Simpson Oil Field Development, Offshore Abutilon Island, Lowendal Islands, North West Shelf

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Apache Northwest Pty Ltd

Report and recommendations of the Environmental Protection Authority

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Summary and recommendations

Apache Northwest Pty Ltd proposes to construct two offshore mini platforms and install undersea pipelines connecting existing oil/gas wells to Apache's existing Varanus Island Hub facility. The Simpson Development is expected to run for approximately 10 years. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for Environment and Heritage on the environmental factors relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment and Heritage on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Relevant environmental factors

In the EPA's opinion, the following are the environmental factors relevant to the proposal, which require detailed evaluation in the report:

(a) Oil spill risk – spills from the development and pipeline bundle; and

(b) Artificial light – potential impacts on hatchling turtles.

Conclusion

The EPA has considered the proposal by Apache Northwest Pty Ltd to construct two offshore mini platforms and undersea pipelines connecting existing oil/gas wells to Apache's existing Varanus Island Hub facility.

The EPA notes that the Lowendal and nearby islands are classified as reserves for conservation of flora and fauna and are used as breeding grounds by a number of sea turtle and sea bird species which are listed in the National List of Threatened Species under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

The EPA also notes that the proposed production project is to be located 400 metres from the shoreline of Abutilon Island, one of the offshore island nature reserves. Sea turtles have been recorded nesting on this island, however the number of turtles breeding on the island is small and, on a regional basis, Abutilon Island is a relatively minor turtle rookery.

With respect to the potential for an oil spill from the Simpson Development the EPA notes:

- the low probability of an oil spill occurring from the proposed development;
- the detailed engineering and ecological risk assessment which the proponent has carried out;
- the additional engineering safety features that have been designed into the project, such as minimisation of flanges and location of all process hardware onshore;
- the installation of the two mini platforms and subsea pipelines will be timed to avoid the most sensitive season for turtles and sea birds; and
- the proponent's Oil Spill Contingency Plan will be upgraded to incorporate the proposed facilities.

The EPA has concluded that, even in the unlikely event of an oil spill from the proposed development, it is not likely that that there would be significant long-term consequences for populations of turtles or birds, nor is it likely that there would be significant long-term impacts on marine habitats.

It is therefore the EPA's opinion that the proposal can be managed so that it is most unlikely that EPA's environmental objective will be compromised.

The EPA notes that artificial lighting on near-shore facilities has the potential to attract hatchling turtles and, in turn, facilitate predation by fish and sea birds. However, the Simpson Development mini-platforms will be unstaffed and the only lights necessary will be yellow

flashing warning lights for navigation safety. Literature and expert opinion indicate that such flashing lights are unlikely to attract hatchling turtles and therefore unlikely to affect levels of predation. The EPA's opinion is that this factor can be managed to meet the EPA's objective.

The EPA has therefore concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the proponent's commitments and the recommended conditions set out in Appendix 4 and summarised in Section 4.

Recommendations

The EPA submits the following recommendations to the Minister for Environment and Heritage:

- That the Minister notes that the proposal being assessed is for the construction of two offshore mini platforms and installation of undersea pipelines.

2. That the Minister considers the report on the relevant environmental factors as set out in Section 3.

3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponent's commitments.

4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Conditions

Having considered the proponent's commitments and information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Apache Northwest Pty Ltd to construct two offshore mini platforms, and install undersea pipelines, is approved for implementation.

These conditions are presented in Appendix 4. Matters addressed in the conditions include the requirement that the proponent will fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4.

Contents

1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for Environment and Heritage on the environmental factors relevant to the proposal by Apache Northwest Pty Ltd to construct an offshore oil and gas development. The project is to be located 0.4 kilometres east of Abutilon Island and one kilometre south of Varanus Island in the Lowendal group of islands on the North West Shelf.

Apache's existing operations are centred on Varanus Island, the largest of the Lowendal Islands. Apache is currently operating nine offshore oil and gas installations, ranging in distance from 5–63 km away from Varanus Island. All of these installations are brought together into a central operations area referred to as the Varanus Island Hub. The proposed Simpson development will become an additional installation of the Varanus Hub operations.

The proposed development is close to environmentally sensitive areas. All of the Lowendal Islands are reserves for conservation of flora and fauna and vested in the Conservation Commission. Given the high conservation significance of these islands, EPA determined that the proposal should be formally assessed at the level of Public Environmental Review (PER).

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses environmental factors relevant to the proposal. The Conditions and commitments to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 provides Other Advice by the EPA, Section 6 presents the EPA's conclusions and Section 7, the EPA's Recommendations.

Appendix 3 includes a summary of submissions. The proponent's response to submissions is included in Appendix 5 as a matter of information only and does not form part of the EPA's report and recommendations. Issues arising from this process and which have been taken into account by the EPA appear in the report itself.

2. The proposal

The proposed Simpson Development proposal will make use of three existing wells and one that is the subject of a separate referral. The development will consist of:

- the Simpson Alpha offshore mini-platform located at the Tanami-4 and Tanami-5 wells surface location;
- the Simpson Bravo offshore mini-platform located at the Simpson-1 and Simpson-3H well locations; and,
- a sub-sea pipeline bundle linking the two mini-platforms to each other and to existing facilities on Varanus Island.

The pipeline bundle will consist of:

- a production pipeline transporting oil, produced formation water and natural gas;
- a return water pipeline for disposal of produced formation water into an existing deep disposal well;
- a return gas pipeline containing lift gas; and
- an umbilical containing corrosion inhibitor chemicals and dry utilities gas (compressed gas used to drive chemical injection pumps and other pneumatic devices).

The well fluids produced from the Tanami and Simpson wells will flow into a production pipeline connecting to the existing processing facilities on Varanus Island. These processing facilities include an oil/gas/water separator and a gas compressor. Produced formation water (PFW) will be injected into the existing Alkimos-1 deep disposal well or via the return PFW pipeline to the existing Tanami-5 water disposal well, as process conditions dictate. No PFW will be disposed of into the ocean except under emergency conditions.

Produced natural gas from the Simpson field will be recovered from the separator, compressed and delivered to the low temperature separation plant on Varanus Island. The processed gas will be sold as sales gas to domestic and industrial markets. No flaring or gas venting will occur except under emergency conditions.

The oil produced from the Simpson field will be stored in the existing bulk storage tanks for loading to oil tankers via the Varanus Island offloading marine terminal. Because of a decline in production from other wells attached to Varanus Hub, the proposal will not result in an overall increase in the frequency of tanker activity into the marine terminal.

To ensure that the oil wells can produce at optimal rates, gas lift will be made available to the Tanami-4, Simpson-1 and Simpson-3H wells. A return gas pipeline from the island to the two mini-platforms will contain natural gas to cater for the gas lift requirements.

The expected productive life of the Simpson Development is 10 years.

The location, regional setting, general schematic and on-shore pipeline route are shown in Figures 1 to 3.

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Section 2 of the PER (Apache, 2001).

Table 1. Summary of key proposal characteristics

Element	**Description**
Name of proposal	Simpson development
Name of proponent	Apache Northwest Pty Ltd
Life of the project	10 years (estimated)
Location	Lowendal Islands
Major components	The Simpson Alpha offshore mini-platform located at the Tanami-4 and Tanami-5 wells surface location; The Simpson Bravo offshore mini-platform located at the Simpson-1 and Simpson-3H well locations; and A sub-sea pipeline bundle linking the two mini-platforms to each other and to existing facilities on Varanus Island.
Area of disturbance	Temporary disturbance to about 1,800 m^2 of shallow marine, macroalgae habitat and 200 m^2 of terrestrial habitat containing sparse vegetation.
Estimated production	Annual average production of 2,500 bbls per day at the commencement of the project in 2001. Peak annual average production of 8,037 bbls per day in 2002. Decrease in annual average production to 754 bbls per day by 2010.
Waste management	Produced formation water and production chemicals will be disposed of down either of two deep disposal wells.

Abbreviations: **m^2 = square metres;**
bbls per day = barrels per day.

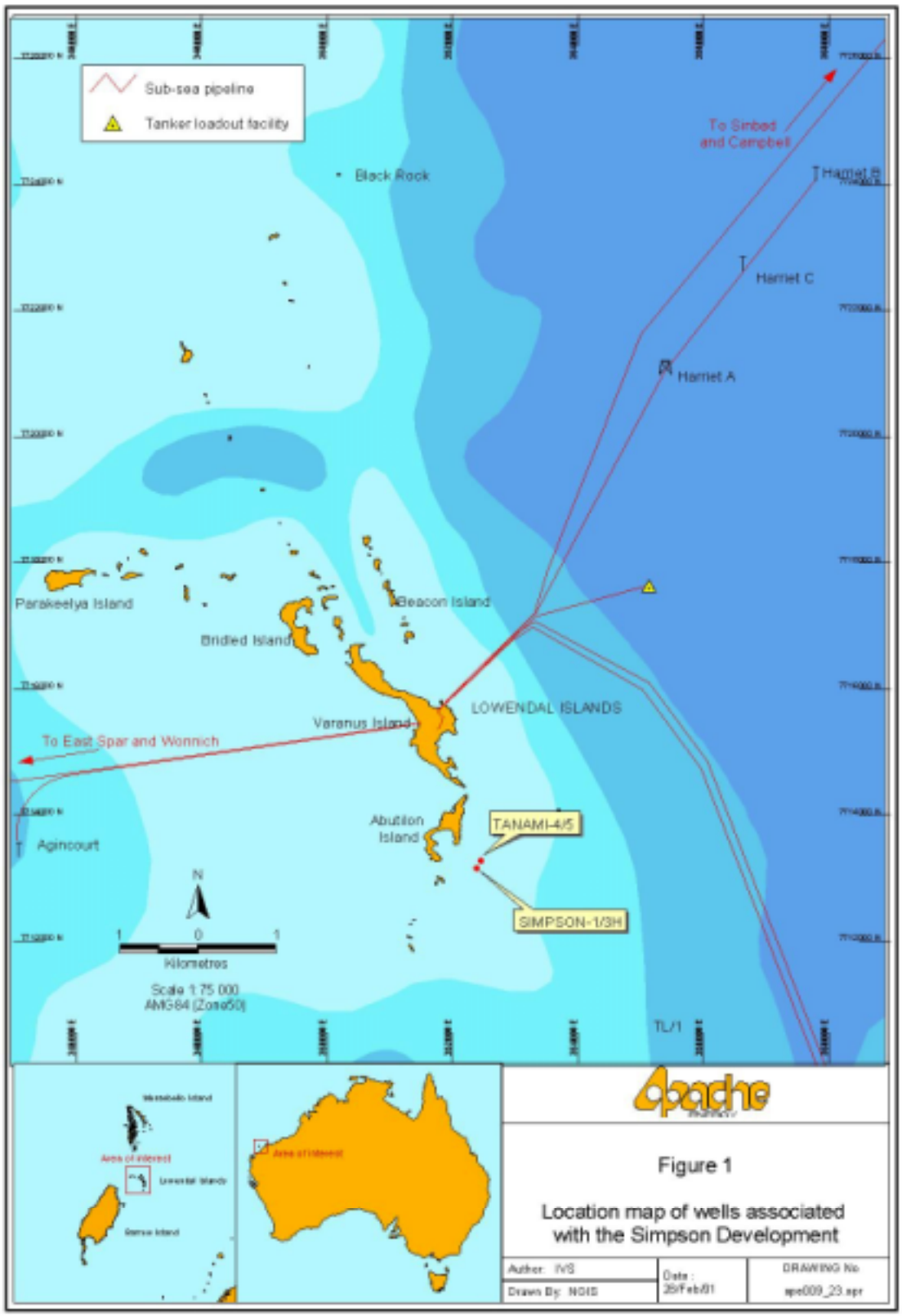

Figure 1 Location map of wells associated with the Simpson Development

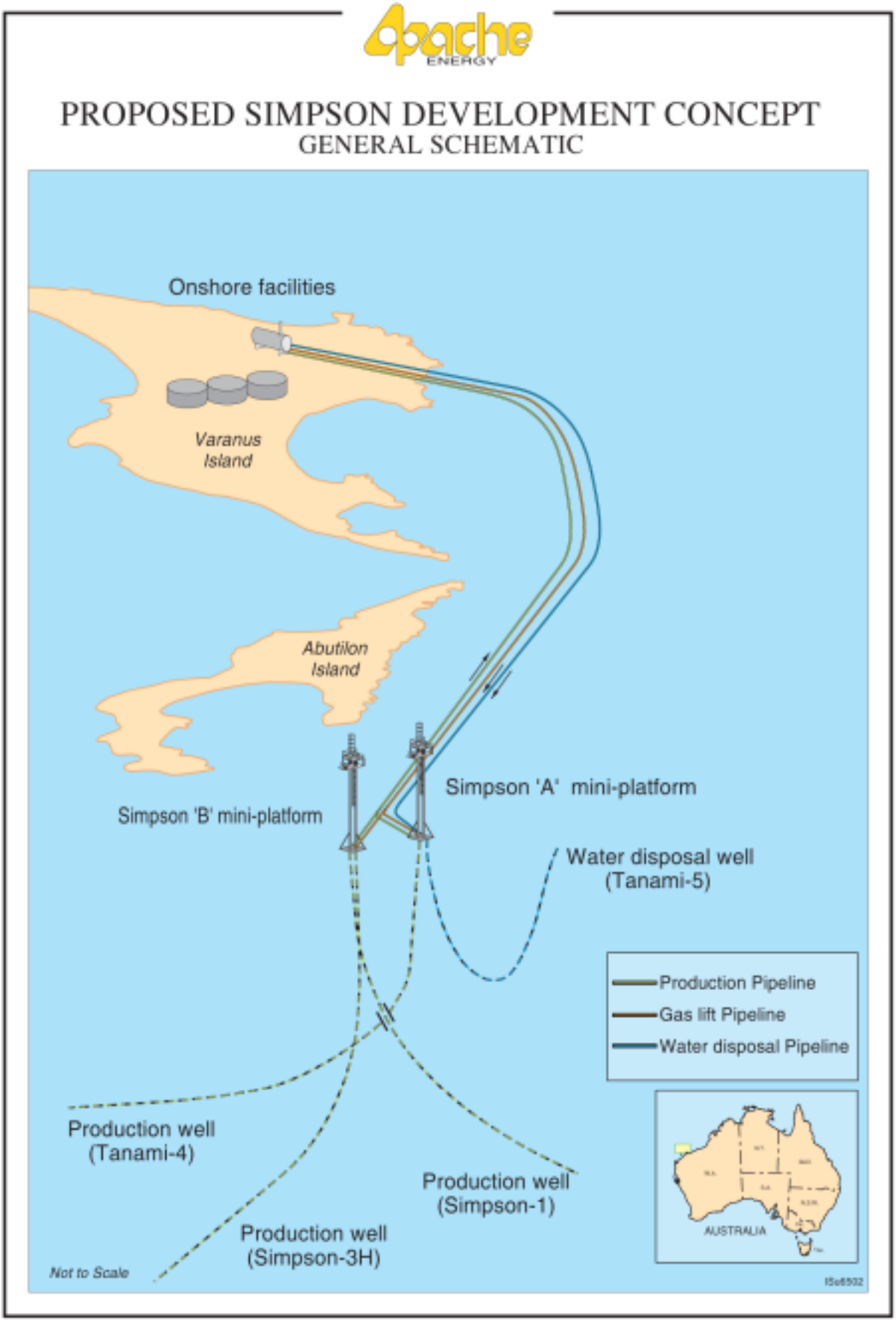

Figure 2. Proposed Simpson Development concept – general schematic

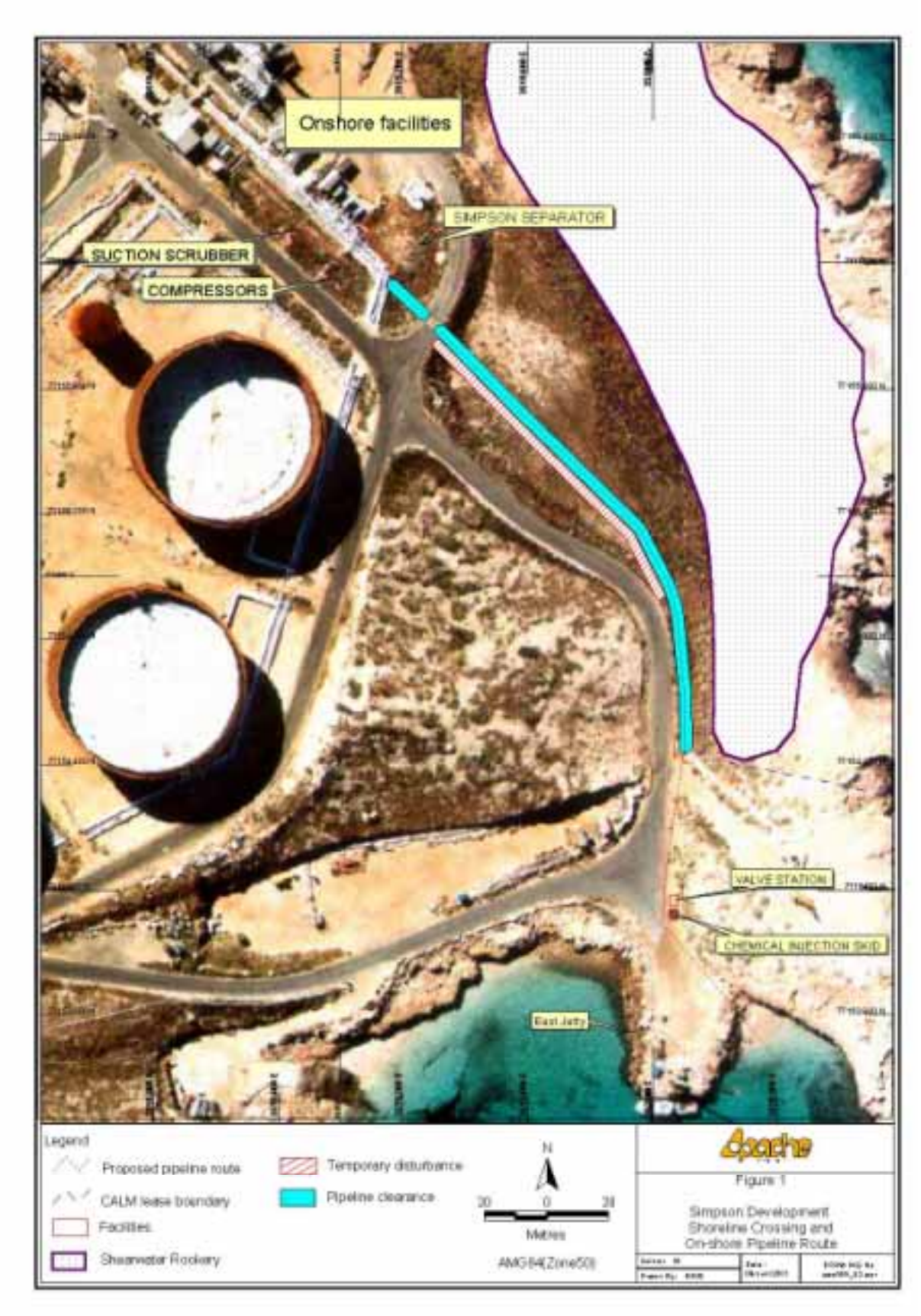

Figure 3 Simpson Development shoreline crossing and on-shore pipeline route

3. Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment and Heritage on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

The identification process for the relevant factors is summarised in Appendix 3. The reader is referred to Appendix 3 for evaluation of preliminary factors not discussed in detail in the main body of this report, including the reasons why these were not considered to be relevant factors.

It is the EPA's opinion that the following are the environmental factors relevant to the proposal which require detailed evaluation in this report:

(a) Oil spill risk – spills from the development and pipeline bundle; and

(b) Artificial light – potential impacts on hatchling turtles.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the proponent's PER document and the submissions received, in conjunction with the proposal characteristics.

Details on the relevant environmental factors and their assessment are contained in Sections 3.1-3.2. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

The issue of spills from shipping has been considered and is discussed under "Other Advice" in section 5.

3.1 Oil Spill Impacts – spills from the development and pipeline bundle

Description

The Tanami-4 and –5, and Simpson-1 and -3H well locations are in shallow water (approximately 6 metres deep) 400 metres east of Abutilon Island and 2 kilometres south of Varanus Island.

The Lowendal and nearby islands are reserved for the conservation of flora and fauna and are vested in the Conservation Commission. The marine area is proposed for inclusion as part of a marine conservation reserve (Marine Management Area).

There are at least 78 listed species of particular conservation significance[1] potentially found on and in the vicinity of the Lowendal Islands. The following groups are considered particularly sensitive to oil spills:

- sea turtles; and
- seabirds (eg terns, wedge-tailed shearwater, shorebirds).

The most sensitive season for these species is during summer when sea turtles, terns and shearwaters breed on islands in the area. Migratory shorebird numbers are also highest in summer.

Sensitive habitats in the area are:

- intertidal and shallow sub-tidal algae beds; and
- corals, in particular those found on the intertidal and shallow subtidal zones.

[1] National List of Threatened Species (EPBC Act); CALM Declared Threatened Fauna; ANZECC Threatened Fauna List; Convention on the Conservation of Migratory Species of Wild Animals, Bonn 1979; Japan Australia Migratory Bird Agreement (JAMBA); China Australia Migratory Bird Agreement (CAMBA).

Oil spill scenarios and probability

Oil spill risk during the installation phase is mainly related to the potential for accidental rupture of the support vessel fuel tank (maximum diesel spill 80,000 kg). This would be a rare event such as resulting from collision of work vessels. The proponent will manage the risk of a spill affecting turtles and seabirds by choosing an installation period outside of the sensitive summer period when turtles breed and seabird numbers are greatest. The pipeline installation is expected to take approximately two weeks.

During the operation phase, potential light crude oil spill scenarios are:

- Loss of containment from the onshore pipeline and separator (100 – 12,500 kg);
- Loss of containment from offshore pipeline (100 – 12,500 kg);
- Loss of production well tubing and well control (12,500 – 100,000 kg).

These three scenarios are discussed below based on information given in the PER document. Leak frequency analysis for hardware components in these scenarios was carried out for the proponent by IRC, an independent consultant with recognised international expertise in its field. The leak frequency analysis was based on a count of the system components and application of failure rate data from E&P Forum 1996, PARLOC 1996 and SINTEF databases. An overview of these three databases is given on p171 of the proponent's PER report.

There are number of components to the overall risk:

- The probability of a leak occurring;
- The probability that the hydrocarbon will reach the shoreline; and
- The short and long term environmental impacts should a spill occur and reach the shoreline.

Scenario 1. Loss of Containment from the Onshore Pipeline and Separator (100 – 12,500 kg)

A leak in the onshore pipeline and separator is considered unlikely with one leak predicted to occur every 3200 years[2] (leak frequency 3.1×10^{-4}). The extent of toxic and smothering effects on terrestrial flora and fauna would be dependent on the spill volume, season, weather conditions and mitigating actions. It is important to note that the onshore pipeline will run adjacent to, and in close proximity to an important shearwater rookery. Risk in this critical area has been minimised by totally avoiding the use of flanges and valves (use of welded joints only). The pipeline will sit above ground on supports to avoid external corrosion due to contact with the soil and also make even the smallest leak easy to detect. The pipeline runs along a well-used road, further facilitating early recognition of a leak. Automatic shut down has been included in the design and will be triggered by a drop in line pressure, although a minor leak may be too small to trigger a shut down. Automatic shut down valves are backed up by manual shut down. Continuous chemical injection for corrosion control and regular corrosion monitoring is another safety feature.

Scenario 2. Loss of containment from offshore pipeline (500 – 12,500 kg)

A leak in this area is considered unlikely; however, if there is an incident there is a 66–88% probability that it will reach the shore, depending on the season and wind. Modelling predicts that there could be 1 incident every 500 years (probability 2×10^{-3}) that impacts on the shoreline[3].

The offshore pipeline is close to beaches (400 metres) that are sometimes used by turtles for breeding and sea birds may raft in near shore areas. The extent of toxic and smothering effects on flora and fauna would be dependent on the spill volume, season, weather conditions and mitigating actions.

[2] The estimated probability is for of a spill anywhere in the given range (100-12,500 kg).

[3] Based on a spill probability of 1 in 435 years and a probability of the given spill reaching the shoreline of 66-88% (depending on the size of the spill and the weather conditions)

Features intended to mitigate risk are construction with heavy walled pipeline material, minimisation of flanges, valves and connection points, continuous chemical injection for corrosion control, regular corrosion monitoring and inspections, trenching of pipeline for avoidance of collision risk in areas subject to marine traffic (also amended navigation charts), and automatic (pressure sensing) line shutdown with manual backup.

Scenario 3. Loss of production well tubing and well control (12,500 – 100,000 kg)

This would be a very rare event, but if it did occur the probability of impacting on the shoreline would be 85–97% depending on the wind, season and spill volume. The production wells are just 400 metres from the Abutilon Island shoreline. The estimated probability of a 100,000 kg oil spill from a production well occurring that impacted on the shoreline is one spill in almost a million years (1.1×10^{-6}) per well[4]. The range in spill sizes given relates to the nature of the incident and how quickly it could be brought under control. A major incident could only occur in the first 2 years of production while there is still sufficient pressure in the formation to cause the wells to flow without assistance.

The overriding philosophy used in designing the wells is that for any hydrocarbons to escape they would need to break through two pressure tested barriers. These two barriers include an inner casing, which contains the production tubing sitting inside the outer, thick-walled casing. Corrosion resistant chromium steel is to be used for the flow-line and the Christmas trees atop each well are to be forged from a single stainless steel block to minimise connection points and increase its strength. Shut down valves are to be placed within each well 100 metres below the sea bed and at the well head to provide a double flow barrier. A low pressure signal would automatically shut down these valves in less than 60 seconds, along with those at the offshore inlet to the production pipeline and at the shoreline valve station. All shut down valves would fail safe, that is, the control system acts to keep the valves open under normal operating conditions, but if the control system is accidentally severed the valves will slam shut.

The formal safety risk assessment concluded that the 200 m distance between platforms is sufficient to avoid overpressure incidents on one platform impacting on the other. In the case of leak ignition the worst possible jet fire lengths do not exceed 106.5 m.

The supporting substructure of the two mini-platforms has been designed against 50 year storm criteria with the "air gap" (gap between the water level and the bottom of the topside) based on the 100 year storm wave height. The design includes a substantial safety margin and reliability analysis based on a 2000 year storm has been included in the scope of the independent validation authority. In addition, the requirements of the API-RP-2A design code (21st edition) have been met, these limit the structural utilisation of the monopods to 85% of allowable stress for a 2000 year storm event. The substructures will have a planned fatigue life of not less than 20 years compared to a planned Simpson Development production life of 10 years.

Each mini platform will be unstaffed and has been designed to have minimal process facilities in order to minimise risk of an oil or chemical spill. Both decks on the mini platforms will be bunded and if there are any minor spills they will be collected in a sump and injected into the production line.

Within two years of commissioning, liquids from Simpson field will require gas lift assistance to allow liquids to flow from the reservoir. Even without the fail-safe devices that are to be installed, this will limit the size of an oil spill possible at that time. At decommissioning the wells will be sealed to the standard required by the Department of Minerals and Petroleum Resources (DMPR, formerly DME) and the lack of reservoir pressure will give further

[4] The 100,000 kg spill was considered to be the worst case scenario of an uncontrolled loss from an operational well where all safeguards were lost. This allows a conservative 51 days to get the well under control again (100,000/1952 - where 1952 kg is the peak daily well production, which only occurs only in the first 2 years). Probability of smaller well related spills have been assessed for a range of sizes including:

- 7.1×10^{-5} per year for less than 25 kg liquid release
- 1.8×10^{-5} per year for 25-500 kg liquid release

These risks are associated with a potential release from one segment of the well (from sub sea safety valve to the valve on top of the platform (Christmas tree).

assurance that that there will be no loss of containment from the sealed production wells after decommissioning.

Emergency response to an oil spill

The proponent's Oil Spill Contingency Plan includes an environmental atlas that details response strategies appropriate for all locations likely to be impacted by an oil spill. In the case of an oil spill from the Simpson development, the first response would come from the Varanus Island Hub, with subsequent broader oil industry support. A shallow draught purpose built oil spill response vessel would be at the spill site within 10-15 minutes in order to deploy zoom booms and shallow water shoreline booms. The proponent conducts regular exercises in deployment of this equipment. Dispersants would not be used in near shore areas due to the presence of corals.

The degree of success of the oil spill response would be greatly influenced by the size of the oil spill, the weather, whether it occurs at night or during the day and the tidal flux. An attempt would be made to deflect the hydrocarbon plume away from contact with the shoreline and reefs into open water where within a short time it would evaporate, disperse and biodegrade. Simpson crude has similar characteristics to Harriet crude which has been shown to evaporate and degrade quickly at sea. Observers tracking a 25,000 litre spill of Harriet crude in 1999 reported that there was no observable plume after 5 days and laboratory analysis of sea water, beach sand and oysters failed to detect any hydrocarbons[5](DEP, 1999).

Submissions

Four main issues were raised in the submissions:

- The existing Varanus Island process facility has drainage that could be improved in consultation with CALM and DEP during the proposed plant modification.
- There has been no discussion of the pipeline landfall and route options, nor any discussion of the drainage design, and the proposed route runs adjacent to a shearwater rookery;
- No attention has been given to damage by collision, seismic activity or sabotage; and
- Oil spill response capabilities need to be of the highest order and the Oil Spill Contingency Plan should incorporate revised training and equipment requirements.

Assessment

The area considered for assessment of this factor is the Lowendal Islands and nearby Barrow Island and Montebello Islands.

The EPA's environmental objective is to avoid pollution by hydrocarbons. To assess oil spill risk the following components of risk were considered:

- probability of an spill occurring;
- probability of the spill contacting sensitive areas if it occurs;
- the probable ecological impact; and
- the probable complications and environmental recovery time especially to listed threatened species[6] and sensitive habitats.

The estimated risk of an oil spill occurring and then reaching the nearest shoreline is given in Table 2. Note that the risk of a spill occurring in the first place is low but, if a spill does occur, the risk of it reaching a shoreline is high. Depending on the spill size, season and weather

[5] The laboratory sampling period finished three days later.

[6] National List of Threatened Species (EPBC Act); CALM Declared Threatened Fauna; ANZECC Threatened Fauna List; Convention on the Conservation of Migratory Species of Wild Animals, Bonn 1979; Japan Australia Migratory Bird Agreement (JAMBA); China Australia Migratory Bird Agreement (CAMBA).

conditions, any of the islands of the Barrow/Lowendal/Montebello group may be impacted, although the greater the distance the more the spilled oil would be degraded before impact.

A 600 metre section of the submerged pipeline is to be trenched in the vicinity of the East Wharf on Varanus Island as a safety measure to avoid the possibility of vessel impact. The remaining offshore pipeline will not be trenched because of the water depth. Larger vessels would be grounded before they could reach the pipeline or mini-platform. Smaller vessels that routinely visit Varanus Island have a draft of 2 m or less and would pass over the pipeline even at low tide. A 500 metre exclusion zone will exist under the regulations of the Australian Maritime Safety Authority (AMSA) and the *Petroleum (Submerged Lands) Act 1982* (PSLA). Flashing navigation warning lights will mark the location of the mini-platforms by night and Admiralty charts will be amended and notice given to mariners by AMSA.

Table 2. Oil spill risk for various scenarios[7]

Scenario	**Probability of a spill**	**Probability of a given spill impacting shore**	**Overall risk to shoreline**
Separator and onshore pipeline loss of containment (size 100-12,500 kg)	3.1×10^{-4} (1 spill in 3200 years)	Onshore location	Onshore location
Offshore pipeline loss of containment (size 100-12,500 kg)	2.3×10^{-3} (1 spill in 435 years)	66-88%	2.0×10^{-3} (1 spill in 500 years)
Loss of production well tubing and well control[8]**.** (size 12,500-100,000kg)	1.1×10^{-6} (1 spill in 910,000 years)	85-97%	1.1×10^{-6} (1 spill in 910,000 years)

Consideration has been given to the possibility of seismic instability. High resolution 3D seismic reflection data used for the discovery of the Simpson Field gives no evidence that the surface facilities are located on a geological fault system or that any wells intersect an active fault. Geotechnical surveys prior to drilling the wells confirmed the stability of the sea bed.

The possibility of damage to the Simpson Development by means of sabotage has been considered in the design to the extent that the production wells and pipelines have been designed to fail safe in the case of a breach in the pipeline and/or the control system. The design includes a series of shutdown valves along the pipeline and in each production well (eg safety shutdown valve 100 metres below the sea bed). These valves require a continuous signal from the control system (indicating that the operating pressure is steady) in order to stay open.

If an offshore oil spill should ever occur, the estimated minimum time until shoreline contact of the oil slick is 1-2 hours. A recent oil spill response exercise carried out by the proponent deployed two booms within 55 minutes (see Appendix 5). In a real spill the efficiency of the

[7] Where there is a difference in oil spill probability over the range of oil spill sizes that are cited, the worst case is reported. In general the probability of a given spill reaching the shore increases as the size of the spill increases, and is greater under winter weather conditions. To reflect this the probability of a given spill reaching the shoreline is shown as a range rather than a single value. Mathematically, "overall risk" to the shoreline is the product of the probability of a spill occurring and the probability of it then reaching the shoreline.

[8] The 100,000 kg spill was considered to be the worst case scenario of an uncontrolled loss from an operational well where all safeguards were lost. This estimate allows a conservative 51 days to get the well under control again (100,000/1952 - where 1952 is the peak well production per day, which only occurs only in the first 2 years).

booms and success of the deployment would be influenced by the weather and time of day or night in which the spill occurred.

As part of its Continuous Improvement program the proponent has recently made a major upgrade to its oil spill response equipment at Varanus Island. This equipment was used in the above trial. The Apache Oil Spill Contingency Plan will be upgraded to include the Simpson Development. The intention of the oil spill response would be to deflect any oil slick to sea away from sensitive near shore habitats and shorelines, where possible. This would allow the oil time to degrade and dissipate naturally. No dispersants would be used in near shore areas due to the possible presence of corals and other sensitive shallow water marine life.

Effects of an oil spill on the habitats of Abutilon and Varanus Island

The fact that the minimum time for a spill from the Simpson Development to impact on Abutilon Island shoreline is 1-2 hours implies that the oil would not be significantly weathered and would still retain a high concentration of the toxic components of the Simpson crude oil. Given the shallow depth of water (less than six metres), oil droplets and dissolved hydrocarbons might reach the seabed in the shallower waters surrounding the development location, depending on the wave energy at the time of the spill.

If crude oil becomes entrapped in fine sediments chronic (long term) contamination may result. Such entrapped oil may gradually release petroleum hydrocarbons over a period of months or years thereby causing ongoing pollution. Chronic oil pollution can have significant effects on coral health and reproduction (Jackson *et al*, 1989; Loya and Rinkevitch, 1987). However, in the Simpson area the seabed is comprised of limestone pavement with overlying calcareous sand (less than 5 cm to 1 metre thick) and Simpson crude is a light crude oil. Sediments with low natural organic matter present, such as sands or gravels, would be expected to trap only very low concentrations of hydrocarbon as it is the organic content to which hydrocarbon becomes sorbed (Swan *et al*, 1994). Chronic pollution due to oil entrapment is therefore considered unlikely.

Important habitats that could be impacted are discussed below.

1. Algal communities and coral

In subtidal areas direct oiling of marine flora and fauna is unlikely and it is more likely that they would be affected by dissolved hydrocarbons or contact with oil droplets entrained in the water column.

Should the algal and seabed habitats be adversely impacted, recovery is expected to commence almost immediately. Algae die off at the end of each summer in the Lowendal region and re-establish again in the spring. Recovery of the algal communities may therefore take from one to several growing seasons, depending on the extent and timing of the damage. The epifauna (attached marine animals) associated with the algae would also recover rapidly once the algae re-establish. The majority of the fauna have planktonic larvae that would assist in rapid re-colonisation.

Corals located in shallow, subtidal areas exposed to dissolved hydrocarbons are likely to exhibit sub-lethal responses such as reduced growth rate or inhibited reproductive capacity, rather than mortality. Corals in intertidal areas would be more vulnerable due to potential for direct contact with oil. These conclusions are supported by field tests that were carried out after the Gulf War oil spill in 1991 and which found that this major oil spill resulted in only minor impacts on coral reefs (Greenpeace, 1992; Saenger, 1994; Vogt, 1995a; Vogt 1995b). Significantly, corals in the Gulf are subtidal and were not exposed to direct contact with floating oil slicks.

Replacement of corals in habitat impacted by an oil spill would probably be mainly by recruitment of corals from undamaged areas rather than regeneration of any live coral. Coral planulae (planktonic larvae) would be available for re-colonisation from surrounding non-impacted patch and fringing reefs after the spawning season. Potential sources could also be from distant reefs although the specific pathways of larval replenishment are unknown.

2. Shoreline and intertidal sediments

The initial result of shoreline oiling is often large scale mortality of plants and animals that live in the intertidal zone. In general, shorelines exposed to high energy waves and strong near-shore currents recover more quickly than sheltered bays or shallow, subtidal habitats.

The rocky shorelines of Abutilon and Varanus Islands are exposed to high-energy waves and currents that would help break down the light Simpson oil. The wave and tidal energy would also help clean the shoreline. It is expected that re-colonisation of the intertidal shorelines by the pre-spill species of fauna and algae would be rapid. Field work carried out during the *Exxon Valdez* in Alaska and the *Sea Empress* spill off the coast of Wales have shown that recruitment of the rocky shore fauna started immediately and recovery in the rocky shoreline environment occurred within a few years (Stoker *et al.* 1992; SEEEC Report Summary 1998).

The small bay to the eastern side of Abutilon Island may be adversely impacted if large quantities of oil get entrained within the bay. This is a sheltered bay so degradation of the oil would occur primarily through evaporation and microbial action. A certain proportion of any free oil present on the water surface within the bay would dissolve into the water column causing a short-term degradation of the water quality and contact with the benthic (sea bed) habitat. In addition, some of the free oil could potentially contact the sandy beaches, soaking into the sand.

Degradation of oil in sandy, intertidal sediments is rapid compared to muddy, finer sand sediments (Baker 1971), but any oil retained in the sand would enter the marine environment during each tide cycle until the oil degraded. Any oil entrained in the sand on the beaches would degrade relatively rapidly given the light characteristics of the oil and the porous nature of the sandy beach sediments. There is some potential for penetration of oil deep into sediments via burrows but the overall effects are expected to be minor.

The impact to the sandy beaches on the eastern side of Varanus Island would be less due to the increased distance to the beaches from the development site allowing more weathering of the oil prior to shoreline contact. These beaches are also more exposed to wave and tidal action, which would further assist in the degradation of the oil.

Effects of an oil spill on turtle and seabird populations

There are three species of marine turtles known to occur in the project area: the Hawksbill (*Eretmochelys imbricata),* the Flatback (*Natator depressus*) and the Green (*Chelonia mydas*). The species of turtle visiting the Lowendal Islands region in greatest numbers is the Hawksbill turtle. Flatback turtles are seen frequently while Green turtles are seen the least.

All three species of turtles found in the region are listed as vulnerable in the National List of Threatened Species (EPBC Act) and green and hawksbill turtles are listed as endangered migratory species under the Bonn Convention[9] (the flatback turtle is an Australian endemic species). Australia is one of the few countries still to have relatively large turtle populations (Limpus, 1990). Green and hawksbill turtles are migratory and subject to exploitation in traditional fisheries in northern Australia and neighbouring countries. All species may incur significant mortality as a by-catch of commercial fishing in Western Australian waters (Prince, 1990).

Little is known about the impacts of oiling on turtles. Females would be the most vulnerable during the summer egg-laying period. Males would be less vulnerable as they stay offshore and can move away from a spill. Hatchlings would be vulnerable in the late summer months when they emerge from their nests and head to the water.

It is important to note that Abutilon Island is not a major turtle nesting beach, in fact turtle tracks are only occasionally seen there (Apache, 2001; K Pendoley *pers. comm.*). Beaches on Varanus Island are more important as nesting sites and a spill originating from the proposed Simpson location would have a lesser effect on these beaches as the oil would have had time to weather prior to reaching these beaches.

[9] Convention on the Conservation of Migratory Species of Wild Animals, Bonn, 23 June 1979.

Notable sea birds that breed on Varanus Island and Abutilon Island are the wedge-tailed shearwater (*Puffinus pacificus*) and several species of tern (eg bridled - *Sterna anaethetus,* crested –*Sterna bergii* and lesser crested – *Sterna bengalensis*). These species are listed as threatened species on the National List of Threatened Species (EPBC Act, 1999). In addition, the wedgetailed shearwater is on the JAMBA list, the lesser crested tern is on the CAMBA list and the bridled tern is on both JAMBA and CAMBA lists. There are other listed birds that visit the region but which are less likely to be significantly affected by an oil spill. Examples are terrestrial birds and migratory shore birds, although it is possible that migratory shorebirds may be affected if present.

In the case of an offshore oil spill, shearwaters and other seabirds would only be significantly affected if they happened to be rafting (swimming) or feeding in an area impacted by the oil slick. Wedge-tailed shearwaters probably feed more than 40 km from breeding colonies, but they do raft at dusk within sight of their breeding islands. So an oil spill at the Simpson Development would be more likely to affect them by oiling of their plumage than by ingestion. Oiling could potentially be more significant during the chick rearing period (approximately January to April) as there are more frequent changeovers of parental birds. Terns tend to feed closer to shore, however, and would be more susceptible to oiling of plumage than shearwaters.

A scientific study on the effects of oiling on shearwaters in Hawaii used an experimental set-up to apply oil internally and externally to wedge-tailed shearwaters (Fry et al., 1986). The study found that crude oil on feathers significantly reduced breeding success via a reduction in the waterproofing of the adults, ingestion during preening and transfer to eggs and chicks by incubating adults. In terms of longer term recovery, the study concluded that because shearwaters are less committed to breeding in any given year than many other avian species, breeding attempts may be suspended in 'poor' years (potentially one in which an oil spill occurred) or at times when individual survival is imperilled. Thus, the loss of a single season may represent only 5 % of the expected breeding life of the bird. The individual may forego one season's breeding rather than risk survival while attempting to breed.

If an oil spill occurred that adversely impacted on shearwater populations breeding on the Lowendal Islands, the recovery rate would depend on the size and age structure of the pre-breeding pool (Fry *et al,* 1986). Given the general decline (due to natural causes)[10] of the Pilbara shearwater population (including the populations breeding in the Lowendal Islands), recovery would be expected to be slow. Breeding success for terns on the Lowendal Islands has been variable over recent years, such that the recovery rate would depend on the size and age structure of the breeding pool (Apache, 2001).

The proposed onshore section of pipeline passes very close to an important shearwater rookery. Although alternative landfall localities and pipeline routes were considered by the proponent, they were not discussed in the PER. The other two options were discarded due to concerns in relation to proximity to beaches and access across the shearwater rookery. The possibility of a pipeline breach adjacent to the rookery is to be assessed further by the proponent by taking into account the potential impacts and mitigation effects by some form of containment or bund beside the pipeline. This will be done in consultation with CALM.

Effects of an oil spill on marine mammals

It is anticipated that a spill from the Simpson location would have a minor, if any, impact on cetaceans (whales and dolphins) and dugongs. These animals are found in very low numbers and have the ability to move away from an oil spill. Whales and dolphins have been observed to avoid oil slicks, and dugongs are assumed to be able to do the same, although no information on their response is currently available (Baker *et al,* 1994).

[10] Several natural factors (ie not associated with the oil industry) have been identified that influence the number, behaviour and reproductive success of wedge-tail shearwaters at colonies on the North West Shelf. These factors include habitat instability, tropical cyclone events and oceanic changes influencing prey availability (i.e. variations in the extent of warm, low salinity waters in the region, caused by the *El Nino* Southern Oscillation) (Astron Environmental, 2000)

Other considerations

The project has some environmental advantages. The upgrade of the processing plant on Varanus Island (covered separately by a Works Approval), which includes modifications necessary for the Simpson Development, will include improved oil spill containment/drainage features. Also, the pipeline bundle to the mini-platform will include a produced formation water (PFW) return line to allow deep well injection back into the formation down one of the Tanami wells. This will be a backup deep disposal well and will allow the proponent to continue to avoid marine disposal.

The EPA notes that the proponent's past environmental performance has generally been good, as befits the sensitive environment in which the company operates. Although Apache suffered an oil spill in 1999 the end result was that there were no apparent environmental effects. The spill occurred 4.2 km east of Varanus Island at the Marine Loading Terminal when a valve on an underwater pipeline was accidentally damaged by the chain lift on the flexible loading hose at the end of the pipeline. 25,000 litres of Harriet light crude (which has similar chemical and physical characteristics to Simpson crude) escaped. In this case oil slick remained in open waters and the oil spill response involved mainly aerial tracking and computer modelling. Within five days dispersion and evaporation were such that there was no evidence of a spill either as a floating sheen or on the shorelines of the islands. Hydrocarbon analysis of beach sand, water and oysters failed to detect anything. Three weeks after the incident, the proponent and officers of DEP and DME, undertook a low altitude helicopter survey of the region and confirmed the limited effects of the spill. The incident demonstrates how quickly such light crude is likely to dissipate.

Since this spill the proponent has changed the design of the tanker loading system in order to minimise the potential for human error during tanker loading. This same approach of minimising the potential for human error has been used in the design of the Simpson Development by simplifying the design of the mini-platforms so that they are un-staffed, and equipped with fail-safe systems.

The proponent may be considered to be an industry leader in public consultation and this has been demonstrated with the Simpson Development proposal by involvement of both government and non-government organisations in a risk analysis workshop at the design stage.

Summary

The EPA notes that the Lowendal and nearby islands are classified as reserves for conservation of flora and fauna and are used as breeding grounds by a number of sea turtle and sea bird species which are listed in the National List of Threatened Species under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)[11].

The EPA also notes that the proposed production project is to be located 400 metres from the shoreline of Abutilon Island, one of the offshore island nature reserves. Sea turtles have been recorded nesting on this island, however the number of turtles breeding on the island is small and, on a regional basis, Abutilon Island is a relatively minor turtle rookery.

With respect to the potential for an oil spill from the Simpson Development the EPA notes:

- the low probability of an oil spill occurring from the proposed development;
- the detailed engineering and ecological assessment which the proponent has carried out;
- the additional engineering safety features that have been designed into the project, such as minimisation of flanges and location of all process hardware onshore;
- the installation of the two mini platforms and subsea pipelines will be timed to avoid the most sensitive season for turtles and sea birds; and

[11] May also be listed as CALM Declared Threatened Fauna or in the ANZECC Threatened Fauna List; Convention on the Conservation of Migratory Species of Wild Animals, Bonn 1979; Japan Australia Migratory Bird Agreement (JAMBA); and China Australia Migratory Bird Agreement (CAMBA).

- the proponent's Oil Spill Contingency Plan will be upgraded to incorporate the proposed facilities.

The EPA has concluded that, even in the unlikely event of an oil spill from the proposed development, it is not likely that that there would be significant long-term consequences for populations of turtles or birds, nor is it likely that there would be significant long-term impacts on marine habitats.

It is therefore the EPA's opinion that the proposal can be managed so that it is most unlikely that EPA's environmental objective will be compromised.

3.2 Artificial lighting – potential impacts on hatchling turtles

Description

Artificial lighting on the offshore facilities has the potential to attract marine life and facilitate predation. In particular, light overspill is known to affect turtles. Hatchling turtles find their way at night from the beach to the ocean by means of brightness cues, the natural night light intensity close to the horizon being greater over the ocean than on land due to natural features such as topography and vegetation (Witherington and Martin, 1996).

The proponent will avoid artificial lighting issues during the construction phase by scheduling construction near turtle nesting beaches outside of the peak turtle breeding period. However, once the two mini platforms are constructed they will require flashing navigation warning lights due to DMPR requirements under the *Petroleum (Submerged Lands) Act 1982* (PSLA). No other artificial lighting will be required because the mini platforms will be unstaffed. The mini platforms are 400 metres offshore from a beach on Abutilon Island where turtles sometimes nest.

Navigational warning lights similar to those proposed for the Simpson mini platforms are used on Beacon Island for tankers and the mooring buoys. The same lighting configuration has also been installed on Sinbad, Campbell, Wonnich and Agincourt platforms.

Submissions

There were no submissions regarding this factor.

Assessment

The area considered for assessment of this factor is Abutilon Island and in particular the turtle nesting beach 400 metres from the mini platforms.

The EPA's environmental objective for this factor is to protect sea turtles and other wildlife from the effects of artificial lighting. In particular to protect turtle hatchlings which may suffer disorientation/attraction due to artificial light, leading to increased mortality by predation.

During the construction phase the proponent will not carry out offshore construction activities during the peak turtle/seabird breeding season and the construction will take just two weeks. This will avoid significant impacts on turtles due to light overspill during night time construction work.

During the operation phase, however, the offshore mini platforms must be equipped with permanent flashing warning lights for navigation safety. The *Petroleum (Submerged Lands) Act Schedule 1995 Part III Clause 314* states "There shall be a flashing yellow light showing the letter U in Morse Code at intervals of not more than 30 seconds and visible for a distance of not less than 4 n mile from all points more than 5 metres above sea level when the meteorological visibility is not less than 10 n[autical] miles".

The information available on the effects of flashing strobe lights on sea turtle orientation is not great; however, it is likely that flashing lights have little effect or no effect. Mrosovsky (1978) found experimentally that in preference tests between flashing and a continuous light hatchling

green turtles (*Chelonia mydas*) "were not influenced much by flashing lights". The results suggested that turtles integrate brightness information over time in their sea finding behaviour. While it is probable that hatchlings are attracted to some degree when the light flashes, the attraction is thought to be proportional to the "on" time of the light (Dr B.Witherington, Florida Fish & Wildlife Commission, *pers.comm.*).

Loggerhead and green turtle hatchlings show little or no attraction to light sources that are rich in yellow light (Witherington and Martin,1996). Fortuitously, the PSLA requirement is for yellow warning lights.

Summary

Having regard to:

a) the short (two week) offshore construction period when lights will be required for night work along with the proponent's commitment not to carry out offshore construction during the peak turtle/seabird breeding period; and,

b) current literature and expert opinion suggesting that turtle hatchlings will not be unduly attracted to near-shore yellow flashing navigation lights with consequent increase in mortality due to predation;

it is the EPA's opinion that the proposal can be managed to meet the EPA's objective provided that the proponent prepares and implements an Environmental Management Plan including specific reference to management of light overspill.

4. Conditions and commitments

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment and Heritage on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal and, following discussion with the proponent, the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for, and commitment to, continuous improvement in environmental performance. The commitments, modified if necessary to ensure enforceability, then form part of the conditions to which the proposal should be subject, if it is to be implemented.

4.1 Proponent's commitments

The proponent's commitments as set in the PER and subsequently modified, as shown in Appendix 4, should be made enforceable.

4.2 Recommended conditions

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Apache Northwest Pty Ltd to construct two offshore mini platforms and to construct undersea pipelines connecting existing oil/gas wells to the Apache's existing Varanus Island Hub, is approved for implementation.

These conditions are presented in Appendix 4. Matters addressed in the conditions include the requirement that the proponent will fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4.

5. Other Advice

Shipping oil spill incidents such as the *Kirki* and *Exxon Valdez* have left powerful images which no doubt have influenced the public perception of the oil industry and in particular the transport of petroleum in oil tankers. In 1992 the Parliament of the Commonwealth of Australia report *Ships of Shame - Inquiry into Ship Safety* indicated that the high incidence of tanker related incidents at that time was related to the poor condition of the ageing tanker fleet. Classification societies responsible for ships' condition surveys were sometimes less than exacting in their surveys because of the competitive pressures that they were under. Flag States were also in competition with each other and this situation meant that there were opportunities for substandard ships to be registered.

Due to the sensitive location of the Simpson Development proposal the assessment has included some investigation into the pre-qualification of ships used by the proponent. Since the Simpson Development crude oil production will simply offset declining production from other fields there will be no net increase in tanker traffic above historic levels. The expected number of tanker loadings for the year 2002 will be about 14. There is however, the potential for further projects that might, in time, have a cumulative effect and result in an increase in tanker traffic.

The following information is provided to show how the proponent is performing in the important area of pre-qualification of ships.

Since the *Ships of Shame* report and high profile high cost incidents such as the *Exxon Valdez* and *Kirki* incidents, the oil industry has made some moves to reduce the risk of shipping related oil spills. There are databases available to check the suitability of ships available for charter, but these databases do not provide the complete answer. This is because there is a reluctance to commit to record comments that might be challenged in a court of law. Also, although the standards required by the various Flag States differ, the physical condition of the ships they register is not correlated to the Flag State standards because many of the better ships register under the same flag as the poorer ones.

When a ship is nominated to offload a cargo from Varanus Island there are standard chartering questionnaires and suitability assessment forms that must be examined before acceptance. These forms provide information on the vessel's age, material and manpower condition, compliance and certification, and factors laid out in the International Safety Guide for Oil Tankers and Terminals (International Chamber of Shipping, 1991).

The forms are assessed by the Marine Pilot (contracted) and Varanus Island Field Superintendent (staff) to ascertain any potential problems with regard to age, previous accidents, non-compliance or lack of information. The Marine Pilot maintains his own database and communicates with a network of contacts in the industry. During an interview with DEP officers he produced a number of papers from his records such as memoranda addressed to members of his network requesting their experience with a certain vessel with which he had not had personal experience. A number of vessels had not been accepted for use at Varanus Island. A vessel might not be accepted if it was considered of doubtful condition or if it was not suitably equipped to ensure safe tie up in the configuration used at the Varanus Island deep-water loading terminal. The Marine Pilot stated that the proponent was always supportive of his decisions even if the decision was to not accept the nominated ship.

When the nominated and accepted vessel arrives at Varanus Island, the Marine Pilot has the responsibility to carry out inspections prior to berthing the ship and may turn a vessel away if it does not comply with Varanus Island requirements. He also must decide on the safety of berthing and loading in the available window in the weather. There are standard procedures with preset triggers so that the necessity of making decisions under pressure is avoided. Further checks and examinations are carried out before and during loading. Reports are completed for the record.

The Marine Pilot thus carries the load of responsibility for the pre-qualification, berthing and loading of tankers at Varanus Island. He is an independent contractor and stakes his reputation on his decisions and performance. It was evident from a DEP site inspection of the facility and discussion with personnel on site that the proponent has actively sought out as a matter of priority a Marine Pilot of long experience and proven record.

EPA advises that the proponent has demonstrated its commitment to chartering ships that are fit for purpose. If the volume of oil for shipping increases above historical levels with subsequent proposals, the shipping and ship loading facilities will need to be re-assessed.

6. Conclusions

The EPA has considered the proposal by Apache Northwest Pty Ltd to construct two offshore mini platforms and undersea pipelines connecting existing oil/gas wells to Apache's existing Varanus Island Hub facility.

The EPA notes that the Lowendal and nearby islands are classified as reserves for conservation of flora and fauna and are used as breeding grounds by a number of sea turtle and sea bird species which are listed in the National List of Threatened Species under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

The EPA also notes that the proposed production project is to be located 400 metres from the shoreline of Abutilon Island, one of the offshore island nature reserves. Sea turtles have been recorded nesting on this island, however the number of turtles breeding on the island is small and, on a regional basis, Abutilon Island is a relatively minor turtle rookery.

With respect to the potential for an oil spill from the Simpson Development the EPA notes:

- the low probability of an oil spill occurring from the proposed development;
- the detailed engineering and ecological risk assessment which the proponent has carried out;
- the additional engineering safety features that have been designed into the project, such as minimisation of flanges and location of all process hardware onshore;
- the installation of the two mini platforms and subsea pipelines will be timed to avoid the most sensitive season for turtles and sea birds; and
- the proponent's Oil Spill Contingency Plan will be upgraded to incorporate the proposed facilities.

The EPA has concluded that, even in the unlikely event of an oil spill from the proposed development, it is not likely that that there would be significant long-term consequences for populations of turtles or birds, nor is it likely that there would be significant long-term impacts on marine habitats.

It is therefore the EPA's opinion that the proposal can be managed so that it is most unlikely EPA's environmental objective will be compromised.

The EPA notes that artificial lighting on near-shore facilities has the potential to attract hatchling turtles and, in turn, facilitate predation by fish and sea birds. However, the Simpson Development mini-platforms will be unstaffed and the only lights necessary will be yellow flashing warning lights for navigation safety. Literature and expert opinion indicate that such flashing lights are unlikely to attract hatchling turtles and therefore unlikely to affect levels of predation. The EPA's opinion is that this factor can be managed to meet the EPA's objective.

The EPA has therefore concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the proponent's commitments and the recommended conditions set out in Appendix 4 and summarised in Section 4.

7. Recommendations

The EPA submits the following recommendations to the Minister for Environment and Heritage:

1. That the Minister notes that the proposal being assessed is for the construction of two offshore mini platforms and construction of undersea pipelines connecting existing oil/gas wells to the Apache's existing Varanus Island Hub facility.
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponent's commitments.
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Appendix 1

List of submitters

Organisations:

Department of Transport
Department of Minerals and Energy
Department of Conservation and Land Management
Conservation Council of Western Australia Inc.

Appendix 2

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Appendix 3

Summary of identification of relevant environmental factors

Appendix 3: Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
OIL SPILLS			
Spills from the development and pipeline bundle	The oil/gas production mini-platforms and sub sea pipeline are within 400 m of Abutilon Island and within 2000 m of Varanus Island. In the case of an oil spill there is potential for environmental damage to sensitive coastal areas that are used by endangered/migratory fauna such as turtles and sea birds. All of the Lowendal Islands are a C class reserve for conservation of flora and fauna.	<u>CALM</u> ▪ Much of the existing Varanus Island process facility has surface drainage which could be improved in consultation with CALM and DEP during the proposed plant modification. ▪ The pipeline landfall and route options have not been discussed and risk assessed. ▪ Drainage design of the pipeline corridor adjacent to the shearwater rookery has not been discussed. ▪ Oil spill response capabilities need to be of the highest order. <u>Department of Transport</u> ▪ The PER states that dispersants would be effective on an oil spill for several days whereas they would actually be effective for less than a day. ▪ Due to the sensitivity of the area, a review of the Oil Spill Contingency Plan should incorporate revised training and equipment requirements. ▪ The proponent's commitment to ensure no disposal of Produced Formation Water to the marine environment is endorsed. <u>Conservation Council of WA</u> ▪ The drainage design of the onshore pipeline corridor adjacent to the shearwater rookery should be addressed. ▪ Little has been said about the existing groundwater contamination on Varanus Island. A plan for groundwater contamination prevention, monitoring and remediation is required. <u>Public</u> • No attention has been given to the possibility of sabotage, collision and seismic activity.	The probability of a large oil spill is low but the consequences of such an oil spill may be significant due to nearby sensitive ecosystems. **Considered to be a relevant environmental factor**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
Spills from Shipping	Produced crude oil will be loaded from the existing marine terminal offshore of Varanus Island. The risk of spills from shipping is proportional to the shipping traffic and also depends on the standard of ships and procedures used.	DEP • Are "Flag of Convenience" vessels accepted at Varanus Is.?	The proposed production wells are intended to offset declining production, so shipping will not increase above historic levels. Nevertheless, shipping will increase above recent levels and an opportunity exists to review standards currently in use. **EPA to provide advice on this matter.**
CONSTRUCTION IMPACTS			
Coral Reefs	The mini platforms and sub sea pipeline are in close proximity to coral reefs and there is potential for physical damage by work vessels and their anchor chains.	DME • Anchoring of work vessels during offshore pipeline installation was discussed at the risk assessment workshop but not in the PER report.	This aspect can be managed by choosing a pipeline route based on habitat surveys. Corals can be avoided and the construction areas confined to areas of unconsolidated sand or limestone pavement. Factor does not require further EPA evaluation.
Turtle/bird breeding	Three species of turtles use the sandy beaches for breeding. Also an important area for shearwater breeding. Potential for construction to interfere with breeding success due to spills, physical contact, noise and light overspill.	DME • Light and noise emissions during offshore pipeline installation were discussed at the risk assessment workshop but not in the PER report.	This will be managed by scheduling construction outside of the peak turtle or sea bird breeding period (November to March). Factor does not require further EPA evaluation
Feral animals, weeds and other exotic species	Potential for introduction of terrestrial pests via work boats and construction crews. The Lowendal Islands are a C-class reserve for conservation of flora and fauna.		The proponent has an existing operation centred on Varanus Island. Quarantine procedures are already in existence and will be extended with specific application to Abutilon Island. CALM does not permit landings on Abutilon Island.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
			Factor does not require further EPA evaluation
Sand dunes and coastal vegetation	Pipeline will cross the Varanus Island shoreline with a potential to open up coastal erosion.	CALM • Clearing of vegetation for the onshore pipeline needs to be discussed in greater detail.	The shoreline has been previously stabilised with rock boulders and cement blocks to ensure integrity of existing wharf. There will be no additional impact. Factor does not require further EPA evaluation
EMISSIONS			
Liquid emissions	There is a requirement to dispose of produced formation water (PFW), water containing pipeline treatment chemicals (biocides, pickle liquors and corrosion inhibitors) and pipeline hydrotest waters. The marine environment is unsuitable as a sink (shallow water, predominantly macroalgae, exposed sand, limestone pavement, and to a lesser extent corals).	DME • It is unclear whether sewage will be disposed of overboard during construction of the offshore pipeline.	PFW and other contaminated waters will be disposed of by deep well injection back into the producing formation. There will be no discharge to the marine environment. The proposal will have the benefit that it will provide an additional deep injection well and associated infrastructure which will serve as a backup disposal route for existing and proposed facilities. Sewage will not be discharged to the marine environment during construction. Factor does not require further EPA evaluation
Introduced marine organisms	There is a risk of introducing exotic marine organisms via ballast water or hull fouling of tankers.		The majority of tankers coming to Varanus Island have no need to discharge ballast water. The remaining risk is reduced by compliance with mandatory AQIS requirements. The proposal will not increase shipping above historical levels. Factor does not require further EPA evaluation

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
			.
Greenhouse gases	Green house gases will be emitted from production processes and carbon dioxide may be included in the produced gas.	Public • It would be better for Australia to focus on renewable sources of energy such as wind power, tidal surge and wave power and geothermal gradients.	Venting and flaring will only be allowed under emergency conditions. Other sources will be minor. The produced natural gas will contain 3% CO_2 which will remain in the sales gas. Approximately 0.8% (10,400 tonnes) of the proponent's greenhouse gas emissions will be due to this project and there will not be a significant increase over historical emission levels Factor does not require further EPA evaluation.
Light overspill	The offshore facilities and construction vessels may result in some light overspill with the potential to attract marine life (especially hatchling turtles) facilitating predation.	DME Light and noise emissions during offshore pipeline installation were discussed at the risk assessment workshop but not in the PER report.	**Considered to be a relevant environmental factor**
DECOMMISIONING			
Decommissioning/rehabi	When the productive life of		Following the economic completion of the

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
litation	infrastructure (sub sea pipeline, mini platforms and wells) is over it may present a navigation/oil spill hazard and be visually undesirable if simply abandoned.		Simpson field all wells will be plugged to meet DME requirements and casings cut just below the level of the seabed. Platforms and pipelines will be removed or as directed by the relevant Minister(s). Factor does not require further EPA evaluation.

Appendix 4

Recommended Environmental Conditions and Proponent's Consolidated Commitments

Statement No.

RECOMMENDED ENVIRONMENTAL CONDITIONS

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

SIMPSON OIL FIELD DEVELOPMENT, OFFSHORE ABUTILON ISLAND, LOWENDAL ISLANDS, NORTH WEST SHELF

Proposal: Construction of two offshore oil and gas mini-platforms and undersea pipeline bundle connecting Tanami-4, Tanami-5, Simpson-1 and Simpson-3H wells to existing facilities at the Varanus Island Hub as documented in Schedule 1.

Proponent: Apache Northwest Pty Ltd

Proponent Address: 3rd Floor , 256 St Georges Terrace, PERTH WA 6000

Assessment Number: 1358

Report of the Environmental Protection Authority: Bulletin 1023

The proposal to which the above report of the Environmental Protection Authority relates may be implemented subject to the following conditions and procedures:

Procedural conditions

1 Implementation

1-1 Subject to these conditions and procedures, the proponent shall implement the proposal as documented in Schedule 1 of this statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in Schedule 1 of this statement in any way that the Minister for Environment and Heritage determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in Schedule 1 of this statement in any way that the Minister for Environment and Heritage determines, on advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

2 Proponent Commitments

2-1 The proponent shall implement the consolidated environmental management commitments documented in Schedule 2 of this statement.

2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of conditions and procedures in this statement:

3 Proponent

3-1 The proponent for the time being nominated by the Minister for Environment and Heritage under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for Environment and Heritage has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person in respect of the proposal.

3-2 Any request for the exercise of that power of the Minister referred to in condition 3-1 shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.

3-3 The proponent shall notify the Department of Environment Water and Catchment Protection of any change of proponent contact name and address within 30 days of such change.

4 Commencement

4-1 The proponent shall provide evidence to the Minister for Environment and Heritage within five years of the date of this statement that the proposal has been substantially commenced.

4-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for Environment and Heritage will determine any question as to whether the proposal has been substantially commenced.

4-3 The proponent shall make application to the Minister for Environment and Heritage for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement at least six months prior to the expiration of the five year period referred to in conditions 4-1 and 4-2.

4-4 Where the proponent demonstrates to the requirements of the Minister for Environment and Heritage on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

5 Compliance Audit and Performance Review

5-1 The proponent shall prepare an audit program in consultation with and submit compliance reports to the Department of Environment, Water and Catchment Protection that address:

- the implementation of the proposal as defined in Schedule 1 of this statement;
- evidence of compliance with the conditions and commitments; and
- the performance of the environmental management plans and programs.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Director General of the Department of Environment, Water and Catchment Protection is empowered to audit the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement. Usually, the Department of Environment, Water and Catchment Protection prepares an audit table that can be utilised by the proponent, if required, to prepare an audit program to ensure the proposal is implemented as required. The Director General is responsible for the preparation of written advice to the proponent, which is signed off either by the Minister or, under an endorsed condition clearance process, a delegate within the Environmental Protection Authority or the Department of Environment, Water and Catchment Protection that the requirements have been met.

Schedule 1

The Proposal (Assessment No.1358)

The Simpson development proposal will consist of:

6 the Simpson Alpha offshore mini-platform located at the Tanami-4 and Tanami-5 wells surface location;

7 the Simpson Bravo offshore mini-platform located at the Simpson-1 and Simpson 3H well locations; and

8 a sub-sea pipeline bundle linking the two mini-platforms to each other and to existing facilities on Varanus Island.

The pipeline bundle will consist of:

- a production pipeline transporting oil, produced formation water and natural gas;
- a return water pipeline for disposal of produced formation water into a deep disposal well;
- a return gas pipeline containing lift gas; and
- an umbilical containing corrosion inhibitor chemicals and dry utilities gas.

The well fluids produced from the Tanami and Simpson wells will flow into a production pipeline connecting to the existing processing facilities on Varanus Island. These processing facilities include an oil/gas/water separator and a gas compressor. Produced formation water (PFW) will be injected into the Alkimos-1 deep disposal well or via the return PFW pipeline to the Tanami-5 water disposal well, as process conditions dictate.

Any produced natural gas from the Simpson field will be recovered from the separator, compressed and delivered to the low temperature separation plant on Varanus Island. The processed gas will be sold to domestic and industrial markets. No flaring or venting of the associated gas will occur unless under emergency conditions.

The oil produced from the Simpson field will be stored in the existing bulk storage tanks for loading to oil tankers via the Varanus Island offloading marine terminal. There will not be an overall increase in the frequency of tanker activity into the marine terminal.

To ensure that oil wells can produce at optimal rates, artificial lift in the form of gas lift will be made available to the Tanami-4, Simpson-1 and Simpson-3H wells. A return gas pipeline from the island to the two mini-platforms will contain natural gas to cater for the gas lift requirements.

Key proposal characteristics are presented in Table 1.

Table 1 - Key Proposal Characteristics

Element	Description
Name of proposal	Simpson development
Name of proponent	Apache Northwest Pty Ltd
Life of the project	10 years (estimated)
Location	Lowendal Islands
Major components	The Simpson Alpha offshore mini-platform located at the Tanami-4 and Tanami-5 wells surface location; The Simpson Bravo offshore mini-platform located at the Simpson-1 and Simpson-3H well locations; and A sub-sea pipeline bundle linking the two mini-platforms to each other and to existing facilities on Varanus Island.
Area of disturbance	Temporary disturbance to about 1,800 m^2 of shallow marine, macroalgae habitat and 200 m^2 of terrestrial habitat with sparse vegetation.
Estimated production	Annual average production of 2,500 bbls per day at the commencement of the project in 2001. Peak annual average production of 8,037 bbls per day in 2002. Decrease in annual average production to 754 bbls per day by 2010.
Waste management	Produced formation water and production chemicals will be disposed of down deep disposal wells.

Abbreviations: **m^2 = square metres;**
bbls per day = barrels per day.

The project location and regional context are shown in Figure 1, a schematic of the Simpson Development proposal shown in Figure 2 and a map of the on-shore pipeline route is shown in Figure 3.

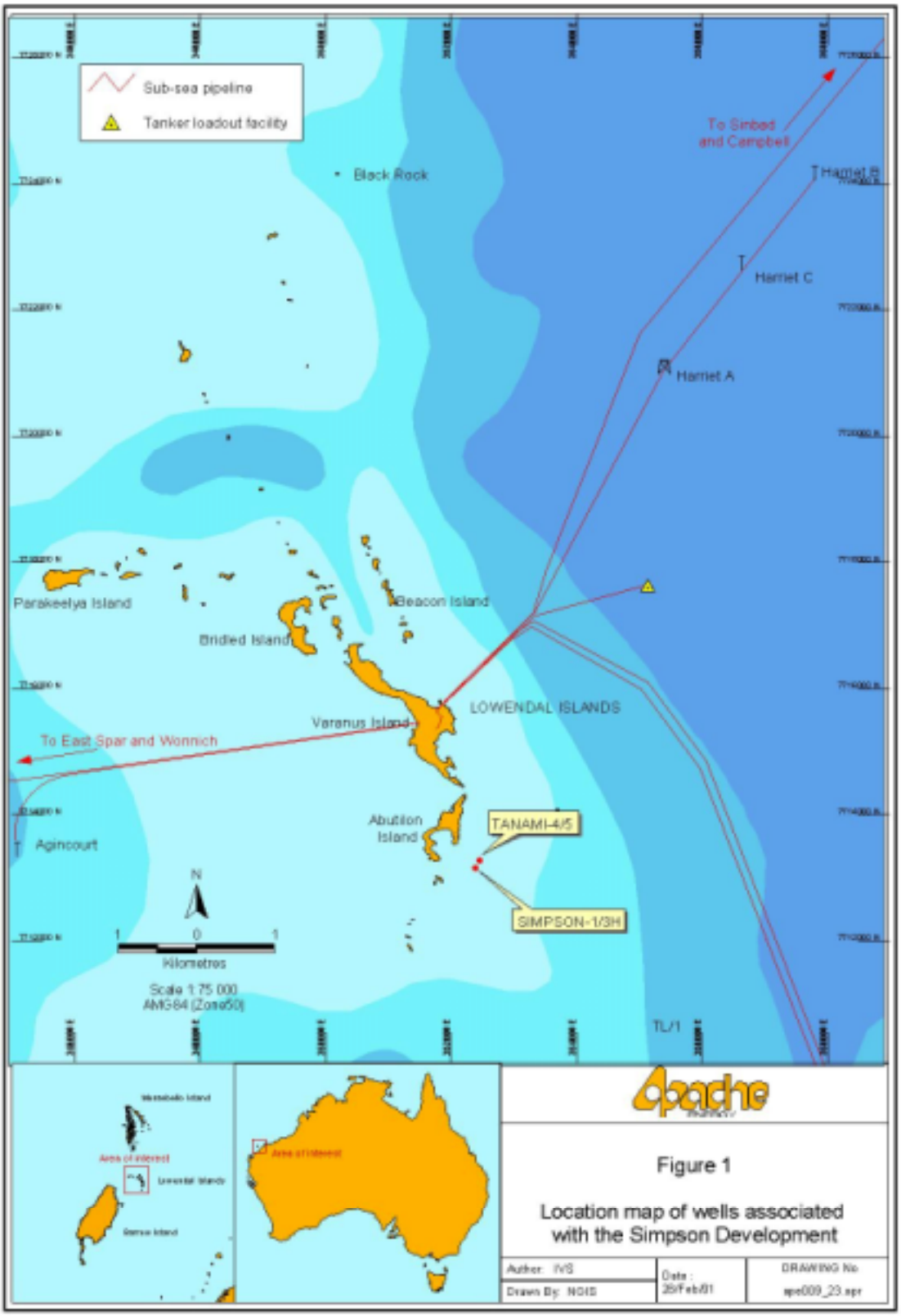


Figure 1 Location map of wells associated with the Simpson Development

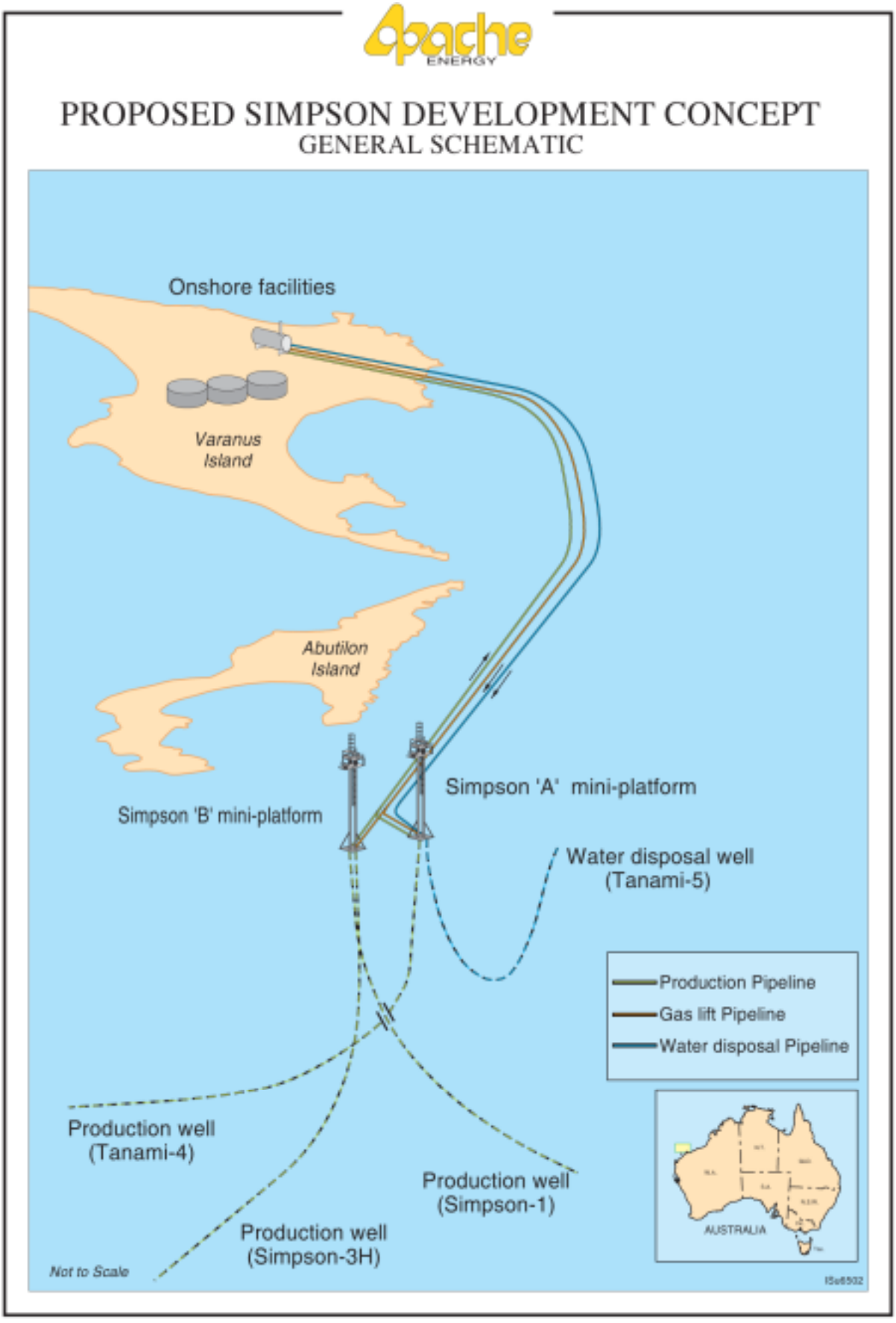


Figure 2. Proposed Simpson Development concept – general schematic

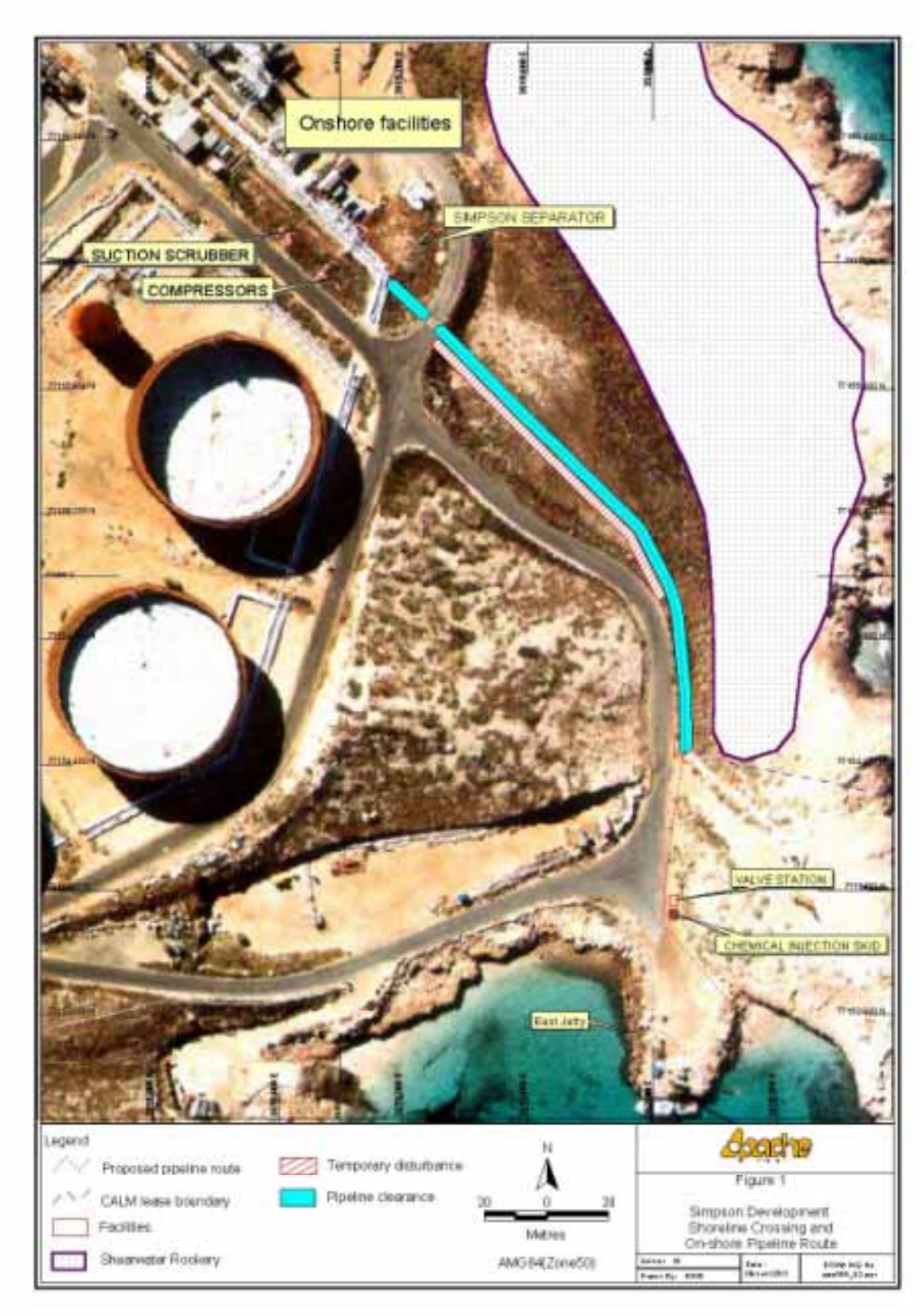


Figure 3 Simpson Development shoreline crossing and on-shore pipeline route

Schedule 2

Proponent's Environmental Management Commitments

June 2001

SIMPSON OIL FIELD DEVELOPMENT, OFFSHORE ABUTILON ISLAND, LOWENDAL ISLANDS, NORTH WEST SHELF (Assessment No. 1358)

Apache Northwest Pty Ltd

No.	Topic	Actions	Objectives	Timing	Advice
1.	Construct-ion Impacts	Prepare a Construction Environmental Management Plan which addresses: ▪ selection of pipeline route; ▪ navigation warning light colour and flashing configuration; ▪ vessel anchoring/refuelling ▪ access to islands and Varanus Is. shearwater *(Puffinus pacificus)* rookery; ▪ clearing of vegetation; ▪ drainage/bunding of onshore pipeline; ▪ timing of activities to minimise impacts on threatened fauna; ▪ quarantine of islands; and ▪ waste disposal /spills.	To protect corals and soft bottom benthos. To protect island flora and fauna To avoid impacts on threatened fauna. To prevent shoreline erosion. To protect the marine environment.	Before c onstruction	DOC DMPR
2.	Construct-ion Impacts	Implement the approved Construction Environmental Management Plan.	Achieve the objectives of commitment 1.	During construction.	DOC DMPR
3.	Operational Impacts - Emissions	Prepare an Emissions Management Plan which addresses disposal of: ▪ Produced Formation Water; ▪ process chemicals such as corrosion/scale inhibitors and hydrotest waters; ▪ sewage; and ▪ solid wastes.	To protect the marine environment and island flora and fauna.	Prior to construction	DMPR
4.	Operational Impacts - Emissions	Implement the Emissions Management Plan.	Achieve the objectives of commitment 3.	Construction and operation phase.	DMPR
5.	Oil Spill Response	Update the Apache Oil Spill Contingency Plan to include the Simpson Development area and in particular a program of training exercises centred on the Simpson Area.	To facilitate prompt and effective oil spill response.	Prior to commissioning	DMPR
6.	Oil Spill Response	Implement the revised Oil Spill Contingency Plan.	Achieve the objectives of commitment 5.	Prior to commissioning	DMPR
7.	Decomm-issioning	Prepare a Decommissioning Plan which addresses the removal of the mini platforms and pipeline bundles and well plugging.	To protect the marine environment.	Broad plan before construction, detailed plan 1 year before decommissioning.	DMPR
8.	Decomm-issioning	Implement the Decommissioning Plan.	Achieve the objectives of commitment 7.	During decommissioning.	DMPR

Abbreviations: **DOC = Department of Conservation;**
DMPR = Department of Minerals and Petroleum Resources.

Appendix 5

Proponent's Response to Submissions

(Note : A summary of submissions is included in Appendix 3)

Anonymous Submission

Issue: Storm Damage

Initially, the substructure engineering design was confirmed against the 50-year storm criteria with the "air gap" (gap between the water level and the bottom of the topside) based on the 100-year storm wave height. Further detailed review of the structural reliability of the strengthened well conductors (two support each mini-platform), the geotechnical properties of the underlying seabed stratigraphy and the oceanographic conditions has verified that the structures have been designed to survive a storm of return period of 2000 years without collapse. This satisfies the recommendations of the draft International Standards Organisation – Petroleum and Natural Gas Industries, Offshore Structures – Fixed Steel Structures (ISO 13819-2 Draft C, 1997).

Issue: Collision/Obstacle

Given the close proximity of the development to land (Abutilon Island and Varanus Island) and the shallow water surrounding the development (less than 10 m), it would not be possible for larger vessels such as tankers to come in contact with the mini-platforms or pipelines. Such vessels would be grounded on the seabed long before they came in close proximity to the mini-platform or pipelines. Of the smaller vessels that do routinely visit Varanus Island, the maximum vessel draft is 2 m. Vessels would traverse the pipeline where water depths are 2.2 m LAT, thus, these routine vessels have sufficient draft to pass over the pipeline (International Risk Consultants, 2001c). In addition, the pipeline will be trenched for the first 600 m from Varanus Island in the vicinity of the East wharf as an added protective measure from vessel impact.

Smaller vessels such as supply and support vessels for the oil and gas industry, recreational or fisheries vessels will be made aware of the presence of the mini-platforms and pipelines by the following means:

- Navigation or warning lights will be installed on each mini-platform in compliance with the following:

  (a) Petroleum (Submerged Lands) Act Schedule 1995 Part III Clause 314; and.

  (b) Navigation Act

  Where it is possible, navigation lights will be designed so as to minimise the likelihood of influencing the orientation behaviour of nesting turtles and emerging hatchlings yet remain within the requirements of the relevant legislation.

- An exclusion zone of 500 m:

  (a) according to Australian Maritime Safety Association (AMSA) regulations will prohibit anchoring around the pipeline and mini-platforms; and

  (b) according to the PSLA section 119 prohibit unauthorised vessels approaching the platforms.

  A designated anchoring area exists within the exclusion zone for the mooring of field support vessels.

- Admiralty charts are amended by RAN Hydrographic Office to display the location of the mini-platforms, pipelines and exclusion zones.

- Notice to Mariners issued by AMSA Navigational Services provide warnings for ship collision avoidance by updating mariners on the location of new structures, pipelines etc.

Issue: Seismic Instability

The Simpson field was discovered using modern high-resolution 3D seismic reflection data. There is no evidence from this data that the Simpson surface facilities are located on a geological fault system or that any of the wells intersect an active fault. Geotechnical surveys prior to the drilling of the wells confirmed the stability of the seabed.

Issue: Sabotage/Hostile War Activities/Theft

Such issues are not directly the responsibility of the proponents to manage. It is highly unlikely, however, to be an issue in this region. More isolated and distant unmanned platforms on the North West Shelf are in existence and sabotage, hostile war activities and theft have not been an issue with those to date.

Issue: Renewable Energy

The energy policy of the Office of Energy of Western Australia promotes energy efficiency and encourages the use of renewable energy. However, the 1998/99 figures quoted by the Office of Energy 2000 report of the principal sources of WA's primary energy, were:

(a) natural gas 48%;

(b) oil and condensate 33%;

(c) coal 17%.

(d) renewable energy sources 2%.

Until the cost of renewal sources can compete with fossil fuels, fossil fuels will continue to the predominant source of energy in the world.

In the meantime, oil and gas developments in the North West Shelf are becoming increasingly important as the production from the Bass Strait fields continues to decline. The Bass Strait fields have historically been the major source of supply for Australia's petroleum requirements. Both Western Australia and the Australian governments recognise the need for Australia to at least maintain present levels of self sufficiency in oil and gas so as to supply the existing reliance on this fuel source.

As shown in Figure 8 of the Public Environmental Review, the Simpson field will augment presently declining oil production levels from its existing Harriet, Agincourt and Tanami fields located near Varanus Island.

Submission No. 2: Department of Minerals and Energy

Issue: Sewage Discharge during Construction

As pointed out, information given in Section 5.6 of the PER is inconsistent with that given in Section 7.1.1 and Table 23, when it states that a small volume of sewage will be discharged to the marine environment during the construction phase. Apache confirms that there will be no discharge of sewage into the marine environment during the well completion, installation of the Simpson mini-platforms and pipeline, in accordance with MARPOL requirements.

Issue: No discussion of anchoring, waste management, noise and light during installation of the offshore pipeline bundle in Section 5.2 or Table 10

These issues are discussed in relation to the installation of the mini-platforms and it is an oversight that they were omitted from Section 5.2 and Table 10. The information provided on barge mooring and anchoring, noise, lights, sewage and grey water, galley wastes, contaminated drainage water and solid wastes during the installation of the mini-platforms apply equally to the installation of the offshore pipeline bundle. This information is provided in detail in Section 5.1 and Table 10.

The management controls for the construction of the mini-platforms will equally apply to the pipeline construction to address the mentioned issues.

Comment: Development of an Environmental Management Plan

Apache will develop an Environmental Management Plan for the installation phase of the Simpson Development that will address the implementation of PER commitments and Ministerial conditions.

Submission No. 3: Department of Conservation and Land Management

Issue: Oil spills relating to operation of onshore processing facilities

Apache is currently putting together an application for Works Approval for the upgrade of liquid processing facilities to increase the efficiency of production from the existing Harriet, Tanami, Agincourt and Gipsy developments. This upgrade will include facilities for the handling of liquids from Simpson and will ensure that the oil spill containment features of these facilities will match or likely be better than the existing East Spar facilities.

Specifically, it is proposed to contain surface drainage from the liquids upgrade project within the plant area by installing a bund around the upgraded facilities. The bunded area will be contoured such that any rainfall run-off and other fluids will drain into a central sump. The sump will be cleared regularly and the fluids will be processed through the existing oily water processing system on Varanus Island.

The application for Works Approval will be submitted to DEP for approval and copied to CALM for its comments.

Issue: Evaluation of pipeline route and landfall options

Three options for the pipeline route and landfall were considered and assessed in a study by International Risk Consultants (2001c). The options considered were:

- pipeline to "Amenity Beach", coming onshore at the ramp adjacent to the East Mallard Landing Area,
- pipeline to East Wharf, coming onshore to the east of the wharf,
- pipeline to eastern shore of Varanus Island, coming onshore to the east of the shearwater rookery.

Options 1 and 3 above were eliminated because of environmental concerns in relation to proximity to beaches and access across the shearwater rookery, respectively. By far the best option environmentally was Option 2.

The best option for the offshore route determined the place of landfall, which in turn determined the route for the onshore section of the pipeline. The proposed onshore route of the pipeline essentially follows the path of existing pipelines and as such provides the least impact and disturbance to vegetation and habitats within the CALM lease.

Mitigation measures during the construction phase of the onshore pipelines include:

- placement of a plastic mesh fence in front of the existing orange rope which demarcates the CALM lease boundary and shearwater rookery to prevent trespass by personnel and equipment during the onshore construction phase.
- additional signage will be on-site to indicate the location of shearwater rookeries and areas of significant vegetation.

- on-site presence of Apache environmental personnel during the construction phase of the development.

Issue: Drainage design around the pipeline adjacent to the shearwater rookery

Two 12" pipelines will sit in a U-shaped saddle approximately 1 m above the existing pipelines. At present, there is no bunding or containment around the existing pipelines as they run parallel to the shearwater rookery. It may be possible to build an earthen bund or install something similar between the pipelines and the shearwater rookery, however, such earthworks would involve permanent clearance of vegetation and represent an additional disturbance to the area.

This section of the pipeline will now be butt-welded rather than flanged, further reducing the risk of leaks from joined areas of the pipe. Welded valves decrease the number of potential leak sources, thereby leading to a reduction in the release frequency estimates for the onshore section of the pipeline (International Risk Consultants, 2001b).

The consequences of a pipeline breach adjacent to the rookery will be assessed further, by taking into account the potential impacts and mitigation effects from some form of containment or bund beside the pipelines. This will be done in consultation with CALM.

Issue: Clearing of vegetation needs to be minimised to that absolutely necessary

Statements made in Section 5.3.3 regarding clearance of vegetation have led to some ambiguity in the nature and extent of the clearance. For clarification, no additional vegetation along the proposed onshore pipeline route will be permanently removed, due to the Simpson production pipeline being constructed above an existing pipe-rack (Tanami production pipeline). That is the Simpson production pipeline will sit on top of the existing Tanami pipeline.

Currently, vegetation growing within 1 m each side of all pipelines on Varanus Island is sprayed with herbicide for reasons of safety and maintenance, therefore there is an existing area of clearance of 200 m^2 (the section of pipeline is 100 m long) associated with the Tanami pipe-rack.

In order to install the pipeline on the existing Tanami pipe-rack a temporary access track will be required along the north western side of the Tanami pipeline to assist cranes with access. This area is shown on the attached Figure 1 as a 'temporary disturbance' and represents approximately 600 m^2 of previously disturbed vegetation and 100 m^2 of the low open shrubland with associated mixed grassland (characterised by the shrubs *Lawrencia viridigrisea*, *Threlkeldia diffusa*, *Atriplex isatidea* and *Salsola tragus*, the grasses *Spinifex longfolius* and *Sporobolus virginicus*, and the annual herbs *Ptilotus exaltatus*, *Cleome viscosa*, *Flaveria australasica*, *Tribulus occidentalis* and *Boerhavia schomburgkiana*).

In order to minimise disturbance the area will be mowed ensuring that the vegetative root stock and topsoil remains in place. This will ensure rapid rehabilitation of the area once construction is complete.

Issue: Is there adequate capability to protect high conservation values within the area in the event of an oil spill

A fast response vessel and additional oil spill response equipment have recently been purchased in response to Apache's expanding activities in the Barrow/Lowendal/Montebello region. Specifically in relation to the Simpson Development, trials have been carried out to assess response and equipment deployment times at the Simpson well head locations and the shallow subtidal, intertidal and beaches of Abutilon Island (see Attachment 1).

On this basis, strategies for managing an oil spill in this area are being refined and will be incorporated into the Oil Spill Contingency Plan.

The merit in deploying a boom during "periods of greatest risk", as suggested by CALM, can be reviewed during the upcoming Construction Hazid Workshop. The workshop will examine all aspects of the offshore installation for the Simpson Development. The merits in deploying a boom will need to be examined in light of the possible increased likelihood of vessel collisions. Note, however, that the events or occurrences, identified during the Environmental Hazid Workshops (International Risk Consultants, 2001a) and assessed quantitatively by International Risk Consultants (2001b), that provided the greater risks are not planned or predictable events making the deployment of a boom ahead of time groundless.

Submission No. 4: Department of Transport

Issue: Timing of use of dispersants

The statement in the PER on page 82 that Harriet crude is readily amenable to dispersants for several days is a typographical error and should be several hours instead of days. Table 14 on page 82 summarises the properties of Harriet crude oil from laboratory testing and states that the crude is only amenable to dispersants within 3 hours after spillage.

Comment: Updated Oil Spill Contingency Plan

Apache's Oil Spill Contingency Plan (AE-00-EF-008 Rev 1A and AE-00-EF-008/2) underwent major revision in 2000. The current OSCP was submitted to DME for approval on 31st January 2001. Subsequently, DME reviewed and approved the OSCP on 21st February 2001. The OSCP was written in accordance with National Plan format. It will be revised to include the Simpson development.

Comment: No release of produced formation water to marine environment

There will be no discharge of produced formation water to the marine environment from the Simpson Development.

Submission No. 5: Conservation Council of Western Australia Inc.

Issue: Effects on the Shearwater Rookery

The lack of bunding or containment around the existing pipelines as they run parallel to the shearwater rookery is discussed in detail in the section relating to CALM's submission above.

Issue: Effects on groundwater

Low level groundwater contamination has been recorded from nine of the fifteen monitoring bores installed on Varanus Island.

The source of contamination has been attributable to the disposal of produced formation water (PFW) to shallow disposal bores. This practice ceased in February 1998, with all PFW now disposed 1,880 m below seabed into the Alkimos reservoir (a disused production well).

Existing groundwater contamination levels are not excessive with total petroleum hydrocarbons (TPH) levels all below the Dutch C guidelines. Regular monitoring of the physio-chemical parameters of the ground water indicates that dissolved oxygen levels are positive and are assisting in the process of natural degradation of any occurring hydrocarbons.

A formal groundwater monitoring program is in place for Varanus Island. As TPH levels are low and naturally degrading no remedial action besides ongoing monitoring is presently planned.

All processing vessels and bulk storage tanks on Varanus Island are bunded to contain any oil spills or leaks. These containment measures will apply to any additional processing equipment installed on the island.

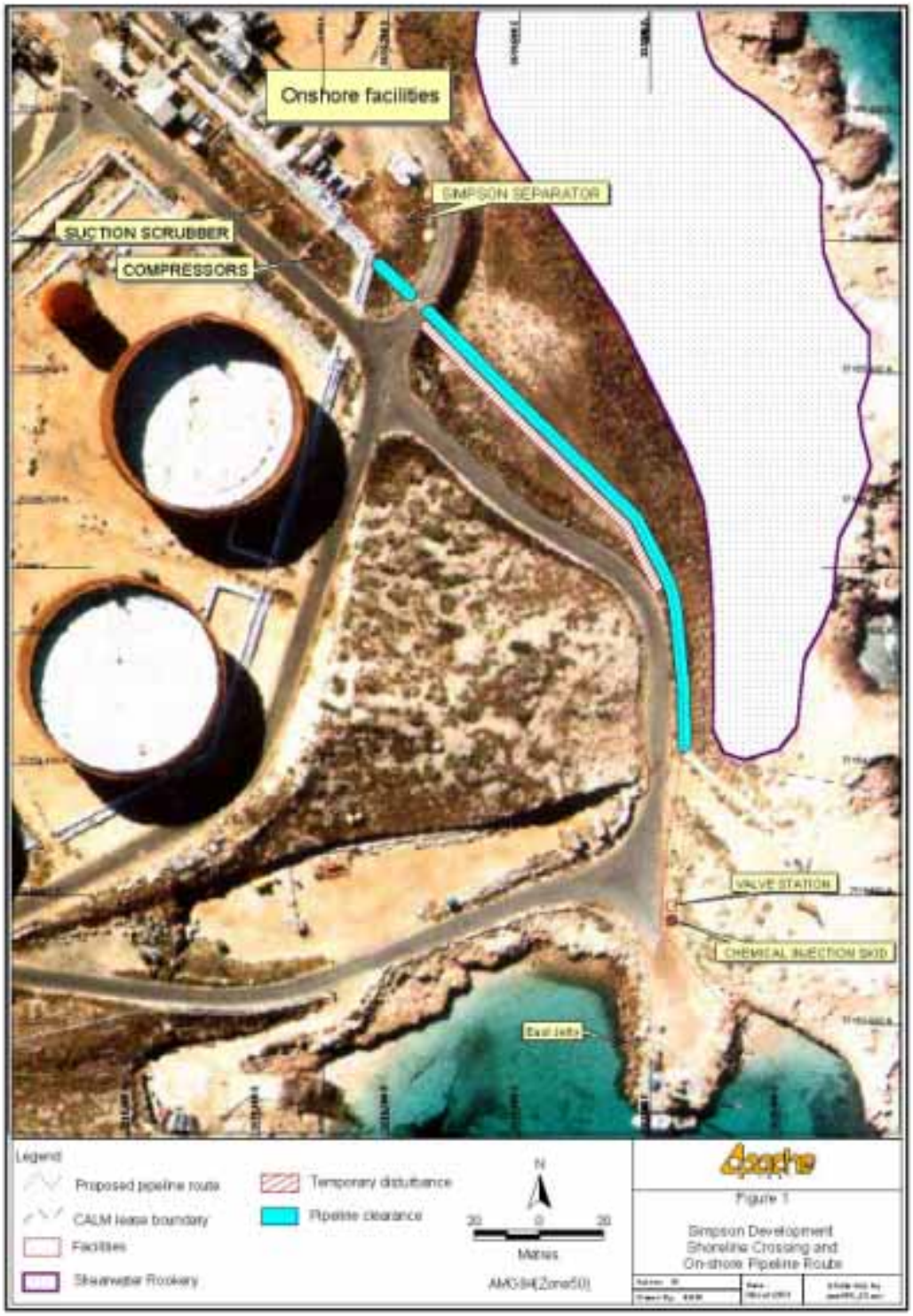
References

International Risk Consultants (2001a) Simpson Development Environmental Hazid Workshop Report. Report to Apache Energy Ltd, 15 January 2001 (RS-REP-00-117-003 REV 0)

International Risk Consultants (2001b) Simpson Development Leak Frequency Assessment. Report to Apache Energy Ltd, 13 February 2001 (RS-REP-00-117-001 REV 4)

International Risk Consultants (2001c) Simpson Development and Varanus Island Liquids Process Equipment Upgrade Concept Selection Evaluation. Report to Apache Energy Ltd, 23 February 2001 (RS-REP-00-117-002 REV 1)

Office of Energy Government of Western Australia (2000) Energy 2000 Western Australia.


Onshore facilities
SIMPSON SEPARATOR
SUCTION SCRUBBER
COMPRESSORS
VALVE STATION
CHEMICAL INJECTION SKID
Legend
Proposed pipeline route
CALM lease boundary
Facilities
Shearwater Rookery
Temporary disturbance
Pipeline clearance
N
20
0
20
Metres
AMG 84 (Zone 50)
Figure 1
Simpson Development
Shoreline Crossing and
On-shore Pipeline Route

Attachment 1

OIL SPILL RESPONSE FOR THE SIMPSON MONOPOD

APACHE ENERGY LIMITED (A.C.N. 009 301 964)

Level 3, 256 St Georges Terrace,

Perth, Western Australia 6000

(PO Box 477, West Perth 6872 Western Australia)

Telephone: (08) 9422 7222 Facsimile: (08) 9422 7445

1. PURPOSE

The purpose of this report is to provide an example of the expected response times that would be envisaged should an oil spill incident occur on one of our offshore platforms.

This report will detail the approach to the incident, the types of vessels involved, the amount of personnel used on each vessel and all of the relevant factors surrounding the incident

2. SCOPE.

This is a report covering a practical demonstrating of the workforce's ability to respond quickly to an oil spill. This incident was an exercise designed to show the competence of our Island workforce's ability to handle such a situation. The report will undertake to show all of the steps of the exercise, especially the timing that would be critical to the safe and effective containment of any offshore oil spill. This exercise sets out to follow a common and standardised plan for all operations in this region, and it is necessary to ensure that members of the oil spill response team have a clear understanding of their roles and responsibilities to all oil spill incidents. Spills in any of our Varanus hub area, originating from Production, or drilling will involve the coordination of some of the same resources and personnel.

3. DEFINITIONS.

AEL	Apache Energy Limited
DoME	Department of Minerals and Energy
PSLA	Petroleum Submerged Lands Act
SMS	Safety Management System
OH&S	Occupational Health and Safety
PIC	Person in charge

4. REFERENCES.

AE-91-IF-001	Safety Management system
AE-90-IF-002	Occupational Health and Safety
AE-00-EF-008	North West Oil Contingency Plan

5. REPORT

This report will take the exercise from the start illustrating times and events of specific stages. The exercise was arranged and controlled by Paul Lemmon (Leading hand Roustabout,) assuming the role of Team Leader**,** this ensured that all response personnel involved in the activity were familiar with there roles, particularly with regard to the establishment of strategies, communications and rapid deployment of equipment and materials.

The exercise assumes that all personnel are responding to an emergency situation, and the team leader, **has** shown all personnel where they should go, also he will summarise what they should do once they have become aware that an emergency exists.

6.0 EXERCISE

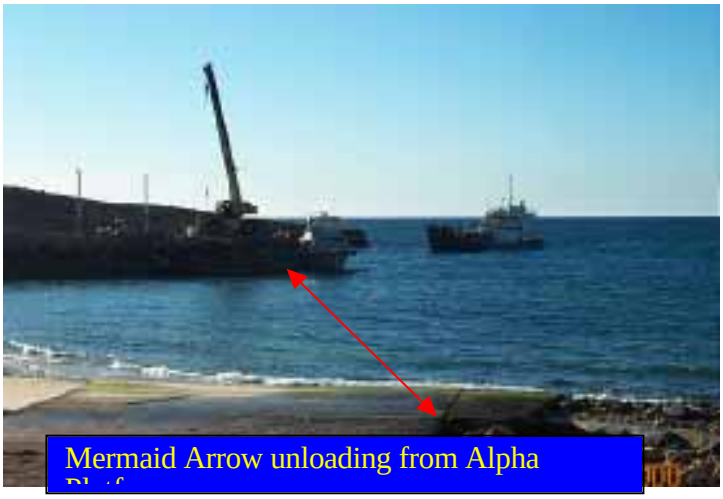
SUNDAY 20/5/01

1330 hrs

Alarm was raised, in keeping with agreed strategy it was decided to run the **Kepner Sea curtain,** (400 Mts) as the main barrier, protecting the adjacent Island

and a 400 foot wing of the **Versatech Zoom Boom** in the bay of the island as a secondary defence against any oil passing the primary barrier.

At the time of the alarm the **Mermaid Arrow,** was on the east wharf, having just been unloaded from the Alpha Platform. The weather was east southeast at less than eight knots, and the tide was in full spring and ebbing



1336 hrs

The **kepner Sea curtain** is at the wharf and being loaded on the mermaid arrow.

The mermaid crew consists of two personnel, there are also five Apache personnel on board for the exercise assisting. These personnel will be known as team One for the exercise

Simultaneously team 2 are hooking up the fast response vessel the **Monte Belle,**

The Monte belle is already loaded with 400 foot of Zoom Boom and its associated anchors.

1339hrs

The **Monte Belle** is launched with 6 Personnel.

1342 hrs

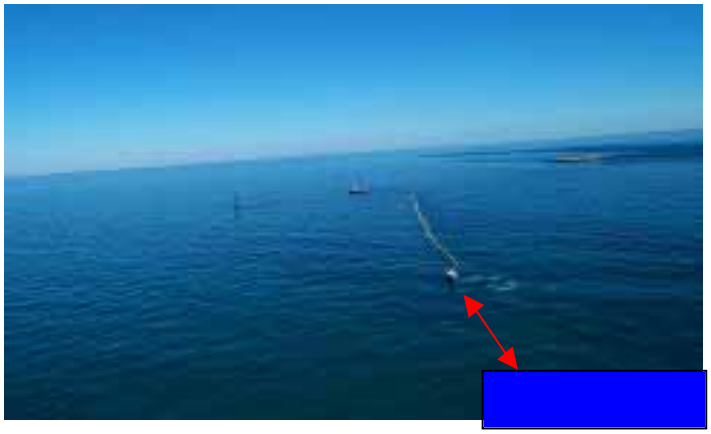
Monte Belle on Site at Simpson awaiting **Mermaid Arrow.**

1346 hrs

Mermaid Arrow on site at **Simpson** ready to start deploying Kepner Sea curtain

1349 hrs

The Monte Belle is made fast to the tail of the Kepner curtain and begins pulling out Curtain.

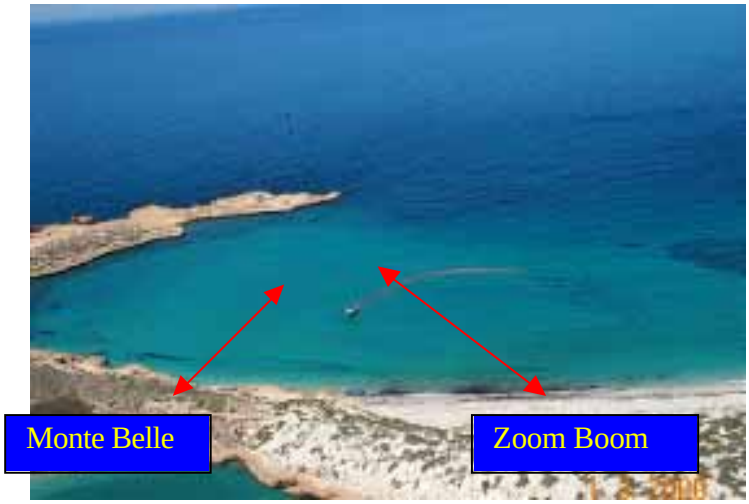


1356 hrs

With 250 Meters of the Sea Curtain deployed the **Monte Belle** leaves the **Mermaid Arrow,** to continue streaming the curtain out.

1359 hrs

The Monte Belle arrives in the bay of the Abolution Island and deploys the Zoom Boom.



1412 hrs

A 400-foot wing of the Zoom Boom is anchored in the bay and the **Monte Belle** leaves to return to the **Mermaid Arrow** to assist.

1418 hrs

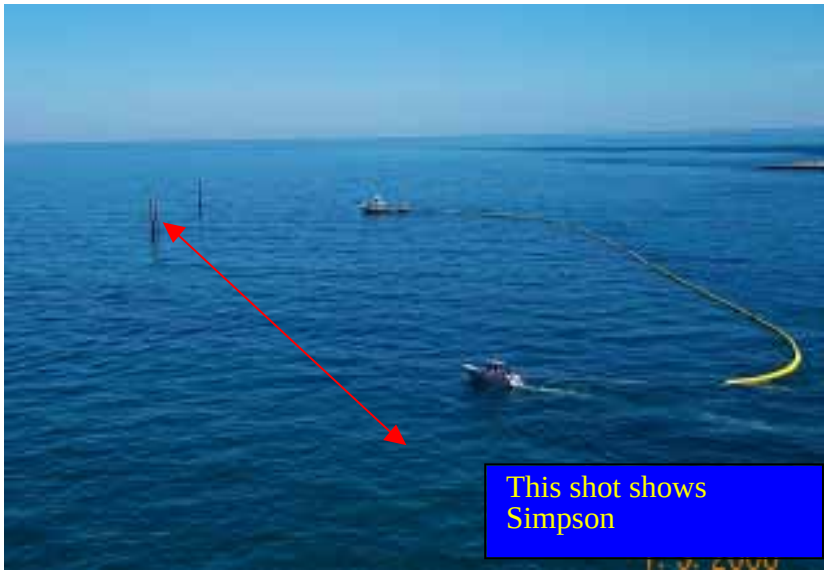
The **Monte Belle** makes fast to the tail of the Kepner Sea Curtain and begins to sweep the boom in Conjunction with the **Mermaid Arrow.**

Pictures of this manoeuvre continued on next page.

1422 hrs The Boom is under control of the two vessels.

Both Vessels continuing a sweeping pattern towards

Different view



This shot shows Simpson

7.0 SUMMARY

In Summary the exercise went very well, and all personnel responded rapidly, the control with the two vessels was good, to control a spill situation, given all the circumstances of this weather pattern, the whole exercise from start to finish took 55 minutes from the point of raising the alarm.