# 7 FRAMEWORK ENVIRONMENTAL MONITORING AND MANAGEMENT PLAN

## 7.1 INTRODUCTION

This Chapter presents a framework Environmental Management and Monitoring Plan (EMMP) for the Prelude FLNG Project. The purpose of this framework is to demonstrate Shell's delivery mechanism for the commitments made in this draft EIS and outline the monitoring that will be undertaken throughout project execution. The Prelude FLNG project is being developed with the environmental objectives presented in *Table 7.1*.

Identifying impacts began in the earliest phases of the project design and will continue throughout the lifecycle of the project. The Impact Assessment methodology undertaken during this draft EIS provides a robust and public process for the identification of potential impacts, prediction of their significance and development of the mitigation and ongoing management measures.

The Impact Assessment process undertaken for this draft EIS has concluded that planned and unplanned operations of a FLNG facility do not represent a significant risk to any listed or migratory species, threatened ecological communities, nor the marine, socio-economic or cultural environment if the documented design and mitigation measures are implemented.

## 7.2 MITIGATION & MANAGEMENT MEASURES

This section provides an overview of Shell's approach to the ongoing management of potential impacts to ALARP levels through the life cycle of the Prelude FLNG Project. These impacts have been identified through the impact assessment process detailed in *Chapter 6* of this draft EIS. The process of managing potential impacts will be addressed through the following:

- Designed Mitigation Measures: Avoiding or reducing at source through engineering/design so that a feature that may potentially cause an impact is designed out or altered;
- Management Measures: Establishing and implementing operational procedures to reduce the likelihood and/or severity of an impact occurring through actions or activities.
- Monitoring of Management Measures: Set in place monitoring procedures to provide verification of the overall design and effectiveness of the mitigations measures and thereby allow for adjustment accordingly.

*Table 7.1 Environmental Aspects and Management Objectives*

| Aspect | Objectives |
|---|---|
| Marine Environment | • Maintain biodiversity, species distribution and function of marine ecosystem.<br>• Ensure that potential risks to significant marine communities and species are avoided or mitigated and controlled.<br>• Avoid significant impacts to *EPBC Act* listed species (as defined in *EPBC Act* Policy Statement 1.1). |
| Air Quality/ GHG Emissions | • Reduce emissions through the use of technological efficiencies.<br>• Minimise flaring and venting to only that required for safety reasons.<br>• Reduce GHG emissions to ALARP levels within the context of the development restrictions of this project, through the: 1) Decision to implement FLNG as the means of hydrocarbon extraction and production; and,<br>2) Technological efficiencies. |
| Noise | • Reduce noise impacts to ALARP levels.<br>• Manage noise through the use of technological efficiencies and design mitigation measures. |
| Light | • Reduce light spill to ALARP levels through design measures and selection of technologies. |
| Waste and effluent | • Treat effluent prior to discharge to accepted industry and regulatory standards.<br>• Reduce the pollutant load of controlled water discharges from operations.<br>• Handle and dispose of waste in a manner as to control loss to environment.<br>• Implement a "minimise, segregate, recycle and reuse" approach to the project as appropriate. |
| Hydrocarbon/ chemical release | • Reduce risks of accidental discharge through design measures and handling practices. |
| Workforce and public health | • Ensure risks to health and safety are reduced to ALARP levels through good design of facilities, development of appropriate procedures, strict vetting of logistics providers and sufficient competency of workforce and contractors by recruitment and training programs. |
| Engagement | • Open communication and implement transparent feedback mechanisms with relevant stakeholders. |
| Economic Development | • Optimise the opportunities for economic benefits to the local and regional community provided by the project. |

As described in *Chapter 4*, the Prelude FLNG Project has been designed with an intent to mitigate potential impacts of an LNG facility development to ALARP. As the project progresses through the further design, engineering, construction, installation, operation and finally decommissioning phases of the project, Shell will continue to strive to avoid or minimise all adverse environmental, socioeconomic and health impacts. To achieve this, Shell will develop a systematic approach to the management of their operations which will include monitoring, measuring performance and taking corrective actions where necessary.

In accordance with the *EPBC Act* and *Sections 5.8* and *Section 5.11* of the DEWHA guidelines for this draft EIS, Shell has developed a framework environmental monitoring and auditing plan for the project, which is discussed in *Section 7.6*. The monitoring requirements associated with the proposed mitigation and management measures are summarised in *Table 7.4* The design and procedural mitigations measures outlined in *Chapter 6* are summarised in *Table 7.2*.

## 7.3 SHELL'S MANAGEMENT SYSTEM

The design and mitigation commitments made in this draft EIS will be implemented, along with other project commitments, through a project specific HSE-MS. The components of the management system, and how the draft EIS process fits into and is delivered by the management system, are described below.

*Table 7.2 Mitigation & Management Measures*

| Aspect | Mitigation and Management Measures | Responsible Party | Timing |
|---|---|---|---|
| Cetaceans | Vessel cetacean interaction procedures will be developed and relevant drilling, construction and supply contractors engaged by Shell will be obliged to comply with these. The procedures will include the requirement to maintain a watch for cetaceans when transiting, to not knowingly approach within 500 m of cetaceans, to take actions to avoid cetaceans located within a distance of 500 m from the vessel when safe to do so and to complete a 'Whale and Dolphin Sighting Report Sheet' (DEWHA 2008) in the event cetaceans are sighted. | Shell will develop procedures, all vessel contractors to implement procedures | All Phases |
| | Helicopter operators engaged by Shell will be obliged to fly above an altitude of 1,000 m within a 300 m horizontal radius of observed whales (except for take-off and landings). | Helicopter contractor | All Phases |
| Birds and Turtles | Helicopter operators engaged by Shell will be obliged to route flight paths to avoid Browse Island and to comply with Civil Aviation Authority procedures to reduce the potential for bird strikes from helicopters. | Helicopter contractor | All Phases |
| | Lighting of the FLNG facility will be designed with the objective of reducing light spill, subject to meeting all workplace health and safety, and navigational requirements. The FLNG facility will be designed to reuse hydrocarbon waste streams generated by normal operations ("no flaring principle"), limiting the extent and duration of flaring -see lighting section below for further details. | EPC Contractor for FLNG facility | Design and FLNG Construction |
| Physical Presence | Selection of project concept as FLNG and positioning of FLNG facility and associated infrastructure in an area that does not have any known significant environmental sensitivities. | Shell | Design |
| | Screens will be installed on the cooling water riser inlets and inlet current speeds will be low (estimated at 0.5 m/s) to prevent the ingress of large marine fauna into the cooling water system.<br><br>TBT antifouling will not be used on the FLNG facility or associated subsea infrastructure. | EPC Contractor for FLNG facility | Design and FLNG Construction |
| Lighting<br>• Lights<br>• Flaring | Locating the FLNG facility in an area that is distant to the closest known significant environmental sensitivities. | Shell | Design |
| | Lighting of the FLNG facility will be designed with the objective of reducing light spill, subject to meeting all workplace health and safety, and navigational requirements. Design measures that will be considered will include:<br>• limiting the effects of reflecting surfaces by assessing the location of luminaries and the use of low-reflective paints;<br>• locating luminaries in such a way that they are shielded as far as practicable from direct line-of-sight from surrounding view points;<br>• directing luminaries inwards on the FLNG facility and away from the ocean; and<br>• the preferential use of low-impact spectrum illumination (including the use of green or blue lighting) over red, orange and white external lighting.<br><br>The FLNG facility will be designed to reuse hydrocarbon waste streams generated by normal operations ("no flaring principle"), limiting the extent and duration of flaring. | EPC Contractor for FLNG facility | Design and FLNG Construction |
| | Continuous illumination of work and accommodation areas on the FLNG facility and supply vessels will be limited wherever practicable to prevent attraction of marine and bird life, although any measures adopted will not compromise safety or navigational requirements. | Shell and Supply vessel contractor | All Phases |
| | Procedures will be designed to limit the occurrence and duration of flaring to ALARP. | Shell | Operations |

*Table 7.2 Mitigation & Management Measures (continued)*

| Aspect | Mitigation and Management Measures | Responsible Party | Timing |
|---|---|---|---|
| Noise | Locating the FLNG facility in an area that is distant to the closest known significant environmental sensitivities. | Shell | Design |
| | An acoustic design study will be undertaken during the Front-End Engineering and Design (FEED) phase to support the overall design process of the FLNG Facility.<br><br>Locating the majority of the process equipment on the topsides of the FLNG facility, not in the hull, and mounting modules on elastomeric mounts or using other vibration isolation methods to reduce vibration where required.<br><br>The FLNG facility will be designed to meet occupational health and safety noise limits. | EPC Contractor for FLNG facility | Design and FLNG Construction |
| | Supply vessels will be new, purpose-built vessels and will incorporate the latest design principles for energy efficiency which should help reduce vessel-generated underwater noise levels.<br><br>A maintenance program will be developed for the FLNG facility and supply vessels which will include inspection and maintenance of noise suppression equipment to ensure occupational health and safety noise limits are met. | Shell and Supply vessel contractor | Design<br><br>Operations |
| Wastes<br>Hazardous and non-hazardous solid wastes<br>Liquid Wastes<br>• Drilling fluids<br>• Hydrotest<br>• PFW and other process waters<br>• Subsea control fluids<br>• Cooling water<br>• Drainage<br>• Ballast water<br>• Sewage and grey water | The FLNG facility will be designed so that drainage water from deck areas that have the potential to be contaminated with oil or chemicals (excluding areas handling LNG or LPG) and water from areas which are likely to be contaminated with oil (sumps, bunds, machinery spaces, etc) are directed to the slop tanks for treatment. Bunded areas will be incorporated on the FLNG facility around machinery using hydrocarbons to reduce risk of leaks reaching the ocean.<br><br>The FLNG facility will be designed so that water from areas accidentally contaminated with oils can be directed into the PFW system for treatment prior to disposal.<br><br>FLNG facility PFW and waste water treatment system designed to achieve hydrocarbon concentrations of 30 mg/l or less as requirements under the *OPGSS Act*. Monitoring of the discharge stream will be undertaken prior to disposal and wastes not meeting specification will be diverted to storage tanks and returned to the PFW treatment system for retreatment. Provision will be made for the capacity to store onboard 2 to 3 days worth of produced water and contaminated drain water, to cater for the unlikely event of failure or poor performance of the treatment system.<br><br>The FLNG facility will be designed to include designated areas for segregation and collection of solid wastes.<br><br>The FLNG facility will be fitted with a macerator that is able to macerate wastes to a diameter of less than 25 mm prior to overboard disposal. | EPC Contractor for FLNG facility | Design and FLNG Construction |

*Table 7.2 Mitigation & Management Measures (continued)*

| Aspect | Mitigation and Management Measures | Responsible Party | Timing |
|---|---|---|---|
| Wastes<br>Hazardous and non-hazardous solid wastes<br>Liquid Wastes<br>• Drilling fluids<br>• Hydrotest<br>• PFW and other process waters<br>• Subsea control fluids<br>• Cooling water<br>• Drainage<br>• Ballast water<br>• Sewage and grey water | Waste Management Plans will be developed and adopted for the construction, operation and decommissioning phases of the Prelude FLNG project and contractors engaged by Shell will be obliged to implement these. The Waste Management Plans, will define the approved methods and locations for the transport and disposal of all wastes and will include documented waste consignment processes and licensing requirements for waste management services and facilities. These plans will also demonstrate how:<br>• The principle of 'avoid, reduce, re-use and dispose in an environmentally responsible manner' will be adopted. One focus will be on avoiding waste at source. Waste segregation and storage facilities will be provided in line with the relevant Australian standards, MARPOL and the World Bank guidelines.<br>• When selecting materials, non-hazardous solid materials that meet technical requirements and are as cost-effective as hazardous materials will be given preference.<br>• Wastes will be segregated into waste streams and wastes not being disposed of overboard will be clearly labelled and appropriately stored on the FLNG facility for transport to onshore contractors, approved and registered with relevant authorities, for disposal or treatment.<br>- Cooking oils and greases from the support vessels and the FLNG facility will be collected and transported back to the mainland for disposal.<br>- Batteries will be collected and stored in separate (dedicated) containers; batteries will not be incinerated, but preferably recycled and, if not possible, disposed of in a safe and controlled manner.<br>- Disposal of spent adsorbent from the mercury removal unit shall be transported to an appropriately licensed treatment facility.<br>- Lube and motor oils waste will be returned to a recycling plant or refinery.<br>- Medical waste will be incinerated onshore; chemicals and solvents (eg AGRU fluids) will be returned to the supplier for recycling or to a suitable onshore waste disposal facility.<br>- Sludges from the FLNG Facility will be collected and transported back to the mainland for disposal. | Shell will develop plans, Shell and contractors to implement procedures | All Phases |
| | Sand and sludge generation will be reduced through the design of the production wells, including the installation of sand screens and traps if practicable. | Shell | Design |
| | Drilling fluids will be re-used and muds and cuttings separated using shale shakers or centrifuges as per standard industry practice. Water Based Muds will be used for drilling the top hole sections of the wells.<br><br>The Synthetic Based Muds (SBM) will be low toxicity and approved for use of by the regulator. Cuttings contaminated with synthetic based muds will be treated to achieve less than 6.9% synthetic based mud by weight prior to overboard discharge. Spent synthetic based mud will be collected on board and transported to shore for disposal. | MODU Contractor | Drilling |
| | Selection of chemicals for hydrotest, process chemicals and subsea control fluids will involve consideration of environmental performance as well as technical requirements.<br><br>Hydrotest water will be discharged to sea through the FLNG facility, which allows greater control over storage times and discharge rates to ensure minimal environmental impacts.<br><br>A maintenance program will be developed for the FLNG facility and supply vessels which will include inspection and maintenance of treatment systems to ensure discharge limits are met.<br><br>Materials handling procedures will be developed and implemented to reduce the risk of spills and leaks. | Shell | Installation and Operations |

*Table 7.2 Mitigation & Management Measures (continued)*

| Aspect | Mitigation and Management Measures | Responsible Party | Timing |
|---|---|---|---|
| Wastes<br>Hazardous and non-hazardous solid wastes<br>Liquid Wastes | Vessel/rig vetting procedures will be developed and implemented to ensure that all vessels engaged by Shell meet the obligations under the relevant legislation (eg *OPGGS Act*, *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* and MARPOL).<br>• For the MODU and FLNG facility, sewage and grey water will be disposed of in accordance with the *OPGGS Act*. Sewage will be passed through a macerator able to macerate wastes to a diameter of less than 25 mm prior to overboard disposal.<br>• For all other vessels, sewage and grey water will be disposed of in accordance with international legal requirements under MARPOL 73/78 and the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*<br>• All vessels engaged by Shell will be obliged to conduct ballast tank operations in line with IMO guidelines and, where applicable, comply with Australian Quarantine regulations. | Shell | All Phases |
| Emissions<br>• Flaring<br>• Venting<br>• Combustion<br>• Fugitive | The selection of project development concept as FLNG, which has a smaller environmental footprint than an onshore LNG plant development (with associated offshore platform, export pipeline and coastal dredging).<br><br>Locating the FLNG facility in an area that is distant to the closest known significant environmental sensitivities. | Shell | Design |
| | Reducing the volume of emissions is the primary method through which emissions to air will be managed.<br>• A 'no venting' principle with respect to the disposal of hydrocarbon streams from process units and other equipment has been applied to the Prelude FLNG Project. Some venting may be required, however, in special cases where routing to the flare is prohibited for safety or other reasons.<br>• A 'no flaring' principle with respect to the disposal of hydrocarbon streams from normal operations has been applied to the Prelude FLNG Project. Some flaring will be required , however, for safety reasons during start up and shut down and process upsets.<br><br>The FLNG facility will be designed to run efficiently, whilst meeting reliability requirements and flanges, pumps, seals and valves to be used on the facility will be selected with the objective of reducing emissions.<br><br>The design of the FLNG facility will allow the installation of adequate equipment to monitor and record emissions for which regulatory limits exist and/or for which performance statistics are required. This monitoring and recording will be based on automatic on-line technology, where available and practical. | EPC Contractor for FLNG facility | Design and FLNG Construction |
| | Procedures will be designed to limit the occurrence and duration of venting and flaring to ALARP.<br>As part of the ongoing design process, studies will be undertaken to:<br>• further minimise flaring during cold and warm start-ups;<br>• investigate flow assurance requirements and the need for de-pressuring flowlines in a shutdown; and<br>• investigate process availability and reliability to maximise operational run lengths and reduce process trips and losses to flare. | Shell | Operation Design |

*Table 7.2 Mitigation & Management Measures (continued)*

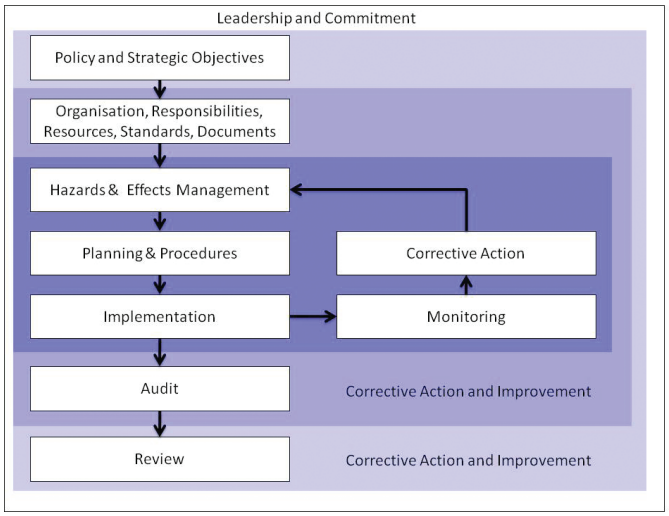
| Aspect | Mitigation and Management Measures | Responsible Party | Timing |
|---|---|---|---|
| Spills<br>Hydrocarbon spills<br>Non-hydrocarbon spills | The FLNG facility will be designed to withstand a 1 in 10,000 year weather event, with in-built facility integrity and will be double hulled.<br><br>The FLNG facility will be designed with an emergency stoppage mechanism for the transfer of liquid products to and from the FLNG facility and quick disconnect couplings for transfer hoses/loading arms where appropriate.<br><br>The main diesel and aviation fuel storage tanks on the FLNG facility will be fitted with high and low level alarms, level gauges and bunds and any overflow will routed to treatment.<br><br>The FLNG facility will be designed so that drainage water from deck areas that have the potential to be contaminated with oil or chemicals (excluding areas handling LNG or LPG) and water from areas which are likely to be contaminated with oil (sumps, bunds, machinery spaces etc) are directed to the slop tanks for treatment.<br><br>The FLNG facility will be designed so that water from areas accidentally contaminated with oils can be directed into the PFW system for treatment prior to disposal. | EPC Contractor for FLNG facility | Design and FLNG Construction |
| | Subsea equipment will be subject to dropped object studies to ensure that the risks posed by dropped objects are 'ALARP'. | Shell | Design |
| | Vessel and drill rig vetting procedures will be developed and implemented to ensure that all vessels engaged by Shell are able to comply with the relevant legislation and Shell standards including:<br>• Vessels must meet the survey requirements for their class.<br>• Vessels and rigs must have their own Ship Board Oil Pollution Emergency Plan (SOPEP) in compliance with MARPOL 73/78 and carry at least the minimum required oil response equipment.<br>• Vessels must comply with the requirements of the Multifunctional Oil Spill Advisory Group 'Guidelines for Shell Companies on Preparedness, Response and Compensation for Oil and Chemical Spills.'<br>• Rigs must be fitted with Blow Out Protectors suitable for the pressure expected to be encountered.<br><br>Preparation of a government approved Oil Spill Contingency Plan before any developments take place. | Shell | All Phases |
| | Materials handling procedures will be developed to reduce the risk of spills and leaks and will include the definition of suitable sea states and times for transfers, operating and communication procedures to ensure close monitoring of offloading and fuel transfer operations, routine maintenance and inspection of loading equipment and storage facilities and in place containment/recovery systems.<br><br>The selection of chemicals will involve consideration of environmental performance as well as technical requirements The bulk chemical containers on the FLNG facility will be designed to withstand collisions, using features such as recessed valves and metal cages.<br><br>Chemicals on the FLNG facility and supply vessels will be securely stored within bunded areas<br><br>The FLNG facility and supply vessels will locate chemical spill recovery equipment near onboard chemical supplies. | Shell | Operations |

*Table 7.2 Mitigation & Management Measures (continued)*

| Aspect | Mitigation and Management Measures | Responsible Party | Timing |
|---|---|---|---|
| Introduced Marine Species | Selection of project concept as FLNG removes the need for coastal export facilities. Positioning of FLNG facility outside Australia's territorial sea, 40 km from the nearest land and in water depths of 250m. | Shell | Design |
| | Vessel vetting procedures will be developed and implemented to ensure that all vessels engaged by Shell meet the requirements of the relevant legislation. Under the *International Convention for the Control and Management of Ship's Ballast Water and Sediments 2004*, ships are required to implement a ballast water and sediment management plan and ships must carry a Ballast Water Record Book. A number of Guidelines are provided by the IMO (2004) which include the following requirements:<br>• the uptake of ballast shall be avoided where practicable in shallow water and at night when the number of marine organisms in the water column may increase due to the rise of bottom dwelling organisms, and also in ports where populations of harmful organisms are known to occur;<br>• avoiding the unnecessary discharge of ballast;<br>• regular cleaning of ballast tanks; and<br>• implementing ballast water management procedures which include replacing ballast at sea with clean open ocean water. (Marine species taken on in port areas are unlikely to survive in the open ocean due to the different conditions.) | Shell | All Phases |
| | To control fouling by marine organisms, the outer hull of the FLNG facility will be coated with anti-fouling paint (TBT free) and the cooling water system will be treated with hypochlorite. | EPC Contractor for FLNG facility | Design and FLNG Construction |
| Social-Economic<br>• Fisheries<br>• Navigation and Shipping<br>• Workplace Health and Safety | Gazetting the FLNG facility and its 500 metre safety and security exclusion zone.<br><br>Issuing a "Notice to Mariners" through the Australian Hydrographic Service describing the facility, its operations and coordinates (including the position, size and direction of subsea gas gathering infrastructure that could pose a potential hazard to draggers or long-line trawlers);<br><br>Contacting the fishery licence groups that operate in the project area, providing them with detailed information on the nature of the undersea infrastructure that could potentially pose a snagging or collision hazard to their members.<br><br>Lighting the FLNG facility and support vessels as required under the *Navigation Act 1912* and maintaining a watch for shipping activity in the project area.<br><br>Distribute information to the FLNG facility crew on the fishing rights and practices of the Indonesians under the MOU and procedures for dealing with boats that might enter the 500m safety and security exclusion zone and having materials in Bahasa Indonesian/and or a recorded voice message on board the FLNG facility and supply vessels for communicating with fishermen who approach the FLNG facility.<br><br>Ensuring that radio communication and safety protocols are established for communication with vessels entering the safety and security zone around the FLNG facility. | Shell | Installation Operation |
| | Providing anti-collision radar on the FLNG facility;<br><br>Lighting the FLNG facility and support vessels as required under the *Navigation Act 1912*. | EPC Contractor for FLNG facility | Design and FLNG Construction |
| | Shell will hold early discussions with Broome Health Authorities on coordinating emergency response in a manner to maintain health service for local residences.<br><br>Shell will prepare detailed Workplace Health and Safety and Emergency Management Plans to meet all Shell's and regulatory requirements . | Shell | All Phases |

The HSE-MS is a tool used by Shell to ensure and demonstrate that HSE objectives are met and that continuous improvement is achieved. Each Shell Company is required to implement such a system and to report its progress to Shell Group level. The key elements of the Shell HSE-MS are outlined in *Figure 7.1*.

*Figure 7.1 HSE Management System Structure*




In short, the HSE-MS comprises:

- organisational aspects, including strategic objectives, definition of responsibilities for HSE management, required standards and how documents will be managed;
- the Hazards and Effects Management Process (HEMP), which aims to identify and assesses hazards and effects, and drives the development of measures to control or manage them and
- the plan-do-check-feedback 'loop' to ensure that lessons learned from the management of hazards and effects are fed back into the HEMP in an effort to prevent reoccurrence or escalation.

The aim of the HSE-MS is to ensure environmental management is integrated throughout the organisation from senior management to individual staff, contractors and suppliers. The audit and review function of the HSE-MS seeks to ensure that the system is being fully implemented and to identify areas for improvement.

As an integral part of Shell's Global HSE-MS, Shell have established a number of standards and targets which all Shell companies must abide with, in addition to local regulatory requirements. These are included in Shell's *Global Environmental Standards* (Shell, 2007) which seek to ensure that environmental performance in all Shell companies meet both local and international standards of environmental management. These standards are translated by each business unit into HSE business performance indicators. Shell companies therefore have to monitor and report their performance against these indicators.

### 7.3.1 EIS and the Prelude HSE-MS

The relationship between the EIS process and the HSE-MS is shown in *Figure 7.2*.

The figure illustrates the two parallel processes for the management of potential environmental impacts associated with the Prelude development:

- **Statutory Requirements:** The requirements associated with the *EPBC Act* and the *OPGGS Act*, including the commitments made in the draft EIS and EPs.
- **Shell Requirements:** Incorporating the environmental management measures from the draft EIS, the EMMP and the EPs into the HSE-MS that will be developed for this project.

## 7.4 GUIDELINES FOR MITIGATION, MANAGEMENT AND MONITORING

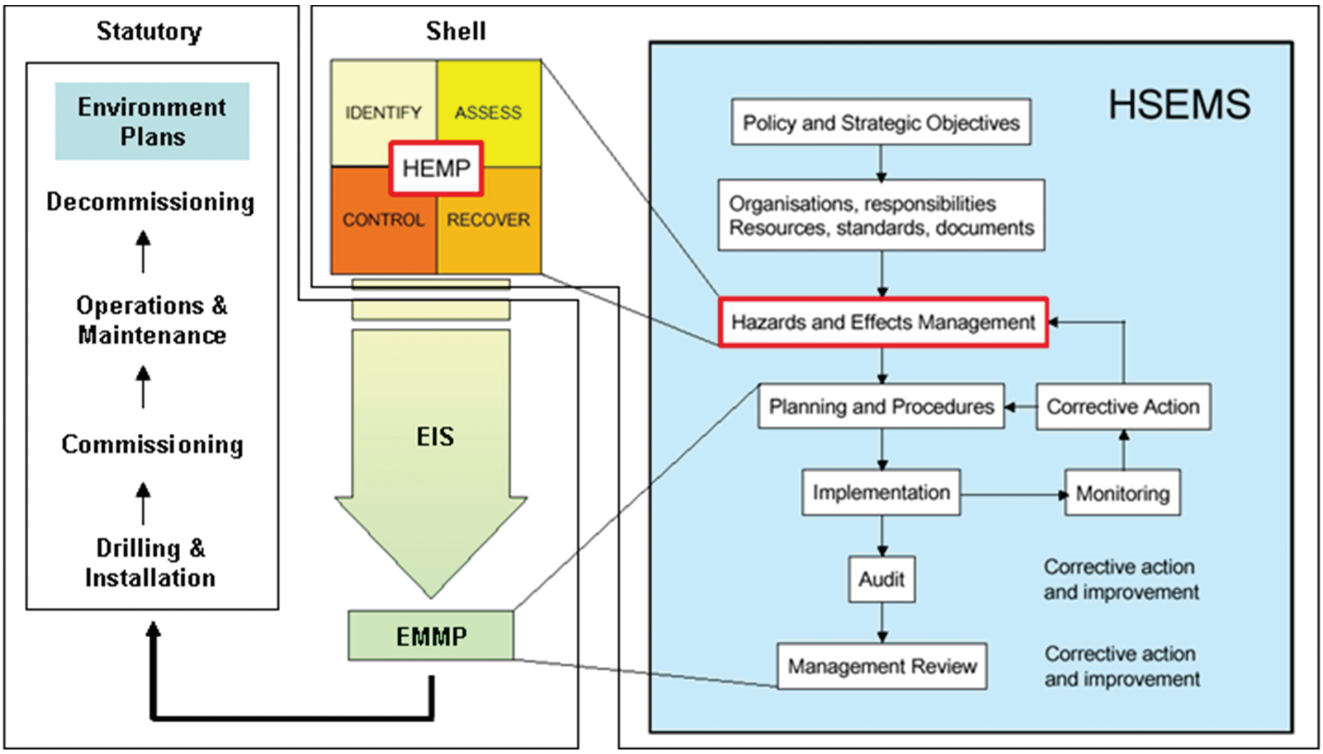
### 7.4.1 Shell Commitment and Policy

The Shell Group operates under a common set of business principles, supported by policies, standards and business controls which are implemented throughout the organisation structure. In support of the business principles, there is a Group Health, Safety and Environment Policy which requires every Shell Company to manage HSE in a systematic manner.

A copy of the Policy, endorsed and adopted by Shell Australia, is presented in *Figure 7.3*. The policy illustrates the commitment made by the senior management and all staff of Shell to achieve not only compliance with environmental standards set by the Company and by the Australian Commonwealth Government but also to seek continual improvements in HSE performance.

Additionally, Shell's management commitment towards

*Figure 7.2 Relationship between the EIS, EPs and HSE-MS*




HSE is reflected by the following:

- Communicating HSE expectations to employees and contractors to drive the process for HSE excellence;
- Prioritising HSE matters on the agenda of meetings, from the Board downwards;
- Demonstrating commitment to implementing the HSE measures and achieve external certification of the system (eg. ISO 14001) by ensuring that the necessary resources, milestones and reviews are allocated with the Business Plan;
- Recognising achievement and holding staff and contractors accountable for knowingly violating HSE standards and procedures;
- Communicating the importance of HSE considerations in business decisions and in communication with stakeholders;
- Demonstrating active personal participation in HSE activities such as training, reward and recognition schemes, industry/contractor workshops, conferences and audits;
- Leading high potential incident investigations;
- Championing HSE activities, such as contractors' HSE workshops and HSE toolbox meetings, champion activities associated with achieving sustainable development;
- Seeking internal and external views on HSE;
- Senior Shell personnel being directly involved in improvement efforts identified from management reviews and audits;
- Director accountability for Group HSE Policy and reporting on the status of such implementation; and
- Providing sufficient resources and training to supervise contractors and their taking accountability for actions of contractors under their control.

### 7.4.2 Adopted Standards for the HSE-MS

The Prelude HSE-MS will be developed to comply with:

- Commonwealth and any relevant State statutory requirements;
- Shell corporate requirements;
- The international standard on environmental management systems ISO 14001; and
- Internationally recognised best practice procedures and protocols including:
  - World Bank/IFC Performance Standard 1 and

*Figure 7.3 Shell Health, Safety and Environment Commitment and Policy*

# Health, Safety, Security and Environment

Shell in Australia has a HSSE performance we can be proud of. At Shell we commit to:

- pursuing the goal of no harm to people;
- protecting the environment;
- using materials and energy efficiently to provide our products and services;
- developing energy resources, products and services consistent with these aims;
- publicly reporting on our performance;
- playing a leading role in promoting best practice in our industries;
- managing HSSE matters as any other critical business activity;
- promoting a culture in which all Shell employees share this commitment; and
- creating a secure business environment that minimises economic loss and business disruption, safeguarding Shell's people, integrity and reputation.

In this way we aim to earn the confidence of customers, shareholders and society at large, to be a good neighbour and to contribute to sustainable development.

Every Shell company:

- has a systematic approach to HSSE management designed to ensure compliance with the law and to achieve continuous performance improvement;
- sets targets for improvement and measures, appraises and reports performance;
- requires contractors to manage HSSE in line with this policy;
- requires business partners under its operational control to apply this policy and uses its influence to promote it in its other ventures; and
- includes HSSE performance in the appraisal of all employees and rewards accordingly.

Each of us has a right and duty to intervene with unsafe acts and conditions or when activities are not in compliance with this policy.

Russell Caplan
Chairman, Shell Companies in Australia

February 2006

SHELL IN AUSTRALIA

Guidance Note: Social and Environmental Assessment and Management Systems;
- World Bank/IFC EHS Guidelines for Liquefied Natural Gas Facilities;
- World Bank/IFC EHS Guidelines – Offshore Oil and Gas Development;
- Australian Petroleum Production and Exploration Association Guidelines;
- The Oil and Gas Industry: Operating in Sensitive Environments 2003 – International Petroleum Industry Environmental Conservation Association (IPIECA); and
- UNEPs Environmental Management in Oil and Gas Exploration and Production and the Oil Industry International Explorations and Production Forum (E&P Forum).

The HSE-MS will be audited against the ISO 14001 standard, by an accredited independent third party, to achieve certification to this standard.

### 7.4.3 Environment Plans

The development and approval of activity-specific EPs prior to key stages of the Prelude FLNG Project is a legislative requirement under the *Petroleum (Submerged Lands) (Management of Environment) Regulations 1999*. EPs will detail the implementation of objectives, commitments and practices defined for the project at each progressive stage of project development (ie drilling and installation, commissioning, operations and maintenance, and decommissioning). Each EP will outline specific strategies to avoid, mitigate or reduce potential environmental impacts. The plans will be used to inform the workforce of the monitoring, auditing, reporting and corrective action requirements. The EPs will also identify the roles and responsibilities of key individuals/positions from the company and/or contractor teams.

## 7.5 HSE-MS IMPLEMENTATION AND REVIEW

### 7.5.1 Introduction

Potential impacts arising from the development and operation of the Prelude FLNG Project have been assessed and mitigation and management measures identified. These are detailed in *Chapter 6* of this draft EIS and summarised in *Table 7.2*. Mitigation and management measures will be delivered through the Prelude HSE-MS and the statutory EPs.

### 7.5.2 Responsibilities

#### *Role of the Shell Project Team*

As operator of the Prelude FLNG Project, Shell holds responsibility for the environmental performance of the overall project through all its phases, including the monitoring of contractors' performance. Shell also holds responsibility for:
- reviewing the environment, social and community health management elements of the Engineering, Procurement and Construction (EPC) Contractors' bids;
- reviewing the selected EPC Contractor's HSE plans and procedures; and
- monitoring the performance of the EPC Contractor to ensure that the overall objectives of the HSE-MS and statutory EPs are met.

Shell will provide sufficient and suitably qualified resources to fulfil its management function throughout the life of the Prelude FLNG Project. This will be through the development of an HSE team, which will comprise an HSE manager and advisors with links to specialist technical advisors as appropriate. While the EPC Contractor(s) will be responsible, through their contractual terms, for assuring that the design, procedures, procurement, construction and commissioning adhere with all environmental, socio-economic and health controls and mitigation measures specified in this draft EIS and subsequent statutory EPs, as detailed through the HSE MS, Shell holds ultimate responsibility.

The EPC Contractor(s) will be required to demonstrate to the satisfaction of the Project Team, how compliance with the draft EIS, EPs and the HSE-MS requirements will be achieved through the development of detailed HSE plans, procedures and method statements. The EPC Contractor's HSE plans, procedures and method statements will be submitted for review and approval by Shell and will be the basis for open discussion to promote an appropriate management regime for the project. The EPC Contractor(s) will be required to undertake regular inspections and to

provide related reports to the Shell Prelude HSE team, thereby enabling Shell to monitor and evaluate performance against the measures and objectives established in this draft EIS and the statutory EPs. Shell will also undertake regular audits of the EPC Contractor(s) to ensure compliance with agreed objectives and targets - *see Section 7.5.4*.

Shell will lead ongoing consultation and communication with all stakeholders. Part of this engagement process will be focused on encouraging feedback from government and other interest groups on the performance of the project in order to quickly identify and resolve any issues or grievances, should they arise.

Before commencing each of the project phases within Australian jurisdiction, Shell must submit to the Designated Authority (WA Department of Mines and Petroleum (DMP)) an EP for that phase and have it approved. Similarly, Shell will be required to develop and have accepted a safety case for the FLNG facility. NOPSA has responsibility for administering the safety requirements of the *OPGGS Act* and its associated regulations. Before the DMP may grant the 'Consent to Construct and Install', NOPSA must have accepted a Facility Description, a Formal Safety Assessment and those parts of the Safety Management System that relate to construction and installation. A Safety Case must have been accepted by NOPSA for the granting of the 'Consent to Use'.

### 7.5.3 Competence

All personnel required on the project shall be employed on the basis they are competent to do the job. Additionally, all personnel will be given an induction prior to the commencement of the work to ensure that they are aware of their obligations and commitments.

Comprehensive training programs will be developed which will address both administrative and technical environmental management procedures. These programs will be developed and implemented prior to the commencement of each project phase. The programs will be tailored to meet the specific requirements of various roles that employees and contractors undertake for the project.

### 7.5.4 Reporting & Feedback

#### *Shell Expectations*

In accordance with Shell HSE-MS requirements, regular HSE audits will be undertaken by Shell and Shell Corporate auditors.

The HSE-MS will also undergo a process of regular internal audits and external audits which are required by the ISO 14001 certification conditions. Assessing the operational aspects and monitoring, audits will investigate compliance with agreed objectives and targets, the effectiveness of the HSE-MS and its implementation. The HSE-MS will therefore be subject to ongoing review and development to ensure that it remains appropriate for all aspects of the project.

All audit findings will be reviewed by the Project Manager and HSE Manager and, where corrective actions are deemed necessary, specific plans (with designated responsibility and timing) will be developed aimed at achieving continuous improvement in the environmental performance of the facility.

Corporate Environmental Performance Targets are set by Shell Group and are approved by the HSE Committee. The targets are cascaded down to the Business. These targets are aimed at driving continuous improvements in performance. Reporting against environment parameters identified in the Shell Group Performance Monitoring and Reporting standard will take place each quarter using the Shell Data Loader. This data is used as the basis for an annual Shell Group external HSE report (Shell Sustainability Report), which is publicly and externally reported.

### 7.5.5 Incident Investigation and Reporting

#### *Shell Requirements*

Shell requires that all environmental incidents are reported and investigated using Shell's incident reporting and investigation procedures. Contractors will also be required to report incidents to the Prelude HSE Manager in accordance with the Shell incident reporting procedure.

### *Reporting under the Petroleum Legislation*

**Reporting Arrangements**

Shell is required to report performance to the DMP and as such the HSE-MS and the EPs will include arrangements for:

- recording, monitoring and reporting information about the activity (including information required to be recorded under the *OPGGS Act*, the regulations and any other environmental legislation applying to the activity) sufficient to enable the DMP to determine whether the environmental performance objectives and standards in the EPs are met; and
- reporting at intervals agreed with the DMP, but not less often than annually (*Clause 15, Petroleum (Submerged Lands) Management of Safety Offshore Facilities Regulations 1996)*.

**Reportable Incidents**

Under legislation *(Petroleum (Submerged Lands) (Management of Safety Offshore Facilities) Regulations 1996* and the *P(SL)A* Specific Requirements as to Offshore Petroleum Exploration and Production), the DMP must be notified of all Reportable Incidents.

Reportable Incidents are defined as:

- "an incident mentioned in the environment plan for the activity that has caused, or has the potential to result in, moderate to catastrophic environmental consequences as categorised by the risk assessment process undertaken as part of the preparation of the environmental plan"; and
- "an escape or discharge into the area of more than 80L of petroleum (not being a discharge into the sea of petroleum in a mixture of petroleum and water where the concentration of petroleum in a mixture of petroleum and water is not greater than 50 mg/L)."

DMP will be notified of and provided written reports of reportable incidents in accordance with Regulations 26 and 26A of the *Petroleum (Submerged Lands) (Management of Safety Offshore Facilities) Regulations 1996*. The written report must contain:

- all material facts and circumstances concerning the reportable incident that the operator knows or is able, by reasonable search or enquiry, to find out;
- any action taken to avoid or mitigate any adverse environment impacts of the reportable incident; and
- the corrective action that has been taken, or is proposed to be taken, to prevent a similar reportable incident.

**Recordable Incidents**

A Recordable Incident for an operator of petroleum activity, as defined in the *Petroleum (Submerged Lands) (Management of Safety Offshore Facilities) Regulations 1996*, is an incident arising from the activity that:

- breaches a performance objective or standard in the environment plan that applies to the activity; and
- is not a Reportable Incident.

DMP will be notified of all Recordable Incidents, according to the requirements of Regulation 26B of the *Petroleum (Submerged Lands) (Management of Safety Offshore Facilities) Regulations 1996*.

The report will comprise:

- a record of all Recordable Incidents that occurred during the calendar month;
- all material facts and circumstances concerning the Recordable Incidents that the operator knows or is able, by reasonable search or enquiry, to find out;
- any action taken to avoid or mitigate any adverse environment impacts of the Recordable Incidents; and
- the corrective action that has been taken, or is proposed to be taken, to prevent similar Recordable Incidents.

The Prelude HSE Manager will report on a monthly basis to DMP.

### *Spill Reporting Obligations*

Other key legislative drivers for reporting incidents include those listed in *Table 7.3*. Reporting of accidents and dangerous occurrences as defined by the *Petroleum (Submerged Lands) (Management of Safety Offshore Facilities) Regulations 1996* will be in accordance with Clause 4b of those regulations.

### 7.5.6 Records

The following records will be kept through the life of the Prelude FLNG Project:

*Table 7.3 Oil Spill Reporting Requirements*

| Quantity | Jurisdiction | Authority | Legislation |
|---|---|---|---|
| All discharges not in accordance with MARPOL | WA State Waters | DPI | *Pollution of Waters by Oil and Noxious Substances Act 1987* |
| All discharges not in accordance with MARPOL | Commonwealth waters | AMSA | *Prevention of Pollution by Ships 1983* |
| Spills >80 litres or uncontrolled vapour releases >1kg | Commonwealth/ State waters | NOPSA | *P(SL) (Management of Safety on Offshore Facilities) Regulations 1996* |
| Spills >80 litres | State waters | DMP | *Petroleum (Submerged Lands) Act 1982* |
| All spills | Port | Port Authority | *Port Authority Act 1999* |

- attendance of employees and contractors at the HSE induction;
- occurrence of any environmental incidents and any actions undertaken to control environmental impact as a result of the incident;
- reports of any Regulatory Authority inspection and any actions undertaken to rectify any issues raised by either audit or inspection;
- internal and external audit reports;
- non-conformance with Environmental Performance Objectives and Activities;
- waste log and manifests;
- effluent discharge log;
- fuel use and emission calculations;
- GHG emissions;
- upset or non-routine conditions; and
- marine notices and broadcasts.

## 7.6 ENVIRONMENTAL MONITORING FRAMEWORK

Monitoring is required in order to demonstrate compliance with legal limits and Shell's project requirements (compliance monitoring) established in this draft EIS. Monitoring will also provide verification of the overall design and effectiveness of the implemented control measures. The key objectives of Shell's proposed monitoring activities are as follows:

- to monitor discharges and emissions to ensure compliance with relevant standards and Shell's environmental objectives;
- to provide an early indication that any of the environmental control measures or practices are failing to achieve acceptable standards;
- to determine whether environmental changes are attributable to the project activities, other activities or as a result of natural variation; and
- to provide a basis for continuous review and improvement to the operational monitoring program.

In developing the monitoring program, the following considerations and strategies have been applied:

- statutory requirements;
- internationally accepted industry best practice;
- responsiveness to the detection of environmental changes/ trends;
- logistically practical; and
- cost effective.

*Table 7.4* outlines the recommended monitoring framework during:

- drilling and installation; and
- commissioning and operational/maintenance phases of the project.

This framework will be further developed prior to initiation of the above phases as part of the statutory EPs and HSE-MS, and will be updated throughout the project lifecycle as appropriate. Monitoring requirements for decommissioning will be developed at a later stage.

In addition to the routine monitoring outlined in *Table 7.4*, Shell will develop and undertake the environmental studies listed below within the first five years of operation, to confirm the impact assessments made within this draft EIS and to contribute to the knowledge base for future FLNG developments:

- Underwater Noise monitoring will be undertaken to expand on the database of whale activity in the project area and measure noise levels generated by the FLNG Facility and during LNG/LPG tanker berthing and offloading.
- Cooling Water dilution and chemical composition will be measured and compared against the results of the modelling presented in this draft EIS.

- An identification guide and monitoring program will be developed to document the composition and abundance of birds, including listed species, which land on or frequent the area around the FLNG facility.

## 7.7 GREENHOUSE GAS MANAGEMENT PLAN

The Greenhouse Gas Management Plan will incorporate and co-ordinate the following project requirements; the Shell Greenhouse Gas Management Standard, project commitments and Australian Federal Government reporting requirements.

This will include the management, measurement and recording of:

- energy use;
- greenhouse gas emissions;
- transport activities; and
- waste management.

### *Reduction opportunities to be considered*

Opportunities will continue to be explored during the FEED design phase to reduce GHG emissions during the operational phase of the Prelude FLNG Project.

Final project design is still ongoing and therefore not all reduction opportunities have been quantified but the following are being considered as part of the FLNG design process:

- studies to minimise flaring during cold and warm start-ups;
- flow assurance studies to avoid need for de-pressuring flowlines in a shutdown;
- availability/reliability studies to maximise run lengths with optimum efficiency operation and reduce trips and losses to flare; and
- maintenance philosophy to balance maintenance onboard the FLNG facility versus the onshore Maintenance Workshop, trying to optimise plant availability and minimise the number of supply vessel movements.

Geosequestration of the Prelude reservoir $CO_2$ has significant cost and technical uncertainties. Therefore, reservoir $CO_2$ will be safely vented once it has been separated from the feedgas (see *Section 4.4.2*). Nonetheless, Shell believes geosequestration will be a key technology to combat climate change and will continue to investigate other opportunities to implement Carbon Capture and Storage.

## 7.8 SOCIAL COMMITMENTS AND ENGAGEMENT

### 7.8.1 Social and Health Commitments

Shell reinforces health and safety as a core value. Emphasis is placed upon encouraging a safety culture in the workplace, by setting clear expectations, improving safety training and encouraging people at all levels to be leaders in safety. Shell supplements engineering driven safety procedures with behavioural safety programs. This involves staff in the development of plans and actions to further improve safety.

Shell is developing an Australian Industry Participation Plan that aims to maximise opportunities for Australian industry to benefit from the Prelude FLNG Project. By providing full, fair and reasonable opportunities for local companies to compete on price, performance and suitability, local benefits of the project can be maximised. Engagement with large projects such as the Prelude FLNG Project can improve the capacity of local businesses to compete globally.

Shell invests in the communities where it has businesses. Shell's social investment program targets investments that assist community organisations to achieve their goals, with a focus on health, education and the environment. Shell recently entered into a three year agreement with *Indigenous Community Volunteers* to assist their expansion into the Kimberley. As the Prelude FLNG Project proceeds, Shell will be evaluating opportunities to work with and invest in local communities.

### 7.8.2 Stakeholder Engagement

Stakeholder engagement is a core Shell policy and will continue throughout the development and operation of the Prelude FLNG Project, informing and guiding development planning. There will be focused briefing programs in the lead-up to all project milestones, so that stakeholders are aware of and can comment on proposed activities. Shell's Stakeholder Engagement Plan for Prelude will be regularly

*Table 7.4 Monitoring Framework*

| Aspect | Source | Parameters | Monitoring Frequency | Reporting | Responsible Party |
|---|---|---|---|---|---|
| Drilling/ Installation | | | | | |
| Waste | Hazardous and non-hazardous wastes stored and transported for onshore disposal | • *Inventory:*<br>- Quantity of waste generation<br>- Quantity of waste disposal<br>- Location of waste disposal site<br>• *Waste Consignment Notes* | Internal: continuously<br><br>External: As per legal obligations | Internal | Shell/ Contractors |
| Marine Environment | Unplanned Event resulting in hydrocarbon or non-hydrocarbon spill | • Number and volume of accidental spills:<br>- As per Shell corporate requirements<br>- If over 10 t, report to AMSA<br>- If over 80 L, report to NOPSA<br>- If consequence of spill categorised as moderate or higher on risk assessment in EP, report to DMP.<br>• Root cause of non-routine events, spills and accidents | As required | Internal<br><br>External to relevant agencies<br><br>Refer *Section 7.5.5* | Shell |
| Marine Environment | Discharge of Drilling wastes | • Type of drilling fluids used<br>• Quantity of WBM and SBM discharged to sea<br>• Efficiency of solids control system<br>• Quantity of bulk WBM and SBM and cement discharged to sea<br>• Quantity of SBM returned to shore for disposal<br>• Quantity and type of drilling chemicals<br>• Lithology and estimated volume of cuttings generated | Continuously during drilling | Internal | Shell |
| Marine Environment | Support vessels | • Observation of cetaceans numbers and locations in vicinity of vessels during transit<br>• Record behaviours | During transit | Whale and Dolphin Sighting Report to DEWHA via email to Cet_sightings@deh.gov.au | Shell/Contractors |
| Air emissions and GHG | Generators on MODU rig and other emission sources | • Inventory of fuel used and associated emissions | Daily (calculation) | Internal<br><br>Annual National Greenhouse and Energy Reporting (NGER) and Carbon Pollution Reduction Scheme (CPRS) reporting | MODU Contractor |

*Table 7.4 Monitoring Framework (continued)*

| Aspect | Source | Parameters | Monitoring Frequency | Reporting | Responsible Party |
|---|---|---|---|---|---|
| Commissioning/ Operation/ Maintenance | | | | | |
| Waste | Hazardous and non-hazardous wastes stored and transported for onshore disposal | • *Inventory:<br>- Quantity of waste generation<br>- Quantity of waste disposal<br>- Location of waste disposal site<br>• *Waste consignment Notes<br>*As a minimum, monitoring and recording of hazardous/ scheduled waste must be in accordance with Western Australian legislative requirements | Internal: continuously<br>External: As per legal obligations | Internal | Shell/Contractors |
| Marine Environment | Unplanned Event resulting in hydrocarbon or non-hydrocarbon spill | • Number and volume of accidental spills:<br>- As per Shell corporate requirements<br>- If over 10 t, report to AMSA<br>- If over 80 L, report to NOPSA<br>- If consequence of spill categorised as moderate or higher on risk assessment in EP, report to DMP.<br>• Root cause of non-routine events, spills and accidents | Continuously | Internal<br><br>External to relevant agencies<br><br>Refer *Section 7.5.5* | Shell |
| Marine Environment | Release of subsea fluid controls | • Type of fluid used<br>• Inventory calculation to understand period volume lost to marine environment | Continuously, via product consumption records | Internal | Shell |
| Marine Environment | Liquid discharges (PFW, cooling water, desal brine, meg brine, sewage/ grey water) | • Volumes discharged<br>• In-line monitoring of temperature, oil in water and chlorine to ensure average daily discharge does not exceed limits<br>• Performance of monitoring equipment associated with PFW discharges (Clause 29A P*(SL) Management of Environment Regulations* | Continuously, via product consumption records | As agreed with DMP, likely to be monthly | Shell |
| Air emissions and GHG | Operation emissions | • Inventory of fuel used and associated emissions<br>• Inventory of production to calculate $CO_2$ vented | Daily (calculation) | Internal<br>Annual NGER and CPRS reporting obligations | Shell |
| | None routine events | • Flaring duration<br>• Calculation of emissions through volume of product/ duration of flaring | As required | As agreed with DMP, likely to be monthly | Shell |

reviewed and updated, and targeted engagement plans will be developed around specific project milestones or issues.

Shell prefers to engage directly with stakeholders but will also include new tools such as a Prelude FLNG Project website in 2009. The website will not only provide the latest information on the project for the public but will also alert contractors to opportunities as they arise. To complement the website, a series of supplier workshops to outline potential opportunities are planned.

## 7.9 FRAMEWORK EMERGENCY RESPONSE PLANS

### 7.9.1 Introduction

An Emergency Response Plan will be developed to manage unplanned events and emergencies. The plan will include procedures to deal with the following events (as a minimum):

- hydrocarbon spills (detail provided in *Section 7.9.2* below);
- chemical spills;
- damage to wells, pipes, flowlines and other subsurface, surface or suspended structures;
- fires and explosions;
- security issues or terrorism;
- medical evacuation;
- extreme weather conditions; and
- traffic or transport accidents.

The Emergency Response Plan will follow industry best practice, legislative requirements and Shell standards and procedures and will satisfy the following key requirements:

- it receives the approval of the relevant authorities;
- staff are trained in its activation and implementation;
- it is backed-up by the necessary resources, equipment and facilities;
- it is known to external agencies that may be called upon to respond; and
- drills are conducted and evaluated.

### 7.9.2 Hydrocarbon Spill Response

The Prelude FLNG facility hydrocarbons inventory relevant to spill response planning comprises condensate, diesel and aviation fuel. It does not include LNG and LPG as these refrigerated products evaporate quickly and completely during a spill event.

Shell has a range of controls in place to reduce the risk of a hydrocarbon spill and to respond effectively in the event of a spill. These are based on standard industry practice in preventing any unplanned discharge of hydrocarbons. Examples of operational prevention measures are:

- quick disconnect couplings for transfer hoses;
- storage tanks fitted with level gauges and high and low level alarms;
- overflow lines from storage tanks typically discharge to the drains system;
- in place containment/recovery systems; and
- real-time monitoring of transfer volumes and loading rates.

Other controls take the form of procedural measures such as:

- training and protocols;
- close visual monitoring of product/fuel transfer operations;
- no product transfer outside defined weather limits; and
- regular maintenance checks, including testing and changeover of floating hoses used for condensate transfer.

In addition to these operational mitigation measures, Shell manages hydrocarbon loss of containment through comprehensive Spill Contingency Planning arrangements.

#### *Oil Spill Contingency Plans*

Under the Commonwealth *Petroleum (Submerged Lands) (Management of the Environment) Regulations 1999*, an Oil Spill Contingency Plans (OSCP) is required as part of the proposal's Implementation Strategy. In the event of a hydrocarbon spill from petroleum operations affecting the environment, Shell is required to notify the Government and to implement Shell's OSCP.

Additionally, Shell is party to the following National, State and Industry arrangements for the prevention of, and response to, uncontrolled releases of hydrocarbons at sea.

- The National Plan to combat Pollution of the Sea by Oil and Noxious Substances (NATPLAN). NATPLAN has been developed by Commonwealth and State governments and Industry. It is administered by the Australian Maritime Safety Authority (AMSA). This plan combines the efforts and resources of the Commonwealth and State Governments and the Oil/Gas and Shipping Industry to combat oil spills in the marine environment. NATPLAN provides stock piles of oil spill response equipment around Australia in collaboration with State and Industry bodies. Western Australia is currently well provisioned with two of the largest stockpiles in Dampier and Fremantle and a more recent relocation of resources to the Port of Broome to strengthen industry resources in the Browse Basin.
- West Plan – Marine Oil Pollution (WestPlan-MOP). Supporting NATPLAN is the WestPlan-MOP, which details the arrangements between the WA State government agencies and industry to combat marine oil pollution within WA. It prescribes responsibilities and procedures, and provides a basis for coordination of resources for responding to spills offshore. The Western Australian NATPLAN State Committee and the operational arm of this committee, the Executive Response Group, administer WestPlan-MOP.
- AMOSPlan. AMOSPlan is managed by the Australian Marine Oil Spill Centre (AMOSC). The AMOSPlan will be activated by Shell when the response to an oil spill incident is regarded by Shell to be requiring resources beyond those of the company itself. This group coordinates the participation of the oil industry in NATPLAN. AMOSC's role includes the:
  - provision of oil spill response personnel and equipment on 24 hour stand-by;
  - provision of oil spill training services at the training centre in Geelong; and
  - administration of the oil industry mutual aid arrangements where industry oil spill response resources are available to NATPLAN, through AMOSC.

### *Spill Categories*

For the purposes of response planning, spills are divided into three categories depending on the spill size. The categories also act as triggers for the activation of the National Plan, WestPlan-MOP, AMOSPlan and Shell's own response plan (*Table 7.5*).

*Table 7.5 Tiered Response and Escalation Triggers.*

| | Tier 1 | Tier 2 | Tier 3 |
|---|---|---|---|
| Spill Size | <10 tonnes | 10-1,000 tonnes | >1,000 tonnes |
| Incident Control | Shell responsible for the management of the oil spill. | Request for assistance will be made directly to AMOSC. | Assistance will be requested from AMSA and NATPLAN. |
| Potential Impact | Low | Moderate | High |
| Indicative Resources Mobilised | | | |
| Shell | | | |
| AMOSC/ Industry | | | |
| WA State | | | |
| AMSA | | | |
| International | | | |

### *Training and Exercises*

As part of Shell's spill response preparedness, regular training will be conducted with appropriate staff. Exercises are a regular facet of Shell's spill response either through notification exercises involving regulators and other industry bodies, or through regular desktop emergency scenarios. Shell staff have participated in State and National exercises and maintain an ongoing commitment to manage the response to oil spills.

## 7.9.3 Cyclones

The operations philosophy during adverse weather is similar to other operators in the area. Key cyclone design and operational controls considered for the FLNG facility during the operations phase are described below.

- The FLNG facility is not self-propelled and has been designed so that is does not need to be decoupled from the turret mooring system during a cyclonic event. The turret structure and its associated mooring chains and suction anchors have been designed to resist loads due to hull deflections, mooring loads and direct slamming loads that may be encountered in extreme 10,000 year weather conditions.
- Major maintenance campaigns and equipment overhauls requiring large numbers of additional

personnel to be accommodated on the FLNG facility will be preferentially undertaken outside the cyclone season.

- The FLNG facility will have clearly defined weather operational criteria. On the approach of cyclonic weather, the core production crew will remain on board but all non-essential personnel will be down-manned in accordance with established "Offshore Cyclone Down-manning and Up-manning Coordination" procedures. All loading and unloading operations will be discontinued once the weather operational limits are reached and the vessels sent away to a safe location. The FLNG will continue production until such time that wind speeds above 70 knots are predicted to reach the facility within the time required to shut-in the facility. This is known as the critical path duration.

## 7.10 ENVIRONMENTAL OFFSETS

Environmental offsets are actions taken outside the area of influence of a particular project that compensate for potentially major or critical impacts that arise from the development and operation of the project. Environmental offsets provide an opportunity to achieve long term conservation outcomes while providing flexibility to project proponents who wish to undertake activities that may have environmental impacts.

*Section 5.9* of the EIS guidelines issued by DEWHA for the Prelude FLNG Project points out that environmental offsets may be appropriate when they:

- are necessary or convenient to protect or repair impacts to a protected matter;
- relate specifically to the matter (for example, species) being impacted; and
- seek to ensure that the health, diversity and productivity of the environment is maintained or enhanced.

This draft EIS demonstrates that there are no significant environmental impacts predicted to arise from the Prelude FLNG Project and that FLNG has a smaller environmental footprint than the alternative LNG development scenarios as outlined in *Section 4.3.1*. As such, environmental offsets are not required for the project.

## 7.11 CONCLUSION

Shell is committed to protecting the environment during all stages of the Prelude FLNG Project. To assist in meeting this commitment a HSE-MS will be developed in accordance with Shell Company requirements, which will capture legislative requirements, commitments developed in this draft EIS as well as commitments made in the EPs required under the *OPGGS Act*. Monitoring will be carried out in order to demonstrate compliance and will be used to provide verification of the overall design and effectiveness of the implemented control measures. Adequate resources will be committed to the HSE-MS and contractors will be contractually obliged to meet the requirements of the HSE-MS.

# 8 CONCLUSION

Shell is proposing to develop and export the gas and condensate from the Prelude field within title area WA-371-P, which is located in Commonwealth waters, 200 km offshore Western Australia in a water depth of about 250 m. Shell examined a range of options to develop the Prelude field including 'do nothing', a traditional onshore Liquefied Natural Gas (LNG) plant at a number of proposed locations and a technically innovative offshore Floating LNG (FLNG) solution. A FLNG facility was determined to be the most appropriate. Compared to a conventional onshore LNG development, FLNG notably reduces several potential environmental impacts by restricting the disturbance area to within the immediate location of the remote gas field and removes the need for construction and operation of a subsea pipeline, an onshore processing facility and export jetties with the associated dredging.

This draft EIS has been prepared in accordance with the requirements of the *EPBC Act* (1999), including the principles of ecologically sustainable development, and the 'Guidelines For An Environmental Impact Statement For The Proposed Prelude Floating Liquefied Natural Gas Facility Western Australia (EPBC 2008/4146).'

Particular focus has been placed upon those aspects which relate to the three controlling provisions under which the project was identified as a controlled action:

- Sections 18 and 18A (Listed threatened species and communities);
- Sections 20 and 20A (Listed migratory species); and
- Sections 23 and 24A (Commonwealth marine environment).

The project area is remote and in deep water. The environment of the project area is typical of the ocean on Australia's North West Shelf and the sea floor contains no significant features. The nearest potential sensitive environment is Browse Island, located some 40 km to the SSE, and the Humpback Whale migration routes and calving grounds off the Kimberley coast are located some 200 km south of the project area.

Potential impacts from noise, light, emissions and spills have been investigated and analysed, using technical assessment and modelling studies where appropriate. All potential impacts which could arise from the Prelude FLNG Project were assessed as a minor risk with the exception of:

- disturbance to the seabed through the establishment of subsea infrastructure and drill cutting discharge during the construction phase is assessed as a moderate negative impact. The potential impacts associated with these activities will be managed to 'As Low As Reasonably Practicable' by the application of management measures outlined in this draft EIS;
- greenhouse gas emissions assessed in an Australian context as a moderate negative impact during the operations phase. The FLNG facility is 15-25% less $CO_2$ intensive than a conventional onshore LNG plant but has a carbon footprint of 2.3 million tonnes per year of GHG gases emitted at full throughput (compared to

a total of 576 million tonnes per year for Australia); and

- economic impacts which were assessed as a moderate positive impact. The project could directly create more than 500 Australian jobs during construction and 320 direct jobs for 25 years during operations. Most of the operational jobs will be held by FIFO workers on the FLNG facility. The project is also expected to employ support crews and logistics personnel in Broome and/or Darwin. Indirectly, the project can be expected to support employment in local small business and revenue for local merchants and service suppliers.

A management framework has been presented in this draft EIS, centred on Shell's Health Safety and Environment Management System (HSE-MS). A Prelude specific HSE-MS will be developed and along with the Environment Plans required under the *Petroleum (Submerged Lands) (Management of Environment) Regulations 1999*, will operationalise procedures and practices to ensure site construction, commissioning, operation and eventually decommissioning will all be executed in a manner that ensures the ongoing effectiveness of the mitigation and management measures presented in this draft EIS, and that the predicted low impact will be achieved.

In summary, the major conclusions of the draft EIS are:

- the drilling of development wells, installation of seabed infrastructure, and routine operations of a FLNG facility do not represent a significant risk to any listed or migratory species, threatened ecological communities, or the marine, socio-economic or cultural environment; and
- in the unlikely event that a non-routine incident occurs, modelling has illustrated that under worst case conditions the potential environmental impacts will be minor.

Overall, it is concluded that by implementing the design features and the mitigation measures, including the environmental, socio-economic and health management measures described within this draft EIS, the Prelude FLNG Project will have no significant impacts upon the environment or upon listed threatened species and communities, listed migratory species or upon the Commonwealth marine environment, as defined under the *EPBC Act (1999)*.

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# INFORMATION SOURCES

This report has been prepared in conjunction with an independent consultant, Environmental Resources Management (ERM).

All external reports produced for this draft EIS have been reviewed for accuracy and content by the contracted external agencies responsible for the reports, prior to issuing these reports to Shell. Shell personnel with relevant expertise have then reviewed the documents prior to using the information in this report.

External reports used in this report include:

| Name of Report | Author | Date |
|---|---|---|
| Ambient sea noise sources from near Browse Island, Kimberley, 2006-2008. (Underwater Noise Baseline Report) | Centre for Marine Science and Technology – Curtin University | December 2008 |
| Prediction of underwater noise associated with the proposed Shell Prelude development Floating Liquefied Natural Gas facility. (Underwater Noise Modelling Report) | Centre for Marine Science and Technology – Curtin University | December 2008 |
| Prelude Marine Baseline Survey Report | Environmental Resources Management | December 2008 |
| A description of cetacean distribution and abundance in the Scott Reef/ Browse Basin development areas during the Austral winter of 2008 | Centre for Whale Research (WA) Inc. | March 2009 |
| Cooling Water Dispersion Prelude | Deltares | January 2009 |
| Light Impact Assessment Draft Report | Environmental Resources Management | April 2009 |
| Hydrodynamic and Water Quality Modelling Report | Environmental Resources Management | March 2009 |
| Prelude FLNG Project Economic Impact Assessment | Environmental Resources Management | June 2009 |

Literature resources used in this report are cited in the relevant References section.

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