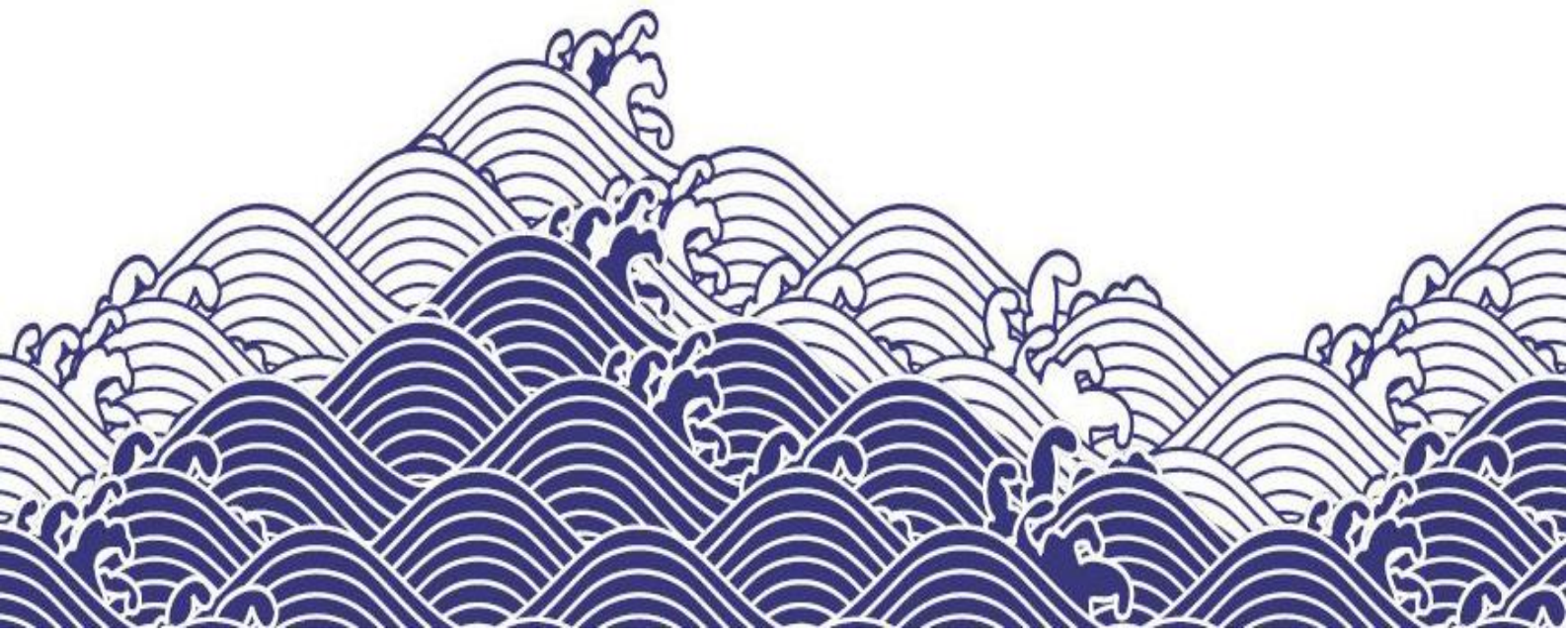


**Appendix E:**

**Ichthys LNG AGRU Upgrades and  
CCS Preparedness Project: Draft  
Construction and Commissioning  
Environment Management Plan**



**RECORD OF AMENDMENT**

Revision	Section	Amendment

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**Terms, abbreviations and acronyms**

<b>Term, abbreviation or acronym</b>	<b>Meaning</b>
AAPA	Aboriginal Areas Protection Authority (NT)
AGRU	acid gas removal unit
AHD	Australian height datum
Air NEPM	Ambient Air Quality National Environment Protection Measure
ALARP	as low as reasonably practicable
ASS	acid sulphate soils
BMS	business management system
BIA	biological important areas
BTEX	benzene, toluene, ethylbenzene and xylenes
CCS	carbon capture and storage
CFA	continuously flight augured
CO <sub>2</sub>	carbon dioxide
Cwlth	Commonwealth
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cwlth)
DAFF	Department of Agriculture, Fisheries and Forestry (Cwlth)
DLPE	Department of Lands, Planning and Environment (NT)
DO	dissolved oxygen
Draft CCEMP	Draft Ichthys LNG AGRU Upgrades and CCS Preparedness Project Construction and Commissioning Environment Management Plan (L075-AH-PLN-70005)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth)
EMF	environmental management framework

<b>Term, abbreviation or acronym</b>	<b>Meaning</b>
EPC	engineering, procurement and construction
FRP	filterable reactive phosphorus
g/L	grams per litre
HSE	health, safety and environment
INPEX	INPEX Operations Australia Pty Ltd
ISQG	interim sediment quality guideline
LOA	likelihood of occurrence
LOR	limits of reporting
MOF	module offloading facility
N <sub>2</sub>	nitrogen
NCW	non-contaminated water
NO <sub>2</sub>	nitrogen dioxide
NO <sub>x</sub>	nitrogen oxides (NO and/or NO <sub>2</sub> )
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
O <sub>3</sub>	ozone
OCPs	organochlorine pesticide
OPPs	organophosphate pesticides
PAHs	polycyclic aromatic hydrocarbons
PASS	potential acid sulphate soils
PCBs	polychlorinated biphenyls
PFASs	per- and polyfluoroalkyl substances
Project footprint	The area that would be disturbed as result of the civil construction activities required to support the installation of new infrastructure within the Ichthys LNG facility.

Term, abbreviation or acronym	Meaning
	This includes the Bulk Area, CO <sub>2</sub> pipeline ROW, the supplementary power area and the power cable ROW.
RBL	rating background level
ROW	right of way
SO <sub>2</sub>	sulphur dioxide
SPMT	self-propelled modular transport
T	Tonnes
TBT	tributyltin
TN	total nitrogen
TP	total phosphorus
TPWC Act	<i>Territory Parks and Wildlife Conservation Act 1976 (NT)</i>
TRHs	total recoverable hydrocarbons
TSS	total suspended solids
WMPC Act	<i>Waste Management and Pollution Control Act 1998 (NT)</i>

### Measurement/units

Measurement/unit	meaning
°C	degrees Celsius
%	percentage
µg/L	micrograms per litre
AHD	Australian height datum
bbbl	barrel
Bq/g	becquerel per gram (radionuclides)
dB	decibels

<b>Measurement/unit</b>	<b>meaning</b>
dB(A)	A-weighted decibels, a measurement of sound level that takes into account the human ear's varying sensitivity to different frequencies.
g/L	grams per litre
kL	kilolitres
km	kilometres
m	metres
m <sup>3</sup>	cubic metres
mm	millimetres
Mm <sup>3</sup>	million cubic metres
m <sup>3</sup> /hr	cubic metres per hour
Mtpa	megatonnes per annum
NTU	measure of turbidity
pH	Quantitative measure (logarithmic scale) of the acidity or basicity of an aqueous solution.
ppt	parts per thousand; a unit of measurement for salinity, specifically indicating the number of grams of salt per kilogram of seawater.

## 1 INTRODUCTION

INPEX Operations Australia Pty Ltd (INPEX) is actively working to decarbonise its operations, to provide a stable supply of diverse and clean energy sources. Key to the planned decarbonisation of the INPEX-operated Ichthys liquid natural gas (LNG) facilities is the development of a carbon dioxide (CO<sub>2</sub>) compression and export system at Bladin Point, near Darwin.

To support this, upgrades are required to the existing acid gas removal units (AGRUs) to improve their capability to separate CO<sub>2</sub> from reservoir feed gas. In addition, a new CO<sub>2</sub> compression and export system and CO<sub>2</sub> export pipeline are proposed to be integrated into the existing Ichthys LNG facility processing systems (located in LNG Train 1 and Train 2 areas). This would enable CO<sub>2</sub> extracted during processing to be compressed and transported to an offshore storage location (the subject of separate referrals).

### 1.1 Purpose

The purpose of this Draft Construction and Commissioning Environment Management Plan (Draft CCEMP) is to:

- demonstrate that all reasonable and practicable measures have been taken to manage the risks associated with, and the potential environmental impacts arising from proposed construction, construction, installation, pre-commissioning, cold commissioning and preservation activities being undertaken at the Ichthys LNG facility.
- demonstrate alignment with the Northern Territory Environment Protection Authority (NT EPA) Guideline for the Preparation of an Environmental Management Plan (NT EPA 2015).

This Draft CCEMP describes:

- the proposed construction, installation, pre-commissioning, cold commissioning and preservation activities
- the existing environment within which the construction, installation, pre-commissioning, cold commissioning and preservation activities will occur
- the environmental risk assessment process including a conceptual site model and demonstration of risk to as low as reasonably practicable (ALARP)
- the proposed stakeholder engagement and communication
- the environmental management frameworks to be implemented, including an adaptive management strategy
- the proposed environmental monitoring
- the implementation strategy including reporting, auditing and review requirements.

Once a preferred contractor has been engaged to undertake the works, the Draft CCEMP will be updated. The final CCEMP will incorporate any additional requirements that may arise through the Northern Territory Government and Commonwealth approval processes.

### 1.2 Scope

The following new infrastructure is proposed to be installed at the Ichthys LNG facility:

- modularised equipment to upgrade the two existing AGRUs
- CO<sub>2</sub> compressor modules (including auxiliary vents)

- an in-plant section of CO<sub>2</sub> export pipeline, export metering, and PIG (pipeline inspection gauge) launcher/receiver
- a modular building with combined electrical and control equipment to power and control the new facilities
- a common dehydration module
- a water treatment system, including water tanks, to treat and reuse water recovered from the CO<sub>2</sub> stream.

This Draft CCEMP covers the following activities associated with the installation of the above infrastructure:

- site-preparation/construction (e.g. earthworks)
- installation (excluding installation of brown fields equipment, instruments, etc. refer to Section 1.2.1)
- pre-commissioning and cold commissioning<sup>1</sup>
- preservation.

Once cold commissioning has been performed, the equipment will remain in place and preserved until a suitable carbon capture and storage (CCS) Project has been determined and environmental approvals are obtained.

During execution of the Project the Ichthys LNG site would be separated into INPEX Operations-controlled areas and a Project controlled area (i.e. where major construction activities and supporting temporary Project infrastructure would be located). The Project controlled area is shown in Figure 1-1, all areas outside this are considered to be Operations-controlled areas (refer to Section 1.2.1).

### 1.2.1 Out of scope

Installation of brown fields equipment, instruments, etc. within the existing Ichthys LNG facility equipment/systems (Operations controlled areas) will be managed under the requirements of the Onshore Operations Environmental Management Plan (L060-AH-PLN-60005), environment protection licence (EPL288 as amended) and interfacing Site Management Plan.

Installation of such equipment, instruments, etc. will not impact on the operational function of any existing equipment/system until they are fully commissioned and operational (subject to separate approvals).

---

<sup>1</sup> Cold commissioning is defined as any commissioning activities which can be completed prior to the introduction of hydrocarbons or CO<sub>2</sub>.



Figure 1-1: Project controlled area

### 1.3 Proponent

INPEX Operations Australia Pty Ltd (INPEX), a wholly owned subsidiary of INPEX CORPORATION, is the proponent and operator for the Project on behalf of its Ichthys LNG Pty Ltd (an incorporated joint venture).

The addresses of INPEX offices in Australia are as follows:

<b>Perth office</b>	<b>Darwin office</b>
INPEX Operations Australia Pty Ltd Level 22, ENEX 100 100 St Georges Terrace PERTH WA 6000	INPEX Operations Australia Pty Ltd Level 8, Mitchell Centre 59 Mitchell Street Darwin NT 0800

## 2 ENVIRONMENTAL MANAGEMENT FRAMEWORK

### 2.1 Corporate framework

INPEX's Business Management System (BMS) is a comprehensive, integrated system that includes standards and procedures necessary for the management of health, safety and environment (HSE) risks.

The INPEX health, safety, security, environment and quality policy sets the direction and minimum expectations for environmental performance and is implemented through the standards and procedures of the BMS. The BMS and INPEX health, safety, security, environment and quality policy are further described in Section 7.

### 2.2 Legislative framework

Legislation applicable to the Project is described in Table 2-1.

**Table 2-1: Legislation applicable to the Project**

Legislation	Regulator	Relevance to the Project
<b>Commonwealth</b>		
<i>Biosecurity Act 2015</i>	Department of Agriculture, Fisheries and Forestry (DAFF)	The Act and its supporting legislation are the primary legislative means for managing risk of pests and diseases entering Australian territory and causing harm to animal, plant and human health, the environment and/or the economy. Approval is required from DAFF to re-establish the MOF as a first point of entry of ships entering from international waters and to unload modules and other equipment.
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	The Act provides for the protection and management of nationally and internationally important flora, fauna, ecological communities, and heritage places.
<b>Northern Territory</b>		
<i>Environment Protection Act 2019</i>	Northern Territory Environment Protection Authority (NT EPA)	The Act aims to promote ecological sustainable development, manage significant disturbances through an environmental approval process, provide for broader community involvement and recognise the importance of participation of Aboriginal people and communities in environmental decisions.

Legislation	Regulator	Relevance to the Project
<i>Waste Management and Pollution Control Act 1998 (WMPC Act)</i>	NT EPA	<p>The Act provides for the protection, and where practicable the restoration and enhancement of the quality of, the Territory environment. Specifically, by preventing pollution, reducing the likelihood of pollution occurring, effectively responding to pollution, avoiding and reducing the generation of waste, increasing the re-use and recycling of waste, and effectively managing waste disposal. It also to encourages ecologically sustainable development and facilitates the implementation of national environment protection measures.</p> <p>Schedule 2 of Act outlines activities that require an approval or licence under the Act, which requires approvals and licences for activities that relate to processing of hydrocarbons to produce, store and/or despatch liquefied natural gas or methanol. INPEX will engage with the NT EPA on the requirement for approvals under the WMPC Act for construction activities associated with the Project. Waste management during the Project will be in compliance with the requirements of the Act.</p>
<i>Water Act 1992</i>	NT EPA	<p>The Act Provides for the investigation, allocation, use, control, protection, management and administration of water resources, including extraction of ground water, wastewater management and water pollution. Under the Act waste discharge licences are required where an activity could affect a declared beneficial use of a water resource.</p> <p>A waste discharge licence may be required if wastewater associated with pre-commissioning activities is required to be discharged to Darwin Harbour.</p>
<i>Weeds Management Act 2001</i>	Department of Lands, Planning and Environment (DLPE)	<p>The Act allows for the declaration of weeds into classifications for the purposes of preventing a plant entering into, or managing the plant in, the Territory or a part of the Territory. The Act provides for statutory weed management plans, which prescribe management actions for high priority weeds. The Act also gives powers to authorised officers, including the power to order certain activities in relation to declared weeds.</p>
<i>Territory Parks and Wildlife Conservation Act 1976 (TPWC Act)</i>	DLPE	<p>The Act forms a framework for the establishment and management of parks and reserves and declaration of protected wildlife.</p> <p>This Act has been considered with regard to the potential interactions with protected Wildlife.</p>

<b>Legislation</b>	<b>Regulator</b>	<b>Relevance to the Project</b>
<i>Heritage Act 2011</i>	DLPE	<p>The Act provides for the conservation of the Northern Territory's cultural and natural heritage. All Aboriginal or Macassan archaeological places or objects are automatically declared heritage places or objects under the Act. Other places or objects can be nominated, and if accepted, can be declared heritage places or objects under the Act. A works approval is required to carry out work on a heritage place or object.</p> <p>No heritage objects/places are known to exist within the fence line of Ichthys LNG facility, where the Project would occur. In the event a previously unidentified object is discovered during construction, an unexpected/chance finds procedure will be implemented.</p>
<i>Northern Territory Aboriginal Sacred Sites Act 1989</i>	Aboriginal Areas Protection Authority (AAPA)	<p>The Act provides protection from unauthorised entry or damage to all sacred sites in the Northern Territory. Under the Act those wishing to undertake works on land or sea are required to obtain an Authority Certificate.</p> <p>Authority Certificates are a legal document that protects sacred sites from damage by setting out the conditions for carrying out specific works on an area of land and/or sea.</p> <p>INPEX has been issued an AAPA Authority for the area where Project activities would occur (refer to Section 4.3.2).</p>
<i>Planning Act 1999</i>	DLPE	<p>The Act regulates how land in the Northern Territory can be developed and used. This includes the establishment of planning schemes, development consent authority and planning commission.</p> <p>The Project is located entirely within the existing Ichthys LNG plant boundary (NT Portion 7002) and is zoned "Development". For all new development at Ichthys LNG a new development permit is required, where this constitutes &gt;5% change to the existing site.</p>
<i>Ports Management Act 2015</i>	Department of Logistics and Infrastructure	<p>The Act provides for the control, management and operation of ports, and for related purposes.</p> <p>A safety exclusion zone around the MOF is likely to be required during MOF offloading activities.</p>

### 3 ACTIVITY DESCRIPTION

#### 3.1 Schedule

An indicative schedule of proposed activities associated with the Project, subject to approvals being obtained, is presented in Figure 3-1.

Activity	2026				2027				2028				2029				2030			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Site establishment and civils works																				
Brownfields modifications																				
Module installation																				
Pre-/cold commissioning																				
Pipeline installation (On-plot)																				

**Figure 3-1: Indicative schedule of proposed activities**

#### 3.2 Work location

All works and activities would occur within the Project controlled area shown in Figure 1-1 and Figure 3-2. This incorporates both areas where the construction, installation, pre- and cold-commissioning activities would occur as well as locations which would be used for laydown and crib rooms.

The “Project footprint” is defined as the area that would be disturbed as a result of the civil construction activities required to support the installation of new infrastructure within the Ichthys LNG facility. All construction work associated with AGRU upgrades, and the CO<sub>2</sub> compression and export system would be completed in an area of vacant land, situated to the east of Ichthys LNG Trains 1 and 2 and positioned within the perimeter fence line of the existing facility, in Bulk Areas A and B, collectively referred to as the ‘Bulk Area’ (Figure 3-3). All construction works for the pipeline would occur in a right of way (ROW), which extends from the Bulk Area, continues along the eastern boundary of Ichthys LNG facility and terminates at the western boundary of Ichthys LNG facility (Figure 3-3). All construction works associated with installation of the supplementary power infrastructure would occur in vacant land east of the combined cycle power plant and main power substation (Figure 3-3). Associated cables to support of importation of power would be located within a proposed supplementary power cable ROW (Figure 3-3). This follows the route of the CO<sub>2</sub> pipeline within the Ichthys LNG facility; however, the width varies in areas due to operational restrictions or presence of existing infrastructure.

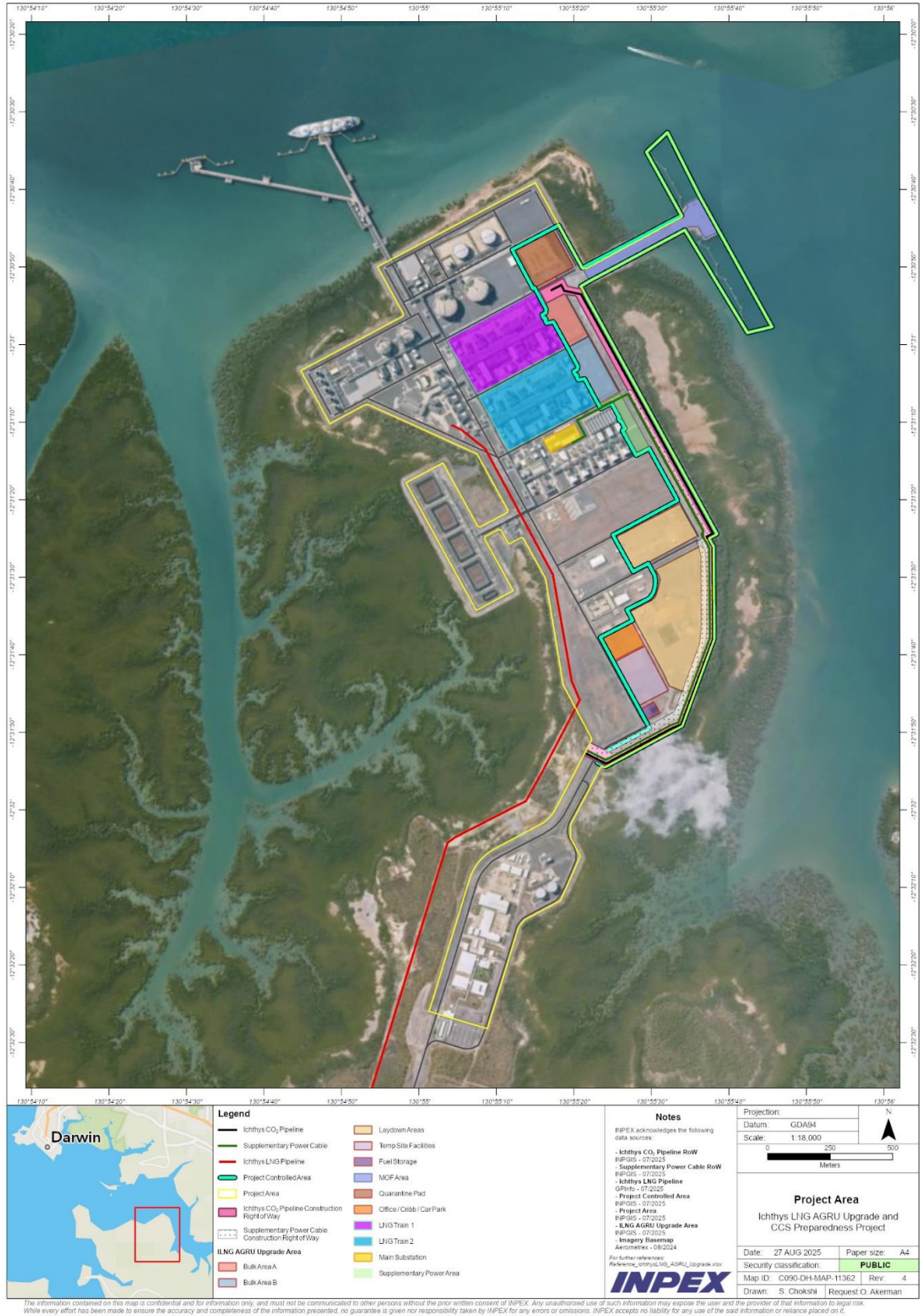


Figure 3-2: Project controlled area within Ichthys LNG



Figure 3-3: Project footprint

### 3.3 **Activities required to support AGRU upgrades and new CO<sub>2</sub> compression and export system**

The following activities are covered by this Draft CCEMP:

- site-preparation
- construction (civil works, piling, drainage installation, etc.)
- installation/connection (i.e. module delivery/installation, installation of the CO<sub>2</sub> pipeline and cabling, and brownfield upgrades within the Ichthys LNG facility)
- pre-commissioning and cold commissioning\* of the upgraded AGRUs and CCES equipment/infrastructure
- preservation of the CO<sub>2</sub> pipeline, upgraded AGRUs and CCES infrastructure/equipment.

These are described in the following sections.

#### 3.3.1 **Construction**

##### **Excavation, trenching and compaction (earthworks)**

###### ***Bulk Area and CO<sub>2</sub> pipeline ROW***

Site preparation and civil works would occur within the Bulk Area and the CO<sub>2</sub> pipeline ROW located within the existing perimeter fence line of the Ichthys LNG facility. This would be undertaken using a variety of different earthmoving equipment (dependent on the task being performed). These include, but are not limited to, excavators, trenchers, graders and water trucks.

It is estimated that approximately 21,000 m<sup>3</sup> of spoil would be excavated during earthwork activities. A large volume of the excavated material would be targeted for re-use as backfill, with an estimated volume of 10,000 m<sup>3</sup> forecast as spoil requiring disposal. Spoil may be temporarily stored onsite, prior to being disposed offsite by a suitable licenced contractor.

The Bulk Area and CO<sub>2</sub> pipeline ROW were established during initial Ichthys LNG facility construction. The current finished ground surface consists of "cut and fill". The cut areas are largely covered by a layer of compacted general fill up to 2.5 m deep, which is underlain (in places) by aggregate rocks and low permeable geofabric material. Some filled areas located along the edges of the Project Area underwent significant ground improvement works.

It is not anticipated excavations within the Bulk Area are likely to encounter acid sulphate soils (ASS) or Potential ASS (PASS); however, there is a low likelihood that ASS/PASS may be encountered in some areas within the CO<sub>2</sub> pipeline ROW (refer to Section 4.1.4).

In the event that ASS/PASS is encountered any affected spoil would be removed and replaced with engineered fill. The affected ASS/PASS spoil would then be treated/neutralised at a suitable treatment pad located within the Project Area prior to being disposed offsite by a suitably licenced contractor. A conservative estimate of the volumes of ASS/PASS spoil that may need to be treated/neutralised is ~500 m<sup>3</sup>.

###### ***Supplementary Power Area and cabling***

Site preparation and civil works would be required at the supplementary power and associated cable locations. The works would include earthwork for excavation and modification of cable routes and trenches. This would be undertaken using a variety of different earthmoving equipment (dependent on the task being performed). These include, but are not limited to, excavators and trenchers.

The supplementary power location requires extensive trenching to accommodate underground power and controls cables. In addition to this trenching, conduits and concrete pits for cable pulling and jointing would be required for the cable cables for future green power import within the pipeline ROW (Figure 3-3). Trenching methods for these are currently being assessed and multiple methods might be used dependent on the location of the cable in proximity to other assets. Methods being considered include open-cut shoring, benching and battering trenching methods as well as more conservative methods such as high-pressure water excavation and hand digging.

Excavations works would be required for the installation of the supplementary power earth grid. The depth of the earth grid would be ~ 500 mm deep with earth rods driven or drilled at various locations within this area.

## **Foundation installation**

### ***Bulk Area***

Up to 350 (bored) piles (15 m deep with a 900-1200 mm diameter), would be installed using the "continuously flight augered (CFA)" piling method and a secondary means of "bored in-situ non-displacement piling".

CFA piling and bored piling techniques are very similar. CFA piles utilise of cast-in-place concrete pile formed by drilling with a hollow-stemmed auger, then pumping concrete through the stem as the auger is withdrawn and finally inserting a steel reinforcement cage.

Alternatively, the bored piling technique is completed with a separate drill piece allowing a steel reinforced cage to be installed and final concreting to be completed separately.

Piling would result in approximately 4,000 m<sup>3</sup> of spoil being generated. Spoil would be temporarily stored, prior to being disposed offsite by a suitably licenced contractor. Spoil may be re-used for fill purposes, subject to the outcomes of a suitability assessment.

### ***Supplementary Power Area***

Concrete foundations for the BESS facility may be either installed via in-situ pouring of concrete or these may be pre-cast and then installed.

## **Other construction activities**

### ***Temporary infill of Ichthys LNG facility stormwater drain***

The temporary modification of the internal Ichthys LNG stormwater drainage (also referred to as the non-contaminated water drain) infrastructure surrounding the Bulk Area is required to enable the transport of modules from the MOF face to their position in the Bulk Area. Heavy movement or lift equipment (e.g. self-propelled modular transport (SPMT) spreads, large heavy lift cranes, etc.) transporting modules would be required to cross the existing stormwater (NCW) drainage structure.

The temporary modification of the drain would involve the placement of temporary infrastructure within the drain system. The indicative locations where this may be required is shown in Figure 3-4. Any temporary installation of infrastructure would be designed such that it does not adversely affect the functionality of the drainage system. Prior to demobilisation the stormwater drainage system would be reinstated as per current design/operations.

### ***Underground service crossings***

Where SPMT movements and large heavy machinery will cross underground services, preparations would be made to ensure these are not impacted.

### ***Dewatering activities***

Dewatering is the process of removing water from a construction site and disposing of it at another location, ensuring construction work can occur safely. During the Project dewatering activities may be required to remove water within open excavations/trenches due to groundwater seepage or storm events.

Dewatering may involve relatively simple removal of small amounts of water at bottom of an excavation by diesel driven sludge pumps or flex drive pumps or may involve large volumes of water where the excavation/penetration is situated below the level of water table or during significant deluge events resulting in increased run-off. However, for large volumes of water, a de-watering system consisting of large diesel driven pumps may be required.

Several options are being considered for the management of construction wastewater (including wastewater generated from dewatering activities) during Project execution. These include, but are not limited, the following:

- transfer to the existing Ichthys LNG facility evaporation basin (where seasonal conditions permit)
- transfer to a temporary holding pond (i.e. constructed of earth berm walls and a liner, which can be progressively moved)
- discharge via a temporary outfall at the MOF (subject to separate approvals and discharge criteria)
- temporary onsite storage for offsite disposal by a suitably licenced contractor.



Figure 3-4: Indicative locations where temporary infill of the Ichthys LNG stormwater (NCW) drain may be required

### 3.3.2 Installation of new equipment/infrastructure

#### Transport, installation and connection of modules and other equipment to the Bulk Area

##### **Module transport**

Prefabricated modules would be delivered to the site via specialised vessels/barges and offloaded at the MOF. Up to ten modules and a series of pipe rack modules (~12) are expected to be delivered at various stages between 2028 and 2029. Further, subsequent standard cargo materials are likely to be delivered to East Arm Port and transported to site via road or may be brought in over the MOF.

Once modules or equipment is offloaded at the MOF, they are inspected and either moved using heavy lift equipment (e.g. SPMT) to the final location or temporarily kept in the MOF area. Note, smaller modules may be placed in their final location using heavy lift cranes. In some cases, modules may need to be transported to the designated DAFF Pad (biosecurity pad) and subjected to a biosecurity control before being mobilised to their final location.

The existing haul roads installed during the construction phase of the Ichthys LNG facility are designed to enable the transportation of heavy module structures from the MOF to the hardstand within the Ichthys LNG facility (e.g. they are wide bitumen sprayed seal roads). As described in *Other construction activities*, a small section of the existing stormwater drainage system would need to be temporarily infilled to allow for the movement of heavy movement/lift equipment transporting modules/equipment from the MOF face to their position in the Bulk Area.

Module movements would be sequenced to optimise construction efficiency within Bulk Area and simultaneous operations associated with the CO<sub>2</sub> pipeline construction.

##### **Module installation/connection**

Once modules are positioned and secured on the pre-installed foundations, transportation appurtenances will be removed and then mechanical, electrical and instrumentation connections would be completed in a sequenced order. During installation and connection activities, each major system would undergo a series of checks to confirm they have been adequately prepared in readiness for pre-commissioning activities (Section 3.3.3).

Key installation/connection activities would include:

- completion of cable trays and supports linking modules, pipe racks and existing/new LER's
- completion of process pipework and utility connections
- installation of power, instrumentations and telecommunications cabling including, as applicable, cable connections between other systems (e.g. between new and existing LIR/LER termination points and module receival points)
- connection of process and utilities pipework to existing Train 1 and Train 2 tie-in points
- connection to localised drainage systems
- completion of roads and paving not able to be completed till module installation.

For each module the following installation/connection activities would be required:

- removal of packing/preservation utilised during marine transportation
- removal of transportation appurtenances (e.g. temporary bracing, etc.)
- removal of module preservation fluids and first fill oils and lubricants

- installation of shipped loose items, including installation of major and minor access ways (if these are shipped loose)
  - installation/adjustment of key pipework assemblies
  - installation of safety systems
  - completion/check of packaged equipment assemblies
  - completion of final instrumentation and electrical connections
  - cleaning of module critical systems
- coating (painting) and insulation activities.

### **Installation of supplementary power and cabling**

Cables would be laid at the bottom of excavated trenches on a sand bedding or would utilise buried conduits for later cable pull-through. Trenches would be progressively backfilled following pre-commissioning testing activities.

Heavy infrastructure/equipment (e.g. batteries containers and power converters) within the supplementary power area would be installed using cranes.

### **3.3.3 Pre-commissioning of AGRUs and CCES**

Pre-commissioning is a set of static and de-energised checks and tests carried out on each item of the plant equipment and pipework to ensure that the facilities have been constructed in compliance with Project specifications and standards. Pre-commissioning activities include:

- cleaning and treatment (e.g. water cleaning (e.g. flushing, jetting), air cleaning (blowing/flushing), steam cleaning, mechanical cleaning, chemical cleaning)
- hydrostatic pressure testing.

These are described further in the following sub-sections.

#### **Cleaning and treatment – water cleaning**

Water cleaning may be used to remove debris and loose material within pipework or tanks/vessels. Methods that may be used during pre-commissioning activities include:

- circulation of water at high velocity
- low-pressure water spray
- high-pressure water spray (i.e. jetting).

The cleaning of systems would result in an estimated 5,000 m<sup>3</sup> of wastewater being generated. All of the wastewater and cleaning solutions generated from these activities would be recaptured on completion and disposed of by a suitably licenced contractor.

#### **Cleaning and treatment – air cleaning**

Air cleaning involving the introduction of high velocities of air into pipework may be used to dislodge and carry away debris within pipework. Two methods that may be used during pre-commissioning activities include:

- Continuous: air blown high pressure source, typically a high-capacity compressor or reticulation network

- Rapid depressurisation: air blown high pressure source, which is released at a high velocity.

### **Cleaning and treatment – steam cleaning**

Steam cleaning involves high temperature blowing and thermal cycling between blows to aid in dislodgement of debris.

### **Cleaning and treatment – mechanical cleaning**

The following mechanical cleaning methods may be used during pre-commissioning:

- Hand cleaning: vessels/tanks are cleaned using suitable tools (brushes, scrapers, etc.) and debris is removed by vacuum or blow.
- Blasting: vessels/tanks are cleaned using sand/grit/garnet blasting.

Any wastes associated with blasting activities would be captured and disposed of in accordance with the legislative requirements.

### **Cleaning and treatment – chemical cleaning**

Chemical cleaning uses an acid solution to remove free iron and other contaminants from the surface. One of the main systems which would require chemical cleaning is the AGRU which is described in further detail below.

#### ***AGRU system cleaning***

Cleaning of the AGRU system is required to remove traces of oil contamination within new equipment prior to first process energisation. The following steps are generally applied:

- dilute weak acid (citric) flush
- dilute weak acid (citric) flush
- dilute weak alkali solution flush to perform de-greasing. (Sodium Hydroxide or other suitable de-greasing alkali)
- demineralised water flush.

The cleaning of the AGRU system would result in an estimated 3,000 m<sup>3</sup> of wastewater being generated. All wastewater and cleaning solutions generated from these activities would be recaptured on completion and disposed of offsite by a suitably licenced contractor.

### **Hydrostatic pressure testing**

All new/upgraded equipment and pipework (with exception of the CO<sub>2</sub> pipeline) would be hydrostatic pressure tested. The testing of the pipework and equipment would be undertaken using demineralised water as a test medium.

Hydrotest water volumes would vary over time, with the total volume of water required for pre-commissioning activities estimated to be 15,000 m<sup>3</sup>. Hydrotest water would be re-used where it remains fit for purpose.

### **3.3.4 Pre-commissioning of supplementary power**

Pre-commissioning checks and tests would be undertaken following construction; this would involve electrical integrity and function testing. No emissions or discharges are associated with pre-commissioning activities required for the supplementary power. Commissioning of the power transmission circuits for green power import would be undertaken only once an offsite interface facility was connected, this is subject to separate approvals.

### **3.3.5 Cold commissioning of AGRUs and CCES**

Commissioning is a series of dynamic and energised checks and tests that need to be carried out to demonstrate and ensure that the facilities are ready to operate safely and steadily in compliance with Project specifications and standards. There are two types of commissioning, cold and hot, with only cold commissioning being considered in this referral.

Cold commissioning focuses on testing if equipment is mechanically sound from a functionality perspective without introducing any process fluids/materials or power required during operations.

The cold commissioning includes the following:

- leak testing
- pump system testing
- dehydration system testing.

#### **Nitrogen leak testing**

This type of testing enables infrastructure to be tested close to their expected operating pressure, detecting any leaks and repairs required prior to operation.

High pressure nitrogen is used as the test medium for leak testing of infrastructure/equipment. Nitrogen would be sourced from the atmosphere (membrane separation) or supplied in cryogenic liquid form by tankers. Helium (He) would be added as 1% of the test fluid, supplied in compressed gas cylinders by an external supplier, as required.

This testing provides added checks to ensure the integrity of new pipework prior to hot commissioning/operations.

#### **Pump, vessels and pipework system testing**

New pumping equipment, vessels and pipework systems would be tested using water as a test medium in an open circuit format. Water used for testing would be sourced from the existing demineralisation plant at Ichthys LNG facility. In addition, pump testing water may be treated with standard chemicals (e.g. biocide, oxygen scavenger, corrosion inhibitor, etc.).

It is estimated that pump, vessel and pipework system testing would result in ~400 m<sup>3</sup> of wastewater (~200 m<sup>3</sup> per LNG train). Wastewater and cleaning solutions generated from these activities would be recaptured on completion and disposed of by a suitably licenced contractor.

### **Dehydration system testing**

System pressurisation using dry nitrogen (N<sub>2</sub>) would be undertaken to allow compressor and full system function testing prior to introduction of process fluids. The system would be depressurised to atmosphere on activity completion.

#### **3.3.6 Preservation of AGRU, CCES and CO<sub>2</sub> pipeline**

Once pre-commissioning activities are completed, CCES equipment/infrastructure and piping (located within the existing Ichthys LNG facility and Bulk Area) and the CO<sub>2</sub> pipeline would be put into preservation until such time it could be connected to future offsite CCS project infrastructure.

In addition, the upgraded AGRU would also be put into preservation until such time Plover gas wells are brought on-line, and the CO<sub>2</sub> capacity exceeds the existing AGRU system design.

## 4 EXISTING ENVIRONMENT

This section provides an overview of the existing environment and environmental values relevant to the Project area and the surrounding environment that may be impacted (directly or indirectly) by the Proposal activities. A quick reference guide linking description of the environment and relevant NT EPA environmental factors (NT EPA 2025) is provided in Table 4-1, noting the description of the environment is not limited to these factors.

**Table 4-1: NT EPA environmental factors and description of the environment sections**

Theme	Factor	Relevant sections
Land	Terrestrial environmental quality	Section 4.2.3
	Terrestrial ecosystems	Sections 4.2.1 and 4.2.3
Water	Hydrological processes	Section 4.1.5
	Inland water quality	Section 4.1.6
Sea	Marine environmental quality	Sections 4.1.8 and 4.1.9.
	Marine ecosystems	Sections 4.2.1 and 4.2.2
Air	Air quality	Section 4.1.3
People	Community and economy	Section 4.4
	Culture and heritage	Section 4.3

### 4.1 Physical environment

#### 4.1.1 Climate and meteorology

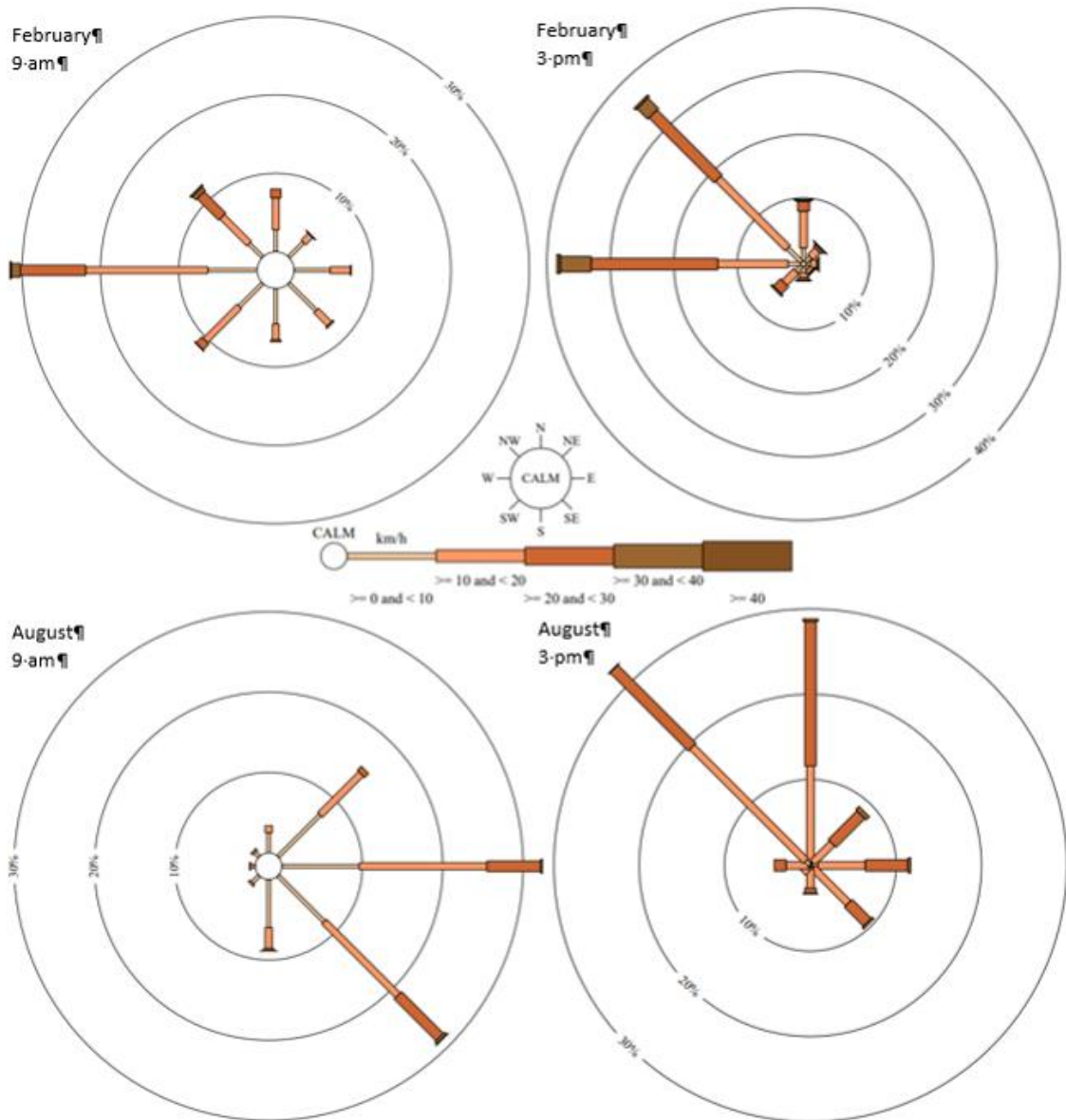
The Ichthys LNG facility lies in the monsoonal tropics of northern Australia, which has two distinct seasons: a hot wet season from November to April and a warm dry season from May to October. April and October are transitional months between the wet and dry seasons. Darwin has a mean annual rainfall of 1,724 mm, with rain falling on an average of 113 days (mainly in the wet season). The mean annual evaporation rate is 2,444 mm. The average monthly conditions for Darwin are presented in Table 4-2.

During the wet season, which has an official start date of 1 November each year, prevailing winds are westerly and west-north-westerly. Winds in the dry season, which has an official start date of 1 May each year, vary from south-easterly to northerly. Wind roses for Darwin are shown in Figure 4-1.

The area is subject to tropical low-pressure systems and cyclones, particularly from November to April. Tropical cyclones bring strong winds, heavy/squally rainfall, local flooding and storm surges. Damage from cyclones can occur up to 50 km inland from the coast.

**Table 4-2: Average monthly weather conditions for Darwin (BOM 2022)**

<b>Month</b>	<b>Average maximum temperature (°C)</b>	<b>Average minimum temperature (°C)</b>	<b>Average monthly rainfall (mm)</b>	<b>Average relative humidity (9 am; %)</b>	<b>Average relative humidity (3 pm; %)</b>
January	31.8	24.9	431.3	81	70
February	31.5	24.8	369.0	83	72
March	32.0	24.6	310.8	82	67
April	32.8	24.1	101.7	74	52
May	32.1	22.2	20.4	65	43
June	30.7	20.0	1.8	60	38
July	30.7	19.3	1.1	60	37
August	31.5	20.3	4.6	64	40
September	32.7	23.0	16.53	68	47
October	33.3	24.9	71.2	69	52
November	33.4	25.3	143.2	72	58
December	32.7	25.3	252.0	76	65



**Figure 4-1: Wet season (February) and dry season (August) indicative wind roses for the Darwin area (BOM 2022)**

#### 4.1.2 Noise

Given the location of the Ichthys LNG facility on Bladin Point, there are limited off-site noise sensitive receptors in close proximity to the facility. Nonetheless, as part of good industry practice, noise has been monitored and assessed during the project planning, construction and operation phases.

Ambient noise levels were measured prior to construction of the Ichthys LNG facility at O'Farrell's Road, Bayview Haven and Constance Court, Palmerston (SVT Engineering Consultants 2009). During construction, continuous airborne noise monitoring was undertaken at Ichthys LNG project site as well as at Palmerston. Minor noise exceedances were recorded in Palmerston; however, none of the exceedances were considered to be project-attributable (URS 2013; AEC Environmental 2014, 2015a). The ambient and construction noise level measurements provide a baseline for the operational phase. Noise monitoring undertaken during operations has confirmed measured noise levels at the Ichthys LNG facility boundary are within the permissible noise limits (70dB(A)) for industrial premises.

### 4.1.3 Air quality

Ambient air quality in the Darwin airshed is influenced by several sources, including biogenic sources (soil, natural and agricultural vegetation), smoke from bushfires, vehicles and industrial sources. Generally, the concentrations of nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>) and photochemical oxidants (as measured by ozone (O<sub>3</sub>)) in the Darwin airshed are relatively low. Particulate levels in the Darwin airshed vary seasonally due to annual backburning and bushfires; the 2024 Darwin Harbour Integrated Report Card (DHIRC 2024) reported that 94% of days in the wet season were below the PM<sub>2.5</sub> good air quality indicator, compared to only 39% of days in the dry season.

The nearest sensitive receptors for air emissions from the Ichthys LNG facility are the residential areas of Palmerston. The Ambient Air Quality National Environment Protection Measure (Air NEPM) specifies maximum acceptable ground-level concentrations for a range of common parameters relevant to airsheds across Australia. Of these, the parameters relevant to Ichthys LNG context in Darwin are NO<sub>2</sub>, O<sub>3</sub>, SO<sub>2</sub> and particulates (measured as PM<sub>2.5</sub> and PM<sub>10</sub>). A cumulative air quality assessment was undertaken for the Draft EIS in 2010 (SKM 2010) and updated to incorporate revised plant configuration in 2014 (Pacific Environment 2014).

The 2010 air quality assessment included establishment of the background air quality using air emissions from biogenic sources (soil and vegetation), vehicles, shipping traffic and industrial sources already present on Middle Arm Peninsula prior to construction of the Ichthys LNG facility (ConocoPhillips Darwin LNG plant, Channel Island power station and Weddell power station) (SKM 2010). The background air quality was found to be good; the maximum ground level pollutant concentrations for NO<sub>2</sub> (1 hr average), O<sub>3</sub> (1 hr average), SO<sub>2</sub> (1 hr average) and PM<sub>10</sub> (1 day average) were found to be 27%, 20%, 12% and 22% of the Air NEPM criteria, respectively. Ambient air quality monitoring completed for compliance against the Ichthys LNG facility environmental protection licence has primarily detected seasonal exceedances of Air NEPM criteria for particulates, related to planned and unplanned burning activities. No exceedance of Air NEPM at receptors has been attributed to Ichthys LNG operations.

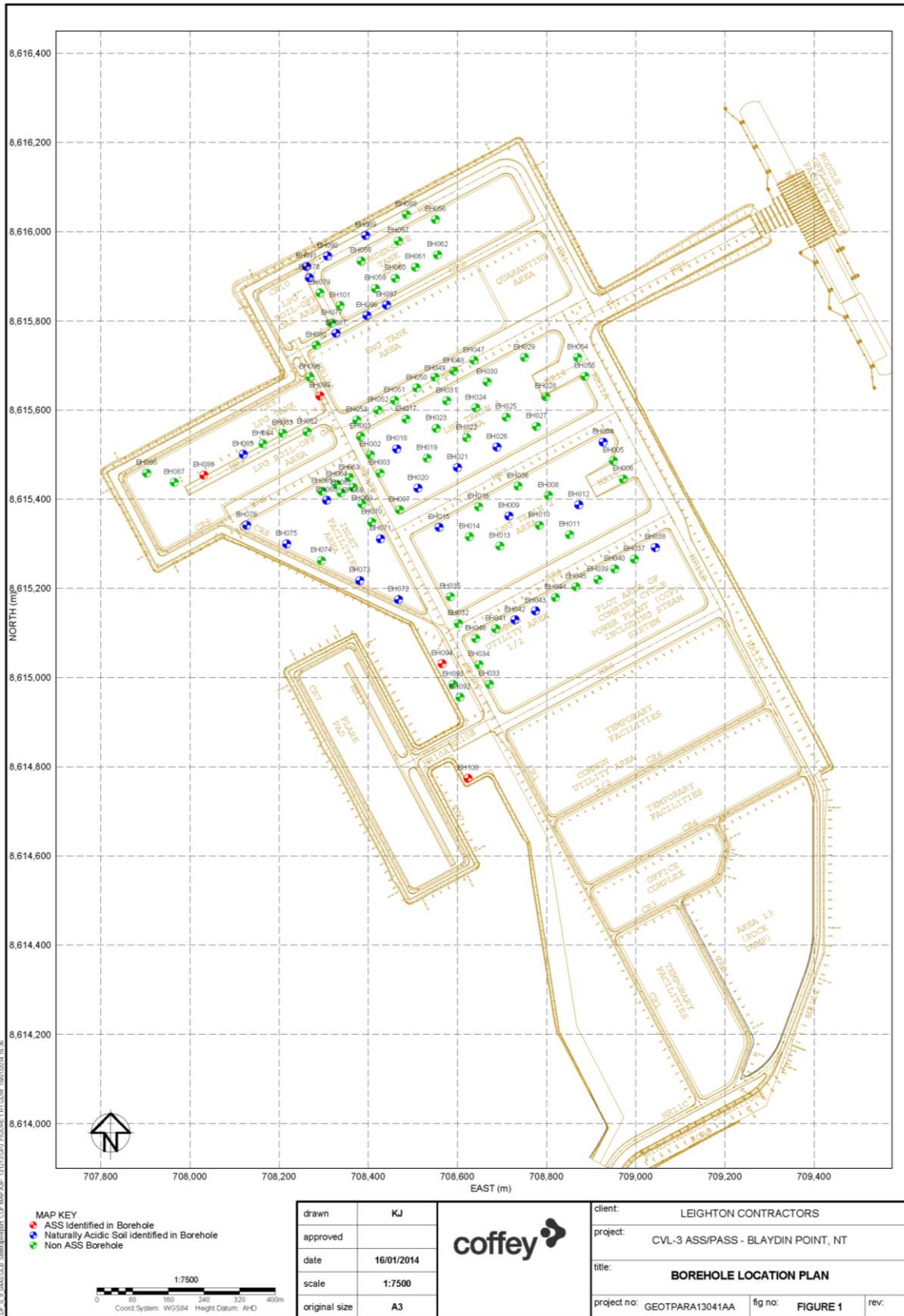
### 4.1.4 Geology and geomorphology

Bladin Point is a low-lying peninsula, which is separated from the mainland by a mudflat. The area is underlain by Early Proterozoic and Burrell Creek Formation rocks, with some Cretaceous Darwin Formation rocks along the shoreline. Soils over half of the site are very gravelly, massive earths that range in depth from shallow (<0.25 m) to moderately deep (0.25 to <0.5 m) (Fogarty et al. 1984).

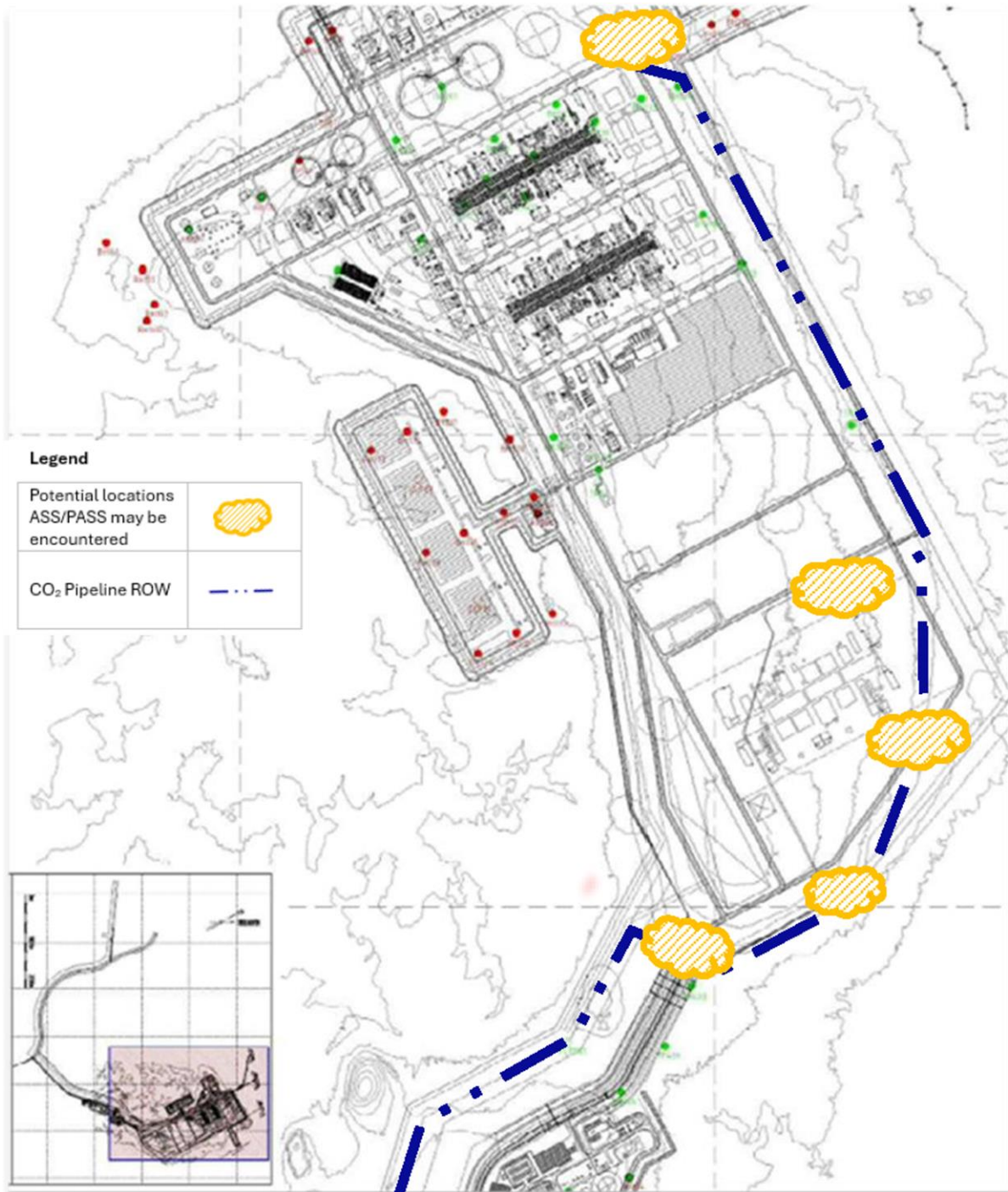
The following soil families have been identified at Bladin Point: Bladin (red, fine sandy clay loam); Hotham (brown, massive, fine sandy loam with medium gravel); Koolpinyah (yellow sandy loam over sandy clay loam); Mullalgah (deep, peaty soils on marine sediments); Euro (hydrosols on intertidal flats); Maand (poorly drained marine muds); and Rinamatta (siliceous sands).

The Mullalgah, Euro, Maand and Rinamatta soil families contain varying levels of acid sulphate soils (ASS). Geotechnical investigations for Ichthys LNG construction phase identified areas of ASS within Ichthys LNG footprint, with key areas being the ground flare pad, tankage flare, condensate tank area, module offloading facility causeway and tidal area of the haul road (JKC 2014; Coffey 2014). In addition to areas of ASS, geotechnical investigations also reported soils with natural non sulphuric acidity (pH levels as 3.4 to 6.8); natural acidity formed through hydrolysis reactions where the anions are leached and replaced with hydrogen soils. No boreholes containing ASS were reported from within the Bulk Area (Figure 4-2); however, there is a low likelihood that ASS/PASS may be encountered in some areas within the CO<sub>2</sub> pipeline ROW (Figure 4-3).

The current finished ground surface consists of 'cut and fill'. The cut areas are generally covered by a layer of compacted general fill up to 2.5 m deep, which is underlain (in places) by aggregate rocks and low permeable geofabric material. Some filled areas located along the edges of the Site underwent significant ground improvement works.



**Figure 4-2: Acid sulphate soils borehole investigation plan and presence of acid sulphate soils (Coffey 2014)**



**Figure 4-3: Locations where potential acid sulphate soils may be encountered with the CO<sub>2</sub> pipeline ROW**

#### 4.1.5 Hydrology and hydrogeology

Bladin Point is generally flat and varies only 10 m in topography. After rainfall, the majority of surface water flows east into the Elizabeth River and west into Lightning Creek, with some surface water discharging north into Darwin Harbour and south towards the isthmus and a tidal salt flat.

Groundwater levels are generally shallow, with recharge mainly occurring by rainfall infiltration during the wet season. A semi-confined aquifer in the clayey sand/gravel horizons of the Darwin Formation generally follows the original topography of the site with the lowest levels located near the coast. The groundwater levels in this aquifer fluctuate seasonally between 0.5 and 5 m and are also influenced by the Darwin Harbour tides in coastal areas. Groundwater level contours indicate that groundwater flows radially from the central part of Ichthys LNG towards low lying area typically inundated by tides (AEC Environmental 2015b). Construction of the Ichthys LNG facility has altered the topography of Bladin Point and subsequent recharge of groundwater through decreased permeability associated with compacted soil and fill, sealed surfaces and storm water drainage system. Ongoing groundwater monitoring throughout operations has measured both increases and decreases in seasonal groundwater levels compared to baseline (AECOM 2024). The 100-year storm surge level at Bladin Point is estimated at 4.9 m AHD and the 500-year storm surge level is estimated at 5.6 m AHD. Most Ichthys LNG facilities (including all critical facilities) are located above 6.5 m AHD, with some non-critical support infrastructure located above 5.8 m AHD which provides 0.2 m above the estimated 500-year storm surge level to account for potential sea level increase.

#### 4.1.6 Groundwater quality

Aquifers in the Darwin Formation are typically acidic to neutral, with a pH ranging from 4.1 to 7.6 (Radke et al. 1998). Sampling of groundwater at Ichthys LNG site prior to construction recorded fresh to saline water with pH levels of 4.6 to 6.4. The natural acidity of groundwater reflects the natural acidic soils found at Bladin Point. Reported concentrations of aluminium, arsenic, cadmium, copper, manganese, nickel and zinc were higher than ANZG (2018) trigger values prior to commencement of construction. Reported concentrations are a likely result of historic groundwater interaction at different depths within the aquifer with soil stratigraphy for some time under acidic conditions resulting in metal mobilisation. Nutrients have likely been released into the uppermost aquifer by rainwater interaction with organic rich surface material, organic muds and inorganic minerals in rocks and soils (AEC Environmental 2015b).

Under the *Water Act* (NT), beneficial uses for groundwater have been declared for the Darwin Rural Adelaide River Water Control District which includes Ichthys LNG site. These are listed as agriculture, aquaculture, public water supply, cultural, industry, rural stock and domestic, mining activity and petroleum activity. Water quality objectives for groundwater in the region have been set as listed in Table 4-3.

Groundwater monitoring carried out throughout Ichthys LNG construction phase analysed a large number of bores and parameters. Groundwater parameters were not uniform across Ichthys LNG, with natural pockets of acidic groundwater and variable metal concentrations. Natural groundwater pH values were consistently lower than pH 7 (median of 5.5) and in some cases were as low as pH 3, with no notable decreasing trend over the construction monitoring (AEC Environmental 2018). The groundwater levels during construction rose and fell in accordance with the season, with the lowest levels in in October (dry season end) and the peak levels being reached in late-March/early-April (wet season end) (AEC Environmental 2018). Measured salinity levels also indicated that majority of bores are brackish to hypersaline. Naturally elevated concentrations of metals and nutrients were consistently reported throughout construction. Majority of nutrient samples (88% of ammonia, 73% of total nitrogen, 67% of total phosphorus and 61% of oxides of nitrogen) exceeded water quality objectives for Darwin Harbour (NRETAS 2010). Similarly, metals frequently exceeded their relevant trigger values (41% of aluminium, 63% of arsenic, 25% of cadmium, 80% of cobalt, 22% of copper, 66% of manganese, 52% of nickel, 58% of zinc).

Post construction groundwater monitoring results have been consistent with those of construction and baseline, with sporadic exceedances of triggers at individual bores. These have not been attributed to any Ichthys LNG operational activity or event. In 2024 the monitoring contractor completed a review of several sites that were showing increasing trends in groundwater analytes (AECOM 2024). Of particular note were sites VWP 341, BPGW40 and BPGW41, which occur along the eastern site boundary. The review noted that concentrations of manganese, cobalt, zinc, and ammonia at the three bore sites are likely increasing because of a combination of reduced recharge (less water in), lower aquifer permeability (less water flowing), and lower rates of dispersion (more accumulation of solutes). The accumulation mechanisms are the result of long-term and permanent changes to the local hydrogeology and presence of source materials (i.e., fill and/or mangrove mud). They do not appear to be the result of a point source such as a leak of spill within the LNG facility (AECOM 2024).

**Table 4-3: Groundwater quality objectives**

Indicator	Upper estuary water quality objectives
Indicator for environmental use: aquatic ecosystem protection	
pH	Maintain between 7 – 8.5
Conductivity	Maintain <400 µS/cm
Toxicants	Refer to ANZG (2018)
Indicator for Protection of Cultural Use: Aquatic Foods	
Toxicants	Refer to Australian Drinking Water Guidelines (NHMRC 2011)

#### 4.1.7 Harbour hydrodynamics and metocean conditions

Darwin Harbour is classed as a macro-tidal estuary, with maximum tidal range reaching 7.8 m (Padovan 2003; Li 2013). The Darwin region experiences a semidiurnal tidal cycle (i.e. two highs and two lows per day) with a slight diurnal inequality between the successive tides (INPEX 2010). The daily tidal range is characterised by a pronounced variation in magnitude, repeating approximately every 15 days (spring-neap tide cycle). The average daily tidal range is ~6 m during the spring phase and ~3 m during neap phase of the tidal cycle (Cardno 2014). There is also considerable annual variability, with the largest spring tides typically occurring in March and September/October.

Tidal excursions range from 8 to 15 km during spring tides and 2 to 8 km during neap tides (Hanley & Caswell 1995; Semeniuk 1985). The large tidal ranges produce strong currents that peak at speeds of up to 2-2.5 m/s.

Darwin Harbour is considered well protected from waves, with most waves generated within the Harbour or in Beagle Gulf. Waves during the wet season can reach heights of up to 1 m, although average wave height are generally less than 0.5 m with short mean periods of 2-5 s. Average wave heights and periods during the dry season are even lower. Tsunamis and swell waves (long-period waves) are unlikely to occur in Darwin Harbour due to its orientation and the protection from ocean swells by the Tiwi Islands.

#### 4.1.8 Harbour sediment quality

Numerous sediment quality surveys have been undertaken in Darwin Harbour (RHDHV 2022; Cardno 2022; Radke et al. 2020a, 2020 b, 2021, 2023, 2024; AECOM 2020; INPEX 2019, 2020, 2021, 2023; GHD 2019; Munksgaard et al 2013; URS 2009; Fortune 2006). Results from published monitoring studies in East Arm have found the sediment to be primarily comprised of sand with varying amounts of gravel, silt and clay, depending on the sample location (e.g. intertidal areas or channels). Sampling of deposited material within the jetty pockets adjacent to Ichthys facilities was found to be predominantly silts and clay (INPEX 2016, 2019, 2020,2023).

Analysis of potential inorganic contaminants in Darwin Harbour such as metals (including metalloids) found that arsenic concentrations commonly exceed the ANZG (2018) SQGV (sediment quality guideline value) of 20 mg/kg. However, these high concentrations have been attributed to local geology (weathering of arsenic rich coastal substrata) rather than anthropogenic sources (Fortune 2006). Furthermore, previous bioavailability testing has indicated that only a small proportion is bioavailable indicating that it is unlikely to be toxic in the marine environment.

A range of other metals (e.g. antimony, chromium, copper, lead, mercury, nickel and silver) have also been recorded to infrequently exceed SQGVs; however, their mean concentrations have always remained below SQGVs. Exceedances are typically associated with individual samples or samples collected adjacent to urbanised or developed areas. Notably, sampling near the MOF (INPEX 2023) indicated no exceedances of the SQGV for any tested analyte.

Until recently few sediment sampling programs have analysed samples for other contaminants such as organic compounds. Sediment sampling to inform dredging activities at Coonawarra (GHD 2019), Mandorah (Cardno 2022), the proposed ship-lift in East Arm (AECOM 2020) and Middle Arm Sustainable Development Precinct (RHDHV 2022) have all included various analysis of organics. However, the most recent comprehensive surveys were undertaken by the Northern Territory Government (NTG) in 2019, 2020 and 2023 (Radke et al. 2020a, 2020b, 2021, 2023, 2024), as part of the Ichthys LNG Darwin Harbour Integrated Marine Monitoring and Research Program environmental offset. These surveys cover the entire Darwin Harbour extent and include tributyltin (TBT), per- and polyfluoroalkyl substances (PFASs), polychlorinated biphenyls (PCBs), organophosphate pesticides (OPPs), organochlorine pesticide (OCPs), polycyclic aromatic hydrocarbons (PAHs), total recoverable hydrocarbons (TRHs) and benzene, toluene, ethylbenzene and xylenes (BTEX). INPEX (2023) also tested the MOF berth pockets for organics (total petroleum hydrocarbons, TRH, PAH, BTEX).

Of the aforementioned organics, PCBs, OPPs and BTEX have been below laboratory limits of reporting (LORs) in all surveys for which they have been analysed. Results for TBT were all below LOR in East Arm in Radke et al. (2020a) and RHDHV (2022), while a single TBT result was reported in AECOM (2020) adjacent to the multi-user barge ramp facility in East Arm. Sampling at Coonawarra (GHD 2019) and Mandorah (Cardno 2022) reported eight and two samples with TBT respectively. Coonawarra is known to contain legacy TBT contaminated sediments, with TBT identified in all previous sediment surveys (GHD 2019). Following detection of TBT at Mandorah, twelve additional targeted TBT samples were collected, all of which were below LOR (Cardno 2022), indicating highly localised source.

Widespread occurrence of PFASs in Darwin Harbour was reported in Radke et al. (2023), with 15 different PFASs detected across 32 sites with detection frequencies highest adjacent urban catchments. Sampling sites within tidal creeks contiguous with Royal Australian Air Force Base Darwin had the largest number of PFASs and the highest concentrations. Dieldrin was the only OCP identified in Radke et al. (2021) and was reported at two locations: the highly urbanised Rapid Creek and adjacent to Fisherman's Wharf. In all other surveys, OCPs have been below LOR (URS 2009; GHD 2019; RHDHV 2022). Polycyclic aromatic hydrocarbons have been reported sporadically in Darwin Harbour, with PAH concentrations well below SQGVs. Elevated PAH concentrations have typically been associated with urbanised or developed areas (e.g. Coonawarra, Rapid Creek, Fisherman's Wharf). Similar to PAH, some elevated TRHs concentrations have been associated with urbanised or developed areas with a single reported exceedance of SQGVs in Buffalo Creek. However, unlike other organic contaminants, trace levels of TRHs have been reported at the majority of sites throughout Darwin Harbour and likely reflect the presence of biogenic hydrocarbons throughout Darwin Harbour. No organic compounds were detected above SQGVs within the MOF berth pockets (INPEX 2023)

Three surveys have included analysis for radionuclides, URS (2009), AECOM (2020) and RHDHV (2022), with all results well below interim sediment quality guideline (ISQG) values from the National Assessment Guidelines for Dredging 2009 (35 Bq/g; Commonwealth of Australia 2009) with average concentrations of 0.6, 1.2 and 0.9 Bq/g respectively.

#### 4.1.9 Harbour water quality

Darwin Harbour is a naturally turbid environment due to the large tidal ranges and associated currents, with clearest water occurring during neap tides while the spring tides are associated with increased turbidity due to increased current velocities.

During the wet season, monsoonal troughs and tropical cyclones (events) significantly influence water quality, in particular turbidity. These events increase metocean conditions (wind and waves) which suspend sediments resulting in high turbidity levels (>150 NTU daily average) in coastal waters outside the Harbour, while waters within the Harbour are typically sheltered. If these events coincide with spring tides, the tidal currents can advect the highly turbid coastal waters into the Harbour resulting in increased turbidity (>100 NTU daily average) (Cardno 2015; URS 2009). Turbidity inside the Harbour will also be increased by increased sediment loading from surface runoff associated with increased rainfall during such events.

Conversely, metocean conditions in the dry season are relatively benign, with water quality primarily driven by tides. As a result, clearer waters are measured inside and outside the Harbour, with turbidity typically between 1 and 7 NTU (median daily average).

Water temperature typically varies from 24°C in the dry season to over 30°C in the wet season; however, the timing, duration and frequency of wet season events can significantly influence water temperature causing declines of 2°C to 4°C. The rainfall associated with these events can also drive fluctuations in salinity within Darwin Harbour.

Salinity within Darwin Harbour is generally slightly lower in the wet season when compared to the dry season due to rainfall; however, in either season there can be strong local gradients in salinity. During the wet season, salinity can range from approximately 30 to 35 ppt in the mid-Harbour down to near 0 ppt further up rivers (Makarynska 2019), where there are significant freshwater inflows. During the dry season, a lack of rainfall and increased evaporation can lead to salinities between 35 and 40 ppt in upstream waters where there is limited tidal flushing (Cardno 2014; Makarynska 2019).

Dissolved oxygen in Darwin Harbour typically ranges from 74-96% (mean 84%), with no seasonal effects (INPEX 2011; Padovan 1997).

A seasonal summary of mean water quality is provided in Table 4-4.

**Table 4-4: Mean water quality levels recorded near Bladin Point**

Parameter	Dry season	Wet season
Temperature	24.5°C*	30.6°C*
Salinity	35.5 ppt*	29 ppt*
Dissolved oxygen	(median 35.83 g/L) †	(median 32.37 g/L) †
pH	93.3% of saturation*	87.8% of saturation*
Turbidity	(median 88.3% in July 2017) †	(median 75.9% in February 2017) †

\* URS 2009

† AEC Environmental 2017

The *Water Act* (NT) defines several beneficial uses for water bodies in the Northern Territory. Beneficial uses describe how a community values and uses a water resource. These are then used to set water quality objectives relevant to the beneficial uses declared for a particular water body. The declared beneficial uses for the Darwin Harbour Region – High Water Mark and Darwin Harbour Region – Natural Waterways are as follows:

- aquaculture: water for commercial production of aquatic animals, including related research
- environment: water to maintain the health of aquatic ecosystems
- cultural: water to meet aesthetic, recreational and cultural needs

Water Quality Objectives for Darwin Harbour have been set by the NT government for several water types (DENR 2010); those relevant to the saline waters around Bladin Point are the objectives for upper estuary waters as listed in Table 4-5.

**Table 4-5: Water quality objectives for Darwin Harbour upper estuary**

Indicator	Upper estuary water quality objectives
Indicator for environmental use: aquatic ecosystem protection	
Dissolved oxygen (DO)	Maintain DO between 75–100% saturation
pH	Maintain pH between 7–8.5
Total nitrogen (TN)	Maintain TN <300 µg/L
NOx	Maintain NOx <20 µg/L
Ammonia	Maintain Ammonia <20 µg/L
Total phosphorus (TP)	Maintain TP <30 µg/L
Filterable reactive phosphorus (FRP)	Maintain FRP <10 µg/L

Indicator	Upper estuary water quality objectives
Chlorophyll a	Maintain Chlorophyll a <4 µg/L
Total suspended solids (TSS)	Maintain TSS <10 mg/L
Toxicants	Refer to ANZG (2018)
Indicator for protection of cultural use: recreation primary contact	
Enterococci	All samples to be less than or equal to 50 Enterococci/100 mL
Escherichia coli	No single sample greater than 200 E. coli/100 mL
Pathogenic protozoans	<10 pathogenic protozoans/100 mL
Indicator for protection of cultural use: aquatic foods	
Guideline for water in shellfish growth harvest areas	Median concentration of faecal coliform should not exceed 14 MPN/100 mL (no more than 10% of the samples exceeding 43 MPN/100 mL)
Standard in edible tissue	Fish for human consumption should not exceed a limit of 2.3 MPN E. coli/g of flesh with a standard plate count of 100 000 organisms/g
Toxicants	Refer to ANZG (2018)

## 4.2 Biological environment

### 4.2.1 Conservation values

#### Matters of national environmental significance

An EPBC Protected Matters Search Tool (PMST) report was generated on the 19 August 2025 with a 1 km buffer surrounding the Ichthys LNG Facility (refer Appendix A). The report identified the following species as potentially using the Ichthys LNG area:

- 51 listed threatened species
- 60 listed migratory species
- 95 listed marine species
- 13 whales and other cetaceans.

Twenty-five of the listed species were both threatened and migratory. Other matters of national environmental significance identified in the report relate to the surrounding Darwin Harbour, being:

- a wetland of national significance in the Directory of Important Wetlands in Australia (Port Darwin NT029).

- a biologically important area (BIA) for breeding and foraging, for Australian snubfin dolphin (*O. heinsohni*), Indo-Pacific humpback dolphin (*S. chinensis*) and Indo-Pacific bottlenose dolphin (*T. Aduncus*); and
- considered a BIA for flatback turtle interesting and habitat critical to the species survival.

A likelihood of occurrence assessment (LOA) has been undertaken on the listed marine, migratory and threatened species identified in the EPBC PMST report, to determine which of the species have the potential to occur in the vicinity (1 km) of the proposed development footprint. A summary of the species identified in the LOA as being known to or likely to be present in the marine, mangrove and mud flat/salt flat communities adjacent to the proposed development footprint are presented in Table 4-6.

**Table 4-6: Summary of threatened and listed species known to or likely to occur within 1km of the Ichthys LNG facility**

Common Name	Scientific Name	EPBC Act Listing	TPWC Act	Likelihood of occurrence
<b>Birds</b>				
Asian Dowitcher	<i>Limnodromus semipalmatus</i>	Listed marine species Migratory Vulnerable	-	Likely to occur
Bar-tailed Godwit (two sub-species)	<i>Limosa lapponica baueri &amp; menzbieri</i>	Endangered	-	Known to occur
Great Knot	<i>Calidris tenuirostris</i>	Listed marine species Migratory Vulnerable	Critically Endangered	Known to occur
Greater Sand Plover	<i>Charadrius leschenaultii</i>	Listed marine species Migratory Vulnerable	Vulnerable	Known to occur
Lesser Sand Plover	<i>Charadrius mongolus</i>	Listed marine species Migratory Endangered	Endangered	Known to occur
Eastern/Far Eastern Curlew	<i>Numenius madagascariensis</i>	Listed marine species Migratory Critically Endangered	-	Known to occur
Black-tailed Godwit (3 species)	<i>Limosa limosa</i> <i>Limosa lapponica baueri &amp; menzbieri</i>	Listed marine species Migratory	Vulnerable	Likely to occur

Common Name	Scientific Name	EPBC Act Listing	TPWC Act	Likelihood of occurrence
		Endangered	Critically Endangered	
Common Greenshank	<i>Tringa nebularia</i>	Listed marine species Migratory Endangered	-	Likely to occur
Common Sandpiper	<i>Actitis hypoleucos</i>	Listed marine species Migratory	-	Likely to occur
Curlew Sandpiper	<i>Calidris ferruginea</i>	Listed marine species Migratory Critically Endangered	Critically Endangered	Likely to occur
Red Knot	<i>Calidris canutus</i>	Listed marine species Migratory Vulnerable	Endangered	Likely to occur
Grey Plover	<i>Pluvialis squatarola</i>	Listed marine species Migratory Vulnerable	-	Likely to occur
Osprey	<i>Pandion haliaetus</i>	Listed marine species Migratory	-	Known to occur
Ruddy Turnstone	<i>Arenaria interpres</i>	Listed marine species Migratory Vulnerable	-	Likely to occur
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	Listed marine species	-	Likely

Common Name	Scientific Name	EPBC Act Listing	TPWC Act	Likelihood of occurrence
		Migratory Vulnerable		
Terek Sandpiper	<i>Xenus cinereus</i>	Vulnerable	-	Known
Whimbrel	<i>Numenius phaeopus</i>	Listed marine species Migratory	-	Known
<b>Fish</b>				
Beady Pipefish	<i>Hippichthys penicillus</i>	Listed marine species	-	Likely to occur
Bentstick Pipefish	<i>Trachyrhamphus bicoarctatus</i>	Listed marine species	-	Likely to occur
Blue-speckled Pipefish	<i>Hippichthys cyanospilos</i>	Listed marine species	-	Likely to occur
Mud Pipefish	<i>Halicampus grayi</i>	Listed marine species	-	Likely to occur
Short-keel Pipefish	<i>Hippichthys parvicarinatus</i>	Listed marine species	-	Likely to occur
Spotted Seahorse	<i>Hippocampus kuda</i>	Listed marine species	-	Likely to occur
<b>Marine mammals</b>				
Australian/Indo-Pacific Humpback Dolphin	<i>Sousa sahalensis /S. Chinensis</i>	Migratory Listed whales/other cetaceans Vulnerable	-	Known to occur

Common Name	Scientific Name	EPBC Act Listing	TPWC Act	Likelihood of occurrence
Australian Snubfin Dolphin	<i>Orcaella heinsohni</i>	Migratory Listed whales/other cetaceans Vulnerable	-	Known to occur
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)	<i>Tursiops aduncus</i> (Arafura/Timor Sea populations)	Migratory Listed whales/other cetaceans	-	Known to occur
<b>Marine reptiles</b>				
Stokes' Sea Snake	<i>Hydrophis stokesii</i>	Listed marine species	-	Likely to occur
Green Turtle	<i>Chelonia mydas</i>	Listed marine species Migratory Vulnerable	-	Known to occur
Saltwater Crocodile	<i>Crocodylus porosus</i>	Listed marine species Migratory	-	Known to occur
Flatback Turtle	<i>Natator depressus</i>	Listed marine species Migratory Vulnerable	-	Known to occur

## Nationally important wetlands

Darwin Harbour is listed as a wetland of national significance in the Directory of Important Wetlands in Australia (Port Darwin NT029) and is a good example of a shallow branching embayment that supports important habitats (e.g. mangrove swamps) and has high cultural significance.

## Biological important areas

Darwin Harbour has been identified as a BIA for breeding and foraging, for Australian snubfin dolphin (*O. heinsohni*), Indo-Pacific humpback dolphin (*S. chinensis*) and Indo-Pacific bottlenose dolphin (*T. aduncus*). Darwin Harbour is also considered a BIA for flatback turtle internesting. While Darwin Harbour is a known BIA for dolphins and the flatback turtle, there are no significant marine turtle nesting beaches or dolphin feeding habitats in the vicinity of the Ichthys LNG facility.

### 4.2.2 Marine Habitats

Darwin Harbour has a complex assemblage of marine habitats and there are large differences in the extent, diversity and significance of the associated biological communities. The most common marine habitat around Bladin Point is soft-bottom benthos and sediment.

There are also small areas of mixed community reef and reef with less than 10% macrobiota in the vicinity of Bladin Point. Other marine communities in Darwin Harbour include communities dominated by macroalgae and filter-feeders. The composition, abundance and/or spatial extent of some communities in Darwin Harbour (such as macroalgae and seagrass) varies between the wet season and dry season. Marine habitats in proximity to the Project Area are shown in Figure 4-4.

## Mangrove communities

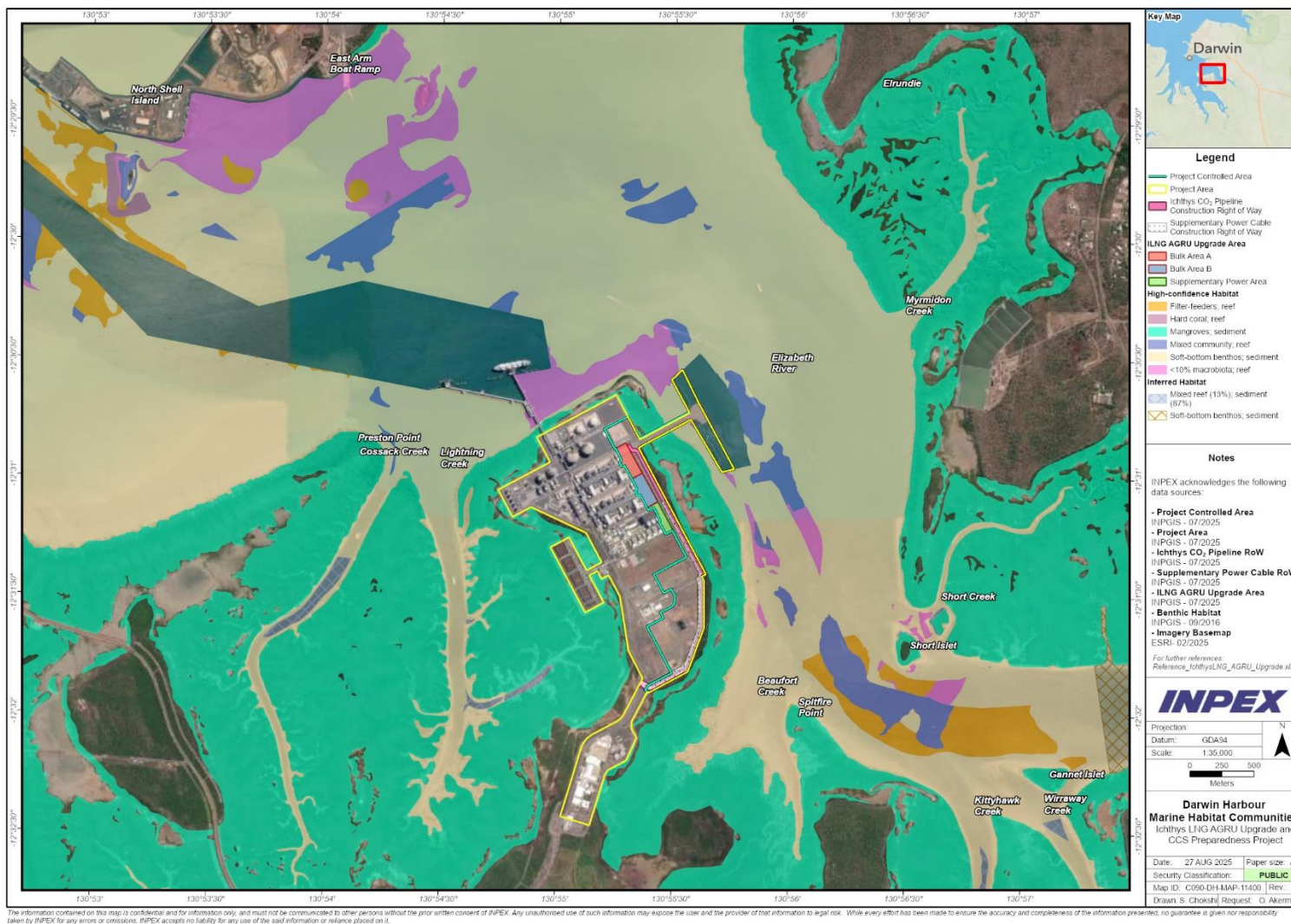
Bladin Point lies within the Darwin Coastal Bioregion, which is characterised by mangroves, monsoon vine forest and tall open eucalypt forest. The mangrove communities around the onshore facilities are considered to have high conservation value in Darwin Harbour for biological and cultural reasons but are considered regionally common (DENR 2020) (refer to Figure 4-5 for a map of mangrove and salt flat habitat distribution).

Mangrove communities are important to the ecological health of Darwin Harbour and provide food and shelter for a wide range of animals (e.g. nursery grounds for juvenile fish and crabs). Mangroves in the Darwin Harbour area constitute approximately 44% of the mangrove communities in the Darwin Coastal Bioregion and about 5% of the total mangrove area of the Northern Territory. Darwin Harbour is also recognised for its mangrove diversity, containing 36 of the 50 known mangrove species worldwide.

Mangrove mapping by Brocklehurst et al (2018) indicates that the mangrove communities present adjacent to the pipeline ROW Corridor include the following species:

- *Rhizophora stylosa/Camptostemon schultzei* low to mid closed-forest/open-forest (shoreline forest and tidal creek forest) (group 1a & 2a)
- *Rhizophora stylosa/Bruguiera spp/Ceriops spp* low closed-forest/low open-forest (transition zone) (group 3a)
- *Ceriops tagal* low closed-forest/low open-forest (tidal flats) (group 4a)
- Mixed species low closed-forest (hinterland) (group 4b)
- *Ceriops tagal* low closed-forest/open-forest (hinterland) (group 4c); and

- *Avicennia marina/Ceriops* spp low open-forest/low closed-forest (group 5b)
- Mixed species low open-forest/low closed-forest (group 5c)
- *Sonneratia alba* low woodland/low open forest (group 8).



**Figure 4-4: Marine habitats in proximity to the Ichthys LNG facility**

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**Figure 4-5: Vegetation communities in proximity to the Ichthys LNG facility**

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### 4.2.3 Terrestrial vegetation

The Project site was cleared during the construction of the Ichthys LNG facilities, with no remaining vegetation existing within the Ichthys LNG. Annual weed surveys have been undertaken in and around Ichthys LNG since 2008. Weed surveys have recorded the following weed species which are listed as declared weeds under the *Weeds Management Act 2001* (NT) within the Ichthys LNG facility:

- Flannel weed (*Sida cordifolia*): located on the southeastern boundary of the operations complex
- Lion's tail (*Leonotis nepetifolia*): located on the southeastern boundary of the operations complex
- Barnyard grass (*Echinochloa colona*): located on the eastern boundary of Ichthys LNG
- Perennial mission grass (*Cenchrus polystachios*; formerly known as *Pennisetum polystachion*): located in the southwestern corner of the operations complex and south of Ichthys LNG.
- Mimosa (*Mimosa pigra*): recorded in small, isolated patches of the site.
- Sicklepod (*Senna obtusifolia*): recorded in small, isolated patches of the site.

### 4.2.4 Fauna

Baseline surveys for the Ichthys LNG development (GHD 2009) recorded 148 vertebrate species, including nine mammal species, 106 bird species, 22 reptile species and 11 frog species (GHD 2009).

A survey of biting insects at Bladin Point found that biting midges were much more abundant than mosquitoes (Department of Health and Families 2009). The most common biting midge recorded was *Culicoides ornatus* (mangrove biting midge) and the most common mosquito species recorded was *Aedes vigilax* (northern salt marsh mosquito).

Introduced terrestrial fauna species recorded on Bladin Point include the cane toad (*Rhinella marina*), feral pigs (*Sus scrofa*), cats (*Felis catus*), black rat (*Rattus rattus*) and insect pest species. The cane toad is the most widely occurring pest species recorded on Bladin Point. Feral cats were recorded along the GEP in December 2013 (AEC Environmental 2014). The tracks of dogs or dingos were also recorded in December 2013; however, no animals were sighted (AEC Environmental 2014).

No fauna habitats exist within the Ichthys LNG facility development footprint, following completion of construction. Where fauna is located within the Ichthys LNG facility fence boundary these are removed and relocated by appropriately trained and qualified site personnel under Ichthys LNG Onshore Operations Environmental Management Plan.

#### Shorebirds

Targeted shorebird survey data available from 2018 to 2022 from the Middle Arm Peninsula and surrounds were compiled as part of the Middle Arm Sustainable Development Precinct (MASDP) environmental assessment (EcOz 2023). A summary of the shorebird surveys completed are presented below.

The shorebird habitat availability and distribution within the Middle Arm Peninsula is relatively well understood (EcOz 2023). The Middle Arm Peninsula is surrounded by an extensive intertidal zone, with previous targeted surveys showing that shorebirds are distributed throughout this zone at low tide in a manner that does not indicate strong preferential use of available foraging habitat (EcOz 2023).

Twelve shorebird species have been recorded within the Middle Arm Peninsula. Of the 12 species recorded, seven migratory shorebird species are currently listed under the EPBC Act or TPWC Act, including (EcOz 2023):

- Far Eastern Curlew (Critically Endangered)
- Bar-tailed Godwit (Endangered<sup>2</sup>)
- Common Greenshank (Endangered)
- Greater Sand Plover (Vulnerable)
- Grey Plover (Vulnerable)
- Sharp-tailed Sandpiper (Vulnerable)
- Terek Sandpiper (Vulnerable).

Shorebird count data for Middle Arm between 2018 and 2022 is presented in Figure 4-6.

The intertidal areas along Middle Arm from Lightning Creek to the north-west of the Peninsula – including Cossack Creek – represent one of three key foraging sites within Darwin Harbour (EcOz 2023). Large congregations of shorebirds have been recorded during low tide aerial surveys on the intertidal mudflat between the Bladin Point (INPEX operations) and the Darwin LNG plant (Lilleyman et al. 2020 in EcOz 2023). However, survey records show that areas immediately surrounding Ichthys LNG (within 1 km buffer) are not core habitat in context to surrounding areas of the Middle Arm Peninsula.

The salt pans (used as roost sites) surrounding Ichthys LNG are not used by the shorebirds and fewer shorebirds have been observed within the intertidal foraging habitat in comparison the surrounding Middle Arm Peninsula.

The threatened shorebird species that have been observed within 1 km of the Ichthys LNG facility (Far Eastern Curlew, Common Greenshank, Greater Sand Plover, and Terek Sandpiper) have been also observed in greater numbers in other areas of the Darwin Harbour. For example:

- The Far Eastern Curlew is shown to predominantly use roost sites within the north, south and west salt pan habitat areas, located further west of the Ichthys LNG facility. During 2019, 14 individuals were recorded off Bladin Point north of the Ichthys LNG site. The extensively available intertidal foraging habitat broadly across the Middle Arm Peninsula, is also used by this species, with annual surveys from 2019 to 2021 recording between 35 and 110 individuals, meeting the threshold for national significance for this species during these surveys.
- Seven Bar-tailed Godwit (sub-species *Limosa lapponica menzbieri*) were recorded within the Middle Arm Peninsula (Wickham Point and the Elizabeth River intertidal zone). There are no known records within 1 km buffer of the Ichthys LNG facility. The threshold for nationally important habitat for Bar-tailed Godwit is not met within any count in Middle Arm Peninsula or elsewhere in the Darwin Harbour (EcOz 2023). Most records of this species are located in the North Darwin region at East Point, Casuarina Coastal Reserve or Lee Point (EcOz 2023).
- The Common Greenshank has a wide spread of foraging and roosting around the harbour (EcOz 2023), with only several records within 1 km buffer of the Ichthys LNG facility.
- The Middle Arm Peninsula supports both roosting and foraging habitat for the Greater Sand Plover (EcOz 2023). Of the 39 individual records on the Middle Arm Peninsula during 2019, six records were within 1 km buffer of the Ichthys LNG facility, five within the Bladin Point intertidal foraging habitat, and one record off Bladin Point. For

<sup>2</sup> Listed as critically endangered under the TPWC Act

context, most records of this species are located in the north Darwin region at East Point, Casuarina Coastal Reserve and Lee Point. The threshold for nationally important habitat is not met for any count in Middle Arm Peninsula (EcOz 2023).

- Grey Plover habitat use and counts are sparse within the Middle Arm Peninsula and the broader Darwin Harbour area, with only one individual recorded in the Middle Arm Peninsula (EcOz 2023). No Grey Plover species have been recorded within 1 km of the Ichthys LNG facility.
- Four Sharp-tailed Sandpiper individuals have been recorded within the Middle Arm Peninsula. None of this species has been recorded within 1 km of the Ichthys LNG facility.
- The Middle Arm Peninsula supports nationally important habitat for the Terek Sandpiper. The threshold for national importance has been met twice, once in 2019 (100 individuals) and again in 2021 (57 individuals). The count of a flock of 100 birds was on intertidal foraging habitat off Bladin Point, within the 1 km buffer of the Ichthys LNG facility. For context, most records of this species are located in the North Darwin region at East Point, Casuarina Coastal Reserve or Lee Point. The threshold for nationally important habitat has therefore been exceeded six times recently at East Arm Wharf (EcOz 2023).



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**Figure 4-6: Migratory shorebird count data for Middle Arm between 2018 and 2022 (EcOz 2023)**

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## 4.3 Cultural environment

### 4.3.1 Onshore cultural heritage objects/sites

Middle Arm Peninsula is located within the traditional country of the Larrakia people. During archaeological surveys undertaken to support the construction of the Ichthys LNG facility, a number of Aboriginal heritage sites were identified in and adjacent to the onshore development area. Following consultation with the Larrakia Heritage Management Executive Committee<sup>3</sup> and NT Heritage Branch the following actions were taken:

- sites and objects within the Ichthys LNG fence line were removed or relocated to an agreed location ("Heritage Hill")
- sites and objects outside of the Ichthys LNG fence line have been protected using measures such as the implementation of conservation zones.

Aboriginal heritage sites recorded adjacent to or near the Ichthys LNG facility are protected under the *Heritage Act 2011* (NT), these are described in Table 4-7. There are no known Aboriginal heritage sites within the fence line of the Ichthys LNG facility, where Project activities are planned to be undertaken.

In addition to Aboriginal heritage sites, archaeological surveys undertaken to support the Ichthys LNG Development Project identified World War II objects on Bladin Point. Objects found within the vicinity of Ichthys LNG were deemed to not be of heritage value and were removed following consultation with the NT Heritage Branch. There are no known World War II heritage sites within, where Project activities are planned to be undertaken.

**Table 4-7: Heritage sites in proximity to the Ichthys LNG facility**

Site	Description	Significance
Cultural Heritage Conservation Zone 2	Shell middens and mounds	Low to moderate
Cultural Heritage Conservation Zone 3	Shell midden and mounds	Low to high
Heritage Hill	Shell, stone and glass scatters	Low
ISO2 and ISO3	Relocated material including shell and stone artefact scatters	Low
ISO25	Quartz and three shells	Low
Site 1	Isolated scatter of quartz flakes	Low
Site 3	Shell midden	Low

<sup>3</sup> The Larrakia Heritage Management Executive Committee was established by INPEX prior to the construction of the Ichthys LNG facility. The committee is now referred to as the Ichthys Larrakia Advisory Committee.

### 4.3.2 Sacred sites

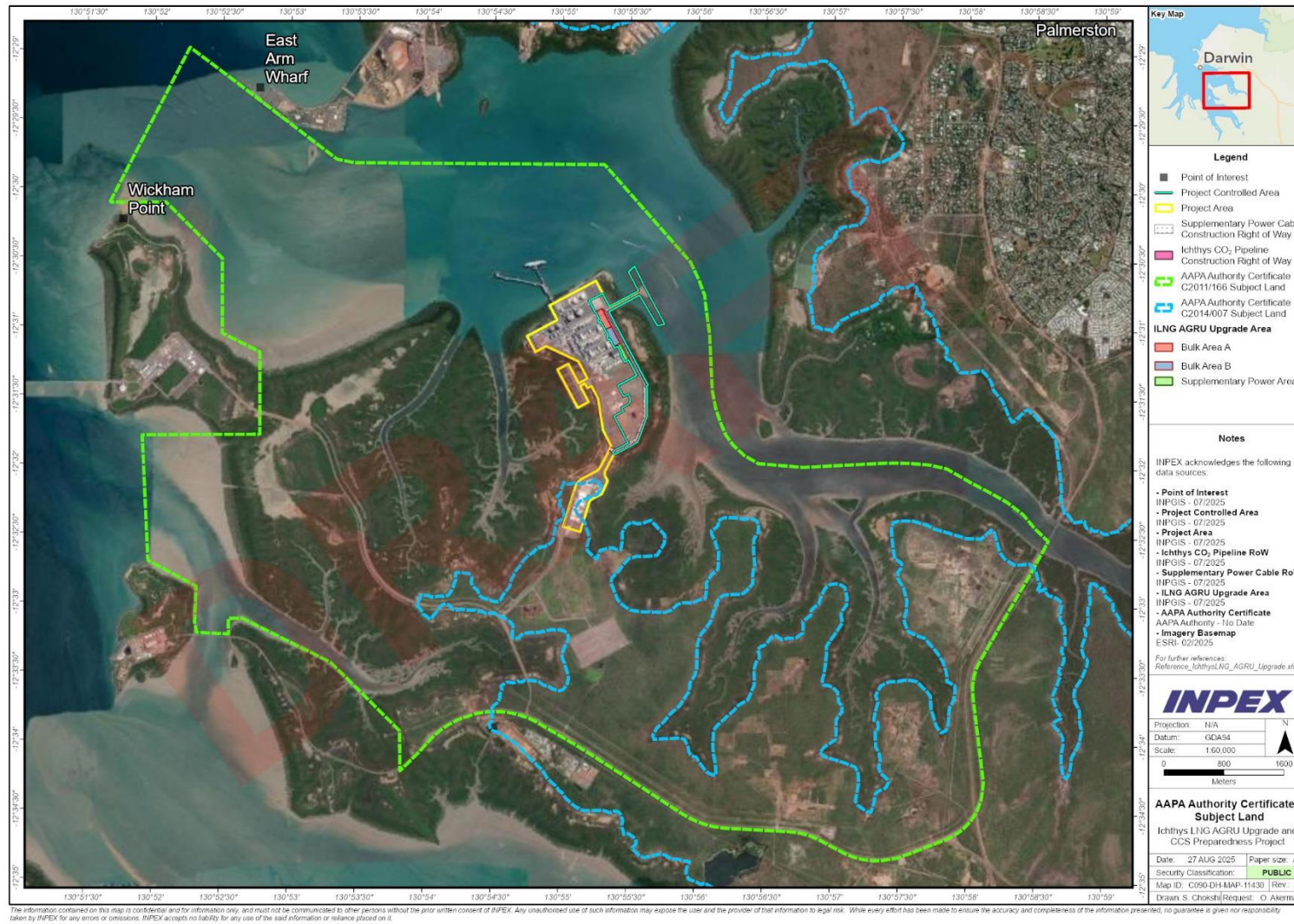
Sacred sites are places within the landscape that have a special meaning or significance under Aboriginal tradition. In coastal and sea areas, sacred sites may include features that lie both below and above the water (AAPA 2025). There are several sacred sites in Darwin Harbour and the surrounding waters. All sacred sites within the Northern Territory are protected under the *Northern Territory Aboriginal Sacred Sites Act 1989* (NT).

Anyone proposing to use or work on land in the Northern Territory may apply to the AAPA for an Authority Certificate to cover their proposed activities. Authority Certificates are issued following consultation with traditional custodians and include conditions on what can and cannot be done in and around identified sacred sites. The Larrakia people are acknowledged as the traditional owners of the area in and around Darwin.

INPEX holds two Authority Certificates, which cover the locations and the activities required to be undertaken by the Project (refer to Table 4-8 and Figure 4-7).

**Table 4-8: AAPA Authority Certificates relevant to Project activities**

Certificate reference	Subject land	Proposed work or use
C2011/166	Section 1813 Hundred of Ayres, Section 1814 Hundred of Ayres, NT Portion. 2367 and Middle Arm, inclusive of adjacent areas of mangroves and Darwin Harbour waters.	All works necessary to plan, develop, operate and maintain an industrial estate for gas-based industry, including but not limited to seabed dredging activities.
C2014/007	Part of Darwin Harbour.	Environmental monitoring programs involving one or more of the following general activities: soft bottom benthos monitoring, water quality and sedimentation, marine pest monitoring, fish and invertebrate monitoring.



**Figure 4-7: Subject land of obtained AAPA Authority Certificates**

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#### **4.4 Socio-economic environment**

##### **4.4.1 Recreational use of Darwin Harbour**

Darwin Harbour is a prime recreational and tourism resource for the NT, with activities such as fishing, boating, water skiing and beach use being popular activities. Fish species commonly targeted in Darwin Harbour by recreational fishers include snapper, mud crab, barramundi, small bait fish and some game fish. Boat ramps in the inner Darwin Harbour include Channel Island, Dinah Beach, East Arm and Palmerston.

##### **4.4.2 Darwin Port operations**

Darwin Harbour is a working port and is developing into a major service centre for the mining and energy sectors. Darwin Port operations consist of marine traffic of non-commercial vessels (e.g. recreational anglers) and trading vessels, including commercial ships carrying cargo and passengers, rig tenders, tankers and bulk-cargo vessels that regularly utilise East Arm Wharf and Hudson Creek.

## **5 ENVIRONMENTAL RISK ASSESSMENT**

A systematic risk assessment process has been adopted for the environmental management of Project activities. The risk assessment process has been developed in line with Australian Standard AS/NZS ISO 31000:2009 risk management principles and guidelines. This process aligns with INPEX's HSSEQ Policy, which requires the identification of environmental hazards and risks associated with our business, and management of these to levels that are 'as low as reasonably practicable' (ALARP).

The following sections provide an overview of the risk assessment process and outcomes.

### **5.1 Conceptual site model**

A conceptual site model is a written or illustrated representation of the predicted relationships between receptors or resources in the environment and the stressors to which they may be exposed. Conceptual site models are used in the preliminary phases of the risk assessment process to identify the linkages between hazards (i.e. sources of/mechanisms for potential harm), exposure pathways/routes and receptors. Further, it can be used to screen out impossible or implausible hazards in scenarios where there is no exposure pathway/route or receptor.

The development of the conceptual site model for the Project activities has relied upon the activity description presented in Section 3 to determine the mechanisms/sources of potential environmental impact. The information provided in Section 4 (existing environment) was used to determine the key receptors. The overarching conceptual site model for Project activities is presented in Figure 5-1.

Source/activity	Potential release mechanism	Pathway	Exposure route	Environmental receptors				Cultural and social receptors		
				Terrestrial ecosystems	Terrestrial animals	Marine ecosystems	Marine animals	Heritage sites	Community/people	Commercial
Civil construction activities (excavations, trenching, piling, temporary storage of spoil).	<ul style="list-style-type: none"> <li>Exposure of ASS/PASS resulting in generation of acid leachate.</li> </ul>	<ul style="list-style-type: none"> <li>Seepage into groundwater/soil.</li> <li>Contaminated surface water run-off.</li> <li>Accidental discharge of acid leachate wastewater to marine environment.</li> </ul>	<ul style="list-style-type: none"> <li>Reduced water quality</li> <li>Reduced soil quality</li> </ul>	✓	✓	✓	✓			
	<ul style="list-style-type: none"> <li>Rainfall resulting in erosion.</li> </ul>	<ul style="list-style-type: none"> <li>Sediment laden surface water run-off.</li> </ul>	<ul style="list-style-type: none"> <li>Reduced water quality</li> <li>Smothering of mangrove aerial roots</li> <li>Reduced visual amenity</li> </ul>	✓	✓	✓			✓	
	<ul style="list-style-type: none"> <li>Earthworks (excavations, trenching and piling).</li> </ul>	<ul style="list-style-type: none"> <li>Ground disturbance.</li> </ul>	<ul style="list-style-type: none"> <li>Discovery of previously unidentified heritage site/object</li> </ul>					✓	✓	
Dewatering of excavations and trenches.	<ul style="list-style-type: none"> <li>Discharge of wastewater via temporary outfall.</li> </ul>	<ul style="list-style-type: none"> <li>Accidental discharge of sediment laden or contaminated water discharged to marine environment.</li> </ul>	<ul style="list-style-type: none"> <li>Reduced water quality.</li> <li>Reduced visual amenity.</li> </ul>			✓	✓		✓	
<ul style="list-style-type: none"> <li>Civil construction activities (excavations, trenching, piling, temporary storage of spoil).</li> <li>Pre- and cold-commissioning activities (pneumatic testing and line blowing).</li> </ul>	<ul style="list-style-type: none"> <li>Generation of dust emissions as result of construction and pre- and cold-commissioning activities.</li> </ul>	<ul style="list-style-type: none"> <li>Wind transport of dust emissions beyond Project Area.</li> </ul>	<ul style="list-style-type: none"> <li>Reduced air quality</li> <li>Reduced visual amenity</li> <li>Smothering of surrounding vegetation communities.</li> </ul>	✓					✓	
	<ul style="list-style-type: none"> <li>Noise and vibration from rotating or moving equipment.</li> </ul>	<ul style="list-style-type: none"> <li>Transmission of noise and vibration beyond Project Area.</li> </ul>	<ul style="list-style-type: none"> <li>Behaviour changes of terrestrial fauna</li> <li>Reduced noise amenity</li> </ul>		✓				✓	
Import of modules from international locations.	<ul style="list-style-type: none"> <li>Transport of modules.</li> </ul>	<ul style="list-style-type: none"> <li>Biofouling/high-risk ballast water.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction and establishment of invasive marine species.</li> </ul>			✓			✓	✓
	<ul style="list-style-type: none"> <li>Offloading of modules at Ichthys LNG.</li> </ul>	<ul style="list-style-type: none"> <li>Presence of exotic environment pests on modules.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction and establishment of exotic environment pests.</li> </ul>	✓					✓	✓
Vehicle and machinery movements, and spoil stockpile.	<ul style="list-style-type: none"> <li>Operation of vehicles and machinery on site.</li> <li>Rainfall, wind facilitating transport of invasive species within Ichthys LNG.</li> </ul>	<ul style="list-style-type: none"> <li>Presence of invasive species on machinery/vehicles.</li> <li>Presence of invasive species within excavated spoil.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction/spread of invasive species (i.e. weeds)</li> </ul>	✓					✓	✓
<ul style="list-style-type: none"> <li>Construction and pre- and cold-commissioning activities.</li> <li>Construction waste material management.</li> <li>Storage and handling of hazardous materials.</li> <li>Use of temporary ablution blocks.</li> </ul>	<ul style="list-style-type: none"> <li>Loss of containment – spills, leaks, seepage or wind blown</li> </ul>	<ul style="list-style-type: none"> <li>Seepage into groundwater/soil.</li> <li>Contaminated surface water run-off.</li> </ul>	<ul style="list-style-type: none"> <li>Reduced water quality</li> <li>Reduced soil quality</li> </ul>	✓	✓	✓	✓			

Figure 5-1: Conceptual site model for Project activities

## 5.2 Summary of risk assessment outcomes

The Project risk assessment was informed by the conceptual site models described in Section 5.1. For the purposes of the risk assessment, an environmental aspect is defined as a feature or characteristic of the Project activities that has the potential to affect the environment.

Following the identification of activities, which could result in a particular environmental aspect, the potential environmental impacts associated with each aspect were identified. For each source of environmental risk, control measures were then identified for evaluation. Where the level of risk reduction achieved by these control measures was determined to be grossly disproportionate to the "cost"<sup>4</sup> of implementing them, the control measure was not included, and the risk was considered to be managed to ALARP.

The consequence and likelihood of each impact was then assessed to determine the residual risk that remained after controls to be implemented were taken into consideration.

The consequence is defined as an outcome or impact from an event occurring. For the purposes of the assessment, the consequence level applied was based on the credible worst-case scenario and assumed no control measures were in place.

The likelihood can be described as the level of probability that, or the frequency with which, the described consequence will impact upon the environment. When determining the likelihood of a consequence occurring, any proposed control measures identified to mitigate the potential impact considered.

The risk matrix used to determine the risk of impact for Project activities is provided in Figure 5-2.

The outcomes of the risk assessment are presented in Table 5-1, and where relevant includes reference to the environmental management frameworks within this Draft CCEMP used to manage individual environmental aspects.

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<sup>4</sup> Cost includes financial cost, time or duration, effort, occupational health and safety risks, or environmental impacts associated with implementing the control.



# Risk Matrix

Refer to the Risk Matrix Guideline [0000-A0-GLN-70019] for guidance on how to apply the risk matrix.

CONSEQUENCE TABLE								LIKELIHOOD TABLE						
Consequences								Severity	Likelihood Level					
Financial (USD)	Ichthys Production	Health & Safety	Environment	Reputation	Community	Legal	6 Remote		5 Highly Unlikely	4 Unlikely	3 Possible	2 Likely	1 Highly Likely	
A	> \$1B	> 30 days Ichthys full shutdown	> 20 fatalities or permanent total disabilities	Regional scale event, permanent impact on environment. Eradication of local populations of protected species	Prolonged international multi-NGO and media condemnation and public protests. Loss of host government support and/or social licence to operate. Company reputation severely tarnished	Catastrophic and long-term impact, and destruction of highly valued social and cultural matters	Prosecution, potential jail sentences for directors and senior officers. Prolonged litigation, heavy fines (>\$50M), threat to license to operate and future approvals		A Catastrophic	6	5	4 Critical Risk	3	2
B	\$100M - \$1B	> 10 days Ichthys full shutdown	2 - 20 fatalities or permanent total disabilities	Large scale event, long term impact on environment. Extensive impact on populations of protected species	International multi-NGO and media condemnation. Host government registers concerns. Prolonged large protests. Company reputation seriously impacted	Major and widespread disruption to a number of communities with damage to highly valued social and cultural matters	Prosecution of company, directors or senior officers. Prolonged litigation, heavy fines (<\$50M), significant restrictions on license to operate	B Major	7	6	5	4	3	2
C	\$10M - \$100M	3 - 10 days Ichthys full shutdown	Serious injury or fatality	Medium to large scale event, medium term impact on environment. No threat to overall population viability of protected species	Serious public or national media outcry. Damaging NGO campaign. Large protests. Company reputation impacted	Significant disruption and impact to a community, regional communities, and to social and cultural matters of significant value	Significant, or multiple moderate breaches of legislation, regulation, contract or licence conditions. Significant litigation and fines (<\$5M)	C Significant	8	7	6 High Risk	5	4	3
D	\$1M - \$10M	1 - 3 days Ichthys full shutdown	Permanent partial disability, serious illness or lost time injury	Local to medium scale event with short to medium term impact on environment. No threat to overall population viability of protected species	Major adverse national media, public or NGO attention. Significant protests. Asset reputation impacted	Regional community concern or disruption with moderate impact on social and cultural values	Moderate breach of legislation, regulation, contract or licence condition. Investigation by regulatory authorities. Potential litigation and moderate fines (<\$1M)	D Moderate	9	8	7	6	5	4
E	\$100K - \$1M	Production Trip with immediate restart < 1 day Ichthys full system lost production	Alternate duties injury, medical treatment injury, minor illness	Local scale event with short term impact on the environment. Minor and temporary impact on a small portion of the population of protected species	Attention from regional media with heightened concern of local community. Criticism by community or NGOs	Minor and localised community concern or disruption with limited and short-term impact on social and cultural values	Minor breach of legislation, regulation, contract or licence condition. Report provided to regulatory authorities. Potential for minor fines (<\$100K)	E Minor	10	9	8 Moderate Risk	7	6	5
F	< \$100K	Insignificant production impact	First aid case	Local scale event with temporary impact on environment. Behavioural responses inconsequential ecological significance to protected species	Short term local concern or complaints. Low level media or regulatory issue - potential for community or union concerns	Isolated community concern with no lasting effect on social and cultural values	Breach of internal standards. Potential scrutiny by regulatory authorities	F Insignificant	10	10	9 Low Risk	8	7	6

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Figure 5-2: INPEX risk matrix

**Table 5-1: Risk assessment summary outcomes**

Activity	Aspect	Potential interaction with the environmental receptors	Management controls	Residual risk		
				Consequence	Likelihood	Residual risk
Storage and handling of hazardous materials. Refuelling of equipment/vehicles.	Hazardous materials and chemicals	Loss of contaminants or spills of chemicals, hydrocarbons, and hazardous substances resulting in contamination of soils within and adjacent to Project activities. Contamination of water by mishandling of fuels and/or hazardous waste.	Refer to Section 6.9.	Minor (E)	Unlikely (4)	Moderate (8)
Excavation, trenching, piling disturbance below ground level. Temporary storage of piling spoil.	Exposure of ASS/PASS	Disturbance of Acid Sulphate Soils (ASS) resulting in contamination of soil or receiving water (acidic and metalliferous drainage). Contamination of groundwater due to disturbance of ASS.	Refer to Section 6.2.	Minor (E)	Highly unlikely (5)	Low (9)
Earthworks, excavation, trenching, stockpiles.	Erosion and sediment control	Erosion and soil loss impacting soil quality and structural integrity and resulting in sedimentation to receiving environment. Reduced habitat quality as a result of sedimentation. Sedimentation from disturbed areas resulting in turbidity in receiving water.	Refer to Section 6.1.	Insignificant (F)	Unlikely (4)	Low (9)
Earthworks, excavation and trenching	Biting insects	Pooling of water resulting in creation of biting insect habitat.	Refer to Section 6.1.	Insignificant (F)	Unlikely (4)	Low (9)
Earthworks, excavation and trenching	Cultural heritage and sacred sites management	Disturbance to a sacred site. Discovery of previously unidentified heritage object or site.	Refer to Section 6.7.	Moderate (D)	Remote (6)	Low (9)
Dewatering of trenches and excavations.	Groundwater quality	Changes to groundwater levels and water quality	Refer to Section 6.1.	Insignificant (F)	Possible (3)	Low (9)
Fuel combustion from vehicles, vessels, machinery and equipment	Air emissions - NO <sub>x</sub> , SO <sub>x</sub> , greenhouse gases, particulates (PM <sub>10</sub> , PM <sub>2.5</sub> ).	Reduction in ambient air quality. Contribution to greenhouse gas emissions.	Refer to Section 6.4.	Minor (E)	Highly unlikely (5)	Low (9)
Earthworks, truck movement, heavy machinery, piling, trenching, pneumatic testing and line blowing.	Air emissions - dust	Reduced habitat quality as a result of dust laden vegetation surrounding the Project area. Reduced air quality due to dust generated during construction.	Refer to Section 6.4.	Insignificant (F)	Unlikely (4)	Low (9)
Wastewater discharges at the temporary MOF outfall	Wastewater discharged to Darwin Harbour	Pollution of marine water (Darwin Harbour). Bioaccumulation and toxicity effects. Alteration of the marine environment through wastewater discharges.	Refer to Section 6.8.	Minor (E)	Highly unlikely (5)	Low (9)
Earthworks, truck movement, heavy machinery, piling, trenching, pneumatic testing and line blowing.	Noise - auditory	Loud construction noise disturbing threatened and/or migratory fauna, including migratory birds, causing them to leave the surrounding habitat.	Refer to Section 6.3.	Insignificant (F)	Unlikely (4)	Low (9)

Activity	Aspect	Potential interaction with the environmental receptors	Management controls	Residual risk		
				Consequence	Likelihood	Residual risk
		Noise and vibration emissions from construction activities that could affect the amenity of surrounding sensitive residential receptors.				
Night construction or commissioning works requiring artificial lighting	Fauna management	Potential for light spill to alter nocturnal activities of native and threatened species.	Refer to Section 6.6.	Insignificant (F)	Unlikely (4)	Low (9)
Vehicle / machinery movement, earthworks, excavation, trenching	Fauna management	Mortality and/or injury of individuals due to vehicle strike and/or earthwork activities.	Refer to Section 6.6.	Insignificant (F)	Unlikely (4)	Low (9)
Biosecurity (international) – Transport and import of modules from overseas locations.	Biosecurity management	Introduction of invasive species and/or disease. Introduction of marine pest species.	Refer to Section 6.5.	Moderate (D)	Highly unlikely (5)	Low (9)
		Competition for resources with native species. Predation of native species. Introduction of diseases.				
Generation of hazardous and non-hazardous waste during construction and commissioning activities.	Waste management	Inappropriate storage, handling, distribution or disposal of chemicals/liquid (hazardous) waste resulting in: <ul style="list-style-type: none"> <li>Contamination of groundwater.</li> <li>Contamination of soil.</li> <li>Contamination of surface water.</li> <li>Pollution of marine water (Darwin Harbour).</li> <li>Damage to benthic environment (Darwin Harbour).</li> <li>Bioaccumulation and toxicity.</li> <li>Impact to fauna.</li> <li>Attraction of fauna or introduced terrestrial species to waste.</li> <li>Indirect impacts to fauna through predation.</li> <li>Impact to vegetation.</li> <li>Generation of odour.</li> </ul>	Refer to Section 6.8.	Minor (E)	Unlikely (4)	Moderate (8)
Water supply and use for construction and commissioning activities	Water resource management	Overuse of water resource.	Refer to Section 7.8.	Insignificant (F)	Unlikely (4)	Low (9)

## 6 ENVIRONMENTAL MANAGEMENT

The following sections describe the environmental management frameworks (EMFs) that will be implemented to manage specific aspects and activities associated with the construction, construction, installation, pre-commissioning, cold commissioning and preservation, in order to minimise/mitigate the risk to sensitive receptors.

Environmental objectives, targets and indicators have been developed for each EMF in order to demonstrate the effectiveness of controls in minimising impacts. Further, the EMFs have been developed using a standard template to ensure information is presented in a uniform and consistent manner (Table 6-1 and Table 6-2).

**Table 6-1: Environmental objectives, targets and indicators**

Objective/s	Target/s	Indicator/s
The overarching environmental objective/s to be achieved. Where the objective relates to a NT EPA (2025) environmental factor, the environmental factor objective has been used.	The target that must be met in order to achieve the overarching objective/s.	The factor to be measured to assess whether the target/s have been achieved.

**Table 6-2: Environmental management framework template**

Item	Controls
Element	Aspect that requires management.
Applicable legislation, guidelines and standards	The international conventions, Territory/State legislation, standards and guidelines applicable to the Project.
Management actions	All tasks to be undertaken to meet the objective/s. For example, implement sediment and erosion control measures.
Monitoring	Activities that will be performed to monitor the success of meeting the objective/s and target/s or management actions.
Applicable period	Active period of management framework or relevant management plan.

## 6.1 Erosion and sediment control management framework

During the Project, erosion and sediment loss may occur as result of civil construction activities (i.e. excavations, trenching, etc.). If erosion and sediment loss is not managed during the wet season, there is the potential to impact on the integrity and quality of the adjacent terrestrial/marine environments (i.e. sedimentation resulting in reduced water quality) as a result of surface water run-off.

The objectives, targets and indicators for management of erosion and sediment loss are described in Table 6-3. The management actions to be implemented to assist in achieving these are described within the erosion and sediment control management framework in Table 6-4.

**Table 6-3: Erosion and sediment control management objectives, targets and indicators**

Objective/s	Target/s	Indicator/s
<ul style="list-style-type: none"> <li>Terrestrial environmental quality: Protect the quality and integrity of land and soils so that environmental values are supported and maintained.</li> <li>Hydrological processes: 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.</li> <li>Marine environmental quality: Protect the quality and productivity of water, sediment and biota so that environmental values are maintained.</li> </ul>	Erosion and sediment controls are implemented and maintained.	<ul style="list-style-type: none"> <li>Sediment and erosion control structure inspection records.</li> <li>Maintenance records of erosion and sediment control structures.</li> </ul>
	Discharged stormwater and construction water will comply with obtained approvals and criteria identified within the any endorsed erosion and sediment control plan.	Quality of water discharged from erosion and sediment control structures.
	100% of workforce has completed a Project HSE induction which will include information on erosion and sediment control management.	Training records.

**Table 6-4: Erosion and sediment control management framework**

Erosion and sediment control management framework	
Element	Soil erosion and transport of sediment during rainfall events.
Applicable legislation, guidelines and standards	<i>Water Act 1992</i> (NT) IECA Best Practice Erosion and Sediment Control Guidelines (IECA 2008)
Management actions	<ul style="list-style-type: none"> <li>Soil disturbance activities will be minimised as far as practicable.</li> <li>Where practicable, earthworks and trenching activities will be undertaken during the dry season (i.e. May to October).</li> </ul>

<b>Erosion and sediment control management framework</b>	
	<ul style="list-style-type: none"> <li>• A site-specific Erosion and Sediment Control Plan (ESCP) will be prepared in accordance with the IECA Best Practice Erosion and Sediment Control Guidelines (IECA 2008) and endorsed by a Certified Professional Erosion and Control Specialist, to manage erosion risk. The ESCP will include: <ul style="list-style-type: none"> <li>- temporary and permanent control measures</li> <li>- protection of stockpiles and exposed soil areas</li> <li>- ongoing inspection and maintenance of controls when in effect.</li> </ul> </li> <li>• Erosion protection infrastructure (e.g. silt fencing, contouring, etc.) will be installed in accordance with developed ESCP to ensure that sediment is contained within the construction area as far as is practicable.</li> <li>• All stormwater discharge from within the construction area will be in accordance with water quality criteria within the ESCP.</li> <li>• Any dewatering (where water is attributable to rainfall only) of trenches, open excavations will be subject to EPC dewatering permit process.</li> <li>• Controls within the ESCP will be implemented prior to the commencement of wet season (i.e. September).</li> <li>• Clean surface-water run-off will be diverted around the perimeter of the construction area to the existing stormwater drain system (NCW), where practicable.</li> <li>• If soil erosion is evident, exposed surfaces at the affected area will be stabilised with whatever means is considered practicable (e.g. matting, soil stabiliser, etc.) to mitigate and stabilise the area in accordance with the ESCP to meet the water-quality requirements.</li> <li>• Long term soil stockpiles (&gt;1 month) will be protected to avoid or minimise erosion. Short-term stockpiles will be stabilised if warranted by site-specific risks. Stabilisation techniques may include compaction, soil stabilisers, matting or other slope stabilisation products.</li> <li>• Regular visual inspections are carried out for mosquito larvae in high-risk areas and controls / remediation will be implemented as required.</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>• Prior to the commencement of the wet season (i.e. September) installed erosion and sediment controls will be inspected to identify any issues or maintenance requirements.</li> <li>• During the wet season (October-April) erosion and sediment control devices will be inspected regularly to check they are maintained and are in good working order.</li> <li>• Visual inspections will be undertaken of existing stormwater drainage system adjacent to construction activities, and where sediment build up is evident this will be removed.</li> </ul>
Applicable period	Erosion and sediment control measures are in place prior to the commencement of any wet season whilst civil construction activities (e.g. earthworks, trenching and excavations) are occurring.

<b>Erosion and sediment control management framework</b>	
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	Ongoing inspection and maintenance of erosion control measures during the wet season.
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## 6.2 Acid sulphate soil management framework

During the Project, acid sulphate soils (ASS) may be encountered in areas where civil construction activities (e.g. earthworks, excavations, trenching, etc.) are occurring within the pipeline ROW. If encountered ASS is not managed, there is the potential to impact on the integrity and quality of the terrestrial and marine environments if sulfuric acid leachate (generated when ASS is exposed to oxygen) results in acidification of surrounding soils and water. ASS is not anticipated to be encountered within the Bulk Area.

The objectives, targets and indicators for management of ASS are described in Table 6-5. The management actions to be implemented to assist in achieving these are described within the ASS management framework in Table 6-6.

**Table 6-5: Acid sulphate soils management objectives, targets and indicators**

Objective/s	Target/s	Indicator/s
<ul style="list-style-type: none"> <li>Terrestrial environmental quality: Protect the quality and integrity of land and soils so that environmental values are supported and maintained.</li> <li>Hydrological processes: 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.</li> <li>Marine environmental quality: Protect the quality and productivity of water, sediment and biota so that environmental values are maintained.</li> </ul>	No incidents of Project attributable mobilisation of heavy metals and acidification products to the surrounding environment.	<ul style="list-style-type: none"> <li>Incident and investigation records.</li> <li>Records of ASS presence in sediment/soil/surface water.</li> </ul>
	100% of workforce has completed a Project HSE induction which will include information on ASS/PASS management.	Training records.

**Table 6-6: ASS/PASS management framework**

Item	Content
Element	Exposure of ASS/PASS during civil construction activities.
Applicable legislation, guidelines and standards	<p><i>Waste Management and Pollution Control Act 1998</i> (NT)</p> <p>National Acid Sulfate Soils Guidance: Guidance for the dewatering of acid sulfate soils in shallow groundwater environments (Shand et al. 2018).</p> <p>National Acid Sulfate Soils Guidance: National acid sulfate soils sampling and identification methods manual (Sullivan et al. 2018)</p> <p>Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines Version 5.1 (Dean et al. 2024)</p>

Item	Content
Management actions	<ul style="list-style-type: none"> <li>• Based on previous studies PASS/ASS is highly unlikely to be encountered within the Bulk Area.</li> <li>• While the chance of encountering ASS/PASS within the pipeline ROW within Ichthys LNG is considered highly unlikely, a geotechnical program will be undertaken to confirm the presence/absence of PASS/ASS, prior to commencement of construction.</li> <li>• Site inductions will include basic identification of ASS (i.e. visual indicators, odour, etc.).</li> <li>• Where suspected PASS/ASS is encountered during excavations it will be kept separate from other spoil material.</li> <li>• Any suspected PASS/ASS will be transferred to a dedicated treatment pad for stockpiling.</li> <li>• ASS/PASS may either be treated onsite or removed from site and disposed of by suitably licenced waste contractor capable of accepting untreated ASS.</li> <li>• Where onsite stockpiling/treatment of ASS is required, dedicated PASS/ASS treatment pads will be constructed in accordance with National guidance (Shand et al. 2018). The treatment pad/s will: <ul style="list-style-type: none"> <li>- be hydrologically isolated.</li> <li>- include a 300m thick compacted (to achieve appropriate low permeability) layer of non-ASS clayey material/impervious physical barrier as the basal layer</li> <li>- include a guard layer of neutralising agent on top of the basal layer (prior to placement of soils requiring treatment)</li> <li>- include diversion drains to prevent stormwater run-on into the treatment pad.</li> <li>- ensure stormwater runoff and leachate is contained within the treatment pad by suitable bunds (min of 1 m) and can be collected in a sump or detention basin.</li> </ul> </li> <li>• A suitably qualified person will undertake sampling and assessment of the material to confirm the presence of ASS and determine the required treatment rate.</li> <li>• An ASS/PASS management procedure will be developed in accordance with the requirements of the National guidelines and prescribe: <ul style="list-style-type: none"> <li>- sampling design, methods and minimum samples to be taken.</li> <li>- Sample analysis methods (e.g. chromium reducible sulphur method, titratable actual acidity method and net acid soluble sulphur method) used to determine treatment requirements.</li> <li>- Treatment (neutralisation) options (e.g. lime).</li> <li>- Verification testing methods and validation criteria to confirm success of treatment</li> <li>- Adaptive management actions if treated ASS does not meet the validation criteria.</li> <li>- Maintenance of sampling/testing records.</li> </ul> </li> </ul>

Item	Content
	<ul style="list-style-type: none"> <li>Treated ASS materials will not be used as backfill within excavations below the groundwater table.</li> </ul>
Monitoring	Sampling and analysis of suspected ASS/PASS material to determine appropriate management measures.
Applicable period	During civil construction activities (e.g. earthworks, trenching and excavations).

### 6.3 Noise and vibration management framework

During the Project, noise and vibration emissions will be generated as result of construction (e.g. piling, earthworks), pre- and cold-commissioning activities (e.g. line blowdowns, pneumatic testing). If noise and vibrations emissions are not managed, there is the potential to impact on the values of terrestrial habitats (and fauna that use them) and residential communities adjacent to the Project Area.

The objectives, targets and indicators for management of noise and vibration are described in Table 6-7. The management actions to be implemented to assist in achieving these are described within the noise and vibration management framework in Table 6-8.

**Table 6-7: Noise and vibration objectives, targets and indicators**

Objective/s	Target/s	Indicator/s
<ul style="list-style-type: none"> <li>Community and economy: Enhance communities and the economy for the welfare, amenity and benefit of current and future generations of Territorians.</li> <li>Terrestrial ecosystems: Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.</li> </ul>	Noise at site boundary remains within predicted levels.	Noise monitoring results.
	No community complaints relating to noise received during Project activities.	Complaints log.

**Table 6-8: Noise and vibration management framework**

Item	Content
Element	Noise and vibration resulting from construction activities.
Applicable legislation, guidelines and standards	<p><i>Waste Management and Pollution Control Act 1998</i> (NT)</p> <p>Matters of National Environmental Significance: Significant impact guidelines 1.1 – <i>Environment Protection and Biodiversity Conservation Act 1999</i> (DEWHA 2013).</p> <p>EPBC Act Policy Statement 3.21: Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DEE 2017).</p>

Item	Content
	<p>Guidelines for Assessment of Impacts on Terrestrial Biodiversity (NT EPA 2013a)</p> <p>Australian Standard AS 2436 Guide to noise and vibration control on construction, maintenance and demolition sites.</p>
Management actions	<ul style="list-style-type: none"> <li>• Piling method (bored) selected that minimise impacts of noise and vibration to sensitive receptors.</li> <li>• Acoustic barriers or enclosures will be installed around noisy activities, as required.</li> <li>• Machinery and vehicles will be maintained and operated to minimise noise and vibration generation (e.g. noise-attenuation devices, vibration dampening).</li> <li>• As required, Project stakeholders and neighbours will be notified about dates, times, and nature of potential noise-generating activities and mitigation measures to be implemented.</li> <li>• An enquiries hotline will be maintained and monitored.</li> <li>• A transport management plan will be implemented to manage the movement of construction vehicles and plant to and from the Project site.</li> </ul>
Monitoring	<p>Noise monitoring to validate modelling outcomes will be undertaken during piling and cold-commissioning activities (i.e. line blowing).</p>
Applicable period	<p>Throughout Project activities.</p>

## 6.4 Dust and air emissions management

During the Project, dust and air emissions will be generated as result of construction (e.g. earthworks), pre- and cold-commissioning activities (e.g. leak testing). If dust and air emissions are not managed, there is the potential to impact on the values of terrestrial habitats (and fauna that use them) and residential communities adjacent to the Project Area.

The objectives, targets and indicators for management of dust and air emissions are described in Table 6-9. The management actions to be implemented to assist in achieving these are described within the dust and air emissions management framework in Table 6-10.

**Table 6-9: Dust and air emissions objectives, targets and indicators**

Objective/s	Target/s	Indicator/s
<ul style="list-style-type: none"> <li>Air quality: Protect air quality and minimise emissions and their impact so that environmental values are maintained.</li> <li>Terrestrial ecosystems: Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.</li> </ul>	No significant airborne dust emissions beyond the Ichthys LNG facility boundary.	<ul style="list-style-type: none"> <li>Visual observations/site inspection records</li> <li>Incident and investigation records.</li> </ul>
	Dust deposition on vegetation adjacent to the Ichthys LNG facility boundary are not above typical levels expected for construction.	<ul style="list-style-type: none"> <li>Visual observations/site inspection records</li> <li>Incident and investigation records.</li> </ul>
	No community complaints relating to dust during Project activities.	Complaints log.

**Table 6-10: Dust and air emissions management framework**

Item	Content
Element	Dust generated during civil construction activities.
Applicable legislation, guidelines and standards	National Environment Protection (Ambient Air Quality) Measure (Cwlth) <i>Waste Management and Pollution Control Act 1998 (NT)</i>
Management actions	<ul style="list-style-type: none"> <li>Where practicable, construction activities will be planned, scheduled and executed to avoid the generation of dust.</li> <li>Where, generation of dust is unavoidable, dust-suppression techniques to protect vegetation, worker health and amenities will be implemented.</li> <li>Sources of water for dust suppression may include: <ul style="list-style-type: none"> <li>scheme water (PWC)</li> <li>suitably treated water from, on-site water tanks and dewatered excavations.</li> </ul> </li> <li>Dust-suppressant additives may be used to increase effectiveness and to reduce the volume of water required.</li> </ul>

Item	Content
	<ul style="list-style-type: none"> <li>• Mobile concrete batch plants and crushing and screening plant must be operated with suitable dust-extraction systems, screens, enclosures and/or sprays where practicable to minimise dust.</li> <li>• Aggregate and sand stockpiles associated with mobile concrete batch plant will be contained within bunkers, kept damp or otherwise treated/converted so as to minimise airborne dust.</li> <li>• Dust associated with the operation of mobile concrete batch plants will be managed consistent with the Environmental Best Management Practice Guideline for Concreting Contractors (NSW DEC 2004).</li> <li>• Multiple handling of soil and rock materials will be minimised.</li> <li>• Loads in all trucks transporting soil, aggregate or other dust-generating materials to and from the construction area must be covered.</li> <li>• Dust generation from offloading/handling materials will be reduced by minimising the height of the drop, and by use of a chute, screens, enclosures, sprays, covers, dust guards, and dust extraction systems as appropriate.</li> <li>• Stockpiles will be managed to reduce dust-generation. Controls may include: <ul style="list-style-type: none"> <li>- locating stockpiles in areas protected from wind</li> <li>- minimising the number and size of stockpiles</li> <li>- using watering sprays and/or plastic covers on piles if wind is lifting material</li> <li>- spraying surfaces using water trucks.</li> </ul> Stockpile management shall be in accordance with IECA (2008) guidelines. </li> <li>• All vehicles and machinery will be fitted with appropriate emission-control equipment, will be maintained. Regular inspection and maintenance of vehicles, plant, equipment and machinery will be completed. Pre-start inspection records and equipment maintenance logs will be completed.</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>• Visual observations/site inspections will be undertaken to confirm no significant airborne dust and/or dust deposition on vegetation beyond the Ichthys LNG facility boundary.</li> <li>• Site inspections of spoil stockpiles.</li> </ul>
Applicable period	Throughout Project activities.

## 6.5 Biosecurity management framework

During the Project, the import of modules from overseas locations has the potential to introduce marine pests<sup>5</sup> or exotic environmental pests<sup>6</sup> into Australia. If biosecurity aspects of the Project are not managed, there is the potential to impact on the quality of adjacent terrestrial/marine environments if a pest species was introduced and established within adjacent terrestrial/marine environments.

The Project site was cleared during the construction of the Ichthys LNG facilities, with no remaining vegetation existing within the Ichthys LNG. Annual weed surveys have recorded a number of species within Ichthys LNG facility, which are listed as declared weeds under the *Weeds Management Act 2001* (NT).

The objectives, targets and indicators for management of biosecurity are described in Table 6-11. The management actions to be implemented to assist in achieving these are described within the biosecurity management framework in Table 6-12.

**Table 6-11: Biosecurity objectives, targets and indicators**

Objective/s	Target/s	Indicator/s
<ul style="list-style-type: none"> <li>Terrestrial ecosystems: Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.</li> <li>Marine ecosystems: Protect marine habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.</li> </ul>	No increase in the abundance or distribution of declared weed species or introduction of exotic environmental pests attributable to Project activities.	Incident and investigation records.
	All personnel involved in module import and receipt at the Ichthys LNG facility will undertake DAFF biosecurity awareness training.	Training records.
	No introduction of marine pest attributable to Project activities.	Incident and investigation records.

**Table 6-12: Biosecurity management framework**

Item	Content
Element	Introduction of marine pests, exotic species or spread of invasive species.
Applicable legislation, guidelines and standards	<ul style="list-style-type: none"> <li><i>Biosecurity Act 2015</i> (Cwlth)</li> <li>Biosecurity Amendment (Biofouling Management) Regulations 2021 (Cwlth)</li> </ul>

<sup>5</sup> The Department of Agriculture, Fisheries and Forestry (DAFF; Cwlth) defines a "marine pest" as: marine plants or animals that not native to Australia but have been introduced by human activities such as shipping, that have the potential to significantly impact on marine industries and the environment. <<https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/marine-pests>>

<sup>6</sup> The DAFF (Cwlth) defines "exotic environmental pests" as: weeds, animals or diseases that are not present in Australia. <<https://www.agriculture.gov.au/biosecurity-trade/policy/environmental/exotic-environmental-pests#:~:text=Exotic%20environmental%20pests%20are%20weeds,are%20trying%20to%20eradicate%20the>>

Item	Content
	<ul style="list-style-type: none"> <li>• <i>Fisheries Act 1988</i> (NT)</li> <li>• <i>Weeds Management Act 2001</i> (NT).</li> <li>• Australian ballast water management requirements (DAWE 2020).</li> <li>• Australian biofouling management requirements (DAFF 2023)</li> </ul>
Management actions	<p><b>International imports</b></p> <ul style="list-style-type: none"> <li>• Contractor vessels/barges transporting modules will comply with the relevant requirements of the <i>Biosecurity Act 2015</i>, supporting instruments and guidance relating to ballast water and biofouling management and report this via the Commonwealth Maritime and Aircraft Reporting System prior to entry into Australian waters.</li> <li>• Personnel directly involved in the import of modules and receipt of modules at the MOF location will complete the DAFF Biosecurity Awareness eLearning package.</li> <li>• INPEX will engage with DAFF to obtain “first point of entry” status for the MOF, to allow for the import of modules directly to the Ichthys LNG facility.</li> <li>• A site-specific biosecurity management plan for module imports at the MOF will be developed and approved by DAFF prior to implementation. Content of the biosecurity management plan will align with the following DAFF standards: <ul style="list-style-type: none"> <li>- Biosecurity incident response standard</li> <li>- Waste goods management standard</li> <li>- General port facility standard</li> <li>- Biosecurity risk awareness standard</li> <li>- Environmental management standard.</li> </ul> </li> <li>• A biosecurity approved premises will be established in proximity to the MOF receipt area to allow for isolation and further cleaning/remediation of equipment (where deemed necessary by a DAFF officer).</li> <li>• Darwin Harbourmaster will be notified of planned module delivery schedules, and INPEX will develop relevant communication materials notifying harbour-users.</li> </ul> <p><b>Weed management</b></p> <ul style="list-style-type: none"> <li>• Site inductions include information regarding weed and terrestrial pest identification and management.</li> <li>• All works will be undertaken in existing cleared and hard stand areas of the Ichthys LNG facilities.</li> <li>• All works will be subject to following requirements for weed management at the Ichthys LNG facility under the Onshore OEMP: <ul style="list-style-type: none"> <li>- When required vehicles, machinery and equipment entering and exiting the Ichthys LNG site from outside of Darwin will be subject to cleaning such that the vehicle is clean and free from weed and seed material.</li> <li>- Vehicles, equipment and machinery washdown is only undertaken at designated washdown areas.</li> </ul> </li> </ul>

<b>Item</b>	<b>Content</b>
	<ul style="list-style-type: none"> <li>- Weed control activities are undertaken at the Ichthys LNG facility on a regular basis in accordance with the NT Weed Management Handbook.</li> </ul>
Monitoring	Biosecurity inspections upon receipt of modules at the MOF. Weed monitoring (as per OEMP requirements).
Applicable period	Throughout Project activities.

## 6.6 Fauna management framework

There is no existing habitat within the boundaries of the Ichthys LNG facility which would support fauna; however, during Project activities, there is potential for interaction with fauna that come within the Ichthys LNG facility fence line.

The objectives, targets and indicators for management of fauna are described in Table 6-13. The management actions to be implemented to assist in achieving these are described within the fauna management framework in Table 6-14.

**Table 6-13: Fauna management objectives, targets and indicators**

Objective/s	Target/s	Indicator/s
Terrestrial ecosystems: Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.	No incidents related to fauna injuries or deaths attributable to Project activities.	Incident and investigation records.
	100% of workforce has completed a Project HSE induction which will include information on terrestrial fauna management.	Training records.

**Table 6-14: Fauna management framework**

Item	Content
Element	Interactions with fauna during construction activities.
Applicable legislation, guidelines and standards	<ul style="list-style-type: none"> <li><i>Environment Protection and Biodiversity Conservation Act 2008</i> (Cwlth).</li> <li><i>Territory Parks and Wildlife Conservation Act 1976</i> (NT).</li> </ul>
Management actions	<ul style="list-style-type: none"> <li>Fencing is installed around the perimeter of the Ichthys LNG site, which prevents access by large fauna species (e.g. wallabies, crocodiles, etc.).</li> <li>Site inductions include information regarding fauna and ecological values adjacent to the Project area, key activities that may impact on fauna and fauna management requirements.</li> <li>Site speed limits are enforced to avoid or minimise vehicle strike incidents.</li> <li>Catching, feeding or intentionally harming native or feral animals is prohibited.</li> <li>If injured or trapped native fauna are found within Ichthys LNG, personnel will contact the security office immediately to coordinate the removal and relocation of the animal.</li> <li>If the fauna is injured, the security office will contact the organisation Wildcare Inc. NT for its rescue service (telephone 8988 6121 or 0408 885 341).</li> <li>If the fauna is uninjured, the animal will be captured and released by an accredited wildlife handler in an area of suitable habitat adjacent to Ichthys LNG.</li> </ul>

Item	Content
	<ul style="list-style-type: none"> <li>• If a snake is observed at Ichthys LNG site, an accredited snake-handler will capture and remove the snake from work areas for relocation.</li> <li>• Additional lighting required for night works will be at the minimum required to ensure the safety of personnel.</li> </ul>
Monitoring	Register of relocated fauna.
Applicable period	Throughout the life of Project.

## 6.7 Cultural heritage and sacred site management framework

As identified in Section 4.3, there are no known sacred sites or heritage objects/sites within the Project footprint where ground disturbance works would occur. During the Project, previously unidentified heritage objects may be discovered during civil construction/ground disturbance activities (e.g. excavations, trenching, etc.). If appropriate AAPA Authority Certificates and a chance find procedure are not in place there is the potential to impact on culture and heritage.

The objectives, targets and indicators for management of cultural heritage and sacred sites are described in Table 6-15. The management actions to be implemented to assist in achieving these are described within the cultural heritage and sacred site management framework in Table 6-16.

**Table 6-15: Cultural heritage and sacred site objectives, targets and indicators**

Objective/s	Target/s	Indicator/s
Culture and heritage: Protect culture and heritage	100% of workforce has completed a Project HSE induction which will include information on the cultural heritage chance find process.	Training records.

**Table 6-16: Cultural heritage and sacred site management framework**

Item	Content
Element	Damage or disturbance to sacred sites or previously unidentified heritage objects/sites
Applicable legislation, guidelines and standards	<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cwlth).</i> <i>Aboriginal Land Rights (Northern Territory) Act 1976 (Cwlth).</i> EPBC Act (Cwlth). <i>Heritage Act 2011 (NT).</i> <i>Northern Territory Aboriginal Sacred Sites Act 1989 (NT).</i>
Management actions	<ul style="list-style-type: none"> <li>The entire Project footprint was cleared of vegetation and was subject to standard cut and fill activities (min of 2.5 m) during the construction of the Ichthys LNG facility; approved as part of the Ichthys LNG Development Project.</li> <li>No sacred sites or known heritage sites/objects are present within the Ichthys LNG facility fence line where Project activities would occur (Section 4.3).</li> <li>Relevant APPA Authority certificates have been obtained (Section 4.3.2) and will be provided to contractors undertaking the works.</li> <li>Site inductions will include information on sacred sites, basic information to assist in recognition of heritage sites/objects and the chance find procedure.</li> <li>In the event a potential Aboriginal heritage site/object is discovered during excavation, trenching or other ground disturbance works, the works will cease immediately, and the chance find procedure will be followed:</li> </ul>

Item	Content
	<ul style="list-style-type: none"> <li>- The site will be cordoned off.</li> <li>- Contractor work supervisor is to immediately notify the INPEX Project Construction Manager, providing GPS location, description of site/object and scaled digital photos.</li> <li>- INPEX Project Construction Manager to provide information to the INPEX Aboriginal Affairs Manager to engage suitable heritage consultants/Larrakia heritage monitors (if not already present) to determine if the object/site is a heritage site/object.</li> <li>- Where it is determined the find is a heritage object/site INPEX will notify the Northern Territory Heritage Branch. Where it is determined the find is not a heritage object/site advice provided by heritage consultants/Larrakia heritage monitors will be provided back to INPEX Construction Manager/Contractor to confirm works can re-commence.</li> </ul>
Monitoring	N/A
Applicable period	During ground penetration activities (e.g. excavations, trenching, piling).

## 6.8 Waste management framework

During the Project, waste (including wastewater) will be generated as result of construction, pre- and cold-commissioning activities. Improper of waste has the potential to result in injury to or mortality of marine/terrestrial fauna as a result of ingestion or entanglement, or pollution to the adjacent marine/terrestrial environments.

The objectives, targets and indicators for management of waste and wastewater discharges are described in Table 6-17. The management actions to be implemented to assist in achieving these are described within the waste and liquid discharges management framework in Table 6-18.

**Table 6-17: Waste management objectives, targets and indicators**

Objective/s	Target/s	Indicator/s
<ul style="list-style-type: none"> <li>Marine environmental quality: Protect the quality and productivity of water, sediment and biota so that environmental values are maintained.</li> <li>Terrestrial environmental quality: Protect the quality and integrity of land and soils so that environmental values are supported and maintained.</li> </ul>	Zero incidents of solid waste lost to the marine or terrestrial environment.	Incident and investigation records.
	Zero incidents of unauthorised construction wastewater being discharged to the terrestrial or marine environment	Incident and investigation records.
	100% of workforce has completed a Project HSE induction which will include information on waste management practices.	Training records.

**Table 6-18: Waste management framework**

Waste management framework	
Element	Generation of waste and wastewater during Project activities.
Applicable legislation, guidelines and standards	<ul style="list-style-type: none"> <li><i>National Environment Protection (Movement of Controlled Waste between States and Territories) Measure 1998</i> (Cwlth)</li> <li><i>Transport Of Dangerous Goods by Road and Rail (National Uniform Legislation) Act 2010</i> (Cwlth)</li> <li><i>Waste Management and Pollution Control Act 1998</i> (NT)</li> <li><i>Water Act 1992</i> (NT)</li> <li><i>Marine Pollution Act 1999</i> (NT)</li> <li><i>Litter Act 1972</i> (NT)</li> <li>Movement of Controlled (Listed) Waste: Guide to using the NT Oline Waste Tracking System (DLPE 2024)</li> </ul>
Management actions	<p><b>General</b></p> <ul style="list-style-type: none"> <li>The Site induction will include the following specific components for waste management: <ul style="list-style-type: none"> <li>identification of waste types, including non-hazardous waste, hazardous waste and listed/controlled waste</li> <li>key requirements for handling, transportation and</li> </ul> </li> </ul>

**Waste management framework**

- storage, including segregation of wastes
  - waste storage facilities on site
  - spill clean-up and reporting.
  - Personnel who routinely handle hazardous materials or wastes (e.g. refuelling personnel, pump operators, mechanics, and stores personnel) will receive training in handling, transporting and storing hazardous materials or wastes; in reporting and documentation requirements; and in spill clean-up techniques and practices.
  - The waste hierarchy of avoid, reuse, recycle, recover, treatment, containment and disposal will be used to guide waste management for construction.
  - Chemicals and substances used during the Project will be selected in accordance with the INPEX chemical selection process (Section 7.7.2) and managed to minimise the potential adverse environmental impact associated with their disposal.
  - Up-to-date SDS for chemicals used during the Project activities will be kept in accessible locations.
- Solid waste, spent chemicals, etc. management**
- Waste will be stored in the designated waste stations and appropriately segregated into hazardous waste and non-hazardous waste and where possible into recyclable or reusable hazardous waste and recyclable or reusable non-hazardous waste. In the event of the discovery of any unidentified wastes, these will be treated as hazardous waste and stored accordingly.
  - Biosecurity waste will be managed, transported and disposed of using DAFF approved procedures.
  - Sufficient and appropriate waste receptacles will be provided and must meet the following provisions:
    - adequate number of bins for waste segregation (recycling, reuse and disposal) and sufficient volume
    - labelling that clearly identifies contents
    - sufficient capacity—waste receptacles must not be overfilled
    - appropriateness to the waste being contained (i.e. be compatible, leakproof and fit for purpose)
    - a cover or lid to prevent ingress of rain and/or prevent animals being attracted or having access to putrescible wastes.
  - Appropriate temporary containment facilities will be used for the storage of Listed/Controlled wastes. These facilities will comply with appropriate standards, bunding and containment requirements.
  - Biosecurity waste receptacles will be segregated from other waste streams.
  - Spill kits will be located on site in accessible locations and will be regularly inspected and maintained.
  - Only approved and licensed waste contractors will be engaged for waste disposal.

<b>Waste management framework</b>	
	<ul style="list-style-type: none"> <li>• Only waste providers who are authorised by DAFF will be engaged for disposal of biosecurity waste.</li> <li>• A Contractor waste management procedure will be developed which will describe the waste management strategies, including the management of Controlled wastes. The procedure will adhere to NT EPA Guidelines for Movement of Controlled (Listed) Waste.</li> </ul> <p><b>Wastewater management</b></p> <ul style="list-style-type: none"> <li>• Several options are being considered for the management of wastewater generated during Project activities (i.e. construction, pre-, cold commissioning). These include, but are not limited, the following: <ul style="list-style-type: none"> <li>- transfer to the existing Ichthys LNG evaporation basin (where seasonal conditions permit)</li> <li>- discharge via a temporary outfall at the MOF (subject to issuance of a waste discharge licence under the Northern Territory <i>Water Act 1992</i>)</li> <li>- temporary onsite storage for offsite disposal by a suitably licenced contractor (subject to testing to determine the appropriate disposal method).</li> </ul> </li> <li>• If the option to dispose of wastewater via a temporary MOF outfall is pursued, the following will apply: <ul style="list-style-type: none"> <li>- The outfall design will incorporate use of a multiport diffuse to allow for sufficient near-field dilution within proximity of the discharge point.</li> <li>- Modelling will be undertaken to determine the extent of the required mixing zone, to enable effective dispersion of wastewater.</li> <li>- A waste discharge licence will be applied for under the <i>Water Act 1992</i> (NT).</li> <li>- Any wastewater discharged via the MOF outfall will comply with WDL wastewater quality limits.</li> <li>- A receiving environment water quality monitoring program will be implemented to verify modelling outputs and determine if receiving water is being adversely impacted.</li> </ul> </li> <li>• Wastewater generated during Project activities (e.g. hydrotest water) will be reused where it remains fit for purpose.</li> <li>• A Contractor wastewater management procedure will be developed which will include a description of the proposed wastewater management strategies (capture, storage and disposal) and water quality testing requirements.</li> <li>• Black/grey wastewater associated with temporary ablution blocks, will be collected and disposed of offsite via suitability licenced contractor.</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>• Waste (including wastewater) forecasting and tracking will be undertaken.</li> <li>• Routine housekeeping inspections of waste receptacles and waste storage areas.</li> </ul>

<b>Waste management framework</b>	
	<ul style="list-style-type: none"><li>• Where a temporary outfall at the MOF is used for disposal of construction, pre-, cold commissioning a suitable monitoring plan will be developed and incorporated into this Draft CCEMP.</li></ul>
Applicable period	Throughout the life of Project.

## 6.9 Hydrocarbon and chemical management and spill response framework

During Project activities, improper management of chemicals and hydrocarbons has the potential to result in pollution to the environment.

The objectives, targets and indicators for management of hydrocarbons and chemicals, and response to spill events are described in Table 6-19. The management actions to be implemented to assist in achieving these are described within the hydrocarbon and chemical management framework in Table 6-20.

**Table 6-19: Hydrocarbon and chemical management and spill response objectives, targets and indicators**

Objective/s	Target/s	Indicator/s
Terrestrial environmental quality: 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.	100% compliance with hazardous materials and dangerous good legislation, Australian Standards and safety data sheet requirements.	Incident and investigation records. Inspection/audit records.
	100% of workforce has completed a Project HSE induction which will include information on spill prevention and response practices.	Training records.

**Table 6-20: Hydrocarbon and chemical management and spill response framework**

Item	Content
Element	Hydrocarbon and chemicals management, and spill response.
Applicable legislation, guidelines and standards	<i>Waste Management and Pollution Control Act 1998</i> (NT) <i>Dangerous Goods Act 1998</i> (NT)
Management actions	<ul style="list-style-type: none"> <li>Personnel who routinely handle hazardous materials or wastes (e.g. refuelling personnel, pump operators, mechanics, and stores personnel) will receive training in handling, transporting and storing hazardous materials or wastes; in reporting and documentation requirements; and in spill clean-up techniques and practices.</li> <li>Use, handle, store and dispose of all hazardous materials and dangerous goods will be in accordance with the <i>Dangerous Goods Act 1998</i> and the <i>Waste Management and Pollution Control Act 1998</i>.</li> <li>A variety of temporary bunding will be available for use around the site, including banded pallets and drip trays.</li> <li>Bunds will be checked and emptied before and after heavy rain events.</li> <li>Transfer equipment (e.g. hoses and connections) must be compatible and suitable for the materials being transferred and must be free from defects.</li> <li>Refuelling of vehicles will occur within designated areas.</li> </ul>

Item	Content
	<ul style="list-style-type: none"> <li>• Chemicals and substances used during the Project will be selected in accordance with the INPEX chemical selection process (Section 7.7.2) and managed to minimise the potential adverse environmental impact associated with their disposal.</li> <li>• Safety data sheets will be available on the facilities to aid in the identification of appropriate spill clean-up and disposal methods.</li> <li>• Induction to include information regarding spill response, clean-up and reporting.</li> <li>• Emergency Response Plan and spill response procedure.</li> <li>• Spill kits will be located on site in accessible locations and will be regularly inspected and maintained.</li> </ul>
Monitoring	Routine inspections of hazardous materials areas.
Applicable period	Throughout Project activities.

## 7 ENVIRONMENTAL MANAGEMENT IMPLEMENTATION STRATEGY

This section provides a description of the INPEX Australia BMS which captures the HSE requirements to manage HSE risks and meet legislative and corporate obligations, as applicable to the implementation of this Draft CCEMP.

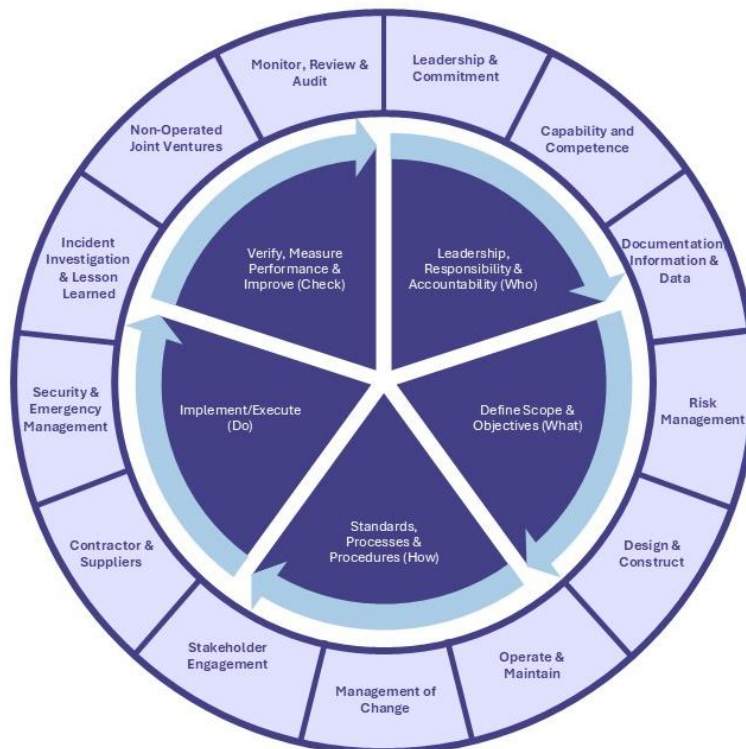
### 7.1 INPEX BMS overview

The BMS is a comprehensive, integrated system that includes standards and procedures necessary for the management of HSE risks. Activities to manage HSE risks are planned, implemented, verified and reviewed under an iterative “plan, do, check, act” (PDCA) cycle. The PDCA cycle enables INPEX to ensure that processes are adequately resourced and managed and that opportunities for improvement are determined and acted on.

INPEX HSE requirements are designed to meet the in-principal expectation of several standards, international management frameworks, guidelines and legislation. Of particular relevance to this Draft CCEMP are the following:

- Environmental Management Plan Guidelines (DCCEEW 2024)
- Guideline for the Preparation of an Environmental Management Plan (NT EPA 2015)
- IOGP 511 Operating Management System in practice
- International Standards Organisation (ISO) 9001 Quality Management Systems
- ISO 14001 Environmental Management Systems.

The components of the BMS relevant to HSE are grouped into 13 external elements (Figure 7-1). These elements have to be managed and implemented properly in order to achieve the desired HSE performance and reflect a PDCA cycle, which is applied to every aspect of the 13 elements.



**Figure 7-1: INPEX BMS - HSE requirements**

## 7.2 EPC contractor HSE management system

The EPC (engineering, procurement and construction) contractor will have a HSE management system, which has been developed to align with the HSE requirements of the INPEX BMS.

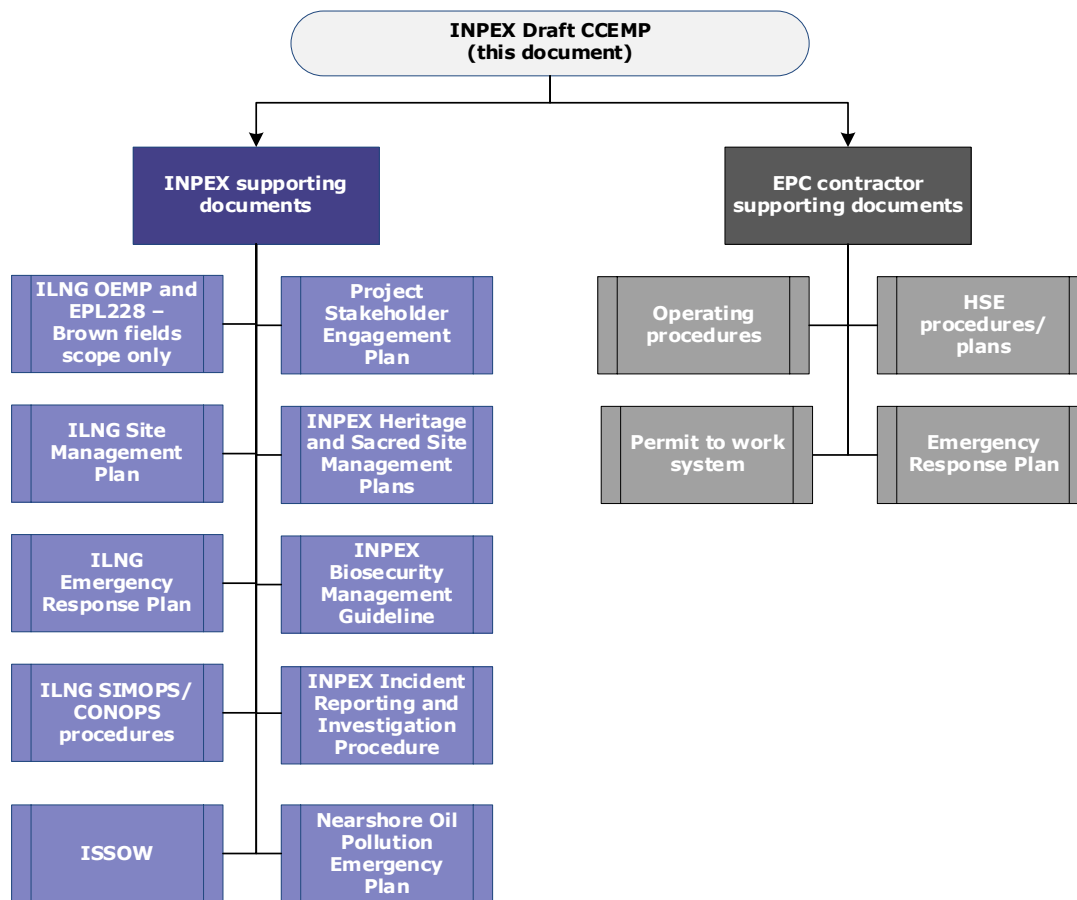
The EPC contractor will develop a HSE management plan (or similar) for the Project scope of work. The plan is required to be aligned with INPEX HSE policies, plans, standards and procedures, in accordance with contract requirements, and will be reviewed and approved by INPEX prior to commencement of Project activities.

The EPC Contractor's HSE management plan (or similar) will, as a minimum:

- address risks associated with the EPC Contractor's scope of work
- demonstrate how this Draft CCEMP will be implemented by the EPC Contractor
- align with INPEX policies, plans, standards and procedures for HSE, in accordance with contract requirements
- address all legal and other requirements applicable to the EPC Contractor's scope of work.

### 7.2.1 Interface with other INPEX and EPC contractor documents

Figure 7-2 illustrates the relationship between this Draft CCEMP and other supporting INPEX and EPC Contractor documents.



**Figure 7-2: Interface documents**

### **7.3 Leadership and commitment**

INPEX environmental performance is achieved through strong visible leadership, commitment and accountability at all levels of the organisation. Leadership includes defining performance targets and providing structures and resources to meet them. Achieving high levels of HSE performance is defined within the highest levels of management system documents (policies) and is cascaded through subsidiary documents.

The INPEX health, safety, security, environment and quality policy (HSSEQ Policy; Figure 7-3) solidifies this commitment and states the minimum expectations for environmental performance. The policy applies to all INPEX controlled activities in Australia including activities associated with the Project. All personnel, including contractors, are required to comply with the policy.

The policy (as amended) is available on the INPEX intranet and displayed at all INPEX workplaces. It will be communicated to personnel involved in the activities, including contractors, through inductions.



## ***Health, Safety, Security, Environment and Quality Policy***

### ***Objective***

INPEX contributes to the creation of a brighter future for society through our efforts to develop, produce and deliver energy in a sustainable way. We are actively supporting a cleaner energy future, as detailed in our [INPEX Vision 2035 – Realizing a Responsible Energy Transition](#) which describes our roadmap for the next decade to deliver global growth and reliable, lower carbon energy.

### ***Strategy***

To accomplish this, INPEX will:

- maintain a strong culture of visible leadership to empower all personnel to achieve HSSEQ goals and objectives
- comply with applicable legislation, INPEX Standards as well as relevant international standards and practices
- maintain trust with all stakeholders by ensuring that process safety risks associated with our operations are identified and demonstrably managed to “As Low As Reasonably Practicable” (ALARP) in addition to HSSEQ risks
- ensure our operations obtain and sustain their regulatory and social licenses to operate through establishing, implementing, proactively challenging and verifying our critical controls and systems of work
- empower people to intervene to control hazards and prevent hazardous acts
- set, measure and review HSSEQ performance objectives and targets
- evaluate HSSEQ risks and opportunities, ensuring appropriate change management processes and controls are in place prior to implementing any change.
- ensure all our personnel have the necessary awareness, competence, knowledge, resources and support to meet HSSEQ objectives and targets
- provide clearly defined HSSEQ performance expectations for our contractors and suppliers, and work collaboratively with them to achieve these
- enable informed decisions through a foundation of open communication with all relevant stakeholders to pursue mutually beneficial outcomes on HSSEQ related matters
- actively promote and prioritize safe, commercially viable measures to reduce greenhouse gas emissions, protect biodiversity, improve waste management and increase understanding of the natural environment across all our operations
- drive improvement in HSSEQ performance by monitoring, auditing, reviews, incident investigation and promoting a culture of continuous learning.

### ***Application***

This policy applies to all INPEX controlled activities in Australia and related project locations. It will be displayed at all company workplaces and on the Company's intranet and it will be reviewed regularly.

A handwritten signature in black ink, appearing to read "村山 敬博" (Murayama Tetsu).

**Tetsu Murayama**  
Managing Director, Country Chair Australia

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**Figure 7-3: INPEX health, safety, security, environment and quality policy**

## 7.4 Capability and competence

INPEX appoints and maintains competent personnel to manage environmental risks and provide assurance that the INPEX health, safety, security, environment and quality policy, objectives and performance expectations will be achieved. This applies to individual competencies established in position descriptions and competency plans that set expectations, track progress and monitor results. It also applies to the overall capability of the organisation through well-defined organisational structures and provision of resources.

### 7.4.1 Roles and responsibilities

INPEX has established and implements standards, procedures and systems to build and maintain a trained and competent workforce capable of fulfilling its assigned roles and responsibilities, as well as meeting its legislative and regulatory requirements. The selection process for the key INPEX personnel identified in Table 7-1 includes consideration of their previous work experience and recognised qualifications when compared with the INPEX minimum competency standards. Key personnel are provided with a position description to formalise their role and define their responsibilities.

The key roles are responsible for collecting and maintaining the required evidence and monitoring data as specified in this Draft CCEMP. Additional supporting roles and responsibilities related to the implementation of HSE requirements are also listed in Table 7-1.

Prior to mobilisation of personnel, those in key roles (Table 7-1) will be informed of their respective responsibilities in relation to this Draft CCEMP.

INPEX conducts 'training needs' analysis for each of the key roles listed in Table 7-1 to define minimum training requirements. The analysis is used to develop training plans which document, schedule and record completion of specific HSE training for individuals.

**Table 7-1: Key INPEX personnel and support roles and responsibilities**

Key role	Responsibilities
General Manager Onshore Projects	Ensures overall compliance with the INPEX BMS HSE requirements including environmental performance outcomes and standards.
INPEX Execution Manager	<ul style="list-style-type: none"> <li>Ensures relevant INPEX BMS HSE requirements are communicated to contractors.</li> <li>Ensures activities are undertaken in accordance with this Project CCEMP.</li> <li>Ensures any changes to the activity that may affect the performance outcomes and environmental management procedures detailed in this Project CCEMP. are communicated to the INPEX HSE team.</li> <li>Ensures availability of resources required to ensure that commitments in this Project CCEMP are met.</li> <li>Ensures the EPC construction manager and personnel adhere to the requirements of the Project CCEMP.</li> <li>Ensures corrective actions raised from environmental audits are tracked and closed out.</li> </ul>
INPEX Execution Lead	<ul style="list-style-type: none"> <li>Ensures the EPC workforce performs activities in a manner consistent with the environmental management procedures detailed in the Project CCEMP.</li> </ul>

Key role	Responsibilities
	<ul style="list-style-type: none"> <li>• Alerts the INPEX Construction Manager to any changes in activities that could have a negative impact on environmental performance.</li> <li>• Ensures any simultaneous operations are conducted in accordance with the Site Plan.</li> </ul>
INPEX HSE Lead	<ul style="list-style-type: none"> <li>• Ensures that environmental audits are undertaken.</li> <li>• Ensures changes that may affect the approved activity or mitigation/management measures are assessed.</li> <li>• Ensures reporting of environmental incidents meets external reporting requirements and INPEX incident reporting requirements</li> </ul>
EPC construction workforce	<ul style="list-style-type: none"> <li>• Participation in inductions, training and meetings as required.</li> <li>• Complying with obtained approval conditions and supporting management plans.</li> <li>• Complying with applicable INPEX policies, standards, procedures, practices</li> <li>• Proactively identifying, reporting and responding to environmental hazards and incidents.</li> </ul>

#### 7.4.2 Organisation

Figure 7-4 illustrates the indicative organisational structure for the Project during execution of the activities at the Ichthys LNG facility.

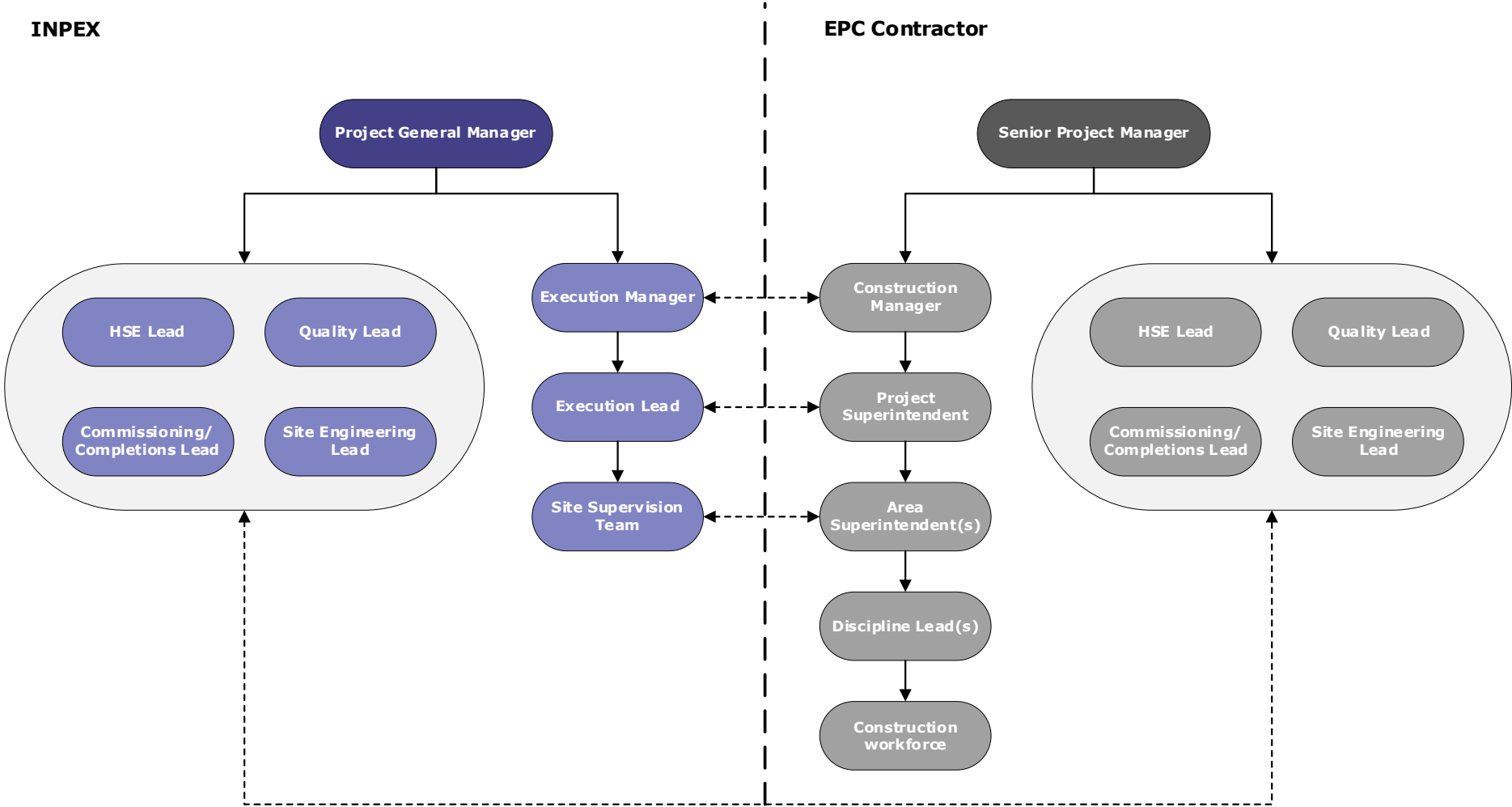


Figure 7-4: Indicative Project organisation structure

### 7.4.3 Inductions and training

Inductions are conducted for all personnel (including INPEX representatives, contractors, subcontractors and visitors) before they commence Project activities described in this Draft CCEMP. Inductions cover the HSE requirements under the INPEX BMS, including information about the commitments contained in this Draft CCEMP and any subsequent approvals obtained. A summary of the inductions and training programs in place to ensure relevant personnel are aware of their responsibilities is presented in Table 7-2.

In addition, environmental awareness is communicated to all personnel through a number of different mechanisms including environmental alerts, environmental bulletin posts on INPEX intranet site and posters displayed at work locations.

**Table 7-2: Inductions and training**

Induction/training course	Target audience	Purpose/Content
HSE Project Induction	All Project personnel (INPEX and EPC)	<p>The HSE induction informs personnel of the social and environmental sensitivities in the vicinity of Project and covers specific environmental management requirements including the following:</p> <ul style="list-style-type: none"> <li>• a general description of the Project, including any environmentally critical activities</li> <li>• overview of environmental approvals and their requirements</li> <li>• adherence to standards and procedures; the use of job hazard analyses (JHAs) and permits to work (PTWs) systems; hazard identification and management process</li> <li>• spill management, including prevention, response and clean up, location of spill kits and reporting requirements</li> <li>• hazardous materials/chemical management requirements</li> <li>• waste management requirements (segregation and appropriate storage of wastes)</li> <li>• erosion and sediment control management requirements</li> <li>• acid sulphate soils management requirements</li> <li>• fauna interaction procedure</li> <li>• cultural heritage chance find procedure</li> <li>• portable water use and conservation</li> <li>• hazard identification and management process</li> <li>• reporting of environmental incidents and hazards.</li> </ul>

Induction/training course	Target audience	Purpose/Content
DAFF Biosecurity awareness training	Personnel involved in module import and receipt at the Ichthys LNG site.	<p>The DAFF online training covers the specific biosecurity matters:</p> <ul style="list-style-type: none"> <li>• Identification of biosecurity risks</li> <li>• Australia’s responsibility and obligations in managing biosecurity risks</li> <li>• How to respond to identified biosecurity risks</li> <li>• Common biosecurity risks at seaport first points of entry.</li> </ul>
Emergency response training	All Project personnel (INPEX and EPC)	Personnel will participate in emergency response training commensurate with allocated roles and responsibilities. Training will be scheduled and maintained in accordance with the requirements of the relevant emergency response plans and HSE training programs.

## 7.5 Documentation, information and data

INPEX implements and maintains document and records management procedures and systems. These are in place to ensure that the information required to support safe and reliable survey operations, is current, reliable and available to those who need it. It also ensures that organisational knowledge and learning is captured and preserved to enable the effective operations of processes to maintain compliant management of HSE information.

Documents and records are stored electronically in INPEX document management systems and databases. This Draft CCEMP and associated documentation are maintained within a database, with current versions also available via the controlled document repository.

Records to demonstrate implementation of the INPEX BMS HSE requirements and compliance with legislative requirements and other obligations are identified and maintained for at least five years. These records include:

- written reports – including risk assessment reports, hazard and risk registers, monitoring reports, ALARP demonstrations and audit and review reports– about environmental performance or implementation strategies
- records relating to environmental performance or the implementation strategies
- records of environmental emissions and discharges
- management of change records
- incident and/or near miss investigation reports
- lessons learned records
- improvement plans (corrective actions, key performance indicators)
- records relating to training and competency in accordance with this Draft CCEMP.

## 7.6 Risk Management

A robust, structured process is applied by INPEX to identify hazards and ensure that HSE risks arising from assets and operations are systematically identified, assessed, evaluated and controlled to levels as low as reasonably practicable.

The risks and impacts associated with Project activities are detailed in Section 5. Additional risk assessments will be undertaken on an ongoing basis when triggered by any of the following circumstances:

- when there is a proposed change to the activity, as identified by a Project MoC request
- when identified as necessary following the investigation of an event
- when additional or new information about environmental impacts or risks becomes available
- if there is a change in regulations, as necessary
- during scheduled reviews of the documentation associated with this Draft CCEMP.

The risk assessments will be carried out in line with the assessment process described in Section 5 and are aligned to the HSE requirements of the INPEX BMS. This ensures that risks related to the activity are systematically identified, assessed, evaluated and controlled.

## 7.7 Design and construct

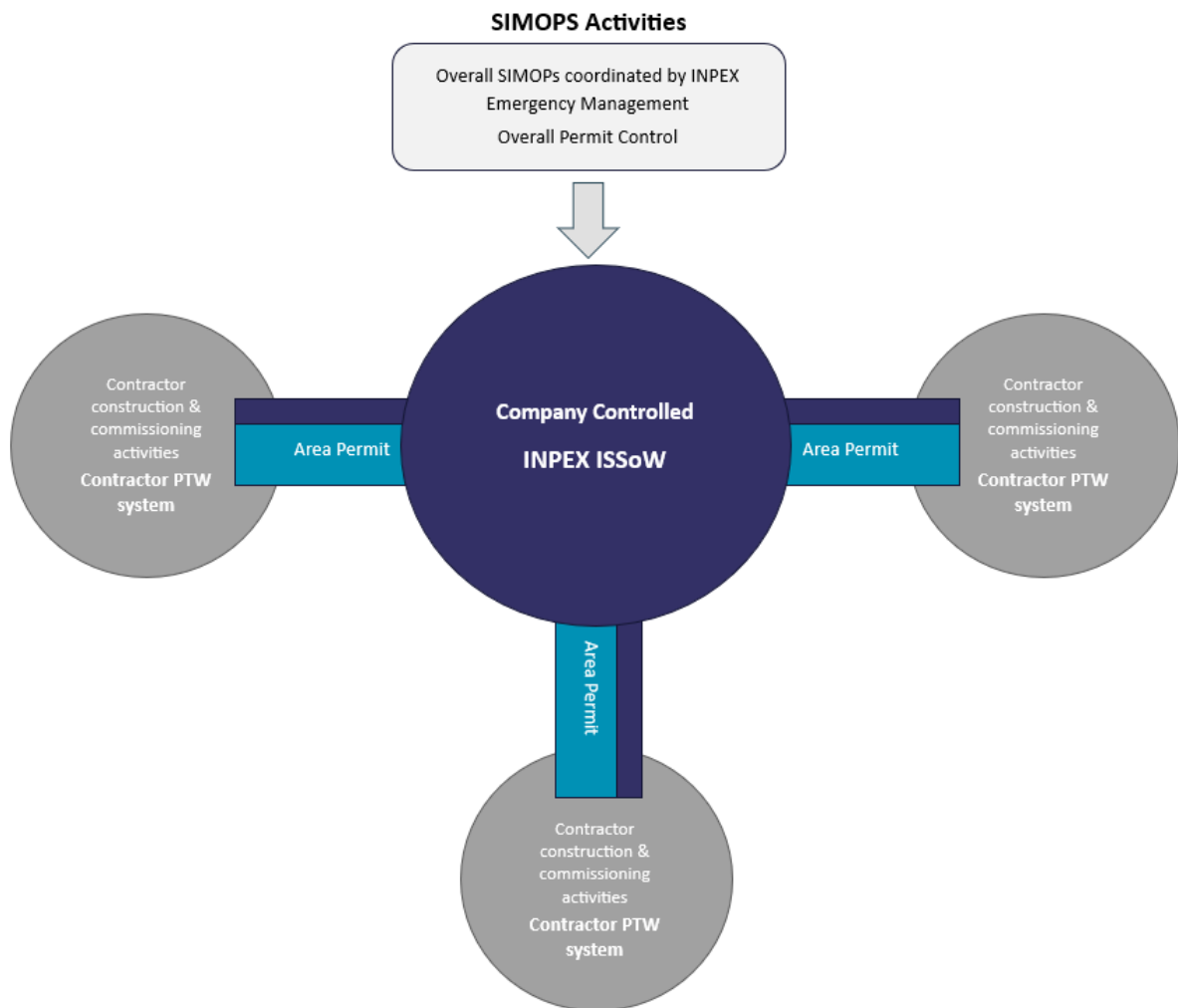
### 7.7.1 Permit to work

INPEX has adopted the Integrated Safe System of Work (ISSoW) as the framework in which all work is to be safely and uniformly managed in INPEX controlled areas and in those areas where INPEX directs that EPC Contractor implements the ISSoW.

Where INPEX directs that the INPEX permit to work system is to be applied in an Area prior to handover, the EPC Contractor shall authorise access to isolation points for personnel implementing isolations under INPEX ISSoW.

Areas in which both INPEX and the EPC Contractor are carrying out activities (i.e. SIMOPS), or areas adjacent to those SIMOPS areas, will be authorised by INPEX by the use of Area Permits.

Area Permits will also apply to any other EPC Controlled Areas that Company deems require Company oversight. The Area Permit will allow Company to require the EPC Contractor to implement required safety measures to manage SIMOPS and will outline conditions to apply over all Permits to Work operating within the specified area. This allows construction, installation, pre- and cold commissioning to proceed according to the EPC Contractor Permit to Work System under the governance of INPEX SIMOPS risk assessment process. Figure 7-5 identifies the interface between INPEX and EPC Contractor Permit to Work systems.



**Figure 7-5: Interface between the Company and EPC Contractor permit to work systems**

### 7.7.2 Chemical assessment and approval

The purpose of the INPEX Chemical Assessment and Approval Procedure is to establish and communicate the process for the assessment and approval of chemicals for use on INPEX sites or facilities. The procedure has been developed to ensure compliance with relevant Australian legislation and to assess chemicals based on toxicity, bioaccumulation and biodegradation potential. By implementing the procedure, exposure to chemicals by personnel and/or the environment resulting from INPEX activities are assessed and controlled. This procedure promotes the use of chemicals that present low health and/or environmental hazard levels. All chemicals required to be used during Project activities will be assessed using the process described in the INPEX Chemical Assessment and Approval Procedure prior to being brought on to the Ichthys LNG facility.

Any chemical that is proposed to be discharged into the marine environment as a part of Project activities will have to undergo an environmental assessment. The assessment considers the following:

- chemical's toxicity, bioaccumulation, and biodegradation potentials
- discharge concentration
- frequency of discharge
- maximum credible volume of chemical anticipated to be discharged in 24 hours

- if the chemical is listed on the Australian Inventory of Chemical Substances (AICS)
- if the chemical or component of the chemical is registered on either the OSPAR priority action or possible concerns lists.

### 7.8 Potable water use and conservation

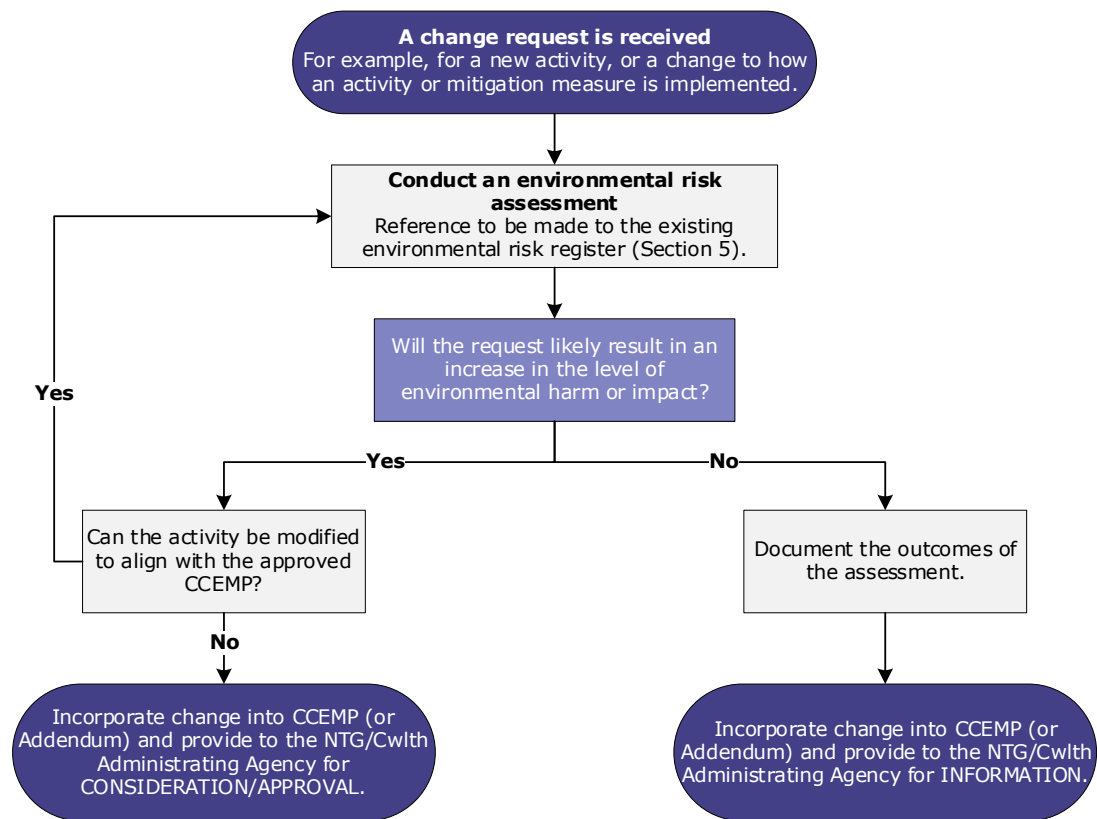
Water efficiencies and conservation will be considered throughout the execution of the Project. This will include, but not limited to, the following:

- Opportunities for re-use of treated water during construction activities will be identified.
- Records will be maintained of potable use required for Project activities.
- Water use and conservation measures will be included in the Project HSE induction.

### 7.9 Management of change

INPEX’s HSSEQ Policy requires the Project to set, measure and review environmental performance objectives and targets and ensure appropriate management of change processes are followed.

In the event that there is an alteration to Project activities proposed in this Draft CCEMP, or there is a change to how activities or mitigation measures are implemented, the management of change process illustrated in Figure 7-6 will be followed. This will determine whether the works will or may cause, or increase, the potential for environmental harm, such as by any increase of discharges, or increase in impacts to habitat of listed species in proximity to the Project.



**Figure 7-6: Management of change process**

## **7.10 Stakeholder engagement**

### **7.10.1 HSE communications**

INPEX HSE requirements and matters are communicated throughout the organisation. This facilitates the cascading and implementation of business policies and standards through the business, and on to contractors who work on behalf of INPEX.

INPEX and its contractors adopt a number of methods to ensure that information relating to HSE risks and impacts are communicated to personnel, including:

- daily toolbox meetings
- Project HSE meetings
- use of noticeboards, intranet, HSE alerts and newsflashes e.g. environmental aspects and events
- internal and external reporting.

### **7.10.2 Ongoing stakeholder engagement**

Stakeholder engagement that will be undertaken throughout the execution of the Project is described in the Ichthys LNG AGRU Upgrades and CCS Preparedness Stakeholder Engagement Plan (0000-A0-PLN-70045), which has been provided separately to the NT EPA as a standalone document.

## **7.11 Contractors and suppliers**

Selection and management processes are in place to ensure that contractors working for, or on behalf of, INPEX are able and willing to meet the minimum business expectations of INPEX, including those related to HSE and risk management.

Contractors and suppliers are selected based on their capabilities and managed throughout the scope of works to deliver on HSE and process safety performance expectations.

The processes for pre-qualification, selection and management of suppliers and contractors are detailed within the INPEX BMS such that:

- HSE and process safety risks associated with the scope of work are identified and known
- contractors and suppliers are selected based on their organisational capability and personnel competence to execute the scope of work, including effective management of HSE and process safety risks
- roles and responsibilities, and minimum performance expectations are communicated to contractors and suppliers, and form part of contractual obligations
- contractors are partnered to deliver desired HSE and process safety performance targets, and monitored for compliance with contractual requirements
- lessons learned from each scope of work are applied to future activities.

## **7.12 Security and emergency management**

INPEX maintains a trained and ready emergency management capability to execute emergency response and crisis management. The Incident Management Teams (IMTs) provide operational management support to a site-based emergency and the Crisis Management Team (CMT) provides strategic direction with respect to management of reputational damage and impacts to business continuity.

The INPEX emergency, incident and crisis management system consists of emergency response teams (ERTs) located at its facilities, IMTs in Darwin and Perth respectively, and the CMT located in Perth.

EPC Contractor emergency response arrangements, required to be in place during SIMOPS, will align with the Ichthys LNG emergency response processes/plans. Interfaces between Ichthys LNG and EPC emergency response plans will be defined within developed SIMOPS plans.

## **7.13 Incident investigation and lessons learned**

### **7.13.1 HSE performance measurement and reporting**

HSE performance data is monitored in accordance with the INPEX BMS. This enables the status of conformance with HSE obligations and goals to be determined and also ensures HSE risks are being effectively managed to support continuous improvement. HSE will be regularly reviewed by Project senior management.

### **7.13.2 Internal reporting**

#### **Routine reporting**

Internal reporting between the EPC Contractor and INPEX will be undertaken on weekly and monthly basis which will include, but is not limited to, the following:

- details of HSE incidents and investigations
- waste volumes
- wastewater discharge volumes
- water consumption volumes.

#### **Environmental event reporting and investigation**

INPEX refers to environmental incidents, hazards, non-compliances and near misses as environmental events. All environmental events related to Project activities will be reported to INPEX by the EPC Contractor in accordance with contract requirements. All events will be documented and investigated as appropriate. Any associated preventive or corrective actions will be documented and tracked to close-out by the EPC Contractor and verified by INPEX.

### **7.13.3 External reporting**

#### **Environmental performance reporting**

Environmental performance reporting will be undertaken by INPEX, within input from contractor, in accordance with obtained environmental approvals.

#### **Environmental incident and non-compliance reporting**

External incident and non-compliance reporting to Administering Agencies or Regulators will be undertaken by INPEX. Table 7-3 outlines the external reporting requirements and responsibilities for incident and non-compliance reporting.

In addition to external notifications of environmental incidents outlined in Table 7-3, accidents or incidents, where required, will be reported to the Australian Maritime Safety Authority under the *Occupational Health and Safety (Maritime Industry) Act 1993* or to Northern Territory WorkSafe under the *Work Health and Safety (National Uniform Legislation) Act 2011*, within the statutory timeframes, as required by legislation.

**Table 7-3: External reporting – environmental incidents and non-compliances**

Description	Responsible	Regulator	Timeframe
Non-compliances with obtained environmental approvals	INPEX	NT EPA	As soon as Practicable after (and in any case within 24 hours) first becoming aware of the non-compliance.
Incidents reportable under Section 14 of the WMPC Act	INPEX	NT EPA	As soon as practicable (and in any case within 24 hours) after first becoming aware of the event occurring.
Incident resulting in a significant impact to matters of national environmental significance or habitat for listed species in Darwin Harbour	INPEX	DCCEEW	As soon as practicable (and in any case within 24 hours) after first becoming aware of the event occurring.
Discovery of previously unidentified heritage object/site	INPEX	DLPE – Heritage Branch	Upon being notified of a discovery of potential heritage object/site.

## 7.14 Monitor, review and audit

### 7.14.1 Receiving environment monitoring

The following receiving environment monitoring programs have been identified as required to confirm potential impacts are within those predicted, assess the effectiveness of identified environmental management actions/controls and ensure the environmental objectives identified in Section 6 are achieved:

- Visual observations/site inspection of airborne dust and dust deposition on vegetation adjacent to the Ichthys LNG facility.
- Noise monitoring to validate modelling outcomes would be undertaken during piling and cold-commissioning activities (i.e. line blowing).
- Erosion and sediment control monitoring/inspection program would be undertaken.
- MOF temporary outfall monitoring would be undertaken in accordance with obtained waste discharge licence conditions.

These programs would be further defined once an EPC contractor is determined and the Draft CCEMP would be updated to reflect the monitoring methodologies, parameters monitored and frequency of the monitoring.

### 7.14.2 Audit and inspections

Regular inspections and audits would be undertaken during Project execution to ensure appropriate implementation of the management measures outlined in this Draft CCEMP. These may include:

- Routine environmental inspections
- EPC Contractor environmental audits
- Regulator inspections and audits as defined in obtained environmental approvals

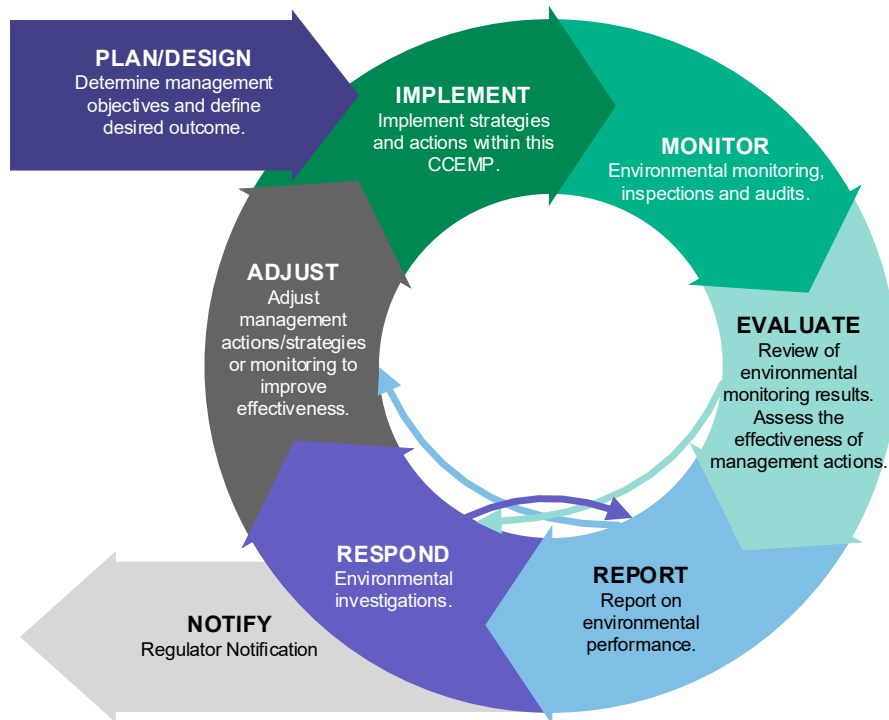
Inspection and audit results would be used to re-evaluate the identified risks and appropriate corrective actions (and timeframes) would be identified to address non-conformances or findings, and these would be tracked in relevant action tracking systems.

### 7.14.3 Adaptive management framework

This Draft CCEMP incorporates the basic principles of adaptive management as set out in ANZG (2018):

*"a continuous cycle of improvement based on setting goals and priorities, developing strategies, taking action and measuring results, and then feeding the results of monitoring back into new goals, priorities, strategies and actions."*

Figure 7-7 provides an overview of the adaptive management framework that is implemented under this Draft CCEMP.



**Figure 7-7: Adaptive management framework**

The adaptive management framework has been designed to allow for regular review and revision of the monitoring and management undertaken as part of this Draft CCEMP. Monitoring and management requirements may change as a result of the following:

- changes in Project activities

- as part of the MOC process (Section 7.9); or
- on the basis of monitoring results.

Updates to the Draft CCEMP, resulting from the implementation of the adaptive management process, will be submitted in accordance with obtained environmental approval requirements.

#### **7.14.4 Review and revision of this Draft CEMP**

This Draft CCEMP will be reviewed by INPEX and the selected EPC Contractor prior to the commencement of any Project activities to ensure its continuing suitability and consistency with current regulatory requirements.

Any subsequent revisions of final CEMP will be undertaken in circumstances where there has been a significant deviation from the activities and management controls described within the final CCEMP. Any proposed changes will be assessed to determine their potential to result in new or increased environment impact in accordance with management of change process described in Section 7.9.

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## **APPENDIX A: EPBC PROTECTED MATTERS SEARCH**



Australian Government

Department of Climate Change, Energy,  
the Environment and Water

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 19-Aug-2025

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

# Summary

## Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance (Ramsar)</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	None
<a href="#">Listed Threatened Species:</a>	51
<a href="#">Listed Migratory Species:</a>	60

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <https://www.dcceew.gov.au/parks-heritage/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<a href="#">Commonwealth Lands:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	95
<a href="#">Whales and Other Cetaceans:</a>	13
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None
<a href="#">Habitat Critical to the Survival of Marine Turtles:</a>	1

## Extra Information

This part of the report provides information that may also be relevant to the area you have

<a href="#">State and Territory Reserves:</a>	None
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Nationally Important Wetlands:</a>	1
<a href="#">EPBC Act Referrals:</a>	11
<a href="#">Key Ecological Features (Marine):</a>	None
<a href="#">Biologically Important Areas:</a>	4
<a href="#">Bioregional Assessments:</a>	None
<a href="#">Geological and Bioregional Assessments:</a>	None

# Details

## Matters of National Environmental Significance

### Listed Threatened Species

[ [Resource Information](#) ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.  
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
<b>BIRD</b>			
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Chloebia gouldiae listed as Erythrura gouldiae</a> Gouldian Finch [90091]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Erythrotriorchis radiatus</a> Red Goshawk [942]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Falco hypoleucos</a> Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Geophaps smithii smithii</a> Partridge Pigeon (eastern) [64441]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Limnodromus semipalmatus</a> Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Limosa lapponica baueri</a> Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Pluvialis squatarola</a> Grey Plover [865]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Sternula albifrons</a> Little Tern [82849]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Tyto novaehollandiae kimberli</a> Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<b>FROG</b>			
<a href="#">Uperoleia daviesae</a> Howard River Toadlet, Davies's Toadlet [85375]	Vulnerable	Species or species habitat may occur within area	In feature area
<b>MAMMAL</b>			
<a href="#">Antechinus bellus</a> Fawn Antechinus [344]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Conilurus penicillatus</a> Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Dasyurus hallucatus</a> Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Macroderma gigas</a> Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Mesembriomys gouldii gouldii</a> Black-footed Tree-rat (Kimberley and mainland Northern Territory), Djintamoonga, Manbul [87618]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Orcaella heinsohni</a> Australian Snubfin Dolphin [81322]	Vulnerable	Breeding known to occur within area	In feature area
<a href="#">Petrogale concinna canescens</a> Nabarlek (Top End) [87606]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Phascogale pirata</a> Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Saccolaimus saccolaimus nudicluniatus</a> Bare-rumped Sheath-tailed Bat, Bare-rumped Sheath-tail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Sousa sahalensis</a> Australian Humpback Dolphin [87942]	Vulnerable	Breeding known to occur within area	In feature area
<a href="#">Trichosurus vulpecula arnhemensis</a> Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Xeromys myoides</a> Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area	In feature area

## REPTILE

<a href="#">Acanthopphis hawkei</a> Plains Death Adder [83821]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Lepidochelys olivacea</a> Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Tiliqua scincoides intermedia</a> Northern Blue-tongued Skink [89838]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Varanus mertensi</a> Mertens' Water Monitor, Mertens's Water Monitor [1568]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Varanus mitchelli</a> Mitchell's Water Monitor [1569]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
<b>SHARK</b>			
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Glyphis garricki</a> Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Pristis clavata</a> Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Pristis pristis</a> Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Pristis zijsron</a> Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding likely to occur within area	In feature area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Sphyrna lewini</a> Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
null			
<a href="#">Balaenoptera omurai</a> Omura's Whale [87136]		Species or species habitat likely to occur within area	In feature area
Migratory Marine Birds			
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat known to occur within area	In feature area
<a href="#">Fregata ariel</a> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In feature area
<a href="#">Fregata minor</a> Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In feature area
<a href="#">Phaethon lepturus</a> White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
<a href="#">Phaethon rubricauda</a> Red-tailed Tropicbird [994]		Species or species habitat may occur within area	In feature area
<a href="#">Sternula albifrons</a> Little Tern [82849]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Migratory Marine Species			
<a href="#">Anoxypristis cuspidata</a> Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area	In feature area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Carcharhinus longimanus</a> Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
<a href="#">Carcharias taurus</a> Grey Nurse Shark [64469]		Species or species habitat may occur within area	In feature area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Crocodylus porosus</a> Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area	In feature area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Dugong dugon</a> Dugong [28]		Species or species habitat known to occur within area	In feature area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Lepidochelys olivacea</a> Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]		Species or species habitat may occur within area	In feature area
<a href="#">Mobula alfredi as Manta alfredi</a> Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In feature area
<a href="#">Mobula birostris as Manta birostris</a> Giant Manta Ray [90034]		Species or species habitat may occur within area	In feature area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Orcaella heinsohni</a> Australian Snubfin Dolphin [81322]	Vulnerable	Breeding known to occur within area	In feature area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
<a href="#">Pristis clavata</a> Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Pristis pristis</a> Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Pristis zijsron</a> Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding likely to occur within area	In feature area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Sousa sahalensis as Sousa chinensis</a> Australian Humpback Dolphin [87942]	Vulnerable	Breeding known to occur within area	In feature area
<a href="#">Tursiops aduncus (Arafura/Timor Sea populations)</a> Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In feature area
<b>Migratory Terrestrial Species</b>			
<a href="#">Cecropis daurica</a> Red-rumped Swallow [80610]		Species or species habitat may occur within area	In feature area
<a href="#">Cuculus optatus</a> Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area	In feature area
<a href="#">Hirundo rustica</a> Barn Swallow [662]		Species or species habitat known to occur within area	In feature area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat known to occur within area	In feature area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat known to occur within area	In feature area
<b>Migratory Wetlands Species</b>			
<a href="#">Acrocephalus orientalis</a> Oriental Reed-Warbler [59570]		Species or species habitat may occur within area	In feature area
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Calidris alba</a> Sanderling [875]		Species or species habitat likely to occur within area	In feature area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area	In feature area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area	In feature area
<a href="#">Glareola maldivarum</a> Oriental Pratincole [840]		Species or species habitat may occur within area	In feature area
<a href="#">Limnodromus semipalmatus</a> Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Numenius phaeopus</a> Whimbrel [849]		Species or species habitat likely to occur within area	In feature area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area	In feature area
<a href="#">Pluvialis squatarola</a> Grey Plover [865]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In feature area

## Other Matters Protected by the EPBC Act

Listed Marine Species	[ Resource Information ]		
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
<a href="#">Acrocephalus orientalis</a> Oriental Reed-Warbler [59570]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Anseranas semipalmata</a> Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Bubulcus ibis as Ardea ibis</a> Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Calidris alba</a> Sanderling [875]		Species or species habitat likely to occur within area	In feature area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat known to occur within area	In feature area
<a href="#">Cecropis daurica as Hirundo daurica</a> Red-rumped Swallow [80610]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Chalcites osculans as Chrysococcyx osculans</a> Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Fregata ariel</a> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In feature area
<a href="#">Fregata minor</a> Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In feature area
<a href="#">Glareola maldivarum</a> Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Hirundo rustica</a> Barn Swallow [662]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Limnodromus semipalmatus</a> Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Numenius phaeopus</a> Whimbrel [849]		Species or species habitat likely to occur within area	In feature area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Phaethon lepturus</a> White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
<a href="#">Phaethon rubricauda</a> Red-tailed Tropicbird [994]		Species or species habitat may occur within area	In feature area
<a href="#">Pluvialis squatarola</a> Grey Plover [865]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Rostratula australis as Rostratula benghalensis (sensu lato)</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Sternula albifrons as Sterna albifrons</a> Little Tern [82849]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
<b>Fish</b>			
<a href="#">Campichthys tricarinatus</a> Three-keel Pipefish [66192]		Species or species habitat may occur within area	In feature area
<a href="#">Choeroichthys brachysoma</a> Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area	In feature area
<a href="#">Choeroichthys suillus</a> Pig-snouted Pipefish [66198]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Corythoichthys amplexus</a> Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area	In feature area
<a href="#">Corythoichthys flavofasciatus</a> Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area	In feature area
<a href="#">Corythoichthys haematopterus</a> Reef-top Pipefish [66201]		Species or species habitat may occur within area	In feature area
<a href="#">Doryrhamphus excisus</a> Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area	In feature area
<a href="#">Doryrhamphus janssi</a> Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area	In feature area
<a href="#">Festucalex cinctus</a> Girdled Pipefish [66214]		Species or species habitat may occur within area	In feature area
<a href="#">Halicampus brocki</a> Brock's Pipefish [66219]		Species or species habitat may occur within area	In feature area
<a href="#">Halicampus grayi</a> Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In feature area
<a href="#">Halicampus spinostris</a> Spiny-snout Pipefish [66225]		Species or species habitat may occur within area	In feature area
<a href="#">Haliichthys taeniophorus</a> Ribbioned Pipehorse, Ribbioned Seadragon [66226]		Species or species habitat may occur within area	In feature area
<a href="#">Hippichthys cyanospilos</a> Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Hippichthys parvicarinatus</a> Short-keel Pipefish, Short-keeled Pipefish [66230]		Species or species habitat may occur within area	In feature area
<a href="#">Hippichthys penicillus</a> Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In feature area
<a href="#">Hippocampus histrix</a> Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area	In feature area
<a href="#">Hippocampus kuda</a> Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In feature area
<a href="#">Hippocampus planifrons</a> Flat-face Seahorse [66238]		Species or species habitat may occur within area	In feature area
<a href="#">Hippocampus spinosissimus</a> Hedgehog Seahorse [66239]		Species or species habitat may occur within area	In feature area
<a href="#">Micrognathus micronotopterus</a> Tidepool Pipefish [66255]		Species or species habitat may occur within area	In feature area
<a href="#">Solegnathus hardwickii</a> Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	In feature area
<a href="#">Solegnathus lettiensis</a> Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
<a href="#">Solenostomus cyanopterus</a> Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In feature area
<a href="#">Syngnathoides biaculeatus</a> Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Trachyrhamphus bicoarctatus</a> Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In feature area
<a href="#">Trachyrhamphus longirostris</a> Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area	In feature area
<b>Mammal</b>			
<a href="#">Dugong dugon</a> Dugong [28]		Species or species habitat known to occur within area	In feature area
<b>Reptile</b>			
<a href="#">Aipysurus duboisii</a> Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area	In feature area
<a href="#">Aipysurus laevis</a> Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area	In feature area
<a href="#">Aipysurus mosaicus as Aipysurus eydouxii</a> Mosaic Sea Snake [87261]		Species or species habitat may occur within area	In feature area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Crocodylus johnstoni</a> Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area	In feature area
<a href="#">Crocodylus porosus</a> Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Hydrelaps darwiniensis</a> Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis atriceps</a> Black-headed Sea Snake, Banded Sea Snake [1101]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis coggeri</a> Cogger's Sea Snake, Black-headed Sea Snake [25925]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis elegans</a> Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis hardwickii as Lapemis hardwickii</a> Spine-bellied Sea Snake [93516]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis inornatus</a> Plain Sea Snake [1107]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis kingii as Disteira kingii</a> Spectacled Sea Snake [93511]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis macdowelli as Hydrophis mcdowelli</a> MacDowell's Sea Snake, Small-headed Sea Snake, [75601]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis major as Disteira major</a> Olive-headed Sea Snake [93512]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Hydrophis ornatus</a> Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis pacificus</a> Pacific Sea Snake, Large-headed Sea Snake [1112]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis peronii as Acalyptophis peronii</a> Horned Sea Snake [93509]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis platura as Pelamis platurus</a> Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis stokesii as Astrotia stokesii</a> Stokes' Sea Snake [93510]		Species or species habitat may occur within area	In feature area
<a href="#">Hydrophis zweifeli as Enhydrina schistosa</a> Australian Beaked Sea Snake [93514]		Species or species habitat may occur within area	In feature area
<a href="#">Lepidochelys olivacea</a> Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Parahydrophis mertoni</a> Arafura Smooth Sea Snake, Northern Mangrove Sea Snake [1090]		Species or species habitat may occur within area	In feature area

## Whales and Other Cetaceans

[ Resource Information ]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Balaenoptera omurai</a> Omura's Whale [87136]		Species or species habitat likely to occur within area	In feature area
<a href="#">Delphinus delphis</a> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
<a href="#">Grampus griseus</a> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]		Species or species habitat may occur within area	In feature area
<a href="#">Orcaella heinsohni</a> Australian Snubfin Dolphin [81322]	Vulnerable	Breeding known to occur within area	In feature area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
<a href="#">Sousa sahalensis</a> Australian Humpback Dolphin [87942]	Vulnerable	Breeding known to occur within area	In feature area
<a href="#">Stenella attenuata</a> Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
<a href="#">Tursiops aduncus (Arafura/Timor Sea populations)</a> Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In feature area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Habitat Critical to the Survival of Marine Turtles			[ Resource Information ]
Scientific Name	Behaviour	Presence	Buffer Status
All year (Jun - Aug)			
<a href="#">Natator depressus</a>			
Flatback Turtle [59257]	Nesting	Known to occur	In feature area

## Extra Information

Nationally Important Wetlands			[ Resource Information ]
Wetland Name	State	Buffer Status	
<a href="#">Port Darwin</a>	NT	In feature area	

## EPBC Act Referrals

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
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<a href="#">East Arm Marine Industry Park, Darwin, NT</a>	2014/7318		Completed	In buffer area only
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### Controlled action

<a href="#">Barramundi Nursery Farm</a>	2005/2378	Controlled Action	Completed	In feature area
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<a href="#">Darwin to Moomba Gas Pipeline</a>	2001/213	Controlled Action	Completed	In feature area
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<a href="#">Glyde Point and Middle Arm Peninsula Infrastructure Support</a>	2001/334	Controlled Action	Completed	In feature area
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<a href="#">Glyde Point Industrial Estate and Associated Infrastructure</a>	2004/1506	Controlled Action	Completed	In feature area
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<a href="#">Ichthys Gas Field, Offshore and onshore processing facilities and subsea pipeline</a>	2008/4208	Controlled Action	Post-Approval	In feature area
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<a href="#">Methanol Plant</a>	2001/195	Controlled Action	Completed	In feature area
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<a href="#">Middle Arm Peninsula Industrial Area Development</a>	2001/339	Controlled Action	Completed	In feature area
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<a href="#">Operation of 17 Tiger Helicopters at Robertson Barracks</a>	2004/1459	Controlled Action	Post-Approval	In feature area
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### Not controlled action

<a href="#">Waterfront Redevelopment</a>	2003/1256	Not Controlled Action	Completed	In feature area
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Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
<a href="#">Wickham Point Interconnect Gas Pipeline</a>	2008/4309	Not Controlled Action	Completed	In buffer area only

## Biologically Important Areas [ [Resource Information](#) ]

Scientific Name	Behaviour	Presence	Buffer Status
<b>Dolphins</b>			
<a href="#">Orcaella heinsohni</a>			
Australian Snubfin Dolphin [81322]	Breeding	Known to occur	In feature area
<a href="#">Sousa chinensis</a>			
Indo-Pacific Humpback Dolphin [50]	Breeding	Known to occur	In feature area
<a href="#">Tursiops aduncus</a>			
Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Breeding	Known to occur	In feature area
<b>Marine Turtles</b>			
<a href="#">Natator depressus</a>			
Flatback Turtle [59257]	Interesting	Likely to occur	In feature area

# Caveat

## 1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

## 2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

## 3 DATA SOURCES

### Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

### Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

## 4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact us](#) page.

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