



11 Environmental Management Program

11 ENVIRONMENTAL MANAGEMENT PROGRAM

11.1 Introduction

This chapter describes how INPEX intends to implement a range of environmental management measures and controls throughout the life of the Ichthys Gas Field Development Project (the Project). These are intended to demonstrate how INPEX will avoid, or minimise to an acceptable level, the potential negative environmental impacts identified in this draft environmental impact statement (Draft EIS).

The management measures and controls, together with specified objectives, targets and indicators, are outlined in the various provisional environmental management plans (EMPs) provided as annexes to this chapter and documented in Chapter 7 *Marine impacts and management*, Chapter 8 *Terrestrial impacts and management* and Chapter 10 *Socio-economic impacts and management*. These provisional plans will be used as the basis for the development of detailed environmental documentation, for example the plans, processes and procedures that will be required for the different phases of the Project, as well as for specific activities associated with the Project.

The detailed environmental documentation for plans, processes and procedures will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

11.2 INPEX's Health, Safety and Environmental Management Process

INPEX is committed to delivering energy in a safe and environmentally responsible manner. To assist in meeting this commitment, the company has developed a Health, Safety and Environmental Management Process (HSE Management Process). This 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 environmental protection measures.

The HSE Management Process has been based on a continuous improvement model as defined in the internationally recognised standards *AS/NZS ISO 14001:2004, Environmental management systems—Requirements with guidance for use* and *AS/NZS 4801:2001, Occupational health and safety management systems—Specification with guidance for use*. The model is shown in Figure 11-1.

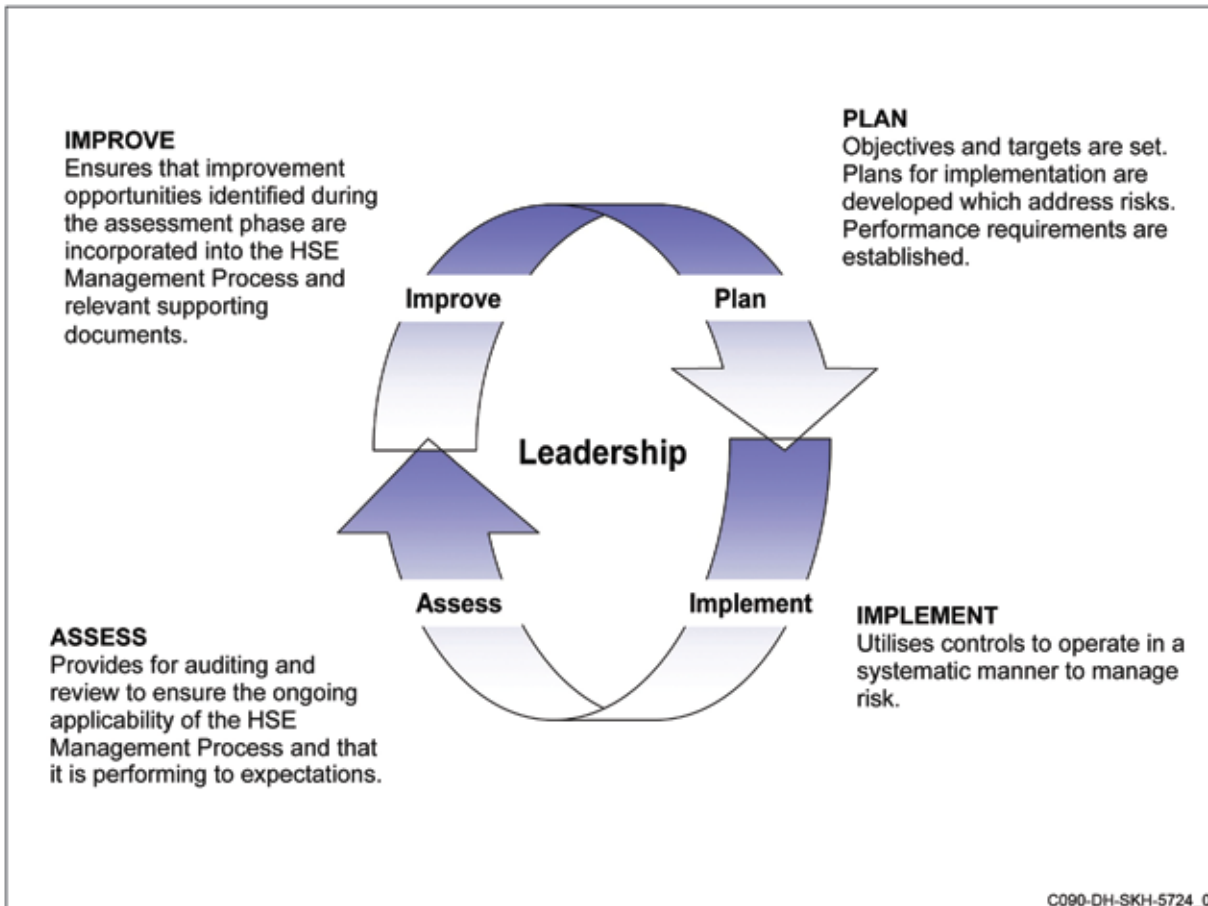


Figure 11-1: HSE management model

The HSE Management Process is structured around 10 core elements (see Table 11-1) with associated sub-elements, each of which describes an essential part in the overall management of matters relating to health, safety and the environment. The elements are interrelated and the implementation of each is essential for the effective operation of the HSE Management Process as a whole. Each of the elements is addressed in additional detail later in this chapter.

Ownership of the HSE Management Process resides with INPEX's line managers, who will make provision for the resources necessary to assure the successful implementation and sustainability of the process.

Table 11-1: Core elements of INPEX's Health, Safety and Environmental Management Process

Element	Title
1	HSE policy and leadership
2	Planning
3	Organisation and resources
4	Documents and records
5	Risk management
6	Regulatory requirements
7	Implementation, monitoring and measurement
8	Emergency and crisis management
9	Inspection and audit
10	Management review

11.2.1 Element 1: HSE policy and leadership

INPEX is committed to managing environmental, health and safety issues to the highest standards and has set out its environmental, health and safety commitment in the form of an environmental policy and a health and safety policy (see Figure 11-2 and Figure 11-3). The policies, approved by INPEX's Managing Directors, clearly state INPEX's commitment to continuous environmental performance improvement.

INPEX considers leadership accountability and visibility to be key components in the successful implementation of the HSE Management Process. The visibility of the commitment of INPEX managers will demonstrate to employees, contractors, government and the community that the company regards excellence in environmental management as a priority.

Environmental Policy

Objective

INPEX is a worldwide oil and gas exploration and development company committed to delivering energy resources in an environmentally responsible manner.

We recognise that we have a responsibility to support the principles of sustainable development and that we owe a duty of care to both the natural environment and the communities in which we operate.

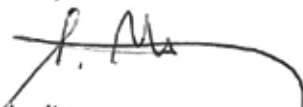
Strategy

INPEX will:

- plan and perform its business activities so that negative impacts on the environment are avoided or kept at levels that are 'as low as reasonably practicable'
- comply with all applicable laws and regulations, and apply appropriate standards where laws and regulations do not exist or are considered not to be sufficiently comprehensive
- develop, implement and maintain management processes to ensure the company's compliance with obligations and commitments and to drive continual improvement in environmental performance
- set, measure and review environmental standards, objectives and improvement targets
- endeavor to prevent pollution and seek continual improvement with respect to emissions, discharges, wastes, energy efficiency and resource consumption
- actively promote the reduction of greenhouse gas emissions across our operations in a safe and technically and commercially viable manner
- monitor the environment where we operate and adjust our practices where required
- maintain and regularly test emergency plans to ensure a quick and effective response in the event of emergencies
- provide employees with appropriate training and resources required to fulfil their environmental responsibilities and accountabilities
- engage openly with our stakeholders on environmental issues
- ensure that all INPEX employees and contractors are aware of this policy, understand their responsibility to report environmental hazards and incidents, and know they are empowered to intervene if they have environmental concerns.

Application

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



Seiya Ito
Managing Director
October 2009

Figure 11-2: INPEX Environmental Policy

Health and Safety Policy

Objective

INPEX is a worldwide oil and gas exploration and development company committed to conducting all its activities in a manner that is safe and not injurious to health.

Our health and safety goal is to prevent workplace incidents and meet the performance expectations of our stakeholders.

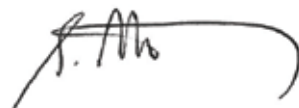
Strategy

INPEX will:

- establish and maintain a safety culture where safety is a core value
- comply with all applicable laws and regulations and apply INPEX standards where laws and regulations do not exist or are considered insufficient
- implement management processes based on internationally accepted standards
- set, measure and review health and safety objectives and targets, and provide training and resources which will enable our business to meet them
- integrate health and safety management into our existing and planned business activities by identifying hazards and managing risks to "as low as reasonably practicable" levels
- maintain and regularly test an emergency response management process to ensure the safety of personnel, the protection of the environment, the safeguarding of assets and the protection of our assets
- communicate openly on health and safety issues with internal and external stakeholders to formulate objectives and targets, develop solutions, foster stakeholder engagement and promote industry development
- ensure that all INPEX personnel and contractors are aware of this policy, understand their responsibility to report hazards and incidents in their work areas, and know that they are empowered to intervene if they have health or safety concerns
- strive for continual improvement in health and safety performance through monitoring, audit and review processes.

Application

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



Seiya Ito
Managing Director
October 2009

Figure 11-3: INPEX Health and Safety Policy

11.2.2 Element 2: Planning

Planning is an essential part of the HSE Management Process as it assists INPEX in fulfilling its HSE policies. The following subsections detail the key sub-elements of the planning.

HSE plans

INPEX will develop annual HSE plans to target specific HSE issues and ensure that responsibilities for individual actions are clearly assigned. Development of HSE plans is carried out on the basis of a continuous-improvement cycle and will define objectives that are clearly measurable and achievable.

The development of HSE plans will be formalised and will be scheduled to coincide with the budget planning cycle.

Objectives and targets

INPEX will establish, implement and maintain documented objectives and targets consistent with the requirements of the HSE policies.

The HSE objectives and targets will be set alongside business targets during the business planning process to give a clear indication of the importance placed by INPEX on HSE performance. Programs will be developed to ensure that these objectives and targets are achieved.

Environmental objectives and targets for the Project have been identified in the individual provisional EMPs—see Section 11.3 and annexes 1–16 to this chapter. Objectives and targets will be reviewed regularly through the operations phase to ensure that there is continuous improvement in environmental performance.

Daily task control

INPEX will manage the planning required for daily task management through the implementation of risk assessments (e.g. through job hazard analysis, the “step back 5 × 5” approach¹, and environmental impact assessments), pre-start work reviews, and permit-to-work systems.

Contractor management

INPEX pre-evaluates contractor parties and service providers to assess their technical capabilities, their experience, and their commitment to health and safety, environmental protection and quality assurance.

The preparation of an HSE plan is required for long-term or high-risk third-party contracts. No work will be permitted to commence on site until all appropriate documentation has been approved by INPEX.

A process will be established to ensure that effective communication channels are established between INPEX and its major contractors and service providers. This communication may include regular “toolbox” or HSE meetings and will be used to discuss any relevant HSE issues, including critical interfaces, permits to work, risk assessments, process changes, and performance monitoring and evaluation.

11.2.3 Element 3: Organisation and resources

INPEX will identify and provide the resources required to implement, maintain and improve the HSE Management Process and environmental commitments. Similarly, key contractors will be required to demonstrate to INPEX’s satisfaction that they have appropriate HSE resources and organisational structure to meet environmental commitments and Project conditions. Responsibilities and accountabilities for the provision of environmental management are assigned to all personnel throughout the organisation by means of management plans, procedures and position descriptions.

Roles and responsibilities

Roles and responsibilities will be documented in position descriptions for all INPEX positions. The descriptions will define the primary role and include any HSE responsibilities relevant to a specific position.

The environmental roles and responsibilities of those to be involved in the Project are shown in Table 11-2.

¹ The term “step back 5 × 5” is an HSE precept and slogan encouraging workers to figuratively step back five paces and pause for five minutes to reflect upon likely hazards before embarking on an activity.

Table 11-2: Environmental roles and responsibilities for implementation of the HSE Management Process

Position(s)	Roles and responsibilities
INPEX managing directors:	<ul style="list-style-type: none"> • have overall responsibility for the environmental policy and activities of the organisation • have the ultimate responsibility for achieving objectives and authorising the environmental policy.
INPEX directors and managers:	<ul style="list-style-type: none"> • have a commitment to the environmental policy and are responsible for ensuring that employees, under their direction, are aware of the requirements of the HSE Management Process • ensure that employees, under their direction, are trained and resourced to enable them to implement the requirements of the HSE Management Process.
INPEX Environmental Manager:	<ul style="list-style-type: none"> • provides support services to line managers and employees in accordance with the requirements of the HSE Management Process • provides environmental training to INPEX departments in support of their continuous-improvement requirements • establishes the environmental legal compliance and requirements register • prepares operations EMPs and procedures that comply with the requirements of the relevant statutes, industry best practice and the International and Australian Standard <i>AS/NZS ISO 14001:2004</i> • reviews and approves contractor EMPs being developed as part of the Project, e.g. construction EMPs and drilling EMPs.
INPEX personnel:	<ul style="list-style-type: none"> • take all reasonable and practical steps to protect the environment • follow any instructions given by management in relation to the protection of the environment • participate in prescribed environmental training.
Contractors:	<ul style="list-style-type: none"> • operate under a health, safety and environmental management system that is consistent with the requirements set out by INPEX and the International and Australian Standard <i>AS/NZS ISO 14001:2004</i> • meet the objectives and targets set out in the provisional EMPs (see annexes 1–16 to this chapter) and carry out the management measures and controls necessary for each aspect or activity • see to the preparation of construction EMPs, drilling EMPs, etc. • liaise with INPEX’s Environmental Department in the development of EMPs to ensure that they meet INPEX requirements • ensure that all services suppliers and subcontractors have an appropriate management system in place and verify the effectiveness of the proposed management and environmental management controls.

Training, awareness and competence

INPEX and contractor staff will undertake environmental awareness training to provide them with an understanding of INPEX’s Environmental Policy, the environmental aspects and impacts of the proposed activities, and the HSE Management Process. This will be undertaken through staff inductions and, where required, through targeted training programs for specific activities or positions. Environmental training programs will be developed and implemented prior to the commencement of the construction and operations phases of the Project.

Contracts awarded for the construction, commissioning, operations or decommissioning phases of the Project will detail specific requirements for contractors in respect of environmental training needs.

Communication

Effective internal and external communication processes, including responding to public concerns, are an integral part of effective environmental management.

The environmental requirements of the HSE Management Process will be communicated through site HSE communication meetings, HSE committee meetings (executive and employee), HSE toolbox meetings, HSE training, inductions, and INPEX’s intranet, as well as through the distribution of plans, procedures and work instructions.

Procedures have been implemented for receiving, documenting and responding to communications from external sources on environmental matters, including complaints and requests for information.

Information and opportunity for feedback on the environmental aspects and impacts of the Project will be available to the public through the environmental approval process, INPEX's Internet web site and a telephone number service which is free to the caller (1800 705 010).

11.2.4 Element 4: Documents and records

INPEX will maintain documented HSE programs and procedures to address hazards and risks, regulatory requirements, and operating standards identified in the HSE Management Process elements.

Detailed environmental documentation, for example plans, procedures and processes, will be developed for the Project to assist in the successful implementation of the HSE Management Process; these are discussed in further detail in Section 11.3.

Document control

INPEX has implemented a document control system which will be utilised for all Project documents. The information will be maintained in a suitable medium, in both printed and electronic form, to provide direction to related documentation and to describe the core elements of the management system and how these elements interact.

Control of environmental records

INPEX will ensure that all environmental records will be legible, identifiable and traceable to the activity, product or service involved. Environmental records will be stored and maintained in such a way that they are readily retrievable.

11.2.5 Element 5: Risk management

INPEX has developed an HSE Risk Management Process to describe the methods and responsibilities to be used by INPEX to ensure that risk management is planned and executed effectively. The Risk Management Process ensures the systematic assessment and management of HSE risk.

The risk assessment methodology applied in this Draft EIS is described in detail in Chapter 6 *Risk assessment methodology*.

Change control

Change in the work environment can pose HSE risks and in the oil & gas industry it is recognised that work arising from temporary and permanent changes to organisation, personnel, systems, processes, procedures, equipment, products, materials or substances, laws and regulations cannot proceed unless a "management of change" process is completed. All proposed changes will therefore be managed in accordance with INPEX's Change Management Procedure.

11.2.6 Element 6: Regulatory requirements

INPEX will implement a compliance framework to manage and monitor its regulatory obligations and ensure that performance expectations are met. In its Environmental Policy the company has committed to comply with all relevant laws, regulations and standards for the protection of the environment.

INPEX will ensure that it achieves full HSE regulatory compliance by the following means:

- It will implement awareness training for its employees and contractors.
- It will actively use and maintain the regulatory compliance framework.
- It will conduct regular audits of its systems and activities to monitor compliance.

A summary of the government approvals and legislative requirements applicable to the Project has been provided in Chapter 1 *Introduction*.

11.2.7 Element 7: Implementation, monitoring and measurement

The following subsections detail the key sub-elements of the implementation, monitoring and measurement component of the HSE Management Process.

Work procedures

Procedures will be developed to minimise the exposure to actual or potential hazards associated with the work to be performed. The need for procedures will be identified by reviewing processes, activities or tasks and assessing their potential impact from an HSE perspective on personnel, assets and the environment.

Section 11.2.4 *Element 4: Documents and records* should be referred to for the types of documents that will support the HSE Management Process.

Monitoring performance

Proactive and reactive key performance indicators (KPIs) will be developed by INPEX to monitor HSE performance against objectives and to promote continuous improvement.

The KPIs will be tracked and monitored by using HSE scorecards. These will be developed for the whole business and also for work teams to ensure that there is alignment and consistency in achieving HSE performance goals. The scorecards will consider the HSE plan and business requirements.

Performance statistics based on the scorecards will be compiled and distributed to internal and external stakeholders as appropriate.

Environmental indicators and monitoring programs associated with the aspects or activities of the Project have been described in Section 11.3.3 *Implementation of environmental management plans* and in the individual EMPs in annexes 1–16 to this chapter.

Incident notification, reporting and investigation

INPEX has developed and implemented an incident management and investigation procedure. The intention of this procedure is to ensure that all incidents, including “near misses”, no matter how minor, are reported, recorded and investigated. This will achieve the following objectives:

- “at risk” behaviours will be identified
- deficiencies in workplace conditions will be identified
- improvements to methods and equipment will be identified
- failures in management systems and controls will be identified
- lessons will be learned
- regulatory-authority and industry reporting obligations will be fulfilled
- management systems will be continuously improved.

This procedure provides the guidelines to ensure that all incidents are uniformly, methodically and effectively investigated to a degree commensurate with their potential severity. The objective is to establish the facts, determine the root cause(s) and to take the appropriate action to prevent a recurrence of the event.

All incidents, investigations and corrective and preventive actions will be input into INPEX’s incident reporting database and tracked until closure.

Asset integrity

INPEX will emphasise the importance of ongoing asset integrity in contributing to a safe and environmentally sound operation. Asset integrity is a key component in the prevention of major accident events.

Systems will be established to ensure the ongoing integrity of plant and equipment. These systems will include maintenance, inspection, testing, calibration and certification of equipment at frequencies appropriate for the level of risk associated with the equipment and/or as determined by manufacturers’ requirements.

11.2.8 Element 8: Emergency and crisis management

Plans and procedures will be developed to identify all potential crisis and/or emergency threats associated with INPEX’s operational locations. A rapid and effective response to emergency situations can significantly reduce any impact on people’s safety, the environment and the community. This response is achieved by implementing prevention, preparation, response and recovery strategies.

Crisis and emergency threats will be identified utilising the hazard identification and risk assessment tools discussed in Section 11.2.5 *Element 5: Risk management*. Based on the possible emergency and crisis situations identified during this process, operating procedures will be developed in order to keep control of such situations and to reduce the risk of environmental impact. Procedures that are directly related to response to environmental incidents are presented in the relevant EMPs (e.g. onshore oil-spill prevention and response).

All emergency and crisis management plans will contain the identification of resources (personnel and equipment), key roles and responsibilities, and the procedures to be followed if the plans are activated. Relevant personnel will receive sufficient training to ensure that they have the skills and competence to respond to an emergency.

In addition to emergency and crisis management plans, a Project oil-spill contingency plan (OSCP) will be prepared to ensure that INPEX can respond rapidly and effectively to an oil spill into the marine environment.

Individual vessels, specifically oil tankers of 150 gross tonnage and above and every other ship of 400 gross tonnage and above, are also required under Regulation 37 of Annex 1 of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) to produce a shipboard oil pollution emergency plan.

11.2.9 Element 9: Inspection and audit

Review audits, both internal and external will be conducted to ensure the following:

- that there is compliance with regulatory requirements, Project approval conditions, and licence conditions
- that the identified objectives of the Project are being achieved.

A formalised audit schedule will be developed, and will define the scope and frequency of audits.

11.2.10 Element 10: Management review

In order to maintain continuous improvement, formal reviews of the suitability and effectiveness of the HSE Management Process and its associated implementation documents will be scheduled periodically.

Management reviews will be based on the following considerations:

- audit and incident investigation outcomes
- changes in organisation and/or operational practices
- changes in statutory environmental requirements
- assessments of the extent to which objectives, targets and performance standards have been met

- analyses of the continuing adequacy of the HSE Management Process.

Implementation documents (e.g. management plans, procedures and monitoring programs) will be reviewed periodically to assess their effectiveness and to ensure that they remain applicable to current operations.

Management review outcomes, including observations, conclusions and recommendations, will be documented and tracked through to completion.

11.3 Environmental management plans

A key component of the HSE Management Process is the development and implementation of EMPs which detail the environmental protection and management measures and controls necessary to avoid, reduce or mitigate the environmental impacts of the Project. Figure 11-4 shows where the EMPs are placed in relation to other HSE Management Process documentation.

Detailed EMPs will be developed prior to the construction and operations phases of the Project in order to manage the identified potential impacts on the marine and terrestrial environments of the Project area.

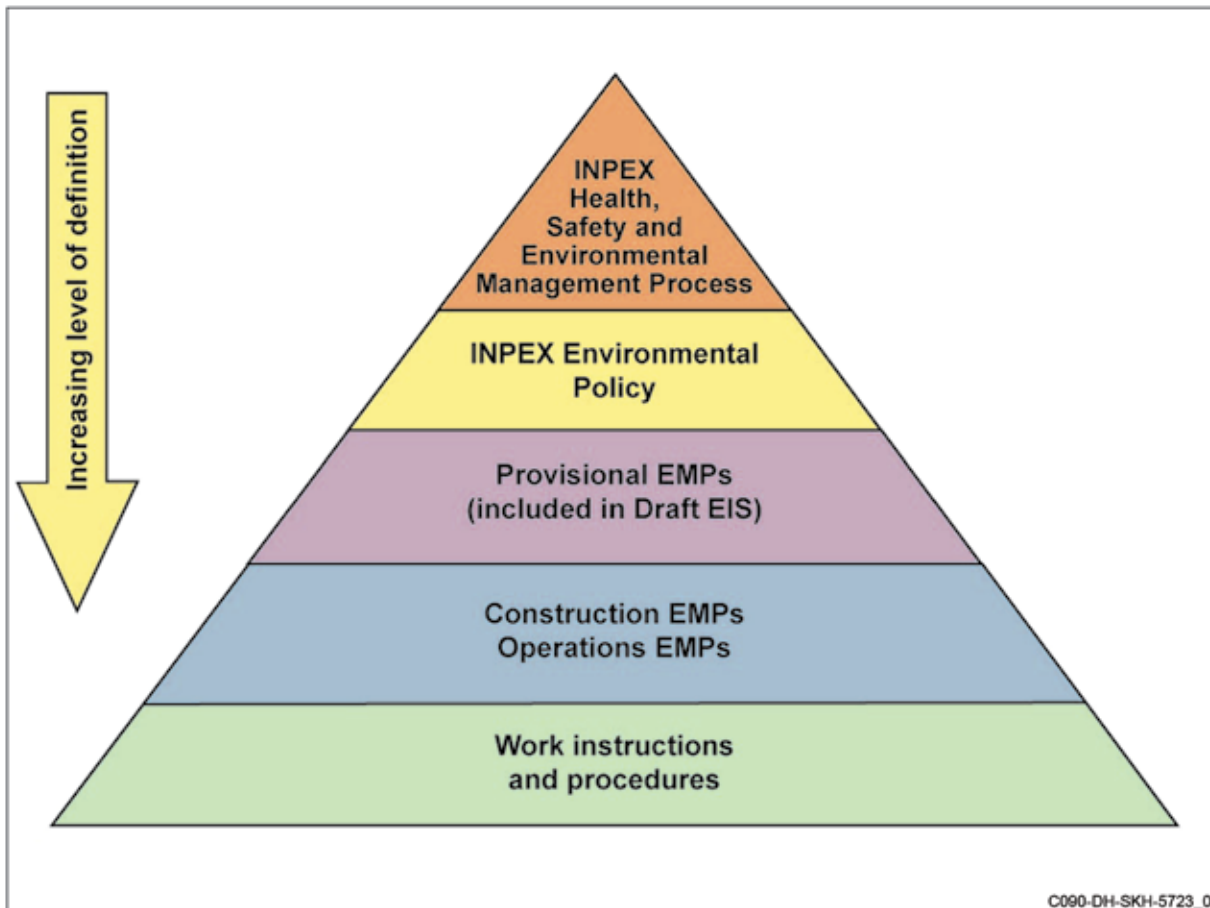


Figure 11-4: Hierarchy of environmental documentation

In addition to these, work instructions and procedures will be developed to support the EMPs and ensure that they are effectively implemented.

As the Project is currently in the design phase, provisional EMPs have been developed for significant environmental aspects, issues or specific activities and summarise the core management strategies as outlined in this Draft EIS.

A greater level of detail on the technical input and practical application of the management and control measures will become available as the Project moves towards the construction phase. These further details will be used in an ongoing program of improvement and refinement of EMP documentation to ensure that the objectives as outlined in this chapter and in the provisional EMPs are achieved. Flexibility to improve on the EMPs for implementation will be maintained; however, any additions will be over and above those outlined in this Draft EIS.

The format and content of the provisional EMPs prepared as part of this Draft EIS are outlined in Section 11.3.1 and presented in annexes 1–16 to this chapter.

Matters of national environmental significance

As part of the approvals process INPEX is required to show that it has identified suitable mitigation measures to address potential impacts on the “matters of national environmental significance” listed in Chapter 2 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act). Matters of national environmental significance applicable to the Project development area include the following:

- listed threatened species and ecological communities
- migratory species protected under international agreements
- the Commonwealth marine environment.

Relevant management controls to mitigate impacts on “matters of national environmental significance” are identified in chapters 7 and 8. In addition, EMPs which are applicable to “matters of national environmental significance” are listed below.

The EMPs applicable to the management of impacts on Commonwealth marine environment are as follows:

- Provisional Decommissioning Management Plan (Annexe 5)
- Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan (Annexe 10)
- Provisional Waste Management Plan (Annexe 16).

The EMPs applicable to the management of impacts on marine threatened and migratory species are as follows:

- Provisional Cetacean Management Plan (Annexe 4)
- Provisional Piledriving and Blasting Management Plan (Annexe 12).

The EMP applicable to management of impacts on terrestrial threatened and migratory species is as follows:

- Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan (Annexe 15).

Environmental management plans required by the Commonwealth for offshore activities

In addition to the approvals required under the EPBC Act, INPEX will develop environment plans as required under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cwlth). Specific activities that environment plans will be developed for under these regulations will include the following:

- pipeline installation
- drilling
- installation and hook-up of the central processing facility (CPF) and the floating production, storage and offtake facility (FPSO)
- operations of the CPF and the FPSO.

In addition to the development of these EMPs, the existing OSCP will be updated to ensure that it reflects and addresses current Project activities and phases.

11.3.1 Provisional environmental management plans

The provisional EMPs have been structured so that they provide the core information required to develop construction EMPs (CEMPs) and operations EMPs (OEMPs) required under the *Waste Management and Pollution Control Act* (NT) and the *Water Act* (NT) once contracts have been awarded and construction and operations plans develop. This EMP structure was developed with input from the Northern Territory's Department of Natural Resources, Environment, the Arts and Sport (NRETAS)² and the Commonwealth's Department of the Environment, Water, Heritage and the Arts (DEWHA). The purpose of developing the plans at this earlier stage of the Project is to demonstrate INPEX's capacity to manage the environmental risks to an acceptable level.

² 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.

The provisional EMPs outline the potential impacts, objectives, targets and indicators, some of the key management measures, and the monitoring, reporting, auditing and review requirements. These have been developed through the environmental impact assessment process and, where applicable, are in accordance with regulatory-authority requirements and are designed to meet the expectations of government and the community.

These provisional EMPs will serve as a guide and framework for the development of more detailed CEMPs and, in due course, OEMPs.

The provisional EMPs prepared as part of this Draft EIS are shown in Table 11-3 and presented in annexes 1–16.

11.3.2 EMP objectives and targets

For each of the provisional EMPs, INPEX has set out environmental objectives and targets with consideration of the following:

- INPEX’s Environmental Policy
- environmental aspects and impacts
- relevant Australian and other standards
- legal and other requirements
- the measurability of objectives
- the drive for continuous improvement.

Environmental objectives and targets relating to specific aspects and activities of the Project, and which will be adopted in the detailed EMPs, are identified in the provisional EMPs in annexes 1–16 to this chapter.

Environmental objectives, targets and indicators are described and defined in this section to promote consistent application and to ensure that all parties concerned interpret them in the same way.

“Environmental objective”

Each EMP will have high-level objectives which will be consistent with INPEX’s environmental policy and the commitments set out in the Draft EIS. An “environmental objective” can be defined as follows:

An “environmental objective” is a specific environmental goal.

Interpreted from AS/NZS ISO 14001:2004, Environmental management systems—Requirements with guidance for use

In order to gauge the extent to which environmental objectives have been achieved, threshold values or narrative statements will be set in the EMPs for specific indicators which, if reached, will trigger specified management responses.

Table 11-3: Provisional environmental management plans

Annexe Number	Title	Addresses “matters of national environmental significance”*
1	Provisional Acid Sulfate Soils Management Plan	no
2	Provisional Air Emissions Management Plan	no
3	Provisional Bushfire Prevention Management Plan	no
4	Provisional Cetacean Management Plan	yes
5	Provisional Decommissioning Management Plan	yes
6	Provisional Dredging and Dredge Spoil Disposal Management Plan	no
7	Provisional Dust Management Plan	no
8	Provisional Greenhouse Gas Management Plan	no
9	Provisional Heritage Management Plan	no
10	Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan	yes
11	Provisional Onshore Spill Prevention and Response Management Plan	no
12	Provisional Piledriving and Blasting Management Plan	yes
13	Provisional Quarantine Management Plan	no
14	Provisional Traffic Management Plan	no
15	Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan	yes
16	Provisional Waste Management Plan	yes

* “Matters of national environmental significance” are defined and discussed in Chapter 2 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) and listed in *Matters of national environmental significance: significant impact guidelines 1.1* (2009), a DEWHA publication available online at <<http://www.environment.gov.au/epbc/publications/pubs/nes-guidelines.pdf>>.

“Environmental target”

An “environmental target” can be defined as follows:

An “environmental target” is a detailed project-specific performance requirement.

Environmental targets are derived from environmental objectives and are used to achieve these objectives. Targets may be associated with one or many indicators.

Interpreted from AS/NZS ISO 14001:2004, Environmental management systems—Requirements with guidance for use

Targets specified in the EMPs will be used in this context where, if the target threshold is reached, a management response will be triggered and an investigation against the environmental standard will be undertaken.

The setting of target thresholds in the EMPs will be based on a level at or below a “standard”, as defined below.

“Environmental indicator”

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) defines an “indicator” as follows:

[An] Indicator is taken to mean a significant physical, chemical, biological, social or economic variable which can be measured in a defined way for management purposes.

A guidebook to environmental indicators (CSIRO 1999) (viewed online on 1 March 2010 at <<http://www.csiro.au/csiro/envind/code/pages/menu.htm>>)

An example of an indicator could be the number and diversity of organisms in a stream. These can *indicate* whether an aquatic ecological system is functioning normally or not.

To be effective, an indicator must be relevant, representative and able to show concerned parties something about the system that they need to know. It must be easy to understand, even by people who are not experts. It must be reliable, so that the information the indicator provides is trustworthy. And it must be timely, so that the information is made available while there is still time to act.

11.3.3 Implementation of environmental management plans

Project components for which contractors or INPEX will be required to produce detailed EMPs will include the construction, operations, commissioning and decommissioning phases. Different Project components will require different combinations of aspect and activity EMPs. The final list of EMPs will depend on how many different contracts are set up for the Project. Table 11-4 illustrates how EMPs may be applied across various phases of the Project.

Contracts awarded for the different phases of the Project will specifically detail the requirements for contractors in respect of EMP implementation and development.

Prior to the commencement of activities, INPEX will review and approve these CEMPs to ensure that they are consistent with the provisional EMPs and, as such, meet all commitments made in the EIS as well as in any other legislative requirements or ministerial conditions.

11.4 Monitoring programs for the receiving environment

Appropriate and detailed environment monitoring programs for the receiving environment will be developed in consultation with regulatory authorities prior to the commencement of construction activities.

The aims of the monitoring programs are as follows:

- to identify environmental change in the receiving environment and validate modelling results and predicted impacts
- to allow INPEX to incorporate changes to its activities if the actual impacts 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. Triggers for management responses will be identified where appropriate. A preliminary outline of the proposed receiving environment monitoring programs is outlined in Table 11-5.

Table 11-4: Implementation of EMPs through the different phases of the Project

Name	Construction		Commissioning		Operations		Decommissioning	
	Onshore	Nearshore and Offshore	Onshore	Nearshore and Offshore	Onshore	Nearshore and Offshore	Onshore	Nearshore and Offshore
Acid Sulfate Soils Management Plan	✓	✓	-	-	-	-	✓	✓
Air Emissions Management Plan	-	-	✓	✓	✓	✓	✓	✓
Bushfire Prevention Management Plan	✓	-	✓	-	✓	-	✓	-
Cetacean Management Plan	-	✓	-	✓	-	✓	-	✓
Decommissioning Management Plan	-	-	-	-	-	-	✓	✓
Dredging and Dredge Spoil Disposal Management Plan	-	✓	-	-	-	✓	-	-
Dust Management Plan	✓	-	-	-	-	-	-	-
Greenhouse Gas Management Plan	-	-	✓	✓	✓	✓	-	-
Heritage Management Plan	✓	✓	✓	-	✓	-	✓	-
Liquid Discharges, Surface Water Runoff and Drainage Management Plan	✓	✓	✓	✓	✓	✓	✓	✓
Onshore Spill Prevention and Response Management Plan	✓	-	✓	-	✓	-	✓	-
Piledriving and Blasting Management Plan	✓	✓	-	-	-	-	-	-
Quarantine Management Plan	✓	✓	-	✓	✓	✓	✓	✓
Traffic Management Plan	✓	-	-	-	-	-	-	-
Vegetation Clearing, Earthworks and Rehabilitation Management Plan	✓	-	-	-	-	-	✓	-
Waste Management Plan	✓	✓	✓	✓	✓	✓	✓	✓

Table 11-5: Summary of monitoring programs for the receiving environment

Program	Purpose	Parameters assessed or measured	Phase
Wastewater discharge model validation	To validate wastewater discharge dispersion modelling at the product loading jetty discharge location.	<ul style="list-style-type: none"> • concentrations and dispersion patterns determined (using fluorescent dye or similar method in conjunction with field sampling) 	Operations
Darwin Harbour water quality monitoring program	To determine if the Project effluent discharges adversely impact on water quality in Darwin Harbour.	<ul style="list-style-type: none"> • nutrients • biochemical oxygen demand • heavy metals • pH • temperature • total petroleum hydrocarbons 	Operations
Marine sediments and bio-indicators monitoring program	<p>To determine whether construction activities in acid sulfate soils have resulted in changes in pH and heavy-metal availability in marine sediments around the onshore development area.</p> <p>To assess any accumulation of metals and petroleum hydrocarbons in sediments and selected bio-indicators that might result from surface-water and groundwater flows from the onshore facility.</p>	<ul style="list-style-type: none"> • pH • bio-available heavy metals and petroleum hydrocarbons in sediments. • intertidal invertebrate tissue concentrations of metals and petroleum hydrocarbons 	Construction Operations
Dredge-plume discharge monitoring program	To monitor dredge-plume discharges at selected coral monitoring locations in East Arm and in waters around the offshore spoil disposal ground.	<ul style="list-style-type: none"> • nephelometric turbidity units (NTUs) • total suspended solids 	Construction
Reactive coral monitoring program (dredging)	To identify stress in corals at Channel Island, which may be caused by the dredging program, and to identify the necessary triggered management responses.	<ul style="list-style-type: none"> • turbidity (using turbidity loggers and a visual assessment of plumes from the air) • coral condition (judged by visual assessment and coral mortality) 	Construction
Coral monitoring program (dredging)	To investigate the degree of resilience of corals in East Arm (South Shell Island and at a site north-east of Wickham Point) to exposure to sediment and elevated turbidity throughout the dredging works.	<ul style="list-style-type: none"> • coral condition (judged by visual assessment and coral mortality) 	Construction
Soft-bottom benthos monitoring program (dredge spoil disposal)	To determine the effects of dredge spoil disposal on soft-bottom benthos communities at the offshore spoil disposal ground.	<ul style="list-style-type: none"> • species diversity and abundance 	Construction
Soft-bottom benthos monitoring program (dredging)	To document the effect of increased suspended sediment loads and sedimentation on soft-bottom benthos communities in zones potentially impacted by dredging.	<ul style="list-style-type: none"> • species diversity and abundance 	Construction
Intertidal sedimentation monitoring program (dredging)	To assess the effects of sedimentation on intertidal ecosystems throughout East Arm.	<ul style="list-style-type: none"> • sedimentation depths • mangrove canopy cover • mangrove leaf area index 	Construction
Groundwater quality monitoring program	To determine if development in the onshore development area adversely impacts on groundwater quality.	<ul style="list-style-type: none"> • salinity • pH • total petroleum hydrocarbons • heavy metals • ground water levels 	Construction Operations

Table 11-5: Summary of monitoring programs for the receiving environment (continued)

Program	Purpose	Parameters assessed or measured	Phase
Drilling discharges (SERPENT program)	To work in collaboration with the SERPENT* project to determine the impacts of production-drilling discharges on epibenthic macrofauna.	<ul style="list-style-type: none"> mapping epibenthic habitat and drill-cuttings distribution abundance and distribution of epibenthic macrofauna 	Production drilling
Air quality model validation	Validation of air emissions modelling using the proposed NRETAS-established monitoring point at Darwin Airport.	<ul style="list-style-type: none"> sulfur dioxide nitrogen dioxide particulates (PM₁₀)[†] photochemical oxidants (ozone) 	Operations
Airborne noise model validation	Validation of airborne noise modelling.	<ul style="list-style-type: none"> noise measurements in the City of Palmerston and the Darwin suburb of Bayview 	Construction Operations
Marine pests monitoring program	To work in collaboration with relevant Territory regulatory authorities to develop a monitoring framework anticipated to be consistent with the monitoring framework proposed by the Commonwealth Government's National Introduced Marine Pests Coordination Group.	<ul style="list-style-type: none"> to be determined in consultation with the National Introduced Marine Pests Coordination Group 	Construction Operations
Weed monitoring program	To monitor the distribution and abundance of listed weed species occurring in the onshore development area.	<ul style="list-style-type: none"> visual inspections in the development area to document new infestations of listed weed species 	Construction Operations
Vegetation rehabilitation monitoring program	To determine the level of success of rehabilitated areas.	<ul style="list-style-type: none"> species diversity of vegetation compared with surrounding environment visual assessment of establishment of vegetation 	Construction Operations
Mangrove health monitoring program	To determine if Project activities in the onshore development area adversely impact on mangrove health around Blaydin Point.	<ul style="list-style-type: none"> canopy cover leaf defoliation index 	Construction Operations

* The SERPENT (Scientific and Environmental ROV Partnership using Existing iNdustry Technology) project is a global collaborative project hosted by the DEEPSEAS group within the Ocean Biogeochemistry and Ecosystems Group at the National Oceanography Centre in Southampton, UK.

† PM₁₀ = particulate matter with diameters smaller than 10 µm.

Monitoring programs for the receiving environment will be periodically reviewed and modified to ensure their continued suitability and value. Reviews, at a minimum, will consider the following:

- the timing, frequency and relevance of monitoring
- the effectiveness of monitoring design to assess environmental performance requirements
- the closing date for individual programs.

11.5 Environmental offsets

Section 9 of the EIS guidelines (see Appendix 1) prepared in September 2008 for the Ichthys Project jointly by NRETAS (then NRETA) and the DEWHA states the following:

Where impacts are reasonably unavoidable or can not be mitigated, offsets should be proposed that deliver a real conservation outcome. Proposed offsets should target the matter protected by the EPBC Act that is being impacted. Given the nature and location of the potential impacts of the proposal, direct offsets such as acquisition of habitat areas may not be suitable.

It is recommended that indirect offsets be proposed, such as:

- Implementation of recovery plan actions for threatened and/or migratory species; and
- Contributions to relevant research programs targeting threatened and/or migratory species.

While neither the DEWHA nor NRETAS have finalised and agreed policies on offsets, INPEX recognises that offsets can provide improved environmental outcomes.

The Draft EIS demonstrates that no significant environmental impacts are expected in the Commonwealth marine area³ and INPEX therefore does not propose any additional direct offsets for this area. INPEX has, however, undertaken extensive biological surveys in Commonwealth waters and along the adjoining coastline of Western Australia which have provided (and will continue to provide) a major contribution to the scientific knowledge of ecological processes and of plant and animal distribution in the marine and terrestrial environments of north-western Australia.

The studies INPEX has undertaken include the following:

- regional-scale aerial surveys to identify marine turtle nesting locations on the mainland and on coastal islands from Broome to Cape Bougainville
- detailed surveys of marine turtle nesting activity and abundance on several islands off the Kimberley coast
- surveys to identify potential foraging areas, inter-nesting areas and migratory routes for green and flatback turtles by means of satellite-tagging and -tracking
- genetic analyses of green and flatback turtles nesting on the islands of the Kimberley region
- extensive aerial and boat-based surveys to identify the distribution ranges of the humpback whale, pygmy blue whale, and other species of marine megafauna off the Kimberley coast
- offshore sea-noise logger surveys to gather data to identify pygmy blue whale distribution and abundance
- detailed coral habitat mapping and species identification surveys on a number of Kimberley islands
- fish, algae and mollusc surveys of a number of Kimberley islands
- benthic infauna surveys in the offshore development area and at the Maret Islands.

3 The "Commonwealth marine area" is defined by the DEWHA at <<http://www.environment.gov.au/epbc/protect/marine.html>> as "any part of the sea, including the waters, seabed, and airspace, within Australia's exclusive economic zone and/or over the continental shelf of Australia, that is not State or Northern Territory waters".

It is important to note that these studies have been undertaken in areas where there was previously very little scientific information available for environmental management and planning. A large proportion of the scientific information generated as a result of the INPEX surveys extends beyond the environmental assessment needs of the proposed Ichthys Project and therefore constitutes a valuable indirect environmental offset for the Kimberley region and the Browse Basin. The survey data will assist the Commonwealth and Western Australian governments with the planning of marine protected areas and in the preparation of threatened and migratory species recovery planning. To date, the cost of the INPEX biological surveys amounts to more than A\$15 million.

"Matters of national environmental significance" and of significance to the Northern Territory also occur in areas under Northern Territory jurisdiction, most notably in Darwin Harbour. INPEX is committed to working closely with both the DEWHA and NRETAS to identify and explore potential environmental offset opportunities in the Darwin region. Areas which currently appear to offer beneficial environmental offset opportunities include the following:

- participation in and funding of the proposed integrated marine monitoring program for Darwin Harbour
- provision of funding to government, or direct complementary research, to improve the understanding of coastal dolphin abundance, distribution and critical resource needs in Darwin Harbour.

INPEX's approach to offsetting greenhouse gas liabilities under the Commonwealth Government's proposed Carbon Pollution Reduction Scheme (CPRS) are outlined in Chapter 9 *Greenhouse gas management*.



Provisional Acid Sulfate Soils Management Plan

Annexe 1 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential environmental impacts of, disturbance of acid sulfate soils (ASSs). Disturbance to these soils could occur as a result of earthworks and reclamation activities undertaken in intertidal areas during the onshore and nearshore construction phase of the Project.

ASSs are naturally occurring soft sediments and soils containing iron sulfides, principally iron disulfide (FeS_2), but also iron monosulfide (FeS). The exposure of the sulfides in such soils to oxygen by drainage or excavation leads to oxidation of the sulfides and to the generation of sulfuric acid (H_2SO_4). The sulfuric acid may then react with other soil constituents to liberate “heavy metals” such as aluminium, manganese, iron, copper and arsenic into surface water and groundwater. Some heavy metals can be toxic to plants and animals depending on their concentration and bio-availability.

The term “acid sulfate soils” refers to both “actual acid sulfate soils” (AASSs) and “potential acid sulfate soils” (PASSs). These are defined in Section 1.2 *Plan definitions* below.

Soil mapping and soil chemical analyses conducted by URS Australia Pty Ltd (see Chapter 3 *Existing natural, social and economic environment*) have identified four of the seven soil “families” on Middle Arm Peninsula as containing some level of ASSs. The Euro soil family was identified as containing high-risk PASSs, the Mullalgha soil family as containing moderate-risk ASSs, and the Maand soil family as containing low-risk ASSs. The Rinamatta soil family contains a siltstone several metres below the surface. Groundwater monitoring near this siltstone indicated a pH as low as 5, indicating low-risk ASSs from the siltstone. All of these soil families are typically associated with mangrove swamp and melaleuca habitats. The other three soil families in the onshore development area were identified as having no risk of ASSs.

Most of the facilities in the onshore development area will be constructed in areas that presently contain woodland and vine-forest vegetation communities. As these vegetation communities are not associated with the Euro, Maand, Mullalgha or Rinamatta soil families, most of the onshore facilities will be constructed in areas with no ASS risk. In addition, as siltstone in the Rinamatta soil family is several metres below Australian Height Datum (AHD) it is unlikely that this will be excavated.

Detailed geotechnical studies including chemical testing for ASSs will be conducted during the detailed design phase of the Project. The results of these investigations will further assist the environmental and engineering teams to understand the acid-generating potential and physical extent of any ASSs in relation to the onshore development footprint. Detailed ASS testing, in accordance with guidelines developed for ASSs in Queensland (Ahern, Ahern & Powell 1998) will take place once the infrastructure designs are further developed prior to construction commencing.

As the Project is still in its FEED phase, the management controls outlined in this provisional environmental management plan (EMP) primarily deal with the potential options available to INPEX for the management of ASSs. This plan will be updated with specific management controls as infrastructure design for the Project progresses and more detailed ASS information becomes available prior to construction.

This provisional environmental management plan (EMP) for acid sulfate soils is attached as Annexe 1 to Chapter 11 *Environmental management program* of the Project’s draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX’s Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX intends to minimise the potential environmental impact of disturbance to ASSs as a result of Project activities through the identification of suitable engineering design and management strategies.
- It describes the proposed monitoring requirements for all phases of the Project.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of future more detailed environmental documentation such as the plans, procedures, etc., which will be required throughout the life of the Project.

The scope of this provisional EMP includes the onshore and nearshore construction activities that have the potential to disturb ASSs, including the onshore section of the gas export pipeline (including the shore crossing), the flare area and the module offloading facility.

1.2 Plan definitions

Acid sulfate soils

“Acid sulfate soils” include both “actual” acid sulfate soils (AASSs) and “potential” acid sulfate soils (PASSs). These two types of ASSs may be found in the same soil profile, with a disturbed AASS layer overlying an undisturbed and still anaerobic PASS layer.

Actual acid sulfate soils

“Actual acid sulfate soils” are the naturally occurring sediments and soils containing iron sulfides, principally iron monosulfide (FeS) or iron disulfide (FeS₂), which have been subjected to disturbance and exposed to air. This exposure has therefore already resulted in the oxidation of some of the (solid) sulfides and the generation of liquid and leachable sulfuric acid. This acid moving through the soil has the potential to mobilise naturally occurring heavy metals such as aluminium, manganese, copper and arsenic, which have the potential to cause secondary contamination of soils and water. As an AASS is already leaching acid it will have a very low pH.

Potential acid sulfate soils

Potential acid sulfate soils are soils which contain iron sulfides or sulfidic materials which are in an anaerobic environment and have therefore not been exposed to air and oxidised. The pH of such a soil in its undisturbed state can be 4 or higher and may even be neutral (pH 7) or slightly alkaline. However, if disturbed, exposed to air and oxidised, PASSs become AASSs and pose a considerable environmental risk as they commence to leach sulfuric acid. Disturbances that can result in the oxidation of PASSs include the lowering of natural water tables and the excavation of soils that were previously below natural groundwater levels.

1.3 Activities that may lead to disturbance of acid sulfate soils

During the construction phase of the Project, activities that may lead to disturbance of PASSs include earthworks and construction works occurring in and around the mangrove and melaleuca forests. These construction components include the following:

- the pipeline shore crossing and the onshore pipeline route through mangrove areas
- the flare area
- the module offloading facility.

Piledriving activities associated with the construction of the product loading jetty are not likely to cause any significant disturbance to PASSs as the operations will not excavate these soils or expose them to air.

1.4 Potential impacts

The potential environmental impacts associated with the disturbance of PASSs in the onshore development area and the generation of sulfuric acid leachate around the area include the following:

- the acidification of soils, which reduces soil productivity
- the acidification of surface water and groundwater, which has a deleterious effect on plant growth and health
- the acidification of marine water affecting water quality and marine biota in the vicinity of the onshore development area.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for the management of ASSs are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

Table 2-1: Acid sulfate soil management objectives, targets and indicators

Objectives	Targets	Indicators
Minimise disturbance to PASSs outside the designated construction and earthworks areas.	<ul style="list-style-type: none"> Zero incidents of disturbance to PASSs outside the areas of unavoidable disturbance required for the construction of infrastructure. 	<ul style="list-style-type: none"> Number of incident reports and the area and quantity of disturbance outside the designated disturbance footprint.
Handle and dispose of all excavated ASSs in accordance with agreed ASS management strategies.	<ul style="list-style-type: none"> Zero incidents of excavated ASS not handled or disposed of in accordance with the agreed ASS management strategies. 	<ul style="list-style-type: none"> Quantitative records of ASS removal to approved disposal facilities or locations. Number of incident reports of non-compliance with agreed ASS management strategies.
Minimise changes in surface- and groundwater quality during construction activities.	<ul style="list-style-type: none"> No significant alteration in pH or heavy-metal concentration in surface- and groundwater above the natural background range. 	The exact monitoring indicators will be determined when infrastructure design and construction methodology have been further advanced.
Minimise the disturbance to and alteration of vegetation communities as a result of disturbance to ASSs.	<ul style="list-style-type: none"> Zero decline in mangrove vegetation community health in areas adjoining ASS risk areas attributable to acid drainage. 	The exact monitoring indicators will be determined when infrastructure design and construction methodology have been further advanced.
Minimise the potential for increases in heavy-metal concentration in the tissues of the intertidal invertebrate fauna community.	<ul style="list-style-type: none"> No increase in heavy-metal concentrations in intertidal invertebrate communities above safe seafood consumption levels. 	The exact monitoring indicators will be determined when infrastructure design and construction methodology have been further advanced.

3 MANAGEMENT APPROACH

Detailed ASS documentation will be developed for the construction phase of the Project. These documents will align with this provisional acid sulfate soils EMP. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX. The potential management techniques will take into consideration the recommendations of Dear et al. (2002).

A summary of the main engineering and management controls to be employed in the detailed documentation to mitigate the risks associated with disturbance of ASSs are outlined below.

3.1 Engineering controls—design phase

The final design of infrastructure in the onshore development area will take into consideration, as far as is practicable, all possible options to avoid disturbing PASSs. Among these options are the following:

- mixing the PASS in situ with cement slurry to harden it, neutralise it and make it more stable
- installing columns or piles and a deck structure in PASS areas in order to minimise the generation of AASSs, with Project facilities being constructed on top of the decking.

3.2 Management controls—construction

A number of management options are available to treat and dispose of disturbed ASSs during construction. Staged levels of management and treatment will be employed, depending on the acid-generating potential and extent of these soils within the onshore development footprint. Options currently being considered for the treatment and disposal of disturbed ASSs include the following:

- soil stabilisation through the placing of fill material on top of the possible ASSs until the surface is suitable for construction
- the neutralisation of excavated ASSs through physical mixing with lime, then reuse as backfill
- the neutralisation of excavated ASSs through physical mixing with lime, then disposal at designated onshore sites
- the excavation and offshore disposal of ASSs below LAT (Lowest Astronomical Tide) to ensure that the soils do not oxidise.

Other construction techniques that may be employed to minimise the impact of earthworks on non-excavated ASSs during construction may include the following:

- the use of low-ground-pressure vehicles to reduce soil consolidation and expression of groundwater
- the laying of geotextile fabrics underneath vehicle traffic routes, soil stockpile areas, etc., to reduce soil loading and thus minimise soil consolidation and expression of groundwater in areas with an ASS risk
- the laying of geotextile fabrics along exposed soil surfaces to reduce oxidisation of the soil surface and to stabilise soil faces
- the use of lime to neutralise exposed soil surfaces and trench beds in ASS risk areas
- the storage and/or treatment of all excavated ASS material in a clay-based bunded pad with a lime guard layer
- the installation of leachate collection drains around ASS storage and/or treatment pads to trap and contain any acidic leachate or runoff. Captured leachate will be neutralised prior to disposal
- the neutralisation of any groundwater extracted from trenching and excavated areas where AASSs or PASSs are present.

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the identified objectives and targets. For example, a marine sediments and bio-indicators monitoring program will be developed to assess whether construction activities in ASS areas have resulted in changes in pH and heavy-metal availability in marine sediments around the onshore development area.

The detail of the monitoring activities to be undertaken will be determined once infrastructure design and associated construction methodologies have been further advanced during the detailed design phase of the Project, including further ASS testing during geotechnical investigation programs.

Triggered management response

A management response will be triggered by any of the following three circumstances:

1. an ASS “incident”
2. the identification by an annual management review of a failure to meet an objective or target
3. an exceedance of monitoring criteria.

The responses to each of these three situations are outlined below.

Response to ASS incidents

Non-compliance with any of the ASS controls outlined in this document will be classified as an incident.

The detection of incidents associated with ASSs will trigger internal notifications, reporting requirements, investigation and associated corrective and preventive actions. The level of investigation will be dependent on the potential risk associated with the event.

ASS incidents will include the following:

- changes in sediment, surface- or groundwater pH or heavy-metal concentrations above the natural background range levels, in comparison with preconstruction baseline monitoring data
- changes in vegetation health adjacent to ASS areas caused by acid drainage
- non-compliance with the agreed soil-protection, handling, treatment and disposal management procedures.

Corrective and preventive actions that may be triggered as a result of the investigation may include the following:

- increased sampling (both frequency and location) of sediment, surface- and groundwater pH and heavy-metal concentrations around the construction area to identify or confirm the sources of acid leaching or heavy-metal contamination
- an increased level of monitoring of vegetation communities and invertebrate animals
- the digging of leachate drains to capture acidic water for neutralisation
- the neutralising of AASSs where practicable
- providing refresher training for personnel on Project ASS management processes.

INPEX’s Incident Reporting, Recording and Investigating Procedure or the Project contractor’s document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigating requirements. All ASS incidents will be entered into INPEX’s and its contractors’ incident databases and corrective actions will be tracked to closure.

Response to non-compliant annual management review outcomes

Failure to meet identified objectives and targets will trigger the following responses:

- a review and audit of ASS management practices to assess the practicability of their implementation, to identify new technologies to further reduce impact, and to assess the resources required to implement the plan
- a review of current objectives and targets to assess achievability.

The response to the results of investigations and audits may include the following:

- an update of plans and associated documentation to reflect changes to management practices
- the arrangement of refresher training in appropriate management practices and processes for personnel involved in construction activities in ASS areas
- the possible sourcing of additional resources to assist in the successful implementation of the agreed management practices.

An exceedance of monitoring criteria

The response to the exceedance of monitoring criteria may include the following:

- an increase in the monitoring frequency of relevant parameters at control and impact monitoring sites
- the investigation of possible sources or causes for the exceedance
- an increase in management controls such as the installation of interception drains, the neutralisation of exposed faces and drainage water with lime, and the sealing of exposed faces with geotextile fabric.

5 REPORTING, AUDITING AND REVIEW

Reporting and auditing will be undertaken during the construction phase of the Project. A summary of the reporting and auditing requirements relating to ASS management is presented below:

- Incidents resulting from the disturbance of ASSs will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- An annual INPEX environmental report for the Project will be produced. It will include details of the volumes of ASSs disturbed, the quantities and methods of ASS disposal, and monitoring results.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Construction contractors will be required to produce and provide to INPEX a monthly environmental report including a record of monthly environmental incidents.
- Records will be audited periodically to ensure that all personnel on site have completed the required health, safety and environment (HSE) induction.

- Detailed ASS management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one of a suite of plans, procedures and processes designed to ensure that INPEX's acid sulfate soils management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the implementation of INPEX's acid sulfate soil management requirements:

- incident reporting, recording and investigating
- health, safety and environment induction
- permit-to-work system.

7 APPLICABLE LEGISLATION

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments specifically related to ASS management include those listed below.

- *Environment Protection and Biodiversity Conservation Act 1999* (Cwth).
- *Soil Conservation and Land Utilization Act* (NT).
- *Waste Management and Pollution Control Act* (NT).

8 REFERENCES

- Ahern, C.R., Ahern, M.R. and Powell, B. 1998. *Guidelines for sampling and analysis of lowland acid sulfate soils (ASS) in Queensland 1998*. Queensland Acid Sulfate Soils Investigation Team, Department of Natural Resources, Indooroopilly, Brisbane, Queensland.
- Dear, S.E., Moore, N.G., Dobos, S.K., Watling, K.M. and Ahern, C.R. 2002. Soil management guidelines: Version 3.8. In *Queensland Acid Sulfate Soil Technical Manual*. Department of Natural Resources and Mines, Indooroopilly, Brisbane, Queensland. Viewed online on 2 February 2010 at <http://www.nrw.qld.gov.au/land/ass/pdfs/soil_mgmt_guidelines_v3_8.pdf>.



Provisional Air Emissions Management Plan

Annexe 2 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential environmental impact of, air emissions generated by the Project both onshore and offshore during its lifetime.

Emissions that will be generated over the life of the Project and which will have the potential to impact adversely on the environment include carbon dioxide (CO₂), nitrogen oxides (NO_x and N₂O); sulfur oxides (SO_x); volatile organic compounds (VOCs), including benzene, toluene, ethylbenzene and xylenes (collectively called BTEX); methane (CH₄); and particulates. They will primarily arise through the commissioning and operations phases from combustion, flaring and venting and from fugitive sources.

Dust is the key emission of concern during the construction phase at the onshore development area. Emissions such as NO_x, SO_x and particulates during the estimated five-year construction phase will come primarily from marine vessel engines, from airline flights and from the vehicles and equipment required to support the construction crew in their activities at the onshore development area. However, the volume and duration of these emissions will be very minor in comparison with the emissions generated during the commissioning and operations phases. For this reason the gas-processing facilities have been the focus of an extensive air-quality assessment and modelling program.

This provisional environmental management plan (EMP) for air emissions is attached as Annexe 2 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional plans will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

Greenhouse gas emissions are specifically addressed in Chapter 9 *Greenhouse gas management* and in the Provisional Greenhouse Gas Management Plan which is attached as Annexe 8 to Chapter 11. However it should be noted that options to improve the Project's efficiency in terms of greenhouse gas emissions will generally have a concomitant benefit in reducing other air emissions.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX will minimise the potential environment impact of the Project's air emissions through the identification of suitable management strategies.
- It describes the proposed monitoring requirements for the commissioning and operations phases of the Project.
- It describes the proposed reporting, review and audit requirements for the commissioning and operations phases of the Project.
- It will guide the development of future more detailed environmental documentation, such as the plans, procedures, etc., which will be required throughout the life of the Project.

The scope of this provisional EMP includes significant air emissions released to the atmosphere (i.e. through combustion, flaring and venting and from fugitive sources) as a result of activities in the Ichthys Gas Field Development Project area (both onshore and offshore) during the commissioning and operations phases of the Project. These emissions include NO_x, SO_x, VOCs (including BTEX), CH₄, and particulates.

It does not address the potential environmental impacts of, or the management controls for, the following:

- dust emissions produced during the construction phase
- CO₂, CH₄ and N₂O and their potential to contribute to the phenomenon of global warming.

These are addressed as separate aspects in two other provisional EMPs:

- Provisional Dust Management Plan (Annexe 7 to Chapter 11)
- Provisional Greenhouse Gas Management Plan (Annexe 8 to Chapter 11).

1.2 Plan definitions

Air pollutants

According to the National Environmental Protection Council (NEPC), which produced the National Environment Protection (Ambient Air Quality) Measure in 1998, air pollutants can be divided into three groups: criteria pollutants, air toxics and biological pollutants. Pollutants of the first two groups are the subject of this management plan.

The criteria pollutants include NO₂, sulfur dioxide (SO₂) and particulate matter, while the air toxics include the BTEX compounds.

Project air emissions

Emission sources from the Project will include both direct air emissions from the offshore and onshore production and processing facilities and diffuse air emissions from supply vessels, shipping and aircraft. Emissions from these sources that could potentially impact on air quality are NO_x , SO_2 , particulates (as PM_{10} ¹) and VOCs. The BTEX compounds make up only a small fraction of the VOCs and other compounds generated from the combustion of natural gas. Ozone (O_3) can be indirectly produced by the reaction of oxides of nitrogen and VOCs in the presence of sunlight.

Flaring

Non-routine flaring is defined as an infrequent event such as would occur during processing-plant commissioning, start-ups, shutdowns, and unexpected compressor and other equipment failures. In these situations the plant will automatically flare large quantities of gas for safety reasons.

Fugitive emissions

Fugitive emissions are the gases resulting from leaks, including those from pump seals, pipe flanges and valve stems.

1.3 Air emissions

Air emissions likely to be produced during the commissioning and operations phases of the Project include the following:

- NO_x
- SO_2
- VOCs (including the BTEX compounds)
- CH_4
- particulates.

1.4 Potential sources of air emissions

During the commissioning and operations phases, the sources of air emissions will be associated with the activities listed below.

Onshore and nearshore

- combustion of gas in the gas turbines, furnaces and incinerators
- combustion of gas through non-routine and routine flaring activities
- emergency power generation during the operations phase
- operations of vehicles and equipment.

There may also be vented and fugitive emissions from a variety of sources, including leaks from pump seals and pipe flanges.

Offshore

- combustion of gas in the gas turbines
- emergency power generation during the operations phase
- combustion of gas through non-routine and routine flaring activities
- operations of cranes and equipment.

There may also be unintended process venting and fugitive emissions from a variety of sources, including leaks from pump seals and pipe flanges.

1.5 Potential impacts

Potential impacts on the environment from Project-related air emissions resulting from onshore and offshore activities include the following:

- a reduction in ambient air quality
- a reduction in visual amenity
- the emission of air pollutants (including NO_x and SO_2) to the atmosphere, adversely impacting on the natural environment and human health.

¹ Particulate matter (PM) is usually categorised as PM_{10} or $\text{PM}_{2.5}$. The fraction of suspended particles whose diameter is less than 10 micrometres (10 μm) is PM_{10} .

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for the management of air emissions are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

Table 2-1: Air-emission management objectives, targets and indicators

Objectives	Targets	Indicators
Minimise flaring volumes for onshore operations phase.	<ul style="list-style-type: none"> • Targets yet to be defined for operations. • A baseline calculation of annual routine flaring volumes will be undertaken in the first year of operations to verify plant performance against design predictions. Total annual flaring volume reduction targets will then be identified for subsequent years. 	<ul style="list-style-type: none"> • Total annual flaring volumes (ground and emergency flares) during first 12 months of operations. • Actual annual flaring volumes versus annual performance target volumes.
Minimise flaring volumes for offshore operations phase.	<ul style="list-style-type: none"> • Targets yet to be defined for operations. • A baseline calculation of annual flaring volumes will be undertaken in the first year of operations to verify plant performance against design predictions. Total annual flaring volume reduction targets will then be identified for subsequent years. 	<ul style="list-style-type: none"> • Total annual process flaring volumes during the first 12 months of operations. • Actual annual flaring volumes versus annual performance target volumes.
Ensure that onshore stack emissions are consistent with Project design criteria and the vendor's equipment performance specification.	<ul style="list-style-type: none"> • Air emissions from combustion equipment should not exceed Project design criteria and equipment performance specifications. 	<ul style="list-style-type: none"> • Stack emission testing of onshore combustion equipment. • Quantities of fuel used by equipment.

3 MANAGEMENT APPROACH

Detailed air-emission management documentation, for example plans and procedures, will be developed for the commissioning and operations phases of the Project. These detailed documents will align with this provisional air emissions EMP. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

A summary is provided below of the main engineering and management controls to be included in the detailed documentation to mitigate the risks associated with air emissions.

3.1 Engineering controls—design phase

The engineering controls to be implemented during the design phase of the Project are outlined below.

Applicable to both onshore and offshore

- Fuel gas line flowmeters will be installed to support monitoring requirements.
- Valves will be installed in the process system to allow for inventory isolation.
- Process monitoring systems and alarms will be installed to monitor flaring events and process upsets.

- Dry gas seals will be installed on main refrigerant compressors.
- Waste-heat recovery units or heat recovery steam generators will be installed wherever waste heat can be economically utilised.

Onshore-specific

- Residual hydrocarbons and hydrogen sulfide (H₂S) will be removed from the emission stream by acid gas removal unit (AGRU) incinerators.
- In the unlikely event that the AGRU incinerators are shut down, exhaust gases (including H₂S and residual hydrocarbons) will be hot-vented through turbine exhaust stacks to facilitate safe dispersion.
- Open-cycle gas turbines will be designed to achieve a low NO_x outcome.
- Easily accessible sampling points will be provided on major emission points, such as turbines, AGRU incinerators and furnaces (where applicable).
- Boil-off gas from LNG storage tanks and LNG offtake tanker loading operations will be recovered by boil-off gas recompression systems.
- Boil-off gas from the butane and propane storage tanks will be recovered by butane and propane recovery systems. Boil-off gas from the butane and propane tankers will be captured by onboard recovery systems.

- Flare knockout drums and closed-drain systems will be installed for liquids recovery.
- Ground flares and tankage flares will be designed to minimise the generation of particulates (smoke).
- The condensate storage tanks will be fitted with floating roofs.

3.2 Management controls—commissioning and operations phases

The management controls to be implemented throughout the various phases of the Project are outlined below.

Applicable to both onshore and offshore

- Flaring will be limited to that essential during emergencies, process upsets, plant start-ups and shutdowns, commissioning and maintenance.
- There will be no continuous intentional disposal of hydrocarbon gas by venting to atmosphere. (This does not apply to unavoidable minor intermittent releases.)
- Where possible, low-sulfur diesel will be used for diesel-driven equipment during all phases of the Project.
- Regular preventive maintenance and equipment inspections will be scheduled.
- A commissioning plan will be developed to minimise and manage flaring during the commissioning phase for the onshore and offshore facilities.

4 MONITORING

Monitoring activities will be undertaken throughout the commissioning and operations phase of the Project in relation to the identified objectives and targets.

The activities listed below will be undertaken as part of the air-emission monitoring program:

- Air-emission incidents will be monitored through INPEX's and its contractors' incident-reporting databases.
- The six air pollutants covered by the National Environment Protection (Ambient Air Quality) Measure will be monitored using monitoring points established by the Northern Territory's Department of Natural Resources, Environment, the Arts and Sport (NRETAS) at Darwin International Airport.
- Periodic onshore stack emission sampling will be undertaken on gas turbines, furnaces (if required) and the AGRUs. Emissions to be measured will include NO_x, SO_x, BTEX and PM₁₀.
- Data will be collated monthly from offshore and onshore facilities on the quantities of hydrocarbons burned and the volumes of gas flared.

Triggered management response

A management response will be triggered by any of the following three circumstances:

1. an emissions "incident"
2. an exceedance of the monitoring criteria set for the Project
3. the identification by an annual management review of a failure to meet an objective or target.

The responses to these are outlined below.

Response to air-emission "incidents"

A non-compliant air-emission event is classified as an "incident". This would include, for example, a public or internal complaint received regarding excessive generation of black smoke.

Detection of incidents will trigger internal notifications, reporting requirements, investigations and associated corrective and preventive actions. The level of investigation will be dependent on the potential risk associated with the event.

The level of investigation will be dependent on the potential risk associated with the event. Corrective and preventive actions triggered as a result of the investigation could include, for example, equipment maintenance.

INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigation requirements. All incidents and "near misses" will be entered into INPEX's and its contractors' incident databases and corrective actions will be tracked to closure.

Response to an exceedance of air emissions monitoring criteria set for the Project

Examples of air emissions exceedances that could be detected by monitoring include the following:

- exceedance of Project design criteria and vendor equipment specifications for concentrations of NO_x emitted by gas turbines and furnaces (where applicable) during normal operating conditions and upset conditions
- exceedance of Project design criteria and vendor equipment specifications for concentrations of SO_x emitted by gas turbines
- exceedance of Project-defined flaring volumes for onshore and offshore operations.

Responses to an air emissions exceedance could include the following:

- an increase in the frequency of monitoring of relevant parameters at control and impact monitoring sites
- an investigation into the source or cause of the exceedance
- a review and update of existing management controls and procedures associated with air emissions.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will trigger the following responses:

- a review and audit of current air-emission management practices
- investigations into the effectiveness of machinery and equipment to meet identified targets and objectives
- a review of operations equipment and machinery maintenance regimes
- a review of current objectives and targets to assess achievability.

The response to results of investigations and audits could include the following actions:

- an update of plans and associated documents to reflect changes to air-emission management
- the updating of equipment technology to improve air-emission efficiency.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken during the commissioning and operations phases of the Project. A summary of the reporting, auditing and review requirements relating to air-emission management is presented below:

- Incidents resulting from air emissions will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- Annual National Pollutant Inventory reporting requirements will be met.
- An annual INPEX environmental report for the Project will be produced. It will include details of flaring volumes, stack test monitoring results and incidents.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.

- Detailed air-emission management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's air-emission management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the preparation of INPEX's detailed air-emission management documentation:

- air-quality sampling
- incident reporting, recording and investigating
- process equipment maintenance
- start-up and commissioning.

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments, standards and guidelines specifically related to air-emission management include those listed below.

- Department of the Environment, Water, Heritage and the Arts. 2008. *National pollutant inventory*. Commonwealth Government, Canberra, ACT.
- Fuel Quality Standards Regulations 2001 (Cwth).
- 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.
- National Environment Protection Council. 2003. *National Environment Protection (Ambient Air Quality) Measure*. Commonwealth Government, Canberra, ACT.
- Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cwth).
- *Waste Management and Pollution Control Act* (NT).

Provisional Bushfire Prevention Management Plan

Annexe 3 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should demonstrate that it has taken, and will take, all practicable steps to properly manage the risk of bushfires in the onshore development area during the lifetime of the Project.

Fire is a part of the landscape of the Northern Territory, either as a result of controlled-burning practices or as a result of uncontrolled natural or man-made wildfires. Controlled burning is carried out throughout the Northern Territory on an annual basis, usually during the early dry season. This practice assists in the reduction of fuel loads and creates strategic barriers against the spread of wildfires which may occur later in the dry season (August to November).

The onshore development area falls within the Northern Fire Protection Zone and in particular within the Vernon bushfire region. Specific management requirements are associated with the Northern Fire Protection Zone and must be adhered to throughout the Project.

This provisional environmental management plan (EMP) for bushfire prevention is attached as Annexe 3 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX will minimise the risk of a bushfire occurring in the onshore development area through suitable fire prevention management controls.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of future more detailed environmental documentation such as the plans, procedures, etc., which will be required throughout the life of the Project.

The scope of this provisional EMP includes the bushfire prevention methods to be employed in the onshore development area during the lifetime of the Project.

This provisional EMP does not address potential environmental impacts or management controls for the following:

- response to bushfire incidents in or around the onshore development area
- fire prevention controls and responses to fires occurring in the onshore facilities as a result of processing-plant operations.

These are addressed under separate construction and operations emergency response plans.

1.2 Sources of ignition

Potential ignition sources throughout all phases of the Project may include those listed below:

- "hot-work" activities such as grinding and welding
- faulty electrical equipment
- machinery and vehicles
- careless disposal of cigarette butts
- controlled-burning practices
- uncontrollable events such as lightning strikes and arson.

1.3 Potential impacts

Bushfires in the onshore development area have the potential to impact on the environment. Such potential impacts could include the following:

- damage to plant communities
- damage to Project or other infrastructure
- threats to workforce and public safety.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for bushfire prevention management are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

Table 2-1: Bushfire prevention management objectives, targets and indicators

Objectives	Targets	Indicators
Prevent loss or damage to vegetation and habitats from unauthorised bushfires occurring during any phase of the Project.	<ul style="list-style-type: none"> Zero incidents of unauthorised burning of natural vegetation within the onshore development area by Project personnel. 	<ul style="list-style-type: none"> Number of incident reports of unauthorised burning of natural vegetation by Project personnel.
Establish and maintain awareness of the importance of protecting the ecological values of the onshore development area during all phases of the Project.	<ul style="list-style-type: none"> All workforce personnel (including contractors) to complete a health, safety and environment (HSE) induction, which will include information on the ecological values of the onshore development area and on bushfire prevention management. 	<ul style="list-style-type: none"> Number of people accessing the site as recorded by security. Number of people completing HSE inductions.

3 MANAGEMENT APPROACH

Detailed bushfire prevention management documentation, for example plans and procedures, will be developed for all phases of the Project. These documents will align with this provisional bushfire prevention EMP. The detailed documentation will be developed by INPEX's Environmental Department and/or construction contractors in consultation with the Northern Territory's Bushfires Council.

A summary is provided below of the main engineering and management controls to be included in the detailed documentation and design of facilities to mitigate the risk of bushfire.

3.1 Engineering controls—design phase

The engineering controls to be included during the design phase of the Project are as follows:

- Fire protection systems for the operations phase will be designed to enable INPEX personnel to handle bushfires capably until external help arrives.
- Appropriate quantities of water will be stored and made available for firefighting purposes.

3.2 Management controls—all phases

The management controls to be implemented throughout the various phases of the Project are outlined below:

- Detailed bushfire prevention management plans or procedures will be developed in consultation with the Northern Territory's Bushfires Council.
- Grassy vegetation in the onshore development footprint will be controlled to reduce fuel loads and minimise the risk of wildfire. Control methods may include slashing or spraying.

- Firebreaks will be established around Project infrastructure which borders on woodland. Advice will be sought from the Northern Territory's Bushfires Council on firebreak requirements for Blaydin Point.
- Safe designated smoking areas will be established and receptacles for cigarette butts will be provided during all phases of the Project.
- A firefighting capability will be available and strategically located firefighting stations will be established at the onshore Project site.
- An internal "hot-work permit" system will be instituted for all hot-work activities, for example welding and grinding. The permit will specify fire-control practices to help ensure that no fires are started from conducting these activities. Permits will be managed under a permit-to-work system.
- Effective waste management practices will ensure that combustible construction wastes (e.g. timber, cardboard and paper) do not accumulate and pose a fire hazard.
- Firefighting equipment will be maintained and tested according to the relevant Australian standards and regulatory requirements.
- All fire extinguishers will be visually checked on a regular basis.
- Drills will be carried out (under the direction of the emergency response team) to ensure that all personnel are familiar with evacuation procedures and processes.
- Drills will be held periodically with simulated fire situations. Equipment will be tested and response times reviewed.
- Vehicles will be restricted to designated roads and tracks except in the event of an emergency.

- All permanent site vehicles will be equipped with a compatible and appropriately sized fire extinguisher.
- All vehicles will be serviced regularly and maintained to minimise the risk of fires from engines, exhausts, etc.
- The storage of flammable and combustible liquids will be in accordance with regulatory requirements and Australian standards.
- All construction and operations personnel will receive training in the permit-to-work system in place on site during the various phases of the Project.
- Potential ignition sources such as lighters, matches and electronic devices with batteries (cameras, mobile phones, etc) will be strictly controlled at the security gate.
- During all phases of the Project, when first reporting to site, all personnel (including contractors) will be required to attend inductions highlighting the main management controls for fire prevention, including general fire extinguisher use, hot-work permit requirements, emergency evacuation procedures, and the location of fire and emergency muster points.

3.3 Management controls— construction phase

The management controls to be implemented throughout the construction phase of the Project are outlined below:

- Stockpiled vegetation from clearing activities will not be burned, but will be reused where possible or disposed of off site.
- After clearing operations, mulched vegetation stored on site will be stockpiled in a number of designated areas, away from potential ignition sources.
- Vehicles and equipment used for clearing vegetation will be regularly cleaned to remove accumulated combustible vegetation debris.
- Adequate water storage facilities will be made available to meet construction fire prevention requirements.
- A suitable means of raising the alarm in the event of a fire or other emergency on the construction site will be established. The alarm system will be appropriate to ensure that all personnel can be notified immediately of any emergency situation and evacuation, or of any other actions required. As construction progresses and systems are commissioned in specific buildings, personnel will be informed of and trained to recognise the differences between alarm sounds.

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the identified objectives and targets. The activities listed below will be undertaken as part of the bushfire prevention monitoring program:

- Fire incidents will be monitored through INPEX's and its contractors' incident-reporting databases.
- Emergency response drills and exercises will be undertaken periodically to identify any deficiencies in the system.
- Workplace "housekeeping" inspections will be undertaken to ensure that there is no accumulation of waste materials and other combustible substances in work areas.
- Firefighting equipment will be inspected, maintained and tested according to the requirements of the regulatory authorities and the prescriptions of the relevant Australian standards.

Triggered management response

A management response will be triggered by either of the following two circumstances:

1. a fire "incident"
2. the identification by an annual management review of a failure to meet an objective or target.

The responses to these are outlined below.

Response to fire "incidents"

Fire incidents could include the following:

- accidental bushfires caused by Project activities (but not attributable to natural uncontrollable events)
- unauthorised fires leading to a bushfire.

Detection of fire incidents will trigger internal notifications, reporting requirements, investigations and associated corrective and preventive actions.

The level of investigation will be dependent on the potential risk associated with the event. Corrective actions that may be triggered as a result of the investigation would include the review and update of procedures or plans associated with fire prevention and/or refresher training for personnel on Project fire prevention management processes.

INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigation requirements. All fire incidents and "near misses" will be entered into INPEX's and its contractors' incident databases and corrective actions will be tracked to closure.

Response actions to fire incidents will be detailed in the onshore emergency response plans throughout the life of the Project.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will initiate the following response: a review and audit of current fire prevention management practices to assess the practicability of implementation, the identification of potential new ignition sources (not previously identified), and a reassessment of resource requirements.

The response to the results of investigations and audits could include the following:

- an update of plans or procedures to reflect changes to bushfire prevention management practices if applicable
- the arrangement of refresher training for personnel covering management practices and processes for bushfire prevention on site
- the arrangement of refresher training for fire-brigade team members covering firefighting practices.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken throughout the lifetime of the Project. A summary of the reporting, auditing and review requirements relating to bushfire prevention is provided in the following two sections.

5.1 All Project phases

The reporting, auditing and review requirements applicable for all phases of the Project are as follows:

- The Northern Territory's Bushfires Council will be informed of any bushfires in or adjacent to the onshore development area.
- Records will be maintained for portable fire extinguisher test certificates and inspection dates.
- Records will be maintained of the testing and maintenance of other firefighting equipment (e.g. firewater pumps).
- Incidents resulting from bushfire outbreaks will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- An annual INPEX environmental report for the Project will be produced and will include details of bushfire incidents.

- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Records will be audited periodically to ensure that all personnel on site have completed the required health, safety and environment induction.
- Detailed bushfire prevention management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

5.2 Construction phase

In addition to the reporting requirements listed above, during the construction phase contractors will be required to produce and provide to INPEX a monthly environmental report including a record of environmental incidents.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's bushfire prevention management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the implementation of detailed bushfire prevention management plans or procedures:

- incident reporting, recording and investigating
- maintenance of an emergency contact list
- emergency response
- health, safety and environment site induction.

7 APPLICABLE LEGISLATION

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments specifically related to fire management include those listed below.

- *Bushfires Act* (NT).
- *Bushfires Regulations* (NT).
- *Fire and Emergency Act* (NT).



Provisional Cetacean Management Plan

Annexe 4 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risk and potential environmental impact of vessel, aircraft and vertical seismic profiling (VSP) interactions with cetaceans (whales and dolphins) during the lifetime of the Project, from construction and operations through to decommissioning.

This provisional environmental management plan (EMP) for cetaceans is attached as Annexe 4 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional plans will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project where appropriate. The detailed documentation will be prepared by the relevant contracting parties in consultation with INPEX's Environmental Department.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX will minimise the potential impact of vessel, aircraft and VSP activities on cetaceans.
- It describes the proposed monitoring requirements for all phases of the Project.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of future more detailed environmental documentation, such as the plans, procedures, etc., which will be required throughout the life of the Project.

The scope of this provisional EMP encompasses the activities of all vessels and aircraft operating in Australia's territorial waters which might impact upon cetaceans during the Project's lifetime. It also addresses the risks associated with vertical seismic profiling which will be conducted during production drilling.

This provisional EMP does not address the potential environmental impact of, or the management controls for, underwater noise generated by Project-related piledriving or blasting activities. This is addressed in the Provisional Piledriving and Blasting Management Plan (Annexe 12 to Chapter 11).

1.2 Activities that may lead to impacts on cetaceans

Cetaceans have the potential to be present in all marine areas where the Project will operate. The Project activities that have the potential to impact on cetaceans are addressed in this plan as follows:

- marine vessel movements and operations
- helicopter movements
- vertical seismic profiling (during production drilling).

1.3 Potential impacts

Potential impacts on cetaceans as a result of the above activities include the following:

- disruption of natural behaviour
- displacement from natural habitats
- stress or injury
- increased mortality
- reduced breeding success.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for cetacean management are shown in Table 2-1. Engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

Table 2-1: Cetacean management objectives, targets and indicators

Objectives	Targets	Indicators
Minimise the risk of behavioural and stress-related impacts on cetaceans from vertical seismic profiling generated by underwater noise.	<ul style="list-style-type: none"> Operate vertical seismic profiling at all times under predetermined, risk-assessed, acceptable operating parameters. 	<ul style="list-style-type: none"> Measure compliance with operating parameters through audits, inspections, records and incident reports.
Minimise the risk of disturbance to cetaceans through marine vessel and helicopter operations.	<ul style="list-style-type: none"> No incidents of vessel- or helicopter-related disturbance to cetaceans. 	<ul style="list-style-type: none"> Audits and incident reports on compliance of vessels and helicopters with procedures governing interactions with cetaceans.
Establish and maintain awareness of the importance of protecting cetacean species.	<ul style="list-style-type: none"> All members of the marine and aviation workforce (including contractors) to complete a health, safety and environment (HSE) induction, which will include information on cetacean management requirements. Vessel masters and helicopter pilots trained in cetacean interaction procedures. 	<ul style="list-style-type: none"> Assessment of level of training of appropriate personnel on board vessels, aircraft and marine plant. Assessment of level of training for vessel masters and helicopter pilots.

3 MANAGEMENT APPROACH

Detailed cetacean management documentation, for example plans and procedures, will be developed for all phases of the Project. These documents will align with this provisional cetacean EMP. The detailed construction cetacean management documentation will be developed by contractors in consultation with INPEX’s Environmental Department to ensure that they meet INPEX and regulatory authority requirements. The detailed cetacean management documentation for the operations phase will be developed by INPEX’s Environmental Department.

The management controls to be implemented to minimise the risk of impacts on cetaceans during vessel, aircraft and VSP activities, throughout the various phases of the Project, are outlined in the subsections below.

3.1 Vertical seismic profiling

Vertical seismic profiling (VSP) will take place during production drilling activities. A detailed description of VSP activities is provided in Chapter 5 *Emissions, discharges and wastes*, with the risk assessment provided in Chapter 7. In summary, VSP will involve the use of a two- or three-airgun cluster, fired at intervals of 6–10 s, generating a sound-pressure level of approximately 190 dB re 1 µPa at the standard reference distance of 1 m, with a frequency typically

centred around 200 Hz. The VSP operations generally only last for 8–12 hours and will typically occur only once for each production well drilled.

Because of the low frequency of seismic surveys (generally less than 200 Hz), it is likely that only the baleen whales and larger toothed whales will be sensitive to VSP operations. The smaller toothed cetaceans (dolphins and beaked whales) that have much higher auditory bandwidths are not likely to be behaviourally affected by the generation of acoustic signals of such a low frequency.

Received sound levels from an acoustic source generating 190 dB re 1 µPa at 1 m will attenuate rapidly with increasing distance from the acoustic source. During drilling and all offshore operations, the most likely large cetaceans to be encountered are migrating humpback whales, but only in low numbers (McCauley 2009). In addition, McCauley et al. (2000) observed that migrating humpback whales tended to avoid operating seismic sources when the received sound levels were greater than 157–164 dB re 1 µPa rms.

It is therefore anticipated that at distances greater than 500 m from the acoustic source, where received levels should be below 150 dB re 1 µPa, there is a low probability of disturbance to cetaceans from VSP operations.

Although VSP is considered to be a low-risk operation, INPEX will implement the following management measures to ensure that the risk of disturbance to larger cetaceans (i.e. whales) by seismic profiling is minimised. Note that the “observation zone” is defined here as the area of ocean within a 3-km horizontal radius of the VSP acoustic source while the “shutdown zone” is the area of ocean within a 500-m horizontal radius of the acoustic source.

- **Visual observation before start-up:** Visual observations must be undertaken over the observation zone around the VSP acoustic source by a trained crew member for at least 30 minutes before the commencement of the “soft-start” procedure defined below. The procedure may only commence if no whales have been sighted within the shutdown zone around the acoustic source during this 30-minute period.
- **“Soft-start” procedure:** To protect any cetaceans in the vicinity and allow them to move away, the VSP acoustic source must commence operating at the lowest power setting, with a gradual increase in power over a 20-minute period until the full operating power level is reached.
- **Operating procedure:** While the VSP acoustic source is operating, both during soft-start procedures and survey operations, the following measures must be implemented:
 - Visual observations of the 3-km observation zone must be maintained continuously to monitor whale movements during daylight hours.
 - If a whale is sighted within the 3-km-radius observation zone, the operator of the VSP equipment must be placed on standby to power down the acoustic source.
 - If a whale is sighted within the 500-m-radius shutdown zone, the acoustic source must be shut down completely and not restarted until the animal has moved outside the shutdown zone or has not been sighted for 30 minutes. Restart must be carried out using the soft-start procedure.
- **Low-visibility operating procedure:** During periods of low visibility (where the 3-km observation zone cannot be clearly viewed, including night-time) the VSP acoustic source may only be utilised in accordance with the soft-start procedure and operating procedure after there has been a 30-minute period of continuous observation in good visibility to the extent of the 3-km-radius observation zone and during which no whales were sighted. At night the 30-minute observation period will be undertaken with infrared or night-vision binoculars.

Records of all VSP operations will be maintained and will include details of the following:

- the 30-minute observation periods before start-up
- the start-up and shutdown times
- all whale observations
- details of any whale-related shutdowns.

3.2 Vessel and helicopter operations

In general, the cetacean interaction requirements for vessels and helicopters stipulated in this provisional EMP are consistent with the national guidelines for whale and dolphin watching laid down by the Department for the Environment, Water, Heritage and the Arts (DEWHA 2005) and administered by the relevant Commonwealth state or territory management authorities.

Vessels operating in the offshore environment (including during the period of construction of the gas export pipeline) will be traversing unconfined deep waters, providing cetaceans with ample opportunity to hear them and to take evasive action. Vessel strikes causing harm to cetaceans are extremely rare events and smaller cetaceans frequently “bow-ride” or “wash-ride” the waves created by vessels of all sizes. The risk of disturbance or injury to cetaceans as a result of offshore vessel operations is therefore considered to be low. Within the nearshore environment the very slow operational speed of major construction vessels such as dredges, pipelay barges and other survey vessels will greatly limit the chances of vessel strikes on cetaceans.

Noise generated by the engines of vessels, including bow thrusters, could however cause disturbance to cetaceans. The noise levels generated by vessels operating in the offshore and nearshore development area will not be significantly different from routine shipping operations in these areas. However, the concentration of vessels during construction in the offshore development area may increase the risk of disturbance to cetaceans slightly.

Helicopter operations also have the potential to disturb cetaceans through the noise of their engines and rotors. However, as helicopters will only be operating near the ocean surface for very short periods, and infrequently, this is also considered to be a low-risk activity.

There are no known or anticipated whale breeding or mating areas in the vicinity of the offshore development area. However, vessels and aircraft travelling to or from the area from Broome or other coastal locations to the south may occasionally encounter migrating (particularly humpback) whales and calves.

To manage the risk of disturbance to cetaceans through marine vessel or helicopter operations, INPEX will ensure that its vessel masters and helicopter pilots are aware of and will comply with the relevant requirements of the Australian guidelines for whale and dolphin watching, as outlined below.

During all phases of the Project, the general principle guiding vessel operations will be to avoid, as far as practicable, any interaction with cetaceans. Therefore, INPEX vessels in the vicinity of a cetacean or cetaceans will (with the exception of emergency situations) adhere to the following guidelines:

- They will not intentionally approach within 50 m of a dolphin or within 100 m of a large cetacean as shown in Figure 3-1 and Figure 3-2.
- They will operate at a “no wash” speed when they are between 50 m and 150 m of a dolphin or when they are between 100 m and 300 m of a large cetacean as shown in Figure 3-1 and Figure 3-2.

- They will attempt not to approach cetaceans from an angle of less than 60° into or away from the direction of travel of the cetacean(s) as shown in Figure 3-1 and Figure 3-2.
- They will not encourage bow-riding by cetaceans. Should any cetacean(s) commence bow-riding in front of a vessel, the vessel master will not change course or speed suddenly.
- Vessel and aircraft operators will be encouraged to report cetacean sightings to INPEX and the DEWHA.

It should be noted, that in confined waters such as the embayments, estuaries, creeks, channels and river mouths in Darwin Harbour there may be occasions where it may not be possible for vessels to maintain the approach angles or distances. If such situations should arise, notwithstanding the requirement to continue with operations, all efforts will be made to minimise vessel interactions with, or disturbance to, cetaceans.

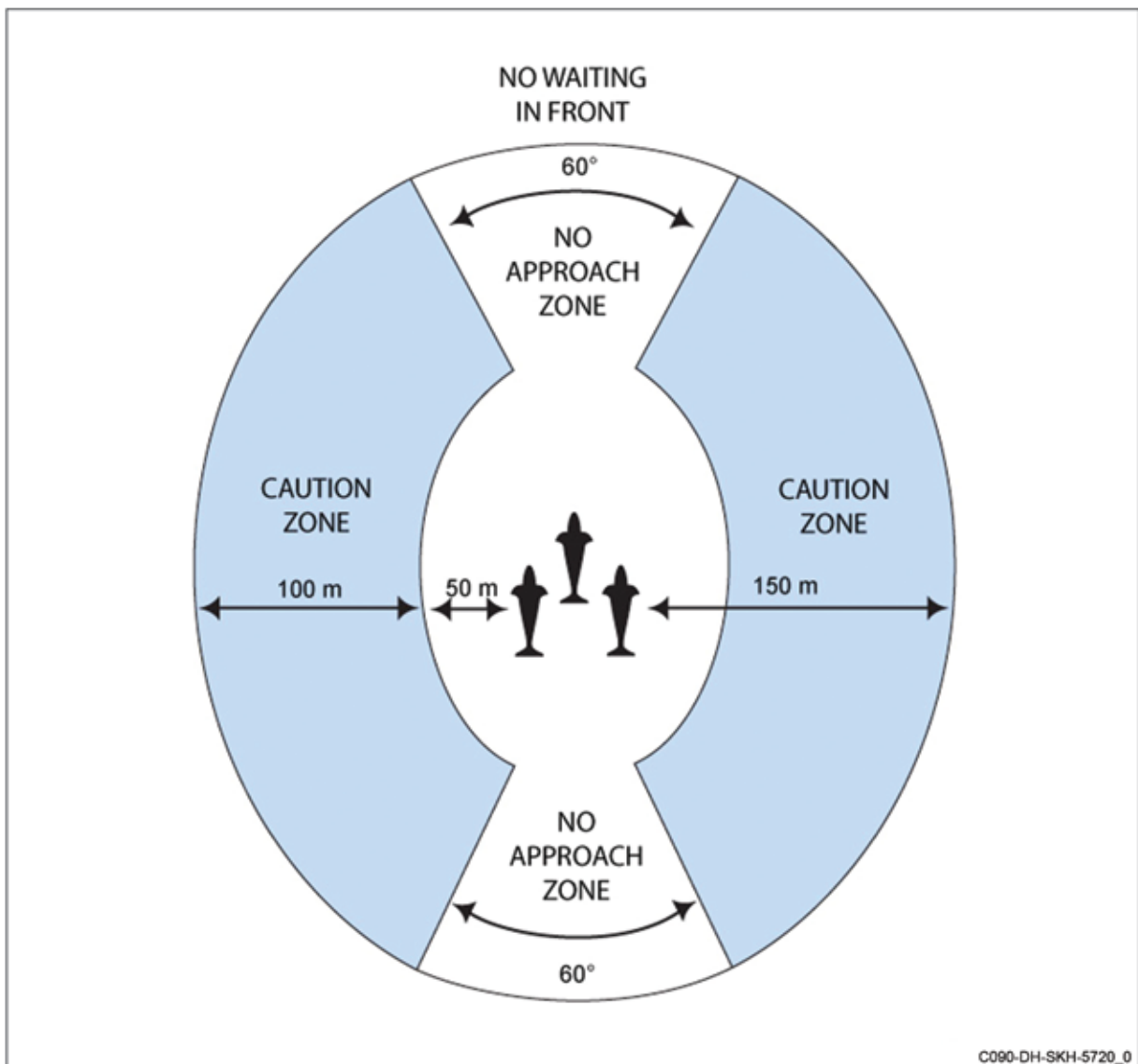


Figure 3-1: Interaction restrictions for marine vessels encountering dolphins (with acknowledgments to the DEWHA)

In accordance with the DEWHA's national guidelines for whale and dolphin watching (DEWHA 2005), INPEX helicopters in the vicinity of a cetacean will, with the exception of take-off, landing or emergency situations, adhere to the following guidelines:

- They will not fly lower than 500 m (1650 feet) or within 500 m of a cetacean as shown in Figure 3-3.
- They will not hover over the no-fly zone as shown in Figure 3-3.
- They will avoid approaching a whale or dolphin head-on.
- They will avoid flying directly over or passing the shadow of the helicopter directly over a cetacean.

Because of the critical importance of a pilot's attending to the primary task of flying the helicopter, reports of cetacean sightings will not be required from helicopters. However, should a helicopter pilot witness a significant incident of disturbance to a cetacean, an incident report must be developed.

3.3 Training and awareness

Relevant personnel involved in VSP activities will be trained in cetacean observation as well as in the appropriate start-up and shutdown operations and recording and reporting procedures. Cetacean observers will be familiar with the CD-ROM whale and dolphin guide produced by the Australian Petroleum Production & Exploration Association (APPEA) (Mustoe & Ross 2004).

Personnel routinely involved in marine vessel operations will be trained in basic cetacean observation and how to record cetacean sightings.

Vessel masters will all be trained in the appropriate vessel stand-off distances and other vessel-cetacean interaction management requirements detailed in sections 3.2.

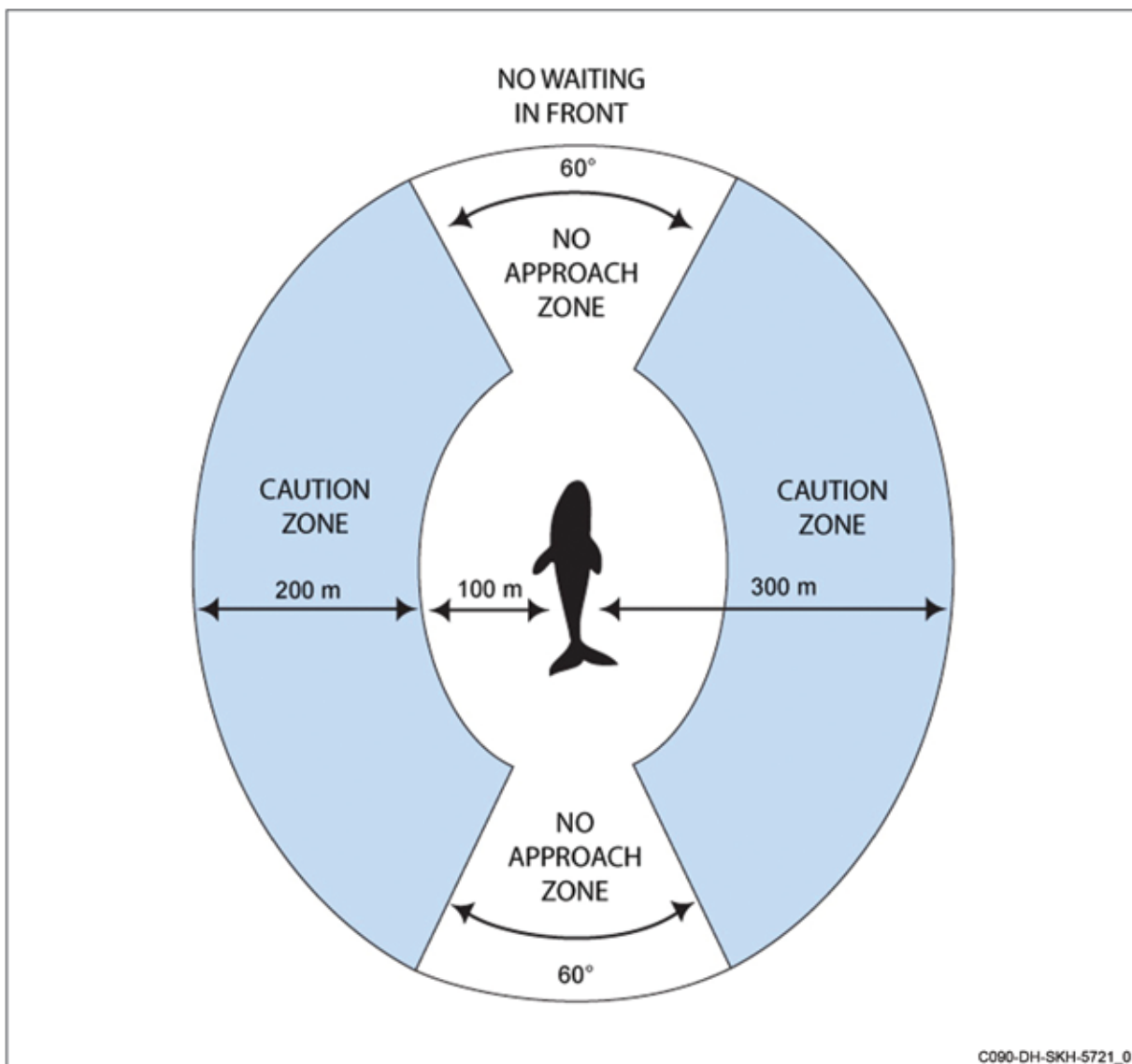


Figure 3-2: Interaction restrictions for marine vessels encountering whales (with acknowledgments to the DEWHA)

Helicopter pilots will also all be trained in the appropriate helicopter procedures as detailed in Section 3.2. However, because it is critically important that a pilot should focus on the task of flying, reports of cetacean sightings will not be required from helicopters.

The training requirements for personnel involved in dredging, piledriving and drill-and-blast operations are contained in the provisional EMPs for these operations.

4 MONITORING

Records will be kept of all cetacean sightings and cetacean-related observations and shutdown periods during VSP activities.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken during all phases of the Project. A summary of the reporting and auditing requirements relating to cetacean management is provided in the following two sections.

5.1 All phases

- Incidents resulting in the disturbance of a cetacean or a breach of a plan or procedure relating to cetacean management will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure.
- All confirmed incidents of disturbance to a cetacean will be reported to the relevant regulatory authority.
- All confirmed "near misses" and incidents will be reported internally to all relevant personnel.

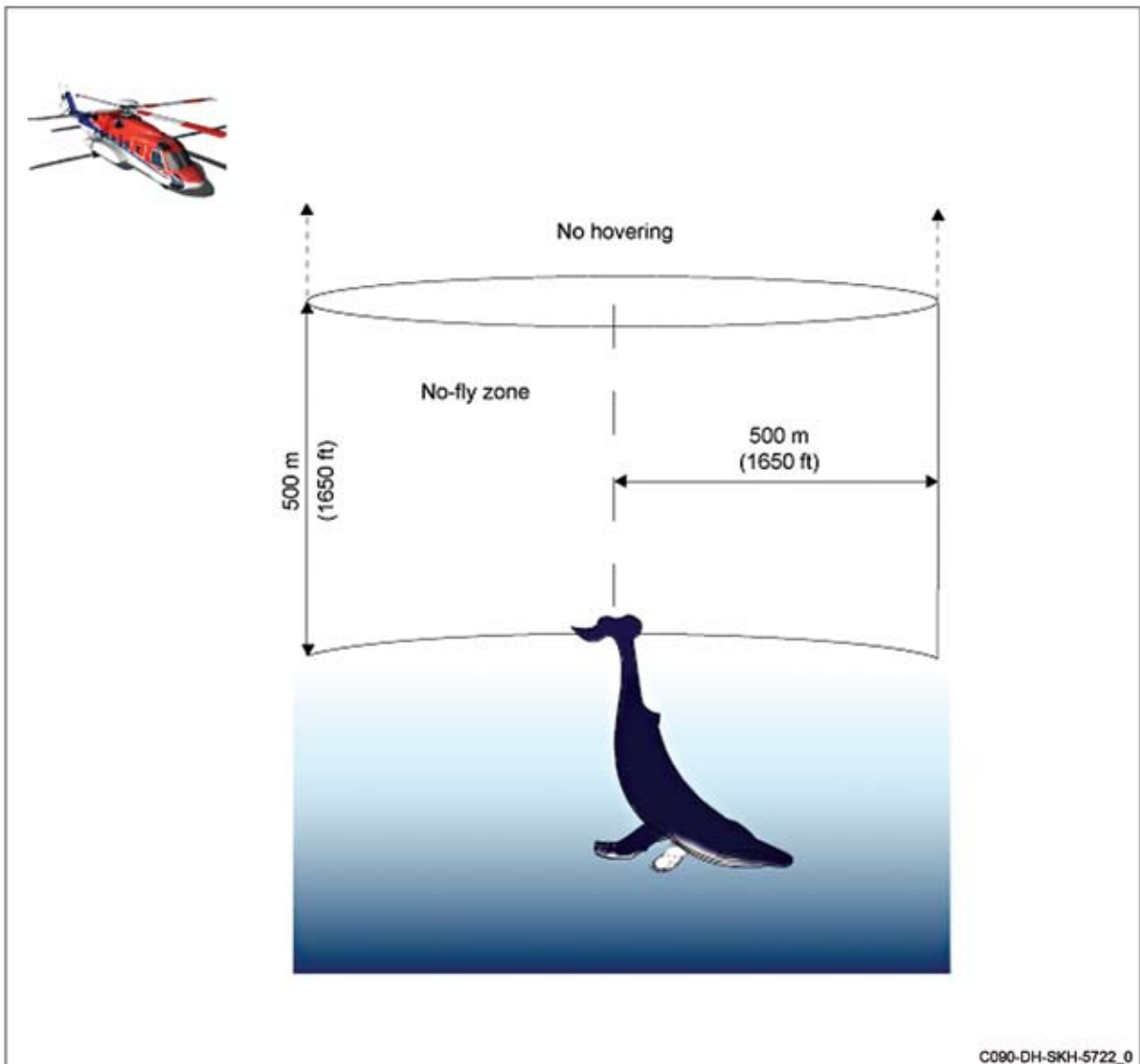


Figure 3-3: Helicopter no-fly zone in the vicinity of any cetacean (with acknowledgements to the DEWHA)

- Relevant details of VSP operations in relation to cetacean management will be recorded for every VSP activity in accordance with the record-keeping requirements stipulated in Section 3.1.
- Cetacean observations from vessel operations that are reported to INPEX will in turn report cetacean sightings to the DEWHA.
- An annual INPEX environmental report for the Project will be produced and will include, as a minimum, details of any cetacean-related incidents, and monitoring program outcomes.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis. External audits will be carried out by external agencies as required.

5.2 Construction, commissioning and decommissioning phases

Construction, commissioning and decommissioning contractors will be required to provide INPEX with a monthly environmental report which will include a record of environmental incidents.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans and procedures that have been or will be developed to ensure that INPEX's cetacean management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

These plans and procedures include the following:

- incident reporting, recording and investigating procedure
- HSE site induction (onshore and offshore) presentation

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments and guidelines relevant to cetacean conservation include those listed below:

- Department of the Environment, Water, Heritage and the Arts. 2005. *Australian national guidelines for whale and dolphin watching 2005*. Commonwealth Government, Canberra, ACT.
- Department of the Environment, Water, Heritage and the Arts. 2008. *Interaction between offshore seismic exploration and whales*. EPBC Act Policy Statement 2.1. Commonwealth Government, Canberra, ACT.
- *Environment Protection and Biodiversity Conservation Act 1999* (Cwth).
- *Territory Parks and Wildlife Conservation Act* (NT).

8 REFERENCES

Department of the Environment, Water, Heritage and the Arts. 2005. *Australian national guidelines for whale and dolphin watching 2005*. Department of the Environment, Water, Heritage and the Arts, Canberra, ACT. Viewed online on 9 February 2010 at <<http://www.environment.gov.au/coasts/publications/pubs/whale-watching-guidelines-2005.pdf>>.

Department of the Environment, Water, Heritage and the Arts. 2008. *Interaction between offshore seismic exploration and whales*. EPBC Act Policy Statement 2.1. Department of the Environment, Water, Heritage and the Arts, Canberra, ACT. Viewed online on 9 February 2010 at <<http://www.environment.gov.au/epbc/publications/pubs/seismic-whales.pdf>>.

DEWHA—see Department of the Environment, Water, Heritage and the Arts.

McCauley, R.D. 2009. *Ambient, biological and anthropogenic sea noise sources from Browse and Maret islands, Kimberley, 2006–2009*. Report R2008-54 prepared by the Centre for Marine Science and Technology, Curtin University of Technology, Perth, for INPEX Browse, Ltd., Perth, Western Australia.

McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M.-N., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J. and McCabe, K. 2000. Marine seismic surveys: a study of environmental implications. *Australian Petroleum Production & Exploration Association Journal* 40: 692–708.

Mustoe, S. and Ross, G. (eds). 2004. *Search Australian whales and dolphins*. CD-ROM identification guide. Australian Petroleum Production & Exploration Association Limited, Perth, Western Australia.

Provisional Decommissioning Management Plan

Annexe 5 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential environmental impacts of, the decommissioning process that will occur at the end of the Project's expected 40-year operating life.

The extent of onshore and nearshore decommissioning and rehabilitation will be agreed with the Northern Territory Government prior to the commencement of decommissioning. Adequate notice will be given by INPEX to the Northern Territory Government to allow for discussions regarding the decommissioning management plan.

Options for decommissioning will depend upon the anticipated future land use and the requirements of the government. For example, if the land is to be used for future industrial activities, it may be desirable that the module offloading facility should be left in situ along with other valuable infrastructure such as the major access road and drainage control structures. Under this scenario, non-essential aboveground infrastructure would be removed and landforms made stable to prevent erosion. If, however, it were to be decided that the onshore development area should be rehabilitated as natural habitat, all aboveground infrastructure would be removed and an active revegetation program would be initiated.

The decommissioning of offshore facilities and infrastructure will comply with applicable regulations and industry best practice at the time of decommissioning and the detail will be agreed upon with the Northern Territory and Commonwealth governments prior to the commencement of decommissioning.

This provisional environmental management plan (EMP) for the decommissioning of the Project is attached as Annexe 5 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the successive phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It outlines the potential options for onshore, nearshore and offshore decommissioning and abandonment of Project facilities and infrastructure.
- It documents some of the management controls for potential decommissioning and abandonment options.
- It describes the proposed monitoring, reporting, review and audit requirements for the decommissioning phase of the Project.
- It will guide the development of the detailed environmental documentation, such as the plans, procedures, etc., which will be required for the decommissioning phase of the Project.

The scope of this provisional EMP includes the decommissioning and abandonment of the onshore, nearshore and offshore Project facilities and infrastructure.

1.2 Decommissioning activities that could lead to impacts on the environment

During the decommissioning phase, activities on site associated with the removal of infrastructure will increase in intensity relative to those occurring during the "normal" operations phase. Of particular note are the potential increases in environmental and social impacts associated with the following activities:

- the demolition of facilities and infrastructure
- equipment, vessel and vehicle movements
- earthworks
- the controlled use of explosives to demolish some facilities, such as the product storage tanks.

1.3 Potential impacts

An environmental impact assessment may be required before decommissioning commences in order to confirm that the planned activities are the most appropriate to the prevailing circumstances. This assessment would aim to demonstrate that the decommissioning activities would not cause unacceptable environmental impacts and would lead to the development of specific management controls. Potential impacts associated with decommissioning activities may include the following:

- acid sulfate soil disturbance
- erosion and sedimentation
- dust generation
- increased pressure on waste disposal facilities
- chemical and hydrocarbon spills
- disturbance to natural habitat
- disturbance to Aboriginal and non-Aboriginal heritage sites
- noise disturbance from blasting activities.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators for decommissioning management will be set out by INPEX prior to the commencement of decommissioning and after consultation with the Northern Territory and Commonwealth governments.

3 MANAGEMENT APPROACH

Detailed decommissioning management documentation, for example plans and procedures, will be developed for this final phase of the Project. These detailed documents will align with this provisional decommissioning EMP. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

A summary of some of the potential engineering and management controls to be incorporated into the detailed documentation to mitigate the risks associated with decommissioning activities is provided below.

3.1 Engineering controls—design phase

The engineering controls that may be implemented during the design phase of the Project are described below.

Applicable to offshore development area

Once the Ichthys Field has reached the end of its useful life, the central processing facility (CPF) and the floating production, storage and offtake (FPSO) facility will be uncoupled from their moorings and towed from the infield location, the reservoir will be permanently isolated, necessary well equipment will be removed and the wells will be plugged and abandoned.

The process of decommissioning the offshore facilities will necessitate the assessment of a range of options, including finding an alternative use for all or part of the CPF and the FPSO facility, the recycling of all or part of these facilities, or the final disposal onshore of all or part of these facilities. The options include leaving other subsea structures in place, including the mooring suction piles, infield flowlines and gas export pipeline. The assessment of options will be based on a range of physical factors (e.g. water depth, ocean processes, and the physical state of the facilities) and other factors (e.g. proximity to sensitive habitats and interference with fishing-industry activities).

Offshore decommissioning will also be subject to further assessment prior to decommissioning under the relevant legislation and international conventions and treaties. These include the following:

- approval requirements under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cwth), the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) and the *Environment Protection (Sea Dumping) Act 1981* (Cwth)
- the requirements of the United Nations Convention on the Law of the Sea (UNCLOS). Article 60(3) states: “Any installations or structures which are abandoned or disused shall be removed to ensure safety of navigation, taking into account any generally accepted international standards established in this regard by the competent international organization. Such removal shall also have due regard to fishing, the protection of the marine environment and the rights and duties of other States. Appropriate publicity shall be given to the depth, position and dimensions of any installation or structures not entirely removed.”
- the requirements of the International Maritime Organization (IMO) including ensuring that the complete removal of facilities is technically feasible or, if structures are left in place, ensuring that there is a clearance depth of 55 m and charting on navigational maps for safety of other users at sea.

While the requirements for decommissioning will depend on the regulations at the end of the useful life of the Project, consideration of decommissioning feasibility will be incorporated into the design of each facility.

These considerations include designing the subsea and floating components so that they can be removed in their entirety. This includes the CPF and the FPSO facility, the FPSO turret, the anchor chains, the risers and their support equipment, the subsea manifolds, and the trees.

Applicable to onshore development area

As with the offshore facility, consideration of decommissioning feasibility will be incorporated into the design of the onshore facility. However, exact design criteria are limited as there is the likelihood that technology and knowledge will advance over the 40-year lifetime of the Project. Limiting decommissioning options to those available during the design phase risks having the Project fall well short of what will be considered “best practice” at the time of decommissioning.

Design options to be investigated will include consideration of removal of some or part of the process modules in the reverse sequence of the installation process. Prefabricated structures of all sizes may be removed using this approach. However, while the plant will be sound for operational purposes, it may not have the structural integrity for removal in large portions. A structural assessment of the integrity of the plant will need to be conducted to inform the assessment of decommissioning options.

3.2 Management controls— decommissioning phase

The management controls that may be implemented during the decommissioning phase are outlined below.

Applicable to onshore, nearshore and offshore development areas

Detailed waste management documentation, for example plans and procedures, will be developed and implemented for all Project areas.

Applicable to nearshore and offshore development areas

Detailed cetacean management documentation, for example plans and procedures, will be developed and implemented for the nearshore and offshore Project areas.

Applicable to the offshore development area

The extent of offshore decommissioning will depend on the prevailing legislation and industry best practice at the time of decommissioning.

- After the reservoir has been permanently isolated, the wellheads will be removed and the wells plugged and abandoned in accordance with Clause 514 of the Petroleum (Submerged Lands) Acts Schedule (DITR 2005) or the applicable legislation in force at the time of decommissioning.
- The CPF and FPSO will be unhooked and removed entirely from the Ichthys Field.

Subject to risk assessment and with the approval of the relevant authorities the following offshore infrastructure may be left in situ:

- the mooring suction piles, infield flowlines, risers and subsea manifolds (following flushing to remove hydrocarbons)
- the anchor chains for the CPF, FPSO and risers.

Applicable to gas export pipeline

The decommissioning of the gas export pipeline will involve the flushing of all hydrocarbons prior to filling it with sea water and leaving it in place.

Applicable to the onshore development area

To what extent the following controls are applied will depend upon the agreed final use of the onshore development area, which will be defined in consultation with the relevant authorities:

- Shallow foundations for plant or tank infrastructure may be excavated, demolished and disposed of.
- Where piled foundations exist, these may be excavated to a depth of 1 m below the existing ground level.
- Excavations resulting from the removal of foundations will be backfilled.
- The controlled use of explosives may be required during some phases of the demolition of the redundant storage tanks. If this is the case, detailed blasting management documentation (plans, procedures, etc.) will be developed and implemented to manage this risk.
- If foundations and infrastructure located in areas associated with acid sulfate soils are removed, detailed acid sulfate soil documentation, for example plans and procedures, will be developed and implemented to manage this risk.
- Detailed onshore spill prevention and response management documentation will be developed and implemented to manage the risk of chemical and hydrocarbon spills.
- Detailed dust management documentation, for example plans and procedures, will be developed and implemented to manage the risk of increased dust.
- Detailed traffic management documentation, for example plans and procedures, will be developed and implemented to manage the risks associated with increased traffic.

In the event that the onshore development area should be required by the Northern Territory Government to be returned to its original state (i.e. before the Ichthys Project commenced), stable landforms will be established and the site will be rehabilitated to an agreed level of representation of the pre-Project plant communities.

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the objectives and targets identified in the suite of provisional EMPs included as annexes to this chapter of the Draft EIS. Prior to undertaking decommissioning activities, INPEX will undertake a review of historical monitoring data (e.g. groundwater quality and mangrove health) and incidents on site that might have caused contamination. Objective, targets and indicators will be updated in the Decommissioning Management Plan to reflect the type and level of activity.

Depending on the final land use agreed for the onshore development area, all or part of the site may need to be rehabilitated. In such a circumstance, INPEX will also develop a monitoring program for completion criteria to verify that the site is being returned to the agreed representative state. Completion criteria will be included for vegetation community composition, extent of weed infestation, erosion control and visual amenity of the site. These completion criteria will be determined in consultation with the Northern Territory Government.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken regularly through the decommissioning phase of the Project. A summary of the reporting, auditing and review requirements relating to decommissioning is presented below:

- Incidents resulting from decommissioning activities will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- An annual INPEX environmental report for the Project will be produced.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Records will be audited periodically to ensure that all personnel on site have completed the required health, safety and environment induction.
- Detailed decommissioning management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.
- Decommissioning contractors will be required to produce and provide to INPEX a monthly environmental report which will include a record of monthly environmental incidents and data.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's decommissioning management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the implementation of detailed decommissioning management documentation:

- incident reporting, recording and investigating
- chemical and hazardous substance management
- waste management
- dust management
- traffic management
- acid sulfate soils management
- onshore blasting
- health, safety and environment site induction
- oil spill contingency.

7 REFERENCES

Department of Industry, Tourism and Resources. 2005. *Petroleum (Submerged Lands) Acts Schedule: specific requirements as to offshore petroleum exploration and production.* (Now as) Department of Resources, Energy and Tourism, Canberra, ACT. Viewed online on 1 March 2010 at <http://www.ret.gov.au/resources/Documents/Upstream%20Petroleum/PSLA_Schedule_of_Specific_Reqs_24_11_0520051124103750.pdf>.

DITR—see Department of Industry, Tourism and Resources.

Provisional Dredging and Dredge Spoil Disposal Management Plan

Annexe 6 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential environmental impacts of, the dredging activities undertaken in the nearshore development area during the construction phase of the Project.

During the construction phase a dredging program will be undertaken for the nearshore facilities, including the product loading jetty, the navigation channel, the module offloading facility and the gas export pipeline shore crossing. Some dredging will also be carried out along the gas export pipeline route in nearshore areas when preparing the seabed for pipelay. Some post-pipelay trenching may be required along the gas export pipeline route in offshore areas, however any impacts associated with this would be localised. No dredging will be required in the offshore development area.

Dredged material will primarily be disposed of offshore, at a spoil disposal ground to the north of Darwin Harbour, around 15 km north-west of Lee Point (Figure 1-1). At the time of developing this provisional management plan, the Darwin Port Corporation (DPC) was in the early stages of planning new settlement ponds that could potentially be used for onshore dredge spoil disposal and land reclamation. Should the opportunity to use these facilities be realised closer to the start of the dredging program, INPEX will explore this option in consultation with the DPC. However, at this stage it is assumed that all dredge spoil from the Project will be disposed of offshore.

This provisional environmental management plan (EMP) for dredging and dredge spoil disposal is attached as Annexe 6 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX will minimise, through the identification of suitable management controls, the potential environmental impacts of the dredging and dredge spoil disposal activities that will be undertaken during the construction phase of the Project.
- It describes the proposed monitoring requirements for the construction phase of the Project.
- It describes the proposed reporting, review and audit requirements for the construction phase of the Project.
- It will guide the development of future more detailed environmental documentation, such as the plans, procedures, etc., which will be required for the Project.

The scope of this provisional EMP includes the dredging and dredge spoil disposal activities undertaken during the Project's construction phase. For the purposes of this EMP, the term "dredging" also includes marine trenching activities.

Maintenance dredging may be required during the operations phase of the Project to ensure the continued operability of the nearshore facilities.

While the frequency and nature of maintenance dredging cannot be accurately determined at this stage, preliminary modelling indicates that maintenance dredging may be required after 10 years with a potential volume of 200 000 m³ of sandy material to be removed. Environmental management of any maintenance dredging required will be incorporated into an operations-phase EMP and has not been included in this provisional EMP. Discussions would also take place with Government to determine if formal impact assessment would be required for maintenance dredging activities. No maintenance dredging will be required along the gas export pipeline route.

The scope of this provisional EMP does not include management of the risks of damage to maritime heritage sites during dredging, management of drill-and-blast activities or management of the introduced marine pest risks associated with dredging vessels.

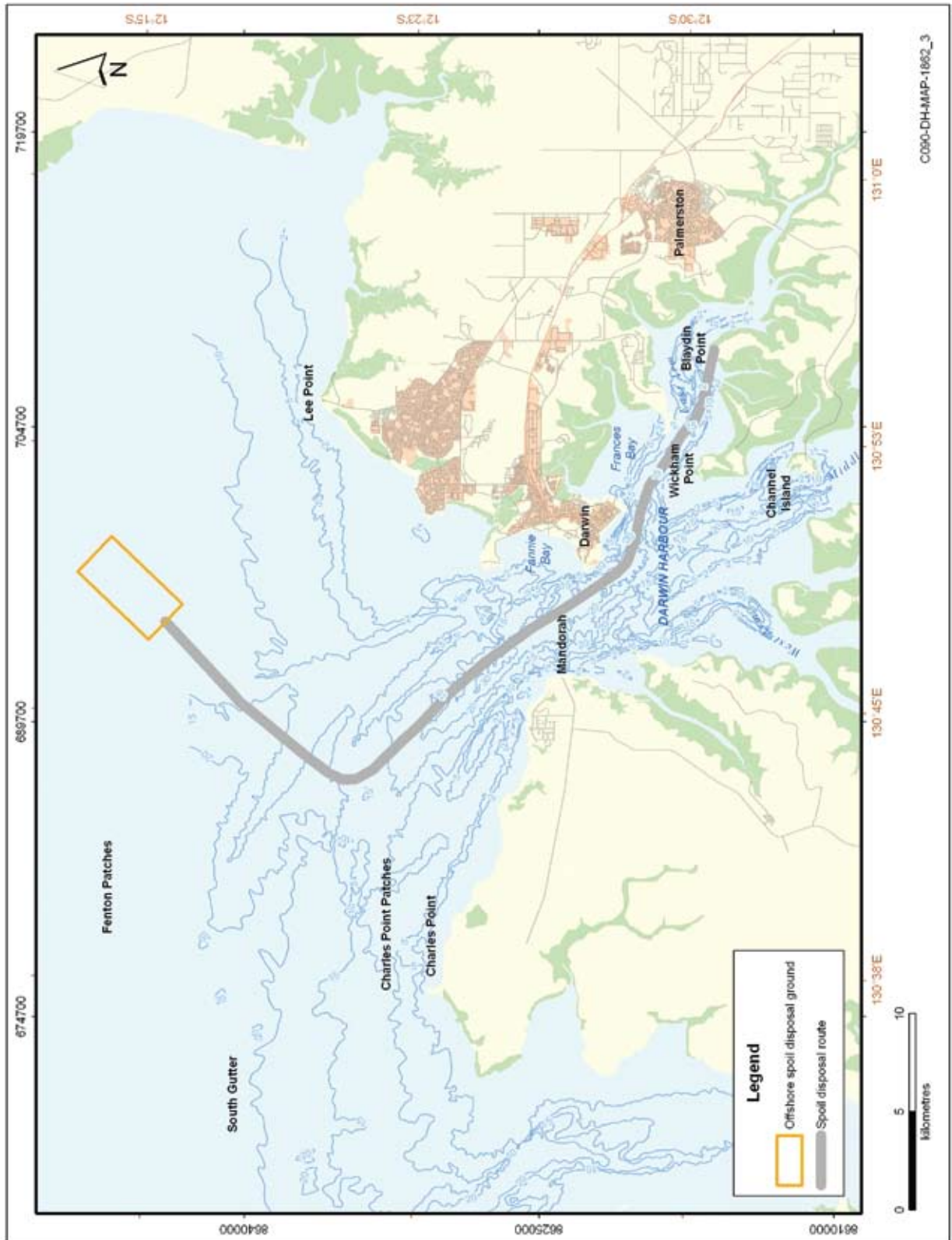


Figure 1-1: Location of the offshore spoil disposal ground

These issues are addressed as separate aspects in three other provisional EMPs:

- Provisional Heritage Management Plan (Annexe 9 to Chapter 11)
- Provisional Piledriving and Blasting Management Plan (Annexe 12 to Chapter 11)
- Provisional Quarantine Management Plan (Annexe 13 to Chapter 11).

1.2 Potential impacts

Potential impacts to marine biota and habitats associated with dredging and dredge spoil disposal include the following:

- the removal of seabed habitats within the dredging footprint
- an increase in the turbidity of Darwin Harbour waters and low-level sediment deposition in nearby benthic habitats, causing reduced growth or mortality of species such as corals
- damage to the heritage-listed Channel Island coral community
- localised noise disturbance to protected marine mammals and reptiles
- accidental entrainment of marine fauna (such as turtles) in trailing suction hopper dredges, causing injury or death
- the introduction of marine pest species
- sediment accumulation in intertidal areas and potential impacts on mangrove health
- the smothering of seabed habitats at the offshore spoil disposal ground
- increased turbidity at the offshore spoil disposal ground and sedimentation of adjacent and coastal benthic habitats.

Potential impacts to other users and to the values of the marine environment include the following:

- an increase in marine traffic in Darwin Harbour, particularly during the construction phase
- localised access restrictions for recreational vessels during dredging activities
- possible low-level accumulation of sediment on, and accidental anchor damage to, maritime heritage sites such as the Catalina flying-boat wrecks and the SS *Ellengowan*
- the creation of navigation hazards for commercial shipping at the offshore spoil disposal ground.

The potential significance of these impacts has been assessed in the Draft EIS for the Project. Specific studies undertaken to address the potential impacts have included the following:

- extensive modelling of the dispersion of sediments from dredging and dredge spoil disposal. Modelling of both turbid plumes and sediment accumulation was undertaken to identify those areas at greatest risk of impact from the activities (HRW 2010, provided as Appendix 13 to this Draft EIS)
- surveys of habitats and biological communities in key areas exposed to turbid plumes and sediment accumulation (URS 2009a, provided as Appendix 8 to this Draft EIS)
- an assessment of the risk posed by underwater noise to protected marine species (URS 2009b, provided as Appendix 15 to this Draft EIS).

The effects of localised seabed disturbance, noise and turbidity are not expected to have a significant negative impact on significant marine mammals and reptiles (e.g. the dolphins and turtles listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)) that utilise Darwin Harbour. No significant breeding or nesting habitats for these species are known to occur in the Harbour, and the foraging habitats available in the nearshore development area are widely distributed elsewhere in the Harbour and along the Northern Territory coast. Both Australian snubfin dolphins (*Orcaella heinsohni*) and Indo-Pacific humpback dolphins (*Sousa chinensis*) have been found to favour river mouths for foraging, probably because of the increased nutrient availability attracting smaller prey species (Mustoe 2008). The Indo-Pacific humpback dolphin is also known to forage in dredged channels (Parra 2006).

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for dredging and dredge spoil management are shown in Table 2-1. The engineering and management controls implemented to help to achieve these targets are described in Section 3 *Management approach*.

Table 2-1: Dredging and dredge spoil management objectives, targets and indicators

Objectives	Targets	Indicators
Avoid damage to the Channel Island coral community by sedimentation and turbidity.	<ul style="list-style-type: none"> No significant hard coral mortality at Channel Island as a result of dredging activities. 	<ul style="list-style-type: none"> Reactive coral monitoring program.
Minimise direct disturbance to marine protected species.	<ul style="list-style-type: none"> No incidents of adverse impacts upon marine protected species. 	<ul style="list-style-type: none"> Marine protected species observations and incidents records.
Avoid disturbance of navigation and shipping activities in East Arm and at the offshore spoil disposal ground.	<ul style="list-style-type: none"> No incidents of damage to ships or interruption to voyages because of reduced under-keel clearance in East Arm or at the dredge spoil disposal ground. 	<ul style="list-style-type: none"> Periodic bathymetric surveys of seabed in East Arm and at dredge spoil disposal ground.
Avoid negative impacts to mangrove communities as a result of sediment accretion from dredging activities.	<ul style="list-style-type: none"> No significant areas of mangrove mortality attributable to sedimentation. 	<ul style="list-style-type: none"> Intertidal sedimentation and mangrove health monitoring program.

3 MANAGEMENT APPROACH

Detailed dredging documentation, for example plans and procedures, will be developed for the construction and operations phases of the Project. These detailed documents will align with this provisional dredging and dredge spoil disposal EMP. The detailed documentation will be prepared either directly by INPEX’s Environmental Department or by specialist contractors in conjunction with INPEX.

A summary is provided below of the main engineering and management controls to be included in the detailed documentation to mitigate the risks associated with dredging and dredge spoil disposal activities.

3.1 Dredging

3.1.1 Engineering controls

The engineering controls to be implemented during the design phase of the Project will include the selection of dredging methods that will minimise the release of fine sediments into the waters of the Harbour. These include the following:

- using the backhoe (BHD) and/or grab dredger (GD) in preference to the cutter-suction dredger wherever practicable
- using the trailing suction hopper dredge (TSHD) in “no overflow” mode.

Deploying silt curtains to restrict the movement of fine sediments released from the dredging equipment has been considered. However, in the strong prevailing tidal currents in Darwin Harbour silt curtains would be easily pulled from their moorings and would quickly fill with silt from the naturally turbid coastal waters.

These factors preclude their use in the nearshore development area.

A range of options for reducing the risks of marine fauna entrainment (especially turtles) by trailing suction hopper dredgers will be explored in consultation with the dredging contractor. Practicable options that could be effective in reducing risks will be incorporated as management controls into the final dredging management plan.

3.1.2 Management controls

The management controls to be implemented during the dredging works are outlined below:

- An application for a waste discharge licence will be sought under the Northern Territory’s *Water Act* prior to the commencement of dredging activities.
- Notice will be provided to the Northern Territory’s Department of Lands and Planning (DLP) and the DPC at least three months in advance of the commencement of dredging and spoil disposal operations. This will allow for a “Notice to Mariners” to be issued, advising vessel operators of any change to maritime traffic conditions because of dredging activities.
- Dredging vessels will be equipped with appropriate global positioning system (GPS) equipment and other navigational aids to ensure that dredging will occur only in the specified dredge footprint.
- The dredge footprint has been designed to avoid maritime heritage areas and sacred sites.
- Anchoring plans and procedures for construction vessels involved in dredging will be developed to avoid sensitive seabed habitats and sacred and heritage sites.

- Controlled zones will be implemented around the *SS Ellengowan*, the *Kelat* and the Catalina flying-boat wrecks.
- Reactive management of dredging activities at the pipeline shore approach and crossing will be carried out in response to measurements of turbid plumes and sedimentation at the nearby Channel Island coral community (see sections 4.1.1 and 4.1.2 for details on trigger levels and management actions).
- Periodic assessments will be made of sediment accumulated at East Arm Wharf, the East Arm boat ramp and the Hudson Creek facilities and, if necessary, remedial dredging or clean-up will be carried out.
- Periodic assessments will be made of the sediment conditions around the Catalina flying-boat wrecks in the vicinity of the dredging activities and, if required, any necessary management controls will be implemented in consultation with NRETAS.

3.2 Dredge spoil disposal

3.2.1 Engineering controls

The engineering controls to be implemented for dredge spoil disposal are outlined below:

- The dredge spoil disposal ground location has been selected to avoid adverse impacts on commercial shipping and recreational fishing activities through the following:
 - locating it away from known shipping routes
 - locating it in an area where there is minimal potential for sediment remobilisation into current and known future shipping channels or into important recreational fishing areas (e.g. Charles Point Patches, Fenton Patches, and the artificial reefs off Lee Point).
- The dimensions of the offshore spoil disposal ground (length and width) have been designed to minimise the potential for the build-up of mounds of dredged spoil that would reduce under-keel clearance for vessels traversing the area.

The location and dimensions of the dredge spoil disposal ground were selected on the basis of comprehensive hydrodynamic and sediment dispersion modelling (APASA 2010). Details of this modelling are presented in Chapter 7 *Marine impacts and management*.

3.2.2 Management controls

The management controls to be implemented during dredge spoil disposal are as follows:

- A “Notice to Mariners” will be issued in conjunction with the DLP and the DPC, advising vessel operators of dredge spoil disposal activities and any changes to bathymetric conditions at the disposal area.
- Disposal activities will be managed in such a way that the larger sediment fractions are retained as much as possible within the spoil disposal ground boundary, and that the seabed at the completion of the spoil disposal operations is reasonably flat.

4 MONITORING

A range of monitoring programs to document the effects of the Project on the receiving environment are presented in Chapter 11. In relation to dredging activities, these monitoring programs include the following:

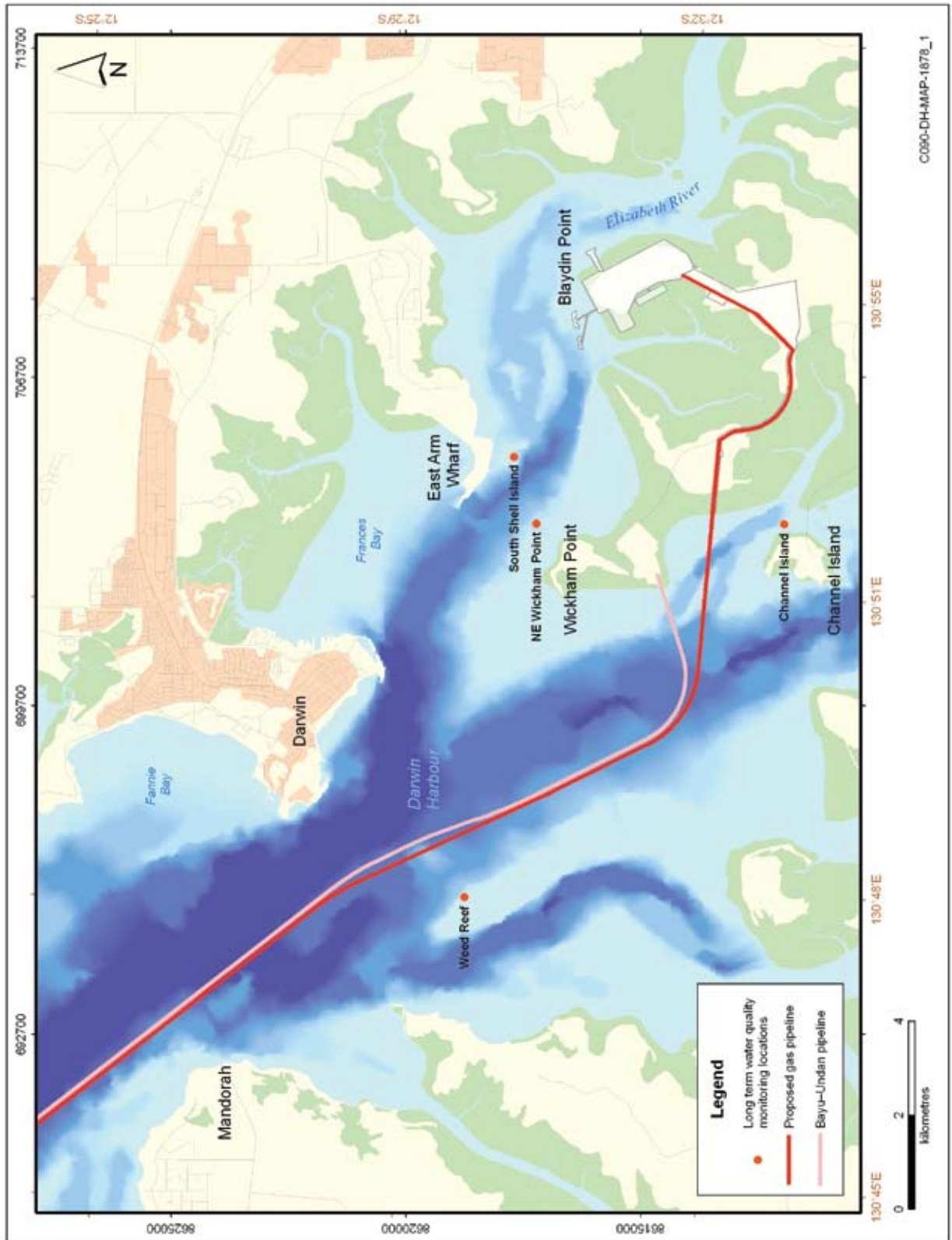
- dredge plume discharge monitoring
- coral monitoring (at South Shell Island and north-east Wickham Point)
- soft-bottom benthos monitoring
- intertidal sedimentation and mangrove health monitoring.

In addition to these, a reactive monitoring program will be developed for the heritage-listed Channel Island coral community. Details are provided in Section 4.1 below.

4.1 Coral monitoring

Monitoring activities will be undertaken throughout the construction phase in relation to the identified objectives and targets. Reactive monitoring of the Channel Island coral community will be carried out in recognition of its listing on the Register of the National Estate and its declaration as a “heritage place” under the *Heritage Conservation Act* (NT). The declaration is based upon the survival of a relatively diverse coral community in an area where the physical conditions—high turbidity, a strong tidal current and seasonally low salinity—appear to be suboptimal for corals.

Coral monitoring at South Shell Island and at a coral community off the north-east coast of Wickham Point will investigate the degree of resilience of corals in East Arm to exposure to sedimentation and elevated turbidity. Plume-dispersion modelling indicates that these communities will intermittently be exposed to turbid plumes but that there will be little, if any, sediment accumulation.



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Figure 4-1: Water quality monitoring sites in Darwin Harbour

4.1.1 Water-quality baseline monitoring program

Baseline water quality will be characterised by a 12-month monitoring program prior to the commencement of dredging activities. Water-quality parameters, including turbidity, salinity and temperature, will be measured in situ using data loggers.

Water-quality data will be collected at the following four sites (see Figure 4-1), which will also be used for coral monitoring:

- the Channel Island coral community approximately 1.5 km south of the pipeline shore crossing, the impact site of primary interest
- Weed Reef, a reference site approximately 3 km south-east of Talc Head that will enable the identification of any broad-scale influences on water quality (e.g. elevated turbidity because of storm conditions)
- South Shell Island, a coral community located on the north side of the shipping channel dredging area in East Arm, approximately 0.5 km south of East Arm Wharf
- a coral community located to the south-west of the shipping channel dredging area in East Arm, approximately 0.6 km off the north-east coast of Wickham Point.

Trigger levels

The water-quality baseline monitoring program will be used to develop trigger levels for turbidity (measured as nephelometric turbidity units (NTUs) that can be used to guide management responses during the dredging program. These trigger levels will be calculated following the methodology of McArthur, Ferry and Proni (2002):

- Baseline data will be tabulated for intensity (range of NTU values), duration (range of hours) and frequency (the number of times that NTUs fell within each range for each duration).
- The 99th percentile turbidity value (i.e. the value below which natural turbidity occurs 99% of the time) will be adopted as the “Intensity Guideline”.
- The 95th percentile turbidity value (i.e. the value below which natural turbidity occurs 95% of the time) will be adopted as the “Threshold Level”.
- The data set will then be analysed to determine the distribution of all duration events during which the turbidity Threshold Level was exceeded. The 95th percentile longest event will be adopted as the “Duration Guideline”.
- All events exceeding the turbidity Threshold Level will be grouped into classes by duration, with a

fortnightly frequency distribution developed for each duration class. The 95% confidence limit will be adopted as the allowable frequency of exceedances (per fortnight) of the Threshold Level for each duration class.

Between wet and dry seasons and between neap and spring tides there are considerable differences in natural turbidity levels; hence a matrix of trigger levels will be required.

4.1.2 Reactive coral monitoring program

The purpose of the reactive coral monitoring program is to identify negative stress responses caused by the dredging program in corals at potential impact sites. Negative stress responses, if identified, may trigger modifications to dredging activities to reduce the environmental impact of the activity.

As noted in Section 1.2, the key potential mechanisms of impact on coral communities are increased turbidity in the water column, which reduces light levels reaching the corals, and direct smothering of corals by settling sediment. The reactive coral monitoring program focuses on measurements of turbidity rather than sedimentation. The latter cannot be measured in a way that accurately represents the degree to which corals are exposed to stress—sediments settle from the water column on to corals during slack tide periods (when current flow is minimal) but are then remobilised into the water column as tidal currents increase.

The reactive coral monitoring program has five main components:

1. a baseline assessment of the coral communities
2. regular measurement of turbidity during dredging activities
3. an assessment of coral condition
4. the initiation of a management response based on monitoring of turbidity trigger levels and coral mortality
5. post-dredging monitoring of coral communities.

Baseline assessment of coral communities

A baseline assessment of coral condition at each site will be made approximately one month before dredging commences. Coral condition will be assessed using the same general approach as that adopted for the East Arm Wharf monitoring program (GHD Pty Ltd 2002) and the Bayu–Undan to Darwin Pipeline Project. The coral communities at Channel Island and Weed Reef are known to be similar in composition and substrate cover.

Monitoring will be focused on hard corals of three genera:

- *Herpolitha*—This is a “slipper” coral that is flat, narrow and elongate with an axial furrow and rounded ends. Mouths are present within the furrow and over the rest of the upper surface. *Herpolitha limax* is common on partly protected reef slopes and in areas of high turbidity, low light and gentle water movement.
- *Mycedium*—This coral is highly adaptive to a wide range of habitats from turbid inshore reefs to offshore reefs in clear water. It is uncommon in areas of strong wave action. *Mycedium elephantotus* forms laminar or encrusting colonies with distinctive corallites facing outwards to the colony perimeter.
- *Turbinaria* spp.—These corals are typically dominant in shallow, turbid habitats, though they are also found in habitats ranging from shallow exposed reefs to protected lagoons. Their morphology is primarily determined by light availability and colonies are typically composed of unifacial laminae which are upright or tiered, on upper reef slopes; highly contorted and fused, in subtidal habitats; or horizontal, in deeper waters.

In previous monitoring programs (e.g. GHD Pty Ltd 2002) a fourth coral genus *Goniopora* was included. However, there is an insufficient density of *Goniopora* colonies at Weed Reef to warrant their inclusion in the present program.

Site establishment will include development of transects at the monitoring sites and tagging of individual coral colonies. If visibility permits, a photographic record will be made of the colonies and the surrounding coral communities. If turbidity levels are too high to permit photography, a semi-quantitative assessment of coral condition will be recorded from diver observations.

Each genus will be represented at each site by 25 colonies (i.e. 75 coral colonies per site). Transects will be of sufficient length to ensure that the required number of colony replicates has been obtained, and that the area covered is of sufficient size to be representative of the particular reef on which it has been placed. Transect lengths are expected to vary between sites and will be determined during site establishment.

Turbidity measurements during dredging

Two weeks prior to the start of dredging works at the gas export pipeline shore crossing, one turbidity logger will be deployed at the Channel Island coral community and another at the Weed Reef reference site. They will be serviced once a week, when data will be downloaded and the loggers redeployed. They will remain in place over the duration of dredging works for the pipeline shore crossing and approaches.

Aerial surveillance of turbid plumes arising from dredging activities at the pipeline shore crossing will also be undertaken. This will occur during daylight hours on every second day over the first two weeks of dredging. Aerial surveys will be carried out at mid-flood tide, when plume excursion “upstream” from the shore crossing would be at a maximum. Past observations (Ian Baxter, Principal Environmental Scientist, URS, pers. comm. April 2009) have shown that the initial flood-tide flow over the Channel Island coral community is in a north–south direction. This reverses after mid-flood tide as water passing around the southern side of Channel Island flows in a northerly direction under Channel Island bridge.

Over the initial surveillance period, it should be possible to develop an understanding of the behaviour of any plumes generated, with “worst case” tidal conditions defined. During spring tides, excursion of plumes towards Channel Island will be maximal because of the strong currents, though the plumes may be less distinguishable as they will be diluted by naturally turbid tidal waters. During neap tides, the plumes will more distinguishable as natural turbidity levels are lower, though they will not be carried as far by the tidal currents.

In the event that turbid water plumes from the dredging works are observed to be reaching Channel Island, data from the turbidity loggers will be downloaded within 24 hours. If there is no evidence from the aerial surveillance that turbid plumes are encroaching on the Channel Island coral community, the turbidity data from the Channel Island logger will be analysed after the first week of dredging. The turbidity data will be compared against the Threshold Level and Intensity Guideline, and the appropriate course of action to comply with the reactive dredging management response framework (Figure 4-2) will be implemented.

If the turbidity Threshold Level has been exceeded on more than the allowable number of occasions, an assessment of coral condition (see next section) will be undertaken. If required, management responses (see below) will be implemented.

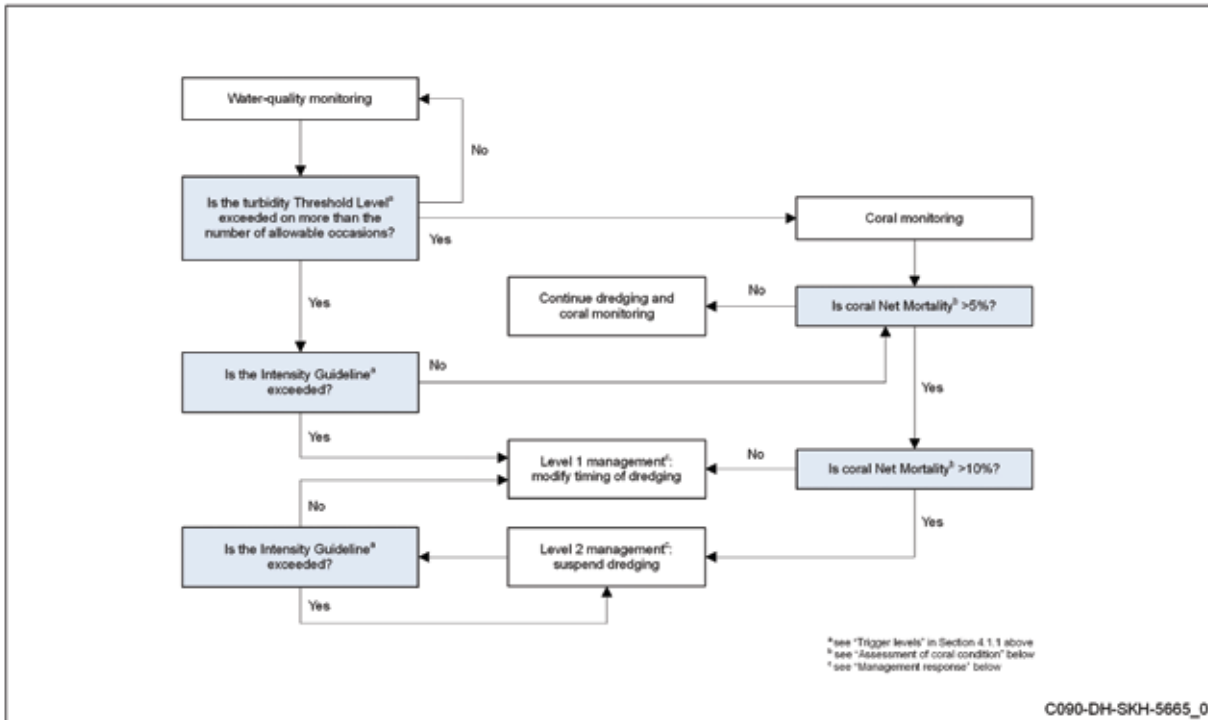


Figure 4-2: Reactive dredging management response framework

Assessment of coral condition

If median turbidity levels at the Channel Island site exceed the Threshold Level (95th percentile) at greater than the allowable frequency during dredging, then the corals tagged during the baseline survey will be rephotographed and scored for partial mortality. Each photograph will be overlain with an 8 × 8 grid and the points scored for mortality. The estimate of coral mortality at each site will be calculated by summing the percentage mortality of each colony and dividing by the number of colonies. This value will be expressed as the reduction in live coral cover as a percentage of the baseline coral cover.

Coral mortality will be evaluated as a relative increase in partial mortality above the baseline:

- MB (Gross Mortality, baseline) = $nPM(i)/(nL(i) + nPM(i))$, where PM(i) and L(i) are the number of points ascribed to Partial Mortality and Live respectively for each individual colony
- MS (Gross Mortality, survey) = as above
- M (Gross Mortality, at site) = $(MS - MB) \times 100$
- MNet (Net Mortality at site) = $M(\text{Site}) - M(\text{Ref})$; where M(Site) is the Gross Mortality at the impact site and M(Ref) is the average Gross Mortality at the reference site. This is the value that will be used to test the coral health limit triggers (5% or 10% mortality).

The adoption of the 5% and 10% mortality triggers is in line with those adopted for recent dredge monitoring programs elsewhere in northern Australia, for example, by Western Australia’s Environmental Protection Authority (EPA) for the Pluto liquefied natural gas (LNG) development on the Burrup Peninsula (EPA 2007). The upper coral health limit trigger (10% mortality) has represented the level at which management actions are required to minimise the risk of dredging-induced coral mortality eventually exceeding 30%. On the basis of findings by Connell (1997), Western Australia’s EPA deemed that an exceedance of 30% mortality represented an unacceptable level of impact for the corals of Dampier Harbour (Stoddart et al. 2005). It is considered that the environmental settings of Darwin and Dampier harbours are similar enough (tropical, macrotidal, typically turbid waters) for the same criteria to be adopted.

While it would be preferable to monitor for sublethal effects rather than for mortality, this is impractical as some measurements of sublethal indicators (e.g. lipid ratios) require time frames unsuited to operational dredge management, while others (e.g. bleaching, fluorescence measurements) may be confounded by responses to factors unrelated to dredging (Stoddart et al. 2005).

Management response

If net coral mortality at the Channel Island site is less than 5%, then turbidity monitoring will continue and dredging will proceed unchanged. If coral Net Mortality is greater than 5%, then there are two levels of management response that may be implemented to reduce the risk of impacts upon the Channel Island coral community (Figure 4-2):

- Level 1—This level will be implemented if the median turbidity level at the Channel Island site exceeds the Threshold Level at greater than the allowable frequency during construction and net coral mortality is between 5% and 10%. It will also be implemented if the Intensity Guideline (99th percentile value) is exceeded and net coral mortality is less than 10%. The timing of dredging activities will be modified so that the potential for plumes to impinge upon the Channel Island coral community is reduced (e.g. restrictions on dredging around low-water periods). These measures will remain in place until the construction activities for the gas export pipeline shore crossing have been completed.
- Level 2—This level will be implemented if coral Net Mortality at the Channel Island site is greater than 10%. Dredging activity will be suspended until such time as the median turbidity level returns to below the Intensity Guideline, or the cause of mortality is demonstrated to be attributable to natural impacts such as thermal bleaching, predation or disease. When dredging recommences, it will proceed with Level 1 management measures in place until the end of the dredging program.

In the event that the median turbidity level at the Channel Island site exceeds the Threshold Level but coral monitoring cannot be undertaken because of the elevated turbidity levels, the following management responses will be implemented until such times as water clarity improves and a coral assessment can be undertaken:

- Level 1 if the median turbidity level is less than the Intensity Guideline.
- Level 2 if the median turbidity level is greater than the Intensity Guideline.

The Northern Territory's Department of Natural Resources, Environment, the Arts and Sport (NRETAS) will be notified of the results of the turbidity and coral monitoring at the earliest opportunity and will be informed of any management actions implemented in response to monitoring data.

Post-dredging monitoring

Post-dredging monitoring of coral health will be undertaken in the event that significant levels of coral mortality are recorded at Channel Island, relative to the reference site, and the mortality cannot be attributed to natural causes. The frequency and duration of any post-construction monitoring will be dependent upon the degree of mortality recorded. Recommendations for any post-construction monitoring will be presented to NRETAS at the conclusion of the dredging program.

4.2 Periodic surveys

4.2.1 Offshore spoil disposal ground

Accumulation of dredged spoil on the seabed at the offshore spoil disposal ground will be monitored during the dredging program to prevent the creation of large mounds that could affect the safe passage of ships over the area. The minimum depth to be maintained across the disposal area will be agreed in consultation with the DLP prior to commencement.

Bathymetric surveys will be conducted over the area as follows:

- prior to commencement of dredged spoil disposal, to establish baseline conditions
- periodically during dredged spoil disposal, initially every 2–4 weeks and less frequently as the accumulation of dredged spoil at the disposal area becomes better understood.
- on completion of the dredging and disposal program.

Management response

The potential for large mounds of dredge spoil to develop will be reduced by continually altering the location of disposal within the ground. Where mounds are found to be accumulating, spoil disposal vessels will be directed away from those areas towards areas of lower seabed profile.

4.2.2 East Arm

Periodic inspections will be conducted in East Arm, where sediment accumulation could potentially impact upon the operability of infrastructure such as the berths at East Arm Wharf, the Hudson Creek export facilities and the East Arm boat ramp. Any unacceptable levels of sediment accumulation that occur in these areas will be removed at the end of the dredging program, or earlier if operability is affected.

Management response

If the depths of accumulated sediment reduce under-keel clearances to less than those agreed with the DPC prior to dredging, then remedial dredging will be undertaken.

4.3 Coastal sedimentation

4.3.1 Sedimentation at vessel ramp facilities

Observations will occur periodically at locations where sediment plume modelling indicates that sedimentation in intertidal areas is likely to occur.

Observations will be conducted at the following locations:

- the East Arm boat ramp
- the Hudson Creek export facility
- East Arm Wharf.

Monitoring at these locations will occur as follows:

- prior to the commencement of dredging in order to establish baseline conditions
- periodically during dredge spoil disposal operations, initially every 2–4 weeks and less frequently once sedimentation patterns become better understood
- on completion of the dredging and dredge spoil disposal program.

Management response

Should quantities of sediment accumulate at the East Arm boat ramp, Hudson Creek export facility or East Arm Wharf that are sufficient to impede boat launching activities, or render them unsafe, these facilities will be cleaned as required.

4.3.2 Sedimentation in mangrove areas

An Intertidal Sedimentation Monitoring Program will be developed to assess the effects of sediment accretion on seaward mangrove communities throughout East Arm.

The monitoring program will include the following activities:

- A baseline assessment of mangrove health and sediment levels will be carried out at key potential impact sites and at suitable reference sites.
- Quarterly rapid assessments of mangrove health will be carried out at the monitoring sites to detect short-term and localised changes in tree condition and canopy cover. Sediment accretion will also be measured, using a surveying method appropriate to the small-scale changes (i.e. centimetres) that may occur.

Management response

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.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken throughout the construction phase of the Project. A summary of the reporting, auditing and review requirements relating to dredging and dredge spoil disposal management is presented below:

- Incidents resulting from dredging and dredge spoil disposal will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- Reporting of all confirmed incidents will be made to the relevant authorities (e.g. NRETAS, the DPC and the DLP).
- An annual INPEX environmental report for the Project will be produced and will include details of dredge incidents.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Records will be audited periodically to ensure that all personnel on site have completed the required health, safety and environment induction.
- Detailed dredging and dredge spoil disposal management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.
- Dredging contractors will be required to produce and provide to INPEX a monthly environmental report which will include a record of all environmental incidents.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's dredging and dredge spoil disposal management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the preparation of INPEX's detailed dredging and dredge spoil disposal management requirements:

- health, safety and environment site induction
- incident reporting, recording and investigating
- monitoring programs
- permit-to-work system.

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards.

In recent years dredging programs have required a waste discharge licence under Section 74 of the *Water Act* (NT). In addition, under the *Darwin Port Corporation Act* (NT) the DPC may make by-laws pertaining to the control, regulation and management of dredging works within port limits.

The Northern Territory Government is presently developing guidelines for dredging activities, which will be based upon the *National assessment guidelines for dredging* prepared by the Commonwealth's Department of the Environment, Water, Heritage and the Arts (DEWHA 2009). These may influence the way in which INPEX's proposed dredging works are licensed.

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Provisional Dust Management Plan

Annexe 7 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential environmental impacts of, the dust that will be generated by clearing and earthworks activities in the onshore development area during the construction and decommissioning phases of the Project.

Dust is generated when there is sufficient wind velocity to lift fine particles from the ground surface. The susceptibility of the particles to lift is dependent on the following:

- the physical characteristics of the soil (e.g. particle composition, density and size)
- the velocity of the wind
- the direction of the wind
- the moisture content and degree of compaction of the soil
- the amount of ground cover.

The susceptibility of particles to lift will also be influenced by Project activities such as vehicle and machinery movements.

Particles with diameters greater than 50 µm are unlikely to become airborne or will only remain in the air for a few minutes and settle near the source. Smaller particles, however, especially those less than 10 µm in diameter, can remain in the air for several days and can be spread by winds over wide areas or long distances from the original source. In addition, these particles can enter the lungs of humans and other animals and can create or exacerbate respiratory problems.

The most significant sources of particulates from the Project will be dust generated during the construction phase and potentially during the decommissioning phase (although the extent of this will be dependent on a government determination on what the land use for the Blaydin Point site is to be when the Project ends). Dust emissions during the operations stage are expected to be minimal as all main access roads and permanent work areas will have been sealed. Dust management will therefore be implemented primarily for the construction phase of the Project.

This provisional environmental management plan (EMP) for dust control is attached as Annexe 7 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for

the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX will reduce the potential environmental impact of dust generated as a result of Project activities through the identification of suitable dust management controls.
- It describes the proposed dust monitoring requirements for the construction phase of the Project.
- It describes the proposed reporting, review and audit requirements for the construction phase of the Project.
- It will guide the development of the detailed environmental documentation, such as the plans, procedures, etc., which will be required during the construction phase of the Project.

The scope of this provisional EMP includes dust generated as a result of onshore clearing, earthworks and drilling and blasting activities in the onshore development area during the construction phase.

This provisional EMP does not address the additional environmental impacts or management controls associated with clearing, earthworks, drilling and blasting activities and dust produced as a result of decommissioning activities. These are addressed as separate aspects under the following provisional EMPs:

- Provisional Decommissioning Management Plan (Annexe 5 to Chapter 11)
- Provisional Piledriving and Blasting Management Plan (Annexe 12 to Chapter 11)
- Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan (Annexe 15 to Chapter 11).

1.2 Plan definitions

Micrometre (µm)

A micrometre is one-millionth of a metre (or one-thousandth of a millimetre). The symbol for the micrometre is µm. (This unit was formerly known as the micron.)

Nanometre (nm)

A nanometre is one-thousandth of a micrometre or one thousand-millionth of a metre. The symbol for the nanometre is nm.

Particulate matter (PM)

This is a term used to describe a complex group of air pollutants that are regarded as a severe health hazard. These pollutants are a mixture of fine airborne solid particles and liquid droplets (aerosols) and include, for example, smoke and dust particles, pollen, a variety of chemical compounds and trace metals. Particulate matter is usually categorised as PM₁₀ or PM_{2.5}.

The particulate matter of concern to the Project is PM₁₀ (for “particulate matter <10 µm”) where the particles have an aerodynamic diameter of less than 10 µm. These particles pose a high degree of health concern because they can pass through the nose and throat and enter the lungs, creating or exacerbating respiratory problems.

1.3 Project dust sources

The following construction activities represent the greatest potential for generating dust emissions:

- all earthwork activities associated with site preparation and construction, including the clearing of vegetation, the grading of soil and fill, and excavation activities including blasting for site levelling and trenching
- materials crushing and screening operations
- loading, dumping and transport of material
- uncovered or exposed surfaces and bulk materials stockpiles
- vehicle movements on unsealed roads and hardstand areas.

1.4 Potential impacts

The potential impacts associated with dust generation include the following:

- adverse impacts on plant health by the smothering of leaves etc.
- adverse impacts on visual amenity

- nuisance to and health impacts on nearby human communities
- health impacts to the workforce.

The effects of dust on animals are likely to be of an indirect nature. Plants affected by excessive dust loads may yield less fruit and seed or they may fail to photosynthesise effectively, lose leaves and, in extreme cases, die. This in turn will affect the resources available to the animals dependent on the vegetation for shelter, food, etc.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for dust management are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

3 MANAGEMENT APPROACH

Detailed dust management documentation, for example plans and procedures, will be developed for the construction phase of the Project. These documents will align with this provisional dust EMP. The detailed documentation will be prepared either directly by INPEX’s Environmental Department or by specialist contractors in conjunction with INPEX.

A summary is provided below of the main engineering and management controls to be included in the detailed documentation and in the design of the Project facilities to mitigate the risk of dust emissions.

3.1 Engineering controls—design phase

Roads required for the operations phase will be sealed as soon as practicable after clearing in order to minimise dust emissions from vehicle movements.

Table 2-1: Dust management objectives, targets and indicators

Objectives	Targets	Indicators
Prevent any adverse impacts from dust on the environment during the construction phase of the Project.	• Zero impacts on vegetation health attributable to dust.	• Number of adverse impacts attributable to dust generation.
	• No significant visible dust attributable to the Project outside the onshore development area boundary.	• Visible dust outside the boundary.
Establish and maintain personnel awareness of the importance of dust management practices during the construction phase.	• All workforce personnel (including contractors) to complete a health, safety and environment (HSE) induction, which will include an overview of dust management practices.	• Number of people accessing the site as recorded by security, versus the number of people completing an HSE site induction.

3.2 Management controls— construction phase

The management controls to be implemented throughout the construction phase of the Project are outlined below:

- Multiple handling of material that has the potential to generate dust will be avoided where possible.
- Dust-suppression techniques will be applied where necessary to protect worker health, vegetation health, and amenity. The techniques employed may include spraying from water trucks and irrigation networks, and stabilisation and revegetation of cleared areas that are no longer needed as soon as practicable during construction.
- Dust-suppression additives may be used to increase the effectiveness and reduce the volume of the water required for dust suppression.
- All trucks transporting soil, aggregate, and/or other dust-generating materials to and from the onshore development area will have their loads wetted or covered, if required, to prevent the creation of dust.
- Blasting mats or similar will be used if blasting has to take place near sensitive receptors (e.g. mangroves).
- Areas cleared for temporary use will be rehabilitated as soon as practicable to minimise the potential for windborne dust generation.
- Personnel (including contractors) will be required to attend inductions when they first attend site during the construction phase of the Project. The induction sessions will include information on the dust-suppression techniques employed on site.

4 MONITORING

Monitoring activities will be undertaken throughout the construction phase of the Project in relation to the identified objectives and targets. The activities described below will be undertaken as part of the dust management monitoring program:

- Visual inspections of dust deposition on surrounding vegetation will be undertaken on a periodic basis.
- Visual inspections will be undertaken during activities likely to create dust (e.g. vegetation clearing and earthworks) to assess the effectiveness of the dust-mitigation measures.
- Dust exceedance incidents will be monitored using INPEX's and its contractors' incident-reporting databases.

Triggered management response

A management response will be triggered by any of the following three circumstances:

- 1 a dust "incident"
- 2 an exceedance of the monitoring criteria for dust emissions
- 3 the identification by an annual management review of a failure to meet an objective or target.

The responses to these are outlined below.

Response to dust "incidents"

A dust incident will be defined as a public complaint or an on-site workforce observation associated with dust. Detection of such incidents will trigger internal notifications, reporting requirements, investigations and associated corrective and preventive actions.

The level of investigation will be dependent on the potential risk associated with the event. Corrective and preventive actions that may be triggered as a result of the investigation would include the review and update of procedures or plans associated with dust management, the provision of refresher training for personnel on Project dust management practices, and/or an increase in dust-suppression activities.

The INPEX Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigation requirements. All dust incidents and "near misses" will be entered into INPEX's and its contractors' incident databases and corrective actions will be tracked to closure.

Response to monitoring exceedances

Exceedances of the monitoring criteria for dust emission will include the following:

- the generation of significant quantities of visible dust at the worksite and beyond its boundaries
- the deposition of significant quantities of visible dust on vegetation beyond the worksite boundaries.

Responses to exceedance of dust emission monitoring criteria could include the following:

- an increased level of application of existing dust suppression management controls
- an increased level of monitoring of vegetation communities
- additional monitoring of PM₁₀ dust emissions at the boundaries of sensitive human communities
- a review and update of procedures or plans associated with dust management
- the provision of refresher training for personnel on Project dust management practices.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will trigger the following responses:

- a review and audit of current dust management practices to assess the practicability of their implementation and to assess the resources required to implement the plan
- a review of current objectives and targets to assess achievability.

The response to the results of investigations and audits could include the following:

- the updating of plans and associated documentation to reflect changes to dust management practices
- the provision of refresher training for personnel on site dust-management practices and processes
- the possible sourcing of additional resources to assist in achieving the successful implementation of the dust management plan.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken during the construction phase of the Project.

A summary of the reporting, auditing and review requirements for dust management is presented below:

- Incidents resulting in the injury or death of plants or animals and impacts on human health as a result of the generation of airborne dust or dust level exceedance will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- Construction contractors will be required to produce and provide to INPEX a monthly environmental report which will include a record of environmental incidents and records of dust-suppression activities.

- An annual INPEX environmental report for the Project will be produced. It will include details of dust monitoring results and dust incidents.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Records will be audited periodically to ensure that all personnel on site have completed a health, safety and environment induction.
- Detailed dust-management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's dust management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the implementation of detailed dust management documentation:

- incident reporting, recording and investigating
- HSE site induction.

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments, standards and guidelines specifically related to dust management include the following:

- AS/NZS 3580.1.1:2007, *Methods for sampling and analysis of ambient air—Guide to siting air monitoring equipment*.
- AS/NZS 3580.10.1:2003, *Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter—Gravimetric method*.
- National Environment Protection Council. 2003. *National Environment Protection (Ambient Air Quality) Measure*. Commonwealth Government, Canberra, ACT.
- National Environment Protection Council. 2008. *National Environment Protection (National Pollutant Inventory) Measure 1998* (as varied). Commonwealth Government, Canberra, ACT.
- *Waste Management and Pollution Control Act* (NT).
- *Workplace Health and Safety Act* (NT).
- *Workplace Health and Safety Regulations* (NT).



Provisional Greenhouse Gas Management Plan

Annexe 8 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

INPEX is seeking government environmental approvals for the Ichthys Gas Field Development Project (the Project). It intends to develop the Ichthys Field off the north-west coast of Western Australia to produce liquefied natural gas (LNG), liquefied petroleum gas (LPG) and condensate for export to markets in Japan and elsewhere. INPEX proposes that gas, together with a relatively small volume of condensate, will be transferred from the offshore central processing facility (CPF) through a subsea gas export pipeline to the onshore processing facility at Blaydin Point on Middle Arm Peninsula in Darwin Harbour. The greater part of the condensate will be exported from a floating production, storage and offtake (FPSO) facility adjacent to the CPF.

As part of the governmental approvals process for the Project, it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the potential environmental impact of greenhouse gas (GHG) emissions generated by the Project both onshore and offshore during its lifetime.

The life-cycle emissions of carbon dioxide (CO₂) and other GHGs from LNG production and consumption are low in comparison with those of other hydrocarbon fuels such as coal and fuel oil. However, the scale of the Project's gas production and processing facilities is such that it will be a major GHG source in Australia and the largest GHG emitter in the Northern Territory.

Natural gas has a positive transitional role to play in the domestic and transport energy markets. Compared with coal and fuel oil, natural gas produces less GHG to produce the same amount of power.

The Project has two significant sources of GHG emissions: reservoir CO₂ and combustion emissions. An emissions assessment by source for GHGs produced by the Project has been conducted in order to evaluate options for minimising GHG emissions and to satisfy the information requirements of the Commonwealth and Northern Territory governments. The methodology employed to calculate GHG emissions is consistent with the methodology used by the Commonwealth's *Department of Climate Change publication National greenhouse accounts (NGA) factors* (DCC 2009).

It is estimated that the average annual emissions from the Project will be 7.0 Mt/a of CO₂, made up of 2.4 Mt/a of reservoir CO₂ emissions and 4.6 Mt/a of combustion CO₂ emissions (of which 2.8 Mt/a will be generated onshore and 1.8 Mt/a offshore) (see Table 1-1).

Total GHG emissions from reservoir CO₂ have been estimated over the 40-year life of the Project as approximately 96 Mt. This assessment indicated that during operations the reservoir GHG emissions will make up approximately 35% of the Project's emissions, while the onshore combustion and offshore combustion emissions will produce 39% and 26% respectively.

This provisional environmental management plan (EMP) for greenhouse gas emissions is attached as Annexe 8 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will be used as a basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX intends to manage GHGs generated as a result of activities during the operations phase of the Project through the identification of suitable GHG management strategies.
- It describes the proposed monitoring requirements for all phases of the Project.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of a future more detailed operations-phase GHG EMP, to be developed prior to the commissioning of the onshore processing plant.

The scope of this provisional EMP takes into account all GHGs generated in association with activities in the Ichthys Project area (both onshore and offshore) during the lifetime of the Project.

1.2 Plan definitions

Biosequestration

Biosequestration is the process of converting a chemical compound through biological processes to a chemically or physically isolated or inert form. The term is most commonly used to refer to the "locking", through photosynthesis, of the carbon in atmospheric CO₂ into plant biomass (usually trees). Biosequestration offsets the effect of the CO₂ and other GHGs released by the development of natural gas fields and the burning of fossil fuels.

Table 1-1: Estimated average annual CO₂ emissions during operations

Source	Approx. power requirement	Approx. heating requirement	40-year annual average (Mt/a)	40-year totals (Mt)
Reservoir				
Brewster	n.a.	n.a.	1.4	56
Plover	n.a.	n.a.	1.0	40
Reservoir total	n.a.	n.a.	2.4	96
Offshore combustion*				
CPF—export gas compression (four RB211 turbines)	100 MW	n.a.	0.5	20
CPF—inlet gas compression (three RB211 turbines)	0 initially; 75 MW from Year 12	n.a.	0.3 [†]	12
CPF—power generation (three RB211 turbines)	75 MW	n.a.	0.3	12
FPSO—power generation (four RB211 turbines)	100 MW	n.a.	0.5	20
FPSO—fired heating for monoethylene glycol (MEG) regeneration, condensate heating and stabilisation	n.a.	60 MW	0.2	8
Offshore total	275–350 MW	60 MW	1.8	72
Onshore combustion[‡]				
Refrigerant compressor turbines (four Frame 7 turbines)	280 MW	n.a.	1.4	55
Power generation turbines (nine Frame 6 turbines, eight running)	220 MW	n.a.	0.9	35
Acid gas removal unit (AGRU) incineration	n.a.	40 MW	0.1	4
Hot-oil furnaces and possibly steam boilers	n.a.	80 MW	0.2	7
Flares (all)	n.a.	n.a.	0.2	9
Onshore total (excl. reservoir)	500 MW	120 MW	2.8	110
Total for Project			7.0	278

* Rolls-Royce RB211 turbines are assumed for offshore use for estimation purposes only. Turbine choice is subject to technical assessment in the detailed-design phase.

[†] CO₂ emissions will be zero for approximately the first 11 years, 0.5 Mt/a for the next 29 years, and will average to 0.3 Mt/a over 40 years.

[‡] General Electric Frame 6 and Frame 7 turbines are assumed for onshore use for estimation purposes only. Turbine choice is subject to technical assessment in the detailed-design phase.

n.a. = not applicable.

Carbon dioxide equivalent

The unit known as carbon dioxide equivalent (CO₂-e) is a measure, using CO₂ as the standard, used to compare the global warming potentials of the different GHGs. The measure is often expressed in millions of tonnes of carbon dioxide equivalents (Mt of CO₂-e). For example, if the global warming potential for methane (CH₄) over 100 years is taken as 21 (DCC 2009), this means that the emission of 1 Mt of CH₄ may be expressed as the emission of 21 Mt of CO₂-e.

Combustion greenhouse gases

In the context of LNG production, “combustion greenhouse gases”, as opposed to “reservoir greenhouse gases”, are created by burning any type of carbon-containing fuel in the LNG production process. They are produced, for example, from the gas turbines used for compression and power generation, from acid gas removal units (AGRUs), from hot-oil furnaces, and from flares.

Geosequestration

Geosequestration is the process of injecting CO₂ into deep geological formations for secure, long-term storage. The technique is also called “carbon (dioxide) capture and storage”.

Global warming potential

Global warming potential (GWP) is a measure of how much a given mass of a greenhouse gas is estimated to contribute to global warming. It is a relative scale which compares the global warming potential of the gas in question with that of an equivalent mass of CO₂ (which has been assigned the point-of-reference global warming potential of 1).

Greenhouse gas

Any of a number of gases found in the atmosphere which contribute to the greenhouse effect. The gases principally responsible for the greenhouse effect are defined in the *National Greenhouse and Energy Reporting Act 2007* (Cwlth) as carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and sulfur hexafluoride (SF₆), together with certain specified hydrofluorocarbons and perfluorocarbons. GHGs also include water vapour, but although water vapour is the most significant GHG, CO₂ is considered the most significant man-made GHG and is the primary focus of government policy.

Methane

Methane is a colourless, odourless hydrocarbon gas. It is the principal component of natural gas. It has the capacity to cause 21 times more global warming than CO₂ per unit of weight (DCC 2009).

Nitrous oxide

Nitrous oxide is a colourless non-flammable gas. It has the capacity to cause 310 times more global warming than CO₂ per unit of weight (DCC 2009).

Reservoir carbon dioxide

Reservoir CO₂ is the CO₂ that is naturally present in a natural gas formation. It is typically vented to atmosphere when the gas is processed. It is sometimes referred to as “native CO₂”.

1.3 Potential sources of greenhouse gas emissions

Emissions of CO₂ are expected to represent about 96% of the Project’s total GHG emissions (measured in tonnes of CO₂-e). The emissions of CH₄ and N₂O combined are expected to contribute about 4% of the total GHG emissions. Significant sources of CO₂ emissions from the Project are listed in Table 1-1.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for the management of GHGs are shown in Table 2-1. The engineering and management controls implemented to help to achieve these targets are described in Section 3 *Management approach*.

3 MANAGEMENT APPROACH

A GHG management plan will be developed prior to the commissioning of the onshore and offshore processing facilities. The detailed plan will align with this provisional greenhouse gas EMP. The GHG management plan for the Project will be developed by INPEX with the support of design and commissioning contractors.

A summary is provided below of the main engineering controls, management controls and offset initiatives that have been adopted or are currently being assessed through the development phase, and which will minimise INPEX’s net contribution to global GHG production.

3.1 Major engineering—design phase

The engineering strategies (each with varying degrees of GHG reduction) being investigated during the design phase of the Project are as follows.

Applicable to both onshore and offshore

- Consideration will be given to installing flare-gas recovery systems on all flare systems.
- A review of flare systems will be undertaken to minimise the number of relief valves directed to flare headers.
- Waste-heat recovery units will be installed wherever waste heat can be economically utilised.
- Selection of turbines will be based both on the Project’s power requirements and on the turbine operating efficiencies in high ambient temperatures.

Table 2-1: GHG management objectives, targets and indicators

Objectives	Targets	Indicators
Minimise GHG emissions through applying safe and cost-effective abatement technologies.	<ul style="list-style-type: none"> • The Ichthys Project should use up-to-date technology, e.g. it should select efficient gas turbines, use waste heat to the fullest practicable extent, and select an efficient AGRU solvent. 	<ul style="list-style-type: none"> • Technology selection benchmarking of selected components, e.g. power generation efficiency.
Offset GHG emissions in a safe and cost-effective manner, consistent with domestic and international obligations.	<ul style="list-style-type: none"> • Targets for offsetting to be set once there is greater certainty in the legal and legislative framework around the Commonwealth Government’s Carbon Pollution Reduction Scheme and once the technical and economic risks associated with offset options have been assessed. 	<ul style="list-style-type: none"> • Total quantity of CO₂-e offset.

- Flow metering and monitoring, and high-pressure alarms, will be installed on all flare systems.
- An electronic process monitoring and control system may be installed to enable monitoring of flaring and process upsets.

Onshore-specific

- Combined-cycle gas turbines will be investigated as an alternative to open-cycle gas turbines for power generation.
- Tandem dry-seal arrangements will be installed in the main refrigerant compressors.
- Condensate tanks will be fitted with floating roofs to minimise emissions.
- High-efficiency pump motors may be installed on equipment.
- The liquefaction units will include provision to reclaim propane on shutdowns instead of needing to flare this inventory.
- Provision may be made to reclaim light and heavy mixed refrigerant rather than sending it to flare.
- Activated methyldiethanolamine (aMDEA) has been selected as the preferred solvent for acid gases in the AGRUs and will help to minimise CO₂-e emissions.
- The high-pressure flash gas from the AGRUs will be directed to the fuel gas system if practicable.
- The low-pressure gas from the AGRUs will be directed to the AGRU incinerators if practicable.
- The liquefaction units may include provision to reclaim light and heavy mixed refrigerant during operating to change the mixed refrigerant composition.
- Boil-off gas recovery systems will be installed for boil-off gas produced by LNG tanks and LNG ships during normal loading operations.
- Measures may be incorporated in the LPG extraction and storage systems to maximise heat recovery and reduce compression, therefore increasing process efficiency.
- The liquefaction process will be designed to recover a significant amount of LPG from the feed gas before LNG is produced.
- High-efficiency insulation of LNG cryogenic lines will be incorporated into the process design.
- Consideration will be given to waste-heat recovery at the AGRU incinerators.
- Turboexpanders will be used in the LPG process to recover power from let-down of feed-gas pressure.

Offshore-specific

- Aeroderivative turbines will be considered for offshore applications.
- Recovery of cargo tank vapours is being considered.

3.2 Management strategies—operations phase

The management strategies to be implemented through the operations phase of the Project will include minimisation of flaring during commissioning and operations.

3.3 Offsets

There may be a number of alternatives available for offsetting the Ichthys Project's GHG emissions, with varying feasibilities, risks and costs. As the policy landscape is still evolving and regulations and legislation are yet to be finalised, INPEX continues to explore alternatives in order to be well prepared to respond once clarity is achieved. A portfolio of GHG offsets may afford the most effective approach by avoiding a high-risk reliance on any single solution for the Project.

Details of a possible range of offset opportunities are provided in this Draft EIS in Chapter 9 *Greenhouse gas management*. A summary is provided below.

Biosequestration

Biosequestration captures carbon by locking it in to plant tissues. In Australia, the primary approach so far has been to plant "carbon-sink" forests of fast-growing, long-lived trees. There are currently few accredited biosequestration service providers. In the future there may be more.

INPEX has initiated a biosequestration assessment project to better understand the potential for this technology to offset the large volumes of CO₂ produced by the Project.

Related to the biosequestration approach are improved forestry and land-management practices to reduce CO₂ emissions. The ConocoPhillips Darwin LNG project, for example, uses fire-management practices to offset CO₂ emissions. Similar options are being assessed by INPEX although at this stage the offsets are not recognised under the Kyoto Protocol and are therefore not compliant with the Commonwealth Government's proposed Carbon Pollution Reduction Scheme legislation.

Geosequestration

Geosequestration involves the injection of CO₂ into underground reservoirs. The technology for CO₂ injection is familiar to oil and gas companies and has been used as an enhanced hydrocarbon recovery technique for many decades. The Sleipner natural gas field in the North Sea is utilising this technology and it is being considered for the Gorgon Project in Western Australia.

Geosequestration is best suited to applications where there are significant point-source GHG emissions, for example industrial processing (including LNG production) and electricity generation where there is suitable storage reservoir capacity nearby.

Buying offset credits on the open 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 II (EU ETS II), voluntary emission reductions (VERs), and removal units (RMUs) are all available for sale on the international market. These offset measures may be acceptable as offsets in Australia. However, this will only be known when details of the Carbon Pollution Reduction Scheme and its associated legislation are finalised.

Prior to commissioning of the onshore processing plant, INPEX will produce a GHG management plan that will provide an updated GHG emission estimate forecast and will consolidate INPEX's plan for technical abatement and offsets.

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project to ensure that the identified objectives and targets are met. The activities listed below will be undertaken as part of the GHG monitoring program and energy-efficiency programs:

- quarterly stack emission monitoring on power generation and compressor turbines and the AGRUs
- the collection of monthly data on the quantities of fuel burned and the quantities of hydrocarbons produced
- the establishment of key performance indicators (KPIs) for the operations phase for flare performance and plant greenhouse gas efficiency.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken during the commissioning and operations phases of the Project. A summary of the reporting, auditing and review requirements relating to GHG management is presented below:

- INPEX will establish a greenhouse gas data management and reporting system to collate data on emissions and offsets, and to verify and report on these data.
- INPEX will report greenhouse emissions under the National Greenhouse and Energy Reporting System (NGERS).

- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- INPEX will require that commissioning contractors provide a monthly environmental report that will include a record of monthly environmental incidents and data on GHG emissions.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's greenhouse gas management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the implementation of a detailed greenhouse gas management plan:

- equipment maintenance
- operations (including flaring)
- start-up and commissioning
- greenhouse gas data management system.

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with relevant laws, regulations and standards. Legislative instruments, standards and initiatives specifically related to GHG management include those listed below.

- the Commonwealth Government's proposed Carbon Pollution Reduction Scheme.
- the Efficiency Standards for Power Generation measure, a Commonwealth Government program to improve efficiency in the greenhouse intensity of energy supply.
- *Energy Efficiency Opportunities Act 2006* (Cwlth).
- *National Greenhouse and Energy Reporting Act 2007* (Cwlth).
- the National Greenhouse and Energy Reporting System (NGERS), a Commonwealth Government approach to the collection of information on greenhouse gas emissions and energy use and production across Australia.
- *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989* (Cwlth).

8 REFERENCES

DCC—see Department of Climate Change.

Department of Climate Change. 2009. *National greenhouse accounts (NGA) factors*. Department of Climate Change, Canberra, ACT. Viewed online on 1 March 2010 at <<http://www.climatechange.gov.au/~media/publications/greenhouse-gas/national-greenhouse-factors-june-2009-pdf.ashx>>.



Provisional Heritage Management Plan

Annexe 9 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential environmental impact of, activities undertaken by the Project during the construction phase which may impinge on both Aboriginal and non-Aboriginal heritage sites in the onshore and nearshore development areas.

The proposed nearshore development requires the construction of a subsea pipeline in the Harbour leading to a pipeline shore crossing on the western side of Middle Arm Peninsula; a product loading jetty and module offloading facility at Blaydin Point; and a shipping channel and turning basin in East Arm. Within this area there are a number of historic submerged maritime archaeological sites, all of which have the potential to be impacted on by the proposed development if its activities are not properly managed.

Many of these wreck sites relate to early shipping in Darwin Harbour and to military activity during World War II. In Middle Arm, the proposed subsea gas pipeline construction corridor encompasses the wreck of the SS *Ellengowan* (1888). In East Arm, the proposed jetty and turning basin are adjacent to six historic Catalina flying-boat wrecks, three belonging to the US Navy and three to the Royal Australian Air Force. The three US Navy planes were sunk during a World War II air raid in 1942. The Heritage Branch of the Northern Territory's Department of Natural Resources, Environment, the Arts and Sport (NRETAS) has indicated that there may be heritage values associated with all of the Catalinas and that these are currently being assessed. One of the US Navy flying boats ("Catalina 6") was located for the first time during site investigations for the Ichthys Project in May 2008. An "interim conservation order" was placed on this wreck in February 2009 in terms of the *Heritage Conservation Act* (NT).

In addition to non-Aboriginal maritime heritage sites, the Aboriginal Areas Protection Authority¹ (AAPA) has identified six maritime sacred sites in the nearshore development area. Sacred sites are surrounded by "restricted works" areas in which no land or maritime development works of any kind are allowed under the provisions of the *Northern Territory Aboriginal Sacred Sites Act* (NT).

In the onshore development area there are also a number of Aboriginal heritage sites and three World

War II historical sites. An archaeological survey commissioned by the Northern Territory Government identified 19 Aboriginal archaeological sites and seven localities containing 20 isolated artefacts within the surveyed area (Wickham Point Industrial Estate) (Bourke & Guse 2007). Of those sites identified, nine sites (consisting mainly of shell and stone-artefact scatters) and one isolated artefact are located close to, or inside, the boundary of the onshore development area. All Aboriginal archaeological sites and objects are protected by the *Heritage Conservation Act* (NT), and require ministerial permission to disturb should there be a likelihood that Project activities might impact on those sites.

Three sites have been identified in the onshore development area as non-Aboriginal historic sites. The main site is located on the northern headland of Blaydin Point and consists of a number of features relating to World War II military activities. These include several concrete slabs, a possible searchlight foundation, a bomb-shelter trench, and buried refuse pits containing World War II and postwar materials. The two other sites 1.5 to 2 km to the south each have communications insulators and associated wire attached to trees (Bourke & Guse 2007). None of the three sites are listed on the Northern Territory Heritage Register and they are not the subject of interim conservation orders.

This provisional environmental management plan (EMP) for heritage site protection is attached as Annexe 9 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX will minimise the potential impact of Project activities on heritage sites, both Aboriginal and non-Aboriginal, through the identification of suitable management strategies.
- It describes the proposed monitoring requirements for all phases of the Project.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.

¹ The Aboriginal Areas Protection Authority is a statutory authority established under the *Northern Territory Aboriginal Sacred Sites Act* (NT) to administer the protection of sacred sites in the Northern Territory.

- It will guide the development of future more detailed environmental documentation, such as the plans, procedures, etc., which will be required throughout the life of the Project.

The scope of this provisional EMP includes all Aboriginal and non-Aboriginal heritage sites in the Project's onshore and nearshore development areas in Darwin.

1.2 Plan definitions

Aboriginal heritage

Aboriginal heritage may be defined as the unique and irreplaceable legacy of the ancient, diverse and complex cultures of the original inhabitants of Australia. It encompasses cultural heritage as commonly understood, but is particularly notable for its emphasis on the particular affinity that Aboriginal people have with the land and the importance they place on social values and traditions, customs and practices, aesthetic and spiritual beliefs, artistic expression and language.

Non-Aboriginal heritage

Non-Aboriginal heritage in the context of the onshore and nearshore development areas may be defined as any movable and immovable objects of archaeological, architectural, artistic and ethnographic importance which have survived from the earliest years of contact and settlement by non-Aboriginal people, including shipwrecks, artefacts, the remains of buildings and campsites, and relics from the two world wars.

1.3 Activities that may disturb Aboriginal and non-Aboriginal heritage sites

The following activities have the potential to disturb heritage sites throughout all phases of the Project:

- dredging
- pipeline construction
- product loading jetty construction
- earthworks (excavation and vibration) and clearing of vegetation
- unauthorised access or activities in undisturbed habitats adjacent to the development site
- vandalism and "souveniring".

Activities undertaken during the construction and decommissioning phases of the Project are considered more likely to have the potential to threaten Aboriginal and non-Aboriginal heritage sites than activities undertaken during the operations phase. This is attributable to the types of activity associated with these phases and to the increased numbers of personnel required to undertake these activities.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for heritage management are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described below in Section 3 *Aboriginal heritage management approach* and Section 4 *Non-Aboriginal heritage management approach*.

Table 2-1: Aboriginal and non-Aboriginal heritage objectives, targets and indicators

Objectives	Targets	Indicators
Avoid disturbance to Aboriginal heritage sites (excluding sites that have been approved for removal).	<ul style="list-style-type: none"> • Zero incidents involving disturbance to Aboriginal heritage sites (excluding sites that have been approved for removal). 	<ul style="list-style-type: none"> • Number of "incident reports" regarding disturbance to Aboriginal heritage sites.
Ongoing protection and preservation of known Aboriginal heritage sites, each of which will remain in place within its own designated protection zone.	<ul style="list-style-type: none"> • Zero occurrences of disturbances attributable to the Project to known Aboriginal heritage sites, each of which will remain in place within its own designated protection zone. 	<ul style="list-style-type: none"> • Baseline data and photography of known Aboriginal heritage sites.
No intrusions of construction activities into sacred sites or maritime-wreck controlled zones (excluding zones where entry has been approved by the relevant authority).	<ul style="list-style-type: none"> • Zero occurrences of construction activities at sacred sites or in maritime-wreck controlled zones (excluding zones where entry has been approved by the relevant authority). 	<ul style="list-style-type: none"> • Number of incidents of construction activities intruding into sacred sites or maritime-wreck controlled zones (excluding zones where entry has been approved by the relevant authority).
Establish and maintain workforce awareness of the importance of the Aboriginal and non-Aboriginal cultural values of sites in the onshore and nearshore development areas.	<ul style="list-style-type: none"> • All onshore and nearshore workforce personnel (including contractors) to complete a health, safety and environment (HSE) induction which will include information on the cultural values of sites in the onshore and nearshore development areas. 	<ul style="list-style-type: none"> • Number of people accessing the site as recorded by security staff. • Record of people completing an HSE site induction.

3 ABORIGINAL HERITAGE MANAGEMENT APPROACH

Detailed Aboriginal heritage management documentation, for example plans and procedures, will be developed for all phases of the Project. These detailed documents will align with this provisional heritage EMP. The detailed Aboriginal heritage management documentation for the construction and operations phases will be developed by the Larrakia Development Corporation in consultation with INPEX's Indigenous Affairs Coordinator.

A summary of the main management controls to be employed to mitigate the risks associated with potential disturbance to Aboriginal heritage sites is outlined below.

3.1 Management controls—all phases

The management controls to be implemented throughout the various phases of the Project are as follows.

Applicable to onshore development area only

- An Aboriginal archaeological sites register for the onshore development area will be established to detail the locations and descriptions of all known archaeological sites. This will also include details of relocation sites if applicable. The register will be updated to record all new discoveries as required.
- A Larrakia Heritage Management Committee (LHMC) with a standing agenda will be established. It will be made up of representatives of the Larrakia people and INPEX.

Applicable to both onshore and nearshore development area

All personnel (including contractors) will attend inductions highlighting the Aboriginal cultural values of the onshore and the nearshore development areas in Darwin Harbour, the need to protect heritage sites, and the mitigating measures to be used when heritage site disturbance is unavoidable.

3.2 Management controls—design phase

The management controls to be implemented during the design phase of the Project are as follows.

Applicable to onshore and nearshore development areas

Sacred site "authority certificates", covering the onshore and nearshore development areas, have been obtained from the AAPA.²

² An Authority Certificate is a legal document of the *Northern Territory Aboriginal Sacred Sites Act*. It sets out the conditions for using or carrying out works on land and sea in the Northern Territory and indemnifies the holder against prosecution under the Act for damage to sacred sites in the area of the certificate, provided that the work or use has been carried out in accordance with the conditions of the certificate.

Applicable to onshore development area only

The entire onshore development area has been comprehensively assessed for the presence of Aboriginal heritage sites.

Prior to commencement of construction, Aboriginal heritage sites in the onshore development area will be divided into two categories: those which will receive full protection from disturbance and those which may need to be removed.

In the case of an Aboriginal heritage site which may have to be moved, INPEX will request permission to do so from the LHMC and NRETAS's Heritage Branch. If permission is granted to remove the site, advice will be sought from the traditional custodians on the correct procedures to be adopted for its removal.

3.3 Management controls—construction phase

The management controls to be implemented throughout the construction phase of the Project are outlined below.

Applicable to onshore development area only

- A schedule of construction activities will be developed so that mitigation measures can be planned and undertaken for all heritage sites that will have to be disturbed. Mitigation measures may include recording and describing heritage sites or removing and relocating them.
- Job hazard analyses, daily toolbox meetings, permit systems or similar will be implemented on site during construction activities and particularly during the early vegetation clearing works. These will be undertaken to ensure that work areas are clearly identified before activities commence, to avoid accidental disturbance to heritage sites either inside or outside the onshore development area boundaries.
- Where the external boundary of an Aboriginal heritage site is 10 m or closer to any proposed construction activity, flagging, temporary fencing or similar will be erected 5 m from the site boundary and appropriate signage will be put in place. The boundary demarcation will be removed when the risk of disturbance no longer exists.
- Where construction activities (including the installation of temporary protection measures) are proposed within 10 m of the external boundary of an Aboriginal heritage site, a Larrakia representative or suitably qualified archaeologist will be present to supervise the activity. However, if for safety reasons this is not possible, a mutually acceptable alternative action will be agreed upon with the LHMC and the construction manager.

- If suspected archaeological material is uncovered or existing sites are damaged during construction activities, work will cease in the immediate area and INPEX's Indigenous Affairs Coordinator will be contacted. The coordinator will consult with Larrakia representatives and ensure that the AAPA and NRETAS are contacted. No further work in the immediate area will be allowed until permission is granted by NRETAS's Heritage Branch, as instructed by the Larrakia custodians.

Applicable to nearshore development area only

- The dredging program footprint has been designed to avoid maritime heritage areas.
- Anchor management plans will be developed to allow safe anchoring of vessels undertaking pipelay, dredging and piling activities in the vicinity of any maritime heritage or sacred sites.
- Exclusion zones will be established around the maritime sacred sites. No works will be permitted within these exclusion zones.

4 NON-ABORIGINAL HERITAGE MANAGEMENT APPROACH

Detailed non-Aboriginal heritage management documentation will be developed for the construction phase of the Project only. These detailed documents will align with this provisional heritage EMP. The detailed non-Aboriginal heritage management documentation for the construction phase will be prepared either directly by INPEX's Environmental Department or by specialist contractors in consultation with INPEX.

A summary of the main management controls to be employed to mitigate the risks associated with potential disturbance to non-Aboriginal heritage is outlined below.

4.1 Management controls—design phase

Applicable to onshore development area only

The entire onshore development area has been comprehensively assessed for the presence of non-Aboriginal heritage sites.

Prior to commencement of construction, non-Aboriginal heritage sites within the onshore development area will be divided into two categories: those which will receive full protection from disturbance and those which may need to be removed.

Applicable to nearshore development area only

Nearshore infrastructure has been designed to avoid impacting any heritage sites.

4.2 Management controls—construction phase

The management controls to be implemented throughout the construction phase of the Project are outlined below.

Applicable to both the onshore and nearshore development area

- All personnel (including contractors) will attend inductions highlighting the non-Aboriginal cultural values of the onshore and nearshore development areas in Darwin Harbour, the need to protect heritage sites, and the mitigating measures to be used when heritage site disturbance is unavoidable.
- A non-Aboriginal archaeological sites register for relevant onshore and nearshore development areas will be established to detail the location and description of all known archaeological sites. This will also include details of relocation sites if applicable. The register will be updated to include all new discoveries as required.

Applicable to onshore development area only

- Although the World War II historical sites on Blaydin Point do not require official approval to disturb, INPEX will consult with NRETAS's Heritage Branch before disturbing the sites and each will be surveyed and recorded.
- A schedule of construction activities will be developed so that mitigation measures can be planned and undertaken for all heritage sites that will be unavoidably disturbed. Mitigation measures may include recording and describing heritage sites and/or removing and relocating them.
- Job hazard analyses, daily toolbox meetings, permit systems or similar will be implemented on site during construction activities and particularly during the early vegetation clearing works. These will be undertaken to ensure that work areas are clearly identified before activities commence to avoid accidental disturbance to heritage sites either inside or outside the onshore development area boundaries.
- If suspected archaeological material is uncovered during construction, work will cease in the immediate area and the Heritage Branch will be contacted.

Applicable to nearshore development area only

- The dredging program footprint has been designed to avoid maritime heritage areas.
- Anchor management plans will be developed in consultation with NRETAS's Heritage Branch, to allow safe anchoring of vessels undertaking pipelay, dredging and piling activities in the vicinity of any heritage sites.
- All vessels will have global positioning system (GPS) coordinates and maps identifying the ship and flying-boat wreck locations in Darwin Harbour.
- To minimise disturbance, a 100-m-radius controlled zone will be established around all known Catalina flying-boat wrecks. If it is deemed necessary to have anchors or anchor cable within this zone then the appropriate anchor management procedures identified in the anchor management plan will apply.
- In the unlikely event that activities such as dredging would be required in the 100-m-radius controlled zone around a Catalina wreck, then a risk-based assessment will be carried out in conjunction with the relevant authorities and, based on this assessment, specific management controls will be adopted.
- INPEX will periodically assess the sediment conditions around the Catalinas closest to the shipping channel and, in consultation with NRETAS, determine whether any remedial action is required to deal with any impacts that might occur.
- To minimise disturbance, a 100-m-radius controlled zone (based on the intersection of latitude 12°32'16.3"S and longitude 130°52'06.3"E on the Port of Darwin 1:50 000 map sheet AUS 26) for the SS *Ellengowan* will apply. If it is necessary to have anchors or anchor cable within this zone then the appropriate anchor management procedures identified in the anchor management plan will apply.
- To minimise disturbance, a 150-m-radius controlled zone (based on the intersection of latitude 12°29'55.4"S and longitude 130°52'40.2"E on the Port of Darwin 1:50 000 map sheet AUS 26) for the *Kelat* will apply. If it is necessary to have anchors or anchor cable within this zone then the appropriate anchor management procedures identified in the anchor management plan will apply.

4.3 Management controls—operations phase

The potential impacts on maritime heritage sites during the operations phase will be limited to increases in sedimentation or sediment scouring on or around the Catalina wrecks adjacent to the shipping channel, turning basin and berthing area arising from vessel operations and from periodic maintenance dredging.

INPEX will periodically assess the sediment conditions around the Catalinas closest to the shipping channel and, in consultation with NRETAS, determine whether any remedial action is required to deal with any impacts that might occur.

5 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the identified objectives and targets. The activities listed below will be undertaken as part of the heritage monitoring program:

Both Aboriginal and non-Aboriginal heritage

Heritage incidents will be monitored through INPEX's and its contractors' incident-reporting databases.

Aboriginal heritage only

- Onshore development area Aboriginal cultural surveys already undertaken will provide the data that will be used as the baseline when assessing performance indicators. The baseline data include photographs of all identified Aboriginal heritage sites.
- Ongoing monitoring will be undertaken for Aboriginal heritage sites. This will involve inspections by Larrakia representatives prior to and during the construction phase and during the commissioning and operations phases. Photographic records will be maintained for each of the sites.

Non-Aboriginal heritage only

Before dredging commences, Catalina flying-boat wrecks will be inspected to determine the current levels of sedimentation and records of these inspections will be kept. Ongoing periodic inspections will be undertaken throughout the dredging program to validate dredging sedimentation modelling predictions.

Triggered management response

A management response will be triggered by either of the following two circumstances:

1. a heritage "incident"
2. the identification by an annual management review of a failure to meet an objective or target.

The responses to these are outlined below.

Response to heritage "incidents"

Heritage "incidents" would include any of the following:

- the discovery of previously unknown heritage sites
- damage caused to previously unknown heritage sites
- damage caused to known heritage sites that have been identified as protected.

Detection of incidents will trigger internal notifications, reporting requirements, investigations and associated corrective and preventive actions.

The level of investigation will be dependent on the potential risk associated with the event. Heritage incidents will be dealt with on a case-by-case basis. Corrective actions that may be triggered as a result of the investigation would include the review and update of procedures or plans associated with heritage management and/or refresher training for personnel on Project heritage management processes.

INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigation requirements. All heritage incidents and "near misses" will be entered into INPEX's and its contractors' incident databases and corrective actions will be tracked to closure.

The triggered management responses to the discovery of human skeletal remains, the discovery of previously unknown onshore heritage sites, or the disturbance of existing onshore Aboriginal heritage sites attributable to Project activities are outlined below.

Discovery of human skeletal remains

The process to be followed if skeletal remains should be discovered is as follows:

- All works in the immediate vicinity of the find that could possibly disturb the site must cease.
- Personnel will immediately notify the work supervisor of the find. The supervisor will then immediately notify the Northern Territory Police and INPEX's Indigenous Affairs Coordinator.
- If the Northern Territory Police should determine that the remains are likely to be historical and of Aboriginal origin, the remains will stay in situ until the AAPA, in consultation with the Larrakia people, decides how to proceed.

Discovery of previously unknown onshore heritage sites

The process to be followed if a previously unknown site of potential heritage significance is discovered is as follows:

- As soon as a previously unknown site is identified, all work in the immediate vicinity that could possibly disturb the find must cease.

- The work supervisor will be notified and will inspect the site to confirm that it is potentially a site of heritage significance. If it is deemed to have potential heritage significance, the site will be photographed and interim protection measures (e.g. temporary fencing) will be put in place.
- The work supervisor will contact INPEX's Indigenous Affairs Coordinator (if it is thought to be an Aboriginal heritage site) or the INPEX Environment Manager (if it is thought to be a non-Aboriginal heritage site) who in turn will inform the AAPA and/or NRETAS's Heritage Branch as appropriate.
- If the site is an Aboriginal site then a Larrakia representative will undertake an inspection to determine if it is potentially a heritage site. Working in conjunction with INPEX's Indigenous Affairs Coordinator, the representative will prepare advice for the LHMC on whether the site can be protected or if site disturbance is unacceptable.
- If the site is required to be disturbed, approval will be sought through NRETAS's Heritage Branch (Aboriginal and non-Aboriginal heritage).
- No further work in the immediate area will be allowed until permission, in writing, is granted by NRETAS's Heritage Branch.

Unauthorised disturbance of known onshore Aboriginal heritage sites

The process to be followed if a known heritage site is damaged or disturbed is as follows:

- If unauthorised disturbance occurs at a known heritage site, all work in the immediate vicinity of the site that could possibly cause further disturbance must cease.
- The work supervisor will be notified, the damage to the site will be photographed, and interim protection measures (e.g. temporary fencing) will be put in place.
- The work supervisor will contact INPEX's Indigenous Affairs Coordinator who will arrange for a Larrakia representative to inspect the site.
- In consultation with the Larrakia representative, INPEX's Indigenous Affairs Coordinator will prepare advice for the LHMC on the extent of the damage and recommendations for possible remedial action.
- Agreed remedial actions will be implemented and the success of remedial actions will be monitored.
- Work will not commence in close proximity to the site until confirmation has been received from the AAPA or NRETAS's Heritage Branch.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will initiate the following responses:

- a review and audit of current heritage protection methods to assess the practicability of implementation and opportunities for improvement
- a review of current objectives and targets to assess achievability.

The response to the results of investigations and audits may include the following:

- an update of plans and associated documents to reflect changes to heritage management practices if applicable
- the arrangement of refresher training for personnel on the cultural values of the onshore and nearshore development areas and the measures INPEX has put in place to protect them.

6 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken throughout the lifetime of the Project. A summary of the reporting, auditing and review requirements relating to heritage matters is provided in the following two sections.

6.1 All phases

Applicable to both Aboriginal and non-Aboriginal heritage matters

- Heritage incidents will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- An annual INPEX environmental report for the Project will be produced and will include details of heritage incidents.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Records will be audited periodically to ensure that all personnel on site have completed the required health, safety and environment induction.
- Detailed heritage management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

Applicable to Aboriginal heritage matters only

- The LHMC will meet to discuss Aboriginal heritage issues on a quarterly basis during the front-end engineering design phase and construction phase and on a half-yearly basis during the operations phase unless otherwise agreed.
- Where necessary, meetings will be held with the LHMC and NRETAS's Heritage Branch and the AAPA to review the implementation of heritage protection measures in the onshore development area.

6.2 Construction phase

Applicable to both Aboriginal and non-Aboriginal heritage matters

- Contractors will be required to produce and provide to INPEX a monthly environmental report including a record of any heritage incidents.
- If previously undiscovered heritage sites (either Aboriginal or non-Aboriginal) are discovered during earthworks preparation the relevant government agencies (NRETAS's Heritage Branch and/or the AAPA) will be notified.

Applicable to non-Aboriginal heritage matters

Where necessary, meetings will be held with INPEX and NRETAS's Heritage Branch to review the implementation of heritage protection measures used in the nearshore area.

7 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's heritage management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the implementation of INPEX's heritage management requirements:

- incident reporting, recording and investigating
- anchor management
- permits to work
- archaeological sites register
- archaeological site maps
- health, safety and environment induction.

8 APPLICABLE LEGISLATION

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments, for example, specifically related to heritage management include those listed below.

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cwlth).
- *Aboriginal Land Rights (Northern Territory) Act 1976* (Cwlth).
- *Australian Heritage Council Act 2003* (Cwlth).
- *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).
- *Heritage Conservation Act* (NT).
- *Historic Shipwrecks Act 1976* (Cwlth).
- *Northern Territory Aboriginal Sacred Sites Act* (NT).

9 REFERENCE

Bourke, P. and Guse, D. 2007. *Archaeological survey of the proposed Wickham Industrial Estate: Indigenous and historic cultural heritage assessment*. Report (Specification No. T07-1780) prepared by Earth Sea Heritage Surveys, Darwin, for the Northern Territory Government, Darwin, Northern Territory.

Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan

Annexe 10 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential environmental impact of, liquid discharges generated by the Project both onshore and offshore during its lifetime as well as changes to surface water runoff and groundwater infiltration as a result of the construction of Project infrastructure onshore.

This provisional environmental management plan (EMP) for liquid discharges, surface water runoff and drainage is attached as Annexe 10 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional plans will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the successive phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

Liquid discharges

Routine liquid discharges will be produced through the construction, precommissioning, commissioning and operations phases of the Project and will be disposed of to the marine environment, both offshore and nearshore. A summary of the sources of these discharges for onshore and offshore activities is provided in Section 1.4 *Sources of liquid discharges*.

Offshore liquid discharges will occur in deep water well away from any sensitive shallow water habitats and will be rapidly diluted and dispersed by ocean currents. The concentration of toxic chemicals in the surrounding waters will be extremely low (away from the initial mixing zone) and unlikely to produce any significant adverse environmental or toxic effects.

Liquid discharges from onshore Project activities, however, have greater potential to produce adverse effects on water quality in Darwin Harbour if not appropriately managed.

Surface water runoff, erosion and drainage

The surface hydrology of the onshore development area will be altered by the clearing of vegetation, the construction of earthworks and the physical presence of the onshore facilities. The area covered by the onshore facilities will alter natural drainage patterns through the construction of large areas of impervious surfaces that will change the volume and pattern of surface water flows and subsurface infiltration.

Surveys of the onshore development area have shown evidence of a natural erosion and sedimentation process occurring, with the fringing mangroves acting as a natural sediment trap. However, the potential rate of erosion from large-scale earthworks at the onshore development area is likely to result in higher than natural levels of sedimentation that must be properly managed if the mangrove community's capacity to cope with sedimentation is to be maintained.

Biting insects

Project activities have the potential to create water-filled breeding sites for biting insects such as the mangrove biting midge and several species of mosquito (DHF 2005). Such activities could include the physical disturbance of intertidal and aboveground areas creating hollows for water pools; the presence of unused receptacles such as bins, drums and other containers that can fill with rainwater; and inadequate maintenance of stormwater drains and sediment ponds.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX, through the identification of suitable management strategies, intends to minimise the potential environmental impact of the liquid discharges generated as a result of Project activities, including those resulting from alterations to surface water runoff patterns or natural drainage systems.
- It describes the proposed monitoring requirements for all Project phases.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of future more detailed environmental documentation, such as the plans, procedures, etc., which will be required throughout the life of the Project.

The scope of this provisional EMP includes the following:

- all liquid wastes generated as a result of activities in the Project area, both onshore and offshore, that are discharged through wastewater effluent systems and vessels (e.g. produced water, sewage, brine)
- surface water runoff and natural drainage issues associated with the onshore processing plant and associated facilities on Blaydin Point.

This provisional EMP does not address the potential environmental impacts of, or management controls for, the following:

- non-hazardous and hazardous liquid waste products (e.g. paints, solvents and oily wastes) from onshore and offshore activities that are not discharged to the environment (excluding food scraps from construction and support vessels or facilities)
- dredging or dredge material discharges
- ballast-water exchange discharges
- spilt liquids.

These are addressed as separate aspects under the following provisional EMPs or in other Project documentation:

- Provisional Dredging and Dredge Spoil Disposal Management Plan (Annexe 6 to Chapter 11)
- Provisional Onshore Spill Prevention and Response Management Plan (Annexe 11 to Chapter 11)
- Provisional Quarantine Management Plan (Annexe 13 to Chapter 11)
- Provisional Waste Management Plan (Annexe 16 to Chapter 11)
- oil spill contingency and shipboard oil pollution emergency plans (not provided in this Draft EIS).

1.2 Plan definitions

Liquid discharges

The collective term “liquid discharges” is used to describe both the liquids produced as a result of Project activities that are discharged to the environment and the natural discharges that will need to be managed to avoid contamination of the environment. These include the following:

- produced discharges: drill muds, subsea fluids, hydrotest water, produced water, process water, cooling water, liquids contained in non-hazardous drain systems, brine, sewage and grey water
- natural discharges: deck drainage, surface water runoff and stormwater drainage.

Construction and precommissioning

This stage starts with the construction of the major civil engineering works, including foundations, tanks, the module offloading facility, etc., and extends through the installation of the modules, the pipeline and the product loading jetty to hook-up and the end of the precommissioning of the first train (i.e. prior to the introduction of hydrocarbons or other hazardous materials).

Commissioning and operations

Commissioning starts when hydrocarbons are first introduced into the plant from offshore. It includes the first fills of refrigerants, heating oils, amines, etc. Initially this will be for the operation of one train, with the second train approaching the end of mechanical completion and scheduled to be commissioned after a further 6 to 12 months. This phase covers the ongoing operation of the 8.4-Mt/a liquefied natural gas (LNG) processing plant.

1.3 Activities that may influence natural drainage patterns

Project activities that may lead to the alteration of surface hydrology, an increase in the risk of erosion or a reduction in natural drainage include the following:

- the clearing of vegetation during site preparation
- the construction of earthworks for the onshore facilities
- the physical presence of the facilities (e.g. hardstand areas and paving).

1.4 Sources of liquid discharges

The liquid discharges for the various phases of the Project will include the following:

- drilling muds from offshore drilling operations
- subsea hydraulic control fluids for offshore operations
- hydrotest water from precommissioning of the onshore and offshore facilities
- sewage and grey water from construction and supply vessels and from the onshore and offshore facilities
- produced water from the offshore operations
- process water from the onshore operations
- discharges from the desalination plant offshore and the demineralisation plant onshore
- firewater from onshore emergency response exercises and emergency events
- drainage and surface water runoff from rainfall
- cooling water from the offshore operations.

1.5 Potential impacts

Potential impacts to the offshore and nearshore marine environment from liquid discharges include the following:

- a reduction in water quality as a result of increased turbidity
- the smothering of the benthos and alteration of sediment characteristics
- the increased loading of the marine environment with hydrocarbons, other chemicals and nutrients
- an increase in the availability of food for marine biota
- toxic effects on marine biota
- the bioaccumulation of chemicals in marine organisms
- an increase in water temperatures in the immediate vicinity of cooling-water outfalls
- detrimental changes in biological oxygen demand.

Potential impacts from the alteration to surface runoff or natural drainage as a result of construction, earthworks and the physical presence of structures within the onshore development area include the following:

- an increase in erosion and sedimentation in natural drainage systems
- an increase in erosion and sediment loads in the fringing mangrove community
- alterations to the volumes and patterns of surface water runoff
- alterations to groundwater levels and infiltration capacity
- detrimental effects on hinterland mangroves which may be dependent on surface water runoff and groundwater infiltration
- the creation of breeding habitat for biting insects.

Table 2-1: Liquid discharges, surface water runoff and drainage management objectives, targets and indicators

Objectives	Targets	Indicators
Prevent unacceptable level of environmental impacts from liquid discharges during all phases of the Project, both offshore and onshore.	<ul style="list-style-type: none"> • Zero environmental incidents resulting from liquid discharges. 	<ul style="list-style-type: none"> • Number of incident reports and severity of incidents resulting from liquid discharges (including exceedance of liquid discharge limits for nutrients, oil dispersion and heavy metals).
Prevent environmental impact from the discharge of produced water from offshore operations.	<ul style="list-style-type: none"> • Concentration of hydrocarbons in produced water discharged will be limited to not greater than an average of 30 mg/L over any period of 24 hours in accordance with the OPGGS(Environment) Regulations*. 	<ul style="list-style-type: none"> • Concentration of hydrocarbons prior to discharge. • Flow rate and volume of water from oil-and-water separation system.
Minimise discharges of synthetic-based mud (SBM).	<ul style="list-style-type: none"> • The concentration of SBM on drill cuttings released to sea will be limited to a maximum of 10% by dry weight of the base fluid on the drilled cuttings. 	<ul style="list-style-type: none"> • Well average for concentration of SBM in drill cuttings discharged.
Prevent environmental impact from the combined jetty discharge stream from the onshore facilities during the operations phase.	<ul style="list-style-type: none"> • Wastewater discharge streams will meet Project design criteria and equipment performance specifications. 	<ul style="list-style-type: none"> • Concentration of discharge constituents from wastewater discharge streams. • Flow rate and volume of discharge. • Darwin Harbour water-quality monitoring program outcomes.
Ensure that changes to groundwater and surface water flows do not negatively impact on fringing mangrove communities.	<ul style="list-style-type: none"> • No significant changes to fringing mangroves communities as a result of changes to surface water and groundwater flows in the onshore development area. 	<ul style="list-style-type: none"> • Health of fringing mangroves measured through leaf defoliation index or similar.
Establish and maintain awareness of the importance of liquid discharge and drainage management practices during all phases of the Project.	<ul style="list-style-type: none"> • All workforce personnel (including contractors) to complete a health, safety and environment (HSE) induction, which, where appropriate, will include information on liquid discharges and drainage management practices. 	<ul style="list-style-type: none"> • Numbers of people accessing the site. • Number of people completing HSE inductions.

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

† MARPOL 73/78 = *International convention for the prevention of pollution from ships, 1973, as modified by the protocol of 1978 relating thereto.*

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for the management of liquid discharges, surface water runoff and drainage are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

3 MANAGEMENT APPROACH

Detailed liquid discharges, surface water runoff and drainage management documentation, for example plans and procedures, will be developed for all phases of the Project. These detailed documents will align with this provisional liquid discharges, surface water runoff and drainage EMP. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

A summary is provided below of the main engineering and management controls to be employed in the detailed documentation to mitigate the risks associated with liquid discharges generated by the Project (both onshore and offshore) and changes to surfaces water runoff and groundwater infiltration as a result of the presence of Project infrastructure onshore.

3.1 Engineering controls—design phase

The engineering controls to be included during the design phase of the Project are as follows.

Onshore-specific

- The design of appropriate drainage systems will be based on statistical data with consideration of rainwater infiltration.
- During the construction phase, surface water runoff from the Project footprint will be directed to sedimentation systems to facilitate the removal of sediment and contaminants. These systems will be located in various locations around the plant. Their design will include series of retention barriers and sedimentation ponds.
- Natural drainage will be maintained around roads by installing drains and culverts, particularly in intertidal areas such as the causeway between Blaydin Point and Middle Arm Peninsula. Any sheet-flow retention will be considered using curb and surface runoff control and containment during the construction and operations phases.
- Sedimentation systems will be designed in such a way that water will not be retained for long periods; this will prevent the breeding of biting insects. Erosion control measures will be put in place to prevent spillways from such systems from creating erosion and potential pooling.

- Sediment control and drainage interception systems infrastructure, such as culverts, drains, silt traps, sediment ponds, etc., will be employed to manage sediment loads in surface water runoff.
- As some areas on Blaydin Point will remain uncleared or unsealed there will be some groundwater recharge during rainfall events.
- On-site roads required for the operations phase will be sealed during the construction phase to minimise sediment runoff into surface drainage channels.
- Erosion protection infrastructure will be installed in areas of high erosion risk.
- All drainage will be designed to shed water away from foundations and with appropriate treatments to prevent scouring.
- Surface water drains and discharge points throughout the onshore development area will be designed to minimise erosion and pooling of water.
- Surface water drainage channels throughout the onshore development area will be designed to minimise the creation of habitat for biting insects.
- Numerous surface water drains will be constructed around the perimeter of the onshore development area and will, where applicable, distribute fresh water to mangrove areas.
- The drainage system will be designed to separate the contaminated areas from the non-contaminated areas. The oily-water contaminated wastewater streams will be directed to the oily-water treatment system.
- The oily-water treatment system will be designed to meet a <10-mg/L petroleum hydrocarbon criterion.
- The process water systems and neutralisation unit will be designed to achieve the following criteria for temperature and pH at the combined discharge point on the product loading jetty:
 - 26–35 °C
 - pH 5–9.
- The permanent sewage treatment facility will be designed to meet the following criteria for treated wastewater:
 - total nitrogen: <40 mg/L
 - total phosphorus: <10 mg/L
 - biological oxygen demand <20 mg/L
 - faecal coliforms <400 cfu/100 mL.
- Water-quality monitoring points will be installed in the drainage system to allow monitoring of selected discharge streams.
- The jetty outfall discharge point will incorporate a diffuser to maximise dilution and reduce the extent of the mixing zone.
- Bunding and sumps will be provided for storage areas for fuels, chemicals and waste.

Offshore-specific

- Wellhead valves will be designed to minimise the volumes of subsea control fluids released.
- Wells will be designed to minimise the generation of oil on cuttings within the technical constraints of drilling an operational well.
- Electronic monitoring equipment will be installed for continuous monitoring of the produced water from the floating production, storage and offtake (FPSO) facility.
- The central processing facility (CPF) drainage systems will be designed to include “open” (non-contaminated) and “closed” (contaminated) drainage flows.
- Areas on the mobile offshore drilling unit (MODU), construction barges, CPF and FPSO that are more likely to have small oil spills will have containment facilities such as bunding to prevent contamination of deck washdown and stormwater runoff.
- All sewage facilities on vessels (including the MODU and the installation, decommissioning and support vessels) will comply with the requirements of MARPOL 73/78 and the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cwlth).
- A macerator will be installed on the permanent offshore facilities (the CPF and FPSO) to macerate sewage to particle sizes less than 25 mm in diameter prior to discharge.

3.2 Management controls—all phases

The management controls to be implemented throughout the successive phases of the Project are outlined below.

Applicable to both onshore and offshore

- Chemicals and hazardous substances used during all Project phases will be selected and managed to minimise the environmental impact associated with their transport, transfer, storage, use and disposal.
- Scheduled preventive equipment maintenance and regular equipment inspections will be undertaken to prevent equipment failure and potential contamination of facility drains and process areas.

Onshore-specific

Equipment and containers (e.g. buckets) which have the ability to capture and hold water will be positioned appropriately or stored under cover to prevent the creation of breeding habitat for biting insects. Equipment and vessels which are unable to be stored or positioned to avoid this will be inspected regularly during the wet season and any pooling water will be removed or treated.

Offshore-specific

- Water-soluble, low-toxicity subsea control fluids will be used.
- Sewage wastes from the CPF and FPSO facilities will be macerated to particles and scraps with diameters less than 25 mm prior to discharge in accordance with Clause 222 of the Petroleum (Submerged Lands) Acts Schedule (DITR 2005). The discharge will take place through submerged caissons.
- Produced water will be treated to reduce the oil content prior to discharge.
- The concentration of petroleum hydrocarbons in produced water discharged to sea will be limited to not greater than an average of 30 mg/L over any period of 24 hours in accordance with the requirements of Clause 29 of the OPGGS(Environment) Regulations. The oil-in-water concentration will be measured continuously by an electronic meter.

3.3 Management controls—nearshore and offshore

Construction vessels, supply vessels and the MODU will conform with the following prescriptions laid down by the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cwlth) and the *Marine Pollution Act* (NT).

- Sewage will not be discharged within 3 nautical miles of land.
- Only treated sewage with particles less than 25 mm in diameter will be discharged between 3 and 12 nautical miles of land.
- Untreated sewage may be discharged beyond 12 nautical miles of land.

The water discharged to sea from construction and supply vessels will not exceed an oil-in-water concentration of <15 mg/L in accordance with Annex I of MARPOL 73/78 and the Marine Pollution Regulations (NT).

3.4 Management controls—drilling

The management controls to be implemented throughout the Project’s drilling operations are outlined below.

Offshore-specific

- Low-toxicity water-based muds (WBMs) will be used for the top-hole sections of wells.
- Synthetic-based muds (SBMs) will be used in the bottom-hole sections. These muds will not be routinely discharged to the marine environment, with the exception of small amounts adhering to drill cuttings.

- SBMs will be recovered and returned to shore for recycling or reuse or, if these options are not practicable, for disposal in an approved manner.
- SBMs will be reused several times and an effort will be made to separate as much of the SBM from the cuttings as can practicably be achieved.
- The use of cuttings driers to reduce SBMs on cuttings will be investigated.
- The concentration of SBM on drill cuttings discharged to sea will be restricted to 10% by dry weight or less in accordance with Western Australian Government guidelines (DoIR 2006). An internal target of 5% or less of SBM on drill cuttings released to sea will be set.
- A drilling environmental management plan will be prepared to meet the requirements of the OPGGS(Environment) Regulations and will describe controls for preventing the accidental release of SBMs.

3.5 Management controls— construction phase

The management controls to be implemented throughout the construction phase of the Project are outlined below.

Onshore-specific

- Large-scale vegetation clearing and earthworks will preferentially be undertaken in dry-season conditions. Should clearing and earthworks be required to be undertaken during the wet season, adequate control measures will be implemented to avoid erosion and sedimentation impacts.
- Cleared vegetation will be mulched and stockpiled on site boundaries. The mulch will be used for soil stabilisation and rehabilitation purposes where possible. Mulched vegetation that will not be reused will be disposed of off site.
- Erosion protection infrastructure (e.g. silt fencing, contouring, and sediment ponds) will be installed to ensure that sediment is contained within the site boundaries as far as practicable.
- If soil erosion is evident, exposed surfaces at the affected area will be stabilised with mulched vegetation, dust suppressants or slope stabilisation products.
- Treated wastewater is being considered for use during construction, particularly for irrigation or construction purposes. If this option is adopted, water quality will meet all regulatory requirements for irrigation.

- Temporary sediment systems will be regularly maintained to clear silt and aquatic vegetation to prevent the creation of habitat suitable for breeding mosquitoes.
- All borrow pits in the onshore development area will be rendered free-draining on completion of construction.

3.6 Management controls— precommissioning phase

The management controls to be implemented throughout the precommissioning phase of the Project are outlined below. Precommissioning includes an integrity test of the LNG train and storage tanks prior to the introduction of hydrocarbons.

Applicable to both onshore and offshore

- Hydrotest management plans will be developed in consultation with regulatory authorities and will be implemented prior to precommissioning. The procedure will include hydrotest discharge water-quality requirements and discharge options.
- The biocides used in hydrotest water will be of the lowest practicable toxicity without compromising operational requirements.
- The use and choice of chemicals in hydrotest water will be based on their low potential for environmental harm and their concentration in the water will be kept to as low a level as is reasonably practicable.
- Modules will be precommissioned off site if possible.
- During dewatering of the gas export pipeline, treated water (approximately 1 GL) will be discharged at the offshore facility.

Onshore-specific

In addition to the management controls described above, hydrotest water will be reused where practicable for onshore operations. If hydrotest wastewater is discharged into Darwin Harbour then a licence will be sought under the *Water Act* (NT).

Offshore-specific

Hydrodynamic modelling of hydrotest water plumes from the gas export pipeline will be undertaken prior to the commissioning phase in order to be able to predict the dispersion of pollutants into the offshore marine environment.

3.7 Management controls— operations phase

Onshore-specific

Surface water drainage channels will be regularly maintained to clear silt and aquatic vegetation in order to prevent the creation of habitat suitable for breeding mosquitoes.

Maintenance practices during the operations phase (e.g. drainage of hydrocarbons from tanks and equipment) will avoid discharge of hydrocarbons to the oily-water treatment system.

Nearshore- and offshore-specific

Vetting procedures for condensate tankers will be developed and implemented, ensuring that ballast water tanks are segregated from fuel and product tanks.

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the identified objectives and targets. The activities listed below will be undertaken as part of the liquid discharges, surface water runoff and drainage management monitoring program:

Water-quality monitoring of liquid discharges applicable to both onshore and offshore

The monitoring strategies to be implemented for both the offshore and onshore operations are outlined below:

- Workplace “housekeeping” inspections will be undertaken to ensure that there are no spills within drainage systems or bunded areas and that remediation measures are implemented.
- Monitoring of liquid discharge incidents will be undertaken through INPEX’s and its contractors’ incident-reporting databases.

Water-quality monitoring of liquid discharges from offshore facilities

The monitoring strategies to be implemented for offshore operations and drilling activities are outlined below:

- The oil-in-water concentration in produced water will be measured continuously by an electronic meter and records will be retained.
- Periodic sampling of produced water discharges will be undertaken for full characterisation of the chemical components. Ecotoxicity testing of the produced water will be undertaken following water production.
- Calculations will be performed to determine well averages for SBM concentrations on dry drill-cutting discharges.

- Work will be carried out in collaboration with the SERPENT project¹ to determine the impacts of production drilling discharges on epibenthic macrofauna in the offshore area.

Water-quality monitoring of liquid discharges into Darwin Harbour

Water-quality monitoring strategies to be implemented for onshore operations are outlined below:

- Wastewater streams will be sampled at appropriate frequencies and selected water quality parameters will be documented.
- A Darwin Harbour water quality monitoring program will be developed by INPEX to determine if the Project’s effluent discharges adversely impact on water quality in the Harbour.
- Validation of wastewater discharge dispersion modelling will be undertaken at the product loading jetty discharge location.

Surface water runoff and groundwater monitoring

The monitoring strategies to be implemented for onshore operations are outlined below:

- Baseline groundwater analysis will be used as the benchmark for comparisons of groundwater levels and quality.
- A groundwater quality monitoring program will be developed to determine if development in the onshore development area adversely impacts on groundwater quality.
- A mangrove health monitoring program will be developed to determine if Project activities in the onshore development area adversely impact on mangrove health.
- A marine sediments and bio-indicators monitoring program will be developed to assess any accumulation of metals and petroleum hydrocarbons in sediments and selected bio-indicators that might result from surface water and groundwater flows from the onshore facility.
- Periodic visual monitoring for soil erosion will be carried out during the construction phase.
- Regular inspections will be carried out in locations identified as high-risk areas for the breeding of mosquitoes, for example low-lying areas and sediment ponds during the construction phase, or holding basins and similar structures during the operations phase.

¹ The SERPENT (Scientific and Environmental ROV Partnership using Existing iNdustry Technology) project is a global collaborative project hosted by the DEEPSEAS group within the Ocean Biogeochemistry and Ecosystems Group at the National Oceanography Centre in Southampton, UK.

Triggered management response

A management response will be triggered by any of the following three circumstances:

1. a liquid discharge, surface water runoff or drainage “incident”
2. an exceedance of monitoring criteria
3. the identification by an annual management review of a failure to meet an objective or target.

The responses to these are outlined below.

Response to liquid discharge, surface water runoff or drainage “incidents”

A non-compliant liquid discharge, surface water runoff or drainage event will be classified as an “incident”. Detection of incidents will trigger internal notifications, reporting requirements, investigation and associated corrective and preventive actions.

Liquid-discharge and related incidents will include the following:

- an event such as a spill that has led to the contamination of a wastewater stream and has the potential to significantly alter combined jetty discharge outputs
- disposal of sewage from construction and supply vessels not in accordance with MARPOL 73/78 prescriptions and the Marine Pollution Regulations (NT).

The level of investigation will be dependent on the potential risk associated with the event. Corrective and preventive actions that may be triggered as a result of a liquid-discharge or related incident investigation could include the following:

- the reviewing and updating of procedures and plans associated with the management of liquid discharges, surface water and drainage and of accidental spills
- the provision of refresher training for personnel on the Project processes laid down for liquid discharge, surface water and drainage management as well as on spill clean-up techniques.

INPEX’s Incident Reporting, Recording and Investigating Procedure or the Project contractor’s document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigating requirements. All liquid-discharge, surface water runoff and drainage incidents and “near misses” will be entered into INPEX’s and its contractors’ incident databases and corrective actions will be tracked to closure.

Response to an exceedance of liquid discharge, surface water or drainage monitoring criteria

Liquid-discharge, surface water or drainage monitoring criteria exceedances could include any of the following scenarios:

- The combined jetty discharge from the onshore facility exceeds identified design specifications.
- Petroleum hydrocarbons in produced water discharged to sea exceeds an average of 30 mg/L over any 24-hour period (in contravention of Regulation 29 of the OPGGS(Environment) Regulations 2009 (Cwlth)).
- Discharges to sea from oil-and-water separation systems on offshore and nearshore construction and supply vessels exceed the oil-in-water concentration of <15 mg/L set by MARPOL 73/78.
- Well averages for SBM concentrations on dry drill-cutting discharges are greater than 10% by weight.
- Reduced vigour or die-offs are noted in hinterland mangroves which may be dependent on groundwater infiltration or surface water runoff.
- The presence of mosquito larvae within high-risk breeding areas, sediment ponds and holding basins or similar.
- There is evidence of soil erosion in the onshore development area.

Responses to exceedance of liquid-discharge, surface water or drainage monitoring criteria could include the following:

- the identification of the cause (or source) of the liquid discharge exceedance, the reduction in loads of the contaminant of concern (i.e. source control), and in situ remedial work
- the stabilisation of exposed surfaces of eroded areas with mulched vegetation, dust suppressants or slope stabilisation products
- the institution of a spraying program for mosquito larvae, the maintenance of sediment ponds (removal of aquatic vegetation, clearing of silt, etc.), and the removal of pooled areas through levelling
- an increase in the monitoring frequency of relevant parameters at control and impact monitoring sites
- a review and update of existing management controls and procedures associated with liquid discharges, surface water runoff and drainage.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will trigger the following responses:

- a review and audit of current liquid discharge and drainage management practices to assess the practicability of their implementation, to identify new sources of liquid discharges, and to assess the resources required to implement the management plan
- a review of current internal objectives and targets to assess achievability.

The response to the results of investigations and audits may include the following actions:

- an update of plans and associated documentation to reflect changes to liquid-discharge and drainage management practices
- the arrangement of refresher training for personnel, to cover site liquid-discharge and drainage management practices and processes.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken throughout all phases of the Project. A summary of the reporting, auditing and review requirements relating to liquid-discharge, surface water runoff and drainage management is provided in the following two sections.

5.1 All phases

The following reporting, auditing and review measures will be put in place for all phases of the Project:

- The quantities of liquids discharged to the marine environment or treated and reused will be recorded.
- Incidents resulting from mismanagement of liquid discharges will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- An annual INPEX environmental report for the Project will be produced and will include details of all incidents relating to liquid discharges, surface water runoff and drainage management.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Records will be audited periodically to ensure that all personnel on site have completed the required HSE induction.
- Detailed liquid discharges, surface water runoff and drainage management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

5.2 Construction, commissioning and decommissioning phases

In addition to the reporting requirements described above, during the construction, commissioning and decommissioning phases of the Project all contractors will be required to produce and provide to INPEX a monthly environmental report which will include a record of environmental incidents.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's liquid discharges, surface water runoff and drainage management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the implementation of INPEX's liquid discharges, surface water runoff, and drainage management requirements:

- incident reporting, recording and investigating
- chemical and hazardous substance management
- equipment maintenance
- bunding and sump inspection
- hydrotest discharge
- health, safety and environment site induction (offshore and onshore).

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments, standards and guidelines specifically related to liquid discharges, surface water runoff and drainage include the following:

- Department of Industry and Resources. 2006. *Petroleum guidelines: drilling fluids management*. Environment Division, Department of Industry and Resources, Perth, Western Australia.
- Department of Industry, Tourism and Resources. 2005. *Petroleum (Submerged Lands) Acts: schedule—specific requirements as to offshore petroleum exploration and production*. Department of Industry, Tourism and Resources (now the Department of Resources, Energy and Tourism), Canberra, ACT.

- Department of Natural Resources, Environment and the Arts. 2006. *Environmental guidelines for reclamation in coastal areas*. Information guidelines originally prepared by the Environment Protection Agency (now the Environment, Heritage and the Arts Division of the Department of Natural Resources, Environment, the Arts and Sport) for the Northern Territory Government, Darwin, Northern Territory.
- *Environment Protection (Sea Dumping) Act 1981* (Cwlth).
- 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.
- *Marine Pollution Act* (NT).
- Marine Pollution Regulations (NT).
- *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cwlth).
- Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cwlth).
- *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cwlth).
- *Waste Management and Pollution Control Act* (NT) and the associated “Compliance Guidelines” prepared by the Department of Natural Resources, Environment and the Arts (now the Department of Natural Resources, Environment, the Arts and Sport), Darwin, Northern Territory.
- Waste Management and Pollution Control (Administration) Regulations (NT).
- *Water Act* (NT).

8 REFERENCES

- Department of Health and Families. 2005. *Guidelines for preventing mosquito breeding associated with construction practice near tidal areas in the NT*. Information guidelines prepared by the Medical Entomology Section of the Centre for Disease Control, Department of Health and Families, Darwin, Northern Territory.
- Department of Industry and Resources. 2006.
- Department of Industry, Tourism and Resources. 2005. *Petroleum (Submerged Lands) Acts Schedule: specific requirements as to offshore petroleum exploration and production*. (Now as) Department of Resources, Energy and Tourism, Canberra, ACT. Viewed online on 1 March 2010 at <http://www.ret.gov.au/resources/Documents/Upstream%20Petroleum/PSLA_Schedule_of_Specific_Reqs_24_11_0520051124103750.pdf>.
- Department of Natural Resources, Environment and the Arts. 2006. *Environmental guidelines for reclamation in coastal areas*. Information guidelines originally prepared by the Environment Protection Agency (now the Environment, Heritage and the Arts Division of the Department of Natural Resources, Environment, the Arts and Sport) for the Northern Territory Government, Darwin, Northern Territory. Viewed online on 1 March 2010 at <<http://www.nt.gov.au/lands/planning/scheme/documents/enviroguidelines.pdf>>.
- DHF—see Department of Health and Families.
- DITR—see Department of Industry, Tourism and Resources.
- DoIR—see Department of Industry and Resources.

Provisional Onshore Spill Prevention and Response Management Plan

Annexe 11 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential environmental impact of, hydrocarbon and chemical spills that may occur during the lifetime of the Project in the onshore development area.

During all phases of the Project, chemicals, hydrocarbons and liquid wastes will be handled, stored and transported in and around the onshore development area. While preventive measures to stop the release of these materials into the environment will be in place, there is the possibility that spills and leaks could occur through accidents or equipment failure.

The potential impact from an accidental spill or leak at the onshore facility will depend on the location of the spill or leak, the nature of the receiving environment, the type of material released, and its volume. Spills or leaks in areas of the onshore facilities that have appropriate preventive measures in place (e.g. banded hardstand areas for fuel storage) will have less effect on environmental receptors than a spill or leak in an area outside the boundaries of the facilities such as a leak from a pipeline.

During the early construction phase of the Project the storage and handling of chemicals and hazardous substances (including wastes) will need to be carefully managed as there will not be permanent infrastructure (e.g. banded hardstand areas) in place for the management and control of spills or leaks.

This provisional environmental management plan (EMP) for onshore spill prevention and response is attached as Annexe 11 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX, through identifying suitable spill prevention and response management controls, intends to minimise the environmental impact of accidental spills as a result of Project activities.
- It describes the proposed monitoring requirements for all phases of the Project.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of future more detailed environmental documentation such as the plans, procedures, etc., which will be required throughout the life of the Project.

The scope of this provisional EMP includes all spills which may occur inside the boundaries of the onshore facilities as well as all spills which may take place in the onshore terrestrial environment, throughout all phases of the Project.

This provisional EMP does not apply to spills to the offshore and nearshore marine environment or spills on support vessels as these are addressed under separate oil-spill contingency plans and shipboard oil-pollution emergency plans.

1.2 Potential sources of onshore spills or leaks

During all phases of the Project, potential sources of chemical or hydrocarbon spills or leaks will include the following:

- earthmoving equipment (e.g. excavators, graders and scrapers)
- construction or operations vehicles (e.g. cranes, trucks and forklifts)
- accidental release of wastewater from bunds and sumps containing hydrocarbons or chemicals
- process equipment maintenance
- process equipment and piping failure
- storage vessel or distributor line failures
- refuelling and transfer operations
- incorrect storage and handling of chemicals or hydrocarbons
- long-term slow leaks from tanks or vessels.

1.3 Potential impacts

Potential impacts associated with onshore spills and leaks of chemicals or hydrocarbons as a result of Project activities include the following:

- contamination of soil
- contamination of surface water
- contamination of groundwater which could flow into Darwin Harbour
- toxic effects to plant and animal life.

The potential environmental impact from an accidental spill or leak will depend on the nature of the material released, the volume of the material released, and the location and receiving environment of the spill or leak.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for onshore spill prevention and response management are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

3 MANAGEMENT APPROACH

Detailed onshore spill prevention and response management documentation, for example plans and procedures, will be developed for all phases of the Project. These detailed documents will align with this provisional onshore spill prevention and response EMP. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

A summary is provided below of the main engineering and management controls to be included in the detailed documentation to mitigate the risks associated with chemical and hydrocarbon spills and leaks.

3.1 Engineering controls—design phase

The engineering controls to be implemented during the design phase of the Project include the following:

- Onshore facilities will be designed and constructed in such a way that spills and leaks can be constrained or isolated, particularly in areas where there is an elevated risk of spill.
- Bunding will be provided for chemical and hydrocarbon storage, handling and transfer areas. It will be designed in accordance with the relevant Australian standards as well as with the requirements of the regulatory authorities.
- Storage facilities for hazardous goods and wastes will be designed in accordance with the prescriptions of the relevant Australian standards as well as with the requirements of the regulatory authorities.

3.2 Management controls—all phases

The management controls to be implemented throughout all phases of the Project are outlined below:

- Detailed spill prevention and response management plans or procedures will identify potential spill sources, the material type (hydrocarbon, chemical, etc.), clean-up methods for various material types, and the locations and contents of spill response kits.
- Chemicals and hazardous substances used during all phases of the Project will be selected and managed to minimise the potential adverse environmental impact associated with their transport, transfer, storage, use and disposal.
- Chemicals and hazardous substances will be stored, transported and handled in accordance with Australian standards and regulatory requirements.
- A tiered management response approach will be developed and implemented for the management of spills of hydrocarbons or chemicals.

Table 2-1: Onshore spill prevention and response management objectives, targets and indicators

Objectives	Targets	Indicators
Prevent environmental impacts from chemical spills during all phases of the Project.	<ul style="list-style-type: none"> • Zero environmental incidents resulting in environmental impact from chemical spill events. 	<ul style="list-style-type: none"> • Number of incident reports and severity of incidents resulting from chemical spill events.
Prevent environmental impacts from hydrocarbon spills during all phases of the Project.	<ul style="list-style-type: none"> • Zero environmental incidents resulting in environmental impact from hydrocarbon spill events. 	<ul style="list-style-type: none"> • Number of incident reports and severity of incidents resulting from hydrocarbon spill events.
Establish and maintain personnel awareness of the importance of good spill prevention and response management practices during all phases of the Project.	<ul style="list-style-type: none"> • All workforce members (including contractors) to complete a health, safety and environment (HSE) induction, which will include information on spill management practices. 	<ul style="list-style-type: none"> • Number of people accessing the site as recorded by security. • Number of people completing an HSE site induction.

- All spills of hydrocarbons and chemicals are to be cleaned up immediately and reported to a supervisor. An incident report will be raised and it will contain, as a minimum, details of the quantity of spilt material, the type of spill (hydrocarbon or chemical), a description of the receiving environment, the location of the spill incident, and how the spill was dealt with. Notifications to government will be made in accordance with detailed onshore spill prevention and response plans or procedures.
- Spill response materials and equipment (including personal protective equipment) will be available during all phases and will contain equipment to combat both chemical and hydrocarbon spills.
- Material safety data sheets (MSDSs) will be available on the facilities to aid in the identification of appropriate spill clean-up and disposal methods.
- Disposal of spill clean-up materials will be managed as prescribed in the detailed waste management plans. Materials (e.g. contaminated absorbents) will be contained and taken to a hazardous-waste storage facility. All containers will be appropriately marked with, as a minimum, labels identifying the type of contaminant they hold. The materials used to construct the containers will be compatible with the chemicals they will contain.
- Whenever practical, refuelling will take place at permanent locations designed and constructed in accordance with Australian standards and regulatory authority requirements.
- Safe fuel transfer procedures will be developed and implemented.
- Bund drain valves will remain closed during normal operations.
- Bunds and sumps will be inspected on a regular basis, in particular prior to extreme weather events and after rain has fallen.
- Regular inspections and preventive maintenance of storage areas and equipment will be undertaken to prevent spills through equipment failure.
- Where practicable, maintenance activities will be performed in areas that are purpose-built with catchments and sumps.
- Where required, bunds and sumps will be drained of standing clean water during the wet season to prevent the contamination of large volumes of water should a spill occur and the overflow of potentially contaminated water to grade during heavy rains.
- Equipment and activities will preferentially be sited in established containment systems, or temporary systems will be used where this is not feasible or effective.

- Stormwater drains are to be kept clean of hydrocarbon or chemical spills.
- Soil contaminated by an onshore spill will either be treated in situ or be removed for treatment and appropriately disposed of in accordance with the detailed onshore waste management plan.
- Personnel (including contractors) will be required to attend inductions when first attending site during the construction, commissioning and operations phases of the Project. The induction sessions will include specific information on the appropriate handling and storage of hazardous materials (e.g. petroleum products), the best practices both for preventing and for cleaning up spills, and training in the site incident reporting procedure.
- Personnel who routinely handle hazardous materials or wastes (e.g. refuelling personnel, pump operators, mechanics, and stores personnel) will receive training in handling, transporting and storing hazardous materials or wastes; in reporting and documentation requirements; and in spill clean-up techniques and practices.
- Personnel forming the emergency response team will receive training on response actions to be taken in the event of a chemical and/or hydrocarbon spill.

3.3 Management controls— construction phase

During the construction phase, appropriate temporary containment facilities will be provided for the storage of chemicals and hydrocarbons and for the storage of hazardous waste until permanent infrastructure is in place.

3.4 Management controls—commissioning and operations phases

Management controls to be implemented throughout the commissioning and operations phases of the Project are outlined below:

- Hydrocarbon or chemical spills in bunds and sumps will be cleaned using absorbent materials, skimmers, or similar (if safe and practical to do so), prior to washing down to an oil-and-water separator for treatment.
- Chemicals and hazardous substances proposed for use by contractors will be submitted for review and approved for use prior to reaching site. This will apply, for example, to external contractors who may be required for such activities as non-routine maintenance activities, large maintenance shutdowns, and cleaning.

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the identified objectives and targets. The activities listed below will be undertaken as part of the hydrocarbon and chemical spill monitoring:

- Hydrocarbon and chemical spill incidents will be monitored through INPEX's and its contractors' incident-reporting databases.
- Records of liquids received, stored and dispensed will be maintained and reconciled.
- Inspections of the process and storage facilities for signs of spills or leaks will be undertaken on a regular basis.
- Bunds and sumps will be inspected regularly and kept free of hydrocarbon or chemical accumulations.
- A periodic analysis will be undertaken of data in incident-reporting databases in order to identify areas with more frequent spill occurrences.
- A groundwater quality monitoring program will be developed to assess water quality and to detect signs of spills or leaks that may occur during the operations phase.
- A marine sediments and bio-indicators monitoring program will be developed to assess any accumulation of metals and petroleum hydrocarbons in sediments and selected bio-indicators that might result from surface water and groundwater flows from the onshore facility.

Triggered management response

A management response will be triggered by either of the following two circumstances:

1. a spill or leak "incident"
2. the identification by an annual management review of a failure to meet an objective or target.

The responses to these are outlined below.

Response to spill or leak "incidents"

Any spill or leak will be classified as an "incident".

Spill incidents could include the following:

- a chemical or hydrocarbon spill or leak that is contained and not released to the environment, but had the potential to do so
- a hydrocarbon or chemical spill or leak that has not been contained in a hardstand bunded area and has been released to the environment.

The detection of incidents associated with chemical or hydrocarbon spills or leaks will trigger internal notifications, reporting requirements, investigations and associated corrective and preventive actions.

The level of investigation will depend on the potential risk associated with the event. Corrective and preventive actions that may be triggered as a result of the investigation would include spill clean-up, ongoing monitoring of the affected site, the review and update of procedures or plans associated with spill management and/or refresher training for personnel on Project spill-management processes.

INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigation requirements. All hydrocarbon and chemical spills, "near misses" and incidents will be entered into INPEX's and its contractors' incident databases and corrective actions will be tracked to closure. As a minimum, details of the quantity of spilt material, the type of spill (hydrocarbon or chemical), a description of the receiving environment, the location of the spill incident, and how the spill was dealt with are required when reporting spills.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will initiate the following responses:

- a review of existing internal objectives and targets to reassess achievability
- an interrogation of incident data to determine the frequency and location of spills on site, to assist in identifying areas where problems recur.

The response to the results of investigations and audits may include the following:

- increased maintenance requirements for problem equipment or the replacement of equipment
- ongoing monitoring (e.g. of groundwater, vegetation) of a spill-affected area to determine if mitigation measures have been effective
- an update of plans or procedures to reflect changes to the management of spill prevention and response
- refresher training for personnel on the practices and processes developed for the Project on how to prevent and respond to spills
- refresher training for personnel on the storage and handling of chemicals and hydrocarbons.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken over the various phases of the Project. A summary of the reporting, auditing and review requirements relating to hydrocarbon and chemical spills is provided in the following two sections.

5.1 All phases

The reporting, auditing and review requirements applicable to all phases of the Project are as follows:

- Incidents resulting in any hydrocarbon or chemical spills as a result of Project activities will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- An annual INPEX environmental report for the Project will be produced. It will include details of the occurrences of hydrocarbon and chemical spills, their frequency, and the volumes spilled.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Records will be audited periodically to ensure that all personnel on site have completed the required HSE induction.
- Detailed onshore spill prevention and response management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

5.2 Construction, commissioning and decommissioning phases

In addition to the reporting requirements described above, during the construction, commissioning and decommissioning phases of the Project, contractors will be required to produce and provide to INPEX a monthly environmental report which will include a record of environmental incidents.

6 SUPPORTING DOCUMENTATION

This provisional plan is one document in a group of plans, procedures and processes designed to ensure that INPEX's onshore spill prevention and response management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the preparation of INPEX's detailed onshore spill prevention and response management documentation:

- equipment maintenance
- chemical and hazardous substance management
- fuel transfer
- incident reporting, recording and investigating
- waste
- oil spill contingency
- HSE site induction.

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments, standards and guidelines specifically related to spills or storage and handling requirements for hydrocarbons and chemicals include the following:

- *AS 1940:2004, The storage and handling of flammable and combustible liquids.*
- *AS/NZS 2243.10:2004, Safety in laboratories—Storage of chemicals.*
- *AS 3780:2008, The storage and handling of corrosive substances.*
- *AS/NZS 3833:2007, The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers.*
- *AS 4326:2008, The storage and handling of oxidizing agents.*
- *AS/NZS 4452:1997, The storage and handling of toxic substances.*
- *AS/NZS 4681:2000, The storage and handling of Class 9 (miscellaneous) dangerous goods and articles.*
- Petroleum (Occupational Health and Safety) Regulations (NT).
- *Waste Management and Pollution Control Act (NT)* and the associated "Compliance Guidelines" prepared by the Northern Territory's Department of Natural Resources, Environment and the Arts (now the Department of Natural Resources, Environment, the Arts and Sport).
- Waste Management and Pollution Control (Administration) Regulations (NT).

Provisional Piledriving and Blasting Management Plan

Annexe 12 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken and will take all practicable steps to properly manage the risks associated with, and the potential environmental impacts of, the piledriving and blasting activities undertaken both onshore and offshore during the construction phase of the Project.

Terrestrial blasting activities during the construction phase (should they be required) will cause some ground vibration but this will be limited. Animals close to blasting sites are expected to be affected by the percussion shock from the explosions. However, it is expected that the human activity in an area prior to the commencement of blasting will drive most of the larger animals temporarily away.

Marine piledriving and blasting activities have the potential to affect marine mammals (i.e. whales, dolphins and dugongs) and other animal groups (e.g. fish, turtles and birds). Underwater noise is influenced by a number of factors, including the frequency of the sound, absorption losses, the sound speed profile throughout the water column, the bathymetry of the area, and the nature of the seabed.

This provisional environmental management plan (EMP) for piledriving and blasting is attached as Annexe 12 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX will minimise the potential environmental impact of piledriving and blasting activities undertaken during the construction phase (both offshore and onshore) through the identification of suitable management controls.
- It demonstrates how INPEX will minimise the potential impacts of piledriving and blasting activities on “matters of national environmental significance”¹ during the construction phase (both offshore and onshore) through the identification of suitable management controls.
- It describes the proposed monitoring requirements for all phases of the Project.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of future more detailed environmental documentation such as the plans, procedures, etc., which will be required for the construction phase of the Project.

The scope of this provisional EMP includes piledriving and blasting (marine and terrestrial) activities undertaken in the Project's construction phase.

1.2 Potential impacts

Potential impacts on marine and terrestrial fauna which are associated with piledriving and blasting activities include the following:

- temporary displacement or disturbance of marine and terrestrial animals
- temporary or permanent hearing-threshold shifts in marine animals
- physical injuries caused to marine animals
- deaths of marine animals.

¹ “Matters of national environmental significance” are defined in the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for piledriving and blasting management are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

Table 2-1: Piledriving and blasting management objectives, targets and indicators

Objectives	Targets	Indicators
Avoid potential impact to cetaceans, dugongs, turtles or crocodiles during blasting activities.	<ul style="list-style-type: none"> Zero incidents from blasting activities impacting on cetaceans, dugongs, turtles or crocodiles. 	<ul style="list-style-type: none"> Number of incident reports from blasting activities impacting on cetaceans, dugongs, turtles or crocodiles.
Avoid potential physiological damage to cetaceans, dugongs, turtles or crocodiles during blasting activities.	<ul style="list-style-type: none"> No cetaceans, dugongs, turtles or crocodiles within the fauna protection zone (see Section 3.1) during the detonation of a blast. 	<ul style="list-style-type: none"> Number of cetaceans, dugongs, turtles or crocodiles within the fauna protection zone during the detonation of a blast.
Avoid potential physiological damage to cetaceans, dugongs, turtles or crocodiles during piledriving activities.	<ul style="list-style-type: none"> No cetaceans, dugongs, turtles or crocodiles within a radius of 100 m of the piledriving activity area prior to the “soft start” (see table footnote) of a piledriving session. 	<ul style="list-style-type: none"> Number of cetaceans, dugongs, turtles or crocodiles observed to be within a radius of 100 m during the “soft start” of a piledriving session.
Avoid deaths of seabirds or other scavenging species foraging for dead fish in blast zones.	<ul style="list-style-type: none"> No seabird or other scavenging animal deaths attributable to blasting activities. 	<ul style="list-style-type: none"> Number of dead animals found.
Establish and maintain awareness of piledriving and blasting impacts on the environment and the management measures put in place to mitigate them during all phases of the Project.	<ul style="list-style-type: none"> Relevant workforce personnel (including contractors) to complete activity-specific health, safety and environment (HSE) induction, which will include information on piledriving and blasting impacts and management practices. 	<ul style="list-style-type: none"> Number of people completing HSE inductions.
Maintain appropriate safety exclusion zone (see Section 3.1) around blasting activities to ensure public safety.	<ul style="list-style-type: none"> Zero incidents of marine traffic or recreational water-users identified in the safety exclusion zone. 	<ul style="list-style-type: none"> Records of safety exclusion zone breaches during blasting operations.

Note: The “soft-start” technique involves gradually scaling up piledriving activities over a 5-minute period. The piledriving blows start at low-impact levels and work up to full impact, providing an opportunity for any impact-sensitive animals that happen to be in the vicinity to leave the area before they are exposed to the full intensity of underwater noise.

3 MANAGEMENT APPROACH

Detailed piledriving and blasting documentation, for example plans and procedures, will be developed for the construction phase of the Project. These documents will align with this provisional piledriving and blasting EMP. The detailed documentation will be prepared either directly by INPEX’s Environmental Department or by specialist contractors in conjunction with INPEX.

A summary of the main management controls to be employed in the detailed documentation to mitigate the risks associated with piledriving or blasting activities is provided below.

3.1 Blasting management controls— construction phase

The management controls to be implemented for blasting activities during the construction phase of the Project are as follows.

Applicable to both onshore and nearshore environments

- Blasting operations will only be undertaken during daylight hours and adequate notice will be provided to people who could be affected by the sound or activities (e.g. Darwin Harbour users, the citizens of Palmerston and the workforce at the Darwin Liquefied Natural Gas plant at Wickham Point).
- Only the minimum required charge will be used for onshore and nearshore blasting operations.
- A permit-to-work (or similar) system will be implemented on site to ensure that areas where onshore and nearshore blasting activities are occurring, or will occur, are clearly identified and that management measures are in place prior to work commencing.
- The drill-and-blast program will be designed to ensure that no damage occurs to buildings, the Bayu–Undan Gas Pipeline, wharf structures or any other underwater infrastructure.

Onshore-specific

- Smaller staggered blasts will be carried out to minimise vibration and noise levels from blasting activities.
- Blasting teams will ensure that the correct “maximum instantaneous charge” and blast-hole sizes are used in order to minimise flyrock generation.
- Access to the onshore development area will be managed to ensure that there are no members of the public within the site boundaries.

Nearshore-specific

- Confined blasting methods will be used, with micro-delays between charges to reduce peak pressure levels of each blast in the surrounding waters.
- Fauna protection zones will be developed for nearshore blasting. The extent of these zones will be determined once detailed geotechnical investigations have been completed and further information from drill and blast contractors has become available.
- Trained marine fauna observers will survey the fauna protection zones prior to the commencement of blasting. If marine megafauna (e.g. cetaceans, dugongs, turtles and crocodiles) are observed to enter the fauna protection zone, blasting activities will be suspended. Detonations will only be permitted if the fauna protection zone is observed to be free of marine megafauna for a period of at least 20 minutes.
- For effective surveillance, blasting will only be conducted during the hours of daylight and in benign sea conditions so that observers will be better able to sight any large marine animals within the fauna protection zone.
- The potential to use passive or active acoustic monitoring to identify submerged marine animals within the fauna protection zone will be evaluated by field testing. If shown to be practicable, these methods are likely to be used to complement vessel-based surveys prior to the commencement of blasting activities.
- Notice will be given to the Northern Territory’s Department of Lands and Planning and the Darwin Port Corporation advising vessel operators of any change to marine traffic conditions because of marine blasting activities.
- A safety exclusion zone for marine traffic and recreational water-users will be established around blasting areas. Public notices will be issued prior to blasting, to inform recreational water-users in any blasting area. INPEX will advise of the date, time and duration of the blasting activities and

will provide details of the boundaries of the safety exclusion zone.

- Explosive casings will be selected to minimise the risk of floating debris which, if ingested, could be harmful to marine mammals, birds, turtles and fish.
- Should fish be killed as a result of blasting activities and float to the surface of the water, they will be retrieved in order to minimise the possibility of scavenging seabirds and other predators being injured by subsequent blasts.
- A permit to conduct marine blasting will be sought from the Department of Resources (formerly the Department of Regional Development, Primary Industry, Fisheries and Resources), as required under Section 16 of the *Fisheries Act* (NT).

3.2 Piledriving management controls— construction phase

The management controls to be implemented for piledriving activities during the construction phase of the Project are as follows.

Nearshore-specific

- It is intended that piledriving activities will be undertaken only during daylight hours. Night-time piledriving will only be resorted to if Project construction activities fall significantly behind schedule.
- A watch will be maintained for cetaceans, dugongs, turtles and crocodiles for a duration of 10 minutes prior to the “soft start” of piledriving activities. If any animal is observed within the “fauna observation zone”, that is, within a radius of 100 m of the piledriving location, the “soft start” will not proceed until the animal has been observed to have moved outside the zone or is not sighted for 10 minutes.
- Piledriving will commence with the “soft-start” procedure, where activities are gradually scaled up over a 5-minute period. This will provide an opportunity for any sensitive marine animals to leave the area before being exposed to the full intensity of underwater noise.
- If piledriving is required after dark, the “soft-start” procedure will be the primary means of providing an opportunity for any sensitive marine animals to leave the area before being exposed to the full intensity of underwater noise.
- A permit-to-work (or similar) system will be implemented on site to ensure that areas where onshore and nearshore piledriving activities are occurring, or will occur, are clearly identified and that management measures are in place prior to work commencing.

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the identified objectives and targets. The activities below will be undertaken as part of the piledriving and blasting monitoring program:

- Piledriving and blasting incidents will be monitored through INPEX's and its contractors' incident-reporting databases.
- Visual monitoring for cetaceans, dugongs, turtles and crocodiles will be undertaken for 10 minutes within a 100-m-radius fauna protection zone around the piledriving activity area prior to the "soft start".
- Visual monitoring for cetaceans, dugongs, turtles and crocodiles within the designated fauna protection zone for blasting work activity will be undertaken for 20 minutes prior to detonation.
- Visual monitoring of marine traffic and recreational water-users approaching the nearshore blasting area will be carried out.
- Visual monitoring of pedestrian, road and marine traffic will be undertaken to ensure that no one approaches active onshore blasting areas.

Triggered management response

A management response will be triggered by any of the following four circumstances:

1. a piledriving or blasting "incident"
2. a sighting of a cetacean, dugong, turtle or crocodile within a designated fauna protection zone
3. the detection of marine vessels or recreational water-users within a designated safety exclusion zone for blasting activities
4. the identification by an annual management review of a failure to meet an objective or target.

The responses to these are outlined below.

Response to piledriving or blasting "incidents"

Incidents likely to trigger an investigation will include the following:

- the death of or injury to a cetacean, dugong, turtle or crocodile as a result of piledriving or blasting activities
- a failure to provide observers for cetaceans, dugongs, turtles and crocodiles during piledriving or blasting activities
- a failure to adhere to the requirement that piledriving should be gradually scaled up over a 5-minute period before operating at full impact
- a failure to adhere to the requirement that piledriving or blasting activities may not commence until the fauna protection zone has been declared free of large marine animals after a designated period of observation.

Management responses to incidents will include the following:

- the reporting of death or injury to a cetacean, dugong, turtle or crocodile to the relevant regulatory authorities
- the provision of refresher training for personnel on Project piledriving and blasting management processes and procedures.

The detection of incidents associated with piledriving and blasting will trigger internal notifications, reporting requirements, investigation and associated corrective and preventive actions. The level of investigation will be dependent on the potential risk associated with the incident.

The INPEX Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigation requirements. All incidents will be entered into INPEX's and its contractors' incident databases and corrective actions will be tracked to closure.

Response to large marine animals within the designated fauna protection zone

Cetaceans, dugongs, turtles or crocodiles entering the fauna protection zone for blasting or piledriving activities will trigger the following responses:

- The piledriving activity "soft start" will not commence until the animal moves outside the 100-m-radius fauna protection zone or is not sighted for 10 minutes.
- Blasting activities will cease and work will not recommence until the cetacean, dugong, turtle or crocodile has moved outside the fauna protection zone or is not sighted for 20 minutes.

Response to detection of marine vessels or recreational water-users within the designated safety exclusion zone

Marine vessels and recreational water-users within the designated safety exclusion zone will trigger the following response:

- Blasting activities will cease and work will not recommence until marine vessels or recreational water-users have moved out of the safety exclusion zone.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will trigger the following responses:

- a review and audit of current piledriving and blasting management practices to assess the practicability of their implementation, to identify new technology or methodology to further reduce impacts, and to assess resource requirements to enable the management plan to be implemented
- a review of current objectives and targets to assess achievability.

The response to the results of investigations and audits might include the following:

- an update of plans and associated documentation to reflect changes to piledriving and blasting management practices
- the provision of refresher training for personnel on Project piledriving and blasting management processes.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken during the construction phase of the Project.

A summary of the reporting, auditing and review requirements relating to piledriving and blasting management is outlined below:

- Incidents resulting from piledriving and blasting will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- Reporting of all confirmed incidents will be made to the relevant regulatory authorities (especially where an animal species is involved and is listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)).
- An annual INPEX environmental report for the Project will be produced and will include details of piledriving and blasting incidents.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Records will be audited periodically to ensure that all personnel on site have completed the required HSE induction.
- Detailed piledriving and blasting management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

- Construction contractors will be required to produce and provide to INPEX a monthly environmental report which will include a record of all environmental incidents.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's piledriving and blasting management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the implementation of detailed piledriving and blasting management documentation:

- incident reporting, recording and investigating
- visual monitoring of cetaceans, dugongs, crocodiles and turtles
- health, safety and environment site induction
- permit-to-work system.

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments, standards and guidelines specifically related to noise and vibration management include the following:

- *AS 1055.1:1997, Acoustics—Description and measurement of environmental noise—General procedures.*
- *AS 2436:1981, Guide to noise control on construction, maintenance and demolition sites.*
- Environment Protection Agency Program. 2007. *Noise guidelines: construction sites.* Draft guidelines prepared by the Environment Protection Agency Program, Department of Natural Resources, Environment and the Arts (now the Department of Natural Resources, Environment, the Arts and Sport), Darwin, Northern Territory.
- *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).
- Environment Protection and Biodiversity Conservation Regulations 2000 (Cwlth).
- *Fisheries Act* (NT).
- Petroleum (Occupational Health and Safety) Regulations (NT).
- *Waste Management and Pollution Control Act* (NT).



Provisional Quarantine Management Plan

Annexe 13 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, the potential introduction and establishment of marine or terrestrial invasive plant or animal species during all phases of the Project.

Invasive species of plants and animals can only colonise new habitats using the pathways available to them. Historically, natural pathways included wind, currents, rivers and mobile vectors such as birds and bats. In the case of the Project, the importation of materials and equipment as well as the importation and use of vehicles, boats and aircraft (and associated personnel) will create a number of new pathways that could be utilised by opportunistic and potentially invasive species.

The introduction of marine invasive species (“marine pests”) into waters of the Project area can potentially threaten biodiversity, fisheries and other biological, commercial and recreational marine values of the area. The Commonwealth’s Department of Agriculture, Fisheries and Forestry (DAFF), for example, estimates that in recent years more than 250 exotic marine species have been introduced into Australian waters, although not all have become pests (DAFF 2009).

Of all the marine-based activities associated with the Project, the nearshore activities, particularly during construction, present the greatest risk of introduction of marine pests. Introduction of a marine pest into the offshore development area is considered to pose only a minimal risk because of the depth of water in which the offshore infrastructure is located and the distance of the Ichthys Field from the Australian mainland (around 220 km).

Project activities also have the potential to introduce new terrestrial species of plants and animals into the onshore Project area on Middle Arm Peninsula in Darwin Harbour. This is likely to pose the biggest risk during the construction phase of the Project because of the increased number of international imports required at this time, and the use of excavation vehicles.

This provisional environmental management plan (EMP) for quarantine is attached as Annexe 13 to Chapter 11 *Environmental management program* of the Project’s draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and

procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX’s Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX will minimise the likelihood of any invasive species being introduced into the Project area and minimise the potential environmental impact of such an introduction, should it occur, through identified preventive quarantine management controls.
- It describes the proposed monitoring requirements for all phases of the Project.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of future more detailed environmental documentation, such as the plans, procedures, etc., which will be required throughout the life of the Project.

The scope of this provisional EMP includes the following:

- the quarantine requirements for international vessels sailing to or from the waters surrounding the offshore and nearshore Project areas
- the quarantine requirements for prefabricated modules and other direct imports from outside Australia, which are shipped directly to the module offloading facility on Blaydin Point
- the quarantine requirements for the mobilisation of clearing and excavation vehicles to the onshore development area.

This provisional EMP does not address the potential environmental impact of, or the management controls for, reducing the further spread of existing weed species in the onshore development area and their ongoing control, the sequestered quarantine waste from maritime vessels, or the direct imports from overseas offloaded at East Arm Wharf.

These are addressed as different aspects under the following EMPs:

- Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan (Annexe 15 to Chapter 11)
- Provisional Waste Management Plan (Annexe 16 to Chapter 11).

As East Arm Wharf has common-user quarantine and customs facilities available, quarantine management of goods passing through that facility falls outside the scope of this EMP.

1.2 Plan definitions

Australian Quarantine and Inspection Service

The Australian Quarantine and Inspection Service (AQIS) is part of the Commonwealth's Department of Agriculture, Fisheries and Forestry. AQIS provides quarantine inspection services for the arrival of international passengers, cargo, mail, animals and plants or their products into Australia, and inspection and certification for a range of animal and plant products exported from Australia. It monitors products being imported that may present a risk to the health of Australia's people, plant life or animal life.

Biofouling

Biofouling in terms of the Ichthys Project can be defined as the growth of or fouling by marine species of plants and animals on the submerged portions of ships' hulls, oil and gas platforms, jetties, etc. Biofouling on maritime vessels can assist in the introduction, spread and potential establishment of marine pest species.

Ballast water

Ballast water is sea water that unladen ships carry to provide stability and then discharge when their cargo is loaded. However, as ballast water pumped into a ship at a given port will contain a wide variety of marine organisms, from plankton and the larvae of various marine organisms to fish and seaweeds, there is clearly a risk of bringing marine pests to the port where the ballast water is discharged. AQIS deems all salt water from ports and coastal waters outside Australia's territorial sea to present a high risk of introducing exotic marine pests into Australia (DAFF 2008a).

AQIS requires masters of vessels plying international waters to manage ballast water prior to arrival in Australia's territorial sea. (The territorial sea is the area out to 12 nautical miles from the Australian territorial sea baseline along the coast.)

Invasive species

Invasive species are defined by the International Union for Conservation of Nature and Natural Resources (IUCN) as "organisms—usually transported (directly or indirectly) by humans—which successfully establish themselves in, and then overcome, otherwise intact pre-existing native ecosystems" (IUCN 2008). They inevitably damage environmental, agricultural or other social resources once they take hold.

Invasive species of particular concern are recognised under Commonwealth, state, and territory laws. These laws will provide the basis for a list of species of concern to the Project.

Marine invasive species ("marine pests")

Marine pests in Australia are marine plants or animals that are not native to Australia and which have been translocated to Australian waters by various vectors, including ballast water discharged by commercial shipping; biofouling on hulls and inside internal seawater pipes of commercial and recreational vessels; aquaculture operations, by accident or by intention; and aquarium imports.

They may have a significant impact on human health, fisheries and aquaculture, shipping and ports, tourism, environmental values, biodiversity and ecosystem health. Marine pest infestations also have a large financial impact.

Quarantine

The definition of quarantine in this EMP is essentially the same as that laid down by the *Quarantine Act 1908* (Cwth). The Act takes the scope of quarantine as including measures for the examination, exclusion, detention, observation, segregation, isolation, protection, treatment and regulation of vessels, installations, human beings, animals, plants or other goods or things. It also makes provision for the seizure and destruction of animals, plants or other goods or things. These measures have as their objective the prevention or control of the introduction, establishment or spread of diseases or pests that could cause significant damage to the ecosystems of the Project area, its animal and plant species, and the people who work there.

Quarantine-approved premises

Quarantine-approved premises (QAP) are post-border premises approved by the AQIS where post-entry quarantine activities (such as detailed inspections, fumigation, or the safe and secure removal of unwanted material, etc.) may be carried out responsibly so that the AQIS can be sure that quarantine tasks are performed with a minimal degree of risk.

Terrestrial invasive species

Terrestrial invasive species in the context of the Project's onshore development area in Darwin Harbour are plants and animals that are not native to northern Australia, which have the potential to survive in the onshore development area and which may threaten the environmental or social resources in the area by the damage they can cause.

1.3 Project quarantine pathways

The key Project pathways that have the potential to allow invasive species to become introduced or spread within the Project area are outlined in the following sections.

Marine quarantine pathways

The marine quarantine pathways for marine pest transfer into the offshore and nearshore Project areas are as follows:

- ballast-water exchange from vessels (domestic and international) sailing to or from the waters surrounding the offshore and nearshore Project areas
- biofouling by marine organisms on the hulls and other submerged parts of maritime vessels such as pipelay barges, dredgers and mobile offshore drilling units (MODUs) and other maritime infrastructure such as the central processing facility (CPF) and the floating production, storage and offtake (FPSO) facility.

Terrestrial quarantine pathways

The terrestrial quarantine pathways for terrestrial invasive species into the onshore Project area are as follows:

- prefabricated modules, equipment and other goods shipped from overseas direct to the module offloading facility on Blaydin Point
- earthmoving equipment mobilised to the onshore development area.

1.4 Project quarantine impacts

Potential impacts associated with the introduction and successful establishment of introduced species as a result of Project activities in either the marine or the terrestrial environment include the following:

- the displacement of native species
- the alteration and degradation of habitats and ecosystems
- the potential for impact on maritime-based activities and industries such as fishing and shipping.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for marine and terrestrial quarantine management are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described under Section 3 *Management approach*.

3 MANAGEMENT APPROACH

Detailed quarantine management documentation, for example plans and procedures, will be developed for all phases of the Project. These detailed documents will align with this provisional quarantine EMP and will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

Table 2-1: Quarantine management objectives, targets and indicators

Objectives	Targets	Indicators
Minimise the risk of introduction of marine pests into the offshore and nearshore Project areas.	<ul style="list-style-type: none"> • Zero introductions of marine pests attributable to the Project into offshore and nearshore Project areas. 	<ul style="list-style-type: none"> • Confirmed reports of introductions of marine pests into nearshore and offshore Project areas.
	<ul style="list-style-type: none"> • Zero breaches of marine biofouling and ballast-water management requirements. 	<ul style="list-style-type: none"> • Record-keeping, auditing, investigations and incident reports relating to marine biofouling and ballast-water management requirements.
Minimise the risk of introduction of terrestrial invasive species into the onshore Project area.	<ul style="list-style-type: none"> • Zero introductions of terrestrial invasive species attributable to the Project into the onshore Project area. 	<ul style="list-style-type: none"> • Confirmed reports of terrestrial invasive species in the onshore Project area.
	<ul style="list-style-type: none"> • Zero breaches of terrestrial quarantine management requirements. 	<ul style="list-style-type: none"> • Record-keeping, auditing, investigations and incident reports relating to terrestrial quarantine management requirements.
Establish and maintain personnel awareness of the importance of good terrestrial quarantine management practices during all phases of the onshore Project.	<ul style="list-style-type: none"> • All workforce personnel (including contractors) to complete a health, safety and environment (HSE) induction, which will include information on quarantine management practices. 	<ul style="list-style-type: none"> • Number of people accessing the site as recorded by security staff. • Record of people completing an HSE site induction.

A summary is provided below of the main engineering and management controls to be included in the detailed documentation to mitigate the risks associated with quarantine breaches.

3.1 Engineering controls—design phase

The engineering controls to be implemented throughout the various phases of the Project are outlined below:

- A temporary, dedicated QAP will be established on Blaydin Point during the construction phase. Vessels, equipment and modules entering from another country will be inspected here for quarantine material. The design of the QAP and the inspection procedures to be put in place will be according to AQIS standards. A temporary washdown area for earthmoving and other clearing vehicles will be constructed for the construction phase.

3.2 Management controls—all phases

Management controls to be implemented throughout all phases of the Project are outlined below:

- Ballast-water management of vessels engaged in Project activities will be undertaken in accordance with AQIS requirements.
- Biofouling management of all Project-associated vessels will be undertaken in accordance with the relevant regulatory requirements of the time. Anticipated regulatory requirements are outlined in a draft overview of proposed Australian biofouling management requirements prepared by the Department of Agriculture, Fisheries and Forestry (DAFF 2008b).
- INPEX will undertake a marine biofouling risk assessment of international vessels engaged in Project activities to assist in the early identification of biofouling risk and the determination of an appropriate management approach.
- Relevant quarantine information will be provided to international vessels engaged in Project activities to assist operators to meet AQIS requirements for biofouling.
- Baiting and trapping programs will be in place on international vessels engaged in Project activities in accordance with AQIS requirements.
- Topsides of international vessels will be inspected prior to commencement of Project activities to ensure that they meet AQIS requirements.
- Specific AQIS requirements identified during the prequalification period and through to final award and implementation will be developed.
- A packaging specification, applicable to all suppliers, contractors and subcontractors, will be developed to outline the requirements for

packaging of prefabricated modules and other direct imports from international ports to the module offloading facility on Blaydin Point or East Arm Wharf.

- During the contracting process, international suppliers and contractors will be provided with relevant quarantine information to assist in the preparation of quarantine goods into a state acceptable to AQIS.
- Advice will be sought from AQIS regarding the development of inspection procedures and plans associated with overseas module fabrication facilities.

3.3 Management controls—construction phase

Management controls to be implemented throughout the construction phase of the Project are outlined below:

- Vehicle hygiene requirements for earthmoving and other clearing vehicles will be included in any clearing and earthworks contracts.
- Prior to arrival at the onshore development area, all earthmoving and other vehicles used for clearing purposes will be expected to meet vehicle hygiene requirements. This may include pressure-hosing of vehicles to remove any vegetation debris, earth, seeds, etc.
- Prior to commencing activities, all earthmoving and other vehicles used for clearing purposes will be inspected on arrival at the onshore development area.
- Any earthmoving or other vehicles used for clearing purposes that fail to meet vehicle hygiene requirements, will undergo remedial cleaning at the temporary vehicle washdown area prior to commencement of work at the onshore development area.
- Prior to departing from the onshore development area, all earthmoving and other clearing vehicles will be washed down to remove vegetation, dirt, seeds, etc.
- All imports arriving from international ports at either the Blaydin Point module offloading facility or East Arm Wharf will need to meet both AQIS and INPEX requirements. All goods will be inspected prior to mobilisation into the onshore development area.
- The designated QAP on Blaydin Point will be used for more detailed inspections, isolation or cleaning of equipment that does not meet AQIS and INPEX requirements for imports arriving from international ports at the module offloading facility on Blaydin Point (e.g. prefabricated modules, equipment and machinery).

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the identified objectives and targets. The activities listed below will be undertaken as part of the marine and terrestrial quarantine monitoring programs:

- Quarantine incidents will be monitored through INPEX's and its contractors' incident-reporting databases.
- All earthmoving and other vehicles used for clearing purposes will be inspected prior to commencing activities in the onshore development area.
- Periodic audits of vessel ballast-water exchange records will be carried out to ensure that they meet AQIS requirements.
- Periodic audits of vessel antifouling records will be carried out to ensure that they meet the requirements of both INPEX and the regulatory authorities.
- All goods arriving at the QAP will be scrutinised against INPEX and AQIS quarantine requirements.
- Remotely operated vehicle (ROV) video footage obtained from marine fouling inspections (for wave-loading purposes) will also be used for opportunistic marine pest monitoring on offshore structures.
- A marine pest monitoring program will be developed for Darwin Harbour in conjunction with the relevant regulatory authorities, including the Northern Territory's Department of Natural Resources, Environment, the Arts and Sport and Department of Resources. It is anticipated that the monitoring program methodology will be consistent with the monitoring framework proposed by the Commonwealth Government's National Introduced Marine Pest Coordination Group.

Triggered management response

A management response will be triggered by any of the following three circumstances:

1. a quarantine breach "incident"
2. the identification of a potential marine pest species through Darwin Harbour or offshore development area marine pest monitoring
3. the identification by an annual management review of a failure to meet an objective or target.

The responses to these are outlined below.

Response to quarantine breach "incidents"

Quarantine breach incidents could include the following:

- Maritime vessel ballast-water exchange records or ballast-water exchange practices do not meet AQIS requirements.
- Maritime vessel biofouling management requirements, as determined through the vessel risk assessment process, have not been undertaken in accordance with INPEX's requirements.
- Maritime vessel antifouling records have not been maintained to a standard that meets the requirements of both INPEX and the regulatory authorities.
- Earthmoving machinery or vehicles used for clearing purposes are found not to meet the specified vehicle hygiene requirements on arrival at the onshore development area.
- Modules, equipment, containers or other direct imports received at the module offloading facility or the QAP do not meet AQIS importing requirements.

The detection of incidents associated with quarantine breaches will trigger internal notifications, reporting requirements, investigations and associated corrective and preventive actions.

The level of investigation will be dependent on the potential risk associated with the event. Corrective and preventive actions that may be triggered as a result of the investigation would include the remedial cleaning of equipment, the isolation of equipment, the review and update of procedures or plans associated with quarantine management, and/or the provision of refresher training for personnel on Project quarantine management processes.

INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigation requirements. All quarantine incidents will be entered into INPEX's and its contractors' incident databases and corrective actions will be tracked to closure.

Response to the identification of a potential marine pest species

The response to the identification of a potential marine pest species will be to notify the relevant regulatory agencies and confer with the Consultative Committee on Introduced Marine Pest Emergencies on the appropriate actions to be taken in response to the incident.

Specimens of the suspected organism would be collected as soon as practicable for formal identification.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will trigger the following responses:

- a review of existing internal objectives and targets to reassess achievability
- the interrogation of incident data to determine if there are deficiencies in quarantine management.

The response to the results of investigations and audits may include the following:

- an update of plans or procedures to reflect changes to the quarantine management
- refresher training for personnel on the practices and processes developed for quarantine management for the Project.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken throughout all phases of the Project. A summary of the reporting, auditing and review requirements relating to quarantine management is provided in the following two sections.

5.1 All phases

The following reporting, auditing and review requirements will be put in place for all phases of the Project:

- Incidents resulting in any quarantine breaches as a result of Project activities will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- An annual INPEX environmental report for the Project will be produced.
- Ballast-water management and antifouling management records will be maintained for all relevant Project vessels.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Maritime vessel ballast-water and antifouling management records will be audited periodically to ensure that they meet AQIS and INPEX requirements.
- Records will be audited periodically to ensure that all personnel on site have completed the required health, safety and environment induction.

- Detailed quarantine management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

5.2 Construction, commissioning and decommissioning phases

In addition to the reporting, auditing and review requirements described above, during the construction, commissioning and decommissioning phases of the Project contractors will be required to produce and provide a monthly environmental report to INPEX which will include a record of environmental incidents.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's quarantine management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the implementation of INPEX's detailed quarantine management documentation:

- contract quarantine information packages
- incident reporting, recording and investigation procedure
- health, safety and environment site induction (offshore and onshore).

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments, standards and guidelines specifically related to quarantine management include those listed below.

- Australian Quarantine and Inspection Service. 2007. *Guide to completing the quarantine pre-arrival report (pratique) form for vessel clearance*. Department of Agriculture, Fisheries and Forestry, Canberra, ACT.
- Australian Quarantine and Inspection Service. 2008. *Treatments and fumigants: AQIS heat treatment standard: Version 1*. Department of Agriculture, Fisheries and Forestry, Canberra, ACT.
- Australian Quarantine and Inspection Service (AQIS). 2008. *Australian ballast water management requirements*. Department of Agriculture, Fisheries and Forestry, Canberra, ACT.

- Australian Quarantine and Inspection Service. 2008. *Importer's information for offshore inspections of machinery & equipment*. Department of Agriculture, Fisheries and Forestry, Canberra, ACT.
- Australian Quarantine and Inspection Service. 2009. *Cargo containers: quarantine aspects and procedures*. Department of Agriculture, Fisheries and Forestry, Canberra, ACT.
- Australian Quarantine and Inspection Service. 2010. *AQIS methyl bromide fumigation standard: Version 1.4*. Department of Agriculture, Fisheries and Forestry, Canberra, ACT.
- Commonwealth Government. 2009. *National biofouling management guidance for the petroleum production and exploration industry*. The National System for the Prevention and Management of Marine Pest Incursions, Canberra, ACT.
- Fisheries Regulations (NT).
- 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.
- International Maritime Organization. 1998. *Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens*. International Maritime Organization, London, United Kingdom.
- *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006* (Cwlth).
- *Quarantine Act 1908* (Cwlth).
- Quarantine Proclamation 1998 (Cwlth).
- Quarantine Regulations 2000 (Cwlth).

8 REFERENCES

- DAFF—see Department of Agriculture, Fisheries and Forestry.
- Department of Agriculture, Fisheries and Forestry. 2008a. *Australian ballast water management requirements*. Department of Agriculture, Fisheries and Forestry, Canberra, ACT. Viewed online on 1 March 2010 at <http://www.daff.gov.au/__data/assets/pdf_file/0004/713884/bw-requirements.pdf>.
- Department of Agriculture, Fisheries and Forestry. 2008b. *Overview of the proposed Australian biofouling management requirements*. Draft information package prepared for the petroleum production and exploration industry by the Department of Agriculture, Fisheries and Forestry, Canberra, ACT.
- Department of Agriculture, Fisheries and Forestry. 2009. *Introduced marine pests*. Fact Sheet 1. Department of Agriculture, Fisheries and Forestry, Canberra, ACT. Viewed online on 1 March 2010 at <http://www.daff.gov.au/__data/assets/pdf_file/0009/5985/fs1_introducedpests.pdf>.
- International Union for Conservation of Nature and Natural Resources. 2008. *What are alien invasive species?* International Union for Conservation of Nature and Natural Resources, Gland, Switzerland. Viewed online on 1 March 2010 at <http://www.iucn.org/congress_08/about/special_events/sailing/protecting_oceans/ais/what_are_ais/>.
- IUCN—see International Union for Conservation of Nature and Natural Resources.



Provisional Traffic Management Plan

Annexe 14 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential social impacts of, the changes to pre-existing traffic conditions that will occur during the construction phase of the Project.

The greatest impact on normal traffic conditions that would be attributable to the Project will be the increase in vehicle movements generated during the construction and decommissioning phases. The magnitude of the increase in traffic during the decommissioning phase, however, will be dependent on as yet undetermined government requirements for the final land use at Blaydin Point when the Project ends. The additional traffic generated during the construction and decommissioning phases will be primarily attributable to employee transport between the onshore development area and the accommodation village and to truck movements.

Changes to normal traffic conditions during the operations phase are expected to be minimal as the numbers of vehicles and people accessing the onshore processing plant and related facilities will be greatly reduced from the numbers that are planned for the construction phase.

Nevertheless, a traffic impact assessment undertaken in 2008 by URS Australia Pty Ltd (see Appendix 22) concluded that the overall traffic impact of the onshore Project on the existing Darwin and Palmerston road networks will be minimal in comparison with the impact of the general growth in background traffic because of population growth.

This provisional environmental management plan (EMP) for traffic is attached as Annexe 14 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX intends to minimise the potential social impact of changes to normal traffic conditions that will be attributable to Project activities during the construction phase, through the identification of suitable traffic management systems and controls.
- It describes the proposed monitoring requirements for all phases of the Project.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of future more detailed environmental documentation, such as the plans, procedures, etc., which will be required throughout the life of the Project.

This provisional EMP does not address additional environmental impacts or management controls associated with maritime vessel traffic and changes to normal traffic conditions attributable to decommissioning activities. These will be addressed as separate aspects as follows:

- Maritime vessel traffic will be managed in accordance with the Darwin Port Corporation's requirements.
- Decommissioning traffic management is discussed in the Provisional Decommissioning Management Plan (Annexe 5 to Chapter 11 of this Draft EIS).

1.2 Activities that will lead to changes to onshore traffic conditions

Activities that will lead to changes in normal traffic conditions during the construction phase of the Project will include the following:

- the commuting of the construction workforce between the accommodation village and the onshore development area
- the transport of materials from quarries to the onshore development area
- the transport of equipment from East Arm Wharf to the onshore development area
- the movement of oversized vehicles through residential communities and business zones to the onshore development area
- the use of public transport by construction workers after hours
- normal local deliveries to the construction site.

1.3 Potential impacts

The potential impacts associated with changes to traffic conditions as a result of Project activities during the construction phase include the following:

- disruption and delays to local traffic
- localised traffic congestion
- additional pressure on existing public transport
- accidents on public roads involving Project vehicles
- loss of construction material during transport (e.g. aggregate, soil, stones).

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for traffic management are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

3 MANAGEMENT APPROACH

Detailed traffic management documentation, for example plans and procedures, will be developed for the construction phase of the Project. These detailed documents will align with this provisional traffic EMP. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

A summary is provided below of the main engineering and management controls to be included in the detailed documentation to mitigate the risks associated with changes in normal traffic conditions attributable to the Project.

3.1 Engineering controls

The engineering controls that may be considered during the construction phase of the Project are possible upgrades to roads and intersections.

3.2 Management controls

The management controls to be implemented during the construction phase of the Project are outlined below:

- Bus transport from the accommodation village or designated pick-up areas will be provided for the majority of construction personnel.
- Where possible, transport of workers to and from the accommodation village to the onshore development area will be conducted outside normal peak-hour traffic times.
- Locally employed workers will be transported by bus to the onshore development area. Workers will be collected from designated bus pick-up areas; these areas will include a car park where personnel can park their vehicles during their shifts.
- Designated routes for travel to and from quarries, the accommodation village, the Darwin central business district, airport and East Arm Wharf will be set for the Project. The selection process for the routes will give consideration to minimising disturbance to local traffic.
- Designated routes of travel will be provided to all persons using vehicles for Project activities (such as for the collection and delivery of materials and equipment, and the transport of workers).
- The use of unsealed roads outside the onshore development area by Project vehicles will be avoided as far as is practicable.
- Permits will be obtained for any oversized vehicles required for onshore Project activities in accordance with the *Motor Vehicles Act* (NT) and the *Motor Vehicles (Standards) Regulations* (NT).
- The provision of shuttle buses or similar transport for the workforce to local community areas, for example to the central business districts of Palmerston and Darwin after hours, will be given consideration by the Project.

Table 2-1: Traffic management objectives, targets and indicators

Objectives	Targets	Indicators
Prevent impacts from the transport of workers to and from the onshore development area during the construction phase.	<ul style="list-style-type: none"> • Zero incidents of buses using unauthorised traffic routes to access the onshore development area from the accommodation village, or vice versa. 	<ul style="list-style-type: none"> • Number of incident reports and severity of incidents resulting from buses using unauthorised transport routes to access the onshore development area from the accommodation village.
Prevent impacts from the transport of materials by heavy vehicles to and from the onshore development area during the construction phase.	<ul style="list-style-type: none"> • Zero incidents of heavy vehicles using unauthorised traffic routes to gain access to or depart from the onshore development area from or to East Arm Wharf, the Darwin central business district, the airport or quarries. 	<ul style="list-style-type: none"> • Number of incident reports and severity of incidents resulting from heavy vehicles using unauthorised transport routes to gain access to or depart from the onshore development area from or to East Arm Wharf, the Darwin central business district, the airport or quarries.

- Location-dependent speed limits will be imposed in the onshore development area to reduce the potential for vehicle accidents, the creation of dust, and accidental collisions with animals.
- The Project will work in conjunction with the Northern Territory's Department of Planning and Infrastructure 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.

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the identified objectives and targets. The activities listed below will be undertaken as part of the traffic monitoring program:

- Traffic incidents will be monitored through INPEX's and its contractors' incident-reporting databases.
- Periodic analyses of the data in the incident-reporting databases will be undertaken to identify deficiencies in traffic management practices.
- Vehicle (including bus) safety inspections will be undertaken periodically.

Triggered management response

A management response will be triggered by either of the following two circumstances:

1. a traffic "incident"
2. the identification by an annual management review of a failure to meet an objective or target.

The following two sections outline the responses to each of these two situations.

Response to traffic "incidents"

Project traffic "incidents" are taken to include the following:

- Project vehicles involved in traffic accidents
- Project vehicle breakdowns on public roads
- public complaints regarding traffic management
- unauthorised deviations from designated travel routes.

The detection of incidents associated with Project traffic will trigger internal notifications, reporting requirements, investigations and associated corrective and preventive actions.

The level of investigation will depend on the potential risk associated with a traffic incident. Corrective and preventive actions that may be triggered as a result of an investigation would include the review and update of procedures or plans associated with traffic management and/or refresher training for personnel on Project traffic management processes.

The INPEX Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigation requirements. All traffic incidents will be entered into INPEX's and the Project contractors' incident databases and corrective actions will be tracked to closure.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will trigger the following responses:

- a review of existing internal objectives and targets to reassess achievability
- an interrogation of incident data to determine deficiencies in traffic management practices.

The response to the results of investigations and audits may include the following:

- an update of plans or procedures to reflect changes to the traffic management systems
- refresher training for personnel on the traffic management practices and processes developed for the Project.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken throughout the construction phase of the Project. A summary of the reporting, auditing and review requirements relating to changes in traffic conditions is provided below:

- Incidents resulting from Project activities will be reported in accordance with INPEX's Incident Reporting, Recording and Investigating Procedure or the Project contractor's document equivalent (approved by INPEX).
- An annual INPEX environmental report for the Project will be produced.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Records will be audited periodically to ensure that all personnel on site have completed the required health, safety and environment (HSE) induction.

- Detailed traffic management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.
- Construction contractors will be required to produce and provide to INPEX a monthly environmental report which will include a record of all environmental incidents.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document of a suite of plans, procedures or processes designed to ensure that INPEX's traffic management objectives are achieved and undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues listed below have been or will be developed to further support the implementation of detailed traffic management documentation:

- traffic routes and maps
- driving conduct
- incident reporting, recording and investigating
- health, safety and environment site induction.

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments, for example, specifically related to traffic management include those listed below.

- *Motor Vehicles Act* (NT).
- Motor Vehicles (Standards) Regulations (NT).
- *Traffic Act* (NT).
- Traffic Regulations (NT).

Provisional Vegetation Clearing, Earthworks and Rehabilitation Management Plan

Annexe 15 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process for the Ichthys Gas Field Development Project (the Project), it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential environmental impact of, vegetation clearing and earthworks undertaken for the Project in the onshore development area during the construction phase. The company must also demonstrate that it will be able to successfully rehabilitate any areas that are temporarily disturbed during the life of the Project.

This provisional environmental management plan (EMP) for vegetation clearing, earthworks and rehabilitation is attached as Annexe 15 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

Surveys undertaken by GHD Pty Ltd (see Appendix 16 to this Draft EIS) indicated that there are three broad vegetation units within the onshore development area: eucalyptus woodlands, monsoon vine thickets and mangroves.

The highest animal species richness found in the onshore development area was associated with the eucalyptus woodlands (see Chapter 8 *Terrestrial impacts and management*). This vegetation type is well represented elsewhere on Middle Arm Peninsula, and the loss of these woodlands from the onshore development area is not likely to have a significant overall impact.

Monsoon vine forest has unique features and is regarded as having a high conservation value in the Darwin Coastal Bioregion. The area of monsoon vine forest on the Blaydin Point peninsula is relatively large compared with other patches around Darwin Harbour and has probably been isolated from fire damage to some extent by the intertidal salt flats around the island–peninsula. However, the monsoon vine forest at Blaydin Point represents just 1.0% of the total area of this vegetation type in the bioregion.

Fringing mangrove communities occupy much of the intertidal areas of the onshore development area.

Under the Northern Territory Planning Scheme these communities are zoned for “conservation”. Clearing associated with the onshore development and pipeline shore crossing will cause localised disturbance to the mangrove systems in these areas. However Darwin Harbour as a whole has extensive areas of mangrove forest and the proposed disturbance associated with these areas is not expected to have any significant impact on the distribution of mangroves in the Harbour.

Only one species of plant in the onshore development area is considered “vulnerable” under the *Territory Parks and Wildlife Conservation Act* (NT): this is the cycad *Cycas armstrongii*. No plant species or vegetation communities in the onshore development area have been identified as “matters of national environmental significance” under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act).

Four of the weeds identified in the onshore development area are listed as Schedule Class B/C weeds under the *Weeds Management Act 2001* (NT). These are mission grass (*Pennisetum polystachion*), hyptis (*Hyptis suaveolens*), lantana (*Lantana camara*) and gamba grass (*Andropogon gayanus*). This classification obliges landholders to make “reasonable attempts” to contain the growth and prevent the spread of these species.

No animal species listed as threatened under either the EPBC Act or the *Territory Parks and Wildlife Conservation Act* was recorded during field surveys although a number of birds listed as migratory under the EPBC Act were observed. Database searches, however, indicate that there are a number of threatened and migratory species that could potentially occur in and around the onshore development area.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX, through the identification of suitable management controls, intends to minimise the potential environment impact of clearing and earthworks activities during the construction phase in the onshore development area.
- It describes the proposed rehabilitation controls during all phases of the Project.
- It describes the proposed monitoring requirements for clearing and rehabilitation activities.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of future more detailed environmental documentation such as the plans, procedures, etc., which will be required throughout the life of the Project.

The scope of this provisional EMP includes all clearing and earthwork activities undertaken in the onshore development area during the Project's construction phase as well as the ongoing terrestrial vegetation rehabilitation programs which will be undertaken as the Project progresses.

This provisional EMP does not address the potential environmental impact of, or the management controls for, the following:

- dust generated as a result of clearing activities
- drainage and erosion
- the excavation of acid sulfate soil or potential acid sulfate soil
- onshore spill prevention and response
- the discovery or removal of Aboriginal or non-Aboriginal heritage sites
- bushfire prevention requirements
- the quarantine management of equipment before and after its arrival on the onshore development area
- decommissioning activities.

These are addressed as separate aspects or activities under the following provisional management plans:

- Provisional Acid Sulfate Soils Management Plan (Annexe 1 to Chapter 11)
- Provisional Bushfire Prevention Management Plan (Annexe 3 to Chapter 11)
- Provisional Decommissioning Management Plan (Annexe 5 to Chapter 11)
- Provisional Dust Management Plan (Annexe 7 to Chapter 11)
- Provisional Heritage Management Plan (Annexe 9 to Chapter 11)
- Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan (Annexe 10 to Chapter 11)
- Provisional Onshore Spill Prevention and Response Management Plan (Annexe 11 to Chapter 11)
- Provisional Quarantine Management Plan (Annexe 13 to Chapter 11).

1.2 Clearing and earthworks activities

The onshore infrastructure associated with the development will require clearing and earthworks activities. These will include the following:

- clearing works during construction
- earthworks for site preparation and construction
- the disposal and/or storage of cleared vegetation
- the establishment of borrow pits
- vehicle movements to and from the onshore development area.

1.3 Potential impacts

Potential impacts associated with clearing and earthworks activities in the onshore development area include the following:

- the loss of eucalyptus woodlands, monsoon vine forest and mangrove habitat
- a localised reduction in the biodiversity of native animals and plants
- the removal of cycads classed as "vulnerable" under the *Territory Parks and Wildlife Conservation Act*
- death or injury to animals as result of accidental entrapment
- the clearing of vegetation outside the approved Project footprint
- further spread of existing weed species in the onshore development area.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for vegetation clearing, earthworks and rehabilitation management are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

Table 2-1: Vegetation clearing, earthworks and rehabilitation management objectives, targets and indicators

Objectives	Targets	Indicators
Avoid disturbance to animals and plants outside the approved clearing footprint during the construction phase of the Project.	<ul style="list-style-type: none"> • Zero incidents of unauthorised clearing and disturbance. 	<ul style="list-style-type: none"> • Area cleared outside authorised clearing footprint.
Avoid injury or death to animals resulting from accidental entrapment during construction of the onshore development area infrastructure.	<ul style="list-style-type: none"> • Zero incidents of death or injury to animals resulting from accidental entrapment. 	<ul style="list-style-type: none"> • Number of incident reports relating to death or injuries of animals attributable to accidental entrapment.
Timely and successful rehabilitation of selected disturbance areas.	<ul style="list-style-type: none"> • Rehabilitation work is completed in a timely manner once an area is no longer required. • Rehabilitation of vegetation is successful. 	<ul style="list-style-type: none"> • Rehabilitation work is completed within a specified period of time. • Revegetation indicates that the flora composition of rehabilitated areas is comparable to the pre-existing vegetation.
Prevent the spread of listed weed species within the onshore development area.	<ul style="list-style-type: none"> • Weeds confined to existing areas of infestation only. 	<ul style="list-style-type: none"> • Extent of listed weed infestations within the onshore development area.
Establish and maintain awareness of the importance of protecting the ecological and heritage values associated with the onshore development area.	<ul style="list-style-type: none"> • All workforce personnel (including contractors) to complete a health, safety and environment (HSE) induction, which will include information on the ecological and heritage values associated with the onshore development area. 	<ul style="list-style-type: none"> • Number of people accessing the site as recorded by security. • Number of people completing an HSE site induction.

3 MANAGEMENT APPROACH

Detailed clearing and earthworks documentation, for example plans and procedures, will be developed for the construction phase of the Project. Similarly detailed rehabilitation documentation will be developed for other Project phases and activities. These documents will align with this provisional vegetation clearing, earthworks and rehabilitation EMP. The detailed documentation will be prepared either directly by INPEX’s Environmental Department or by specialist contractors in conjunction with INPEX.

A summary is provided below of the main engineering and management controls to be included in the detailed documentation in order to mitigate the risks associated with clearing and earthworks activities. Such controls will assist with later rehabilitation works.

3.1 Engineering controls—design phase

The vegetation clearing footprint for the onshore development area will be minimised through the appropriate design of the onshore facilities, subject to constructibility and safety operating requirements.

3.2 Management controls—all phases

Control methods will be developed to deal with infestations of listed weeds as described in the *Weeds Management Act 2001* (NT) and that are identified as occurring in the onshore development area (e.g. along roadsides, cleared areas, firebreaks and easements).

3.3 Management controls—construction phase

The management controls to be implemented for vegetation clearing, earthworks and rehabilitation during the construction phase of the Project are outlined below:

- Large-scale vegetation clearing and earthworks will preferentially be undertaken in dry-season conditions. Should clearing and earthworks be required to be undertaken during the wet season, adequate control measures will be implemented to avoid erosion and sedimentation impacts. INPEX’s proposed erosion and sedimentation controls are described in the Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan (Annexe 10 to Chapter 11).
- Major clearing activities will be undertaken in such a manner as to allow animal movement into remaining or surrounding vegetation.
- Areas to be cleared will be pegged and clearly delineated using high-visibility flagging tape or a similar device, so that operators are aware of the site boundaries.
- Areas to be cleared will be clearly marked on the construction and design plans and these plans will be readily available to personnel.

- All forms of disturbance, including personnel and vehicle movements, will be contained within the designated onshore development area to avoid impacts to surrounding vegetation. Some additional clearances may be required around the perimeter of the site to allow for appropriate firebreaks.
- Temporary fencing may be erected to assist in defining the construction site works area boundary to prevent personnel and machinery from accessing areas outside the approved footprint of the Project.
- Job hazard analyses, daily toolbox meetings, permit systems or similar will be implemented on site to ensure that areas to be cleared are clearly identified prior to work commencing and to avoid disturbance to Aboriginal heritage sites both inside and outside the site boundaries.
- If it is determined that specimens of the cycad *Cycas armstrongii* are to be moved off site and used for commercial purposes, a permit under the *Territory Parks and Wildlife Conservation Act* will be applied for and obtained prior to this being undertaken.
- 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. Mulched vegetation that will not be used will be disposed of off site. No stockpiled vegetation will be burned.
- Previously disturbed areas that have large infestations of listed weed species will either be cleared separately from undisturbed areas to avoid spreading weeds and their seeds to weed-free areas or will be managed through weed control programs. These will possibly include a combination of herbicide spraying and burning during appropriate seasonal conditions to remove the weed infestation before clearing commences.
- Any cleared vegetation infested with listed weeds where weed control measures have not been taken will be separately stockpiled and removed from site.
- Some topsoil which has not been infested with seed from listed weed species will be retained on site for reuse in rehabilitation and landscaping or will be integrated into cut and fill.
- Any topsoil from cleared areas where the vegetation was recorded as having been infested by a listed weed and where weed control has not been applied, will either be removed from site or be used as fill and covered.
- Temporarily disturbed areas such as those in the vicinity of the pipeline shore crossing and onshore pipeline route and areas around the plant that do not need to remain cleared will be reinstated and rehabilitated.
- “High-risk” entrapment areas (e.g. deep trenches or pits) will be provided with sloping egress ramps to allow animals to escape. Targeted inspections of these areas will be undertaken and any remaining trapped animals will be removed and released.
- Personnel (including contractors) will be required to attend inductions which will provide information on the importance of protecting the ecological and heritage values associated with the onshore development area.

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the identified objectives and targets. The activities described below will be undertaken as part of the vegetation clearing, earthworks and rehabilitation monitoring program:

- Incidents resulting from clearing, earthworks or rehabilitation activities will be monitored through INPEX’s and its contractors’ incident-reporting databases.
- Clearing will be monitored to ensure that there is no unauthorised clearing beyond the approved onshore development footprint. This will be determined using GPS (global positioning system) equipment to establish the boundaries of the cleared areas.
- A vegetation rehabilitation monitoring program will be developed to assess the progress and success of any rehabilitation works.
- A weed monitoring program will be developed to monitor the distribution and abundance of listed weed species in the onshore development area.
- Target inspections of “high-risk” entrapment areas will be undertaken during the construction phase.

Triggered management response

A management response will be triggered by either of the following two circumstances:

1. a vegetation clearing and earthworks “incident”
2. the identification by an annual management review of a failure to meet an objective or target.

The responses to these are outlined below.

Response to clearing or earthworks “incidents”

A non-compliant event is classified as an “incident”. Detection of incidents will trigger internal notifications, reporting requirements, investigations and associated corrective and preventive actions.

Incidents that may occur as a result of clearing activities include the following:

- clearing outside the approved Project footprint
- new infestations of listed weed species appear along access roads or in disturbed areas in the Project footprint
- the death or injury of an animal as a result of its being struck by a vehicle, becoming trapped in a pit, etc.

The level of investigation will be dependent on the potential risk associated with the event. Corrective actions that may be triggered as a result of the investigation would include the following:

- the implementation of control measures such as the spraying of infestations of weeds with herbicides
- a review and update of the procedures, processes and plans associated with vegetation clearing, earthworks and rehabilitation.

INPEX’s Incident Reporting, Recording and Investigating Procedure or the Project contractor’s document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigation requirements. All clearing incidents and “near misses” will be entered into INPEX’s and its contractors’ incident databases and corrective actions will be tracked to closure.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will initiate the following responses:

- a review and audit of current clearing, earthworks and rehabilitation management practices to assess the practicability of their implementation
- a review of current objectives and targets to assess achievability.

The response to the results of investigations and audits will include the following:

- an update of plans and associated documentation to reflect changes to clearing, earthworks and rehabilitation management practices (if applicable)
- the arrangement of refresher training courses for personnel, covering site-clearing, earthworks and rehabilitation management practices and processes
- the possible sourcing of additional resources to assist in the successful implementation of good site-clearing, earthworks and rehabilitation management practices.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken for earthworks and clearing activities during the construction phase and for rehabilitation activities in successive phases. A summary of the reporting, auditing and review requirements relating to clearing and rehabilitation management is outlined in the following two sections.

5.1 All phases

The reporting, auditing and review requirements applicable during all phases of the Project are as follows:

- Incidents will be reported in accordance with INPEX’s Incident Reporting, Recording and Investigating Procedure or the Project contractor’s document equivalent (approved by INPEX).
- An annual INPEX environmental report for the Project will be produced.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.
- Records will be audited periodically to ensure that all personnel on site have completed the required health, safety and environment induction.
- Detailed vegetation clearing, earthworks and rehabilitation management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

5.2 Construction phase

The reporting requirements applicable to the construction phase are as follows:

- A register will be maintained to record all clearing activities being undertaken.
- Project contractors will be required to provide INPEX with a monthly environmental report including details of monthly environmental incidents.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures or processes designed to ensure that INPEX's vegetation clearing, earthworks and rehabilitation management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

The following supporting INPEX documents have been or will be developed and should be read in conjunction with this provisional EMP:

- Provisional Acid Sulfate Soils Management Plan (Annexe 1 to Chapter 11)
- Provisional Dust Management Plan (Annexe 7 to Chapter 11)
- Provisional Heritage Management Plan (Annexe 9 to Chapter 11)
- Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan (Annexe 10 to Chapter 11)
- Provisional Onshore Spill Prevention and Response Management Plan (Annexe 11 to Chapter 11)
- Provisional Quarantine Management Plan (Annexe 13 to Chapter 11).

Documentation or processes addressing the issues outlined below have been developed to further support the implementation of detailed clearing, earthworks and rehabilitation management documentation:

- incident reporting, recording and investigating
- permit-to-work system
- health, safety and environment site induction.

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments, standards and guidelines specifically related to vegetation clearing, earthworks and rehabilitation management include those listed below.

- Environment Protection Authority. 2006. *Environmental guidelines for reclamation of coastal areas*. Northern Territory Government, Darwin.
- *Environment Protection and Biodiversity Conservation Act 1999* (Cwth).
- Department of Natural Resources, Environment, the Arts and Sport. 2006. *Land clearing guidelines*. (Originally published as Technical Report No. 27/2002 in 2002 and revised in 2006). Northern Territory Government, Darwin.
- *Soil Conservation and Land Utilization Act* (NT).
- *Territory Parks and Wildlife Conservation Act* (NT).
- *Weeds Management Act 2001* (NT).



Provisional Waste Management Plan

Annexe 16 – Chapter 11 *Environmental Management Program*

1 OVERVIEW

As part of the approvals process it is necessary that INPEX should show that it has taken, and will take, all practicable steps to properly manage the risks associated with, and the potential environmental impacts of, waste generated by the Project during its lifetime.

At different periods during the life of the Project varying quantities of waste of different types will be generated. It is expected, for example, that the quantities of waste material produced during the construction and decommissioning phases of the Project will be considerably higher than that produced during the operations phase over a similar time period.

In addition to this, the main waste types generated during the construction and decommissioning phases will differ from those produced during the operations phase, which will be dominated by hydrocarbon processing.

The waste types addressed here include solid and liquid hazardous wastes (e.g. oily rags and absorbents, solvents, batteries, fluorescent tubes, oily sludge, paints and oil filters) and non-hazardous wastes (e.g. paper, food waste, domestic waste, scrap metal, plastics, wood, glass and cardboard).

This provisional environmental management plan (EMP) for waste is attached as Annexe 16 to Chapter 11 *Environmental management program* of the Project's draft environmental impact statement (Draft EIS). It is one of a suite of similar EMPs dealing with different aspects and activities of the Project. These provisional EMPs will form the basis for the development of more detailed environmental management documentation, for example plans and procedures for the various phases of the Project as well as for specific activities associated with the Project. The detailed documentation will be prepared either directly by INPEX's Environmental Department or by specialist contractors in conjunction with INPEX.

1.1 Purpose and scope

The purpose of this provisional EMP is as follows:

- It demonstrates how INPEX will minimise the potential environmental impact of wastes generated as a result of Project activities through the identification of suitable waste management strategies.
- It describes the proposed monitoring requirements for all phases of the Project.
- It describes the proposed reporting, review and audit requirements for all phases of the Project.
- It will guide the development of future more detailed environmental documentation such as the plans, procedures, etc., that will be required throughout the life of the Project.

The scope of this provisional EMP includes all wastes (liquid and solid) that will be generated in association with activities in the Project area (both onshore and offshore), including non-hazardous and hazardous wastes.

This provisional EMP does not address potential environmental impacts or waste management controls for the following:

- process-generated wastes that are emitted to atmosphere (e.g. through flaring or as fugitive emissions)
- liquid wastes discharged through liquid effluent systems (e.g. produced water, wastewater, or drilling muds)
- dredge spoil
- acid sulfate soils
- contaminated materials or soil from onshore spill clean-up operations.

These are addressed as separate aspects under the following provisional EMPs:

- Provisional Acid Sulfate Soils Management Plan (Annexe 1 to Chapter 11)
- Provisional Air Emissions Management Plan (Annexe 2 to Chapter 11)
- Provisional Dredging and Dredge Spoil Disposal Management Plan (Annexe 6 to Chapter 11)
- Provisional Liquid Discharges, Surface Water Runoff and Drainage Management Plan (Annexe 10 to Chapter 11)
- Provisional Onshore Spill Prevention and Response Management Plan (Annexe 11 to Chapter 11).

1.2 Plan definitions

Listed wastes

Appendix A to this EMP contains the "listed wastes" prescribed under Schedule 2 of the Waste Management and Pollution Control (Administration) Regulations (NT).

Only listed wastes that have been determined under the New South Wales Environment Protection Authority Waste Guidelines (DECC 2008; DECCW 2009) as acceptable for disposal by burial may be disposed of at the Northern Territory's Shoal Bay Waste Disposal Site (DIPE 2005).

Under the *Waste Management and Pollution Control Act* (NT) waste contractors collecting, transporting, storing, recycling, treating or disposing of listed wastes are required to have an environmental protection licence.

Hazardous waste

Hazardous wastes (recyclable and non-recyclable) are wastes composed of or containing materials that may pose a threat or risk to public health, safety or the environment (including plants and animals). They include substances which are toxic, infectious, mutagenic, carcinogenic, teratogenic, explosive, flammable, corrosive, oxidising or radioactive. The hazardous waste generated may include medical waste, excess or spent chemicals, contaminated scrap metals or drums, oily rags and absorbents, solvents, batteries, fluorescent tubes, oily sludge, paints, oil filters, and naturally occurring radioactive materials (NORMs).

Non-hazardous waste

Non-hazardous wastes (recyclable and non-recyclable) are wastes composed of or containing materials which are not harmful to humans and which would not have a serious impact on the environment (including plants and animals) if released. They are made up of a combination of putrescible solids and liquids, and inert solids, including paper, food waste, domestic waste, scrap metal, plastics, wood, glass, cardboards, and sewage sludge.

Quarantine waste

In the context of the Ichthys Project, quarantine waste means materials or goods of quarantine concern as determined by the Australian Quarantine and Inspection Service (AQIS) and which are subject to and/or identified under the *Quarantine Act 1908* (Cwlth) and associated legislative instruments. It includes materials used to pack and stabilise imported goods; galley food and other waste from overseas vessels; human, animal or plant waste brought into Australia; refuse or sweepings from the hold of an overseas vessel; and any other waste or other material that has come into contact with the quarantine wastes listed above (EPA 2009).

1.3 Project waste sources

Waste generated onshore and offshore throughout the various phases of the Project will be a result of the operations and associated activities of the following:

- construction and development work. Sources of waste will include building and excavation operations; spill incidents; office, accommodation and kitchen operations; medical facility operations; and international vessels
- supply and logistics bases. Sources of waste will include day-to-day operations, packaging, administration operations, and spill incidents
- the mobile offshore drilling unit (MODU). Sources of MODU waste will include drilling activities, galley and accommodation operations, and spill incidents
- pipelay, supply and support vessels and third-party contractor vessels. Sources of waste will include galley waste, quarantine wastes (e.g. packaging), operations, and maintenance
- the central processing facility (CPF) and the floating production, storage and offtake (FPSO) facility. Sources of CPF and FPSO waste will include maintenance operations, the day-to-day operations of the process facilities, spill incidents, office and accommodation operations, kitchen operations, and medical facility operations
- the liquefied natural gas (LNG) processing plant on Blaydin Point. Sources of waste will include maintenance operations, pigging operations, the day-to-day operations of the processing facilities, spill incidents, office operations, medical facility operations, and international vessels.

1.4 Potential impacts

Project activities associated with waste generation, storage and disposal have the potential to impact on the onshore and offshore environment if not managed effectively. The following impacts could occur:

- localised, low-to-medium-level contamination of soils and surface water
- native animals being attracted to waste collection sites
- marine animals being attracted to waste discharge sites, potentially resulting in indirect impacts through predation
- the attraction of pest animals (e.g. seagulls) to waste collection sites
- the generation of offensive odours
- pollution of the marine environment from inappropriate handling and storage of waste, for example through nutrient enrichment
- toxic effects on marine biota
- an increase in fire risk associated with the storage of waste materials
- risks to human health.

2 OBJECTIVES, TARGETS AND INDICATORS

The objectives, targets and indicators set out by INPEX for waste management are shown in Table 2-1. The engineering and management controls to be implemented to help to achieve these targets are described in Section 3 *Management approach*.

Table 2-1: Waste management objectives, targets and indicators

Objectives	Targets	Indicators
Prevent environmental impacts from waste generated during all phases of the Project.	<ul style="list-style-type: none"> Zero environmental incidents (including “near misses”) resulting from waste mismanagement. 	<ul style="list-style-type: none"> Number of incident reports and severity of incidents resulting from waste mismanagement (including incorrect storage, spills, etc.).
Minimise the generation of waste during all operations. (See note below.)	<ul style="list-style-type: none"> Targets will be defined. A baseline calculation of annual waste volumes will be undertaken in the first twelve months of full operations (two LNG trains) and total waste reduction targets will be identified for subsequent years. 	<ul style="list-style-type: none"> Total annual waste volumes (including types, disposal method, etc.) during the first 12 months of full operations (two LNG trains).
Minimise the amount of waste sent to landfill during the operations phase of the Project.	<ul style="list-style-type: none"> 10% of the total volume of waste to be recycled by the end of the first year of full production. 	<ul style="list-style-type: none"> Annual volumes of waste produced. Annual volumes of wastes recycled.
Establish and maintain awareness of the importance of good waste-management practices during all phases of the Project.	<ul style="list-style-type: none"> All workforce personnel (including contractors) to complete a health, safety and environment (HSE) induction, which will include information on waste-management practices. 	<ul style="list-style-type: none"> Number of people accessing the site as recorded by security. Number of people completing an HSE site induction.

Note: During the construction and decommissioning phases of the Project, it is expected that the quantities of waste generated will fluctuate significantly both annually and from the start to the end of each phase in comparison with the volumes expected from steady normal operations.

As the annual waste amounts during these phases will vary greatly, it is difficult to identify meaningful annual reduction target percentages. Targets for the reduction of waste have therefore not been set for these phases, although management strategies have been identified and will be implemented to reduce the volumes of waste.

3 MANAGEMENT APPROACH

Detailed waste management documentation, for example plans and procedures, will be developed for all phases of the Project. These documents will align with this provisional waste EMP. The detailed documentation will be prepared either directly by INPEX’s Environmental Department or by specialist contractors in conjunction with INPEX.

A summary is provided below of the main engineering and management controls to be included in the detailed documentation in order to mitigate the risks associated with waste generated by the Project.

3.1 Engineering controls—design phase

The engineering strategies to be implemented during the design phase of the Project are as follows.

Applicable to both onshore and offshore

- Storage areas for hazardous or dangerous goods wastes will comply with applicable regulatory requirements and Australian design standards.
- Sufficient space will be provided on or within the CPF, the FPSO facility and the onshore gas plant to allow for the segregation and storage of wastes.

Offshore- and nearshore-specific

Macerators will be installed on support and construction vessels, the CPF, the FPSO facility, and the MODU in order to manage food wastes in accordance with the requirements of Annex V to the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) and Clause 222 of the Petroleum (Submerged Lands) Acts Schedule (DITR 2005). Accordingly, all food scraps will be ground to a size capable of passing through a screen with openings no greater than 25 mm prior to discharge, with such discharges occurring no closer than 12 nautical miles from the nearest land.

3.2 Management controls—all phases

The waste management controls to be implemented throughout all phases of the Project are outlined below.

Applicable to both onshore and offshore

- Responsible waste management will be accomplished through the application of the practices outlined in the waste management hierarchy—from source reduction, reuse and recycling to recovery, treatment and responsible disposal.

- Positive efforts will be made to maximise recycling during all phases of the Project, with a goal of 10% of all waste to be recycled by the end of the first year of full production during operations.
- An inventory including descriptions of foreseeable waste types produced throughout the various phases of the Project will be provided in the detailed waste management plans and will include instruction on appropriate waste handling and disposal practices.
- Only approved and licensed waste contractors will be employed for waste disposal.
- Waste minimisation will be included in the tendering and contracting process.
- Chemicals and hazardous substances used during all phases of the Project will be selected and managed to minimise the potential adverse environmental impact associated with their transport, transfer, storage, use and disposal.
- Material safety data sheets (MSDSs) will be available on the facilities to aid in the identification of appropriate spill clean-up and disposal methods.
- Where possible, required materials and chemicals will be purchased in bulk in order to reduce the amount of packaging waste. For example, chemicals could be supplied in intermediate bulk containers in preference to drums.
- Waste will be stored in the designated waste stations and appropriately segregated into hazardous waste and non-hazardous waste, and, where possible, into recyclable or reusable hazardous waste and recyclable or reusable non-hazardous waste. In the event of the discovery of any unidentified wastes, these will be treated as hazardous waste and stored accordingly.
- Bins containing food or other putrescible wastes will be covered to prevent scavenging by animals or infestation by flies.
- All hazardous liquid wastes will be stored over a bund in leak-proof sealed containers.
- All waste receptacles will be clearly labelled as to the nature of the materials that may be placed in them in order to avoid contamination or mixture of incompatible materials.
- Waste receptacles will not be permitted to be overfilled with materials.
- Management of “listed waste” will meet Northern Territory and Commonwealth regulatory requirements with regard to storage, transport and disposal.
- General “good housekeeping” practices will be undertaken to ensure that there is no accumulation of waste materials in the facilities, accommodation buildings, etc.
- All waste generated, stored and disposed of will be recorded, manifested and tracked to ultimate disposal. The facility logistics coordinators and onshore supply base will retain records and manifests of the quantities and types of waste stored and transported for disposal. Vessels and vehicles transporting waste will retain records and manifests of the quantities and types of wastes transported.
- The waste contractors will be required to retain records of the quantities and types of waste received and disposed of, as well as of the disposal method. Waste-disposal contractors will be required to provide INPEX with waste-disposal records.
- Waste-generation impacts will be taken into consideration during job hazard analyses (JHAs) where appropriate.
- Special arrangements will be made in advance for waste generated as a result of maintenance activities, for example the disposal of sizeable quantities of various non-hazardous wastes or non-routine hazardous waste.
- Spill kits will be placed in areas where liquid wastes are stored.
- Disposal of spill clean-up materials will be managed as prescribed in the detailed waste management plans. Materials (e.g. contaminated absorbents) will be contained and taken to a hazardous-waste storage facility. All containers will be appropriately marked with, as a minimum, labels identifying the type of contaminant they contain. The materials used to construct the containers will be compatible with the chemicals they will hold.
- During all phases of the Project all personnel, when first attending site, will be required to attend inductions highlighting the facility or vessel waste-management controls.

Nearshore-specific

The waste-management controls for international vessels docking at East Arm Wharf or at the onshore facility during all phases of the Project are outlined below:

- Food scraps from construction and support vessels working in the nearshore area (i.e. Darwin Harbour, but including the dredge spoil disposal ground north of Darwin Harbour) will not be discharged into the sea, but will be returned to shore for onshore disposal, in accordance with the provisions of the *Marine Pollution Act* (NT).
- All international vessels will comply with AQIS requirements with regard to the appropriate disposal of quarantine waste.

- All quarantine wastes from visiting international vessels will be segregated from onshore domestic wastes. Where domestic and quarantine wastes are mixed, they will be classified and disposed of as quarantine waste.
- Quarantine waste will be removed by an authorised contractor to an approved quarantine waste disposal area off site.

Offshore-specific

Offshore-specific waste-management strategies to be implemented during all phases of the Project are outlined below:

- All hazardous wastes returned to the mainland will be clearly labelled in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail and/or the International Maritime Dangerous Goods (IMDG) Code. In addition, waste chemicals, hazardous substances or dangerous goods returned to the mainland for disposal must be accompanied by copies of the MSDSs and dangerous goods declarations (if required).
- All non-hazardous wastes from vessels and offshore facilities (with the exception of food scraps) will be returned to the mainland for disposal.
- Food scraps from the CPF and the FPSO will be disposed of in accordance with the requirements of Annex V of MARPOL 73/78 and Clause 222 of the Petroleum (Submerged Lands) Acts Schedule (DITR 2005). Accordingly, all food scraps will be ground to a size capable of passing through a screen with openings no greater than 25 mm prior to discharge, with such discharges occurring no closer than 12 nautical miles from the nearest land.
- Food scraps from construction and support vessels will be disposed of in accordance with the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cwth). The following prescriptions apply:
 - between 3 and 12 nautical miles of land, food scraps will be ground to diameters of less than 25 mm prior to being discharged
 - beyond 12 nautical miles of land, unground food scraps may be discharged without treatment, except when a vessel is within 500 m of a fixed or floating platform.

Nearshore- and offshore-specific

In addition to the above, all solid wastes (with the exception of food scraps) from offshore and nearshore construction and support vessels will be returned onshore for disposal. These will include the following:

- plastics
- floating dunnage, lining and packaging materials
- paper, rags, glass, metal, crockery, and similar refuse.

All hazardous wastes will be retained on board vessels and offshore facilities, and transported to the mainland for disposal.

3.3 Management controls—construction phase

Onshore-specific

During the early construction phase for the onshore facilities, appropriate temporary containment facilities will be utilised for the storage of wastes until permanent infrastructure is in place.

3.4 Management controls—operations phase

Offshore-specific

Where practicable, the generation of sands and sludge will be avoided or minimised at source. The amount of sands and sludge disposed of overboard will be kept to a minimum and will only be so disposed of with the approval of the relevant regulatory authorities.

Process equipment will be designed to restrict the potential for scale formation; scale-inhibition chemicals will be used if required.

If NORMs are generated in a waste stream, a procedure will be developed for their storage and handling requirements. The disposal of NORMs will be determined on a case-by-case basis and will be discussed with the relevant regulatory authorities. The selected disposal method will minimise the potential for environmental impact.

4 MONITORING

Monitoring activities will be undertaken throughout the life of the Project in relation to the identified objectives and targets. The activities listed below will be undertaken as part of the waste monitoring program:

- Waste incidents will be monitored through INPEX's and its contractors' incident-reporting databases.
- Records will be maintained of the quantities of waste generated, the quantities transported and disposed of, and the methods of disposal (e.g. landfill or recycling) for all phases of the Project. Records will include waste manifests and disposal certificates.

- Workplace “housekeeping” inspections will be undertaken to ensure that there is no accumulation of waste materials in work areas and that wastes are appropriately stored.

Triggered management response

A management response will be triggered by either of the following two circumstances:

1. a waste “incident”
2. the identification by an annual management review of a failure to meet an objective or target.

The responses to these are outlined below.

Response to waste incidents

Waste incidents would include the following:

- liquid waste spills to the environment
- discovery of an unknown or unidentified waste product
- unaccounted for waste (at any stage from generation to disposal)
- incorrect recording of waste type or quantity
- incorrect storage or transport of waste.

Detection of incidents associated with waste mismanagement will trigger internal notifications, reporting requirements, investigations and associated corrective and preventive actions.

The level of investigation will be dependent on the potential risk associated with the event. Corrective and preventive actions that may be triggered as a result of the investigation include spill clean-up, treatment and isolation of the item, an audit of the waste tracking system, a review and update of procedures or plans associated with waste management, and/or refresher training for personnel on Project waste management processes.

INPEX’s Incident Reporting, Recording and Investigating Procedure or the Project contractor’s document equivalent (approved by INPEX) will be used to determine incident severity, potential risk and associated reporting, recording and investigation requirements. All waste incidents and “near misses” will be entered into INPEX’s and its contractors’ incident databases and corrective actions will be tracked to closure.

Response to adverse findings by an annual management review

Failure to meet identified objectives and targets will trigger the following responses:

- a review and audit of current waste management practices to assess the practicability of their implementation, to identify new sources of waste, to assess resource requirements and to investigate further opportunities for recycling or reuse of products
- a review of current objectives and targets to assess achievability.

The response to the results of investigations and audits may include the following actions:

- an update of plans and associated documentation to reflect changes to waste management practices (if applicable)
- the arrangement of refresher training for personnel, to cover site waste management practices and processes
- the possible sourcing of additional resources to assist in the successful implementation of good waste management practice; such resources might include personnel, storage areas, waste receptacles, etc.

5 REPORTING, AUDITING AND REVIEW

Reporting, auditing and reviews will be undertaken throughout all phases of the Project. A summary of the reporting, auditing and review requirements relating to waste management is provided in the following two sections.

5.1 All phases

The following reporting, auditing and review requirements will be implemented for all phases of the Project:

- The quantities of waste generated, stored and disposed of will be recorded and tracked to its ultimate disposal.
- Incidents will be reported in accordance with INPEX’s Incident Reporting, Recording and Investigating Procedure or the Project contractor’s document equivalent (approved by INPEX).
- Monthly internal environmental reporting will be undertaken and will detail quantities of non-hazardous, hazardous and recyclable waste materials produced.
- An annual INPEX environmental report for the Project will be produced and will include details of waste incidents.
- INPEX and its contractors will conduct internal compliance audits on a periodic basis.

- Verification and compliance audits of waste contractors will be periodically undertaken.
- Records will be audited periodically to ensure that all personnel on site have completed the required HSE induction.
- Detailed waste management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with the requirements of INPEX and the regulatory authorities.

5.2 Construction and decommissioning phases

During the construction and decommissioning phases, in addition to the reporting requirements described above, contractors will be required to produce and provide to INPEX a monthly environmental report which will include a record of all environmental incidents.

6 SUPPORTING DOCUMENTATION

This provisional EMP is one document in a suite of plans, procedures and processes designed to ensure that INPEX's waste-management activities are undertaken in compliance with legislative requirements and in a safe and environmentally responsible manner.

Documentation or processes addressing the issues outlined below have been or will be developed to further support the preparation of INPEX's detailed waste-management documentation:

- incident reporting, recording and investigating
- chemical and hazardous substance management
- management of NORMs
- logistics guidelines for the transport of waste
- waste tracking
- HSE induction.

7 APPLICABLE LEGISLATION, STANDARDS AND GUIDELINES

INPEX is committed to complying with all relevant laws, regulations and standards. Legislative instruments, standards and guidelines specifically related to waste management include those listed below.

- AS/NZS 1596:2008, *The storage and handling of LP gas.*
- AS 1940:2004, *The storage and handling of flammable and combustible liquids.*
- AS/NZS 2243.10:2004, *Safety in laboratories—Storage of chemicals.*
- AS 3780:2008, *The storage and handling of corrosive substances.*
- AS/NZS 3833:2007, *The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers.*

- AS 4326:2008, *The storage and handling of oxidizing agents.*
- AS 4332:2004, *The storage and handling of gases in cylinders.*
- AS/NZS 4452:1997, *The storage and handling of toxic substances.*
- AS/NZS 4681:2000, *The storage and handling of Class 9 (miscellaneous) dangerous goods and articles.*
- Australian Petroleum Production & Exploration Association. 2008. *Code of environmental practice.* Australian Petroleum Production & Exploration Association, Canberra, ACT.
- Australian Pipeline Industry Association Ltd. 2009. *Code of environmental practice: onshore pipelines.* Australian Pipeline Industry Association Ltd, Canberra, ACT.
- *Dangerous Goods Act (NT).*
- *Dangerous Goods Regulations (NT).*
- Department of Industry, Tourism and Resources. 2005. *Petroleum (Submerged Lands) Acts Schedule: specific requirements as to offshore petroleum exploration and production.* Department of Industry, Tourism and Resources (now the Department of Resources, Energy and Tourism), Canberra, ACT.
- *Environmental Offences and Penalties Act 1996 (NT).*
- *Environmental Protection (National Pollutant Inventory) Objective [Northern Territory].*
- *Environment Protection (Sea Dumping) Act 1981 (Cwlth).*
- *Environment Protection (Sea Dumping) Regulations 1983 (Cwlth).*
- *Hazardous Waste (Regulation of Exports and Imports) Act 1989 (Cwlth).*
- *Hazardous Waste (Regulation of Exports and Imports) Amendment Act 1996 (Cwlth).*
- 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.
- International Maritime Organization. 1972. *Convention on the prevention of marine pollution by dumping of wastes and other matter [as modified by the 1996 protocol].* International Maritime Organization, London, United Kingdom.
- International Maritime Organization. 2004. *International maritime dangerous goods (IMDG) code.* International Maritime Organization, London, United Kingdom.
- *Litter Act (NT).*

- *Marine Pollution Act* (NT).
- Marine Pollution Regulations (NT).
- National Environment Protection (Movement of Controlled Waste between States and Territories) Measure (as varied December 2004).
- National Environment Protection (Used Packaging Materials) Measure (as varied July 2005).
- National Transport Commission. 2008. *Australian code for the transport of dangerous goods by road and rail*. 7th ed. National Transport Commission, Melbourne, Victoria.
- *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cwlth).
- *Quarantine Act 1908* (Cwlth).
- Quarantine Regulations 2000 (Cwlth).
- Secretariat of the Basel Convention. 1992. *Basel convention on the control of transboundary movements of hazardous wastes and their disposal*. Secretariat of the Basel Convention, Geneva, Switzerland.
- *Waste Management and Pollution Control Act* (NT) and the associated “Compliance Guidelines” prepared by the Department of Natural Resources, Environment and the Arts (now the Department of Natural Resources, Environment, the Arts and Sport), Darwin, Northern Territory.
- Waste Management and Pollution Control (Administration) Regulations (NT).

8 REFERENCES

DECC—see Department of Environment and Climate Change.

DECCW—see Department of Environment, Climate Change and Water.

Department of Environment and Climate Change. 2008. *Waste classification guidelines: Part 2—Immobilisation of waste*. Environment Protection Authority, Department of Environment and Climate Change, Sydney, New South Wales. Viewed online on 1 March 2010 at <<http://www.environment.nsw.gov.au/resources/waste/08203immobilisationwaste.pdf>>.

Department of Environment, Climate Change and Water. 2009. *Waste classification guidelines: Part 1—Classifying waste*. Environment Protection Authority, Department of Environment, Climate Change and Water, Sydney, New South Wales. Viewed online on 1 March 2010 at <<http://www.environment.nsw.gov.au/resources/waste/091216classifywaste.pdf>>.

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DITR—see Department of Industry, Tourism and Resources.

Environment Protection Authority. 2009. *Waste definitions*. EPA Guideline 842/09. Environment Protection Authority, Adelaide, South Australia. Viewed online on 1 March 2010 at <http://www.epa.sa.gov.au/xstd_files/Waste/Guideline/guide_waste_definitions.pdf>.

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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)*. Viewed online on 1 March 2010 at <http://www.imo.org/Conventions/mainframe.asp?topic_id=258&doc_id=678>.

Appendix A: Listed wastes (from Schedule 2 of the Waste Management and Pollution Control (Administration) Regulations (NT))

Listed wastes
Acidic solutions or acids in solid form
Animal effluent or residues (including abattoir effluent, poultry and fish processing waste)
Antimony; antimony compounds
Arsenic; arsenic compounds
Asbestos
Barium compounds other than barium sulfate
Basic solutions or bases in solid form
Beryllium; beryllium compounds
Boron compounds
Cadmium; cadmium compounds
Ceramic-based fibres with physico-chemical characteristics similar to those of asbestos
Chlorates
Chromium compounds that are hexavalent or trivalent
Clinical and related wastes
Cobalt compounds
Containers that are contaminated with residues of a listed waste
Copper compounds
Cyanides (inorganic)
Cyanides (organic)
Encapsulated, chemically fixed, solidified, or polymerised wastes
Ethers
Filter cake
Fire debris and fire washwaters
Fly ash
Grease-trap waste
Halogenated organic solvents
Highly odorous organic chemicals (including mercaptans and acrylates)
Inorganic fluorine compounds excluding calcium fluoride
Inorganic sulfides
Isocyanate compounds
Lead; lead compounds
Mercury; mercury compounds
Metal carbonyls
Nickel compounds
Non-toxic salts
Organic phosphorus compounds
Organic solvents excluding halogenated solvents
Organohalogen compounds that are not otherwise specified in this Schedule
Perchlorates
Phenols; phenol compounds including chlorophenols
Phosphorus compounds other than mineral phosphates
Polychlorinated dibenzo-furan (any congener)
Polychlorinated dibenzo-p-dioxin (any congener)
Residue from industrial waste treatment or disposal operations

Appendix A: Listed wastes (from Schedule 2 of the Waste Management and Pollution Control (Administration) Regulations (NT))(continued)

Listed wastes
Selenium; selenium compounds
Sewerage sludge and residues including nightsoil and septic tank sludge
Soils contaminated with a listed waste
Surface active agents (surfactants) that contain principally organic constituents and that may contain metals and inorganic materials
Tannery wastes (including leather dust, ash, sludge and flours)
Tellurium; tellurium compounds
Thallium; thallium compounds
Triethylamine catalysts for setting foundry sands
Tyres
Vanadium compounds
Waste chemical substances arising from research and development or teaching activities, including those substances which are not identified and/or are new and the effects of which on human health and/or the environment are not known
Wastes containing peroxides other than hydrogen peroxide
Waste, containing cyanides, from heat treatment and tempering operations
Waste from the manufacture, formulation, and use of wood-preserving chemicals
Waste from the production, formulation and use of biocides and phytopharmaceuticals
Waste from the production, formulation and use of inks, dyes, pigments, paints, lacquers and varnish
Waste from the production, formulation and use of organic solvents
Waste from the production, formulation and use of photographic chemicals and processing materials
Waste from the production, formulation and use of resins, latex, plasticisers, glues and adhesives
Waste from the production and preparation of pharmaceutical products
Waste mineral oils unfit for their original intended use
Waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water
Waste pharmaceuticals, waste drugs and waste medicines
Waste resulting from surface treatment of metals and plastics
Waste tarry residues arising from refining, distillation and any pyrolytic treatment
Waste substances and articles containing or contaminated by polychlorinated biphenyls (PCBs), polychlorinated naphthalenes (PCNs), polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs)
Wastes of an explosive nature not subject to the Dangerous Goods Act (NT)
Wool scouring waste
Zinc compounds

