# Stag Facility Operations Environment Plan Summary

APACHE ENERGY LTD (ABN 39 009 301 964) 100 ST GEORGES TERRACE / PERTH / WA / 6000 TEL (08) 6218 7100 / FAX (08) 6218 7200

**CONTENTS**

# 1. INTRODUCTION

The Stag Field Production and Export Facility (Stag Facility) is situated within production licence WA-15-L (**Figure 1-1**). Apache Energy Limited (AEL) is the operator of WA-15-L on behalf of the joint venture partners Apache Northwest Pty Ltd (33%) and Santos Offshore Pty Ltd (67%).

The purpose of the Stag Facility is to produce oil from the Stag reservoir. The Stag oil is a heavy crude with a very low proportion of volatile compounds due to microbial degradation within the reservoir.

The Stag field has been in production since 1998.

## 1.1 Compliance

The Stag Facility Operations Environment Plan (EP) (EA-62-RI-023/1) was prepared as a revision of an existing Environment Plan to comply with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (OPGGS (E) Regulations) under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) (Cmlth). The EP has been reviewed and accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on 12th June 2014.

This EP summary has been prepared as per the requirements of Regulation 11 (7) and (8) of the referenced OPGGS(E) Regulations.

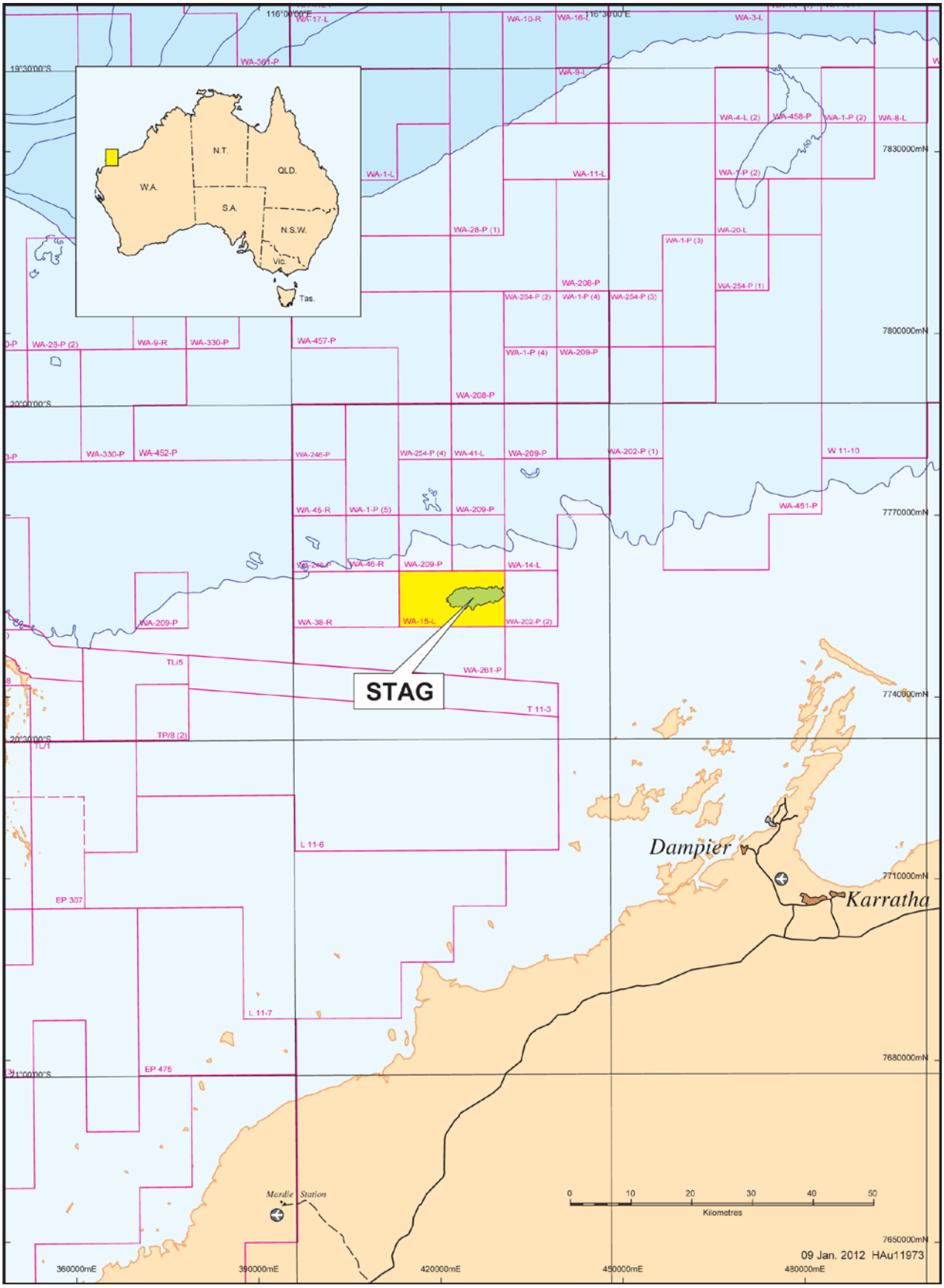


**Figure 1-1: Location of the Stag Facility**

## 2. ACTIVITY LOCATION

The Stag facility is located in Commonwealth Waters approximately 60 km north-west of Dampier and 64 km north-east of the Montebello Islands on the North West Shelf of Western Australia. Water depth over the field is approximately 49 m. The facility (see **Figure 2-1**) 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;
- 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; and
- Support/supply vessels, work vessels and tug boats supporting tanker movement, facility logistics, maintenance and provisioning.

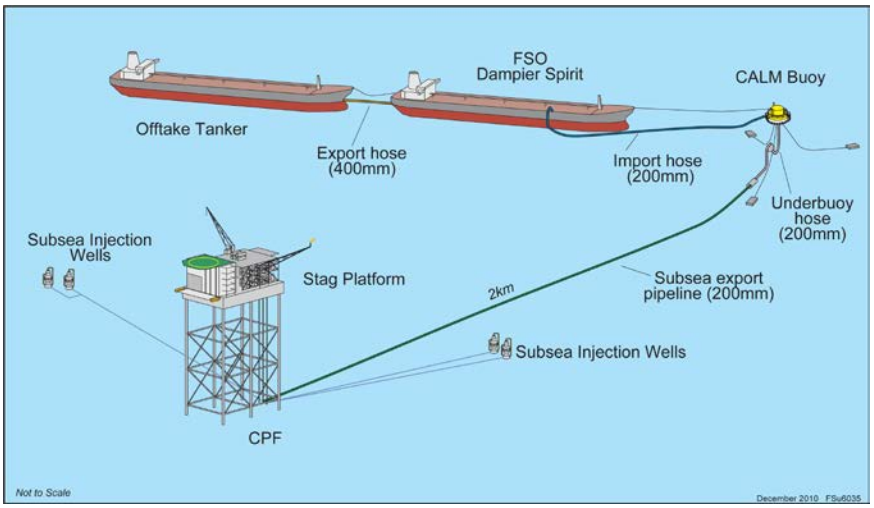


**Figure 2-1: Schematic of the Stag Facility**

The CPF consists of a six-leg jacket piled to the seabed upon which a six-leg barge type deck structure is installed. The platform stands approximately 20m above sea level (excluding cranes and flares). The CPF is located above the original Stag-6H well (**Table 2-1**)**.**

**Table 2-1: Surface Location Stag Facility**

| Parameter | Stag CPF |
|---|---|
| Surface hole location | 20° 17’ 24.79” South, 116° 16’ 30.99” East<br>7,756,236.55 mN, 424,328.30 mE |
| CALM buoy location | 20° 16’ 23.7” South, 116° 16’ 29.5” East<br>7,758,114.338mN, 424,276.882 mE |

(GDA 94 Zone 50)

The Operational Area for the activity is defined as the area within the 500 m radius Exclusion Zone that extends around the CPF, CALM buoy, pipeline and FSO (whilst at mooring). There is also a cautionary area circle as designated by AMSA of 2.5 nautical miles radius charted around the Stag Field facilities, with the centre located 1,365 m due north of the CPF. This location is arranged such that the limits of the circle sweep out by the FSO, offtake tanker and support vessel at the same distance from the edge of the cautionary area as the CPF.

# 3. DESCRIPTION OF THE ACTIVITY

## 3.1 Operations

### 3.1.1 Crude oil production

The CPF, a mobile offshore production unit (MOPU), holds all the necessary production and accommodation utilities to lift reservoir fluids, separate the fluids into clean oil, gas and water, control and monitor processing and separation systems, carry out well intervention and work-overs and accommodate the workforce.

### 3.1.2 Well Intervention and work-overs

During operations, a range of well intervention activities are undertaken to enable continuing production from the wells. These activities include suspending, plugging, deplugging, perforating and abandoning wells, maintenance of well infrastructure, commissioning of new wells. These activities are carried out by a Hydraulic Work-over Unit located on the CPF.

### 3.1.3 Maintenance, Installation and Repair Activities

Maintenance, installation and repair activities may include routine, corrective (e.g. repair of equipment) and non-routine maintenance both of topsides and subsea infrastructure, which may also occur during shutdown periods. Generally these activities may involve additional personnel and the use of ROVs, divers and work vessels, which may require anchoring within the Operational Area. An ongoing maintenance program is in place for the Stag facility, and further inspections (subsea via ROV, AUV or divers) are completed to inform any required maintenance or modifications.

### 3.1.4 Processing and discharge of Produced Formation Water

Onboard the Stag CPF, recovered Produced Formation Water (PFW) is treated to an oil in water content of <30mg/L (averaged over 24 hours) prior to discharge overboard. PFW exceeding the discharge limits may be diverted to slops tanks, to the FSO, or production may be reduced or stopped.

### 3.1.5 Loading and offloading operations

Crude oil produced on the CPF is continuously transferred to the FSO via a subsea flowline and under buoy hose to the CALM buoy and from there through a 189m long, double carcass type floatation hose to the FSO. Normal production rates are around 10,000bbl/day but maximum production is 36,000bbl/day (approximately 6 $km^3$/day). The offloading operations between the FSO and an export tanker occur on a scheduled interval. Maximum storage capacity of a tanker is typically around 85 $km^3$.

## 3.2 Vessels and helicopters

Several vessel-based support activities are undertaken from time to time to ensure the efficient day-to-day operation of the Stag facility and for environmental monitoring requirements. The vessels used for these activities depend on the specific requirements of the proposed activity and availability of vessels. The vessels are vetted by Apache to ensure it is appropriate for the required activities.

Helicopter operations are restricted to daylight hours; night landing will only be permitted in the case of an emergency. Helicopter flights occur from Dampier to the CPF and to the FSO averaging one inward and one outward flight per day.

## 3.3 Oil Spill Contingency Planning

Apache has in place an Oil Spill Contingency Plan (OSCP) for the Stag facility to enable timely response to a hydrocarbon release during operations of the facility. The plan contains credible spill scenarios and results of spill fate modelling, response strategies and priorities and arrangements in place to support a response

to the identified spill scenarios. The geographical scope of the OSCP, which effectively covers the greatest area identified by stochastic spill modelling, extends approximately 500km North, 500km West, 350 km north-east, 300 km south-west and 40 km south of the Operational Area.

Following a Net Environmental benefit Assessment (NEBA), the response strategies that would be considered in the event of a hydrocarbon release are:

- Source control
- Monitor and Evaluate
- Chemical/Mechanical Dispersion
- Containment and Recovery
- Protection and Deflection
- Shoreline Clean-up
- Oiled Wildlife Response
- Type II Scientific Monitoring

# 4. DESCRIPTION OF ENVIRONMENT

## 4.1 Physical environment

The Stag facility lies in the arid tropics experiencing high summer temperatures and periodic cyclones. Rainfall in the region is low with evaporation generally exceeding rainfall throughout the year, although intense rainfall may occur during the passage of summer tropical cyclones and thunderstorms (Condie *et al*., 2006).

Salinity is relatively uniform at 34–35 ppt throughout the water column and across the North West Shelf (NWS). Due to the low average rainfall in the region there is little freshwater run-off from the adjacent mainland (Blaber *et al*., 1985). NWS waters are usually thermally-stratified, with a marked change in water density at approximately 20 m (SSE, 1993). Surface temperatures vary annually, being warmest in March (32°C) and coolest in August (19°C). Vertical gradients are correlated to sea surface temperatures and are greatest during the warm-water season (SSE, 1991). Near-bottom water temperature is approximately 23°C, with no discernible seasonal variation.

Wind shear on surface waters generates local-scale drift currents that can persist for extended periods (hours to days). During October–March, the prevailing non-storm winds are from the south-west, west and north-west ranging up to a maximum speed of ~30 knots. Winds from the south-east to north-east direction are generally strongest in spring and summer with wind speed reaching 20 knots. During June-August, winds are generally lighter and more variable in direction. Extreme wind conditions in the area may be generated by tropical cyclones, strong easterly pressure gradients, squalls, tornados and water spouts.

The wave climate is generally composed of locally generated wind waves (seas) and swells that are propagated from distant areas (WNI, 1995). In summer, seas typically approach from the west and southwest, while in winter, seas typically approach from the south and east. Mean sea wave heights of less than 1 m with peak heights of less than 2 m are experienced in all months of the year (WNI, 1995). Mean swell heights are low at around 0.4–0.6 m in all months of the year. Tropical cyclones have generated significant swell heights of up to 5 m in this area, although the predicted frequency of swells exceeding 2 m is less than 5 per cent (WNI, 1995).

The dominant offshore sea surface current (typically seaward of the 200 m isobath) is the Leeuwin Current, which carries warm tropical water south along the edge of WA's continental shelf, reaching its peak strength in winter and becoming weaker and more variable in summer (CMAR, 2007; Condie *et al*., 2006). The Indonesian Throughflow is the other important current influencing the upper 200 m of the outer NWS (Woodside, 2005; CMAR 2007). Modelling indicates that significant east–west flows occur across the NWS to the north of the North West Cape, possibly linking water masses in the area (Woodside, 2005; Condie *et al*., 2006). Due to the complex oceanography of the NWS offshore drift currents comprise a series of interconnected eddies and connecting flows that can generate relatively fast (1–2 knots) and complex water movement. These offshore drift currents also tend to persist longer (days to weeks) than tidal current flows (hours between reversals).

## 4.2 Biological environment

The Stag facility is situated within Commonwealth waters of the North-west Marine Region (DSEWPaC, 2008). Low density benthic communities of bryozoans, molluscs and echinoids are supported within the bioregion. Sponge communities are also sparsely distributed on the shelf and are found only in areas of hard substrate.

The expected benthic habitats within the Operational Area of the Stag Facility are soft sediments. While there are no benthic primary producers (benthic photosynthetic organisms) associated with the soft sediment habitat within the Operational Area, subsea infrastructure such as the CPF platform, CALM buoy mooring and FSO hull likely provides attachment points with sufficient light availability for algae as well as other filter feeding organisms (e.g. hydroids, bryozoans and molluscs).

AEL conducted sampling of the infauna within the Operational Area prior to development drilling as a baseline for comparison to the post-development and post-commissioning situation (Kinhill, 1997, 1998). This study confirmed that the benthic biota within the vicinity of Stag is comparable to that found over similar substratum and at similar depths over the wider region (Ward and Rainer, 1988; Woodside, 1988; Rainer, 1991). Soft sediment benthic fauna comprises predominantly mobile burrowing species including molluscs; crustaceans (crabs, shrimps and smaller related species); polychaete, sipunculid and platyhelminth worms; asteroids (sea stars); echinoids (sea urchins), and other small infaunal animals.

In a search of EPBC Act Protected Matters Database, a number of matters of National Environmental Significance were identified that may be impacted by planned or unplanned (e.g. hydrocarbon spill) activities, including 2 Ramsar sites, 1 World Heritage Property, 3 National Heritage Properties, 10 Commonwealth Marine Reserves, 7 Key Ecological features, 7 State marine reserves, and 3 Commonwealth Natural Heritage Places. The majority of these features would only be impacted in the unlikely event of an unplanned hydrocarbon spill to the marine environment.

The EPBC Act Protected Matters Database identified 21 species of marine fauna found in the Operational Area and zone of potential impact (ZPI) from a worst-case spill scenario which are listed as threatened species (endangered or vulnerable) under the EPBC Act. The list included five marine mammals, six reptiles, three seabirds and six fish. The database identified 41 marine migratory species (fish, mammals, reptiles and birds) and 26 migratory wetland species (birds) that may be impacted in the unlikely event of a worst-case hydrocarbon spill.

Some operational activities will overlap the March–June period when whale sharks are likely to be most abundant on the NWS; however, given the distance to the Ningaloo Marine Park where they aggregate (approximately 180 km southwest), large numbers are not expected to be encountered.

The activity will also coincide with humpback whale (north and south) migration. There are no resting areas that have been identified nearby the Stag facility. Aerial surveys and noise logger recordings undertaken for Chevron's Wheatstone Project indicated that the main distribution of humpback whales were sighted at an average distance of 50 km from the mainland during the northern migration and 35 km during the southbound migration (RPS, 2010). There is the potential for Sei whales and Fin whales to migrate through the region during summer and autumn. However, there is not enough information available their migration between Australia and the Antarctic.

The nearest turtle nesting sites are the Dampier Archipelago, Montebello Islands, Lowendal Islands and Barrow Island. Most specimens of the Short-nosed Seasnake (*Aipysurus apraefrontalis*) have been collected from Ashmore and Hibernia reefs (Minton and Heatwole, 1975), which are not within the area. The threatened bird species identified may occasionally over-fly the Operational Area or greater potential spill trajectory area when in transit or during foraging, but are not expected to be encountered in significant numbers.

### 4.3 Socio-economic environment

The Stag Field is located approximately 60 km offshore from the Port of Dampier. Smaller coastal fishing and tourism settlements occur at Onslow, approximately 200 km to the south, and Point Samson, some 100 km to the southeast. Socio-economic activities that may occur within the area include commercial fishing and oil and gas exploration and production; and to a lesser extent, recreational fishing and tourism.

Offshore and coastal waters in the North-west Marine Region support a valuable and diverse commercial fishing industry, dominated by Pilbara fisheries. While some fisheries have permitted fishing zones that overlap the Operational Area it is unlikely that there is significant fishing effort in this area. The Stag location is too deep for any dive based fisheries, is too far offshore for the Onslow Prawn Fishery and does not contain seabed features or reef that attract target species within the Mackerel Fishery or Pilbara Trap Fishery.

Commonwealth managed fisheries are permitted to operate within or adjacent to the Stag Operations 500m exclusion zone and ZPIs, but effective fishing effort is either non-existent or of very limited nature (AFMA, 2011).

Water-based tourism activities undertaken across the NWS include whale watching, recreational boating and fishing, charter boat fishing, snorkelling and diving, and surfing. Given the considerable distance of the operational area from the nearest population centre at Dampier (approximately 605 km away) there is unlikely to be any tourism based activities in the area.

The Stag Facility is located 4 km northwest of a designated shipping route.

There are no World Heritage properties, National Heritage places, wetlands of international importance or Aboriginal heritage sites located within the Operational Area. The closest known historic shipwreck location is at Trial Rocks (approximately 95 km west of the operational area) where the wreck of the vessels *Trial* and *Tanami* are believed to occur.

## 5. STAKEHOLDER CONSULTATION

Apache maintains a comprehensive stakeholder database containing fishing interest groups, government and non-government authorities and other stakeholder parties including the community. This database was used to identify stakeholders located, or operating, in the proximity of the activity. Apache has maintained relationships to assist information sharing with key stakeholders for many years and regularly communicates with stakeholders on a variety of activities, always seeking comment and fielding enquiries.

Relevant interested parties for consultation directly relating to the operational activities were identified as listed in **Table 5-1**.

**Table 5-1: Summary of stakeholders consulted**

| Group | Stakeholder |
|---|---|
| Commercial fisheries | • Austral Fisheries<br>• Australian Fisheries Management Authority (AFMA).<br>• Commonwealth Fisheries Association (CFA);<br>• Department of Fisheries (DoF).<br>• MG Kailis<br>• Pearl Producers Association<br>• A Raptis and Sons.<br>• Western Australian Fishing Industry Council (WAFIC).<br>• WestMore Seafoods<br>• Shark Bay Seafoods<br>• Individual fishing licence holders |
| Recreational fisheries | • Marine Tourism WA<br>• Recfishwest |
| Marine conservation | • Department of Parks and Wildlife (DPaW) |
| Marine activities, spill response and safety | • Australian Marine Oil Spill Centre (AMOSC)<br>• Australian Maritime Safety Authority (AMSA).<br>• Department of Mines and Petroleum (DMP);<br>• Department of Defence<br>• Department of Transport (DoT). |

### 5.1 Consultation Summary

All correspondence with external stakeholders is recorded in the stakeholder database and AEL will remain available before, during and after completion of the development activity. Concerns will be listed against contact details for the relevant project personnel. Consultation material will be provided to relevant personnel.

AEL considers that consultation with regulators and key stakeholders has been adequate; all stakeholders and relevant parties have been actively engaged by AEL regarding the AEL developments on the NWS (including Stag Operations) and also, where applicable the proposed oil spill response strategies for these activities.

Ongoing feedback that has been provided to AEL through a number of offshore activities undertaken in 2013/2014 confirms previous statements that if no information is received in the 4-6 weeks following email notifications that it is unlikely that the stakeholder had a concern with the activities, and where feedback was received, it indicated that there was no concern with the identified stakeholders regarding Stage Operations.

AEL has detailed communications procedures for the life of the project and will maintain two-way communications with stakeholders regarding Stag Operations and all current or proposed activities undertaken on the NWS. Many stakeholders have stated that they will contact AEL by exception, that is, if upon receiving the Stakeholder Information Package they feel the activity poses a risk to them, they will contact AEL.

## 6. ENVIRONMENTAL HAZARDS AND CONTROLS

Identification of hazards and assessment of risks was determined using a qualitative assessment process defined by the *Apache Environmental Risk Identification Procedure*. The Environmental Risk Assessment (ERA) identifies potential and expected hazards and environmental impacts and determines the risk of the impact occurring. For each impact the risk is determined prior to implementation of proposed management controls (inherent risk), and again after management controls have been implemented (residual risk). The control measures adopted are designed to eliminate the risk, or reduce the risk to a level that is tolerable or as low as reasonably practicable (ALARP). The environmental risk assessment for the Stag Operations centred around past hazard identification workshops attended by a subset of AEL's environmental scientists and Operations personnel, with the most recent held on 4th February 2013.

The environmental risk assessment identified 15 planned environmental risks and 7 unplanned environmental risks. The key environmental hazards and control measures to be applied are provided in **Section 9**. These are consistent with Apache corporate and project specific performance objectives, standards and criteria. All commitments associated with these will be used to reduce environmental risk to ALARP and will be of an acceptable level.

## 7. MANAGEMENT APPROACH

The activity will be managed in compliance with the *Stag Operations EP (EA-62-RI-023/1)* and *Stag Oil Spill Contingency Plan (EA-62-RI-023/2)* accepted by NOPSEMA under the OPGGS(E) Regulations, other environmental legislation and Apache's Management System (e.g. Apache Environmental Management Policy).

The objective of the EP and OSCP is to ensure that potential adverse environmental impacts associated with the activity during both planned operational activities and unplanned events, are identified and assessed and to stipulate mitigation measures to avoid and/or reduce any adverse impacts to the marine environment to ALARP.

The EP details, for each environmental impact identified (and assessed in the Environmental Risk Assessment) specific performance objectives, standards and procedures and identifies the range of controls to be implemented (consistent with the standards) to achieve the performance objectives. The EP also identifies the specific measurement criteria and records to be kept to demonstrate the achievement of each performance objective.

The OSCP details Apache's response preparedness and strategies, monitoring and evaluation strategies, termination criteria and performance objectives and measurement criteria for each of the critical controls described in the OSCP.

The goals of the environmental implementation strategy as detailed in the EP are to direct, review and manage activities so that environmental impacts and risks are continually being reduced to ALARP, and performance objectives and standards are met. The implementation strategy includes the following elements:

1. Systems, practices and procedures;
2. Key roles and responsibilities;
3. Training, competencies and ongoing awareness;
4. Monitoring, auditing, management of non-conformance and review;
5. Records management;
6. Incident response and preparedness including oil spill contingency planning; and
7. Reporting.

The reporting requirements for routine activities and environmental incidents (recordable and reportable) and reporting on overall compliance of the activity with the EP (e.g. annual performance reports submitted to NOPSEMA) are also detailed.

## 8. CONTACT DETAILS

Further information about the Stag Operations activity can be obtained from:

Minh Hopkinson

Environment Manager

Apache Energy Limited

100 St Georges Terrace, Perth, Western Australia, 6000

Phone: 08 6218 7036

Email: minh.hopkinson@apachecorp.com

## 9. ENVIRONMENTAL IMPACTS AND CONTROLS

The following tables (refer to **Table 9-1** and **Table 9-2** below) provide a summary of potential environmental impacts that could be expected from the operations activity for planned activities and unplanned events. It lists the activities which might give rise to environmental impacts and the subsequent controls and measures which eliminate or ensure the environmental risk is reduced to ALARP.

Table 9-3 provides a summary of the controls in place to ensure the responses to a hydrocarbon spill are managed to eliminate, or ensure the environmental risk from the response strategy is reduced to ALARP.

**Table 9-1: Environmental risk summary for planned activities**

| PLANNED ACTIVITIES | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| Disturbance to Marine Habitats and Seabed | The physical presence of the Stag facility infrastructure and vessel in the Operational Area. | Physical damage/loss to soft sediment benthic habitats and associated biota;<br>Provision of artificial habitat. | • Offtake Tanker Masters are aware of the predetermined Offtake Tanker Anchorage Location;<br>• Anchoring of work vessels only undertaken in accordance with Stag Facility Safety Case Part II (GA-00-RF-014);<br>• JSAs and PTW are completed for lifts as mutually agreed to in the contract, a bridging document or safety case revision;<br>• A HAZID workshop and approved Lift Plan are conducted for 'Engineered Lifts';<br>• Lifting equipment inspected, tested, maintained and operated as per Safety case<br>• Landing rails are provided under ROV to minimise interaction with benthic fauna during operation;<br>• Anti-fouling coating on vessels will comply with a current International Anti-fouling System Certificate or Statement of Compliance of Anti-fouling Systems if required under Annex I of the International Convention on the Control of Harmful Anti-fouling Systems on Ships. |
| Disturbance to Marine Fauna | The physical presence of the Stag facility infrastructure, vessels and helicopters in the Operational Area. | Behavioural and physiological effects on marine fauna;<br>Disturbance to migration patterns of marine fauna | • Support Vessel Masters are aware of the speed and approach requirements consistent with DEH Whale Interaction/ Watching Guidelines (2005) and Part 8 of the EPBC regulation (2000);<br>• Except for landing and take offs, helicopters must not be operated at a height lower than 1650 feet or within a horizontal distance of 500 metres from a cetacean. |
| Artificial light | Safety and operational lighting on CPF, FSO and vessels. | Potential attraction/ disturbance to marine biota including, most relevantly, marine turtles and seabirds. | • Lighting on the CPF, FSO and vessels is designed to be at a minimum safe operational level in line with the Stag Facility Safety Case Part II (GA-00-RF-014) and AMSA Marine Order Part 30 – prevention of collisions navigation requirements. |
| Noise emissions | Noise generated by the CPF, FSO, vessels and helicopters | Physiological or behavioural effects to fauna. | • Machinery is to be maintained in accordance with the manufacturer's specifications and/or the facility/vessels Maintenance Management System.<br>• Support Vessel Masters are aware of the speed and approach requirements consistent with DEH Whale Interaction/ Watching Guidelines (2005) and Part 8 of the EPBC regulation (2000). |

| PLANNED ACTIVITIES | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| Marine Pest Introduction | Introduction through biofouling on vessels, high risk ballast water exchange or via routinely immersed equipment | Competition with native marine flora and fauna | • Apache's vetting process for out of State contracted support vessels identifies low risk of introducing marine pest species of concern in the Operational Area;<br>• If in-water cleaning self-assessment is carried out prior to planned in-water class inspections / maintenance (e.g. UWILD), it will be completed as per 'In-water Cleaning Guidelines' (DAFF, 2013)<br>• No vessel shall exchange 'high-risk' ballast water, as defined in Australian Ballast Water Management Requirements (DAFF, 2009), inside Australia's territorial waters (defined as the 12 nautical mile limit from territorial baseline).<br>• Vessels will have a Quarantine pre-arrival report (QPAR) submitted between 12 and 48 hours prior to arrival at an Australian port and accepted by Australian Quarantine and Inspection Service (AQIS).<br>• A Biofouling Management Plan will be in place for the FSO for management of marine pest if required for overseas shipyard activities. |
| Air emissions | Power generation;<br>Process heating;<br>Production gas;<br>Flaring;<br>Engine exhausts;<br>Fugitive emissions;<br>Venting of inert gas;<br>Ozone depleting substances in closed system rechargeable refrigeration systems. | Reduction in air quality<br>Greenhouse gas emissions | • Vessel engines meet NOx and SOx emission levels as required by Regulation 13 of MARPOL Annex VI and legislated under AMSA Marine Order Part 97.<br>• All engines, compressors and machinery (including burners) on the CPF, FSO, support vessels and offtake tankers are maintained on a regular basis as outlined in the Maintenance Management System;<br>• Ozone-depleting substances managed in accordance with Regulation 13 of MARPOL Annex VI. |
| Discharge of produced formation water (PFW) | PFW (<30 mg/L oil average over 24 hrs) is discharged from the CPF at a rate of 3,816 $m^3$/d, and intermittent with a lower volume and rate | Reduction in water quality<br>Potential toxicity to marine biota | • A continuous OIW monitor is in place and functioning on the CPF and FSO such that it is:<br>- Fitted with an alarm that sounds if OIW concentration is >30 mg/L;<br>- Displayed in the CPF/FSO control room<br>• To confirm that no discharge of PFW from the CPF with an average OIW concentration of greater than 30 mg/L over any 24 hour period occurs, a minimum of six PFW samples are to be analysed every 24 hour period for OIW concentration, including 3 during the day shift and 3 during the night shift;<br>• If manual sampling indicates an average OIW content of 30 mg/L will be exceeded over a 24 hour period, |

| PLANNED ACTIVITIES | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| | from the FSO. | | PFW discharge is diverted to CPF slops tank or diverted to FSO;<br>• The FSO PFW (slops tank water) discharge occurs only in daylight hours;<br>• The FSO PFW discharge will be shut-in if OIW monitor indicates PFW OIW concentration of >30 mg/L;<br>• If the Sigrist Unit on the FSO is out of service a sample of PFW (port slops tank stripping pump sample) must be sent to the Stag CPF laboratory for OIW content analysis and confirmation that OIW content of the sample is <30 mg/L must be received before the FSO can discharge PFW;<br>• PFW treatment equipment (Corrugated Plate Interceptors and Gas Flotation Unit) and continuous OIW monitoring equipment is maintained in accordance with manufacturer's specifications;<br>• Stag CPF continuous OIW monitor is calibrated every 3 months by Stag personnel and annually by an independent party;<br>• Stag CPF spectrophotometer is calibrated weekly by Stag chemist;<br>• Production chemicals are rated and selected according to AEL's *Operations Chemical Selection Evaluation and Approval Procedure (EA-91-II-1001);*<br>• Optimal dosages (i.e. not too low or too high) of production chemicals are maintained by regular analysis of water samples from production equipment.<br>• If non-performance is determined during routine operations or a change to routine operations is proposed, the adaptive management process will be triggered. The adaptive management process will:<br>- Undertake an impact assessment to determine if the performance deviation or proposed change to operations will lead to a significant increase in impact;<br>- Undertake further studies as required to inform the impact assessment;<br>- Undertake an ALARP/ Acceptable evaluation of the impacts predicted to occur; and<br>- Revise and resubmit the EP for acceptance in the event if required.<br>• During routine operations, the following performance will be achieved:<br>- Monthly averaged OIW concentrations measured for the year do not indicate an increasing trend in OIW concentration;<br>- Monthly average of PFW discharge volume from the CPF does not exceed 3,816 m3/d;<br>- Biannual characterisation of contaminants of concern are not greater than 25% than historical maximum; and<br>- Annual measurement of NORMs (Ra226 and Ra228).<br>• 5 yearly water and sediment quality monitoring demonstrates that 95% species protection trigger values and sediment ISQG low values are met at the boundary of the area of impact;<br>• Field validation study carried out within 6 months of EP acceptance to verify the predicted area of impact |

| PLANNED ACTIVITIES | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| Discharge of sewage and sullage (grey water) | CPF, FSO and vessels will generate sewage and sullage. | Reduction in water quality<br>Behavioural effects of marine biota | • Support vessel/FSO has a sewage treatment plant (STP) that is compliant with, and surveyed as per MARPOL Annex IV/Marine Orders 96.<br>• Sewage systems are maintained as per the CPF, FSO and support vessels Maintenance Management Systems;<br>• Persons-onboard (POB) do not exceed the maximum carrying capacity of the FSO STP. |
| Liquid discharges | Deck drainage and bilge water;<br>Oily water;<br>Desalination brine;<br>Cooling water. | Reduction in water quality<br>Potential toxicity to marine biota | • Machinery space and dirty water from CPF and FSO (at mooring) are comingled with PFW in slops tanks; performance standard and measurement criteria for PFW therefore apply (see above);<br>• If required under MARPOL Annex I, support vessels have oily water filtering and monitoring equipment that is compliant and surveyed/maintained as per MARPOL Annex I;<br>• Vessels without oily water filtering equipment will hold oily water onboard until disposed of onshore at a reception facility or to a carrier licensed to receive the waste;<br>• Oily filtration residue (sludge) disposed of onshore at a reception facility or to a carrier licensed to receive the waste;<br>• Water cooled equipment/machinery and heat exchangers on the CPF, FSO and support vessels maintained in accordance with the Maintenance Management Systems;<br>• CPF and FSO potable water systems maintained in accordance with the Maintenance Management Systems;<br>• Scale inhibitors will be suitable for human consumption and non-toxic to the environment under AEL's *Operations Chemical Selection Evaluation and Approval Procedure (EA-91-II-1001)*. |
| Abrasive blasting waste discharge | Maintenance of painted surfaces | Reduction in water quality<br>Potential toxicity to marine biota | • Wet-blasting work areas will be encapsulated as far as practicable;<br>• Where an area is not feasibly encapsulated, waste will be minimised by only blasting corroded sections and feathering 50mm adjacent to such sections and retaining around adjacent coating;<br>• No corrosion inhibitors containing chromate, nitrate or nitrite will be used in wet abrasive blasting and are selected according to AEL's *Operations Chemical Selection Evaluation and Approval Procedure (EA-91-II-1001)*;<br>• Blasting waste will be swept up to isolated areas for small jobs or a vacuum unit used for large jobs to collect blasting waste;<br>• No blasting waste to be disposed to the marine environment as far as practicable or washed down drains.<br>• Blasting waste will be disposed of on the mainland at an approved waste disposal facility;<br>• A wet-blasting procedure and completed job safety and environment analysis (JSA) will be present on-site during wet-blasting activities; |

| PLANNED ACTIVITIES | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| | | | • If blasting waste reaches the marine environment the volume will be recorded. |
| Interaction with commercial and recreational Fishing and shipping | The physical presence of the Stag facility infrastructure and vessel in the Operational Area. | Socio-economic impacts | • The Stag facility is charted on Australian Hydrographic Service (AHS) nautical charts;<br>• Navigation and communication equipment on the FSO and support vessels complies with applicable AMSA Marine Orders (e.g. Marine Order 21 and 27) and/or Safety of Life at Sea (SOLAS) requirements;<br>• ARPA Radar with integrated AIS system and VHF radio are located on the FSO and support vessels;<br>• Navigational aids on the CPF are compliant with Stag Offshore Facility Performance Standard Assurance Plan: PS-04 (GA-00-RG-047);<br>• A Marine VHF Radio is located in the CPF radio room and central control room (CCR) and the FSO cargo control room (CCR)<br>• Continuously manned CPF CCR and FSO CCR;<br>• No recreational/commercial fishing or shipping vessel incursions into the 500 m Exclusion Zone (Operational Area);<br>• Ongoing consultation with relevant stakeholders (further consultation potentially required if Stag Facility operations and subsequent risk alters to that previously communicated). |
| Disruption to tourism and/or visual amenity | The physical presence of the Stag facility infrastructure and vessel in the Operational Area. | Socio-economic impacts | • The Stag facility is charted on Australian Hydrographic Service (AHS) nautical charts;<br>• Navigation and communication equipment on the FSO and support vessels complies with applicable AMSA Marine Orders (e.g. Marine Order 21 and 27) and/or Safety of Life at Sea (SOLAS) requirements;<br>• ARPA Radar with integrated AIS system and VHF radio are located on the FSO and support vessels;<br>• Navigational aids on the CPF are compliant with Stag Offshore Facility Performance Standard Assurance Plan: PS-04 (GA-00-RG-047);<br>• A Marine VHF Radio is located in the CPF radio room and central control room (CCR) and the FSO cargo control room (CCR)<br>• Continuously manned CPF CCR and FSO CCR;<br>• No tourism vessel incursions into the 500 m Exclusion Zone (Operational Area);<br>• Ongoing consultation with relevant stakeholders (further consultation potentially required if Stag Facility operations and subsequent risk alters to that previously communicated). |
| Disturbance to Heritage and Conservation Values | Operational activities in the Stag Field | Socio-economic impacts | • The relevant authorities will be notified in the event that any matters of heritage, cultural or archaeological significance should be encountered. |

**Table 9-2: Environmental risk assessment summary for unplanned events**

| UNPLANNED EVENTS | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| Release of non-hazardous and hazardous solid wastes | Equipment malfunction or damage;<br>Incorrect storage;<br>Human error;<br>Incorrect operation of machinery and equipment. | Reduction of water quality<br>Potential toxicity or impact to marine biota | • For the FSO and support vessels for which MARPOL Annex V and/or Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Part IIIC) / AMSA Marine Order 95 applies, wastes are contained, segregated, stored, labelled, processed and disposed of in accordance with a Garbage Management Plan, as specified in MARPOL Annex V or AMSA Marine Order 95;<br>• Disposal of solid wastes from the FSO and support vessels for which MARPOL Annex V and/or Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Part IIIC) / AMSA Marine Order 95 applies, is recorded in a Garbage Record Book as specified in MARPOL Annex V or AMSA Marine Order 95;<br>• For offtake tankers, wastes are contained, segregated, stored, labelled, processed and disposed of in accordance with a Garbage Management Plan as specified in MARPOL Annex V;<br>• Disposal of solid wastes from offtake tankers is recorded in a Garbage Record Book as specified in MARPOL Annex V.<br>• Non-hazardous solid wastes on the CPF are disposed of in accordance with AEL's *Waste Management Procedure (EA-60-RI-167)*;<br>• Environmentally hazardous solid wastes on the CPF are disposed of in accordance with AEL's *Controlled Waste Procedures (EA-00-II-003)*;<br>• Offsite hydrocarbon testing of Stag sands for the purpose of landfill disposal is conducted as per *Stag CPF Operational Guide – Sediment for offsite analysis (STAG/OPG/LA/360)*;<br>• Offsite NORMS testing (U- and Th- series elements) of Stag sands is conducted annually;<br>• Any radioactive contaminated NORMs waste is to be handled, stored and disposed of as per *AEL Radiation and NORMs Procedure (AE-91-IG-040)*;<br>• Produced sands are disposed of in accordance with *Stag Produced Sand Disposal Procedure (EA-62-IG-001)*;<br>• All disposed wastes from the FSO/CPF have been manifested and/or tracked with volumes/weights recorded;<br>• No visible litter around deck of FSO/CPF and support vessels;<br>• Waste segregation is in place on board CPF, FSO and support vessels;<br>• All bins (except scrap metal) have covers and are kept closed to prevent windblown materials / waste overboard;<br>• All stored hazardous materials are labelled, securely stored in storage fit for purpose in bunded areas and current MSDS are available near storage location. Harmful substances transported in packaged form, as defined in MARPOL Annex III, are marked, labelled and stowed in accordance with MARPOL Annex III regulations;<br>• CPF/FSO cranes and lifting equipment is inspected, tested and certified as per schedule and requirements |

| UNPLANNED EVENTS | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| | | | within *PS-05 Cranes & Lifting Equipment (GA-02-RF-048)*;<br>• Lifting equipment is maintained in accordance with the planned maintenance systems<br>• CPF personnel involved in lifting operations are competent as per requirements within AEL *Lifting Equipment Management System Safe Lifting Operations (AE-91-IF-017)*. |
| Release of hazardous liquids | Equipment malfunction or damage;<br>Incorrect storage;<br>Human error;<br>Incorrect operation of machinery and equipment. | Reduction of water quality<br>Potential toxicity to marine biota | • For the FSO and support vessels for which MARPOL Annex V and/or Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Part IIIC) / AMSA Marine Order 95 applies, wastes are contained, segregated, stored, labelled, processed and disposed of in accordance with a Garbage Management Plan, as specified in MARPOL Annex V or AMSA Marine Order 95;<br>• Disposal of oil wastes from the FSO and support vessels for which MARPOL Annex I and/or Protection of the Sea (Prevention of Pollution from Ships) Act 1983 / AMSA Marine Order 91 applies, is recorded in an Oil Record Book as specified in MARPOL Annex I or AMSA Marine Order 91;<br>• For offtake tankers, wastes are contained, segregated, stored, labelled, processed and disposed of in accordance with a Garbage Management Plan as specified in MARPOL Annex V;<br>• Disposal of oil wastes from offtake tankers is recorded in an Oil Record Book as specified in MARPOL Annex I;<br>• Environmentally hazardous waste on the CPF, including oil waste are disposed of in accordance with AEL *Controlled Waste Procedures (EA-00-II-003)*;<br>• Equipment containing hydrocarbons (hydraulic fluids, lube oil etc.) have maintenance scheduled and undertaken as per a maintenance management system;<br>• Chemical injection lines to the ESP inhibitors are flushed with water to prevent any spills of chemicals during the ESP pull operations;<br>• Low environmental risk production chemicals favoured as per AEL's *Operations Chemical Selection Evaluation and Approval Procedure (EA-91-II-1001)*;<br>• CPF/FSO cranes and lifting equipment are inspected, tested and certified as per schedule and requirements within *PS-05 Cranes & Lifting Equipment (GA-02-RF-048)*, and maintained in accordance with planned maintenance systems;<br>• In line with MARPOL Annex 1, support vessels over 400 gross tonnage will have a current Shipboard Oil Pollution Emergency Plan (SOPEP)/Shipboard Marine Pollution Emergency Plan (SMPEP) and International Oil Pollution Prevention (IOPP) certificate;<br>• Support vessel spill exercises conducted a minimum of every three months and recorded in vessel log;<br>• FSO spill exercises are conducted monthly as per Teekay form *FM0068 - Program and Record for Shipboard Training and Drills*; |

| UNPLANNED EVENTS | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| | | | • Annual CPF spill exercises as part of monthly incident response drills;<br>• Spill kit located near high risk spill areas, are intact, clearly labelled and contain adequate quantities of absorbent materials;<br>• NOPSEMA accepted OSCP onboard CPF, FSO and support vessels<br>• Incident Action Plan (IAP) to be prepared and submitted within 30 days of notification of release to NOPSEMA and ongoing until the source of the release is controlled;<br>• Daily sequence of events log containing any observations, actions or reports pertaining to the releases or mitigation measures implemented is maintained once IAP established;<br>• Ongoing preparation and submission of IAPs until the source of the release is controlled<br>• Export hose flushed with seawater pumped from starboard slop tank and discharged into port slop tank;<br>• CPF/FSO crew and support vessel masters must complete an environmental induction containing basic information on chemical and hydrocarbon management, as well as spill prevention and response measures.<br>• ROV monitoring of the conductors so as to conclusively identify the release location/s.<br>• Recovery of residual hydrocarbons within conductor casing back to CPF and processing of hydrocarbons and liquids until inventory in conductor is under control.<br>• Recovery of residual hydrocarbons through plugging, abandonment and recompletion of an existing well on the Stag platform to a shallow fluid recovery well before the end of field life. |
| Release of marine diesel | Vessel collision;<br>Other damage to storage tanks;<br>Spill during transfer. | Reduction of water quality<br>Potential toxicity to marine biota | • All refuelling hoses are fitted with dry-break couplings and are buoyant or fitted with floats;<br>• Visual inspection of dry break couplings and hoses prior to diesel transfer;<br>• Permit-to-work documentation is complete and signed off to ensure refuelling is undertaken in accordance with AEL *Refuelling and Chemical Transfer Management procedure* (AE-91-IQ-098);<br>• Fuel transfer areas are bunded;<br>• CPF bunding, sumps and drains are inspected as per *PS-14 Bunding and Open Drains (GA-00-RG-057*);<br>• If required under MARPOL Annex I, support vessels have oily water filtering and monitoring equipment that is compliant (e.g. discharges oily water with OIW <15 mg/L) and surveyed/maintained as per MARPOL Annex I;<br>• CPF bulk diesel storage tank inspected as per PS-02 Hydrocarbon Containment: Hydrocarbon Containing Equipment (GA-00-RG-045) and deemed fit for purpose;<br>• Diesel transfer hose is pressure tested at least annually as per As per AEL *Refuelling and Chemical Transfer Management procedure* (AE-91-IQ-098);<br>• Support vessel and FSO crew qualified in accordance with International Convention of Standards of Training, |

| UNPLANNED EVENTS | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| | | | Certification and Watch-keeping for Seafarers (STCW95) / AMSA Marine Orders Part 3: Seagoing Qualifications or certified training equivalent.<br>Note:<br>• Navigational aids requirements are described in Interaction with commercial and recreational fishing and shipping controls;<br>• Dropped object controls are described in Disturbance to Marine Habitats and Seabed hazard;<br>• Spill responses are managed as per information provided under Release of hazardous liquids controls. |
| Release of Heavy Fuel Oil (HFO) | Vessel collision with FSO or offtake tanker. | Reduction of water quality<br>Potential toxicity to marine biota | • The Offtake Tanker crew must be qualified to the requirements of the International Convention on Standards of Training Certification and Watch Keeping for Seafarers (STCW);<br>• An OCIMF Ship Report (SIRE) inspection of the Offtake Tanker will have been completed in the past 12 months – the SIRE contains information on crew management and crew qualifications;<br>• Support vessel and FSO crew qualified in accordance with International Convention of Standards of Training, Certification and Watch-keeping for Seafarers (STCW95) / AMSA Marine Orders Part 3: Seagoing Qualifications or certified training equivalent;<br>• The Offtake Tanker Master is aware of all procedures in the *Stag Marine Facility Berthing Handbook (GF-00-RG-013)*;<br>• Support vessel Masters are aware of the 5 knot speed restriction within the Exclusion Zone (Operational Area) as described in the *Stag Marine Facility Operating Manual (GF-91-IG-001)*;<br>• CPF and FSO have onboard a NOPSEMA accepted *Stag Facility Operations OSCP* (EA-62-RI-023/2);<br>• Offtake tanker will have an approved MARPOL Shipboard Oil Pollution Emergency Plan (SOPEP) or Shipboard Marine Pollution Emergency Plan (SMPEP).<br>Note:<br>• Navigational aids requirements are described in Interaction with commercial and recreational fishing and shipping controls. |
| Surface spill of crude oil | Collision involving FPSO or tanker;<br>Spill during transfer or offtake operations;<br>Topside equipment failure; | Reduction of water quality<br>Potential toxicity to marine biota | • Offtake tankers must be compliant with international conventions concerning crew competency, navigation and communication equipment and pollution prevention including STCW, MARPOL and SOLAS;<br>• When filling cargo tanks, controls in place include:<br>- Slowing load rate when topping off tanks;<br>- Electronic and manual systems to report on ullage of tanks;<br>- Independent high level alarm. |

| UNPLANNED EVENTS | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| | Rupture/leak in fuel oil storage/transfer lines on CPF/FSO<br>Process upset | | • Support vessel and FSO crew qualified in accordance with International Convention of Standards of Training, Certification and Watch-keeping for Seafarers (STCW95) / AMSA Marine Orders Part 3: Seagoing Qualifications or certified training equivalent;<br>• Offtake tanker crew qualified in accordance with International Convention of Standards of Training, Certification and Watch-keeping for Seafarers (STCW95) or certified training equivalent;<br>• Berthing of offtake tankers will be in accordance with weather conditions as outlined in the *Guidelines for Vessel Acceptance* listed in Appendix 2 of the *Stag Marine Facility Berthing Handbook (GD-00-RG-013)*;<br>• Offtake tankers must have sufficient ballast to ensure safe handling and manoeuvrability;<br>• Berthing of offtake tankers will be under the control of a Pilot/Mooring Master and a review of berthing safety procedures will take place before berthing commences;<br>• Support vessel Masters are aware of the 5 knot speed restriction within the Exclusion Zone (Operational Area) as described in the *Stag Marine Facility Operating Manual (GF-91-IG-001)*;<br>• CPF and FSO have onboard a NOPSEMA accepted *Stag Facility Operations OSCP* (EA-62-RI-023/2);<br>• Offtake tanker will have an approved MARPOL Shipboard Oil Pollution Emergency Plan (SOPEP) or Shipboard Marine Pollution Emergency Plan (SMPEP).<br>• Safety Instrumented Systems (SIS) components are regularly inspected/tested, and meet requirements, as per PS-08 ESD and Blowdown: Safety Instrumented Systems (GA-00-RG-051)<br>• Emergency Shutdown (ESD) push buttons are located in the central control room and throughout the CPF<br>• ESDVs are regularly tested as per PS-06 ESD and Blowdown: Emergency Shutdown Valves (ESDVs including HIPPS) (GA-00-RG-049)<br>• CPF hydrocarbon containing equipment, PSVs, CPF bunding, Christmas tree valves are regularly inspected and maintained as per procedures and maintenance system<br>• A Permit to Work (PTW) system is implemented where appropriate, to assure competent personnel and implementation of relevant procedures<br>• A Job Safety Analysis (JSA) and Permit to Work (PTW) will be completed for all non-routine work on the facility<br>• Bunding/ drip trays under all skids and potential leak sources<br>• Position classification and skills matrix for all personnel involved in operation, maintenance and incident response on the CPF<br>• One FSO deck officer is present within the Cargo Control Room (CCR) to monitor relevant monitoring systems during crude oil import including hawser load cell readout, ARPA radar, station keeping of FSO, video monitoring of CALM buoy, hawser and import hose, cargo tank ullage, communication equipment and wind |

| UNPLANNED EVENTS | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| | | | speed/direction<br>• Maintenance of FSO CCR monitoring equipment undertaken in accordance with the manufacturer's specifications and/or Preventative Maintenance System<br>• Floating hoses and hawser maintained and managed in accordance with the requirements of OCIMF requirements, planned maintenance systems and Teekay's Procedures and Guidelines<br>• FSO disconnects from CALM buoy during cyclones and inoperable weather conditions<br>• Export hose flushed with seawater pumped from starboard slop tank and discharged into port slop tank<br>• Support vessels maintain the requested 500m exclusion zone around CALM buoy and FSO<br>Note:<br>• Navigational aids requirements are described in Interaction with commercial and recreational fishing and shipping controls.<br>• Dropped object controls are described in Disturbance to Marine Habitats and Seabed hazard;<br>• Spill responses are managed as per information provided under Release of hazardous liquids controls. |
| Subsea release of crude oil | Damage to subsea infrastructure;<br>Vessel collision with CALM buoy;<br>Equipment/material fatigue. | Reduction of water quality<br>Potential toxicity to marine biota | • Support vessel Masters are aware of the 5 knot speed restriction within the Exclusion Zone (Operational Area) as described in the Stag Marine Facility Operating Manual (GF-91-IG-001);<br>• Inspection of the export pipeline is performed in accordance with the schedule outlined in the Subsea Inspection Procedure (AE-91-IS-001), Corrosion Monitoring Procedure (AE-91-IN-006), Stag facility PS-03 (GA-02-RG-046) and Topside Riser & Wellhead conductor Inspection Procedure (AE-91-IS-001);<br>• Inspection of under-buoy hose (PLEM to CALM buoy) is performed in accordance with the schedule outlined in the Subsea Inspection Procedure (AE-91-IS-001), Stag facility PS-03 (GA-02-RG-046) and OCIMF guidelines for the handling, storage, inspection and testing of hoses in the field;<br>• Fluid in the under-buoy hose is back-flushed towards the CPF with compressed air prior to buoy-hose change-out As per the 2008 Stag Under Buoy Hose Change-out Procedure (GF-00-IG-002);<br>• An Anchor Handling Vessel will be used if running anchors over pipelines and anchoring locations will comply with pipeline offsets stated in AEL's Anchor Handling Manual for Vessels Operating in the Vicinity of Submarine Pipelines and Subsea Installations (SP-00-SX-036);<br>• SIS components are regularly inspected/tested, and meet requirements, as per *PS-08 ESD and Blowdown: Safety Instrumented Systems (GA-00-RG-051)*;<br>• Emergency Shutdown (ESD) push buttons are located in the central control room and throughout the CPF and FSO; |

| UNPLANNED EVENTS | | | |
|---|---|---|---|
| **Hazard** | **Cause** | **Potential Impacts** | **Risk Treatment**<br>**Avoidance, Mitigation & Management Controls** |
| | | | • A copy of AEL's *Emergency Pipeline Repair Plan (SP-14-RL-063)* is on the Stag CPF;<br>• CPF and FSO have onboard a NOPSEMA accepted *Stag Facility Operations OSCP* (EA-62-RI-023/2).<br>Note:<br>• Dropped object prevention controls are described in Disturbance to Marine Habitats and Seabed hazard;<br>• Spill response is managed as per information provided under Release of hazardous liquids controls. |
| Hydrocarbon Spill Response | Implementation of hydrocarbon spill response strategies. | Hydrocarbon spill response activities can exacerbate or cause further environmental harm. | • All response activities will be implemented in accordance with the *Stag Facility Operations OSCP* (EA-62-RI-023/2), which contains numerous control measures to reduce the environmental impacts of all response strategies.<br>• All response activities will be selected based on an ongoing Net Environmental Benefit Analysis (NEBA). |

**Table 9-3: Oil Spill Response Management Summary**

| Response strategy and Management | Management Control |
|---|---|
| Training and competency | • ICT Team maintains acceptable levels of training;<br>• ICT team participates in regular training exercises. |
| Initial notifications and activations | • 1st Strike Activation Plans are in place and followed;<br>• Notification and Reporting plan is in place and followed. |
| Reducing impacts from the response using the Incident Action Plan (IAP) process | • Ongoing spill response (following initial 1st-strike, notifications, and activations) will be implemented through IAPs;<br>• The ICT set performance objectives, performance standards, and performance measurement criteria for the ongoing response strategies and these are authorised by the Incident Commander in the IAPs;<br>• Performance against the objective and standards is assessed during the response and recorded in the IAP following the operational period;<br>• The NEBA process will be used to evaluate all response strategies to inform the development/refinement of IAPs for each operational period;<br>• Response strategies are terminated when each response termination criteria is met |
| Maintaining a state of readiness | • Completed NEBA provides direction on appropriate response strategies for the IAP; |

| Response strategy and Management | Management Control |
|---|---|
| | • The OSCP shall be reviewed and updated as necessary in response to one or more of the following:<br>  • When major changes have occurred which may affect the Oil Spill Response coordination or capabilities;<br>  • Changes to the environment plan;<br>  • Following routine testing of the plan; or<br>  • After an actual incident.<br>• Personnel on the support vessels are to have completed a preparedness exercise;<br>• Responder Personnel undertake training and exercises;<br>• Response Equipment is regularly inspected, maintained and tested to remain ready for deployment;<br>• Sufficient numbers of trained personnel will be available for spill response teams;<br>• A review will be undertaken following any oil spill response to determine if the responses detailed in the OSCP were implemented as planned, and were aligned with the relevant legislative and regulatory controls;<br>• Audits will be conducted during exercising and testing of the OSCP. |

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