T1094

GRAPHITE MINES OF AUSTRALIA

STATEMENT OF PROPOSED MINING OPERATION AND DECLARATION OF ENVIRONMENTAL FACTORS FOR THE ULEY GRAPHITE DEPOSIT - SOUTH AUSTRALIA

ENVELOPE 8400

TENEMENT: RL46 - RL67 (Retention leases)

TENEMENT HOLDER: Graphite Mines of Australia Pty Ltd

CONTENTS

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SOUTH AUSTRALIA

DEPARTMENT OF MINES AND ENERGY

OPEN FILE ENVELOPE NO. 8400

STATEMENT OF PROPOSED MINING OPERATIONS AND DECLARATION OF ENVIRONMENTAL FACTORS FOR THE ULEY GRAPHITE DEPOSIT, SOUTH AUSTRALIA

Submitted by

Graphite Mines of Australia Pty Ltd

1988

"Graphite Mines of Australia, Statement of Proposed Mining Operations and Declaration of Environmental Factors for the Uley Graphite Deposit - South Australia"

TITLE

This document shall be referred to as :

"Graphite Mines of Australia, Statement of Proposed Mining Operations and Declaration of Environmental Factors for the Uley Graphite Deposit, South Australia" 1988

AGENCY RESPONSIBLE

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OBJECTIVES

The objective of the proposed mining operation is to extract and beneficiate graphite mineral, using open pit mining methods and flotation beneficiation techniques, from a known mineral bearing lode.

The objective of this report is to review the proposed mining operation, compile an accurate description of the physical and human environment as they exist today and recommend procedures to ensure that :

(i) Mining operations carried out within the lease applied for, will not adversely affect biological, ecological and scenic features outside the area of the lease.

(ii) Disturbance of the natural environment within the lease is minimised and where possible, disturbed areas are rehabilitated.

1. INTRODUCTION

The Uley graphite deposit is a high grade ore reserve within the broader "Mikkira" graphite resource which is located on the southern tip of the Eyre Peninsula, S.A.

Mikkira was the name given to Exploration Licence 1139, on which CRA Exploration Pty Ltd discovered significant quantities of coarse flake graphite in 1981. The project was subjected to extensive metallurgical and marketing investigations, and finally deemed too small for CRA to develop.

In April 1987, Solution Mining Pty Ltd entered into agreement with CRA to purchase the Retention Leases encompassing the resource and following further geological, metallurgical and marketing investigations, Solution's wholly owned subsidary, Graphite Mines of Australia Pty Ltd wishes to carry forward full scale development.

The proposed mine site is located 23 km south west of the deep water port of Port Lincoln, an agricultural and fishing centre with a population of approximately 12,000. (Refer Fig.1.1)

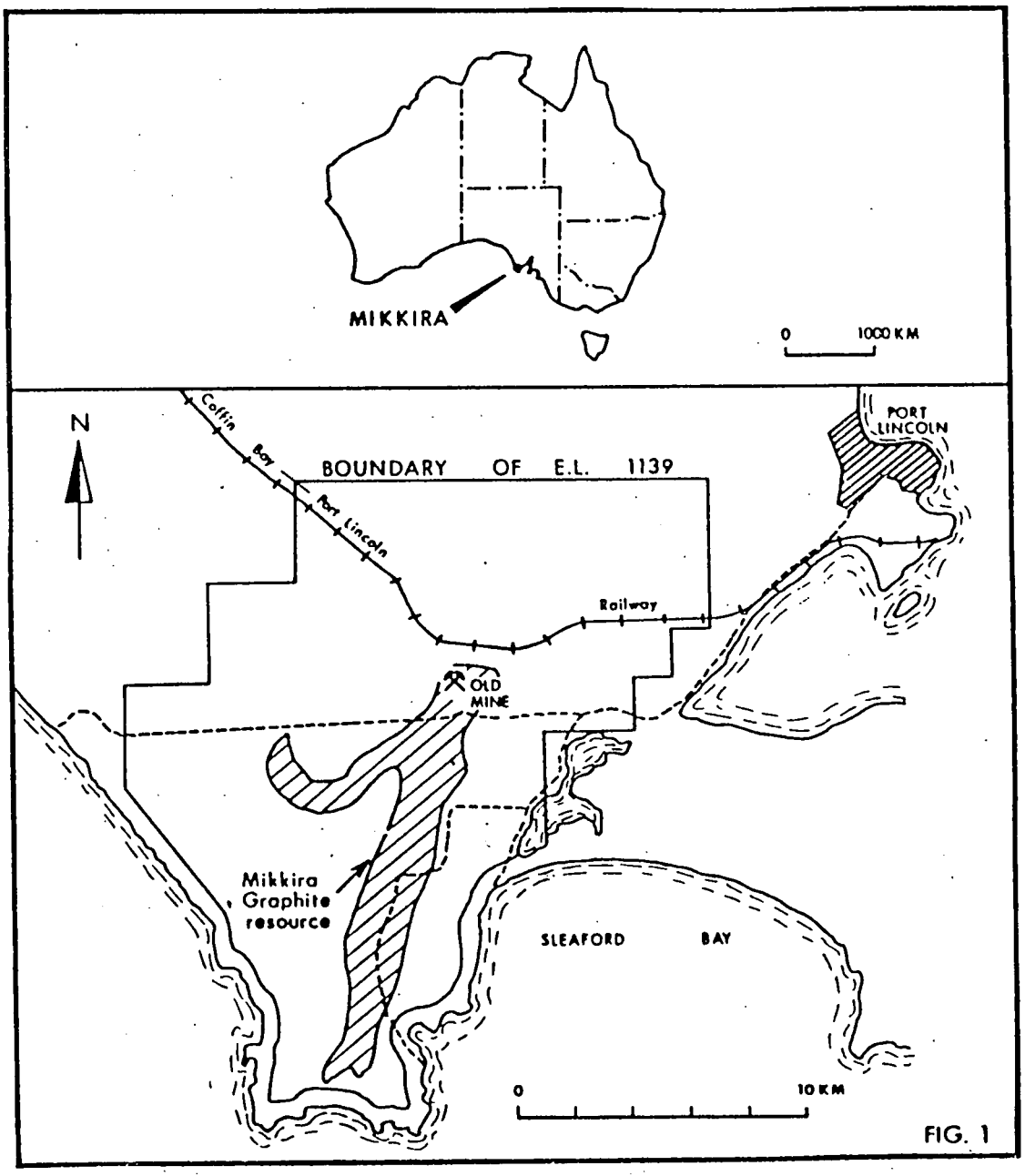
MIKKIRA
0 1000 KM
N
Coffin Bay
Port Lincoln
BOUNDARY OF E.L. 1139
Railway
PORT LINCOLN
OLD MINE
Mikkira Graphite resource
SLEAFORD BAY
0 10 KM
FIG. 1

Figure 1.1

2. GRAPHITE - THE COMMODITY

2.1 Introduction

Graphite, with the exception of the synthetic form, is a natural mineral. It is black / grey with a hardness of 2 on Mho's scale and has one of the lowest coefficients of friction of any known solid.

It is odourless, tasteless, non toxic and almost chemically inert. It is flexible and sectile over a wide temperature range and exhibits a low coefficient of thermal expansion whilst being an excellent conductor of heat and is generally not wetted by metals.

Graphite is commonly used for one or a combination of the attributes above. Figure 2.1 shows the wide area of usage within the USA in 1986.

2.2 Forms of Graphite

The world trade in natural graphite is divided into two principal areas, amorphous and crystalline.

Amorphous graphite is the commercial name for graphite which occurs as cryptocrystalline masses because of its earthlike appearance. It is a low priced product and current world production satisfies demand.

Crystalline graphite occurs as flake, vein and powder. World production of vein and powder has generally been sufficient to meet demand. High quality flake, however, has been increasingly difficult to obtain and commands a premium in price over other forms.

China has trebled its production capacity since 1977 and, in the process, accounted for 85% and 60% of the Japanese and European flake graphite markets respectively.

Communication with corporations to date indicate a strong market desire to have a second significant producer which would preferably be in a free-world country.

2.3 Industry Outlook

The outlook for good quality crystalline flake graphite is encouraging. Its unique properties and a low threat of substitution from other materials, will ensure its continued use in new technology areas such as the magnesia-graphite refractory bricks. The growth rate in demand from 1980 to 1990 is estimated at around 3.5 % pa.

Of important note is the export potential upon the sucessful development of this resource. Australia currently imports 1,500 tonnes of crystalline graphite in various forms for various uses, the largest of these being the refactory industry. Testwork carried out to date on Mikkira graphite by domestic consumers proves it to be totally acceptable. Full scale development of the resource is planned over two stages, firstly, production of 2500 tpa then after a period of two to three years, doubling of this production to 5,000 tpa. This represents a potential export revenue (combined with import saving) of $2.5m lifting to $5m with only 2.5% to 5.0% of the current world consumption addressed.

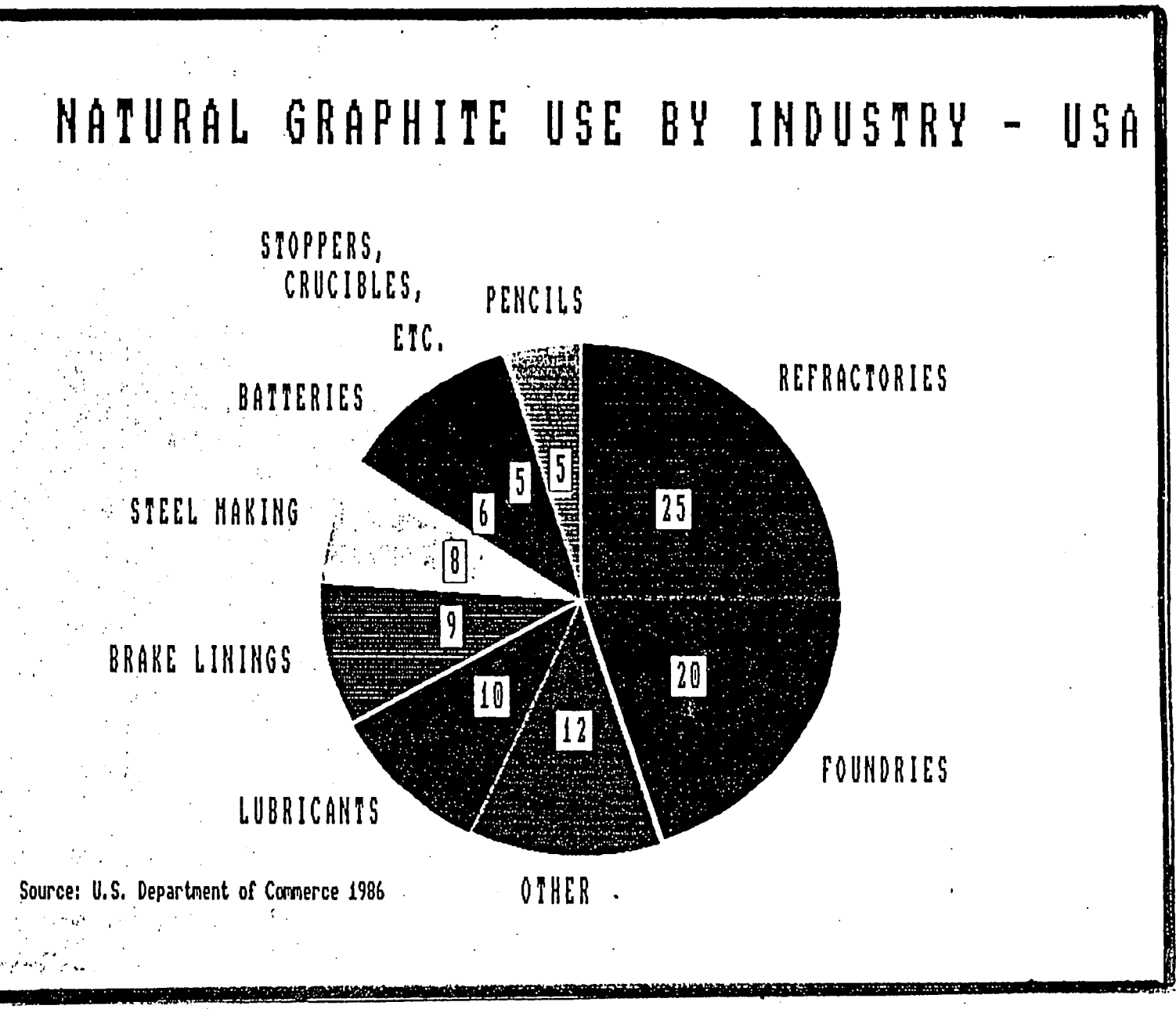
NATURAL GRAPHITE USE BY INDUSTRY - USA
STOPPERS, CRUCIBLES, ETC.
PENCILS
REFRACTORIES
BATTERIES
STEEL MAKING
BRAKE LININGS
LUBRICANTS
FOUNDRIES
OTHER
5
5
25
6
8
9
10
12
20
Source: U.S. Department of Commerce 1986

Figure 2.1

3. LEASE LOCATION

The Uley deposit is located on Retention Lease No. 66 (Refer Fig.3.1)

Application has been made for a Mining Lease encompassing the deposit and proposed area for the treatment plant. The Mining Lease covers an area of 71.3 hectares. (Refer Fig.3.2)

Access from Port Lincoln to the proposed mining operation is via Proper Bay Road turning into the road along the southern boundary of Hundred of Lincoln, thence to the mine site. (Refer Fig.3.3)

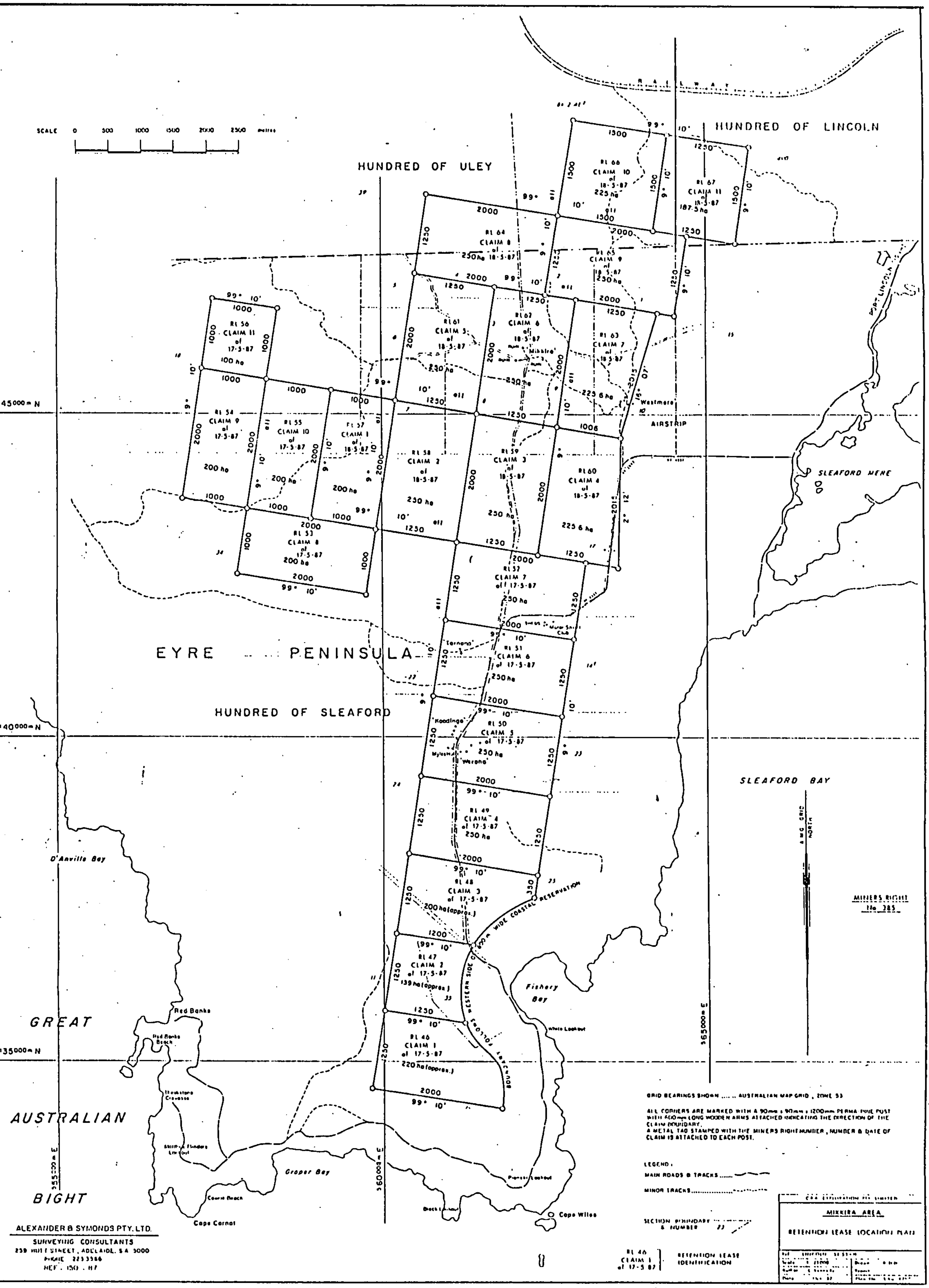
RAILWAY
HUNDRED OF LINCOLN
HUNDRED OF ULEY
HUNDRED OF SLEAFORD
EYRE PENINSULA
SCALE 0 500 1000 1500 2000 2500 metres
RL 66 CLAIM 10 of 18-5-87 225 ha
RL 67 CLAIM 11 of 18-5-87 187.5 ha
RL 64 CLAIM 8 of 18-5-87 250 ha
RL 65 CLAIM 9 of 18-5-87 250 ha
RL 56 CLAIM 11 of 17-5-87 100 ha
RL 61 CLAIM 5 of 18-5-87 250 ha
RL 62 CLAIM 6 of 18-5-87 250 ha
RL 63 CLAIM 7 of 18-5-87 225.6 ha
RL 54 CLAIM 9 of 17-5-87 200 ha
RL 55 CLAIM 10 of 17-5-87 200 ha
RL 57 CLAIM 1 of 18-5-87 200 ha
RL 58 CLAIM 2 of 18-5-87 250 ha
RL 59 CLAIM 3 of 18-5-87 250 ha
RL 60 CLAIM 4 of 18-5-87 225.6 ha
RL 53 CLAIM 8 of 17-5-87 200 ha
RL 52 CLAIM 7 of 17-5-87 250 ha
RL 51 CLAIM 6 of 17-5-87 250 ha
RL 50 CLAIM 5 of 17-5-87 250 ha
RL 49 CLAIM 4 of 17-5-87 250 ha
RL 48 CLAIM 3 of 17-5-87 200 ha (approx.)
RL 47 CLAIM 2 of 17-5-87 139 ha (approx.)
RL 46 CLAIM 1 of 17-5-87 220 ha (approx.)
'Mikkira'
Westmore
AIRSTRIP
SLEAFORD MERE
SLEAFORD BAY
PORT LINCOLN
'Koodinga'
'Warona'
Fishery Bay
GREAT AUSTRALIAN BIGHT
O'Anville Bay
Red Banks
Groper Bay
Cape Carnot
Cape Wiles
White Lookout
45000m N
40000m N
35000m N
555000m E
560000m E
565000m E
AMG GRID NORTH
MINERS RIGHT No 385
GRID BEARINGS SHOWN ...... AUSTRALIAN MAP GRID, ZONE 53
ALL CORNERS ARE MARKED WITH A 90mm x 90mm x 1200mm PERMA PINE POST WITH 600mm LONG WOODEN ARMS ATTACHED INDICATING THE DIRECTION OF THE CLAIM BOUNDARY.
A METAL TAG STAMPED WITH THE MINERS RIGHT NUMBER, NUMBER & DATE OF CLAIM IS ATTACHED TO EACH POST.
LEGEND:
MAIN ROADS & TRACKS
MINOR TRACKS
SECTION BOUNDARY & NUMBER
RL 46 CLAIM 1 of 17-5-87 RETENTION LEASE IDENTIFICATION
MIKKIRA AREA
RETENTION LEASE LOCATION PLAN
ALEXANDER & SYMONDS PTY. LTD.
SURVEYING CONSULTANTS

Figure 3.1

GRAPHITE MINES OF AUST. PTY. LTD.

ULEY MINING LEASE AREA

SCALE	1 : 4000
DRAWING No	
DRAWN BY	P. WHITTENBURY
DATE	
AMMENDMENTS	

13

CADASTRAL BOUNDARY
BLOCK BK 2
HUNDRED OF ULEY

CADASTRAL BOUNDARY
BLOCK 490
HUNDRED OF LINCOLN

EXISTING ROAD

PROBABLE TERRACED OVERBURDEN DISPOSAL SITE

PROPOSED TAILINGS DAM

PROPOSED PERIMETER OF OPEN PIT

HIGH GRADE ORE STOCKPILE

CRUSHING STATION

ORE BIN

TREATMENT PLANT

LOW GRADE ORE STOCKPILE

PROCESS WATER STORAGE DAM

EXISTING ROAD

MINING LEASE BOUNDARY

10600N
10400N
10200N
10000N
9800N
9600N
9400N
9200N

9800E
10000E
10200E
10400E
10600E
10800E

Page No. 10.
Figure 3.2.
Shaded Area Represents Vegetation

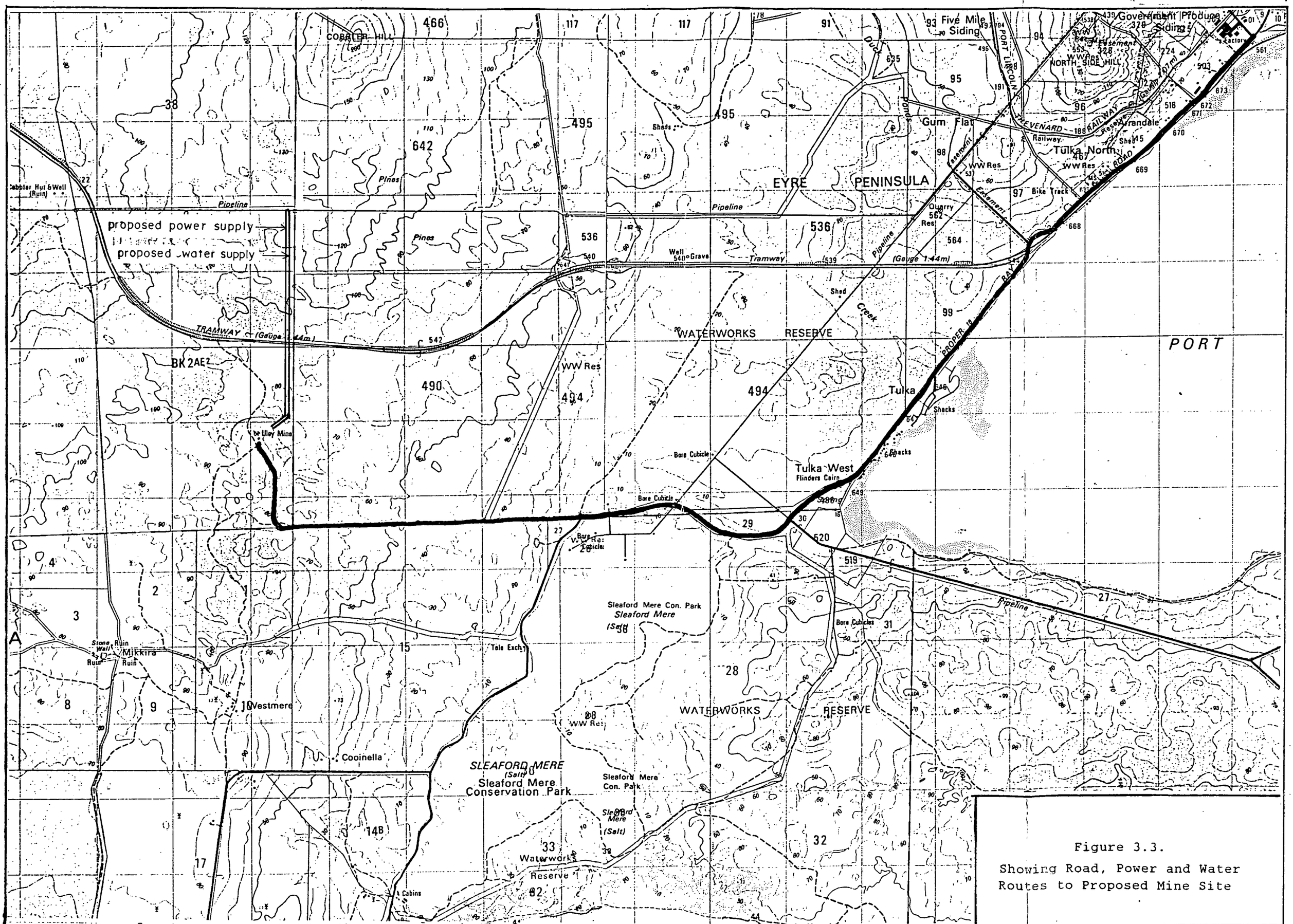

Figure 3.3.

Showing Road, Power and Water Routes to Proposed Mine Site

4. PROJECT INFRASTRUCTURE

4.1 Water

Application will be formalised to E&WS for a mains water supply to be reticulated via a 75 mm NB feeder from the pipeline running east/west some 3.5 kilometres to the north of the proposed operations site. (Refer Fig.3.3)

Water consumption will reduce to approximately 30 kilolitres per day once steady state is reached in the water reclamation program and discussions with the department to date indicate that supply can be made available.

4.2 Power

Treatment plant power will be in the form of electricity.

Application will be formalised to ETSA for a 3 phase aerial conductor to reticulate sufficient power to the mine site.

Only 650 kW will be required at the outset, however it is prudent to install larger conductors to cater for plant extensions and the possibility of other consumers desiring to tap the supply.

Currently, ETSA supply the E&WS pumping station to the northwest of the proposed mining lease with 33kV via a route alongside the pipeline. Discussions carried out with ETSA to date indicate that power can be made available from that source and it is envisaged that power and water can be supplied to the operation via a common route. (Refer Fig.3.3)

4.3 Road Access

Road access to the proposed mining lease will be via public roads to the point of entry onto Block BK2AE^2 which is owned by Mr J Cassanova. (Refer Fig.3.3)

The public road along the hundred boundary between Lincoln and Sleaford is in poor state of repair and will require upgrading prior to commencement of operations, as will the track leading to the mine site once entering Block BK2AE^2.

5. MINING PROPOSAL

5.1 Geology

Regional

The Mikirra Graphite Project is on the southern extremity of the Gawler Craton, a part of the Australian Pre-Cambrian Shield. The Hutchison Group (within the Gawler Craton) is the host unit to the graphite mineralization. It is a Lower Proterozoic metamorphosed sedimentary sequence of about 1800m years age, consisting of schists, dolomites, iron formations and gneisses with abundant pegmatite, aplite and amphibolite intrusive sills. Weathering is pervasive to at least 50 metres over most of the Hutchison Group. The graphite mineralization is hosted near the base of the Middleback Iron formation.

Local

The Mikirra deposits are in slightly undulating landforms, c.a. 80 metres above sea level.
The Uley graphite lodes are hosted by the garnetiferous quartz feldspar pegmatite. Both the host gneiss and the graphite lodes are highly ferruginous and deeply weathered.
There are two discernable lodes separated by the intrusive pegmatite which have been folded into an anticlinal structure plunging at c.a. 35 degrees to the north.
The orebodies are overlain by tertiary travertine / calcrete and a thin lateritic soil layer. The travertine / calcrete varies from a few centimetres to two metres in thickness.

5.2 Pit Design

Mining will be conducted by open cut methods.

Geological data from J Hull and consulting geologist M Rogers was used to design a pit to extract high grade ore sufficient to supply the proposed treatment rates for a period of ten years. Total pit depth at this point will be 85 metres.

The proposed pit (illustrated in Figure 5.1) removes a total of 1,253,000 bank cubic metres containing 256,000 bank cubic metres (590,000 tonnes) of graphite ore at a grade of 9.9% carbon. This reserve utilises a 8% carbon cut off grade which is necessary to maintain project viability over the first six years of operation.

During the mining operation, a significant portion of the remaining 997,000 cubic metres will carry low grade graphite. It is estimated that 310,000 cubic metres (approx. 700,000 tonnes) of the material removed over and above the ore reserve to be treated during the first 10 years, will be low grade ore averaging 5.0% carbon. This material, although cannot be treated during the first 6 years due to economic demands, will probably be treated beyond that time provided economic viability exists, and therefore will be stockpiled for that purpose.

Total waste material therefore will be 687,000 bank cubic metres (approx. 1,000,000 broken cubic metres) to be disposed of as overburden.

Total stockpiled material will be 310,000 bank cubic metres (approx. 470,000 broken cubic metres) which will be treated after the first 6 years of operation.

Total treated material will be 256,000 bank cubic metres (approx. 380,000 broken cubic metres) which will be treated immediately following mining.

Total surface area opened by the excavation will be 33,600 square metres (or 3.36 hectares)

5.3 Mining Technique

(i) Pit Procedures

The ore is overlain by travertine - calcrete on the northern sections and goethite - clay in the southern surface areas. Some blasting may be required in removing the calcareous waste but down to 30 metres in general, bulldosing, ripping and excavating will be utilised in mining operations.

If some blasting proves necessary in the calcareous waste material, it will be conducted only to shatter in situ rock masses rather than shoot benches. Therefore, potential flyrock problems are eliminated.

Ore benches will be cut at 5 metres depth to allow accurate grade control and to maintain a high graphitic carbon feed to the mill.

The ore becomes more competent where pegmatites exist below 30 metres which is the general depth of the oxidation/weathering profile.

(ii) Mine Water

Dewatering will not prove a problem. Investigations to date indicate pit inflow will be less than 1 litre per second. This water will be pumped with ease using small equipment to the treatment plant tailings dam where sediment can settle out before it is reclaimed for use as treatment process water.

(iii) Rehabilitation Considerations

Soil removed from the pit surface will be laid down separately and utilised for rehabilitation and landscaping consistant with pasture - grazing land utilization requirements.

Waste tonnage is not significant and the first use of this material will be for mill/crusher pads, ore stockpile bases, road making around the site, tailings / water reclamation dams and surface works.

When disposal of waste rock becomes necessary, it is intended to place this material in an elevated terrace form in an area to the north east of the pit where currently exists a large expanse of calcrete rock outcrop. As there already exists a sloping landform in this area, gradational elevation to the overburden terrace can readily be achieved and an area of approximately 250 metres square (6 hectares) can be reclassified from its current rock condition to grazing pasture on completion of the mining operation by spreading top soil removed at the outset of pit excavation. (Refer Fig.5.2) and (Refer Plate 5.1)

GRAPHITE MINES OF AUST PTY LTD

ULEY MINE PIT PROPOSAL

SCALE 1:1000
DRAWING Nº 021
DRAWN BY D. RUNGE
DATE
AMMENDMENTS

Figure 5.1.

Proposed Open Pit

GRAPHITE MINES OF AUST. PTY. LTD.

ULEY MINING LEASE AREA

SCALE	1 : 4000
DRAWING Nº	022
DRAWN BY	P. WITTENBURY
DATE	
AMMENDMENTS	

CADASTRAL BOUNDARY
BLOCK BK 2 ...
HUNDRED OF ULEY

CADASTRAL BOUNDARY
BLOCK 490
HUNDRED OF LINCOLN

EXISTING ROAD

PROBABLE TERRACED
OVERBURDEN DISPOSAL SITE

PROPOSED
TAILINGS DAM

PROPOSED PERIMETER
OF OPEN PIT

HIGH GRADE ORE
STOCKPILE

CRUSHING
STATION

ORE BIN

TREATMENT
PLANT

LOW GRADE
ORE
STOCKPILE

PROCESS WATER
STORAGE DAM

EXISTING ROAD

MINING LEASE
BOUNDARY

10400E
10900E
10800E

10600N
10400N
10200N
10000N
9800N
9600N
9400N
9200N

Figure 5.2.
Lease Map

Plate 5.1
Foreground showing typical calcrete capping
(vegetation in background should not be disturbed)

5.4 Mining Method

Mining will be by open pit methods with annual material movement during the first three years totalling 140,000 tonnes (60,000 bank cubic metres).

This will increase during year four to 360,000 tonnes (160,000 bank cubic metres) owing to increased strip ratios and scheduled treatment plant expansion.

The equipment fleet indicated would include :

1 Bulldozer - Cat. D8K or D9
1 Loader - Cat. 980C or 988B
1 Hydraulic Excavator - Cat. 235 or 245
3 Off highway trucks (35 tonne)
1 Grader and Water cart

This fleet would provide a material movement capacity up to 500,000 tonnes per annum and mining will be conducted during the summer dry months only with ore being stockpiled to ensure treatment plant feed throughout the full 12 months of each year.

As the rockmass is porous in nature, a substantial moisture content (3 - 5%) exists insitu. This fact reduces the problem of dust both in the open pit around operating equipment and on stockpiles and overburden dumps.

Dust conditions will be monitored by the appropriate authority (Mines and Energy) and will be reduced by water sprays around points of activity, should the need arise.
The water cart included in the equipment fleet will be used to suppress dust on roadways in and around the pit.

Mining will be conducted by contractors under the daily supervision of mine personnel.

6. ORE TREATMENT PROPOSAL

6.1 Metallurgy

Preliminary bench scale testing was carried out on Mikkira ores by Coal-Tec Pty Ltd in 1982. This work was followed up by further bench scale testwork carried out by CRA Research at Cockle Creek in 1982/83. Good recoveries (93%) and grades (90% FC) were achieved at final sizing of 80% +177um.

In October and November 1983 a bulk sample of 180 tonnes was taken from near surface and treated in a pilot plant operated by the Metallurgical Research Dep't of the Zinc Corporation at Broken Hill. A flowsheet for a mill to treat 50 tph of ore was developed from this test program. Seven hundred kilograms of coarse concentrate was produced and distributed to potential consumers worldwide.

The testwork has shown that graphite quality is a function of size and the coarser fractions have the highest purity.

Pilot plant testwork has been conducted on site at Uley during 1988 which has endorsed the findings of previous work and confirmed suitability of the treatment plant flowsheet proposed by consulting metallurgist Dr.R.Blanks, Metskill.

6.2 Treatment Plant Location

All processing will be conducted on site at the Uley mine. It is intended to erect the small (30,000 tonnes per annum throughput) plant all within several hundred metres of the proposed mine pit. (Refer Fig 5.2)

6.2 Treatment Plant Location Cont....

Maximum benefit will be made of the sloping landform to the south of the mine site for the treatment plant to assist the flow of materials (Refer Plate 6.1), with the tailings dam being located on the more level and rocky ground to the north east.

6.3 Treatment Plant Design

Graphite is a naturally floating mineral and needs a simple collector such as diesel oil or kerosine for efficient flotation. Dispersants and gangue depressants are required to prevent contamination and guarantee product purity. Generally flotation is done at low solids pulp densities, particularly in the cleaning stages.

A primary crushing facility will handle run of mine ore and reduce it to a product size of minus 75mm (three inch). A single stage semi-autogeneous mill will be utilised for grinding. This avoids overgrinding and maximises the level of coarse product produced. Similarly, flotation, attritioning and leach agitation is moderated to avoid particle breakdown.

The plant flowsheet (illustrated in Fig.6.1) involves multi-stage flotation and attritioning with final magnetic separation after drying for production of flake graphite of plus 95% FC at plus 180um sizing.

A secondary product of smaller flake size and lower carbon content is produced within the same flowsheet. This material represents that which is smaller than 180um in flake size to begin with or which is produced by the milling and attritioning action on the particles during processing.

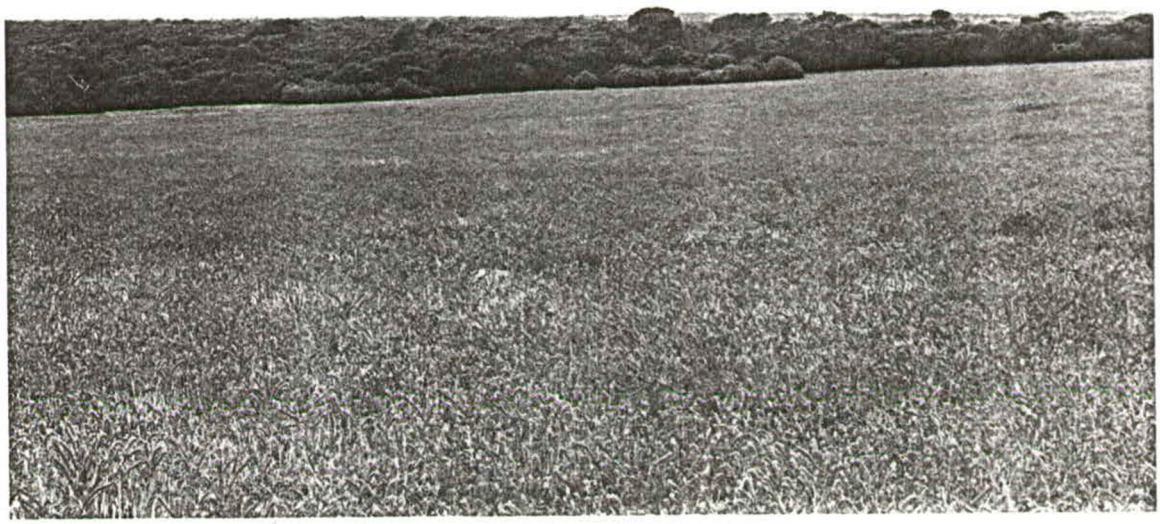

Plate 6.1
Proposed mill site
(showing current grazing land condition)

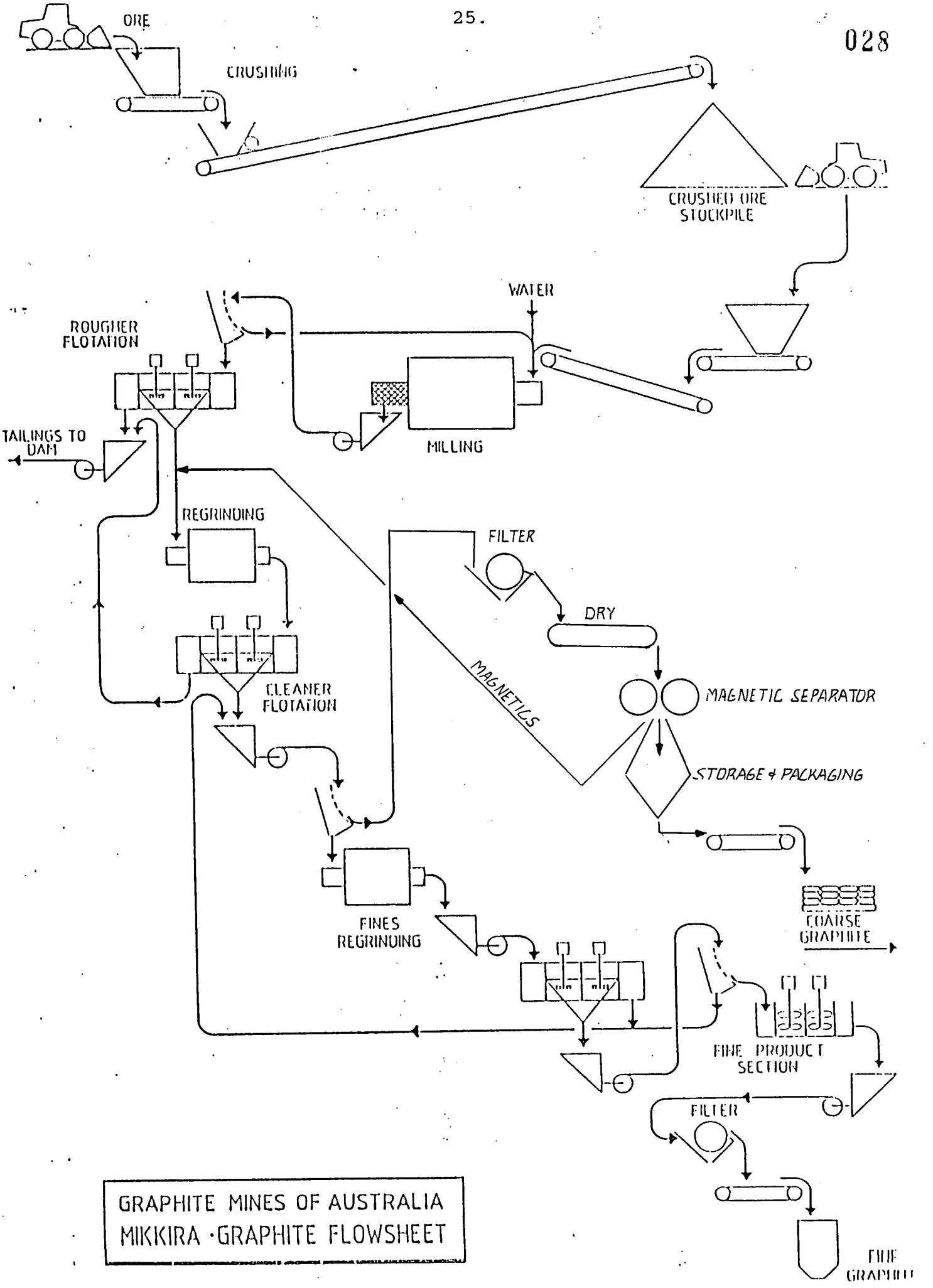
ORE
CRUSHING
CRUSHED ORE STOCKPILE
WATER
ROUGHER FLOTATION
MILLING
TAILINGS TO DAM
REGRINDING
FILTER
DRY
MAGNETICS
MAGNETIC SEPARATOR
CLEANER FLOTATION
STORAGE & PACKAGING
COARSE GRAPHITE
FINES REGRINDING
FINE PRODUCT SECTION
FILTER
FINE GRAPHITE
GRAPHITE MINES OF AUSTRALIA
MIKKIRA · GRAPHITE FLOWSHEET

Figure 6.1.

6.3 Treatment Plant Design Cont....

Market requirements dictate the product split for size and purity which can readily be achieved by changing screen meshes and the number of regrinding circuits applied.

After drying, the products are stored in enclosed bins from where they are pneumatically reclaimed and packaged in 25kg paper sacks which will be palletized and protected with shrinkwrap before containerization.

6.4 Processing Environmental Factors

(i) Dust

The main area where dust may cause a problem is within the crushing circuit. All processing beyond this point is conducted wet (slurries) until the final product is dried and packaged, which activity is carried out completely enclosed.

The crushing network design incorporates covered conveyors to prevent wind creating dust (and to keep crushed product dry during rain seasons) and pneumatic dust suppression at the crusher and ore transfer points. Dust suppression in crushing circuits has been carried out and improved over many years of operations and the technique can be classed a proven one. (Refer "Perry's Chemical Engineers Handbook - McGraw-Hill 1984.)

(ii) Water Management

Approximately 6 tonnes of water will be used to fully process each tonne of ore. Water will be reclaimed from tailings once a sufficient supply has been established in the tailings dam (ie approx. 60,000 kl).

Prior to that point, all process water will be obtained from either the mine dewatering program and/or the proposed pipeline from the E & WS supply line located some 3 kilometres to the north of the mine site.

(Refer Fig 3.3)

Reclaimed process water (from tailings dam) and make-up process water (from pipeline) will be contained in a small holding dam at the plant. This will be clay sealed and sized to contain 1500 kl. Its purpose is to ensure constant supply to the plant and reduce surges on piped supply.

Process water requirements will be 600 kl per day at the outset with about 15% of this being supplied from the mine dewatering program.

Water loss through tailings consolidation, vegetation and evaporation is anticipated to be 20% which means that when the process reaches "steady state" for water requirements, make-up of approximately 30 kilolitres per day will be required.

It is important to note that the operation will be almost self sufficient for water at this stage (30 kl / day) and will not be faced with the problem of excess water requiring disposal or storage.

Reclaimed water will be monitered for reagent content and reagents will only be added on a "make-up" basis, as required.

(iii) Process Reagents

Reagents to be used in the processing of ore include :

Dieselene - 0.035 kg / tonne of ore
or 4.2 litres / day
This is used as a "collector", the majority of which reports with the graphite concentrate and is vapourized off during drying.

Aero 65 frother (Polypropylene glycol)
0.25 kg / tonne of ore
or 30.0 litres / day
This is used to create froth in the froth flotation circuit (bubbles for the graphite to "adhere" to with the assistance of the diesel collector).

CMC - Carboxy Methol Cellulose
0.025 kg / tonne of ore
or 3.0 kg / day
This is a conditioner used to assist in depressing unwanted minerals

Na_2SiO_3 - Sodium Silicate (Water Glass)
0.25 kg / tonne of ore
or 16.0 litres / day
This is a conditioner used to depress unwanted silica particles.

Quebracho - (Tannin)
0.25 kg / tonne of ore
or 16.0 kg / day
This is a conditioner used to depress unwanted calcite particles.

(iv) Concentrate and Tailings Analyses

Graphite, being such a readily flotable mineral, does not require any exotic chemicals in the concentration process. Reagents used are substantially diluted to non-toxic characteristics.
The concentrating technique used is to comminute the ore feed, float the graphite and dispose of the tailing in a suitable holding dam. Substantial control and iteration of processes must be applied during concentration, however the technique uses purely mechanical methods to beneficiate the product with the assistance of very minor amounts of conditioning reagents in the flotation circuit.

Graphite Concentrate

Typical analysis of the concentrate to be produced at Uley is :

Carbon in natural graphite form	(C)	95.0%
Iron Oxide in natural form	(Fe_2O_3)	2.0%
Silica in natural form	(SiO_2)	1.0%
Calcium Carbonate in natural form	($CaCO_3$)	1.0%
Aluminium Oxide in natural form	(Al_2O_3)	1.0%
Other naturally occuring minerals		Trace

Tailings

Tailings are the comminuted remainder of original rock minerals contained in the pegmatites gniesses and shists which will be mined. It will be deposited in slurry form. Non toxic reagents listed above will be contained in the tailings dam together with the tailings mineral residues. Reagents will represent 100 ppm of the residue stored in tail.

(v) Rehabilitation Considerations

Soil will be removed from the treatment plant site and tailings dam sites and laid aside for future rehabilitation and landscaping consistent with pasture - grazing land utilization requirements.

Tailings disposal will be totally contained within a dam and elevated in terrace form. It will be deposited in slurry form via a tailings pump and pipeline.

During operations, trees and grasses consistent with the local environment will be encouraged to propogate around the plant and dam sites. Watering will be established using drip feeders during the early years.

As there will be no toxic substances existing in the tailings disposed, fauna will undoubtedly be attracted to new habitats around the dam area which will be fenced since an expanse of shallow water will exist there.

On completion of operations, any existing dam batters can be graded to shallow angles and stored topsoil spread across the elevated terrace.

Treatment plant equipment would either be relocated to new operations sites or sold off as used equipment. Foundation concrete can be uplifted, broken up and deposited in the bottom of the exhausted open pit. The area of the treatment plant would then be rehabilitated to pasture using the stored topsoil.

7. PERSONNEL

The project will demand a workforce of 15 full time employees to carry out the metallurgical operations and administration associated with the total operation.

In addition to these personnel, it is estimated that a further 5 operators will be required by the successful contractor for carrying out the mining operation. This will be conducted on a half yearly basis.

All personnel associated with the project will be resident in Port Lincoln, or environs.

Mr Peter Wilkinson, Senior Employment Officer, Port Lincoln Branch, Commonwealth Employment Scheme, foresees no problems in recruiting both semi skilled and unskilled labour for the project from among their registered persons unemployed.

Local recruitments will already be housed in Port Lincoln and their families will already be utilising the infrastructure of schools and other necessary facilities.

Personnel employed will be required to use their own means of transport to travel to and from work. It is envisaged that 5 employees per shift (3 shifts per day) will probably "pool" travelling arrangements, therefore requiring up to 6 cars per day using public roads to access the mine site for this purpose.

8. SAFETY

8.1 Personnel Safety

All employees associated with the project will undergo an induction course covering all aspects of the operation with particular emphasis on the area of work that they will be involved in.

This will also include such matters as :

- equipment and machinery handling
- fire precautions and what to do in the event of fire
- basic fire fighting procedures
- reporting procedures
- what to do in the event of an accident
- basic first aid procedures
- health and hygiene

An equipped first aide centre will be established on site and all employees will be encouraged and assisted to qualify for St John first aid certificates. It is anticipated to have a first aider on shift whenever operations are being carried out. A registered nursing sister will be employed in an "on call" basis at all times.

8.2 Fire Precautions

In selecting plant equipment, fire resistant materials will be utilised wherever possible and plant layout will address the matter of fire safety.

As the project will be serviced by mains water supply, a constant pressure head will be available at the mine site enabling an effective fire hydrant facility. In addition to this, BCF fire extinguishers will be located at strategic locations around the site and within the plant.

A substantial cleared area will be constantly maintained around te operations site to guard against damage from bush fires should such an event arise. This same cleared area will prevent any unlikely internal fire spreading to the surrounding bush land.

8.3 Reagent Area

The few reagents that will be used in the flotation circuits will be located in one central preparation area and distributed in a fully enclosed pipe network to their point of application.

Any necessary or recommended safety clothing will be supplied for operators when working in this area as well as the usual first aid equipment including open showers and eye wash baths.

9. ENVIRONMENTAL FACTORS

9.1 Land Usage

The mining lease which has been applied for lies totally within Block BK2AE^{2} in Hundred of Uley. This property is owned under freehold title by Mr J Cassanova who has used the land to date to graze sheep. Large areas have been cleared by the farming operation and previous mining operations and grasses planted for the grazing exercise.

(Refer Plates 6.1 & 9.1)

Block BK2AE^{2} covers 1080 hectares and the mining lease applied for totals 79 hectares within this block. The area of land which will be affected by the operation will total less than 20 hectares of which, aproximately 2 hectares will require clearing. It should be noted that, according to the landowners, the total of the area which will be cleared is regenerated vegetation since previous mining operations.

Graphite Mines of Australia Pty Ltd and Mr J Cassanova are currently discussing compensation for loss of grazing land (or other alternatives) whereby agreement will be reached between both parties. Such agreement will be submitted to the Dep't of Mines & Energy immediately upon completion.

Plate 9.1
Cleared grazing land
(showing exploration costeans in foreground)

9.2 Soils

The soil profile consists of three soil horizons above highly weathered basement rocks as shown in Figure 9.1.

Refer also - Plate 9.2.

SOIL PROFILE - ULEY
(Taken in exposed trench)

0 cm -- ----------	
	(Sandy) loam - black in colour
5 cm -- ----------	
	Laterite pebbles Sandy clay loam - grey in colour
30 cm -- ----------	
	Feruginous yellow clay with lateritic pebbles
90 cm -- ----------	
	Weathered basement rocks +/- graphite

Figure 9.1

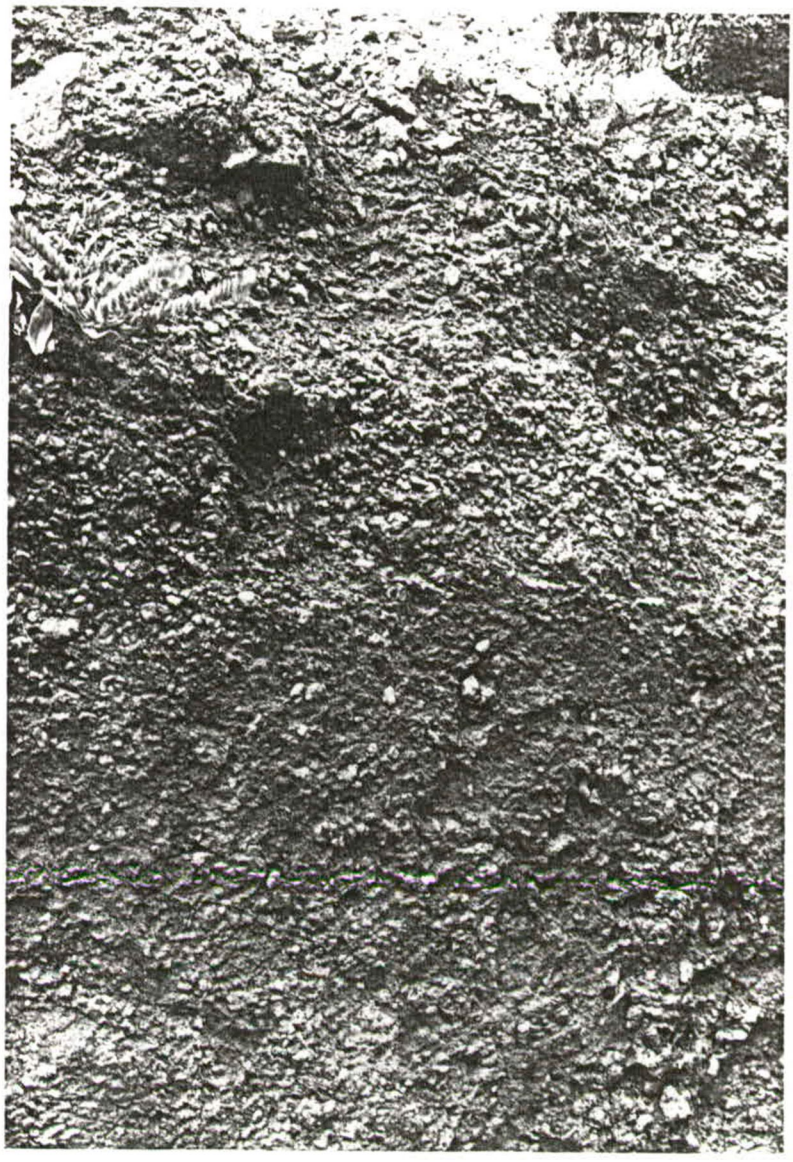

Plate 9.2
Soil profile as exposed in open trench

9.3 Climate

Both rainfall and minimum and maximum temperatures are shown in Figure 9.2. Mean monthly temperatures vary from 12.3 degrees in winter to 20.5 degrees in summer. The average annual rainfall for the district is 489 mm.

Wind frequency analyses for the Port Lincoln area are illustrated in Figure 9.3.

It is anticipated that the predominant wind at the mine site will be from the south, ranging east and will average between 5 and 10 km/hr.

DATA FOR PORT LINCOLN POST OFFICE

Mean Monthly Temperature (in Degrees C) - Maximum.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maxim. Temp.	25.4	25.3	23.8	21.9	19.0	17.0	16.1	16.7	18.1	20.3	22.1	23.7

Mean Monthly Temperature (in Degrees C) - Minimum.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minim. Temp.	15.6	16.0	15.0	13.0	11.0	9.4	8.4	8.5	9.3	10.9	12.6	14.0

Monthly Rainfall (mm) - Mean and Median.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	13	15	20	38	57	74	78	69	50	35	22	18
Median	8	12	14	29	52	70	73	67	47	31	18	13

Figure 9.2

Obtained from Bureau of Meteorology, Adelaide.

BUREAU OF METEOROLOGY - SURFACE WIND ANALYSIS

PERCENTAGE OCCURRENCE OF SPEED VERSUS DIRECTION BASED ON 30 YEARS OF RECORDS

FIRST YEAR : 1957 LAST YEAR : 1986 NUMBER OF MISSING OBSERVATIONS (AS PERCENTAGE OF MAXIMUM POSSIBLE) : 2.60 %

STATION : 018079 PORT LINCOLN POST OFFICE 34 44 S, 135 52 E 4.0 M ELEV

JANUARY 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	5	3	1	1	*	*	*		7
NE		5	4	4	1	*	*		16
E		5	4	7	3	*	*		20
SE		2	3	5	4	*			15
S		6	5	5	3	1			22
SW		3	3	4	3	1	*	*	14
W		1	1	1	1		*	*	4
NW		1	1	1	*	*		*	2
ALL		26	22	28	15	3	1	*	

NO. OF OBS. 928

FEBRUARY 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	8	3	1	1	*	*	*		5
NE		3	3	4	1	*	*		11
E		3	5	8	3	*	*		19
SE		3	4	8	4	*			20
S		5	6	6	4	*	*		21
SW		3	2	3	2	1	*		11
W		1	1	1	1	*			3
NW		1	*	*	*	*		*	2
ALL		22	23	30	14	3	*	*	

NO. OF OBS. 846

MARCH 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	6	3	2	2	1		*		8
NE		4	2	3	1	*	*		10
E		4	3	5	2	1	*		15
SE		3	4	6	3	*	*		16
S		7	5	5	3	*	*		19
SW		4	4	5	2	1	*		15
W		2	1	2	1	1	*		7
NW		1	1	1	1	*	*		6
ALL		28	20	29	13	3	1		

NO. OF OBS. 898

APRIL 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	10	4	3	3	2	*	*		12
NE		2	2	2	2	*	*		8
E		3	3	4	1	*			11
SE		2	3	3	1		*		9
S		6	2	3	1	*	*		12
SW		6	3	4	1	1	*		14
W		4	2	4	2	1	*	*	13
NW		2	2	3	2	1	*	*	11
ALL		30	20	25	10	3	1	1	

NO. OF OBS. 895

JANUARY 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	1	2	1	*					2
NE		4	3	4	*		*		11
E		4	8	11	3	*	*		26
SE		1	2	4	4	*	*		11
S		2	6	8	7	2	*		24
SW		1	2	5	6	1	*	*	16
W		1	*	1	2	1	*	*	6
NW		1	*	*	1	1	*		3
ALL		16	22	33	27	5	1	*	

NO. OF OBS. 918

FEBRUARY 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	2	2	1	*	*	*		*	3
NE		3	4	4	1	*	*		12
E		3	7	11	4	*	*		25
SE		1	3	7	5	*	*		16
S		2	6	7	7	1	*		23
SW		1	3	5	5	1	*		14
W		*	*	1	1	1	*		3
NW		*		*	*	*	*		1
ALL		12	23	35	23	3	1	*	

NO. OF OBS. 845

MARCH 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	2	2	*	*	*		*		5
NE		6	4	4	1				12
E		3	7	9	2	*			22
SE		1	4	7	4	1			16
S		2	5	8	5	1	*		20
SW		2	3	6	4	1	*	*	17
W		1	1	1	2	1	1	*	7
NW		1	*	*	1	*	*		3
ALL		15	23	35	18	4	2	*	

NO. OF OBS. 898

APRIL 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	2	1	1	1	1	1	*	*	6
NE		4	5	4	1	*	*		16
E		4	7	7	1				19
SE		2	2	4	1	*			9
S		3	3	5	2	1			14
SW		1	4	5	4	1	1	*	17
W		1	1	4	4	2	1	1	14
NW		*	1	2	2	1	*	*	6
ALL		16	25	32	16	6	2	1	

NO. OF OBS. 897

* OCCURRED BUT LESS THAN 0.5 PERCENT

PRODUCED BY M.I.S.S. 29/ 7/86

FRAME A05

Figure 9.3. (Page 1 of 3)

BUREAU OF METEOROLOGY - SURFACE WIND ANALYSIS

PERCENTAGE OCCURRENCE OF SPEED VERSUS DIRECTION BASED ON 30 YEARS OF RECORDS

FIRST YEAR : 1957 LAST YEAR : 1986 NUMBER OF MISSING OBSERVATIONS (AS PERCENTAGE OF MAXIMUM POSSIBLE) : 2.60 %

STATION : 013070 PORT LINCOLN POST OFFICE 34 44 S, 135 52 E 4.0 M ELEV

MAY 0900 HOURS LST

DIRN	CALM	SPEED (KM/HR) 1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	10	4	3	3	2	1	1	*	15
NE		1	2	2	1	*			8
E		1	1	2	1	*	*		5
SE		2	1	1	*	*			3
S		3	2	1	1	*			6
SW		8	4	3	2	1	*	*	17
W		6	5	4	2	1	*	*	18
NW		4	3	4	3	1	1	*	17
ALL		29	21	21	12	4	2	*	

NO. OF OBS. 929

JUNE 0900 HOURS LST

DIRN	CALM	SPEED (KM/HR) 1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	10	4	4	5	3	*	1	*	17
NE		1	1	1	1	*	*		5
E		*	1	1	1		*		4
SE		1	1	1					2
S		3	1	1	1	*			6
SW		5	3	2	1	*	*		13
W		8	5	4	2	*	*	*	20
NW		6	5	6	4	2	1	*	23
ALL		28	21	22	12	4	3	*	

NO. OF OBS. 869

JULY 0900 HOURS LST

DIRN	CALM	SPEED (KM/HR) 1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	9	5	4	4	3	1	1	*	18
NE		1	1	2	1	*			4
E		1	1	1	*		*		3
SE		*	*	1	*				1
S		3	2	1	1	*	*		6
SW		6	3	3	2	1	*	*	15
W		8	5	5	2	*	*	*	21
NW		5	5	7	4	1	1	*	23
ALL		28	20	23	13	4	3	*	

NO. OF OBS. 899

AUGUST 0900 HOURS LST

DIRN	CALM	SPEED (KM/HR) 1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	9	6	5	5	2	1	1	*	19
NE		1	2	2	1	*			6
E		1	1	*	1	*			2
SE		1	*	1	*				2
S		3	2	2	1	*	*	*	8
SW		7	4	4	2	1	*	*	17
W		6	4	5	3	1	*	*	19
NW		5	4	6	4	2	1	*	21
ALL		27	21	23	13	4	2	1	

NO. OF OBS. 897

MAY 1500 HOURS LST

DIRN	CALM	SPEED (KM/HR) 1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	3	2	2	2	1	1	*		9
NE		3	4	4	1	1			14
E		2	4	3	1	*			11
SE		1	1	1	*				4
S		1	4	2	2	*	*	*	10
SW		3	4	6	4	1	1	*	20
W		2	3	5	4	1	*		14
NW		2	2	4	4	2	1		14
ALL		17	25	29	18	6	2	*	

NO. OF OBS. 927

JUNE 1500 HOURS LST

DIRN	CALM	SPEED (KM/HR) 1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	5	3	3	3	2	1	*	*	12
NE		4	5	4	1	1	*	*	14
E		2	2	2	*	*			6
SE		1	1	1	*				3
S		1	2	2	1	*		*	6
SW		3	4	6	3	1	*		16
W		3	3	6	4	2	1	*	18
NW		2	4	5	4	2	1	*	19
ALL		18	22	30	17	6	2	1	

NO. OF OBS. 865

JULY 1500 HOURS LST

DIRN	CALM	SPEED (KM/HR) 1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	3	2	3	3	3	*	1	*	12
NE		4	3	3	1	*	*		12
E		1	1	1	*	*			4
SE		1	1	1	*				3
S		2	3	2	1	*	*		8
SW		2	5	6	4	2	1		19
W		2	4	6	5	2	1	*	20
NW		2	3	4	5	2	1	*	18
ALL		16	23	26	20	7	4	1	

NO. OF OBS. 895

AUGUST 1500 HOURS LST

DIRN	CALM	SPEED (KM/HR) 1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	2	3	3	3	2	*	*		11
NE		3	6	4	1	*	*		13
E		2	2	1	1	*			6
SE		1	1	*	1	*			2
S		2	4	3	2	*			10
SW		2	6	7	4	2	1	*	20
W		2	3	5	6	3	1	*	20
NW		2	2	5	5	2	1	*	17
ALL		16	23	27	20	8	3	1	

NO. OF OBS. 895

* OCCURRED BUT LESS THAN 0.5 PERCENT

PRODUCED BY M.I.S.S. 29/ 7/86

FRAME 805

Figure 9.3. (Page 2 of 3)

BUREAU OF METEOROLOGY - SURFACE WIND ANALYSIS

PERCENTAGE OCCURRENCE OF SPEED VERSUS DIRECTION BASED ON 30 YEARS OF RECORDS

FIRST YEAR : 1957 LAST YEAR : 1986 NUMBER OF MISSING OBSERVATIONS (AS PERCENTAGE OF MAXIMUM POSSIBLE) : 2.60 %

STATION : 018070 PORT LINCOLN POST OFFICE 34 44 S, 135 52 E 4.0 M E.E.

SEPTEMBER 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	A L
N	7	3	4	5	2	1	1	*	15
NE		2	2	3	1	*	*	*	9
E		1	2	2	2	*	*		7
SE		1	1	2	*	*			3
S		3	3	3	2	*			11
SW		5	4	4	3	1	1		19
W		2	5	4	2	1	*	*	16
NW		2	2	5	1	1	*	*	13
ALL		21	23	27	13	5	3	1	

NO. OF OBS. 866

OCTOBER 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	A L
N	5	6	3	3	2	*	*	*	13
NE		3	4	4	2	*		*	14
E		2	3	4	2	*			11
SE		2	1	3	1	*			7
S		3	3	4	2	*	*		12
SW		3	6	6	4	1	*	*	19
W		1	2	3	2	*	1		10
NW		3	1	2	1	1	*	*	9
ALL		22	20	28	18	4	2	1	

NO. OF OBS. 898

NOVEMBER 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	A L
N	5	3	1	2	1	*	*	*	7
NE		5	4	6	2	*	*		17
E		3	4	5	2	*	*		14
SE		2	2	3	1	*	*		9
S		4	4	4	1	*	*		14
SW		6	6	5	4	1	1		18
W		1	1	3	3	1	1	*	10
NW		2	1	1	1	*	*	1	5
ALL		23	21	28	16	4	2	1	

NO. OF OBS. 869

DECEMBER 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	A L
N	5	3	1	2	1	*	*	*	7
NE		4	3	4	2	*	*		13
E		3	4	5	2	*	*		14
SE		3	4	3	2	*			12
S		5	4	6	3	*	*	*	19
SW		4	4	5	4	1	*		18
W		1	1	2	3	1	*		9
NW		1	*	1	1	*			4
ALL		24	22	29	17	2	*	*	

NO. OF OBS. 892

SEPTEMBER 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	A L
N	2	3	2	2	1	*	*	*	8
NE		3	5	5	2	*	*		15
E		2	3	4	1	*	*		10
SE		*	1	1	1	*			3
S		1	3	4	2	*	*	*	11
SW		2	5	6	6	2	1	1	22
W		1	2	4	5	3	2	*	16
NW		2	2	3	3	1	1	*	12
ALL		13	23	29	21	7	4	1	

NO. OF OBS. 863

OCTOBER 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	A L
N	2	2	2	1	1	*	*	*	6
NE		6	5	5	1	*			15
E		2	5	7	2	*			16
SE		*	1	1	1	*			4
S		2	3	5	3	*	*		13
SW		1	3	7	6	2	1	*	20
W		1	2	3	4	3	1	1	14
NW		2	1	1	2	1	1	*	7
ALL		13	22	32	20	7	3	1	

NO. OF OBS. 893

NOVEMBER 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	A L
N	1	2	2	1	*			*	5
NE		3	5	6	1	*	*		15
E		3	6	9	2	*			20
SE		*	2	3	2	*			7
S		1	5	5	5	1	*		17
SW		1	3	7	6	2	1	*	20
W		*	1	3	4	2	1	*	11
NW		1	1	1	1	*	*	*	6
ALL		12	23	36	21	5	3	1	

NO. OF OBS. 865

DECEMBER 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	A L
N	1	2	1	1	*		*	*	6
NE		3	4	4	1				12
E		2	6	8	2	*			19
SE		1	2	3	2	*	*		8
S		2	6	9	5	1	1	*	23
SW		1	4	7	6	2	*	*	20
W		1	1	2	3	2	1	*	10
NW		1	*	1	1	*	*	*	3
ALL		12	26	36	19	6	2	1	

NO. OF OBS. 894

* OCCURRED BUT LESS THAN 0.5 PERCENT

PRODUCED BY M.I.S.S. 29/ 7/86

FRAME COS

Figure 9.3. (Page 3 of 3)

9.4 Flora

The vegetation near and around the proposed mine site has been inspected in detail by Ms.E.Poole (refer Agency Responsible) and is described as open scrub. (Refer Plate 9.3).
In the immediate vicinity of the pit site, this open scrub is dominated by Eucalyptus diversifolia "coastal White Mallee",interspersed with Casuarina stricta "She Oak" and Acacia sp. in the upper stratum.
Occasional plants of Melaleuca lanceolata "Moonah" and Polygala myrtifolia "Myrtle-leafed Milkwort" (an introduced species) (more particularly) occur on the outer edge of the scrub, away from the planned pit site. Callistemon macropunctatus "Scarlet Bottlebrush" is found in open areas only.

The scrub in question (area to be disturbed) is quite dense with canopy but with very little understorey growth. Only very few plants of Baekea behrii "Broom Baekea", Hakea vittata and Hakea cycloptera are to be found. Undergrowth, where present, is more inclined to be of Clematis microphylla "Old Man's Beard", Senecio pterophorus "African Daisy" and "Bridle Creeper".

This scrubland in the region of the old mine, mill site and mullock dump is regenerated scrubland since the cessation of mining operations in the 1950's. (Refer Plate 9.4)

On the northern edge of the dam area (old mine site), Xanthorrhoea sp. occur in few numbers.

The landowner at present utilises the land mass for the grazing of sheep. Grazing density averages 3 sheep per hectare for this area.

Plate 9.3
Typical open scrub around proposed mine site

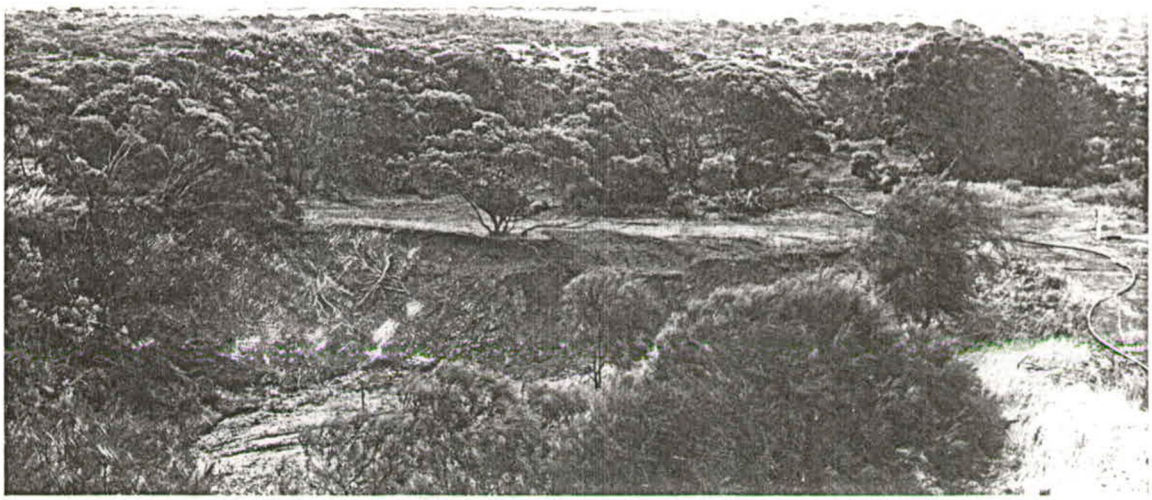

Plate 9.4
Old mine site showing regenerated growth

To the north of the mine site and on the edge of the scrub inspected, the land is covered quite thickly with sheet calcrete. This could well be a possible site to dump unrequired overburden and residue from mining operations, to produce a better soil profile for future grazing land. This would cause no disruption to present vegetation as this is sparse, having been cleared in times past.

The scrub land appears to be of reasonably uniform type throughout the area with only minor additions or deletions to plant species present. All plants in the area regenerate relatively quickly, as can be seen around the old mine site.

The proposed pit site would require the clearing of a minimal amount of the existing scrub (possibly all of which has regenerated since the 1950's) and should cause no major disruption to the native fauna nor any detrimental consequences to the local flora.

9.5 Fauna

Upon consultation with National Parks and Wildlife, Port Lincoln, it was indicated that, due to the sparse scrub habitat with minimal understorey growth, few animals habitat this area.

Kangaroo, emu, rabbit, fox, mouse are all present in this general area.

Reptiles would include the Peninsula Brown Snake, Stumpy Tail Lizard and other smaller lizards not obvious upon inspection of the scrub by Ms E Poole.

Bird life includes the Port Lincoln Parrot, Bronze Wing and Top Knot Pidgeons, Raven and other smaller birds.

9.6 Peninsula Water Reserves

The mining lease which is under application is situated outside any basins reserved by E&WS for water supply. This is illustrated in Figure 9.4, where it is seen that two basins exist, one to the east and one to the west of the proposed mine site, with the edge of the closest reserve being some 2.5 kms from the mining lease.

Diamond drilling which has been conducted to date to depths of up to 150 metres has indicated no substantial flow rates of underground water and in fact, quite the opposite exists whereby the area is excessively "dry" for its location with an anticipated make of only 1 litre per second into the proposed pit.

Even though no toxic chemicals will be used in the processing, the tailings dam will be clay sealed to ensure no water loss into the surrounding country. This is in order to conserve water as process water will be constantly recirculated.

Monitoring for seepage / leakage can be readily and effectively achieved by locating shallow pits around the tailings dam.

Discussions to date with Mr B Mills of the Pt Lincoln Engineering and Water Supply indicate that the department has no concern with the presence of the mining operation at Uley with regard to depletion of surrounding basins.

ENGINEERING AND WATER SUPPLY DEPARTMENT
ULEY-WANILLA AND ULEY SOUTH UNDERGROUND WATER BASINS
SCALE
LA 124

HUNDRED OF WANILLA
ULEY-WANILLA BASIN
HUNDRED OF LAKE WANGARY
HUNDRED OF ULEY
HUNDRED OF LINCOLN
ULEY SOUTH BASIN
HUNDRED OF SLEAFORD
PORT LINCOLN PROPER
HUNDRED OF FLINDERS
LINCOLN NATIONAL PARK
SLEAFORD BAY

Mining Lease
Under Application

LOCALITY PLAN
SCALE

SECTION	HUNDRED	TENURE
5	WANILLA	FREEHOLD CT 1999/72
100	"	RESERVE Gaz. Gaz. 20-1-55
101	"	" " 10-12-60
10	ULEY	" " 30-7-59
19	"	" " "
20	"	" " "
29	"	" " "
30	"	" " "
32	"	" " "
34	"	" " "
35	"	" " "

Boundary of land under this lease and reserved at the Minister of Water Resources shown thus .....
Bore and Monitoring Number shown thus 0-0
Water works and sites in continuous shown thus 100
Total area of land holdings = 33,000 ha.

SECTION	HUNDRED	TENURE
400	LINCOLN	FREEHOLD CT 3575/35
404	"	RESERVE Gaz. Gaz. 20-1-55
406	"	" " "
10	SLEAFORD	FREEHOLD CT 3575/35
210	"	" CT 3580/49
17	"	RESERVE Gaz. Gaz. 10-4-75
18	"	" " "
20	"	" " "
28	"	" " "
29	"	" " "
30	"	" " "
35	"	" " "
40	FLINDERS	" " 30-7-59

Boundary of land under this lease and reserved at the Minister of Water Resources shown thus .....
Bore and Monitoring Number shown thus 0-0
Total area of land holdings = 16,000 ha.

ENGINEERING AND WATER SUPPLY DEPARTMENT
LINCOLN UNDERGROUND WATER BASIN
SCALE
LA 123

Figure 9.4.

Peninsula Water Basins

9.7 Noise

The only noise created by the operation will include :

- Mobile equipment operating in the pit and around the plant
- Crushing station activity
- Milling activity
- Rock blasting should the need arise in later years as pit depths increase.

Noise from the pit will decrease to the surrounding country as working levels drop below surface. Engines operating mobile equipment will be muffled in accordance with manufacturers specifications.

Noise from crushers will be approximately half that of typical road plant crushers by reason of the rock types being crushed. By far, the majority of rock will be schists requiring little effort to break.

Noise from the proposed mills will be minimal as the SAG mill and rod regrind mills will be rubber lined in order to reduce iron contamination of the product.

Blasting is not envisaged at this stage and if introduced at a later date, will only be conducted on an irregular basis when need arises and with the approval of the appropriate authority (ie Mines and Energy).

9.8 Human Consideration

The closest human inhabitants to the mine site reside some 4 kilometres away (farming settlement). There are no residents within direct view of the operation or that would be affected by constant noise from the operation.

The closest community is located at Tulka, which is located on Proper Bay Road, the proposed means of access to the mine site from Port Lincoln. Increased traffic on this road will be insignificant as it is already used by a great many tourists and local residents to access the beaches on the southern part of the peninsula.

This road is of high quality, being a two carriageway, sealed surface, servicing the farming and fishing communities south of Port Lincoln.

The operation will demand road transport of approximately 50 tonnes per week to convey containerised product to port or other destination.

Estimated increase in traffic using public roads servicing the mining operation is :

Light vehicles	- 60 per week
Trucks despatching product	- 4 per week
Trucks delivering supplies	- 5 per week