Gas Export Pipeline Precommissioning

Environment Plan Summary

Document No.: X280-AH-PLN-10000
Security Classification: Public

Notice

All information contained with this document has been classified by INPEX as Public and must only be used in accordance with that classification. Any use contrary to this document's classification may expose the recipient and subsequent user(s) to legal action. If you are unsure of restrictions on use imposed by the classification of this document you must refer to the INPEX Sensitive Information Protection Standard or seek clarification from INPEX.

Uncontrolled when printed.

Table of Contents

List of Tables

List of Figures

1 Introduction

1.1 Background

INPEX Ichthys Pty Ltd (INPEX), on behalf of the Ichthys Upstream Unincorporated Joint Venture Participants intends to develop the Ichthys Field in the Browse Basin off the north-west coast of Western Australia to produce liquefied natural gas, liquefied petroleum gases and condensate for export to markets in Japan and elsewhere.

The Ichthys Field is located within the area covered by production licence WA-50-L, in the northern Browse Basin, approximately 210 km north-west of the coast of mainland Western Australia and 820 km south-west of Darwin. Gas from the Ichthys Field will undergo preliminary processing on an offshore Central Processing Facility to remove water and raw liquids, including the greater part of the condensate. This condensate will be pumped to a nearby floating production, storage and offtake facility from which it will be transferred to tankers for export to overseas markets. The gas will be transferred from the Central Processing Facility via an 889 km gas export pipeline to an onshore processing plant at Bladin Point in Darwin (Figure 1-1).

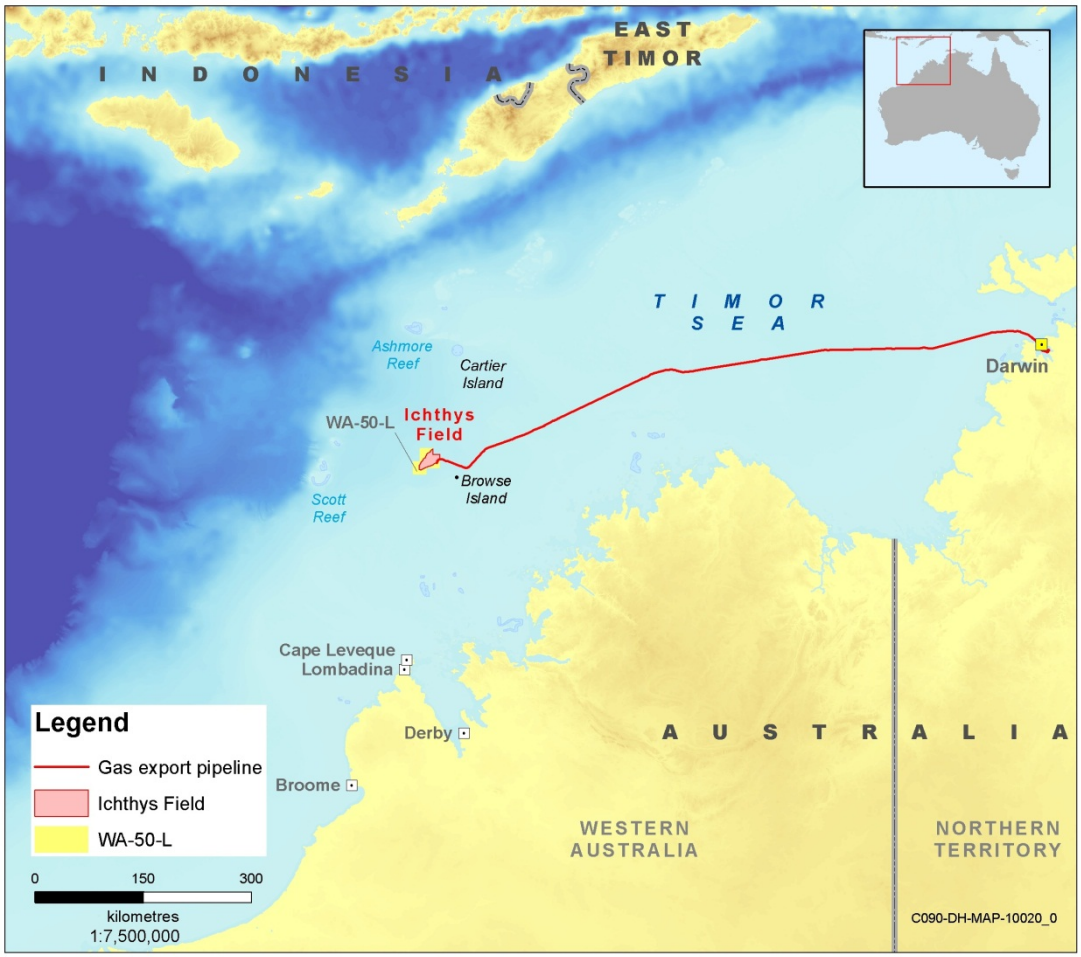

Figure 1-1: Location of the Ichthys Field

1.2 Scope

The Gas Export Pipeline – Precommissioning Environment Plan applies to the leak test of the 42-inch tie-in spool and precommissioning of the gas export pipeline. These activities will result in planned discharges to Commonwealth waters originating within production licence WA-50-L within an area defined as the 'URF Site' (Figure 1-2).

Vessel and aerial operations within the URF Site have already been risk assessed and are managed in the NOPSEMA accepted INPEX Umbilicals, Risers and Flowlines (URF) Installation Environment Plan (E075-AH-PLN-10000). A summary of this EP is available on the NOPSEMA website.

There are no additional vessel, or aerial, operations associated with the activities covered by this EP, which have not already been accounted for within the accepted URF EP. Consequently, vessel and aerial operations are outside the scope of this EP.

1.3 Location

The leak-test and precommissioning activities will result in discharges from the gas export riser base within the URF Site which is located within Commonwealth waters (Figure 1-2).

To complete the activities managed under this plan, an onshore spread will be installed and operated within the Northern Territory (Figure 1-2). The spread is required to pressurise the 42-inch tie-in spool, launch the "pig train", evacuate the gas export pipeline and inert the pipeline with nitrogen (N_2). The management and operation of the onshore spread, however, is not within the scope of the Environment Plan.

1.4 Schedule and timing

The leak-test and precommissioning activities are scheduled to be performed between mid-2015 and mid-2016. Potential changes in the installation schedule have been accounted for in the risk assessment, with the potential environmental impact of activities assessed for all seasons, or the season for which the greatest impacts are predicted where impact varies for different seasons.

1.5 Titleholder details

Details of the titleholder's nominated liaison person are provided in Table 1-1:

Table 1-1: Titleholder's nominated liaison person

Name	*Jake Prout*
Position	*Offshore HSE – Environment Lead*
Business address	*Level 19, 100 St Georges Tce, Perth, WA 6000*
Telephone number	*+61 8 6213 6000*
E-mail address	*Jake.Prout@inpex.com.au*

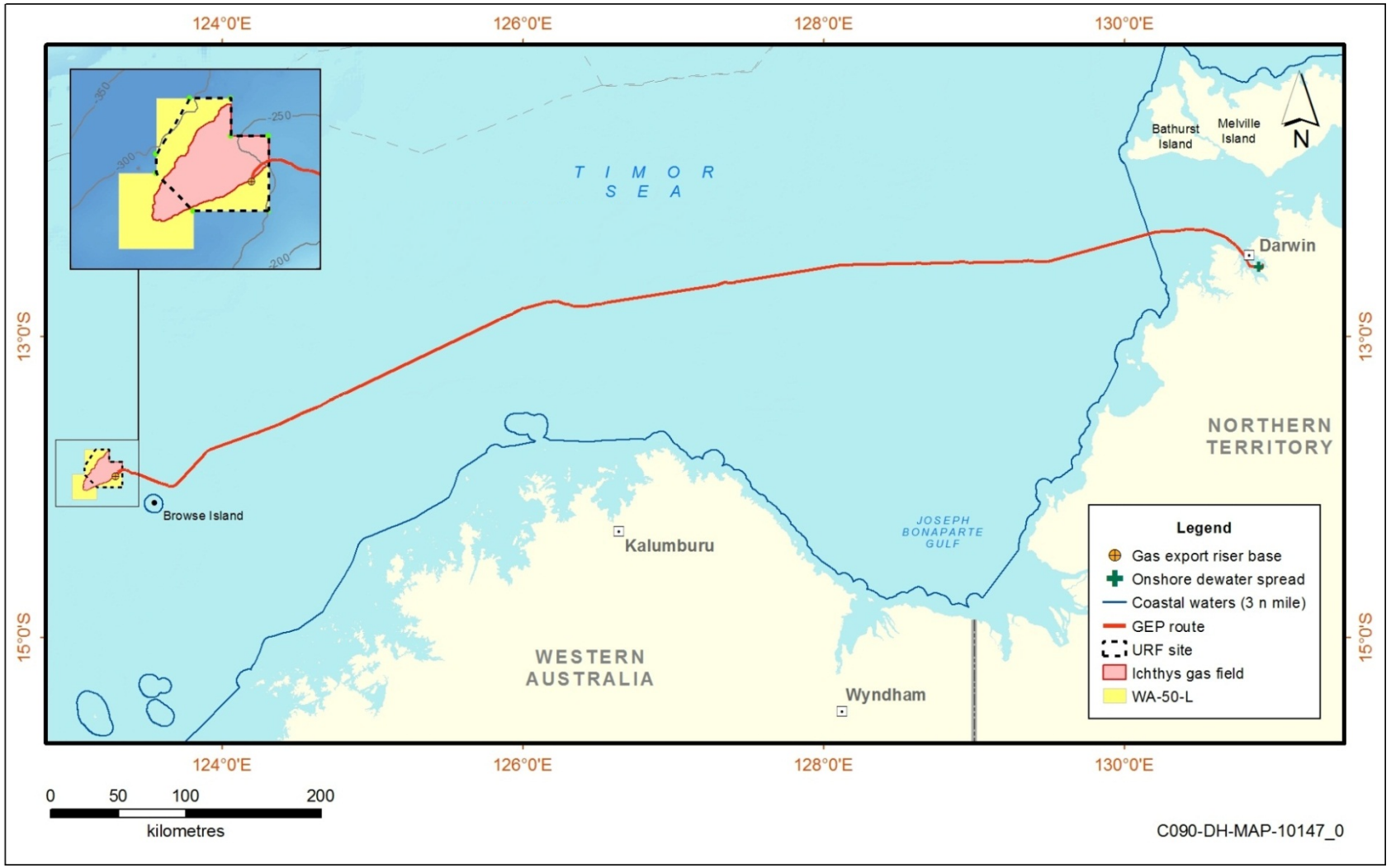

Figure 1-2: Location of discharge point and onshore spread

Document no.: X280-AH-PLN-10000
Security Classification: Public -
Revision 1
Date: 27/12/2014

2 Description of Activity

2.1 Overview of the activities

Activities to be managed under the Gas Export Pipeline – Precommissioning Environment Plan are:

- *the leak test of the 42-inch tie-in spool connections; and*
- *precommissioning the gas export pipeline.*

A leak test is performed by pumping liquid into the infrastructure until a pre-set pressure is achieved. This ensures that infrastructure connections have met design specifications. If the desired pressure cannot be reached, the leak test is deemed unsuccessful. A leak test will be undertaken to test the integrity of the 42-inch tie-in spool. The 42-inch tie-in spool is a piece of infrastructure that connects the pipeline end termination to the gas export riser base. A field schematic identifying the gas export pipeline, gas export riser base and 42-inch tie-in spool is given in Figure 2-1.

Precommissioning is the process of readying infrastructure for commissioning and operations. For the purposes of this EP, precommissioning is achieved by removing preservation fluid and ensuring the pipeline is rendered inert before receiving hydrocarbons.

Preservation fluid is removed from the gas export pipeline by inserting a series of pigs into the pipeline which travel freely, pushing fluid in front of it and out of the pipeline. Pigs are received at the offshore end of the pipeline in a pig receiver which is attached to the gas export riser base (Figure 2-1).

Preservation fluids are used to preserve infrastructure before commissioning and operations. The chemicals used to treat both seawater and potable water includes a biocide (gluteraldehyde) and an oxygen scavenger (sodium bisulfite). Biocides are intended to protect against microbiologically induced corrosion, whilst oxygen scavengers are chemicals that react with oxygen to reduce or remove dissolved oxygen from the preservation fluid completely. Monoethylene glycol (MEG) will also be used as a conditioning fluid during pigging, where it is added as a "slug" between the pigs. MEG is an alcohol used as a hydrate inhibitor(antifreeze) and condensate remover which will condition the gas export pipeline before the pipeline is inerted (see Section 2.3).

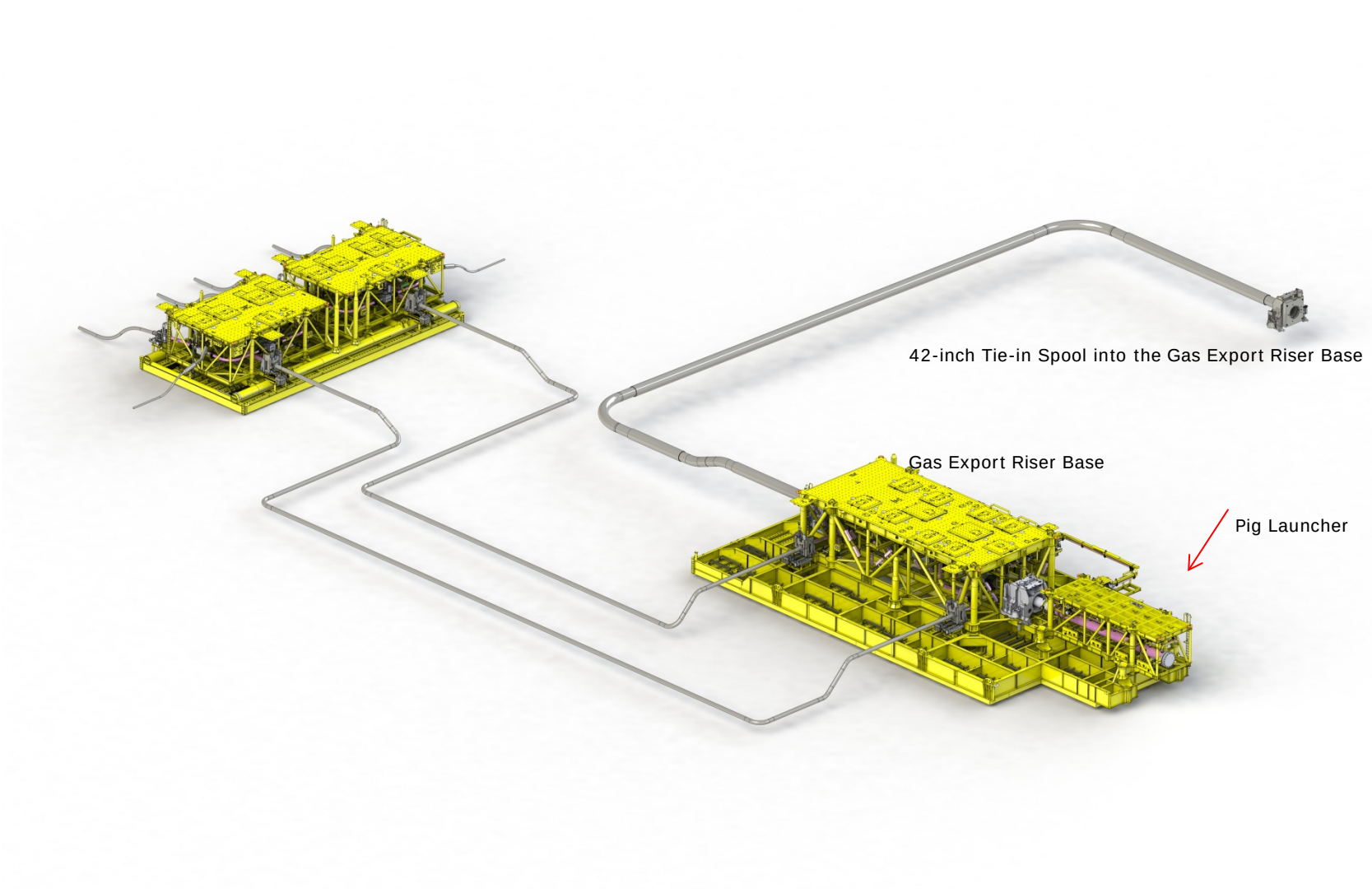

Figure 2-1: Field schematic showing the layout of the subsea infrastructure associated with this plan

2.2 Leak test of the 42-inch tie-in spool

The integrity of 42-inch tie-in spool connections is tested by pressurising the gas export pipeline to five per cent above the maximum defined working pressure. This will be achieved by injecting treated potable water from the onshore spread. Once connection integrity is verified, the pressure will be relieved by discharging the fluid into the marine environment at the URF Site.

Discharges will occur via an outlet, or outlets, from the gas export riser base located approximately 4–12 m above the seabed. The outlet valves will be controlled by a remotely operated underwater vehicle.

The maximum expected discharge volume from depressurisation will be 11 000 m^3 at a maximum rate of 0.68 m^3 per second. The maximum rate is limited by the cross-sectional area of the outlet ports. The maximum discharge rate will occur only during the first hour or so of depressurisation. Thereafter, the discharge rate will decline steadily. The entire depressurisation discharge is expected to occur over 24 to 36 hours. Once the pressure has declined to ambient pressure and leak-testing is successful, the gas export pipeline will be left full of filtered inhibited seawater until the precommissioning is required.

2.3 Precommissioning the gas export pipeline

Key components associated with precommissioning of the gas export pipeline include:

- pigging the gas export pipeline;
- gas export pipeline evacuation; and
- nitrogen inerting.

2.3.1 Pigging the gas export pipeline

Precommissioning of the gas export pipeline is required to remove filtered inhibited seawater from the pipeline before it can receive any hydrocarbons. This will be achieved by pigging the pipeline from the onshore spread that will include capacity for an air compression spread and storage of nitrogen. Installation and operation of the spread is outside the scope of the environment plan and subject to approvals by the Northern Territory Environment Protection Authority under Northern Territory legislation.

The pig train will be propelled from a temporary pig launcher located at the onshore end of the gas export pipeline, with dry, filtered, compressed air. Pigging is expected to occur over a period of 20–30 days, which is based on estimated pig speeds of between 0.35 m/s and 1.0 m/s. During this time, approximately 710 000 m^3 of filtered inhibited seawater and 11 000 m^3 of treated potable water will be displaced through the gas export riser base located within the URF Site (Figure 1-2). The discharge point is approximately 4–12 m above the seabed and in approximately 250 m water depth.

The pig train will comprise three 250 m^3 monoethylene glycol (MEG) slugs and four 250 m^3 treated potable water slugs injected ahead of, and around, the pigs. The MEG slugs will be treated with Company-approved non-hazardous tracer dye.

The pigs will be tracked during their journey from shore. As they reach the pig receiver, attached to the gas export riser base, the pigging fluids will be discharged.

2.3.2 Gas export pipeline evacuation

Once dewatered, the internal pressure of the gas export pipeline will be reduced by installing and operating vacuum units within the onshore spread. Internal pressure is expected to be reduced to 0.25 kPa in order to reduce the oxygen content in the pipeline to less than 5% before injecting vaporised nitrogen.

2.3.3 Nitrogen inerting

Following evacuation of the pipeline, the gas export pipeline and gas export riser base will be filled with vaporised nitrogen to ensure the system is inert before commissioning. The volume of liquid nitrogen required is expected to be ~53 m^3. It will be drawn into the pipeline through the created vacuum via pumps from the onshore spread in Darwin.

3 Receiving Environment

The environment that may be affected by activities within the scope of the environment plan is described below.

3.2 Physical environment

3.2.1 Climate and meteorology

The climate at the URF Site is monsoonal with two distinct seasons (summer and winter). As a result of two major atmospheric pressure systems that affect the northern regions of Australia, the prevailing winds from October to February are warm, and come from the north-west and south-west. During May and June, the prevailing winds are cooler south-easterlies.

Tropical cyclones in the North West Marine Region generally form over the Indian Ocean and Timor and Arafura seas, before moving into the Kimberley and Pilbara regions. The activity is situated within the most cyclone-prone area of Australia. Cyclones typically track west-south-west at speeds of 5–20 km/h and transition to a more southerly track. Tropical cyclones are likely to occur the URF Site from November to April with the peak period from January to March during the tropical wet season (BoM 2013).

3.2.1 Oceanography

The surface currents north of Western Australia are dominated by the Indonesian Throughflow (Figure 3-1), which is influenced by broad-scale climatic and oceanic events.

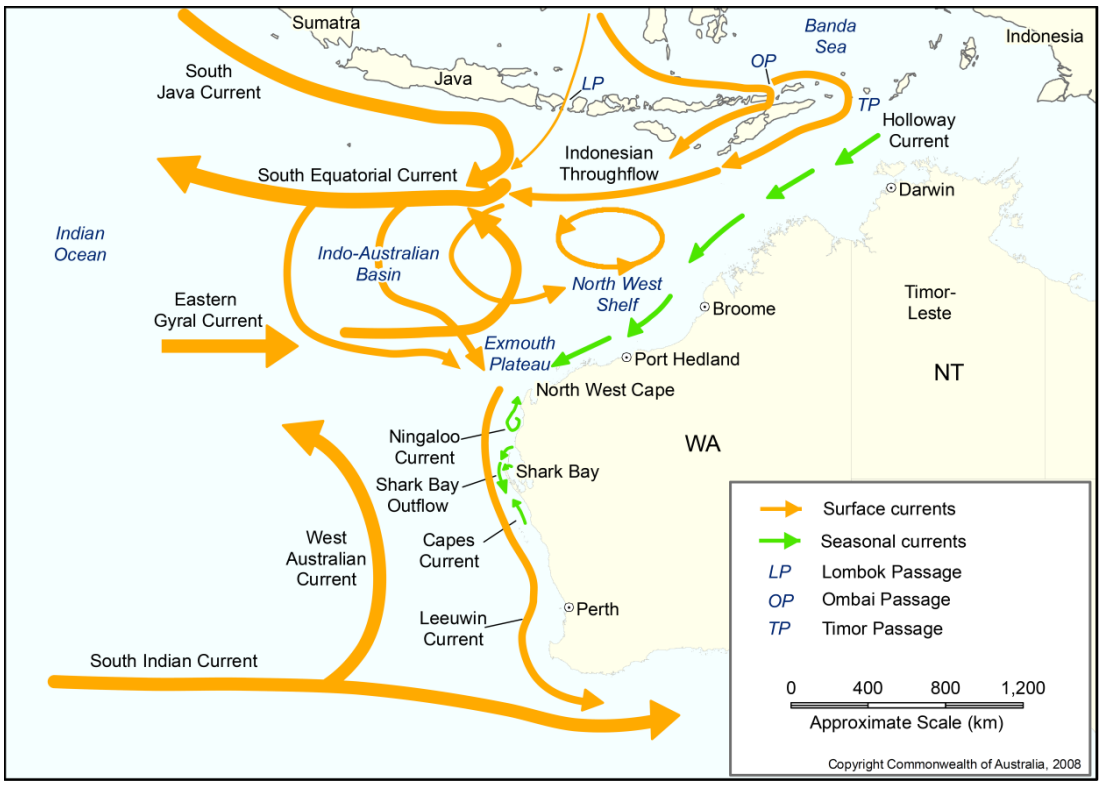

Figure 3-1: Surface currents for West Australian waters (DEWHA 2007)

Within the URF Site, currents are expected to flow to the north-east between December and February and reach up to 0.9 m/s. During the rest of the year, current speeds may reach up to 0.4 m/s, flowing predominantly to the south-west from March to August, and from the south-west and north-east between September and November (Bluelink ReANalysis; Oke et al 2009, Schiller et al, 2008). The current regime is dominated by semi-diurnal tides, with two daily high tides and two daily low tides. Barotropic tidal currents predominantly flow in the cross-shelf direction at the shelf break and in the along-shelf direction when approaching the coast (McLoughlin et al. 1988).

Waves across the URF Site are generated by local winds, generally from the west during summer (westerly monsoon) and the east during winter (easterly trades). Wave heights in the area are generally less than 1 m (RPS 2008).Swell is generated by distant storms in the Indian Ocean, usually travelling from the west and south-west depending on the locations of the storms, bathymetry and wind direction. Maximum and mean swell are typically larger during winter due to the strong easterly winds and larger background swell from the Southern and Indian Oceans.

3.2.2 Bathymetry

The seabed depth of the URF Site drops generally from east to west, with depths of 245 m in the east to around 320 m in the north-west corner (INPEX 2010). All seabed slopes within the URF Site are less than one degree, except where sand waves cause local variations in the north-east and south-west areas.

3.3 The biological environment

3.3.1 Benthic habitats and emergent habitats

Surveys were undertaken within the URF Site to provide an indication of the benthic habitat types and benthic fauna abundance within the Ichthys Field. Substrates within this area were observed to be bare, with heavily rippled sand waves approximately 10 m apart indicating strong near seabed currents and mobile sediments (RPS 2007). Grab samples of sediments over similar habitat to that within the URF Site identified that little to no benthic infauna were present. Summaries drawn from the surveys indicate that:

- *diverse and abundant benthic infaunal communities are not present in this area; and*
- *the benthic substrate is comprised of mobile sediments under the influence of very strong currents which are not conducive for abundant and diverse benthic infaunal communities*

Visual ROV surveys within 6 km of the discharge location indicate that the benthic habitat is ubiquitous with very few species of epibenthic organisms present (RPS 2007). RPS (2007) only observed an anemone, a galatheid crab and an olive-tailed flathead during the survey.

3.3.2 Key ecological features

The only key ecological feature within proximity of the environment that may be affected is the continental slope demersal fish communities. This feature is, however, outside of the URF Site and not expected to be impacted by this activity. This feature is important as the diversity of demersal fish assemblages

on the continental slope in this area is considered high compared to elsewhere along the continental slope.

3.3.3 Species of conservation significance (EPBC listed species)

A search of the Department of Environment's Protected Matters database (DSEWPaC 2013) identified a total of 10 "Threatened" species and 17 "Migratory" species (nine of which are also listed as Threatened) that potentially use the area of URF Site. The search did not identify any "Threatened Ecological Communities". In addition, the search identified 52 "listed marine species" and 20 "whales and other cetaceans" that may occur at, or immediately adjacent to, the URF Site. No known breeding grounds or sensitive habitats critical to the species listed are identified in the search within the URF Site.

3.4 Existing users and uses

3.4.1 Commercial fishing

Identified Fisheries with the potential to be impacted by this discharge include:

- *North West Slope Trawl Fishery (Commonwealth);*
- *Western Skipjack Fishery (Commonwealth);*
- *Western Tuna and Billfish Fishery. (Commonwealth);*
- *Mackerel Managed Fishery (State);*
- *Northern Demersal Scalefish Managed Fishery (State);*
- *North Coast Shark Fishery (State);*
- *Pearl Oyster Managed Fishery (State).*

Consultation with Australian Fisheries Management Authority and the Department of Fisheries (Western Australia) indicated that none of the identified fisheries are expected to be active within the area potentially impacted by the discharge. Consultation with fishing permit holders did not identify any areas within the URF Site that are expected to be targeted by commercial fisheries.

3.4.2 Traditional Indonesian fishing

Under a memorandum of understanding signed between Australia and Indonesia in November 1974, an agreement to permit traditional Indonesian fishing practices in the region was formalised (DSEWPaC 2011). This agreement enables Indonesian and Timorese fishermen to legally harvest certain marine products within the memorandum of understanding boundary, which the URF Site is located within.

3.5 Particular values and sensitivities.

Given the nature of the activities within the scope of the environment plan (subsea discharges) the environmental receptors with the potential to be affected by the activities are limited to:

- *transient pelagic fauna;*

- *benthic habitats within the URF Site; and*
- *state and Commonwealth fisheries.*

4 Stakeholder Consultation

4.1 Consultation already undertaken

INPEX has been a member of the Australian business community since 1986 and during this time has engaged with stakeholders on a regular basis for a broad range of activities. As such, INPEX has utilised well developed stakeholder engagement processes as outlined in Figure 4-1.

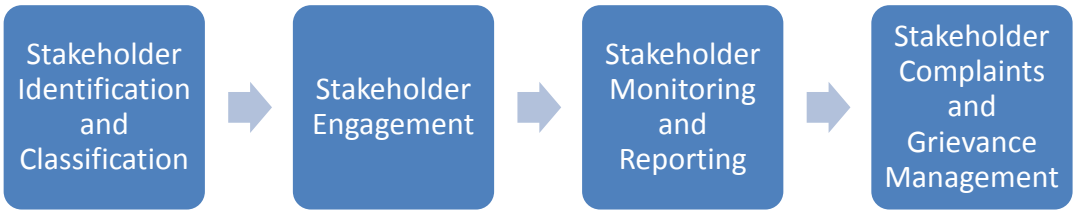

Figure 4-1: Stakeholder management process

The stakeholder engagement process involved the following stages:

Stakeholder identification and classification *– This stage involved a workshop to identify relevant stakeholders and assess the levels of interest and influence that each stakeholder would specifically or potentially have in relation to the precommissioning activities.*

Stakeholder engagement *– To facilitate the engagement process, all relevant stakeholders were provided with fact sheets that gave a general overview of offshore construction activities and provided key information about the precommissioning activities including location and schedule (timing and duration).*

Stakeholder monitoring and reporting *– Stakeholder engagement has been, and will continue to be, monitored during the course of the precommissioning activities.*

Stakeholder complaints and grievance management *– Any concerns or complaints received in response to the precommissioning activities have been treated as issues and dealt with in the course of developing the Gas Export Pipeline - Precommissioning Environment Plan. INPEX has documented any change to the proposed management of an activity, where management or resolution of an issue has required such change.*

INPEX used this process to engage with relevant stakeholders that have an interest in, or the potential to be impacted by, the Project

In addition to provision of the factsheets, INPEX has also engaged with stakeholders through face-to-face meetings, emails and phone communications, to provide additional information on the Project and the consultation process.

Stakeholder groups engaged include:

- *Commonwealth, state, territory and local government departments and agencies' ministers of relevant portfolios;*
- *National Native Title Tribunal, relevant Aboriginal and Torres Strait Islander land councils and prescribed bodies corporate, traditional owners and relevant land councils in areas potentially impacted by the precommissioning activities;*

- *the commercial fishing industry and its associations, and individual operators (permit or licence holders/lessees) in fisheries potentially impacted by the precommissioning activities;*
- *recreational fishing associations; and*
- *environmental, heritage and marine research groups.*

A summary of relevant stakeholders, and if they identified any concerns of merit during the consultation process is provided in Table 4-1.

Table 4-1: Stakeholder consultation summary

Stakeholder	***Concerns raised***
Commonwealth, state, territory and local government departments and agencies' ministers of relevant portfolios	
Chief Minister (Northern Territory)	*No*
Department of Industry (Commonwealth)	*No*
Minister for Industry (Commonwealth)	*No*
National Offshore Petroleum Titles Administrator (Commonwealth)	*No*
Department of the Environment (Commonwealth)	*No*
Minister for Environment (Commonwealth)	*No*
Department of Fisheries (Western Australia)	*No*
Minister for Fisheries (Western Australia)	*Yes*
Department of Mines and Petroleum (Western Australia)	*No*
Minister for Mines and Petroleum (Western Australia)	*No*
Department of Agriculture, Fisheries and Forestry (Commonwealth)	*No*
Minister for Resources and Energy; Tourism (Commonwealth)	*No*
Minister for Primary Industry and Fisheries; Mines and Energy (Northern Territory)	*No*
National Native Title Tribunal, relevant Aboriginal and Torres Strait Islander land councils and prescribed bodies corporate, traditional owners and relevant land councils in areas potentially impacted by the precommissioning activities	
National Native Title Tribunal	*No*
Indigenous Land Corporation	*No*
Commercial fishing industry and its associations	
Australian Fisheries Management Authority	*No*
The Pearl Producers Association and the Paspaley Pearling Company	*No*
Western Australian Fishing Industry Council	*No*

All individual permit holders whose fishing permits overlap the environment that may be affected.	*No*
Recreational fishing associations	
Recfishwest	*No*
Environmental, heritage and marine research groups	
Centre for Whale Research (WA) Inc.	*No*

4.2 Summary of Concerns

During stakeholder consultation for this activity, the Department of Fisheries (Western Australia) raised a concern regarding the potential impacts of filtered inhibited seawater on marine species and requested that water quality be tested before its release. In response, INPEX described that:

- *the discharge will be assessed under the NOPSEMA EP; and*
- *a chemical selection process will be implemented so that impacts associated with discharges are kept to as low as reasonably practicable (ALARP).*

INPEX met with Department of Fisheries (Western Australia) following this response to describe the project and monitoring proposed to be undertaken during the activity. The outcomes from this engagement confirmed that no additional monitoring other than that described in the environment plan were required by Department of Fisheries (Western Australia).

No additional concerns regarding the activities have been raised during stakeholder consultation.

4.3 Ongoing consultation

INPEX will maintain communications and continue consultation with relevant stakeholders throughout the duration of the activity. Additional consultation will be undertaken for three main reasons:

- *to provide a general update on all activities associated with the Ichthys Project;*
- *where there is a significant change in the project scope (see Section 6.3.2); or*
- *where an additional request for information / feedback is requested from stakeholders that have been previously engaged.*

5 Environmental Hazards and Controls

INPEX has a risk management process to guide activities and ensure they are undertaken such that risks and impacts are managed to ALARP. A risk assessment has been undertaken for all activities within the scope of the Gas Export Pipeline – Precommissioning Environment Plan in accordance with INPEX procedures as well as the procedures outlined in the Australian and New Zealand Standards AS/NZS ISO 31000:2009, Risk management – Principles and guidelines. A summary of the risk assessment process and its outcomes in relation to precommissioning activities is detailed below.

5.1 Risk assessment process description

5.1.1 Step 1 – Risk and impact identification

- *Identify events: Identification of planned and credible unplanned events which have the potential to impact on the environment.*
- *Identify impacts: Identification of adverse or beneficial changes to environmental or socio-economic receptors resulting from events (planned and credible, unplanned interactions).*
- *Identify primary controls.*

5.1.2 Step 2 – Risk and impact analysis

- *Determine consequence severity rating: With primary controls in place, a determination is made of the maximum credible consequence severity rating assuming credible failure of controls (informed by the history of occurrence within an individual company or the industry as a whole).*
- *Determine likelihood rating: Considering primary controls are in place, the likelihood rating that best describes the chance of the selected consequence severity level actually occurring is determined. A likelihood rating is not assigned to a known impact.*
- *Determine risk rating: Risk rating is selected from the INPEX Risk Matrix, based on the consequence and likelihood ratings.*

5.1.3 Step 3 – Risk evaluation

ALARP evaluation: Impacts that have a low risk rating or known impacts with a consequence severity rating of 'Insignificant' are considered 'broadly tolerable' and managed through the use of primary controls. These are subject to a high level ALARP evaluation.

For potential impacts that are of a moderate, high or critical risk rating, or known impacts with a consequence severity rating between A and D, a detailed evaluation is performed of secondary controls which could reduce the potential impacts and known impacts to ALARP.

Step 2 of the risk assessment process is then repeated in consideration of secondary controls to determine whether a risk has been reduced to 'broadly tolerable' or 'tolerable' if ALARP categories and a known impact has been reduced to D, E or F consequence severity rating.

Acceptability evaluation: Following the ALARP evaluation, further evaluation is performed with consideration to the outcomes of stakeholder consultation; the INPEX environment policy; potential changes in legislation or in technology; and social, cultural or political sentiment. This evaluation may result in the commitment to additional secondary controls which are above those considered reasonably practicable.

5.2 Summary of events

The credible events associated with the precommissioning of the Gas Export Pipeline were limited to discharges of filtered inhibited seawater to the marine environment.

To determine the concentrations at which the discharge was predicted to have no effects, ecotoxicity information was sourced for each active constituent within the filtered inhibited seawater. As biocide was identified as having the highest toxicity, it was used to determine the worst case extent associated with the discharge. This information identified a predicted no effects concentration of 0.033 ppm for the discharge. Given the expected final concentration of the biocide, a safe dilution factor of 333 is required to reach the predicted no effects concentration (0.033 ppm).

5.2.2 Modelling

Hydrodynamic modelling was undertaken by Asia Pacific Applied Science Associated to predict near-field and far-field dilutions to inform the extent and duration of safe dilutions.

5.2.3 Modelling results

The models indicate that the plumes for both activities move mainly with the tidal axis in east-south-east and west-north-west directions and will result in a localised reduction in water quality and toxicity to marine organisms within the discharge plume. The reason for this is the predominance of persistent tidal currents in the area (APASA, 2014).

Even when the discharge temperature increases, resulting in a slight positive buoyancy, the trapping depth for the precommissioning discharge is 220 m (APASA, 2014). The plume width for the precommissioning discharge was restricted to 25 m (APASA, 2014).For all seasons, 95% dilution is experienced in the near-field which even in the slowest current speeds occurs within 53 m of the discharge.

Farfield modelling indicates that a dilution of 400, which is very close to the required dilution of 333, would be reached approximately 2100 m from the discharge location). As such, a conservative estimate for the extent of the potential impact associated with a discharge from dewatering of the gas export pipeline is approximately 2100 m from the discharge location.

The total residence time for the environment potentially exposed to the plume is a function of discharge duration and final discharge dissipation. Modelling indicates that a worst case residence time for a precommissioning discharge is 31 days and 6 hours.

5.3 Impact and risk assessment summary

Based on the modelling and ecotoxicity information, the extent of impacts are limited to within 2100 m of the discharge point. Potential impacts and risks in this area were identified to be:

- *a temporary decline in water quality due to the discharge of oxygen-depleted water and associated impacts to marine organisms; and*
- *toxicity to marine organisms due to the chemical biocide, oxygen scavenger, fluorescein dye or MEG within the water column.*

There are limited benthic communities within, and adjacent to, the URF Site, with the majority of seabed comprised of soft sediments. There is the potential for an extended period of time where benthic fauna (given their lack of motility) will be exposed to concentrations with the potential to result in acute impacts and oxygenation levels that are below ambient. As a worst case scenario (and not taking into account biocide degradation or chemical inactivity) any exposure to benthic fauna within 53 m of the discharge has the potential to result in acute impacts. Given that the benthic fauna with the potential to be fatally exposed (within 53 m of the discharge location) is not of particular value and is sparse, scattered and representative of a variety of typically common and widespread taxa, the potential consequence is considered to be minor.

There are no known breeding grounds or sensitive habitats critical to EPBC-listed species within the environment that may be affected by this discharge; however "matters of national environmental significance" such as turtles, several whale species and whale sharks have previously been recorded within this area. These species however do not regularly dive to these depths (i.e. >220 m) if at all. Exposure to fauna is expected to be limited to benthic organisms and demersal fish only. In such a case, given demersal fish motility and the relatively slim and small plume depths, it is expected that they would move outside of these areas (resulting in a temporary behavioural change). As such, there is the potential that this discharge will result in a minor, but temporary impact to demersal fish populations.

5.3.2 Consequence

In accordance with the INPEX Risk Matrix, the impacts to benthic and pelagic organisms are considered to have a severity level of Minor (E) given that there will be a minor impact to benthic epifauna, and the potential for temporary impacts to transient marine fauna.

5.3.3 Likelihood

As the activities are planned discharges with a known impact, likelihood has not been assigned.

5.3.4 Control measures

Controls aimed at minimising the environmental impacts from discharges are based on compliance with procedures governing:

- *the selection and use of these fluids; and*
- *the methods used during leak-test and precommissioning activities.*

A summary of the control measures to be implemented are:

- *leak-test activities will be in compliance with design specifications for preservation fluid concentration to achieve the required function and over pressure testing will be set at 5% above the flowline operating specification;*
- *precommissioning activities will be undertaken in such that pigging speeds are limited to 1m/s, no more than three MEG slugs will be used to pig the GEP and the total accumulated volume of MEG discharge is limited to 750m^3; and*
- *Chemicals shall be selected in accordance with the INPEX gas export pipeline – Offshore GEP Post-Lay Flood, Clean, Gauge and Hydrotest Specification (B28-AY-SPC-0002), specifically they will:*
  - *have a hazard quotient category of Silver or better in accordance with the UK Offshore Chemical Notification Scheme;*
  - *have chemical components included on the UK's Centre for Environment, Fisheries and Aquaculture Science list of notified chemicals in accordance with the OSPAR Commission's recommendation on a Harmonised Offshore Chemical Notification Format;*
  - *have MSDSs recorded in ChemAlert will comply with the National Occupational Health and Safety Commissions National Code of Practice for the Preparation of Material Safety Data Sheets (NOHSC 2011) and classify hazardous substances as per the Approved Criteria for Classifying Hazardous Substances (NOHSC 1008, 2004); and*
  - *ensure chemicals subject to a risk assessment within Section 7 of the Gas Export Pipeline – Precommissioning Environment Plan will be used for the treatment of all sea water (within the scope of this plan) and Treated Potable Water, unless other products are approved by INPEX.*

5.3.5 Demonstration of ALARP

The primary controls described above include engineering and administrative controls. An assessment of additional controls to reduce the impact and risk were evaluated, however these were deemed grossly disproportionate to the benefit gained. As such the impacts and risks associated with the activities are considered to be reduced to as low as reasonably practicable.

5.3.6 Demonstration of acceptability

The potential impacts and risks associated with the planned discharges are considered to be acceptable as:

- *no significant impacts to water quality and marine organisms are expected;*
- *further opportunities to reduce the impacts have been investigated and the adopted controls reduce the impacts and risks to As Low As Reasonably Practicable;*
- *the proposed controls are consistent with regulatory requirements and INPEXs Environment Policy; and*
- *no objections were identified by any stakeholder during consultation efforts.*

6 Monitoring Environmental Performance

INPEX maintains the Health, Safety, Environment Management System based on the Plan, Do, Check, Act model as described within AS/NZS 4801:2001, Occupational health and safety management systems––Specification with guidance for use, OHSAS 18001, Occupational Health And Safety Management Systems Requirements and AS/NZS ISO 14001:2004, Environmental management systems—Requirements with guidance for use. A summary of the Check / Act components is provided below to demonstrate how environmental performance is monitored.

6.2 Check

6.2.1 Inspections and Audits

INPEX will undertake readiness reviews, weekly environment inspections and internal audits throughout the duration of the activities covered within the Environment Plan. Specifically:

- *INPEX will undertake a readiness review of the contractor to ensure that the environmental performance outcomes and environmental performance standards as documented in this plan can be achieved;*
- *the Contractor and/or INPEX Health, Safety, Environment advisers will conduct weekly inspections of facilities associated with leak-test and precommissioning activities;*
- *INPEX will perform an onshore audit of the Contractor managing the dewatering spread at least 30 days before activities associated with this plan and will review compliance with the performance outcomes, standards and measurement criteria; and*
- *in the event that the activity runs for more than two months, an additional audit will be conducted prior to activity completion.*

Preventive and corrective actions as identified from the readiness review, inspections, audits or monitoring will be identified, documented and their completion verified via the Contractor's central action tracking register, or the INPEX Unifier Action Tracking system, as relevant to the party responsible for ensuring implementation of the action.

6.2.2 Monitoring

INPEX will implement a monitoring program for precommissioning activities that consists of both operational monitoring (onshore) and infield monitoring.

Operational Monitoring

For the purposes of the EP, operational monitoring is defined as the onshore component that monitors inputs into the gas export pipeline. This will provide assurance that the correct chemical types and concentrations are being used; that pigging speeds are within the defined limits; and that pig train design aligns with that defined in the EP. Specific inputs that will be monitored are:

- *volumes of chemical used in water treatment;*

- *volumes of MEG used in pigging operations ;*
- *volumes of water used in flooding operations;*
- *pigging speeds (to be limited to 1 m/s); and*
- *dissolved oxygen content within filtered inhibited seawater.*

Infield Monitoring

To assess that the control measures detailed in the environment plan are effective in reducing the environmental impacts of the discharge to the predicted as low as reasonably practicable and acceptable levels, infield monitoring will be undertaken for the gas export pipeline precommissioning discharge. Three periodic water samples of the gas export pipeline contents will be taken during the activity. This will allow INPEX to assess its environmental performance against the proposed controls described within the environment plan and report actual outcomes to NOPSEMA. Water samples taken can be used to confirm:

- *dissolved oxygen levels (confirm that all oxygen scavenger has been utilised);*
- *pH (provides an indication of oxygen scavenger bi-product levels); and*
- *biocide concentration levels.*

6.3 Act

6.3.1 Review of Environmental Performance

Once monitoring information has been collected, and in accordance with Regulation 14 (3)(b) of the OPGGS (Environment) Regulations, an assessment will be undertaken to confirm that the control measures detailed in the environment plan were effective in reducing the environmental impacts and risks of the activity to as low as reasonably practicable and an acceptable level. This assessment will include:

- *an evaluation against environmental performance standards associated with planned discharges;*
- *an evaluation against assumptions used in the modelling (that formed the basis of this risk and impact assessment) which are:*
  - *discharge volumes*
  - *key model parameters (limited to discharge velocities, rates, volumes, durations).*

Where infield monitoring data collected is grossly different from the assumed data provided in the plan, a management of change process will be triggered to evaluate the difference in potential impacts and risks associated with the discharge parameters. Where actual impacts and risks are assessed as having a greater severity to that assessed in this plan, the activity will be recorded as a recordable incident and reported to NOPSEMA.

6.3.2 Management of Change

Any amendments to activities associated with the following will be subject to a risk assessment process to evaluate any likely environmental impacts and risks to verify whether a revised version of the environment plan is required:

- *changes to the management practices or operational management of the activities;*

- *changes to regulatory requirements, corporate requirements, industry codes and standards, including changes to the controls detailed in the management plans submitted for approval as required by EPBC Act approval 2008/4208 (Section 3.1); or*

- *the introduction of new, or significant modification of activities accepted under this EP.*

If the risk assessment process indicates a significant negative change of the impacts and environmental risks, then a revised environment plan will be submitted to NOPSEMA under Regulation 17 of the OPGGS (E) Regulations.

7 Oil Pollution Emergency Plan

No credible hydrocarbon spill scenarios have been identified for this activity as all components within the scope of this EP are managed from an onshore facility.

As there are no credible spill scenarios associated with the offshore petroleum activity as described in this EP, an oil pollution emergency plan has not been developed.

8 References

APASA—see Asia-Pacific Applied Science Associates.

Asia-Pacific Applied Science Associates (APASA). 2013. Field of Effect Calculations for Mechanical Completion and Dewatering Scope of Work for the Gas Export Pipeline. Report prepared for SAIPEM by Asia-Pacific Science Associates, East Perth, Western Australia

BoM – see Bureau of Meteorology

Bureau of Meteorology (BoM). 2013. Climatology of Tropical Cyclones in Western Australia. Viewed online on 20 May 2013 at <http://www.bom.gov.au/cyclone/climatology/wa.shtml>.

DEHWA – see Department of Environment, Water, Heritage and the Arts

Department of Environment, Water, Heritage and the Arts (DEWHA). 2007. A Characterisation of the Marine Environment of the North-west Marine Region; A summary of an expert workshop convened in Perth, Western Australia. Department of the Environment, Water, Heritage and the Arts, Canberra (now the Department of Environment). Viewed online on 9 October 2013 at <http://www.environment.gov.au/coasts/mbp/publications/north-west/pubs/nwcharacterisation.pdf>.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC). 2013. EPBC Protected Matters Search Tool. Accessed online on 26 September 2013 at http://www.environment.gov.au/epbc/pmst/

DSEWPaC - see Department of Sustainability, Environment, Water, Population and Communities (as of 2012 the Department of the Environment).

INPEX. 2010. Ichthys Gas Field Development Project: draft environmental impact statement. Report prepared by INPEX Browse Limited, Perth Western Australia, for the Commonwealth Government, Canberra ACT, and the Northern Territory Government, Darwin, Northern Territory. Viewed online on 9 October 2013 at <http://www.inpex.com.au/projects/ichthysproject/environmentaldocumentation/draft-eis/draft-eis.aspx>.

McLoughlin, R.J., Davis, T.L.O. and Ward, T.J. 1988. Sedimentary provinces, and associated bedforms and benthos on the Scott Reef–Rowley Shoals platform off north-west Australia. pp. 133–144 in Australian Journal of Marine and Freshwater Research 39.

Oke, P.R., Brassington, G.B., Griffin, D.A. and Schiller, A. 2009. Data assimilation in the Australian Bluelink system. Mercator Ocean Quarterly Newsletter 34: 35–44.

RPS – see RPS Environmental Pty Ltd.

RPS Environmental Pty Ltd. (RPS). 2007. Environmental baseline survey results. Report prepared by RPS Environmental Pty Limited for INPEX Browse, Ltd., Perth, Western Australia

RPS Environmental Pty Ltd. (RPS). 2008. INPEX environmental impact assessment studies – Technical appendix: Marine ecology. Report prepared by

RPS Environmental Pty Limited., Perth, for INPEX Browse Limited, Perth, Western Australia

Schiller, A., P.R. Oke, G.B. Brassington, M. Entel, R. Fiedler, D.A. Griffin and J.V. Mansbridge 2008. Eddy-resolving ocean circulation in the Asian-Australian region inferred from an ocean reanalysis effort. Progress in Oceanography 76: 334-365.