DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 89/26

NARACOORTE FILLING SAND AND RUBBLE PIT EML 5526 SECS. 700 & 701 HD. NARACOORTE D.G. & V.A. PITT

GEOLOGICAL SURVEY

by

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MINERAL RESOURCES BRANCH

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DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 89/26
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NARACOORTE FILLING SAND AND RUBBLE PIT EML 5526 SECS. 700 & 701 HD. NARACOORTE

D.G. & V.A. PITT

ABSTRACT

Since 1956, filling sand and limestone rubble have been mined from a former Railway Reserve, 2.5 km east-northeast of Naracoorte.

The rubble pit is in Naracoorte Limestone Member of Early Miocene age and comprises shelly fossil fragments which have been partly recrystallised. Fine-grained sand (probably Molineaux Sand equivalent) overlies limestone and was deposited on the leeward eastern slope of a former coastal cliff which defines East Naracoorte Range.

Hand auger drilling indicated resources of 180 000 tonnes of filling sand on sections 700 and 701. In order to restrict vegetation clearance and to minimise the visual impact of quarry operations, EML 5526 was granted over a reduced area containing indicated resources of some 50 000 tonnes of filling sand.

Mining methods are described which, when used in conjunction with progressive rehabilitation to native vegetation, will encourage safe operation with minimal impact to the current amenity or landscape quality of the area.

INTRODUCTION

In December 1986, DG & VA Pitt made application for a mining tenement over sections 700 and 701, hundred Naracoorte. Incorporated in the area applied for were an operating filling sand pit and an old limestone rubble quarry. Following comments received from Department of Environment and Planning and Corporation of Naracoorte, an on-site inspection was made on 22 September, 1987 to resolve potential conflicts regarding further clearing of native vegetation and possible increased visual impact of quarry operations.

Geological advice was sought subsequently on the reserves and quality of the extractive minerals present. On 3 to 4 December 1987, a reconnaissance geological map was prepared and, with assistance from M.H. Stadter (Senior Geologist, Naracoorte Regional Office), six hand auger holes were drilled to determine sand thickness and to collect samples for size analysis.

Results of geological investigations and proposed mining methods were submitted to the Tenement Review Committee for consideration. On 3 February 1988, the Committee recommended that the Minister offer the applicants a mining lease over a reduced area.

This report briefly reviews the background to mining on sections 700 and 701 and documents the results of geological and mining investigations.

LOCATION AND LAND USE

The workings are 2.5 km east-northeast of Naracoorte city centre, on the eastern flank of Naracoorte Range (Fig. 1). Past mining activity extended over sections 699, 700 and 701 (formerly 1181) hundred Naracoorte, part of the Corporate Town of Naracoorte. Current workings are largely confined to section 701 and the eastern and southern portions of section 700 (Fig. 2).

Access from Naracoorte is 2.1 km east along Smith Road then 400m north-northeast along an unsealed road to an entrance gate directly opposite the railway crossing (Fig. 2).

Land enclosed by sections 699, 700 and 701 was gazetted as a Railway Reserve in 1881 and has been quarried for stone and sand since, at least, 1956. Unquarried portions of these sections comprise remnant native vegetation principally Brown Stringybark (Eucalyptus baxteri) open forest on the east facing dune slope with Hill Gum (Eucalyptus fasciculosa) and Brown Stringybark open forest on the dune crest.

Adjacent land use includes dwellings on land with partly cleared native vegetation, cleared farmland and limestone rubble quarries. Sections 699 to 701 are zoned Rural Living 2 by Corporate Town of Naracoorte and are intended ultimately for detached dwellings on large allotments, once land disturbed by quarry operations has been rehabilitated.

MINERAL TENURE AND PRODUCTION

D. Pitt commenced mining sand on section 701 in 1956, operating under lease to the South Australian (SA) Railways. Similarly, V. Nesci operated a limestone quarry located at the southern end of sections 700 and 699 under lease to SA Railways until 1964. Changes to the Mining Act in 1971 required all commercial operations for minerals to be conducted on a mining tenement under the Act. Pitt continued to pay rent and royalty to, and operate under lease to, SA Railways.

In 1981, Pitt attempted to obtain tenure but this was abandoned when preliminary enquiries indicated that the land may have been included in the transfer of State country railways to the Commonwealth government. A title search in 1984 showed that the land remained the property of State Transport Authority (STA). Pitt was advised to seek Ministerial approval to apply for a mining tenement on a gazetted Railway Reserve. STA however, reached agreement with Pitt for sale of the land and on 23 October 1986, sections 699, 700 and 701 were transferred to Pitt on freehold title.

On 8 December 1986, DG & VA Pitt registered Mineral Claim (MC) 2091, of 13.35 ha, covering sections 700 and 701. Following discussions with Department of Environment and Planning and Corporation of Naracoorte, Pitt was offered an Extractive Mineral Lease (EML) over a reduced area of 10.15 ha which excluded native vegetation on the crest of the dune.

On 19 August 1988, EML 5526 was granted for a term of seven years.

Past production records are not held by the Department but recent extraction of sand is estimated at about 2000 tonnes per annum. The limestone rubble quarry ceased production in 1964, but a small stockpile of rubble has been scraped from the pit floor in recent times (Plate 1). A significant quantity of limestone rubble was extracted from the floor of the sand pit for the Naracoorte stock yards and this area is now subject to flooding by rising water table during the winter months.

GEOLOGY

Regional geology is summarised on Figure 1 compiled from NARACOORTE (Rochow, 1969) and PENOLA (Sprigg et al., 1951).

The sand deposit formed by aeolian deposition of fine-grained quartz sand (probably Molineaux Sand equivalent) on the leeward, eastern slope of an old coastal cliff of Gambier Limestone which defines East Naracoorte Range.

The whole of the lease area is underlain by Gambier Limestone which is exposed by quarrying in the southwestern corner of the tenement and crops out as a slightly karstic surface overlain by thin clay soil in the southwest and northeast (Figs. 2 and 3).

Limestone in the quarry is composed of coarse shelly fossil fragments which have been leached and partly recrystallised to form irregular patches of hard crystalline limestone. The unit is equated with Naracoorte Limestone

Member of Early Miocene age which was deposited as a coquina of variable thickness over even-grained bryzoal limestone (Ludbrook, 1961).

A soil profile was developed on limestone prior to deposition of overlying sand and is preserved as a red-brown, moderately plastic clay to 1m thickness.

Naracoorte Range marks the eastern limit of Pleistocene seas and comprises a complex shoreline facies of beach deposits and calcarenite dunes (Bridgewater Formation) stranded by retreat of the sea during Pleistocene to Holocene times. While West Naracoorte Range is mostly recemented calcarenite, East Naracoorte Range is Gambier Limestone uplifted along the Kanawinka Fault to form a barrier to easterly marine incursion during the Pleistocene (Williams, 1978, Kenley, 1971). As the sea retreated, calcarenite dunes formed against Gambier Limestone cliffs and in places breached the former coastline to be deposited further inland. Bridgewater Formation calcarenite was not identified in the lease area but may be encountered during mining as thin deposits on Gambier Limestone.

Fine-grained quartz sand which covers much of the lease area was deposited later, possibly during Holocene times when fine-grained Molineaux Sand, mobilised by prevailing winds, blanketed vast areas of the South East. Sand accumulated as thick deposits on the leeward side of older cemented calcarenite dunes and the now partly buried cliffs of Gambier Limestone. Up to 14m of sand is exposed in the pit face (Plate 2) but true thickness over most of the tenement is between 4 to 5m (Fig. 3).

Cycles of aeolian sand deposition are recorded in the pit face as 50-100mm thick sediment layers comprising clean sand capped by a thin deposit of fine-grained sand with clay (Plate 3). Also a percentage of silt and clay 'fines' was carried downwards by percolating rainwater to concentrate in sand above the contact with underlying Gambier Limestone or fossil clay soil. As a result, pale grey to pale yellow clean sand is restricted to the top 2-3.5 m becoming pale orange brown to orange with fines content increasing near the base of the sand.

Sand is composed of well-sorted, subrounded quartz grains of average size 0.2 mm. Grains are mostly clear quartz with lesser amounts of opaque white grains and some pale yellow to orange quartz grains. Dark brown to black opaque grains are present in trace amounts.

AUGER DRILLING AND SAND SIZE ANALYSES

During 3 to 4 December 1987, six open shell, hand auger holes (NP1 to NP6) totalling 24.7m were drilled with the assistance of M.H. Stadter (Naracoorte Regional Office). Location of holes is shown on Figure 2 and logs are given in Appendix A.

Holes NP1 to NP4 were terminated in moderately stiff, slightly clayey sand which proved difficult to penetrate with the hand auger. Holes NP5 and NP6 intersected Gambier Limestone below thin sand and clay cover.

Bulk sand samples for sizing analysis were taken from holes NP1 to NP5. Samples were sieved at Glenside Core Library using procedures described in Australian Standard (AS) 1141-1980, sections 11 and 12. Results,

shown as graphical plots in Appendix B, are compared with AS 1465-1974 which defines size grading limits for natural fine aggregates suitable for construction purposes.

Size grading for a sample can be represented conveniently by a number called Fineness Modules or 'FM'. The finest sand which meets specification AS 1465-1974 has FM 1.35 and the coarsest FM 4.00. Sand suitable for concrete occupies a restricted range of FM 2.20-3.45 within the general specification. FM is calculated on a 'fines free' basis (ie silt and clay content are excluded) and therefore fines content is quoted with FM.

A summary of drillhole and sizing data (FM and fines content) is presented in Table 1.

Table 1 Summary of drillhole and sizing data

Hole No.	Depth (m)	Sand thickness (m)	Sand Interval tested (m)	FM	Fines (%)
NP1	5.0	5.0	0-3.7	0.96	2.00
			3.7-5.0	0.65	9.67
NP2	4.0	4.0	0-3.5	1.01	3.60
NP3	5.5	5.5	0-4.9	0.97	5.50
NP4	5.0	5.0	0-4.8	0.86	3.64
NP5	3.7	3.5	0-3.5	1.03	2.63
NP6	1.5	0.7	-	-	-

SAND QUALITY

Naracoorte dune sand has an FM range of 0.65 to 1.03 and is too fine-grained to meet construction sand specifications as defined by AS 1465-1974. Sand for filling or packing purposes is commonly specified to be free flowing, free of lumps, rocks and noxious weeds with 100% passing 4.75 mm and less than 5% passing 75μm. Sand on sections 700 and 701 is suitable for filling although care should be taken not to include too much clayey sand from near the base.

Clean sand from the deposit would also be suitable for blending with concrete sand mined by Pitt on EML 3395, 13 km north of Naracoorte. Coarse sand on EML 3395 is mined from a well-sorted beach deposit (Keeling et al., 1981) and the addition of a small percentage of finer-grained sand would improve the grading for use in concrete.

RESOURCES

Resources of filling sand on MC 2091 were calculated for the whole of the area between the current working face and the western claim boundary (Area A + B) and for the area behind the working face from which vegetation had already been stripped (Area B) (Fig. 4). Average sand thickness for the larger area was taken as 3.5m, which excludes 0.5m of topsoil to be stripped and stockpiled. For the area already stripped of vegetation, an average thickness of sand was taken as 4.0 m. Bulk SG for sand was assumed to be 1.6. Resource calculations are given in Table 2 together with an estimate of pit life based on current production rates of 2000 tonnes per annum (tpa) and for increased production of 5000 tpa.

Table 2 Resource calculations and estimated pit life

	Area A + B	Area B
Area (m^2)	32 000	8 250
Ave. sand thickness (m)	3.5	4.0
Volume of sand (m^3)	112 000	33 000
Bulk SG	1.6	1.6
Resources (indicated)	180 000	52 800
Pit Life	(Years)	
@ 2 000 tpa	90	26
@ 5 000 tpa	26	10

On consideration of available resources and current production rates, the Tenement Review Committee opted to offer Pitt a lease over a reduced area for a period of seven years. The lease area is shown on Figures 2 and 4 and effectively makes available resources of sand in the cleared area only. This takes into consideration comments by Department of Environment and Planning and Corporation of Naracoorte with regard to restricting unnecessary vegetation clearance and keeping the visual impact of the quarry to a minimum. The offer, however, does not exclude an application for mining the remaining resource on section 700 at some time in the future but consideration of such an application would have to take into account the success or otherwise of rehabilitation of worked out areas on the current lease.

MINING AND REHABILITATION

Working and rehabilitation of the deposit were discussed with Pitt on 22 September 1987. Essentially there are two distinct operating areas; the sand face developed in the north of section 701 and along the boundary with section 700, and the limestone rubble pit at the southern end of section 700 (Fig. 2).

Fine-grained, free-running sand has been worked by excavating from floor level back into the hill, in a westerly direction, using a front-end loader, loading directly into road trucks. As the mining face retreated west, the height of the face increased to its present maximum height of 14m. To reduce the possibility of creating an unstable sand face, two alternative mining methods are proposed:

I (See Fig. 5). This method involves the use of a crawler tractor to bulldoze sand down the face on a batter of maximum slope 1 vertical: 1.5 horizontal. Sand would be stockpiled on the pit floor for loading as required by front-end loader.

II (See Fig. 6). This method involves the use of bowl excavating scrapers travelling in a continuous path over the sand deposit forming benches which are worked down with successive passes. Sand won could be transferred by bowl scraper and stockpiled at Pitt's concrete batching plant yard in Smith Street.

Both mining methods require stripping of vegetation and topsoil approximately 30m in advance of mining.

The limestone rubble pit could be worked by ripping and bulldozing the stone on a batter to the pit floor from where it could be loaded into road trucks (Fig. 7). Hard, oversize stone would need to be sorted for secondary breaking using a rockbreaker. The existing excavation is screened from view by vegetation along the southern boundary and further excavation would be below the established embankment. Battered pit faces will be readily rehabilitated requiring only spreading of sand and topsoil and subsequent regeneration of vegetation.

Rehabilitation of the worked out floor of the sand pit is required under conditions of the Extractive Mineral Lease. The only area to be excluded is that required for vehicle traffic. Currently, large areas of pit floor are subject to flooding by rising water table particularly during the winter months. This is primarily the result of extraction of rubble, below the sand, for use in construction of Naracoorte stock yards. Pitt proposes to backfill low lying areas with clean filling as it becomes available.

Rehabilitation of the pit floor will require a minimum spread of 150 mm of overburden and sand which should then be deep ripped to improve moisture penetration. In April to May of any year, proceeding

winter rains, the area must be sown with a mixture of grasses to ensure soil binding and prevent erosion. In December to February of any year, or as advised by Department of Environment and Planning, advice from National Park officers should be sought on the collection of branches from surrounding native vegetation containing a mature seed source. These are to be spread over the stabilised areas to encourage natural regeneration of indigenous plant species.

Rehabilitation of the pit floor will progressively thicken the existing vegetation screen. It is proposed that mining will not encroach within 5m of the northern lease boundary and will be battered on a final slope of 1 vertical: 3 horizontal.

The view of the old limestone quarry is mostly hidden by native vegetation along the southern boundary.

The proposed mining method of working below the brow of the contour and maintaining the existing 20m of vegetation will effectively screen the excavation from view. Progressive battering of existing, near vertical faces will ultimately eliminate the visual impact of the old quarry.

SUMMARY AND CONCLUSIONS

Since 1956, filling sand and limestone rubble have been quarried from a former railway reserve, 2.5 km east-northeast of Naracoorte, now covered by freehold sections 699 to 701.

DG & VA Pitt purchased these sections in October 1986 and a mining lease was applied for, in December 1986, over sections 700 and 701.

In August 1988, EML 5526 was granted over a reduced area taking into consideration the need to minimise both clearing of remnant native vegetation and the visual impact of quarry operations.

The limestone rubble quarry is in shelly, partly recrystallised Gambier Limestone (Naracoorte Limestone Member) of Early Miocene age. Filling sand is won from overlying aeolian, fine-grained dune sand probably equivalent to Molineaux Sand of Holocene age.

Geological mapping and six hand auger holes indicated resources of 180 000 tonnes of filling sand of which some 50 000 tonnes are available within the reduced area now covered by EML 5526. At present rates of extraction, resources are sufficient for at least 20 years operation.

Methods of quarrying and rehabilitation are proposed which will encourage safe operations with minimal impact on the current amenity and landscape quality of the area.

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Senior Geolgist

R.C. Cox
Mining Engineer -
Inspector of Mines

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APPENDIX A

Auger drillhole Logs

D.G. & V.A. Pitt,
MC 2091
Hd. Naracoorte Sec. 700 & 701

Drillhole logs

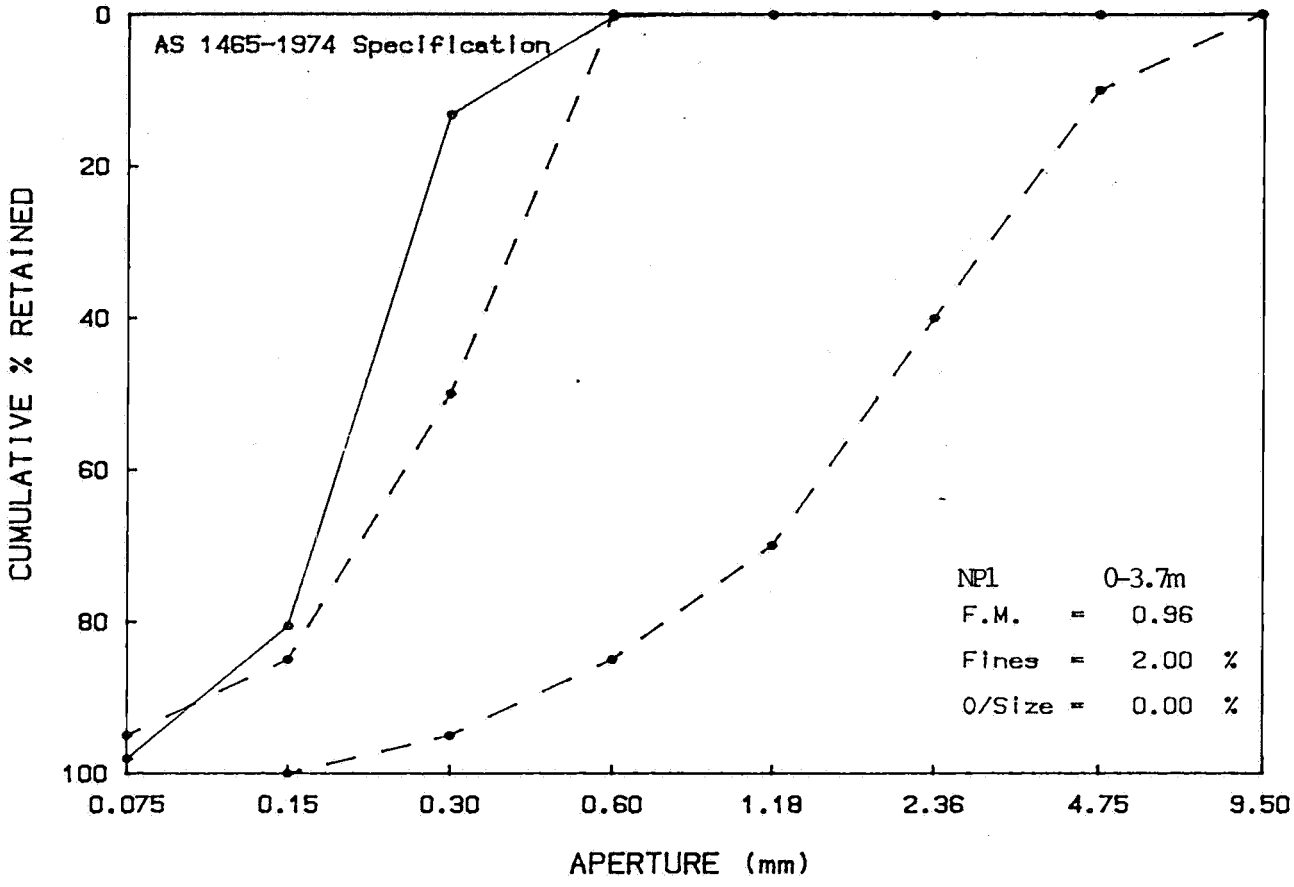
Hole No.	Depth (m)	Description	Sample	FM	Fines (%)
NP 1	0 - 2.0	SAND VF-M, clean, pale grey to pale yellow.	Al 0 - 3.7m	0.96	2.00
	2.0 - 3.7	SAND F-M pale yellow.			
	3.7 - 5.0	SAND VF-M sl. CLAYEY yellow with reddish - orange clay bands.	A2 3.7 - 5m	0.65	9.67
	EOH 5.0m	Logged. J.L.K. 3/12/87			
NP 2	0 - 0.6	SAND VF-M, pale grey	A3		
	0.6 - 3.5	SAND VF-M, clean, pale yellow.	0 -3.5m	1.01	3.60
	3.5 - 4.0	SAND VF-M, mod. CLAYEY orange.			
	EOH 4.0m	Logged J.L.K. 3/12/87.			
NP 3	0 - 1.0	SAND VF-M, pale grey.	A4		
	1.0 - 2.0	SAND VF-M pale orange.	0 - 4.9m	0.97	5.50
	2.0 - 4.9	SAND VF-M pale yellow.			
	4.9 - 5.5	SAND VF-M sl.-mod. CLAYEY orange.			
	EOH 5.5m	Logged J.L.K. 3/12/87			
NP 4	0 - 0.6	SAND VF-M, pale grey.	A5 0 - 4.8m	0.86	3.64
	0.6 - 4.8	SAND VF-M, clean pale yellow to yellow-orange.			
	4.8 - 5.0	SAND VF-M, sl.-mod. CLAYEY orange.			
	EOH 5.0m	Logged J.L.K. 3/12/87			
NP 5	0 - 2.0	SAND VF-M pale grey to pale yellow.	A6 0 - 3.5m	1.03	2.63

	2.0 - 3.5	SAND VF-M pale yellow.
	3.5 - 3.7	SAND VF-M mod. CLAYEY orange overlying CALCRETE then GAMBIER LST
	EOH 3.7m	Logged J.L.K. 4/12/87
NP 6	0 - 0.7	SAND VF-M dark grey
	0.7 - 1.4	CLAY mod. SANDY, mod. plastic reddish - orange.
	1.4 - 1.5	LIMESTONE, calcrete developed on GAMBIER LST?
	EOH 1.5m	Logged J.L.K. 4/12/87.

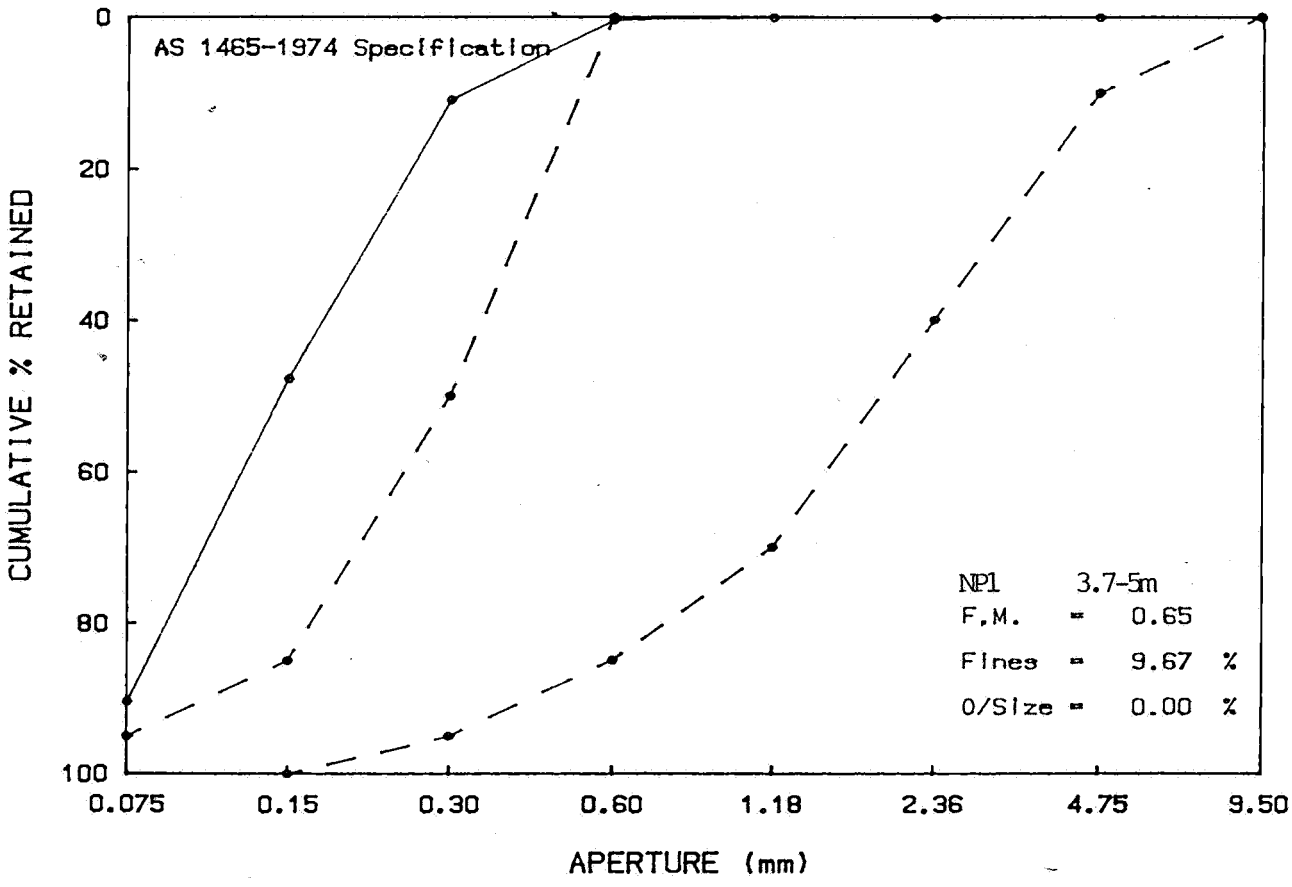
APPENDIX B

Sand sizing analyses - graphical plots.

A1


AS 1465-1974 Specification
CUMULATIVE % RETAINED
0
20
40
60
80
100
0.075
0.15
0.30
0.60
1.18
2.36
4.75
9.50
APERTURE (mm)
NP1 0-3.7m
F.M. = 0.96
Fines = 2.00 %
O/Size = 0.00 %

A2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CUMULATIVE % RETAINED
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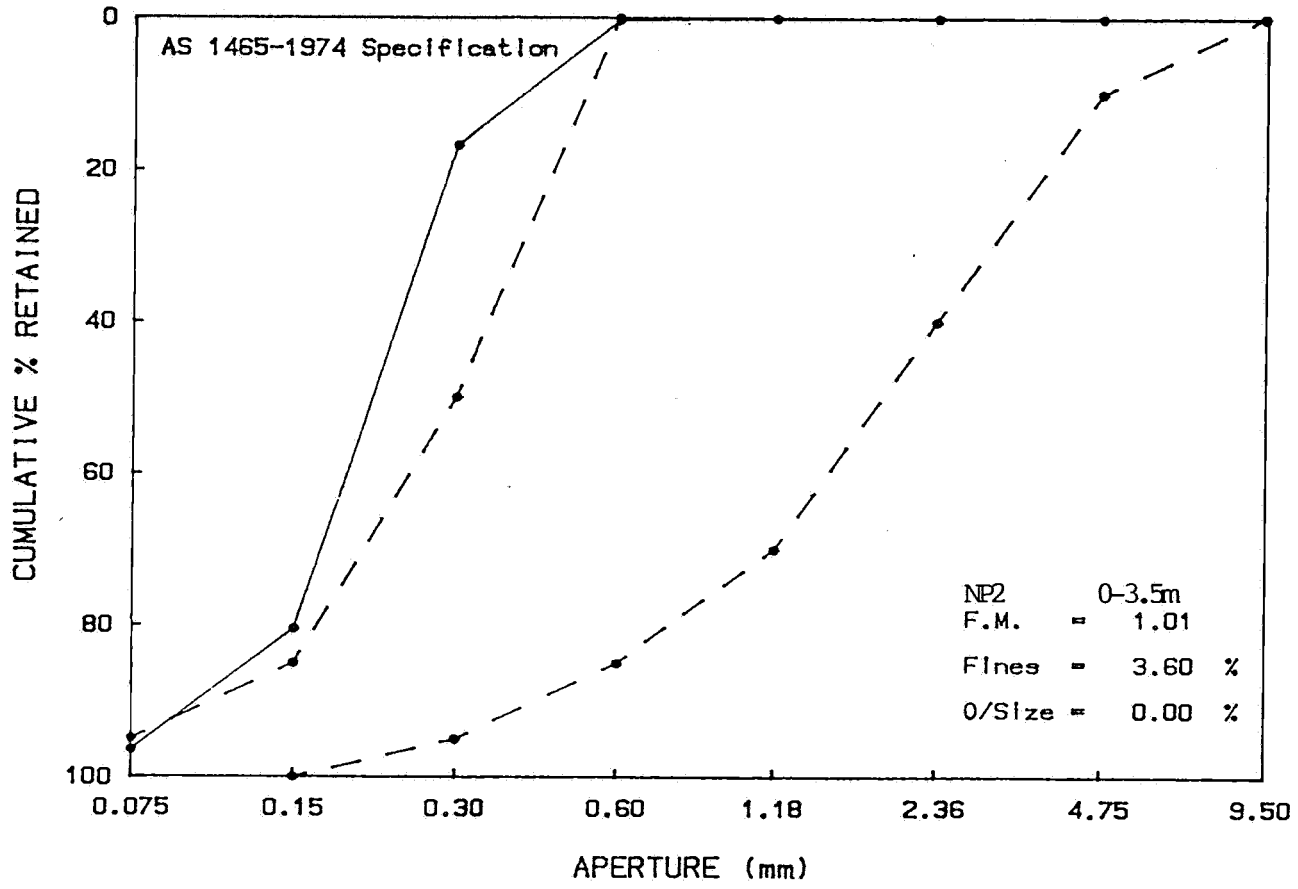
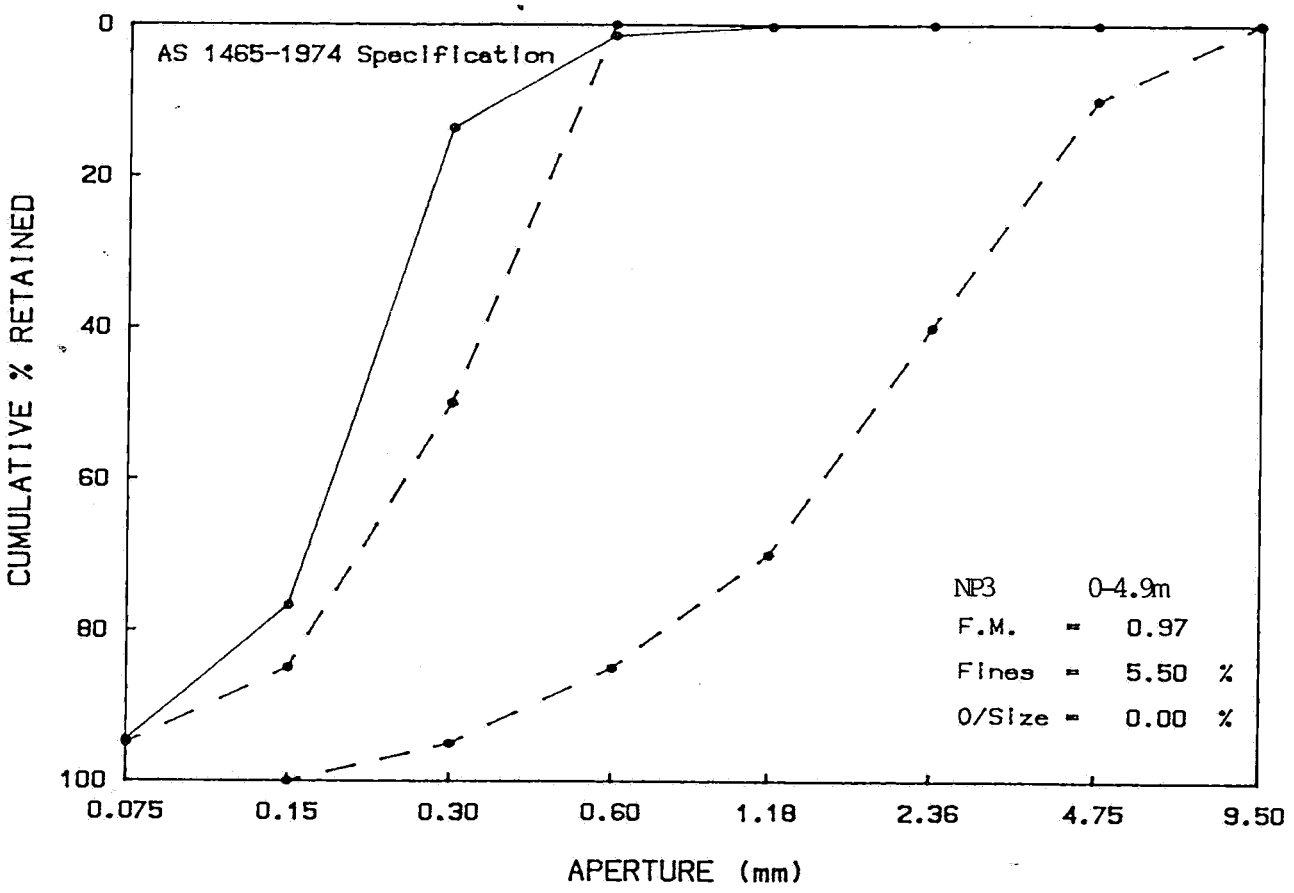
20
40
60
80
100
0.075
0.15
0.30
0.60
1.18
2.36
4.75
9.50
APERTURE (mm)
NP1 3.7-5m
F.M. = 0.65
Fines = 9.67 %
O/Size = 0.00 %

A3


AS 1465-1974 Specification
CUMULATIVE % RETAINED
0
20
40
60
80
100
0.075
0.15
0.30
0.60
1.18
2.36
4.75
9.50
APERTURE (mm)
NP2 0-3.5m
F.M. = 1.01
Fines = 3.60 %
O/Size = 0.00 %

A4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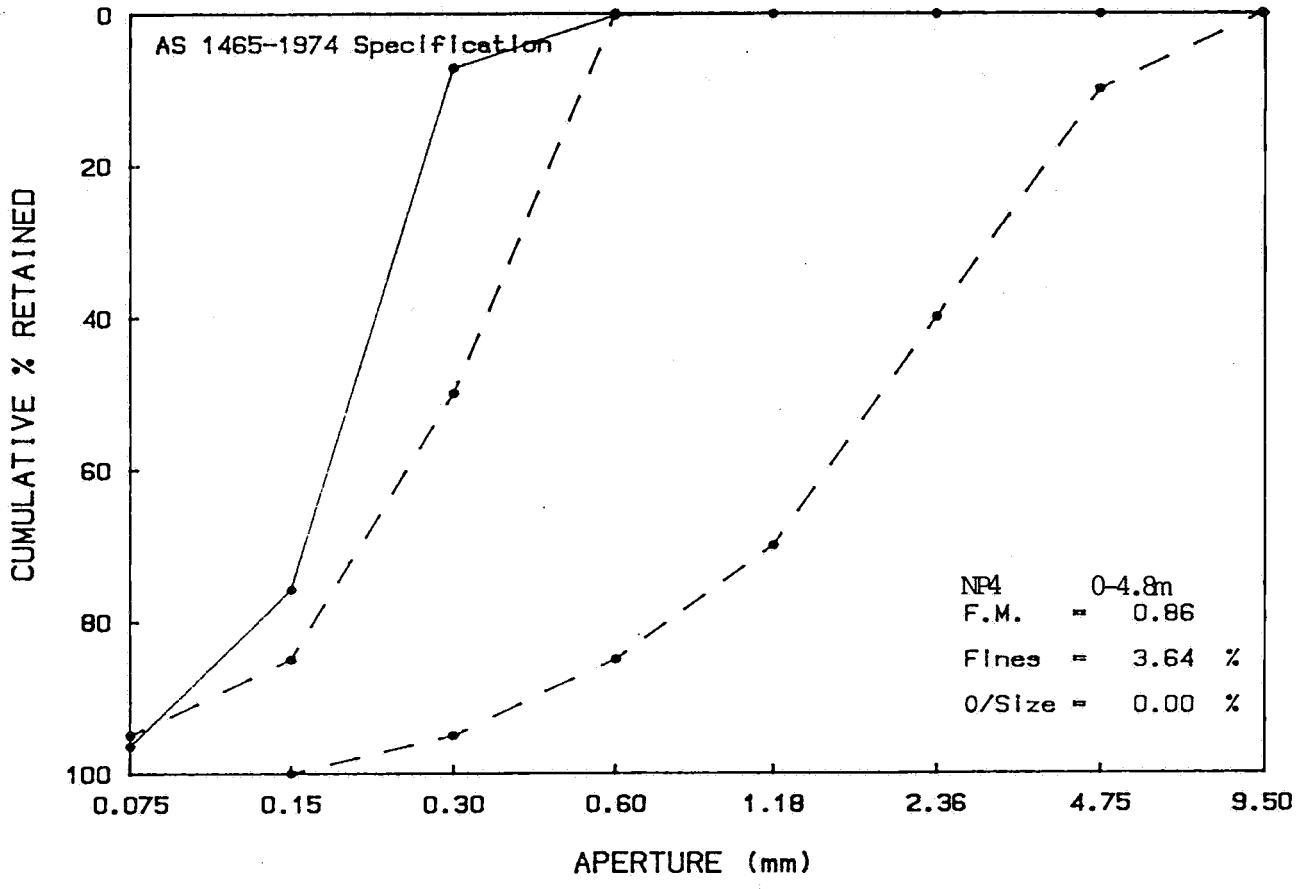
CUMULATIVE % RETAINED
0
20
40
60
80
100
0.075
0.15
0.30
0.60
1.18
2.36
4.75
9.50
APERTURE (mm)
NP3 0-4.9m
F.M. = 0.97
Fines = 5.50 %
O/Size = 0.00 %

A5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CUMULATIVE % RETAINED
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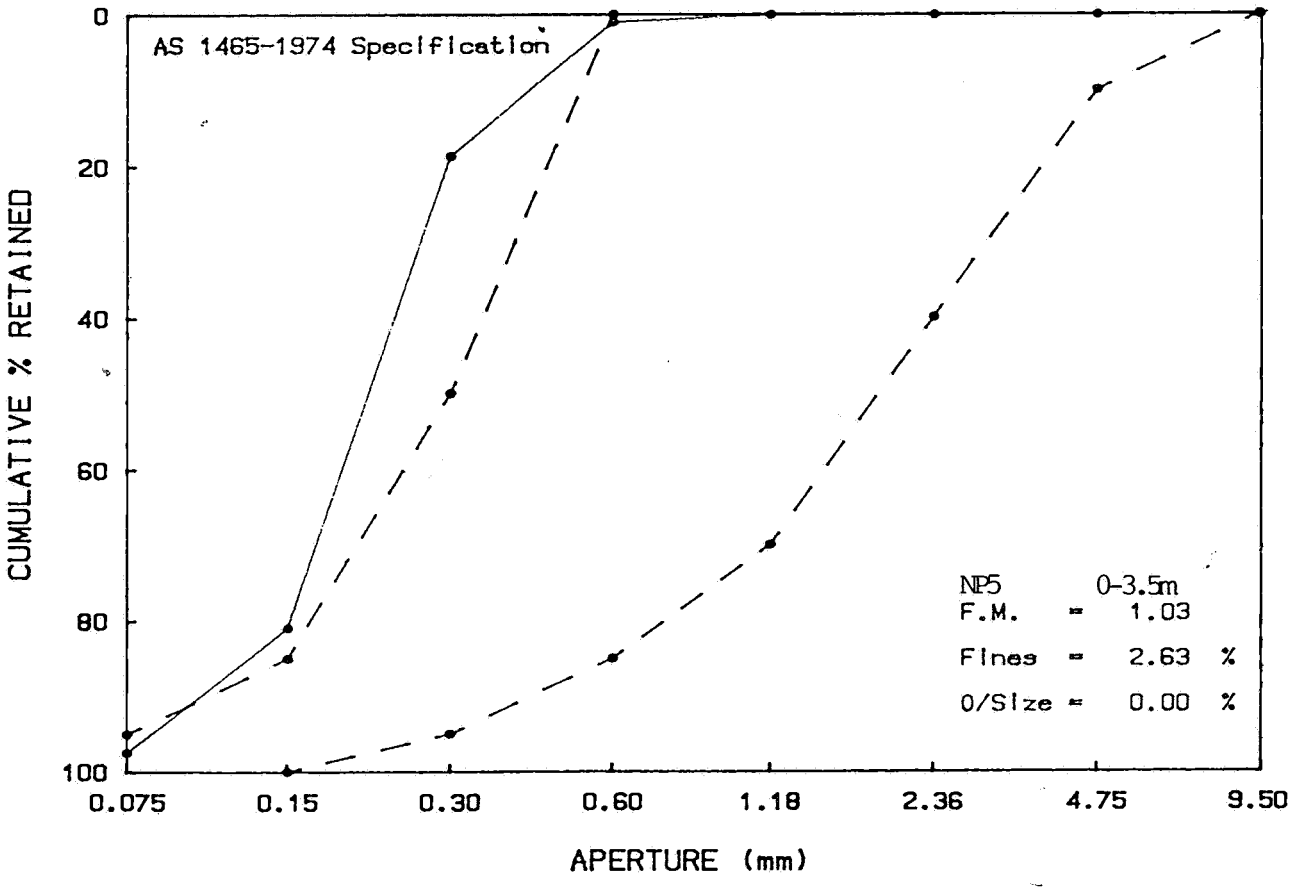
20
40
60
80
100
0.075
0.15
0.30
0.60
1.18
2.36
4.75
9.50
APERTURE (mm)
NP4 0-4.8m
F.M. = 0.86
Fines = 3.64 %
O/Size = 0.00 %

A6


AS 1465-1974 Specification
CUMULATIVE % RETAINED
0
20
40
60
80
100
0.075
0.15
0.30
0.60
1.18
2.36
4.75
9.50
APERTURE (mm)
NP5 0-3.5m
F.M. = 1.03
Fines = 2.63 %
O/Size = 0.00 %

PLATES

Fig. 1. Rubble pit in Gambier Limestone (Naracoorte Limestone Member) showing near vertical old quarry faces and recent stockpile scraped from the pit floor. View to the north, December, 1987.

E00010

Fig. 2. Naracoorte filling sand pit showing main working face exposing 14m of fine-grained, aeolian, quartz sand. Dark orange-brown sand in lower face corresponds with increasing clay content. View southwesterly, December 1987.

Slide No. 37988

Fig. 3. Detail of pit face, southern end, showing bedding in dune sand outlined by fine-grained slightly clayey laminations. View northerly, December 1987.

Slide No. 37989

E00010

FIGURES

Fig. 1. Rubble pit in Gambier Limestone (Naracoorte Limestone Member) showing near vertical old quarry faces and recent stockpile scraped from the pit floor. View to the north, December, 1987.

Fig. 2. Naracoorte filling sand pit showing main working face exposing 14m of fine-grained, aeolian, quartz sand. Dark orange-brown sand in lower face corresponds with increasing clay content. View southwesterly, December 1987.

Slide No. 37988

Fig. 3. Detail of pit face, southern end, showing bedding in dune sand outlined by fine-grained slightly clayey laminations. View northerly, December 1987.

Slide No. 37989

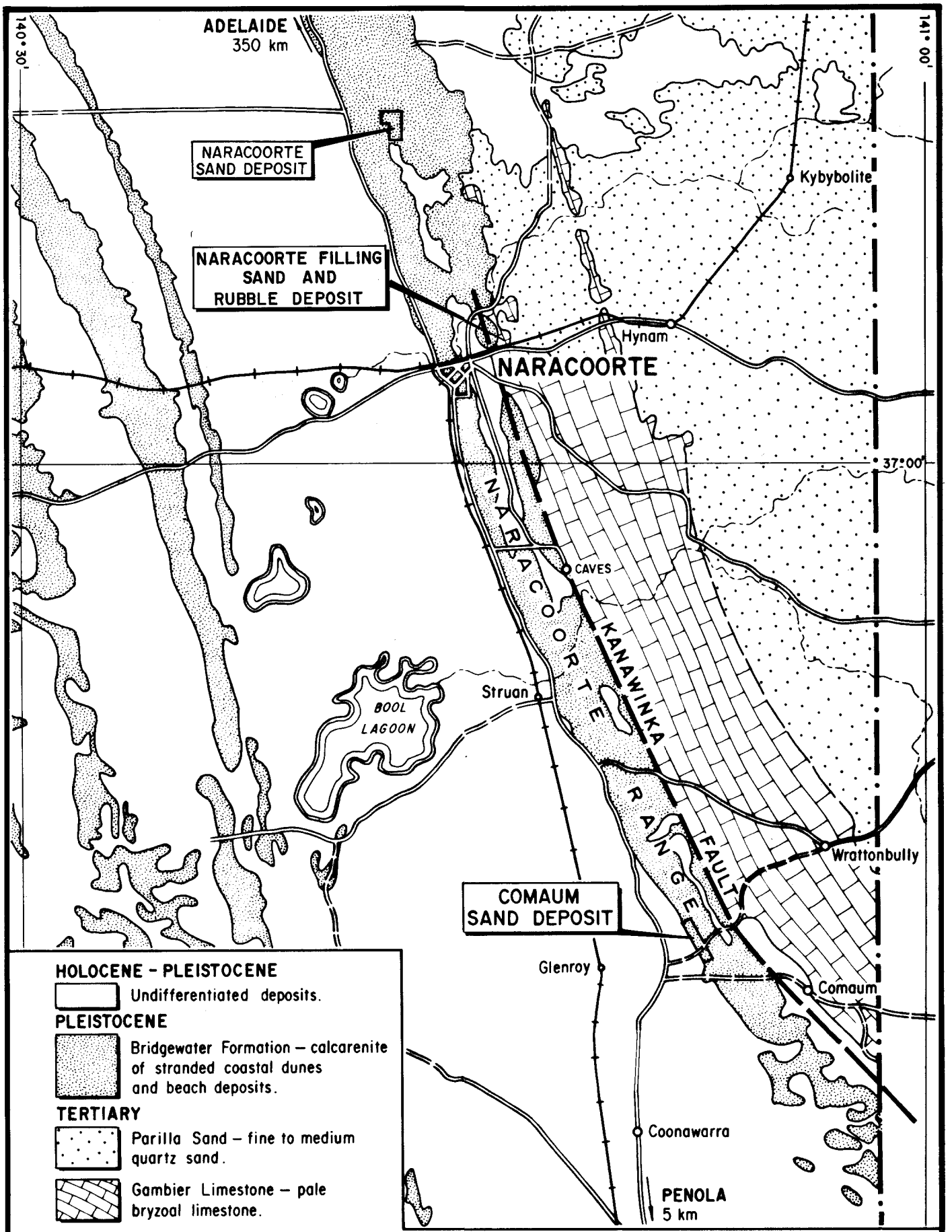


Figure.....1

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED J. Keeling	C.D.O. 25·5·89 DATE
NARACOORTE FILLING SAND AND RUBBLE DEPOSIT SEC. 700 AND SEC. 701, HUNDRED OF NARACOORTE	DRAWN R. Bird	SCALE As shown
	DATE 10-2-1988	PLAN NUMBER
LOCATION AND REGIONAL GEOLOGY	CHECKED	S19836

4542

686
687
688
689
690
691
692
695
696
697
698
699
700
701
684
1127
1011
75
70
95
90
85
80
65
100
105
110
A
A'
B
B'
C
C'
D
D'
NP1
NP2
NP3
NP4
NP5
NP6
Claim Boundary MC 2091
Filling Sand Pit
EML 5526
PT. 705
1011 STONE RESERVE
GARTHYS
D.G. Pitt Concrete Batching Plant
Limestone Rubble Pit
ROAD
To Hynam
SMITH
STREET
28

REFERENCE

HOLOCENE — Molineaux Sand - medium to fine -grained quartz sand.

PLIOCENE - PLEISTOCENE — Terra Rossa soil - thin red-brown clay and sandy clay developed on Gambier Limestone.

TERTIARY — Gambier Limestone, including Naracoorte Limestone Member rubbly shelly limestone over bryzoal limestone.

● NP4 ..... Hand auger hole

FOR DETAILS ON SECTIONS SEE FIGURE 3
(PLAN NO. 88-68)

SCALE

100 0 100 200 300 400 500
METRES

Figure 2

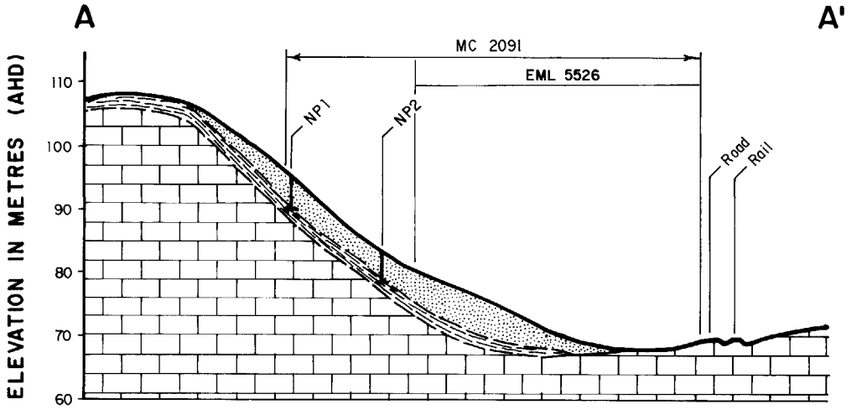
DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

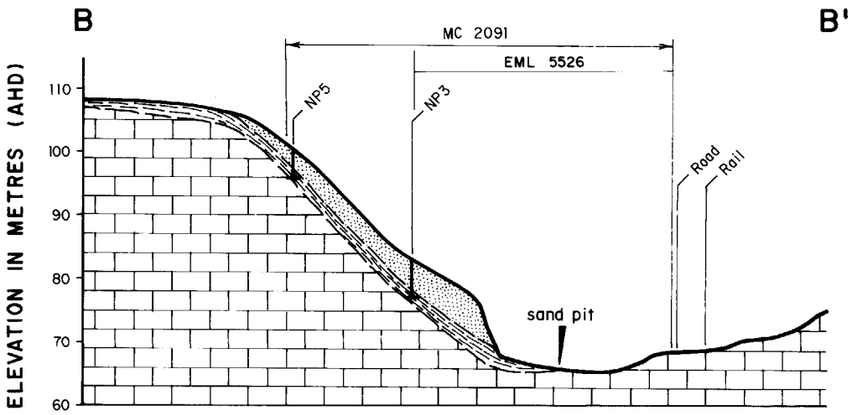
NARACOORTE FILLING SAND AND RUBBLE DEPOSIT
EML 5526 D.G. & V.A. PITT
SEC. 700 AND SEC. 701, HUNDRED OF NARACOORTE

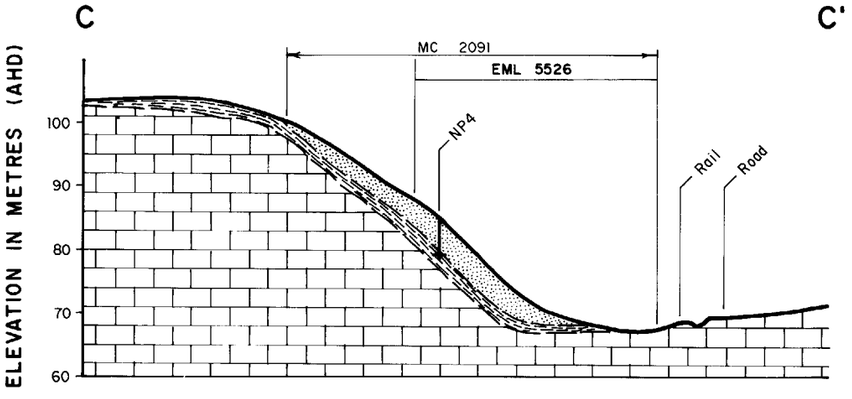
GEOLOGICAL PLAN AND AUGER HOLE LOCATION

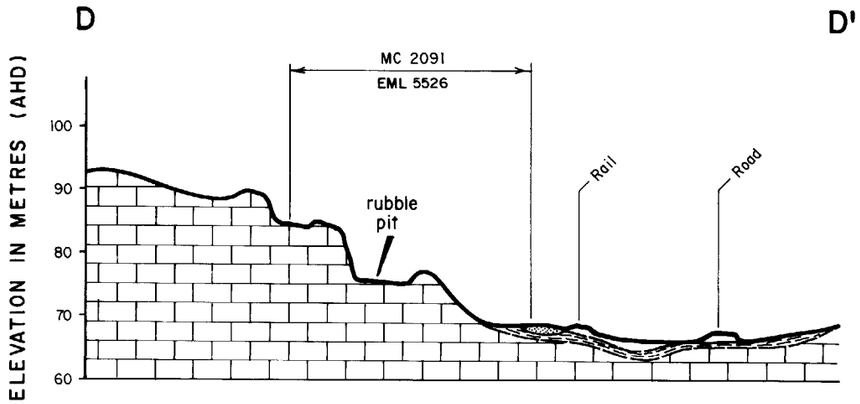
COMPILED J. Keeling	CDO 25-5-89 DATE
DRAWN R. Bird	SCALE As shown
DATE 19-2-1988	PLAN NUMBER 88 - 67
CHECKED	

4542









REFERENCE

HOLOCENE		Molineaux Sand - medium to fine-grained quartz sand.
PLIOCENE-PLEISTOCENE		Terra Rossa soil - thin red-brown clay and sandy clay developed on Gambier Limestone.
TERTIARY		Gambier Limestone, including Naracoorte Limestone Member - rubbly shelly limestone over bryzoal limestone.

SCALE

100 0 100 200

METRES

V/H = 5

FOR LOCATION OF SECTIONS SEE FIGURE 2 (PLAN NO. 88-67)

Figure 3

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

NARACOORTE FILLING SAND AND RUBBLE DEPOSIT
EML 5526 D.G. & V.A. PITT
SEC. 700 AND SEC. 701, HUNDRED OF NARACOORTE

GEOLOGICAL SECTIONS

COMPILED J. Keeling		CDO 25.5.89 DATE	
DRAWN R. Bird		SCALE As shown	
DATE 12-2-1988		PLAN NUMBER 88 - 68	
CHECKED			

4542

686
687
688
689
690
691
692
695
696
697
698
699
700
701
684
1011
STONE
RESERVE
1127
D.C. Reserve
PT. 705
PT. 26
28
EML 5526
A
B
NP1
NP2
NP3
NP4
NP5
NP6
BOUNDARY OF AREA USED FOR RESERVE CALCULATION
D.G. Pitt
Concrete
Batching Plant
CARTHYS ROAD
SMITH STREET
To Hynam

N

REFERENCE

Remnant native vegetation

Area stripped of vegetation behind pit face

● NP4 ..... Hand auger hole

SCALE

100 0 100 200 300 400 500

METRES

Figure 4

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

NARACOORTE FILLING SAND AND RUBBLE DEPOSIT
EML 5526 D.G. & V.A. PITT
SEC. 700 AND SEC. 701, HUNDRED OF NARACOORTE

AREA USED IN RESERVE CALCULATIONS

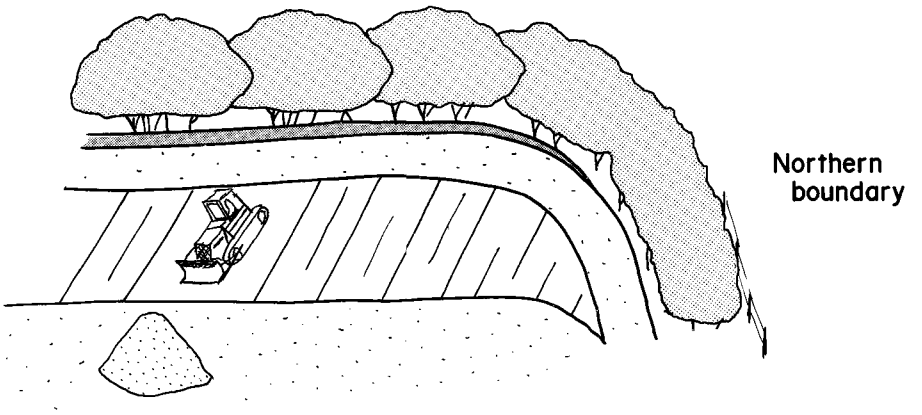
COMPILED J. Keeling	CDO 25·5·88 DATE
DRAWN R. Bird	SCALE As shown
DATE 18-2-1988	PLAN NUMBER 88 - 69
CHECKED	

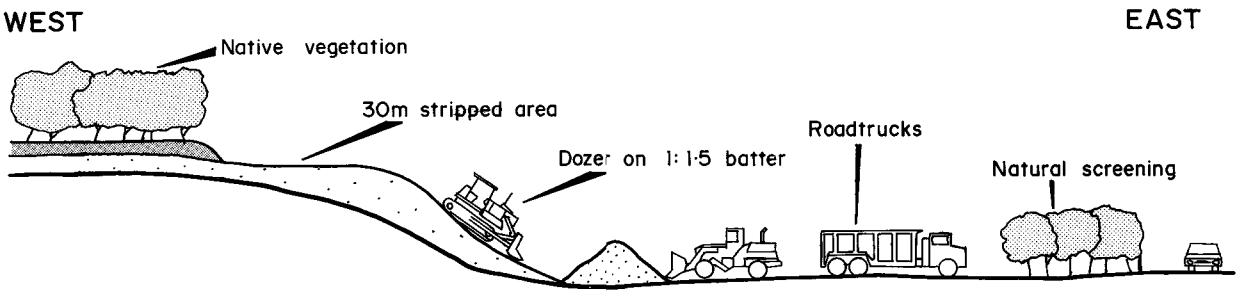
4542

MF 146 F

SAND OPERATION

CONCEPT VIEW OF BATTER DOZING





SECTION THROUGH PIT

Mining Method (I) Dozing on a Batter

a) Prestrip vegetation approximately 30m ahead of the mining face.

b) Doze sand down the slope on a 1:1·5 batter to the pit floor using a crawler tractor.

c) Load from stockpiles direct into roadtrucks

d) Progressively rehabilitate the pit floor in stages as the mining face advances.

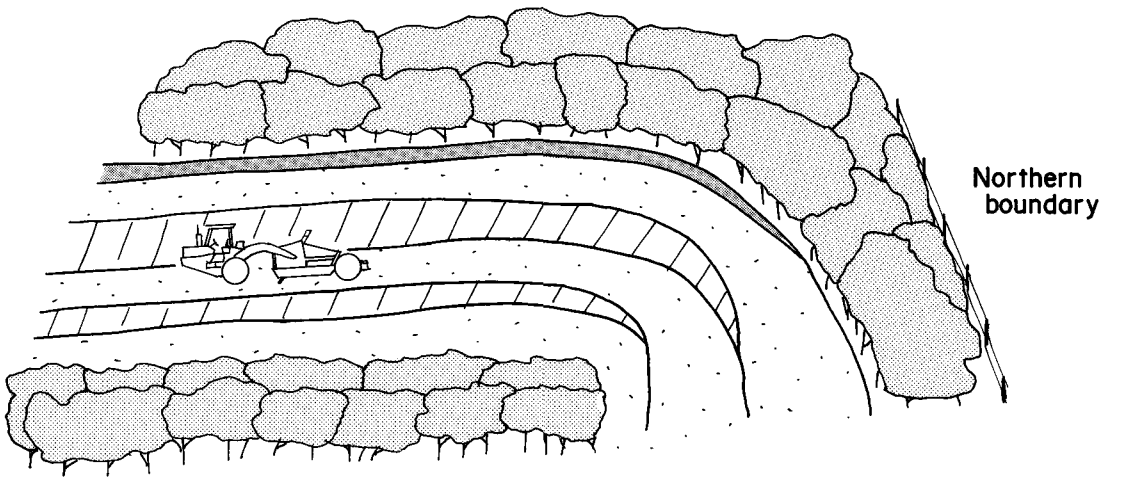
Figure.....5

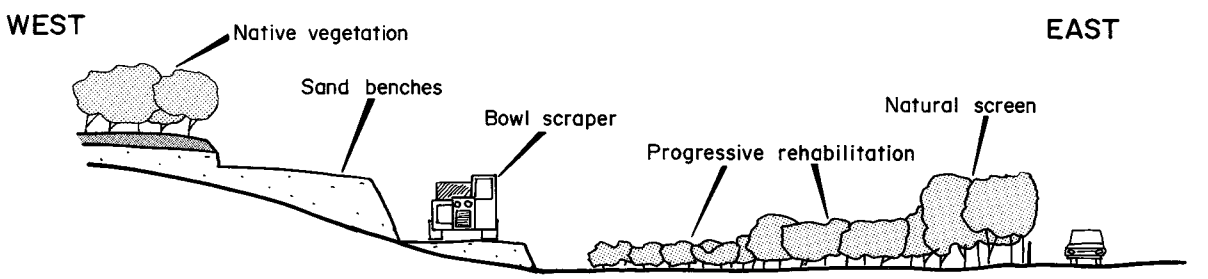
DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED R. Cox	C.D.O. 25·5·89 DATE
NARACOORTE FILLING SAND AND RUBBLE DEPOSIT EML 5526 D.G. & V.A. PITT SEC. 700 AND SEC. 701, HUNDRED OF NARACOORTE	DRAWN R. Bird	SCALE Not to scale
	DATE 13-4-1989	PLAN NUMBER
MINING METHOD (I) DOZING	CHECKED	S20751

4542

SAND OPERATION

CONCEPT VIEW OF SCRAPER OPERATION





SECTION THROUGH PIT

Mining Method (II) Bowl Elevating Scrapers

a) Prestrip vegetation progressively 30m ahead of the mining face.

b) Establish scraper road and work down the bench.

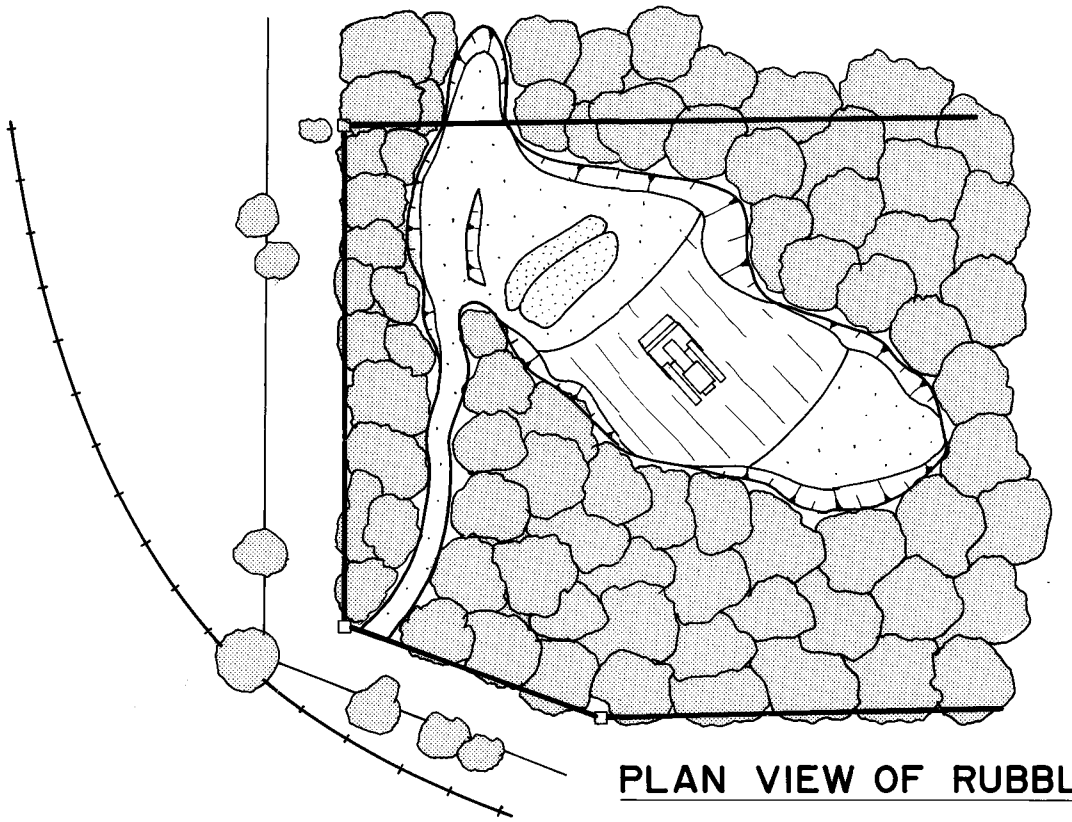
c) Establish new benches as required to maintain production and achieve a safe bench height.

d) Progressively rehabilitate the pit floor as the mining face advances.

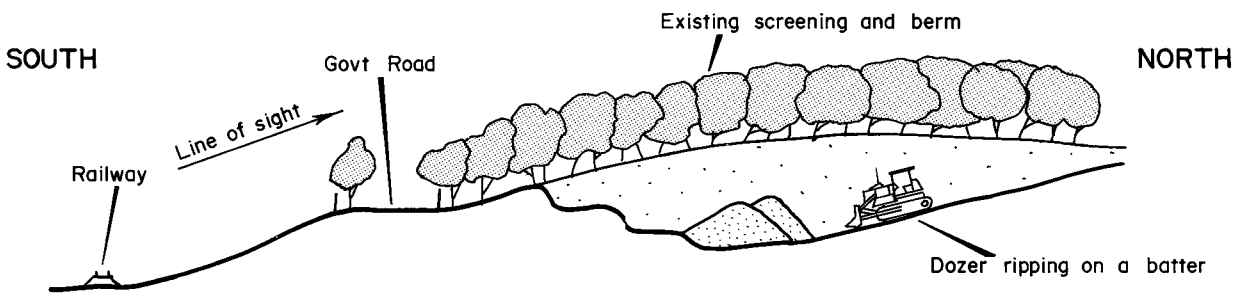
Figure.....6

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED R. Cox	C.D.O. 25·5·89 DATE
NARACOORTE FILLING SAND AND RUBBLE DEPOSIT EML 5526 D.G. & V.A. PITT SEC. 700 AND SEC. 701, HUNDRED OF NARACOORTE	DRAWN R. Bird	SCALE Not to scale
	DATE 13-4-1989	PLAN NUMBER
MINING METHOD (II) SCRAPERS	CHECKED	S20752

4542



PLAN VIEW OF RUBBLE PIT



SECTION THROUGH RUBBLE PIT

Limestone Rubble Pit

The existing rubble pit can be operated by ripping on a batter with a crawler dozer operating behind the screen of the existing vegetation and established cut below the contour of the hill.

Battering on a slope will enable progressive rehabilitation of the existing near vertical faces.

Figure.....7

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED R. Cox	C.D.O. 25-5-89 DATE
NARACOORTE FILLING SAND AND RUBBLE DEPOSIT EML 5526 D.G. & V.A. PITT SEC. 700 AND SEC. 701, HUNDRED OF NARACOORTE	DRAWN R. Bird	SCALE Not to scale
	DATE 13-4-1989	PLAN NUMBER
LIMESTONE RUBBLE PIT	CHECKED	S20753

4542