

**Environmental Impact Report**  
**for**  
**McNamara Park 1, PEL 72**  
**in the**  
**Otway Basin – South Australia**

Origin Energy Resources Limited  
A.B.N.  
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## CONTENTS

Page No.

<b>1</b>	<b>PROPOSED ACTIVITIES</b>	<b>4</b>
1.1	INTRODUCTION	4
1.2	LOCATION AND ACCESS	4
1.3	SITE REQUIREMENTS	5
1.3.1	Rig Pad, Sump and Flarepit	5
1.3.2	Camp site	5
1.3.3	Water Supply	5
1.3.4	Ancillary Services	5
1.3.5	Construction & Management	6
1.4	Drilling Activities	6
1.4.1	Traffic Movements	6
1.4.2	Well Construction.	6
1.4.3	Drilling activity Management.	7
1.5	Production.	8
1.6	Abandonment and Rehabilitation.	8
1.6.1	Abandon Drilling well	8
1.6.2	Abandon producing well	8
1.6.3	Rehabilitation Management	9
<b>2</b>	<b>SUMMARY OF LOCAL ENVIRONMENT</b>	<b>9</b>
2.1	REGIONAL CHARACTERISTICS	9
2.1.1	Land Use	9
2.1.1.1	Agriculture	9
2.1.1.2	Nature and Heritage Conservation	9
2.1.2	Land form and soils	10
2.1.3	Vegetation and habitat	10
2.1.4	Fauna	10
2.1.5	Hydrology	11
2.2	WELLSITE AND ACCESS ROUTE CHARACTERISTICS	12
2.2.1	Land Use	12
2.2.2	Land form and soils	12
2.2.3	Vegetation and habitat	12
2.2.4	Fauna.	13
2.2.5	Hydrology	13
2.2.6	Biophysical significance and sensitivity	13
2.3	ABORIGINAL HERITAGE	13
2.4	EUROPEAN HERITAGE	13
2.5	LOCAL COMMUNITY	14
<b>3</b>	<b>RISKS ARISING FROM PROPOSED ACTIVITIES.</b>	<b>15</b>
3.1	Risks to the Natural Environment.	16
3.1.1	Processes creating risks.	16
3.1.2	Possible impacts on soils.	16
3.1.3	Possible impacts on vegetation and habitat	16
3.1.4	Possible impacts on groundwater	16
3.1.5	Possible impacts on surface hydrology	18
3.2	Risks to the social and economic environment	18
3.2.1	Possible impacts on existing land uses.	18
3.2.2	Possible impacts on local community resources and safety	18
3.2.3	Possible impacts on European Heritage	19
3.2.4	Possible impacts on Aboriginal heritage.	19

<b>4</b>	<b>MANAGEMENT OF IMPACTS AND IMPACT RISKS.</b>	<b>20</b>
4.1	Site Planning and Design	20
4.2	Stakeholder Consultation	20
4.3	Site and access construction	20
4.3.1	Creek Crossings	20
4.3.2	Connection to Public Road	21
4.3.3	Borrow	21
4.3.4	Excavation	21
4.3.5	Dust	21
4.3.6	Noise	21
4.3.7	Waste	22
4.3.8	Management during Construction	22
4.4	Drilling Activities	22
4.4.1	Public access to the site	22
4.4.2	Well Construction	22
4.4.3	Drilling activities	24
4.4.3.1	Dust	24
4.4.3.2	Noise	25
4.4.3.3	Waste Management	25
4.4.3.4	Chemical Management	25
4.4.3.5	Rig Safety	26
4.5	Management during Drilling	40
4.5.1	Training	40
4.5.2	Monitoring, Performance and Reporting	40
4.5.3	Emergency Planning	41
<b>5</b>	<b>REFERENCES</b>	<b>43</b>

## APPENDICES

Appendix 1:	Corporate Environment Policy
Appendix 2:	Location Map
Appendix 3:	Site Photographs
Appendix 4:	Well Stratigraphy and Construction

## FIGURES AND TABLES

Table 1	Potential Significance of Environmental Aspects for McNamara Park 1	15
Table 2	Summary of Possible Environmental Impacts, Management Strategies and Objectives.	27

# 1 PROPOSED ACTIVITIES

## 1.1 INTRODUCTION

Origin Energy Resources Limited (Origin Energy) is the operator of Petroleum Exploration Licences (PELs) 27, 32, 57, 66 and 72 and Petroleum Production Licences (PPLs) 62 and 168 in the Southeast corner of South Australia. Origin Energy proposes to drill the petroleum exploration well McNamara Park 1 in PEL 72. The well will test a faulted horst block structure located on the McNamara High trend. The primary objective of the well is the Waarre Sandstone and the secondary objective is the Upper Flaxman Formation. Should the well be successful it will be cased and cemented for future production. All aquifers will be isolated by casing or, in the short term, drilling fluids specifically designed to minimize entry of fluids to the respective formations. In the event of the well failing to intersect economic hydrocarbons McNamara Park 1 will be plugged and abandoned, a process that involves placing cement plugs across all permeable zones to ensure permanent isolation. All activities on the rig will be conducted by a Company with proven experience according to best industry practice and to conform with the relevant State and Federal Government regulations.

Oil Company of Australia Limited "OCA" (ABN. 68 001 646 331) will manage the drilling of the well. OCA is an 85% owned subsidiary company of Origin Energy Limited. Funding for the well will be partly shared with the PEL57 Joint Venture.

The well is anticipated to spud in early April 2001 and the drilling phase will take approximately 14 days to conclude. If the well is successful then completion and testing activities could take a further 7-14 days. Origin Energy will control environmental impact to acceptable levels to minimise inconvenience and risk to the landowner, the local community, Company and rig personnel and third parties in general during the drilling of McNamara Park 1.

## 1.2 LOCATION AND ACCESS

The McNamara Park 1 surface location is ~1400 meters northwest of the McNamara 1 well (see location map Appendix 2). The location is approximately 10 km west of Mt. Gambier and less than 15 km to the west of the Katnook – Mt. Gambier Gas Pipe line. The surface location is located on Lot 25, Crown Plan Hundred of Blanche and is privately owned. The property owner is Mr Roger Wirth. The property is a former dairy farm but is currently run as a Beef cattle operation. Access to the site will be directly off Megaw Road and along an existing private road. The actual rig site will be on an open paddock and approximately 600 metres of new gravelled access road will be built. The landowner has been advised of the planned drilling activity as required under the *Petroleum Act 2000* and representatives of the Kungari Aboriginal Association have inspected the site.

The property comprises cleared grazing land with topography limited to a remnant sand dune (Figures 3 and 5, Appendix 3) and isolated limestone outcrops. The sub-surface drilling target is located at considerable depth below farm infrastructure and a deviated well path will be programmed to allow displacement of the rig location to the far side of the dune (see proposed well path, Appendix 4). The proposed location will minimise noise and visual impact to the landowner and ensure that the fragile dune is not affected. Pad and access road construction will be carried out with minimal impact on the soil. Origin Energy acknowledges that operation of the drilling rig will focus attention on the region and will take all necessary precautions to protect third parties and restrict unauthorised entry to the well site.

### **1.3 SITE REQUIREMENTS**

#### **1.3.1 Rig Pad, Sump and Flare pit**

The well site requires a firm and level pad for the positioning of the Drilling Rig. This involves the clearing of an area of 150m x 150m for the drill pad including provision for a 15-20 m perimeter firebreak. The pad will be covered with gravel to a depth of approximately 30 to 50 cms laid directly on the topsoil. Due to the weight of the drill rig structure an area 18 metres by 10 metres will be excavated to a depth of 70 cm and built up with compacted gravel. Exploratory site investigation holes have been drilled on the McNamara Park 1 site to confirm this requirement. A shallow reservoir sump for mud and site run off will be constructed and lined with polythene liner. A banked flare pit will also be constructed.

#### **1.3.2 Camp site**

A separate 50m x 50m clearing adjacent to the rig is required for a self-contained thirty person relocatable camp. All construction areas will be surveyed and pegged to clearly define site limits with ongoing supervision at all stages by the OEL Landman

#### **1.3.3 Water Supply**

Water will be taken from a bore to be drilled adjacent to the wellsite for the specific purpose of supplying drilling water. The well will be drilled and constructed by a licenced bore driller, Sims Water Well Drillers, with all necessary approvals to be obtained from the relevant authorities. Approximately 0.8 ML of water will be used during the drilling of the well. If the well is successful then completion and testing activities could consume a further 0.05 –0.1 ML of water.

#### **1.3.4 Ancillary Services**

Toilet facilities will be located at the rig (approximately 5 person capacity) and at the campsite (approximately 30 person capacity). Septic tanks are to be installed at both the rig and campsite.

### 1.3.5 Construction & Management

OEL employs a local Landman to liaise with property owners and local interest groups and to provide on-site supervision of all site construction and rehabilitation activities. Chris Annear of Petroleum Support Services Mt Gambier will provide this service for the McNamara Park 1 well. Lease and access construction services will be provided by Gambier Earth Movers from Mt Gambier

## 1.4 Drilling Activities

### 1.4.1 Traffic Movements

The well will be drilled using the OD&E Limited Rig #30. The rig is being mobilised from a Santos well site near Port Campbell in Western Victoria. The rig will be moved along sealed public roads and the designated private access to the McNamara Park 1 location. The rig and self-contained camp consists of approximately forty trailer loads of equipment. Spikens Transport from Warrnambool in Western Victoria is the primary rig transport contractor. A further 10-12 trailer loads of ancillary services and equipment for the drilling are being mobilised from Port Campbell, Roma (QLD), Portland (Victoria) and Adelaide. The rig, camp and ancillary services will arrive on site over a period of 3-4 days at the start of the well and depart in a similar fashion upon conclusion of the well.

The camp is situated adjacent to the rig and water will be pumped to the location. Daily traffic movements to and from the well site during the drilling of the well will be minimal and restricted to crew change and supply truck vehicles weekly. Cementing, logging and testing contractor personnel will be mobilised as required and visitors may access the site under control of the drilling supervisor. Access by the general public will be restricted.

### 1.4.2 Well Construction.

The McNamara Park 1 well will be drilled to a total depth of ~ 2100 metres AHBRT and directionally steered to intersect the target formation at the optimum position. The abbreviated well construction plan is as follows.

- Install 456 mm conductor at ~ 24 metres, cement to surface, install cellar
- Drill 311 mm hole to 530 metres
- Run 245 mm casing, cement to surface
  - Surface casing isolates all intersected aquifers, prevents subsurface fluid communication and prevents deeper, high pressure zones from increasing formation pressure in shallow sands
- Install BOPs and pressure test

- Blow-out preventers allow control of subsurface pressure during the drilling phase so that unintended release of hydrocarbons to the surface does not occur.
- Drill out and conduct FIT
  - The ability of the formation at the casing shoe to withstand high pressure is tested with a leak-off test: if a high pressure hydrocarbon zone is intersected by subsequent drilling the pressure at which fracturing occurs is therefore known and remedial action can be planned to control the well
- Drill 216 mm to TD at ~ 2100 metres AHBRT (Cut Core if reservoir section is penetrated)
- Log well and conduct Velocity survey
- Run DSTs in response to shows and log information
  - Drill stem tests allow formation fluids to flow to the surface in a controlled fashion; in the event of hydrocarbons flowing to surface a risk of fire is recognized and necessary precautions are taken to minimize danger to the rig crew and third parties.
- Run plugs to abandon the well or run and cement 178 mm casing
  - Long term isolation of aquifers is guaranteed via either steel production casing run and cemented over the penetrated section or an abandonment programme whereby cement is placed over all potentially permeable zones in the well.

If the well is cased then completion and testing operations will follow, otherwise the rig will be removed from the site and the site restored as soon as practical. Factors that may influence this process include specific requests by the landowner and prevailing weather.

#### 1.4.3 Drilling activity Management.

Working hours during the drilling phase will be on a 24-hour, seven day a week basis, with the drill crews being rotated as agreed with the drilling contractor according to good industry practice. The camp and overall living conditions are maintained in an hygienic state and are conducive to relaxation between shifts in recognition of the physical nature of work and risks associated with the drilling industry.

On-site responsibility for the execution of the approved Drilling plan rests with the OCA Drilling Supervisor. The Drilling Supervisor reports to the OCA Drilling Superintendent. Third party contractors, drilling contractors and rig personnel will report to the Drilling Supervisor. The senior Drilling Contractor representative on-site is the Rig Manager. The qualifications, responsibilities and reporting obligations of all OCA well site personnel are detailed in the OCA Drilling Communications Manual – May 1998.

The Drilling Supervisors for the McNamara Park 1 well will be OCA's Senior Rig Supervisor Barry Beetson or Senior Drilling Engineer Ernie Trethowan. In addition a Drilling or Completions Engineer from the OCA office, Brisbane, will be on the rig in the role of Night Drilling Supervisor or as a technical specialist during well completion or testing activities.

## **1.5 Production.**

In the event that McNamara Park 1 is a commercial discovery the well will be formally handed over the Origin Energy Production Operations Group who will be responsible for the long-term management of the well and the well-site. This management will be in accordance with the gazetted Origin Energy Resources Limited SEO for Production and Processing of Petroleum and Associated Activities in the Otway Basin – South Australia.

## **1.6 Abandonment and Rehabilitation.**

### **1.6.1 Abandon Drilling well**

Communication between sub-surface aquifers with different pressures and salinity has been identified as a major risk (see section 4) and abandonment procedures will be undertaken to minimise that risk. If the well is abandoned at the end of the drilling stage (section 1.4.2) then cement plugs will be placed to isolate all permeable formations and aquifers and across the 245 mm casing shoe. The 245 mm casing will be cut at 1.0 metre below surface and a 6-metre surface cement plug will be set. The cellar will be removed and backfilled. An abandonment plaque will be posted in the nearest fence line. All excavations will be backfilled and the entire well and campsite will be restored including removal of road gravel and sheeting materials. The cleared surface will then be ripped and any stockpiled topsoil and vegetation respread and reseeded as necessary. Perimeter fencing will remain intact until vegetation is re-established

### **1.6.2 Abandon producing well**

If the well is completed and tied in for production then an interim rehabilitation of the site will be performed. The access tracks will remain and the drill pad will be reduced to a size that is safe and adequate for operational activities. Gravel removed from the pad will be stockpiled for use at other locations upon agreement with the landowner and/or Shire Council. The cleared surface will then be ripped and any stockpiled topsoil and vegetation respread.

Upon conclusion of production operations the completion equipment will be withdrawn from the well and cement plugs will be placed to isolate any aquifers that have been exposed by perforations in the steel casing. The wellhead equipment will be removed and the 245 mm and 178 mm casing strings will be cut ~ 1.0 metre below surface and a 6-metre surface cement plug will be set. The cellar will be removed and backfilled. An abandonment plaque will be posted in the nearest fence

line. Any remaining excavations will be backfilled and the entire wellsite and campsite will be restored including removal of road gravel and sheeting materials. The cleared surface will then be ripped, and any stockpiled topsoil and vegetation respread and reseeded as necessary. Perimeter fencing will remain intact until vegetation is re-established.

### 1.6.3 Rehabilitation Management

The same OEL Landman employed to undertake all site construction would also supervise rehabilitation activities. Restoration usually takes place in autumn to avoid the summer heat and dry soil conditions and to best make use of the autumn/winter rains to achieve the maximum vegetation re-growth. All rehabilitation activities will meet the satisfaction and approval of the landowner.

## 2 SUMMARY OF LOCAL ENVIRONMENT

### 2.1 REGIONAL CHARACTERISTICS

#### 2.1.1 Land Use

##### 2.1.1.1 Agriculture

Almost all the original forest and woodland vegetation in the immediate region has been cleared and replaced with pasture, grape vines and forest plantations. Substantial drainage has enabled the cultivation of pastures in the previously frequently inundated low-lying areas. Grazing is by far the most important agricultural activity in the region with beef cattle, sheep and dairy cattle accounting for most livestock. The property on which McNamara Park 1 will be located has been cleared and is devoted solely to grazing (see figures 1 – 6, Appendix 3).

The Coonawarra Winery Region is located on the northern edge of the project area but will not be impacted by McNamara Park 1. Most vineyards are located within close proximity of the Riddoch Highway between Penola and Coonawarra.

##### 2.1.1.2 Nature and Heritage Conservation

In view of the enormous loss of native vegetation and habitat in the Southeast only a relatively small area is devoted to native conservation (1.9% of the total area). The remnant vegetation and swampland is fragmented into small blocks which have assumed great importance in conserving some of the ecological diversity of the region. No areas of significance occur in close proximity to the McNamara Park 1 well site but transferred risk in the form of fire or vehicular spill of petroleum approaching or leaving the site is acknowledged and will be minimized.

### 2.1.2 Land form and soils

The area covered by petroleum permits operated by Origin Energy encompasses four distinct environmental regions as defined by Laut *et al* (1977). The McNamara Park 1 well in PEL 72 falls in the *South Coast Environmental Region*. The coastline is characterised by unstable dunes with occasional blowouts and swales. The soils consist largely of calcareous sands. A northwest/southeast remnant sand dune is present at the well site (figure 3, Appendix 3) and protective measures will be taken to avoid initiating erosion. A minor eroded section of dune is apparent in Figure 6, Appendix 3.

### 2.1.3 Vegetation and habitat

Most (approximately 90%) of the land in the Southeast has been cleared for pasture and forestry. Only scattered remnants of the original natural vegetation now remain in National and Conservation Parks and as uncleared patches on farmland. All natural vegetation is subject to State Government controls on clearing. No areas of native scrub remain in proximity to the McNamara Park 1 well site (see photographs, figures 1 – 6, Appendix 3).

### 2.1.4 Fauna

The loss of native vegetation in the Southeast since European settlement has resulted in a significant depletion of habitat available to fauna consequently the diversity and abundance of fauna has declined dramatically in the region.

Of the 42 species of mammals that inhabited the Southeast prior to European settlement, 11 are thought to have become regionally extinct, another nine have become very rare and a further five appear to be endangered. Most of the extinct species inhabited the woodlands and grasslands which were the first habitats to be extensively cleared. The surviving mammals inhabit the remnant patches of forest, scrub and swamp that still remain in the region. Examples of mammals that are still reasonably common in the area include the yellow-footed antechinus *Antechinus flavipes*, the western grey kangaroo *Macropus fuliginosus*, the swamp rat *Rattus lutreolus*, the fat-tailed dunnart *Sminthopsis crassicaudata* and several species of bats and possum (Tyler *et al*, 1983). Animals with wide-ranging territories may cross the cleared grazing land peripheral to the McNamara Park well site but the high level of activity on the rig is likely to minimise their approach.

The loss of habitat has probably greatly affected the abundance of birds inhabiting the Southeast although their diversity is likely to be only slightly lower. The Southeast still supports 74% (319) of the State's bird species and 64% (198) of its native breeding birds. Of the breeding birds 14 are virtually or apparently extinct in the region (Tyler *et al*, 1983). The orange-bellied parrot *Neophema chrysogaster* which inhabits the Southeast coastline in winter is regarded as endangered at the state,

national and international level. Flight paths of some species may transgress the well site but a combination of noise, artificial lighting and the limited surface area of the derrick in open grazing land will minimise risk.

Currently, 36 reptile species inhabit the Southeast. Of these 2 are tortoises, 10 are snakes and the remainder are lizards. The three dangerous snakes inhabiting the region are the tiger snake *Notechis scutatus*, the copperhead *Austrelaps superbus* and the brown snake *Pseudonaya textilis* (Tyler *et al*, 1983). Snakes are likely to be opportunistic colonisers of artificial habitats and may frequent the location, especially in immobile areas such as skid modules, camp buildings and well site shacks.

### 2.1.5 Hydrology

An unusual feature of the Southeast is the lack of surface streams and rivers. The largely flat terrain with its system of parallel dune ridges has resulted in the formation of many interconnected swamps that generally have a slow northwesterly flow. Until the artificial drainage system was constructed there were few outlets to the sea and large areas of the South East were seasonally inundated

The groundwater hydrology of the region is dominated by two aquifer systems. These are associated with the highly porous Gambier Limestone near the surface and the deeper Dilwyn Formation consisting of sands and gravels.

The Gambier Limestone generally forms a 20 metre thick unconfined aquifer containing good quality water (<500 mg/L total dissolved solids). Since it is recharged directly by rainfall during winter the water table often rises to near the ground surface and is vulnerable to contamination. Any activity that may result in surface run-off poses a threat to water quality in the Gambier Limestone and all activities at the McNamara Park well site will be conducted in a manner that minimises risk of contamination.

The Dilwyn Formation forms a 20 – 100 metres thick confined aquifer and contains water of good quality (600 – 1000 mg/L total dissolved solids). This aquifer is not only used to supply most of the town and city water supplies in the Southeast but is also used for irrigation, watering stock and for industrial purposes. Risk of down-hole contamination of this and all other aquifers will be minimised by running a combination of low fluid-loss drilling mud, steel casing and a cementing programme that will effectively isolate all permeable sands.

Chemical analyses of water recovered from aquifers below the Dilwyn Formation shows that salinity increases to higher levels with depth and the water is unsuitable for agriculture; this observation lowers the magnitude and associated risk of contamination by saline mud filtrate.

## **2.2 WELLSITE AND ACCESS ROUTE CHARACTERISTICS**

### **2.2.1 Land Use**

The location is some 500 metres from a shed and proposed farmhouse. Some internal property fencing is to be modified. This will assist the property owner with management of the property in its current development as a beef cattle operation rather than the original use as dairy farm. Existing access tracks can be used with minor widening for some 400 metres; an additional 600 metres of road including provision for a ring road around the lease will be constructed. The landowner is aware that minor impact to limestone outcrops is likely during the road construction phase.

### **2.2.2 Land form and soils**

The well site is flat with minor undulations (see photographs, Appendix 3). The topography is “karst” like with shallow soil overlying limestone. There is evidence of subsurface water activity and surface subsidence of the limestone. There are no watercourses for several kilometres. There are remnant sand dunes (Figure 3, Appendix 3) and limestone outcrops on the property. The landholder has warned of the problems of drifting sand on these hills once the surface is disturbed and site has been located to avoid these areas. Minor existing erosion is apparent in figures 5 and 6, Appendix 3). Vehicular access to the site will be directly off the Megaw Road and then along an existing private road. A track will be required to cross the open paddock and will be routed to ensure it does not interfere with the remnant sand dune. A Geo-technical investigation including the drilling of site investigation holes has been performed on the proposed site to confirm the absence of caverns and finalise rig pad construction specifications.

### **2.2.3 Vegetation and habitat**

The well site and access is grassed with improved pastures, clover, rye grass, Lucerne and pussy tail grass. There are no trees on the proposed well site (see photographs Appendix 3). No vegetation needs to be removed from the access road but some trees will require minimal trimming to allow heavy vehicle access.

#### 2.2.4 **Fauna.**

The location of the well on totally cleared farming land essentially means that the habitat for native animals has been previously removed. Animals with wide ranging territories (e.g. macropods) may access the site but are unlikely to approach with the possible exception of reptiles (snakes and lizards). Avifauna will cross the rig site following their normal flight paths but the rig will be sufficiently visible (via natural and artificial light 24 hours) to minimise hazards. Scavenging species may approach the camp site seeking food.

#### 2.2.5 **Hydrology**

The topography is “karst” like with shallow soil overlying limestone. There is evidence of subsurface water activity and surface subsidence of the limestone. There are no watercourses for several kilometres. The well will penetrate aquifers in the Gambier Limestone and Dilwyn Formation, both of which will be isolated from potential communication by an appropriate casing and cementing programme.

#### 2.2.6 **Biophysical significance and sensitivity**

The EPBC database has been consulted regarding threatened species but the prior clearance of native scrub and wet lands has eliminated habitats for potentially vulnerable species. The well site and access are very small area within an extensive land system. Neither possesses any characteristics indicating particular conservation significance, or the possibility of conservation significance. Impact management becomes a matter of good house keeping and conformance with established procedures. The transient nature of the drilling phase ensures that no long term interruption to migration paths will occur.

### 2.3 **ABORIGINAL HERITAGE**

Sand dunes are typically sites of former occupation, however the McNamara Park 1 site is in an area that has been pasture improved several times and has endured heavy dairy cow traffic. The site is low lying with shallow soil overlaying limestone. The extent to which the area has been cleared and grazed ensures that no undisturbed sites will be present.

The OEL Landman and representatives of Kungari Aboriginal Association inspected the McNamara Park 1 site on 05 February 2001. No sites of Aboriginal Heritage or Cultural significance were acknowledged. Further inspections will occur once construction commences during the excavation of the drilling fluid sump and flare pits.

### 2.4 **EUROPEAN HERITAGE**

No sites of European heritage have been recorded in the vicinity of the location.

## 2.5 LOCAL COMMUNITY

The well site is situated some ten km from the city of Mt Gambier (see location map, Appendix 2). The well site is on private property. There will be a short period of relatively high use of public roads during the mobilisation and demobilisation stages as detailed under section 1.4.1. The Drilling Rig Contractor is contractually obliged to seek all local authority, Traffic authorities and Police permits for the movement of the Drilling rig along public roads, including if necessary joint inspection of such roads before and after the move. Rig mobilisation and demobilisation and general transport activities will be scheduled to avoid conflict with local road usage wherever possible, eg school buses.

A local Landman is employed to handle all liaison with property owners and local interest groups and to provide on site supervision of all site construction and rehabilitation activities.

Origin Energy will employ wherever possible local Contractors and Businesses to provide services on the project. The drilling rig itself is self-contained with onsite accommodation. Personnel employed for well completion and testing activities will be accommodated offsite in local towns and villages.

Origin Energy will be liasing with the local volunteer Country Fire Service with respect to Fire fighting resources for the activity.

### 3 RISKS ARISING FROM PROPOSED ACTIVITIES.

Risks arising from the proposed activity in a general sense are tabulated below (Table 1). In most cases the drilling of McNamara Park 1 will have minimal surface impact due to the cleared nature of the site and being on private land. The greatest risks are therefore associated with risk transferred from the site such as regional pressurisation (supercharging) of shallow aquifers, spread of weeds and plant pathogens, and supply vehicle accidents/ roll-over in transit to and from the rig and fire.

The specific risks, their potential impact and the proposed management strategy pertaining to the McNamara Park 1 well are addressed in Table 2.

**Table 1**

**Potential Significance of Environmental Aspects for McNamara Park 1**

Environmental Aspects	Cleared	Uncleared			
	Farm or Plantation Forest Land	Plains	Wetlands	Ranges and Hills	Dunes
Vegetation Clearance					
Cultural Heritage Sites	*				
Introduction of Weeds	◆	◆	◆	◆	◆
Wind Erosion	◆				
Water Erosion	*				
Aquifer pressurisation	◆	◆			
Groundwater Pollution	◆	◆	◆		
Surface Water Pollution	◆	◆	◆		
Visual Impacts	◆				
Vehicular transport	◆	◆	◆	◆	◆
Land Use Conflict	◆				
Fire	◆	◆	*	◆	◆
Waste Management	◆	◆	◆		
Noise	◆				
Dust	◆	*			

◆ = Major Concern

\* = Moderate Concern

### **3.1 Risks to the Natural Environment.**

#### **3.1.1 Processes creating risks.**

The main risks to the natural environment at the McNamara Park 1 well arise due to;

- The possibility of spills during construction of the rig pad, campsite and new access roads.
- The possibility of spills during drilling activities
- The possibility of spills during rig materials supply activities
- Drilling activities resulting in groundwater impacts, especially the possibility of total fluid losses whilst drilling the surface hole section
- Inadequate casing and cementing programme allowing communication and cross-flow between aquifers with different salinity and pressure
- The introduction of disease or plant pathogens that would have an impact on vegetation or other land users
- Initiation of fire on the rig and subsequent spread to surrounding countryside

Other risks have been assessed as having very low potential impact due to the ability to quarantine and rehabilitate affected areas while operating on private land and with the consent of the landowner.

#### **3.1.2 Possible impacts on soils.**

Soil coverage on the site is both shallow and of generally poor quality. Spills of chemicals, diesel fuels and improperly disposed waste materials can contaminate the soil. The level of traffic can detrimentally impact the soil, either by compaction or mobilization to form dust, both of which could increase the risk of erosion or limit the rehabilitation success as well as affecting the landowner.

#### **3.1.3 Possible impacts on vegetation and habitat**

Construction of the access tracks and the well site will not cause impact due to the absence of vegetation and habitat (see photographs, Appendix 3). There is no indigenous native fauna associated with the site. A search of the EPBC website has not identified species at risk. The importation of exotic plant diseases or pathogens has the potential to cause damage to existing grazing fodder or impact other land users. The wellsite is fenced and will remain so until rehabilitation is completed, denying access to livestock.

#### **3.1.4 Possible impacts on groundwater**

The well is prognosed to penetrate aquifers in both the Gambier Limestone and the Dilwyn Formation (see Appendix 4 for prognosed stratigraphy). The possible presence of vuggy cavities and highly permeable sands means that there is a risk of losses of drilling fluid to the formation ranging from minimal to total whilst drilling these sections. The potential for these losses is geologically controlled and not necessarily indicated by surface conditions and therefore virtually impossible to

predict. The drilling fluid losses will be restricted to native clay-based mud and the small volume of loss relative to the size of the aquifer will minimise the impact of this risk. Historically only one of the sixteen wells drilled by the Origin Group in the Otway has experienced total fluid losses and this loss was eliminated by 170 metres depth below surface. The surface hole section in McNamara Park 1 will be drilled in less than 24 hours and cumulative time to drill, seal and isolate (with steel casing and cement) the upper hole sections will be less than 48 hours. Historically total mud losses of the order of 500 bbls would be expected over this interval but the anticipated volume is accepted as insignificant due to the non-toxic nature of the mud used (native clays and fresh water) and in relation to the size of the aquifer.

Periods of heavy rain could lead to flooding of the lease area and stormwater runoff to grazing land. McNamara Park is planned to drill before the rainfall season commences and this risk is minimised. Rainfall data for the Penola Post Office covering 20 years from 1979 - 1999 show that rain is most likely in the middle of the year. Some exceptions do occur and the March/April period may have moderate to heavy rain e.g. March 1983 - 121mm; April 1980 & 1982 - 100mm. Rainfall distribution throughout the month is the most important consideration and intermittent rain interspersed with dry, windy periods will be easiest to accommodate. Drainage will be directed to the lined sump and storage volume will be adequate to handle intermittent rain. Excess fluids can be pumped from the sump if necessary and disposed at an approved facility.

There is the potential for cross flow between aquifers and permeable formations if the cementing quality or coverage is inadequate. Poor isolation between deep and shallow aquifers could lead to over-pressuring or supercharging of the shallow aquifers with consequent risk to water bore drilling. In addition water with higher salinity and negligible agricultural or commercial value from a deep aquifer could contaminate shallow aquifers and reduce their economic value. The risk of a poor cement job is considered to be very low as OCA adopts best industry practice in relation to casing and cementing procedures. OCA, operating as the Drilling Manager for Origin Energy, has historically achieved 100% cement bonds on all wells drilled in the Otway basin.

Spills of chemicals and diesel fuels and improper disposal of waste materials can contaminate unconfined aquifers by percolation but this risk is perceived to be very low. The drilling fluids sump is lined with an impermeable membrane and any spills that may occur on the graveled site are directed to the lined sump. The contaminated gravel is ultimately recovered for treatment and dedicated procedures are in place for the handling of all chemicals and waste products.

Vehicular transport of fuel to the rig poses the risk of mishap along access roads. This risk will be minimised by a programme of driver education, signage and a preferred delivery schedule. In the

event of a spill the area will be rehabilitated by a combination of soil removal and on-site bio-remediation.

### **3.1.5 Possible impacts on surface hydrology**

Spills of chemicals, diesel fuels and improperly disposed waste materials can contaminate surface streams and drainage. The construction of the rig pad, campsite and access roads has the potential to impact on surface drainage patterns primarily by the redirection of overland water flows. The McNamara Park 1 well site is bounded by a remnant sand dune to the southwest (see figure 5, Appendix 3) and limestone outcrops to the northeast: drainage will be controlled within this environment to minimize risk of dispersal of contaminated water. The highly permeable nature of the soil on the McNamara Park 1 well site virtually eliminates the possibility of generating an overland water flow.

## **3.2 Risks to the social and economic environment**

### **3.2.1 Possible impacts on existing land uses.**

The importation of exotic plant diseases or pathogens has the potential to cause damage to existing vegetation or land uses. This risk is seen as minimal as the rig and ancillary equipment are all coming from unaffected areas and previously have been operating on graveled pads. In the event of any introduced weed species being identified on site the area will be treated by the appropriate method and in accordance with the landowner's wishes. The landowner has been informed of the rig and associated support vehicles' likely provenance.

Careless use of welding and grinding equipment on the rig could initiate fires. Rig and camp personnel similarly must be aware of fire risk and extinguish cigarettes prior to disposal.

### **3.2.2 Possible impacts on local community resources and safety**

Mobilization and demobilization of the drilling rig and camp necessitates use of heavy vehicle transporters on generally under-utilized roads. The relevant local authorities must be informed of planned heavy vehicle activity and the necessary approvals gained. Population density on grazing land increases dramatically and supply vehicles to replenish consumables are required on a regular basis for both the camp and the rig. Narrow and/ or unsealed roads must be shared with the local community, potentially during periods coinciding with school bus movements, and precautions to avoid accidents must be observed. Dust constitutes a hazard that must be minimized by spraying roads when necessary and drivers must be made aware of general road conditions that may result in loss of transported load. Vehicle movements will be required for site restoration after the rig has been removed.

Fire is a threat because of its potential to spread rapidly from the site of initiation. The Country Fire Service will be informed of both the potential for fire and the level of occupancy in otherwise vacant grazing land. The presence of the CFS will also be requested during periods of heightened danger such as well testing, thus placing demands on their organization. Under Section 54 of the *Country Fires Act 1989* an officer may “enter ... any land or building” and may “take and use water or any other fire extinguishing material from any land”. OERL will support the CFS in the course of their duties should the need arise and will make available stored water on the lease should it be required.

### 3.2.3 Possible impacts on European Heritage

In the absence of any particular European heritage items or relationships the activities pose no risk to European Cultural aspects

### 3.2.4 Possible impacts on Aboriginal heritage.

The proposed well site has been surveyed for cultural relics by the relevant body and no sites have been acknowledged.

The drilling activities pose no risk to Aboriginal heritage unless items of cultural or heritage significance are discovered during excavation activities on the site. The OEL Landman is in attendance for all excavation activities on the site. In the event of the discovery of potential cultural heritage material the Landman will immediately inform the OCA Drilling Superintendent. Activities that may lead to damage of a newly discovered heritage artefact/ feature will immediately be suspended within a radius of 100m of the identified site. The State Department of Aboriginal Affairs and any other relevant regulatory authorities will be informed of the discovery so that the material can be evaluated for cultural and heritage value. If the discovery is determined to be of heritage significance, OEL will take the advice of relevant stakeholders with respect to the appropriate course of action.

## **4 MANAGEMENT OF IMPACTS AND IMPACT RISKS.**

### **4.1 Site Planning and Design**

The McNamara Park 1 surface location has been selected to minimise the amount of cut and fill required in a fairly fragile soil profile and to stay as far as practicable from farming infrastructure on the property. The property owner has requested that the gravel for the rig pad be laid directly on top of the existing soil. OEL have employed this process elsewhere in the Otway basin with greater rehabilitation success than is achieved by removing and stockpiling the soil. No disruption will occur to the remnant sand dune and isolated limestone outcrops during construction of the rig pad. Some internal fencing on the property is to be moved to make access for the rig easier but also to assist Mr Wirth with management of his Beef cattle operation. There are no trees at the chosen proposed McNamara Park 1 site. Some trees along the access road will require minimal trimming. Existing access tracks will be used with minor widening for some 400 metres; an additional 600 metres of road including provision for a ring road around the lease will be constructed. This road will be sheeted with gravel and kept to a maximum of 5.0 metres wide. Minor disruption to surface limestone outcrops is anticipated with construction of the access track and the landowner is aware of this risk. All rig traffic will be restricted to this road and traffic speed limits will apply. Provision has been made in the Construction Contract for the watering of roads if dust becomes a problem. The topography is "karst" like with shallow soil overlying limestone. There is evidence of subsurface water activity and surface subsidence of the limestone. There are no watercourses for several kilometres. A Geo-technical investigation including the drilling of site investigation holes has been performed on the proposed site to confirm the absence of caverns and finalise rig pad construction specification. There is no possibility of flooding or ponding of water in the McNamara Park 1 vicinity based on surface topography and climate records appropriate to the time of drilling.

### **4.2 Stakeholder Consultation**

Mr Roger Wirth, the property owner, was served Notice of Entry under Part 10, Section 61 of the *Petroleum Act 2000* and has been consulted at all stages. Origin Energy has concluded a compensation agreement with Mr Wirth. Representatives of the Kungari Aboriginal Association have been informed of the proposed activity and visited the site on 05 February 2001 with the OEL Landman. The local police will be informed of the Emergency Response Plan by the OCA Rig Supervisor and the local CFS will be invited to attend any DST or testing activities.

### **4.3 Site and access construction**

#### **4.3.1 Creek Crossings**

The location and access routes have been selected to ensure that there are no creek crossings.

#### 4.3.2 **Connection to Public Road**

The rig access road will be on private land and is not for public use. The high level of visibility poses a risk to third parties who are unfamiliar with drilling activities and have not undergone an induction programme. Signs will be placed near the entry to the rig road to discourage public entry and minimise associated risk. The signs will warn against trespassing and warn of dangers associated with drilling and truck movements. The OEL Landman or construction supervisor will have the authority to ask uninvited persons to leave.

#### 4.3.3 **Borrow pit**

It is necessary to perform minor levelling of 2-3 small limestone ridges for vehicle access. This material will be used on the rig pad and will minimise the amount of imported fill required. Imported Gravel Material for the rig pad and access roads is to be taken from pits operating under a current Extractive Mining Lease (EML). The pad will be covered with gravel to a depth of approximately 30 to 50 cms laid directly on the topsoil. Due to the weight of the drill rig structure an area 18 metres by 10 metres will be excavated to a depth of 70 cm and built up with compacted gravel.

#### 4.3.4 **Excavation**

A two-stage sump will be constructed and lined with a 300-micron premium grade polythene membrane to prevent seepage into shallow aquifers or leakage into surface water. Drains will be dug to direct all onsite drainage to the PVC lined sump. A flare pit measuring 10 m x 5 m will be constructed some 46 m from hole centre according to industry standards – the drilling programme is designed such that no fluids are discharged to the flare pit excepting in an Emergency in which case they will be flared. The OEL Landman will be in attendance during all excavation to monitor for the possibility of discovering any items of Aboriginal cultural or heritage significance.

The campsite is to be constructed adjacent to the rig (~100m), and some 500 metres from the shed and proposed farmhouse

#### 4.3.5 **Dust**

All rig traffic will be restricted to this road and traffic speed limits will apply. Provision has been made in the Construction Contract for the watering of roads if dust becomes a problem.

#### 4.3.6 **Noise**

Noise is not expected to be an issue during construction as activities will occur during daylight and on the opposite of the remnant sand dune to the nearest dwelling.

#### 4.3.7 Waste

The Construction Contractor is responsible for removal of all waste products generated during construction activities to an approved facility.

#### 4.3.8 Management during Construction

Chris Annear of Petroleum Support Services Mt Gambier OEL will provide on site supervision of all site construction and rehabilitation activities for the McNamara Park 1 well. Gambier Earth Movers will provide lease and access construction services from Mt Gambier. Site Construction activities will be performed in accordance with the “ Specification for Earthworks Schedule - Otway Basin Campaign 2001”

### 4.4 Drilling Activities

#### 4.4.1 Public access to the site

The rig will be located only 1 km from a public road and will be clearly visible. This poses a risk to third parties who may wish to trespass but have not undergone an induction programme. The rig access road is on private land and should not be open to the public. Signs will be placed near the entry to the rig road to discourage public entry; the signs will warn against trespassing and inform the reader of dangers associated with drilling and truck movements. The OCA Rig Supervisor and the Drilling Contractor Rig Manager will have the authority to ask tourists to leave. Whilst OEL in general discourage casual visitors to the rig, management systems are in place to ensure that visitors are handled in a courteous, safe and informed manner. Clearly designated Visitor parking bays will be set up at the campsite. All Visitors will undergo a detailed Visitor Induction and be escorted whilst on the drilling site.

#### 4.4.2 Well Construction

The well construction plan follows accepted codes of practice for onshore drilling and workovers and has been designed with specific emphasis on the management of the impact on groundwater. No petroleum based drilling fluids will be used. Drilling mud in top-hole will comprise only natural clays and water-based products. Drilling fluid properties in the deeper section will be designed to minimise fluid losses and maximise hole cleaning. Casing strings will be set into competent formations and the annular space cemented to isolate aquifers and permeable formations. Centralisers will be used to ensure 360° cement coverage radially around the casing and scratchers will scour mudcake from the borehole to ensure a safe cement bond with the formation. Casing float accessories and cement baskets will also be used as appropriate to ensure the best cementing outcome.

If the well is abandoned, cement plugs of not less than 50 metres lineal extent will be placed to isolate all permeable formations and aquifers plus a 50 metre plug across the surface casing shoe and a 6 metre surface plug. Abandonment plugs will be set using the balanced plug technique and API class G cement. The plug across the surface casing will be tested for position and pressure. The casing will be filled with biocide-treated mud before setting the surface plug and removing the BOPs. Any Production casings run will be cemented with API class G cement with additives as necessary to achieve design properties. The final blend is based on a Laboratory test performed by the Cementing Contractor using a sample of actual mix water from the specific drilling site (Collected by the Contractor at the time of pumping the surface casing job). Annular rise for the production casing string is designed to be 100 m above the surface casing shoe. Slurry volumes pumped will be 10% excess to the integrated caliper volume. Acoustic cement quality assessment logs will be run on any production casing strings prior to perforation. This log includes a 50 metre pass across the Top of Cement to ensure that cement rise is according to design i.e. displacement volumes have been adequate to push cement into the annulus and above any permeable zones. The production casing string will not be perforated before the cement has attained 95% of ultimate compressive strength based on the Lab test data and never within 48 hours of pumping.

Specific details for the proposed McNamara Park 1 well are as follow.

The well is prognosed to intersect the following formations as shown in the predicted stratigraphic section, Appendix 4.

Gambier Limestone  
Narrawaturk Marl  
Mepunga Formation  
Dilwyn Formation  
Pember Mudstone  
Pebble Point Formation  
Paaratte Formation  
    Intra Paaratte  
    Belfast Mudstone  
Flaxman Formation  
Lower Flaxman Formation  
    Waarre Formation  
    Eumeralla Formation

- Prior to moving in the Drilling rig a 456 mm conductor is to be set at ~24 metres and cemented to surface with construction cement using a combination of balanced plug and surface top up techniques. The string will isolate the near surface aquifers from potential communication.

- After the drilling rig is installed, a 311 mm surface hole will be drilled using a freshwater & native gel (bentonite) mud system to 50 metres into the Pember Mudstone at ~ 530 metres
- If significant fluid losses are encountered the hole will continue to drill until the loss zones are fully penetrated. The hole will then be opened to 445 mm and a second conductor casing being 340 mm API 5CT seamless steel casing will be run and cemented to surface using a combination of balanced plug and surface top up techniques. This cement will be supplied from the local batching plant (Readymix). The surface casing will isolate aquifers as well as preventing cross-flow with deeper high pressure zones that could cause significant safety problems on the rig – the BOP will be attached to this string to ensure pressure control during well operations.
- At TD of the surface hole section 244 mm API 5CT seamless steel casing will be run and cemented back to surface using API class G cement + 1% CaCl<sub>2</sub> accelerator and pressure cementing techniques. Cement volume will be pumped as 100% excess to calculated volume. Casing float accessories, centralisers, scratchers and cement baskets will be used as appropriate to ensure the best cementing outcome.
- In the event that cement returns either do not reach surface or slump away from surface then an annular top-up job will be performed using trammel pipe. This top-up will be performed using batch mixed construction cement from the local agitator plant.
- After installing and testing BOPs a 216 mm hole will be drilled using a KCL – PHPA mud system to ~ 2000 metres. No down hole problems are anticipated in this section. The salinity of the mud system will exceed that of the native formation in order to control clay swelling and some loss to the formation is expected; benign fluid loss additives (e.g. starch) will be used to minimise filtrate invasion and the fluid volume will be insignificant in relation to the volume of any penetrated aquifer. It must be noted that the deeper aquifers are not utilised for agriculture due to inherently high salinity and have no commercial value.
- At TD of the production hole the well will be logged and tested as appropriate.
- The well will then either be plugged & abandoned or production casing will be run and cemented and the well suspended for future completion.

If production casing is run then the cement volume pumped will be sufficient to achieve an annular rise 100 metres above the surface casing shoe + 10% as calculated from an integrated calliper volume log.

#### 4.4.3 **Drilling activities**

##### 4.4.3.1 **Dust**

All rig traffic will be restricted to the designated road and traffic speeds will apply. Provision has

been made in the Construction Contract for the watering of roads if dust becomes a problem.

#### **4.4.3.2 Noise**

Noise is not expected to be a significant issue during drilling despite the proximity to the landholder's infrastructure; this is due to the relocation of the rig to the far side of the remnant dune. The next nearest habitation is more than one kilometre away. Adjacent landholders will be advised of any potentially "noisy" activities such as DSTs. Perforation of casing during the course of well completion will be conducted during daylight hours only.

#### **4.4.3.3 Waste Management**

Waste Management will be in accordance with the provisions of the OCA/OEL "Waste Management Plan – Revision 1/0, September 1999". Steel wastes will be collected in skips provided by Northcott Contracting for recycling through Multimetals. Domestic wastes, drums, pallets and recyclable materials will be collected by Northcott Contracting and disposed of at the Wattle Range Council Waste facility. Hazardous wastes (if any) will be separated from general waste and collected by Northcott Contracting and disposed off at the Wattle Range Council Waste facility. Waste grease and oils are to be stockpiled in suitable drums and disposed of at the Cleanaway Facility, Mt Gambier. Northcott Contracting will truck the liquid contents of the drilling fluids sump to the SA Water Finger Point Facility. Solids will be disposed of locally at either the Wattle Range Council Waste facility or the GEM facility in Mt Gambier. Once empty the sump liner is to be removed and the sump will be back-filled with the original soil. The surface will be levelled and, if required, re-seeded. The sump will be fenced at the completion of drilling activities until earth cover is restored.

Septic tanks will be installed at both the campsite and the rig site. All black water is directed to these tanks and periodically removed by Northcott Contracting to the Finger Point treatment facility. All grey water is directed to earthen pits.

#### **4.4.3.4 Chemical Management**

Chemical Management will be in accordance with the provisions of OCA/OEL "Chemical Management Plan – Revision 1/0 April 2000. A Register of all Chemicals is kept in the OCA Brisbane office together with copies of the appropriate MSDS. A copy of MSDS for all chemicals is kept on the rig. A designated chemicals storage area will be established onsite. Hazchem are kept in a separate flagged storage area and drains from these areas are designed such that any spillage is directed to the lined sump. Any fuel storage areas will be drained to the lined sump. All chemical transfers are registered using the OCA MMM and MMM-DG Documents. All chemical transport is by licensed (DG) transport contractors. The rig will have a quantity of "Sokerol" absorbent material and approved contaminated soil collection drums on site. Any contaminated soil collected during the activities will be removed to the Gambier Earth Moving (GEM) facility in

Mt Gambier. A lined pit will be constructed to collect any oil or grease spillages from the campsite generators.

#### **4.4.3.5 Rig Safety**

The Drilling activity is designed to prevent unplanned emissions from the well. Casing will be set into competent formations and cemented in accord with design parameters and Company approved procedures. Blow out prevention equipment will be installed and operational. BOP drills will be conducted. OEL has an effective emergency response plan and procedures in place to minimise risk in the event of an accident. Emergency response training is conducted as routine Company policy: rig personnel will be made aware of the location and operation of safety equipment via a programme of induction and on-going safety meetings. OCA an owner of the joint onshore Drilling Permit to Work System (together with Santos, Century Drilling and ODE Limited) and this system will be enforced throughout the campaign.

The local CFS will be onsite for any DST operation.

All reservoirs in the McNamara Park 1 well are predicted to have a normal water pressure gradient. All wellhead equipment will be rated to a minimum 3000 psi. The maximum predicted surface pressure is 17.250 Mpa (2500 psi). The ODE #30 rig is equipped with a full 5000 psi BOP stack.

#### ***Light Emissions***

Any artificial lighting required will be positioned to minimise light emanating from the plant while still allowing for the safe operation of the site. Drilling activities will be performed on a 24-hour basis. The property owner has been informed. Any well completion and extended testing activities will be conducted on a twelve-hour “daylight” only basis.

**Table 2**

**Summary of Possible Environmental Impacts, Management Strategies and Objectives.**

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
<p>Macro/ social effects</p> <p>Degradation of Public infrastructure</p> <p>Reduction in aesthetic and recreational value.</p> <p>Operations in relation to land owners and access to the land not conducted according to the Act</p>	<p>Overall impact on the local community of having a Drilling Rig moving through and operating in the Area</p>	<p>Consultation with local landholders, the District Councils, the Aboriginal communities and relevant Government departments prior to the commencement of operations</p> <p>All statutory approvals will be obtained prior to drilling. Layout shall be designed to minimise the area of disturbance and fit in with local infrastructure whilst maintaining appropriate workplace safety standards. Rig mobilisation and demobilisation and general transport activities will be scheduled to avoid conflict with local road usage wherever possible, eg school buses.</p> <p>A local Landman has been employed to liaise with property owners and local interest groups and to provide on site supervision of all site construction and rehabilitation activities.</p> <p>McNamara Park 1 was inspected with the landowner on 05 February 2001 following initial correspondence 16 January 2001. Representatives from the Kungari Aboriginal Association were in attendance.</p> <p>Wherever possible local Contractors and Businesses are employed to provide services on the project. The drilling rig itself is self-contained with onsite accommodation. Well completion and testing activities are accommodated offsite in local towns and villages.</p> <p>The Drilling Rig Contractor is contractually obliged to seek all local authority, Traffic authorities and Police permits for the movement of the Drilling rig along public roads, including if necessary joint inspection of such roads before and after the move.</p> <p>The Drilling Supervisor once on site will advise the local police, volunteer Country Fire Service and other emergency services of the proposed activities.</p> <p>A pre spud Operations and HSE management meeting is held on site with all Contractors and if near Penola attended by a representative of the local Origin Energy Production Facility</p> <p>Arrangements have been made to employ the following Contractors on various components of the 2001 Otway Drilling Campaign; Earthmoving – Gambier Earthmoving; Fencing – Roger Wirth, property owner; water bore and conductor installation – Sims Drilling , Waste Material Transport – Northcott Contracting, Rig transport – Spikens Transport Warrnambool; General freight – K&amp;S Portland, offsite meals and accommodation – various Motels &amp; Lodges in Penola, Taxi services to and from the rig – Gambier Taxis, Landman - Chris Annear of Petroleum Support Services Mt Gambier</p>	<p>Minimise risks to the safety of the public, employees and other third parties</p> <p>Avoid disturbances which have long term adverse impact on biological, cultural, aesthetic and agricultural values of a particular area</p> <p>Conduct all operations relating to land owners and access to the land according to the Act</p> <p>Plan vehicular movements and schedule activities as best as possible to minimise inconvenience to the local community</p> <p>Control noise from road vehicles and machinery</p>

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
		<ul style="list-style-type: none"> <li>• The local police will be invited onsite and appraised of the Emergency Response Plan</li> <li>• The local volunteer Country Fire Service “CFS” will be invited to attend to any DST activities that occur. (OEL make a donation to this organization)</li> <li>• The property owner at McNamara Park 1 has been served notice of intended entry as required under the <i>Petroleum Act 2000</i></li> <li>• McNamara Park 1 was inspected with the landowner on 05 February 2001 following initial correspondence 16 January 2001. Representatives from the Kungari Aboriginal Association were in attendance.</li> <li>• Compensation has been negotiated with the property owner</li> <li>• The rig to be used for this well, ODE #30 is being mobilised from the Port Campbell area in Victoria – all transport will be normal road going vehicles. Spikens Transport from Warrnambool in Victoria provides rig transport.</li> <li>• Ancillary services and equipment for the drilling are being mobilised from Port Campbell as well as Roma (QLD), Portland (Victoria) and Adelaide. All transport will be normal road going vehicles</li> </ul>	
<p>Physical Damage to soils, vegetation and habitat</p> <p>Increased erosion and potential for the introduction or spread of weeds.</p> <p>Possible disturbance to sites of Aboriginal and European</p>	<p>Construction of access, campsite and rig pad.</p> <p>Mobilisation and demobilisation of Drilling Rig and ancillary equipment</p> <p>Drilling Activities</p>	<p><b>Site Planning and Design</b></p> <p>An understanding of the potential impacts that may occur is gained prior to any activity-taking place by performing a desktop review of environmental, cultural and social issues.</p> <p>Overlapping of the proposed location and possible access route on a Landsat image or aerial photograph has been used to make an initial environmental assessment of the proposed operation and determine if alternative locations are likely to be needed before any data is sent to the field for the initial site reconnaissance. A site which will not compromise the geological objectives of the well has been selected.</p> <p>A new access track has been located to avoid long term damage to the land.</p> <p>The Location Reconnaissance Report “LRR” has been completed prior to any site clearing activities and sensitive sites/areas are clearly marked for avoidance (e.g. protected vegetation, mature trees). The LRR assists in determining the final drilling location.</p> <p>The drill pad, access tracks and campsite are located to minimise disturbance to features of natural,</p>	<p>Avoid initiating erosion on shallow limestone soil substrates and any area of relief such as palaeo-dunes</p> <p>Minimise impacts to soil.</p> <p>Avoid disturbances which have long term adverse impact on biological, cultural, aesthetic and agricultural values of a particular</p>

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
<p>heritage significance.</p> <p>Reduction in soil fertility</p> <p>Contamination</p> <p>Removal of Natural habitat</p> <p>Alteration to surface drainage patterns</p>		<p>scientific, cultural or historical heritage significance and to ensure that the area of disturbance is minimised.</p> <ul style="list-style-type: none"> <li>The LRR has determined that the initially proposed McNamara Park 1 well site was in proximity to remnant sand dunes and limestone outcrops, both of which need to be avoided and not disturbed because of the potential to initiate erosion. The landholder has warned of the problems of drifting sand on these hills once the surface is disturbed. The proposed location is only 200 metres from a shed and proposed farmhouse. The location straddles two landholders. Access to the site would require road building.</li> <li>The site has been moved to an alternative location some 300 metres to the North East. The new site is located on the flat away from the existing shed and proposed house site and away from the remnant sand dunes. Road access will be along an existing private road and then across an open paddock and does not interfere with the remnant sand dune. No vegetation needs to be removed from the access road; some trees will need to be trimmed to allow heavy vehicle access. There will be minimal cut and fill, which conforms to the OEL standard, and the property owner request that no topsoil is to be removed the well, will be steered to intersect the target formations.</li> </ul>	<p>values of a particular area</p>
<p>Physical Damage to soils, vegetation and habitat</p> <p>Increased erosion</p> <p>Reduction in soil fertility</p> <p>Contamination</p> <p>Removal of Natural habitat</p> <p>Alteration to</p>	<p>Construction of access, campsite and rig pad.</p> <p>Mobilisation and demobilisation of Drilling Rig and ancillary equipment</p> <p>Drilling Activities</p>	<p><b>Construction</b></p> <p>Site clearing will be limited to a maximum area of 150m x 150m for the drill pad, which includes provision for a 15m-perimeter firebreak increasing to 20m behind the flare pit, and 50m x 50m for the camp. All construction areas will be surveyed and pegged to clearly define site limits with ongoing supervision at all stages by the OEL Landman. Substantial trees will not be affected at the well site due to the extensive clearing that has occurred but minimal trimming of overhanging branches will be required along access roads.</p> <p>Risk to local residents will be increased by the atypical vehicular traffic. Transport activities involving heavy earthmoving equipment and trucks along local roads will be scheduled to avoid times when school buses are active.</p> <p>No top soil will be removed unless required for the building of a sump and flare pit, or where the site has to be cut/filled. Any topsoil and seed/root stock that is removed will be stockpiled for use during rehabilitation. Stockpiles shall be restricted to 1 to 1.5 m in height so as not to reduce the nutrient value of the soil.</p>	<p>Avoid initiating erosion on shallow limestone soil substrates and any area of relief such as palaeo-dunes</p> <p>Minimise impacts to soil</p> <p>Conduct all operations relating to land owners and access to the land according to the Act</p> <p>Avoid contamination of aquifers and</p>

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
<p>surface drainage patterns and risk of erosion caused by failure to return all surfaces to original levels and drainage</p> <p>Failure to conduct all activities according to best industry practice and acceptance by landowners and the local community</p>		<p>Natural surface water drainage will be maintained and kept free of any stockpile soil and fill. Water channelling that could lead to erosion will be avoided.</p> <p>The sump will be lined and positioned such that contained liquids will not pollute or impact on surface or sub-surface drainage. The sump and flare pit will be constructed according to industry standards and soil will be stockpiled for restoration</p> <p>Onsite drainage is directed to the sump for effective separation of clean and dirty water; off site surface drainage shall be directed away from the drilling pad, sumps and pits.</p> <p>Traffic is allowed only on designated access routes as agreed with the property owner.</p> <ul style="list-style-type: none"> <li>• There are no trees at the proposed McNamara Park 1 site. Some trees along the access road will need to be trimmed back.</li> <li>• Existing access tracks can be used with minor widening for some 400 metres; an additional 600 metres of road including provision for a ring road around the lease will be constructed.</li> <li>• The topography is “karst” like with shallow soil overlying limestone. There is evidence of subsurface water activity and surface subsidence of the limestone. There are no watercourses for several kilometres</li> <li>• The well site is currently grassed with improved pastures, clover, rye grass, Lucerne and pussy tail grass.</li> <li>• Minor levelling of 2-3 small limestone ridges is required to construct the access track which will minimise the amount of imported fill required</li> <li>• Gravel Material for the rig pad and access roads if imported will be taken from pits operating under a current Extractive Mining Lease (EML).</li> <li>• Some internal property fencing is to be modified. This will assist the property owner with management of the property in its current development as a beef cattle operation rather than the original use as dairy farm</li> <li>• A two-stage sump will be constructed and lined with a 300-micron premium grade polythene membrane to prevent seepage into shallow aquifers or leakage into surface water. Drains will be dug to direct all onsite drainage to the PVC liner. A flare pit measuring 10 m x 5 m will be constructed some 46 m from hole centre according to industry standards – the drilling programme is designed such that no fluids are discharged to the flare pit excepting in an</li> </ul>	<p>minimise impacts on surface water and its drainage patterns</p> <p>Conduct all operations in relation to landowners and access to the land according to the Act</p> <p>Prevent the introduction and establishment of exotic weed species</p> <p>Avoid spills of oil or hazardous material outside permeable sumps or other areas designed to contain such spills</p> <p>Minimise adverse impacts on livestock</p>

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
		<p>Emergency, in which case they will be flared.</p> <ul style="list-style-type: none"> <li>• The campsite is to be constructed adjacent to the rig (~100m), and some 500 metres from the shed and proposed farmhouse</li> <li>• Water supply is to be taken from a registered bore on the property.</li> <li>• Arrangements have been made to undertake a geo-technical investigation (core drilling) of the pad area prior to construction to ensure adequate foundations for the Drilling Rig</li> <li>• Site Construction activities will be performed in accordance with the “ Specification for Earthworks Schedule - Otway Basin Campaign 2001”</li> </ul> <p><b>Weeds and plant pathogens</b></p> <p>A desktop review will be conducted to assess the potential for the importation of weeds or plant pathogens. This involves the checking of the current work location of the rig, its proposed mobilisation route and the new location against local databases.</p> <p>If a declared weed or plant pathogen is discovered on site it will not be disturbed. The location of the infestation will be reported to the landholder and advice on required action (where necessary) will be sought from the relevant regulatory authority.</p> <ul style="list-style-type: none"> <li>• The drilling rig to be used for McNamara Park 1, ODE #30, is being mobilised from a Santos well site on cleared grazing land near Port Campbell in Western Victoria. The Santos well site gravelled. The area has a comparable climatic and vegetation environment to the McNamara Park 1 well site. There are no identified weeds or plant pathogens associated with the current site.</li> <li>• The rig will be moved along sealed public roads to the McNamara Park 1 location. The rig pad, campsite and access roads at McNamara Park 1 are all gravelled and compacted.</li> <li>• All transport will be restricted to these agreed access routes.</li> </ul> <p>There is no possibility of flooding or ponding in the McNamara Park 1 area.</p>	
Intrusion or physical damage to areas of Aboriginal and European heritage	<p>Construction of access, campsite and rig pad.</p> <p>Mobilisation and demobilisation of</p>	<p><b>Protection of cultural heritage</b></p> <p>The LRR is used to identify any potential risk areas, which are then flagged and inspected by representatives of the local Aboriginal community together with the OEL Landman.</p> <p>The OEL Landman is in attendance for all excavation activities on the site. In the event of the discovery of potential cultural heritage material the Landman will immediately inform the OCA Drilling</p>	Avoid disturbances which have long term adverse impact on biological, cultural, aesthetic and agricultural

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
<p>significance</p> <p>Failure to recognise sites of significance that may be exposed during construction and to take appropriate measures to protect them and notify the relevant authorities</p>	<p>Drilling Rig and ancillary equipment</p> <p>Rig and third party personnel movements</p>	<p>Superintendent.</p> <p>Activities that may lead to damage of a newly discovered heritage artifact/feature will immediately be suspended within a radius of 100m of the identified site.</p> <p>The State Department of Aboriginal Affairs and any other relevant regulatory authorities will be informed of the discovery so that the material can be evaluated for cultural and heritage value.</p> <p>If the discovery is determined to be of heritage significance, OEL will take the advice of relevant stakeholders with respect to the appropriate course of action.</p> <ul style="list-style-type: none"> <li>• The McNamara Park 1 site is in an area that has been pasture improved several times and has endured heavy dairy cow traffic. The site is low lying with shallow soil overlaying limestone. The extent to which the area has been cleared and grazed ensures that no undisturbed sites will be present</li> <li>• Sand dunes are typically sites of former occupation and this is an additional reason that the site has been moved in order to avoid any impact on the remnant dune.</li> <li>• The McNamara Park 1 site was inspected by the OEL Landman and representatives of the Kungari Aboriginal Association on 05 February 2001</li> </ul>	<p>values of a particular area</p>
<p>Disturbance to rare, endangered, vulnerable flora</p>	<p>Construction of access, campsite and rig pad.</p> <p>Mobilisation and demobilisation of Drilling Rig and ancillary equipment</p> <p>Rig and third party personnel movements</p>	<p>An understanding of the potential impacts that may occur is gained prior to any activity-taking place. The Commonwealth EPBC website is consulted. The appropriate management strategies would be developed in response to the identification of endangered species, the key criteria being avoidance.</p> <ul style="list-style-type: none"> <li>• The proposed location falls entirely within farming land – there is no evidence rare or endangered flora due to the cleared land at the McNamara Park 1 well site.</li> <li>• OEL can summarily terminate staff including Contractors found to be in breach of Company policies with relation to flora</li> </ul>	
<p>Pollution through local spills and sump overflows</p>	<p>Vehicle and plant refuelling during construction,</p>	<p><b>Waste Management</b></p> <p>Waste Management will be in accordance with the provisions of the OCA/OEL “Waste Management Plan –</p>	<p>Minimise impact on the environment of waste handling and</p>

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
	Drilling and Rehabilitation Drilling Activities Chemical spills onsite or in transit Waste Material Generation	Revision 1/0, September 1999” OEL acknowledges that the potential impact of some wastes may be greater than others and rig personnel will be instructed to identify and separate respective categories of waste. No waste products will be left on site at the conclusion of drilling activities. All Waste streams will be removed to the appropriate handling facility. <ul style="list-style-type: none"> <li>• Steel wastes will be collected in skips provided by Northcott Contracting for recycling through Multimetals</li> <li>• Domestic wastes, drums, pallets and recyclable materials will be collected by Northcott Contracting and disposed off at the Wattle Range Council Waste facility</li> <li>• Hazardous wastes (if any) will be separated from general waste and collected by Northcott Contracting and disposed off at the Wattle Range Council Waste facility</li> <li>• Waste grease and oils are to be stockpiled in suitable drums and disposed of at the Cleanaway Facility Mt Gambier</li> <li>• Northcott Contracting will truck the liquid contents of the drilling fluids sump to the SA Water Finger Point Facility. Solids will be disposed of locally at either the Wattle Range Council Waste facility or the GEM facility in Mt Gambier. Once empty the liner is removed and the sump will be back-filled with the original soil, levelled and, if required, re-seeded. The sump will be fenced at the completion of drilling activities until earth cover is restored</li> <li>• Septic tanks will be installed at both the campsite and the rig site. All black water will be directed to these tanks and periodically removed by Northcott Contracting to the Finger Point treatment facility. All grey water will be directed to earthen pits.</li> </ul>	disposal Avoid spills of oil or hazardous material outside of impermeable sumps or other areas designed to contain such spills Minimise risks to the safety of the public, employees and other third parties Avoid contamination of aquifers and minimise impacts on surface water and its drainage patterns
Pollution through local spills and sump overflows	Vehicle and plant refuelling during construction, Drilling and Rehabilitation	<b>Chemical Management</b> Chemical Management will be in accordance with the provisions of OCA/OEL “Chemical Management Plan – Revision 1/0 April 2000 A Register of all Chemicals is kept in the OCA Brisbane office together with copies of the appropriate	Minimise impact on the environment of waste handling and disposal Avoid spills of oil or

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
	Drilling Activities Chemical spills onsite or in transit Waste Material Generation	MSDS A copy of MSDS for all chemicals is kept on the rig A designated chemicals storage area will be established onsite. Hazchem are kept in a separate flagged storage area, drains from these areas are designed such that any spillage is directed to the lined sump. The rig will have a quantity of absorbent material and approved contaminated soil collection drums on site. The favoured mechanism by which to remediate spills is bio-remediation to the end point of 0.1% total petroleum hydrocarbons in soil after 12 months (based on the Victorian EPA guidelines). Any contaminated soil collected during the activities will be removed to the Gambier Earth Moving (GEM) facility in Mt Gambier. Any fuel storage areas will be drained to the lined sump All chemical transfers are registered using the OCA MMM and MMM-DG Documents All chemical transport is by licensed (DG) transport contractors <ul style="list-style-type: none"> <li>• The rig will have a quantity of “Sokerol” absorbent material and approved contaminated soil collection drums on site</li> <li>• Any contaminated soil collected during the activities will be removed to the Gambier Earth Movers (GEM) facility in Mt Gambier.</li> <li>• A lined pit will be constructed to collect any oil or grease spillages from the campsite generators</li> </ul>	hazardous material outside of impermeable sumps or other areas designed to contain such spills  In the event of a spill, minimise impacts on fauna, flora, soil, livestock and surface and ground water
Contamination of aquifers  Failure to prevent shallow aquifers becoming over-pressured due to communication with deeper zones  Inconsumable water to local	Drilling Fluid losses  Cuttings and mud disposals in sump  Drilling through Gambier Limestone & Dilwyn aquifers	<p><b>Minimising risk of contamination and cross flow in aquifers</b></p> OEL acknowledges that contamination of shallow aquifers and cross flow between permeable zones is a major threat to the environment in the Penola district. The potential for aquifer contamination will be avoided by applying standard petroleum drilling procedures for well construction.  No petroleum based drilling fluids will be used. Drilling mud will be water-based products. Drilling fluid properties will be designed to minimise fluid losses and maximise hole cleaning.  Mud used in the top-hole will be salt-free but salt will be added for drilling the section below the surface casing to control dispersion. Aquifer salinity in the lower hole section is too high for agricultural use and saline mud filtrate will be rapidly diluted, both factors minimising potential environmental impact  Drilling fluids will be contained within the well area and fluid circulation system (i.e. mud tanks, fluid pump system, shaker tanks, cellar, well and sump).	Minimise loss of reservoir and aquifer pressures  Avoid contamination of aquifers and minimise impacts on surface water and its drainage patterns  Minimise risks to the safety of the public

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
<p>communities and ecosystems</p> <p>Water shortages</p>		<p>Excavated areas that are required for storage of fluids will be lined to prevent seepage of potentially contaminated fluids into underlying soil and shallow aquifers</p> <p>Casing strings will be set into competent formations and the annular space cemented to isolate aquifers and permeable formations</p> <p>Casing float accessories, centralisers, scratchers and cement baskets will be used as appropriate to ensure the best cementing outcome i.e. scratchers will remove the mud filter cake to ensure a competent bond with the formation and centralisers will ensure emplacement of cement radially around the casing.</p> <p>If the well is abandoned, cement plugs of not less than 50 metres lineal extent will be placed to isolate all permeable formations and aquifers, plus a 50 metre plug across the surface casing shoe and a twenty metre surface plug. Abandonment plugs will be set using the balanced plug technique and API class G cement. The plug across the surface casing will be tested for position and pressure. The casing will be filled with biocide treated mud before setting the surface plug and removing the BOPs.</p> <p>Any Production casing string will be cemented with API class G cement and additives as necessary to achieve design properties. The final blend is based on a Laboratory test performed by the Cementing Contractor using a sample of actual mix water from the specific drilling site (Collected by the Contractor at the time of pumping the surface casing job)</p> <p>Slurry volumes pumped for the production casing string will be 10% excess to the integrated caliper volume</p> <p>Acoustic cement quality assessment logs will be run on any production casings prior to perforation. This log includes a 50 metre pass across the Top of Cement to ensure that cement rise is according to design</p> <p>The Production casings will not be perforated before the cement has attained 95% of ultimate compressive strength based on the Lab test data and never within 48 hours of pumping</p> <p>The McNamara Park 1 well is prognosed to intersect the following formations(see Appendix 4):-</p> <p style="text-align: center;">Gambier Limestone  Narrawaturk Marl  Mepunga Formation  Dilwyn Formation  Pember Mudstone  Pebble Point Formation  Paaratte Formation  Intra Paaratte</p>	<p>and other third parties</p>

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
		<p style="text-align: center;">Belfast Mudstone Flaxman Formation Lower Flaxman Formation Waarre Formation Eumeralla Formation</p> <p>Due to the nature of the surface formations there is potential for serious fluid losses whilst drilling the upper hole sections. The well construction plan is as follows</p> <ul style="list-style-type: none"> <li>• Prior to moving in the Drilling rig a 456 mm conductor is to be set at ~24 metres and cemented to surface with construction cement using a combination of balanced plug and surface top up techniques.</li> <li>• After the drilling rig is installed, a 311 mm surface hole will be drilled using a freshwater &amp; native gel (bentonite) mud system to 50 metres into the Pember Mudstone at ~ 530 metres</li> <li>• If massive fluid losses are encountered the hole will continue to drill until the loss zones are fully penetrated. The hole will then be opened to 445 mm and a second conductor casing being 340 mm API 5CT seamless steel casing will be run and cemented to surface using a combination of balanced plug and surface top up techniques. This cement will be supplied from the local batching plant (Readymix)</li> <li>• At TD of the surface hole section 244 mm API 5CT seamless steel casing will be run and cemented back to surface using API class G cement + 1% CaCL2 accelerator and pressure cementing techniques. Cement volume will be pumped as 100% excess to calculated volume. Casing float accessories, centralisers, scratchers and cement baskets will be used as appropriate to ensure the best cementing outcome.</li> <li>• In the event that cement returns either do not reach surface or slump away from surface then a annular top up job will be performed using trammel pipe. This top will be performed using batch mixed construction cement from the local agitator plant</li> <li>• After installing and testing BOPs a 216 mm hole will be drilled using a KCL – PHPA mud system to ~ 2000 metres. No down hole problems are anticipated in this section</li> <li>• At TD of the production hole the well will be logged and tested as appropriate.</li> <li>• The well will then either be plugged &amp; abandoned or production casing will be run and cemented and the well suspended for future completion.</li> </ul>	

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
		<p>IF PRODUCTION CASING IS RUN THEN THE CEMENT VOLUME PUMPED WILL BE SUFFICIENT TO ACHIEVE AN ANNULAR RISE 100 METRES ABOVE THE SURFACE CASING SHOE + 10% AS CALCULATED FROM AN INTEGRATED CALLIPER VOLUME LOG.</p>	
<p>Pollution through drilling activities and discharges from the Rig and/or well</p>	<p>Well Testing  Well Control Incidents  Noise  Dust  Fire</p>	<p><b>Drill Stem Testing</b></p> <p>Before flow testing, the gas and/or fluids chemical composition must be determined before release to atmosphere. Personnel shall remain on site for the duration of the well test. Any test tanks shall be routinely checked and emptied as required. Any signs of hydrocarbon losses/spills shall be reported immediately and the required clean up response undertaken. The local CFS will be onsite during any DSTs conducted at McNamara Park 1. Fire prevention measures will be in force.</p> <p><b>Noise</b></p> <p>Noise emissions will be managed so as to not cause a social nuisance. Consideration shall be given to reducing noise at the source, reducing exposure time and mitigation with physical barriers.</p> <ul style="list-style-type: none"> <li>• The property owner at McNamara Park 1 has been consulted and made aware of the proposed activities. Some rig procedures are inherently noisy such as laying down drill pipe and running casing; these activities involve movement of material up or down the V door and catwalk with attendant noise;</li> <li>• The next nearest habitation is more than 1 km away from the rig.</li> </ul> <p><b>Dust</b></p> <p>Access roads will be watered as necessary</p> <ul style="list-style-type: none"> <li>• Provision has been made in the Earthworks contract for the watering of property roads at the McNamara Park 1 well site</li> <li>• Speed limits will be set to assist with dust minimisation</li> </ul> <p><b>Well Control / Safety Issues</b></p> <p>The Drilling activity is designed to prevent unplanned emissions from the well. Casing will be set into competent formations and cemented in accord with design parameters and Company approved procedures</p>	<p>Minimise risks to the safety of the public, employees and other third parties</p> <p>In the event of a spill, minimise the impacts on fauna, flora, soil, livestock and surface and ground water.</p> <p>Control production and dispersal of dust on unsealed roads and drilling lease areas.</p> <p>Minimise chance of fire by clearing of dry pasture around facilities</p> <p>Confinement of flammable sources, restriction of certain practices and access to suitable fire fighting equipment</p>

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
		<p>Blow out prevention equipment will be installed and operational. BOP drills will be conducted.</p> <p>OEL has an effective emergency response plan and procedures in place and emergency response training is conducted. Rig personnel will be made aware of the location and operation of safety equipment via a programme of induction and on-going safety meetings</p> <p>OCA is a an owner of the joint onshore Drilling Permit to Work System (together with Santos, Century Drilling and ODE Limited) and this system will be enforced throughout the campaign</p> <ul style="list-style-type: none"> <li>• The ODE #30 rig is equipped with a full 5000 psi BOP stack</li> <li>• All wellhead equipment will be rated to a minimum 3000 psi</li> <li>• All reservoirs in the McNamara Park 1 well are predicted to have a normal water pressure gradient. The maximum predicted surface pressure is 17.250 Mpa (2500 psi)</li> </ul> <p><b>Light Emissions</b></p> <p>Any artificial lighting required will be positioned to minimise light emanating from the plant, while still allowing for the safe operation of the site.</p> <ul style="list-style-type: none"> <li>• Drilling activities will be performed on a 24-hour basis. The property owner has been informed</li> </ul> <p>Any well completion and extended testing activities will be conducted on a twelve-hour “daylight” only basis.</p>	
<p>Pollution</p> <p>Damage or injury to personnel and equipment</p>	<p>Offsite activities</p> <p>Testing</p> <p>Welding and grinding</p> <p>Camp activities</p>	<p><b>Fire Prevention</b></p> <p>Offsite, the primary management relies on the local volunteer Country Fire Service “CFS”. The CFS and other local Emergency Authorities are kept fully appraised the activities. OEL will obtain permits in accordance with the Country Fires Act before any fire or flare is lit during the fire season. The CFS will be notified prior to and requested to be on site during any testing. OEL will comply with the request of other land users who have a proprietary interest in fire control such as Forestry</p> <p>Onsite, the drilling rig and camp have fire extinguishers and fire hoses to fight fires in these locations and rig personnel are trained in the use of fire fighting equipment. Vehicles will be fitted with fire extinguishers.</p> <p>Rig and camp personnel will be made aware of the location and operation of fire fighting equipment via induction and an on-going programme of safety drills and training</p> <p>All welding and grinding is performed either in a designated area or under the jurisdiction of a Hot Work Permit issued under the joint onshore Permit To Work System “PTWS”.</p>	<p>Minimise risks to the safety of the public and other third parties</p> <p>Minimise chance of fire by clearing of dry pasture around facilities</p> <p>Confinement of flammable sources, restrictions on certain procedures and ready access to</p>

Possible Impact	Main Source of risk	Management Strategies (Avoidance, Management, Mitigation)	Environmental Objectives
		Permit issued under the joint onshore Permit To Work System "PTWS". All construction vehicles are fitted with fire extinguishers. <ul style="list-style-type: none"> <li>The local CFS captain is Mr Rodger Clark. He may be contacted on 8739-9227</li> </ul>	suitable fire fighting equipment
Site Restoration and promotion of natural pasture regeneration of disturbed areas.  Unsuccessful rehabilitation  Compaction of soil impeding growth of pasture grasses  Erosion of unconsolidated soil  Poor regrowth	None or infertile or contaminated soil  No Regrowth  Poor soil stability, insufficient storm water management  No seed stock	<b>Rehabilitation of the site</b>  At the conclusion of activities all waste products will be removed and the campsite, rig pad and access tracks restored to as near as practical to that existing before the activities, taking into account just consideration of any landholder requests. As much as practicable of the gravel used on the drill pad will be recovered and stored for later re-use Gravel from the access roads will be recovered and stored for later re-use e.g. road repair/maintenance  Where sheeting has been placed over topsoil, the sheeting will be removed and the topsoil ripped to a depth of 300 mm. The surface will be returned to the natural contours.  Where severe compaction has occurred the ground will be ripped to a depth of 500 mm on the contour to break-up severe compaction and promote re vegetation.  Where vegetation has been cleared, revegetation will be promoted by resspreading topsoil and resspreading the vegetation originally cleared from the site. If necessary topsoil will be imported and the site will be reseeded with purchased seed stock  Water storage dams should not be restored if they are required for future use by the operator in agreement with the landowner or requested for retention by the pastoral lessee or landowner.  If restoration of water storage dams is required, the plastic liner will be removed and the dam will be backfilled and the surface smoothed.  Diversion drains will be installed or the surface ripped along the contours, where necessary, to prevent the concentration and momentum of water flow.  Well site rehabilitation will be carried out by a local Contractor under the supervision of the OEL Landman	Minimise risks to the safety of the public, employees and other third parties  Minimise adverse impacts on livestock  Minimise impacts to soil  Avoid disturbances which have long term impact on biological, cultural, aesthetic and agricultural values of a particular area

## 4.5 Management during Drilling

Onsite responsibility for the execution of the approved Drilling plan rests with the OCA Drilling Supervisor. The Drilling Supervisor reports to the OCA Drilling Superintendent. Third party contractors, drilling contractors, and rig personnel will report to the Drilling Supervisor. The senior Drilling Contractor representative onsite is the Rig Manager. The qualifications, responsibilities and reporting obligations of all OCA well site personnel are detailed in the OCA Drilling Communications Manual – May 1998. The Drilling Supervisors for the McNamara Park 1 well will be OCA's Senior Rig Supervisor Barry Beetson or Senior Drilling Engineer Ernie Trethowan. In addition a Drilling or Completions Engineer from the OCA Brisbane office will be on the rig in the role of Night Drilling Supervisor or as a technical specialist during well completion or testing activities.

### 4.5.1 Training

It is the responsibility of the Drilling Supervisor to ensure that all site personnel, including contractors have undergone appropriate site environmental induction. Training shall include the following items:

- OCA/Origin Energy environmental policies (refer Appendix 1);
- Environmental sensitivities associated with the project area;
- Activities that have the potential to cause an adverse environmental impact;
- Environmental Objectives for the project; and
- Control measures that are to be implemented to minimise the environmental impacts.

Any new people and visitors entering the well site will undergo an induction. Records of attendees at all meetings and/or training sessions will be maintained.

### 4.5.2 Monitoring, Performance and Reporting

Oil Company of Australia, on behalf of Origin Energy, manages its drilling operations in accordance with the OCA Interim Environmental Compliance Manual – Drilling. Monitoring of activities is conducted through the completion of checklists, which are contained in the manual. The checklists that are relevant to drilling operations are listed below.

- Reconnaissance Report,
- Compliance with Interim Policy – Checklist 1, and
- Expanded Environmental Assessment – Checklist 2.
- Lease Contractor Instruction and Compliance – Checklist 3A & 3B. The Contractor Instruction is issued to the lease contractor prior to the start of construction. The contractor

is responsible for implementing the measures contained and providing a sign-off that they are complete. An Origin Energy Representative following construction of the lease area completes the Compliance Checklist.

- Camp Site Construction and Compliance - Checklist 3C & 3D. The Camp Site Construction Checklist is issued to the camp contractor prior to the start of construction. The contractor is responsible for implementing the measures contained and providing a sign-off that they are complete. An Origin Energy Representative following completion of the camp area completes the Compliance Checklist.
- Drilling Rig Operations – The Pre-spud Safety and Environmental Audit. The contractor and an Origin Representative complete this checklist prior to the commencement. A weekly Safety & Environmental Check is then used to follow up issues associated with the original audit
- Rehabilitation - Checklist 5. Following the completion of the rehabilitation of the area an Origin Energy Representative completes this checklist. Monitoring of the progress of rehabilitation will be undertaken within one year of completion of the project and reviewed at least annually. Either an Origin Energy Representative or independent consultant will undertake this review.
- Drilling Audit – Checklist 6. Following completion of the drilling program an Origin Representative completes this checklist.
- Complaints Form. The Complaints Form is completed by the Drilling Supervisor following any complaint and passed onto the Drilling Superintendent for action.
- Incident Reports. All incidents, whether Health, Safety or Environmental, are dealt with initially by use of the “Alert Booklet”. If further action is required this is followed up by more comprehensive reports and/or investigations.

In addition to the above checklists, an independent environmental consultant will prepare a Rehabilitation Close-Out Report following the completion of rehabilitation. The Drilling Superintendent, who is responsible for initiating any corrective actions, reviews copies of all completed reports.

#### 4.5.3 *Emergency Planning*

Emergency procedures for drilling operations are contained within the Oil Company of Australia Drilling Manual – Emergency Response Manual. A copy of this manual has previously been submitted to PIRSA. A copy of the Manual shall be kept at all drilling sites.

- The Emergency Response Manual contains:
- Emergency Alert Plans
- Emergency Contact Numbers
- Media Guidelines
- Investigation and Work Resumption Procedures
- Procedures for Specific Emergency Incidents
- Report Forms.

In addition, the most up to date contact information, including emergency contacts is included in each Drilling Program, which is held at each drill site.

## 5 REFERENCES

Boral Energy, 1996. *Environmental Handbook for South Australia. Onshore Petroleum Exploration and Production.*

Department of Mines and Energy, 1990. *The Environmental Management of petroleum Drilling and Worker Operations in the South-East of South Australia. Code of Environmental Practice.*

Oil Company of Australia Limited, 1998. *Interim Environmental Compliance Manual Drilling.*

Origin Energy, 2000. *Statement of Environmental Objectives for Drilling and Well Operations in the Otway Basin - South Australia.*

Petroleum Division, Primary Industries and Resources, South Australia, 2000. *Criteria for Classifying the Level of Environmental Impact of Regulated Activities: Requirement under Part 12 Petroleum Act 2000.*

Petroleum Division, Primary Industries and Resources, South Australia, 2000. *Criteria and Methodology for Determining Project Environmental Significance.*

Petroleum Division, Primary Industries and Resources, South Australia, 2000. *Acrasia #1 - Environmental Significance Assessment.*

## Health, Safety & Environment

### We at Origin Energy are committed to

- Eliminating or managing hazards and practices in our business that could cause accident, injury or illness to people, damage to property or unacceptable impacts on the environment.
- Assisting all employees to meet their health, safety and environmental obligations.
- Conducting all activities mindful that the decisions we make should recognise both short and long term economic, environmental and community considerations.

### We will demonstrate this commitment by

- Integrating Health, Safety and Environment (HSE) management into the planning and operation of all Origin Energy businesses. Accountability for implementing this policy will be clearly defined and the principles by which we operate will be effectively communicated.
- Providing systems for identifying, classifying, assessing, controlling and reviewing HSE risks in all areas. Formal, documented processes for controlling the risks and effectively managing incidents will be established and communicated.
- Ensuring adequate resources, with appropriate training and qualifications, are provided to manage, maintain and implement HSE systems and controls. Systems for work procedures will be developed, implemented, maintained and reviewed regularly for appropriateness.
- Ensuring communication channels are available to provide staff with relevant information on HSE issues. Employee committees or other appropriate mechanisms will ensure involvement of all personnel is possible.
- Measuring, monitoring and reviewing HSE performance as part of our management reviews, with records maintained and results reported to senior management, relevant authorities and other stakeholders.
- Ensuring procedures for the purchase or supply of goods or services include HSE requirements consistent with these management principles. Contractors must comply with our HSE standards and requirements.
- Ensuring that, in the event of a work related injury or illness, we support the full recovery of injured employees through prompt treatment and active rehabilitation programs. In the event of an environmental incident, we will take those steps necessary to minimise the impact of any such incident. We will ensure that the opportunity is taken to learn from any incident and improve our health, safety and environmental capabilities.
- Taking all viable opportunities to reduce waste and greenhouse gas emissions, conserve energy and recycle materials.



Grant King  
Managing Director  
May 2000



465,000 mE

470,000 mE

475,000 mE

37 48 00 S

37 50 00 S

37 52 00 S

140 34 00 E

140 36 00 E

140 38 00 E

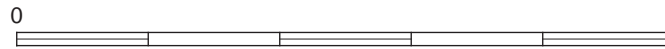
140 40 00 E

140 42 00 E

5,815,000 mN

5,810,000 mN

McNamara Park 1 (Surface Location)



KILOMETRES

UNIVERSAL TRANSVERSE MERCATOR PROJECTION  
 AUSTRALIAN NATIONAL SPHEROID  
 C.M. 141 00 00E  
 Mapsheet Datum "AGD84"

**APPENDIX 3:**  
**PHOTOGRAPHS OF THE McNAMARA PARK 1 WELL SITE**



Figure 1. Eastern aspect



Figure 2. Northern aspect



Figure 3. View from top of sand dune



Figure 4. View towards hayshed showing existing road. This road is to be used as far as the hayshed and a new road across the paddock will be constructed.

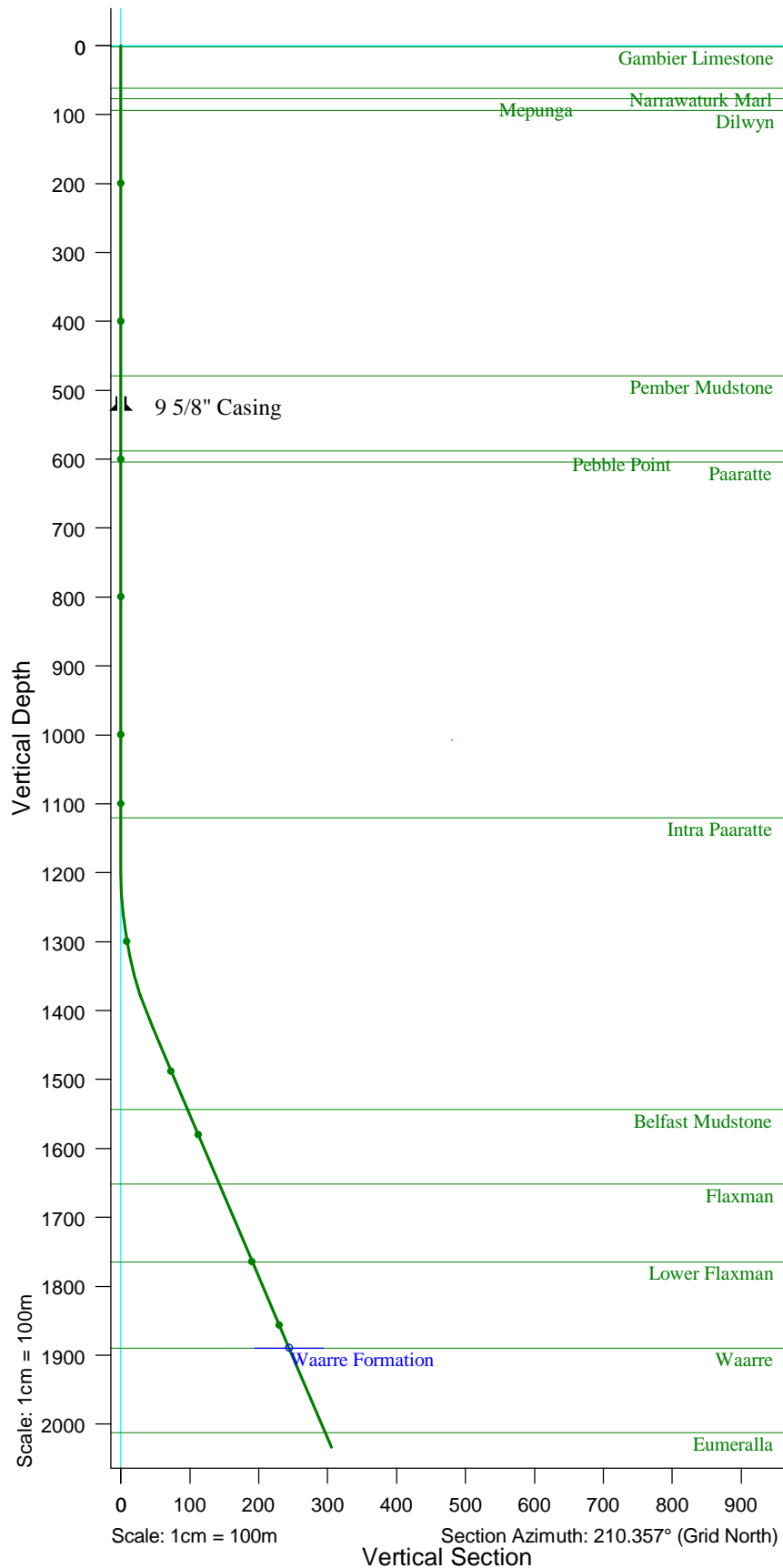


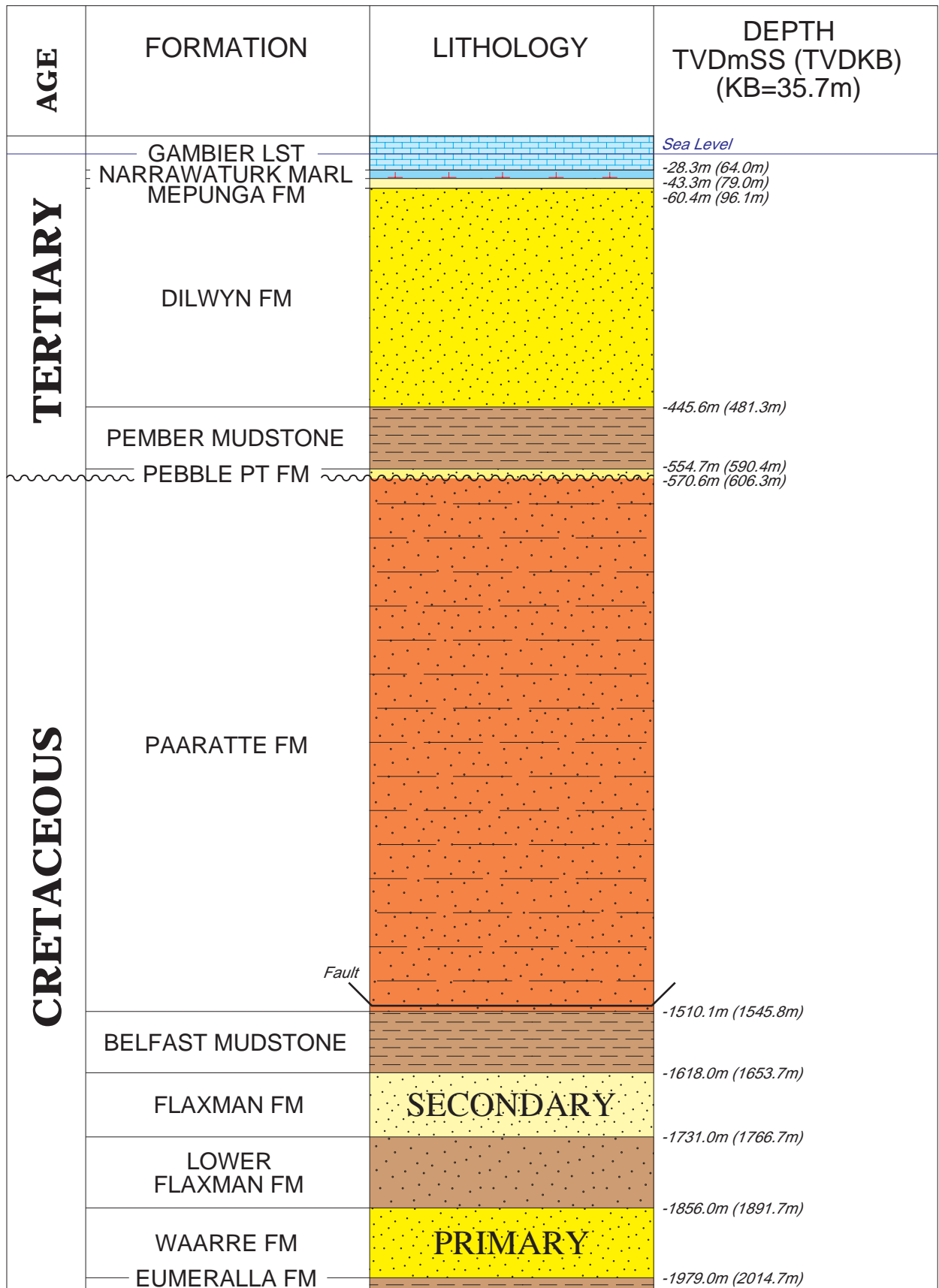
Figure 5. View to west. Note the minor erosion already present in the north-west corner of the photograph.



Figure 6. Close up of existing erosion. No activities will take place on the dune due to the sensitivity to erosion once the sand is disturbed.

**Well : McNamara Park #1**





TD = -2000m (2035.7m)

**OTWAY BASIN - SOUTH AUSTRALIA (PEL 72)**  
**PREDICTED SECTION - McNAMARA PARK 1**