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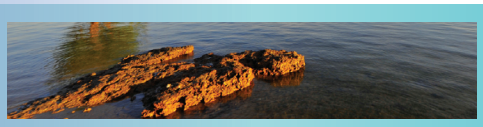

Ichthys Gas Field Development Project

EXECUTIVE SUMMARY

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Ichthys Gas Field Development Project: draft environmental impact statement—Executive summary

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The Draft EIS has been prepared for this purpose only, and no one other than the ministers and their delegated representatives should rely on the information contained in the Draft EIS to make any decision.

In preparing the Draft EIS, INPEX has relied on information provided by specialist consultants, government agencies and other third parties identified in the document. INPEX has not verified the accuracy or completeness of this information except where expressly acknowledged in the Draft EIS.

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Invitation to comment

All members of the public, businesses and interest groups are invited to comment on this Draft Environmental Impact Statement (Draft EIS).

This document presents the case for the environmental acceptability of the Ichthys Gas Field Development Project. The Project proposes to construct offshore extraction and processing facilities in the Browse Basin off the Western Australian coast, a subsea pipeline to onshore processing facilities at Blaydin Point in Darwin Harbour, and product offloading facilities, including a jetty and a shipping channel, adjacent to Blaydin Point. The Project will produce around 8.4 million tonnes of liquefied natural gas per annum, together with liquefied petroleum gases and condensate as secondary products.

The proposal is being jointly assessed by the Australian and Northern Territory governments under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) and the *Environmental Assessment Act* (NT) respectively.

This Draft EIS is available for public review and comment for a period of eight weeks, which is advertised in the national and Northern Territory press. This period will take into account public holidays in both the Australian Capital Territory and the Northern Territory.

HOW TO MAKE A SUBMISSION

A submission may include comment, additional information, or an opinion relevant to the information provided in the Draft EIS, or in a general way related to the proposed development.

Submissions must be made in writing and respondents should note the following points:

- Refer to the project title (the *Ichthys Gas Field Development Project*).
- Each matter raised should refer to the relevant section and page number of the Draft EIS (e.g. Chapter 7, Section 7.1.2, page 383).
- Supporting factual information and/or references should be provided for each point raised.
- The name and address of the respondent(s) and the date of submission should be included.
- The submission should be delivered by no later than 5.00 p.m. on the final day of the advertised review period at the nominated electronic or postal address below.
- All written submissions should be signed[1].

Submissions may be lodged electronically or by post.

Electronic submissions may be dispatched directly to INPEX online via the INPEX web site (www.inpex.com.au) or e-mailed directly to inpex_eis@inpex.com.au.

Postal submissions should be addressed to:
Ichthys Gas Field Development Project
Draft EIS Comment
PO Box Z5023
St Georges Tce WA 6831

INPEX will forward an acknowledgment of receipt for all submissions received prior to the close of the review period and will record and collate all submissions and provide copies to the relevant government assessment agencies.

1 Each submission will be treated as a public document unless delivered in confidence.

ACCESSING THE DOCUMENT

The Draft EIS can be viewed online at www.inpex.com.au and at the following locations:

Northern Territory

- **Department of Natural Resources, Environment, the Arts and Sport**
  Level 2, Darwin Plaza, 41 Smith Street Mall, Darwin
- **Development Assessment Services**
  Department of Lands and Planning
  Ground floor, Cavenagh House,
  38 Cavenagh Street, Darwin
- **Minerals and Energy InfoCentre**
  Department of Resources
  Level 3, Paspalis Centrepoint Building,
  Smith Street Mall, Darwin
- **Northern Territory Library**
  Parliament House, Bennett Street, Darwin
- **Darwin City Council libraries:**
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  Karama Library
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  Goyder Square, The Boulevard, Palmerston
- **Katherine Public Library**
  First floor, Randazzo Building, Katherine Terrace, Katherine
- **Tennant Creek Public Library**
  Civic Centre, Peko Road, Tennant Creek
- **Alice Springs Public Library**
  Corner of Leichhardt Terrace and Gregory Terrace, Alice Springs
- **The Environment Centre NT**
  Unit 3, 98 Woods Street, Darwin
- **Northern Land Council**
  45 Mitchell Street, Darwin
- **Larrakia Nation Aboriginal Corporation**
  Unit 4/1 Pavonia Place, Nightcliff
- **Litchfield Council**
  7 Bees Creek Road, Freds Pass
- **Environment Hub**
  Shop 9, Rapid Creek Business Village
  48 Trower Road, Millner
- **INPEX Darwin Office**
  Level 8, Mitchell Centre
  59 Mitchell Street, Darwin

Australian Capital Territory

- **The Library of the Department of the Environment, Water, Heritage and the Arts**
  John Gorton Building, King Edward Terrace,
  Parkes, Canberra

Western Australia

- **State Library of Western Australia**
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  25 Francis Street, Perth
- **INPEX Perth Office**
  Level 22, 100 St Georges Terrace, Perth

Hard copies can be obtained by submitting a request by e-mail to inpex_eis@inpex.com.au or by telephone to 1800 705 010.

Additional information can be obtained directly from the government regulator web sites provided below:

Commonwealth Government: Department of the Environment, Water, Heritage, and the Arts (DEWHA) at <http://www.environment.gov.au/>

Northern Territory Government: Department of Natural Resources, Environment, the Arts and Sport (NRETAS) at <http://www.nt.gov.au/nreta/>.

Foreword

On behalf of INPEX Browse, Ltd. and in cooperation with our joint venturer, Total E&P Australia, I am pleased to present this draft environmental impact statement (Draft EIS) for the proposed Ichthys Gas Field Development Project.

INPEX has been a member of the Australian business community since 1986. In 2000 INPEX discovered the giant Ichthys gas and condensate field and since then we have worked continuously toward developing this world-class resource in a manner that is technically and economically viable, and environmentally and socially responsible.

This document presents a comprehensive description of the Ichthys Project, the natural and socio-economic environment in which it will be developed and the actual and potential impacts it will have. As the cleanest of all fossil fuels, LNG is an energy source appropriate for today's carbon-constrained world. It is my belief that this Draft EIS demonstrates a sound case supporting approval of the Ichthys Project.

The commercial development of the Ichthys Project promises to deliver substantial social and economic benefits to the people of Darwin, the Northern Territory and Australia through the creation of employment and training opportunities, improved infrastructure, and the significant economic stimulus it will provide.

In designing the Ichthys Project, INPEX and its contractors have carried out comprehensive environmental surveys in and around Darwin Harbour, at the Ichthys Field and along the subsea pipeline route from the field to Darwin. Extensive socio-economic studies have also been undertaken to identify the benefits that will flow from this development.

In addition, this Draft EIS has been prepared through a process of extensive consultation with relevant government agencies and non-government organisations, as well as through engagement with the broader community at public forums and briefings.

As both the Northern Territory Government and Australian Government regulators decided on a joint assessment process, the Draft EIS addresses the requirements of both jurisdictions and has been prepared in accordance with the published guidelines.

I thank all those who have contributed to this process to date and I would now like to invite all members of the Northern Territory and broader Australian communities to review this document and provide feedback on the proposed Ichthys Project.

Your contribution to the evaluation of the Ichthys Project Draft EIS will be very welcome and can only improve the quality and integrity of the assessment process leading to better outcomes for all.

Seiya Ito
Managing Director
INPEX Browse, Ltd.

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1 Introduction

This document is the Executive Summary for the Ichthys Gas Field Development Project: *draft environmental impact statement* (Draft EIS). It has been prepared by INPEX Browse, Ltd. (INPEX) as Operator of the Ichthys Project in joint venture with Total E&P Australia.

This Executive Summary outlines the proposed Project, the joint Commonwealth and Northern Territory environmental impact assessment process to which it is subject, the natural and socio-economic environments in which it is set, and the actual and potential impacts associated with the Project. Importantly, it provides details of the management controls proposed by INPEX to reduce the risk of impacts to the natural and socio economic environments and describes the residual risks that remain after the application of such controls.

The Draft EIS has been prepared to comply with guidelines set by the Northern Territory and Commonwealth governments and has taken into account concerns and issues raised in community consultation exercises undertaken in the Darwin region.

It should be noted that further details associated with Project impacts, proposed management controls (including environmental management plans), and a detailed list of management commitments are provided in the Draft EIS and its related technical appendices.

1.1 Project overview

INPEX is seeking the approval of the Northern Territory and Commonwealth governments to develop the Ichthys gas and condensate field to produce liquefied natural gas (LNG), liquefied petroleum gases (LPGs) and condensate for export to markets in Japan and elsewhere.

The Ichthys Field is located in the Browse Basin at the western edge of the Timor Sea, around 450 kilometres north-north-east of Broome and 820 kilometres west-south-west of Darwin. The field encompasses an area of approximately 800 square kilometres in water depths ranging from 235 to 275 metres. Appraisal drilling and development studies suggest that the P_{50} resources[2] of the Ichthys Field are 12.8 trillion cubic feet of sales gas and around 527 million barrels of condensate[3,4], split between a Cretaceous reservoir in the Brewster Member and a Jurassic reservoir in the Plover Formation.

INPEX proposes to install a floating central processing facility (CPF) for the extraction of natural gas and condensate at the Ichthys Field. The bulk of the condensate would be exported directly from the field after processing on a floating production, storage and offtake (FPSO) facility moored some distance from the CPF. Natural gas and LPGs from the field will be directed through a gas export pipeline from the field to onshore facilities at a site zoned for industrial development at Blaydin Point in Darwin Harbour in the Northern Territory. The gas will be processed through a two train 8.4 Mt/a LNG processing plant. LPGs and the residual condensate will also be produced for export at the onshore facilities.

The construction phase of the Project would cover a period of 5 to 6 years from the final investment decision (FID) to the export of the first cargo of gas approximately five years later.

1.2 Project proponent

INPEX's parent company INPEX CORPORATION has been involved in the development of oil and gas resources for more than four decades and has been steadily increasing its exploration and development activities in many countries around the world. It is, for example, currently taking part in a number of projects in Australian waters. These include the Van Gogh and Ravensworth oil extraction projects in the southern part of the North West Shelf in Western Australia and, until it ceased production in October 2009, the nearby Griffin Fields oil & gas project. INPEX has also established itself with the Darwin and Northern Territory communities through its partnership, with the major stakeholder ConocoPhillips, in the Bayu–Undan oil & gas project in the Timor Sea and the Darwin Liquefied Natural Gas plant at Wickham Point in Darwin Harbour.

2 In the oil & gas industry, P_{50} resources (often called "proved plus probable") are in effect a median estimate of the resources expected to be extracted from a hydrocarbon field. A P_{50} estimate refers to a value which has a 50 per cent probability of being exceeded.

3 The hydrocarbon resources reported in this document are based upon the "Statement of Hydrocarbon Resources" which was registered with Western Australia's Department of Mines and Petroleum on 27 March 2009. The P_{50} resources notified were 12.8 trillion cubic feet of sales gas and 527 million barrels of condensate. These figures were INPEX's best estimates at the time of preparation of this document, but are subject to subsequent review. Modelling and emission estimates are based upon the registered 2009 figures.

4 In metric measure this equates to 361 billion cubic metres of gas and 83 gigalitres of condensate.

In early 1998, INPEX CORPORATION (as Indonesia Petroleum, Ltd.) bid for a petroleum exploration permit for permit area WA-285-P in the northern Browse Basin about 200 kilometres off Western Australia's Kimberley coast, at the western edge of the Timor Sea. This petroleum exploration permit was awarded to INPEX CORPORATION on 19 August 1998. The subsidiary company INPEX Browse, Ltd. was established immediately after the grant of the permit and became the permit holder, 100 per cent equity holder and Operator.

The company's drilling program from March 2000 to February 2001 in the north-western portion of the permit area resulted in the significant gas and condensate discovery in the Ichthys Field. Shortly afterwards INPEX commenced the Ichthys Gas Field Development Project. In 2006 INPEX transferred a 24 per cent participating interest in the Project to Total E&P Australia (Total). Total has had a long-standing partnership with INPEX elsewhere in the world and also has in-depth experience and expertise with LNG and LPG projects in many countries.

In September 2009 Retention Lease WA-37-R was awarded to INPEX as the Operator of the Ichthys Field. The area covered by the lease is approximately 912 square kilometres.

Since the initial drilling program commenced in 2000, INPEX has drilled eight appraisal wells at the Ichthys Field and has operated two years of boat-based field studies at the Maret Islands off the Kimberley coast. These were undertaken without any reportable environmental incidents. INPEX has also been acknowledged by the Australian Petroleum Production & Exploration Association (APPEA), which awarded its 2008 Environmental Award (exploration company category) to INPEX for its innovative low-environmental-impact approach to its geotechnical drilling activities on the Maret Islands.

INPEX reports on its global environmental performance annually through its corporate sustainability report.

Contact details

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59 Mitchell Street
DARWIN NT 0800

1.3 Environmental assessment process

In May 2008 INPEX referred its Project proposal to the Commonwealth's Department of the Environment, Water, Heritage and the Arts (DEWHA) and the Northern Territory's Department of Natural Resources, Environment and the Arts (now NRETAS)[5]. Both agencies determined that the Project should be formally assessed at the EIS level.

The Project does not require assessment under Western Australia's *Environmental Protection Act 1986* as Western Australia's jurisdiction does not extend beyond the state's coastal waters zone (which extends only 3 nautical miles seaward of the territorial sea baseline).

The Project was assessed by the DEWHA as having the potential to cause a significant impact on the following "matters of national environmental significance" that are protected under Part 3 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act):

- listed threatened species and ecological communities (sections 18 and 18A)
- migratory species protected under international agreements (sections 20 and 20A)
- the Commonwealth marine environment (sections 23 and 24A).

In order to ensure that these and other potential environmental, social and economic impacts from the Project are adequately investigated, in September 2008 the DEWHA and NRETAS developed a set of guidelines (*Guidelines for preparation of a draft environmental impact statement: Ichthys Gas Field Development Project*) to direct INPEX's production of a single environmental impact assessment document, the Draft EIS. This is designed to satisfy the requirements of both the Commonwealth Government and the Northern Territory Government.

The Draft EIS aims to demonstrate that INPEX has achieved the following:

- It has studied and developed an understanding of the existing environment in enough detail to predict changes that could occur as a result of Project activities.
- It has incorporated environmental management controls into the design and planning phases of the Project to avoid or minimise impacts on the environment through all phases of the Project—construction, commissioning, operations and, where appropriate, decommissioning.

5 The Northern Territory's Department of Natural Resources, Environment and the Arts (NRETA) became the Department of Natural Resources, Environment, the Arts and Sport (NRETAS) in August 2008.

- It has generated and documented sufficient detail about the Project to allow appropriately informed feedback to be submitted by interested parties through the public review period for the Draft EIS.
- It has generated and documented sufficient detail to allow appropriately informed recommendations to be developed by the Northern Territory Government's NRETAS and the Commonwealth Government's DEWHA for transmission to their respective responsible ministers.

Assessment of the Draft EIS will be undertaken in accordance with the Commonwealth's EPBC Act and the Northern Territory's EA Act. This combined environmental assessment process will be undertaken in stages. The whole process, from initial proposal to final approval, is presented graphically in Figure 1-1.

Scope of the Draft EIS

The Draft EIS includes assessment of the following Project components:

- offshore infrastructure and activities at the Ichthys Field
- the gas export pipeline from the Ichthys Field to Darwin Harbour
- nearshore infrastructure, including the pipeline shore crossing and associated activities in Darwin Harbour and at the proposed offshore spoil disposal ground north of the Harbour
- onshore infrastructure on Blaydin Point and Middle Arm Peninsula and associated activities that could cause off-site impacts, such as air emissions and traffic.

As the accommodation village for the construction phase of the Project needs to be completed and available prior to commencement of works at Blaydin Point, a series of approvals separate from the Draft EIS are being sought. These approvals require the assessment of a range of environmental and social factors. However, the potential social and traffic impacts associated with introducing a construction workforce into the Darwin region are discussed in the Draft EIS.

An expansion of the production capacity beyond two LNG trains would be subject to future approval but will depend on further gas reserves being identified as well as on market and supply variables. Consideration of any such expansion is therefore not within the scope of the Draft EIS.

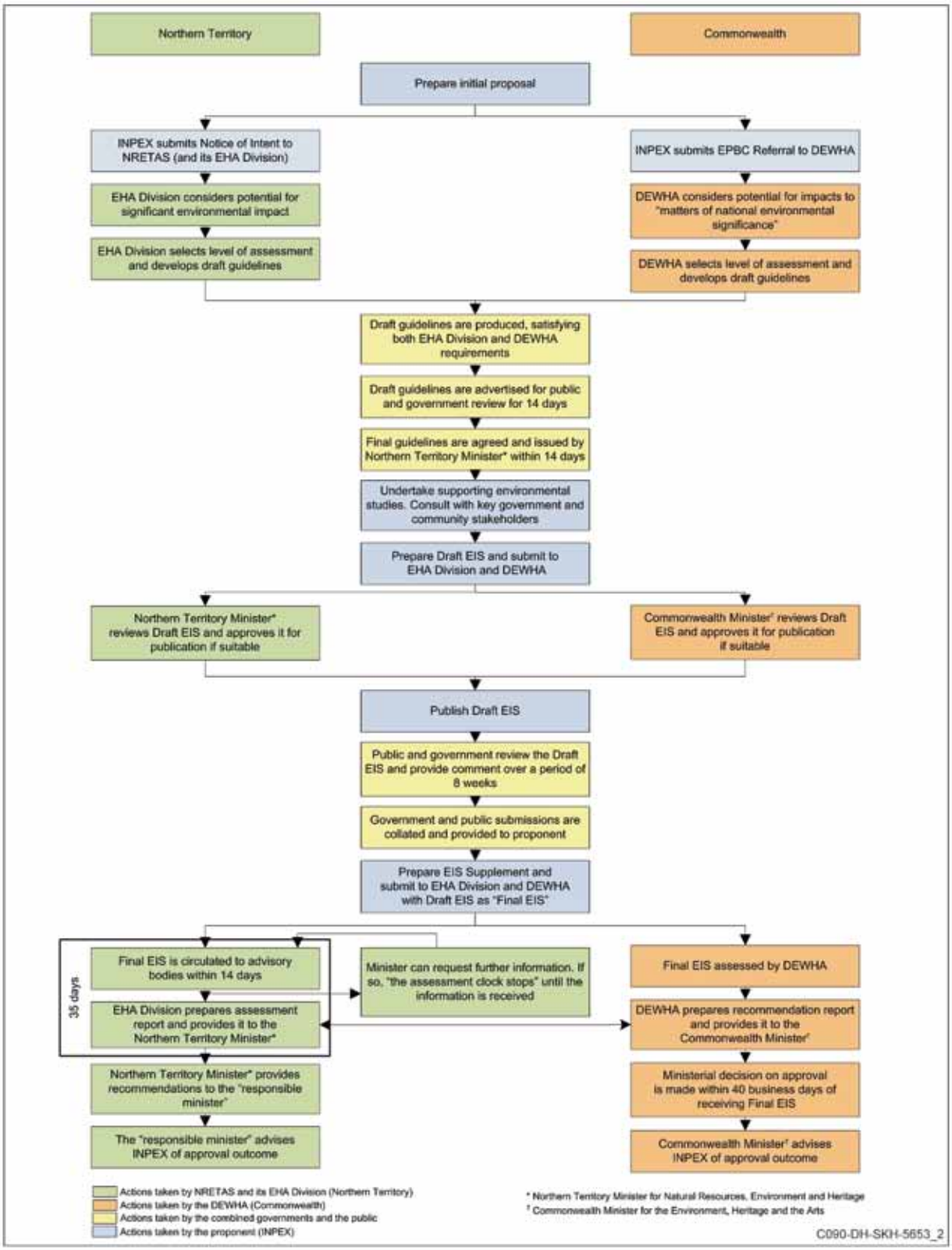


Figure 1-1: The environmental assessment process for the Project

2 Project Description

This section of the Executive Summary summarises the major infrastructure components and supporting facilities required to take the Ichthys Field to commercial production. These include the installation of subsea and processing facilities offshore, the installation of a subsea gas export pipeline, and the construction of an onshore gas processing plant and export facilities.

INPEX intends to install a floating central processing facility (CPF) for the extraction of natural gas and condensate at the Ichthys Field (see Figure 2-1). The condensate will be exported from the field at a rate of up to 85 000 barrels per day (at the start of LNG production) from the offshore facilities through a floating production, storage and offtake (FPSO) facility. Natural gas and LPGs from the field will be directed through a gas export pipeline from the field to onshore facilities at a site zoned for industrial development at Blaydin Point in Darwin Harbour.

The gas will be processed through a two-train LNG processing plant with a combined production capacity of approximately 8.4 megatonnes per annum. This production rate represents the average plateau rate over the first 23 years of the Project. Thereafter, LNG production will gradually decline as the Project slowly runs out of gas but continues to produce LNG at rates below 8.4 megatonnes per annum. Total annual production will vary from year to year depending on factors such as the composition of the gas from the reservoir and the duration and frequency of maintenance activities.

The onshore processing plant will also produce up to approximately 1.6 megatonnes of LPGs per annum and 15 000 barrels per day of condensate which will be carried to the plant with the gas stream through the gas export pipeline.

2.1 Major infrastructure components

The infrastructure required for the Project will consist of offshore gas and condensate extraction, processing, storage and transportation facilities; a subsea pipeline; and onshore gas-processing and export facilities at Blaydin Point. Key considerations in the design of the offshore and onshore facilities include the following:

- ensuring the health, safety and welfare of personnel working on the Project
- minimising any negative impacts the Project might have on the environment and the Northern Territory community
- fulfilling all relevant Territory and Commonwealth legislative obligations
- incorporating projected climate-change scenarios into the design, for example potential rises in sea level and/or temperature change
- developing and maintaining a culture of corporate social responsibility in respect of the community and a wide range of stakeholders
- providing a reliable supply of LNG, LPGs (propane and butane) and condensate to customers.

The following represents the “base case” infrastructure proposed as part of this Draft EIS as developed in the front-end-engineering design phase (FEED). As FEED progresses and the Project moves into the detailed-design phase, the design of this infrastructure will be refined.

Subsea infrastructure at the offshore development area will consist of the following:

- approximately 50 subsea wells drilled from between 12 and 15 drill centres, developed over a period of 40 years
- control umbilicals and service lines.

The subsea infrastructure will be tied back via flexible risers, flowlines and umbilicals to the CPF and FPSO. Both the CPF and FPSO, as presented in Figure 2-2, will be moored in position for the duration of the expected 40-year life of the Project.

These facilities will provide the following services:

- The CPF will be used for gas–liquid separation; gas dehydration; gas export; future inlet compression; and export of a commingled stream of condensate, monoethylene glycol (MEG) and water to the FPSO. (The MEG will be used to prevent the formation of hydrates, primarily between methane and water.)
- The FPSO will be used for condensate dewatering and stabilisation, condensate storage and export, MEG regeneration, and produced-water treatment.

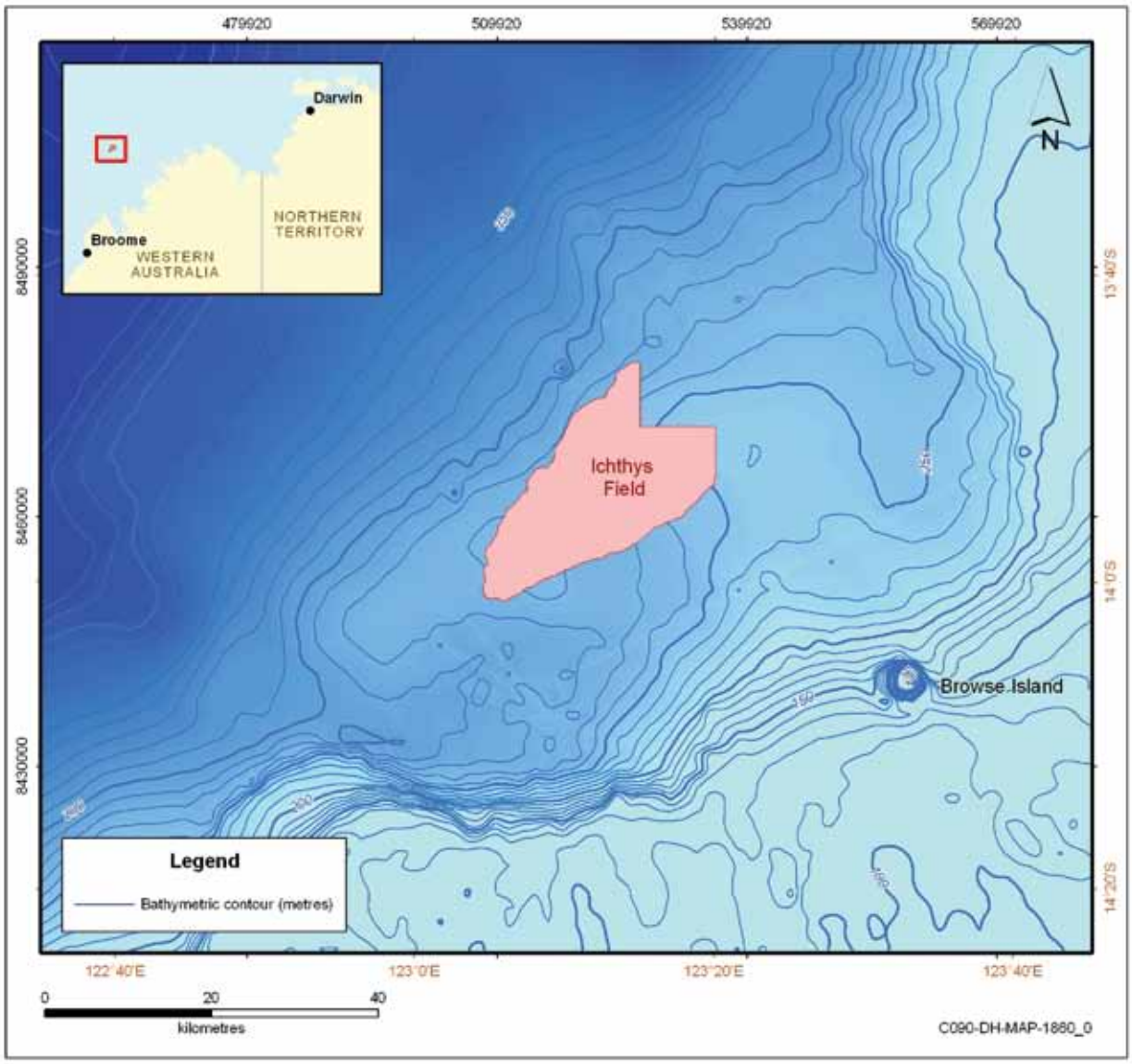


Figure 2-1: Location of the Ichthys Field

A subsea gas export pipeline with an outside diameter of approximately 42 inches (*c*.1.07 metres) and approximate length of 852 kilometres will be installed between the offshore development area and the entrance to Darwin Harbour. (The total length of the pipeline from the CPF to the receiving facilities at the gas-processing plant at Blaydin Point will be approximately 885 kilometres.) The pipeline will be weight-coated with concrete for stabilisation on the seabed, but sections will also be afforded additional protection, where required, by trenching and "rock dumping" depending on depth and location.

The locations of the onshore processing plant on Blaydin Point and the gas export pipeline route through Darwin Harbour are shown in Figure 2-3.

Nearshore infrastructure will consist of the following:

- an approximately 27-kilometre length of the subsea gas export pipeline from the mouth of Darwin Harbour parallel to the existing Bayu–Undan Gas Pipeline to the western side of Middle Arm Peninsula
- a pipeline shore crossing on the western side of Middle Arm Peninsula
- a module offloading facility on Blaydin Point for receiving prefabricated gas-processing modules and some construction materials
- a product loading jetty on the north-western end of Blaydin Point with one berth for LNG export and one for propane, butane and condensate export
- a shipping channel, approach area, turning basin and berthing area for the product tankers
- a dredge spoil disposal ground outside Darwin Harbour, 12 kilometres north-west of Lee Point.

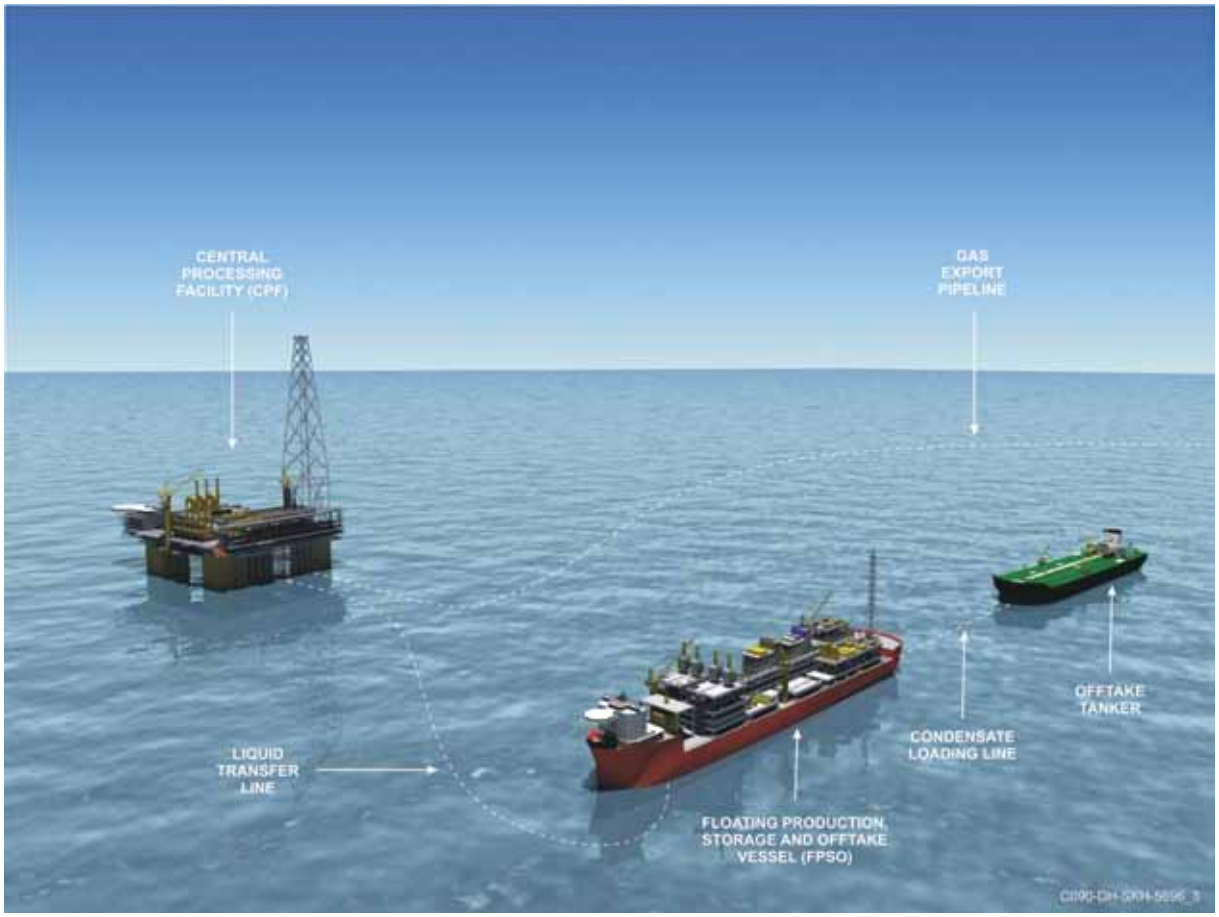


Figure 2-2: Indicative schematic of the offshore floating facilities

Onshore infrastructure will consist of the following:

- a 6-kilometre-long onshore pipeline corridor from the shore-crossing area to the Blaydin Point gas-processing plant site
- a gas reception area with a pig receiver and a slug catcher
- two gas liquefaction trains (each producing approximately 4.2 megatonnes of LNG per annum)
- gas treatment facilities (acid gas removal, dehydration, mercury removal)
- a propane and butane fractionation plant
- a condensate stabilisation plant
- utilities distribution and storage (power generation, fuel, water, nitrogen, compressed air)
- storage tanks (two for LNG; two large and one small tank for condensate; and one each for propane and butane) and LNG and LPG recovery units for boil-off gases
- an emergency gas flare system consisting of a ground flare and enclosed tankage flares
- a wastewater collection and treatment system
- various other installations, including a warehouse, workshops, a fuel storage area, firefighting facilities, a guard room and security buildings, and a control room.

Onshore permanent supporting facilities such as communications, security and administration buildings will be located in a site administration area south of Blaydin Point in the central part of Middle Arm Peninsula.

Other facilities required to support the Project that are not directly assessed in this Draft EIS include the following:

- an accommodation village for the workforce during the construction period
- quarries for the supply of fill, rock and aggregate
- a rock load-out facility and stockpile area for transferring rock for subsea pipeline stabilisation
- a maritime supply base for onshore and offshore operations
- a tug harbour
- waste disposal facilities
- utility corridors (e.g. for power and water).

These facilities will either be supplied by third parties or will be subject to separate approval processes.

An indicative schematic of onshore and some of the nearshore infrastructure is provided in Figure 2-4. The proposed site plan for the onshore development area is illustrated in Figure 2-5.

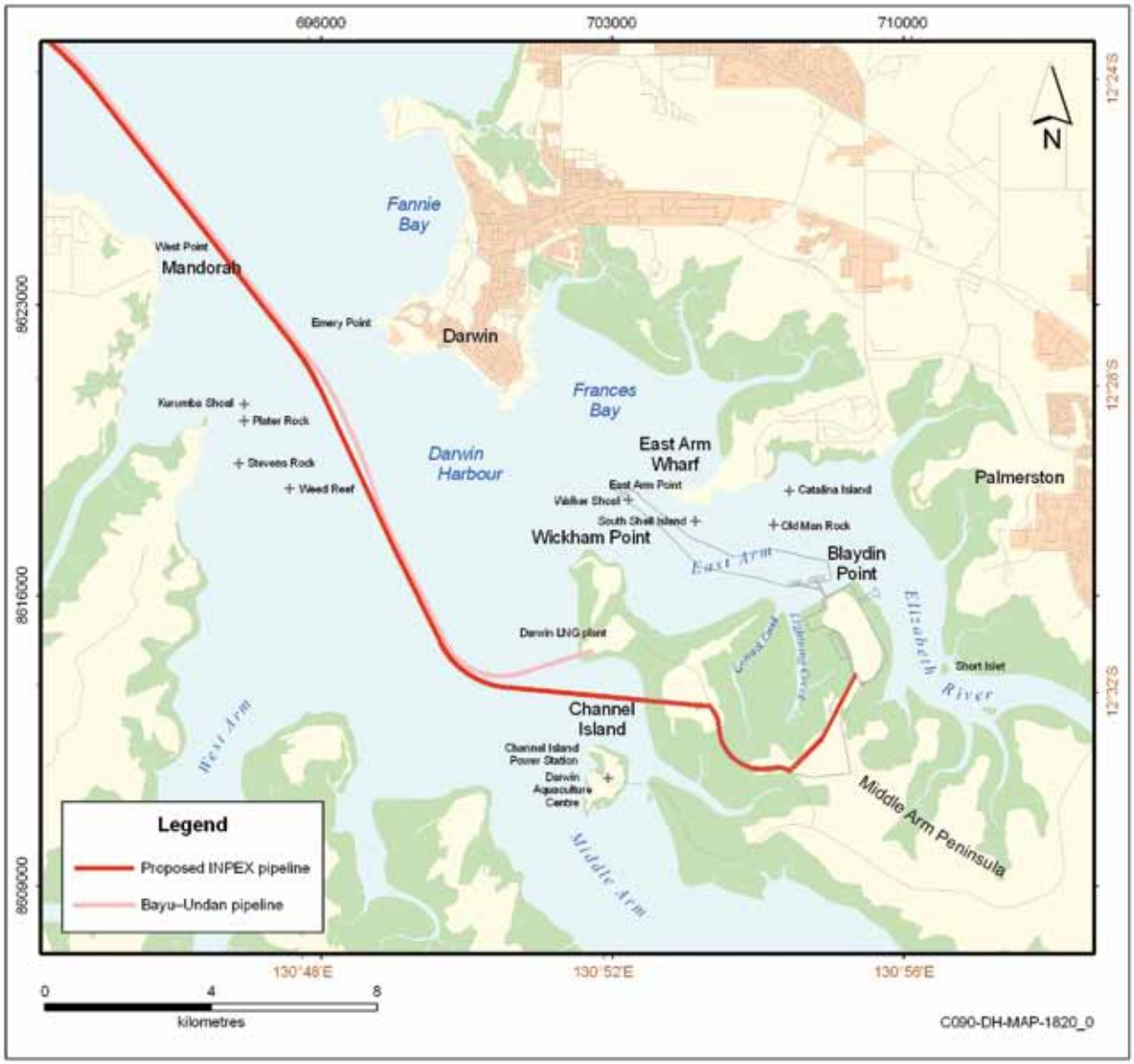


Figure 2-3: Location of the onshore processing plant on Blaydin Point and the gas export pipeline route through Darwin Harbour

2.2 Alternatives

During the concept selection stage of the Project, a number of alternatives were considered for different components of the Project. These included site selection, assessment of technically feasible design alternatives, and the "no development" option.

2.2.1 Site selection

Following the appraisal of the Ichthys Field's gas and condensate reserves, INPEX investigated the options to bring the hydrocarbon products to market. Currently proven technology for the processing of LNG for export involves the development of large onshore gas-processing trains with deepwater anchorages for LNG tankers. A decision was made by INPEX to pursue this approach for the Project.

The selection of a site for the onshore gas-processing component of the Ichthys Project commenced with studies conducted in 2002 that assessed a number of possible locations. These studies indicated that the Maret Islands in the Kimberley region of Western Australia were the most appropriate location for the onshore facility; this was based on what was understood at that time of the environmental, political, engineering and commercial constraints.

INPEX initiated an approvals process with the Commonwealth Government in May 2006 in order to pursue the Maret Islands option, referring its proposal to develop the Ichthys Field to the Commonwealth's Department of the Environment and Water Resources (DEW)[6] and Western Australia's Environmental

6 The Commonwealth's Department of the Environment and Water Resources became the Department of the Environment, Water, Heritage and the Arts (DEWHA) in December 2007.

Figure 2-4: Indicative schematic of the onshore and nearshore infrastructure at Blaydin Point

Protection Authority (EPA). These agencies determined that the Project should be formally assessed at the EIS and the environmental review and management program (ERMP) levels respectively.

Work accordingly began on the preparation of a draft EIS/ERMP for the Maret Islands location.

By 2007, significant uncertainty relating to INPEX's ability to develop the LNG facility at the Maret Islands location in the Kimberley region became apparent. Consequently, INPEX revisited sites that were considered in earlier stages of the Project's site-selection phase and determined that it would be technologically feasible to export Ichthys gas to an onshore gas-processing location in the Darwin region, despite the considerably greater length of subsea pipeline that would have to be constructed to transport the gas. During this period, the Northern Territory Government offered INPEX the Blaydin Point site for the onshore components of the Project. It is the Northern Territory Government's preferred site for an LNG facility and is primarily zoned for industrial development under the Northern Territory Planning Scheme[7].

7 Department of Planning and Infrastructure. 2008. *Northern Territory planning scheme*. Department of Planning and Infrastructure, Darwin, Northern Territory.

In order to facilitate the acquisition of land tenure, INPEX initiated discussions with the Northern Territory Government which led to the signing of a Project Development Agreement (PDA) on 18 July 2008 by INPEX Browse, Ltd., Total E&P Australia, and the Northern Territory Government. The PDA outlined the approximate plan for the onshore area of the Project as well as conditions that are required to be fulfilled in order to gain land tenure. The ongoing discussion regarding land tenure of the onshore development area will be based on the adjusted development area boundaries as presented in the Draft EIS.

2.2.2 Design alternatives

Consideration of environmental, social, economic and safety criteria has been included in the concepts and designs selected for the Project. Technically feasible design concepts that have been particularly influenced by these criteria include the following:

- alternative subsea pipeline routes, shore-crossing locations and onshore pipeline routes
- alternative locations for offloading the modules for the onshore gas-processing plant, that is, whether to build a new module offloading facility at Blaydin Point or to use the existing facilities at East Arm Wharf and transport the modules to site by road

Figure 2-5: Onshore development area infrastructure

- alternative concepts for the product loading jetty and navigation channels at Blaydin Point
- alternative locations for a dredge spoil disposal ground
- alternative onshore gas-processing plant layouts.

INPEX has also considered a number of alternative offshore processing concepts and selected the one considered most appropriate for the scale of the Project and the location of the Ichthys Field.

Alternative locations and designs of the accommodation village for the construction workforce are subject to a series of separate approvals from the regulatory authorities that are not within the scope of the Draft EIS.

2.2.3 Consequences of adopting the "no development" option

As the permit holder and Operator of the Ichthys Project, INPEX has an obligation to undertake exploration of its permit area, to verify the nature and extent of the hydrocarbon reserves which it contains and to investigate the manner in which these reserves can be commercialised. Should the Project be commercially viable and not proceed, INPEX would not be fulfilling its obligations.

In addition, significant social and economic advantages resulting from the Project would be lost to northern Australia in general and to the Darwin region in particular. The Project has the potential to generate substantial new export income, to create numerous employment opportunities and to strengthen the Northern Territory's economic development. It would be the largest private-sector investment in the history of the Darwin region and would provide opportunities for business and employment for over four decades.

2.3 Development schedule

The construction phase of the Project will cover a period of 5 to 6 years from the final investment decision to the loading of first LNG cargo. Figure 2-6 presents the indicative construction schedule. As presented, construction and commissioning of the second LNG train will continue as gas is being produced from the first LNG train. From the commencement of commissioning, the aim is to run both the offshore and onshore facilities continuously for the duration of the anticipated 40-year life of the Project.

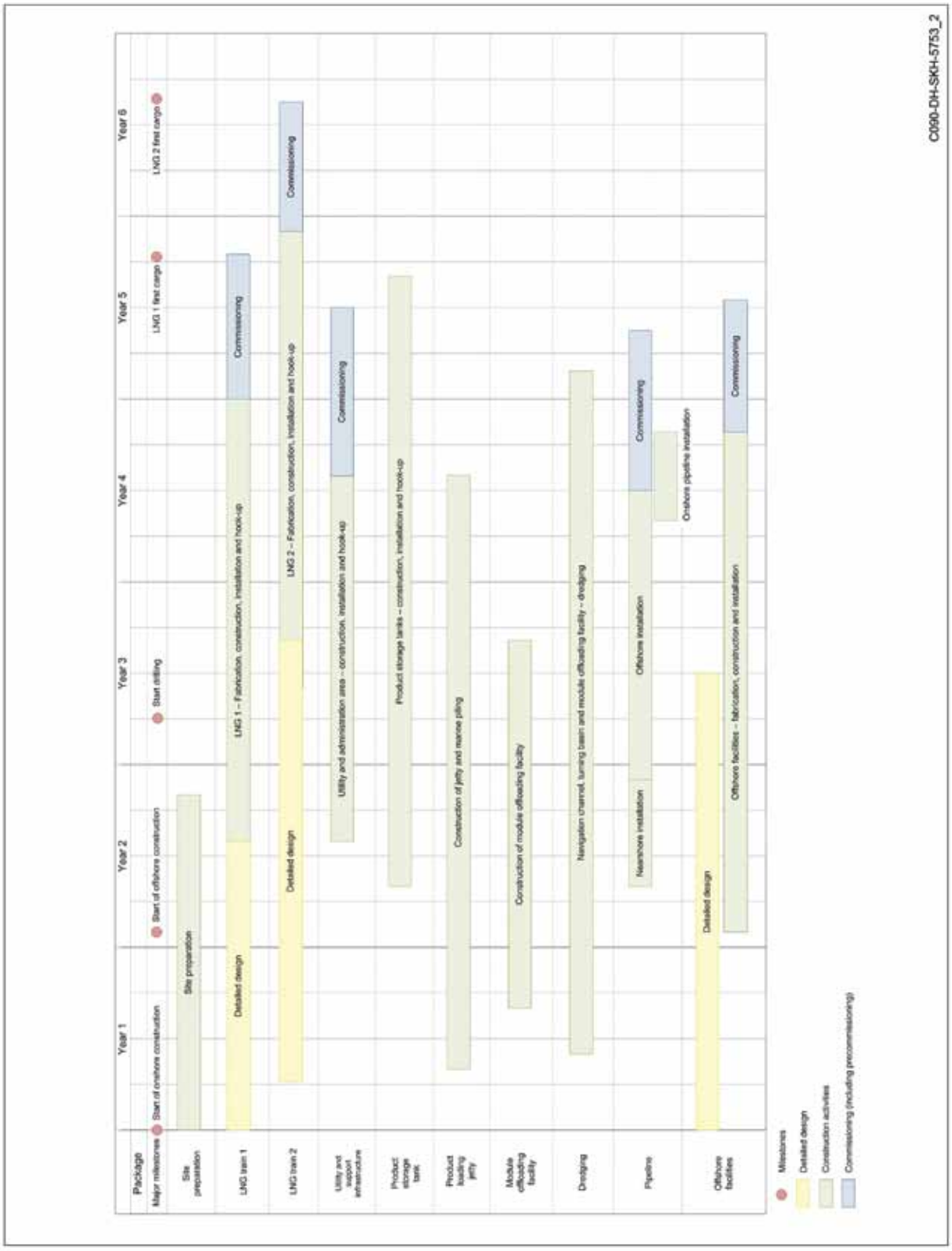


Figure 2-6: Indicative development schedule

3 Stakeholder Involvement

INPEX recognises stakeholder consultation as an important and ongoing process in the Ichthys Project. From the outset, INPEX has embarked on a program of consultation and communication with a broad range of government, industry and community stakeholders. Such consultation is a vital part of the environmental assessment process for the Project which adds to the formal input that will be provided by government and the public in response to the Draft EIS.

In the preparation of the Draft EIS, INPEX has consulted widely with government departments, community groups, business representatives and users of Darwin Harbour. The Commonwealth and Northern Territory government reviews of the Draft EIS and the subsequent period for public review and comment will offer an opportunity to all interested parties to provide input into the environmental assessment process.

INPEX has developed a stakeholder communication plan to facilitate a considered and coordinated approach to its engagement with all stakeholders. This is described in further detail below.

3.1 Stakeholder Communication Plan

The purpose of the Stakeholder Communication Plan is to facilitate effective involvement of stakeholders throughout the Project's 40-year production lifespan, from the approvals phase through to the construction, commissioning, operations and decommissioning phases.

As described in the plan, INPEX's approach is as follows:

- to identify the full range of stakeholders with an interest in the Project
- to establish and maintain a consistent and coordinated approach for communication with local communities, government agencies, special-interest groups and industry
- to provide stakeholders with information about the Project, the approvals process and overall Project timelines
- to identify known and emerging environmental, social and cultural heritage aspects of the Project which might be of interest or concern to stakeholders
- to inform stakeholders about the key environmental, social and cultural heritage factors associated with the Project, the potential impacts of Project activities, and the management strategies to be put in place to minimise or mitigate such impacts
- to consider stakeholder concerns during Project decision-making processes
- to ensure that there is timely and accurate feedback and provision of information on how INPEX will manage any impacts and issues.

The plan also outlines the engagement and consultation activities that have taken place since the formal commencement of the environmental impact assessment process in May 2008 and provides a summary of what is proposed for the future. To ensure that it maintains its relevance over the long term, the Stakeholder Communication Plan will be updated as required.

3.2 Implementation of the Stakeholder Communication Plan

Consultation undertaken by INPEX to date has included the following:

- open community forums in Darwin and Palmerston
- socio-economic impact assessment interviews
- presentations to a wide range of community and business groups, including an industry forum in Darwin
- regular formal meetings with Northern Territory and Commonwealth government agencies
- regular formal meetings and presentations to elected and executive representatives of the Darwin, Palmerston and Litchfield councils
- regular formal meetings with a wide range of community and business groups, including an industry forum in Darwin
- discussions with Aboriginal groups, including the Northern Land Council and the Larrakia Development Corporation
- sponsorship and representation at events such as the Freds Pass Rural Show and the Palmerston Festival
- formal meetings with training and education providers to identify opportunities for sponsorship and capacity-building.

In addition, consultation was undertaken with the Northern Territory Government, local government, local businesses and the local community during February 2009 to seek support for the planning process for the development of INPEX's proposed accommodation village at Howard Springs. Environmental and social impacts for this development will be assessed under a separate approvals process.

Community forums

INPEX held the first of its open community forums in Darwin and Palmerston in November 2008 (Figure 3-1). The forums were widely advertised and attended by about 400 people and were designed to encourage stakeholder participation by presenting the key aspects of the Project, the likely impacts, and the proposed management controls.

Key issues raised at these forums include the following:

- employment and training opportunities associated with the Project
- potential accommodation shortages and pressure on infrastructure during the peak employment period
- the dredging program and its potential impact on other Harbour users
- the visual impact of the development on the Harbour

Figure 3-1: Community forum held in Darwin in November 2008

- access to waters adjacent to the onshore processing plant for recreational users
- air emissions and their impact on air quality
- liquid discharges and their impact on water quality.

Consultation with traditional owners

INPEX intends to establish and maintain sustainable and mutually advantageous relationships with traditional owners in the Darwin region, including the original inhabitants of the Blaydin Point area, the Larrakia people. It aims to achieve this by adopting the following measures:

- consulting relevant Aboriginal communities to promote an understanding of each other's concerns and aspirations
- helping relevant Aboriginal communities manage any issues and challenges they might face in relation to INPEX's proposed operations
- consulting with Aboriginal communities and other appropriate organisations to increase the pool of potential employees for the company
- offering a range of school- and community-level initiatives
- supporting partnerships that make a positive difference to Aboriginal communities.

Comprehensive stakeholder communication will continue throughout the life of the Project as INPEX continues to consult with key stakeholders about the progress of the Project and opportunities for local involvement during its construction, operations and decommissioning phases. Activities such as community forums and the establishment of an office in Darwin's central business district will ensure that INPEX will have an open and accessible presence in the Darwin community while developing and maintaining an understanding of the issues relating to the Project.

4 Existing Environment

This section of the Executive Summary summarises the key physical, biological, social and economic features of the existing environment in the areas to be affected by the Project. A description of the regional environment is also included in order to provide context for the significance of the habitats, resources and socio-economic conditions that currently exist in and around the development areas.

The geographical area affected by the Project can be divided into three main components:

- the offshore development area, which includes the Ichthys Field in the Browse Basin off the coast of north-western Australia as well as the pipeline route from the field to the mouth of Darwin Harbour
- the nearshore development area, which includes the pipeline route from the mouth of Darwin Harbour south to the waters around Blaydin Point and Middle Arm Peninsula as well as the offshore spoil disposal ground about 15 kilometres north of the entrance to Darwin Harbour
- the onshore development area, which includes the site proposed for the onshore processing plant at Blaydin Point and the onshore pipeline corridor from the shore crossing south of Wickham Point to the Blaydin Point plant.

4.1 Offshore marine environment

The Ichthys Field is located in Retention Lease WA-37-R, which was granted to INPEX and Total E&P Australia (the Joint Venture Parties) on 21 September 2009 in a portion of petroleum exploration permit area WA-285-P R1 (see Figure 4-1). The nearest sensitive marine habitats are Browse Island, located 33 kilometres to the south-east of the field, and Echuca Shoal, located approximately 55 kilometres to the east.

The subsea pipeline route will extend from the Ichthys Field to the shore-crossing area south of Wickham Point on Middle Arm Peninsula in Darwin Harbour, a distance of around 885 kilometres. Most of this route is distant from land, with the exception of the eastern end of the route that curves around Cox Peninsula just before it enters Darwin Harbour.

4.1.1 Climate and oceanography

The climate in the Browse Basin region is monsoonal with warm north-west and south-west winds in summer (October–February) and cooler south-easterly winds in winter (May–June). This area is also prone to tropical cyclones, mostly during the tropical wet season (December–March). It is expected that cyclones could have an impact on the Ichthys Field at least once every two years. Under extreme cyclone conditions winds can reach 300 kilometres per hour.

The Browse Basin generally experiences large tides and tidal currents. Mean sea level at the Ichthys Field is about 2.7 metres above Lowest Astronomical Tide (LAT), with a spring-tide range of about 5.0 metres. Tides are semidiurnal, with two daily high tides and two low tides. The swell tends to be higher during winter (with typical significant wave heights about 0.8 metres) than in summer (with typical significant wave heights about 0.7 metres), because the swell-generating storms move further north in winter. Swell periods are generally of the order of 12–18 seconds.

The offshore waters in the Ichthys Field area are between 235 metres and 275 metres deep and are typified by thermal stratification that varies in strength according to the season. At the Ichthys Field, surface water temperatures are about 30 °C in summer (March) and 26–27 °C in winter (July), with major thermoclines at 30–50 metres depth in summer and 70–120 metres in winter. Below the thermocline, water temperatures decrease by approximately 1 °C per 10 metres of water depth, dropping to as low as 12 °C at 250 metres. Extreme weather events, such as cyclones and monsoons, may also promote temporary mixing of water layers across the thermocline. In shallower waters (less than 100 metres deep) along the greater part of the pipeline route, the seabed water temperature remains relatively constant at around 25 °C.

Salinity is spatially and temporally consistent at 34–35 parts per thousand as expected for locations that are distant from major freshwater discharges. Dissolved oxygen concentrations in the waters of the Ichthys Field showed constant levels of 6.0–6.5 parts per million above the thermocline in both summer and winter. Below the thermocline, dissolved oxygen decreased with depth with levels as low as 3 parts per million at 250 metres, indicating that mixing is limited because of the strong thermal stratification.

4.1.2 Marine habitat and fauna

Surveys show that the seabed at the Ichthys Field is generally flat with shallow sand waves. The sediments grade from soft featureless sandy silts in the north

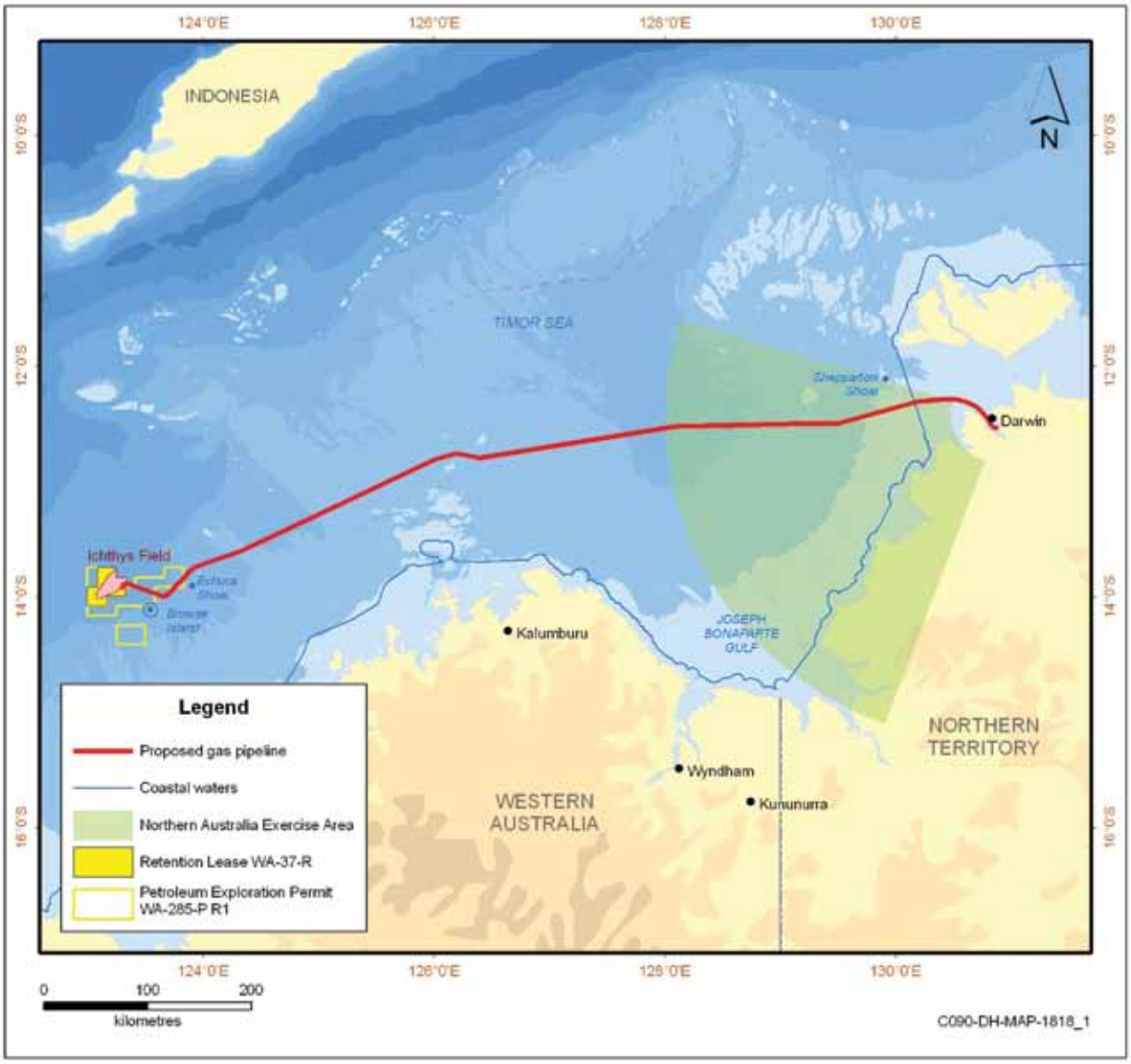


Figure 4-1: The offshore development area

to gravelly sands in the south. Very few epibenthic organisms were observed and the seabed features indicate strong near-seabed currents and mobile sediments. Infaunal assemblages are dominated by deposit-feeding polychaete worms and small shrimplike crustacean species. Soft substrates are typical of deep continental shelf seabeds and this habitat is very widely distributed in the deeper parts of the Browse Basin.

The greater part of the proposed pipeline route encompasses featureless, unconsolidated clay–silty sands with low benthic diversity. Areas of hard substrate host benthic fauna that is common throughout the region, including soft corals, gorgonians and sponges.

Browse Island is an isolated sandy cay surrounded by an intertidal reef platform and a shallow fringing reef. It is located approximately 33 kilometres south-east of the offshore development area. Rocky-shore habitat around the island is represented only by exposed beach rock and there are no intertidal sandflats. The reef platform is high and conspicuously barren in many places. The reef crest and seaward ramp habitats around the edge of the reef support moderately rich assemblages of molluscs, while the shallow subtidal zone is narrow and supports relatively small areas of well-developed coral assemblages. Browse Island is listed as a nature reserve as the coarse coral sand beach zone is used by green turtles (*Chelonia mydas*) as a nesting area.

Echuca Shoal is located approximately 55 kilometres east of the offshore development area. It supports small coral colonies with low species richness and abundance, with coral rubble suggestive of strong currents. The shallow shoal areas which rise to

approximately 13 metres below LAT are dominated by a flat reef platform comprising hard corals, crinoids, sea whips and soft corals. At greater depths the density of epibenthic fauna decreases dramatically, with sea whips and sea fans dominant (particularly between 80–100 metres). Below the drop-off of the slope at the edge of Echuca Shoal (at depths of 180–200 metres), bare sand is the dominant substratum with sponges, crinoids and occasional echinoderms and gorgonians present.

Baleen whales, toothed whales and dolphins occur in the offshore development waters at the Ichthys Field and along the gas export pipeline route, although these areas do not represent significant breeding or foraging habitat for these animals. Humpback whales (*Megaptera novaeangliae*) are the most common whale species observed in the region, as they migrate annually from their Antarctic feeding grounds to their breeding and calving areas in coastal waters of the Kimberley region in the north of Western Australia. Humpback whales are listed as "vulnerable" under the EPBC Act.

The offshore development area is unlikely to support breeding and feeding grounds for turtles, although the coastal waters and beaches of the Kimberley are known to host significant green turtle and flatback turtle (*Natator depressus*) rookeries. Both species are listed as "vulnerable" under the EPBC Act. Flatback turtles are also abundant in turbid, shallow inshore waters in the west of the Northern Territory, with nesting areas located on islands such as Bare Sand Island and Indian Island, south-west of the Cox Peninsula. Limited low-density nesting has been observed in Darwin Harbour—at Cox Peninsula near Mandorah and at Casuarina Beach.

A number of EPBC-listed migratory seabirds occur in the offshore development area, although at low densities. Within the region, the Roebuck Bay – Eighty Mile Beach area and Ashmore Reef are important aggregation sites for migratory birds that utilise the East Asian – Australasian Flyway. These are 450 kilometres south-south-west and 160 kilometres north of the Ichthys Field respectively.

4.2 Nearshore marine environment

The nearshore development area includes the entrance to Darwin Harbour through to the coastal waters around Blaydin Point and Middle Arm Peninsula below the low-water mark (see Figure 4-2).

4.2.1 Climate and oceanography

Darwin Harbour lies in the monsoonal (wet–dry) tropics of northern Australia and experiences two distinct seasons—a hot wet season from November to March and a warm dry season from May to September. The months of April and October are transitional. Maximum temperatures are hot all year round, but November is the hottest month (25–33 °C) while June and July are the coolest (20–30 °C). The mean annual rainfall is 1711 millimetres, with rain falling on an average of 111 days, mainly in the wet season.

Darwin Harbour is a large ria system, or drowned river valley, with an area of about 500 square kilometres. In its southern and south-eastern portions the Harbour has three main components—East Arm, West Arm and Middle Arm—that merge into a single unit, along with the smaller Woods Inlet, before joining the open sea. Freshwater inflow to the Harbour occurs from January to April, when estuarine conditions prevail in all areas.

The main channel of the Port of Darwin is around 15–25 metres deep, with a maximum depth of 36 metres. The channel favours the eastern side of the Harbour, with broader shallower areas occurring on the western side. The channel continues into East Arm, towards Blaydin Point, at water depths of more than 10 m below LAT; the bathymetry in this area has been modified by dredging and reclamation for the development of East Arm Wharf.

Darwin Harbour is characterised by a macrotidal regime, with predominantly semidiurnal tides. Mean sea level is approximately 4.0 metres above LAT, and spring tides can produce tidal ranges of up to 7.5 metres. The large tidal ranges produce strong currents that peak at speeds of up to 2–2.5 metres per second.

Water quality in Darwin Harbour is generally high, although naturally turbid most of the time. Water-quality parameters vary greatly with the tide (spring versus neap), location of sampling (inner versus outer Harbour), and with the season (wet season versus dry season). Anthropogenic influences to Harbour water quality include the port operations at East Arm Wharf, historical industrial activities at Darwin Waterfront and Sadgroves Creek, and discharge from the Larrakeyah sewage plant by the Power and Water Corporation.

Average water temperatures measured in the nearshore development area were 30.6 °C in the wet season and 24.5 °C in the dry season. Salinity levels recorded in the East Arm area ranged from 19.1 parts per thousand to 36.3 parts per thousand. Mean salinity levels in the Harbour were lower in the wet season than the dry season. Algal blooms, which are symptomatic of excessively nutrient-rich water, have not been recorded in the Harbour.

Harbour waters remain well oxygenated throughout the year, with levels ranging from 74 per cent to 96 per cent saturation (with an average of 84 per cent). Dissolved oxygen levels are generally higher in the

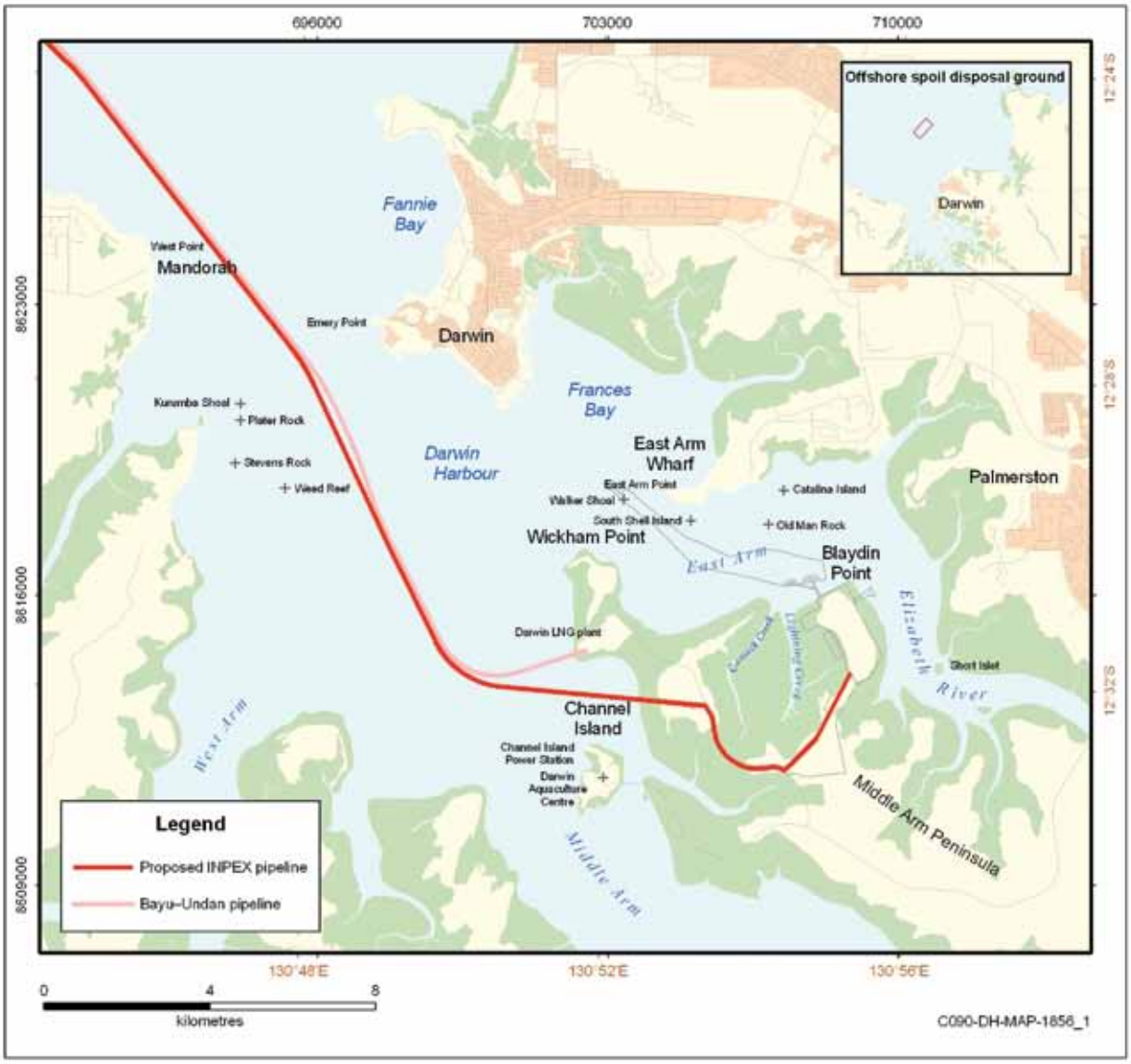


Figure 4-2: The nearshore development area in Darwin Harbour

surface waters and in the main body of the Harbour. Levels are lower in the wet season.

Sediments in the nearshore development area range from terrigenous gravels in the main Harbour channel; calcareous sands close to small coral communities and shoals; terrigenous sands on beaches and spits; and mud and fine sand on broad, gently inclined intertidal mudflats. Elevated levels of arsenic were recorded at some sites in surface and subsurface sediments. This is likely to be an indication of local geology rather than man-made contamination. Laboratory testing showed that this arsenic would not be toxic in the marine environment, as only very small proportions dissolved into "bioavailable" forms that can be absorbed by plants or animals (including humans). Tributyltin (TBT) compounds were not recorded above laboratory detection limits in surveys of the sediments of the nearshore development area.

Petroleum hydrocarbons were recorded in some locations; in all cases, however, the concentrations were well below the screening levels identified in the Commonwealth's *National assessment guidelines for dredging 2009*.

4.2.2 Marine habitat and fauna

Marine habitats of Darwin Harbour are shown in Figure 4-3. Key marine communities include hard and soft corals, macroalgae and subtidal soft-sediment invertebrate communities. Mangrove stands and mudflats dominate the intertidal zone throughout the Harbour.

Coral-dominated communities in Darwin Harbour are located in lower intertidal to high subtidal areas to depths of 5–10 metres below LAT. These areas are characterised by strong currents where the sediment load is kept in suspension and light intensity does not

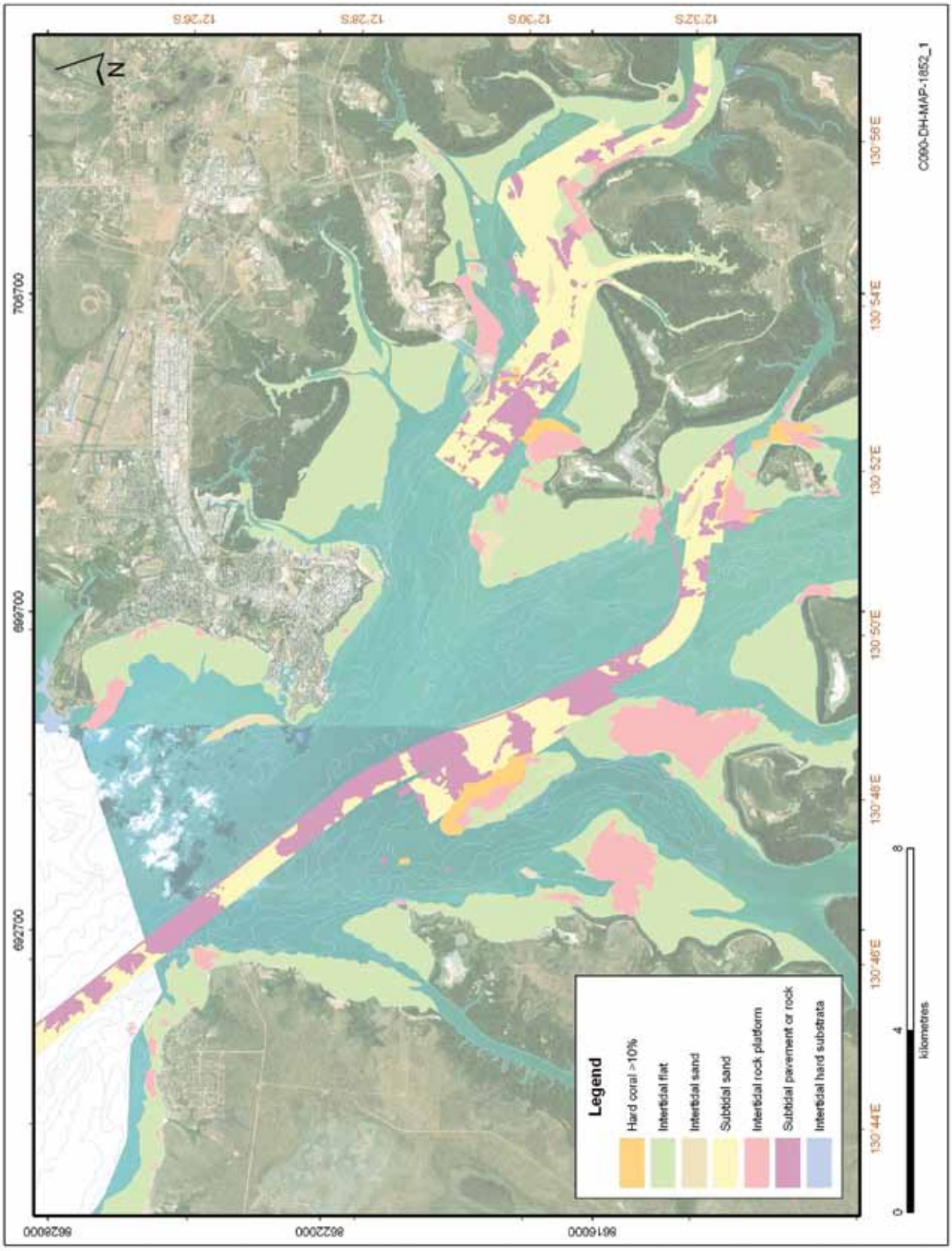


Figure 4-3: Marine habitats in Darwin Harbour

fall below a minimum value for coral and algal survival. Known localities of coral-dominated communities are Channel Island, Weed Reef, north-east Wickham Point and South Shell Island.

The coral community on the rocky platform at Channel Island is listed on the Register of the National Estate and is a declared "Heritage Place" under the *Heritage Conservation Act* (NT). The community is relatively diverse and demonstrates that a coral-based community can survive in an area where most physical conditions are adverse (e.g. high turbidity, strong tidal currents, and seasonally low salinity).

In the vicinity of Blaydin Point, the shoreline comprises sloping rock platforms or intertidal mudflats with moderate bioturbation. The deeper subtidal area (approximately 1500 metres from the shoreline) comprises moderate soft coral cover (mainly *Sarcophyton* and *Dendronephthya* species) on hard substrates, together with zoanthids, bryozoans, hydroids, ascidians and sponges. At deeper sites where hard pavement is not exposed, the fauna typically includes gorgonian fans, sea whips, sea pens and large sponges.

The rock-armour covering the existing Bayu–Undan pipeline in Darwin Harbour has a high coverage of soft coral, gorgonians, algae and hydroids with less than 5 per cent hard-coral coverage. A moderate abundance of fish life also surrounds the pipeline, the most noticeable being surgeon fish of the family Acanthuridae. The surrounding sand- and silt-covered seabed supports a low coverage of sparse sea whips and sea pens.

The seabed at the offshore dredge spoil disposal ground is characterised by flat, featureless benthic habitat of silt–sand in water depths of 15–20 metres. The area supports sparse benthic communities of burrowing infauna and epibenthic fauna such as bryozoans, sponges and soft corals. No seagrasses or hard corals were recorded in surveys of the area.

The most commonly recorded cetacean species in Darwin Harbour are three coastal dolphins—the Australian snubfin (*Orcaella heinsohni*), the Indo-Pacific humpback (*Sousa chinensis*) and the Indo-Pacific bottlenose (*Tursiops aduncus*). Occasional pods of false killer whales (*Pseudorca crassidens*), an oceanic dolphin, are also known to visit the Harbour.

Dugongs are known to occur in Darwin Harbour waters, although in relatively low numbers, and have been observed foraging on the rocky reef flats between Channel Island and the western end of Middle Arm Peninsula. As no seagrass occurs on the reef flat in this area, the dugongs were likely to have been feeding on macroalgae.

Green, flatback and hawksbill (*Eretmochelys imbricata*) turtles visit Darwin Harbour regularly to forage for food. However, the shoreline throughout Darwin Harbour, largely consisting of mangroves and mudflats, does not support nesting activity for marine turtles. This is with the exception of a few locations at Cox Peninsula and Casuarina Beach, where very low-density nesting of flatback turtles has been reported. The green, flatback and hawksbill turtles are all listed as "vulnerable" under the EPBC Act.

Other large marine animals that inhabit Darwin Harbour include the saltwater crocodile (*Crocodylus porosus*), a diverse range of marine and mangrove-dwelling snakes and two species of sawfish listed as "vulnerable" under the EPBC Act: the freshwater sawfish (*Pristis microdon*) and green sawfish (*Pristis zijsron*). The nearshore waters around Blaydin Point are not considered significant foraging or breeding grounds for these species.

Of the 55 potentially invasive marine species identified by the National Introduced Marine Pests Coordination Group, none are known to occur in Darwin Harbour and the region is considered free of marine pests.

4.3 Onshore terrestrial environment

The onshore development area includes the terrestrial environment above the low-tide mark at Blaydin Point and parts of Middle Arm Peninsula. An access road and pipeline corridor also extend the onshore development area across Middle Arm Peninsula to the water's edge south of Wickham Point (Figure 4-4).

4.3.1 Physical environment

Blaydin Point is a low-lying peninsula oriented north–south, extending from Middle Arm Peninsula into the waters of East Arm in Darwin Harbour. Blaydin Point is separated from the mainland by a mudflat, which is flooded during spring tides.

Soil surveys of the onshore development area identified potential acid sulfate soils (PASSs) in the mangrove and swamp areas. The potential was generally higher in the subsoil than in surface layers. Subsurface soils were typically dark-coloured silty clays, with high organic matter accumulation, anaerobic conditions and the "rotten-egg" odour indicative of hydrogen sulfide.

Throughout the onshore development area the surface soil layer rapidly absorbs rainfall when the soil is dry, such as at the end of the dry season. After regular rainfall the surface layer becomes saturated

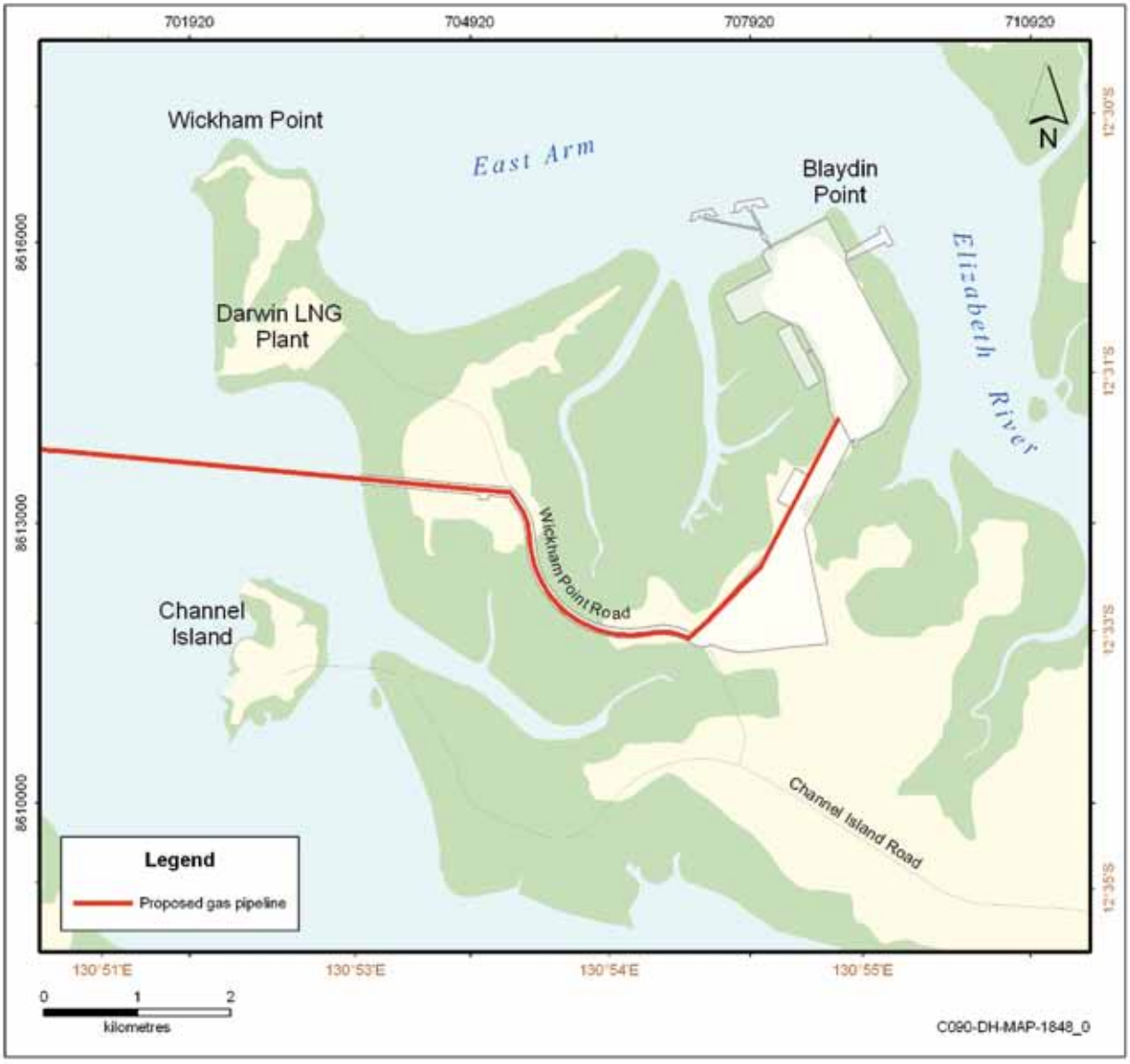


Figure 4-4: The onshore development area

and surface-water flows increase. Where water accumulates at the outer edges of Blaydin Point, surface-water flow is likely to become increasingly turbulent and occupy temporary drainage channels. These channels become the ephemeral sections of the tributary creeks that feed into Lightning Creek to the west and East Arm to the east.

Groundwater under the central elevated areas of Blaydin Point is of low salinity and of a similar quality to rainwater and drinking water. The most prominent aquifer is known as the Bathurst Island Group and occurs in the sand and gravel horizons of the soils at the interface between the overlying sediments and bedrock.

Ambient air quality in the Darwin region is influenced by a number of sources including biogenic emissions (from vegetation and soil), smoke from bushfires, and anthropogenic emissions from vehicles and industrial facilities. Ambient air-quality studies showed that concentrations of nitrogen dioxide, sulfur dioxide and ozone in the Darwin airshed are relatively low, falling well below levels that could affect public health under the criteria provided by the National Environment Protection (Ambient Air Quality) Measure.

4.3.2 Vegetation and fauna

Vegetation in the upland portions of the development area is dominated by *Eucalyptus miniata* and *E. tetrodonta* woodland, a common vegetation community that is widespread throughout the Darwin Coastal Bioregion. Surveys of the area indicated that this vegetation type provided habitat for the greatest number of animal species, particularly birds. Vegetation communities of the onshore development area are shown in Figure 4-5.

Monsoon vine forest also occurs in the onshore development area and supports species such as *Carpentaria acuminata*, *Acacia auriculiformis* and

Calophyllum soulattri. While monsoon vine forest is found throughout the Darwin Coastal Bioregion, it occurs in relatively small, isolated patches. This vegetation community provides important habitat for several species of bird that feed on fruit and flowers.

The coastal fringes of the onshore development area are dominated by mangroves. The Darwin Harbour mangrove community is known for species richness, containing 36 of the 50 mangrove species known worldwide. The most common mangrove species in Darwin Harbour are *Rhizophora stylosa*, *Ceriops tagal*, *Sonneratia alba*, *Bruguiera exaristata*, *Avicennia marina* and *Camptostemon schultzii*. The mangrove vegetation community provides habitat for mangrove specialist bird species such as the cicadabird (*Coracina tenuirostris*), black butcherbird (*Cracticus quoyi*) and white-breasted whistler (*Pachycephala lanioides*).

The cycad *Cycas armstrongii* occurs in the eucalypt woodland community within the development area. The species is listed as "vulnerable" under the *Territory Parks and Wildlife Conservation Act* (NT) (TPWC Act). *C. armstrongii* is endemic to the Northern Territory and is locally abundant across the western Top End region, the Cobourg Peninsula and the Tiwi Islands (Melville Island and Bathurst Island).

A number of animal species listed as threatened under the TPWC Act or the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) may occur in and around the onshore development area, such as the northern quoll (*Dasyurus hallucatus*), water mouse (*Xeromys myoides*), red goshawk (*Erythrotriorchis radiatus*) and the floodplain monitor (*Varanus panoptes*); however these species were not recorded during pre-development surveys.

Twelve species of weeds occur at the onshore development area. Four of these species—hyptis (*Hyptis suaveolens*), lantana (*Lantana camara*), mission grass (*Pennisetum polystachion*) and gamba grass (*Andropogon gayanus*)—are listed as declared weeds under the *Weeds Management Act 2001* (NT), and three are also weeds of significance according to the Commonwealth list of "weeds of national significance". Introduced animal species that inhabit the onshore development area include the cane toad (*Bufo marinus*), black rat (*Rattus rattus*) and feral pig (*Sus scrofa*).

Extensive biting-insect habitat exists at the onshore development area. The mangrove biting midge (*Culicoides ornatus*) is particularly prevalent and mosquito species including *Aedes vigilax*, *Culex annulirostris*, *Culex sitiens*, *Verrallina funerea* and *Aedes notoscriptus* also occur in the area. These mosquitoes are all potential carriers of disease.

4.4 Social and cultural environment

4.4.1 Land and sea use

The onshore development area on Middle Arm Peninsula is currently undeveloped vacant Crown land falling under the jurisdiction of the Litchfield Council. Middle Arm Peninsula was identified as a site for future industrial development by the Northern Territory Government and is classified as such under the Northern Territory Planning Scheme.

Current use of the land and marine environment on the Middle Arm Peninsula includes a power station and an aquaculture facility on Channel Island, and ConocoPhillips' Darwin LNG plant and offloading facility at Wickham Point. The area is regularly used for recreational fishing and by Aboriginal people for traditional hunting and gathering. Blaydin Point itself is used informally for camping.

In Darwin Harbour, the most intensive use of the marine area is for commercial shipping, recreational boating and military activities. Underwater power and communication cables extend across the Harbour on the seafloor between Mandorah and Myilly Point, and the Bayu–Undan pipeline to the Darwin LNG plant runs down the centre of the Harbour. Tourism activities such as charter fishing, scuba-diving, sailing and general boating are undertaken throughout the Harbour.

4.4.2 Population and demographics

The population of the Northern Territory in 2006 was 192 898 people, representing approximately one per cent of Australia's total population. Around half of this population resided in the Darwin region. Demand for inner-city housing in Darwin has been continually increasing, driven by the migration of new workers in the mining, tourism and defence industries from interstate and overseas. As a result of this migration, the Northern Territory's population is younger than that of the general Australian population with a median age of both males and females of 30 years, compared with the national median ages of 35 and 37 years for males and females respectively.

4.4.3 Cultural heritage

Middle Arm Peninsula is within the traditional country of the Larrakia people. Eight Aboriginal archaeological sites and one isolated artefact are located close to, or within, the boundary of the onshore development area.

Other historic sites in the onshore development area include an anti-aircraft searchlight battery from World War II located on the north side of Blaydin Point and a Catalina (World War II flying boat) wreck located in the intertidal area on the east side of Blaydin Point.

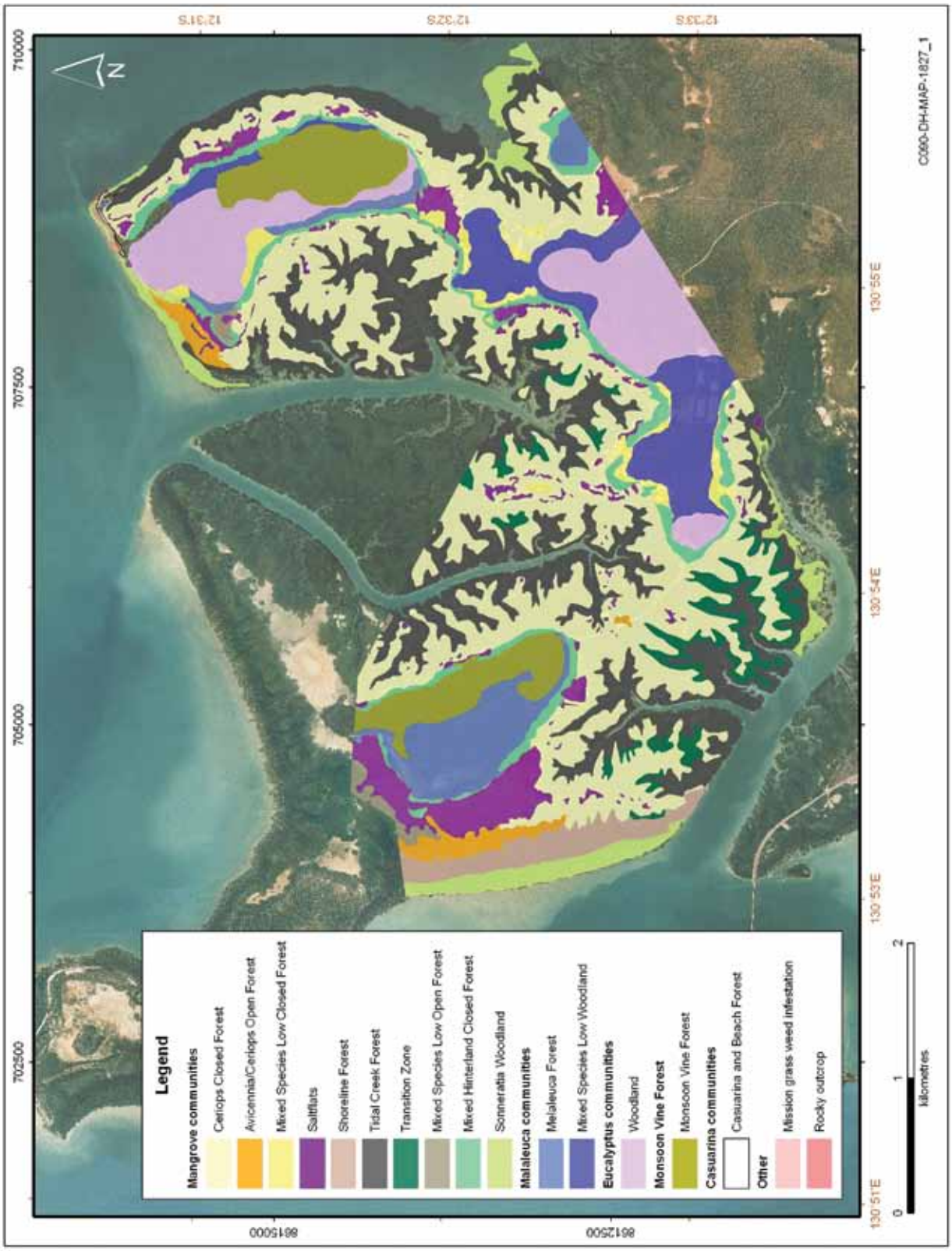


Figure 4-5: Vegetation communities of the onshore development area

Shipwrecks such as the SS *Ellengowan* and the *Diemen* and the World War II shipwrecks the SS *Mauna Loa*, the *British Motorist*, the USAT *Meigs*, the *Neptuna*, the SS *Zealandia* and the USS *Peary* are located in Darwin Harbour near, but outside, the disturbance area for nearshore infrastructure. The wrecks of five Catalinas are located in Harbour waters north of Blaydin Point.

4.5 Economic environment

The Northern Territory has a relatively diverse economy, with a strong reliance on the mining industry. Construction, government administration, defence, manufacturing and the service industries also play a major role in the economy.

In 2006, the labour force participation rate for Darwin city was 65.6 per cent, higher than the Northern Territory and Australian participation rates and, in fact, over recent years Darwin has tended to have lower unemployment than other areas of Australia.

Employment in City of Darwin is spread across a range of areas, with a particular focus on the service industries. The largest industry employer in 2006 was in the area of public administration, probably associated with the Australian Defence Force. Similarly, the largest industry employer in the areas of Palmerston and East Arm is public administration, much of this attributable to the defence sector, in particular to the Robertson Barracks situated near Palmerston. Other important industries in Palmerston and East Arm include retail trade, construction, health care and social assistance, and education and training.

In 2005–06, the mean household income per week in the Darwin region was $1675, which was higher than the Australian average of $1410 per week. Disposable household income was also higher at $730 per week, compared with $678. These results are likely to be in part due to a younger population and larger working population in the area.

Despite these relatively high levels of income, the population of the Darwin region is not necessarily "wealthy". Mean household net worth, an estimate of a household's assets such as property and investments, was the lowest in the country, at $411 569. This finding would be related to Darwin having the highest proportion of renters in the country (38.6 per cent of total households).

5 Risk Assessment Methodology

The systematic identification, assessment and mitigation of risk to the environment and the community is an essential component of the way INPEX conducts its business. This section summarises the methodology used to identify and categorise environmental and public safety risks resulting from planned activities associated with the Project.

5.1 Environmental risk assessment

Environmental risk assessment is the process of identifying the likelihood and consequence of potential environmental impacts from a particular "environmental aspect" resulting from Project activities.

The risk assessment methodology adopted for the Draft EIS ensures that a systematic approach is applied to the assessment and management of environmental risk. The methodology can be divided into three main steps:

1 risk scoping and preliminary risk assessment
2 detailed risk assessment
3 communication of residual risk.

The methodology applied as part of this environmental impact assessment is summarised in the flow diagram in Figure 5-1.

Assessment was carried out through desk-based and workshop-based assessments using predetermined definitions of likelihood and consequences categories to rank each risk identified. Where appropriate, quantitative methods were used to assist in evaluating risks, for example, risk arising from onshore air emissions were modelled to predict ground-level concentrations of air pollutants and compared against national air-quality guidelines. Similarly, oil-spill risks were quantified referring to industry databases on oil-spill frequencies and by predicting the fate of spill events using spill trajectory modelling.

Several iterations of risk assessment were undertaken where, firstly, higher risk activities and aspects were identified and, secondly, management controls were applied and the residual risk was evaluated. The risk assessment methodology used by INPEX is undertaken in accordance with Australian Standard *AS/NZS 4360:2004, Risk management* together with its associated document *Risk management guidelines—Companion to AS/NZS 4360:2004* (Handbook HB 4360:2004).

Proposed management measures and controls, together with risk assessment outcomes are identified in sections 6, 7 and 9 of this Executive Summary.

5.2 Public safety risk assessment

In accordance with Australian and international practice applied in the oil & gas industry, all Project infrastructure will be designed and operated in accordance with the principle of managing risk to "as low as reasonably practicable" (ALARP) levels. This principle is supported by various legislative requirements that include licensing of the onshore LNG plant site at Blaydin Point (including the product loading jetty) as a "major hazard facility" under the *Dangerous Goods Act* (NT) and the Dangerous Goods Regulations (NT). Public risk from major hazard facilities are managed in accordance with the National Standard for "Control of Major Hazard Facilities" and the Code of Practice (1996) issued by Safe Work Australia, formerly the Australian Safety and Compensation Council.

Part of the process of acquiring a Dangerous Goods Licence for a major hazard facility such as the onshore processing plant at Blaydin Point involves undertaking hazard identification and risk management processes in order to assess the safety risk to the public from major incidents resulting from the onshore plant. These risks are assessed through quantitative risk assessments (QRAs). QRA involves using specialised modelling to determining location-specific risks to off-site populations using failure frequencies, available literature appropriate to the Project and potential hazardous scenarios. These location-specific risks can then be compared against agreed fatality risk criteria for other Australian industrial developments.

Currently there are no public risk criteria laid down by legislation in the Northern Territory. The Territory's NT Worksafe advised that the "Victorian 'Interim' offsite individual risk criteria" should be used as a guideline. The risk assessment criteria detailed in this guidance are applicable to the considerations of land-use planning and development in the vicinity of potentially hazardous facilities.

Both the public safety and environmental risk assessments are summarised in sections 6–9 of this Executive Summary to the Draft EIS.

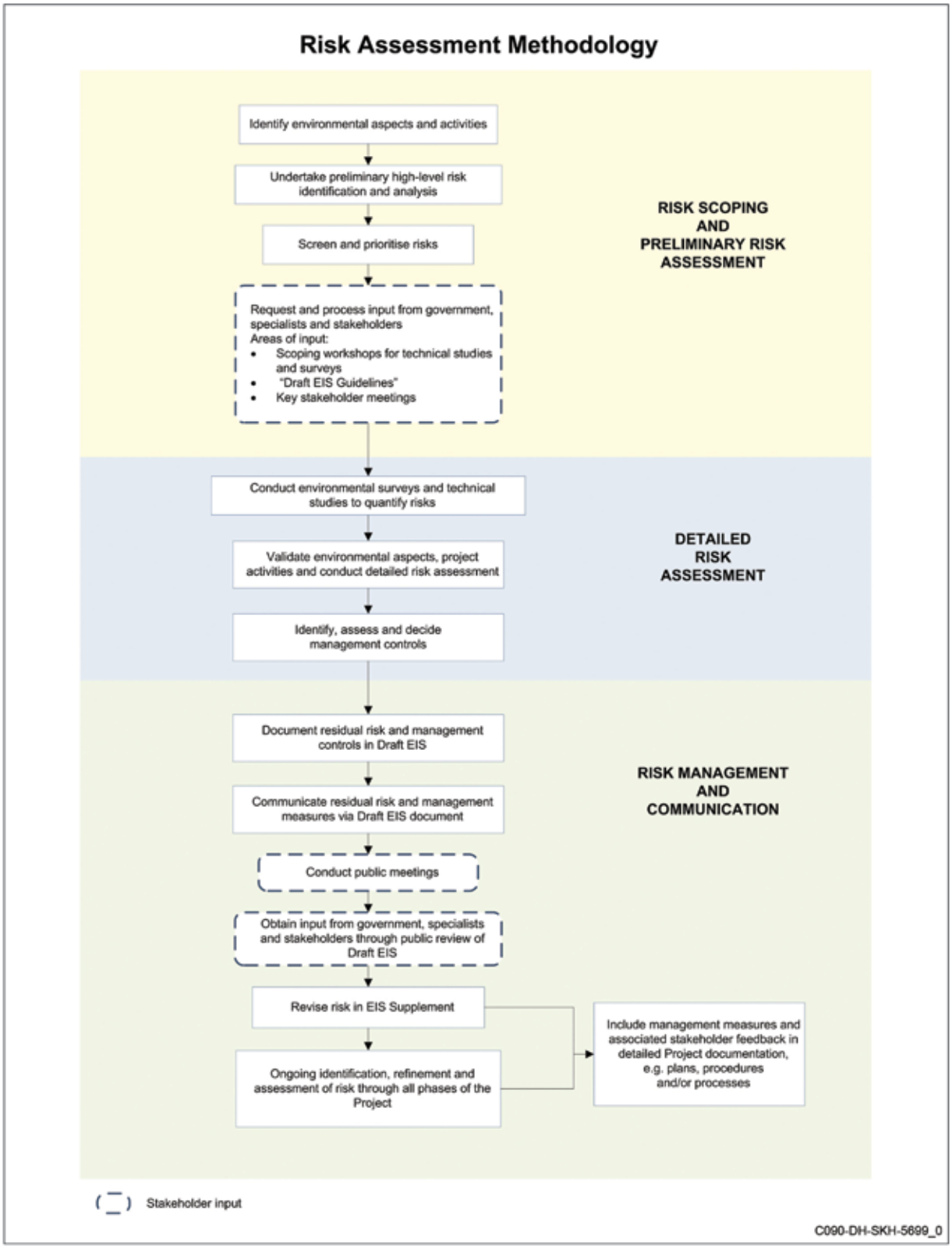


Figure 5-1: Risk assessment methodology

6 Marine Impacts and Management

This section of the Executive Summary summarises the potential impacts to the marine environment that will be associated with the offshore and nearshore development areas of the Project and identifies the key management controls which will be applied to mitigate these impacts.

Offshore environment

Activities in the offshore development area that have the potential to impact on the environment include the installation of facilities, routine discharges and emissions (e.g. produced water, drilling muds and noise), and accidental events such as spills of condensate or diesel. Baseline surveys and modelling informed an assessment of the potential environmental impacts of these activities.

The risk assessment process, taking into account management controls and mitigating factors, identified 13 “medium” and 26 “low” residual risk potential environmental impacts associated with the offshore development area. These risk ratings are considered to be acceptably low, mitigating risks to sensitive habitats and significant or migratory species.

“Matters of national environmental significance” associated with the offshore development area include the Commonwealth marine environment and some threatened and migratory animal species that could occur in the area, including whales and other cetaceans, turtles, sharks and seahorses. Surveys at the Ichthys Field recorded only a low number of whales and the area is not considered significant to whale breeding or feeding. Development of the offshore facilities and gas export pipeline would affect a very small proportion of the extensive and relatively uniform marine habitats in the region, and would not reduce the available habitat for significant species. No threatened ecological communities occur in or near the offshore development area.

The most significant ecological habitat in the vicinity of the offshore development area is Browse Island, which is located approximately 33 kilometres from the offshore facilities. The island is used for nesting by green turtles, which are listed as “vulnerable” under the EPBC Act. The only potential impact to Browse Island associated with the Project is the risk of hydrocarbons reaching shore in the unlikely event of a major condensate spill. Other emissions and discharges from the Project, including light, noise, produced water and drilling muds, are expected to remain distant from the island.

Drill cuttings from the construction of subsea production wells will generate a turbid plume in offshore waters, which will be dispersed by the strong ocean currents and deep water. While water-based muds (WBMs) will be discharged along with drill cuttings, synthetic-based muds (SBMs) will be recovered for recycling and reuse prior to eventual onshore disposal. The percentage by dry weight of SBMs released on drill cuttings will be restricted to 10 per cent or less, in accordance with the guidelines laid down by Western Australia’s Department of Mines and Petroleum. In addition, an internal target will be set to achieve 5 per cent or less.

Produced-water volumes from the offshore facilities will vary throughout the life of the Project and will contain varying concentrations of production chemicals. A comparison of expected field dilution rates against typical produced-water ecotoxicity indicates that Ichthys Field discharge concentrations should dilute to below acute toxicity levels within 10–60 metres and to below chronic toxicity levels within 1.1–3.6 kilometres of the release point.

A large volume of water (1 gigalitre) with low concentrations of dissolved chemicals will be discharged offshore after hydrotesting of the gas export pipeline. This “one-off” discharge is anticipated to rapidly disperse into the open ocean and will remain distant from sensitive habitats.

Discharges of drill cuttings, drilling muds, produced water and hydrotest water will comply with the requirements of offshore petroleum legislation. No wastes other than grey water, macerated sewage and food scraps will be discharged from the CPF and FPSO.

Ichthys Field condensate is a light oil with low viscosity and a relatively low proportion of aromatic hydrocarbons. In the unlikely event of accidental spills, any hydrocarbons at the water surface would undergo rapid weathering (evaporation of 70–80 per cent of the spill volume) within the first day of release. Under certain wind conditions, however, trajectory modelling indicates that there is a slight chance that persistent hydrocarbons from large spills could reach points on

the shorelines of Browse Island, Seringapatam Reef, Scott Reef and Western Australia's Kimberley coast. Spill scenarios of this scale include the rupturing of a subsea flowline, a CPF diesel fuel leak, the rupturing of a condensate transfer line, a ship colliding with the FPSO, or a subsea well failure. The likelihood of shoreline oil exposure from these scenarios ranges from "unlikely" (4.9×10^{-4}) to "remote" (4.9×10^{-7}) events per annum.

Because of the remote location of the Ichthys Field, emissions and discharges are very unlikely to combine with those from other facilities and contribute to cumulative impacts. The recently proposed Prelude field is located 15 kilometres to the north of the Ichthys Field, while the fields of Jabiru, Challis and Montara are situated between 150 and 270 kilometres to the north-east.

Nearshore environment

Activities in the nearshore development area that have the potential to impact on the environment include the construction of facilities and the associated dredging program, routine wastewater discharges, and accidental events such as hydrocarbon spills or the introduction of marine pests. Baseline surveys, modelling and comparison of the Project with similar past developments informed an assessment of the potential environmental impacts of these activities.

The risk assessment process, taking into account management controls and mitigating factors, identified 17 "medium" risk and 24 "low" risk potential environmental impacts associated with the nearshore development area. These risk ratings are considered acceptably low, mitigating the risks to sensitive habitats and significant or migratory species and minimising pollution impacts to the surrounding community.

"Matters of national environmental significance" associated with the nearshore development area are threatened and migratory animal species, including cetaceans, dugongs, birds, turtles, sharks and seahorses, and migratory birds that could occur in the area. While coastal dolphins, dugongs, marine turtles and sawfish are known to occur in Darwin Harbour, no significant breeding or feeding grounds have been identified for these species in or near the nearshore development area.

Dredging is required to provide a shipping channel and turning basin to provide tanker access to the product loading jetty, to provide access to the module offloading facility and to facilitate burial of the gas export pipeline. The dredging program proposed during the nearshore construction period will remove mainly soft-sediment benthic communities and some areas of rock pavement that support corals and algae. These marine communities are well represented elsewhere in the Harbour.

Dredging will generate turbid plumes that are mainly confined to East Arm. Turbid plumes will reduce the incident light levels reaching benthic biota, which could affect sensitive species such as corals and algae. However, predictive modelling shows that turbidity will be influenced by tidal currents and suspended-sediment levels in the water column in many places fall to close to background during neap tides as the sediments settle, before being resuspended by strong spring-tide movements. Hence, benthic biota will experience periods of turbidity close to background levels, throughout the dredging program and this is expected to mitigate long-term impacts upon these communities.

Turbid plumes can also release nutrients stored in marine sediments, providing a food source for fish and subsequently attracting predators such as marine mammals and reptiles. Conversely, marine megafauna may be deterred from the area because of the noise and movements of the various dredging and support vessels.

Predictive modelling of the proposed four-year dredging program indicates that some fine marine sediments will build up in shoreline areas around East Arm. Mangrove vegetation communities occur along these shorelines and some species rely on specialist root adaptations such as pneumatophores, stilt roots and buttress roots to facilitate gas exchange and respiration in anaerobic, waterlogged soils. Excess sedimentation on these structures could result in reduced mangrove tree health and even death. Around 2 hectares of mangroves are predicted to receive more than 100 millimetres of sediment as a result of the dredging program, which may cause tree deaths. An additional 28 hectares of mangroves are predicted to receive between 50 millimetres and 100 millimetres of sediment which may cause reduced tree health or even localised deaths.

A monitoring program will be developed to assess sedimentation and mangrove health in these areas. If mangrove tree deaths result because of sedimentation from the dredging program (and are not attributable to natural causes or activities external to the Project), rehabilitation of the affected areas will be undertaken after the completion of dredging activities through a combination of natural recruitment, facilitated natural recruitment and active planting.

Sedimentation is not predicted to occur to any significant extent at coral communities in the Harbour, as tidal currents will remove any settling particles relatively quickly.

Offshore disposal of dredge spoil will be carried out in an area of relatively featureless sandy seabed, with sparse benthic biota in water depths of 15–20 metres. Turbid plumes generated by this spoil placement will be dispersed to the north-east and south-west by repeated tidal currents. On large spring tides, this could cause suspended-sediment concentrations of up to 7 milligrams per litre around the Vernon Islands, and up to 12 milligrams per litre in the Howard River in Shoal Bay. During neap tides, however, these concentrations would decrease to near-background levels. Hard corals and seagrasses are rare in these areas and soft-coral and algal communities are expected to be able to withstand these periodic turbidity events without significant decreases in growth. Some low-level sedimentation of intertidal and subtidal areas could result within embayments in Shoal Bay and Adam Bay, which are naturally muddy depositional areas.

Marine blasting will be used during construction to remove hard rock in the vicinity of Walker Shoal. This activity will generate underwater noise and blast impacts that could cause avoidance behaviour or injuries (or even death in the case of blasting) to marine megafauna in close proximity. Confined blasting methods will therefore be used, with micro-delays between blasts to reduce peak pressures and the radius of impact zones. Protection zones will be implemented for marine megafauna, with blasting activities suspended if animals are observed inside these zones. Passive and active acoustic monitoring techniques will be investigated and, if implemented, this would complement vessel-based surveillance for fauna protection zones, reducing risks even further. Some fish deaths are expected, in close proximity to the blasting and these cannot be avoided. Marine blasting is only required during the construction phase and blasting activities will be localised.

Alternative techniques to drilling and blasting are being investigated for the removal of the hard rock material within the shipping channel. At this stage, however, it is not possible to confirm whether there are any viable alternatives.

Piledriving will be required for jetty construction. As with marine blasting, this will generate underwater noise and vibration that could cause avoidance behaviour or injuries to marine megafauna in the close vicinity. An observation zone and a soft-start procedure (in which activities are gradually scaled up over a five-minute period) will be implemented at the commencement of piledriving activities. Piledriving is not expected to significantly disturb local populations of marine megafauna. Piledriving is only associated with the construction phase and the effects will be localised.

Predictive modelling indicates that treated wastewater discharges from the Project will dilute rapidly to below biological effect levels and that any hydrocarbons discharged from the onshore development area will degrade quickly under natural weathering processes. Similarly, fresh water discharged after hydrotesting will mix quickly with nearshore marine waters without significant disturbance to biota. Other emissions, such as noise and light, will represent an incremental increase to the emissions already received by the nearshore marine environment and are not expected to significantly affect ecological processes in Darwin Harbour.

Spill-trajectory modelling indicates that accidental hydrocarbon spills during vessel refuelling or condensate loading could be transported to points on the shorelines of East Arm by tidal movements and seasonal winds. Mangroves are known to be particularly sensitive to contamination by hydrocarbons and could suffer reduced growth or death in the unlikely event of a spill. Spill prevention and response controls will decrease the likelihood of spills occurring and reaching the shore. Leaks or ruptures of the gas export pipeline are highly unlikely and are not predicted to cause shoreline exposure along the greater part of its length because of the volatility of the gas and condensate in the pipeline.

The use of large slow-moving vessels such as pipelay barges during the nearshore construction phase represents the main marine pest transfer risk for the Project, particularly where these vessels will be mobilised from overseas ports. Quarantine procedures will be implemented, in consultation with the Australian Quarantine and Inspection Service (AQIS) and other relevant government authorities. This will protect the marine habitats and the maritime infrastructure and industries in Darwin Harbour from marine pest introductions.

A range of monitoring programs are proposed, to measure potential effects on the receiving nearshore marine environment. These will include the following:

- a Darwin Harbour water quality monitoring program, which will determine whether effluent discharges adversely impact water quality
- a marine sediments and bio-indicators monitoring program, which will identify changes in pH and heavy-metal availability in marine sediments as a result of construction activities in acid sulfate soils as well as the accumulation of metals and petroleum hydrocarbons in sediments and selected bio-indicators as a result of surface-water and groundwater flows

- a mangrove health monitoring program, which will assess any impacts to mangrove health around Blaydin Point and East Arm as a result of activities in the onshore development area
- coral monitoring programs, which will identify stress in corals at Channel Island during dredging (and will trigger management responses if required) and which will document the dredging effects of increased turbidity and sedimentation on corals in East Arm
- a soft-bottom benthos monitoring program, which will be developed with pre- and post-dredging sampling of benthic communities to identify any changes occurring as a result of both the dredging and the spoil disposal programs
- a marine pests monitoring program, to identify the presence of marine pests in a timely manner, consistent with the monitoring framework proposed by the Commonwealth Government's National Introduced Marine Pests Coordination Group.

INPEX considers that the level of management and risk reduction presented for the offshore and nearshore development areas represents a proactive and conservative approach to maintaining environmental values, while allowing progress for the Project in a sustainable fashion. The management controls to be implemented will be further developed in consultation with stakeholders and will continue to be updated throughout the various stages of the Project.

Table 6-1 presents the potential impacts, management controls, mitigating factors and the residual risks to the marine environment. The integration of these controls into the environmental management program is discussed in Section 10 of the EIS.

Table 6-1: Marine impacts, management and residual risks

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Marine – offshore				
Seabed disturbance	Installation, operation and decommissioning of offshore infrastructure.	Removal or disturbance of seabed sediments.	Seabed habitat at the Ichthys Field consists of unconsolidated sands with low biodiversity and is similar to wide surrounding areas. The disturbance area is a very small portion of the total field area. Flowlines will be laid directly on the seabed, not trenched. Provisional Decommissioning Management Plan.	Low
	Gas export pipeline construction and operation.	Disturbance of a variety of seabed types along the pipeline route.	The gas export pipeline to be installed with concrete weight coating, to minimise the need for trenching or rock-armouring. The gas export pipeline route avoids sensitive benthic habitats. The seabed habitat at the Ichthys Field consists of unconsolidated sands with low biodiversity and is similar to wide surrounding areas.	Medium
Artificial habitat	Long-term operation of the CPF, FPSO and other surface and subsea facilities in the offshore marine environment.	Subsea and surface structures provide new habitat for marine fouling communities. Benthic community composition is altered. Biological productivity and diversity is increased.	The affected area is a very small portion of the total field area. Any antifouling paints used on surface or subsurface structures will be selected in accordance with regulatory-authority requirements. The CPF and FPSO will be removed from the infield location at decommissioning. Provisional Decommissioning Management Plan.	Low

Table 6-1: Marine impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Drill cuttings	Construction of offshore subsea wells.	Water quality decreased through increase in turbidity. Temporary disturbance to marine biota.	The strong ocean currents and deep water in the offshore development area will lead to rapid dispersion of turbid plumes. Drilling Environmental Management Plan as required under the OPGGS(Environment) Regulations[7].	Low
		Alteration of sediment characteristics.	The strong ocean currents and deep water in the offshore development area will spread cuttings piles in thin layers across the seabed. The benthic communities present are widespread and extensive in comparison with the disturbance area. Drilling Environmental Management Plan as required under the OPGGS(Environment) Regulations.	Medium
Drilling mud discharge	Discharge of WBMs to sea.	Toxicity to marine biota. Increased turbidity.	The strong ocean currents and deep water in the offshore development area will lead to rapid dispersion of cuttings and turbid plumes. Drilling Environmental Management Plan as required under the OPGGS(Environment) Regulations.	Low
	Discharge of SBMs adhering to drill cuttings.	Toxicity to marine biota. Alteration of sediment characteristics, including depletion of oxygen in surface sediments. Increased turbidity.	The strong ocean currents and deep water in the offshore development area will lead to rapid dispersion of cuttings and turbid plumes. Use WBMs in upper-hole sections instead of SBMs. Recover SBMs after drilling and reuse or dispose of onshore. The percentage by dry weight of SBMs released on drill cuttings will be restricted to 10 per cent, with an internal target of 5 per cent or less. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan. Drilling Environmental Management Plan as required under the OPGGS(Environment) Regulations.	Medium
Release of subsea control fluids	Control of subsea tree valves.	Toxicity to marine biota.	Design of equipment to reduce volume of fluid released. Selection of water-soluble, low-toxicity control fluid. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Low
Hydrotest water discharge	Commissioning of offshore gas production infrastructure.	Reduction in water quality because of dissolved chemical additives. Toxicity to marine biota.	Strong current regime and deep water in the offshore marine environment. Select hydrotest chemicals with consideration of their ecotoxicity potential. Precommission modules off site, if practicable. Hydrotest Management Plan (to be developed). Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Low

7 Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cwlth).

Table 6-1: Marine impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Produced-water discharge	Routine operation of offshore gas production infrastructure.	Reduction in water quality because of elevated concentrations of dispersed oil, metals and production chemicals. Toxicity to marine biota.	The strong current regime and deep water in the offshore marine environment will disperse the discharge plume rapidly. The concentrations of oil-in-water will be ≤30 milligrams per litre (24-hour average) and will be monitored constantly to ensure compliance. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Medium
Sewage and grey-water discharge	Routine operation of offshore vessels and facilities.	Alteration of marine environment including nutrient enrichment and toxicity.	The strong ocean currents and deep water will result in rapid dispersion in the offshore development area. Comminuted sewage (<25 millimetres) will be discharged from the CPF and FPSO through submerged caissons. Sewage and grey water will be treated and disposed of in accordance with the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cwlth) and the *Marine Pollution Act* (NT). No discharge from vessels will be made within 3 nautical miles of land. Only treated waste (macerated to <25 millimetres) will be discharged between 3 and 12 nautical miles from land, and untreated waste may be discharged beyond 12 nautical miles. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Low
Cooling water discharge	Routine operation of offshore facilities.	Alteration of marine environment through increase in water temperature.	The strong ocean currents and deep water will result in rapid dispersion in the offshore development area. No specific management proposed as this is considered a negligible risk to the marine environment.	Low
Discharge of ballast water	Routine operations of offshore vessels and facilities.	Contamination of the marine environment by hydrocarbons.	Implementation of vetting procedures for condensate tankers, ensuring that ballast-water tanks are segregated from fuel and product tanks.	Low
Antifouling leachate	Routine operation of support vessels, pipelay barge and subsea structures.	Toxic effects on marine biota from leached copper and biocide chemicals.	Leachates will be diluted rapidly in the strong-current, deep-water offshore environment. Antifouling paints or methods with the least potential for environmental harm will be used on subsea infrastructure, subject to operational requirements. Antifouling paints containing TBT compounds will not be used on any Project vessels or equipment.	Low

Table 6-1: Marine impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Accidental hydrocarbon spills	Offshore hydrocarbon spills ranging from 2.5 cubic metres of diesel to 1000 cubic metres of condensate.	Exposure of offshore waters to surface oil. Low-level exposure of Browse Island, Seringapatam Reef and Scott Reef to surface oil. Reduced growth of benthic communities.	Range of management controls including the following: • Facility integrity will be provided through initial design and shutdown systems. • Industry standard equipment and procedures will be employed. • Ongoing maintenance such as integrity testing and regular inspections will be carried out. • Reviews of subsea equipment for snagging and dropped-object damage will be carried out. • Radio contact between vessels in the field and FPSO will be maintained. • Collision prevention procedures will be instituted. • The FPSO will be designed to be double-sided. • A maintenance and inspection program for the condensate loading hose will be put in place. • Offloading operations will be monitored by a terminal representative on board the condensate tanker. • All valves and transfer lines will be checked before use. • Hoses, couplings and the sea surface will be visually monitored during refuelling. • "Dry-break" or breakaway couplings will be used where practicable. • Radio contact will be maintained between vessels during refuelling. • Spill response equipment and procedures will be available. • Blow-out preventers will be installed on all subsea wells. • Measurement-while-drilling techniques will be used. • A well control manual will be utilised. • Oil Spill Contingency Plan.	Low to medium
Deck drainage and stormwater runoff	Routine washdown of decks during operations, and stormwater runoff.	Reduction in water quality caused by small quantities of oil, grease and detergents. Toxicity impacts to marine biota.	Containment of areas where small spills are more likely, and treatment of contaminated deck drainage prior to discharge. Oil-in-water concentrations will meet regulatory-authority requirements: • not greater than an average of 30 milligrams per litre over any period of 24 hours from the FPSO and CPF • not more than 15 milligrams per litre for the mobile offshore drilling unit (MODU) and other vessels according to MARPOL 73/78 Annex I (IMO 1978[8]) and the Marine Pollution Regulations (NT). Spill-response equipment and procedures. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Low

8 International Maritime Organization. 1978. *International convention for the prevention of pollution from ships, 1973, as modified by the protocol of 1978 relating thereto (MARPOL 73/78)*. International Maritime Organization, London, United Kingdom.

Table 6-1: Marine impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Generation of scale with naturally occurring radioactive materials (NORMs)	Well-intervention work, surface equipment operation, maintenance and decommissioning.	Toxicity effects on marine biota, as well as health risks to operators.	Process equipment will be designed to restrict the potential for scale formation and scale inhibition chemicals will be used if required. Should scale be found to contain NORMs, the disposal method will minimise the potential for environmental harm and will be selected in consultation with the regulatory authorities.	Low
Non-hazardous waste	Generation of non-hazardous waste through routine offshore operations.	Pollution of the marine environment, if disposed of overboard.	Non-hazardous wastes to be retained on board vessels, and transported to onshore facilities for disposal. Provisional Waste Management Plan.	Low
Food scraps	Routine operation of offshore vessels.	Alteration of marine environment including nutrient enrichment.	Low volume of waste, in strong current and deep-water marine environment. Dispose of to sea according to MARPOL 73/78 Annex V, Regulation 3(1b and 1c) (IMO 1978): • untreated if to be disposed of beyond 12 nautical miles of land • macerated to <25 millimetres if to be disposed of between 3 and 12 nautical miles from land. Food scraps will be retained on board and disposed of onshore if generated within 3 nautical miles of land. Provisional Waste Management Plan.	Low
Hazardous wastes	Generation of hazardous waste through routine offshore operations.	Pollution of the marine environment, if disposed of overboard.	Chemicals and hazardous substances used will be selected to minimise adverse impacts associated with their disposal. Hazardous wastes to be retained on board vessels and offshore facilities until they can be transported to onshore facilities for disposal. Provisional Waste Management Plan.	Low
Underwater noise	Noise generation during construction from vertical seismic profiling (VSP), drilling, supply vessels and pipelay barge, and from the installation of field infrastructure (heavy-lift vessels, anchor handlings, tugs, etc.).	Avoidance by marine animals of the immediate area around vessels and facilities.	The offshore development area is distant from critical breeding and feeding grounds for marine mammals and turtles. Construction noise will be generated on an intermittent basis only. Procedures put in place for cetacean observation and exclusion during VSP operations. Provisional Cetacean Management Plan.	Low
	Noise generation during operations from FPSO, CPF and supply vessels.	Avoidance by marine animals of the immediate area around vessels and facilities.	The offshore development area is distant from critical breeding and feeding grounds for marine mammals and turtles. Provisional Cetacean Management Plan.	Low

Table 6-1: Marine impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Marine pests	Operation of vessels between the offshore development area and Australian or overseas ports.	Alteration of marine ecology in biofouling communities on submerged structures at offshore development area.	Carry out biofouling risk assessment for all vessels. Vessel compliance with regulatory-authority guidelines for biofouling. Opportunistic monitoring of submerged surfaces using remotely operated vehicles (ROVs). Provisional Quarantine Management Plan.	Low
	Use of pipelay barge and support vessels in coastal areas near Darwin.	Invasion of native marine ecosystems by pests, threatening native marine plants and animals and impacting upon maritime-based industries.	Carry out biofouling risk assessment for all vessels. Vessel compliance with regulatory-authority guidelines for biofouling. Provisional Quarantine Management Plan.	Medium
Marine megafauna	Use of operation and construction vessels in the offshore development area.	Physical injury to large marine animals from collision with vessel.	The offshore development area is outside the key breeding and feeding areas for humpback whales. Construction vessels travel at low speeds. General noise and activity would deter marine animals from entering the area. Procedures for avoiding interaction between vessels and helicopters with cetaceans. Provisional Cetacean Management Plan.	Low
Marine – nearshore				
Seabed disturbance	Dredging and blasting for construction of access to jetty and module offloading facility.	Removal of soft-bottom biota and habitat. Removal of some areas of hard substrate. Provision of new artificial hard substrate habitat.	Soft-bottom habitat is widespread in Darwin Harbour. The disturbance footprint will be minimised where possible within the constraints of infrastructure engineering and operability. Dredging vessels will be equipped with navigational aids to ensure that dredging occurs within the specified dredge footprint. A soft-bottom benthos monitoring program will be put in place. Provisional Dredging and Dredge Spoil Disposal Management Plan. Provisional Piledriving and Blasting Management Plan.	Medium
	Dredging, trenching and pipelay at pipeline shore crossing.	Removal of soft-bottom biota and habitat. Provision of new artificial hard substrate habitat.	The disturbance footprint will be minimised where possible within the constraints of infrastructure engineering and operability. Anchoring plans and procedures for pipelay construction vessels will be developed to avoid sensitive seabed habitats. Dredging vessels will be equipped with navigational aids to ensure that dredging occurs within the specified dredge footprint. Provisional Dredging and Dredge Spoil Disposal Management Plan.	Low
	Trenching and rock dumping for construction of gas export pipeline.	Removal of soft-bottom biota and habitat. Provision of new artificial hard substrate habitat.	The disturbance footprint will be minimised where possible within the constraints of infrastructure engineering and operability. Dredging vessels will be equipped with navigational aids to ensure that dredging occurs within the specified footprint. An increase in hard-substrate biota and attraction of fish may benefit recreational fishing resources.	Medium

Table 6-1: Marine impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Hydro-dynamics	Development of nearshore infrastructure and dredging area.	Reduced flushing of East Arm. Local changes to sedimentation and hydrodynamic processes affecting benthic habitats.	Dredging channel aligned with normal current directions in East Arm. Modelling indicates localised changes to currents and sedimentation only, with minimal impact on flushing processes and waves.	Medium
Turbid plumes	Dredging for construction of jetty, module offloading facility and pipeline.	Sedimentation and turbidity impacts to coral communities in the vicinity, leading to reduced growth or death.	Corals found in East Arm occur at other sites throughout Darwin Harbour. Tidal currents assist in removing sediment from coral surfaces. Provisional Dredging and Dredge Spoil Disposal Management Plan.	Medium
		Sedimentation and turbidity impacts to soft-coral and sponge communities.	Soft-coral and sponge communities in East Arm occur at other sites throughout Darwin Harbour. Tidal currents assist in removing sediment from soft-coral and sponge surfaces.	Medium
		Sedimentation and turbidity impacts to fish eggs and larvae.	Turbid plumes decrease to relatively low levels at mid- and far-field distances. Mangrove habitats utilised for fish breeding are extensive and widespread throughout Darwin Harbour.	Medium
		Reduction in available habitat and food resources for coastal dolphins.	No significant breeding or foraging areas for these species are known in the nearshore area. Dolphins may benefit from foraging opportunities around plumes. Other similar habitat within and near Darwin Harbour will remain unaffected by turbid plumes.	Medium
		Reduction in available habitat and food resources for marine turtles.	No significant breeding or foraging areas for these species are known in the nearshore area. Other similar habitat within and near Darwin Harbour will remain unaffected by turbid plumes.	Medium
	Dredging for construction of jetty, module offloading facility and pipeline.	Reduction in available habitat and food resources for dugongs.	Key dugong habitats at Channel Island and Weed Reef are not predicted to be affected by plumes. No significant seagrass habitat exists in the nearshore area. Macroalgal communities occur throughout Darwin Harbour and most will not be affected by turbid plumes.	Medium
	Dredging for pipeline shore crossing.	Sedimentation and turbidity impacts to protected Channel Island coral community, leading to reduced growth or death of benthic biota.	The dredging program in the vicinity of Channel Island is brief in duration. The corals are likely to be adapted to a high-turbidity environment. Reactive coral monitoring program. Provisional Dredging and Dredge Spoil Disposal Management Plan.	Medium
Sand transport	Dredging for construction of jetty, module offloading facility and pipeline.	Smothering of soft-sediment biota in East Arm.	Sand transport already occurs under existing current flows. The benthic biota are sparse and are likely to be adapted to sand movement. Soft-sediment biota are well represented throughout the Harbour.	Low

Table 6-1: Marine impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Coastal sedimentation	Dredging for construction of access to jetty and module offloading facility.	Sedimentation of mangroves around East Arm, causing reduced plant growth or death. Localised deaths or reduced growth of invertebrate fauna communities.	If mangrove tree deaths result because of sedimentation from the dredging program (and are not attributable to natural causes or activities external to the Project), rehabilitation of the affected areas will be undertaken after the completion of dredging activities through a combination of natural recruitment, facilitated natural recruitment and active planting. The mangrove zone is likely to receive regular influxes of sediment and the invertebrate fauna is likely to be tolerant or to recover quickly. Intertidal sedimentation monitoring program. Provisional Dredging and Dredge Spoil Disposal Management Plan.	Medium
Acid sulfate soils	Excavation of mangrove mud for construction of pipeline shore crossing and module offloading facility.	Acid sulfate soil leaching, reducing marine water quality. Reduced health of intertidal marine animals as a result of acidity or toxic metal levels in local waters.	Daily tidal movements will dilute nearshore waters and flush leachates from the local area. Excavation volumes will be minimised where possible. Marine sediments and bio-indicators monitoring program. Provisional Acid Sulfate Soils Management Plan.	Medium
Seabed disturbance	Offshore dredge spoil disposal.	Smothering of benthic communities inside disposal area, and then outside the area as sediments disperse. Alteration of seabed sediments.	Sediment types and benthic communities are common throughout the region. Hydrodynamic modelling was used to select the disposal area in order to minimise remobilisation of sediments into sensitive locations. Soft-bottom benthos monitoring program. Provisional Dredging and Dredge Spoil Disposal Management Plan.	Medium
Coastal sedimentation	Offshore dredge spoil disposal.	Low-level deposition of sediments on to coastal subtidal and intertidal marine habitats, causing smothering and reduced growth of benthic biota.	Affected areas are naturally depositional environments, where the marine communities are adapted to sedimentation. There are few seagrasses and hard corals in the affected areas. Macroalgae are more tolerant of variable light conditions.	Medium
Turbid plumes	Offshore dredge spoil disposal.	Low light conditions over coastal benthic biota, causing reduced growth and primary production.	The plumes are transported to coastal areas on spring tides only. The tidal cycle results in clear water conditions between turbid spring tides. There are few seagrasses and hard corals in affected areas. Macroalgae are more tolerant of variable light conditions.	Medium
Wastewater discharge	Routine operation of onshore processing plant.	Alteration of marine environment through nutrient enrichment, toxic discharges, etc.	A waste discharge licence will be sought for the onshore processing plant from NRETAS under the *Water Act* (NT). Drainage systems will isolate potentially contaminated areas and wastewater will be treated through separate drainage systems prior to discharge. A chemical selection process will be developed and will include consideration of the potential for ecotoxicity. Monitoring and verification will be carried out to ensure that discharge limits are maintained. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Medium

Table 6-1: Marine impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Wastewater discharge	Hydrotesting of onshore gas processing facility.	Localised reduction in water quality. Toxic effects on marine biota.	A waste discharge licence will be sought for the onshore processing plant from NRETAS under the *Water Act* (NT). A chemical selection process will be developed and will include consideration of the potential for ecotoxicity. Module systems will be precommissioned off site if practicable. Hydrotest management plans. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Low
	Operation of vessels in the nearshore development area during construction and operations.	Alteration of marine environment including nutrient enrichment and toxicity.	Discharge of wastewater in accordance with Darwin Port Corporation regulations. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Low
Accidental hydrocarbon spills	Nearshore hydrocarbon spills ranging from 0.2 cubic metres of diesel to 50 cubic metres of condensate.	Exposure of nearshore waters to surface oil. Localised areas of mangroves, intertidal communities and possibly corals exposed to oil, leading to reduced growth or death.	Range of management controls including the following: • The gas export pipeline will be designed to meet the conditions of the area. • The gas export pipeline in Darwin Harbour will be trenched and rock-dumped for protection and stability. • Precautionary zones will be established to prohibit anchoring in the vicinity. • There will be an emergency shutdown interface between vessels and plant. • A maintenance and inspection program will be put in place for the product loading arms. • Hoses, couplings and the sea surface will be visually monitored during vessel refuelling. • Continuous radio contact will be maintained between the vessel and shore. • “Dry-break” couplings and breakaway couplings will be used where practicable. • Spill response equipment and procedures will be available. • Oil Spill Contingency Plan.	Low to medium
Discharge of food scraps	Routine operation of nearshore vessels.	Alteration of marine environment including nutrient enrichment.	Food scraps will be retained on board all vessels in the nearshore development area for later transport to an onshore facility for disposal. Provisional Waste Management Plan.	Low
Non-hazardous waste	Routine operation of vessels during nearshore construction and ongoing product export.	Pollution of the marine environment if disposed of overboard.	All wastes will be disposed of to onshore facilities. Waste minimisation will be included in the tendering and contracting process. Provisional Waste Management Plan.	Low
Hazardous wastes	Generation of hazardous waste through routine nearshore operations.	Pollution of the marine environment if disposed of overboard.	All wastes will be disposed of to onshore facilities. Non-hazardous chemicals will be preferentially used where practicable and cost-effective. Waste minimisation will be included in the tendering and contracting process. Provisional Waste Management Plan.	Low

Table 6-1: Marine impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Underwater noise	Piledriving during jetty and module offloading facility construction.	Avoidance of the area by fish, and potentially a small number of injuries in close proximity to the piledriving activity.	Soft-start procedures will be used to reduce startle responses. Piledriving activities will only be carried out during daylight hours unless construction activities fall significantly behind schedule. Provisional Piledriving and Blasting Management Plan.	Low
		Avoidance of the area by marine megafauna, including threatened species.	No significant breeding, foraging or aggregation areas for threatened species are known to exist in the nearshore development area. An observation zone will be put in place to ensure that large animals are clear of the area prior to the commencement of piledriving. Soft-start procedures will be used to reduce startle responses. Piledriving activities will only be carried out during daylight hours unless construction activities fall significantly behind schedule. Provisional Piledriving and Blasting Management Plan.	Low
	Rock dumping, offshore dredge spoil disposal.	Avoidance of the area by marine megafauna and fish, including threatened species.	No significant breeding, foraging or aggregation areas for threatened species are known to exist in the nearshore development area. Noise source levels from these activities are relatively low.	Low
	Dredging during construction of the nearshore development area.	Avoidance of the area by fish and marine megafauna, including significant species.	Predominantly low-frequency broadband noise. No significant breeding, foraging or aggregation areas for threatened species are known to exist in the nearshore development area. The greater part of Darwin Harbour will remain unaffected by changes in underwater noise levels.	Low
	Use of explosives on hard rock at Walker Shoal during construction.	Localised injuries or deaths to fish. Avoidance of the area by fish.	Confined blasting methods with micro-delays between blasts will be used to reduce peak pressures and the radius of impact zones. Use the minimum required charge for blasting. Provisional Piledriving and Blasting Management Plan.	Medium
		Localised injuries or deaths to marine megafauna, including threatened species.	No significant breeding, foraging or aggregation areas for threatened species are known to exist in the nearshore development area. Confined blasting methods with micro-delays between blasts, to reduce peak pressures and radius of impact zones. Use the minimum required charge for blasting. Fauna protection zones, with blasting activities suspended if marine megafauna are observed inside the zones. Blasting during daylight and benign sea conditions only. Provisional Piledriving and Blasting Management Plan.	Medium
	General shipping and vessel movements.	Displacement of fish and marine megafauna from the vicinity of vessels.	The nearshore area is located close to an existing port. Marine megafauna may be accustomed to vessel traffic. No significant breeding, foraging or aggregation areas for threatened species in the nearshore development area. Provisional Cetacean Management Plan.	Low

Table 6-1: Marine impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Marine pests	Hull biofouling during construction phase (e.g. on pipelay barge, dredging barge) and operations phase.	Invasion of native marine ecosystems by pests, threatening native marine plant and animal life and impacting maritime industries.	Biofouling risk assessment in place for all vessels. Ensuring vessel compliance with regulatory-authority guidelines for biofouling. Marine pest monitoring program. Provisional Quarantine Management Plan.	Medium
	The discharge of ballast water during construction and operations.	Invasion of native marine ecosystems by pests, threatening native marine plant and animal life and impacting maritime industries.	Discharge of ballast water into Darwin Harbour will be carried out in accordance with AQIS requirements. Marine pest monitoring program. Provisional Quarantine Management Plan.	Medium
	The transfer of exotic marine pests to coastal ports because of infection of vessels at the offshore development area.	Invasion of native marine ecosystems by pests, threatening native marine plants and animals and impacting maritime industries.	Biofouling risk assessment in place for all vessels. Ensuring vessel compliance with regulatory-authority guidelines for biofouling. Undertaking opportunistic ROV inspection of submerged infrastructure surfaces at offshore facilities. Provisional Quarantine Management Plan.	Medium
Vessel movements	Operation of construction and support vessels in the nearshore development area during construction phase, and tanker vessels and support vessels during operations.	Vessel collision, causing injury or death to marine megafauna. Disturbance to feeding activities and displacement from normal habitat.	No critical breeding or foraging areas for cetaceans, dugongs or turtles are known to exist in the nearshore development area. Large numbers of vessels already use Darwin Harbour regularly. Procedures for avoiding interactions between vessels and cetaceans. Provisional Cetacean Management Plan.	Low
Dredging	Operation of trailing suction hopper dredger (TSHD) in nearshore development area during construction.	Entrainment of marine turtles and sawfish, causing injury or death.	No critical breeding or foraging areas for turtles or sawfish are known to exist in the nearshore development area. Practical options for reducing the risks of marine fauna entrainment in TSHDs will be explored and incorporated into the final dredging management plan. Provisional Dredging and Dredge Spoil Disposal Management Plan.	Medium

7 Terrestrial Impacts and Management

This section of the Executive Summary summarises the potential impacts to the terrestrial environment and the regional airshed that will be associated with the onshore development area of the Project and identifies the key management controls which will be applied to mitigate these impacts.

This area includes land above the low-water mark on Blaydin Point and Middle Arm Peninsula in Darwin Harbour.

Activities at the onshore development area that have the potential to impact on the environment include clearing and excavation for site preparation, the construction of the onshore facilities, the generation of emissions during operations (such as air pollutants and noise), and accidental occurrences such as hydrocarbon spills. Baseline surveys and modelling informed an assessment of the potential environmental impacts of these activities.

The risk assessment process, taking into account management controls and mitigating factors, has identified 15 "medium" and 10 "low" residual risk potential terrestrial environmental impacts associated with the onshore development area. These risk ratings are considered acceptably low, mitigating risks to significant or migratory species in the vicinity of the onshore processing plant and minimising pollution impacts to the surrounding community.

"Matters of national environmental significance" associated with the onshore development area are threatened and protected animal species, including a number of small mammals, reptiles and terrestrial and migratory birds that could occur in the area. Fauna surveys on site recorded 12 migratory bird species, but no threatened mammals, reptiles or birds. The removal of vegetation for construction of the onshore facilities will reduce the available habitat for these species on a local scale. No threatened ecological communities or Ramsar wetlands[9] occur in, or near, the onshore development area.

The cycad *Cycas armstrongii*, which is listed as "vulnerable" under the *Territory Parks and Wildlife Conservation Act* (NT), occurs in the onshore development area in the eucalypt woodland vegetation community. However, the cycad is locally abundant throughout the Darwin Coastal Bioregion and clearing for the Project does not represent a significant impact to this species on a regional scale.

Important terrestrial habitats that will be affected by vegetation-clearing in the onshore development area include monsoon vine forest and mangroves, which support some specialist species (e.g. bird species that feed on particular fruits or flowers). These vegetation communities occur in other areas around the shores of Darwin Harbour and throughout the Darwin Coastal Bioregion. Mangroves are generally protected from clearing through current planning laws in the Northern Territory, and clearing for the Project represents less than 0.3 per cent of the total area of mangroves in Darwin Harbour. Monsoon vine forest occurs in relatively isolated patches and removing individual patches may have ecological consequences for the remaining patches. At present, there are numerous areas of monsoon vine forest located around the broader Darwin Harbour region and clearing for the Project represents 4 per cent of the total existing area. In addition, existing plantings of tropical fruit-bearing trees in the Darwin suburbs and surrounding rural areas effectively supplement the native monsoon vine forest habitat for some frugivorous animal species.

Terrestrial impacts such as soil erosion and exposure of acid sulfate soils will be minimised by management controls. These impacts will only be associated with construction activities and are likely to be short-term and localised. The onshore development area will be designed to minimise disruptions to natural surface-water flows.

The predictive air-quality model developed for the Project represents a cumulative assessment of impacts to the Darwin airshed. It incorporates the emissions from existing sources (both natural and anthropogenic) and then adds in the predicted emissions from the proposed onshore development area. The model indicates that all air pollutants in the Darwin airshed remain well below the relevant National Environment Protection (Ambient Air Quality) Measure (NEPM) guideline limits throughout the operations phase of the Project. However, based on

9 A Ramsar wetland is a site designated for inclusion on the Ramsar List of Wetlands of International Importance. The Ramsar Convention (the "Convention on Wetlands of International Importance, especially as Waterfowl Habitat") was signed in Ramsar in Iran in 1971 and came into force in 1975. Australia signed the convention in 1971.

measurements conducted by NRETAS, there are likely to be very occasional events, particularly during the dry season, where bushfires will contribute particulate material into the Darwin airshed to the extent that the NEPM criterion for particulates with diameters less than 10 micrometres will be approached or exceeded. Under such conditions and depending on prevailing wind directions, the INPEX facilities may be a minor contributor to a potential excursion of the NEPM particulate matter criterion. However, in the absence of bushfires, the NEPM air-quality criterion for particulates will also be met comfortably at all times after the addition of the INPEX facilities.

It is considered that the level of management and risk reduction presented for the onshore development area represents a proactive and conservative approach to maintaining environmental values, while allowing progress for the Project in an economically sustainable fashion. The management controls to be implemented will be further developed in consultation with stakeholders and will continue to be updated throughout the various stages of the Project.

Table 7-1 presents the potential impacts, management controls, mitigating factors and the residual risks to the terrestrial environment. The integration of these controls into the environmental management program is discussed in Section 10.

Table 7-1: Terrestrial impacts, management and residual risks

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Terrestrial				
Soil erosion	Large-scale earthworks for construction of onshore processing facility. Clearing of vegetation during site preparation.	Sedimentation of mangrove areas around the onshore development area, leading to smothering of pneumatophores and reduced plant growth or death.	Large-scale vegetation-clearing will be undertaken preferentially in dry season conditions to avoid the erosion risks associated with monsoon rains in the wet season. Erosion-protection infrastructure (e.g. silt fencing, spoon drains, contouring, and sediment ponds) will be installed to ensure that sediment is contained within the site boundaries as far as possible. If soil erosion becomes evident, exposed surfaces at the affected area will be stabilised with mulched vegetation, dust suppressants or slope-stabilisation products. Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Low
Acid sulfate soils	Earthworks in the onshore development area for the pipeline shore crossing, onshore pipeline, ground flare and module offloading facility.	Acidification of soils, surface water and groundwater, reducing soil productivity and plant growth.	Facilities to be designed to minimise excavation of PASSs. If excavation is unavoidable, management options include neutralising and re-covering with clean fill, or disposing of off site. As an alternative, excavated PASS material may be disposed of at the offshore spoil disposal ground. Provisional Acid Sulfate Soils Management Plan.	Medium

Table 7-1: Terrestrial impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Surface-water management	Sealing of parts of the ground surface throughout the onshore development area for the processing plant and associated infrastructure.	Increase in total volume of surface-water runoff. Alteration of surface-water drainage direction and volumes. Isolation of groundwater system from freshwater recharge, lowering of water table and potential for seawater intrusion. Reduced health or mortality of hinterland mangrove community because of reduced access to fresh groundwater.	Some areas of Blaydin Point will remain uncleared or unsealed to allow for groundwater recharge by rainfall. Install multiple surface-water drains to distribute fresh water into mangroves. Install culverts to maintain natural tidal flows underneath the causeway from Blaydin Point to Middle Arm Peninsula. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Medium
Vegetation	Clearing of vegetation during site preparation.	Loss of mangrove habitat. Localised reduction in biodiversity.	The vegetation-clearing footprint for the onshore development area will be minimised during the design of the onshore facilities, subject to design, construction and safety requirements. Contain all disturbance (including vehicle movement) within the development footprint. Mangrove communities are common throughout Darwin Harbour and the Darwin Coastal Bioregion. Temporarily disturbed areas within the onshore development area (e.g. near the pipeline shore crossing, along the onshore pipeline route, and in small areas around the processing plant) will be revegetated and rehabilitated following the completion of construction activities. Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan.	Medium
	Clearing of vegetation during site preparation.	Loss of *Eucalyptus* woodland and *Melaleuca* forest habitat. Localised reduction in biodiversity.	The vegetation-clearing footprint for the onshore development area will be minimised during the design of the onshore facilities, subject to design, construction and safety requirements. Contain all disturbance (including vehicle movement) within the development footprint. Store topsoil from cleared areas in stockpiles for future use in rehabilitation. Cleared vegetation will be mulched and stockpiled on site boundaries or off site. Where possible, the mulch will be used for both rehabilitation and soil stabilisation to prevent erosion. Cleared vegetation that cannot be reused will be disposed of off site. No stockpiled vegetation will be burned. *Eucalyptus* woodland and *Melaleuca* forest communities are common throughout the Darwin Coastal Bioregion. Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan.	Low

Table 7-1: Terrestrial impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Vegetation	Clearing of vegetation during site preparation.	Removal of cycads, which are classed as "vulnerable" under the *Territory Parks and Wildlife Conservation Act* (NT). Localised reduction in biodiversity.	*Cycas armstrongii* is common throughout the Darwin Coastal Bioregion. Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan.	Low
	Clearing of vegetation during site preparation.	Loss of monsoon vine forest habitat. Localised reduction in biodiversity.	The vegetation-clearing footprint for the onshore development area will be minimised during the design of the onshore facilities, subject to design, construction and safety requirements. Contain all disturbance (including vehicle movement) within the development footprint. Store topsoil from cleared areas in stockpiles for future use in rehabilitation. Cleared vegetation will be mulched and stockpiled on site boundaries or off site. Where possible, the mulch will be used for both rehabilitation and soil stabilisation to prevent erosion. Cleared vegetation that cannot be reused will be disposed of off site. No stockpiled vegetation will be burned. Other monsoon vine forest habitats exist within the region. Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan.	Medium
Habitat	Clearing of vegetation for site preparation.	Loss of habitat for terrestrial fauna.	Major clearing activities undertaken to allow animals to move into the remaining vegetation in the vicinity. Habitat to be cleared is well represented elsewhere on Middle Arm Peninsula, and in the region. No significant animal species recorded in recent surveys of the onshore development area. Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan.	Medium
Animals	Temporary creation of trenches and excavations during construction.	Entrapment of animals, with possibility of injuries or deaths.	"High-risk" entrapment areas (e.g. deep trenches or pits) will have sloping egress ramps. Targeted inspections will be undertaken and any trapped animals will be removed and released. Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan.	Low
Weeds	Machinery for earthmoving and clearing of vegetation entering the onshore development area from elsewhere in the Northern Territory or Australia.	Accidental introduction of new weed species to Blaydin Point and Middle Arm Peninsula, displacing native species and altering ecosystem function.	Control infestations of listed weeds in the onshore development area and access road. Hygiene procedures will be applied to earthmoving and vegetation-clearing equipment. Weed monitoring. Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan.	Medium

Table 7-1: Terrestrial impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Pest animals	Vehicles and equipment entering the onshore development area from elsewhere in the Northern Territory and Australia (overland).	Accidental introduction of new pest animal species to Blaydin Point and Middle Arm Peninsula, displacing native species and altering ecosystem function.	Inspect earthmoving and clearing vehicles etc. prior to their arrival at the onshore development area. Covering and storage of putrescible waste, with off-site disposal. Provisional Quarantine Management Plan.	Medium
	Vessels and equipment entering from another country (overseas).	Accidental introduction of new pest animal species to Blaydin Point and Middle Arm Peninsula, displacing native species and altering ecosystem function.	Establish quarantine-approved premises during construction, according to AQIS requirements. Inspect incoming vessels, modules and equipment for quarantinable material. Provisional Quarantine Management Plan.	Medium
Fire	Vegetation clearing during site preparation (early construction phase).	Bushfire in vegetated areas throughout Blaydin Point and Middle Arm Peninsula. Damage to vegetation, habitat and infrastructure, and risks to public safety.	Emergency response equipment and procedures. Mulched vegetation stored on site from clearing operations will be stockpiled in designated areas, away from potential ignition sources. Stockpiled vegetation from clearing activities will not be burned, but will be reused where possible or disposed of off site. Establish firebreaks around Project infrastructure that borders woodlands, taking advice from the Northern Territory's Bushfires Council. Provisional Bushfire Prevention Management Plan.	Medium
	Operating heavy machinery, undertaking "hot work" and operating the ground flare in the vicinity of vegetated areas, during construction and operations.	Bushfire in vegetated areas throughout Blaydin Point and Middle Arm Peninsula. Damage to vegetation, habitat, infrastructure and risks to public safety.	Control fuel load in grassed and vegetated areas to minimise risk of intense bushfires through weed control. Emergency response equipment and procedures. Establish firebreaks around Project infrastructure that borders woodlands, according to advice from the Northern Territory's Bushfires Council. Provisional Bushfire Prevention Management Plan.	Low
Dust	Earthworks and vehicle movement at onshore development area during the construction phase.	Nuisance and health impacts (of PM_{10}) on the nearby community.[10]	Residential and urban areas are located distant from the onshore development area. Prevailing winds during the dry season are mainly easterly, blowing dust away from Palmerston. Provisional Dust Management Plan.	Low
	Earthworks and vehicle movements at onshore development area during the construction phase.	Dust deposition on surrounding vegetation, smothering it and reducing growth. Health impacts on the workforce.	Dust-control measures, including wetting down exposed surfaces. Roads required for operations phase to be sealed during construction. Provisional Dust Management Plan.	Low

10 Particulate matter smaller than 10 micrometres (10 µm) in diameter.

Table 7-1: Terrestrial impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Air quality	Combustion of fuels (power generation, compression and process heat) during normal operations and upset conditions.	Reduction in local and regional air quality (with respect to oxides of nitrogen (NO_x), oxides of sulfur (SO_x), ozone (O_3), and PM_{10}). Health impacts on community and local environment.	Design facilities to reduce air emissions to ALARP levels (e.g. low-NO_x technology in gas turbines, incineration of amine plant emissions, low-smoke ground flare). Undertake air-quality monitoring to confirm modelling predictions. Provisional Air Emissions Management Plan.	Low
Odour	Venting of acid gas removal unit (AGRU) exhaust gases (including hydrogen sulfide (H_2S) which is responsible for "rotten-egg" odour) during AGRU incinerator shutdowns.	Nuisance odour impacts on community.	Redirect AGRU exhaust gases to the gas turbine stacks during AGRU incinerator shutdowns. Rapid dispersion of emissions by most ambient weather conditions. Provisional Air Emissions Management Plan.	Low
Non-hazardous waste	Generation of waste during construction and operations phases (e.g. domestic waste, packing materials, offcuts).	Littering of environment around Blaydin Point. Attraction of animals. Odours.	Reduce generation of waste through tender conditions and purchasing. Provide adequate space and facilities to segregate and contain waste. Make positive efforts to maximise recycling during all phases of the Project. Cover all bins to exclude animals and prevent windblown waste. Provisional Waste Management Plan.	Low
Hazardous waste	Generation of hazardous waste during construction and commissioning phases.	Localised, low-to-medium-level contamination of soils and surface water from accidental spills.	Minimise waste generation through tender conditions and purchasing. Provide temporary waste-storage facilities during construction, prior to completion of permanent facilities. Make positive efforts to maximise recycling during all phases of the Project. Install appropriate bunding around facilities. Provisional Waste Management Plan.	Medium
	Generation of hazardous waste during operations.	Localised, low-level contamination of soils and surface water from accidental spills.	Minimise waste generation through tender conditions and purchasing. Provide adequate space and facilities to segregate and contain waste. Make positive efforts to maximise recycling during all phases of the Project. Install appropriate bunding around facilities. Provisional Waste Management Plan.	Medium

Table 7-1: Terrestrial impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Spills and leaks	Storage, handling and transfer of fuels and chemicals during construction.	Localised contamination of soils, surface water or groundwater.	Temporary storage and containment facilities installed while permanent facilities are being constructed. Training provided to personnel who routinely handle hazardous materials (e.g. refuelling personnel, pump operators, mechanics, stores personnel) in handling, transport, storage and clean-up. Provisional Onshore Spill Prevention and Response Management Plan.	Medium
	Loss of containment of production chemicals (e.g. activated methyldiethanol-amine (aMDEA)).	Localised contamination of soils and groundwater requiring dedicated clean-up and remediation.	Design of facilities for isolation and containment in high-risk areas. Storage facilities designed in accordance with Australian standards and the requirements of the relevant regulatory authorities. Chemicals selected and managed to minimise the potential environmental impact associated with their transport, transfer, storage, use and disposal. Provisional Onshore Spill Prevention and Response Management Plan.	Medium
	Storage, handling and transfer of fuel and chemicals during operations.	Localised contamination of soils and groundwater requiring dedicated clean-up and remediation. Localised contamination of surface-water runoff. Contamination of groundwater aquifer, with potential flow into Darwin Harbour waters.	Design of facilities for isolation and containment in high-risk areas. Bunding installed in chemical and hydrocarbon storage, handling and transfer areas. Storage facilities designed in accordance with Australian standards, and the requirements of the relevant regulatory authorities. Drainage system will direct potentially contaminated surface runoff to an oily-water treatment system. Onshore Spill Prevention and Response Management Plan. Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan.	Medium
	Long-term bulk storage of liquid hydrocarbons (condensate).	Contamination of soils and groundwater that extends off site (e.g. into Darwin Harbour) and is difficult and expensive to remediate. Threats to environmental and human health. Reduction in potential for future use of land and groundwater at Blaydin Point.	Design of facilities for isolation and containment in high risk areas (e.g. condensate tanks). Storage facilities designed in accordance with Australian standards and the requirements of the relevant regulatory authorities. Groundwater monitoring program. Provisional Onshore Spill Prevention and Response Management Plan.	Medium

8 Greenhouse Gas Management

This section of the Executive Summary estimates the Project's greenhouse gas (GHG) emissions, discusses these emissions in an Australian and Northern Territory context, compares Ichthys and other LNG project GHG emissions on a life-cycle basis, and summarises INPEX's approach to GHG management.

Project GHG emissions

Figure 1-1 shows that INPEX expects the Ichthys Project to produce approximately 280 megatonnes of carbon dioxide (CO_2) over its 40-year lifetime. Of this total, about 34 per cent will come from reservoir CO_2, 26 per cent from offshore combustion sources, and 40 per cent from onshore combustion sources.

The combustion sources that will produce CO_2 emissions include equipment such as gas turbines, burners, heaters, boilers and flares. Greenhouse gas emissions will also be derived from methane (CH_4) and nitrous oxide (N_2O) which have global warming potentials[11] significantly greater than CO_2 (at 21 and 310 times respectively, on a weight basis). Small amounts of CH_4 will be released in the exhaust gases as a result of incomplete fuel combustion. Even smaller quantities of N_2O will also be formed during fuel combustion by the reaction of nitrogen and oxygen. However, despite their high global warming potentials, these two combustion by-products will contribute less than 5 per cent of the Project's total GHG emissions measured in carbon dioxide equivalents (CO_2-e)[12].

Project GHG emissions in an Australian and Northern Territory context

Table 8-1 compares the Project's estimated GHG emissions with 2007 Australian and Northern Territory GHG emissions. The relative contribution of the

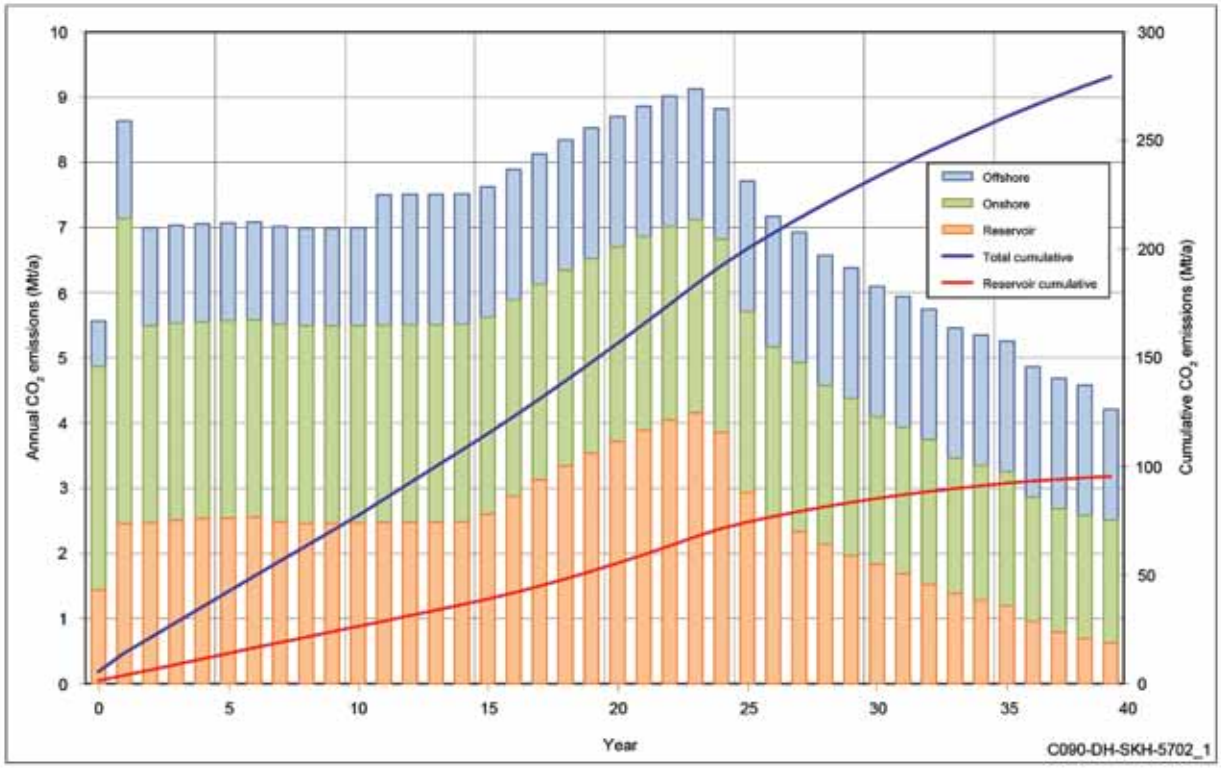


Figure 8-1: Estimated annual CO_2 emissions over the Project's 40-year operational life

11 Global warming potential (GWP) is a measure of how much a given mass of a GHG will contribute to global warming if released into the earth's atmosphere. GWP is a relative scale which compares the mass of the GHG in question with that of the same mass of carbon dioxide (CO_2), which has been conventionally assigned a GWP value of 1.

12 The expression "carbon dioxide equivalent" (CO_2-e) is a measure, using CO_2 as the standard, used to compare the global warming potentials of the different greenhouse gases. For example, if the global warming potential for methane over 100 years is taken as 21, this means that the emission of 1 megatonne of methane may be expressed as the emission of 21 megatonnes of carbon dioxide equivalents.

Table 8-1: Project greenhouse gas emissions relative to the greenhouse gas emissions for Australia and the Northern Territory in 2007

	CO_2-e emissions (Mt/a)	Percentage of 2007 Australian GHG emissions	Percentage of 2007 Northern Territory GHG emissions
Australian GHG emissions (2007)	597.2	n.a.	n.a.
Northern Territory GHG emissions (2007)	17.2	2.9	n.a.
Ichthys Project total GHG emissions (40-year annual average)	7.0	1.2	n.a.
Ichthys Project onshore GHG emissions (40-year annual average)*	5.2	n.a.	30

Source: Department of Climate Change. 2009. *Australian national greenhouse accounts: state and territory greenhouse gas inventories 2007.*

* Onshore CO_2-e emissions include onshore combustion emissions and reservoir emissions. Even though reservoir CO_2 emissions will be sourced from Commonwealth waters outside the Northern Territory, the reservoir CO_2 will be emitted to atmosphere in the Northern Territory.

n.a. = not applicable.

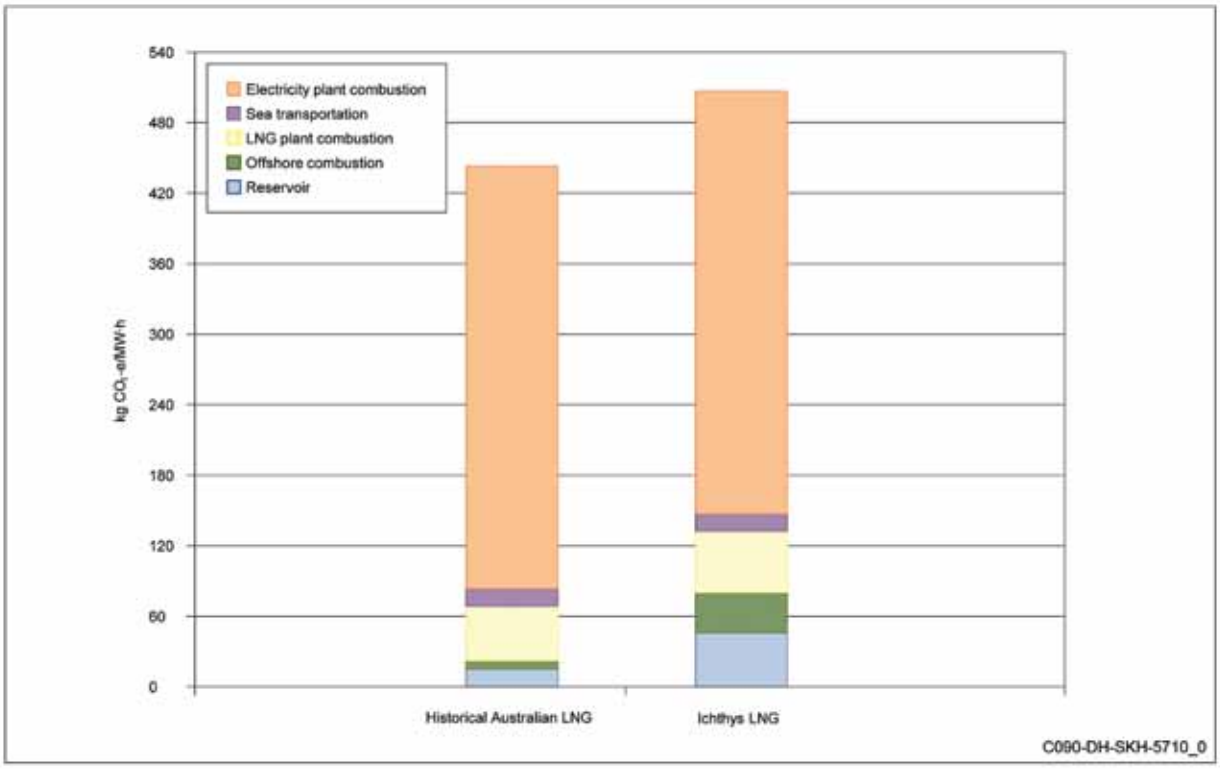
Project's GHG emissions compared against 2007 levels is 1.2% of the Australian CO_2-e emissions and 30% of the Northern Territory's CO_2-e emissions.

Comparison of Ichthys and other project CO_2 emissions on a life-cycle basis

The biggest differences in efficiencies in CO_2 emissions between LNG projects typically arise in relation to:

- the proportion of CO_2 naturally present in the reservoir gases used to make the LNG
- the nature of the offshore facilities (and their associated combustion CO_2 emissions) needed to get the gas to the liquefaction facility via a gas export pipeline and, in many cases, to remove a portion of the hydrocarbon liquids first.

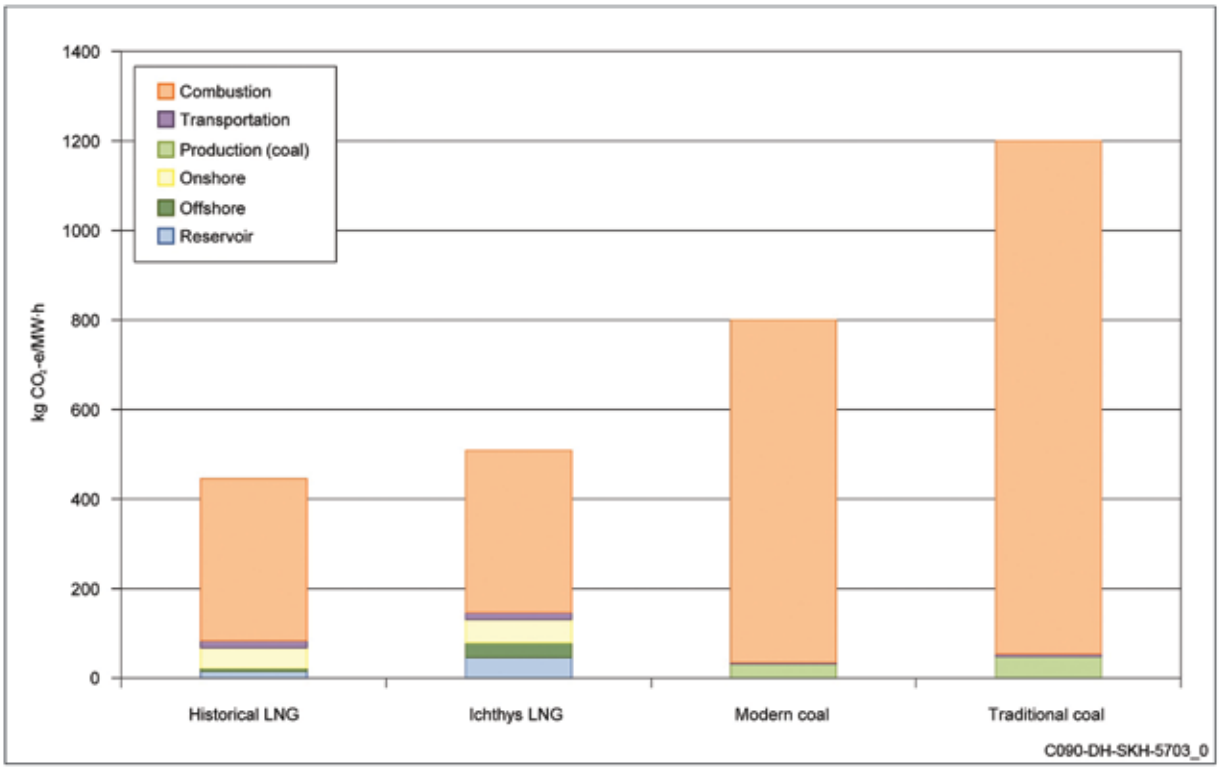
Figure 8-2 shows the comparative CO_2 emissions per megawatt hour (MW·h) for electricity generation using Ichthys LNG and historical Australian LNG. The differences reflect the fact that the Ichthys Field's Brewster and Plover gas reservoirs contain higher reservoir CO_2 levels than the gas fields that have historically supplied other LNG plants in Australia. In addition, the Project will need relatively energy-intensive offshore facilities because of a combination of factors: deeper water at the field location, a greater



Adapted from APPEA 2009, J.P. Morgan Equity Research 2008, and Pace 2009[13].

Figure 8-2: CO_2-e emission benchmarking on the basis of electricity generated per megawatt hour

13 These references are given in full in Chapter 9 *Greenhouse gas management* in the Draft EIS.



Adapted from APPEA 2009, J.P. Morgan Equity Research 2008, and Pace 2009.

Figure 8-3: Life-cycle CO_2-e emissions from the use of LNG and coal to produce electricity

distance between the field and the onshore LNG plant, and the need to remove condensate from the gas at the offshore facility.

Figure 8-3 shows that the use of LNG as an energy source produces significantly less life-cycle greenhouse gas emissions (from production, processing, transportation, and end-use combustion) than either coal or fuel oil. Electricity produced from LNG generates 40–60 per cent less CO_2 than electricity produced from coal. Every tonne of LNG used to generate electricity averts the emission of up to 4 tonnes of CO_2 when compared with coal-fired electricity generation. Ichthys LNG will be marketed to the Asia-Pacific region and will in large part be used for power generation. In a global context, therefore, the use of Ichthys LNG to generate electricity in Asia will likely result in a significant reduction in CO_2 emissions.

INPEX GHG mitigation and management strategy

INPEX recognises the potential for GHGs to impact on the environment on a global scale through their contribution to the phenomenon of global warming. The company is committed to managing its GHG emissions by actively promoting the reduction of GHG emissions across its operations in a safe and technically and commercially viable manner.

There are a number of alternatives available to INPEX for GHG management, all with varying costs and risks.

As the policy landscape is still evolving and legislation is yet to be finalised, INPEX is exploring practicable alternatives in order to be well prepared to respond once legislative requirements become clear. To this end INPEX is developing a portfolio of GHG mitigation opportunities, which may afford the lowest risk and cost approach for the Project and avoid a reliance on any single solution. The main opportunities under evaluation include the following:

- additional engineering abatement techniques
- biosequestration (carbon capture through tree plantings)
- geosequestration (permanent storage of reservoir CO_2 in underground reservoirs)
- the purchase of offset credits on the open market.

Engineering abatement opportunities that will reduce GHG emissions and improve energy efficiency are being identified and assessed by INPEX's onshore and offshore facility engineering teams. Options that are safe and that are technically and commercially viable are likely to be incorporated into facility design. INPEX will also monitor and review technological developments and operational practices to identify GHG emission reduction opportunities during the Project's design phase and through its operational life.

The following range of energy-efficient technologies has been identified for use on the Project:

- the selection of activated methyldiethanolamine (aMDEA) as the CO_2 removal solvent
- the selection of energy-efficient turbines for compressor drivers and power generation
- the incorporation of waste-heat recovery units to minimise the need for supplemental fired heating
- the employment of other technical improvements, including onshore AGRU flash-gas recovery and offshore flare-gas recovery
- the possible implementation of combined-cycle power generation onshore.

The company has already identified and committed to technical-abatement and energy-efficiency measures that will reduce CO_2 emissions by around 100 megatonnes over the Project's 40-year life.

Biosequestration is the process of "locking", through photosynthesis, the carbon in atmospheric CO_2 into plant biomass (usually trees). Biosequestration offsets the effect of the CO_2 and other GHGs released into the earth's atmosphere by the development of natural gas fields and the burning of fossil fuels.

In 2008 INPEX initiated a "Biosequestration Assessment Project" with the planting of 1.4 million trees in south-west Western Australia to gain a better understanding of the potential for biosequestration to offset large volumes of CO_2.

Related to the biosequestration approach is the improvement of forestry and land management practices to reduce CO_2 emissions. ConocoPhillips, for example, as Operator of the Darwin LNG plant, uses improved fire-management practices in savannah as a contribution to managing its CO_2 emissions. Similar options are being assessed by INPEX. At this stage, however, fire-management offsets are not recognised under the Kyoto Protocol[14] and may therefore not be compliant with Australia's proposed Carbon Pollution Reduction Scheme (CPRS) legislation.

Geosequestration is the process of injecting CO_2 into deep geological formations for secure, long-term storage. The technique is also called "carbon (dioxide) capture and storage" (CCS). The technology for CO_2 injection has been used by oil and gas companies as an enhanced hydrocarbon recovery technique for many decades.

The following CO_2 offset credits are available for sale on the international market:

- certified emission reductions (CERs) from clean development mechanism (CDM) projects
- emission reduction units (ERUs) from joint implementation (JI) projects
- European Union allowances (EUAs) under the European Union Emissions Trading Scheme Phase 2 (EU ETS II)
- voluntary emission reductions (VERs)
- removal units (RMUs).

These credits may be acceptable as offsets in Australia. However, this will only be known when details of the proposed CPRS and its associated legislation are finalised.

A Provisional Greenhouse Gas Management Plan has been developed that outlines the management strategies and objectives, monitoring and reporting requirements for all phases of the Project. This plan will guide the development of more detailed GHG management plans prior to commissioning of the onshore gas-processing plant.

14 The Kyoto Protocol is an agreement made under the United Nations Framework Convention on Climate Change (UNFCCC). Countries that ratify the protocol commit to reduce their emissions of CO_2 and other GHGs or to engage in activities such as emissions trading if they maintain or increase emissions of these gases. The protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. As of November 2009, 187 states had signed and ratified the protocol.

9 Socio-economic Impacts and Management

This section of the Executive Summary summarises the potential impacts of the Project on the community in the vicinity of the development areas in and around Darwin Harbour, as well as on the wider regional economy. It also identifies the key management controls which will be applied to mitigate these impacts.

The socio-economic aspects of the Project's operating environment are complex, and are influenced by many factors that are outside the control of the Project. These include the fluctuations in national and global economies and the resulting effects on labour markets.

The risk assessment process, taking into account management controls and mitigating factors, identified 11 "medium" and 7 "low" residual risk potential socio-economic impacts associated with the Project. These risk ratings are considered acceptably low, mitigating risks to the livelihoods and lifestyles of the surrounding community.

The Project's most intense socio-economic impacts are likely to be associated with the construction phase of the nearshore and onshore development areas. Road transport used for ferrying Project personnel and materials to the onshore development area will increase local traffic volumes, although modelling indicates that the incremental increase attributable to the Project is minor in comparison with the effects of expected population growth in the Darwin region.

Recreational fishing activities in East Arm and along the pipeline route will be temporarily disrupted in the immediate vicinity of Project vessels during the construction phase. Exclusion zones will be established around dredging, piledriving, pipelay and drill-and-blast vessels to manage public safety. These activities will be focused on localised areas in the nearshore development area and will not prohibit fishing and recreational boating nearby, provided that safe distances are maintained.

Aboriginal people living in the Darwin area frequently fish and forage for food and other resources in intertidal areas at low tide, as well as in Darwin Harbour. In the Harbour itself these activities are common around Nightcliff, Coconut Grove, Kulaluk, Sadgroves Creek, Lee Point and Blaydin Point. It is predicted that there will not be any direct impact on Nightcliff, Coconut Grove, Kulaluk, Sadgroves Creek and Lee Point areas and therefore impacts on traditional fishing practice will be negligible for these areas. However, there will be an impact on traditional fishing practices undertaken on and around Blaydin Point during both the construction and the operations phases. This is because public access to the onshore site will be restricted and marine exclusion zones will be put in place for safety reasons. This impact is expected to be minimal given that the fishing areas affected near Blaydin Point represent a very small proportion of the areas available in Darwin Harbour.

The Project will provide a high level of demand for personnel during its construction phase, which may be met locally in Darwin and Palmerston depending on the skill sets required, but is also likely to require fly-in, fly-out staff. An accommodation village will be developed in Howard Springs (east of Palmerston) to minimise the short-term impacts on the already constrained local housing market that might otherwise be caused by a large influx of Project personnel, many of whom will be single. The development of this facility is subject to its own approvals process.

Three Aboriginal archaeological sites will be disturbed during land-clearing for the onshore development area, subject to permission from NRETAS under the *Heritage Conservation Act* (NT). The onshore facilities have been designed around a number of other heritage sites that will remain undisturbed. Heritage sites in the vicinity of the nearshore development area will not be disturbed, as the maritime infrastructure has been designed specifically to avoid these sites. This includes a number of submerged Catalina flying-boat wrecks from World War II. Low levels of sand movement on to one of these wrecks (Catalina 3) may occur as a result of dredging activities, which represents a small increase in the natural movement of sand that already occurs throughout East Arm under ambient tidal currents. This is not expected to negatively affect the heritage values of the wreck site. The gas export pipeline has been aligned to avoid Aboriginal sacred sites in the nearshore development area.

Modelling of noise emissions from the onshore gas-processing plant indicates that received levels in the nearest residential areas (in Palmerston) will not exceed identified noise criteria and are unlikely to be audible above ambient noise in most conditions. Other impacts to the community that may be considered on a cumulative basis include light and visual amenity.

In the local context, where several industrial facilities already operate on the shores of Darwin Harbour, the additional impacts imposed by the Ichthys Project are moderate. These impacts are mitigated by distance—the onshore development area is 4 kilometres from Palmerston and 10 kilometres from Darwin's central business district.

The Project facilities have been designed to minimise the risk to public safety associated with accidental events such as major hydrocarbon leaks or explosions. Controls to mitigate risks from major incidents include designing and constructing the facility in line with established industry standards and codes of practice, positioning equipment to reduce off-site consequences, and developing and exercising emergency plans and response procedures in consultation with the relevant emergency-response authorities.

The results from the preliminary quantitative risk assessments (QRAs) conducted to date indicate that the onshore development area and pipeline do not pose unacceptable safety risks to the public around Darwin and neighbouring residential areas such as Marlow Lagoon (which is adjacent to Palmerston). Where risks posed to users of the Harbour in the vicinity of the jetty heads and trestle are higher than acceptable for active open spaces, nominal safety exclusion zones will be established. As the acceptable risk contours border the main channel of Lightning Creek, risk values will need to be confirmed by a final QRA based on a complete plant design to determine whether access to this creek can be maintained.

Socio-economic impacts associated with the offshore development area are limited to interactions with commercial fishing and shipping activities. Any impacts to commercial fishing are likely to be minor. Data on fishing effort indicate that the offshore facilities will be located close to an area utilised by the North West Slope Trawl Fishery. However, it should be noted that publicly available fishing effort data do not record fishing areas fished by five operators or fewer and that it is possible therefore that some low-level fishing activities may occur in the vicinity of the offshore facilities. In addition, the gas export pipeline overlaps an area utilised by the Northern Prawn Fishery. In this case, however, the standard safety exclusion zone to be established will not significantly reduce the area available for fishing.

Potential impacts to shipping activities are also likely to be minor as there are no identified shipping channels in the vicinity of the offshore development area.

Economic modelling indicates that the Project will benefit the Northern Territory economy, contributing an increase of almost 18 per cent to the gross state product during each year of operation and increasing household spending. The Project will also benefit the Australian economy, with predicted average annual contributions of A$3.5 billion (an additional 0.2 per cent) to Australia's gross domestic product. The Project offers opportunities for employment and training, with flow-on potential for business development and increased investment in infrastructure and services.

It is considered that the level of management and risk reduction presented in this Draft EIS represents a proactive and conservative approach to maintaining socio-economic values, while allowing the Project to progress in a sustainable fashion. The management controls to be implemented will be further developed in consultation with stakeholders and will continue to be updated throughout the various stages of the Project.

Table 9-1 presents the potential impacts, management controls, mitigating factors and, where appropriate, the residual risks to the social and economic environment. The integration of these controls into the environmental management program is discussed in Section 10.

Table 9-1: Socio-economic impacts, management and residual risks

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Social				
Social integration	Recreational activities of construction workforce.	Increase in antisocial behaviour at local recreational venues such as hotels and bars.	Personnel representing the Project will be expected to exhibit professional standards of behaviour as required by the INPEX Code of Conduct. Project personnel will be subject to random drug and alcohol testing. A code of conduct for the residents of the accommodation village will be developed and implemented. The longer working hours required from Project personnel may discourage workers from attending facilities such as hotels and bars outside the accommodation village after hours. The accommodation village will include facilities such as licensed restaurants and bars, which may reduce the use of existing local facilities by the construction workforce. A large portion of the construction workforce is likely to be recruited on a fly-in, fly-out basis, with the majority of personnel returning home during their time off.	Not applicable
	Recreational activities of construction workforce.	Increase in pressure placed on social venues such as sporting facilities, food outlets, and taverns.	The accommodation village will include a number of licensed restaurants and a range of social and recreational facilities will be established for the benefit of the residents. This will assist in limiting the pressure placed on existing facilities enjoyed by the local community. Ongoing consultation with the community will be undertaken to monitor the extent and impact of workforce integration.	Not applicable
Housing workforce	Accommodation requirements for the construction workforce in the Darwin area.	Increased pressure placed on an already difficult housing market.	An accommodation village will be constructed to house the greater part of the construction workforce. It is intended that this village will be seen as a desirable place to live and it will be designed to cater for a wide range of people, both singles and couples. An accommodation strategy is being developed to address accommodation solutions for regular Project personnel as well as for short-term visitors during the operations phase (including teams brought in to carry out periodic maintenance operations).	Not applicable
Social services for Project	Emergency health services for the construction workforce.	Increased pressure placed on emergency health services, e.g. triage services.	First-aid clinics will be established at the onshore development area and at the accommodation village. INPEX will work in conjunction with the Northern Territory Police, Fire and Emergency Services in order to effectively plan for any major emergencies. An emergency response plan will be developed for both the construction and operations phase of the Project. Emergency response teams will be established.	Not applicable

Table 9-1: Socio-economic impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Social services for Project	Emergency fire services for onshore development area.	Increased pressure on existing emergency fire services.	INPEX will work in conjunction with the Northern Territory Police, Fire and Emergency Services in order to effectively plan for any major emergencies. A firefighting capability will be available, along with strategically located firefighting stations on the Project plant site. Fire-protection systems for the operations phase will be designed to enable INPEX personnel to handle fires capably until external help arrives.	Not applicable
Utilities and infrastructure	Use of existing power, water and sewage infrastructure during construction, precommissioning and commissioning.	Increased pressure on utilities supply and infrastructure.	During construction, power will predominantly be supplied using on-site diesel generators with some mains power from the Darwin grid required to support temporary construction buildings and lighting requirements. Temporary ablution blocks and sewage treatment systems will be in place to meet sewage management and treatment requirements during construction. The Power and Water Corporation has advised that the water demands for the Project can be met using scheme water, without affecting regional supplies. Ongoing consultation will be undertaken with local government, the Department of Lands and Planning and the Power and Water Corporation in order to effectively plan for the provision of scheme water for Project requirements.	Not applicable
	Use of existing power, water and sewerage infrastructure during operations.	Increased pressure on utilities supply and infrastructure.	Permanent sewage-treatment facilities will be installed for the operations phase of the Project. The onshore facilities will be self-sufficient in power generation capacity during the operations phase. The Power and Water Corporation has advised that the water demands for the Project can be met using scheme water, without affecting regional supplies. Ongoing consultation will be undertaken with local government, the Department of Lands and Planning and the Power and Water Corporation in order to effectively plan for the provision of scheme water for Project requirements.	Not applicable
Traffic and transport	Daily transport of construction personnel to site. Regular transport of materials and equipment from East Arm Wharf to site during construction. Transport of rock from the quarries to site.	Increased congestion on local roads. Increased risk of road accidents.	Buses provided to transport a majority of the Project personnel to and from work to reduce total traffic. Designated travel routes to and from quarries, accommodation facilities, Darwin's central business district and East Arm Wharf will be set for the Project. The Project will work in conjunction with the Department of Lands and Planning to identify any proposed road projects that may need to be brought forward or upgrades that may need to be undertaken to assist in reducing potential pressure on existing road systems. Provisional Traffic Management Plan.	Medium

Table 9-1: Socio-economic impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Maritime traffic and navigation	Construction and operation of offshore infrastructure in open ocean.	Forced alteration of shipping route.	Low level of shipping activity in the offshore development area. An application will be made to the relevant government regulatory agencies to implement a safety exclusion zone and restricted navigation zone. These zones will be gazetted on navigational charts. Standard maritime communications equipment, navigation lights and markers on all Project vessels. A "Notice to Mariners" on the location of offshore infrastructure and pipeline will be issued.	Low
	Use of vessels for pipeline construction in offshore development area.	Forced alteration of shipping route.	Standard maritime communications equipment installed on all vessels. Activities will be transient and short-term only.	Low
	Operation of nearshore construction vessels and dredgers.	Forced alteration of shipping route in the Harbour. Increase in competition for port resources with other users. Spoil disposal ground could cause hazards to shipping navigation in the area.	Cooperation with Darwin Port Corporation to manage shipping traffic schedules and exclusion zones during construction. A "Notice to Mariners" will be issued on nearshore construction activities, e.g. dredging and rock dumping. Construction-vessel traffic will be short-term in duration. Periodic bathymetric surveys to be undertaken to confirm sediment deposition depth and patterns. The spoil disposal ground is not located in a shipping route. Ensure that under-keel clearance at the spoil disposal ground is maintained for maritime vessels.	Medium
	Operation of tanker vessels in nearshore area.	Forced alteration of shipping route in the Harbour. Increase in competition for port resources with other users.	Exclusion zones will be put in place around product tankers and will be enforced by tugs. Cooperation with Darwin Port Corporation to manage shipping traffic schedules during operations.	Medium
Recreation	Operation of nearshore infrastructure (jetty) with exclusion zones for security and public safety.	Reduction in access to recreational fishing grounds.	Fishing areas to be affected represent a very small proportion of the areas available in Darwin Harbour.	Medium
	Dredging during construction of nearshore infrastructure.	Reduced access to recreational diving sites (e.g. wrecks) due to reduced visibility in turbid waters.	Dredging is a construction-phase activity and will only temporarily reduce visibility	Medium
	Construction and operation of onshore infrastructure.	Loss of access to camping and four-wheel-drive areas and traditional hunting and gathering areas at Blaydin Point.	Many other similar areas are available around Darwin Harbour.	Medium

Table 9-1: Socio-economic impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Recreation	Construction and operation of onshore infrastructure.	Loss of access to traditional fishing and foraging grounds on Blaydin Point.	Fishing and foraging areas to be affected represent a very small proportion of the available areas in Darwin Harbour.	Medium
Aboriginal cultural heritage	Land clearing prior to construction in the onshore development area, and vehicle movement in the vicinity of heritage sites.	Disturbance or removal of Aboriginal archaeological sites within or near the onshore development footprint protected under the *Heritage Conservation Act* (NT).	Design of infrastructure to avoid onshore heritage sites where possible. Seek ministerial permission to disturb a site. If permission is granted to disturb a site, advice will be sought from the traditional owners on the correct procedures to be adopted for its removal. Daily toolbox meetings, job hazard analyses, permit systems or similar will be implemented on site prior to the commencement of vegetation-clearing or construction activities. Where the external boundary of an Aboriginal heritage site is 10 metres or closer to any proposed construction activity, flagging, temporary fencing or similar will be erected 5 metres from the site boundary and appropriate signage will be put in place. Provisional Heritage Management Plan.	Low
	Construction vessel movements and anchoring in Darwin Harbour.	Disturbance to maritime sacred sites protected under the *Northern Territory Aboriginal Sacred Sites Act* (NT) and the *Heritage Conservation Act* (NT).	Exclusion zones have been established around the maritime sacred sites by the Aboriginal Areas Protection Authority. No works will be permitted in these exclusion zones. Anchor management plans will be developed to allow safe anchoring of vessels undertaking pipelay, dredging and piledriving activities in the vicinity of any nearshore heritage or sacred sites. Provisional Heritage Management Plan.	Low
Non-Aboriginal cultural heritage	Construction activities in the nearshore development area, including dredging and pipelay.	Accidental disturbance to maritime heritage sites listed under the *Heritage Conservation Act* (NT) or the *Historic Shipwrecks Act 1976* (Cwlth).	Design of infrastructure to avoid disturbance to sites. Anchor management plans will be developed in consultation with NRETAS's Heritage Branch to allow safe anchoring of vessels undertaking pipelay, dredging and piledriving activities in the vicinity of any heritage sites. Accurate dGPS locations of all wrecks near the nearshore development area will be provided to construction contractors to enable accurate positioning. Implementation of controlled zones around the SS *Ellengowan*, the *Kelat*, and Catalina flying-boat wrecks. Validation of dredging sedimentation modelling. Provisional Heritage Management Plan.	Medium
	Vessel operations and periodic maintenance dredging activities within the nearshore development area during the operations phase.	Increases in sedimentation or sediment scouring on or around the Catalina flying-boat wrecks adjoining the shipping channel, the approach area, the turning basin and the berthing area.	INPEX will periodically assess sediment conditions in the vicinity of the Catalina wrecks adjacent to the shipping channel and, in consultation with NRETAS, will determine whether any remedial action is required to address impacts should they arise. Provisional Heritage Management Plan.	Low

Table 9-1: Socio-economic impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Noise	Construction and commissioning activities such as piledriving, drilling and rock blasting; pneumatic testing of pipework; air blowing and flaring.	Noise and vibration causes disturbance or nuisance to the local community.	Onshore development area is located several kilometres from the nearest residential or urban area. Blasting activities will only be conducted during daylight hours. Piledriving activities are planned to be undertaken only during daylight hours; however night-time operations may be required if progress falls significantly behind schedule. Notification will be given to communities to give warning prior to blasting operations. Notification will be given to communities to give warning prior to night-time piledriving operations. Provisional Piledriving and Blasting Management Plan.	Medium
	Road transport of workforce, vehicles, equipment, rock and materials during the construction phase.	Noise and vibration causes disturbance or nuisance to the local community.	Buses will be used for workforce transport to reduce the total number of vehicles on the roads. Designated traffic routes will be set for Project vehicles. Provisional Traffic Management Plan.	Medium
	Generation of noise by normal operation of the onshore processing plant.	Noise and vibration causes disturbance or nuisance to the local community.	Onshore development area is located several kilometres from the nearest residential or urban area.	Low
	Generation of noise by emergency flaring during operation of the onshore processing plant.	Noise and vibration causes disturbance or nuisance to the local community.	Onshore development area is located several kilometres from nearest residential or urban area. Noise mitigation measures will be incorporated into the design of the ground flare to reduce noise emissions.	Medium
Visual amenity	Construction of onshore infrastructure.	Reduction in visual amenity resulting from visible dust.	Dust suppressants use on roads and stockpiles during dry conditions. Minimising ground disturbance and the multiple handling of soil or rock materials. Sealing the main access roads throughout the site and to the junction with Wickham Point Road. Provisional Dust Management Plan.	Not applicable
	Operation of onshore processing plant.	Reduction in visual amenity resulting from smoke and light emissions from flares.	Ground flare and tankage flare will be designed to minimise the generation of particulates (smoke). The ground flares will be shielded to reduce light emissions.	Not applicable

Table 9-1: Socio-economic impacts, management and residual risks (continued)

Aspect	Activity	Potential impacts	Management controls and mitigating factors	Residual risk
Commercial fishing	Presence of offshore infrastructure in the open ocean.	Damage to fishing equipment or pipeline.	An application will be made to the relevant government regulatory agencies to implement a safety exclusion zone around surface and subsurface equipment in the offshore development area. This will be gazetted and will appear on navigation charts. An application will be made to the relevant government regulatory agencies to implement a precautionary zone around the offshore pipeline in consultation with relevant regulatory authorities. A precautionary zone will be implemented within 200 metres of the gas export pipeline in the nearshore development area. Notification of the location of the offshore facilities and gas export pipeline will be achieved through the publication of a “Notice to Mariners”. Navigation lights and markers on offshore infrastructure. Standard maritime communications equipment on all Project vessels.	Low

10 Environmental Management Program

This section of the Executive Summary summarises how INPEX intends to implement a range of environmental management measures and controls throughout the life of the Project.

INPEX is committed to applying a systematic pproach to environmental management which aligns with the recognised international standard *AS/NZS ISO 14001:2004, Environmental management systems—Requirements with guidance for use* and is based on the principle of continual improvement of environmental performance (see Figure 10.1). To assist in meeting this commitment, a Health, Safety and Environmental (HSE) Management Process has been developed. The HSE Management Process provides INPEX with a tool for managing the impacts of its activities on the environment, as well as providing a structured approach to planning and implementing environment management controls.

10.1 Environmental management plans

A range of environmental management controls identified in the tables above (see tables 6-1, 7-1 and 9-1) will be applied throughout the life of the Project to ensure that potential negative environmental impacts identified in the Draft EIS are avoided or minimised to an acceptable level. These management controls, together with specified objectives, targets and indicators, are outlined in provisional environmental management plans (EMPs). The provisional EMPs prepared as part of the Draft EIS are listed in Table 10-1.

INPEX is committed to developing detailed environmental management documentation (e.g. plans and procedures) according to an agreed timetable with the Northern Territory Government. The documents will be based on these provisional plans and on recommendations from the relevant agencies and applicable public comments. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

Matters of national environmental significance

Relevant management controls to minimise impacts on the "matters of national environmental significance" defined and discussed in Chapter 2 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth), including the Commonwealth marine environment, are identified in the following provisional EMPs in the Draft EIS:

- Provisional Cetacean Management Plan
- Provisional Decommissioning Management Plan

Table 10-1: Provisional environmental management plans

Title
Provisional Acid Sulfate Soils Management Plan
Provisional Air Emissions Management Plan
Provisional Bushfire Prevention Management Plan
Provisional Cetacean Management Plan
Provisional Decommissioning Management Plan
Provisional Dredging and Dredge Spoil Disposal Management Plan
Provisional Dust Management Plan
Provisional Greenhouse Gas Management Plan
Provisional Heritage Management Plan
Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan
Provisional Onshore Spill Prevention and Response Management Plan
Provisional Piledriving and Blasting Management Plan
Provisional Quarantine Management Plan
Provisional Traffic Management Plan
Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan
Provisional Waste Management Plan

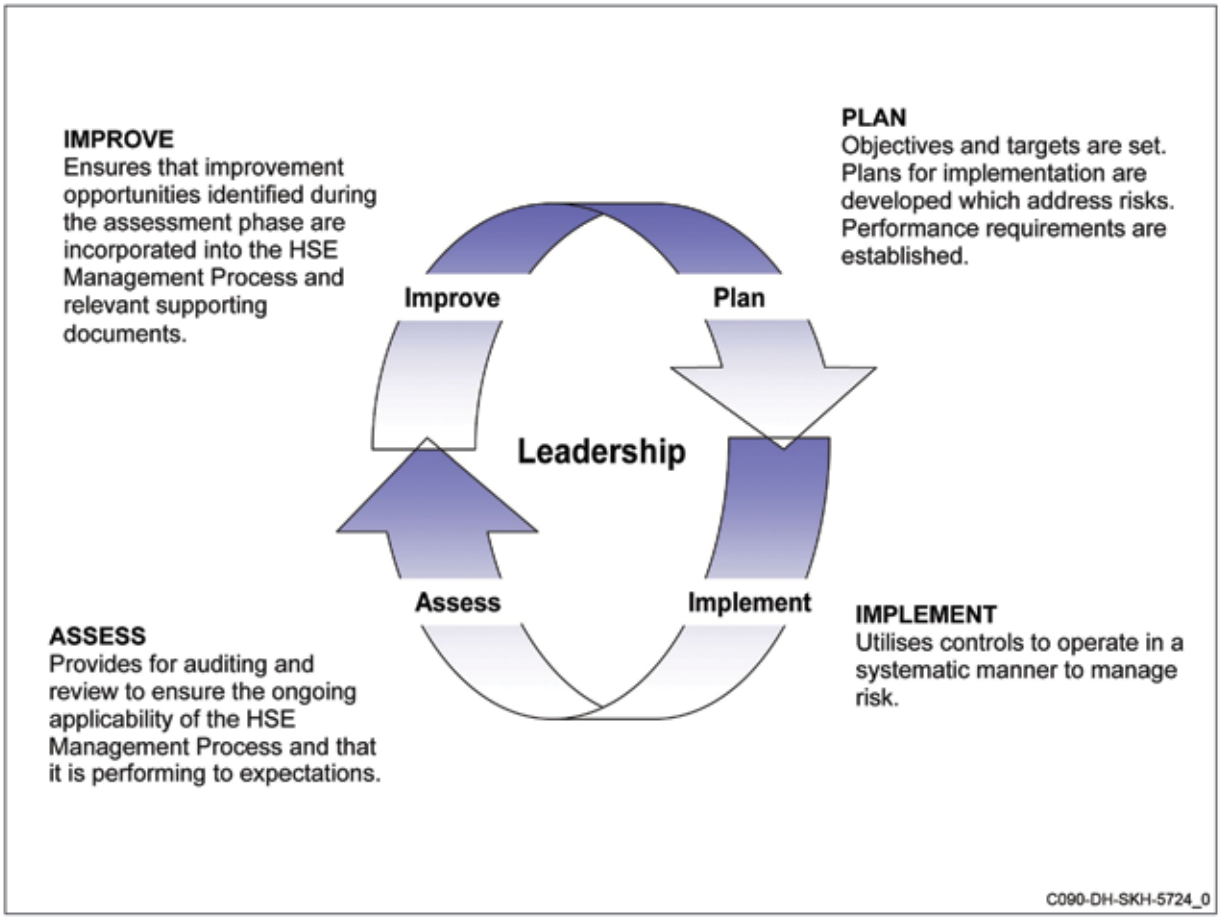


Figure 10-1: Health, safety and environment management model

- Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan
- Provisional Piledriving and Blasting Management Plan
- Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan
- Provisional Waste Management Plan.

Environmental management plans required by the Commonwealth for offshore activities

In addition to the EMPs outlined above, INPEX will develop environment plans and oil-spill contingency plans as required under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cwlth). Specific activities that will require environment plans under these regulations will include the following:

- pipeline installation
- drilling
- installation and hook-up of the CPF and the FPSO
- operations of the CPF and the FPSO.

10.2 Monitoring program for the receiving environment

INPEX is committed to developing a comprehensive receiving environment monitoring program that will be implemented and periodically reviewed in consultation with the relevant authorities. This program will include a number of individual programs which aim to achieve the following:

- to identify environmental change as a result of Project activities, or due to natural or other causes
- to validate modelling results and predicted impacts for Project activities
- to allow INPEX to incorporate changes to its activities if the actual impacts of its activities are more significant than the predicted impacts
- to complement other monitoring being carried out in Darwin Harbour by government agencies and/or other Harbour users.

Each program will be conducted by appropriately qualified personnel in a systematic and scientifically defensible manner.

Conclusion

This Executive Summary provides an overview of the key elements of the primary environmental impact assessment document—the Draft EIS.

Through the development and preparation of the Draft EIS, INPEX has implemented a rigorous risk assessment approach to identify, assess and reduce the risk of adverse impacts to the natural and socio-economic environments in which the Project will be built and operate.

INPEX's broad management commitments for the Project include the following:

- minimising impacts on ecologically valuable areas, such as mangrove communities, and "matters of national environmental significance", such as threatened and migratory species
- actively promoting the reduction of greenhouse gases across its operations in a safe and technically and commercially viable manner
- minimising impacts on the recreational, cultural and tourism values of Darwin Harbour
- minimising impacts on housing markets, social infrastructure and services in the major population centres of Palmerston and Darwin
- providing a major and sustained contribution to the Northern Territory and Australian economies
- ensuring that the facilities are designed to reduce safety risks to as low as reasonably practicable and that risks posed to the public are found to be acceptably low
- preparing and maintaining an integrated safety management system in consultation with the relevant safety authorities
- communicating widely with community and government stakeholders throughout the life of the Project about environmental and community issues, the progress of the Project and opportunities for local involvement.

INPEX has consulted widely with government departments, community groups, business representatives and users of Darwin Harbour during the development of the Draft EIS. Comprehensive stakeholder communication will continue throughout the life of the Project as INPEX continues to consult with the broader community and with key stakeholders about the progress and performance of the Project as well as about opportunities for local involvement during its construction, operations and decommissioning phases.

INPEX has demonstrated its commitment to the reduction of actual and potential Project impacts through an extensive suite of management controls listed in this Executive Summary, together with a range of detailed management commitments which are presented in the Draft EIS.

The provisional environmental management plans listed in Section 10 of this Executive Summary will be further developed and a suite of supporting procedures and processes will be developed to enable effective implementation of management controls. The final documentation will incorporate any conditions set through the Northern Territory and Commonwealth regulatory approval processes, any improvements identified through the public review process of this Draft EIS, and improvements identified through the ongoing design and detailed planning processes undertaken by INPEX and its design and construction contractors.

INPEX is committed to applying a systematic approach to environmental management which aligns with the recognised international standard *AS/NZS ISO 14001:2004, Environmental management systems—Requirements with guidance for use* and is based on the principle of continual improvement of environmental performance. A Health, Safety and Environmental (HSE) Management Process has been developed which will provide a framework for managing the impacts of the Project's activities on the environment, as well as providing a structured approach to planning and implementing environmental management controls throughout the life of the Project.

INPEX will implement a comprehensive environmental monitoring program to quantify the actual impacts on the receiving environment from activities taking place through the construction and operations phases and to allow for improvements in operational practices should unexpected impacts be identified. Results from monitoring will be shared with the public, and INPEX will participate in any future integrated marine monitoring program for Darwin Harbour which has been proposed by the Darwin Harbour Advisory Committee.

The Ichthys Gas Field Development Project will deliver impetus to the Australian economy as a whole and to the Northern Territory economy in particular over a 40-year period. It will also promote the emergence of new technologies and skill sets in the Northern Territory community and deliver greater opportunities for the people of Darwin to grow and prosper.

INPEX believes that the residual risks presented in this Executive Summary demonstrate a sound case for the environmental and social acceptability of the Project.

The full Draft EIS provides a comprehensive reference for all issues discussed in this Executive Summary and it is recommended reading for all those who require greater detail on the Project.

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