

# NATURAL and CULTURAL ENVIRONMENT

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## Chapter 3

### CLIMATE

Whilst extending south to the coast in the vicinity of Nullarbor National Park, the Officer Basin for the greater part lies inland and is comprised of relatively level terrain with few hills or mountains. As a result there is little variation in the climate throughout the region.

The average annual rainfall is low and variable, ranging from ~250 mm/year in the north (Fig. 3.1) to 300 mm/year towards the southern coastal region. Rainfall events show only a weak seasonal pattern, with the southern margins receiving more winter rainfall whilst the northern areas may experience summer rainfall.

Long sustained periods of rain are rare although large falls can occur over short periods. In the northern areas, heavy rainfall can occur during any month of the year although it is not uncommon to experience 2–3 very dry months. Prolonged droughts are frequent throughout the area and evaporation rates are very high, often exceeding 3800 mm/year.

The summer months from December through to February tend to be the hottest time of the year. Mean maximum daily temperatures usually exceed 32°C and are often over 37°C, with the temperature dropping 10–20°C at night. During the winter months it can be mild to warm with a mean maximum temperature of 17°C and a mean minimum of ~5°C.

### LANDFORMS

The Officer Basin underlies a vast area of land totalling over 375 000 km<sup>2</sup>, and covers a wide range of landforms.

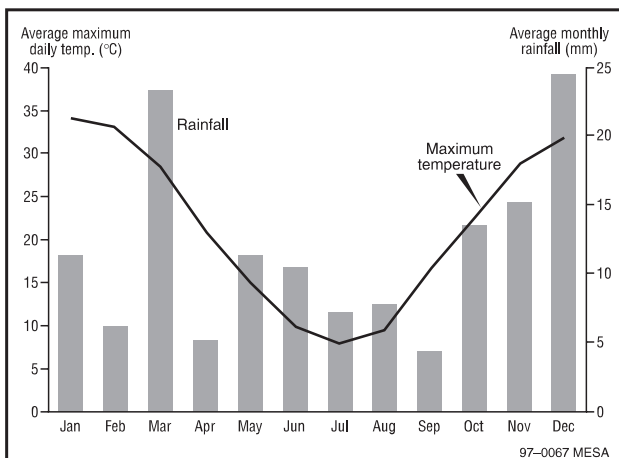


Fig. 3.1 Average monthly rainfall and average maximum daily temperature for Marla.

These landforms can be grouped into three major environmental regions; the western sandplains, the central tablelands and the Nullarbor Plain. Each region consists of a number of major landforms, including dunefields, undulating plains, sandplains, tablelands, clay pans and salt lakes. A number of minor landform patterns or environmental units occur within each of these major landforms. The occurrence of minor landforms can vary, depending upon the detailed morphological characteristics of a major landform based upon the local geology, soil type, topography, drainage patterns and biota.

### Western sandplains region

The western sandplains region is characterised by undulating plains and extensive dunefields. Throughout the dunefields there are occasional silcrete rises, saline depressions and low gibber-covered rises with occasional low hills and ridges. This region includes the Great Victoria Desert which is a transitional zone between the northern margin of the Nullarbor Plain region and the western sandplains region. The Great Victoria Desert is characterised by longitudinal sand ridges up to 20 m high and 100 km long. The desert is so named because of the lack of modern surface drainage.

### Central tablelands

The central tablelands consist of undulating plains covered with silcrete pebbles and rubble. The plains are cut by several large seasonal creek beds and associated floodplains, along with scattered groups of dissected tablelands, mesas, clay pans and salt pans.



Spinifex and mallee vegetation, western sandplains, Officer Basin. (Photo 43105)

## Nullarbor Plain

The Nullarbor Plain is characteristically an undulating, featureless limestone plain with occasional sinkholes and caves, and traces of surface drainage in the form of elongated chains of dry lakes.

## NATIVE VEGETATION

The natural vegetation associations throughout the Officer Basin vary considerably, ranging from woodlands and tall shrublands, to hummock grasslands, chenopod shrublands, grasses, ephemeral forbs and occasionally samphire associations.

Many regions within the basin area, whilst classified as desert, appear very unlike the traditional concept of what a desert should look like. For example, low open woodlands, which generally occur on dunefields, can be found throughout the basin in a variety of topographic situations. Often these woodlands are comprised of one or a number of different species such as myall, black oak, northern cypress pine or mallee.

The understorey of woodlands on the dunes typically consists of tussock grasses, spinifex or sclerophyll shrubs, whereas the understorey on interdunal lows generally consists of various species of saltbush and bluebush. Throughout the plains, the woodlands often give way to mixed chenopod shrubland comprised of species such as saltbush or bluebush with a hummock or tussock grass understorey, or tall shrubland comprised of species such as cassia or mulga with a grass or chenopod understorey.

Vegetation throughout the Officer Basin can vary from very dense to sparse. Generally each plant community occupies a particular habitat, with the distribution of vegetation often reflecting the landform and soil types.

Although there are often large areas with only one vegetation association, many instances occur where there are complexes of two or more different vegetation associations, each occupying a specific niche in the environment.

Small differences in habitat such as depressions or drainage lines may produce slightly more growth and a greater variety of species. Perennial plants throughout the region have adapted to endure long dry spells and extreme temperatures, whilst the appearance of herbaceous plants can be episodic and infrequent depending upon suitable climatic conditions.



Meramangye Lake, Officer Basin. (Photo 43070)

## ENVIRONMENTAL CONSIDERATIONS

### National parks and reserves

Six parks and reserves are fully or partly located within the boundaries of the Officer Basin (Fig. 3.2). These were created to preserve the best examples of vegetation and landforms within the region. Access for exploration and mining is allowed in all parks except the Unnamed Conservation Park and Nullarbor National Park. The conditions for access vary from park to park, based on the type of reserve classification (Conservation Park, National Park or Regional Reserve), the activity proposed and the impact it is likely to have on the environment.

### Summary of environmental regulation

A number of environmental issues are pertinent to petroleum exploration in the Officer Basin, all of which can be resolved by proper operational planning in the initial stages. In order to ensure that activities are undertaken in a manner which minimises environmental impacts, a number of documents are required before approval to commence operations is given.

A Declaration of Environmental Factors (DEF) is required from the licensee. This is the licensee's assessment of the environmental impact of an activity.

A Code of Environmental Practice (CEP) is also required by regulation. The code describes the procedures that the proponent will adopt during the planning, assessment, field management auditing and monitoring phases of the operation. A CEP for seismic operations within the Officer Basin has been developed by MESA and is available to licensees. This provides advice on environmental issues that need to be taken into consideration in planning a project. A company may either adopt this code or use its own CEP subject to approval by MESA.

Although a number of documents are required, the approval process is not onerous. MESA is able to assist licensees by providing examples of the documentation and advising on their scope.

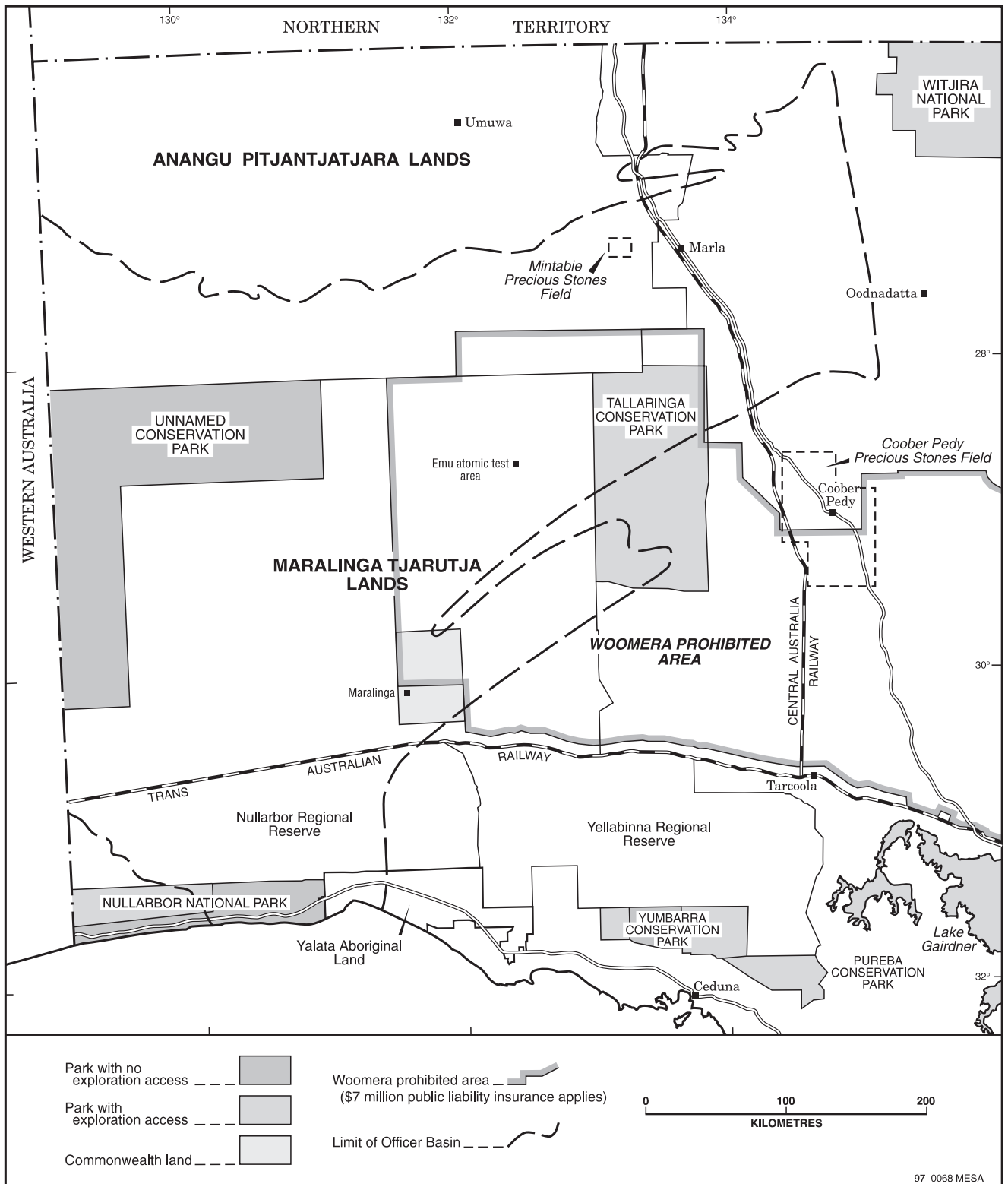
## CULTURAL HERITAGE

### European heritage

Sites of European heritage significance such as historic buildings, graves and geological monuments may be found in the Officer Basin. These are indicated on environmental sensitivity maps which can be purchased from MESA. The majority of sites are small and easily avoided by exploration and production activities.

### Aboriginal heritage

In South Australia it is an offence to disturb or destroy Aboriginal sites, objects or remains. Standard procedures for determining the presence of Aboriginal heritage prior to commencement of activities have been determined. These involve consulting with the relevant Aboriginal organisation and maintaining a watch for sites, objects or remains during exploration. These sites are generally no larger than a few hundred square metres and are easily avoided. Since the



**Fig. 3.2** Parks and reserves, Aboriginal lands, and defence areas covering the Officer Basin area.

inception of the Aboriginal Heritage Act 1988, there have been no conflicts between Aboriginal heritage sites and exploration or production activities. MESA can provide advice to companies on Aboriginal heritage.

The Aboriginal Heritage Act also applies to Aboriginal lands held in freehold, including the Anangu Pitjantjatjara and Maralinga Tjarutja Lands. Access to Aboriginal land for site clearance must be negotiated with the traditional owners (see 'Aboriginal lands').

## ABORIGINAL LANDS

### History

Following the arrival of Europeans in the 1920s to the desert regions of northwestern South Australia, many of the Aboriginal people who lived in those regions moved in three main directions — to Areyonga in the Northern Territory, Ernabella Mission just south of the Northern Territory border, and south to Ooldea Mission on the Trans Australian Railway.

Ooldea Mission closed in 1952 and the people were transferred to a new mission at Yalata. In 1953, the British Government established a base 35 km north of the old Ooldea Mission on what is now known as Maralinga Lands. The purpose of the base was for nuclear weapons testing. Even if Ooldea Mission hadn't closed prior to arrival of the British, it would have had to close due to the proximity of the nuclear testing.

In 1981, the Pitjantjatjara Land Rights Act was passed under which a body corporate — the Anangu Pitjantjatjara (AP) — holds the land under inalienable freehold title. The Act also gives to AP control of entry to the lands and a share of the production of petroleum royalties earned from the land.

The Aboriginal people south of the AP Lands sought similar legislation and, in 1984, the Government recognised their claim and passed the Maralinga Tjarutja Land Rights Act. Under this Act, a corporate body called the Maralinga Tjarutja (MT) was established to receive freehold title to the land.

The AP Lands abut the northern border of the MT Lands and extend as far north as the Northern Territory, covering an area of ~103 000 km<sup>2</sup>. The MT Lands extend south to the Trans Australian Railway, covering ~80 764 km<sup>2</sup>. Whilst the Officer Basin incorporates all of the MT Lands, only the southern portion of the AP Lands falls within its boundaries.

Traditional owners believe that their role with respect to 'land rights' is to fulfil their responsibilities to that land. They are under social and cultural direction to ensure that the land is protected and that sites of significance are avoided. To enable them to discharge that responsibility, traditional owners have to be fully informed of any activities proposed within the lands and the impacts of those activities on the lands. To ensure that all of the people with responsibilities for the land under consideration have been consulted, it is necessary for exploration companies to submit an application with the traditional owners at the earliest possible stage of an exploration program.

Maralinga Tjarutja work closely with the Pitjantjatjara Council in relation to areas of common interest such as petroleum exploration. It is important that potential explorers are prepared to work with the traditional owners to ensure that a reasonable balance is struck.

### Access to Aboriginal lands

Exploration activities have been successfully undertaken in both MT and AP Lands, and the traditional owners are well acquainted with the transient land use of exploration. Both the MT and AP are proud of the work they have done with petroleum companies and have indicated a wish to continue to work towards balancing their own sense of responsibility towards the land and the interests of those who seek to explore and produce from it. In the access agreement negotiated for PEL 61 in AP Lands, provision was made for compensation for exploration activity (expected to be ~\$20 000/year) for a joint-venture partnership option for the Aboriginal owners of the land, and payment of production royalties of 1–3% based on a sliding scale linked to the quantity of oil or gas produced (in the event of a commercial discovery). This royalty to AP is in addition to the 10% State

royalty, which is shared 1/3 to AP, 1/3 for all Aboriginal people in South Australia, and 1/3 to South Australian general revenue.

### AP Lands

Except for a limited number of instances as set out in the Pitjantjatjara Land Rights Act, all non-Pitjantjatjara people are required to apply for permission to enter AP Lands. Exploration companies must first obtain the approval of the Minister administering the Mining and Petroleum Acts to apply to AP for permission to enter those lands. Once permission is obtained, a company may submit an application to the Executive Board of Anangu Pitjantjatjara which then has 120 days from the date of application to grant unconditional permission, permission subject to conditions or to refuse the application.

If the AP refuses permission or imposes conditions unacceptable to the applicant, or the applicant has not received a notice of a decision by AP within 120 days from the date of application, the applicant may request the Minister for Mines to refer the matter to an arbitrator. A determination under this section is binding upon the AP, the applicant and the Crown. There are special provisions in Sections 20 to 24 of the Act in relation to applicants for petroleum exploration and mineral licences (Appendix 3.1).

### MT Lands

Whilst provisions in the Maralinga Tjarutja Land Rights Act relating to access for exploration companies are similar to those for AP Lands, there are two main differences — the Maralinga Tjarutja Land Rights Act limits the amount of compensation provided at the exploration stage to no greater than the amount of compensation provided for under the Mining and Petroleum Acts, and there is a slightly different procedure for appeals.

Where the MT refuses permission or imposes conditions unacceptable to the applicant, or the applicant has not received a notice of a decision by MT within 120 days from the date of application, the applicant may request the Minister for Mines to attempt to resolve the matter by arbitration with the assistance of the Minister for State Aboriginal Affairs. These conditions are set out in detail in Sections 21 to 26 of the Maralinga Tjarutja Land Rights Act 1984 (Appendix 3.2).



*Signing the access agreement for the Maralinga Seismic Survey, 1992. (Photo 40420)*

## ***Access for seismic surveys***

No petroleum exploration was carried out between 1988 and 1992 following withdrawal of Comalco and Amoco from the Aboriginal lands, but two seismic surveys have been carried out since 1992. The first, of 550 km, was recorded as part of the National Geoscience Mapping Accord (NGMA) by the Australian Geological Survey Organisation (AGSO), partly in AP Lands but mainly in MT Lands. The second survey, of 379 km, was recorded by MESA as part of the South Australian Exploration Initiative (SAEI) in eastern AP Lands. Land access was summarised by Gravestock and Lindsay (1994) as follows.

Discussions with AP and MT outlining plans for the NGMA transect commenced in 1990. These involved several visits to Aboriginal communities by AGSO and MESA personnel, and the wide distribution of a leaflet illustrating seismic recording techniques and their effect on the land. In 1992, discussion was formalised and embodied in two agreements signed separately by AP, MT and the South Australian Minister for Mines and Energy. A third agreement between AP and the Minister, modelled on its predecessors, was signed in 1993 to enable the SAEI seismic program to commence.

In essence, each agreement sets out the access conditions for a line scouting stage followed by the line clearing and recording stage. All personnel involved in the scouting teams, both Aboriginal and non-Aboriginal, were fully briefed as to the nature and type of work to be undertaken. In the scouting stage, groups of four men and four women responsible for safeguarding sites of significance were accompanied by anthropologists and MESA officers to mark the route of seismic lines (using GPS) and to clear a work area 200 m either side of the proposed line with due regard to cultural significance. Where necessary, seismic lines were moved or bent to avoid sites of significance without compromising the objectives of the survey. The cleared work corridors were agreed to in writing by AP, MT and MESA. All visitors to the Aboriginal lands were issued with permits stipulating the conditions of entry.

Seismic line preparation followed the marked route ahead of the recording crews, at which time one or more senior Aboriginal men were employed by the AP and MT Councils to act as liaison officers. Liaison officers were chosen to act as representatives for each Council to ensure that the daily management of the seismic program proceeded in accordance with the access agreements. The men had several important duties to perform:

- they were responsible for the pre-work cultural briefing in the field for the seismic crews and other contractors
- they ensured that permit entry conditions were honoured
- crews were kept within the agreed work corridors, except for surveyors and water drillers who were accompanied to trig points and drillsites
- they were responsible for providing an account of the impacts of the seismic lines to their respective Aboriginal communities.

Advice from the liaison officers was passed to the crew chief or the Minister's representative. In addition, these men (and sometimes their families) took off-duty crew members on 'bush tucker trips'. Immediately before crew departure, the liaison officers accompanied AGSO, MESA and contracted personnel on a line inspection to ensure that all rubbish was removed or buried and, where required, seismic lines were rendered impassable to future visitors. As a result of requests, some lines were left open for 4WD vehicles.

The practice of carrying out a scouting stage followed by a monitoring stage for petroleum exploration is likely to become standard practice for licence holders. The cost of this exercise for the seismic surveys varied between \$100 and \$150 per kilometre recorded.

## **OTHER LAND ISSUES**

### **Commonwealth land**

Commonwealth land includes defence facilities, various railway easements, post offices, aerodromes, lighthouses, telecommunication facilities and prohibited areas such as the Maralinga test site known as 'Section 400'. Access to Commonwealth land may be granted, subject to predetermined conditions, by the relevant Commonwealth department with the exception of sensitive defence areas.

### **Maralinga and Emu nuclear weapon test sites**

Between 1953 and 1963, the British Government conducted a program of nuclear weapons development trials at the Maralinga and Emu sites in South Australia. During that period nine atomic bombs were detonated and 700 minor trials were undertaken. The Maralinga site covers ~3000 km<sup>2</sup>. The Emu test site, 200 km north of Maralinga, covers ~500 km<sup>2</sup>. The Maralinga site is owned by the Commonwealth whilst the Emu site is owned by the Crown.

Areas within both test sites are contaminated by radioactive wastes, the principal contaminant being plutonium used during the minor trials. In 1985, the Australian Government established a Royal Commission into British nuclear tests in Australia which proposed that the MT Lands be cleaned up and decontaminated, and that the traditional Maralinga owners be compensated. The Australian Government recently initiated decontamination of the site, with the British Government agreeing to contribute to the cost. It is expected that the clean-up will be completed by the end of 1998, after which the land will be returned to the traditional owners. Public access to the Maralinga and Emu test sites is generally prohibited.

### **Woomera Prohibited Area**

This area, covering 133 300 km<sup>2</sup> (13.5% of SA), was established under the Defence (Special Undertakings) Act 1952. Public access is restricted to Woomera township, Stuart Highway and the Coober Pedy-William Creek road. Access elsewhere in this area is by permit, which can be obtained from the Area Administrator at the Defence Support Centre in Woomera. There is no formal avenue for appeal if the Area Administrator refuses to issue a permit to enter.

Operators within the prohibited area are required to carry \$7 million public liability insurance.

### **Mintabie Precious Stones Field**

Opal was first discovered at Mintabie in the 1920s although it was not until 1976 that heavy earth moving machinery moved in, after which several large finds were made. In 1988, Mintabie produced an estimated \$39 million dollars worth of opal, making it the largest producer of precious opal in the world at that time.

Mintabie is referred to as a 'precious stones field' and, for those wishing to prospect or mine for opal, a Precious Stones Prospecting Permit is required. Many hundreds of opal workings occur throughout the field and consist primarily of large areas ripped by bulldozers to remove the overburden and expose the shallow opal seams.

The Mining Act 1971 provides for stratified titles (section 63(a)), which are proclaimed by the Governor under Section 8(1)(ba). This enables a petroleum exploration licence or production licence to be acquired over a subsurface stratum where the surface is being mined for opal. However, the nature of opal mining in the Mintabie Precious Stones Field could make access for petroleum exploration hazardous due to the number of open cuts.