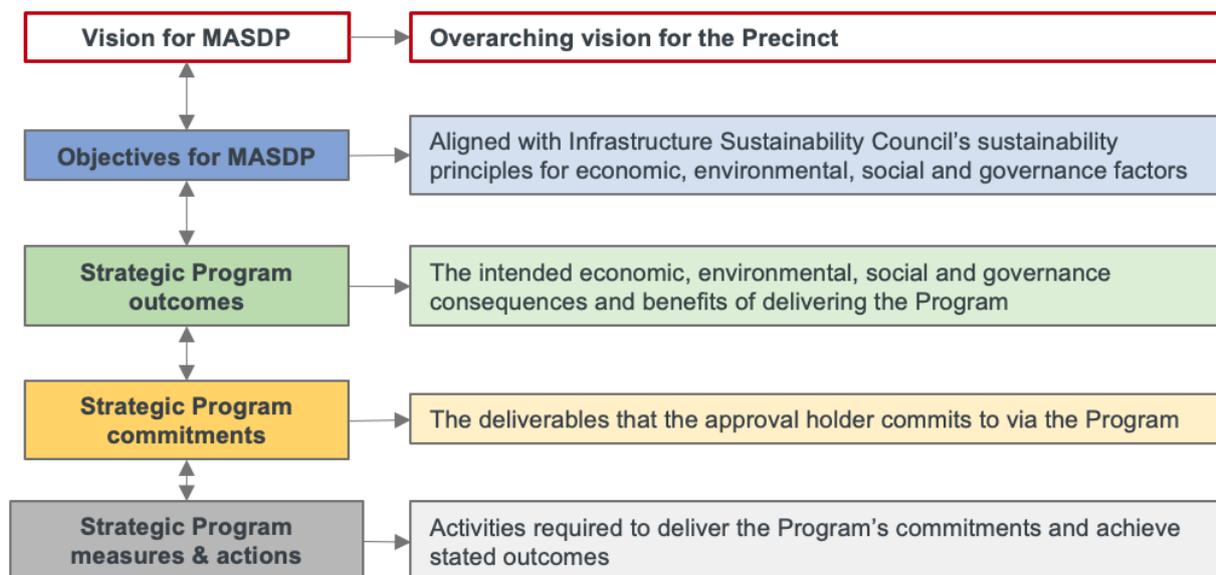


Figure 2-2: Draft outcomes framework

## 2.3 Parts of the Program

As discussed above, the Program has a number of parts, including the Development Plan; Sustainable Outcomes Framework (SOF); the Implementation and Assurance Plan. This section provides a brief overview of each, with further details provided in the standalone Draft MASDP Program. The final content and structure of each part is under development, with the final draft of each part to be presented in the MASDP Program, which will be delivered alongside the draft EIS.

### ***Overarching program***

- Sets the scene including value of strategic approach and supporting policy background
- Provides an overview of best practice sustainable development and how this will be delivered by the Program, introduces the four sustainability components (economic, environmental, social and cultural and governance) and what these are for MASDP
- Establishes the outcomes framework including vision and objectives for MASDP around the four sustainability components
- Addresses key Program requirements e.g., role of approval holder, stakeholders and their roles, spatial and temporal boundaries, relationship between NT and Commonwealth legislation and requirements
- Summarises the key content of the core components below incl. all outcomes and commitments.

### ***Development Plan***

- Sets the scope of development allowed under the Program
- Outlines all development and economic related outcomes and commitments; measures required to implement these (as required)
- Set out as Classes of Action (CoAs) i.e., the groupings of activities that will be undertaken as part of the overarching development plan (terminology is per the *EPBC Act* framework)
- Will include MASDP Plan and Infrastructure Strategy + Industrial Scenarios
- Explicit naming of any exclusions
- Summarises how other sustainability components may be impacted by development (incl. considering cumulative impacts); with strong cross-referencing to EIS.

### ***Sustainability Outcomes Framework***

- Sets out the relevant sustainability components and their specific component values
- Sets sustainability objectives of the Program for economic, environmental, social and cultural and governance components
- Outlines measurable outcomes and commitments for each sustainability component that will be delivered via the Program
- Demonstrates how negative impacts are avoided and minimised (during planning/design and via controls)
- Demonstrates how positive impacts and benefits will be enhanced
- Sets out controls (e.g., management measures) that are required to deliver Program outcomes and commitments; these may include thresholds, triggers, management plan requirements, specific actions tailored to relevant values (economic, environmental, social and cultural and governance) or high-risk impacts
- Distinguishes between Precinct wide requirements and site/project specific requirements
- Biodiversity conservation program including offsets
- Framework for measuring, reporting and responding to longitudinal measurement of cumulative social, cultural and economic impacts (positive and negative)

- Implementation and decision-making mechanisms for SOF e.g. how to track and account for impacts up to maximum threshold; requirements and options if a new development will push the cumulative levels over a threshold.

### ***Implementation and Assurance Plan***

- Links to overarching governance framework for MASDP (which sits outside of, but is overarching of the Program governance structure)
- Implementation framework including:
  - Identifying relevant measurable outcomes and commitments for governance
  - Roles and responsibilities of all relevant parties (governance arrangements)
  - Transparent and effective way to communicate requirements of the Program (and strategic approval) to relevant parties
  - System to verify and track the use of strategic approval (NT and Commonwealth)
  - Decision making over the life of the Program
  - Funding
- Assurance framework including:
  - Monitoring, evaluation, review, and improvement (to ensure outcomes and commitments are being delivered)
  - Key performance indicators (KPIs) and corrective actions (adaptive management frameworks)
  - Reporting on above (compliance and to stakeholders)
  - Timing and frequency of above.
- Process for data management and sharing of data
- Process for ongoing stakeholder engagement (including with regulators and the community).

## **2.4 Development of the full Program**

This referral formally commences the SEA process and includes the standalone draft of the MASDP Program, along with this supporting referral report. Considerable work is still to be undertaken to further develop the Program and the process to do so, this is discussed in the draft MASDP Program. A full draft Program will be submitted to regulators along with the draft EIS and made available for public review and comment, as per the requirements of the *EP Act*.

## 3 Stakeholder engagement

### 3.1 Regulator engagement

Pre-referral discussions with key decision-making authorities (Environmental Assessments Team from Department of Environment, Parks and Water Security (DEPWS) who advise to the NT EPA and Environmental Assessments Team from Department of Agriculture, Water and the Environment who advise to the Commonwealth Environmental Minister) in relation to the SEA commenced January 2021. The purpose of the discussions is to resolve the most appropriate regulatory approaches to environmental approvals at MASDP, to streamline the *EP Act* and *EPBC Act* environmental processes, and create a three-way communication link between the key regulatory teams and DIPL. A pre-referral meeting with DIPL and NT EPA Board Members was held on 08 December 2021.

#### 3.1.1 Ongoing engagement

DIPL will continue to consult with the NT and Commonwealth Environmental Assessment Teams for the duration of the SEA process, and after as required. This includes via workshops with key technical consultants and DIPL hierarchy to progress the environmental impact section of the assessment process.

### 3.2 Community engagement

DIPL has developed a stakeholder engagement strategy to guide stakeholder engagement for the MASDP. An engagement register has been established to record the matters that affected communities and groups raise, which will feed into the impact assessment and design studies. DIPL has also identified dedicated resources to deliver stakeholder engagement. Engagement will be further refined as the MASDP progresses through the impact assessment process to respond to stakeholder concerns.

Stakeholder engagement will also provide inputs to the social impact assessment (SIA) (refer section 5.12 below).

The sections below provide:

- a summary of the objectives of DIPL stakeholder engagement strategy
- key feedback received from engagement undertaken prior to the submission of this referral report
- an outline for continued engagement throughout the SEA process.

#### 3.2.1 Stakeholder engagement

Meaningful stakeholder engagement is central to the feasibility studies and designed to improve project transparency and accountability, as well as reduce risk of project delay or failure. The MASDP stakeholder engagement strategy aligns with the *International Association for Public Participation (IAP2) Core Values* that guide good community engagement<sup>3</sup>. The IAP2 spectrum has been adopted to identify the level of stakeholder engagement. Stakeholders will be engaged according to level of interests and potential impacts. The highest level of engagement will be to 'involve' the community throughout the SEA process so that specific stakeholder groups' concerns and aspirations are consistently understood and considered. Other key standards and frameworks that will inform the stakeholder engagement are:

- Infrastructure Australia's Sustainability Principles (2021)
- International Finance Corporation (IFC) Performance Standards

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<sup>3</sup> The IAP2 Public Participation Spectrum incorporates five levels of participations that define the public role in the stakeholder engagement program – *Inform, Consult, Involve, Collaborate and Empower*. The Spectrum shows that differing levels of participation are legitimate depending on the goals, time frames, resources and levels of concern in the decision to be made.

- Infrastructure Sustainability Council of Australia (ISCA) Infrastructure Sustainability Rating Scheme, measuring social, environmental, governance and cultural outcomes to be delivered by infrastructure projects
- NT EPA Stakeholder Engagement and Consultation - Environmental Impact Assessment Guidance for Proponents (2021)
- International Association for Public Participation Core Values (n.d.) and Quality Assurance Standards (2015).

### 3.2.1.1 Objectives

The objectives of the stakeholder engagement strategy are to:

- Inform and involve stakeholders in the strategic environmental assessment and MASDP planning process through education, transparency, building trust and credibility
- Consult stakeholders to seek feedback and advice to inform good decision making
- Manage expectations of stakeholders
- Demonstrate links to NTG policy priorities and community values.

### 3.2.2 Engagement prior to submission referral

In the current Program phase – baseline environmental studies and concept design/feasibility studies are underway – engagement has largely focused on DIPL introducing stakeholders to the MASDP and seeking confirmation as to how they would like to be engaged.

There have been more than 80 direct contacts with 30 separate stakeholder groups through introductions, presentations and briefings since July 2021. Other stakeholders have been contacted via an emailed introduction with an offer for a meeting and regular updates.

Content for a dedicated website has been developed, with the site expected to be operational by February 2022. Other communication and engagement tools used to date include:

- Development of fact sheets
- Participation and presentations in regional conferences and business network events
- Development of digital media content that has been published across NTG and third-party platforms to build visibility of the MASDP
- Content and information distributed through third-party networks – i.e., local business associations and membership networks.

#### 3.2.2.1 Infrastructure Sustainability Council of Australia

DIPL is partnering with the ISCA to develop a sustainability framework for the planning and design phases of the MASDP. Discussions with ISCA commenced early 2021 (refer to section 2.1 for further information on alignment of sustainability principles of the Program).

ISCA is a member-based, not-for-profit peak body operating in Australia and New Zealand with the purpose of enabling sustainability outcomes in infrastructure. ISCA has developed the Infrastructure Sustainability (IS) Rating Scheme that facilitates the ratings of infrastructure projects and assets. The IS Rating scheme is Australia and New Zealand's only comprehensive rating system for evaluating sustainability across design, construction and operation of infrastructure. Ongoing consultation with ISCA will continue for the duration of the SEA process, and post process if required.

### 3.2.2.2 Engagement with Aboriginal People

Initial introductions and information sessions have occurred with:

- Northern Land Council
- Larrakia Development Corporation
- Larrakia Nation Aboriginal Corporation
- Ironbark Aboriginal Corporation
- Aboriginal Areas Protection Authority.

Initial meetings have focused on introducing the Program and describing the planning and feasibility stages, understanding how organisations and individuals would like to be involved in the engagement process, and following up with key representatives to further define and respond to areas of interest.

### 3.2.2.3 Feedback received from engagement

As the current phase of the engagement has been introductory, the engagement team has not yet gained enough information to confirm critical areas of interest. It is expected that engagement from February 2022 relating to these themes will identify key community values and issues to be addressed.

In building a clear community view relating to values and issues, the integration of an online and offline engagement approach will be implemented. Table 3-1 below summarises the key matters raised during the initial phase of presentations and briefings.

Table 3-1. Summary of stakeholder engagement feedback

Key theme	Key matters raised
Cultural heritage and cultural values	<p>What will the cultural impact of the program of works be? The southern coastline contains petroglyphs outside currently registered and significant archaeological sites exist on the Peninsula.</p> <p>Heritage monitoring – understanding the implementation of and commitment to sacred site protection, overall impact.</p>
Economic development	<p>Darwin has a history of ad hoc development and a boom-and-bust economy – how will MASDP resolve this issue?</p>
Environmental values	<p>Short- and long-term environmental impacts.</p> <p>How will the planning process inform and safeguard the future values of the Harbour?</p> <p>Persistence of existing flora on the Middle Arm Peninsula that has intrinsic value.</p>
Housing availability	<p>Tightening housing stock with increased demand as a result of MASDP construction and following operations. Concerns around lack of residential development, housing affordability and availability.</p>
Input and ongoing communication with the community	<p>Which industries and proponents will be at the MASDP?</p> <p>Concerns around the ability of the community to have access to, and be able to influence the terms and conditions of individual proponent operations – i.e. under the approval notice application process.</p>
Integration with other existing facilities	<p>Compete or co-operate? Landbridge and INPEX are seeking ways to build capability and capacity in partnership.</p>
Local jobs and training	<p>Skills gaps that exist across the Territory means there is a risk of a reliance on FIFO. What assurances will be in place to train, develop and use local businesses and workforce for construction and operation of the MASDP?</p> <p>Workforce training and development should be addressed as a matter of urgency.</p>
Opportunities for Aboriginal employment and contracts	<p>What Aboriginal partnerships and opportunities to participate (i.e., jobs and economic opportunity)?</p>
Recreational fishing	<p>How will coastal fishing be impacted as a result of the strategic proposal, and increased harbour activities?</p>
Sustainable development	<p>How will the MASDP be developed to be adaptable to emerging technologies? Will the MASDP be a green precinct? Why is the government investing in oil and gas industry when we have to meet 2050 zero emissions goal?</p>
Waste management and disposal	<p>Concerns around waste generation and disposal.</p>
Water use and discharge	<p>Recreational value of Manton Dam – what other recreational sources would there be if Manton was recommissioned as a water source as part of the Darwin Water Strategy?</p> <p>Concerns around water demand and use, discharge of water into the harbour.</p>

## 4 NT EPA environmental factors

The NT EPA has developed a framework for the assessment of environmental impacts. This approach uses 14 environmental factors that may be impacted by the strategic proposal to provide a systematic approach to organising environmental information and to establish clear benchmarks based on values.

A self-assessment of the strategic proposal for the MASDP was undertaken using the pre-referral screening tool provided in the guideline *'Referring a proposed action to the NT EPA'* and the strategic proposal triggered a referral based on the type, scale and hazardous nature of the action i.e., an industrial precinct development to attract future industries focused on low emission petrochemicals, renewable hydrogen, carbon capture and storage, and minerals processing.

The self-assessment identified 12 of the environmental factors that have the potential to be significantly impacted by the strategic proposal. These are listed below. The two factors not considered relevant are landforms and aquatic ecosystems and to support this conclusion the values associated with these factors, as well as the other 12, are discussed in Section 5. The 12 factors that are considered to have a potential to be significantly impacted are:

- Terrestrial environmental quality
- Terrestrial ecosystems
- Hydrological processes
- Inland water environmental quality
- Coastal processes
- Marine environmental quality
- Marine ecosystems
- Air quality
- Atmospheric processes
- Community and economy
- Culture and heritage
- Human health

In the context of the MASDP, and for each of the NT EPA's environmental factors and objectives, a description of presence and absence of environmental values was developed, based on desktop assessments, literature reviews and surveys. These are presented in Section 5. The potential for the construction and operation of MASDP to impact on the values of the above factors was assessed with reference to *NT EPA Environmental factors and objectives, environmental impact assessment guidance*. A summary of preliminary potential impacts is provided in Section 6.

## 5 Environmental values

The sections below provide information of the presence and absence of environmental values for each of the NT EPA's 14 environmental factors and objectives.

### 5.1 Landforms

The NT EPA's objective for Landforms is to:

*Conserve the variety and integrity of distinctive physical landforms.*

Preliminary assessment of the SAA has not identified any distinctive geological or anthropogenic landforms that have the potential to be environmental values.

## 5.2 Terrestrial environmental quality

The NT EPA's objective for Terrestrial Environmental Quality is to:

*Protect the quality and integrity of land and soils so that environmental values are supported and maintained.*

The sections below provide the current knowledge of terrestrial environmental quality (land and soil) values in the SAA. The information is based on desktop assessment and a preliminary site investigation conducted over a small portion of the MASDP disturbance footprint.

### 5.2.1 Land units

Preliminary desktop assessment of the land and soils of the SAA identified three dominate soil types within seven land units. Potential acid sulfate soils (PASS) is highly likely over a large proportion of the land components of the SAA based on the land units and mangrove communities associated with Darwin Harbour coastline, specific to the estuarine fringe land units (9a and 9b) in the SAA. Table 5-1 summarises the land and soil characteristics of the MASDP from available land unit mapping (DENR 2010 and Fogarty et al 1984).

Table 5-1. Land units and soil characteristics

Land unit	Description	Dominant soil order	Slope range	Drainage	Runoff
<b>1c Rises</b>	Low scarps and short steep slopes	Rudosols	<3%	Well drained	Very rapid
<b>2a1 Rises</b>	Low rounded hills		0.5 <4%	Well drained	Rapid
<b>2b1 Rises</b>	Gentle side slopes to low hills	Kandosols	2<5%	Well drained	Rapid
<b>4c Plains</b>	Gentle lower slopes	Hydrosols	0.5 <1%	Imperfectly drained	Slow
<b>4d Plains</b>			0.5 <1%	Imperfectly drained	Slow
<b>9a Marine</b>	Estuarine fringe (intermittent and closed mangrove forest communities) – PASS		0%	Very poorly drained	No runoff
<b>9b Marine</b>			0%	Very poorly drained	No runoff

### 5.2.2 Geotechnical investigation

A desktop geotechnical study was completed in October 2021 (Douglas Partners 2021a). In summary, no specific limitations relating to the suitability of the Middle Arm Peninsula for the purpose of constructing and operating the MASDP that cannot be overcome with normal civil engineering works were identified.

A geotechnical intrusive investigation for baseline factual and interpretive reporting was completed in November 2021 (Douglas Partners 2021b). Results supported the desktop geotechnical study summary that no specific limitations that cannot be overcome with normal civil engineering works (i.e., bulk fill, reclamation, re-profiling of site surface, installation of drainage, etc) were identified, subject to a cost benefit analysis. Key civil engineering considerations relating to the construction and operations were provided and will be considered throughout the planning phase of the MASDP.

The investigation comprised:

- drilling of 11 boreholes (maximum depth of 8.45m below ground level)
- excavation of 82 test pits
- pushing of 35 mud probes, followed by laboratory testing of selected samples.

The soil testing was undertaken to relevant Australian Standards at a NATA registered laboratory in Darwin, and comprised the following:

- Atterberg limits and linear shrinkage tests
- Particle size distribution (PSD) tests
- Field moisture content tests
- California bearing ratio (CBR) tests at 95% MMDD, with 4 day soak under a 4.25 kg surcharge.

### 5.2.3 Historical contamination

Sections of the SAA have been cleared for gravel and soil material quarrying activities from large scale to shallow gravel pit operations and subsequently used for illegal dumping of car bodies, asbestos containing material (ACM), tyres and other assorted rubbish (Golder Associates 2019, Douglas Partners 2021b). Preliminary site investigations (PSI) have been conducted over areas within the SAA and identified the potential for low levels of contaminants including some ACM and small amounts of hydrocarbons from the illegally dumped materials (CDM Smith 2017; Golder Associates 2019). A summary of each PSI is provided below.

A PSI was undertaken by CDM Smith (2017) in areas within the SAA, no sampling was undertaken during this investigation. Potential contamination sources associated with illegal dumping were identified with a low to moderate risk of soil contamination and limited exposure pathway was determined. Determination of the extent of contamination was recommended for hydrocarbon, as was removal of all illegally dumped waste and soil stockpiles from the area.

A PSI and shallow soil baseline assessment sampling was undertaken by Golder Associates (2019) in Lot 1817 Hundred of Ayers. No soil contamination from quarrying activities or hydrocarbons from dumping of car bodies were detected. Low levels of surface contamination of asbestos fibres were detected and depth sampling (0.2-0.3 and 0.9-1.0m) below the ACM did not detect any contamination.

A PSI over the MASDP disturbance footprint is being delivered in early 2022.

### 5.2.4 Additional studies

To assist in understanding the potential impact to soils and land within the SAA the following studies will be undertaken for the SEA:

- Preliminary site investigation for all SAA areas
- Earthworks, roads and drainage strategy
- Product and module corridor masterplan
- Headworks and servicing strategy
- Preliminary structural options assessment for the coastal protection revetments concept design.

## 5.3 Terrestrial ecosystems

The NT EPA's objective for Terrestrial ecosystems is to:

*Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.*

Terrestrial ecosystem values in the SAA include NT and Commonwealth listed threatened species, migratory shorebirds and significant habitats (DEPWS 2021), which are:

- Significant vegetation habitat types
  - Monsoon vine forest or vine thicket
  - Sandsheet heath
  - Riparian vegetation
  - Mangroves
  - Vegetation containing large trees with hollows suitable for fauna
- Habitats that might be important to retain local species diversity
  - Wetlands
  - Seasonal wetlands

The Commonwealth listed marine migratory species of value (i.e., Cetaceans) present in the SAA are discussed in the marine ecosystems environmental factor in Section 5.9.

### 5.3.1 Vegetation communities

Vegetation across the Middle Arm Peninsula is predominately Eucalyptus woodland surrounded by mangrove communities, with the following known significant vegetation types (DENR 2020):

- Monsoon rainforest
- Riparian vegetation
- Sandsheet heath
- Wetland habitats

No permanent natural freshwater wetlands vegetation is present, however seasonal wetlands associated with mangrove and salt flat communities do occur in the SAA (DEPWS 2020). Field surveys of these seasonal wetlands (not including mangrove communities) concluded that these areas were small, lacking in complexity and not considered likely to support any threatened species (DEPWS 2020). The presence and absence of marine ecosystems community values are provided in Section 5.9.

#### 5.3.1.1 Monsoon rainforest

Monsoonal rainforest habitats are present in the SAA (DEPWS 2020). Monsoon rainforest provides habitat for a unique suite of species and is considered a significant and sensitive vegetation community under the *NT Planning Act (1999)*. Targeted field surveys were conducted during the vegetative and flowering phase of threatened ground-orchids, between January and February 2020. Approximately 256 ha of monsoon rainforest type communities are scattered across the Middle Arm Peninsula and within the SAA (DEPWS 2020).

### 5.3.1.2 Riparian habitats

Riparian habitats line seasonal drainage and fringing mangrove communities and are present along the coastline of the SAA (APM 2019, DENR 2020). Vegetation community mapping was used to identify these habitats, concluding they do not support any significant or threatened species (DEPWS 2020). It is unknown if these riparian habitats are supported by a groundwater resource. The key value of this habitat is likely to be functionality for soil stability and water filtration to protect downstream mangrove habitats.

### 5.3.1.3 Sandsheet heath

Sandsheet heath habitats are present in the SAA (DEPWS 2020). Sandsheet heath habitats are seasonal wetland communities occurring on distinctive landforms and soil and are present in the Darwin rural region (DEPWS 2020). Existing vegetation mapping data (vegetation landform and soil attributes) and desktop assessment using high-resolution aerial photography and satellite imagery (based on tonal variation, colour and texture) identified that potential sandsheet heath habitat occurred on the eastern side of the SAA. This area was subject to a targeted field survey by DEPWS Flora and Fauna Division in the 2019 dry season. The survey identified the presence of sandsheet heath using habitat values characteristic of sandsheet heath, such as poor drainage and standing/seeping water, and the presence of an indicator species, *Dapsilanthus spathaceus*.

### 5.3.1.4 Wetland habitat

Wetland habitats are present in the SAA and the wider Middle Arm Peninsula (DEPWS 2020). Wetlands encompass a wide range of habitats that permanently or intermittently support plants or animals dependent upon wet conditions to complete their lifecycles. Four vegetation map units were identified as wetland communities occurring on Middle Arm Peninsula, these include *Melaleuca viridiflora* (Broad-leaved Paperbark) wetlands. No permanent natural freshwater wetlands were present. However, seasonal wetlands were present and are also considered important (DEPWS 2020).

## 5.3.2 Threatened species

Sections of the SAA are undeveloped, with areas of cleared vegetation from historic quarrying activities. Details of historic activities and contamination are provided in Section 5.2.

Recent threatened species surveys on the Middle Arm Peninsula include studies for:

- The INPEX Ichthys Project EIS (GHD 2009)
- The centre of the Middle Arm Peninsula (EcOz 2018a, 2018b)
- The TNG environmental approvals process (TNG 2019)
- The MASDP development over the whole Middle Arm Peninsula (DENR 2020).

Four threatened flora species and nine threatened terrestrial fauna species have been recorded in the MASDP and adjacent Weddell. This includes an unreported record from early 2021 of a Mitchell's Water Monitor (*Varanus mitchelli*). With the exception of threatened Typhonium species, recent survey effort is considered adequate for determining presence/absence within the MASDP footprint of threatened terrestrial species known to occur in the broader region. Table 5-2 provides a summary of the records.

Table 5-2. Summary of terrestrial threatened species from Middle Arm Peninsula

Species	Common name	Conservation status <sup>4</sup>		Status on Middle Arm
		EPBC Act	TWPC Act	
<b>Fauna</b>				
<i>Antechinus bellus</i>	Fawn Antechinus	VU	VU	Not recorded – Low likelihood given the lengthy deployment of the traps and the deployment design used being known to detect other threatened species
<i>Dasyurus hallucatus</i>	Northern Quoll	EN	CR	
<i>Geophaps smithii</i>	Partridge Pigeon	VU	VU	
<i>Mesembriomys gouldii gouldii</i>	Black-footed Tree-rat	EN	VU	Known
<i>Rattus tunneyi</i>	Pale Field Rat	-	VU	Recorded 2019 only (APM 2019) Not recorded since, despite significant survey effort (DEPWS 2020)
<i>Saccolaimus saccolaimus</i>	Bare-rumped Sheathtail Bat	VU	DD	Known
<i>Trichosurus vulpecula arnhemensis</i>	Northern Brushtail Possum	VU	-	Known
<i>Tyto ovaehollandiae kimberli</i>	Masked Owl	VU	VU	Not recorded – Low likelihood given the lengthy deployment of the traps and the deployment design used being known to detect other threatened species
<i>Uperoleia daviesae</i>	Howard Springs Toadlet	VU	VU	Not recorded (TNG 2019, DEPWS 2020) and no suitable habitat
<i>Varanus mertensi</i>	Mertens’ Water Monitor	-	VU	Not recorded and no suitable habitat
<i>Varanus mitchelli</i>	Mitchell’s Water Monitor	-	VU	Incidental record mangrove habitat only in Middle Arm Peninsula (DEPWS 2020) Recorded (pers. Comm. Tony Orr 2021)
<i>Varanus panoptes</i>	Yellow Spotted Monitor	-	VU	Not recorded
<i>Xeromys myoides</i>	Water Mouse	VU	VU	Not recorded
<b>Flora</b>				
<i>Atalaya brevialata</i>	-	CR	-	Not recorded – Low likelihood based on previous survey efforts
<i>Cleome insolata</i>	-	-	VU	Not recorded – Low likelihood all suitable habitat surveyed
<i>Cycas armstrongii</i>	Darwin Cycad	-	VU	Known
<i>Typhonium taylori</i>	-	EN	EN	Not recorded – Low likelihood with low uncertainty based on survey effort
<i>Typhonium sp. (Cox Peninsula)</i>	-	-	VU/-	Known Very small area modelled as containing high likelihood habitat have not been surveyed.
<i>Utricularia dunstaniae</i>	-	-	VU	Not recorded – Low likelihood based on survey effort of sandsheet heath
<i>Utricularia singeriana</i>	-	-	VU	Not recorded

<sup>4</sup> CR: Critically Endangered, DD: Data Deficient, EN: Endangered, NT: Near Threatened, LC: Least Concern, VU: Vulnerable,

### 5.3.3 Migratory shorebird species

Surveys of migratory shorebirds have been conducted by Charles Darwin University (CDU) on behalf of the Flora and Fauna Division of DEPWS annually since 2019, for the purpose of compiling a database of all bird species in Darwin Harbour. A total of seven *EPBC Act* listed species are known to occur in the Darwin Harbour region, and two have been recorded within the SAA; the Bar-tailed Godwit (*Limosa lapponica*) and Far Eastern Curlew, (*Numenius madagascariensis*) (Lilleyman and Garnett 2021).

### 5.3.4 Additional studies

To help understand the potential impact to terrestrial ecosystems within the SAA the following studies will be undertaken for the SEA:

- Further survey where required to assess ecological values
- Significant Impact Assessment of all threatened species within the SAA
- Developing an offset to mitigate any residual impacts to threatened species of the SAA.

## 5.4 Hydrological processes

The NT EPA's objective for Hydrological processes is to:

*Protect the hydrological regimes of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.*

The sections below document current knowledge of the hydrological processes in the SAA. The values discussed are surface water, underlying groundwater and the beneficial uses of the water sources.

### 5.4.1 Surface water

No permanent surface waterbodies are present in the SAA. Overland surface drainage becomes concentrated in lower topographic areas that eventually transition into low lying mangrove fringes and salt pans, generally associated with marine creeks and tributaries that further drain into Darwin harbour (Douglas Partners 2021a). These low-lying areas typically become waterlogged and inaccessible during the wet season. In addition, some of the lower slope drainage areas nearer Channel Island Road can become wet and poorly drained (Douglas Partners 2021a). These areas are associated with duplex soils and land units 4c, 4d, 9a and 9b as described in section 5.2.1.

### 5.4.2 Groundwater

The underlying groundwater of the SAA is the Burrell Creek Formation (BCF) in the Elizabeth River sub catchment. The BCF is a large aquifer and a poor groundwater resource, with bore yields typically less than 0.5 L/s, and groundwater generally intercepted between 2.0m and 12m. The quality of the groundwater is discussed in section 5.5.1 below. The majority of the bores drilled in the area are for investigation and monitoring purposes, and no groundwater extraction licences have been issued on the Middle Arm Peninsula. During the geotechnical intrusive investigation, no free groundwater was observed in the test pits or bores while augering to a maximum depth of 8.45m below ground level, further details of groundwater bores are provided in section 5.2.2.

The SAA is part of the Darwin Rural Water Control District and based on the availability of groundwater the estimated use of the aquifer is considered low and not utilised as a groundwater source (DEPWS 2021). A portion of the groundwater is likely connected to the Darwin Harbour (DIPE 2004).

Perched groundwater aquifers are expected across the Middle Arm Peninsula and would be associated with saturation of surface soils during the wet season from direct infiltration and the accumulation of surface runoff, with groundwater perching common over the weathered rock profile (Douglas Partners 2021a). Groundwater levels are known to vary significantly with wet season rainfall patterns and are also a function of soil and rock permeability.

### 5.4.3 Additional studies

To assist in understanding the potential impact to hydrological processes within the SAA the following studies will be undertaken for the SEA:

- Pre-development baseline hydrologic and hydrological modelling across the MASDP disturbance footprint
- Post development hydrologic and hydrological assessment
- Groundwater baseline assessment including recharge and discharge areas, connectivity to Darwin Harbour and flow directions.

## 5.5 Inland water environmental quality

The NT EPA's objective for Inland water environmental quality is to:

*Protect the quality of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.*

The sections below document the current knowledge of the inland water environmental quality and the values associated with freshwater in the SAA.

### 5.5.1 Groundwater

The underlying groundwater aquifer of the SAA is the BCF in the Elizabeth River sub catchment. The BCF underlies the entire Middle Arm Peninsula and is the largest aquifer in the Darwin Region. The aquifer is typically a poor groundwater resource, with bore yields typically less than 0.5 L/s and poor water quality with some areas with high arsenic levels at depths (NTG 2008).

### 5.5.2 Additional studies

To assist in understanding the potential impact to inland water quality within the SAA the following studies will be undertaken for the SEA:

- Baseline groundwater quality assessment
- Reclamation management plan.

## 5.6 Aquatic ecosystems

The NT EPA's objective for Aquatic ecosystems is to:

*Protect aquatic habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.*

This environmental factor focuses on freshwater ecosystems associated with permanent waterbodies, including groundwater dependent ecosystems (GDE). DEPWS (2020) comprehensive assessment of the biophysical values of Middle Arm concluded there are no significant aquatic ecosystems present in the SAA. Furthermore, the Bureau of Meteorology (BOM) (2021) GDE atlas indicates that the potential for GDE is low to moderate.

The mangrove communities and riparian habitats that are within the land disturbance footprint are influenced by the tidal regime of Darwin Harbour, surface water flows and potentially groundwater, hydrological processes and inland environmental water quality as discussed in Section 5.4 and Section 5.5).

## 5.7 Coastal processes

The NT EPA's objective for Coastal processes is to:

*Protect the geophysical and hydrological processes that shape coastal morphology so that the environmental values of the coast are maintained.*

Coastal processes directly support a range of marine ecosystem values (i.e. habitat for marine flora/fauna and the species they support) and indirectly marine environmental quality values (i.e. sediment dispersion and water mixing). Key marine ecosystem habitat values influenced by coastal processes in the SAA are mangrove communities, benthic communities (including seagrass, filter feeds, macro-algae feeder and mixed hard coral communities, intertidal mudflats and seasonal wetlands), The key values of coastal processes of the Darwin Harbour system that support marine ecosystem values are:

- Large tidal range – the currents caused by tides are complex and strong, enabling a highly flushed system
- The coastal hydrodynamic characteristics of a tropical macro-tidal estuary, with drowned river valley, consisting of physical characteristics of ria shorelines and extensive headlands (sediment transport and water filtration).

### 5.7.1 Additional studies

To assist in understanding the SAA's values and assessing impacts to these values the following studies will be undertaken for the MASDP project:

- Coastal hydrodynamic and sediment transport impact modelling (local and regional scales)
- Dredge plume modelling.

## 5.8 Marine environmental quality

The NT EPA's objective for Marine environmental quality is to:

*Protect the quality and productivity of water, sediment and biota so that environmental values are maintained.*

Elizabeth River and Darwin Harbour (including the East Arm, Middle Arm and Outer Harbour zones) are two key marine systems present in the SAA. Preliminary assessment of the systems identified values of oligotrophic status and large tidal movements that create flushing of the systems. These values are to be investigated further. The Middle Arm precinct marine enabling infrastructure requires a dredging program to occur in the Darwin Harbour to allow transportation of material and product to and from the MASDP.

The subsequent sections summarise the current knowledge of water and sediment quality in the Elizabeth River and Darwin Harbour. The information has been summarised from Appendix 9 of NTG Middle Arm Regional Environmental Assessment (DENR 2020), Darwin Harbour report cards (DEPWS 2020), preliminary environmental risk assessment for dredging and disposal options (Royal HaskoningDHV 2021) and preliminary assessments conducted by technical specialists Royal HaskoningDHV.

### 5.8.1 Water quality

The NTG has been monitoring water quality of the Darwin Harbour since 1987. A long-term water quality report card has been developed into the Darwin Harbour Integrated Monitoring and Research Program, and 2021 is the first year that the report card has been published under this integrated program. The 2021 Darwin Harbour integrated report card identifies that the water quality in the zones to be influenced by the MASDP is 'good to very good' quality, with the exception of a creek that receives wastewater from the Palmerston Waste Stabilisation Ponds via Myrmidon Creek, which is classified as 'moderate' quality (DHAC 2021).

### 5.8.2 Sediment quality

The Darwin Harbour report card indicates in 2021 that sediment quality was good in the Middle Arm region and above average in comparison to all the regions assessed (DHAC 2021).

There is limited historical baseline data available from sediment quality surveys in the Darwin Harbour, with baseline surveys conducted by environmental consultants on behalf of NTG only in 1993 and 2012 over the whole of Darwin Harbour. More recently surveys were conducted in 2019, and limited to the East and West Arms only (DENR 2020). The surveys have shown that most measured potential contaminants in sediment have concentrations below sediment quality guideline values relevant at the time of the study (ranges from ANZECC & ARMCANZ 2000 and Australian and New Zealand *Guidelines for Fresh and Marine Water Quality 2018*). Exceedance of guideline values and baseline data for arsenic, nickel and copper, were identified and all (apart from copper) were suspected to be natural occurrences due to the underlying geology (DENR 2020). Copper exceedances were thought to be related to point source pollution (DENR 2020). All other measured potential contaminants were below the guideline values, however elevated concentrations of contaminants were aligned to urban and industrial development areas (DENR 2020).

### 5.8.3 Additional studies

To assist in understanding the SAA's values and assessing impacts to these values the following studies will be undertaken for the MASDP project:

- Conceptual performance estimate of MASDP proposed surface runoff quality treatment (for TSS, TP, TN) performance
- Water and sediment quality sampling
- Water quality modelling (near-field and far-field)
- Dredge plume modelling.

## 5.9 Marine ecosystems

The NT EPA's objective for Marine ecosystems is to:

*Protect marine habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.*

The overarching marine ecosystem values are the listed NT and Commonwealth marine species, including migratory marine species, and benthic communities and habitats (seagrass, coral, macro algae and filter feeder habitats). The current knowledge is based on an analysis of information by the DEPWS (DENR 2020) and marine technical consultants, Royal HaskoningDHV.

### 5.9.1 Marine species

The current knowledge of marine species is sourced from a review of information by the DEPWS (DENR 2020) and marine technical consultants, Royal HaskoningDHV.

#### 5.9.1.1 Listed species

Current knowledge of marine species across the Harbour has been collected over many years through various long-term monitoring surveys. Based on an analysis of EPBC Protected Matters Search Tool (PMST) and existing knowledge, a total of 19 NT and/or Commonwealth listed species are known to occur in the Darwin Harbour region. A summary of the listed marine species known to occur is provided in Table 5-3 and species with the potential to occur in NT waters, though not specifically to Darwin Harbour have not been included in the table (i.e., Killer whales [*Orcinus orca*]). A high-level summary of information about fish species is provided as collectively, fish are an important component of tropical inshore marine ecosystems.

Table 5-3. Summary of listed marine species known to occur in Darwin Harbour

Species	Common name	Conservation status <sup>5</sup>	
		EPBC Act	TWPC Act
<i>Sousa sahalensis</i>	Australian humpback dolphin	Migratory	DD
<i>Orcaella heinsohni</i>	Australian snubfin dolphin	Migratory	DD
<i>Tursiops aduncus</i>	Indo-pacific bottlenose dolphin	Migratory	LC <sup>6</sup>
<i>Dugon dugon</i>	Dugong	Migratory	NT
<i>Pristis clavate</i>	Dwarf sawfish	VU	VU
<i>Pristis microdon</i>	Freshwater sawfish	VU	VU
<i>Pristis zijsrom</i>	Greenwater sawfish	VU	VU
<i>Eretmochelys imbricata</i>	Hawksbill turtle	VU, migratory	VU
<i>Chelonia mydas</i>	Green turtle	VU, migratory	NT
<i>Natator depressus</i>	Flatback turtle	VU, migratory	DD
<i>Lepidochelys olivacea</i>	Olive Ridley turtle	EN, migratory	VU
<i>Caretta caretta</i>	Logger head turtle	EN, migratory	VU
<i>Crocodylus porosus</i>	Estuarine/Saltwater crocodile	Marine, migratory	-
<i>Hydrophis elegans</i>	Bar-Bellied Sea snake	Marine	LC
<i>Hydrelops darwiniensis</i>	Black-Ringed Mud snake	Marine	LC
<i>Pseudoferania polylepis</i>	Macleay's Water snake	Not listed	DD
<i>Parahydrophis mertoni</i>	Northern Mangrove Sea snake	Marine	LC
<i>Hydrophis curtus</i>	Short Sea snake	Not listed	LC
<i>Hydrophis macdowellii</i>	Small-Headed Sea snake	Marine	LC

### 5.9.1.2 Non-listed fish

Darwin Harbour is home to a diverse and abundant fish community, some 415 species have been recorded (Gomelyuk 2012). The abundance and composition of fish species assemblages is dynamic and highly dependent on the type of benthic habitat and community that is available. The diversity of fish within the marine components of the SAA and microhabitats therein contributes to the values of biodiversity and ecological integrity and function. Some species of fish are targeted by recreational fishers, and therefore also have significant social value.

## 5.9.2 Mangrove communities

Mangrove communities surround the Middle Arm Peninsula as part of the extensive mangrove community of Darwin Harbour. They have an important role to marine environmental quality and marine ecosystem values by filtering surface water runoff into the harbour and providing coastline stability from storm surge associated erosion, carbon storage and sequestration and habitat resource for marine fauna (Lee et al. 2014). Their functional role is an important factor when considering the conservation value of mangrove communities. Over 98% of the Darwin Harbour's mangrove communities are intact and under two percent of the vegetation has been lost by clearing activities associated with coastal development (DENR 2020).

<sup>5</sup> CR: Critically Endangered, DD: data deficient, EN: Endangered, NT: Near Threatened, LC: Least Concern, VU: Vulnerable,

<sup>6</sup> The Arafura and Timor Sea populations of spotted bottlenose is listed a migratory under Appendix 11 of CMS Bonn.

DEPWS conducted an analysis of all the mangrove communities of Middle Arm Peninsula, the Darwin Harbour and the broader Darwin region and recommended three key conservation management strategies (DENR 2020). These management strategies are based on the rarity and representation of mangrove communities relative to Darwin Harbour and the broader Darwin region. A summary of the DEPWS recommendations is provided in Table 5-4.

A prioritisation framework as part of the mangrove retention framework for Darwin Harbour is being developed by DEPWS to allow for the consideration of diversity and functional values of mangrove communities that are not considered in the above significance assessment (DENR 2020). Any potential impacts to mangrove communities along the Middle Arm Peninsula will be considered in the context of the broader strategy as it is developed.

Table 5-4. Recommendations for conservation of Middle Arm Peninsula mangrove communities, based on rarity and representation relative to Darwin Harbour and broader Darwin region (Source: DENR 2020).

Regional Significance Value	Classification	Comment	Recommendation
<b>High</b>	<p><b>Rarity:</b> Restricted distribution at two or more scales (never common)</p> <p><b>Representation:</b> Over-represented on Middle Arm</p>	<p>The most restricted of all mangrove communities; regionally significant. Middle Arm supports disproportionately large populations of these communities, in some cases representing the entire Darwin Harbour distribution. Amongst the most restricted of all mangrove communities. Distribution highly limited; regionally significant on Middle Arm.</p>	<p><u>Avoid all disturbance and apply appropriate buffers and mitigation measures if disturbance occurring in nearby area.</u></p>
<b>Moderate</b>	<p><b>Rarity:</b> Less-common at two or more scales and /or restricted in the Darwin region</p> <p><b>Representation:</b> Under-represented at one or both scales and never over-represented in Darwin Harbour.</p>	<p>Less-common communities disproportionately occurring outside of Darwin Harbour, or small populations of regionally restricted communities occurring on Middle Arm. Larger, important populations may be located elsewhere in the Darwin region; Middle Arm populations locally significant and important for Darwin Harbour.</p>	<p><u>Avoid clearing and disturbance if possible and seek alternative solutions locations.</u></p> <p><u>If unavoidable, retain a minimum of 90% of historical local extent of mapped mangrove community, with appropriate mitigation measures put in place.</u></p>
<b>Low</b>	<p><b>Rarity:</b> Common at two or both scales and never restricted</p> <p><b>Representation:</b> Over-represented in Darwin Harbour and never overrepresented on Middle Arm Peninsula, or expected distribution at two scales.</p>	<p>Populations of common communities, or regionally restricted communities with core populations elsewhere to Middle Arm. Important in Northern Territory context, but regional populations are of equal or greater significance to those on Middle Arm.</p>	<p>Minimise clearing and disturbance. <u>Retain a minimum of 90% of baseline Darwin Harbour extent of mapped mangrove community, with appropriate mitigation measures put in place.</u></p>

### 5.9.3 Benthic communities and habitats

Seagrass, algae, hard coral and filter feeder communities are types of benthic communities known to occur in Darwin Harbour.

Benthic communities and habitats (BCH) play important roles in maintaining the integrity of marine ecosystems and the supply of ecological services. There is strong evidence that benthic communities are important for the maintenance of biological diversity by providing structurally complex and diverse habitat, refuge for vulnerable life stages and a varied and increased food supply. The direct and indirect services BCH provide to humans are also significant.

A literature review and gap analysis focusing on BCH has been undertaken by SLR Consulting Australia (SLR) within the SAA for impacts from potential dredging activities within the Elizabeth River and East Arm (SLR 2021). The results of this review indicated:

- There is a diversity of BCH within the SAA
- There are gaps in the existing knowledge and understanding of the extent, composition and condition of BCH within the SAA and areas that may be impacted by the construction of marine enabling infrastructure.

### 5.9.4 Additional studies

In order to understand the significant value of marine ecosystems in the SAA, there are three key values that need further investigation:

- Food resources
- Breeding and refuge habitats
- Migratory pathways
- Map and describe BCH (including current condition) within the SAA that will be directly impacted by the construction of marine enabling infrastructure. Two zones of impact within the SAA will be assessed – Zone of High Impact (ZoHI) – where the impacts are predicted to be irreversible, and within the Zone of Moderate Impact (ZoMI). The zones will focus on which predicted impacts are recoverable within a period of five years following completion of the impacting activities.

The outcome of technical studies will be provided as part of the SEA.

To assist in the assessment of potential impacts to marine ecosystem values, the following studies will be undertaken for the MASDP project:

- Derive and establish thresholds for BCH from potential impacts (including development of hazard profile for the harbour based on water quality pressures)
- Develop a range of site-specific water quality triggers and management responses as part of the Dredge Management Plan and Marine Construction Environmental Management Plan (CEMP)
- Develop and implement a benthic community and fish investigation plan <sup>7</sup>
- Modelling of all potential impacts (i.e., underwater shockwaves, noise and vibration, turbid plumes dispersion, wastewater discharge).

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<sup>7</sup> Able to detect changes to defined aspects of BHC and fish within the Zone of Influence (Zoi) - In accordance with NTG 2016, the Zoi is the area within which changes in environmental quality associated with dredge plumes are anticipated during the dredging operations, but where these changes would not result in a detectable impact on BCH.

## 5.10 Air quality

The NT EPA's objective for Air quality is to:

*Protect air quality and minimise emissions and their impact so that environmental values are maintained.*

Air pollution is caused by pollutants from a wide variety of anthropogenic (human made) and natural sources including industrial and commercial activity, and events such as bushfires and dust storms. All of these pollutants are transported and dispersed through the air via atmospheric dispersion. This is often exacerbated by topographical and meteorological conditions. The primary air pollutants in the Darwin region are particulates from smoke from vegetation burn offs during the dry season, with Carbon Monoxide (CO), Nitrogen Oxides (NO<sub>x</sub>, NO and NO<sub>2</sub>) and Sulfur Dioxide (SO<sub>2</sub>) at very low levels compared to other cities in Australia. Ozone (O<sub>3</sub>) occurs in moderate levels in the Top End, mainly due to natural processes (NT EPA 2020). There are four monitoring stations in the Darwin region.

There is a significant difference in air quality between the wet and dry season in the Darwin region, with the National Environment Protection Measure (NEPM) particulate matter criteria being exceeded on a number of days each dry season. This is associated with bushfire smoke from dry season burn offs. However regional air quality does meet NEMP standard for 98.9% of the year (DHAC 2021).

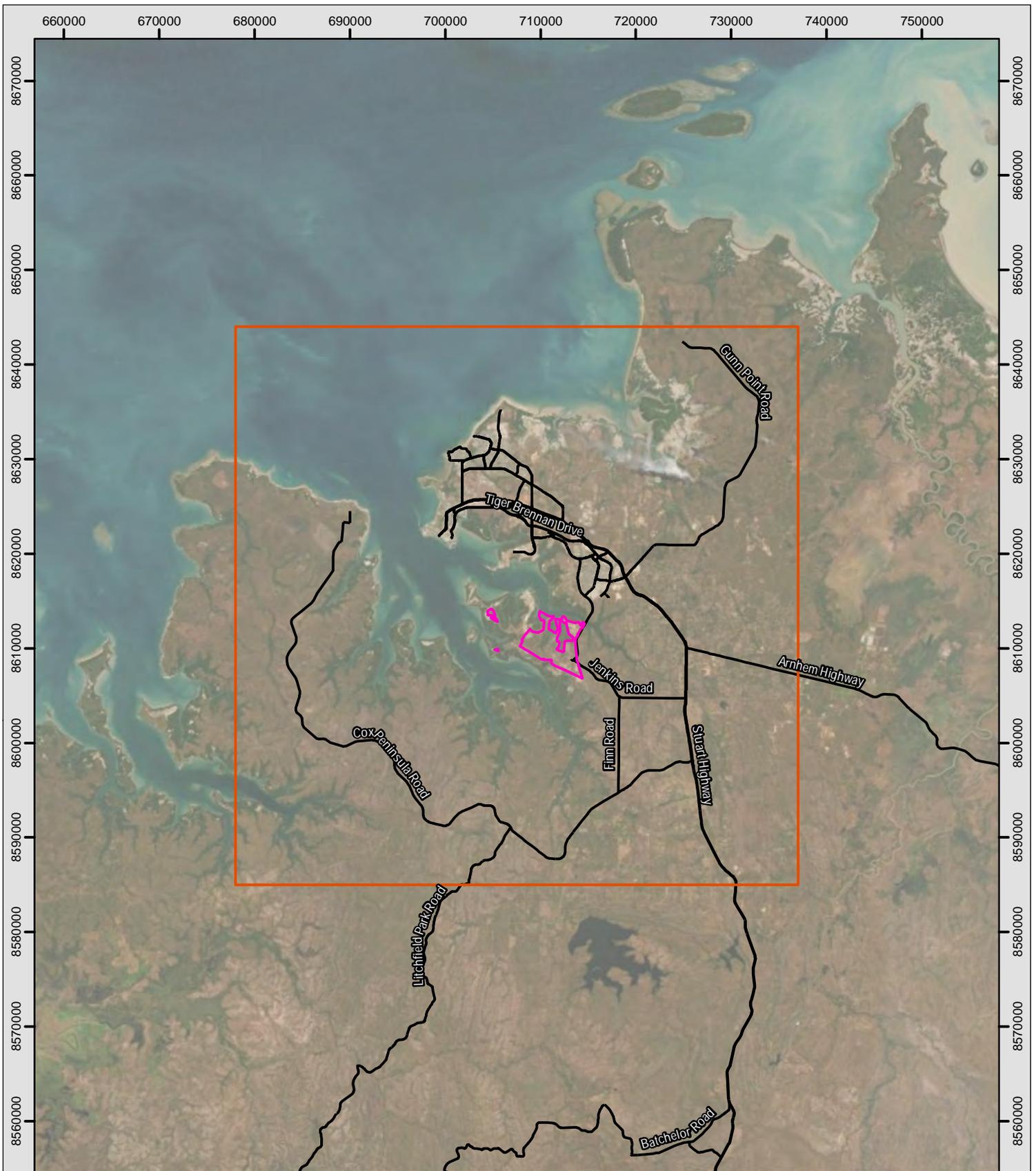
Middle Arm Peninsula is home to existing gas industries, INPEX LNG and Santos Darwin LNG, as well as the Weddell and Channel Island power stations. DIPL has engaged a consultant to develop an airshed model for the Greater Darwin region, including the Middle Arm Peninsula. A regional airshed model compiles all the anthropogenic air pollution sources into an air emissions inventory. This data is then combined with regional meteorology into a model that predicts the spatial and temporal variations in air pollution. An airshed model will provide a basis for assessing the cumulative impact of a multitude of activities and emission sources (regulated and unregulated), as well as the impact of proposals such as the MASDP, that would contribute new emissions to the airshed.

The outputs or effects of the additional planned industries will be modelled against Human Health criteria under the National Environment Protection (Ambient Air Quality) Measure 1998 (AAQ NEPM). The results will be presented in the SEA.

### 5.10.1 Additional studies

To assist in understanding the air quality values in the SAA and assessing impacts to these values the following studies will be undertaken for the MASDP:

- Develop an airshed model incorporating an emissions inventory for the Darwin air shed, to be used for construction and operation of the MASDP. The airshed model assessment area is provided in Figure 5-1.



- Legend**
- Airshed model extent
  - Indicative disturbance area
- Roads**
- Principal road
  - Secondary road

0 3.75 7.5 15

Kilometres

**MAP INFORMATION**  
 Scale: 1:550,000 @ A4  
 Projection: GDA 1994 MGA Zone 52  
 Date Saved: 15/12/2021  
 Client: RH  
 Mapper: DC

**DATA SOURCE**  
 Topographic data: OSM  
 Project data: Air Environmental  
 Imagery: ESRI

Figure 5-1. Map of airshed model assessment area

## 5.11 Atmospheric processes

The NT EPA's objective for Atmospheric processes is to:

*Minimise greenhouse gas emissions so as to contribute to the NTG's goal of achieving net zero greenhouse gas (GHG) emissions by 2050.*

The NT GHG emissions are comparatively low compared to other Australian jurisdictions due to sparse population and low level of industrial development. To assess this factor a dedicated Greenhouse Gas Emissions Study will be undertaken to develop a baseline estimate of the CO<sub>2</sub><sup>e</sup> for the construction and operational life of the MASDP infrastructure. The baseline will support the roadmap required for the optimisation of CO<sub>2</sub><sup>e</sup> emissions during both the construction and operational phases in the development of the infrastructure. This study will include an assessment of direct Scope 1 and indirect Scope 2 and 3 carbon emissions.

The industry building blocks scenarios study will provide an understanding of all other GHG and cumulative emissions based on industry types to be assessed.

If required a greenhouse gas abatement plan framework will be developed for MASDP.

## 5.12 Community and economy

The NT EPA's objective for Community and economy is to:

*Enhance communities and the economy for the welfare, amenity and benefit of current and future generations of Territorians.*

DIPL understands the importance of stakeholder engagement and SIA. DIPL has started stakeholder consultation (section 3) and have engaged a specialist SIA consultant, to complete the SIA. Collectively these will deliver a thorough understanding of the cultural, social and economic context for MASDP, for inclusion into the proposal planning, feasibility studies, design and management. An initial scoping study has informed a suggested approach and social area of influence for the SIA. An outline of the outcomes of the scoping study are provided below.

### 5.12.1 Scoping study

A specialist SIA and engagement and communication consultant has prepared a scoping study. The scoping study covers the communities and people most likely to experience change and positive and negative social impacts from the MASDP and a sensitivity analysis of likely impacts. The impacts will be experienced in different ways, depending on context such as where people live, how they experience impacts, their resilience to change, the stage of the project and situational factors such as cumulative impacts from other projects. The spatial and temporal scope includes:

- People and communities:
  - within the MASDP disturbance footprint
  - in and around Darwin Harbour, other harbour users, and cumulative impacts
  - on the Greater Darwin area, particularly Darwin, Palmerston and Litchfield as areas with social, cultural and economic links to Middle Arm Peninsula.
- All stages of planning, incremental construction, and operation of the MASDP
- Peoples and communities with social and spiritual connections to the region:
  - Larrakia people with cultural links to Middle Arm and Darwin Harbour, who are likely to be dispersed across broad areas
  - people living in areas where workforces are accommodated, or where new subdivisions and social infrastructure is developed to accommodate a growing population
  - the Greater Darwin Area, which is likely to be the key catchment for procurement and workers.

#### 5.12.1.1 Issues analysis and outcome

An issues analysis drew on:

- desktop research, including reports, impact assessment studies for other projects and media coverage, including reports from the Darwin Harbour Advisory Committee and land use planning documents
- expert judgement: local knowledge and experience from working on previous similar projects
- a literature review of best practice strategic and cumulative SIAs, best practice guidance documents, the legislative framework for strategic assessments and international and national case studies
- policy documents: a review of relevant government policy documents and frameworks
- consultation: preliminary consultation with key stakeholder groups to glean insights into key issues and preferred approaches to the research by DIPL communication and engagement staff.

The key issues of significance that emerged as an outcome of the issues analysis were:

- concerns about industrialisation of Darwin Harbour and disturbance to environmental, social, cultural and local economic values
- key indirect impacts likely to be invoked by Program activities, including the need to find major sources of water and energy to enable development
- impacts from an influx of workers, for example pressures on social infrastructure, accommodation and change to sense of place
- pressures for land release to support industrial and residential growth invoked by the construction and operation of MASDP
- potential collective benefits, including economic diversification, employment, contracting, long term opportunities to develop skills and capacity
- changes to recreational and residential amenity for people living, working and visiting the harbour
- reduced community cohesion as a result of polarised views about the MASDP.

Additional impacts may be added in the SIA, as it develops if:

- they are raised during consultation
- there are changes to the assumptions we are working to
- situational factors (such as debate about the future of the harbour) make certain issues topical during our research period.

### 5.12.2 Surrounding communities

The nearest residential area to the land component of the SAA, City of Palmerston, is approximately 3km from the MASDP across the Elizabeth River. The population of the city is approximately 33,786 people (ABS 2017a). Other sensitive receptors are the users of the Elizabeth River and Darwin Harbour waterways, this includes but is not limited to recreational and commercial fisherman and divers, tourism cruise operators and patrons and product shipping operators.

Any infrastructure for construction of the marine enabling infrastructure or exports for future industries to be transported through Darwin Harbour (via shipping vessels) will transverse past the East Arm Industrial Precinct and City of Darwin. East Arm Industrial Precinct is approximately 8km downstream and the City of Darwin is approximately 13 km downstream from the MASDP. The population of Greater Darwin is about 136,828 people (ABS 2017b).

### 5.12.3 Additional studies

An SIA will be undertaken for the MASDP, based on the findings of the scoping study. The SIA for the MASDP will consider social, cultural and economic impacts that could arise as a result of planning, construction and operation of the MASDP. The SIA will identify opportunities to enhance benefits for local communities and broader society. A highly participative approach is recommended so the public:

- is well-informed about proposed development and implications
- has a chance to influence the future scale and pace of development planning on Middle Arm Peninsula
- understands the benefits of development
- has a chance to influence the studies done as part of the strategic assessment.

The SIA will include a values mapping exercise to determine sensitivity to disturbance of values and what trade-offs people are prepared to make when considering social, cultural and economic impacts.

#### 5.12.3.1 Future opportunities for engagement

An ongoing stakeholder engagement plan will be prepared based on the outcomes of the SIA for DIPL to implement. Key stakeholders will be engaged throughout the life of the MASDP using communication tools informed by the SIA as the most appropriate for diverse target audiences. The stakeholder engagement plan will be developed in accordance with the NT EPA Guidelines for Proponents – Stakeholder engagement (2021), the *EP Act's* general duty of the proponent to engage broadly (Section 43 of the *EP Act*) and IAP2 *Core Values, Quality Assurance* Guideline and *Spectrum of Participation Framework*.

## 5.13 Culture and heritage

The NT EPA's objective for Culture and heritage is to:

*Protect sacred sites, culture and heritage.*

A preliminary desktop assessment of current knowledge has been undertaken in the SAA. The assessment identifies the presence of terrestrial and maritime cultural and heritage values protected under the *Heritage Act 2011* and the *Aboriginal Sacred Sites Act 1989*. These values include WWII wrecks, Aboriginal heritage sites such as shell middens and sacred sites. The heritage values of some areas within the SAA have not been assessed and will be under this strategic proposal.

Aboriginal Areas Protection Authority (AAPA) have been engaged to provide an AAPA certificate over the SAA. A now lapsed certificate was issued to Land Development Corporation on 18 April 2019 for the purpose of all works associated with commercial and industrial development. Three restricted work areas (RWAs) were identified to the south of Channel Island Road outside of the land disturbance area and one in Darwin Harbour.

### 5.13.1 Additional studies

To assist in understanding the SAA's values and assessing impacts to these values the following studies will be undertaken for the MASDP project:

- Heritage survey and impact assessment across the MASDP SAA footprint including marine heritage.

## 5.14 Human health

The NT EPA's objective for Human health is to:

*Protect the health of the Northern Territory population.*

The human health values are based on the sensitive receptors identified in Section 5.12.2. A preliminary listing of the values that have the potential to indirectly impact human health values are provided below and form the basis of the impact to human health:

- Safety distance from a hazardous facility to sensitive receptors (i.e. spills, explosions)
- Toxicity levels in fish and crustaceans
- Biting insects to construction and operational personnel.

### 5.14.1 Additional studies

To assist in understanding the SAA's values and assessing impacts to these values the following studies will be undertaken for the MASDP project:

- A complete assessment of the hazards from the MASDP facility for each of the potential industries.

## 6 Preliminary assessment of potential impacts

A preliminary assessment of potential impacts to environmental values associated with implementation of the MASDP Development Plan has been undertaken by technical specialists. The assessment was informed by the results of desktop assessments and previous studies undertaken to define the environmental, social and cultural values of Middle Arm Peninsula and Darwin Harbour, and professional judgement as to the potential impacts to those values that could occur from the actions associated with construction and operation of the MASDP.

The findings of the preliminary impact assessment are summarised in Table 6-1 along with details of the relevant policy and guidelines that will need to be considered through the SEA process. The outcomes of the assessment were used to inform the development of the Draft EIS TOR provided with this document. The Draft EIS TOR have been developed in accordance with NT EPA's guidance *Terms of reference template for a proponent initiated EIS referral* (NT EPA 2021) and aligned to the endorsement criteria for the *EPBC Act*.

Table 6-1. Summary of preliminary assessment of potential impacts against the NT EPA’s environmental factors and objectives

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
<p><b>Terrestrial Environmental Quality</b> Protect the quality and integrity of <u>land and soils</u> so that environmental values are supported and maintained</p>	Intact soils with minimal erosion (gentle slopes <5% with low hills).	<ul style="list-style-type: none"> <li>• Direct disturbance of land and soils from land clearing and earthworks during construction of land enabling infrastructure.</li> <li>• Erosion and offsite movement of sediments.</li> </ul>	<p><i>NT Land Clearing Guidelines (DEPWS 2021)</i> <i>Best Practice Erosion and Sediment Control Guidelines (International Erosion Control Assoc.)</i></p>
	Soil quality	<ul style="list-style-type: none"> <li>• Leaks of hazardous materials from construction plant and equipment or other infrastructure from nominated industries.</li> <li>• Disturbance of PASS with construction of marine and land enabling infrastructure.</li> <li>• Disturbance of ASS with dredging activities.</li> <li>• Acidification of soils from disturbing PASS, reducing soil productivity.</li> </ul>	<p><i>Australian Dangerous Goods Code</i> <i>Work Health and Safety (National Uniform Legislation) Act 2011 and Regulations</i> <i>Australian Standard 1940 Storage and Handling of Flammable and Combustible Liquids</i> <i>National Assessment Guidelines for Dredging (Commonwealth of Australia 2009)</i> <i>National acid sulfate soils sampling and identification methods manual (Sullivan et al. 2018)</i> <i>National Strategy for the management of Coastal Acid Sulfate Soils (National Working Party on Acid Sulfate Soils 2000)</i> <i>Environmental Guidelines for Reclamation in Coastal Areas (NT EPA 2006)</i> <i>National Acid Sulfate Soils Guidance – Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management (Simpson et al. 2018)</i> <i>Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites (NT EPA 2013)</i> <i>Waste Management and Pollution Control Act</i></p>
<p><b>Terrestrial ecosystems</b> Protect <u>terrestrial habitats</u> to maintain environmental values including biodiversity, ecological integrity and ecological functioning.</p>	Threatened species	<ul style="list-style-type: none"> <li>• Loss of habitat - this is particularly true for the range limited Black footed tree rat – <i>Mesembriomys gouldii gouldii</i> and <i>Typhonomys sp. (Cox Peninsula)</i>.</li> <li>• Direct mortality of fauna as a result of collision with vehicles, equipment and land enabling infrastructure.</li> <li>• Habitat degradation by erosion, dust, weeds/pathogens, disturbance of ASS.</li> </ul>	<p><i>Northern Territory Offset Principles – Part of the Northern Territory Offset Framework (DENR 2020)</i> <i>NT Biodiversity Offsets Policy (under-development)</i> <i>EPBC Act Offsets Policy (DSEWPC 2012)</i></p>
	Endangered under <i>EPBC Act</i> - Black footed tree rat – <i>Mesembriomys gouldii</i>	<ul style="list-style-type: none"> <li>• Loss of important habitat.</li> <li>• Mortality of fauna as a result of collision with vehicles, equipment and land enabling infrastructure.</li> <li>• Habitat degradation surrounding SAA by erosion, dust, weeds/pathogens, disturbance of ASS.</li> </ul>	<p><i>Northern Territory Offset Principles – Part of the Northern Territory Offset Framework (DENR 2020)</i> <i>Draft NT Biodiversity Offsets Policy (DWPES in preparation)</i> <i>EPBC Act Offsets Policy (DSEWPC 2012)</i></p>

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
	<i>Typhonium sp. (Cox Peninsula)</i>	<ul style="list-style-type: none"> <li>• Significant loss of population from land clearing.</li> <li>• Habitat degradation from erosion, dust, weeds/pathogens, disturbance of ASS.</li> </ul>	<p><i>Northern Territory Offset Principles – Part of the Northern Territory Offset Framework (DENR 2020)</i>  <i>Draft NT Biodiversity Offsets Policy (DEPWS in preparation)</i>  <i>EPBC Act Offsets Policy (DSEWPC 2012)</i></p>
	Migratory shorebirds <ul style="list-style-type: none"> <li>• Bar-tailed Godwit - <i>Limosa lapponica</i></li> <li>• Far Eastern Curlew - <i>Numenius madagascariensis</i></li> </ul>	<ul style="list-style-type: none"> <li>• Loss of key high tide roosting habitats with land clearing and reclamation of salt pans and mangrove in SAA.</li> </ul>	<p><i>EPBC Act Policy Statement 3.21 – Industry guidelines for avoiding, assessing and mitigating impacts of EPBC Act listed migratory shorebird species (DoEE 2017)</i>  <i>Wildlife Conservation Plan for Migratory Shorebirds Commonwealth of Australia (DBCA 2018)</i></p>
	Sandsheet heath habitat and associated threatened species Monsoon rainforest habitat Riparian habitats	<ul style="list-style-type: none"> <li>• Loss from vegetation clearing.</li> <li>• Loss of flora habitats and ecological integrity.</li> <li>• Impacts from alteration of surface water and groundwater quality and quantity.</li> </ul>	<p><i>Land Clearing Guidelines (DEPWS 2021)</i></p>
	Regional priority weed species	<ul style="list-style-type: none"> <li>• Introduction or increase of weed species due to construction, operation or maintenance activities.</li> </ul>	<p><i>Darwin Regional Weed Strategy 2021-2026 (DEPWS 2021)</i>  <i>Weed Management Plan Gamba Grass 2020-2030 (DEPWS 2020)</i>  <i>Threat abatement plan to reduce the impact on northern Australia’s biodiversity by the fire listed grasses (DSEWPC 2012b)</i></p>
<p><b>Hydrological processes</b>                      Protect the <u>hydrological regimes of groundwater</u> and <u>surface water</u> so that environmental values including ecological health, land uses, and the welfare and amenity of people are maintained.</p>	No permanent surface waterbodies present, only minor ephemeral drainage lines that direct overland rainwater flow into Darwin Harbour.	<ul style="list-style-type: none"> <li>• Alteration of surface water flow characteristics into seasonal wetlands, intertidal areas and Darwin Harbour.</li> </ul>	<p><i>NT Land Clearing Guidelines (DEPWS 2021)</i>  <i>A Stormwater Strategy for the Darwin Harbour Region (NT EPA 2014)</i>  <i>Northern Territory Water Allocation Planning Framework (DENR 2020b)</i>  <i>Water Act (NT)</i></p>
	Groundwater	<ul style="list-style-type: none"> <li>• Alteration of groundwater levels from reduction in recharge potential from increased impermeable surfaces.</li> <li>• Changes to the groundwater/marine interface.</li> </ul>	<p><i>Water Act (NT)</i></p>

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
<p><b>Inland water environmental quality</b> Protect the <u>quality of groundwater</u> and <u>surface water</u> so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.</p>	<p>Groundwater quality and the biophysical values that they support.</p>	<ul style="list-style-type: none"> <li>• Alteration of groundwater quality from contamination from                             <ul style="list-style-type: none"> <li>○ seepage run-off from storage of untreated/unidentified ASS entering Darwin Harbour.</li> <li>○ Seepage run-off from dredge material ground (DMG) (disposal area).</li> <li>○ Leaks of hazardous materials from construction plant and equipment or other infrastructure from nominated industries.</li> </ul> </li> </ul>	<p><i>Australia and New Zealand Environment Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality (2018)</i> <i>Water Quality Objectives for the Darwin Harbour Region (DNREAS 2010)</i> <i>Darwin Harbour Strategy 2020 – 2025 (Darwin Harbour Advisory Committee 2020)</i> <i>Darwin Harbour Integrated Marine Monitoring and Research Program (DEPWS 2016)</i> <i>A Stormwater Strategy for the Darwin Harbour Region (NT EPA 2014)</i> <i>Mangrove retention framework (in development)</i> <i>National acid sulfate soils sampling and identification methods manual (Sullivan et al. 2018)</i> <i>National Strategy for the management of Coastal Acid Sulfate Soils (National Working Party on Acid Sulfate Soils 2000)</i> <i>Environmental Guidelines for Reclamation in Coastal Areas (NT EPA 200 6)</i> <i>National Acid Sulfate Soils Guidance – Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management (Simpson et al. 2018)</i></p>
<p><b>Coastal processes</b> Protect the <u>geophysical</u> and <u>hydrological processes</u> that shape coastal morphology so that the environmental values of the coast are maintained.</p>	<p>Coastal processes support a functioning harbour including ecological partitioning and flushing</p>	<ul style="list-style-type: none"> <li>• Changes to bathymetry (increased channel depth) caused by dredging altering local tidal flow patterns/ current speed/direction.</li> <li>• Alteration of the channel thalweg position.</li> <li>• Construction of jetties and berths alters currents and flows.</li> <li>• Reduction to tidal prism from reclamation of tidal inlet (infilling).</li> <li>• Indirect impacts to water quality from alteration of hydrodynamics from dredging (initial and maintenance) activities.</li> <li>• Indirect impacts to sediment deposition by changes to sediment transport and morphodynamics of estuary bed/sand shoals, ebb tide delta.</li> <li>• Indirect impact to water quality, sediment deposition and tidal flushing from alteration of tidal prism and asymmetry of tides from loss of mangroves and reclamation area.</li> </ul>	<p><i>Guidelines for the Environmental Assessment of Marine Dredging in the Northern Territory (NTG 2016).</i> <i>Technical Guidance – Environmental Impact Assessment of Marine Dredging Proposals (WA EPA 2016a)</i> <i>Water Quality Objectives for the Darwin Harbour Region (DNREAS 2010)</i> <i>Darwin Harbour Strategy 2020 – 2025 (Darwin Harbour Advisory Committee 2020)</i> <i>Environmental Guidelines for Reclamation in Coastal Areas (NT EPA 2006)</i> <i>IAN – Any other specific policies or guidance</i></p>

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
<p><b>Marine environmental quality</b>                      Maintain the <u>quality and productivity of water, sediment and biota</u> so that environmental values are protected.</p>	<p>Darwin Harbour Integrated Report Card 2021 'Very Good' water quality in proposed area of influence from dredging activities.</p>	<ul style="list-style-type: none"> <li>• Sediment plumes/ elevation in turbidity from mobilisation of sediment from capital and maintenance dredging activities.</li> <li>• Sedimentation in area of influence.</li> <li>• Decreased water quality from:                             <ul style="list-style-type: none"> <li>○ Runoff from soil storage areas (ASS and dredge spoil) and stormwater discharges.</li> <li>○ Wastewater discharge</li> </ul> </li> <li>• Contamination by petrochemical spills from machinery operating near/on water:                             <ul style="list-style-type: none"> <li>○ Hydraulic failure</li> <li>○ Fire or explosion</li> <li>○ Structural failure</li> <li>○ Spills and leaks from fuel containment areas</li> <li>○ Capsize of heavy machinery</li> </ul> </li> <li>• Acidic leachate can release aluminium, iron and other metals from soil and sediment, potentially impacting the beneficial uses of the environment.</li> </ul>	<p><i>Water Quality Objectives for the Darwin Harbour Region (DNREAS 2010)</i>  <i>Darwin Harbour Strategy 2020 – 2025 (Darwin Harbour Advisory Committee 2020)</i>  <i>A Stormwater Strategy for the Darwin Harbour Region (NT EPA 2014)</i>  <i>Australia and New Zealand Environment Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality (Sediment Quality Guidelines) (2018)</i>  <i>Waste Management and Pollution Control Act Guidelines for the Environmental Assessment of Marine Dredging in the Northern Territory (NTG 2016).</i>  <i>Technical Guidance – Environmental Impact Assessment of Marine Dredging Proposals (WA EPA 2016a)</i>  <i>National Assessment Guidelines for Dredging (Commonwealth of Australia 2009)</i></p>

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
	<p>Surface water quality and the biophysical values that they support.</p> <p>Water quality of surface water runoff is expected to be near natural (except for small pre-developed areas in the MASDP SAA) presently.</p>	<ul style="list-style-type: none"> <li>• Alteration of surface water quality from contamination from                             <ul style="list-style-type: none"> <li>○ Seepage run-off from storage of untreated/unidentified ASS entering Darwin Harbour.</li> <li>○ Seepage run-off from DMG (onshore disposal area).</li> <li>○ Leaks of hazardous materials from construction plant and equipment or other infrastructure from nominated industries.</li> <li>○ Stormwater run-off from industries.</li> </ul> </li> <li>• Alteration of surface water runoff quantity.</li> </ul>	<p><i>Australia and New Zealand Environment Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality (2018)</i></p> <p><i>Water Quality Objectives for the Darwin Harbour Region (DNREAS 2010)</i></p> <p><i>Darwin Harbour Strategy 2020 – 2025 (Darwin Harbour Advisory Committee 2020)</i></p> <p><i>Darwin Harbour Integrated Marine Monitoring and Research Program (DEPWS 2016)</i></p> <p><i>A Stormwater Strategy for the Darwin Harbour Region (NT EPA 2014)</i></p> <p><i>Mangrove retention framework (in development)</i></p> <p><i>National acid sulfate soils sampling and identification methods manual (Sullivan et al. 2018)</i></p> <p><i>National Strategy for the management of Coastal Acid Sulfate Soils (National Working Party on Acid Sulfate Soils 2000)</i></p> <p><i>Environmental Guidelines for Reclamation in Coastal Areas (NT EPA 200 6)</i></p> <p><i>National Acid Sulfate Soils Guidance – Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management (Simpson et al. 2018)</i></p>
	<p>Darwin Harbour Integrated Report Card (2021) sediment quality is good for metals in sediment.</p>	<ul style="list-style-type: none"> <li>• Release of metals from disturbed sediments (marine traffic and dredging activities).</li> </ul>	<p><i>Darwin Harbour Integrated Marine Monitoring and Research Program (DEPWS 2016)</i></p> <p><i>Wastewater management framework (in development)</i></p>

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
<p><b>Marine ecosystems</b> Protect <u>marine habitats</u> to maintain environmental values including biodiversity, ecological integrity and ecological functioning</p>	<p>Marine mammals :</p> <ul style="list-style-type: none"> <li>• Australian humpback dolphin - <i>Sousa sahalensis</i></li> <li>• Australian snubfin - <i>Orcaella heinsohni</i></li> <li>• Indo-Pacific bottlenose dolphin - <i>Tursiops aduncus</i></li> <li>• Dugong - <i>Dugon dugon</i></li> </ul> <p>Turtles:</p> <ul style="list-style-type: none"> <li>• Hawksbill turtle <i>Eretmochelys imbricata</i></li> <li>• Green turtle <i>Chelonia mydas</i></li> <li>• Flatback turtle <i>Natator depressus</i></li> <li>• Loggerhead turtle <i>Caretta caretta</i></li> <li>• Olive ridley <i>Lepidochelys olivacea</i></li> </ul>	<ul style="list-style-type: none"> <li>• Injury or mortality from vessel interactions or from blasting.</li> <li>• Decreased biodiversity, ecological integrity and ecological function due to disturbance from:               <ul style="list-style-type: none"> <li>○ Underwater noise/ vibration – Dredging (capital and maintenance), blasting, piling for construction of MOF/jetty facilities.</li> <li>○ Habitat loss or modification - Dredging and dredged material placement.</li> <li>○ Toxicant release from sediments – Dredging and dredged material placement.</li> <li>○ Toxicant release from vessels – Construction and operation.</li> <li>○ Light spill – Operation of MASDP.</li> </ul> </li> <li>• Wastewater discharge/toxicants release – Operation of MASDP.</li> </ul>	<p><i>Darwin Harbour Strategy 2020 – 2025 (Darwin Harbour Advisory Committee 2020)</i></p> <p><i>Guidelines for the Environmental Assessment of Marine Dredging in the Northern Territory (NTG 2016).</i></p> <p><i>Technical Guidance – Environmental Impact Assessment of Marine Dredging Proposals (WA EPA 2016a)</i></p> <p><i>National Assessment Guidelines for Dredging (Commonwealth of Australia 2009).</i></p> <p><i>Marine Bioregional Plans for the North Marine Area (DSEWPC 2012)</i></p> <p><i>Water Quality Objectives for the Darwin Harbour Region (DNREAS 2010)</i></p> <p><i>Underwater Piling Noise Guidelines (DPTI 2012)</i></p> <p><i>Recovery Plan for Marine Turtles in Australia 2017-2027 (Commonwealth of Australia 2017)</i></p> <p><i>Environmental Assessment Guidelines for Protecting Marine Turtles and Light Impacts (WA EPA 2010)</i></p>

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
	<p>Non-listed and listed fish species (important to overall marine ecosystem)</p> <ul style="list-style-type: none"> <li>• Dward sawfish - <i>Pristis clavate</i></li> <li>• Freshwater sawfish- <i>Pristis microdon</i></li> <li>• Greenwater sawfish - <i>Pristis zijsrom</i></li> </ul>	<ul style="list-style-type: none"> <li>• Decreased biodiversity, ecological integrity and ecological function due to disturbance from:                             <ul style="list-style-type: none"> <li>○ Disturbance from noise and vibrations from construction and dredging (capital and maintenance) activities.</li> <li>○ Fish eggs and larvae - entrainment into dredge equipment and at seawater intakes.</li> <li>○ Introduction of marine pest species.</li> <li>○ Light spill into the marine environment resulting in behavioural changes and vulnerability to predation.</li> <li>○ Exposure to ship derived spills and contamination.</li> </ul> </li> <li>• Removal/modification (including burial) of habitat (irreversible or recoverable depending on the proximity to the ZoHI or other habitats such as mangroves) resulting in changes to the diversity and abundance of fish species present.</li> <li>• Modification of habitats, by direct disturbance of benthic habitats or changes in habitats from dredging and infrastructure construction.</li> <li>• Suspension of sediments and release of toxicants in sediments.</li> </ul>	<p><i>Guidelines for the Environmental Assessment of Marine Dredging in the Northern Territory (NTG 2016).</i>  <i>Technical Guidance – Environmental Impact Assessment of Marine Dredging Proposals (WA EPA 2016a)</i>  <i>National Assessment Guidelines for Dredging (Commonwealth of Australia 2009).</i>  <i>Underwater Piling Noise Guidelines (DPTI 2012)</i></p>
	<p>Mangrove communities</p>	<ul style="list-style-type: none"> <li>• Loss from land clearing.</li> <li>• Change in mangrove community quality/extent from impacts to surface water or groundwater hydrological regimes from construction of MASDP.</li> <li>• Dredging related turbidity and associated sediment deposition in mangroves.</li> <li>• Hydrostatic head/seepage effects from the containment of water, dredge spoil or similar in ponds on tidal flats and in mangroves.</li> <li>• Dust effects during construction.</li> <li>• Potential sources of pollution and spills from construction and operations within the MASDP.</li> <li>• Impact from modification of tidal flows to /from mangrove areas from the marine enabling infrastructure placement from construction and operations.</li> <li>• Impact from modification of freshwater flows into hinterland margin mangroves from terrestrial sources from construction and operations.</li> <li>• Impacts from construction and operations of mudwaves from the containment of sediment (infill) within tidal flat and mangrove areas.</li> </ul>	<p><i>Environmental Guidelines for Reclamation in Coastal Areas (NT EPA 2006)</i>  <i>Water Quality Objectives for the Darwin Harbour Region (DNREAS 2010)</i></p>

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
	<p>Benthic communities (Seagrass, hard coral and filter feeder communities)</p>	<ul style="list-style-type: none"> <li>• Dredging of the berth pocket and entrance channel.</li> <li>• Placement of dredged material at the Dredge Material Ground (DMG).</li> <li>• Construction of the marine offloading facility, jetties and intakes/outfalls.</li> <li>• Operation of marine enabling infrastructure, including maintenance dredging.</li> <li>• Construction of land based enabling infrastructure.</li> <li>• Operation of land based enabling infrastructure.</li> </ul>	<p><i>Water Quality Objectives for the Darwin Harbour Region (DNREAS 2010)</i></p> <p><i>National system for the prevention and management of marine pest incursions (Commonwealth of Australia 2010)</i></p> <p><i>Anti-fouling and in-water cleaning guidelines (Commonwealth of Australia 2015)</i></p> <p><i>Environmental Factor Guideline – Benthic Communities and Habitat (WA EPA 2016)</i></p> <p><i>Guidelines for the Environmental Assessment of Marine Dredging in the Northern Territory (NTG 2016).</i></p> <p><i>Technical Guidance – Environmental Impact Assessment of Marine Dredging Proposals (WA EPA 2016a)</i></p> <p><i>National Assessment Guidelines for Dredging (Commonwealth of Australia 2009).</i></p> <p><i>WAMSI Dredging Science Node: Effects of dredging and dredging related activities on water quality: Impacts on coral mortality and threshold development (Fisher et al 2019).</i></p> <p><i>WAMSI Dredging Science Node: Defining thresholds and indicators of filter feeder responses to dredging-related pressures (Abdul et al 2018).</i></p> <p><i>WAMSI Dredging Science Node: Determining light stress bio-indicators and thresholds for a tropical multi-species seagrass assemblage (Statton et al 2017a).</i></p> <p><i>WAMSI Dredging Science Node: Sediment burial stress response, bio-indicators and thresholds for a tropical multi-species seagrass assemblage (Statton et al 2017b).</i></p>
<p><b>Air quality</b> Protect <u>air quality</u> and minimise emissions and their impact so that environmental values are maintained.</p>	<p>Darwin air quality is generally good quality, 98.9% of the year Darwin air quality meets NEPM standards (DHAC 2021)</p>	<ul style="list-style-type: none"> <li>• Decline of air quality at sensitive receptor locations from construction and operation of MASDP.</li> </ul>	<p><i>National Environment Protection Measure (NEPM) Ambient Air Quality 1997</i></p> <p><i>NEPM Air Toxins 2004</i></p>

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
<p><b>Atmospheric processes</b>                      Minimise <u>greenhouse gas emissions (GHG)</u> so as to contribute to the NTG’s aspirational target of achieving net zero greenhouse gas emissions by 2050.</p>	<p>NT GHG emissions are comparatively low compared to other Australian jurisdictions due to sparse population and low level of industrial development.</p>	<ul style="list-style-type: none"> <li>• GHG emissions released into atmosphere.</li> <li>• Common use carbon capture and storage facility proposed at MASDP.</li> </ul>	<p><i>National Greenhouse Energy Reporting (NGER) Scheme established through NGER Act 2007</i>  <i>Greenhouse Gas Emissions Management for New and Expanding Large Emitters (NTG 2021b)</i>  <i>NT Offsets Framework (under development)</i>  <i>EPBC Act Offsets Policy (DSEWPC 2012)</i></p>
<p><b>Communities and economy</b>                      Enhance <u>communities</u> and the <u>economy</u> and foster resilience to a changing climate, for the welfare, amenity and benefit of current and future generations of Territorians</p>	<p>The social area of influence takes in people and communities likely to experience positive and negative impacts from the development of the MASDP, including land and seas where people live, work and visit for recreation in the Greater Darwin Region.</p>	<ul style="list-style-type: none"> <li>• Economic benefits from local industry participation and economic diversification.</li> <li>• Economic benefits generated by short term construction and long-term operational job opportunities.</li> <li>• Access issues between Elizabeth River boat ramp and Darwin Harbour.</li> <li>• Reduced marine safety in Darwin Harbour, rivers and creeks</li> <li>• Pressure on existing employers through skills shortages and competition for skilled staff.</li> <li>• Impacts on other economic sectors including tourism, fishing and aquaculture.</li> <li>• Pressure on existing land use plans and need to coordinate planning for future population and industrial growth.</li> <li>• Availability, quality and affordability of short-term and privately owned accommodation, including worker accommodation.</li> <li>• Pressure on existing social infrastructure and services in nearby suburbs, including education, health, transport, emergency services and utilities.</li> <li>• Reduced community cohesion as a result of polarised values and changed demographics (including the potential influx of FIFO workers).</li> <li>• Disturbance to strongly held social, cultural, economic and ecological values of Darwin Harbour (including cultural activities, recreation, aesthetics and sense of place).</li> <li>• Disturbance to the amenity, or living environment, of nearby communities, including air quality, noise, odours, traffic congestion and visual amenity.</li> <li>• Increased road trauma as a result of increased industrial traffic through residential areas.</li> <li>• Increased road trauma as a result of increased industrial traffic through residential areas.</li> <li>• Disturbance to non-heritage listed sites of historical importance, including World War II historical sites around Darwin Harbour.</li> </ul>	<p><i>Guidelines for the preparation of an economic and social impact assessment (NT EPA 2013)</i>  <i>Quality Assurance Standard for Community and Stakeholder Engagement (IAP2 2015)</i>  <i>NTEPA’s 2021 Guidance to proponents on stakeholder engagement and consultation</i>  <i>International Association for Impact Assessment (IAIA) Principles (2003) and Guidance (2015)</i>  <i>New South Wales Government, Guide for social impact assessment (2021)</i>  <i>Guideline for Social Impact Assessment, Jane Munday, 2020, which includes discussion on key indicators that might be incorporated in a strategic assessment.</i>  <i>International Association for Impact Assessment (IAP2), Core Values, Quality Assurance Guideline (2015) and Spectrum of Participation</i>  <i>Darwin Harbour Strategy 2020 – 2025 (Darwin Harbour Advisory Committee 2020)</i>  <i>Delivering the Climate Change Response: Towards 2050 (DENR 2020)</i>  <i>Darwin Land Use Plan (DLPE 2015)</i>  <i>Holtze to Elizabeth River Subregional Land Use Plan 2022 (first draft) (NT Planning Commission 2021)</i></p>

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
		<ul style="list-style-type: none"> <li>• Reduced cultural identity, spiritual ties to the land and seas and ability to pass on knowledge (fishing, foraging, camping, access to and enjoyment of places around the harbour).</li> <li>• Disturbance to places and values that maintain strength of culture for Darwin’s Larrakia people and neighbouring language groups.</li> <li>• Anxieties and fears regarding pollution, degradation of the environment, and industrialisation of the harbour from individual and collective development and regulatory regimes.</li> <li>• Opposition to the need to find new water sources to support development (both desalination and potentially new dams).</li> <li>• Public fears and anxieties about the use of fossil fuels, climate change, sustainability and gas-based development.</li> <li>• Cumulative impacts, e.g. industrialisation, discharge of waste water, dredging, reclamation, increased marine traffic, loss of mangroves and iconic species such as turtles, dugong and dolphins, migratory birds, loss of fishing breeding areas, reduced water quality, contribution to greenhouse gases and climate change.</li> </ul>	

Environmental factors and objectives	Significant environmental values (Summarised from Section 5)	Preliminary potential impacts and/or benefits	Relevant Policy & Guidelines
<p><b>Culture and heritage</b> Protect sacred sites, culture and heritage.</p>	<p>Aboriginal sacred sites Heritage values including European and aboriginal (terrestrial and maritime) Cultural values and land uses</p>	<ul style="list-style-type: none"> <li>• Damage or destruction of terrestrial and maritime archaeological features and/or sites of cultural significance, from construction and operation activities.</li> <li>• The unexpected revealing and/or destruction of buried material culture or human remains during construction works.</li> <li>• Removal of culturally significant artefacts.</li> <li>• Construction design and method resulting in post-construction erosion of archaeological features and significant cultural landscape areas or sites.</li> <li>• Create a visual scarring on the landscape that may detract from culturally significant areas.</li> <li>• Impact to archaeological and cultural sites through:               <ul style="list-style-type: none"> <li>○ air pollutants, including dust and chemicals, within the disturbance footprint and area of influence.</li> <li>○ water pollutants such as sediment, may damage or bury heritage features as a result of increased marine traffic and vessel size.</li> <li>○ Increased access by public from new road/tracks/marine infrastructure and increased awareness of archaeological and cultural features through environmental assessment process.</li> <li>○ Intergenerational impact to the perception of a place’s cultural value once it has been altered.</li> <li>○ Incremental destruction of places through increased development opportunities resulting from the development of the MASDP.</li> </ul> </li> </ul>	<p><i>Heritage Act 2011</i> <i>Aboriginal Sacred Sites Act 1989</i> <i>The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance, (Australia ICOMOS 2013)</i></p> <ul style="list-style-type: none"> <li>a. <i>Practice Note the Burra Charter and Indigenous Cultural Heritage Management</i></li> <li>b. <i>Practice Note Intangible Cultural Heritage &amp; Place</i></li> </ul> <p><i>We’re a Dreaming Country” Guideline for Interpretation of Aboriginal Heritage, National Trust of Australia (2012)</i> <i>Darwin Harbour Strategy 2020 – 2025 (Darwin Harbour Advisory Committee 2020)</i></p>
<p><b>Human health</b> Protect the health of the Northern Territory population.</p>	<p>Nearest residential receptors are 3 km from the MASDP, City of Palmerston, and 13 km from Darwin CBD. Other sensitive receptors are recreational and commercial fishers using Elizabeth River (boat ramp) and Darwin Harbour</p>	<ul style="list-style-type: none"> <li>• Interaction between major hazardous facilities and nearby sensitive receptors.</li> <li>• Toxicity levels in fish and crustaceans caught recreationally and commercially from increased ships in Darwin Harbour and potential spills during operations.</li> <li>• Biting insects.</li> </ul>	<p><i>Construction practice near tidal areas in the Northern Territory - Guidelines to prevent mosquito breeding (Medical Entomology, 2009a).</i> <i>Guidelines for preventing biting insect problems for urban residential developments or subdivisions in the Top End of the Northern Territory (Medical Entomology, 2009b).</i> <i>Guideline: Recommended land use separation guidelines (NT EPA 2017)</i> <i>Guide for Major Hazardous Facility (Safe Work Australia 2012)</i></p>

## 7 Avoiding and minimising impacts

Strong mechanisms for avoiding and minimising negative impacts and maximising benefits from the MASDP is important for the development of the MASDP. These mechanisms are incorporated in the SOF addressed in Section 6.2 of the Draft MASDP Program. Avoiding and minimising and/or offsetting impacts will be delivered in various ways, including:

- During concept design and feasibility studies
- During detailed design
- A due diligence assessment of future industry proponents approval notice application by the Approval Holder prior to submission to NT EPA. The assessment will ensure proponents can meet requirements approved under the Program including commitments and outcomes.
- By governance structure implemented by the Approval Holder through implementation of development standards and controls, which are well informed risk assessments and adaptive management approaches
- By developing and maintaining a suite of tools that allows MASDP managers and proponents to understand and respond to impacts over the long term e.g. airshed and water quality models
- By implementing remedial actions, if and when required.

The detail of what each of the above includes will be developed throughout the development of the MASDP Program, and will be informed by technical studies, risk and impact assessment as a part of the EIS. As an overarching guide, however, measures to avoid and minimise impacts will be proportional to both a value's sensitivity to impacts and the magnitude of such impacts. Further details of this are provided in Section 6.2 of the Draft MASDP Program.

## 8 Application of EP Act Principles and General Duty of Proponents

The referral guidance requests that DIPL discuss how the principles of environment protection and management (Part 2 of the *EP Act*) and the general duty of proponents provided for under Section 43 of the *EP Act* have been applied to the design and subsequent feasibility phases of the strategic proposal. Part 2 of the Act provides Principles of Environmental Protection and Management that decision-makers (i.e. NT EPA) and proponents must take into account when making decisions about actions that could affect the environment. Section 43 prescribes the General duty of proponents when undertaking an EIS process. The specific sections required for consideration at the referral level are listed below:

- Part 2 Principles of Environmental Protection and Management
  - Division 1: Principles of Ecologically Sustainable Development
  - Division 2 Management hierarchies
    - Section 26 Environmental Decision-Making Hierarchy
    - Section 27 Waste Management Hierarchy
- Part 4 Environmental impact assessment process
  - Division 1 Purpose of Environmental Impact Assessment Process
    - Section 43 General Duty of Proponents

Table 8-1 below summarises how each of the sections of the *EP Act* have been applied to the strategic proposal.

Table 8-1. Application of Section 43 General Duties of Proponent

Section 43 General duty	Yes	No	Comment
<b>Have the following principles of ecologically sustainable development been taken into consideration in the design of the Program?</b>			
Decision-making principle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Program development and impact assessment will consider both the (short term, localised) construction phase enabling infrastructure (landside and marine), and the long-term industry operations. Decision-making during the early planning and feasibility stages of the Program, will be undertaken with full consideration of potential significant environmental impact – noting that environment includes the social, economic, cultural and biophysical environments.</p> <p>The community engagement team within DIPL is reaching out to all parts of the community during the early planning phase (pre-feasibility) to introduce the project and to listen to their thoughts, ideas and questions. The community includes all involved and interested stakeholders that have the potential to be directly or indirectly affected by the Program at any point in the Programs timeframe. Decisions and actions that have the potential to affect the community will consider community, social, economic and cultural values and perspectives.</p>

Section 43 General duty	Yes	No	Comment
Precautionary principle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>The Program is being planned alongside the baseline, pre-development studies. DIPL is investing in understanding:</p> <ul style="list-style-type: none"> <li>• What the known (and potentially unknown) environmental values are that have the potential to be significantly impacted.</li> <li>• What the potential significant impact of the classes of actions are (including assessment of the risk-weighted consequences of different options in relation to the classes of actions).</li> <li>• What level of uncertainty exists with regard to the long term, significant impacts that may occur as a result of classes of actions.</li> </ul> <p>Decision-making in the development of the Program and the classes of actions will be, and is currently, based on the understanding that any development will avoid serious or irreversible damage to the environment.</p> <p>In line with the Precautionary Principle, the Program will:</p> <ul style="list-style-type: none"> <li>• Recommend or design preventative actions in the face of uncertainty.</li> <li>• Explore a wide range of alternatives to ensure harmful actions can be eliminated through design choices.</li> <li>• Involve the participation of stakeholders.</li> </ul>
Principle of evidence-based decision-making	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Development of the Program and the EIS report will be undertaken by a team of technical specialists who are able to identify best available information and their work will be technically peer reviewed.</p> <p>Particularly where the information is incomplete, and/or where the level of uncertainty is significant, the Program development and optioning assessment will utilise the principle of evidence-based decision-making to assess the design decisions being made.</p> <p>Investigation of environmental processes and potential significant impacts will be technically peer reviewed where appropriate.</p>
Principle of intergenerational and intergenerational equity	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Decision-making in the development of the Program and the classes of actions will be and is currently based on the understanding that development will avoid serious or irreversible damage to the environment, and that the Program has the capacity to maintain all the ecological processes on which all life depends, and to the maximum extent possible, avoid or mitigate significant environmental impact on the values SAA. In some cases where avoidance or mitigation of significant impact is not possible, the Program will include a proposal to offset those impacts so that the impacted values are maintained and enhanced elsewhere.</p>
Principle of sustainable use	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>DIPL will use the ISCA rating scheme to assess options and make decisions that optimise the environmental, social, economic and cultural outcomes.</p> <p>The Program will address the use of natural resources including gas, water, minerals and energy in the planning phase, to maximise the extent of common user facilities to reduce resource use and recycle/ reuse opportunities.</p>
Principle of conservation of biological diversity and ecological integrity	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Where possible the Program will avoid or mitigate significant environmental impact to biological diversity and ecological integrity. In some cases where these values will be significantly impacted, the Program will include offset areas.</p> <p>The impact assessment for the Program will have a landscape scale focus.</p>

Section 43 General duty	Yes	No	Comment
Principle of improved valuation, pricing and incentive mechanisms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>The MASDP is being developed to provide development-ready sites in a master-planned and pre-approved Precinct that is supported by necessary enabling infrastructure.</p> <p>In doing so, DIPL is cognisant of the requirement to provide to the Community, Regulators and Industry:</p> <ul style="list-style-type: none"> <li>• An SOF that contains clear and measurable outcomes and commitments for the management and conservation of environmental values, including specific, measurable, achievable, relevant and timely performance indicators to demonstrate progress towards achieving these outcomes and commitments</li> <li>• Details of all governance arrangements including the roles and responsibilities of DIPL and industry proponents that operate in the MASDP and the named approval holder (or holders). This includes establishing incentive structures, and market mechanisms, which enable industry to maximise benefits and/or minimise costs to develop solutions and responses to environmental commitments</li> </ul>
Have the following management hierarchies been taken into consideration in the design of the proposed action?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Yes, see comments below.
Environmental decision-making hierarchy	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>The hierarchy of avoid, mitigate and offset are being considered in the concept design of the MASDP. Technical specialists are being involved in the concept design phase to identify potential significant impacts to environmental, cultural and social values and will provide input into best practice avoidance and mitigation measures.</p> <p>An environmental offset for threatened terrestrial species is currently being investigated as part of the Program.</p>
Waste management hierarchy	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Waste management measures will be considered at a high level in the concept designing phase of the MASDP, throughout the development of the industry building blocks scenarios study which has identified the key waste streams for potential future industries.

Other section considerations	43 Yes	No	Comment
Have communities that may be affected by the proposed action been provided with information and opportunities for consultation?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The community engagement process has commenced and will continue through the environmental approval and planning phases of the Program. DIPL is working to a stakeholder engagement strategy and has allocated a team to the delivery of stakeholder engagement. A stakeholder register is used to record all interactions and the issues that are raised.
Has consultation with affected communities, including Aboriginal communities' been undertaken in a culturally appropriate manner?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Engagement with affected communities, including Aboriginal communities has commenced and will continue. For example:</p> <ul style="list-style-type: none"> <li>• DIPL has engaged the Director, Aboriginal Development in the project delivery with a focus on engagement and communications activities.</li> <li>• DIPL has engaged a specialist consultant to work with Aboriginal communities to identify cultural heritage places at Middle Arm.</li> <li>• DIPL intends to apply for AAPA Clearance Certificate in 2022.</li> </ul> <p>DIPL intends to provide Aboriginal community stakeholders with the opportunity to be involved in decision making around significant heritage values protection, and to provide communities with plain English and/or translated information about the Program at MASDP so that they can get involved in a fully informed way.</p>
Has community knowledge and understanding (including scientific and traditional knowledge and understanding) of the natural and cultural values of areas that may be impacted by the proposed action been sought and documented?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Values mapping has commenced. Stakeholder engagement and archaeological assessment is seeking to understand the natural and cultural values of areas that may be impacted. DIPL also intends to leverage the values mapping work carried out by the Darwin Harbour Integrated Report Card team, and to contribute to the development of the 2022 report card program.
Have Aboriginal values and the rights and interests of Aboriginal communities' been addressed in relation to areas that may be impacted by the proposed action?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	DIPL has commenced engagement with Aboriginal communities to understand their values and to address their rights and interests as described above.

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