

13.1 Environmental Management Programme

Preventative and management measures will be applied throughout the life of the Pluto LNG Development to ensure that significant environmental impacts associated with the proposed Development are avoided or minimised.

The measures are consistent with Woodside's Environmental Policy (**Appendix A**) which seeks to ensure that planning and performance of company activities are undertaken to either avoid adverse impacts or keep them to as low as reasonably practicable (ALARP). The Policy is applied to Woodside's activities and is based on the principle of continuous improvement. A Woodside HSE-Management System will also be developed and implemented.

An internal Register of Environmental Hazards has been developed during project planning to identify environmental issues and ensure issues are addressed, along with other business priorities, in the early screening and design stages. Progress will continue to be periodically reviewed and documentation updated during project design and execution.

Environmental performance issues relevant to contractors will be managed through the requirements of Woodside's tendering and contracting procedures. Environmental performance forms part of Contractor and Supplier selection. This process is outlined in the Procurement and Logistics Supply Chain Management System. Contract Sponsors are designated for every contract, and are responsible for activities in the contracting process and for contract execution. The Woodside Contract Sponsor ensures the contractor has appropriate systems in place to manage their Health, Safety and Environmental (HSE) risks. Contractors must have an Environmental Management Plan (EMP) that is acceptable to Woodside before any work can commence. Contractor mobilisation must be conditional upon receipt of an acceptable EMP based on the level of environmental risk.

The following measures will also be implemented to ensure a high level of environmental performance:

- auditing of compliance including corrective actions
- workshops and inductions for staff and contractors focussed on HSE management and performance
- presence of onsite HSE representative during construction activities.

Employees involved in the various activities associated with the proposed Development will undertake HSE inductions, which will involve input from professional HSE staff.

Detailed EMPs and Environment Plans (EPs) will be prepared to regulatory agency requirements for activities identified as potentially impacting on the environment.

13.2 Environmental Management Plans

Environmental aspects of the Pluto LNG Development will be managed primarily through the development and implementation of EPs and EMPs. The purpose of these plans is to identify potential and actual environmental aspects and impacts of all development phases, onshore and offshore, including:

- drilling
- installation, construction and commissioning
- production
- decommissioning.

The plans also describe or reference the procedures and equipment proposed to prevent, monitor and manage possible effects, and will include monitoring programmes. All plans will be drawn up in accordance with the Pluto LNG Development management actions presented in **Table 13-1**.

Offshore EPs follow different requirements to onshore EMPs as the former are drawn up in accordance with the Petroleum (Submerged Lands) (Management of Environment) Regulations 1999. An outline of the requirements of offshore EPs is provided in **Appendix F**. Detailed EPs will cover drilling, installation, production and decommissioning phases of the Development. A Marine Pest Management Plan will also be developed for applicable phases of the Development.

A detailed Dredging and Spoil Disposal Management Plan (DSDMP) will also be developed separate to the Draft PER which will provide the framework for the proposed capital dredging programme to ensure that it is implemented with minimal environmental impact. The framework DSDMP is provided in **Appendix I**.

The EMPs governing onshore activities are structured differently from the offshore EPs. The following individual framework EMPs have been developed to address onshore and nearshore impacts during the construction phase and will be included in a Construction Environmental Management Plan:

- Sea Turtle Management Plan
- Waste Management Plan
- Noise Management Plan
- Blasting Management Plan
- Erosion and Sediment Control Management Plan
- Groundwater and Surface Water Protection Plan
- Onshore Spill Response Plan
- Terrestrial Vegetation and Flora Management Plan
- Terrestrial Fauna Management Plan
- Weed Management Plan
- Dust Management Plan
- Cultural Heritage Management Plan
- Traffic Management Plan
- Rehabilitation Management Plan.

Framework EMPs that will be developed specifically for the operation phase will include: the Waste Water Management Plan, Social Impact Management Plan and Greenhouse Gas Management Plan. These Framework EMPs will be consolidated in an Operation Environmental Management Plan (OEMP). Many of the plans developed for the construction phase will be amended for the operations phase, including the following:

- Waste Management Plan
- Noise Management Plan
- Groundwater and Surface Water Protection Plan
- Onshore Spill Response Plan
- Terrestrial Fauna Management Plan
- Weed Management Plan.

The framework for each plan is given in **Appendix G**; the proposed management measures outlined in **Sections 7, 9** and **11** have been incorporated into these plans. The framework plans will be developed further in accordance with the anticipated Development schedule, once detailed design information is available and the construction contractors are commissioned.

A consolidated overarching EMP document will be developed to combine the individual onshore/nearshore EMPs, in accordance with recognised standards and applicable Commonwealth and Western Australian state legislation. The consolidated EMP will be submitted to the relevant authorities for approval prior to construction. Upon the commencement of the Development, the EMPs will be reviewed according to a regular timeframe and updated if necessary.

13.3 Monitoring Programmes

Specific environmental monitoring programmes for the offshore/marine and onshore components of the Pluto LNG Development will be undertaken. The monitoring programmes will be outlined in detail within the EPs and EMPs and will include:

- information needed to provide a suitable baseline for subsequent monitoring
- the types of impacts that are likely to need monitoring
- the ecosystems parameters to be monitored
- the timing and frequency of monitoring
- policies for evaluating and amending the monitoring programme.

Once detailed design information is available for the proposed Development, the monitoring programme will be finalised and submitted to relevant government agencies with the respective EPs and EMPs. A Framework Marine and Intertidal Monitoring Programme is presented in **Appendix J**.

13.4 Management Actions

Woodside is committed to achieving or exceeding a level of environmental management and performance consistent with national and international standards and statutory obligations. The most economically effective, environmentally sound technology and procedures will be incorporated into the design of the Development in accordance with the ALARP principle.

The proposed Pluto LNG Development will be undertaken in a manner that will minimise impacts on the surrounding biophysical and social environments. Accordingly, management actions have been nominated throughout the Draft PER and are summarised in **Table 13-1**.

Table 13-1 Summary of Proposed Draft Management Actions

Actions No.	Topic	Action	Objective	Timing	Advice from
Stakeholder Engagement					
1	Stakeholder Engagement	Woodside will undertake ongoing liaison with the local community.	To establish a working relationship with community members such that environmental and social impacts arising from the Development are minimised.	Ongoing	
Environmental Management					
2	Environmental Management System	Develop and implement an Environmental Management System .	To manage and minimise environmental impacts and continually improve environmental performance.	All phases	
3	Construction Environmental Management	Develop and implement a Construction Environmental Management Plan for onshore/nearshore activities and Environmental Plans for offshore activities. This will consist of a series of management plans that will include: sea turtles; waste; noise; blasting; erosion and sediment control; ground water and surface water protection; onshore spill response; terrestrial vegetation and flora; terrestrial fauna; weeds; dust; cultural heritage; traffic; social impact; and rehabilitation. These plans will include measures to ensure that construction personnel are properly inducted and that an auditing system is in place to vet implementation of plans.	To manage all relevant environmental factors associated with construction of the proposed development. Minimise environmental impact. Continually improve environmental performance. Ensure all construction personnel are aware of their responsibilities to ensure compliance with management plans.	Prior to construction	Environmental Protection Authority (EPA) Department for the Environment and Heritage (DEH) Department of Environment and Conservation (DEC) Main Roads WA (MRWA) Department of Indigenous Affairs (DIA) Shire of Roebourne
4	Operation Environmental Management	Develop an Operation Environmental Management Plan . This will consist of a series of management plans that will include consideration of: waste water; waste; noise; groundwater and surface water protection; weeds; onshore spill response; terrestrial fauna; greenhouse gases; social impacts; cultural heritage. These plans will include measures to ensure that operational personnel on-site are properly inducted and that an auditing system is in place to vet implementation of plans.	To manage all relevant environmental factors associated with operation of the proposed development. Ensure all operational personnel are aware of their responsibilities to ensure compliance with management plans.	Prior to commissioning	EPA DEH DEC DIA Shire of Roebourne
5	Decommissioning Environmental Management	Develop and implement a Decommissioning Plan .	To manage and/or minimise environmental impacts associated with decommissioning.	Prior to decommissioning	EPA DEC Shire of Roebourne DEH
6	Inductions	Personnel working on site (either offshore or onshore) will undertake environmental and cultural heritage inductions before commencing site work.	To manage and minimise environmental impacts.	All phases	
7	Environmental Performance	Ensure a high level of environmental performance by: <ul style="list-style-type: none"> auditing of compliance including corrective actions workshops and inductions for staff and contractors focussed on HSE management and performance presence of onsite HSE Representative during construction activities. 	To manage and minimise environmental impacts.	All phases	

Terrestrial Environment					
8	Terrestrial Fauna Protection	<p>Prepare and implement a Terrestrial Fauna Management Plan (Table G-12, App. G). Impacts will be minimised by implementing the following measures:</p> <ul style="list-style-type: none"> The working area will be clearly marked on all construction drawings and physically flagged on the ground to ensure only the minimum area required is cleared. Traffic is kept to designated tracks and drivers will abide by the allocated speed limit to minimise fauna fatality or injury by moving vehicles. Measures will be in place to protect the Pilbara olive python, including relocation of Pilbara olive pythons found during earthworks by trained handlers. 	<p>To minimise impacts on terrestrial fauna and habitats.</p> <p>To minimise impacts on fauna species of conservation significance.</p> <p>To minimise death of fauna as a result of vehicle strike.</p> <p>To prevent the spread of introduced species.</p>	Construction and operation	DEC DEH
9	Vegetation and Flora Protection	<p>Prepare and implement a Terrestrial Vegetation and Flora Management Plan (Table G-11, App. G) that includes the following:</p> <ul style="list-style-type: none"> The working area will be clearly marked on all construction drawings and physically flagged on the ground to ensure only the minimum area required is cleared. Vegetation communities of conservation significance in proximity to working areas will be clearly marked and access to these areas will be prohibited. Access for vehicles and machinery will be along designated access tracks and parking areas. The DEC will be consulted regarding the development of suitable management procedures for Priority flora. 	<p>To minimise the amount of vegetation that is permanently cleared.</p> <p>To minimise the effects of construction on Priority flora species.</p> <p>To prevent disturbance of vegetation and flora adjacent to work areas.</p>	Construction	DEC
10	Weeds	<p>Prepare and implement a Weed Management Plan (Table G-13, App. G) that includes the following:</p> <ul style="list-style-type: none"> Establishing and maintaining plant, vehicles and equipment hygiene to prevent introduction and transfer of weeds. Monitoring weeds during site preparation works/construction and operations. Implementing weed control methods to manage any new weed infestations during construction and operations, where they can be effectively controlled. 	<p>To minimise the introduction and spread of weed species.</p>	Construction and operation	DEC

11	Rehabilitation	<p>Prepare and implement a Rehabilitation Management Plan (Table G-17, App. G) that will include the following:</p> <ul style="list-style-type: none"> Rehabilitation and stabilisation will be undertaken following completion of the construction activities. Vegetative matter and topsoil cleared from the working areas will be stockpiled for use in rehabilitation. 	<p>To maximise rehabilitation success, by:</p> <ul style="list-style-type: none"> Minimising the effects of vegetation clearance. Ensuring that the area is suitably rehabilitated with reference to the control of erosion and sedimentation. 	Construction and decommissioning	DEC
12	Erosion and Sedimentation	<p>Prepare and implement an Erosion and Sediment Control Management Plan (Table G-8, App. G) that will include the following:</p> <ul style="list-style-type: none"> The total area to be disturbed will be restricted to the minimum area required for the Development. Runoff control measures will be implemented. Sediment/silt fences will be installed to trap sediment runoff downstream of construction areas. Erosion and sediment control structures will be routinely inspected and maintained to ensure they remain effective, including the removal of accumulated silt as required. 	<p>To minimise soil disturbance, degradation and erosion.</p>	Construction	DEC Commissioner for Soil and Land Conservation
13	Groundwater and Surface Water	<p>Prepare and implement a Groundwater and Surface Water Protection Management Plan (Table G-9, App. G) that will include the following:</p> <ul style="list-style-type: none"> A hierarchal drainage water management system is designed to segregate clean water and treat potentially contaminated water. Strict storage procedures will be maintained for environmentally hazardous materials. The use of water for hydrotesting, dust suppression, potable supplies is correctly permitted and approved. 	<p>To maintain the existing quality of water resources.</p> <p>To minimise the potential for ground and surface water contamination.</p> <p>To minimise pressure on existing water resources.</p>	Construction and operation	DEC Water Corporation Department of Water
14	Acid Sulfate Soils	<p>Should detailed geotechnical investigations and additional desktop investigations identify Acid Sulphate Soils (ASS), a site investigation will be conducted to consider the specific location or locations of disturbance; the nature of disturbance; volume of material to be disturbed and maximum depth of disturbance.</p>	<p>To determine presence of ASS before construction.</p>	Prior to construction	DEC

Marine Environment					
15	Sea Turtle Protection	<p>Prepare and implement a Sea Turtle Management Plan (Table G-1, App. G) that will include the following:</p> <ul style="list-style-type: none"> Minimising lighting to ALARP in nearshore areas while maintaining safe construction and operating conditions. Minimising light spill, particularly where white lights, such as fluorescent lights are used. 	To minimise the impact of blasting activities, vessel movements, permanent structures and lighting on turtles including nesting and hatching activity.	Construction	DEC DEH
16	Drilling	Prepare and implement a Drilling Environment Plan .	To manage environmental impacts during drilling and minimise the potential for sediment and water quality reduction and subsequent impacts on biota.	Drilling	DoIR
17	Waste Water	<p>Prepare and implement a Waste Water Management Plan (Table G-3, App. G) that will include the following:</p> <ul style="list-style-type: none"> The residual total hydrocarbon in water concentration of waste water discharge will be less than 5 mg/l as an annual average for water discharged to Mermaid Sound. Pluto treated waste water composition will be determined and Whole Effluent Toxicity (WET) testing will be undertaken as soon as first water becomes available and periodically thereafter. Monitoring will confirm that a high level of ecological protection is being achieved at the edge of the agreed mixing zone. The concentration of total hydrocarbon in waste water discharged to Mermaid Sound will be measured daily. A comprehensive monitoring programme will be put in place to confirm the prediction of no significant impact to nearshore communities and to ensure contaminants are not bio-accumulated by marine organisms – this will include agreed ‘trigger values’ for initiation of further studies and remedial actions as necessary. 	To comply with applicable legislation and guidelines. Minimise the potential for adverse impacts on water quality.	Operation	DEC DEH
18	Anti-fouling	Construction and/or operation vessels to adhere to complete prohibition on the presence of TBT paints on ships by 1 January 2008	To minimise the impact on marine organisms and comply with IMO regulations.	All phases	
19	Marine Pests	Prepare and implement a Marine Pest Management Plan (Table G-2, App. G) that will include the following: application of the <i>Quarantine Act 1908</i> and Regulations 2000 (Cwrh) and the AQIS ballast water management requirements for international shipping (July 2001); a compulsory requirement for all vessels entering or leaving Australian waters.	To minimise introduction of introduced species and contamination of marine waters.	All phases	AQIS DEH

20	Hydrotest Water	<p>A Pipeline Flooding and Hydrotesting Procedure and a Pipeline Pre-commissioning Procedure will be developed – prior to implementation, an Environment Plan covering flooding, hydrotesting and pre-commissioning activities will be submitted to the regulatory authority for review and approval.</p> <p>Prepare and implement a Dredging and Spoil Disposal Management Plan (App. I).</p>	To minimise the potential for water quality reduction and subsequent impacts on marine and terrestrial environment.	Commissioning	DoIR	
21	Dredging		To manage direct and indirect environmental impacts during dredging and dredge spoil disposal.	Dredging phases	DEH, DEC, DPA	
Emissions						
22	Greenhouse Gas Emissions	<p>Develop and implement a Greenhouse Gas Management Plan (Table G-5, App. G) that includes the following:</p> <ul style="list-style-type: none"> • Ensure greenhouse gas and energy efficiency of design by inclusion of greenhouse gas emissions in all key design decisions and technology selections where relevant. • Ensure efficient operation of the Pluto LNG Development by: <ul style="list-style-type: none"> • Minimising venting and flaring of hydrocarbons and fuel gas consumption by using procedural solutions to reduce venting, flaring and combustion of hydrocarbons to as low as reasonably practicable. • Minimising releases by ensuring equipment is correctly maintained. 	To reduce venting, flaring and combustion of hydrocarbons to as low as reasonably practicable.	Prior to operation	DEC	
23	Combustion Products	Flaring events will be minimised to ALARP.	To reduce flaring and combustion of hydrocarbons to as low as reasonably practicable.	Operation	DEC	
24	Dust Control	<p>Prepare and implement a Dust Management Plan (Table G-14, App. G) that includes the following:</p> <ul style="list-style-type: none"> • The area disturbed will be the minimum required for construction. • Exposed surfaces such as stockpiles and cleared areas, and the duration that these areas are exposed, will be minimised. • Dust suppression techniques and/or watering of unsealed roads, access routes, exposed ground surfaces and stockpiles will be implemented. • Rehabilitation of vegetation will be undertaken in temporarily disturbed areas to minimise dust generation. 	To ensure that the effects of dust generation on the environment and communities are minimised.	Construction	DEC	

25	Noise	<p>Prepare and implement a Noise Management Plan (Table G-6, App. G) that will include the following:</p> <ul style="list-style-type: none"> • Consideration of measures such as low noise air-cooling fans and acoustic lagging on compressor suction, discharge and recycle piping. • Noise levels from flaring are below the Woodside absolute standard for noise emissions of 115 dB(A) at ground level. 	To minimise the impacts of noise on the amenity of the surrounding areas.	Construction and operation	DEC
26	Vibration	<p>Prepare and implement a Blasting Management Plan (Table G-7, App. G) that will include the following:</p> <ul style="list-style-type: none"> • Smaller, more frequent blasts will be planned using sequential explosive charges to minimise cumulative impacts of the explosions. • Use of sirens and signage to inform construction personnel and members of public that blasting will take place. • Public access to the beach at Site A will be restricted during blasting activities. Warning signs will be placed on the beach, and an observer will monitor the beach from a safe location (either on the beach or a nearby boat) to prevent boats landing or to stop blasting until the beach is cleared. 	<p>To ensure the safety of construction personnel and members of the general public during blasting operations.</p> <p>To minimise the noise and vibration impacts associated with blasting.</p> <p>To minimise impacts to terrestrial and marine fauna.</p>	Construction	DEC
27	Waste	<p>Prepare and implement a Waste Management Plan (Table G-4, App. G) for discrete phases of the Development that includes the following:</p> <ul style="list-style-type: none"> • Inductions will provide details on waste management requirements for all waste streams. • Implementation of waste hierarchy: reduce, reuse, recycle and recover waste. • Waste reduction at source will be included in tenders for supply and construction contractors. • All hazardous waste materials will be documented and tracked, segregated from other waste streams and stored in suitable containers. 	<p>To minimise impacts on existing waste facilities.</p> <p>To minimise environmental impacts associated with waste generation and accidental spills.</p> <p>To maximise waste reduction, recycling, reuse and recovery.</p>	Construction, operation and decommissioning	DEC Shire of Roebourne

Non-Routine Discharge				
28	Onshore Spills	<p>Prepare and implement an Onshore Spill Response Plan (Table G-10, App. G) that will include the following:</p> <ul style="list-style-type: none"> • Site inductions will include correct materials handling procedures, spill management and spill response procedures. • Appropriate equipment, such as spill clean up kits and Material Safety Data Sheets, will be available onsite in easily accessible locations. 	<p>To reduce the risk of accidental spills occurring and ensure effective management measures are deployed in the event of a spill.</p> <p>To minimise the potential for water quality reduction and subsequent impacts on marine and terrestrial biota.</p> <p>To minimise impacts on soils, surface and ground water.</p>	DEC
29	Offshore and Nearshore Spill Contingency Planning	<p>Drilling and construction activities will be carried out either under the umbrella of oil spill contingency arrangements in Woodside's region-wide Emergency Response Plan (ERP 3210) or a stand-alone plan that will require government approval. For the operational aspects of the Development, two options are under consideration:</p> <ul style="list-style-type: none"> • Prepare a stand alone Oil Spill Contingency Plan. The plan will: <ul style="list-style-type: none"> – ensure effective and timely management of spills of hydrocarbons – describe the procedures to deal with an oil spill – define the roles, responsibilities of response personnel – be separately assessed by DoIR under the P(SL)A and must be accepted prior to commencement of operations. • Tie-in to the existing regional Oil spill Contingency Plan. 	<p>To prevent hydrocarbon spills and ensure suitable recovery and response controls are in place.</p>	<p>Construction and operation</p> <p>DEC DoIR DPA</p>

Social and Economic Environment					
	Social Impacts	In consultation with local groups prepare and implement a Social Impact Management Plan .	To minimise impacts on stakeholders and the community.	Operation	
30	Cultural Heritage	<p>Prepare and implement a Cultural Heritage Management Plan (Table G-15, App. G) that will include the following:</p> <ul style="list-style-type: none"> Disturbance to sites will be minimised as far as possible – where disturbance to site cannot be avoided, archaeological material will be relocated to designated conservation areas wherever practicable. Any proposed disturbance to cultural heritage sites will be subject to a Section 18 Application under the <i>Aboriginal Heritage Act 1972</i> (WA). Any archaeological discoveries during site preparation work will be reported to the regulatory authority in accordance with reporting and mitigation measures identified in the Cultural Heritage Management Plan, state government policy and the expectations of the Indigenous groups. Access to conservation areas by Indigenous group will be maintained, subject to operational and occupational health and safety constraints. 	<p>To identify, record and assess the significance of all Aboriginal heritage sites.</p> <p>To provide the relevant Aboriginal community and organisations with information about the proposed Development and its potential impacts.</p> <p>To minimise impacts on Aboriginal heritage.</p> <p>To avoid disturbing cultural heritage sites.</p> <p>To protect cultural heritage and prevent disturbance of heritage sites.</p>	Construction	D/A
32	Traffic Control	<p>Prepare and implement a Traffic Management Plan (Table G-16, App. G) that will include the following:</p> <ul style="list-style-type: none"> Identifying construction periods which will result in lessened impact on existing public road network traffic. Assessing of intersections suitable for the movement of pre-assembled units and advice on the required changes to accommodate these. 	<p>To ensure site traffic is managed in such a way so as not to adversely impact on the community, road users and sensitive habitats.</p> <p>To minimise dust generation through traffic movements.</p>	Construction	MRWA Shire of Roebourne