White Opal-1 Exploration Well, Cape Range Peninsula, Shire of Exmouth

Sun Resources NL

Report and recommendations
of the Environmental Protection Authority

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Summary and recommendations

The proponent, Sun Resources NL, proposes to drill a land-based petroleum exploration well ('White Opal-1') on Navy land near Point Murat on the tip of the Cape Range Peninsula in the Shire of Exmouth. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the environmental factors, conditions and procedures relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment 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.

The proposal is also subject to assessment by Commonwealth authorities under the *Environment Protection (Impact of Proposals) Act 1981*.

Relevant environmental factors

Although a number of environmental factors were considered by the EPA in the assessment, it is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in the report:

(a) Subterranean fauna;

(b) Ningaloo Marine Park;

(c) Groundwater quality;

(d) Hydrocarbons (from spills); and

(e) Visual impacts.

The EPA has also provided advice in relation to the EPA's Environmental Protection of Cape Range Province Preliminary Position Statement, which was published in March 1998 (EPA, 1998).

Conclusion

The EPA has considered the proposal by Sun Resources NL to drill the White Opal-1 Exploration Well on the Cape Range Peninsula.

The EPA is aware of the environmental importance of the Cape Range Province, and considers that development and environmental management should be undertaken in a manner which ensures that the long term ability of the area to accommodate human use pressures is not exceeded.

The EPA considers that the proposal can be managed in a manner such that the proposal does not impose an unacceptable impact on the environment, provided that the conditions recommended in Section 4, and set out in formal detail in Appendix 4, are imposed.

Recommendations

The EPA submits the following recommends to the Minister for the Environment:

1. That the Minister considers the report on the relevant environmental factors of Subterranean fauna, Ningaloo Marine Park, Groundwater quality, Hydrocarbons (from spills) and Visual impacts, as set out in Section 3.
2. The Minister notes that the EPA has concluded that the proposal can be managed in an environmentally acceptable manner, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.
3. The Minister imposes the conditions and procedures recommended in Appendix 3 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 Sun Resources NL to drill the White Opal-1 Exploration Well on Cape Range Peninsula is approved for implementation. These conditions are presented in Appendix 3. Matters addressed in the conditions include the following:

(a) the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 3;

(b) the proponent shall prepare a written prescription for contractor work practices covering pre-drilling, drilling and decommissioning, to ensure that work practices are carried out at the level of international best practice; and

(c) the proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit programme prepared by the Department of Environmental Protection in consultation with the proponent.

Contents

1. Introduction and background

The proponent, Sun Resources NL, proposes to drill a land-based petroleum exploration well ('White Opal-1') near Point Murat on the tip of the Cape Range Peninsula in the Shire of Exmouth (Figure 1). The White Opal-1 Exploration Well would be located on Commonwealth (Navy) land approximately 470 metres from the coast, which is also the boundary of the Ningaloo Marine Park. The well will be directionally drilled under the Ningaloo Marine Park to intercept a drilling target at approximately 2 900 metres below sea level (Figure 2).

As the well is situated on Commonwealth land and the resource is a State resource, the proposal is being jointly assessed by the Environmental Protection Authority (EPA) and Environment Australia. The EPA has been nominated as lead agency for the joint assessment, and the Department of Environmental Protection (DEP) will coordinate the assessment. The proposal is being assessed at the level of Public Environmental Review at the State level / Public Environment Report at the Commonwealth level (PER). Both the EPA and Environment Australia will prepare separate reports to their respective Ministers according to the requirements of the WA Environmental Protection Act and the Federal Environment Protection (Impacts of Proposals) Act.

The EPA will produce its assessment report first and this will be followed by a Commonwealth assessment report. Under the Western Australian system, the Minister for the Environment is responsible for giving environmental approval for proposals. In the Commonwealth system, the relevant Action Minister (in this case the Minister for Resources and Energy) gives approval, on advice from the Commonwealth Minister for the Environment.

Further details of the proposal are presented in Section 2 of this Report. Section 3 discusses environmental factors relevant to the proposal. Conditions and procedures to which the proposal should be subject if the Minister determines that it may be implemented are set out in Section 4. Section 5 presents the EPA's conclusions and Section 6 the EPA's recommendations.

A list of people and organisations that made submissions is included in Appendix 1. References are listed in Appendix 2, and recommended conditions and procedures and proponent's commitments are provided in Appendix 3.

The DEP's summary of submissions and the proponent's response to those submissions has been published separately and is available in conjunction with this report.

2. The proposal

Sun Resources NL propose to drill and evaluate a land-based exploration well, White Opal-1, on Cape Range Peninsula for a gas and oil target. The current proposal does not include any future plans to develop a gas or oil field.

The proposed White Opal-1 well is located near Point Murat on the north eastern tip of Cape Range Peninsula (grid co-ordinates 21°48' 57.46"S, 114°11'02.57"E) see Figure 1. The marine waters of the Ningaloo Marine Park are located approximately 470 metres to the southeast and 550 metres to the north of the project area.

Drilling of the White Opal-1 well will intersect a series of geological formations before reaching the hydrocarbon prospect, which is located within the Triassic-aged Mungaroo Formation. A cross section of the proposed drilling operations, illustrating these formations, is given in Figure 2. Based on the most recent interpretation of seismic data, the potential reserves of the drill target are estimated at 247 million barrels of oil or 880 billion cubic feet of gas, or a combination of both (Martinick McNulty, 1998).

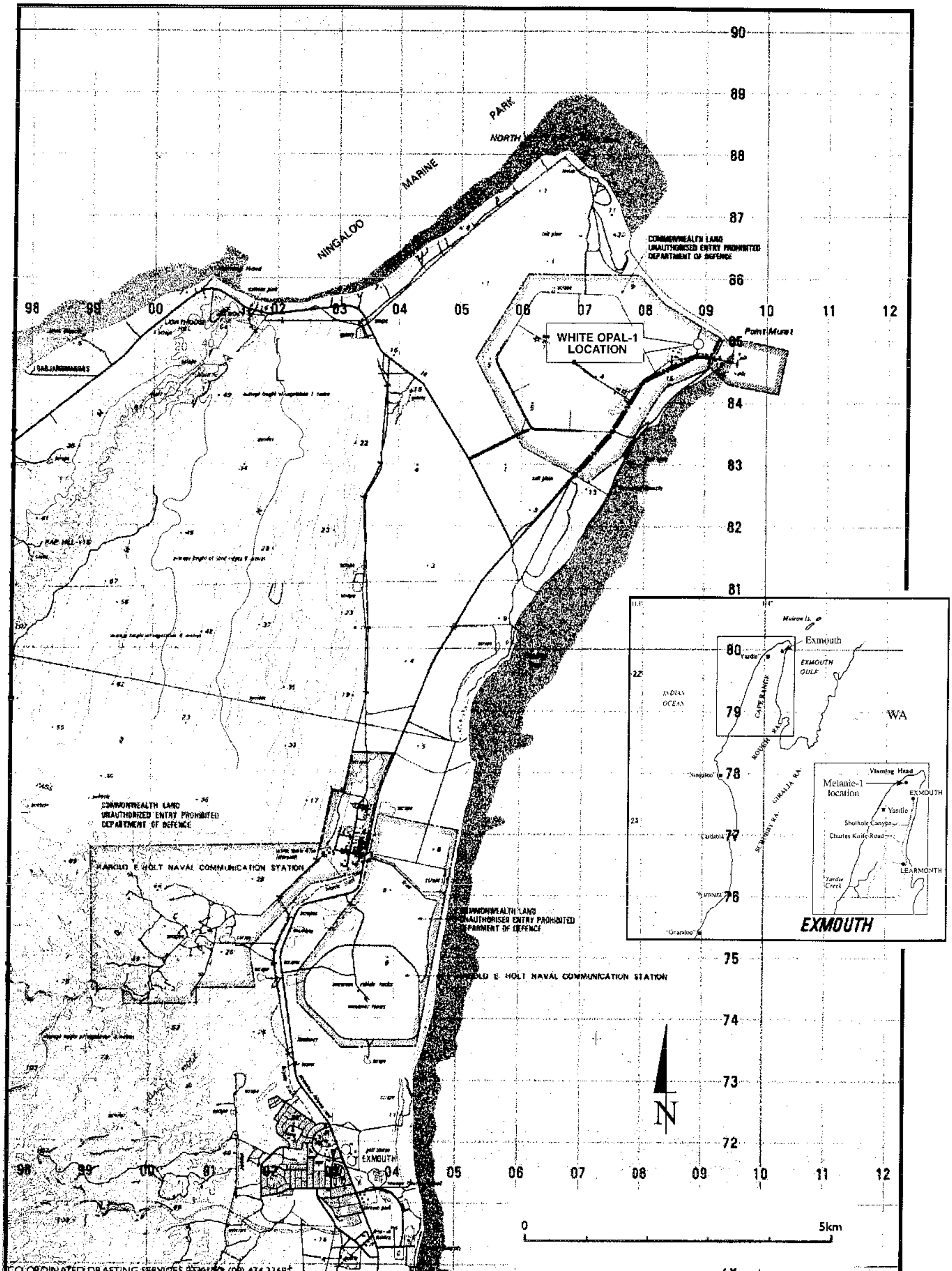

Figure 1. Location of the White Opal-1 well.

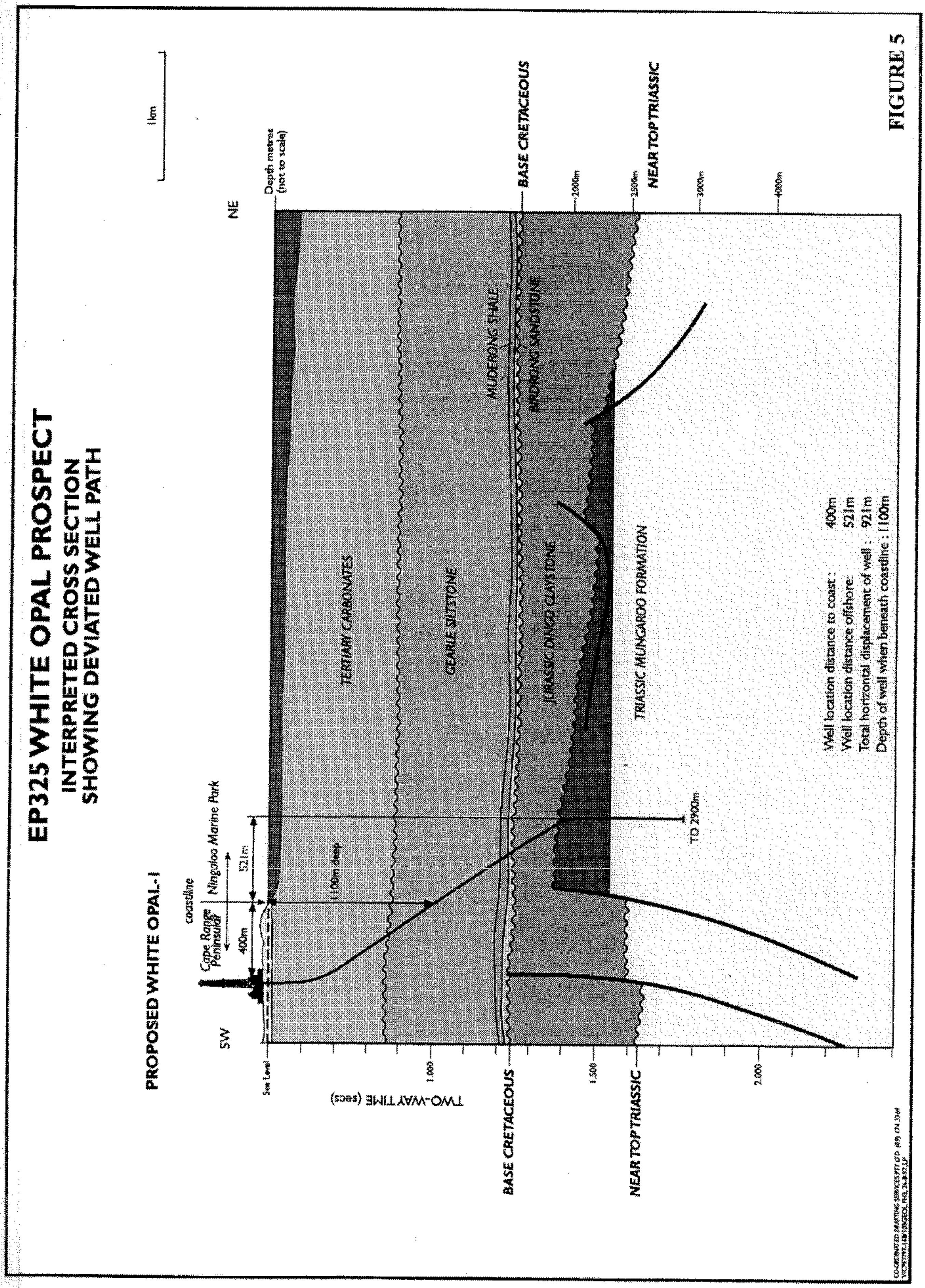

Figure 2. Cross section of drilling operation.

Drilling proposal characteristics are summarised in Table 1 below. Establishment of the drilling site will include the construction of several level pads for various infrastructure, establishing a cellar, which is an excavated area surrounding the hole which is to be drilled, a sump to contain all drilling wastes, and a flare pit to flare hydrocarbons in the event of testing the formation. The total area required for the project area is approximately 1 ha, with an additional 0.25 ha if a rig camp is required to be established on site.

During drilling, between 550 and 750 kilolitres of water will be required, assuming that no lost circulation occurs and that water will be recycled within the drilling circuit. Should lost circulation occur during drilling, the water requirement will increase to approximately 1 250 kilolitres. The water required for drilling will be sourced from an existing pipeline located in close proximity to the project area. This pipeline is part of the Naval Communications power station and returns clean seawater from the station to the jetty at Point Murat.

Table 1. Summary of key proposal characteristics

Proposal characteristic	Description
Life of project	8 weeks
Purpose	exploration for gas/oil
Area of disturbance	100 m x 100 m plus 0.25 ha if rig camp required
Depth of well	• Total vertical depth: 2900 m • Total measured depth: 3140 m
Width of well bore	60 mm to 216 mm diameter
Casing of well	Casing introduced at 20, 250 and 1720 m below surface
Sump	20 m x 20 m x 4 m - capacity 1200 m^3
Flare pit	6 m x 3 m x 2 m with firewall on three sides
Drilling cellar	2 m x 2 m x 1.5 with steel reinforcement of walls
Water	• Source: clean saltwater from existing pipeline • Quantity required: initially 950 to 2300 litres/minute until the well is fully cased. Thereafter it will be recycled • Disposal: water which is not lost to cavernous formations during drilling will be recycled within the drilling circuit and disposed of into the sump
Drilling fluids	• Type: Surface to 250 m - water, bentonite, lime and caustic soda. 250 m to final depth - water and potassium chloride polymers • Quantity: max 600 m^3 • Disposal: waste drilling fluids which are not lost to cavernous formations during drilling will be disposed of into the sump
Drilling waste (cuttings and drill waste)	• Quantity: approx 200 m^3 • Disposal: drilling wastes which are not lost to cavernous formations during drilling will be disposed of into the sump. When dry, the wastes will be removed and disposed of to the requirements of the Shire of Exmouth

Drilling will be to a total vertical depth of 2900 metres and a total measured depth of 3140 metres. The upper 250 metres of the well consists of tertiary limestone formations, of which the section to 40 metres below sea level is expected to be cavernous. This upper 250 metres will be drilled with the aid of water and drilling fluids consisting of bentonite (a naturally occurring clay), lime and caustic soda, and will be fully cased and cemented immediately after drilling. After casing this section, the well will be drilled to a depth of approximately 2900 metres using a water-based potassium chloride polymer. In the event of a gas and/or oil discovery, the well will be production tested prior to appraisal of the field for possible production. In the event that hydrocarbons are found in potentially commercial volumes, the well will be fully cased and suspended pending a decision on commercial development. Any proposal to develop a production well at the site would require separate environmental impact assessment. If hydrocarbons are not found in commercially viable quantities the well will be plugged and abandoned close to ground level, and marked in accordance with the requirements of the Department of Minerals and Energy (DME).

After drilling, the site will be decommissioned and rehabilitated, with all infrastructure removed and any disturbed vegetation or terrain rehabilitated. Drilling is expected to be completed within four weeks, and the entire operations expected to last for a maximum of eight weeks.

A detailed description of the proposed project is provided in Section 5 of the White Opal-1 Exploration Well, Cape Range Peninsula PER (Martinick McNulty Pty Ltd, 1998).

3. Environmental factors

3.1 Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment 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.

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) Subterranean fauna - contamination of cavernous limestone habitat during drilling;

(b) Ningaloo Marine Park - contamination through surface and sub-surface seepage;

(c) Groundwater quality - contamination from drilling and waste disposal;

(d) Hydrocarbons (from spills) - land and sub-surface contamination; and

(e) Visual impacts - effects upon visual amenity.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the PER document and the submissions received, in conjunction with the proposal characteristics (including significance of the potential impacts) and the adequacy of the proponent's response and commitments. On this basis, the EPA considers that the preliminary factors:- turtles; terrestrial flora, Declared Rare and Priority Flora and endangered species; terrestrial fauna, threatened fauna and endangered species; drilling fluids; social impacts; and heritage, and other issues raised in the submissions do not require further evaluation by the EPA. These matters were considered to be either effectively managed by proponent commitments or not to involve significant impacts. The identification process is summarised in Table 2.

The relevant environmental factors are discussed in Sections 3.2 to 3.6 of this report.

3.2 Subterranean fauna

Description

The diversity and significance of subterranean fauna of the Cape Range Peninsula, and the state of knowledge of this fauna, is discussed in the EPA's report and recommendations for the Melanie-1 Exploration Well (Bulletin 865) (EPA, 1997).

The White Opal-1 well will traverse a number of geological formations, as illustrated in the well schematic diagram (Figure 3). In the vicinity of the project area, the Trealla limestone formation is likely to be cavernous (karstic) to a depth of approximately 40 m below sea level.

Subterranean fauna may exist in the cavernous formations of the geological profile. Potential contamination of the subsurface environment, and resultant impacts on subterranean fauna, may occur as a result of spillage or seepage of hydrocarbons, drilling additives and drilling wastes associated with drilling operations. Disposal of waste water into the sump may also result in groundwater contamination as waste water will seep through the sand of the project area and into the groundwater. Additionally, localised loss of subterranean fauna habitat through infilling of caverns by drilling wastes, drilling fluids and sealing cement may occur during drilling.

The proponent has undertaken subterranean fauna sampling of bores in the vicinity of the project area. This sampling did not locate any subterranean fauna specimens. On the basis of water quality observed in nearby bores, Dr Brenton Knott from the University of Western Australia has stated that he considers it is unlikely that subterranean fauna will exist in the vicinity of the White Opal well due to high salinity levels ranging from 21 000 to 32 000 mg/L (Martinick McNulty, 1998) and the presence of hydrogen sulfide.

One submission received expressed concern that, as little is known about subterranean fauna, it can not be determined whether or not the proposal will impact upon the fauna. It was therefore suggested that the precautionary principle be used during assessment of this proposal.

The DME also noted that sampling of subterranean fauna undertaken to date occurred within the sand profile and not the limestone sections within which the majority of the subterranean fauna would be found (if present).

Assessment

Subterranean fauna exists throughout the karst landform system of the Cape Range Peninsula. Species diversity of subterranean fauna is considered by Humphreys and Adams (1993) to be variable within three regions of the Cape, referred to as upper, central and lower regions, and also between coastal and upland areas. Therefore, the area considered for assessment of this relevant environmental factor, subterranean fauna, is the karst landform of the northern coastal area of the Cape Range Peninsula, including the fringing reef.

The EPA's objective in regard to this environmental factor is to maintain the abundance, species diversity and geographical distribution of subterranean fauna, and to ensure that subterranean fauna are protected in accordance with the Wildlife Conservation Act and the Endangered Species Protection Act.

Although subterranean fauna sampling undertaken by the proponent did not locate any subterranean fauna specimens, there is the potential that subterranean fauna may exist in the cavernous (karst) formations of the geological profile. In the vicinity of the project area, this cavernous formation is expected to occur to a maximum of 40 metres below sea level. Potential impacts on subterranean fauna in the vicinity of the project area include loss and contamination of habitat.

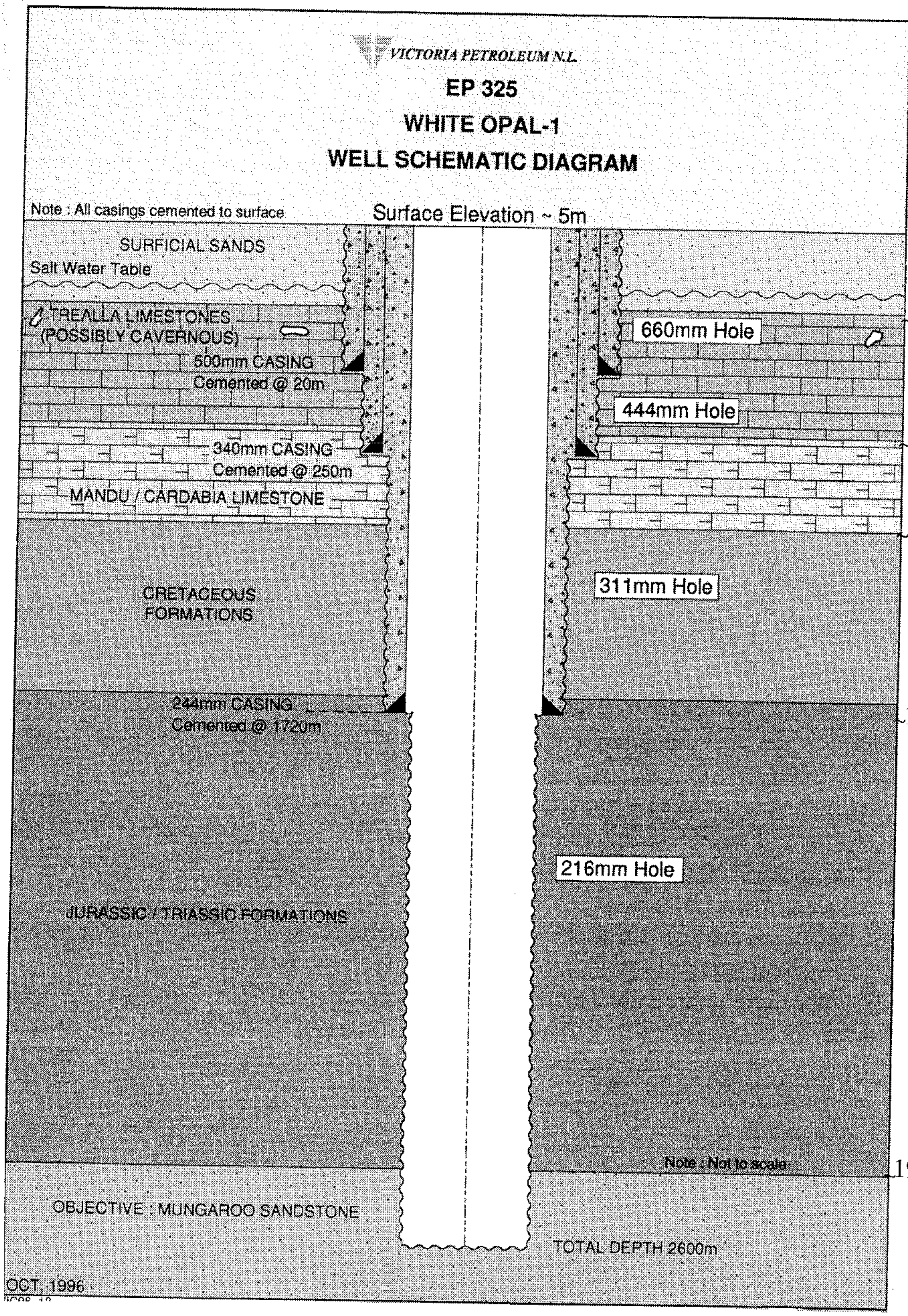

Figure 3. Well schematic diagram.

During drilling of the cavernous sections there is potential for impacts on the subterranean environment from contamination by hydrocarbons, drilling fluids and drilling wastes. Contamination of groundwater is discussed more fully in Section 3.4: Groundwater quality. Section 3.5 discusses the potential for hydrocarbon spills to occur as a result of the project.

The proponent has made a commitment to use non-toxic drilling fluids during the drilling of this section (commitment 5). Furthermore, the proponent will fully case and pressure test the cavernous section prior to drilling the remaining section of the well (commitment 6). This will reduce the potential for seepage of drilling fluids, drilling wastes and any hydrocarbons into the cavernous formation, and therefore reduce the potential for contamination of the subterranean environment and for potential impacts on subterranean fauna. After drilling through this cavernous section, the lower formations are expected to be relatively impermeable, and seepage into the subsurface environment is considered unlikely. Waste drilling fluids will have a total dissolved solids content similar to that of the groundwater beneath the project area. Waste fluids will be disposed of into the sump, and will seep through the sand of the project area and into the groundwater. As the concentrations of drilling fluids used meet Australian and New Zealand Environment and Conservation Council (ANZECC) and EPA guidelines for fresh and marine waters, it is unlikely that recharge of groundwater from the sump will result in contamination of groundwater.

Drilling wastes, consisting of fine limestone particles, may result in a temporary increase in turbidity of the groundwater in close proximity to the well. This increase in turbidity will be temporary, and is not expected to have significant long-term impacts on any stygofauna which may exist below the project area.

Drilling may result in the localised loss of subterranean fauna habitat due to infilling of caverns by drilling wastes, fluids and sealing cement which will be used to case and seal the upper section of the well. The proponent has estimated that a maximum of 16.5 m^3 may be infilled. On a regional basis, this 16.5 m^3 loss of cavernous space is considered to be insignificant.

The EPA notes:

- the significance of subterranean fauna of the Cape Range Peninsula; and
- that subterranean fauna sampling undertaken by the proponent to date utilised existing boreholes in the vicinity of the project area. These existing bores did not extend to a depth beyond the sand profile, and therefore sampling did not occur within the cavernous formation where subterranean fauna is most likely to exist. However, advice from the University of Western Australia indicates that, on the basis of water quality observed in nearby bores (high levels of salinity and hydrogen sulfide), it is unlikely that subterranean fauna will exist in the vicinity of the White Opal well. Even if they did occur, the area of impact of the well bore would not be great.

Having particular regard to the:

1. water quality of the area being unfavourable for subterranean fauna;
2. proponent's statutory obligations under the *Wildlife Conservation Act 1950,* and
3. proponent's commitments to reduce the potential for contamination of the subterranean environment (commitments 5 and 6),

it is the EPA's opinion that the proposal can meet the EPA's objective for subterranean fauna.

3.3 Ningaloo Marine Park

Description

This section addresses the potential for contamination of the Ningaloo Marine Park through surface and subsurface seepage of hydrocarbons, drilling additives and fuel. At its closest point, the coastline and border of the Ningaloo Marine Park is approximately 470 m to the southeast of the project area. The coast and the project area are separated by 18 m high sand dunes to the northwest and a sealed road and undulating sand dunes to the east/southeast. The marine waters of the park are linked to the project area in the subsurface environment through tidal movement, with the aquifer being in hydraulic continuity with the sea.

The potential for contamination of groundwater by hydrocarbons, drilling fluids and drilling wastes is discussed below in Section 3.4: Groundwater. Section 3.5 discusses the potential for hydrocarbon spills to occur as a result of the project.

A number of submissions from conservation groups raised concerns regarding the potential for oil spillages to affect the Ningaloo Marine Park.

Assessment

The area considered for assessment of this factor is the Ningaloo Marine Park in the vicinity of Point Murat.

The EPA's objective in regard to this environmental factor is to protect the conservation values, biodiversity and ecosystem functions of Ningaloo Marine Park.

The proponent has made a number of commitments to reduce the potential for surface and subsurface spillage or seepage of hydrocarbons, drilling fluids and drilling wastes (commitments 4, 5 and 6). In the event that leakage or spillage of hydrocarbons may have occurred and inadvertently resulted in the contamination of the surface or subsurface environment, the proponent has made commitments to contain and remove all surface spillages and to restore groundwater quality (commitments 4 and 7).

Given the proponent's commitments regarding prevention and containment of any spillages, combined with the fact that the project area is approximately 470 m away from the coast, it is considered unlikely that any impacts on the surface or subsurface environment in the vicinity of the project area will result in contamination of the Ningaloo Marine Park.

In response to public submissions, the proponent has outlined that there is a negligible risk of pollution of the land or marine environment occurring. Seepage of contaminants to the Ningaloo Marine Park can only occur if hydrocarbons are present in the well and the casing fails (estimated at 1 in 1 million risk of casing failure), or an uncontrolled spillage occurs with no subsequent remedial action.

The EPA notes:

- the significance of the marine environment in the vicinity of the proposal;
- that the groundwater beneath the project area is in hydraulic continuity with the ocean; and
- the extremely low probability of casing failure (and release of hydrocarbons).

Having particular regard to the:

(a) fact that the proposed site is located approximately 470 m from the border of the Ningaloo Marine Park and the topographical features which would prevent surface drainage to the coast;

(b) casing and pressure testing of the well to prevent surface and subsurface contamination by hydrocarbons and drilling fluids; and

(c) the proponent's commitments to reduce the potential for contamination of the surface and subsurface environment (commitments 4, 5 and 6),

it is the EPA's opinion that the proposal can meet the EPA's objective for the Ningaloo Marine Park.

3.4 Groundwater quality

Description

The proponent has obtained information regarding groundwater characteristics in the area from existing bores in the vicinity of the project area. The quality of water in these bores indicates that the groundwater in the vicinity of the project area is highly saline with the quantity of total dissolved solids ranging from 21 000 to 32 000 mg/L. The groundwater beneath the project area is in hydraulic continuity with the sea and it rises and falls with tidal fluctuations. The mean water level beneath the project area is expected to be approximately 5 m below the surface.

The proposal has the potential to contaminate groundwater in the vicinity of the project area through spillage or seepage of hydrocarbons, drilling additives, drilling wastes and fuels associated with drilling operations. Disposal of waste water into the sump may also result in groundwater contamination as waste water will seep through the sand of the project area and into the groundwater.

Contamination of groundwater, and the resultant contamination of the Ningaloo Marine Park was raised in submissions.

Assessment

The groundwater beneath the project area is in hydraulic continuity with the ocean. Therefore, the area considered for assessment of this factor is the aquifer beneath the project area and between the project area and the extent of the fringing reef.

The EPA's objective in regard to this environmental factor is to ensure that existing and potential groundwater uses, including ecosystem maintenance, are protected, consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993) and the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, 1992).

The proposal has the potential to contaminate groundwater in the vicinity of the project area through surface and subsurface spillage or seepage of hydrocarbons, drilling additives, drilling wastes and fuels associated with drilling operations. Disposal of waste water into the sump may also result in groundwater contamination as waste water will seep through the sand of the project area and into the groundwater.

The potential for contamination of groundwater through drilling is restricted to drilling through the cavernous formations expected to occur within the surface 45 metres of the geological profile. Drilling through this section will result in loss of some, if not all, water and drilling fluids.

The proponent has made a commitment that the cavernous section of the well will be cased and pressure tested to prevent the contamination of the cavernous section by any waste material produced whilst drilling into the non-cavernous formation below 250 m (commitment 6). This will involve casing the well through the Trealla limestone formation (to an estimated depth of 250 m, of which the first 45 m are expected to be cavernous), and cementing down the inside of the well casing in order to cement the base of the casing. From the base upward, cement will fill the annular space between the casing and the wall of the well hole.

During drilling through the cavernous formation, and prior to this section being cased, the proponent has indicated that a drilling fluid consisting of a mixture of water with some bentonite (a naturally occurring clay), lime and caustic soda will be used. Drilling additives, combined with drilling wastes generated from drilling through this section, may result in an increase in turbidity of groundwater, however this increase is expected to be localised and temporary. After casing and sealing of this section, a water-based potassium chloride polymer will be used to facilitate drilling. The proponent has outlined that these drilling fluids will be used in non-toxic concentrations which are within ANZECC and EPA guidelines for fresh and marine waters. ANZECC criteria and concentrations of additives to be used in the drilling of the White Opal well (as calculated by Martinick McNulty, 1998) are summarised in Table 2 below.

Table 2. ANZECC Water Quality Guidelines and proposed concentrations of additives used for drilling the White Opal well.

Parameter	Likely concentrations	ANZECC water type	ANZECC Guideline value
Chloride (Cl^-)	30 - 40 mg/L	Raw drinking water	400 mg/L
Chloride (Cl^-)	30 - 40 mg/L	Fresh waters	<1000 mg/L*
Potassium (K^+)	30 - 40 mg/L	No values listed	N/A

* This value is used loosely as it is for salinity. Cl^- is a major component of most salts.

Hydrocarbon contamination of the surface and subsurface environment has the potential to occur only after drilling of the lower sections of the well have intercepted the target reservoir. The potential for hydrocarbon spills, and resultant impacts, is discussed in Section 3.5 below.

The potential for surface spillage and resultant seepage into the groundwater is minimal. The proponent has made a commitment to implement a number of operational methods to prevent the spillage of waste and drilling materials (commitment 4). Implementation of this commitment will reduce the potential for contamination of the surface environment. Waste drilling fluids produced during drilling will have a total dissolved solids content similar to that of the groundwater beneath the project area. Waste fluids will be disposed of into the sump, and will seep through the sand of the project area and into the groundwater. As the concentrations of drilling fluids used meet ANZECC and EPA guidelines for fresh and marine waters, it is unlikely that recharge of groundwater from the sump will result in contamination of groundwater.

The proponent has made a commitment that, in the event that leakage or spillage of hydrocarbons may have occurred and inadvertently resulted in the contamination of groundwater, the proponent will take action to identify whether groundwater contamination has occurred, and to restore the groundwater quality (commitment 7).

The EPA understands that it is likely that minor amounts of additional additives may be required during drilling. Additionally, it is understood that a number of other drilling materials, such as pipe dope, are required to be used during drilling. To ensure best practice for drilling in an environmentally sensitive area, the EPA will require the proponent to use least toxic materials.

Having particular regard to the:

(a) proposed concentrations of drilling fluids meet ANZECC and EPA guidelines for fresh and marine waters;

(b) potential impacts on groundwater quality resulting from drilling wastes will be limited to localised and temporary increases in suspended solids;

(c) the well will be cased and pressure tested to prevent surface and subsurface contamination by hydrocarbons and drilling fluids;

(d) the proponent's commitments to reduce the potential for contamination of groundwater (commitments 4, 5 and 6); and

(e) EPA's recommended condition regarding contractor work practices to ensure that work practices are carried out at the level of international best practice,

it is the EPA's opinion that the proposal can meet the EPA's objective for groundwater quality.

3.5 Hydrocarbons (from spills)

Description

The current proposal to drill the White Opal-1 exploration well is to investigate the petroleum and gas resources which may exist under the project area. Based on the most recent interpretation of seismic data, the potential reserves of the drill target are estimated at 247 million barrels of oil or 880 billion cubic feet of gas, or a combination of both. The likelihood is higher for a discovery of predominantly natural gas (rather than oil) as the drill target is located near to the existing gas discoveries of Macedon/Pyrenees and Rivoli.

The DME has a number of safety and environmental conditions relating to the drilling of all petroleum exploration wells. The proponent must comply with these conditions during drilling the proposed White Opal-1 exploration well.

The potential for surface spillage of hydrocarbons is limited to accidental spillage of oil brought to the surface from the geological formation potentially containing hydrocarbons. In the event of a gas and/or oil discovery, small samples will be collected for analysis, and the balance will be flared on site. In the PER, the proponent states that the possibility of a large scale spillage of hydrocarbons at the surface of the project area is highly unlikely.

The potential for subsurface seepage of hydrocarbons is limited to seepage through the cavernous limestone formation expected in the first 45 m of drilling. The remaining geological formations below the cavernous section are of comparatively low permeability and any seepage can only extend for very small distances and would be confined to the immediate vicinity of the well.

Surface and subsurface spillages of hydrocarbons have the potential to result in groundwater contamination (see Section 3.4: Groundwater quality). As the groundwater beneath the project area is in hydraulic continuity with the ocean, lateral movement of contaminated groundwater may result in impacts on the adjacent marine environment.

Concerns regarding the potential for surface and subsurface spillages of hydrocarbons, and the resultant impact such spillages may have on the marine environment, were raised in a number of submissions. One submission stated that a contingency plan to deal with any pollution instance should be developed.

Assessment

Hydrocarbons have the potential to contaminate the surface of the land in close proximity to the well, and subsurface cavernous formations. Both surface and subsurface hydrocarbon spillages have the potential to result in contamination of groundwater and subsequent contamination of the adjacent marine environment. Therefore, the relevant area for this factor is considered to be the land in close proximity to the well, subsurface cavernous formations beneath the project area (estimated to occur to a maximum depth of 40 metres below sea level) and the marine environment in the vicinity of the project area.

The EPA's objective in regard to this environmental factor is to ensure that contamination of land, groundwater and/or the marine environment does not occur.

Through the cavernous formation expected in the first 45 m of drilling, the drilling circuit will be cased and pressure tested to prevent potential seepage of hydrocarbons. The method of casing the well is outlined above in Section 3.4: Groundwater quality. The well will be pressure tested prior to drilling the geological formation which may contain gas and/or oil, as required by the safety and environmental conditions of DME. Drilling will not proceed unless adequate pressure is maintained to demonstrate that there is no potential for subsurface seepage.

DME (1997) calculated the risk of a blow-out occurring and the potential for well casing failure for the assessment of the Melanie-1 exploration well. This risk calculation is considered applicable to the White Opal-1 exploration well.

Six petroleum well blow-outs have occurred Australia-wide in the last 30 years. No blow-outs have ever been reported in WA. The White Opal-1 reservoir is not considered to be over pressured, further reducing the probability of a blow-out occurring. The risk of a blow-out is further reduced by the presence of a Blow-out Prevention system which will be fitted prior to drilling below the surface casing, as required by DME. Furthermore, the main resource target for the White Opal-1 well is considered to be gas. If a blow-out did occur, produced water, condensate and gas would preferentially flow into the well pipe. The risk of an oil spill under these conditions would therefore be negligible.

The well will be cased through the first 250 m, of which the first 40 m is likely to be cavernous. The risk of this casing failing was calculated by DME in 1997 during the assessment of the Melanie-1 well, and it was estimated that the risk of casing failure is 1×10^{-6}. The proponent has outlined that a number of management measures will be implemented to reduce the probability of a spill contacting sensitive areas (referred to as secondary risk). Casing of the White Opal-1 well involves sealing the well by cementing down the inside of the well casing (see Section 3.4: Groundwater quality). This cement will provide an additional barrier to potential contaminants. Furthermore, the blow-out prevention valves, mentioned above, will be located in succession in the top of the well in a manner designed to seal the well in the event of a blow-out or "kick" (partial loss of well control), further reducing the potential for secondary risk.

The EPA considers that the risk associated with casing failure, and resultant contamination of the subterranean environment, is sufficiently low as to be acceptable.

In the event of an oil and/or gas discovery, small samples of material will be brought to the surface for analysis. Any excess oil and/or gas will be flared on-site to reduce the risk of spillages. In the event of an accidental surface spillage, all affected soil will be removed and disposed of according to the requirements of the Shire of Exmouth and to a site appropriately licensed by the DEP for the disposal of such wastes.

Given the proponent's commitments regarding prevention, containment and clean up of surface and subsurface spillages, combined with the fact that the project area is approximately 470 m away from the coast, it is considered extremely unlikely that any impacts on the surface or subsurface environment in the vicinity of the project area will result in contamination of the adjacent marine environment.

The EPA notes that DME has a number of safety and environmental conditions relating to the drilling of all petroleum exploration wells. These include:

- petroleum obtained from land covered by a petroleum title shall be properly confined in accordance with good oil field practice;
- surface casing shall be set at least 25 m into a competent formation and the minimum surface casing requirement is 20 m;
- drilling operations and operations to complete or test an exploration well are only permitted to commence after a satisfactory pressure test of all casing strings has been completed, to ascertain that there is no continuous pressure drop. The results must be recorded in the driller's log;
- surface and conductor casing strings are cemented with a volume of cement sufficient to fill the annular space between the casing string and the hole from the shoe of the casing to the surface;
- blow out preventers and related well control equipment shall be installed, operated, maintained and tested in accordance with practices recommended by DME;
- blow out preventer drills are conducted weekly for each drilling crew to ensure that all equipment is operating and that crews are properly trained to carry out emergency duties; and
- an emergency response manual will be prepared.

These conditions will be complied with or exceeded when drilling the proposed White Opal-1 petroleum exploration well. Any fuel associated with the proposal will be stored in accordance with the requirements of DME and Dangerous Goods Legislation.

Furthermore, the EPA notes that, if hydrocarbons are not found in commercially viable quantities, the well will be plugged and abandoned close to ground level and marked in accordance with the requirements of the DME. These requirements include inserting cement plugs at given depths within the well to prevent the possible leakage of hydrocarbons after plug and abandonment. The potential for hydrocarbon leakage from a plugged and abandoned well is considered to be extremely low.

Should hydrocarbons be found in commercially viable volumes, the White Opal-1 well will be fully cased and suspended as required by DME. Further environmental impact assessment will then be required to decide whether approval will be given for commercial abstraction of these hydrocarbons.

Having particular regard to the:

(a) fact that the proponent must comply with statutory safety and environmental conditions relating to the drilling of White Opal set by DME;

(b) fact that the well will be plugged and abandoned close to ground level if hydrocarbons are not found in commercially viable quantities. If hydrocarbons are found in commercially viable quantities, the well will be fully cased and suspended prior to any commercial abstraction of hydrocarbons;

(c) fact that, in view of the management commitments made by the proponent, the potential for subsurface leakage and surface spillage of hydrocarbons is considered extremely unlikely. In the event that contamination does occur, it is considered unlikely that subsequent contamination of the adjacent marine environment will occur due to the distance of the project area from the coast;

(d) proponent's commitments to reduce the potential for hydrocarbon spillage and subsequent contamination of the surface and subsurface environment (commitments 4 and 6); and

(e) EPA's recommended condition regarding contractor work practices to ensure that work practices are carried out at the level of international best practice,

it is the EPA's opinion that the proposal can meet the EPA's objective for hydrocarbons (from spills).

3.6 Visual impacts

Description

Cape Range Peninsula is a major tourist area, and is renowned for its aesthetic and wilderness values. There is concern that exploration drilling on the peninsula will impact upon these values, which will in turn impact upon tourism in the area. Two major parks, Cape Range National Park and the Ningaloo Marine Park, have been established on the Cape. The proximity of these parks in relation to the project area is illustrated in Figure 4.

The project area is located near the tip of Point Murat in an area which has a number of industrial features, such as diesel storage tanks and communication towers. The mast of the drilling rig, which is 45 m high, will be visible for approximately 4 weeks from vessels along the coast in the vicinity of the project area and from the sealed road that connects Exmouth to Point Murat, however it will not be visible from the major tourist drives or vantage points in the area.

A submission from the Western Australian Tourism Commission raised concerns that the proposal would impact on tourism. The submission stated that the area is marketed for its 'wilderness experience' and 'pristine beauty', and that the establishment of a drilling well could have negative impacts on the value of this area as a tourism destination.

Assessment

The area considered for assessment of this factor is considered to be the area within the visual range of the project area.

The EPA's objective in regard to this environmental factor is to ensure that the visual amenity of the area is not unduly affected.

The project area will be visible from vessels along the coast in the vicinity of the project area and from the sealed road that connects Exmouth to Point Murat. However, the site will not be visible from the major tourist drives or vantage points in the area, such as the Yardie Creek Road and the Vlaming Head Lighthouse.

When compared to other areas of the Cape Range Peninsula, the aesthetic and wilderness values of the area in the vicinity of the project area are considered to be somewhat reduced by the presence of a number of industrial features, including diesel storage tanks and communication towers. Therefore the presence of a drilling rig in this area is not considered likely to detract from the visual amenity of the area.

The proponent has indicated that the area required for the operations will be kept to a minimum, and that the project area will cover approximately 1 hectare, with possibly another 0.25 hectares if a drill camp is required to be established on site. The proponent has outlined that drilling operations are expected to be completed within eight weeks, with the drilling rig mast visible for only four weeks, and that the area will be rehabilitated upon decommissioning. Therefore any impacts on the visual amenity of the area will be of a temporary nature.

Having particular regard to the:

(a) fact that the visual amenity of the area is already degraded by industrial structures;

(b) the drilling rig will not be visible from major tourist drives and vantage points;

(c) any visual impacts associated with the proposal will be temporary; and

(d) the proponent's commitments to rehabilitate the area after completion of drilling,

it is the EPA's opinion that the proposal can meet the EPA's objective for visual impacts.

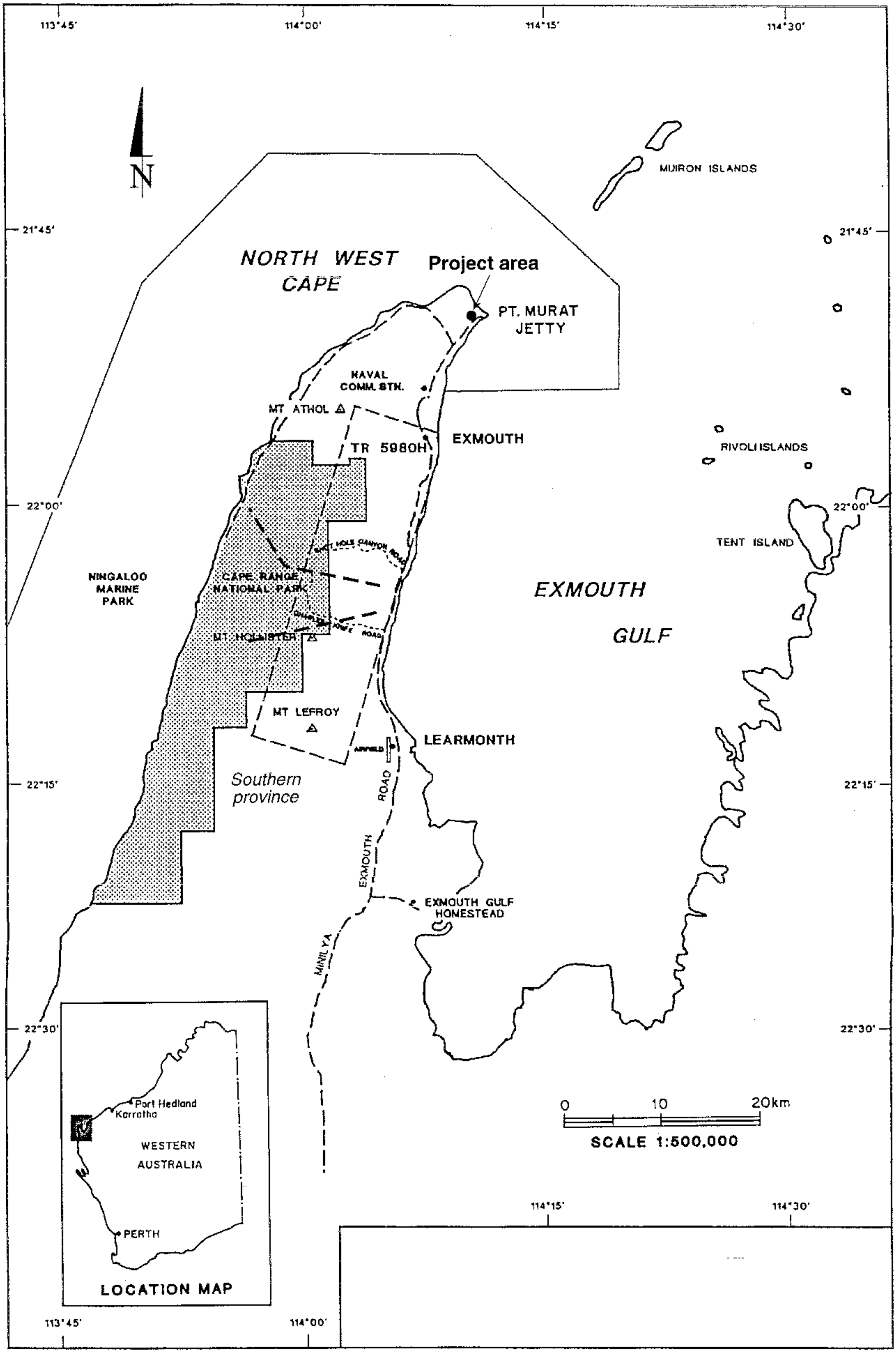

Figure 4. Location of the project area in relation to the Ningaloo Marine Park and Cape Range National Park .

4. Conditions

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment 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.

The EPA may, of course, also recommend conditions additional to that relating to the proponent's commitments.

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 Sun Resources NL to drill the White Opal-1 exploration well, is approved. These conditions are presented in Appendix 3. Matters addressed in the conditions include:

(a) the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 3;

(b) the proponent shall prepare a written prescription for contractor work practices covering pre-drilling, drilling and decommissioning, to ensure that work practices are carried out at the level of international best practice for drilling in environmentally sensitive areas; and

(c) the proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit programme prepared by the Department of Environmental Protection in consultation with the proponent.

5. Other advice

In March 1998, the EPA released a preliminary Position Statement titled 'Environmental Protection of Cape Range Province' (EPA, 1998). The preliminary statement was made available for public comment, and a final Position Statement is currently being finalised.

The Position Statement identifies the importance of the Cape Range Province, and outlines a number of principles to be used during environmental assessment and decision making to ensure environmental protection of the cape. Environmental assessment of the White Opal Exploration Well has been undertaken in accordance with these principles.

The EPA notes that the proposal is subject to review by Commonwealth authorities under the *Environment Protection (Impact of Proposals) Act 1974*.

6. Conclusions

The EPA has considered the proposal by Sun Resources NL to drill the White Opal-1 Exploration Well on the Cape Range Peninsula.

The EPA is aware of the environmental importance of the Cape Range Province, and considers that development and environmental management should be undertaken in a manner which ensures that the long term ability of the area to accommodate human use pressures is not exceeded.

The EPA considers that the proposal can be managed in a manner such that the proposal does not impose an unacceptable impact on the environment, provided that the conditions recommended in Section 4, and set out in formal detail in Appendix 4, are imposed.

7. Recommendations

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment 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.

The EPA submits the following recommendations to the Minister for the Environment that the Minister:

1. considers the report on the relevant environmental for the Environment considers the report on the relevant environmental factors of Subterranean fauna, Ningaloo Marine Park, Groundwater quality, Hydrocarbons (from spills) and Visual impacts, as set out in Section 3.
2. notes that the EPA has concluded that the proposal can be managed in an environmentally acceptable manner, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.
3. imposes the conditions and procedures recommended in Appendix 3 of this report.

Table 3. Identification of relevant environmental factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
BIOPHYSICAL			
Subterranean fauna	Potential impacts on subterranean fauna include localised loss of habitat from infilling of cavernous limestone and groundwater contamination resulting from drilling wastes, hydrocarbon spillages and use of drilling fluids. Further potential for impacts through ground disturbance as a result of surface clearing and minor excavation associated with the construction of the drilling pad.	The potential impacts on subterranean fauna resulting from the proposal was raised in a number of submissions. The submission from DME noted that subterranean fauna sampling carried out in the vicinity of the project area occurred within the sand profile and not in the limestone sections within which a majority of the subterranean fauna would be found (if present).	**Considered to be a relevant factor.**
Ningaloo Marine Park	Potential risk of impacts on the Ningaloo Marine Park through groundwater contamination and/or surface water contamination as a result of hydrocarbon spillages and use of drilling fluids during drilling.	A number of submissions raised concerns regarding the potential for oil spillages to affect the Ningaloo Marine Park.	Although there is little potential for any impacts on the Ningaloo Marine Park to result from this project, the perceived risk of impacts on the park should be evaluated to ensure public concerns are adequately addressed in the EPA's report and recommendations. **Considered to be a relevant factor.**
Turtles	Turtles (mainly Green but also Loggerhead, Flatback and Hawksbill turtles) are known to utilise the beach approximately 600 metres to the north of the project area for nesting between October and February. Hatchlings then emerge between mid-January and late April. Potential for disturbance to turtle nesting habitat, and potential for light produced from drilling operations to deter adult turtles from approaching beaches close to the project area and to distract hatchlings.	The issue of potential disturbance to turtle breeding was raised in a number of submissions. It is considered that more information regarding lighting and the timing of operations needs to be provided. There is concern that the proponent has not made adequate commitments to ensure any impacts on turtles will be managed.	The project area is located approx 380 m inland of the primary dunes, which turtles often utilise for nesting. In response to submissions, the proponent has made two additional commitments that should drilling occur during the period of 1 November to 30 April (when the majority of hatchlings emerge), the proponent will: • take measures to reduce light emanation from the drilling rig (commitment 9); and • implement a monitoring programme to determine the presence of any turtles using the beach nearest the project area (commitment 10). **Not considered a relevant factor.**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Terrestrial flora, Declared Rare and Priority Flora and endangered species	Vegetation of the project area belongs to the "Coastal Dunes" Landscape Unit which comprises approximately 2% (600 ha) of the total Learmonth Landsystem. No Declared Rare and Priority Flora or endangered species occur within the project area. Disturbance to 1 ha of vegetation for establishment of drill site, with potentially a further 0.25 ha being disturbed for rig camp.	Rehabilitation of the project area and the requirement for implementation of measures to prevent introduction of weeds was raised in a number of submissions. It was noted that successful rehabilitation of the area may require active rehabilitation such as direct seeding. The issue of flora and fauna surveys of the area proposed for the potential establishment of an on-site camp was also raised.	The proponent has made a commitment to minimise disturbance to vegetation by flattening and pruning existing vegetation rather than clearing (commitment 3). Disturbed vegetation will be rehabilitated, and an environmental report on the progress of rehabilitation will be prepared one year following decommissioning and forwarded to DME, DEP and the Shire or Exmouth (commitment 8). **Not considered a relevant factor.**
Terrestrial fauna, threatened fauna and endangered species	The project area provides a uniform and common habitat for fauna. No rare or endangered fauna species or habitats supporting rare or endangered species occur within the project area. Disturbance to 1 ha of habitat for establishment of drill site, with a further 0.25 ha potentially being disturbed for rig camp. Light and noise during 8 week drilling period may disturb fauna in the vicinity of the project area.		Any disturbance to fauna will be limited to the project area. Disturbance associated with drilling will be temporary, lasting for 8 weeks. The proponent has made a commitment (commitment 8) that, following decommissioning, the project area will be rehabilitated. **Not considered a relevant factor.**
POLLUTION			
Groundwater quality	Potential for impacts on groundwater quality as a result of introduction of drilling fluids, hydrocarbons and drilling wastes during drilling.	Concern that there is potential for contamination and pollution to occur before casing is completed was raised.	**Considered to be a relevant factor.**
Hydrocarbons (from spills)	Potential for surface and subsurface spillage of hydrocarbons.	The potential for surface and subsurface hydrocarbon spills, and the impacts of such a spill was raised in a number of submissions. Concern that adequate contingency plans to deal with any pollution incident had not been developed by the proponent was also raised.	Although the risk of hydrocarbon spillage causing impacts on the surface or subsurface environment is considered unlikely, the perceived risk of impacts should be addressed to ensure public concerns are adequately addressed in the EPA's report and recommendations. **Considered to be a relevant factor.**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Drilling fluids	Drilling fluids used during drilling operations will temporarily affect the turbidity and quality of groundwater.	A number of submissions raised the issue of toxicity of drilling fluids. The lack of information of other drilling fluid additives, such as pipe dope, was also raised.	**Considered under 'Groundwater quality' as a relevant factor.**
SOCIAL SURROUNDINGS			
Social impacts	Potential for members of the local and wider community to view the proposed exploration for hydrocarbons on the cape as environmentally unacceptable. Services to support the project workforce may affect the local community.		The proponent will continue to liaise with the community regarding the White Opal proposal. There will be minimal social impacts on the local community resulting from implementation of the proposal. **Not considered a relevant factor.**
Heritage	The area is included in an Interim Listing in the Register of the National Estate by the Australian Heritage Commission. The Cape Range Peninsula is also covered by the Native Title Claim WC97/28. The proposal has the potential to disturb heritage sites.	The Aboriginal Affairs Department has advised that they have no record of the report or site form for the shell scatter. Concerns that only one Aboriginal elder was given the opportunity to inspect the project area, and that the native title claimants for the area were not consulted were also raised in submissions.	One Aboriginal site consisting of a broken shell midden and associated artefacts is located approximately 70 m to the north of the project area. This site will not be affected by the proposal. In response to submissions, the proponent has made an additional commitment to avoid damage to the shell midden (commitment 11). **Not considered a relevant factor.**
Visual impacts	The project area and the mast of the drilling rig has the potential to affect the visual amenity of the area.	The WA Tourism Commission raised concerns that the value of the area as a tourism destination, which is marketed for its 'wilderness experience' and 'pristine beauty', may be negatively affected by the proposal.	**Considered to be a relevant factor.**

Table 4. Summary of assessment of relevant environmental factors

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
Subterranean fauna	The karst landform of the northern coastal area of the Cape Range peninsula, including the fringing reefs.	Maintain the abundance, species diversity and geographical distribution of subterranean fauna. Ensure that subterranean fauna are protected in accordance with the Wildlife Conservation Act and the Endangered Species Protection Act.	• Subterranean fauna potentially exist in the cavernous formations of the geological profile, expected to occur to a maximum of 40 metres below sea level; • Subterranean fauna sampling of bores in the vicinity of the project area did not locate any subterranean fauna specimens; • Water in nearby bores has high salinity and H_2S levels, and is not favourable for subterranean fauna • Maximum loss of subterranean fauna habitat from infilling of cavernous limestone estimated at $16.5m^3$; • Potential risk of contamination of subterranean environment reduced by well casing and use of non-toxic drilling fluids; • Increase in turbidity of groundwater will be localised and temporary.	Having particular regard to: • subterranean fauna sampling undertaken to date by the proponent has not identified any subterranean fauna specimens; • the area is considered unlikely to support subterranean fauna; • the proponent's commitments to reduce the potential for contamination of the subterranean environment (commitments 5 and 6); and • the proponent's statutory obligations under the *Wildlife Conservation Act 1950*, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective.
Ningaloo Marine Park	The Ningaloo Marine Park in the vicinity of Point Murat.	Protect the conservation values, biodiversity and ecosystem functions of Ningaloo Marine Park.	• Potential for contamination of Ningaloo Marine Park through surface and subsurface seepage of hydrocarbons, drilling additives and fuel; • At its closest point the coastline and border of the Ningaloo Marine Park is approx 470 metres to the southeast of the project area; • The coast and the project area are separated by 18 metre high sand dunes to the northwest and a sealed road and undulating sand dunes to the east/southeast; • Marine waters are linked to the project area in the subsurface environment through tidal movement, with the aquifer being in hydraulic continuity with the sea; • Potential subsurface seepage prevented by casing the section of the well which passes through the potentially cavernous limestone formation.	Having particular regard to: • the proposed well site is located approx 470 metres from the border of the Ningaloo Marine Park; • the well will be cased and pressure tested to prevent surface and subsurface contamination by hydrocarbons and drilling fluids; and • the proponent's commitments to reduce the potential for contamination of the surface and subsurface environment (commitments 4, 5 and 6), it is the EPA's opinion that the proposal can be managed to meet the EPA's objective.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
Groundwater quality	The aquifer beneath the project area and between the project area and the extent of the fringing reef.	Maintain or improve the quality of groundwater to ensure that existing and potential uses, including ecosystem maintenance, are protected, consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993) and the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC 1992).	• Potential for contamination of groundwater from drilling fluids, hydrocarbons, drilling waste and fuels associated with drilling operations; • The quality of groundwater beneath the project area approximates that of seawater and is not potable; • Casing of the well through potentially cavernous zones will prevent the introduction of potential contaminants into the groundwater aquifer; • Non-toxic drilling additives will be used. Concentrations of drilling additives used will be within ANZECC and EPA guidelines; • Increase in turbidity of groundwater resulting from drilling wastes and drilling fluids will be localised and temporary; • Drilling waste water disposed into sump which will then seep through the sand of the project area into the groundwater.	Having particular regard to: • proposed concentrations of drilling fluids meet ANZECC and EPA guidelines for fresh and marine waters; • potential impacts on groundwater quality resulting from drilling wastes will be limited to localised and temporary increases in suspended solids; • the well will be cased and pressure tested to prevent surface and subsurface contamination by hydrocarbons and drilling fluids; and • the proponent's commitments to reduce the potential for contamination of groundwater (commitments 4, 5 and 6), it is the EPA's opinion that the proposal can be managed to meet the EPA's objective.
Hydrocarbons (from spills)	The land in close proximity to the well, and subsurface cavernous formations beneath the project area, estimated to occur to a maximum depth of 40 metres below sea level.	Ensure that the probability of spillage is extremely low, that actions are taken to reduce identified risks, and that drilling operations and equipment are at the level of international best practice for drilling in environmentally sensitive areas.	• The proposed well will be cased and pressure tested in accordance with DME requirements to prevent any subsurface and surface seepage of hydrocarbons; • The risk of loss of integrity of casing is considered to be low; • Fuels on site will be stored to DME requirements in bunded areas; • DME has a number of safety and environmental conditions relating to the drilling of all petroleum exploration wells; • Should hydrocarbons be found in commercially viable volumes, the well will be fully cased and suspended prior to any proposal for commercial abstraction of hydrocarbons; • All production oil or gas will be flared in the flare pit or diverted into tanks.	Having particular regard to: • the proponent must comply with statutory safety and environmental conditions relating to the drilling of White Opal set by DME; • if hydrocarbons are found in commercially viable quantities, the well will be fully cased and suspended prior to any proposal for commercial abstraction of hydrocarbons; and • the proponent's commitments to reduce the potential for hydrocarbon spillage and subsequent contamination of the surface and subsurface environment (commitments 4 and 6), it is the EPA's opinion that the proposal can be managed to meet the EPA's objective.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
Visual impacts	The area within visual range of the project area.	Ensure that the visual amenity of the area is not unduly affected.	• The mast of the drilling rig will be visible from vessels along the coast in the vicinity of the project area and from the sealed road that connects Exmouth to Point Murat; • Drilling operations will take approximately 4 weeks; • The project area covers approximately 1 hectare which will be rehabilitated at completion of drilling; • The area in the vicinity of the project area already has a number of industrial features which detract from the visual amenity of the area, such as diesel storage tanks and communication towers.	Having particular regard to: • visual impacts associated with the proposal will be temporary; and • the proponent's commitments to rehabilitate the area after completion of drilling; it is the EPA's opinion that the proposal can be managed to meet the EPA's objective.

Appendix 1

List of submitters

Government agencies:

Aboriginal Affairs Department;

Australian Heritage Commission (Environment Australia);

Biodiversity Group (Environment Australia);

Department of Conservation and Land Management;

Department of Defence;

Department of Finance and Administration;

Department of Minerals and Energy;

Environment Protection Group (Environment Australia);

Harold E Holt Naval Communications Station;

Marine Parks and Reserves Authority;

Shire of Exmouth;

Western Australian Tourism Commission;

Organisations:

Conservation Council of Western Australia;

Ningaloo Action Group.

Appendix 2

References

Australian and New Zealand Environment and Conservation Council, 1992. *Australian water quality guidelines for fresh and marine waters*, Australian and New Zealand Environment and Conservation Council.

Department of Minerals and Energy, 1997. *Risk Assessment for the proposed Melanie-1 Petroleum Exploration Well*, unpub.

Environmental Protection Authority, 1993. Draft Western Australian Water Quality Guidelines for Fresh and Marine Waters, Bulletin 711, EPA, Perth, Western Australia.

Environmental Protection Authority, 1997. *Melanie-1 Petroleum Exploration Well, Cape Range Peninsula* Report and recommendations of the Environmental Protection Authority, Bulletin 865, EPA, Perth, Western Australia.

Environmental Protection Authority, 1998. *Environmental Protection of Cape Range Province* Preliminary Position Statement No 1, March 1998.

Humphreys W F and Adams M, 1993. 'Patterns of genetic diversity within selected subterranean fauna of the Cape Range peninsula, Western Australia: systematic and biogeographic implications', *The Biogeography of Cape Range, Western Australia,* Western Australian Museum, Perth, Western Australia. Pp 145 - 164.

Martinick McNulty, 1998. *White Opal-1 Exploration Well, Cape Range Peninsula - Public Environmental Review / Public Environmental Report,* unpub.

Appendix 3

Recommended Environmental Conditions

and proponent's consolidated commitments

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

WHITE OPAL EXPLORATION WELL
CAPE RANGE PENINSULA, SHIRE OF EXMOUTH
(Joint State/Commonwealth assessment)

Proposal: It is proposed to drill a land-based petroleum exploration well on Commonwealth (Navy) land at Point Murat, Cape Range Peninsula, as documented in schedule 1 of this statement. The well will be drilled directionally to intersect a target at a depth of about 2 kilometres below the Ningaloo Marine Park.

Proponent: Sun Resources NL

Proponent Address: P O Box 1786, West Perth WA 6872

Assessment Number: 1167

Report of the Environmental Protection Authority: Bulletin 905

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

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, in the course of implementing the proposal, 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 the Environment 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 Work Practices

3-1 Prior to commencement of drilling, the proponent shall prepare a written prescription for contractor work practices covering pre-drilling, drilling and decommissioning, to ensure that work practices are carried out at the level of international best practice, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection and the Department of Minerals and Energy.

3-2 The proponent shall ensure that pre-drilling, drilling and decommissioning operations comply with the prescription referred to in condition 3-1.

4 Proponent

4-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the Environmental Protection Act is responsible for the implementation of the proposal until such time as the Minister for the Environment 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.

4-2 Any request for the exercise of that power of the Minister referred to in condition 4-1 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.

4-3 The proponent shall notify the Minister for the Environment of any change of proponent contact name and address within 30 days of such change.

5 Commencement

5-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.

5-2 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 the Environment will determine any question as to whether the proposal has been substantially commenced.

5-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement.

5-4 Where the proponent demonstrates to the requirements of the Minister for the Environment 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.

6 Compliance Auditing

6-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit program prepared in consultation between the proponent and the Department of Environmental Protection.

6-2 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.

6-3 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

Schedule 1

The Proposal

It is proposed to drill a land-based petroleum exploration well on Commonwealth (Navy) land at Point Murat, Cape Range Peninsula, Shire of Exmouth. The well will be drilled directionally to intersect a target at a depth of about 2 kilometres below the Ningaloo Marine Park. The target resource is therefore a State resource.

The key characteristics of the proposal are described in the table below.

Element	Description
Life of project	8 weeks
Purpose	exploration for gas/oil
Area of disturbance	100 m x 100 m plus 0.25 ha if rig camp required
Depth of well	• Total vertical depth: 2900 m • Total measured depth: 3140 m
Width of well bore	60 mm to 216 mm diameter
Casing of well	Casing introduced at 20, 250 and 1720 m below surface
Sump	20 m x 20 m x 4 m - capacity 1200 m^3
Flare pit	6 m x 3 m x 2 m with firewall on three sides
Drilling cellar	2 m x 2 m x 1.5 m with steel reinforcement of walls
Water	• Source: clean saltwater from existing pipeline • Quantity required: initially 950 to 2300 litres/minute until well is fully cased. Thereafter it will be recycled • Disposal: water which is not lost to cavernous formations during drilling will be recycled within the drilling circuit and disposed of into the sump
Drilling fluids	• Type: Surface to 250 m - water, bentonite, lime and caustic soda. 250 m to final depth - water and potassium chloride polymers • Quantity: max 600 m^3 • Disposal: waste drilling fluids which are not lost to cavernous formations during drilling will be disposed of into the sump and will seep into the groundwater
Drilling waste (cuttings and drill waste)	• Quantity: approx 200 m^3 • Disposal: drilling wastes which are not lost to cavernous formations during drilling will be disposed of into the sump. When dry, the sump will be buried within the project area.

Map

Figure 1: Surface location of the proposed White Opal exploration well.

Figure 2: Layout of infrastructure on the project area.

Figure 3: Well schematic diagram.

Schedule 2

Proponent's Consolidated Environmental Management Commitments

June 1998

White Opal-1 Exploration Well, Cape Range Peninsula, Exmouth

Sun Resources NL

The Proponent's consolidated environmental management commitments of June 1998 are as follows:

Commitment	Objective	Action	Timing	Whose advice	Measurement / Compliance
1. Proponent will prepare and implement an Environmental Management Plan (EMP)	To manage potential environmental impacts arising from the proposal	The EMP will be prepared prior to the commencement of drilling operations and implemented throughout the operations.	Pre-construction	Western Australian Department of Minerals and Energy (DME) and Department of Environmental Protection (DEP)	EMP to be prepared to the satisfaction of DEP and DME
2. Operational methods will minimise disturbance to soil and terrain	To minimise impact on existing terrain features	Design the layout of facilities within the Project Area on the basis of a site specific assessment.	Pre-construction	Proponent's Environmental Officer	Inspection completed and signed off by Proponent's Environmental Officer
3. Operational methods will minimise disturbance to existing vegetation	To assist in revegetation of the Project Area following decommissioning	a) Where possible, vegetation will be pruned rather than removed to retain an intact root system.	Site preparation	Proponent's Environmental Officer	Pre-drilling inspection completed and signed off by Proponent's Environmental Officer
		b) Parts of the surfaces of essential operational pads will be spread with limestone gravel which will be mostly removed on decommissioning.	Site preparation	Proponent's Environmental Officer	Performance Compliance Report
		c) Shrubs within the Project Area which are not to be damaged will be surrounded with flagging.	Site preparation	Proponent's Environmental Officer	Performance Compliance Report
		d) A weed control programme will be used.	Site preparation and drilling	Proponent's Environmental Officer	Performance Compliance Report
4. Operational methods will prevent the spillage of waste and materials	To protect the surface environment from the spillage of waste	a) All drilling waste will be retained in a sump until the completion of the operations. The sump will then be backfilled and the surface rehabilitated.	Drilling and decommissioning	Proponent's Environmental Officer	Performance Compliance Report
		b) All spillages of oil or fuel will be contained and removed immediately and disposed of at a site appropriately licensed by the WA DEP for the disposal of such wastes.	Drilling and decommissioning	DEP	Performance Compliance Report
		c) All domestic rubbish and similar waste will be disposed of according to the requirements of the Shire of Exmouth.	Decommissioning	Shire of Exmouth	Performance Compliance Report

		d) All fuel in the Project Area will be kept in bunded facilities which meet with the requirements of the WA DME.	Site preparation and drilling	DME	Performance Compliance Report
		e) All production oil or gas will be flared in the flare pit or diverted to tanks.	Drilling	DME	Performance Compliance Report
5. Only non-toxic drilling fluids will be used during the drilling of the exploration well	To protect the subsurface environment from toxic materials	a) A drilling fluid consisting of water, some bentonite and small amounts of lime and caustic soda will be used between a depth of 0 and 250 metres.	Drilling	DEP	Performance Compliance Report
		b) A drilling fluid consisting of water and potassium chloride polymers will be used beyond a depth of 250 metres.	Drilling	DEP	Performance Compliance Report
6. Operational methods will prevent the seepage of harmful pollutants into the subsurface environment	To protect the subsurface environment from seepage of harmful pollutants	a) The exploration well will be cased following the drilling of the cavernous formations where there is potential for seepage.	Drilling	DME	Performance Compliance Report
		b) The casing will be pressure tested according to the requirements of the WA DME.		DME	Performance Compliance Report
7. Take action to restore groundwater quality in the event that leakage or spillage of hydrocarbons may have occurred and inadvertently resulted in the contamination of groundwater.	Maintain the quality of groundwater beneath the Project Area	In the event of leakage or spillage of hydrocarbons, consult with the WA DEP to identify whether groundwater contamination has occurred, and take action to restore groundwater quality.	Drilling and decommissioning	DEP	Performance Compliance Report
8. The Project Area will be rehabilitated to as close to a pre-drilling condition as possible	To return the Project Area to as close to a pre-drilling condition as possible	a) The majority of the introduced limestone gravel will be removed from the Project Area and transported to a site requested by the Shire of Exmouth. Some of the limestone gravel will be buried within the Project Area or left to provide a rough surface to assist in revegetation.	Decommissioning	Proponent's Environmental Officer	Performance Compliance Report
		b) Rehabilitation of the Project Area will be monitored and measured by comparing photos of the area before and after the drilling operations from	Pre-construction and one year following decommissioning	Proponent's Environmental Officer	Performance Compliance Report

		identical positions to provide a reference.			
		c) An environmental report on the progress of rehabilitation will be prepared one year following decommissioning and forwarded to the WA DME, DEP and the Shire of Exmouth.	One year following decommissioning	DME and DEP	Report submitted to DME, DEP and Shire of Exmouth
		d) If monitoring of rehabilitation shows rehabilitation of the area has not been successful, the Proponent will liaise with the WA Departments of Minerals and Energy and Environmental Protection to identify and implement alternative rehabilitation measures.	One year following decommissioning	DME and DEP	Further reporting only if required by DME and DEP
9. Implement a policy of managing light in the Project Area if drilling occurs during the period of 1 November to 30 April	To reduce light emanation (especially floodlights) from the drilling rig and the Project Area in general so that sea turtles (adults and hatchlings) are not attracted by such lights.	Assess the lighting of the drilling rig and the Project Area, and change lights so that bright lights (especially floodlights) are not seen from the nearby beach. Use yellow globes (rather than white or clear globes) and use light shades to ensure that light is directed to operational areas and not the surrounds.	Commissioning of drilling rig	Proponent's Environmental Officer or Project Manager	Inspection completed and signed off by Proponent's Environmental Officer or Project Manager.
10. In the event of drilling occurring during the period of 1 November to 30 April, implement a monitoring programme of the beach nearest to the Project Area for the presence of sea turtles	Determine whether adult sea turtles and/or hatchlings are present on the beach and swales of the adjoining primary dunes nearest to the Project Area.	Each morning inspect about 500 metres of beach and primary dune swales in the vicinity of the Project Area for the presence of sea turtle tracks. In the event of these being present, contact the Exmouth office of CALM and commence directing or transferring adults to the sea and/or collecting hatchlings and releasing these in the sea.	During drilling operations	Proponent's Environmental Officer and Regional Manager of CALM in Exmouth.	Inspection completed and signed off by Project Manager. Any action taken following the discovery of turtle tracks on nearby beaches to be completed to the satisfaction of the Exmouth District Manager of CALM.
11. Implement a policy to protect Aboriginal cultural heritage sites.	To avoid damage to a small shell scatter located about 70 metres to the north of the Project Area.	Mark the site with flagging tape and instruct staff and contractors to avoid the flagged area.	Pre-construction	Proponent's Environmental Officer	Inspection completed and signed off by Proponent's Environmental Officer or Project Manager.