SITEGOAL PTY. LIMITED

ACN 092 317 501

ENVIRONMENTAL IMPACT STATEMENT

PROPOSED WALLERAWANG QUARRY

Pacrim
ENVIRONMENTAL
Report 01/206.1
November 2001

Submission of
environmental impact statement (EIS)
prepared under the Environmental Planning and Assessment Act 1994

EIS prepared by	
name	K. Wayne Perry
qualifications	BSc BArch F.AusIMM, M.EIA, CPEnv
address	Unit 2, 120 Darby Street NEWCASTLE NSW 2300
in respect of	
development application	Proposed Wallerawang Quarry
applicant name applicant address	Sitegoal Pty Limited 191 Main Street Lithgow NSW 2790
land to be developed	Off Great Western Highway, Wallerawang
lot n°. DP/MPS. vol/fol etc proposed development	Lot 6, DP 872230 and Part SF 707
environmental impact statement	☑ an environmental impact statement (EIS) is attached.

certificate

I certify that I have prepared the contents of this Statement and to the best of my knowledge

- it is in accordance with Clauses 72 and 73 of the Environmental Planning and Assessment Regulation 2000;
- it contains all available information that is relevant to the environmental assessment of the development to which the statement relates; and
- it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

signature 

name K. Wayne Perry

date 13 / 11 /2001

Sitegoal Pty Ltd

ENVIRONMENTAL IMPACT STATEMENT

PROPOSED WALLERAWANG QUARRY

Prepared for:

Sitegoal Pty Ltd
191 Main Street
LITHGOW NSW 2790

Telephone: (02) 6352 3377
Facsimile: (02) 6352 3661

Prepared by:

Pacrim Environmental Pty Ltd
2/120 Darby Street
NEWCASTLE NSW 2300

Telephone: (02) 4926 5166
Facsimile: (02) 4926 5125
Email: mail@pacrimenviro.com.au

Report 01/206.1
November 2001

TABLE OF CONTENTS

APPENDICES

After Page N°

FIGURES

PLATES

TABLES

GLOSSARY OF TERMS AND ABBREVIATIONS

°	Degrees
°C	Degrees Celsius
%	Percent
µs/cm	Microsiemens per centimetre. A measure of conductivity
µm	Micron (1x10-6 metres)
µg	Microgram
$\mu g/m^3$	Microgram per cubic metre
AADT	Annualised Average Daily Traffic
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
ANFO	Ammonium Nitrate Fuel Oil explosive
ANZECC	Australian and New Zealand Environment Conservation Council
AS	Australian Standards
AWTS	Aerated Wastewater Treatment System
BOM	Bureau of Meteorology
cm	Centimetres
CO_2	Carbon Dioxide
dB	Decibels – a measure of noise
dB(A)	Decibels ('A' weighted scale)
dB(Lin)	Noise as pressure fluctuations in air measured in decibels
DLWC	Department of Land and Water Conservation (NSW)
DMR	Department of Mineral Resources (NSW)
DUAP	Department of Urban Affairs and Planning (NSW)
EC	Electrical Conductivity (salinity)
EIS	Environmental Impact Statement
EL	Exploration Licence
ENM	Environmental Noise Computer Model
EPA	Environment Protection Authority (NSW)
EP&A Act	Environmental Planning and Assessment Act, 1994
ESD	Ecologically Sustainable Development
g/m^2/month	Grams per square metre per month
ha	Hectares
hr	Hour
km	Kilometres
km/h	Kilometres per hour
kV	kilovolt
L	Litre
L_{Aeq}	Average noise energy during monitoring period

L_{A90}	Average noise energy 90% monitoring period
L_{10}	Noise level exceeded 10% of the monitoring period
L_{90}	Noise level exceeded 90% of the monitoring period
L/d	Litres per day
litres/m^2/hr	litres per square metre per hour
M	Million
ML	Million litres (megalitre)
mg/L	milligrams per litre
m	metres
m/s	metres per second
m^2	Square metres
m^3	Cubic metres
mm	millimetres
mm/s	millimetres per second
MSDS	Material Safety Data Sheet
Mt	Million tonnes (megatonne)
Mtpa	Million tonnes per annum (year)
N	North
NFR	Non Filterable Residue
NHMRC	National Health and Medical Research Council
NPWS	National Parks and Wildlife Service (NSW)
PFM	Planning Focus Meeting
pH	Units of acidity/alkalinity
PM_7	Particulate matter less than 7 microns diameter
PM_{10}	Particulate matter less than 10 microns diameter
POEO Act	Protection of the Environment Operations Act 1997
PPV	Peak Particle Velocity
Pty Ltd	Proprietary Limited
REP	Regional Environmental Plan
RTA	Roads and Traffic Authority (NSW)
S	South
SCA	Sydney Catchment Authority (NSW)
SCS	Soil Conservation Service (NSW)
SE	South East
SEPP	State Environmental Planning Policy
SiO_2	Silica
SOE	Statement of Effects
t	tonne
tpa	Tonnes per annum (year)
TSP	Total Suspended Particulates
WBM	Consultants, WBM Oceanics Australia

EXECUTIVE SUMMARY

BACKGROUND

It is proposed to develop a hardrock quarry at a location approximately 2.5km southeast of Wallerawang. The quarry site is located south of the Great Western Highway and to the west of the Coxs River. The quarry will be developed by Sitegoal Pty. Ltd., a Lithgow-based Company, who have held an exploration licence (EL4473) over the site since 1993.

THE PROJECT

The quarry will comprise a total disturbed area of approximately 11ha and produce quartzite and rock aggregate material for use in the Wallerawang, Lithgow, Blue Mountains and Sydney regions. The quarry will produce approximately 3.5Mt of product material over the initial approval period of 20 years, with an estimated value of $77M.

The quarry site will be developed in three stages and quarry material will be won using a combination of drilling, blasting and rock breaking operations. Quarry product will be crushed and stockpiled on-site using either a mobile crushing plant or a fixed crushing plant, dependent upon contractor and product requirements. Overburden material will be stockpiled on-site for either sale or use in the rehabilitation of the quarry.

It is envisaged that production will vary between 125,000tpa and 500,000tpa depending on market demand. The proposed Wallerawang Industrial Park adjacent to the existing power station, would provide an estimated product requirement of 500,000tpa for at least two years. At this maximum production rate, an estimated 80 loads or 160 heavy vehicle movements will be generated by the project each day. At the lower production rate, vehicle movements are expected to be approximately 40 per day or 20 loads per day. Safe access and egress to the site will be facilitated by the construction of a new intersection approximately 500m west of Barton Ave.

The quarry will generally operate between the hours of 7.00am and 5.00pm Monday to Friday unless market demand necessitates additional production on a Saturday. To satisfy Sydney

market requirements, there will be a need to dispatch trucks in the early hours of the morning. Saturday operations will include plant maintenance and loading of quarry product. It is anticipated that two to four permanent staff will be employed on site, supplemented by contract truck, dozer and excavator drivers.

PREPARATION OF THE EIS

This document has been prepared in accordance with the requirements of the Environmental Planning and Assessment Act and Regulation. It takes into account comments from the public consultation process and the requirements of relevant statutory authorities.

Approval is sought for a production level of up to 500,000tpa. The proposal is deemed to be a State Significant Development, exceeding the 200,000tpa extraction rate listed in the Schedule to the EP&A Act Declaration, dated 3 August 1999.

A Planning Focus Meeting was held with relevant authorities and consultation with the community has been on-going via information brochures, face to face contact and an on site community briefing. Issues raised by the community and Statutory Authorities have been addressed in the EIS.

ENVIRONMENTAL ASSESSMENT

Archaeology.

Site investigations located an aboriginal archaeological site within the area proposed for topsoil storage. Modification of the project layout resulted in the relocation of this proposed stockpile site. Protection of the site will occur through fencing the area to exclude access and by notifying employees of the significance of the site through an induction program. A management plan will be prepared.

Flora and Fauna.

The quarry site is predominantly sub-alpine Eucalypt woodland. Canopy cover is generally continuous across the site, while understorey development is limited. No species of threatened flora were identified or are known to occur on or near the quarry site.

One species of threatened fauna (Yellow-bellied Sheathtail-bat) was identified as occurring on the site. Two other threatened species (Koala and Bathurst Copper butterfly) are recorded in the NPWS database as occurring within a 10km radius of the site. Consideration of the site under SEPP 44 (Core Koala habitat) determined that although sufficient koala feed tree species existed on the site, there was no evidence of koala habitation in the area proposed for quarry development.

It was concluded that due to the abundance of similar habitat both locally and regionally, the quarry development will not affect local populations of threatened species that potentially use the site. Upon completion of quarry activities, the site will be returned to a floristic structure commensurate with the surrounding area.

Surface and Ground Water.

The natural hydrology of the site will be altered during quarry development. Water from undisturbed areas will be diverted around the site and discharged to the Coxs River. Water from disturbed areas will be captured, transported and stored in a series of water management structures constructed on the site. A 7.7ML water management dam will provide the major storage facility on the site. Water re-use and efficiency will be maximised by using water stored in the water management dam for the majority of on-site water requirements, predominantly for dust suppression purposes. An irrigation component is included in the water management design to ensure adequate storage is available on site for the majority of storm events.

The quarry development will operate as a zero discharge site under the majority of climatic conditions. During extreme rainfall events it may be necessary to discharge water from disturbed areas of the site. On these occasions, dilution with runoff from the surrounding catchment areas will minimise surface water impacts.

Due to the fractured nature of the rock and the inability to intersect the groundwater table during drilling operations at the site, groundwater impacts are considered unlikely to occur as a result of the project.

Air Quality.

Modelling of likely dust emissions resulting from the quarry was undertaken for a range of production levels. Results indicate that nuisance and health related dust impacts would be negligible at all production levels and under all wind conditions.

Operational safeguards will include watering of haul roads and machinery manoeuvring areas, keeping stockpiles in a dampened state, a wheel wash facility, sealing of the access road from the wheel wash to the Great Western Highway and the covering of all loads.

In the event that excessive dust generation occurs during adverse wind conditions, activities will be modified or ceased during the period. However, the retention of extensive tree cover around the entire site should minimise this occurrence by sheltering the site from unfavourable winds.

Noise.

Modelling of predicted noise levels for potential receptors in the vicinity of the quarry site indicates that under calm atmospheric conditions, all noise assessment goals will be complied with. During adverse conditions (winds and a temperature inversion) noise assessment goals may be exceeded at some receptor locations.

Operational safeguards have been incorporated to reduce the risk of noise impacts upon the receiving environment. These include restricting or ceasing quarry activity during adverse weather conditions, retaining a 6-8m highwall at the northern end of the quarry to act as a noise buffer and retaining extensive tree cover around the entire quarry site.

Periodic noise monitoring will be undertaken throughout the life of the project to ensure that noise criteria are being complied with. Wind speed and weather conditions will be monitored at a permanent exposed location to allow operational modifications to be considered.

Blasting and Vibration.

Modelling indicates that the prescribed allowable level of blast noise will not be exceeded at any time during quarry operations. Due to the potential for flyrock, it may be necessary to close the Great Western Highway for short periods during blasting operations. Blasting is

expected to occur once every two weeks at the maximum production level reducing to once every two months at the lower production levels.

The quarry site is located adjacent to an existing electricity supply pylon, and therefore blasting will be designed to ensure that vibration levels do not exceed 25millimetres per second, as required by Transgrid. Vibration monitoring will be undertaken at the base of the pylon.

Two operational measures have been included to reduce blast vibration and over-pressure impacts. A small diameter (89mm) drill hole will be used in conjunction with the 'Nonel' initiation system. This system allows for individual in-hole delays and prevents the effects of a single large blast.

Visual.

Quarry operations will not be visible from the majority of public viewing locations identified. View modification at these sites will occur as subtle changes to the current ridgeline profile. Trees occurring in the foreground are likely to obscure the majority of views to quarry activities.

Views of the eastern quarry highwall are likely from the elevated western approaches of the Great Western Highway. However, views from this location will predominantly occur from eastbound road traffic, travelling at the nominal speed of 110km/h. Rehabilitation east of the Stage 2 trench will commence in Year 3 of the quarry program and will soften this outlook considerably.

Site Rehabilitation.

Stabilisation works will commence concurrently with development of the quarry. Quarry benches will be revegetated as soon as practicable using a range of endemic trees and shrubs. Upon completion of quarry activities, the void space, access road and surface facilities areas will be ripped, and seeded/planted with a range of endemic tree, plant and grass species.

The final void will comprise a gently sloping floor (4%) surrounded by steeper side slopes (approximately 50 degrees), not inconsistent with existing slopes in the area.

Land Use.

Land uses in the vicinity of the quarry site comprise a mixture of forestry, rural and residential areas. Nineteen dwellings have been identified as occurring within a 2km radius of the quarry site.

The operation of the quarry will not impact upon the potential land use adjacent to the site. The area is considered too steep for forestry operations and no agricultural activity occurs in the immediate vicinity. Although not visible, quarry operations will be noticeable to nearby residents through increased truck movements on the Great Western Highway and audible blasting operations occurring at intervals between once per two weeks to once per two months, depending upon production levels.

Planning and Services.

The quarry site is located upon land zoned Rural General 1(a) and Rural Forestry 1(f) under the Greater Lithgow Council City LEP (1994). SEPP 44 (Core Koala Habitat) and SEPP 58 (Protecting Sydney's Water Supply) also apply to the quarry development.

Extractive industry is permitted development under the existing land zoning, providing development consent is obtained. The requirements of SEPP 44 and SEPP 58 have been considered and addressed in the development of the EIS document.

Connections for power and telephone services are required at the site. Potable water will be purchased off-site as necessary. Wastewater services will be supplied via the installation of a packaged Aerated Wastewater Treatment System to service the office and amenities. Treated effluent will be irrigated onto a managed vegetated area of the site.

Road Transport.

The quarry development will result in an increase in heavy vehicle movements on both the Great Western Highway and Mudgee Road. The extent of the increase will be dependant upon production levels but will be in the order of 7% to 28% for the Great Western Highway and 18% to 73% for Mudgee Road. The extent of increased traffic on Mudgee Road would be dependent upon the level of activity at the proposed Wallerawang Industrial Park. All traffic to the proposed Wallerawang Industrial Park would travel via Mudgee Road and not via Wallerawang.

A new 'seagull' intersection, designed to RTA standards, will be constructed approximately 500m west of the Barton Ave intersection. The new intersection will provide safe access and egress to and from the quarry site. The new intersection has been designed to minimise traffic disruption on the Great Western Highway by providing a separate acceleration lane for heavy vehicles entering the highway. During fog conditions, no heavy vehicles will be allowed to leave the quarry site until visibility has returned to an acceptable level.

Economic Outputs.

The output value of the quarry is estimated at $3.85M per year at an average production rate of 175,000tpa or $77M over the 20 year approval period. There will be approximately four employees on-site with additional employment resulting from the use of subcontract hauliers and machinery hire. Additional benefits will occur within the Lithgow area from the expenditure for goods and services as well as the payment of wages and taxes.

Cumulative Impacts.

The quarry is sufficiently removed from similar and existing industries so that cumulative impacts of dust and noise will be avoided. The quarry development will result in an increase in heavy vehicle traffic on major roads in the area, however, modelling predicts that the level of service and safety on these roads will not be significantly impacted.

ALTERNATIVES

Alternatives are considered for all facets of quarry design and operation. Analysis of feasible alternatives supports the conclusion that the proposed quarry, as described in the EIS, represents the optimum outcome with respect to design, methodology and management.

Quarry Area.

The siting of the quarry is constrained by several physical attributes, including the geological extent of the quartzite resource, the topographical limitations of the surrounding area, the proximity of the Coxs River, the Great Western Highway and power transmission infrastructure.

Alternative Extraction Methods

Due to the hardness of the quartzite resource, alternative quarrying methods are considered impractical. The quarrying method proposed in the EIS utilises best practice drilling and blasting technology to minimise the level of vibration, overpressure and the generation of fly rock.

Vehicular Access

Several access/egress options for the quarry site were considered and modelled. The proposed access is considered superior in that it requires less construction between the quarry and the Great Western Highway and affords a high level of safety for all users. The RTA concurs with the outcome.

Final Landform Options

Alternative outcomes for the post-quarrying landform were considered. The retention of the eastern highwall is considered the most appropriate alternative as it helps limit noise and dust emissions during the operational phase. The alternative of filling the quarry to its original landform with imported fill is not recommended due to cost constraints and as it may unduly expose the Coxs River to the potential for leachate transfer.

Product Transport Options

The use of rail transport was identified as an alternative product transport option. The existing Wallerawang coal loader, currently used for the loading of timber, would allow the cost-effective transport of bulk product to the Sydney market. However, significant limitations are identified with this alternative. Rail transport would require the availability of a bulk receiver within the Sydney market area who could store and distribute the product to variable markets. Truck transport provides the versatility to service a wide range of small markets at diverse geographical locations and along with the proximity of the proposed quarry development to the Great Western Highway makes road transport of product to the local and Sydney markets, the preferred option.

Not Proceeding

The alternative of not proceeding with the proposed quarry development would result in the loss of an estimated 3.5Mt of high quality quartzite (aggregate) from the Western

Sydney/Lithgow construction industry over the 20 year life of the quarry. In this case, alternative resources in the regions surrounding Sydney would need to be developed. The potential benefits occurring to the local community from the sale of the product would be lost.

1. INTRODUCTION

1.1 BACKGROUND

Sitegoal Pty Ltd, a Lithgow-based Company, has undertaken exploration activities within Exploration Licence EL4473, located to the south east of Wallerawang, since it was granted title in 1993.

The area of interest has a history of extractive industry. The former Hoskins Quarry is located adjacent to the proposed quarry development and last operated in 1927, although the proponents collected a small sample from this quarry for testing purposes in 1994. Also, a surface gravel quarry was in operation to the east and across the Coxs River from the proposed quarry development until recent years, when it was rehabilitated and incorporated into the Rocky Waterhole.

A resource of quartzite and overburden material in excess of 4.4Mt has been proven at the site and Sitegoal intends to develop a hardrock quarry with a life expectancy exceeding 20 years. It will be developed over three stages, resulting in a total disturbed area of approximately 11ha. Production will vary between approximately 125,000tpa/150,000tpa to a maximum of 500,000tpa, dependent upon market demand. Extraction will involve drilling and blasting, and a crusher will be located either in-pit or at the surface facilities site. A sealed access road and a new intersection with the Great Western Highway (located approximately 500m west of Barton Avenue) will be constructed.

1.2 LOCATION AND LAND DETAILS

The proposed quarry development is located adjacent to the Great Western Highway near Wallerawang, NSW. It is approximately 8km north west of Lithgow and 2.5km south east of Wallerawang, as shown in *Figure 1.1* and *Plate 1.* The context of the site is shown in *Figure 1.2.*

The proposed quarry development is located within EL4473 (shown in *Figure 2.1*), a Group 2 Mineral Exploration Licence, that has been held by Sitegoal since June 1994 and has an area of approximately 281ha. EL 4473 is comprised of predominantly Crown Land, occupied by the Lidsdale State Forest, with privately owned land included in the north eastern corner of the licence area. The proposed quarry development site includes a combination of Crown Land (Lidsdale State Forest) and private land (Lot 6, Goh and Hickman for which an option to purchase agreement is available) as illustrated in *Figure 1.2.*

The proposed quarry site is zoned Rural (General) 1(a) to the east and Rural (Forestry) 1(f) to the west. Extractive industries are permissible under these zonings subject to development approval. A land use and zoning map of the project area is provided in *Figure 5.17*.

Since registration of EL4473 in 1993, a number of parcels of land have been subdivided in close proximity to the proposed quarry. Adjacent subdivisions within proximity of the proposed quarry are shown in *Figure 5.18*.

1.3 COMPANY PROFILE

The proponent for this project is the Lithgow-based exploration Company, Sitegoal Pty Limited. The Company was formed in 1994 to undertake mineral exploration and operations within NSW and currently holds a number of other metalliferous exploration leases in the State.

The Company Directors are J. McAuley, R. McAuley, D. Murray and M. O'Toole who report directly to Sitegoal's shareholders, the majority of whom are Lithgow-based.

1.4 APPROVALS REQUIRED

The proposed quarry development represents Designated Development and therefore necessitates the preparation of an Environmental Impact Statement (EIS) under Part 4 of the Environmental Planning and Assessment Act, 1994 (EP&A Act) to accompany the Development Application.

As approval is sought for a production level of up to 500,000tpa, the proposal is deemed to be a State Significant Development, exceeding the 200,000tpa extraction rate listed in the Schedule to the EP&A Act Declaration, dated 3 August 1999.

Integrated Approvals will be required from:

- EPA, concerning approvals under the Protection of the Environment Operations Act 1997 (POEO Act), for licensing of the crusher and for the discharge of water under extreme weather conditions; and
- RTA, concerning access onto the Great Western Highway and to temporarily close the Highway during blasting operations.

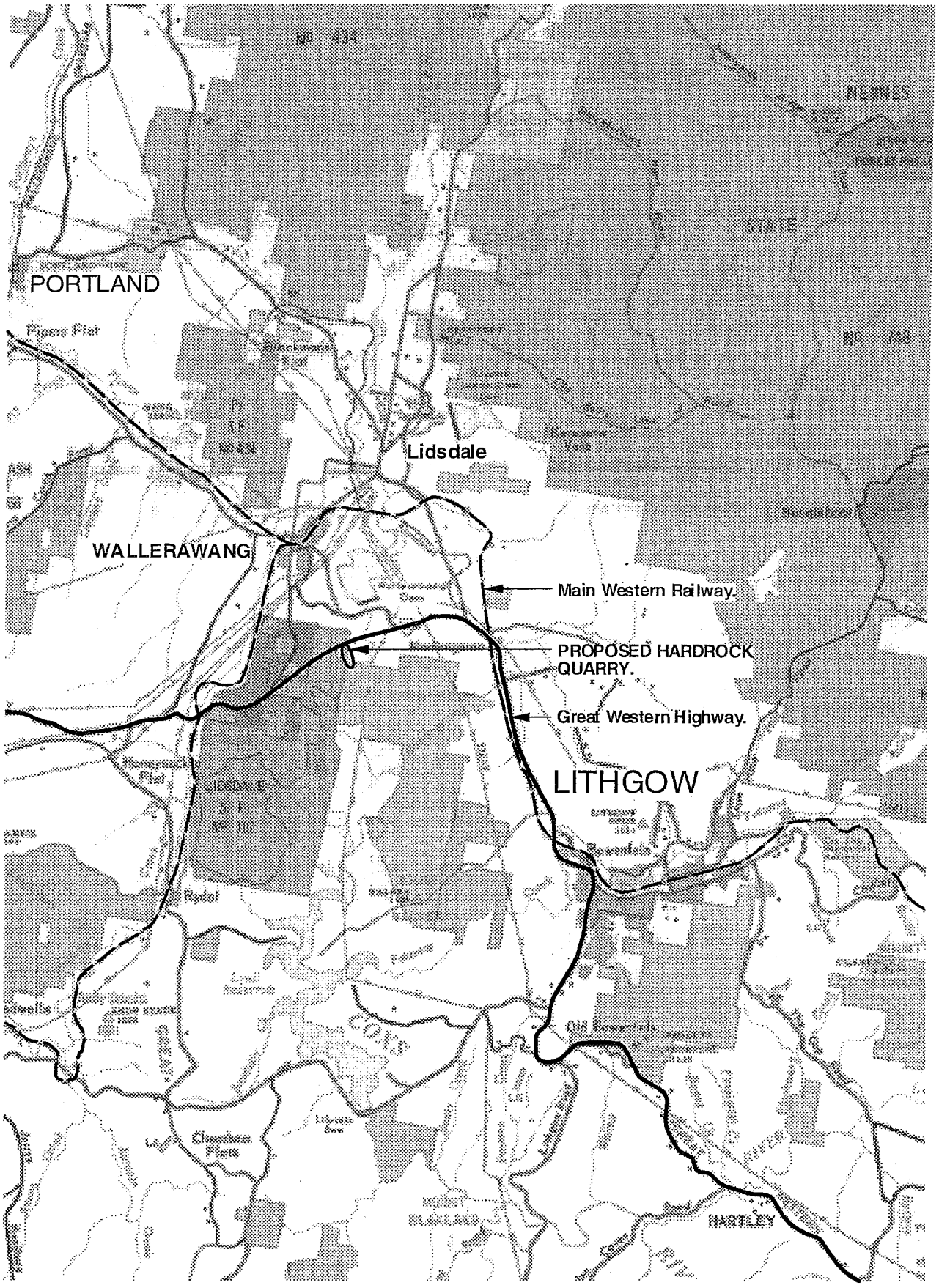


Figure 1.1.

LOCATION.

Base Map Source: CMA-Bathurst State Forests MSCF48

PROJ/DRAFT/WAL/FIG 1.1

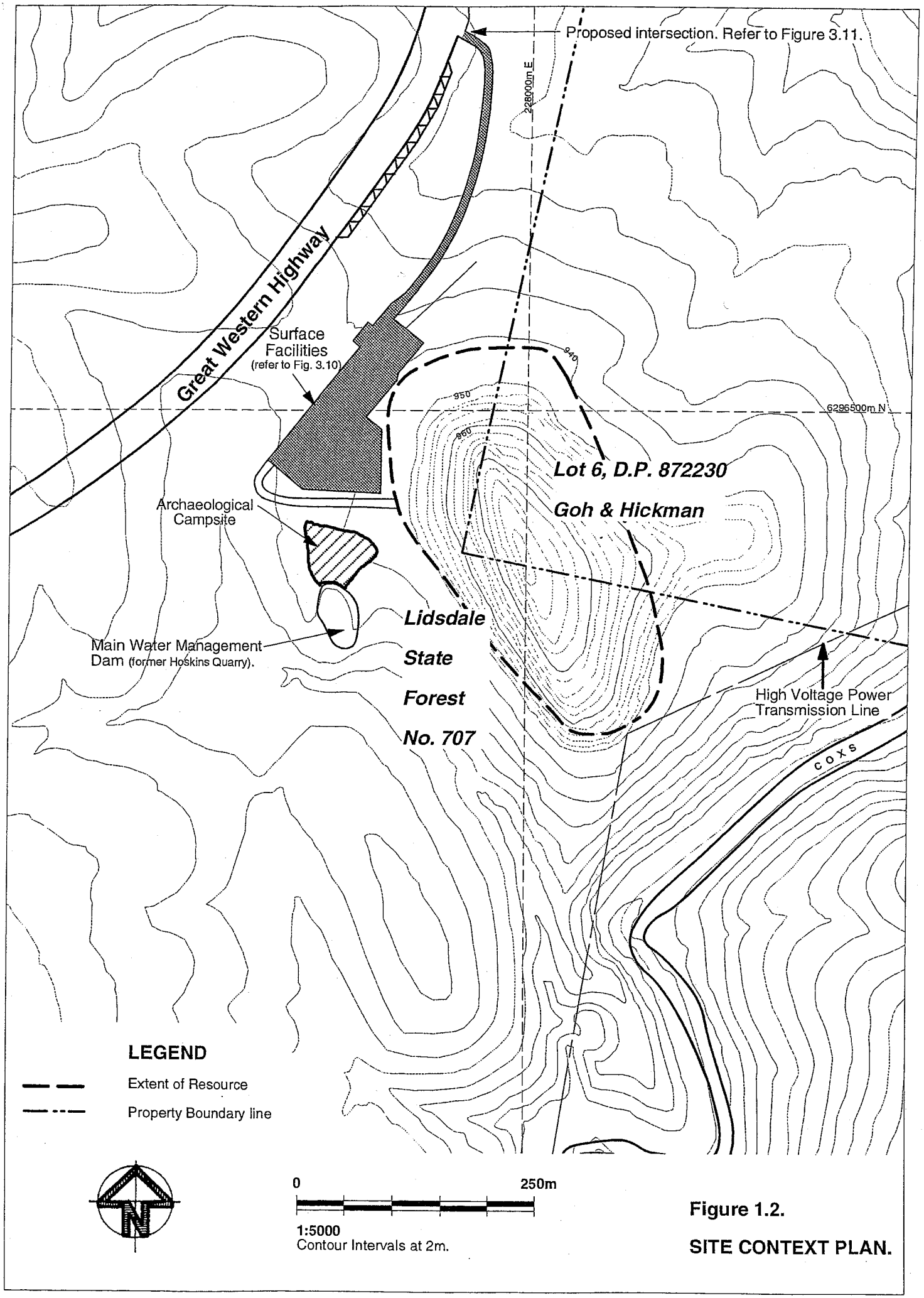


Figure 1.2.

SITE CONTEXT PLAN.

1.5 PROJECT OBJECTIVE AND BASIS OF IMPACT ASSESSMENT

The objective of this EIS is to support the Development Application under the EP&A Act, 1994 for the quarrying of hard rock over a 20 year period, and the progressive rehabilitation of the site.

Formal market agreements have not been established to date and while a production rate of 125,000tpa/150,000tpa is envisaged, impacts have been assessed for the upper production limit of 500,000tpa. The latter represents the level for which approval is sought. This level of production would be sustainable in the supply of construction materials for developments in the Wallerawang Industrial Park.

It is envisaged that the quarry would most likely be operated under contract, therefore a range of equipment and crusher options have been assessed for impact and included in the project description.

1.6 KEY ENVIRONMENTAL ISSUES

Key environmental issues relating to the project were identified from a number of sources including:

- feedback from Statutory Authorities following the Planning Focus Meeting held on 12 October 1999;
- the Director-General's specification (DUAP) for the EIS;
- discussions with the community, the Coxs River Catchment Management Committee;
- Lithgow Council's Environment Advisory Committee;
- and professional assessment by the study team.

Further issues that were raised at the community briefing held on the 6 October, 2001, are summarised in **Table A1.1** of **Appendix 1**. A copy of the DUAP specification is included in **Appendix 1**. Key issues are summarised in **Table 1.1**.

Table 1.1 – Key Environmental Issues

Issue	Reference in EIS
Consideration of relevant SEPP's and REP's	SEPP 33 – Section 5.16, Page 58 SEPP 44 - Section 5.5.3, Page 34 SEPP 58 - Section 5.6.1, Page 35
Water management, particularly regarding potential effects on the Coxs River	Section 4.1, Page 19
Dust generation and the potential for silicosis	Section 4.2, Page 21 Section 5.7.4, Page 39
Appropriate removal strategy for excess site vegetation	Section 4.5.2, Page 24
Noise generation	Section 4.3.2, Page 22 Section 5.8.4, Page 44
Blasting – overpressure and vibration	Section 4.3.2, Page 22 Section 5.9.4, Page 47
Visual Impacts of the proposal	Section 5.10, Page 48
Appropriate Fire Mitigation planning	Section 4.6, Page 26
Site Rehabilitation and Final Landform	Section 4.5, Page 24
Road transport - Access/Egress visibility	Section 4.7, Page 27 Section 5.14.2, Page 56
Assessment of potential threats to Flora and Fauna	Section 5.5, Page 32
Archaeological concerns	Section 5.4, Page 31

This document addresses the major environmental issues and provides a detailed description of how the environmental objectives will be achieved. Best practice management procedures will be adopted for the quarry operation, including the preparation of an Environmental Management Plan and the establishment of an Environmental Management System. An on-going environmental monitoring program will be maintained throughout the life of the quarry.

2. REGIONAL CONTEXT

2.1 REGIONAL GEOLOGY

The strata exposed within the vicinity of the proposed quarry are comprised of metamorphosed and silicified sandstones, siltstones and mudstones belonging to the Late Devonian Lambie Group. These rock units are located on the eastern limb of the Rydal Syncline. Bedding within these units strikes at between 150° and 180° (SSE to S) and dips between 35° and 60°.

The quartzite resource identified for quarrying occurs as a lens dipping steeply at between 35° and 60° (averaging 50°) towards the west. *Figure 2.1* shows the extent of potential resources identified from geological mapping, sampling and drilling within EL4473.

2.2 FUTURE DEMAND

A recent report issued by the Geological Survey of New South Wales (Pienmunne, 2000) presents the latest forecast for supply and demand of coarse aggregate within the Sydney planning region. The report found that, at present, a shortfall between consumption and production from local sources of about 2.5 Mtpa exists. The shortfall is currently being made up by importing material from sources outside the region, mainly from the Shellharbour/Kiama area. However, the report predicts that by 2010 the region will face a greatly increased shortfall as major suppliers in the planning region cease operation. Therefore, new development in the areas surrounding the Sydney planning region has the potential to supply a large proportion of the predicted shortfall after 2010.

2.3 MARKETS

State-wide there are only four quarries that supply silica rich material from either quartzite, quartz gravel or reef quartz deposits. These quarries are located at Marrangaroo (Metromix Pty Ltd), Bolivia (Tenterfield Silica Pty Ltd), Glenella at Cowra (Glenella Aggregates Pty Ltd) and Mulyah at Cowra (T.J. Byrant Pty Ltd).

Potential markets for the product, include developments within the proposed industrial park located adjacent to the Wallerawang Power Station. The market for fill, road base and aggregate for concrete during construction of developments will provide an estimated product requirement of 500,000tpa for at least two years.

It is intended to quarry both quartzite material and rock aggregate. The silica material located to date has an average silica concentration of approximately 92% and a maximum of 97%. For the

production of silicon, a feed source containing a silica content of 99.9% is required. The quarry product is likely to be thermally unstable at temperatures in excess of 1,000°C, at which silicon is smelted, and is therefore considered unsuitable for this use.

Lower purity silica markets such as flux in the steel industry, or those requiring a high strength aggregate such as concrete production, railway ballast and road base aggregate will be targeted. If higher-grade silica material were located in future exploration then markets for silicon metal, ferrosilicon and silicomanganese would also be targeted. Geographically, the marketing of product will focus on the Lithgow, Blue Mountains and Western Sydney regions, and to a lesser extend the Central West region.

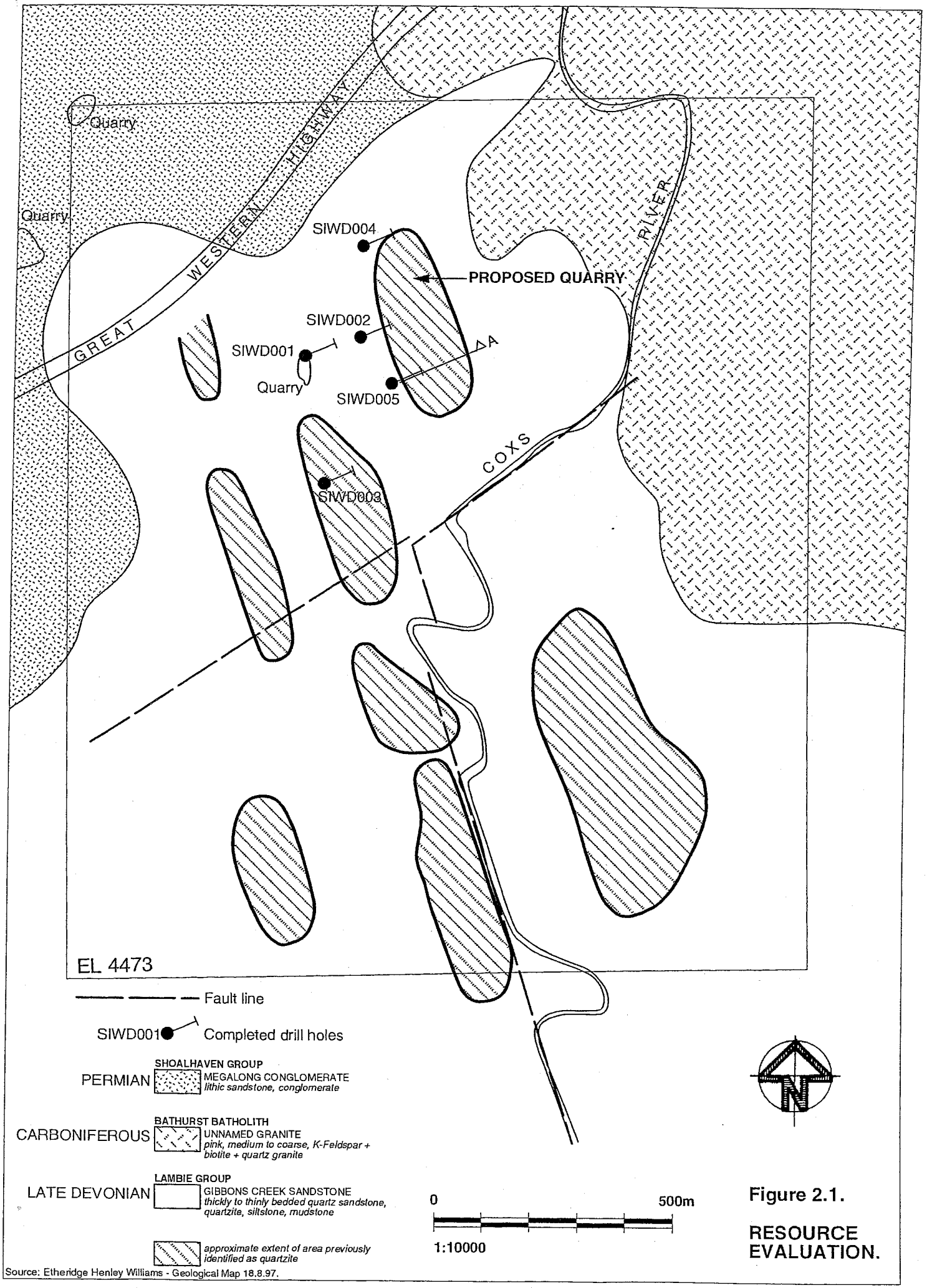
Other metamorphosed sedimentary rock material occurring as overburden to the quartzite material and elsewhere on the site will be marketed for a variety of rock aggregate uses, as well as for fill. The proposed industrial park development adjacent to the Wallerawang Power Station will require large quantities of suitable fill and because of its proximity to the quarry site, may represent one of the major markets.

2.4 ADJACENT RESOURCES

The *Marrangaroo Quartzite Quarry*, operated by Metromix, is located on Oakey Forest Road, Marangaroo approximately 3km SE of the proposed development. The Quarry produces high quality quartzite (SiO_2 96.6-98.1%). Of the current production of about 110,000tpa, approximately 15% is used by BHP in steel making, and the remainder is used as coarse aggregate, mainly in the Greater Lithgow and the Blue Mountains areas. The company has development consent for secured reserves of 6Mt, which can be processed at a maximum rate of 174,000tpa. At present extraction rates, the quarry has a life expectancy of about 30 years.

The *Hartley Quarry* is a recently developed hard rock quarry extracting rhyolite (a volcanic rock). It is located on a ridgeline off the Jenolan Caves Road, near Hartley and approximately 15km south east of the proposed development. The Quarry has inferred reserves of 200Mt of which 20Mt is within the development consent, which was granted to AUS10 Rhyolite in 1994. The planned extraction rate is about 300,000tpa increasing to 550,000tpa after about 5 years.

In May 2000, the proposed *Rydal Quarry*, located approximately 7km south west of the proposed development, was rejected in the Land and Environment Court following a hearing of third party appeals. The quarry proposal was refused as the Court found that many environmental issues were inadequately addressed in the Development Application. If approved, this quarry was to extract quartzite for construction purposes.



Source: Etheridge Henley Williams - Geological Map 18.8.97.

Figure 2.1.

RESOURCE EVALUATION.

3. PROPOSED DEVELOPMENT

3.1 RESERVES AND RATIONALE FOR DEVELOPMENT

Geological evaluation of the quartzite deposits within EL4473 was carried out by Anzeco Pty Ltd in 1993, Etheridge Henley Williams in 1996/97 and Red Hill Geoscience in July, 1999. A number of targets were identified and the location of these is shown in *Figure 2.1*. The most recent exploration concentrated on the proposed quarry site, with three bores drilled in the western side of the proposed quarry site at an angle of 50° to intersect the quartzite body. This evaluation has led to an estimated quartzite reserve of approximately 3.5Mt. The quarry plan, as described in **Section 3.2**, includes a total reserve (quartzite and overburden) until the end of Stage 3 of 4.4Mt. Based upon a 20 year approval period, approximately 3.9Mt of quartzite and overburden material would be extracted.

Typical geological profiles are shown in *Figures 3.1* and *3.2*. An extrapolated cross section of the resource is illustrated in *Figure 3.3*.

The product is valued at a premium on soft rock quarry product and is in a location close to a major transport arterial. Therefore, this development is likely to contribute significantly to the supply of coarse aggregate both locally, and in the greater Sydney Planning Region (as discussed in **Section 2.2**).

3.2 QUARRY PLANNING

Quarry planning, including equipment selection, and drill and blast investigation was undertaken by Colmine Consulting's Principal Mining Engineer.

Constraints influencing quarry design and the associated management safeguards are listed in **Table 3.1**.

Table 3.1 – Quarry Planning Constraints and Management Safeguards

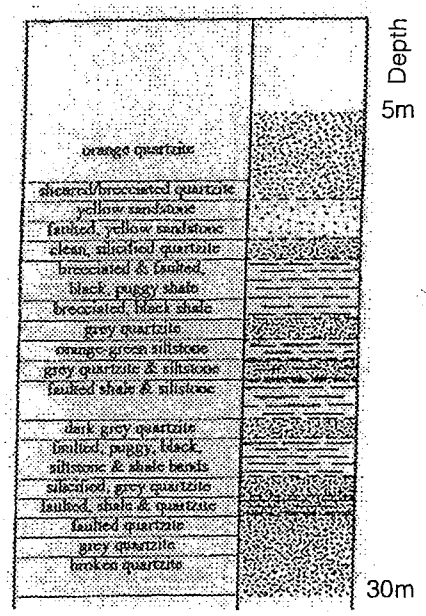
Constraints	Safeguards
1. Proximity to the Coxs River and the need to prevent loose rock entering the River.	The initial trench construction will leave a 3m to 6m high rim along the southern and eastern sides, closest to the Coxs River. This will prevent loose rock during the early stages of development entering the Coxs River. All quarry development will be down dip at a 50° angle, sloping away from the Coxs River. Blasts will be designed to prevent shattering along the outside bund.
2. Avoiding the generation of flyrock from blasting, in consideration of the quarry's proximity to the Great Western Highway and the high voltage power lines.	Flyrock generation will be minimised by the blast design, involving selection of a small drill size diameter and minimising the amount of explosives per hole. The Highway will be closed for a short period of time during blasting if blasting is within 500m of the Highway.
3. The need to minimise noise generation due to residences being in proximity to the quarry (approximately 650m) and future residences being potentially closer (up to 500m).	A highwall will be maintained at all times at the northern end of the quarry to reduce noise levels received north of the Great Western Highway while equipment is working in the northern part of the quarry. Access into the quarry is to be along the north-western side, and not facing Wallerawang.
4. Minimising vibration from blasting because of the closeness of the high voltage powerline pylon to the quarry (50m).	A minimum setback of 50m from the pylon will be maintained. Blasting will commence in the northern section of the quarry initially, furthest from the pylon to enable feedback from early blasts to be incorporated in the blast design as the quarry progresses towards the pylon. Vibration levels at the lower base will not exceed 25mm/s.

The quarry has been planned to be excavated parallel to the dip of the plunging strata (about 50°) along the eastern face and excavated perpendicular to the strata dip on the western face. At all times the quarry will be surrounded by retained existing vegetation.

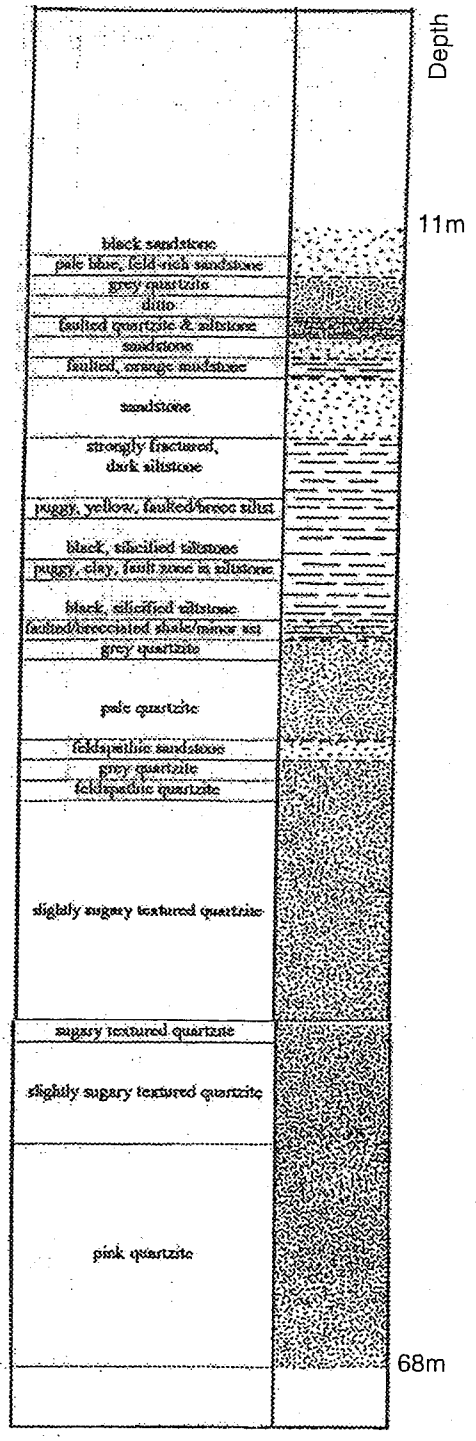
The proposed quarry will be developed within a knoll, located to the east of the former Hoskin's Quarry, as shown in *Figure 1.2*. The proposed area to be quarried is approximately 8ha to 9ha and will be developed in three stages. The knoll has a reserve of approximately 1Mt of quartzite and overburden, which will be extracted during Stage 1 of the development. Stage 2 contains a further 2Mt of quartzite and overburden, and extraction during Stage 3 will result in the extraction of a further 750,000 tonnes, coinciding with the 20 year time frame of the approval.

Approximately 40,000m^3 of overburden material will be excavated during Stage 1, and a further 100,000m^3 during Stage 2. Stage 3 works will not require the removal of additional overburden. Overburden material will be stockpiled in a designated area of the surface facilities area for either sale or for later use in the rehabilitation of the quarry.

Depending upon markets, it is envisaged that quarrying may be undertaken at an initial rate of 500,000tpa dependent on the level of construction activity at the Wallerawang Industrial Park



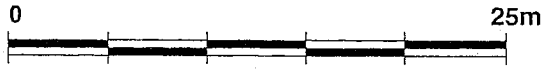
Borehole Log SIWD001



Borehole Log SIWD002

Note: Both holes drilled at 50° to the horizontal.

Location of boreholes shown on Figure 2.1.

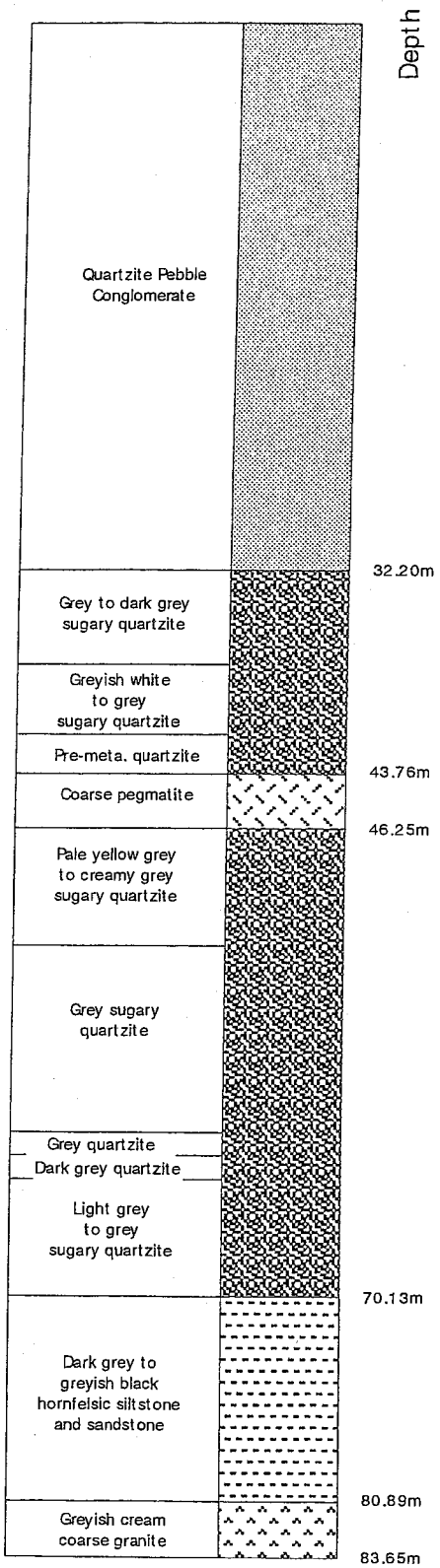


1:380

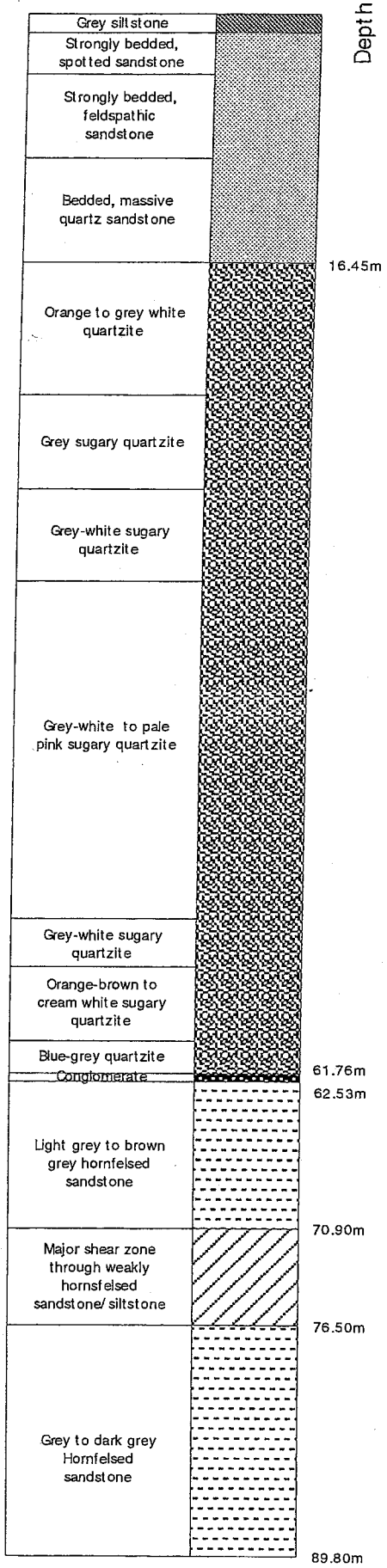
Figure 3.1

BOREHOLE LOGS 001 & 002.

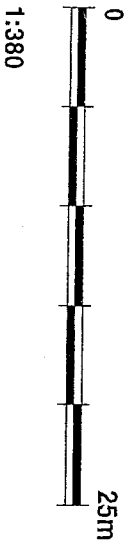
Source: C. Spandler, Etheridge Henly Williams.



Borehole Log SIWD004



Borehole Log SIWD005



Note: Both holes drilled at 50° to the horizontal.

Location of boreholes shown on Figure 2.1.

Source: C. Spandler, Etheridge Henly Williams.

Figure 3.2

BOREHOLE LOGS 004 & 005.

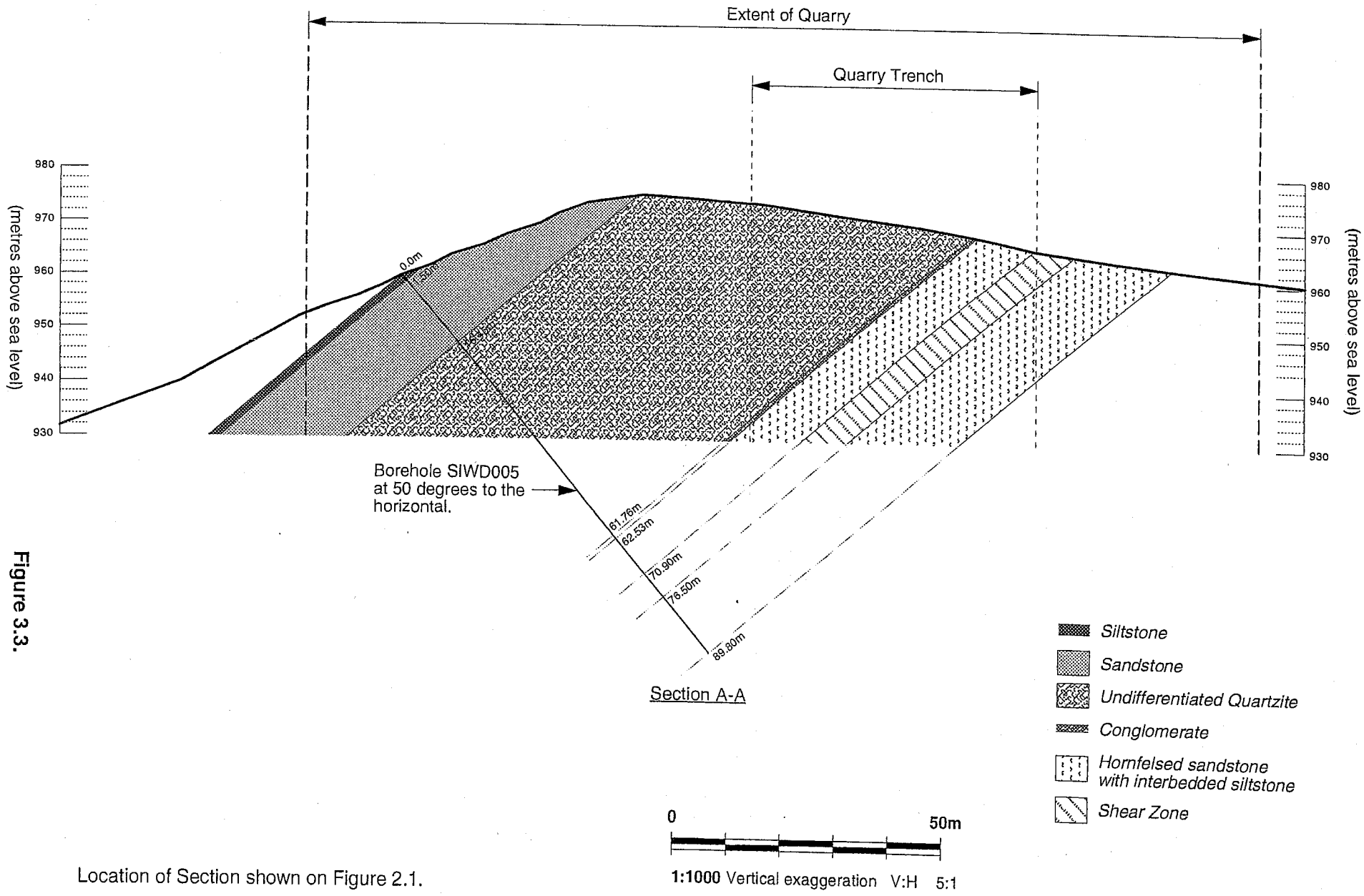


Figure 3.3.

GEOLOGICAL CROSS SECTION.

Location of Section shown on Figure 2.1.

and thereafter it may reduce to a lower rate of approximately 125,000tpa/150,000tpa. The quarry production rate within this range will be determined by market forces.

Stage 1

Extraction will commence in the area of the existing quartzite outcrop. An initial trench will be developed approximately 350m long, 50m wide and up to 18m deep, oriented SSE along the strike of the quartzite and as shown in *Figure 3.4*.

An access road will be constructed perpendicular to the trench, oriented WSW, to minimise noise emissions towards Wallerawang. Development of the trench and access will be undertaken using drilling and blasting techniques and is expected to take approximately 12 to 14 months, depending upon the extraction rate. Approximately 500,000t of material will be removed from the trench resulting in a disturbed area of approximately 3ha.

The remainder of Stage 1 works will involve widening of the trench, using drilling and blasting, east to the edge of the outcrop and west to the roof of the underlying strata, as shown in *Figure 3.5*. This will leave an almost flat floor, dipping approximately 4% to the north, and is expected to result in a quarry life of approximately two years for Stage 1. A further 500,000t of quartzite and overburden will be quarried during this period.

The quarry perimeter will be established within a 50m setback from the power transmission line pylon located at the south western corner of the quarry. Blasting during Stage 1 will leave 3m high rims around the perimeter of the quarry and these will be retained until removed as part of the second bench. These rims will provide an effective means of retaining run-off water within the cut and preventing loose material rolling down external slopes.

Walls of between 6m and 8m will be left at the southern and northern extremities of the cut, as shown in Section 2 of *Figure 3.9*. The highwall at the northern end will result in the reduction of noise emissions to Wallerawang when machinery is working in the northern part of the quarry. Highwalls will be retained at the northern and southern ends for the duration of quarrying.

Stage 2

Stage 2 will consist of a similar approach to that undertaken during Stage 1. A trench will be developed to a depth of 10m below the Stage 1 floor along a SSE orientation, as shown in *Figure 3.6* and Section 1 of *Figure 3.9*. The trench will commence at the 940m contour in the north and extend to the 950m contour in the south, with an estimated total of 700,000t of material removed from the trench area.

The trench will then be widened progressively towards the western boundary, as shown in *Figure 3.7* and Section 1 of *Figure 3.9,* winning a further 1.3Mt of quartzite and overburden. At an extraction rate of 125,000tpa/150,000tpa, it is expected that Stage 2 would take approximately 13 years to complete.

As with Stage 1, all work will be undertaken within the quarry using the highwalls to reduce noise emissions to residential areas. Quarrying in this manner will also allow overburden removal to be undertaken on an "as sold" basis.

As for Stage 1, the 50m setback from the power transmission line pylon and the highwalls along the northern, eastern and southern quarry faces will be retained.

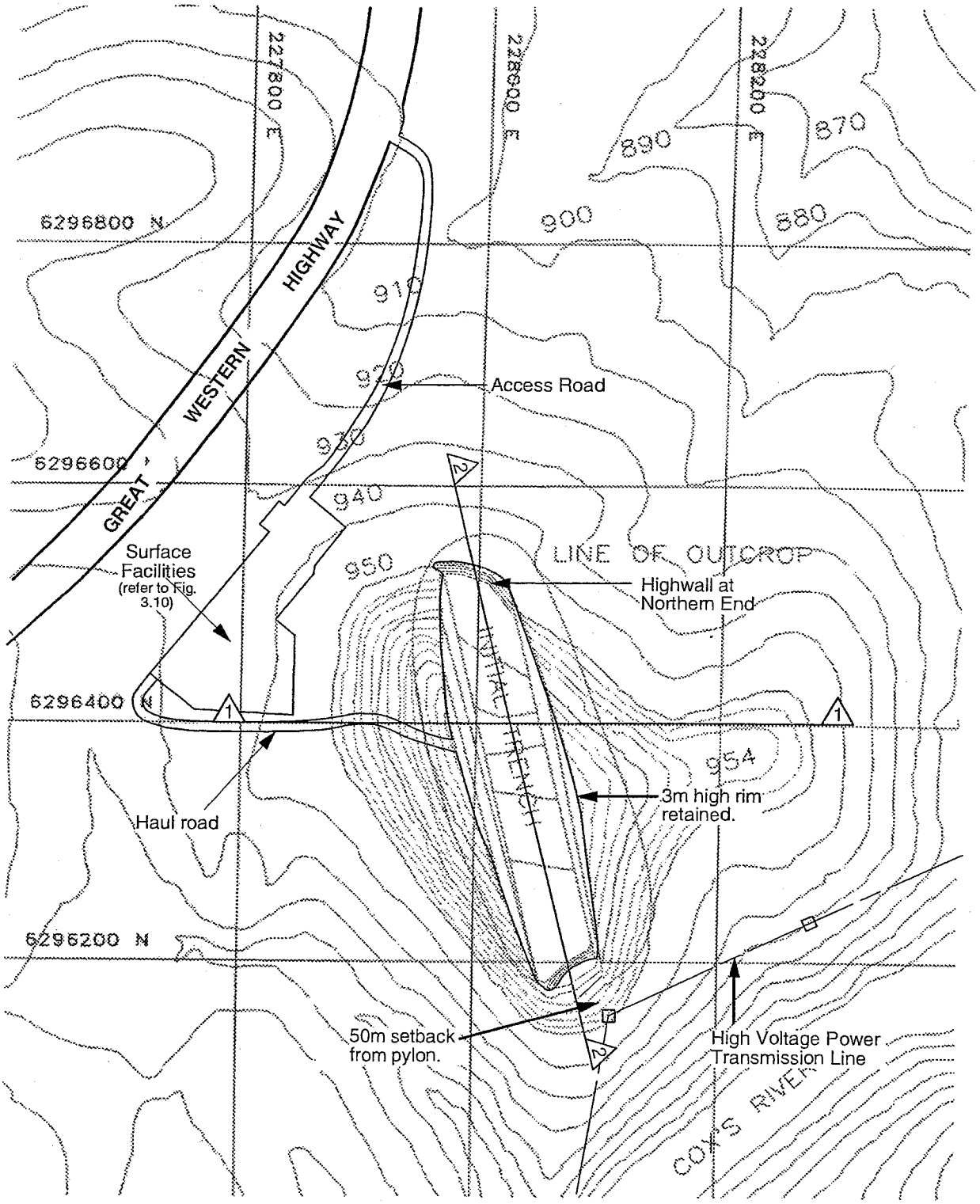
Stage 3

Stage 3 of the operation will involve lowering the Stage 2 floor by a further 10m in depth, as shown in *Figure 3.8* and Section 1 of *Figure 3.9.* There will be no further disturbance of land beyond that cleared for Stage 2 and all drilling and extraction will be contained within the quarry.

There are reserves of approximately 1.4Mt of quartzite within Stage 3. At the end of the 20 year approval period and at the nominal extraction rate of 125,000/150,000tpa, approximately 500,000t of quartzite material would remain within the Stage 3 area.

3.3 MINING EQUIPMENT

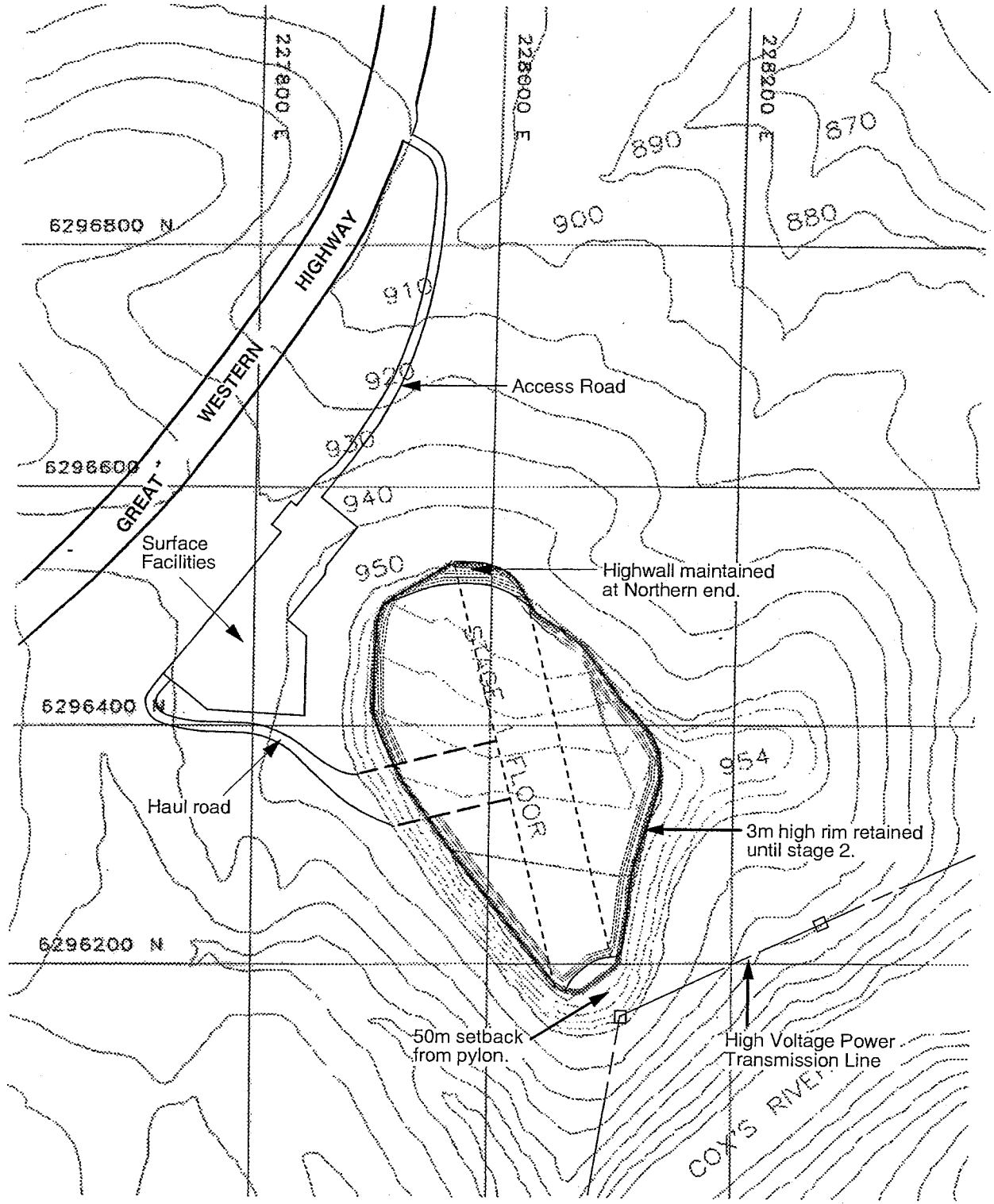
As production is likely to fluctuate between 125,000tpa and 500,000tpa, and the quarry is likely to be operated by a contractor, a range of equipment has been selected with impact assessment being undertaken for the maximum production level and on those items with the highest noise outputs. The range of proposed mobile equipment for excavation and processing is shown in **Table 3.2.**



Sections shown on Figure 3.9.

Figure 3.4.

QUARRY DEVELOPMENT STAGE 1 TRENCH.



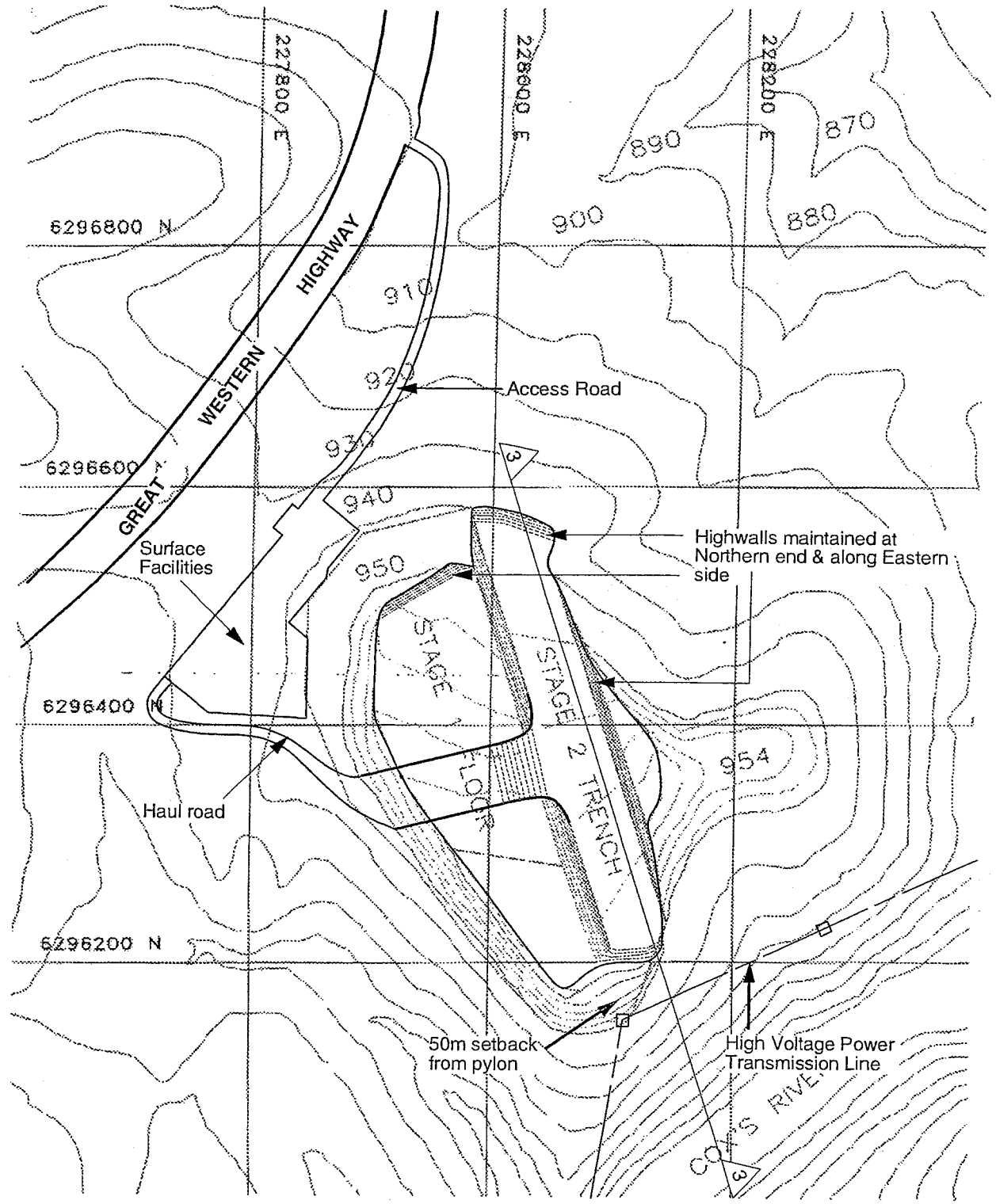
N

0 250m

1:5000

Figure 3.5.

QUARRY DEVELOPMENT STAGE 1 FLOOR.



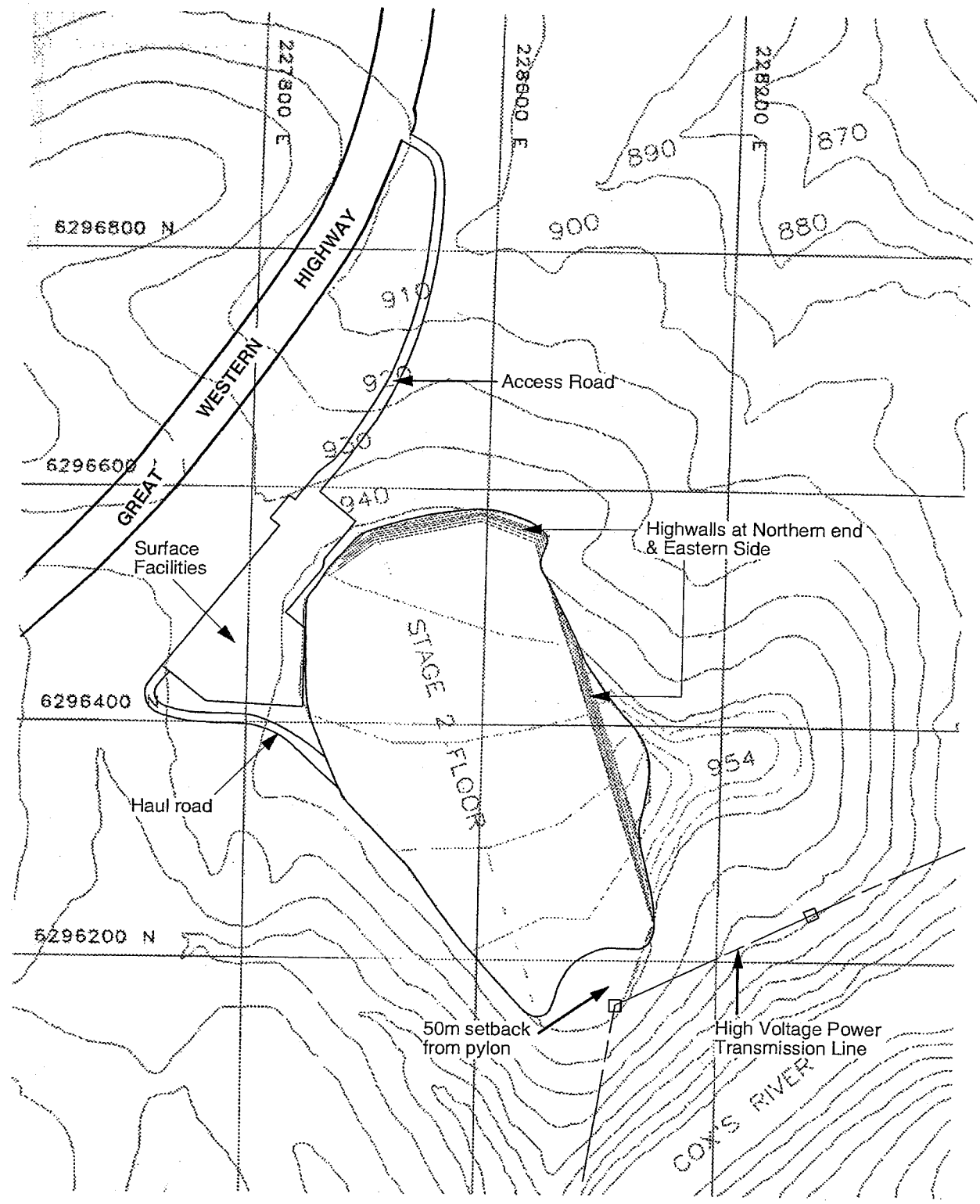
0 250m

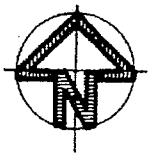
1:5000

Section shown on Fig. 3.9

Figure 3.6.

QUARRY DEVELOPMENT STAGE 2 TRENCH.



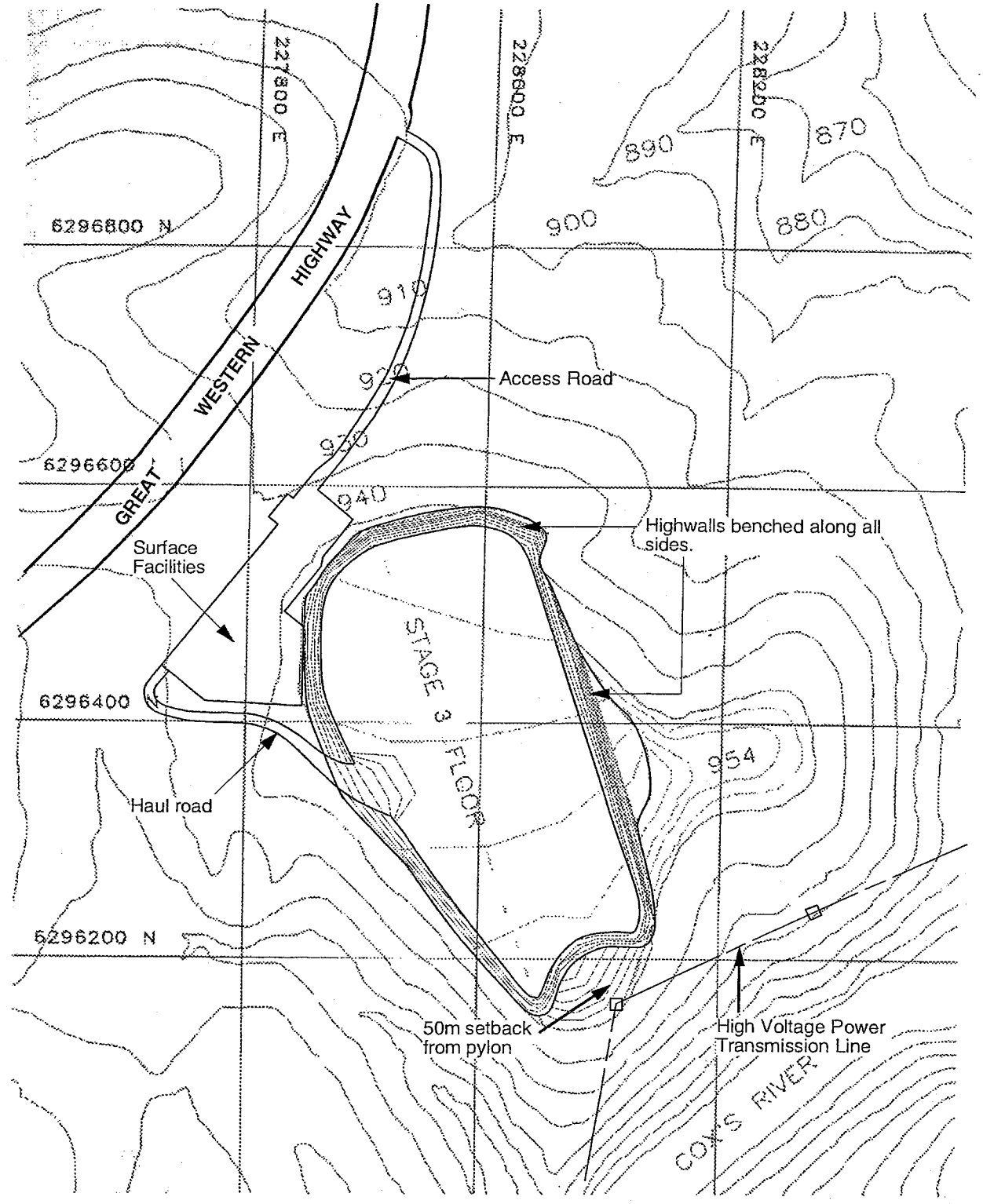


0 250m

1:5000

Figure 3.7.

QUARRY DEVELOPMENT STAGE 2 FLOOR.

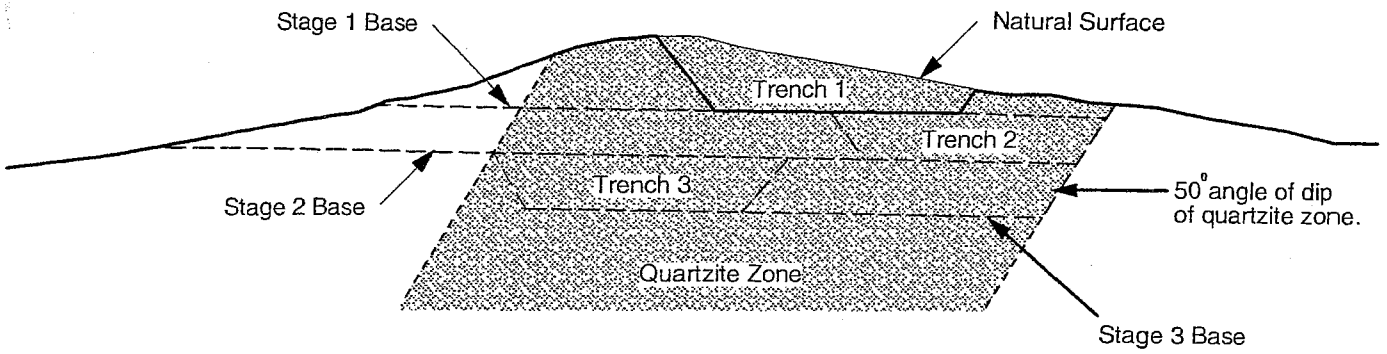


0 250m

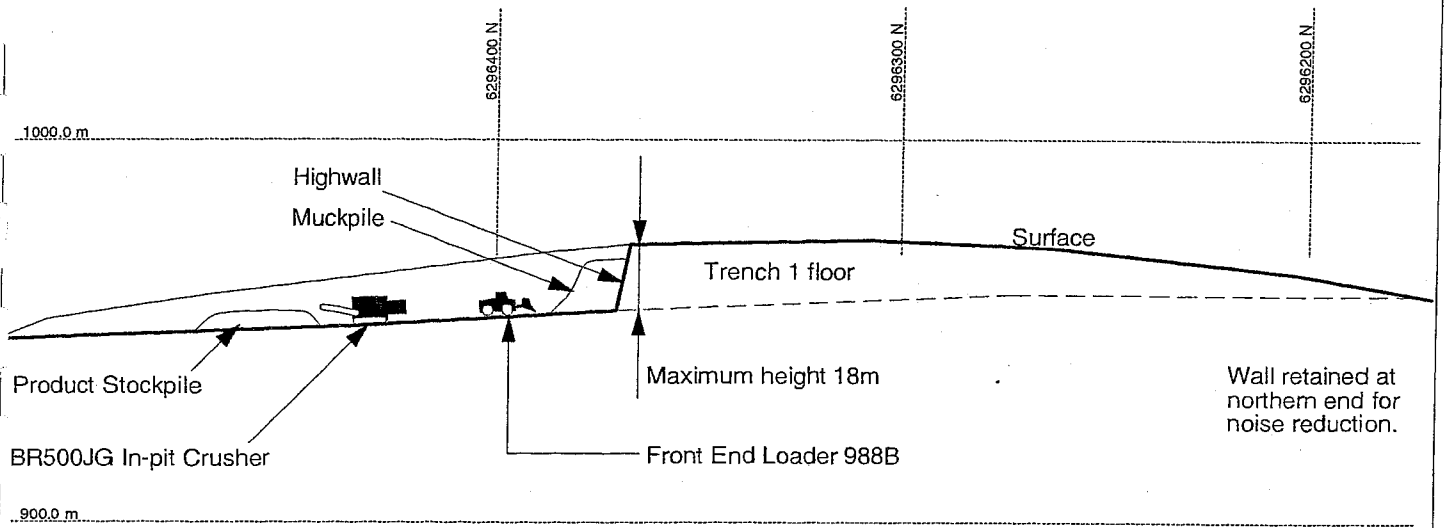
1:5000

Figure 3.8.

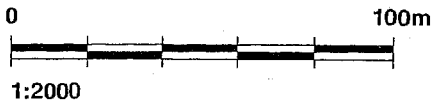
QUARRY DEVELOPMENT STAGE 3 FLOOR.

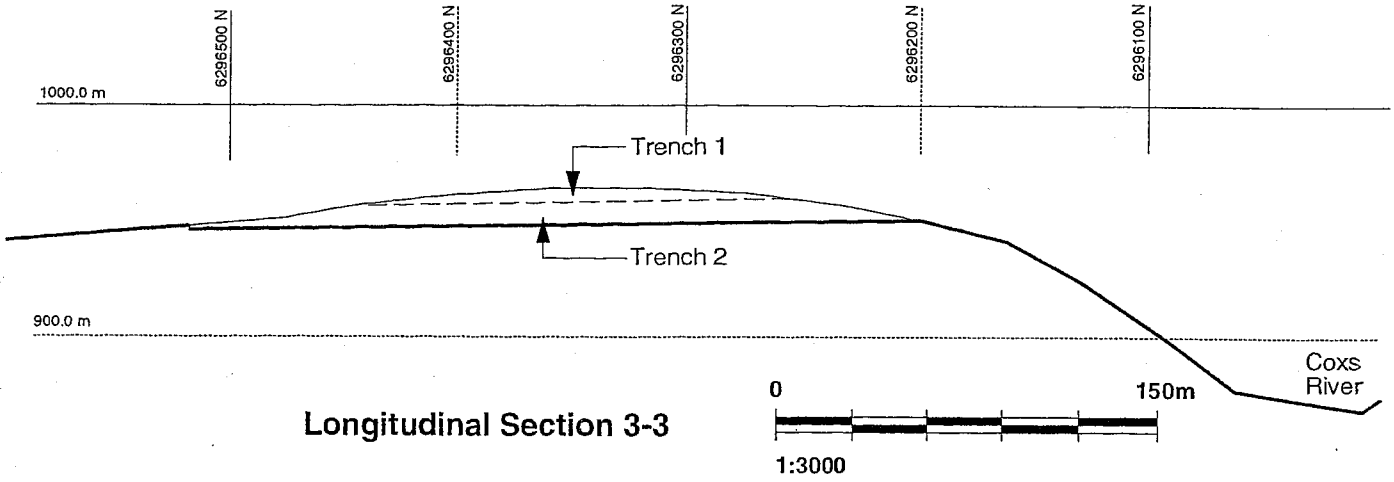


East - West Cross Section 1-1
(Not to scale)



Longitudinal Section 2-2





Longitudinal Section 3-3

Location of Sections shown on Figures 3.4 & 3.6.

Figure 3.9.

CROSS SECTIONS.

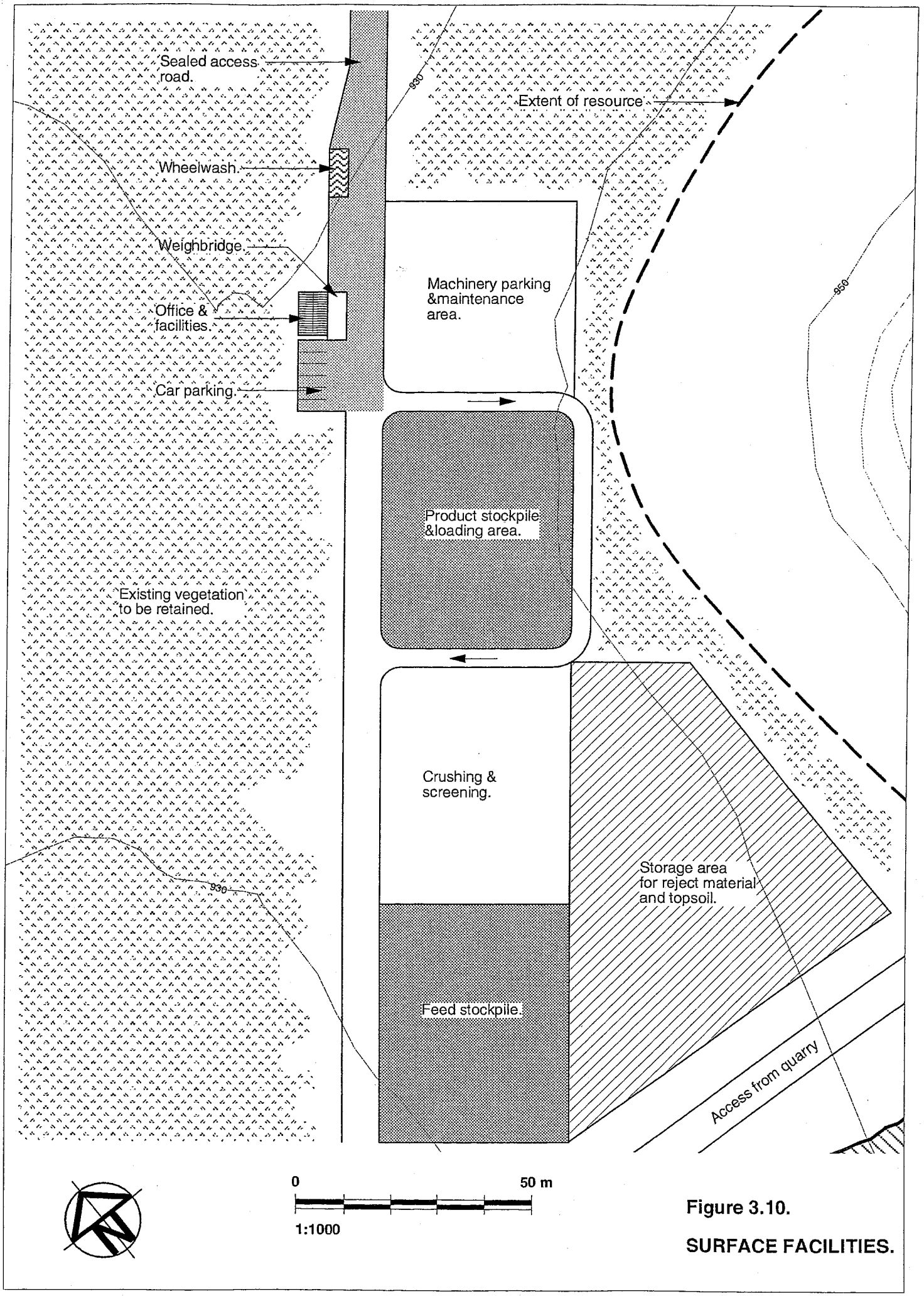


Figure 3.10.

SURFACE FACILITIES.

Table 3.2: Proposed Equipment

Type	Typical Specification
Loading Device: (1 only)	
Front end loader	*Eg* Caterpiller 966
or	
Traxcavator	*Eg* Caterpiller 973
or	
Excavator with backhoe	*Eg* Komatsu PC650
or	
Excavator with shovel	*Eg* Hitachi EX 1100
Trucks	
3 x Highway trucks	Eight wheeler, 20T payload
or	
2 x off highway trucks	*Eg* Euclid R35 or Cat 769
Support Equipment	
1 x Grader (one day/week)	*Eg* Cat 14G
1 x Bulldozer (one day/week)	*Eg* Cat D8N
1 x water cart	*Eg* 5,000L capacity
1 x service truck (as required, or combined with water cart)	*Eg* 2,000L capacity
1 x Excavator fitted with a rock breaker (one day/week)	

3.4 DRILL AND BLAST DESIGN

As result of the hardness of the quartzite material it will be necessary to drill and blast all material during the life of the quarry. A small drill hole diameter (89mm) has been selected in order to reduce the level of overpressure and vibration resulting from blasting. An 'Ingersoll Rand LM600' top hammer drill or similar sized machine would be used. The drill hole pattern area for the average bench height of 10m and a powder factor of 0.85 is 5.1m^2.

At a production level of 500,000tpa, approximately 180 days of drilling would be required, representing 75% of the total working time. In this case the Contractor would either drill in campaigns or drill continuously but based upon shorter working days. At a production level of 125,000tpa/150,000tpa, approximately 45 days of drilling would be required, representing 20% of the total working time. Drilling in this situation would be undertaken in campaigns.

ANFO explosives will be used initially but, dependent upon jointing and the extent of secondary breakage, high-energy, high-density, slurry-type explosives will also be trialed. This may lead to a reduction in drilling requirements by approximately 20%. At a production level of 500,000tpa, blasting will be necessary about once every two weeks, while at a production level of 125,000tpa/150,000tpa, blasting would occur at a frequency of approximately once every two months. Each blast would produce about 19,000t of fractured material.

Following the initial blasts, an assessment will be undertaken to determine whether it is feasible to double the blast size, thereby halving the frequency of blasting. Bulk ANFO explosive will be delivered to site for each blast. Detonators and initiating systems may be stored on-site in which case they would be housed in storage magazines that comply with safety regulations under the Dangerous Goods Act 1975.

The 'Nonel' initiation system with individual in-hole delays will be used. The delays allow each hole to be initiated individually thereby limiting the levels of overpressure and vibration. Breakage of oversize material will be conducted by an excavator fitted with a rock breaker rather than by secondary blasting. It is anticipated that the rock breaker may be used on average one day per week.

Stemming material will be graded, 6 to 10mm in size and will be imported initially until on-site material is available. Close attention will be paid to ensure that the correct type and depth of stemming material is used in order to minimise overpressure.

Blasts will be delayed during adverse weather conditions and during winter, when temperature inversions are more frequent. If necessary, blasts will be detonated during afternoons. When blasting is required within 500m of the Great Western Highway, it will be necessary to close the Highway for short periods of time for safety reasons, in accordance with DMR requirements. The quarry will be set back a minimum of 50m from the power pylon located nearest to the quarry at the south eastern corner. Blasts will be designed to ensure that vibration levels do not exceed 25mm/s at the base of the quarry, as required by Transgrid, the Asset Managers.

3.5 CRUSHING AND STOCKPILING

3.5.1 Crushing

The choice of whether a mobile crusher, located in-pit, or a fixed crusher located within the surface facilities area, as shown in *Figure 3.10*, will be dependent upon the Contractor and market requirements. The selection of the appropriate option will be determined by the nominal final product size required by the market. To ensure that all options are available to the Contractor, several alternatives have been considered. Both crushing scenarios have been modelled for noise impacts.

In-Pit Crushing Option

A mobile, track-mounted crusher, *eg*, a Komatsu BR350 or BR500 can accept a feed size of 1050x750mm and produce a -70mm final product. If the reduction of final product to a top size of 20mm or grading requirements were necessary it would necessitate the use of a secondary

crusher. This crusher would accept the nominal 70mm feed size produced by the primary in-pit crusher and allow for the production of final product in the range of 20mm to 50mm.

Fixed Surface Facility Crusher Option

If market requirements demand a consistently smaller final product size (~20mm) it may be necessary to install a larger, fixed crusher at the surface facilities site. This crushing plant can produce a range of final product (70mm to 5mm) with minimal limits on the size of feed material.

Both mobile and fixed crushers are fitted with dust control sprays with water being supplied from on-board water tanks. It is envisaged that it will be necessary to add an inert, biodegradable surfactant (*eg* "Shell Teepol" household detergent) to the water to ensure effective control of quartzite dust.

3.5.2 Stockpiling

Depending upon the crusher option required, stockpiles will be located either within the quarry (for the mobile crusher option) or at the surface facilities. In either case, it is likely that overburden would be stored at the surface facilities.

If the mobile crusher option is selected, stockpiles may be located either within the quarry or at the surface facilities site. The stockpiling program will be dependent upon both final product requirements and the availability of stockpile surface area within the quarry. In some cases, it is likely that the loading of haulage trucks will occur directly from the mobile crusher.

For the fixed crusher option, there would be two stockpiles, one containing raw quarried quartzite as feed for the crushing plant and the other containing crushed and sized product material. It is proposed that both stockpiles at the surface facilities for the fixed crusher option would contain approximately 10,000 tonnes of material. This amount can be accommodated within a stockpile approximately 40m long, 35m wide and 4m high, trapezoidal in cross-section. The proposed stockpile locations are shown on *Figure 3.10.* In addition to the production stockpiles, reject quarried material will also be stockpiled. Rejects, including unsold overburden material and fine rejects from the screening process will be stockpiled for later use in rehabilitation works.

Stockpiles will be maintained in a damp condition during dry and windy weather using a cannon fitted to the water tanker to minimise dust emissions. As silica dust is difficult to wet, an inert, biodegradable surfactant will be added to the water cart and used in all dust suppression activities.

3.6 SITE DEVELOPMENT

Initial development will focus on the construction of the of the access road, the intersection with the Great Western Highway, the surface facilities and the interim haul road that will provide access to the initial trench. Management safeguards concerning vegetation and topsoil management are described in **Section 4.5**.

3.7 HOURS OF OPERATION, DURATION AND WORKFORCE

It is proposed to operate the quarry between the hours of 7.00am and 5.00pm, generally Monday to Friday, however weekend work may be necessary to meet short-term peak demands. Saturday operations may include maintenance and product loading. Haulage operations will depend on market demand, and it will be necessary to dispatch trucks in the early hours of the morning to satisfy the requirements of the Sydney construction market.

The duration of quarrying will be for the initial approval period of 20 years. However, further reserves, additional to those identified during exploration to date, are likely to be determined as the quarry is developed. These reserves may provide the basis for a future Development Application to extend the life of the quarry.

The number of employees working at the site will vary between two and four, depending upon production levels. There will be additional subcontractors employed including truck drivers, a dozer/grader driver and an operator for the excavator with hammer.

3.8 TRANSPORT

BJ Bradley and Associates undertook a detailed transport study at the site; a copy of the discipline report is included as **Appendix 2**.

Transport of product material will be undertaken by subcontractors using a variety of vehicles including single trucks, truck and dog combinations and articulated vehicles with a maximum capacity of 25t. In order to respond to market requirements, the demand for gravel at a project site at the start of the working day, it will be necessary to transport a proportion of the product outside of quarry operating hours. It is envisaged that a proportion of trucks will leave the site in the early hours of the morning. The noise impacts of these truck movements have also been considered.

Trucks will be loaded from the product stockpiles by a loader and travel via an on-site haulage road to the weighbridge and wheel wash. The access road will be sealed from the wheel wash

to the intersection with the Highway. All trucks loaded with extractive materials, which are likely to generate wind blown dust, will be covered.

Site access and egress will be via a new sealed quarry road, approximately 350m in length, from the proposed surface facilities area to its intersection with the Great Western Highway. A new seagull junction based upon RTA design requirements will be constructed at the intersection. The new junction will be located approximately 500m west of the Barton Avenue intersection and will require the construction of:

- a deceleration lane to provide for eastbound vehicles to turn right into the quarry;
- an acceleration lane located along the existing depressed median to enable laden eastbound trucks to accelerate prior to entering the fast lane on the Great Western Highway; and
- a deceleration lane to provide for westbound vehicles to slow and enter the quarry.

The layout of the proposed intersection is shown in *Figure 3.11.*

At a production rate of 500,000tpa, an average of approximately 80 truck loads (25t capacity) will leave the site per day, resulting in 160 heavy vehicle movements per day. This may occur over the first two years while supplying the needs of construction at the Wallerawang Industrial Park. Once demand from these projects eases, vehicle movements may decrease to about 20 loads or 40 heavy vehicle movements per day, although this will depend upon market demand.

3.9 ENERGY USAGE

The quarry will be a net user of energy, using diesel fuel for all mobile equipment and processing plant. Electric power will be supplied to the site for amenities and office facilities. This will require an extension from the existing service line located along the Great Western Highway.

Equipment will be selected to ensure maximum energy efficiency and in order to minimise greenhouse gas emissions. This will apply particularly to pumps, conveyors, electric motors, lighting units, and mobile equipment.

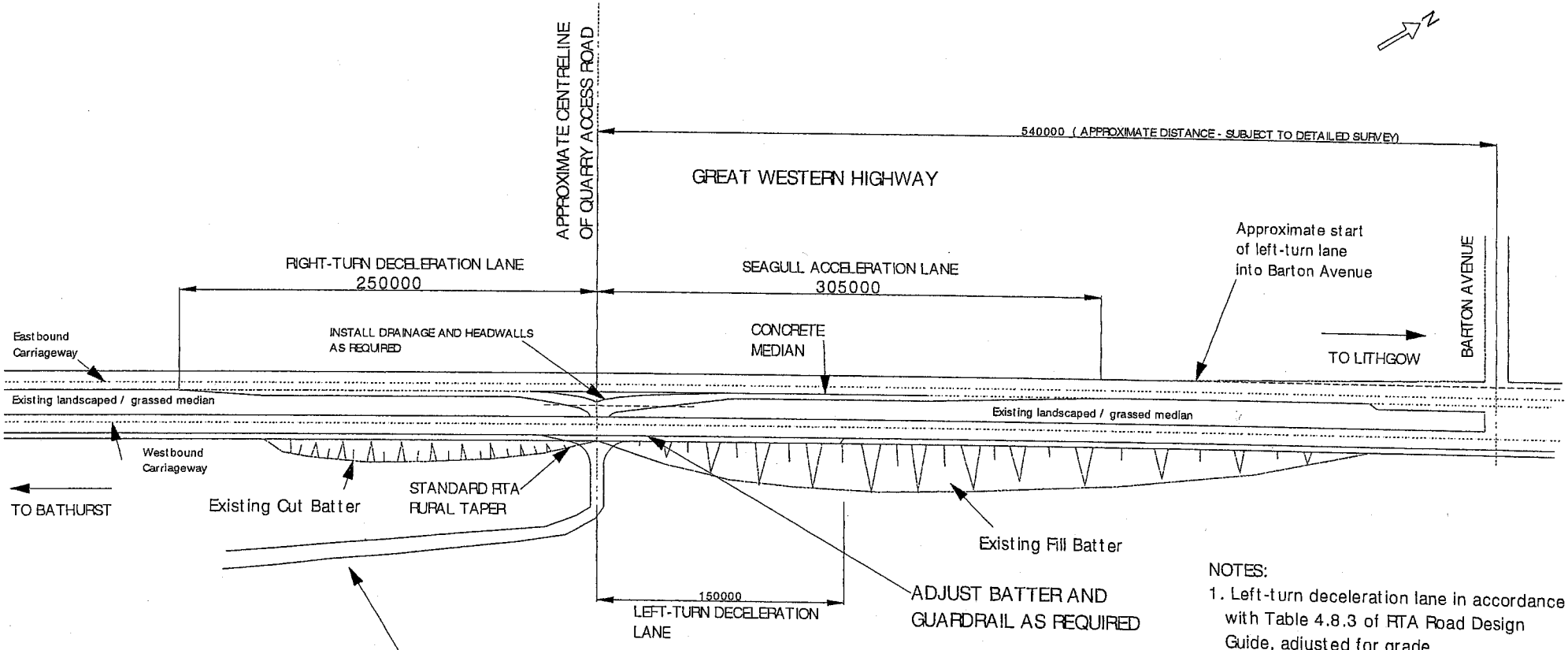
3.10 COMMUNITY AND STATUTORY CONSULTATION

This proposal is considered a State Significant Development, and as such the DUAP guidelines require that a Planning Focus Meeting be held. This meeting was undertaken on 12 October 1999 and was attended by representatives of all vested Government Departments and Statutory Agencies. The outcomes of the meeting were taken into account during the development of this EIS.

To date, the following consultation initiatives have been undertaken on behalf of the proponent:

- September 1999 — Created database of nearby landowners potentially affected by the proposed quarry development. The database list was supplied by Lithgow Council and is used to record details of all communications with landowners and as a mailing list for information sharing.
- 12 October 1999 — Planning Focus Meeting (PFM) held on site.
- 12 November 1999 — As a result of PFM, received guidance documentation from DUAP regarding specific issues to be addressed during the EIS process. Document also included submissions from EPA and Council of the City of Lithgow.
- 17 December 1999 — Consultation held with the Bathurst Local Aboriginal Land Council. During a subsequent site visit an aboriginal campsite was identified in a location initially chosen for placement of the topsoil stockpile. A series of recommendations were put forward to ensure that the archaeological site would not be impacted.
- August 2000 — Disseminated first Community Information Sheet regarding the proposal to all residents recorded in the database, including Wallerawang Primary School.
- 30 August 2000 — Presentation of proposal outline to Coxs River Catchment Management Committee.
- 1 September 2000 — Conducted house visits to nearby residents recorded in the database to describe the proposal and discuss concerns. Contact information was provided for all residents not available on the day. Subsequently, responses or comments have been received from most nearby landowners.
- 11 October 2000 — Presentation of proposal outline to Environmental Advisory Committee - Council of the City of Lithgow.
- 20 September 2001 — Disseminated second Community Information Sheet, that also contained details of the proposed community briefing.
- 6 October 2001 — Community briefing held Saturday morning, 10.30am to 1.00pm. Approximately 40 to 50 persons were in attendance. Details of the questions and responses are provided in **Table A1.1**, of **Appendix 1**.

Continued consultation with Government Departments and Statutory Authorities (as per **Section 1.4**) is also being conducted by way of correspondence. A copy of all correspondence is provided in **Appendix 1**.



NOTES:

1. Left-turn deceleration lane in accordance with Table 4.8.3 of RTA Road Design Guide, adjusted for grade.
2. Right-turn deceleration lane in accordance with Table 4.8.3 of RTA Road Design Guide adjusted for grade.
3. Right-turn acceleration lane in accordance with Table 4.8.5 of RTA Road Design Guide adjusted for grade.
4. Median to be provided to restrict early entry from seagull acceleration lane.
5. Design subject to detailed survey.

Figure 3.11

PROPOSED ACCESS TO QUARRY

0 50 100 150 200 250 300

ALL DIMENSIONS IN MILLIMETRES

Drawn By:

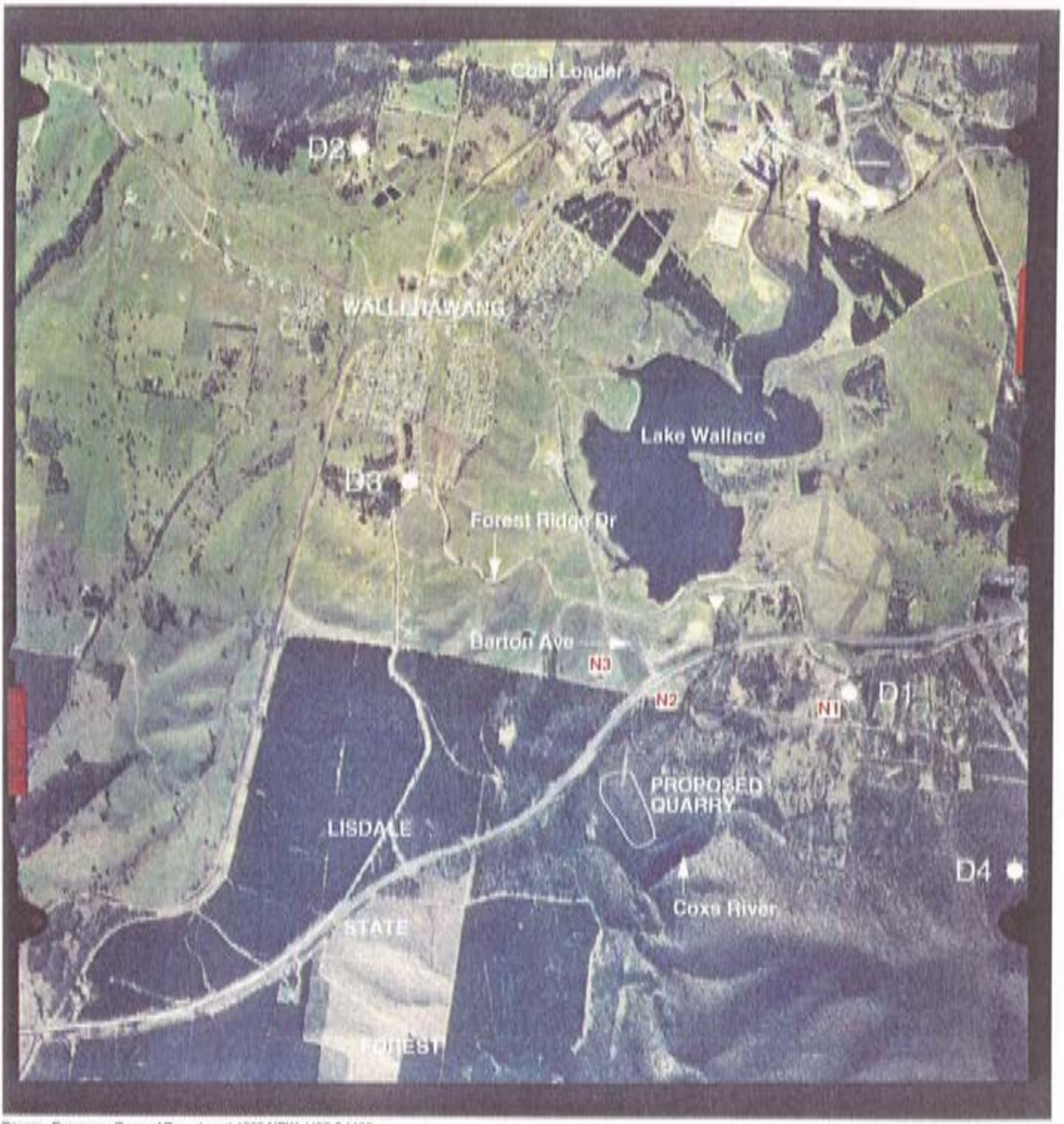
B J BRADLEY & ASSOCIATES
P O Box 2030 Gateshead Business Centre, GATESHEAD, NSW 2290 PHONE/ FAX 02 49485212

PROPOSED ACCESS TO PROPOSED WALLERAWANG QUARRY ONTO GREAT WESTERN HIGHWAY
CONCEPTUAL LAYOUT OF NEW SEAGULL JUNCTION

Drawing No. 001201A

Date: 14 December 2000

Sheet No. 1 of 1



Source: Surveyors General Department 1998 NSW 4437 &4438

D2 ✸ Delta Electricity Dust Gauges

▼ Delta Electricity Water Monitoring Location

■ Atkins Acoustics Noise Logger Location

0 2 km

1:35000 approx.

Plate 1.

AERIAL PHOTOGRAPH (1998) & MONITORING LOCATIONS.

PROJ/DRAFT/WAL/PLATE 1

3.11 CLEANER PRODUCTION

The proposal will generate wastes typical of quarry operations, including used oil and grease, used packaging, cleared vegetation, construction debris, sewage, overburden and fines. The quarry will operate in accordance with the principles of the POEO (Waste) Regulation, 1996, including ESD (refer to **Section 5.17**) and waste minimisation. Some of the measures that may be adopted by the quarry include:

- purchasing and contract guidelines that include environmental and waste considerations;
- recyclable materials will be separated from the mixed waste stream where practicable;
- used oils and grease will be collected separately for recycling off-site;
- residual wastes will be collected separately and disposed of to the nearest Council landfill;
- sewage will be treated through an aerated wastewater treatment system and irrigated over a suitable area;
- cleared vegetation will be used where appropriate for timber, or where possible respread over the site to aid revegetation; and
- surplus overburden and fines will be reused in the rehabilitation of the site.

Runoff water generated on the site by rainfall, dust suppression and production will be collected downslope via a catch drain and retention dam. Water in the retention dam will be settled and then used on site for rehabilitation, dust suppression and production purposes. Water will not be discharged from the site in the majority of circumstances.

4.0 ENVIRONMENTAL MANAGEMENT

4.1 WATER MANAGEMENT AND EROSION CONTROL

4.1.1 Objectives

The principal objective of water management will be the maintenance of existing water quality within Coxs River. This will be achieved by ensuring that there are no discharges from the site in the majority of circumstances, and that unavoidable site discharges are treated sufficiently in compliance with EPA requirements. All run on stormwater (which is expected to be minimal) will be diverted around the site to avoid contamination and sediment entrainment.

4.1.2 Water Usage

Consultants WBM Oceanics conducted a Water Management Study, a copy of which is provided in **Appendix 3**. The results of this study are summarised in this section. The water management study incorporated the use of historical rainfall data (108 years) to determine a site water balance. A non-linear runoff routing model (RAFTS-XP) was also used to model the amount of runoff from the quarry and consequently determine a storage size for the Water Management Dam. The site water balance for dry, wet and average years is covered in detail in **Appendix 3**.

Water usage for dust suppression will be required for the:

- crusher, which will be fitted with a fine mist sprayer;
- haul and access roads;
- quarry stockpiles; and
- mining faces and manoeuvring areas on the quarry floor.

Make-up water will be required to replace water lost through percolation, evaporation and water contained in quarry product. This make-up water will be obtained predominantly from stormwater runoff from the disturbed catchment.

Approximately 50,000L/d of water will be required for dust suppression activities during average climatic conditions. During dry years, the on-site water supply will not be able to meet demand for approximately 30% of this time. It is proposed to either use biodegradable wetting agents to reduce the water demand or to bring onto the site additional water to meet demand for water usage, during dry periods.

An irrigation component is included in the site water balance to enable the Water Management Dam to maintain a 4m freeboard. Irrigation of excess water would be conducted over a 20ha

catchment, with a series of catch drains constructed around this area to contain any runoff. *Figure 4.1* shows the proposed irrigation network.

During periods of constant high rainfall, extending over a 48hr period, the opportunity for on-site irrigation and the demand for dust suppression will be reduced. Under these circumstances the 4m freeboard will be difficult to maintain in the Water Management Dam and discharge from the site may be required. Inspection will be undertaken before water is discharged in order to determine whether the water quality is within the discharge limits. In extreme cases, the use of flocculants may be necessary.

4.1.3 Existing Water Resources

The annual average rainfall and evaporation rates for the area are 870mm and 1320mm respectively[1]. Typical annual runoff rates for small catchments in this location are 10-30% of annual rainfall. Due to the high proportion of steep slopes and outcropping rock within the catchment, a figure of 30% has been assumed. Runoff resulting from rainfall excess will be collected and stored in the on-site Water Management Dam. The total catchment of the quarry and associated infrastructure (Stages 2 and 3) is approximately 11ha.

4.1.4 Water Management Strategy

Stage 1

Site drainage characteristics and the proposed on-site Water Management Dam are shown in *Figure 4.2*. A runoff routing model was used to determine a volume requirement of 7.7ML for the on-site Water Management Dam. This size will ensure that no discharge of dirty water occurs under normal rainfall conditions. The dimensions of the Water Management Dam (55m long x 20m wide x 7m high) indicate that with a 4m freeboard, the site can contain up to a 1 in 20 year, 12 hour event or a 1 in 50 year, 6 hour event during Stage 1. The Water Management Dam will be located on the western side of the quarry development and involve the redevelopment of the former Hoskins quarry. A sectional view of the proposed Water Management Dam is provided in **Appendix 3**.

Initial disturbance will occur during the establishment of the plant processing sites, site amenities, carparking, product stockpile, topsoil stockpiles, site roads and from initial quarrying operations. Potentially contaminated runoff from the initial disturbance areas (6.75ha) will drain into the Water Management Dam via grassed, trapezoidal channel structures. Coarse sediment traps will be installed along each of these channels to capture sand and gravel sized particles prior to discharge into the Water Management Dam. The coarse sediment traps have an approximate capacity of $4m^3$ and may be concrete lined for maintenance purposes.

[1] (Bureau of Meteorology, Lithgow, 1889 - 1996 and NSW Department of Agriculture, Bathurst)

Over steeper sections of the channel, rock rip-rap or fabric will be installed to dissipate high flow velocities and prevent the occurrence of channel scouring.

Cleanwater diversion drains, consisting of grassed and stabilised earthen bund design, will be established as shown in *Figure 4.2*, to divert uncontaminated runoff to the north and south of the site during Stage 1. The clean water that is diverted away from the disturbed areas can be discharged directly into the Coxs River.

Stages 2 and 3

The total area of disturbance for Stages 2 and 3 of the quarry is 9.7ha. Providing a 4m freeboard, the Water Management Dam can contain up to a 1 in 20 year, 3 hour event or a 1 in 50 year, 2 hour event generated by these areas. Larger events and longer duration events will result in a discharge from the site via the spillway.

For Stages 2 and 3, the basic layout of the water management system remains the same as Stage 1, however, clean water is diverted only to the south of the quarry. *Figure 4.3* shows the water management structures in place during Stages 2 and 3. The coarse sediment traps and the contaminated runoff channels will remain in the same place.

Surface water collected from the access roads outside the catchment of the Water Management Dam will be collected in roadside drains and settled in small sediment traps.

Maintenance of water management structures will include regular removal of material from the coarse sediment traps and weekly inspection of all water management structures. Further inspections will be undertaken following heavy rainfall. Any repairs will be undertaken as soon as practicable. Materials removed from the coarse sediment traps will be placed within the stockpile area.

The Water Management Dam will be kept in a drawn-down state to allow maximum storm capacity. The outlet of the Water Management Dam, will be the only dirty water discharge point for the quarry site.

To maximise on-site water efficiency, water from the Management Dam will be used for all landscaping, vehicle washing and dust suppression activities. To maintain adequate freeboard within the Water Management Dam, excess water will be used to irrigate areas of woodlot vegetation around the proposed quarry site. The area to be irrigated will be approximately 20ha. Any runoff from the irrigation areas will be collected via a catch drain, as shown in *Figure 4.1,* to ensure that irrigation runoff does not directly enter the Coxs River. Irrigation water collected within the catch drains will be directed toward a catch dam. Water stored in the

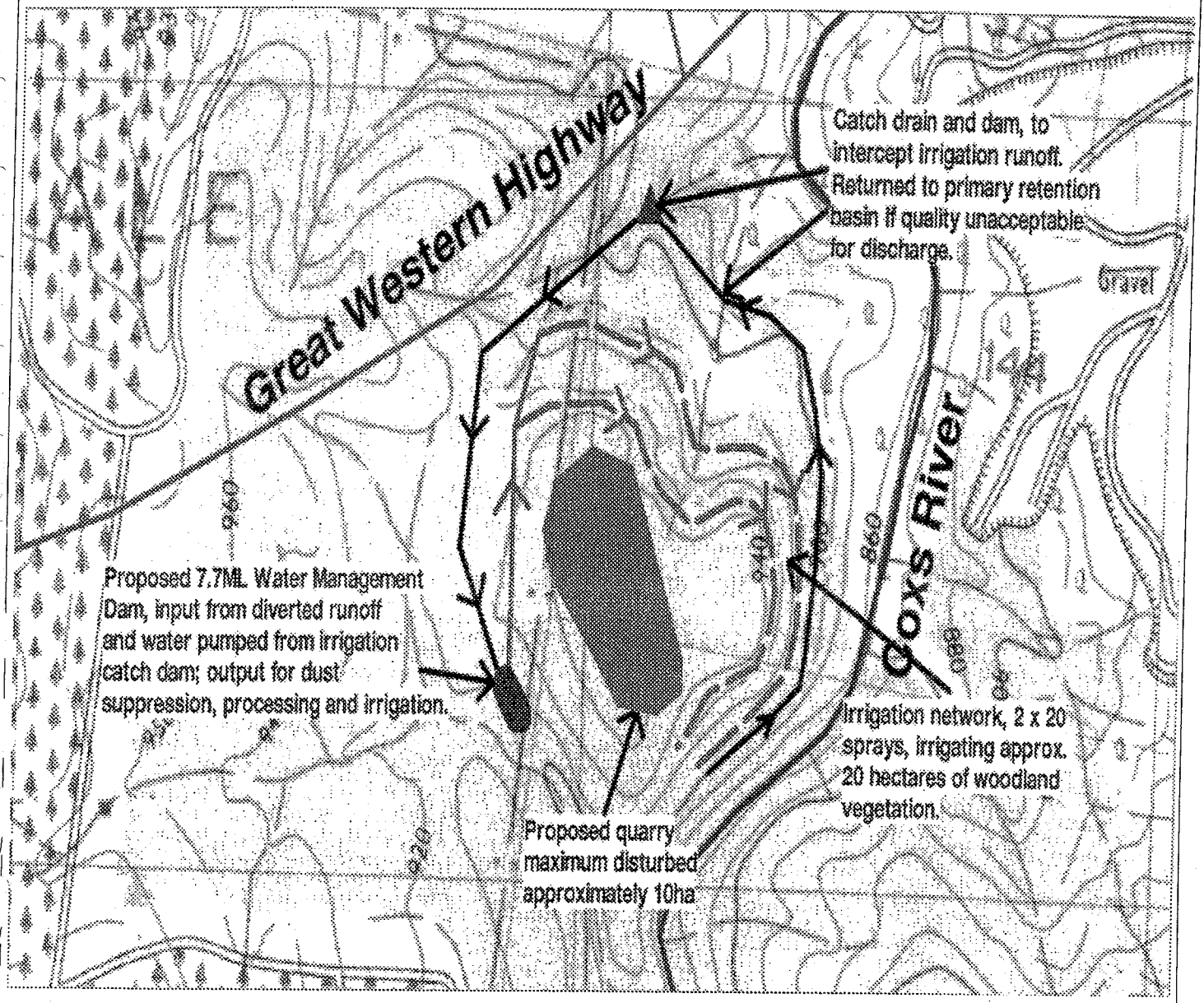
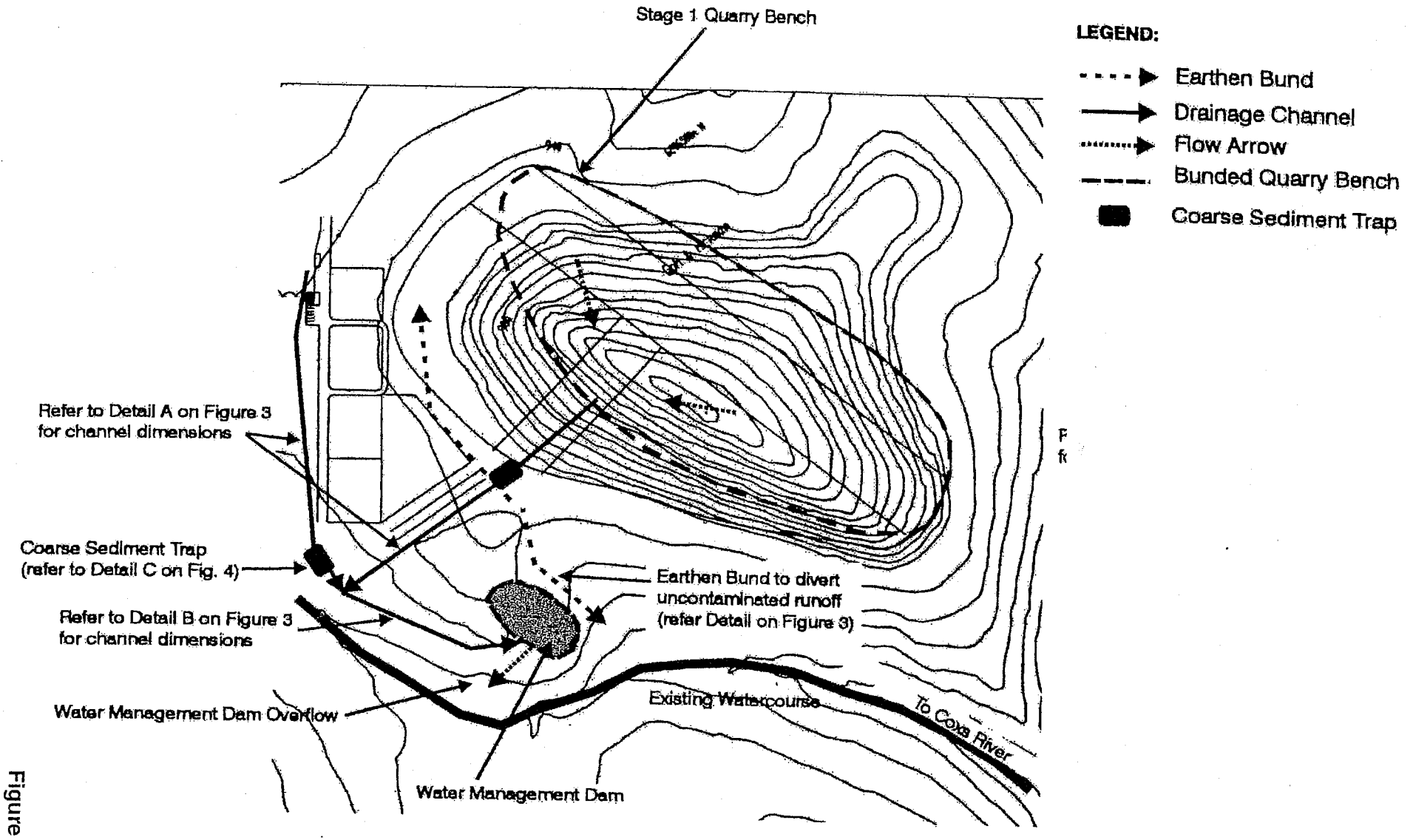


Figure 4.1

PROPOSED IRRIGATION NETWORK



Site Layout - Stage 1

N.T.S.

Figure 4.2

SITE DRAINAGE LAYOUT - STAGE 1