WA North West Shelf Activities
Stag Facility (Permit WA-15-L)
Environment Plan: Public Summary
April 2007

This summary of the Stag Facility (Permit WA-15-L) EP has been submitted to comply with Regulation 11(7)(8) of the Petroleum (Submerged Lands) (Management of Environment)Regulations 1999.

Introduction

Apache Energy Ltd (AEL), on behalf of the joint venture participants, is the operator of the Stag field production and export facility located in permit area WA-15-L, 60 km northwest of Dampier in the Commonwealth waters of the North West Shelf (NWS) (Figure 1).

The objectives of the Environment Plan (EP) are to:

- Undertake a risk-based environmental assessment of the operation of the facility so that personnel involved are aware of potential risks and management measures;
- Outline procedures to minimise environmental impacts;
- Outline the implementation of management strategy and responsibilities;
- Meet environmental legislative requirements; and
- Demonstrate Best Practice Environmental Management (BPEM).

The Stag Facility Environment Plan has recently been revised to comply with the 5 year revision requirement of Regulation 19 of the Petroleum (Submerged Lands)(Management of Environment) Regulations 1999.

Project Description

The facility, located in approximately 49m of water depth, produces oil from the Stag reservoir. The facility consists of:

- a fixed Central Production Facility (CPF), producing and processing oil from a series of wells;
- a single 2 km long carbon steel export oil pipeline on the northeast side of the CPF connecting to a Catenary Anchor Leg Mooring (CALM) buoy;
- four water injection flowlines and wells to assist reservoir fluid recovery;
- a Floating Storage and Offload tanker (FSO), the *Dampier Spirit,* from which oil is exported by trading tankers (offtake tankers): and
- supply vessels and work boats providing support in tanker movements and facility logistics and provisioning.

The CPF is located above the original Stag-6H well whose co-ordinates are:

- 20° 17’ 28.695” South 116° 16’ 26.203” East (7,756,108.12mN, 424,189.76mE)

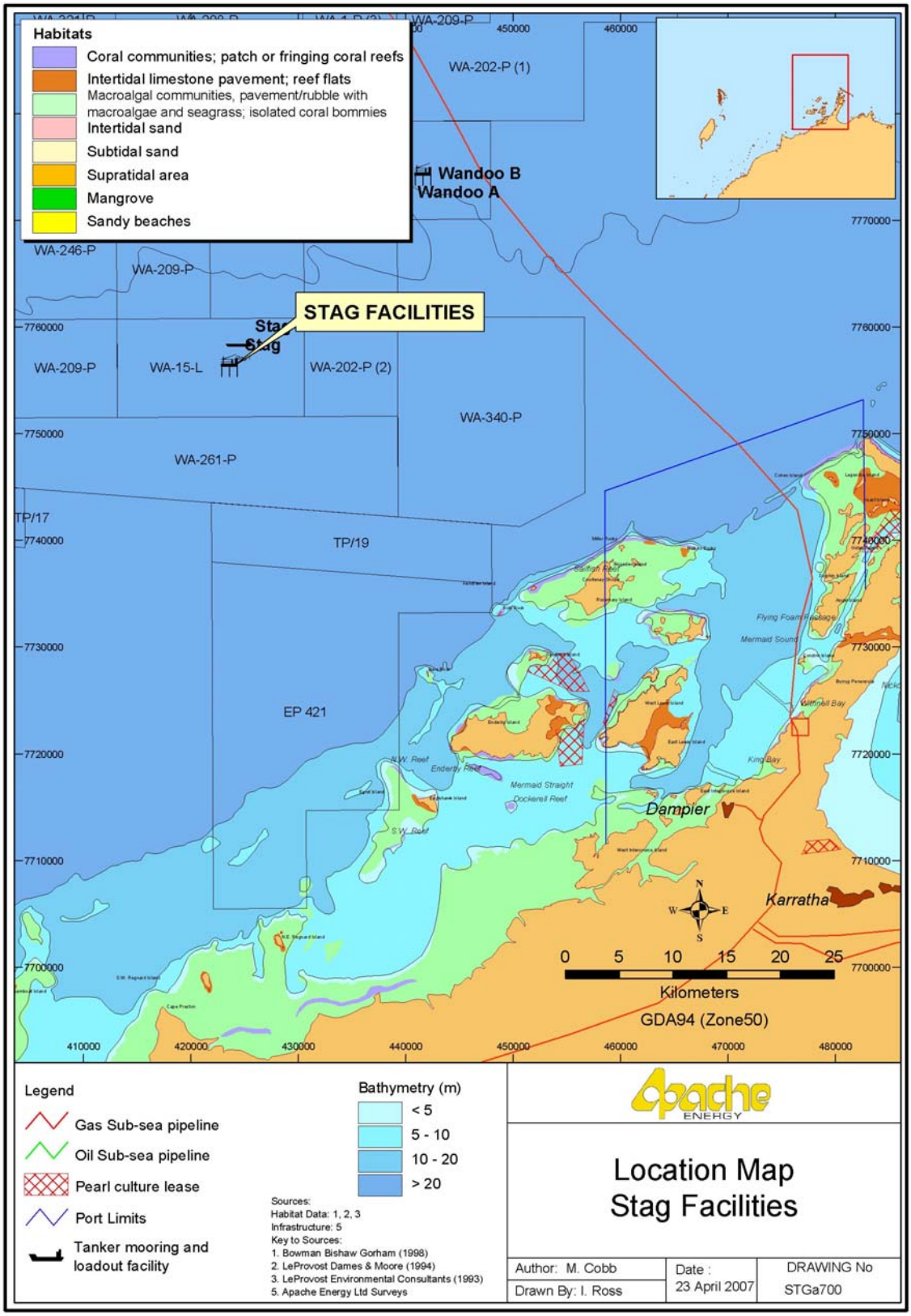

Figure 1 Location of the Stag Facility

The CPF topside structure holds all the necessary production and accommodation utilities including:

- seawater treatment and pumps for water injection;
- oil lifting equipment;
- process vessels and piping to separate and clean oil, gas and water collected from the production wells;
- power generation;
- well intervention and workover equipment;
- control, monitoring and safety systems; and
- accommodation for the workforce.

The CPF has been in production since 1998 and only minor modifications have been undertaken to the facilities.

Receiving Environment

Physical Environment

The NWS lies in the arid tropics region of Australia, which experiences high summer temperatures and periodic cyclones (with associated rainfall). Rainfall is generally low, with evaporation exceeding rainfall. Mean ocean temperatures range from a minimum of 11ºC in winter to a maximum of 37ºC in summer. Shelf waters are usually thermally stratified at a depth of about 20 m.

Wind patterns are monsoonal with a marked seasonal pattern. From October to March, the prevailing non-storm winds are from the south-west, west and north-west at an average speed of less than 10 knots. From June to August, winds are generally lighter and more variable in direction than in spring and summer. Non-storm winds prevail from north-east through to south-east at average speeds of 5-6 knots.

Transitional wind periods, during which either pattern may predominate, can be experienced in April, May and September each year.

The dominant component of the NWS is the Rowley Shelf, comprising extensive cemented calcareous limestone sediments, forming a shallow, gently inclining seabed extending from the coast to 40 km offshore to a water depth of 20 m. The Stag production wells, at 49 m water depth, are located on the mid-continental shelf region (30-100 m water depth), which is characterised by a thick sequence of carbonate rock that is overlain by thin layers of unconsolidated fine to medium grained, carbonate sediments.

Biological Environment

At the water depth in which the Stag production wells are located, the habitats common around the islands of the NWS (such as subtidal sediments, intertidal and subtidal reefs, macroalgal and seagrass beds, intertidal shoals and beaches, mangroves and mudflats) will not be encountered. Benthic infauna (animals that live on or in seabed sediments) are likely to exist at the site, especially if unconsolidated sediments are present. Mobile burrowing species that may be present include crustaceans (crabs and shrimps), worms, sea stars, sea urchins and other small animals. Spatial and seasonal distribution of such species depends on factors such as substrate composition, season, water depth and temperature.

The demersal habitat (ocean bottom) of the NWS hosts a diverse assemblage of fish, many of which are commercially exploited by trawl and trap fisheries, for example the genera *Lethrinus* (emperor) and *Lutjanus* (snapper). Pelagic fish (those living within the water column) in this area include tuna, mackerel, herring, pilchard and sardine. The inshore habitats in this region are not considered to be significant nursery grounds for commercially important deeper-water fish species.

Whale sharks (*Rhincodon typus)* are oceanic and cosmopolitan in their distribution, however, they aggregate in and near the waters of the Ningaloo Marine Park during autumn, around the Exmouth region. They are occasionally observed in the vicinity of the Stag platform.

Four species of marine turtle nest on sandy shore sites of the Dampier Archipelago, Montebello Islands, Lowendal Islands, Barrow Island, and other coastal islands in the Exmouth region. These are the green turtle (*Chelonia mydas),* flatback turtle *(Natator depressus),* hawksbill turtle (*Eretmochelys imbricata*), and the loggerhead turtle (*Caretta caretta*). All four species are on the National List of Threatened Species. The leatherback turtle (*Dermochelys coriacia*) may also visit the open waters of the shelf. The loggerhead, flatback and leatherback turtles are known to feed on mid-water plankton and benthic animals, and can forage in mid-shelf water depths, so may occur around the Stag platform.

The nationally threatened dugong (*Dugong dugong*) occurs across the tropical coastal waters of Australia from Shark Bay to Queensland. They are herbivorous and are generally associated with seagrass beds, upon which they feed. Dugongs are commonly found in shallow sheltered areas (less than 5 m deep), often near islands or large bays. Dugong have not been sighted around the Stag platform.

Dolphins are relatively common in the region. Species known to occur in the region are the bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), Indo-pacific humpback dolphins (*Sousa chinensis*) and the striped dolphin (*Stenella coeruleoalba*).

A number of whale species, including the short-finned pilot whale (*Globicephala macrorhynchus*), false killer whale (*Pseudorca crassidens*), tropical byrdes whale (*Balaenoptera edeni*), southern minke whale (*Balaenoptera acutorostrata*) and humpback whale (*Megaptera novaeangliae*), also occur in the region, the most commonly sighted of these being the humpback whale. This species migrates between the Antarctic waters and the Kimberly region of Western Australia. The peak of their northerly migration between the Exmouth Gulf and the Dampier Archipelago occurs around late July to early August, while the southerly return migration peaks around late August – early September. The Stag platform is located within the migration corridor.

Eighteen species of seabird have been recorded over the NWS waters. These include petrels, shearwaters, tropicbirds, frigatebirds, boobies and terns, and silver gulls. Of these, eight species occur year round and the remaining 10 are seasonal visitors.

Socio-Economic Environment

The regional population centres to the Stag facility adjacent are the Ports of Dampier and Port Hedland and the smaller coastal and fishing towns of Onslow and Point Samson. Dampier, Karratha and Port Hedland are the main service and population centres for the region.

Local people seeking aquatic recreation such as boating, diving and fishing use the coast and islands of the Pilbara. The open waters surrounding the Staq faciltiy do not support significant recreational or tourism activity.

Commercial fisheries are active along the Pilbara coast, however fishing effort in the Commonwealth waters is low, with operators favouring the inshore areas. Pearling is the key industry in the region. Live pearl shell for subsequent use in the pearl culture phase is harvested by divers from several nearshore areas off the Pilbara coast, with pearl culture leases located in the Montebello Islands and the Dampier Archipelago. Prawn trawling activities occur within 5 kilometres of the coastline near Onslow and Nickol Bay, with the major target species being the tiger, western king and banana prawns.

No marine or terrestrial conservation areas are located in the vicinity of the Stag platform.

Table 1 summarises the biological and socio-economic features of the NWS.

Table 1: NWS biological and human activity seasons

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Dugong breeding	breeding											breeding
Hawksbill turtle nesting												
Flatback turtle nesting												
Green turtle nesting												
Loggerhead turtle nesting												
Coral spawning												
Whale migration						north			south			
Whalesharks												
Algae	growing				Shedding fronds				growing			
Seabird nesting												
Prawn trawling												
Tourism												

Key

- Peak activity, presence reliable and predictable
- Low level of abundance/activity/presence
- Activity not occurring within the area

Major Environmental Hazards and Controls

The major environmental hazards and controls associated with operating the Stag Facility are summarised in Table 2 below.

Table 2: Major environmental hazards associated with the Stag Facility

Aspect	Routine / Non-Routine	Hazard	Key Hazard Control and Mitigation Measures
Offtake tanker – ballast water discharge	Routine	Introduction of harmful aquatic organisms into NWS waters through ship's ballast water	IMO and AQIS Australian Ballast Water Management Requirements (2001)
CPF – oil in PFW (within regulatory limits)	Routine	Oily water to sea. Contamination / pollution of water column	Oil in PFW not to exceed legislative 30mg/L average over a 24hr period. AEL Oil in Discharge Waters Procedure (STAG/OPG/LA/170). Biannual audit of PFW analytical methods and chemical monitoring by RACI accredited chemist. In-line monitoring of oil in water levels on discharge water. Procedures in place for maintenance and inspection of oil in water separation and in line monitoring equipment. Biennial review of process chemical use (type, rates, product ecotoxicity). 5-yearly biological monitoring. Technical review of PFW handling every 5 years prior to EP resubmission.
FSO – oil in PFW (within regulatory limits)	Routine	Oily water to sea. Contamination / pollution of water column	Oil in PFW not to exceed legislative 30mg/L average over a 24hr period. Teekay Shipping Marine Operations Management System (MOMS) and Dampier Spirit Ship Specific Work Instruction (SSWI). In-line monitoring of oil in water levels on discharge water. Visual monitoring from FSO during discharges. Sample sent to CPF for analysis prior to discharge. General maintenance of equipment.
CPF / FSO – increasing volumes of PFW discharged over the life of the field	Routine	Steadily increasing discharge of oily water Contamination / pollution of water column	Oil in PFW not to exceed legislative 30mg/L average over a 24hr period. Monitor all process chemicals used at Stag. Biannual chemical monitoring of PFW. Biennial review of process chemical use (type, rates, product ecotoxicity). 5 yearly biological monitoring program. Technical review of PFW handling every 5 years prior to EP resubmission.
CPF / CALM Buoy - crude oil transfer	Non-routine	Release of hydrocarbon from subsea pipeline (small holes in export line) Contamination / pollution of water column	AEL Stag Marine Facility – Operating Manual (GF-91-IG-001). AEL Underwater Inspection Manual (AE-00-MG-005). Pressure Testing the FSO Import Hose (STAG/OPG/PO/170). AEL Stag Marine Facility Emergency Response Plan (GF-00-ZF-002). AEL North West Shelf Oil Spill Contingency Plan (AE-00-EF-008).

Aspect	Routine / Non-Routine	Hazard	Key Hazard Control and Mitigation Measures
CPF / FSO - crude oil transfer	Non-routine	Release of hydrocarbon from subsea pipeline Contamination / pollution of water column	AEL Stag Marine Facility – Operating Manual (GF-91-IG-001). AEL Underwater Inspection Manual (AE-00-MG-005). Pressure Testing the FSO Import Hose (STAG/OPG/PO/170). AEL Stag Marine Facility Emergency Response Plan (GF-00-ZF-002). AEL North West Shelf Oil Spill Contingency Plan (AE-00-EF-008.
FSO / Offtake Tanker	Non-routine	Rupture of fuel/cargo storage tanks due to impact from vessel Contamination / pollution of water column	Exclusion zone in place (500m) Cautionary zone in place (3nm) AEL Stag Marine Facility – Operating Manual (GF-91-IG-001). AEL Stag Marine Facility – Berthing Handbook (GF-00-RG-013). AEL Stag Marine Facility Emergency Response Plan (GF-00-ZF-002). AEL North West Shelf Oil Spill Contingency Plan (AE-00-EF-008).
CPF – crude oil production blow out	Non-routine	Blow out during production (e.g. during wireline operations) Contamination / pollution of water column and potentially remote shorelines	AEL Stag Hydraulic Workover Unit Operations Manual (GA-46-OG-001). AEL Stag Simultaneous Operations Plan - Workover Operation using the Stag Hydraulic Workover Unit (GA-46-ZD-001). AEL North West Shelf Oil Spill Contingency Plan (AE-00-EF-008).
CPF – process chemicals lifting of bulk containers containing chemicals from support vessel	Non-routine	Accidental release of bulk materials during handling. Max 1500L of chemicals or light oil. Biocide worst case. Contamination / Pollution of the sea	AEL Marine Vessels Management and Vessel Loading Procedures, (HE-91-IH-001). AEL Environmental Requirements for Offshore Marine Vessels (AE-91-IQ-202). AEL Stag Marine Facility Emergency Response Plan (GF-00-ZF-002). AEL North West Shelf Operations – Consolidated Emergency Response Plan (AE-00-ZF-002). Chemical containers inspected at chemical company, Toll Welshpool & Dampier. Valves are tied.
Supply Vessels – diesel spillage following collision with CPF / FSO	Non-routine	Accidental release of diesel fuel from supply vessels following collision with CPF / FSO	Qualified Master in charge of vessel. AEL Marine Vessels Management and Vessel Loading Procedures, (HE-91-IH-001). AEL Environmental Requirements for Offshore Marine Vessels (AE-91-IQ-202). AEL Stag Marine Facility Emergency Response Plan (GF-00-ZF-002). AEL North West Shelf Operations – Consolidated Emergency Response Plan (AE-00-ZF-002).

Environmental Management

The environmental risks associated with CPF and FSO operations, together with environmental performance standards and procedures relevant to these risks have been identified within the EP.

The Person in Charge (PIC) of the CPF, and the Vessel Master of the FSO are responsible for ensuring that all procedures are available to personnel and that the procedures are implemented properly. Operations and maintenance manuals, with numerous sub-procedures and guidelines, control the management of the Stag Facility. The Stag management and operational personnel own these documents. They are reviewed on a regular basis and audited by Apache senior management and DoIR Safety/Engineering staff. A summary of relevant environmental procedures and guidelines is provided below:

- Refuelling Procedure – Vessel to CPF, FSO (DR-91-IG-001);
- Draining and Centrifuging (STAG/OPG/PO/270);
- Oil in Discharge Waters (STAG/OPG/LA/170);
- Tanker and Ballast Water Questionnaire (GF-00-RG-013);
- Sediment Sampling for Off Site Analysis (STAG/OPG/LA/360);
- Guidelines for NORMS (APPEA, 2001);
- Landfill Waste Classification and Waste Definitions 1996 (As amended) DoE, 2005;
- Pressure Testing of FSO import hose (STAG/OPG/PO/170);
- AEL Underwater Inspection Manual (AE-00-MG-005);
- FSO Waste Management Plan (MOMS (SP0398 & SP0074)); and
- FSO 'Overboard discharge monitor (Sigrist) Guideline (GL0147 / SSWI).

Emergency response manuals have been prepared to cater for non-routine incidents such as oil and chemical spills. These include:

- Emergency Response Management Manual (AE-00-ZF-025);
- OSCP Volume 1 – Operations (NWS) (AE-OO-EF-008);
- OSCP Volume 2 – Resource Atlas (NWS) (AE-OO-EF-008/2);
- NWS Operations Consolidated Cyclone Response Plan (AE-91-IF-010);
- North West Shelf Operations Consolidated Emergency Response Plan (AE-00-ZF-002);
- Dampier Spirit Emergency Response Plan (GA-00-ZF-001);
- FSO Emergency Response Plan (TK/DS 8.5);
- FSO Shipboard Oil Pollution Emergency Plan (SOPEP)(TK 2.15); and
- Incident Reporting Procedure (AE-91-IF-002).

In addition to Apache's Environmental Management Policy, the following environmental commitments are made within the Stag Facility EP:

- Maintain high environmental standards, comply with the EP;
- All personnel are to be educated in the environmental aspects of the operation;
- Report any incidents which may potentially impact the environment;
- Review contractors code of practice and past performance in safety and environment;
- Annual report on performance to communicate performance against EP to JV

partners and DoIR;
- Facility to be audited against the EP biannually; and
- Adequate insurance cover to be provided for environmental damage.

Consultation

In preparing the original EP, Apache consulted with numerous stakeholder representatives, including:

- DoIR
- Department of Environment and Conservation (DEC)(Nature Conservation - Marine branch)
- Department of Fisheries WA
- Marine and Coastal Community Network
- Environment Protection Agency (EPA)
- Marine Parks Reserve Authority (MPRA)
- DEC (Nature Conservation - Environmental protection)
- WA Fishing industry Council

In revising this EP, Apache's environmental specialists consulted with the Stag Facility PICs, offshore production and maintenance staff, specialist contractors and the FSO operator's (Teekay Shipping) Offshore Operations Manager and Superintendent. In addition Apache's environmental staff also consulted with representatives of the WA DoIR, Petroleum Branch's Environment Division.

Further Details

For further information about the Stag Facility, please contact:

Myles Hyams
Environment Manager
PO Box 477, West Perth, WA 6872
Phone: 08-9422 7222
Email: myles.hyams@aus.apachecorp.com