EIS 994

AB019585

Environmental impact statement for a clay/shale quarry at Lot 3 Adams Road, Luddenham

PROPOSED CLAY / SHALE QUARRY

ADAMS ROAD, LUDDENHAM

Environmental Impact Statement

R.A Cole Town Planning Pty Ltd

Brink & Co Pty Ltd

KOLBACK ENVIRONMENTAL SERVICES LIMITED

Environmental Impact Statement
for
a Clay/Shale Quarry
at
Lot 3 Adams Road, Luddenham

Prepared by:

R. A. Cole Town Planning Pty Ltd
9 Hilar Avenue
CARLINGFORD NSW 2118
A.C.N. 002435770
Telephone: (02) 871-4255
Facsimile: (02) 871-4255

Brink & Co.Pty Ltd
PO Box 40
OURIMBAH NSW 2258
A.C.N. 050212710
Telephone: (043) 89-2300
Facsimile: (043) 89-1600

Form 2

Submission of environmental impact statement (EIS)

prepared under the Environmental Planning and Assessment Act 1979 Section 77

EIS prepared by

name qualifications	Raymond Arthur Cole LGTP, ATCP (Mitchell) Director, R.A. Cole Town Planning Pty Ltd
address	9 Hilar Avenue Carlingford NSW 2118 Telephone: (02) 871-4255
in respect of	Extractive Industry

development application

applicant name applicant address	Kolback Environmental Services Limited Level 1, 2 Blight Street Sydney NSW 2000
land to be developed: address lot no, DPMPS, vol/fol etc proposed development	Lot 3 DP 623799 Adams Road Luddenham

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 51 and 52 of the Environmental Planning and Assessment Regulation 1994, and
- it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

Signature .....

name R A Cole, Director, R A Cole Town Planning Pty Ltd

date 8/9/95

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Section 1

Summary

1.0 SUMMARY

1.1 OBJECTIVES AND OUTLINE OF THE DEVELOPMENT

Kolback Environmental Services Limited seeks development consent from Liverpool City Council to establish a clay/shale quarry and associated facilities on lot 3 Adams Road, Luddenham, located as shown on Figure 2.1.

A previous application by Ferndale Resources Pty Ltd was refused by Council. This new application includes an Environmental Impact Statement by ERM Mitchell McCotter for the filling of the quarry with non-putrescible waste to restore the property to a designed level. This Environmental Impact Statement deals specifically with the clay/shale quarry and refers to the filling statement where operations overlap.

The proposal, being an extractive industry, is "designated development" as provided in the Environmental Planning and Assessment Act 1979, and Regulations, 1994 and as such, the development application must be accompanied by an Environmental Impact Statement. R A Cole Town Planning Pty Ltd and Brink & Co Pty Ltd have been engaged by Kolback Environmental Services Limited to prepare the Statement on their behalf.

The objective of the applicant is to establish and operate a clay/shale quarry which will provide suitable material for the manufacture of bricks and associated products.

The quarry will operate for approximately 12 years, removing approximately 500,000 tonnes of clay, shale siltstone and sandstone per year (total 6,000,000 tonnes). Of this total 350,000 tonnes per year will be removed from the site as the balance is not a suitable product for brick making and will be required as cover material for the landfilling operation.

The quarry and associated activities will operate using the optimum environmental management procedures and techniques to ensure that the minimum adverse environmental impact occurs to the site and the adjoining areas. The total development will operate in accordance with the requirements of State, Federal and Local Authorities.

1.2 JUSTIFICATION FOR THE DEVELOPMENT

Light firing clays and shales are in short supply in the Sydney Metropolitan region and this type of resource is sought after by brick manufacturers throughout the region. Realistically, the clay and shale consumers near the site are best suited to receive the material to minimise transport costs.

Cream firing raw materials have been in steady demand for many years and there is no indication that this demand is lessening. Regular consumption of a diminishing supply of light firing clay and shale is bound to result in an increased demand generally and ensure a continual market for the Luddenham material.

The site is included in Sydney Regional Environmental Plan No. 9 (Extractive Industry) and Draft Sydney Regional Environmental Plan No. 9(2) - Extractive Industry which aim to facilitate the development of extractive resources in close proximity to the Sydney

Metropolitan area. The site is specifically identified in the Draft Plan as being of regional significance.

1.3 ENVIRONMENTAL MANAGEMENT PROCEDURES

1.3.1 Erosion and Sedimentation Controls

The initial phase of the operation will be the construction of bund walls around the perimeter of the site to act as visual and acoustic buffers but also to retain any turbid runoff from disturbed areas within the site.

To minimise any sheet or rill erosion, grass and top soil clearing will only occur as each stage takes place however the clay content of the soil is an inbuilt retardant against erosion.

The exposed surface below the soil contains dense clay which would require considerable effort to make it yield to erosion.

1.3.2 Soil Stripping and Stockpiling

Top soil will be removed by scraper and used to top the bund walls around the site. Excess top soil will be stockpiled inside northern perimeter bund for future rehabilitation of the quarry once finished levels are reached.

1.3.3 Water Management

Primary and secondary sedimentation ponds will be employed to collect runoff before discharge to Oaky Creek. The collected runoff will be used for dust suppression within the quarry area and on the transport routes to Adams Road.

The staging of the quarrying operation has been selected to commence excavations within the 'upstream' side of the site such that direct rainfall on the undisturbed 'downstream' area can flow unimpeded off site as is currently the case.

All runoff from disturbed areas will be isolated by small internal bunds and collected in primary and secondary sedimentation ponds before discharge to Oaky Creek.

1.3.4 Solid Waste Disposal

Overburden and interburden materials not suitable for brick manufacture will be progressively stripped and placed in a worked out section of the quarry floor or within the surface bunded area until the commencement of waste filling operations at the end of year one. Thereafter, this material will be progressively used for intermediate and final cover. Workshop and domestic waste will be removed by waste contractors to a Council's tip.

1.3.5 Dust Controls

Potential sources of dust are soil removal and handling; ripping, pushing and loading of clay/shale material; the open quarry void; site traversing by heavy equipment; transport vehicles and stockpiles.

Controls include the following:-

* minimise areas of disturbance
* regular watering of access roads and heavy trafficked areas
* watering as required of stockpiles
* keeping sealed surfaces free of dropped material.

1.3.6 Noise Controls

All mobile equipment will be fitted with standard silencers appropriate for the equipment. The silencers will be kept in good order to ensure maximum noise suppression.

The bund walls along the northern, western and southern boundary will act as acoustic screens until the clay/shale extraction operation is below ground level.

Noise from the transport vehicles will be heard by the immediately adjacent residents to the north of the site and the construction of roadside acoustic barriers will be undertaken.

1.3.7 Protection of Natural Features

The environmental investigations have shown that there are no unique or unusual natural features occurring on the site that would be disturbed by the quarry operation. Sedimentation ponds will be incorporated in the quarry management to ensure no pollution occurs to Oaky Creek.

1.3.8 Protection of Man-Made Features

The one Aboriginal archaeological site identified on the land will be collected by Gandangarra Local Aboriginal Land Council for storage and future museum display.

1.3.9 Visual Controls

The bund walls around the perimeter of the site will be the main visual barriers in the initial stages of the quarry operation and, when the planting of these bund walls is established, the landscaping will reinforce this barrier.

When quarry operations are below ground level, the activities will not generally be visible from adjoining or distant properties.

The transport vehicles will be visible once they reach natural surface and when proceeding down the access way to Adams Road.

The quarry void will be progressively filled in accordance with the Environmental Impact Statement prepared by ERM Mitchell McCotter, being part of this development application.

1.3.10 Fire, Health and Safety Controls

Appropriate bushfire control measures will be undertaken and fire suppression equipment installed to protect the existing buildings and the quarry equipment and plant in the case of a bushfire or accidental fire (see Section 6.8.2).

Existing rural perimeter fencing will be retained and maintained around the site and security gates erected to prevent unauthorised access.

All internal traffic will be required to travel at designated speeds and to comply with all internal traffic controls.

1.3.11 Conservation of Energy

To ensure efficient energy management, all equipment and plant will be maintained in good condition and operated as required to manufacturer's recommendations.

1.3.12 Road and Entry Upgrading

The following upgrading procedures will be undertaken with the development of the quarry:-

* reconstruction of the intersection of Adams Road and Elizabeth Drive to provide a right turn bay for vehicles turning right into Adams Road as well as a deceleration lane for vehicles turning left into Adams Road. Some shoulder widening is proposed for vehicles turning into Elizabeth Drive and to assist eastbound vehicles on Elizabeth Drive to pass eastbound trucks accelerating from Adams Road.

* reconstruction of Adams Road north of the site access to an acceptable standard.

1.4 ANALYSIS OF ENVIRONMENTAL IMPACTS

1.4.1 Topography

The proposed quarry will have a more pronounced effect on the topography of the site than have the existing rural activities. Bund walls will be erected around the perimeter of the site and the quarry excavations will culminate in a depression with a horizontal floor some 25m to 30m below existing surface levels.

1.4.2 Geology

The Bringelly Shales Geological formation is several hundred metres thick and occurs over at least 200 sq km. The proposed extraction will only affect a fraction of the

volume contained within the formation. Essentially therefore there will be no change in geology.

1.4.3 Soils and Soil Erosion

Top soil will be stripped and stored in bund walls or stock piles for the future rehabilitation program. There will therefore be no net loss or destruction of arable soil and the net impact on the quality of top soil present in the area will be minimal.

The bund can be immediately grassed and hyrdo mulched and with the planned vegetation cover will form effective safeguards against soil erosion. In the quarry area supplementation of effective runoff controls and efficient sedimentation dams will ensure that the sediment yield from the site is minimal.

1.4.4 Hydrology

Because of the surrounding bund walls and staging of the quarrying/landfilling operation, no surface runoff water will enter the site nor will runoff waters from disturbed areas leave the site without passing through sedimentation ponds for precipitation, prior to being released into Oaky Creek.

1.4.5 Water Quality

The proposed drainage management plan with quarry sump and sedimentation ponds and the recycling of water for dust suppression will ensure that the development does not cause any alteration to water quality downstream of the site. Water can only leave the quarry by pumping and that will not be undertaken unless the water quality is such that no pollution will occur to Oaky Creek and other downstream waterways.

1.4.6 Air Quality

The water content and composition of the clay/shale material does not readily generate dust when being excavated or stockpiled. The greatest potential for dust generation is from unsealed haulage roads and unsealed heavily trafficked areas. These areas will be regularly watered to suppress any dust and to ensure that there is no reduction in air quality.

1.4.7 Vegetation and Fauna

Very little existing vegetation will be removed with the quarry development, with the vegetation along Oaky Creek being kept and reinforced with additional planting between the bund wall and the Creek. The bund walls will be planted and there will be a net increase in vegetation on the site.

The primary habitat for wildlife, along Oaky Creek, is being retained and no fauna is expected to be disadvantaged by the quarry operation.

1.4.8 Bushfire Potential

The measures proposed in Section 6.8.2 to prevent the outbreak of bushfires or associated fires at the quarry and associated activities will ensure that any fires are quickly attended to and extinguished.

1.4.9 Noise Impacts

Appropriate noise criteria for each phase of operations have been derived on the basis of EPA guidelines. Noise predictions for each phase of the proposed operations have been performed and indicate that with the recommended noise control measures, the relevant long-term criterion will generally be met at all surrounding residences. During the initial phase of quarrying operations, the criterion for noise from these operations is predicted to be exceeded by up to 6.4dB. However, this exceedance is predicted to be limited to at most three months, which is approximately 2% of the life of the quarry, and predicted noise levels are within the criterion for landfill operations which will apply for subsequent phases of the development.

For other stages of the proposed development, predicted noise levels are within the relevant criteria in all cases.

1.4.10 Visual Impacts

The construction of the bund walls and planting will provide a visual buffer for surrounding properties and from Elizabeth Drive. Once the trees and shrubs have matured, the views into the site will be a treed hedge.

Transport vehicles will be visible as they enter and leave the site on the access way between the top of the quarry and Adams Road.

1.4.11 Aboriginal Relics

A full survey of the site identified one archaeological site, an open surface scatter of flaked stone artefacts. It is intended that these artefacts will be collected for storage and future museum display.

1.4.12 Planning

The proposed development is a permitted use with Council's consent and the site is included in Sydney Regional Environmental Plan No. 9 (Extractive Industry) as a potential for Bringelly clay/shale extraction. The site is also identified as being of regional significance in Draft Sydney Regional Environmental Plan No. 9(2) - Extractive Industry.

Investigations have shown that air, noise and water quality impacts from the quarry operation will be contained within the property boundaries. External impacts relate principally to traffic however transport vehicles will principally use the main road for delivery of materials.

Future planning proposals for the area show that the site is intended as an employment centre for the adjoining Sydney Second Airport. This land use is mainly due to the expected noise impact on the site from the airport activities.

The operation of a quarry on the site will not adversely affect the airport proposal nor will it preclude its future employment centre use if the quarry void is used as a land fill site with suitable compaction measures.

The utilisation of the clay/shale on the site is in keeping with the objectives of Sydney Regional Environmental Plan No. 9 and Draft Sydney Regional Environmental Plan No. 9(2). This is a positive impact of the development.

1.4.13 Land Use

The proposed quarry will not have any adverse impact on other rural land uses surrounding the site or on the establishment of the Second Sydney Airport on adjoining lands to the east and south.

The adjacent land owners will be aware of the quarry operation mainly from vehicle and equipment movements on natural ground surface.

1.4.14 Public Utilities

The servicing requirements of the quarry operation and associated activities can be met from existing supplies.

1.4.15 Roads and Traffic

The transport implications of the proposed development have been reviewed through an assessment of the impact on traffic efficiency, on amenity, on traffic safety and on road pavement damage.

Combined traffic generation predictions for the extraction and landfill operations are significantly less than the predicted increases in traffic volumes from other developments in the area such as Badgerys Creek Airport and South Creek Valley residential development.

Detailed analysis of the effects of the existing traffic on the operation of the Adams Road/Elizabeth Drive intersection indicate that improvements to the intersection are needed. These would require the construction of a right turn bay, deceleration lane and some shoulder widening. The proposed development would not cause any significant delays or loss in the degree of service to turning traffic.

Although it is considered that potential landfill truck traffic on Adams Road south of the site would be minimal, it is proposed that usage of this section of road by vehicles from the development be restricted.

1.4.16 Energy Impacts

The quarry development and associated activities will require only diesel fuel and electricity for its operation and the impact generally will be negligible.

1.4.17 Socio-Economic Impacts

The proposed quarry operation will create 5 employment opportunities which are expected to be filled from the local workforce. The development will also generate external employment mainly from the servicing and transport industries. The Village of Luddenham, with retail and servicing facilities, is expected to benefit from the additional employment and incomes in the area.

The proposed operation will provide a positive and beneficial impact on the local community base.

1.5 ALTERNATIVES TO THE DEVELOPMENT

1.5.1 Alternative Sources

The clay/shale resources of the Luddenham site have been identified as being of strategic regional importance in Sydney Regional Environmental Plan No. 9 (Extractive Industry) and Planning Report.

Detailed geological exploration of the site has confirmed the presence of large reserves of high quality clay/shale suitable for brick manufacture.

There are no other known deposits of similar size or quality in the Bringelly Shale.

1.5.2. Alternative Quarry Plan

The only feasible alternative quarry plan is the formation of a conical pit which is expanded radially to remove material. This plan would result in a single, poor grade material, suitable only for production of reddish bricks.

The light firing materials occur in distinct horizontal layers that must be extracted carefully and selectively.

Apart from varying the staging sequence there is therefore no practical alternative to the proposed quarry plan to ensure protection and extraction of the valuable resource.

1.5.3 Consequence of Not Proceeding

The primary consequences of not proceeding would result in this extensive clay/shale resource not being extracted and therefore a loss to the brick manufacturing industry.

Employment opportunities would be lost and the existing rural activities would continue until a higher land use is permitted, probably in conjunction with the Second Sydney Airport.

Given the strategic importance of the site, the extensive reserve of high quality clay/shale, and the proximity to future population growth areas, the Second Sydney Airport and labour markets, the consequence of not proceeding with the development cannot be either justified or warranted.

Section 2

Introduction

2.0 INTRODUCTION

2.1 HISTORY

A development application and accompanying environmental impact statement was lodged with Liverpool City Council in mid 1992 (DA 430/92) and, following advertising and consultation as required, the Council, at its meeting of 12th October 1992 resolved "not determine the application until full details are received and considered of proposed reinstatement works for the site".

A Report titled "Reclamation Details", dated December 1992, was prepared and lodged with Council.

Liverpool City Council considered the total development of the clay/shale quarry and rehabilitation works and advised, by letter dated 23rd April, 1993, that the application had been refused for the following reasons:

(1) inadequacy of road;
(2) detriment of the amenity of the area;
(3) adverse environmental consequences; and
(4) proximity of the airport.

A fresh application was submitted to Council for the clay/shale quarry and the filling of the quarry void with non-putrescible waste to restore the land to its original landform. The environmental impact statement for the clay/shale quarry was basically the same as the original statement, with minor amendments and updates. The environmental impact statement by Mitchell McCotter dealt specifically with the filling of the quarry void and the assessment of the environmental impact of that part of the development application.

The development application was refused by Council for the following reasons:

(1) The adverse advice received from the Department of Planning wherein they advised deficiencies in the Environmental Impact Statement as follows:

- Proximity of the site to Badgerys Creek Airport,
- Potential deterioration of water quality (both surface and ground) in South Creek,
- Water quality damage and also flow regime damage to Oakey Creek,
- Leachate pollution,
- Inadequate buffer zones for the management of run-off,
- Fire protection management including egress and additional water demand capability,
- The inability of the Water Board to provide sewerage facilities,

(2) The overall effect of the development on surrounding residential amenity and environment,

(3) The application is contrary to:

- The draft revised Sydney Regional Environmental Plan No. 9,

- Sydney Regional Development Advisory Committee Advice of 30 March 1994,

(4) The Public Meeting of 15 October 1994 on site was not truly representative of local residents.

Copies of the letters from Council are contained in Appendix 4 and the reasons for refusal are addressed in Section 7.27.

2.2 OBJECTIVES AND OUTLINE OF THE DEVELOPMENT

This Environmental Impact Statement has been prepared for Kolback Environmental Services Limited to support a Development Application to Liverpool City Council to allow the establishment of a clay/shale quarry on Lot 3 Adams Road Luddenham, located as shown on Figure 2.1.

The applicant, Kolback Environmental Services Limited (KES) is a wholly owned subsidiary of Kolback Group Limited (Kolback). Kolback is a publicly listed Australian company whose core business is the provision of environmental services.

A subsidiary of KES, Camide Pty Limited (Camide) has operated in the clay/shale extraction market for over fifteen years rehabilitating exhausted quarry voids by the emplacement of non-putrescible wastes.

The aim of the quarry operation is to extract and remove up to 350,000 tonnes of clay, shale, siltstone and sandstone from the site annually. Approximately 10,000 tonnes of several types of shale materials will be maintained in stockpiles on the quarry floor.

The quarry will operate over four stages and the existing dwelling will be used as a manager's residence and associated office and the existing large stable and produce shed will be converted into a workshop and amenities facility for at least two of the four stages.

The Company proposes to utilise the best available environmental management procedures in the extraction of the clay/shale and the operations generally on the site. All activities will be undertaken to the requirements of all authorities.

Due to its long involvement in the clay/shale extraction market Camide is very familiar with the requirements of the clay products manufacturing industry and is familiar with extraction protocols which will ensure that maximum commercial benefit is made of the materials.

Camide, since 1988, has operated four separate clay/shale quarries located at Wetherill Park, Horsley Park, Schofields and Londonderry. Commercial landfill operations, fully licensed by consent authorities, have been carried out by Camide from those locations.

Camide has been looking for some time to secure a new site for its ongoing operations. Cream or 'light firing' shales are in short supply within the Sydney region.

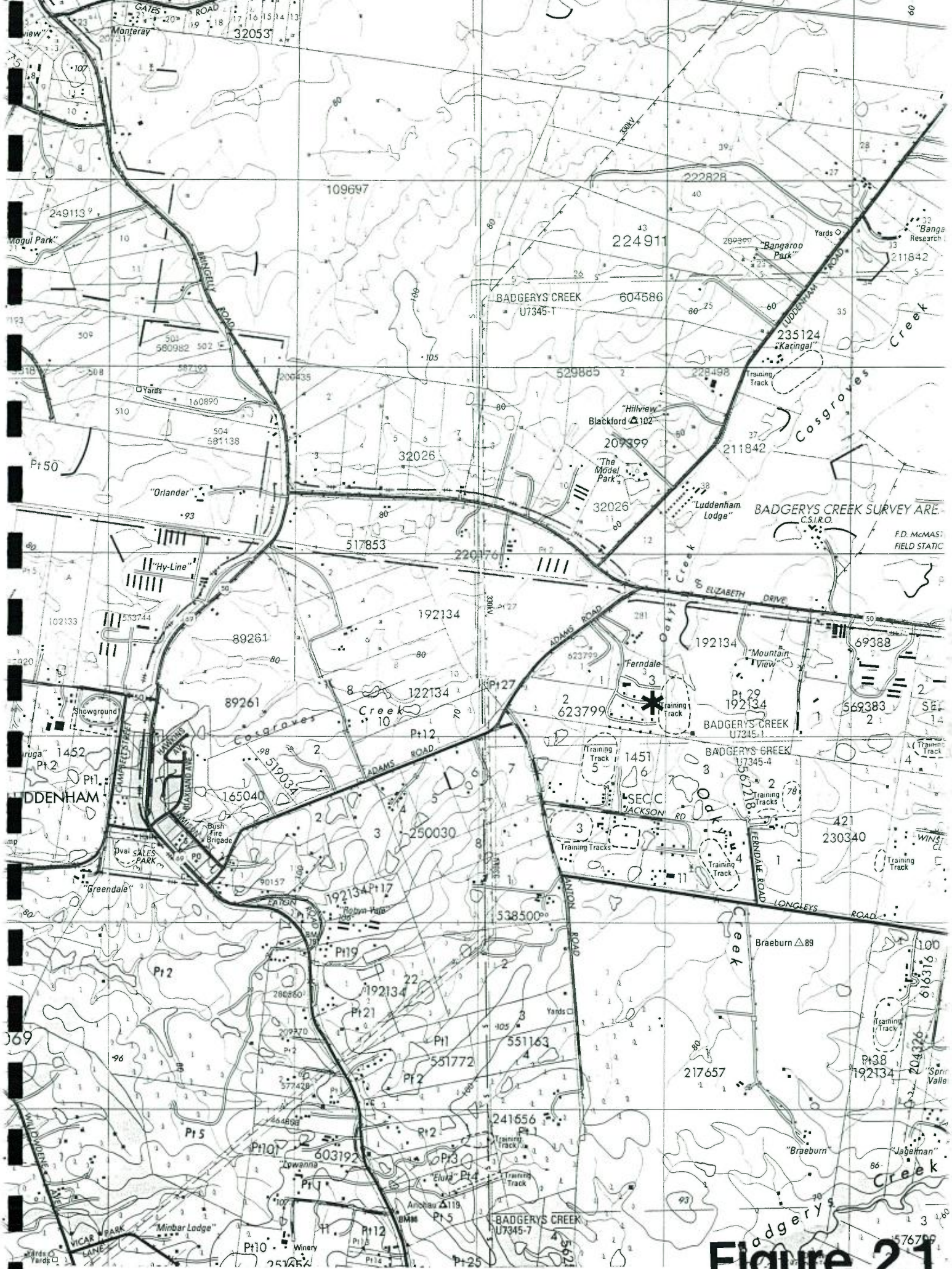


Figure 2.1

LOCALITY PLAN

Crown Copyright
Courtesy Central Mapping Authority

Scale: 1:25000

R. A. COLE TOWN PLANNING PTY. LTD.

The high ratio of 'light firing' shales on the Ferndale site ensures ready acceptance by the brick making industry.

The selection of Ferndale as Camide's preferred location follows an exhaustive search based primarily on the following three points:

* quality of material
* environmental consequences
* proximity to market

Reasons for the Company's extraction proposal are to ensure a long term supply of cream burning brick material for PGH Limited and Camide has had a long relationship with PGH Bricks Limited who support this application, as they did the earlier application.

PGH has agreed to a proposal that would see the stockpiling, by PGH at its sites, of materials in excess of that company's day to day requirements and Camide is prepared to be limited to the stockpile estimates contained within this report.

KES recognises that in some cases the stockpiling of low grade brick making shale by recent entrants to the landfill industry has created an over supply of that material and in many cases problems have been compounded by poor quality control during mining which has resulted in contamination between different grades of shale rendering them useless to brick makers.

Sales of quarry materials will be structured to achieve an orderly development and to ensure this valuable natural resource is utilised to its full potential for the manufacture of clay products. Since its acquisition by Kolback in 1988, Camide has turned over an average of $5.0m in waste revenues annually and filled approximately 2.5 million cubic metres of quarry void and since 1988 has been the largest private landfill operator in the Sydney region.

Operations have now ceased at Wetherill Park, Horsley Park and Schofields. Camide intends to extend its operations to the Adams Road site.

Through its long experience and commercial relationships, Camide is confident of attracting sufficient business of its own and from waste contractors to complete the filling within the time indicated in this report.

Camide has developed a great deal of technical and operational expertise. Its administration and operations staff are well aware of the Company's Environmental Compliance Policy which is overseen by an independent Environmental Audit Committee that reports to Kolback Directors and Camide's day to day operations are also audited by independent risk assessors.

In a regulatory environment where generators of waste are becoming more responsible to ensure ethical disposal of their wastes Camide's compliance with high standards will ensure ready acceptance of the Adams Road site by its customers.

The proposal is "designated development" within the meaning of the Environmental Planning and Assessment Act, 1979 and Regulations, 1994. The development application therefore must be accompanied by an Environmental Impact Statement. R. A. Cole Town Planning Pty Ltd and Brink & Co Pty Ltd have been engaged by Kolback Environmental Services Limited to prepare this Statement on their behalf.

2.3 OVERVIEW OF THE ENVIRONMENTAL IMPACT STATEMENTS

The Environmental Impact Statement has been prepared in accordance with Clauses 51 and 52 of the Environmental Planning and Assessment Regulations, 1994.

The Director of the Department of Urban Affairs and Planning was consulted as to the required form and content and these requirements, as contained in the Director's reply have been taken into account with the preparation of the Statement. The Director's letter is reproduced in full as Appendix 1.

The Environmental Impact Statement has been divided into a number of sections that are inter-related and the data in each section supports statements and conclusions made at the end of that section or in another part of the statement. The Table of Contents at the front of the statement is included as an aid for the reader to locate all information of interest. The following is an outline of each section of the statement.

SECTION 1.0 SUMMARY

This Section summarises the findings of each section of the statement.

SECTION 2.0 INTRODUCTION

The Introduction gives the objectives and outline of the proposed development, and an overview of the Environmental Impact Statement. The results of the consultation with various authorities are presented and the project team is listed.

SECTION 3.0 JUSTIFICATION FOR THE PROPOSED DEVELOPMENT

Section 3.0 details existing markets, future markets and the importance of the site in the region. This Section also gives the justification for the development in terms of the environmental, economic and social considerations.

SECTION 4.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

Investigations were undertaken to assess the characteristics of the existing environment. This information is essential in determining the impact of the proposed development on the site and the area generally and is used to design the operation of the extractive industry with the minimum of environmental impact.

A description of the natural, physical and man-made features and social and economic factors are given in this Section.

SECTION 5.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

This Section gives a full description of the proposed quarry operation including use of the existing buildings, vehicle movements and services.

SECTION 6.0 ENVIRONMENTAL MANAGEMENT

Section 6.0 details the environmental management procedures and techniques proposed with the development to protect the environment and to mitigate against adverse impacts on the environment of the site and the area generally.

SECTION 7.0 ASSESSMENT OF ENVIRONMENTAL IMPACT

This Section assesses the impact of the development on the site and assesses the effectiveness of the control measures detailed in Section 6.0 on the environment. Adverse and beneficial effects are also detailed.

SECTION 8.0 ALTERNATIVES TO THE PROPOSED DEVELOPMENT

Section 8.0 details the alternatives to the proposed development. Alternative resources, alternative quarry plan and the consequences of not proceeding are also described.

2.4 CONSULTATION WITH AUTHORITIES

The following Government Departments and Authorities were consulted in respect of the prosed clay/shale extraction:-

Department of Urban Affairs and Planning
NSW Department of Mineral Resources
Department of Water Resources
Department of Land and Water Conservation - Soil Conservation Service
Roads and Traffic Authority
Environment Protection Authority
Liverpool City Council
Department of Transport and Communication
NSW Agriculture
National Parks and Wildlife Service
Waste Management Authority of NSW
Federal Airports Corporation
Sydney Water
NSW Health Department
Hawkesbury-Nepean Catchment Management Trust
South Creek Catchment Management Committee

The Waste Management Authority of NSW has amalgamated with the Environment Protection Authority in respect of quarry and landfill operations and the reply has come direct from the Environment Protection Authority.

No replies have been received from Sydney Water or Department of Transport and Communications.

The answers to other consultation letters are contained in full in Appendix 3 and the following is a summary of the replies.

2.4.1 Department of Land and Water Conservation (Department of Water Resources, Department of Conservation and Land Management - Soil Conservation Service)

The Department of Land and Water Conservation incorporates now the former Department of Conservation and Land Management (Soil Conservation Service) and Department of Water Resources. Replies have been received on behalf of those organisations.

The Department has no objections to the overall intent of the proposal described in the previous application. The new landfilling EIS should address erosion and sediment control measures and revegetation operations, timing, sowing rates etc.

The previous requirements given in their letters of 4 October 1991 and 15 November 1993 should also be addressed. In regard to the quarrying operation, the Department states as follows:

"Erosion and sediment control is an important environmental consideration prior to and during any activity and/or development. It is essential to minimise on-site erosion, and offsite sedimentation of adjacent properties, streams, waterbodies and the like.

A progressive erosion and sediment control program should be implemented from the initial operation state until the proposal has been completed and the site fully stabilised and/or landscaped.

Such a program should consider:

1. control of surface drainage (especially in main watercourses)

2. early revegetation of completed development areas (i.e., plant redevelopment and pit development areas)

3. the construction of Sediment Trapping Structures (e.g., sediment basins, hay bale and geo-textile fences).

This program is usually presented in the form of an Erosion and Sediment Control Plan (ESCP)."

The Department has enclosed the following data for use in the preparation of the Environmental Impact Statement.

i) Guidelines to meet Soil Conservation Service Requirements for Environmental Impact Statements - Mining - outlining specific areas that need to be addressed in the EIS

ii) Soil Conservation Guidelines for Urban Developments - outlining the components of an Erosion and Sediment Control Plan.

The former Department of Water Resources recommends the following documents be used when preparing the EIS:

a) "Amendments to the NSW Rivers and Foreshores Improvement Act";

b) "The 7-Step Method of controlling Bank Erosion and Sediment Build-up";

c) "The importance of the Riparian Zone in Water Resource Management - A Literature Review";

d) "NSW State Rivers and Estuaries Policy";

e) "Minimum Standards for Works in Rivers and Lakes"; and

f) a revised "General Requirements for Environmental Impact Statements". (This is essentially a checklist of water resources matters to be addressed in the assessment of environmental impacts).

2.4.2 Roads and Traffic Authority

The Authority request the following be considered in the application:

"(i) the proposed point(s) of access to the State Road network and the likely traffic movements per day, including tonnage, (an assessment would be sufficient) to assist in assessing the impact on the road network,

(ii) where existing intersection layout (in the vicinity of the current site) is poor, what improvements are required, or proposed, in terms of traffic safety and efficiency. Items including turning movements, street lighting, street signs and parking restrictions could be addressed,

(iii) the location for vehicle access to the site,

(iv) the likely hours of operation, number of employees and (where the number of employees may exceed 50) the possibility of developing a transport management plan to reduce the total number of car dependant journey to work trips, and

(v) on site parking arrangements, including trucks, company and employee vehicles and provision for cycle parking (or storage).

The issues raised by the RTA and Police representatives when this development was presented to the Sydney Regional Development Advisory Committee in March 1994 should also be addressed."

The Police and Roads & Traffic Authority (RTA) representatives recommended that should Council approve the application the following works should be undertaken:

"1. At the Elizabeth Drive/Adams Road intersection a left turn deceleration lane be provided for the movement from Elizabeth Drive East into Adams Road, and

2. Widening of Elizabeth Drive to provide a seagull island in Elizabeth Drive to provide a right turn bay into Adams Road with an acceleration lane for right turning vehicles out of Adams Road as the speed limit on Elizabeth Drive is 100km/hour.

3. Road shoulder widening on the left hand side of Adams Road at the intersection with Elizabeth Drive to allow left hand turn vehicles to pas right hand turning vehicles. All the above are to be carried out at no cost to the RTA.

4. Consideration should be given to imposing an indexed levy rate of three cents per payload tonne kilometre to major truck movements where appropriate for road maintenance purposes."

2.4.3 NSW Department of Mineral Resources

The Department has required the matters specified in their previous letters to be addressed in the EIS.

1. The amount of clay/shale available for extraction and the method or methods used to determine this amount (e.g. drilling).

2. Anticipated yearly production and life of the operation.

3. Characteristics of the clay/shale to be extracted, i.e. plasticity, green strength, fired colour, etc.

4. Details of any testing carried out to determine the qualities of the clay/shale.

5. Proposed uses and markets for the products.

6. Alternative sources and their availability.

7. Justification for the proposal in terms of local and, if applicable, regional context.

In regard to the rehabilitation of the proposed quarry, the Department advised that such operation should not result in undue sterilisation of valuable clay/shale resources, particularly pale-firing clay and shale.

2.4.4 Federal Airports Corporation

The Corporation has advised their comments made in their letter dated 24 November 1993 remain appropriate. The following issues in relation to Badgerys Creek Airport should be addressed in the EIS:

1. Height restrictions

   Approximately 45m above ground level for Lot 3 DP623799.

2. Pollution control

   - Air (dust and smoke pollution)
   - Water Quality flowing into Oaky Creek
   - Noise

3. Access via airport's roads to quarry to be restricted

4. Birds and wildlife populations to be controlled.

2.4.5 NSW Agriculture

The Department advised that their previous requirements apply to the new development application. The EIS should address the following issues:

Land Resources
Water & Aquatic Resources
Rehabilitation
Cumulative Impact

The letters are given in full in Appendix 3.

2.4.6 Hawkesbury-Nepean Catchment Management Trust

The Trust in the letter dated 15 June 1995, required the following matters to be addressed in the EIS's:

- water quality, surface, groundwater and in Oaky Creek
- assessment of leachate quality, treatment and disposal
- impacts on flora and fauna
- cumulative impacts
- use of scarce resources
- post management issues
- day to day management
- environmental management plan
- SREP No. 20
- Draft Codes of Practice in particular Section 5.

2.4.7 South Creek Catchment Management Committee

No reply has been received from the Committee however Ms D Tkachenko, Co-ordinator of the Committee, advised by telephone that the Committee does not have any requirements other than those advised by the Hawkesbury-Nepean Catchment Management Trust.

2.4.8 Environment Protection Authority

The Authority advised that the matters detailed in their letter of 26 November 1993 and the requirements given in their publication "Revised Draft Environmental Management Guidelines for Solid Waste Landfills" should be addressed in the EIS's.

The previous advices from the State Pollution Control Commission and the Waste Management Authority are not now relevant.

2.4.9 Department of Urban Affairs and Planning

The Director's requirements are given in the letter dated 26 June 1995, reproduced in full in Appendix 1.

An Environmental Impact Statement must accompany the development application to Liverpool City Council, shall be prepared in accordance with Clause 51 of the Regulations and bear a certificate required by Clause 50 of the Regulations. Enclosed with the letter were guidelines for extractive industries and landfill proposals.

Pursuant to Clause 52 of the Regulations the Director requires the following matters to be specifically addressed in the EIS:

- consideration of relevant matters raised in submissions to the exhibition of the previous EIS;

- consideration of relevant provisions of the following statutory planning instruments:

  - Sydney Regional Environmental Plan No. 20 - Hawkesbury-Nepean River;
  - Draft Sydney Regional Environmental Plan No. 20 (Amendment No. 2);
  - Sydney Regional Environmental Plan No. 9 - Extractive Industry;
  - Sydney Regional Environmental Plan No. 9 - Extractive Industry (Draft Amendment No. 2);

- assessment of likely impact on the proposed Badgerys Creek Airport. This should particularly address potential bird hazard;

- assessment of water quality impacts with specific reference to the impacts on Oaky Creek and Cosgroves Creek. This should include means to prevent loss of water quality to both surface waters and groundwater inflows and proposals for establishing a riparian buffer zone;

- assessment of cumulative impacts of this proposal with other quarries/landfills in the area;

- assessment of traffic and transport impacts, particularly in relation to impacts on the Northern Road and Elizabeth Drive;

- assessment of impacts of proposal on items of archaeological or heritage significance, particularly the Luddenham Public School, or the Lawsons Inn;

- results of consultation with:

  - Department of Land and Water Conservation (including Soil Conservation Service)
  - Environment Protection Authority
  - Sydney Water
  - Roads and Traffic Authority
  - NSW Health
  - NSW Agriculture
  - National Parks and Wildlife Service
  - Department of Mineral Resources
  - Federal Airport Corporation
  - Commonwealth Department of Transport and Communications
  - Hawkesbury-Nepean Catchment Management Trust
  - South Creek Catchment Management Committee

The Director also requires that Liverpool City Council be consulted and take into account any comments the Council considers may apply to its determination of the proposal.

2.4.10 NSW Department of Health

The South Western Sydney Area Health Service has replied by letter dated 10 July 1995 which is included in full in Appendix 3.

The majority of the requirements relate to the landfilling part of the operation with concerns as follows:

Health Issues - Environmental health Impact Assessment and Recycling of Treated Timber

Landfill Operations

Water Quality and Management

Air Quality and Management

Erosion Control Measures

Noise and Vibration

Miscellaneous Matters

2.4.11 Liverpool City Council

The Council has required that the matters indicated by the Department of Urban Affairs and Planning are to be addressed and the matters listed in the Statement of Issues filed in the Land and Environment Court, in respect of the discontinued appeal of the previous determination by Council on development of the subject site, should be specifically considered.

The following are the matters listed in the Statement of Issues:

1. The proximity of the subject site to Badgery's Creek Airport.

2. Inadequate erosion and sediment control measures.

3. The likely deterioration of surface and ground water quality in South Creek.

4. The likely adverse affects on water quantity, flow regime and water quality in Oaky Creek and adverse affect on end stream and riparian flora and fauna.

5. The likely adverse affects of leachate generation.

6. The inadequate buffer zones proposed.

7. The likely impact of noise generation.

8. The likely impact of:

   8.1 The emission of land fill gas.

   8.2 Dust and litter generation.

9. Inadequate fire protection measures.

10. Inadequate water supply available.

11. Inadequate measures for disposal of sewerage.

12. Inadequate and inappropriate rehabilitation of site and inappropriate final landform.

13. The likely adverse impact on:

   13.1 Surrounding residential amenity.

   13.2 Surrounding agricultural uses.

   13.3 Surrounding rural environment.

   13.4 Visual quality of the surrounding environment.

14. The application is contrary to the draft Revised Sydney Regional Environmental Plan No. 9.

15. The absence of a Fauna Impact Study.

16. Circumstances of the case.

17. The public interest.

2.4.12 NSW National Parks and Wildlife Services

The Service has replied by letter dated 3 July 1995 advising that their earlier letters on the proposal are still valid and, provided changes are not significant, the service will not have any objections to the project.

The Services' letter of 22 November 1991 in relation to the proposed clay/shale extraction required a survey for Aboriginal relics and a description of the vegetation on the site.

2.5 PROJECT TEAM

This Environmental Impact Statement was prepared by R A Cole Town Planning Pty Ltd, Environmental and Town Planning Consultants of Carlingford, New South Wales and Brink and Company Pty Ltd, Geological, Geotechnical Environmental Consultants of Tumbi Umbi, NSW.

The following Consultants were engaged to prepare specific sections of the Environmental Impact Statement and their reports are given in full in the appendices.

Transport Impact Assessment

ERM Mitchell McCotter
Level 1, 24 Falcon Street
CROWS NEST NSW 2065
Phone (02) 906-1666 Fax (02) 906-5375

Acoustical Impact Statement

ERM Mitchell McCotter
Level 1, 24 Falcon Street
CROWS NEST NSW 2065
Phone (02) 906-1666 Fax (02) 906-5375

Archeological Survey

Pam Dean-Jones
137 Skye Point Road, Coal Point, 2283
Phone (049) 59-2630

Landscaping Report

Stevens Wallman and Associates
34 Jersey Road, Woollahra NSW 2025
Phone (02) 363-2060 Fax (02) 363-2725

Section 3

Justification for the

Proposed Development

3.0 JUSTIFICATION FOR THE PROPOSED DEVELOPMENT

3.1 ECONOMIC CONSIDERATIONS

3.1.1 Existing Markets

Light firing clays and shales are in short supply in the Sydney metropolitan region and therefore all current and future brick manufacturers within a radius of about 100 km may be considered potential consumers. However, realistically the Luddenham clay and shale consumers would be mainly those manufacturers located in the western Sydney region. At this time, the potential consumer for the bulk of the material is the P G H operated plant at Cecil Park.

Indications are that this plant would consume a maximum of 350,000 tonnes annually of light firing materials from the Luddenham resource.

3.1.2 Future Markets

Future demand for cream firing raw materials is difficult to predict, as changing fashions and manufacturing processes affect consumption of specific types of materials. However, a steady demand for light coloured bricks has been evident for many years and there are no apparent indications for diminishing future demand. Therefore, regular consumption of a diminishing supply of light firing clay and shale is bound to result in increased demand on existing resource areas. Hence, the Luddenham resource is expected to be subjected to gradually increasing demands that may reach a million tonnes annually.

However, it is considered prudent to link extraction rates to rehabilitation and final land use capabilities and therefore an annual production of 350,000 tonnes of raw materials from the Luddenham site is adopted for the purposes of this Statement.

3.1.3 Site Importance

The lack of commercial availability of light firing raw materials is a recognised limiting factor in the production and consumption of light coloured bricks. All known manufacturers are involved in a constant search for suitable resources, aided by significant efforts from the Department of Mineral Resources & Energy.

The Luddenham resource contains a considerable volume of light firing raw materials that can be extracted economically. The site is within commercial range of a number of brickmaking plants, several of which are indicated consumers. Hence, the site is of significant economic importance to the brick manufacturing industry and therefore to the community generally.

The Luddenham resource lies within the R.E.P. 9 (Extractive Industry) (Schedule 1, Division 2) and is specifically identified in the D.R.E.P. 9(2) - Extractive Industry (Schedule 1, Division 1) as being of regional significance. These documents aim to facilitate the development of extractive resources in the proximity of the Sydney Metropolitan area.

3.2 SOCIAL CONSIDERATIONS

The establishment of the clay/shale quarry at Luddenham will have a beneficial impact on the employment opportunities in this part of Western Sydney. The proposal will not have any detrimental impact on population growth and population structure in the area and it is expected the existing pattern will continue.

The proposal will provide 5 direct employment opportunities and indirectly it will provide employment for support services as follows:-

Truck drivers
Maintenance and servicing personnel
Business Services
Retail Premises
Equipment Suppliers
Fuel Suppliers

The proposed quarry and its overall operation will provide a beneficial impact on the local community base.

3.3 ENVIRONMENTAL CONSIDERATIONS

The environmental matters detailed by the Department of Urban Affairs and Planning, Liverpool City Council and other Government Departments and authorities have been dealt with in this Statement. The issues required to be addressed under the Environmental Planning and Assessment Act, 1979, and Regulation, 1994 have also been addressed.

The environmental and pollution control measures proposed for this extractive industry will ensure that air quality, noise, visual and water qualities are protected and that any adverse impact on the site will be minimal and within acceptable limits.

Any adverse environmental impact on the natural and man-made environments by the proposed development will be mitigated by the management procedures detailed in the Statement.

Section 4

Description of the Existing Environment

R. A. Cole Town Planning Pty. Ltd.

Brink & Co. Pty. Ltd.

4.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 THE SITE AND EXISTING DEVELOPMENT

The subject site is known as lot 3 in DP623799 and is located on the eastern side of Adams Road, approximately 250m south of Elizabeth Drive, Luddenham.

The lot is hatchet shaped and has a frontage of 13.325m to Adams Road. The access way is 138.145m long and the western bank of Oaky Creek forms the eastern boundary of the site.

The total site area is 19.09ha and is freehold being owned by L W Harpley Snr, L W Harpley Jnr and G R Harpley.

An extract from DP623799 is enclosed as Figure 4.1.

There are two main buildings on the land, a dwelling and produce store with stables. The site has been used for approximately 20 years for horse training and agistment and the produce store has been operating approximately 17 years.

In general terms, the southern part of the site contains fenced yards and shelters, the northern part is used for grazing and there is a trotting track with central horse swimming dam on the south eastern part of the site.

The produce store and stables building contain 5 stables, a lunch room, office and toilet with 2 grain silos on the western side containing oats and barley.

The produce store sells the following bagged goods:-

maize
rolled oats
rolled barley
prepared horse feeds
oaten chaff
lucern chaff
limestone
crushed salt
molasses
wheat
corn
laying pellets
horse pellets

Bales of lucern, hay, oats and clover hay are also stored and sold from the site.

The existing dwelling currently provides a home for 3 persons and the produce store, stables and horse agistment employs 2 permanent staff with casual staff being engaged as required from time to time.

Employees' vehicles are parked in front of the produce store and stables building.

Traffic generated by the existing development involves approximately 10 deliveries to the site per week, half of which are semi-trailers. Other traffic movements are horse floats, approximately 7 per week, employee vehicles and customer vehicles, both cars and trucks.

4.2 ENVIRONS

A land use survey was undertaken on 9 June 1995. Figure 4.2 shows the results of the survey in general terms.

The majority of the surrounding lands are used for grazing purposes with many properties containing horse training tracks and fenced yards.

The rural property to the east, "Mountain View", undertakes tipper truck hire.

Lot 2 DP 623799 adjoining the subject site on part of the western side is now being developed for use as a rifle club and the construction of the Hubertus Country Club has commenced.

The lots to the east and south are part of the proposed Badgerys Creek Second Sydney Airport and have been purchased by the Airport Authority, see later Section 4.17.

The closest residential area to the site is the Village of Luddenham, at the western end of Adams Road, approximately 2.3km in a direct line from the site.

This Village contains approximately 120 dwellings, 2 service stations, shops, roadside stalls, churches, open space areas, transport depot, primary school, post office, bush fire shed and public hall.

4.3 TOPOGRAPHY

Figure 4.3 shows the contours and slope of the land, the results of the survey of the site.

The access handle off Adams Road falls to Adams Road but the remainder of the site falls to Oaky Creek, being the eastern boundary of the site. There are several dams on the site and one large dam which straddles the boundaries between lot 281 to the north and lot 1 to the east.

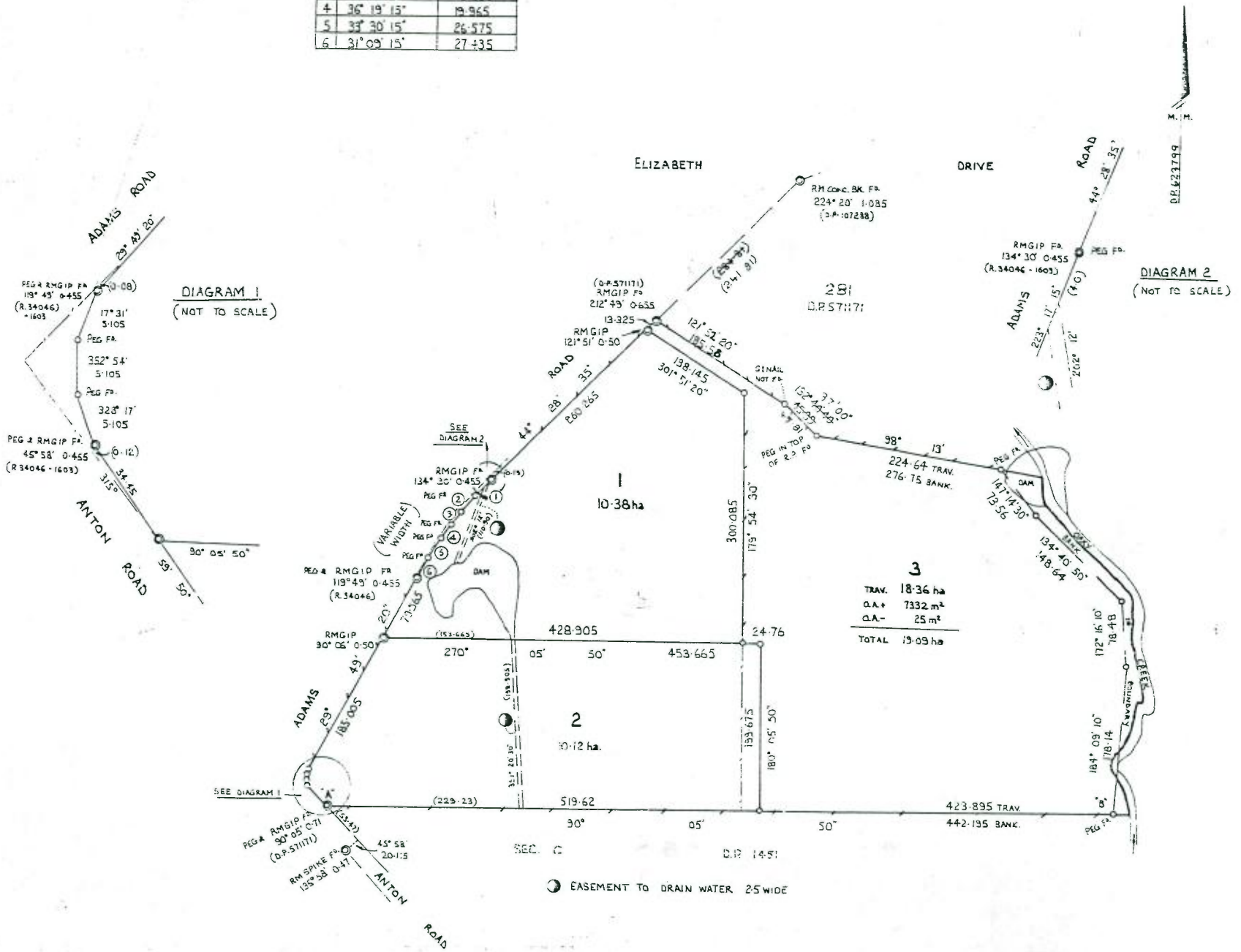
4.4 GEOLOGY

4.4.1 Regional Geology

The Luddenham area lies within the central part of the Sydney sedimentary basin. This basin is a large depression that began to form in early Permian times and gradually filled with a variety of sedimentary strata, including a thick sequence of coal measures. The Hawkesbury Sandstone is a widespread and continuous sheet of sandstone that was deposited in Triassic Times. This originally horizontal expanse of sandy sediments continued to form a shallow central depression which filled with

Plan Drawing only to appear in this [redacted] OFFICE [redacted] ONLY

SCHEDULE OF BOUNDARIES		
No	BEARING	DISTANCE
1	43° 17' 15"	27·435
2	40° 46' 15"	26·575
3	38° 06' 15"	19·965
4	36° 19' 15"	19·965
5	33° 30' 15"	26·575
6	31° 09' 15"	27·435



R. A. COLE TOWN PLANNING PTY. LTD.

D.P.623799

Registered: 7-6-1982

C.A.: 14 OF 22-2-1982

Title System: TORRENS

Purpose: SUBDIVISION

Ref. Map: U7345-1#

Last Plan: D.P. 571171

PLAN OF SUBDIVISION OF LOT 282 IN DP571171

~~Reduction Ratio 1: 1000~~
Lengths are in metres.

~~Mun./Shire~~ City: LIVERPOOL

Locality: LUDDENHAM

Parish: BRINGELLY

County: CUMBERLAND

~~This is sheet 1 of my plan in sheets.~~
(Delete if inapplicable).

I, Barry Anthony Homann
B.A. Homann & Associates Pty. Ltd.
of P.O. Box 183, Liverpool 2170 (O.S.011)
a surveyor registered under the Surveyors Act, 1929, as amended, hereby certify that the survey represented in this plan
is accurate and has been made *~~(1) by me~~ (2) under my immediate supervision in accordance with the Surveyors Practice Regulations, 1933, and was completed on the
28th October 1981

Signature

*Surveyor registered under Surveyors Act, 1929, as amended.
Datum Line of Azimuth 'A' - 'B'
*Strike out either (1) or (2). #Insert date of survey.

Panel for use only for statements of intention to dedicate public roads or to create public reserves, drainage reserves, easements or restrictions as to user.

PURSUANT TO SECTION 88B OF THE CONVEYANCING ACT 1919-1964 IT IS INTENDED TO CREATE:-

1. EASEMENT TO DRAIN WATER 2·5 WIDE
2. RESTRICTION AS TO USER

Figure 4.1
AS SET-OUT IN THE ACCOMPANYING INSTRUMENT SIGNED BY COUNCIL CLERK.

EXTRACT D.P. 623799

ELIZABETH

PENRITH

Vested in the Commonwealth Council for Scientific and Industrial Research

Gaz. 14/7/1938

Gaz. 10/12/1936

COSGROVES

CREEK

LUDDENHAM RD.

M.R. 535

PT. 27

Transmission Easement

ADAMS RD.

Rifle Club

JACKSON RD.

CLOSED ROAD 4.8 D.P. 40076 G.G. Nº 19 OF 1-2-1980

OAKY CREEK

FERNDALE

Scale: 1:8000

R. A. COLE TOWN PLANNING PTY. LTD.

Dwelling
Poultry Farm
Grazing
Crops

Figure 4.2
LAND USE PLAN

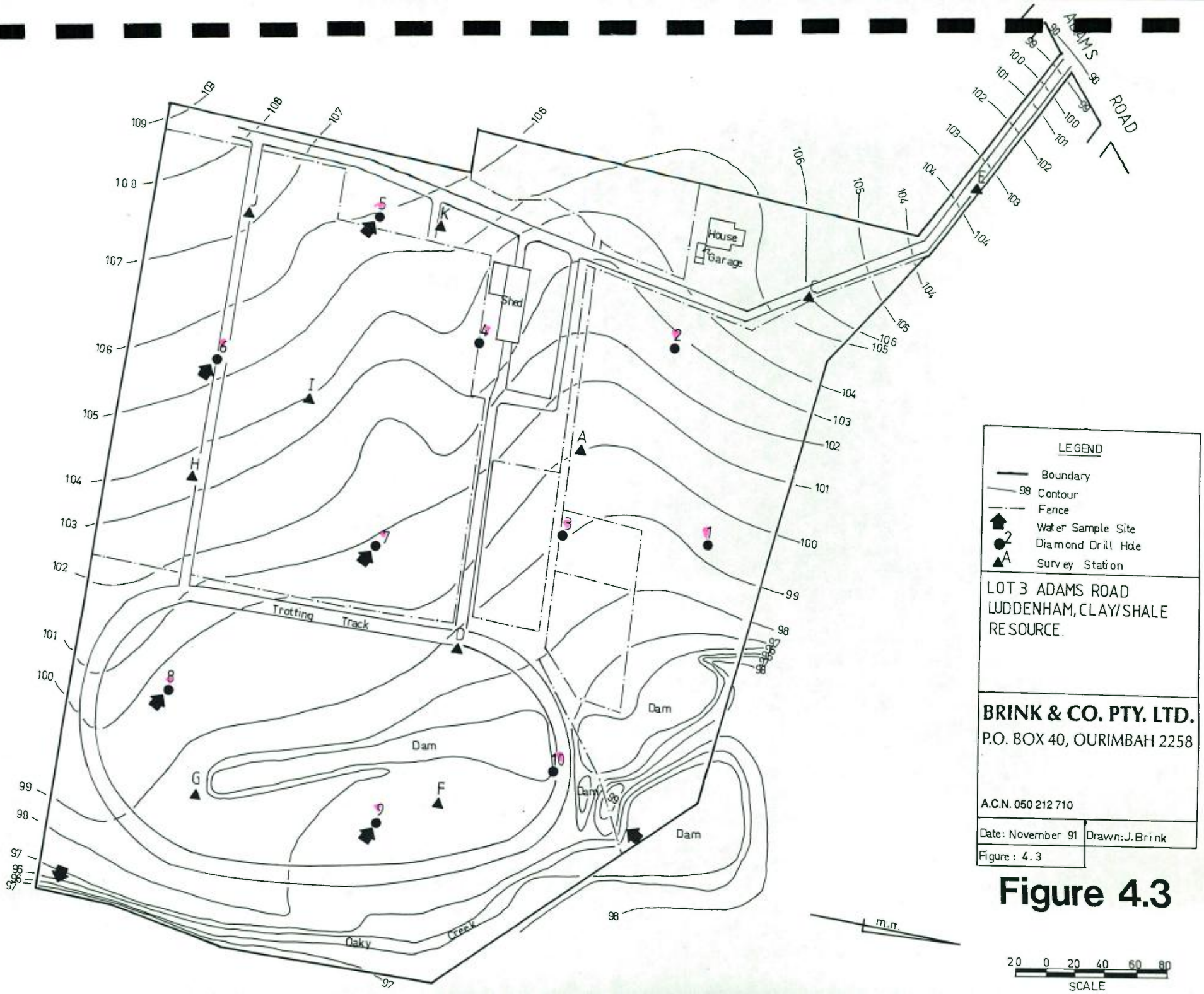

ADAMS ROAD
House
Garage
Shed
Trotting Track
Dam
Dam
Dam
Oaky Creek
m.n.
LEGEND
Boundary
98 Contour
Fence
Water Sample Site
2 Diamond Drill Hole
A Survey Station
LOT 3 ADAMS ROAD
LUDDENHAM, CLAY/SHALE
RESOURCE.
BRINK & CO. PTY. LTD.
P.O. BOX 40, OURIMBAH 2258
A.C.N. 050 212 710
Date: November 91
Drawn: J. Brink
Figure : 4.3
20 0 20 40 60 80
SCALE

Figure 4.3

mainly fine grained sediments forming a series of shaly and silty strata named the Wianamatta Group; it includes the Ashfield Shales and Bringelly Shale.

The Bringelly Shale is the uppermost layer of mainly fine grained and clayey sedimentary strata and attains a total thickness of some 250m (Herbert, 1979). Although difficult to extract from the available literature, the base of the Bringelly Shale at the investigation site is estimated to lie at approximately 30 metres above sea level. This means that the sequence underlying the site lies within the lower 50 metres of the Bringelly Shale. According to some interpretations this zone would have a low potential for brick-making materials, while more recent work by the D.M.E. geologists indicates an irregular distribution of potential resource sequences within the Bringelly Shale. Nonetheless, even the most recent drilling by the D.M.E. indicated a large proportion of sandy and silty bands within the shales and claystone.

4.4.2 Site Geological Evaluation

A preliminary site inspection early in 1991 resulted in the opinion that the subject area was likely to contain light firing clay/shales reserves, as well as reserves of dark firing clay/shales. This was followed by a literature survey and study of geological and topographical maps and aerial photographs.

Three fully cored holes were drilled in February 1991 to a maximum depth of almost 20 metres. The resulting cores were lithologically logged, split and sampled into extractable intervals and the samples were presented to various brick manufacturers for evaluation. Although their method of evaluation was not as anticipated, the response was sufficiently encouraging to drill a fourth hole in April 1991. This hole was drilled to a depth of 27.0 metres. Its core was split, half of it fired in a tunnel kiln at Zacuba and then returned to the boxes for comparison with the raw core.

A large percentage of the core was found to have light firing qualities and consequently an application for a mining lease was lodged, covering the entire area of the subject land, Lot 3 DP 623799 in the Parish of Bringelly.

In order to fully evaluate the potential clay/shale resource a further six fully cored holes were drilled in October 1991. All resulting core was again split and half of the cores were fired in the Zacuba tunnel kiln. After firing the fired core was returned to the boxes, described, photographed and recorded on the drill hole logs.

During progress of the drilling programme the entire property was surveyed topographically to produce an accurate plan showing pertinent surface features, contours and the precise location of all the drill holes. Plans and sections were produced showing the geological interpretation and evaluation of the subject area (Figure 4.3).

Finally, economic reserves were calculated, taking into account limiting factors that apply to mining generally and the subject area specifically.

4.4.3 Site Geology

The surface of the site area lies approximately 80m above sea level and from reports prepared by the N.S.W. Geological Survey it was deduced that Wianamatta Group sedimentary strata below the site are about 120m thick. As the combined thickness of the Ashfield Shale and Minchinbury Sandstone is some 60 metres, the Bringelly Shale is about 60 metres thick. Hence, drilling associated with this investigation did not penetrate the lower 30 metres of Bringelly Shale; drilling was generally discontinued when the core indicated increasingly coarse and hard strata.

The strata intersected in the ten fully cored holes consists of interbedded and interbanded arenaceous and argillaceous shales, carbonaceous claystones, siltstones and sandstones. Lithological boundaries between the various litho types are usually diffuse and gradational, except in the case of the sandstone, which generally occurs in distinct bands with sharply defined upper and lower boundaries. Shales, claystones and siltstones may grade into each other in thin repetitious bands forming laminates or may form layers several metres thick.

Logging of the cores took into account not only the lithological differences but also the perceived minimum practical thicknesses of layers that can be selectively removed. Thus, it is often possible to separately remove a hard 0.2m thick sandstone band from between over and underlying shales or claystones, but the removal of a similar thickness of siltstones from between marginally softer shales may prove very difficult indeed.

The strata within the subject area have a near-horizontal attitude and are covered by a weathered profile of varying thickness and composition. For example, the south-western part of the area (DDH 5) is capped by a sandstone bed of several metres thickness. Its weathered profile is relatively thin and consists of mainly silty to sandy clay containing numerous laterite nodules in the upper section. In contrast, the eastern part (DDH 8, 9, 10) is devoid of the sandstone cap and its upper part consists of a relatively thick plastic, slightly silty clay. The flat topography and proximity of the creek also would have an effect on the development of the thicker weathered profile of the eastern part of the land.

Graphic sections are shown on the logs of the several holes and it is obvious that claystone/shale is the predominant lithotype, followed by siltstone/shale and clay with sandstone forming only a minor proportion. No sandstone was intersected in DDH 7, indicating its discontinuous, lenticular nature.

4.4.4 Reserves

Reserves calculations were based on the following parameters:

* total surface area of 190,000m^2
* extraction base level R.L. = 74m
* boundary buffer zones - 20m wide along fences, 30m from creek bank along eastern boundary
* batters and benches - 30° batter in clay, 70° in shale etc.
* average estimated bulk density of 2 tonnes/m^3.

Basically three categories of material are considered:

* topsoil - 0.4m thick
* clay and extremely weathered shale - 4.0m thick
* claystone, shale, siltstone, sandstone - 24m thick.

Calculated reserves are:

topsoil	- 60,000 m^3 (100,000 t)
clay	- 600,000 m^3 (1,200,000 t)
claystone, shale, siltstone, sandstone	- 3,000,000 m^3 (6,000,000 t)

4.4.5 Quality

4.4.5.1 Top Soil

The topsoil is generally a silty, clayey loam, capable of supporting vigorous vegetation growth. It is to be stockpiled in peripheral bund walls and on the site to be used at a later stage in rehabilitation of depleted and reclaimed extraction areas.

4.4.5.2 Clay

The surficial profile of clay and extremely weathered shale and claystone varies in thickness, but on average is approximately 4 metres thick. The quality of the clay varies in colour, plasticity and lateritic/limonitic nodule content. The several types of clay can be classified during extraction and stockpiled according to specific end uses. However, it is anticipated that the general use for the clays will be as bonding agents in dark firing brick mixtures.

4.4.5.3 Claystone, Shale, Siltstone, Sandstone

The four lithological components of this category have been logged on the bases of extractable thicknesses. Although it is recognised that thin beds of hard sandstone can be extracted and stockpiled separately, the lenticular nature of such hard bands will prevent complete separation. Hence, some small pieces of hard material are expected to contaminate the softer claystone and shale stockpiles. However, properly trained and interested plant operators, together with careful planning and sensitive supervision, should maintain such contamination at an almost insignificant level.

The emphasis in quality control will be on the production of light firing raw materials. Generally, the carbonaceous claystones and shales tend to be light firing, while the harder shales and siltstones tend to fire into darker colours.

Sandstones and hard, indurated siltstones are of no use in the brickmaking industry, but it is likely that it can be used in the region's construction industry as road and land fill.

Table 4/1 shows the combined thicknesses of the several categories of material for each drill hole.

Table 4/1 Material Thicknesses(%)

Drill Hole No.	Clay	Claystone/Shale	Siltstone	Sandstone
1	7.9	86.5	5.6	-
2	13.8	64.5	20.6	1.0
3	26.6	71.7	1.7	-
4	8.0	79.8	6.4	5.1
5	5.6	59.9	28.7	5.8
6	14.3	75.5	5.7	4.4
7	8.8	57.5	31.0	2.8
8	13.2	62.9	19.5	4.5
9	18.5	56.7	23.8	1.0
10	16.9	60.3	20.9	1.9
Mean Values:	13.4	67.5	16.4	1.9

It is anticipated that about half the siltstone will be included with the dark firing shale and the remainder with the sandstone. More precise delineations of fired colour materials can be made when all the cores have been fired in a tunnel kiln at appropriate temperatures. However, preliminary results indicate that at least 50% of the available reserves will be light firing. Hence, an estimate of reserves of the various materials is as shown in Table 4/2.

Table 4/2 Estimated Reserves

Top Soil	60,000 m^3 = 100,000 t
Plastic Clay	600,000 m^3 = 1,200,000 t
Light firing claystone/shale	1,800,000 m^3 = 3,600,000 t
Dark firing claystone/shale	1,000,000 m^3 = 2,000,000 t
Sandstone (construction)	200,000 m^3 = 400,000 t

4.5 SOILS

For the purpose of this study the soils on the subject land are defined as the dark topsoils or the A horizon of the weathered profile.

Topsoils intersected in the drill holes and observed in numerous exposures consist of fine grained silty, clayey loams, generally rich in lateritic nodules, as well as haematite. These soils are generally hard setting, brown to dark grey, and usually about 0.3m thick. They grade into stiff sandy clays which gradually change to recognisable weathered strata.

4.6 SOIL EROSION

4.6.1 Existing Erosion

Although a significant part of the surface area is in a denuded state, caused by overgrazing and trampling in the horse yards, only limited shallow surficial erosion is evident. The creek along the eastern boundary consists of a series of disconnected channels and depressions which are in a relatively stable and stationary position. The edges of the dams on the north-eastern part again show no sign of undue erosion or disintegration.

4.6.2 Erodability and Erosion Hazards

As is evident from the previous section the soils on the subject land are not prone to erosion. In fact, they are quite resistant to degradation by water and wind, owing to the relatively high clay content and the presence of haematite and laterite nodules. When the soils are protected with a cover of grass vegetation they are virtually immune to erosion, especially in this low relief topographic setting.

Potential erosion hazards during the proposed extractive operations may be created by

a. earthmoving equipment forming wheel ruts
b. concentrated water flows along the base of the peripheral bund walls.

Earthmoving equipment will be confined entirely within the areas bounded by the bund walls and therefore cannot affect the surrounding land. The only sensitive phases of the operation will be during the construction of the bund walls and their eventual dismantling and spreading as a final soil cover.

Rapid construction together with immediate seeding are important factors in preventing erosion of the bund walls.

4.7 HYDROLOGY

4.7.1 Surface Drainage and Run-off

Fig. 4.4 is a reproduction of a plan prepared by the Federal Airports Corporation as part of the Badgerys Creek airport study. It shows the location of the subject land in

relation to the catchment area of Oaky Creek. It is clear that all run-off from the property runs into Oaky Creek without affecting any adjacent land. The only adjacent land with some run-off onto the subject land is a limited area near the south-west corner. This gently sloping area would tend to shed run-off against the western part of the southern boundary.

4.7.2 Flooding

The eastern part of the subject land is known to be subject to rare inundation caused by prolonged heavy rain falls. However during twenty years of observation floodwaters have never risen to the level of the trotting track. Hence, only a narrow strip along the creek and a small area near the south-east corner are affected.

The large dam on the north-east corner overflows into the much larger dam on the adjacent land and this in turn discharges into Oaky Creek.

4.7.3 Ground Water

Ground water was intersected in the ten bore holes at relatively shallow depths below the surface. In most holes depth to the water table is between three and five metres, but exceptions are DDH 8 and DDH 10 which are on low, level ground in close proximity to a free standing water surface, approximately 1.5m above the level of the large dam in the north-east corner. Repeated checks revealed minor fluctuations in the water table only.

After evacuating the holes the water flow was estimated at about 0.1 l/sec, except in DDH 7 where the flow exceeded 0.5 l/sec. Such differences are attributed to differences in lithology and the high rate of flow is likely to be over a limited time only, before the lenticular aquifer is exhausted.

Virtually no change in the level of the dams was observed during the year.

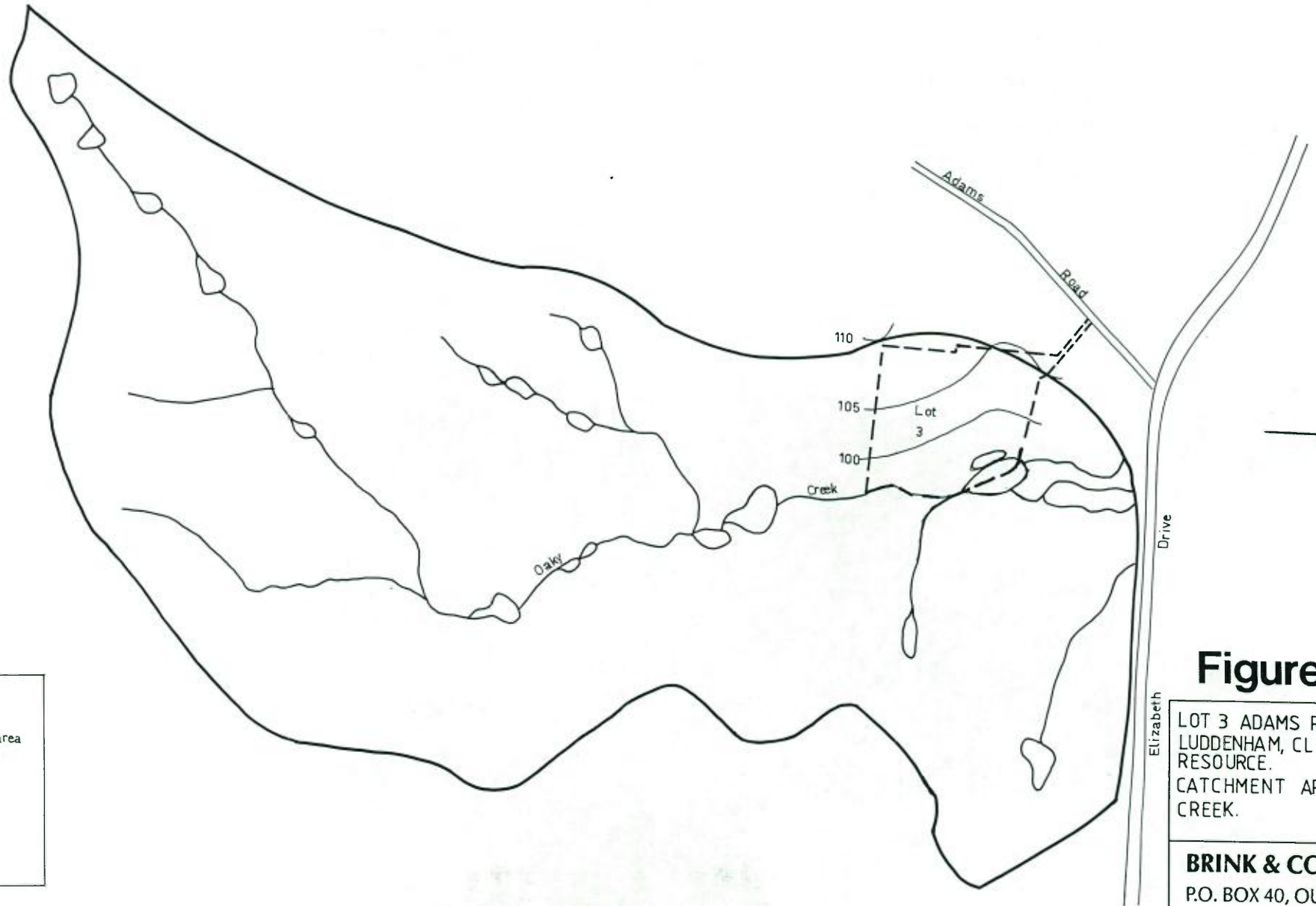
4.8 WATER QUALITY

Water samples were obtained from drill holes, the dam and the creek. The samples were delivered to the Australian Government Analytical Laboratories to undergo a suite of analyses.

Before sampling the water from the drill holes they were evacuated by blowing high pressure air into the bottom. The holes were then given several days to reach equilibrium water levels and then samples were taken from about 10 metres below the surface. This ensured representative samples of ground water that is likely to affect the proposed extractive operations. Water sampling sites are shown on Fig. 4.3.

Generally the sampled water was noted to have a brackish taste.

Water sample locations include drill holes DDH 5, 6, 7, 8 and 9 as well as the creek at the south-east corner and where it enters the large dam near the north-east corner.



LEGEND

Boundary - catchment area

Boundary - lot 3

Contour

Figure : 4.4
Date : Nov 91

- 250 0 250m
Scale.

Figure 4.4

LOT 3 ADAMS ROAD
LUDDENHAM, CLAY/SHALE
RESOURCE.
CATCHMENT AREA, OAKY
CREEK.

BRINK & CO. PTY. LTD
P.O. BOX 40, OURIMBAH 225

A.C.N. 050 212 710

Results of the laboratory analysis are shown in Table 4.8.1 together with analysis results of five samples taken from Hawkesbury Sandstone terrain near Gosford in 1990. The differences are immediately obvious, for example:

	Luddenham Water	Hawkesbury Sst. Water
pH	neutral to alkaline	neutral to acidic
Chloride	very high	very low
Conductivity	very high	very low
Hardness	very high	very low
Dissolved Solids	very high	very low

These differences show that the Luddenham ground water is of poor quality, probably too "salty" to use for agricultural purposes, while the Hawkesbury Sandstone is of "mineral water" quality. It is of interest to note that the sample from the dam is of much better quality than that from the creek and the bore holes; it may be useful to investigate the cause for this "purification".

4.9 METEOROLOGY

4.9.1 Source of Data

Temperature, rainfall, humidity, wind, inversions and fogs data have been drawn from records given in the Department of Science and the Environment, Bureau of Meteorology publication "Climatic Survey Sydney Region 5 New South Wales" for stations at Badgerys Creek, Bringelly, Liverpool and Campbelltown.

4.9.2 Temperature

Table 4.9 gives the average maximum and minimum daily temperatures as recorded at Badgerys Creek, east of the site, February is the warmest month and July is the coldest. The annual mean maximum and minimum temperatures are 23.0°C and 10.5°C respectively.

4.9.3 Rainfall

Table 4.9 also shows average monthly rainfall and the average number of rainy days. Average rainfall ranges from 80mm in January to 42mm in August. The average annual rainfall is 760mm which falls on an average of 82 days each year.

4.9.4 Humidity

Table 4.9 also details the average monthly relative humidity at 9.00am and 3.00pm. The yearly average at 9.00am is 72% while at 3.00pm it is 52%.

Table 4.8.1 - Water Analysis (A.G.A. Laboratories)

	Luddenham (1991)							Hawkesbury Sandstone (1990)				
Sample nos.	Creek	Dam	DDH5	DDH6	DDH7	DDH8	DDH9	A	B	C	D	E
Alkalinity	27	39	1000	660	830	600	520	3.3	0	2.2	5.4	13.0
Chloride	3600	165	8800	7300	12000	12000	8000	12.8	8.5	9.6	18.1	18.1
Colour	25	17.5	1	10	0	1	1	1	5	50	8	35
Conductivity μS/cm	12000	610	28000	22000	35000	28000	24000	78	145	50	93	100
Fluoride	<0.02	<0.02	<0.02	<0.02	0.6	0.12	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1
Hardness (Ca)	12	14	680	200	640	0	220	7.9	38.7	0	7.0	9.0
Hardness (Mg)	1300	67	4100	3800	6300	4400	3600	18.9	14.0	7.9	14.9	14.9
Hardness (Total)	1400	80	4800	3900	7000	4400	3800	26.8	52.7	7.9	21.9	24.8
Nitrate as N	0.04	0.22	0.28	1.1	0.37	0.35	<0.05	0.1	0.6	1.0	0.6	1.4
pH	6.5	6.6	7.1	7.8	7.0	7.8	7.0	6.2	5.0	5.0	6.0	5.6
Phosphate as PO_4	<0.02	<0.7	0.18	0.15	0.07	<0.02	0.35	0.36	0.18	0.63	0.09	2.16
Total Dissolved Solids	7700	390	18000	14000	22000	18000	16000	50	93	32	60	64
Turbidity NTU	1.4	0.42	1.2	16	3.5	1.4	1.4	1.8	40	98	16	40

Results in milligram/litre unless otherwise stated

Hardness and alkalinity expressed as $CaCo_3$

Methods: APHA 16th Edition

4.9.5 Wind

Table 4.10 details the predominant wind directions as recorded at Campbelltown, the closest recording station to the site. The percentage of calm days at 9.00am and 3.00pm is also given in this Table.

South east and north east winds are the predominant winds in the summer months, while in winter months, the south west wind is predominant.

4.9.6 Inversions

An inversion layer occurs during the night and early morning periods due to cold air movement, in the Cumberland Basin. This inversion layer is identified by a brown photochemical smog and is most common between mid autumns and mid spring seasons.

The duration of the inversion layer depends on the prevailing winds and to the heat effect into the layer in the early morning. The dissipation of the inversion is also dependant upon cloud cover and they are usually dispersed in this area by mid morning.

4.9.7 Fogs

Table 4.9 also shows fog frequency, days per month, at Badgerys Creek. There are no recorded instances of fogs in January, February and November.

4.9.8 Microclimate

The microclimate of the area is temperate with warm to hot summers and cold to mild winters. Rainfall is relatively low on an average annual basis and on this basis less than 8 rainy days per month. Fogs are infrequent and the humidity is not high.

4.10 AIR QUALITY

The Environment Protection Authority does not conduct any monitoring of air quality in the vicinity of the site and an air quality analysis has not been undertaken as part of the Environmental Impact Statement.

The applicants/owners have no records in respect of ambient air quality or dust deposition.

However, observations at the site indicate there are no significant sources of dust, although some dust does rise in dry times from horse training tracks around the area. Air quality on the site and in the vicinity of the site is good.

TABLE 4.9 - MICRO-CLIMATE

ITEM	J	F	M	A	M	J	J	A	S	O	N	D	YEARLY AVERAGE
TEMPERATURE °C (Badgerys Creek)													
Average Maximum	28.0	28.5	26.4	24.4	19.5	17.5	17.3	18.4	20.1	23.2	27.1	27.1	23.0
Average Minimum	16.9	16.9	14.6	11.2	6.9	5.9	2.6	5.3	6.6	11.0	12.7	14.9	10.5
RAINFALL mm (Bringelly)													AVERAGE YEARLY TOTAL
Average	80	79	79	69	64	65	51	42	46	54	65	66	760
Rain Days (Average)	8	8	8	7	6	6	5	6	7	7	7	7	82
HUMIDITY (Liverpool)													YEARLY AVERAGE
Average Relative Humidity %													
9.00am	67	71	74	75	78	83	79	74	67	62	62	66	72
3.00pm	56	58	57	50	54	56	48	47	46	47	51	54	52
FOGS (Badgerys Creek)													YEARLY AVERAGE
Average	-	-	1.4	1.0	1.0	2.8	2.4	0.6	0.6	1.4	-	0.6	11.8
Highest	-	-	7	3	4	5	5	2	3	4	-	3	22

TABLE 4.10 - WINDS
(Campbelltown)

	Predominant Wind Direction & Percentage				Calm %	
	9.00am		3.00pm		9.00am	3.00pm
January	South-east	15	North-east	26	24	7
February	South-east	13	North-east	26	36	6
March	South-east	14	South-east	25	34	9
April	South-west	20	South-east	18	37	17
May	South-west	20	South-west	16	41	20
June	South	22	South-west	18	35	22
July	South-west	21	South-west	21	39	19
August	South-west	19	West	15	38	20
September	South-west	14	South-east	18	31	9
October	South-west	18	South-east	19	24	9
November	North-west	13	South-east	23	25	6
December	North-east, South-east, North-west	11 each	North-east	25	28	5

4.11 VEGETATION AND FAUNA

4.11.1 Vegetation

The site slopes gently from the top of a hill on the western boundary down to Oaky Creek which defines the eastern boundary.

Approximately one third of the site is occupied by horse yards, stables, sheds and the cleared trotting track.

The grades range between 1:20 and 1:40 slope with the exception of the trotting track area which is generally flat except for a centrally located dam.

Existing vegetation consists of:

1. Grassland of improved pasture and weed growth.

2. Indigenous vegetation consists of small groves of Eucalyptus moluccana (Grey Box) near the existing house and Casuarina cunninghamiana in the stockyards with a dense buffer of the latter either side of the creek. Remnant and occasional on-site examples of trees associated with E. moluccana are E. paniculata and E. tereticornis.

The plant communities are shown on Figure 4.11 which identifies the existing vegetation to functional areas on the site. These areas and the list of plant species are as follows:-

Area 1 - Stockyards

Casuarina cunninghamiana (grove in stock yards)
Eucalyptus moluccana (grove near house)
Grevillea robusta (occasional specimens)

Area 2 - Trotting Track & Dam

Casuarina cunninghamiana (few and poor specimens)
Acacia parramattensis (few in number)
Eucalyptus paniculata (one only)
Juncus bufonius (dam surrounds)

Area 3 - Creek

Casuarina cunninghamiana (dense screen 20 to 30 metres wide. Trees at 1.5 to 2.0 metre centres)
Eucalyptus tereticornis (2 specimens only)

A former association with Melaleuca linariifolia is evident but this species has died.

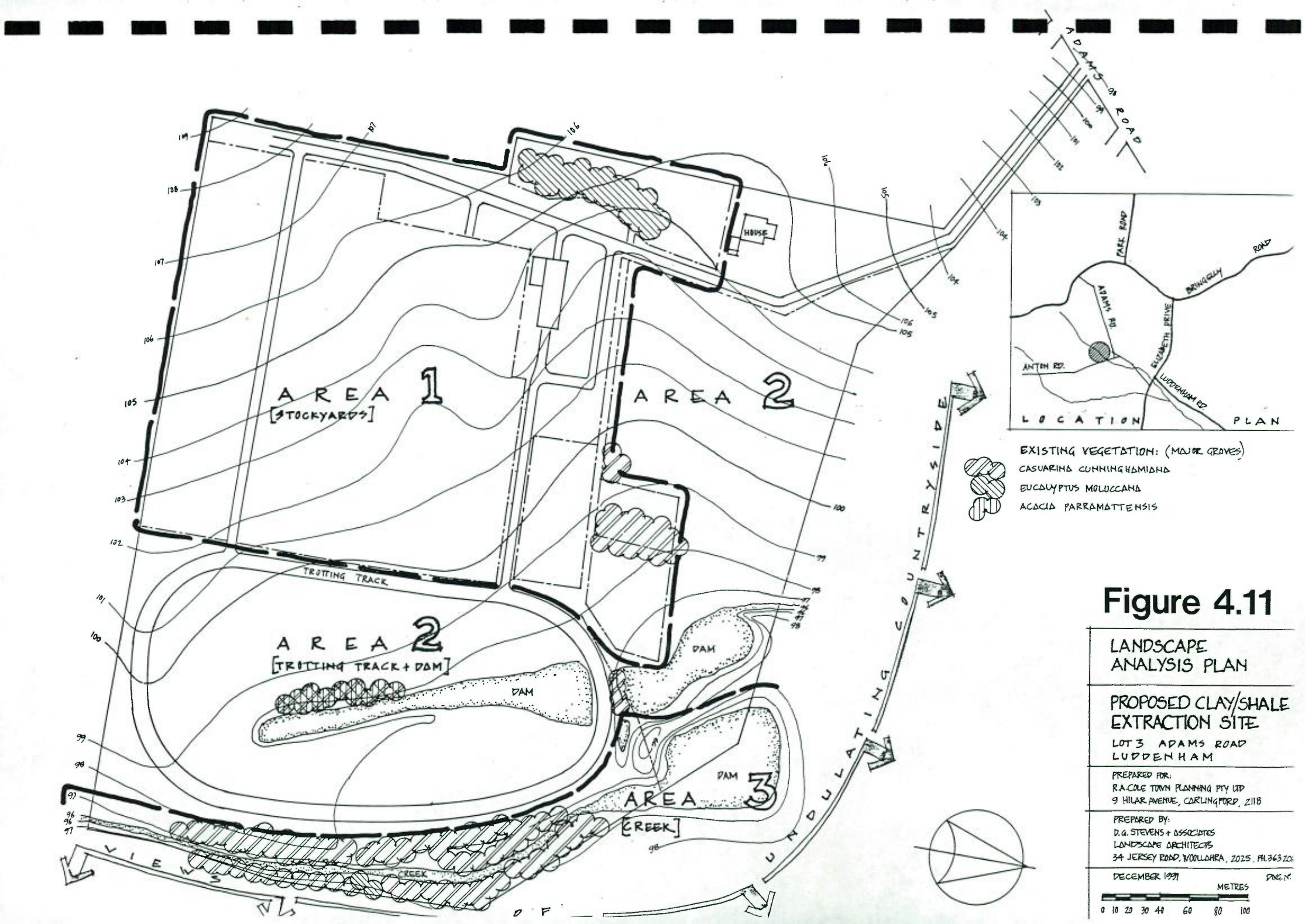


Figure 4.11

LANDSCAPE ANALYSIS PLAN

PROPOSED CLAY/SHALE EXTRACTION SITE

LOT 3 ADAMS ROAD
LUDDENHAM

PREPARED FOR:
R.A.COLE TOWN PLANNING PTY LTD
9 HILAR AVENUE, CARLINGFORD, 2118

PREPARED BY:
D.G. STEVENS + ASSOCIATES
LANDSCAPE ARCHITECTS
34 JERSEY ROAD, WOOLLAHRA, 2025. PH. 363 206

DECEMBER 1991 DWG. N°

METRES
0 10 20 30 40 60 80 100

- Dam

Absence of Casuarina with aquatic plants only including:

Juncus acutus
Juncus bufonius
Paspalum paspalodes
Triglochin procerum
Typha orientalis

The entire Landscape Report is contained in Appendix 5.

4.11.2 Fauna

Only a small area of vegetation exists along the creek with the remainder of the surrounding lands being used generally for grazing purposes. This vegetation and the cleared nature of the site provides limited habitat for native fauna and no identification survey was considered necessary.

The owners have stated that fauna in the area is restricted to foxes, rabbits, snakes, feral dogs and cats, introduced bird life and only the occasional grass parrot and rosellas.

In view of the disturbed nature of the site, a fauna study was not considered necessary and no impact is likely on the habitat of any endangered fauna.

The retention of the creek and lineal open space areas along South Creek and its tributaries will maintain a continuous branching region of floodplain habitat for fauna.

4.12 BUSHFIRE HAZARD

The Fire Control Officer of Liverpool City Council advised that the site was in an area where grass fires occur from time to time, often lit by the burning out of stolen cars. The Council does not have any records of past fires or maps indicating the directional paths or extent.

The Department of Bush Fire Services has produced a Discussion Document "Planning for Bush Fire Protection" and contains provisions that, if implemented, can substantially reduce the threat of bushfires.

The site is gently sloping, towards Oaky Creek to the east, and is generally grassed with very little vegetation other than along the Creek.

The grassed pasture could be assessed as a moderate bushfire hazard, however it is not considered a threat to the operation of the quarry or plant as it can be readily managed by mowing to reduce fuel loads.

4.13 BACKGROUND NOISE

4.13.1 The Site

A detailed Noise Impact Assessment has been undertaken by ERM Mitchell McCotter and the report is given in full in Appendix 6.

Two datasets of baseline noise levels are available for the proposed site and the immediate surrounding area. Short-term ambient noise measurements were undertaken in 1991 for the original quarry EIS (Cole 1994). In relation to the current proposals, more extensive continuous monitoring over a five day period was carried out in June 1995.

In regard to the original quarry EIS, noise measurements took place on 18, 23 and 24 December 1991 and 15-minute sample measurements were conducted at the following four locations:

- Location M1, 285 Adams Road;
- Location M2, 265 Adams Road;
- Location M3, residence located off Jacksons Road and since purchased by the Federal Airports Corporation as part of the Badgery's Creek Airport proposals;
- Location M4, residence located off Elizabeth Drive and since purchased by the Federal Airports Corporation as part of the Badgery's Creek Airport proposals.

Table 2.1 in Appendix 6 gives the noise levels recorded at the above 4 locations.

More extensive monitoring was undertaken over the period 22nd-26th June 1995 at three positions in the vicinity of the proposed site:

- Position 1: western boundary of site to the rear of Hibernian Shooting Club;
- Position 2: adjacent to existing access road; and
- Position 3: northern boundary of Hibernian Shooting Club site, adjacent to 265 Adams Road.

These positions were selected to provide data representative of the locality.

Acoustic Research Laboratories noise loggers were used for the 1995 measurements and were calibrated before and after the monitoring took place. Continuous sample measurements were obtained over the five-day monitoring period with results storedfor each 15-minute period. Observations made during the noise monitoring exercise indicate that the existing noise climate is rural. The predominant noise sources were distant traffic noise from Elizabeth Drive and vehicles accessing the produce/stabling business currently occupying the site.

The results of the monitoring are presented graphically in Appendix A in Appendix 6. It can be seen that the recorded noise levels are similar to those observed during the previous monitoring. Taking account from data from all three monitoring positions, a typical minimum background L_{90} noise level of approximately 34 dB(A) was recorded during the daytime. This is a little lower than the minimum value of 35.5 dB(A) in Table 2.1 in Appendix 6 which is based on a more limited sample of measurement periods.

4.13.2 The Airport Site

In regard to future noise in the area, the Department of Aviation have produced Australian Noise Exposure Forecast (ANEF) contours for the proposed Badgerys Creek Second Sydney Airport which adjoins the subject site to the east and south.

The ANEF system involves the construction of contours linking together points of equal cumulative noise exposure. The contours are derived from an assessment of flight patterns, the number of daily aircraft operations by type of aircraft and time of day or night, noise characteristics of each aircraft type during take-off and landing, and runway utilisation patterns. The contours usually plotted are 20, 25, 30 and 40 ANEF units. The severity of noise effect increases with the ANEF value.

The Department of Aviation has prepared advice on how land should be used near airports. The 25 ANEF contour is regarded as the appropriate criterion for limiting residential land use near airports, while recognising that some people may find exposure to the 20 ANEF level still unacceptable.

In regard to the subject site, except for the access handle, the 20 ANEF contour affects the whole site, the 25 ANEF contour affects the south eastern half of the site while the 30 ANEF contour affects a small section in the south eastern corner.

4.14 VISUAL ASPECTS

The visual aspects of the site are dependant upon the views from the site and the views to the site.

The site is located between two creek systems, Oaky Creek, which is the eastern boundary, and Cosgroves Creek.

The visual impacts of the site and the proposed quarry are summarised as follows:-

East - The site as existing can be readily seen from the adjoining lot 1 "Mountain View", and the hatchet shaped lot containing the poultry shed. However when the quarry is established below ground level the only activity visible from these sites will be the top soil stripping and truck movements to and from the site. These adjoining sites are part of the airport property.

South - Distant views only are available to the subject site from the south and once the quarry operation is below ground level the only activities visible will be the truck movements to and from the site. The adjacent lots to the south are also part of the airport site.

West - The subject site is visible from the adjoining lots 1 and 2 and more distant views to the site are available from the opposite side of Adams Road. Once the earth mound is erected and the quarry operation is below ground level, only truck movements will be visible as they enter and leave the quarry.

North - The subject site is readily visible from lot 281 to the north and distant views are available from Elizabeth Drive and elevated properties on the northern side of Elizabeth Drive. Once the northern bund wall is erected and the quarry operation is below ground level, the actual workings will not be visible from the adjacent property, Elizabeth Drive or other elevated lots in the area. Truck movements however to and from the subject site will be visible in the access handle and on Adams Road.

Village of Luddenham - The site, its use as a quarry, and traffic movements on the site and in Adams Road will not be visible from the Village of Luddenham, located on The Northern Road, approximately 2.3km in a direct line south west of the site.

4.15 ABORIGINAL PRE-HISTORY

The National Parks and Wildlife Service indicated that an archaeological survey of the present site was required and this has been undertaken by Pam Dean-Jones, archaeologist. The report is included in full as Appendix 7.

The area lies within the boundaries of the Gandangarra Local Aboriginal Land Council and Mr Warren Carroll inspected the site with the archaeologist.

One archaeological site, an open surface scatter of flaked stone artefacts, was located during the survey. It is located in the north eastern corner of the study area. Much of the ground surface within the study area has been disturbed by previous land use, and the probability of other sites is considered to be low.

None of the material is considered to be in-situ and there is very little potential for any of in-situ material to remain beyond the margins of the exposure. The site is in poor condition, and the natural substrate of the artefacts is unclear.

On this basis, the archaeological material is not considered to be of scientific significance and no further archaeological investigation is required for the site.

4.16 ZONING AND PLANNING CONTROLS

4.16.1 Interim Development Order No. 74 Liverpool

The site is zoned as Non Urban 1(a) under the above Order, which was gazetted on 7 April 1978. This planning instrument has been subject to many amendments since that time.

An extractive industry is an allowable use with Council's consent under Clause 3 of the Order in the 1(a) zone.

Clause 18(b) of the Order states as follows:-

"18. In respect of any application for the consent of the Council whether under this Order or under any provision of the Act for consent or approval to the carrying out of development, namely -

(b) To the erection or use of an amusement park, cemetery, club, drive-in theatre, industry, place of assembly, plant nursery or recreation establishment or to the carrying out of any other development likely to cause increased vehicular traffic on any road in the vicinity thereof, the Council shall take into consideration whether:-

(i) adequate vehicular exits and entrances from or to the site have been provided so that vehicles using such entrances and exits will not endanger persons and vehicles using any such road;

(ii) space, sufficient to provide for the parking or standing of such number of vehicles, as the Council may determine, is provided on the site or on land adjoining the site not being a public road;

(iii) any representations made by The Traffic Authority of New South Wales and, where the site has frontage to a main road, by the Department of Main Roads, have been met; and

(iv) adequate space has been provided within the site of the building or development for the loading, unloading and fuelling of vehicles and for the picking up and setting down of passengers."

Clause 21 of the Order relates to foreshore building lines and states as follows:-

"21. (1) The Council may by resolution fix building lines (in any clause called "foreshore building lines") in respect of any land fronting any river, creek or other natural watercourse.

(2) A foreshore building line shall, when fixed by the Council, be marked upon a plan or clearly described in the resolution and that plan or resolution shall be open for inspection by the public during office hours of the Council.

(3) A building shall not be erected between a foreshore building line and the river, creek or natural watercourse in respect of which the line is fixed.

(4) The Council may alter or abolish any foreshore building line where the levels of depth of the allotment or other exceptional conditions of the site make it necessary to do so."

The Council has not set a foreshore building line in respect of Oaky Creek at the rear of the subject site.

4.16.2 Liverpool Local Environmental Plan No. 14

The above plan was gazetted on 28 August 1981 and allowed a subdivision of lot 282 DP571171 Adams Road Luddenham into 3 allotments, one of which is the subject site, lot 3 DP623799.

4.16.3 Draft Local Environmental Plan 1995 (Consolidating Local Environmental Plan)

Liverpool City Council has prepared a draft plan, consolidating their various local environmental plans and the exhibition of the draft plan has concluded. The Council is expected to consider the objections in June/July 1995 after which the draft plan will be referred to the Department of Urban Affairs and Planning for final consideration and gazettal.

Under the draft plan, an extractive industry, extractive material and landfill are defined as follows:

> **Extractive industry means:**
>
> (a) development involving the winning or removal of extractive material from land;
> or
> (b) an industry or undertaking (other than a mine) which depends for its operation on the winning or removal of extractive material from the land on which it is carried on.
>
> **Extractive material** means natural resources, such as clay shale, rock, sand, soil and gravel, but does not include coal, shale, petroleum, uranium or any mineral within the meaning of the Mining Act 1973.
>
> **Landfill** means all works or activities including the placement of fill on land or the excavation of land which materially alters the shape, natural form or drainage of land.

The subject site is zoned under the draft plan as Rural 1(a) and in that zone, an extractive industry and a landfill are allowable uses with Council's consent.

Land to the east and south of the subject site is zoned as Special Uses 5(e) Airport for the proposed Second Sydney Airport and the other lands to the north and west are zoned as Rural 1(a). Elizabeth Drive is zoned as Special Uses 5(c) under the draft plan.

Clause 16(5) and (6) state as follows:

> (5) Development may only be permitted on land in the vicinity of Zone No. 5(e) provided that the development does not hinder the development and operation of an airport in Zone No. 5(e).

(6) When determining an application for development and land in the vicinity of an existing or future airport the council shall consider the following:

(a) the impact of the airport on the development to which the application relates;

(b) the Obstacle Limitation Surface Plan prepared by the Civil Aviation Authority for the airport; and

(c) any comments of the Civil Aviation Authority received within 28 days after referral of the application to the authority.

Clause 18, regarding servicing, states:

18. Development may only be permitted if:

(a) in areas not serviced by the Water Board, arrangements satisfactory to the council are required to be made for provision of a water supply and facilities for removal or disposal of sewerage and stormwater;

Clause 20 of the draft plan states, regarding development near a creek or waterway:

20. When determining an application to carry out development in the vicinity of a creek or waterway the council shall consider the impact of the development on the stability of banks, water quality and the needs of existing and potential users of water from that creek or waterway.

Clauses 25 and 26 state the following requirements for extractive industries and landfill:

25. When determining an application for extractive industry or mine the council shall consider how the following matters are to be addressed by the applicant:

(a) how the land will be reinstated;
(b) how the material or refuse will be removed;
(c) how public safety will be secured in the surrounding area; and
(d) how the amenity of the neighbourhood will be protected.

26. The council may only grant consent to landfill if it is satisfied that:

(a) the landfill is required for the reasonable economic use of the land or for the provision of utility services; and

(b) appropriate measures are proposed to ensure that there is no adverse impact on a waterway or private or public property; and
(c) the landfill would not adversely affect drainage, flood behaviour or water quality.

The objectives of the Rural 1(a) zone are given as follows:

29. (1) The objectives of Zone No. 1(a)(Rural) are:

(a) to protect the agricultural potential of rural land and to prevent fragmentation of viable rural holdings;
(b) to permit only those uses which are compatible with the amenity of rural areas and ancillary to development in rural areas;
(c) to ensure that development within rural areas does not generate an excessive demand for public services;
(d) to ensure that development does not hinder the development or operation of an airport in Zone No. 5(e); and
(e) to ensure that development does not hinder the option for proper and orderly development of land in the vicinity of Zone No. 5(e) for airport related purposes.

The site does not conflict with Clause 35 as the access is more than 90m from Elizabeth Drive.

4.16.4 Liverpool Development Control Plan No. 3 - Car Parking Policy

The purpose of this Plan is to ensure that the provision of off-street parking facilities is adequate to satisfy the parking requirements generated by a development.

The Policy has no specific requirements for an extractive industry. An acceptable standard would be one space per employee and one appropriately sized space per truck or piece of equipment based on the site.

The Policy also gives details in respect of design of parking areas, dimension of spaces and widths of aisles and accesses.

4.16.5 Liverpool Development Control Plan No. 6 - Industrial Development Policy

This Policy deals specifically with industrially zoned lands in the City of Liverpool area however the following requirements can be used as guidelines to Council's attitude to industrial development:-

- 10m building line to roads
- loading and unloading areas
- landscaping of building line areas and parking areas
- garbage and trade refuse storage and collection areas
- pollution control.

4.16.6 The Act and Regulations

Extractive industries and waste management facilities or works are designated development under Schedule 3 of the Environmental Planning and Assessment Regulations 1994 and are defined as follows:

"Extractive industries" that obtain extractive materials by methods including excavating, dredging, tunnelling or quarrying or that store, stockpile or process extractive materials by methods including washing, crushing, sawing or separating and:

(1) obtain or process for sale, or reuse, more than 30,000 cubic metres of extractive material per annum; or

(2) disturb or will disturb a total surface area of more than 2 hectares of land by:

- (a) clearing or excavating; or
- (b) constructing dams, ponds, drains, roads or conveyors; or
- (c) storing or depositing overburden, extractive material or tailings; or

(3) are located:

- (a) in or within 40 metres of a natural waterbody, wetlands or an environmentally sensitive area; or
- (b) within 200 metres of a coastline; or
- (c) in an area of:
  - (i) contaminated soil; or
  - (ii) acid sulphate soil; or
- (d) on land that slopes at more than 18 degrees to the horizontal; or
- (e) if involving blasting, within:
  - (i) 1000 metres of a residential zone; or
  - (ii) 500 metres of a dwelling not associated with the development; or
- (f) within 500 metres of the site of another extractive industry that has operated during the last 5 years.

This designation of extractive industries does not include:

- (a) extractive industries on land to which the following environmental planning instruments apply:
  - (i) Sydney Regional Environmental Plan No 11 - Penrith Lakes Scheme;
  - (ii) Western Division Regional Environmental Plan No 1 - Extractive Industries; or
- (b) maintenance dredging involving the removal of less than 1000 cubic metres of alluvial material from oyster leases, sediment ponds or dams, artificial wetlands or deltas formed at stormwater outlets, drains or the junction of creeks with rivers provided that:

(i) the extracted material does not include contaminated soil or acid sulphate soil; or

(ii) any dredging operations do not remove any seagrass or native vegetation; or

(iii) there has been no other dredging within 500 metres during the past 5 years; or

(c) extractive industries undertaken in accordance with a plan of management (such as river, estuary, land or water management plans) provided that:

(i) the plan is:

- prepared in accordance with guidelines approved by the Director of Planning and includes consideration of cumulative impacts, bank and channel stability, flooding, ecology and hydrology of the area to which the plan applies; and
- approved by a public authority and adopted by the consent authority; and
- reviewed every 5 years; and

(ii) less than 1000 cubic metres of extractive material is removed from any potential extraction site that is specifically described in the plan; or

(d) continued operations within the meaning of State Environmental Planning Policy No 37 - Continued Mines and Extractive Industries in respect of which an application for development consent has been made before the end of the moratorium period prescribed under that Policy; or

(e) the excavation of contaminated soil for treatment at another site; or

(f) artificial waterbodies, contaminated soil treatment works, turf farms, or waste management facilities or works, specifically listed elsewhere in this Schedule.

"Waste management facilities or works" that store, treat, purify or dispose of waste or sort, process, recycle, recover, use or reuse material from waste and that:

(1) dispose (by landfilling, incinerating, storing, placing or other means) of solid or liquid waste:

(a) that includes any substance classified in the Australian Dangerous Goods Code or medical, cytotoxic or quarantine waste;; or

(b) that comprises more than 100,000 tonnes of "clean fill" (such as soil, sand, gravel, bricks or other excavated or hard material) in a manner that, in the opinion of the consent authority, is likely to cause significant impacts on drainage or flooding; or

(c) that comprises more than 1000 tonnes per annum of sludge or effluent; or

(d) that comprises more than 200 tonnes per annum of other waste material; or

(2) sort, consolidate or temporarily store waste at transfer stations or materials recycling facilities for transfer to another site for final disposal, permanent storage, reprocessing, recycling, use or reuse and:

(a) handle substances classified in the Australian Dangerous Goods Code or medical, cytotoxic or quarantine waste; or
(b) have an intended handling capacity of more than 10,000 tonnes per annum of waste containing food or livestock, agricultural or food processing industries waste or similar substances; or
(c) have an intended handling capacity of more than 30,000 tonnes per annum of waste such as glass, plastic, paper, wood, metal, rubber or building demolition material; or

(3) purify, recover, reprocess or process (including by mulching or composting) more than 5000 tonnes per annum of organic solid or liquid waste organic materials, including food waste, oil, sludge, pulp, garden refuse, sawdust or wood chips; or

(4) are located:

(a) in or within 100 metres of a natural waterbody, wetlands, coastal dune fields or an environmentally sensitive area; or
(b) in an area of high watertable, highly permeable soils, acid sulphate, sodic or saline soils; or
(c) within a drinking water catchment; or
(d) within a catchment of an estuary where the entrance to the sea is intermittently open; or
(e) on a floodplain; or
(f) within 500 metres of a residential zone of 250 metres of a dwelling not associated with the development and, in the opinion of the consent authority, having regard to topography and local meteorological conditions, are likely to significantly affect the amenity of the neighbourhood by reason of noise, visual impacts, air pollution (including odour, smoke, fumes or dust), vermin or traffic.

This designation of waste management facilities or works does not include:

(a) development comprising or involving any use of sludge or effluent if:

(i) the dominant purpose is not waste disposal; and
(ii) the development is carried out in a location other than one listed in paragraph (4) above; or

(b) development comprising or involving waste management facilities or works specifically listed elsewhere in this Schedule.

Clause 51 of the Regulations require that the contents of an environmental impact statement must include the specific guidelines which are in force for an extractive industry and waste management facility or, if no guidelines are in force, the matters referred to in Schedule 2 of the Regulations.

Under Clause 52 consultation must take place with the Director of Urban Affairs & Planning when preparing an environmental impact statement and the environmental impact statement must have regard to the Director's requirements as to the form and content of the statement.

Section 91(1) of the Act lists the matters required to be taken into consideration by the consent authority when considering a development application and Clause 65 of the Regulations requires the following additional matters in respect of Section 90(1)(s) of the Act:

(a) whether adequate provision has been made to enable disabled persons to gain access to the development or to the land on which the development is proposed to be carried out;
(b) the Government Coastal Policy, in the case of development on land in the area of a council referred to in Schedule 1;
(c) the effect of the development on:
    (i) any protected or endangered fauna (within the meaning of the National Parks and Wildlife Act 1974); and
    (ii) the habitat of any such protected or endangered fauna,
and means to be employed to protect them from harm, or to mitigate the harm if the development is likely to cause them harm;
(d) whether the development will endanger any species of animal, plant or other form of life, whether living on land, in water or in the air;
(e) the matters set out in the document entitled "Planning for Bush Fire Protection" (published by the Department of Bush Fire Services) or in any other publication of that Department published in substitution for that document and approved for the time being by the Director.

The Liverpool City Council area is not included in Schedule 1 of the Regulations.

The Department of Urban Affairs & Planning have prepared an EIS Practice Guidelines for Extractive Industries Quarries.

The purpose of this Practice Guideline is to present a clear and comprehensive statement of the matters which may need to be included in an EIS to fulfil the information requirement for the assessment and determination of quarry or excavation proposals. In particular it is emphasised that details in the EIS should reflect the level of significance.

The environmental impact statement has been prepared generally in accordance with the Guidelines.

4.16.7 Extractive Industry Regional Plans

4.16.7.1 Sydney Regional Environmental Plan No. 9 (Extractive Industry)

This Plan was gazetted on 7 October 1986 with the following aims:-

(a) to facilitate the development of extractive resources in proximity to the population of the Sydney Metropolitan Area and to keep the cost of supplying extractive materials to the community to a minimum -

(i) by identifying land which contains extractive material of regional significance and ensuring that the land is not developed for purposes which are incompatible with the future extraction of that material; and

(ii) by ensuring that encroachment of urban development does not prevent existing extractive industries from realising their full potential;

(b) to permit, with the consent of the council, except as provided by clause 14, development for the purpose of extractive industries on land described in Schedule 1 or 2;

(c) to prohibit development for the purpose of extractive industries on land described in Schedule 4, being land which is environmentally sensitive; and

(d) to ensure that extractive industries are carried out in an environmentally acceptable manner.

The subject site is included in this Plan being within Division 2 of Schedule 1 as "the land identified on Sheet 2 of the map as Bringelly Clay/shale."

Under Clause 6(2) of the Plan an extractive industry may be carried out with the consent of the Council.

Clause 6(3) and (4) state:-

"(3) Where an extractive material is marked on the map in relation to land described in Schedule 1 or 2, the council shall not consent to the carrying out of development for the purposes of an extractive industry on that land if the primary purpose of the development is to extract an extractive material which is different from the extractive material marked on the map.

(4) The council shall not grant consent as referred to in subclause (2) unless it is satisfied that:

(a) noise and vibration levels will be carried out in accordance with the guidelines set out in the State Pollution Control Commission's Environmental Noise Control Manual (1985 edition) (copies of which are available at the office of the council and of the Commission);

(b) the effect of the development on the water quality and hydrodynamics of any watercourse or underground waters in the area has been taken into account; and

(c) rehabilitation measures will be carried out in accordance with the Soil Conservation Service's publication "Guidelines To Meet Requirements for Information on Soil and Land Stability in Proposals for Open-Cut Mining and Rehabilitation" (1985 edition) (copies of which are available at the office of the council and of the Service)."

Clause 8(2) states as follows:-

"(2) When considering a development application to carry out development for the purposes of an extractive industry on land to which this clause applies, the council shall take into account the recommendations for future extraction outlined in Section 3 of the planning report prepared by the Department of Environment and Planning titled "Sydney Regional Environmental Plan - Extractive Industry - Planning Report" (1986)"

The following extract from the Planning Report relates to the extractive area covering the subject site:-

"3.2.2 Potential clay/shale extraction areas of regional significance

The plan identifies three clay/shale resource sites for possible future extraction. These areas are included in Schedule 1, Divisions 2 and 3 of the statutory instrument and are protected to enable the Department of Mineral Resources to test for their ceramic potential and suitability for possible future extraction. These areas comprise:

(i) Potential Bringelly clay/shale extraction areas of regional significance

The plan identifies in Division 2 (map marked "sheet 2 of the plan) resource areas of cream-firing Bringelly clay/shale in the Penrith, Liverpool, Camden and Wollondilly local government areas. This cream-firing clay/shale is used to produce a range of lighter colours for brick manufacture."

Clause 9 of the Plan requires Council to forward a copy of the Development Application for an extractive industry to the Department of Mineral Resources within 7 days of receipt, and to have regard to any representations made when determining the application.

Clause 11 requires the concurrence of the Secretary of the Department of Mineral Resources before consent can be granted.

4.16.7.2 Draft Sydney Regional Environmental Plan No. 9(2) - Extractive Industry

This Draft Plan was placed on public exhibition on 20 December 1993 with the exhibition period to conclude on 28 February 1994.

The aims and objectives of this Draft Plan are similar to those of the existing SREP No. 9.

The subject site, lot 3 DP 623799 Adams Road, Luddenham. Ferndale Resources Luddenham, is specifically included in Schedule 1, Division 1, Item No. 19, as well as being included on the Bringelly clay/shale map, being Division 2 of Schedule 1.

Under Clause 7(1) of the Draft Plan the Council is the consent authority for the purposes of the Draft Plan.

Clause 8 states:-

> "Extractive industries permissible with consent
> 8. (1) This clause applies to land described in Schedule 1 or 2.
>
> (2) A person may, with the consent of the council, carry out development for the purposes of an extractive industry on land to which this clause applies.
>
> (3) The council shall not grant consent as referred to in subclause (2) unless it is satisfied that:
>
> (a) while the development is being carried out, noise and vibration levels will be generally in accordance with the guidelines set out in the Environment Protection Authority's Environmental Noise Control Manual (1985 edition) (copies of which are available at the office of the council and of that Authority);
> (b) the effect of the development on the water quality and hydrodynamics of any watercourse or underground waters in the area has been taken into account; and
> (c) rehabilitation measures will be carried out in accordance with the Department of Conservation and Land Management's publication "Guidelines to Meet Requirements for Information on Soil and Land Stability in Proposals for Open-Cut Mining and Rehabilitation" (1985 edition) copies of which are available at the office of the council and of that Department."

Clause 10 of the Draft Plan states:-

> "10.(1) This clause applies to land described in Schedule 1 or 2.
>
> (2) When considering an application for consent to carry out development for the purposes of an extractive industry on land to which this clause applies, the council shall take into account the recommendations for future extraction outlined in the planning report prepared by the Department of Planning titled "Draft Sydney Regional Environmental Plan No. 9 - Extractive Industry (No. 2) - Planning Report" (1993)."

The Planning Report has specifically identified the site as having a clay/shale resource of regional significance and recommends the extraction of the clay/shale resource,

subject to environmental and economic constraints. The Report also recommends the Department of Mineral Resources undertake further testing of the ceramic material potential of the resources identified in the Bringelly clay/shale area.

The Planning Report also contains details on rehabilitation and recommendations for rehabilitation plans, monitoring and security deposits.

Clause 12 of the Draft Plan requires the Council to forward a copy of the Development Application, within seven days of receipt, to the Direction-General of the Department of Mineral Resources and requires Council to consider any representation made by that Department.

4.16.8 Hawkesbury-Nepean River Regional Plans

4.16.8.1 Sydney Regional Environmental Plan No. 20 - Hawkesbury-Nepean River

The above Plan was introduced in June 1989 and the general aims of the Plans are:-

(a) to improve water quality in the river;
(b) to provide people with a wide range of recreational opportunities along the river;
(c) to protect and promote the economy of the river valley;
(d) to retain the agricultural potential of the river valley;
(e) to protect the significant vegetation and wildlife habitats of the river valley;
(f) to retain the farmland character of the agricultural part of the river valley;
(g) to protect the environmental heritage of the river valley;
(h) to protect and enhance the scenic quality of the river and the river valley;
(i) to regulate the future extraction of sand in and around the river;
(j) to permit urban expansion to take place in an environmentally sensitive manner, by requiring councils to take into account the quality of water in the river; and
(k) to promote the principles of total catchment management and provide a framework for more detailed future planning by local and State government authorities.

There are specific aims dealing with water quality, extraction, recreation and tourism, economy of the river valley, agriculture, vegetation and wildlife habitats, farmed landscape, environmental heritage and scenic quality.

Schedule 3 of the Plan details matters to be considered by the consent authority when determining a development application in the area covered by the Plan. These matters relate to water quality, significant vegetation habitats (including wetlands), extraction, environmental heritage and scenic quality, recreation and tourism and agriculture.

4.16.8.2 Draft Sydney Regional Environmental Plan No. 20 - Hawkesbury-Nepean River (Amendment No. 2)

The above draft plan proposes to amend REP 20 to:

- require the consent of council and the concurrence of the Hawkesbury Nepean Catchment Management Trust for certain types of development
- require councils to consult with the Hawkesbury Nepean Catchment Management Trust for another group of development types before granting consent to a development application
- improve the identification and protection of wetlands which are regionally significant
- make the plan apply to additional land in the Sydney Region
- clarify the provisions which regulate the extraction of sand in the river.

Under Clause 9A the concurrence is required from the Hawkesbury-Nepean Catchment Management Trust for waste management facilities or works.

The Trust has a Draft Code of Practice for Waste Management Facilities or Works.

Under the draft plan, Clause 21 states when the Trust must be consulted and Clause 21 is given below.

21. (1) This clause applies to the following development:
(a) designated development (other than for which the concurrence of the Trust is required by this plan);
(b) development for the purpose of:
- a caravan park or camping ground; or
- an intensive horticulture establishment; or
- intensive livestock keeping; or
- a manufactured home estate; or
- a recreation facility; or
- a small marina; or
- a water recreation facility,

within the meaning of Schedule 7.

(2) A council that receives an application for consent to any development to which this clause applies must, within 7 days after receipt of the application, forward a copy of the application to the Trust for comment.

(3) The council must not determine the development application until:
(a) it has received and considered written comments on the application from the Trust or the Trust has replied that it does not wish to make any such comments; or
(b) 28 days have elapsed after the council has sent the copy of the application to the Trust,

whichever occurs first.

Therefore under the proposed Amendment, the Trust must be consulted in respect of an extractive industry being included as a designated development in Schedule 3 of the Regulations. The Trust has a Draft Code of Practice for developments which require consultation with the Trust.

4.16.9 South Creek Valley Regional Environmental Study

The above Study was placed on exhibition by the Department of Planning in October 1991.

The subject site falls within the catchment of South Creek being located on a tributary, Oaky Creek, and also falls within the Study Area of the Study. The purposes of the Study were to:-

1. Compile a comprehensive database on the characteristics of the South Creek Valley Sector;
2. Analyse issues that would affect any urban development in the study areas and compare these results with the broader assessment done for the Metropolitan Strategy;
3. Present preferred strategies for the development of the area to accommodate part of Sydney's future growth.

The Study identifies that the 20 ANEF contour of the proposed Second Sydney Airport is a major environmental constraint; the subject site is located within this contour area.

The Study proposed that the area bordering the airport site, Elizabeth Drive and Northern Road be "employment area". In relation to this land use, Section 11.3.2 states:-

"Employment areas are located around the airport site within the noise contours because:

- buildings can be designed to comfortably buffer aircraft noise up to the Australian Noise Exposure Forecast 25 contour; and

- the areas would have low residential amenity (experience shows that aircraft flight paths and residential land use are generally incompatible).

Land in this category east of the airport provides a location for specific airport-related uses as it would be highly accessible to the airport and the arterial road system linking the SCVS to the rest of the metropolitan region."

The Study does not consider the clay/shale resource as identified in SREP No. 9 as a constraint against urban development.

4.16.10 Draft Regional Environmental Plan - South Creek Valley

This Draft Plan was placed on public exhibition in October 1991. The general aim of this Plan is to establish a framework for the co-ordinated planning and economic, efficient and environmentally sensitive development of the South Creek Valley Sector to accommodate part of the long term growth of population and employment in the Sydney Region.

An area in the northern part of the SCVS has been deemed as a release area under the Draft Plan and is far removed from the subject site.

The Draft Plan lists the following matters as "objectives and matters for inclusion":-

- Housing
- Economic Development and Employment

- Transport and Accessibility
- Human Services
- Public utilities
- Retail Centres Hierarchy
- Air Quality
- Water Quality
- Flood plain management
- Heritage
- Recreation and open space
- Special considerations

Objectives that could relate specifically to the proposed quarry operation as listed in the SCVS, are as follows:

AIR QUALITY

19. The objectives of this plan in relation to planning strategies concerning air quality are:-

    (a) to achieve a level of air quality in the South Creek Valley Sector which meets government standards for urban development sectors in the Sydney Region; and

    (b) to minimise South Creek Valley Sector's contribution to the forecasted increase in air pollution in the Sydney Basin from the cumulative effects of proposed urban development in south-western Sydney.

WATER QUALITY

20. The objectives of this plan in relation to planning strategies concerning water quality are:-

    (a) to manage urban development in the South Creek Valley Sector so that water quality standards are achieved in South Creek and its tributaries; and

    (b) to ensure that urban development in South Creek Valley does not exacerbate water quality problems in the Hawkesbury-Nepean River system.

SPECIAL CONSIDERATIONS

25. The objectives of this plan in relation to planning strategies concerning special considerations are:-

    (a) to locate compatible uses on land affected by the airport noise contours, defence land blast zone and high voltage electricity transmission lines;

(b) to minimise the environmental impacts of high voltage electricity transmission lines on the landscape and residential areas.

(c) to provide for the noise and odour that may be produced by the operation of sewage treatment plants to be recognised in the planning of adjoining development;

(d) to encourage the amalgamation of fragmented land to facilitate development and negotiations for the provision of services. Discourage fragmentation of large land-holdings to retain existing opportunities for negotiating service provision.

26. In preparing a draft local environmental plan which applies to land adjoining any sewage treatment plant or other special uses which may impact upon surrounding areas, a council shall:-

(a) give consideration to possible adverse effects of the land use on any proposed development of the adjacent land; and

(b) include provisions in the plan to ensure that appropriate buffer areas of non-residential use are created.

The subject site is located within Sheet 4 of the Draft Plan indicating the lands on which items of heritage significance are situated. However neither the site nor its buildings are listed in Schedules 1-4.

This Draft Plan has not progressed past the exhibition period. A Task Force has been formed of government agencies and Liverpool City Council to investigate land uses around the airport and along the access corridors to the airport and to review the South Creek Valley Plan. There is not expected to be any major changes to the proposed employment areas around the airport and the Task Force should hand down its report by the end of September 1995.

4.16.11 State Environmental Planning Policy No. 11 - Traffic Generating Developments

The above Policy was gazetted on 9 August 1985 and established the Traffic Authority of NSW, now the Roads and Traffic Authority, as the sole traffic management authority to be consulted, and ensures that the Authority is given the opportunity to make representations on a development application before Council makes a determination.

The proposed development, being "extractive industry or mining" is included in Schedule 1 subclause (m) of the above Policy.

Under Clause 7(3) the Council is required to forward a copy of a submitted Development Application to the Authority within 7 days of receipt of that application.

4.16.12 Roads and Traffic Authority

The Authority's "Yellow Book" does not contain any specific requirements for a quarry however the publication does contain guidelines for the parking areas, driveways, turning profiles of all types of vehicles and loading bay turning movements for all sizes of trucks.

The publication also contains guidelines for the assessment of the traffic impacts of developments.

In December 1993 the Authority produced a new publication "Guide to Traffic Generating Developments" and has sections on traffic impact studies, land use generation, interpretation of traffic impacts, parking requirements for specific land uses, access and parking and design, residential subdivisions - traffic and safety, cost impacts of traffic generated by developments and administration of State Environmental Planning Policy No. 11.

There are no specific requirements for a quarry/extractive industry however some of the general requirements, e.g. access, are applicable to the proposal.

An extractive industry and a waste disposal depot are included in Table 9.1 and should be referred to the Regional/Zonal Development Committee as part of the Administration procedure for State Environmental Planning Policy No. 11.

4.17 BADGERYS CREEK SECOND SYDNEY AIRPORT

The decision on the location of Sydney's second airport has concluded with the selection of the Badgerys Creek site.

Badgerys Creek was selected as the site for Sydney's next major airport because it:

- is closer to the markets it is intended to serve;
- would involve a lower developmental cost;
- would have less effect on the natural environment.

The site is 46km directly west of the centre of Sydney's business district near the village of Badgerys Creek and immediately adjoins the subject site on the eastern and southern side. The airport site is 1770ha in area and has a mixture of agricultural and rural residential development. Approximately 241 separate titles lie within the site boundary comprising including 207 houses and 750 residents.

The majority of the Airport site has been acquired by the responsible authority. Figure 4.6 is an extract from a brochure produced by the Department of Aviation and shows the proposed layout of the total airport development. The subject site is indicated on the north western side of the Plan by a *.

Section 2.3 of this Statement contains the results of consultation with the Department of Transport and Communications.

4.18 PUBLIC UTILITIES

4.18.1 Water

There is no reticulated water supply to the site and roof water from the existing dwelling and produce shed is collected in tanks for domestic and general use. Water from the existing dam is used to water the horses and other animals on the property.

4.18.2 Sewerage

There are no reticulated sewer mains in the area and the effluent disposal from the dwelling and produce shed is to a septic tank and sullage trenches.

4.18.3 Electricity

There is 3 phase power connected to the dwelling and produce shed.

4.18.4 Telephone

There is a telephone service connected to the dwelling and produce shed.

4.18.5 Gas

There is no gas service available in the area.

4.18.6 Fuel

There is no bulk fuel stored on the site, all vehicles use the service station at the Village of Luddenham for necessary supplies.

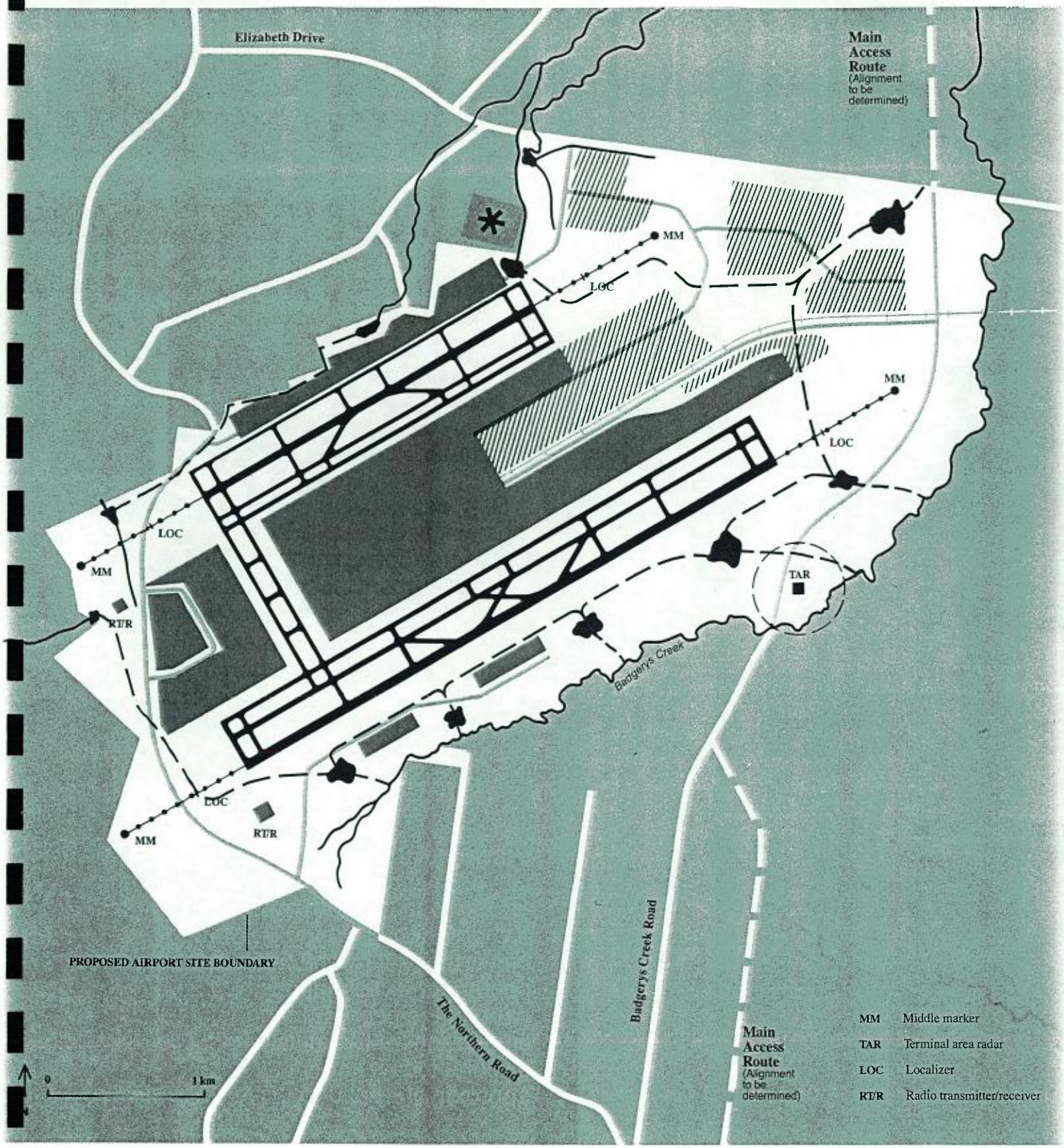
4.19 ROAD NETWORK, STREET FORMATION AND TRAFFIC

A traffic assessment has been undertaken by ERM Mitchell McCotter for the quarry and landfill operations and is contained in full in Appendix 8.

4.19.1 Road Network

The road network in the vicinity of the proposed development is illustrated in Figure 2.1 in Appendix 8. Major roads in the locality are Elizabeth Drive and the Northern Road which are both classified main roads. The site is about 0.5 kilometres south of Elizabeth Drive and 2.0 kilometres east of the Northern Road, near the village of Luddenham.

The site access road connects with Adams Road about 230 metres south of Elizabeth Drive. Adams Road is a local collector road under the control of Liverpool City Council. Luddenham Road connects with Elizabeth Drive from the north about 250 metres west of the Adams Road intersection.



Runway and taxiways

Runway approach lighting

Terminal and apron area

Leased site for airport related activity

Perimeter drainage system

Possible road access route

Possible rail access route

PRELIMINARY MASTER PLAN – BADGERYS CREEK

Figure 4.6

4.19.1.1 Elizabeth Drive

Elizabeth Drive is a major east-west arterial route. A number of recent road improvements including construction of three roundabouts, other intersection improvements and pavement resurfacing have been funded by the Commonwealth Government. Discussions with the Sydney region planning section of the Roads and Traffic Authority of New South Wales have indicated that the condition of the road pavement on Elizabeth Drive is now considered to be adequate and a requirement for a Section 94 levy per tonne kilometre for heavy vehicle movements would not be applicable for Elizabeth Drive.

To the west of Adams Road on Elizabeth Drive there is a two lane roundabout at the intersection with the Northern Road which has recently been constructed and has adequate spare traffic capacity for the foreseeable future. At the intersection with Luddenham Road, Elizabeth Drive has a right turn bay for traffic turning north into Luddenham Road (classified as a rural Type C intersection for right turns). There is also a left turn deceleration lane for eastbound traffic at this intersection traffic (classified as a rural type B intersection for left turns).

At the intersection of Elizabeth Drive and Adams Road there are currently no additional turning lanes for either left or right turning traffic, although these lanes are arguably required for existing turning traffic volumes.

To the east of Adams Road, at the intersection of Elizabeth Drive with Badgerys Creek Road a high standard rural T-intersection with left and right turning lanes has recently been constructed as part of the federally funded program of road improvements for Badgerys Creek Airport.

Similarly, high-capacity "two-lane-entry" roundabouts have been recently constructed at the intersections with Elizabeth Drive at both Mamre Road and Wallgrove Road. These roundabouts have adequate traffic capacity for the short to medium term, prior to the development of the major international airport facility at Badgerys Creek, at which time major widening of Elizabeth Drive east of Badgerys Creek through to Liverpool would be required.

To the east of Wallgrove Road, Elizabeth Drive becomes progressively more urbanised, being widened to four lanes and six lanes respectively as it passes through the existing outer suburbs of Fairfield and Liverpool. There is currently a major traffic signal controlled intersection on Elizabeth Drive at Cowpasture Road. The sections of Elizabeth Drive between Wallgrove Road, Cowpasture Road and Cabramatta Road have daily traffic volumes at or approaching capacity limits for a two-lane road. The general traffic growth in these areas would result in a need for widening of these sections to four lanes within the next few years.

4.19.1.2 The Northern Road

The Northern Road is a major north-south arterial route. To the north of Elizabeth Drive, the Northern Road is a high standard rural arterial road with generally good lane widths, sealed shoulders and an appropriate pavement construction standard to

accommodate the major regional heavy vehicle traffic flows that use this road between Windsor, Penrith and Camden.

South of the intersection of the Western Motorway, which is grade separated, the Northern Road has major intersections at Elizabeth Drive, Park Road, Badgerys Creek Road and Bringelly Road. High-capacity two-lane-entry roundabouts have recently been constructed at the intersections with Elizabeth Drive and Badgerys Creek Road as part of the Commonwealth Government program of road works for Badgerys Creek Airport. The intersections at Park Road and Bringelly Road are rural type intersections with turning lanes.

4.19.1.3 Adams Road

Adams Road has a relatively narrow seal width of 5.8 metres at the site access road junction. The seal has fairly extensive patching at the edges where heavy vehicles would have a tendency to damage the pavement. Adams Road is in a similar condition throughout its 2.5 kilometre length except for a small section at the southern end which has a wider sealed width of 9.3 metres in the village of Luddenham.

The intersection at the south end of Adams Road in the village of Luddenham is in an urban type environment with kerb and gutter along the side of Adams Road.

4.19.1.4 Luddenham Road

Luddenham Road is classified as a regional road and is under the joint control of Penrith City Council and the Roads and Traffic Authority. It provides the most direct route from the locality of Luddenham to the urban areas of Erskine Park, St Marys and Blacktown. Its use however is subject to a three tonne load limit because of the weak pavement and narrow width. Consequently its potential use by traffic from the proposed clay extraction and landfill development site at Luddenham is restricted.

4.19.2 Traffic Volumes

A summary of daily traffic volumes on the local road network surveyed by the Roads and Traffic Authority during the past decade is presented in Table 2.1 in Appendix 8. Daily traffic volumes on sections of Elizabeth Drive increase progressively to the east. The daily traffic volume at the western end at the Northern Road was approximately 6,500 vehicles per day in 1991.

Existing peak hour traffic volumes were surveyed in December 1991 at the intersection of Adams Road and Elizabeth Drive during the morning peak hour 7.00 to 8.00am (Cole, 1994). These traffic counts were repeated in June 1995 along with afternoon peak period counts by ERM Mitchell McCotter. The results of the 1991 and 1995 surveys are summarised in Table 2.2 in Appendix 8. Results of the 1995 survey are illustrated in Figure 2.2 in Appendix 8.

The results of the 1991 and 1995 surveys are summarised in the table on the following page.

EXISTING PEAK HOUR TRAFFIC FLOWS

Road	Traffic flows (vehicles per hour)		
	1991	1995	
	Am (0700-0800)	Am (0715-0815)	Pm (1545-1645)
Elizabeth Drive			
- west of Adams Rd	457	535	485
- east of Adams Rd	458	530	467
Adams Road			
- South of Elizabeth Drive	67	91	70

The Roads and Traffic Authority counts along Elizabeth Drive include a full 24 hourly interval counting station (West of Mamre Road) which indicates morning peak hour traffic volumes are about 8.2 percent of total daily traffic. The peak hour volumes surveyed on Elizabeth Drive and Adams Road correspond to the daily traffic volumes shown in the table below.

ESTIMATED EXISTING DAILY TRAFFIC FLOWS

Road	Traffic flows (vehicles per day)	
	1991	1995
Elizabeth Drive		
- west of Adams Rd	5600	6530
- east of Adams Rd	5600	6470
Adams Road		
- south of Elizabeth Dr	820	1110

These daily traffic volumes are well below the maximum daily traffic capacity limit (approximately 26,000 AADT) for a high standard two lane rural road with these traffic patterns.

The general proportions of existing truck traffic on relevant roads are available from traffic surveys undertaken for the RTA on Elizabeth Drive and the Northern Road (RTA, 1992) and the 1995 peak hour survey on Adams Road as follows:

- the Northern Road, north of Elizabeth Drive = 11.8 per cent heavy vehicles
- Elizabeth Drive, east of Badgerys Creek Road = 7.2 per cent trucks
- Adams Road, south of Elizabeth Drive = 5 per cent heavy vehicles (including light trucks)

4.19.3 Intersection Operation

The operation of the Elizabeth Drive/Adams Road intersection has been assessed using standard gap acceptance techniques and Austroads (1988) guidelines to determine the appropriate intersection configuration.

The assessment found that the intersection currently operates with normal delays and that there is sufficient capacity for all turning movements. The results of the analysis are summarised in Table 2.5 in Appendix 8 along with level of service as determined by the assessment criteria for intersection operation shown in Table 2.4 in Appendix 8.

An assessment of the existing intersection configuration using "Guide to Traffic Engineering Practice-Part 5: Intersections at Grade" (Austroads, 1988) found that the following intersection improvements are required:

- Provision of a right turn bay on Elizabeth Drive with a storage length of 30 metres.
- Provision of a left turn deceleration lane on Elizabeth Drive with a length of 162 metres; and
- Widening of the Adams Road approach to the intersection to allow left turning vehicles to pass vehicles waiting to turn right. The widening needs to accommodate semi-trailers.

Whilst not necessary it would be appropriate to provide an acceleration lane for the right turns onto Elizabeth Drive from Adams Road. Such an acceleration lane would require a length of 440 metres.

4.19.4 Road Safety

The accident history for the intersection of Elizabeth Drive and Adams Road has been obtained from Liverpool Council records. Six accidents have occurred at the intersection since April 1990. Two of these accidents were fatal however they occurred early in the morning and did not involve collision with another vehicle. They are therefore unlikely to be a result of the design of the intersection. Remaining accidents involved collisions with vehicles waiting to turn right at the intersection. Implementation of improvements to the intersection as suggested above should improve traffic safety.

4.19.5 Regional Changes

The traffic impact assessment is required to be undertaken for the combined effect of clay extraction and landfill generated traffic. Because of the relatively long term nature of the development it is appropriate to also consider the future traffic growth resulting from other developments in the area such as the Badgerys Creek Airport and proposed South Creek Valley residential development.

The short term construction traffic for Stage I of Badgerys Creek Airport is anticipated to require the transport to the site of 100,000 cubic metres of crushed rock roadbase and 15,000 cubic metres of aggregates for concrete. These materials would either be transported from the Penrith area or the southern highlands and south coast with stockpiling at Wallgrove quarry. The materials would be transported to the airport site over the two year period 1995 to 1996 approximately.

The planning of airport construction is in progress with construction approximately 12 months away. No details of construction traffic routes are currently available. However, it is considered unlikely that any construction traffic would be permitted to use Adams Road because the recent major access improvements to the airport site have been developed from Badgerys Creek Road. The areas of the airport site where Stage 1 construction would take place are also more readily accessible from Badgerys Creek Road than from Adams Road. The future operational traffic resulting from Stage I of the Badgerys Creek Airport would also be unlikely to use Adams Road.

The Commonwealth Government has now completed its program of road works for Stage I of Badgerys Creek Airport. No further road works would be undertaken prior to construction work and commissioning of Stage II of the airport which, on current passenger demand projections is most likely to be required around the year 2005.

Future operational traffic from the South Creek Valley development has also been considered for the initial stage of that development. The report for the initial stage of development (DOP, 1990) indicated that the future residential growth was not anticipated to generate additional traffic on Elizabeth Drive but was expected to generate significant additional traffic on the Northern Road by the year 2000.

A summary of future traffic volumes on the adjacent road network is presented in Table 2.6 in Appendix 8.

4.20 SOCIO-ECONOMIC PROFILE

Liverpool was founded in 1810 by Governor Lachlan Macquarie and is Australia's fourth oldest town behind Sydney, Parramatta and Hobart.

In 1910 an army camp was established at Holsworthy, beginning the strong association between Liverpool and the army that has spanned the years to this day. The Army's position has greatly influenced the formation of Liverpool's social and business fibre.

The history of Local Government in Liverpool dates back 147 years, with the first District Council being formed in 1848 followed by Liverpool's proclamation as a Municipality in 1872. In those days, Liverpool was basically a farming town, but over the years, commercial enterprises gradually became established to play an important role in the local economy.

Liverpool was proclaimed a City in 1960, with a reputation as a centre of unprecedented residential growth. For the next decade, Liverpool experienced a substantial burst in population following a decision by the Housing Commission to undertake large scale housing developments in the area. The growth slowed briefly

in the 70's but is now on the increase, with the present population standing at approximately 100,000.

The people of Liverpool stem from a multitude of National backgrounds with a high percentage under the age of 20 years.

With the planned release of land for residential development it is expected that Liverpool's population will continue to expand over the next 5-10 years. Estimates show the city's population reaching 200,000 people by the year 2015.

The proposed quarry will provide only a low increase in employment opportunities for the area. The major benefit for the community in an area where substantial population growth is planned, is that the quarry will produce high volumes of construction materials for use in the existing and expanding urban areas.

Section 5

Description of the

Proposed Development

5.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

5.1 OUTLINE OF THE PROPOSED QUARRY OPERATION

The aim of the quarry operation is to extract and excavate 500,000 tonnes of clay, shale, siltstone and sandstone from the site annually. The extractive operation will commence with the stripping of topsoil from about a quarter of the surface area and the placing of it along the periphery to form audio/visual barriers, or bund walls.

The surface layer of plastic clay will then be stripped from about three hectares near the south-west corner, to be stockpiled near the north-east corner and augment the bund walls.

Extraction of the several brickmaking materials will proceed in strips advancing from west to east. The intention is to excavate sufficient area to be able to bench down to R.L. 78 at the western edge of the quarry, grading down at 1% to R.L. 74 at the eastern edge (to allow gravity drainage of leachate). Excavation will be an initial strip along the western boundary and then excavation of similar parallel strips successively to the east, thereby creating and increasing quarry floor area.

As extraction progresses drainage sumps in the descending quarry floor are to be maintained. Sediment free waters are to be pumped to the existing dam, which is to be transformed into a series of settling and sedimentation ponds.

The existing entrance road is to be constructed and sealed from Adams Road to the north-western corner of the land, a distance of approximately 140 metres. It then will continue to the north-western corner of the initial quarry area (Stage 1), where it will descend onto the progressively deeper quarry floor.

As work progresses the stockpiles will be placed on progressively lower levels, until floor level is reached. From then on all stockpiles will be on floor level, some 30 metres below natural surface level. However, it is intended to remove excavated materials from the site as soon as possible, in order to create maximum available space.

During the early years of the operation the existing large shed on the site will be maintained as a workshop and amenities facility, and the dwelling as a manager's residence and office.

5.2 QUARRYING OPERATIONS

5.2.1 Staging Plan and Quarry Life

Extraction of the several materials is to occur in four main stages, each stage to be commenced and completed prior to commencing the next. The basic elements of the four stages are depicted on Figure 5.1 a, b, c and d. The intention is to maintain existing drainage features for as long as possible. The estimated quarry floor levels are shown on each staging plan.

5.2.1.1 Stage 1 (Fig 5.1.a)

Stage 1 will commence with the stripping of topsoil from about five hectares on the south-western portion of the property. Topsoil stripped from this area will be placed along the boundaries and shaped into bund walls, as detailed on Figure 5.2, together with much of the underlying, plastic clay. Extraction of brick making materials will commence on a strip just inside the western bund wall; this initial strip will measure approximately 200m north to south and 60m west to east. This will enable the formation of a quarry floor area with workable dimension.

The progressively descending excavation floor is to be drained by means of sumps and pumping into surface settling ponds.

Successive, narrower, strips will then be extracted in an easterly direction and backfilling will commence from the western quarry wall. A weighbridge and office are to be located near the north-western corner of the property.

Duration of Stage 1 extraction is expected to be 3 years, based on an annual extraction rate of 500,000 tonnes.

5.2.1.2 Stage 2 (Fig 5.1.b)

Stage 2 will consist of the easterly extension of Stage 1 operations. As backfilling of Stage 1 progresses topsoil and unsuitable materials (clay, sandstone, etc.) from the Stage 2 operations will be used as cover material on layers of compacted solid waste fill and finally as topsoil.

Duration of Stage 2 is expected to be 3 years.

5.2.1.3 Stage 3 (Fig 5.1.c)

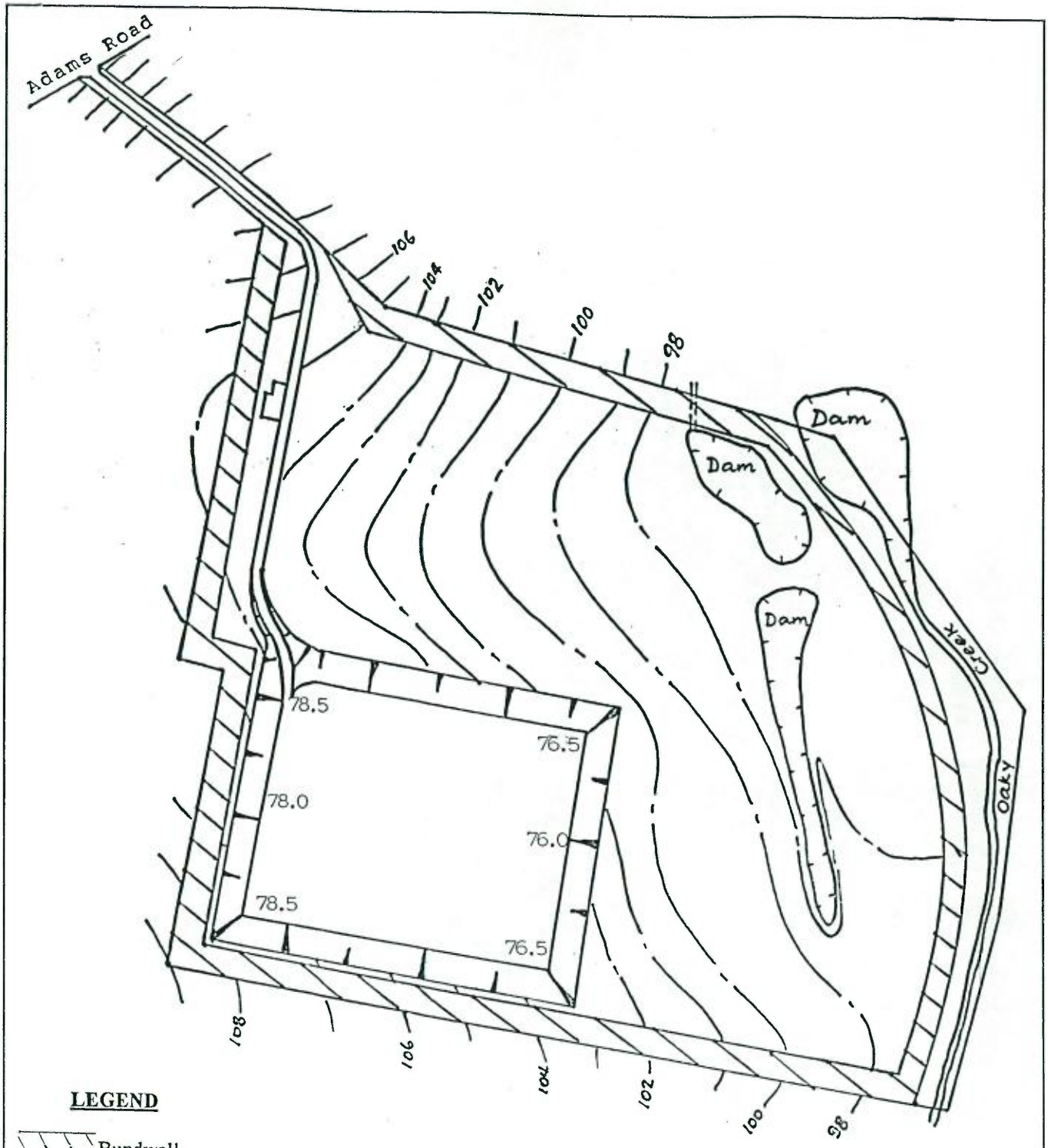
Stage 3 will be a northerly extension of Stage 1. Operations of excavating and backfilling are to be co-ordinated such that access from Stage 3 excavations onto Stage 2 backfilling is unimpeded for transporting soil and unsuitable materials (clay, sandstone, etc) to the layered waste fill.

Drainage will be maintained at all times from quarry floor sumps into surface settling ponds, while de-leaching wells and gravel filled chimney drains against quarry walls will ensure low leachate hydraulic heads below the waste fill material.

Duration of Stage 3 is expected to be 3 to 4 years.

5.2.1.4 Stage 4 (Fig. 5.1.d)

Excavations during Stage 4 will extend easterly from Stage 3 and will involve the removal or re-shaping of the existing ponds near the north-eastern corner of the property. Extraction is expected to cease in the 3rd or 4th year of Stage 4 but waste filling is expected to continue for an additional 3 years.



LEGEND

- Bundwall
- Quarry Face
- Entry/Exit Road
- Settling Ponds
- 78.0 R.L of Quarry Floor
- 106 Contours

Figure 5.1a

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Geological & Geotechnical Consultants

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OURIMBAH NSW 2258
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Fax: (043) 891600

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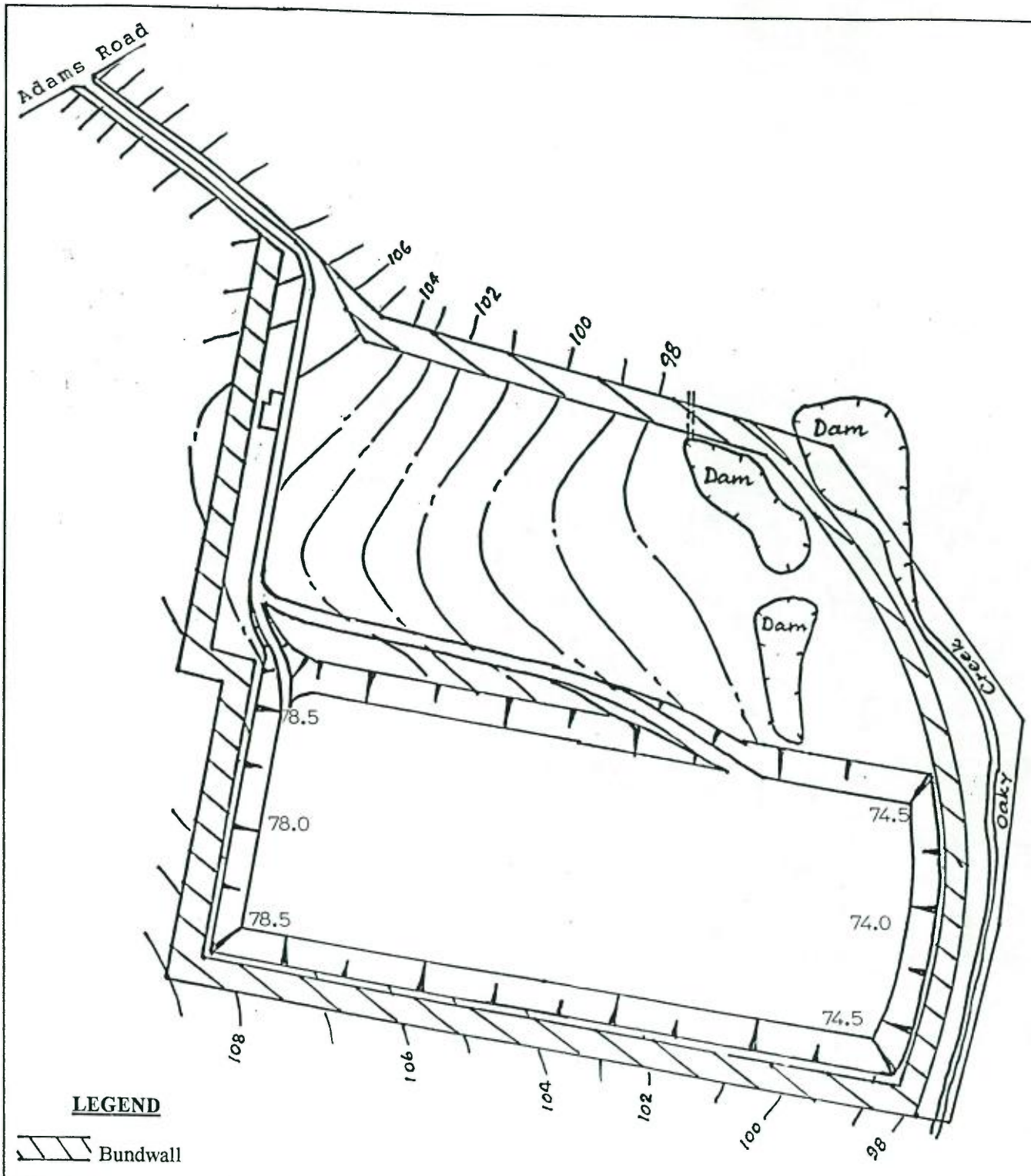
SCALE: 1:4000

DRAWING NO: 5.1a

LOT 3 ADAMS ROAD
LUDDENHAM
CLAY/SHALE RESOURCE
QUARRY STAGE 1

SITE PLAN



LEGEND

- Bundwall
- Quarry Face
- Entry/Exit Road
- Settling Ponds
- 78.0 R.L of Quarry Floor
- 106 Contours

Figure 5.1b

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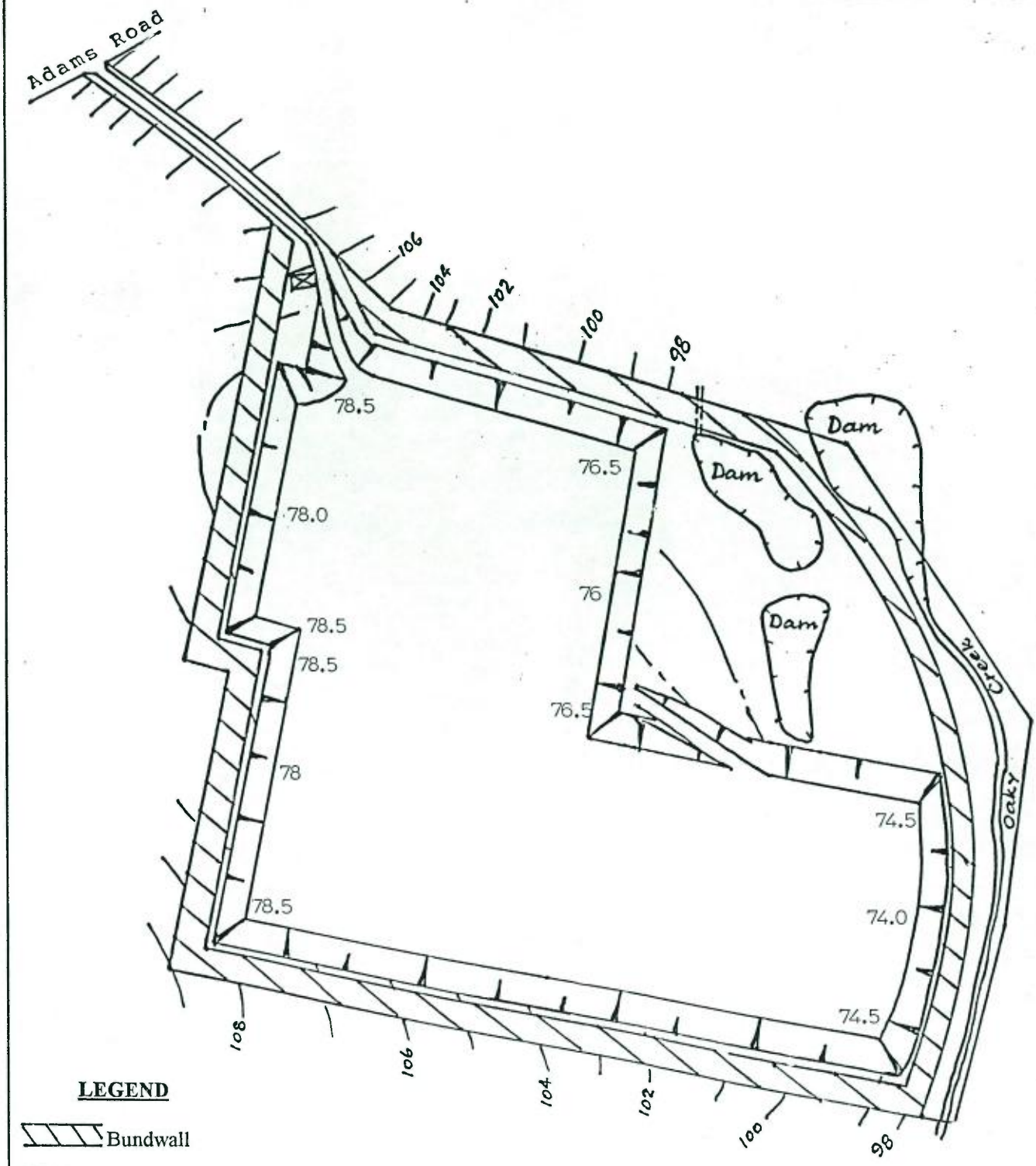
DRAWING NO: 5.1b

LOT 3 ADAMS ROAD
LUDDENHAM
CLAY/SHALE RESOURCE
QUARRY STAGE 2

SITE PLAN



LEGEND

- Bundwall
- Quarry Face
- Entry/Exit Road
- Settling Ponds
- 78.0 R.L of Quarry Floor
- 106 Contours

Figure 5.1c

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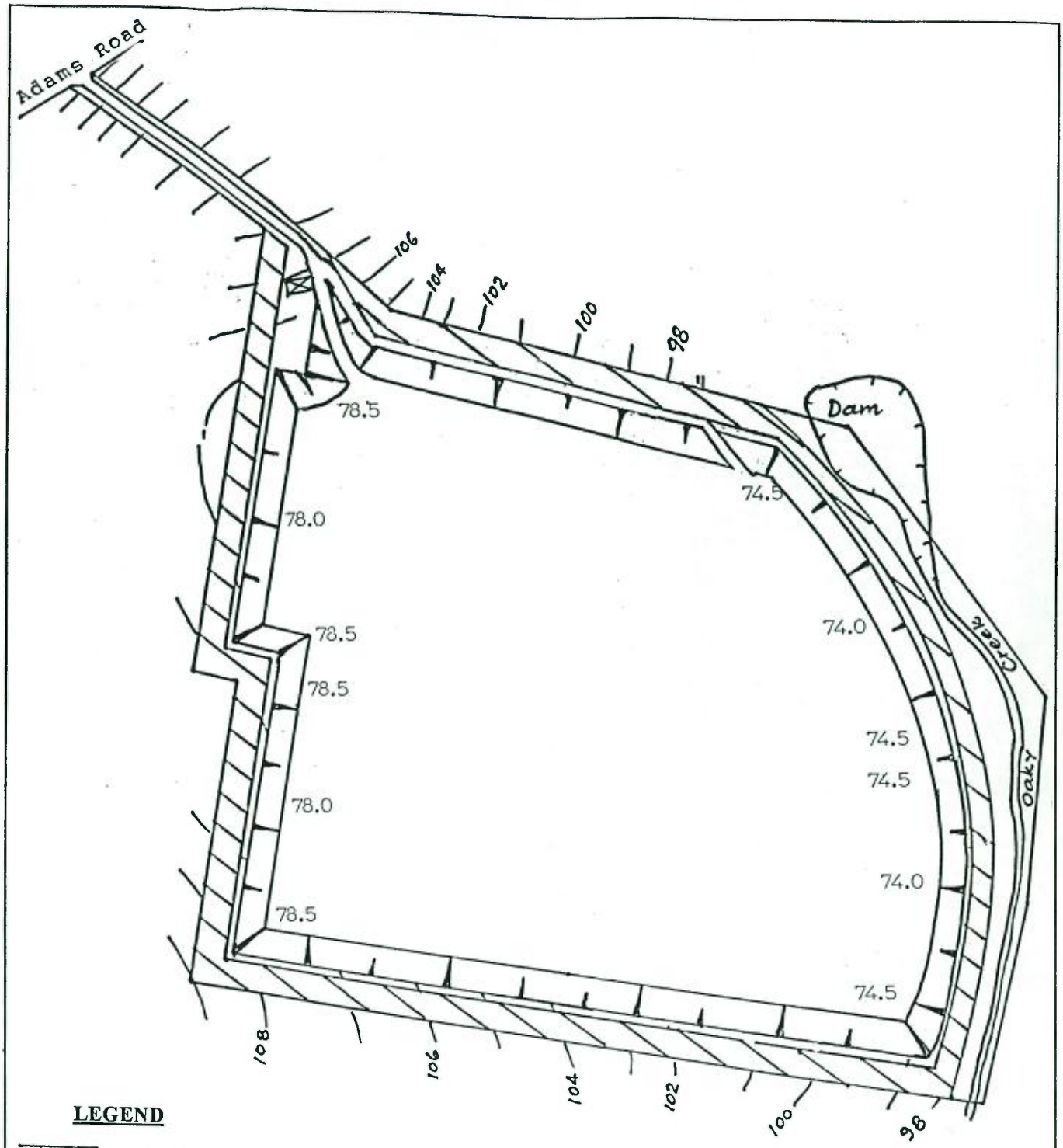
DRAWING NO: 5.1c

LOT 3 ADAMS ROAD
LUDDENHAM
CLAY/SHALE RESOURCE
QUARRY STAGE 3

SITE PLAN



LEGEND

- Bundwall
- Quarry Face
- Entry/Exit Road
- Settling Ponds
- 78.0 R.L of Quarry Floor
- 106 Contours

Figure 5.1d

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OURIMBAH NSW 2258
Ph: (043) 892300
Fax: (043) 891600

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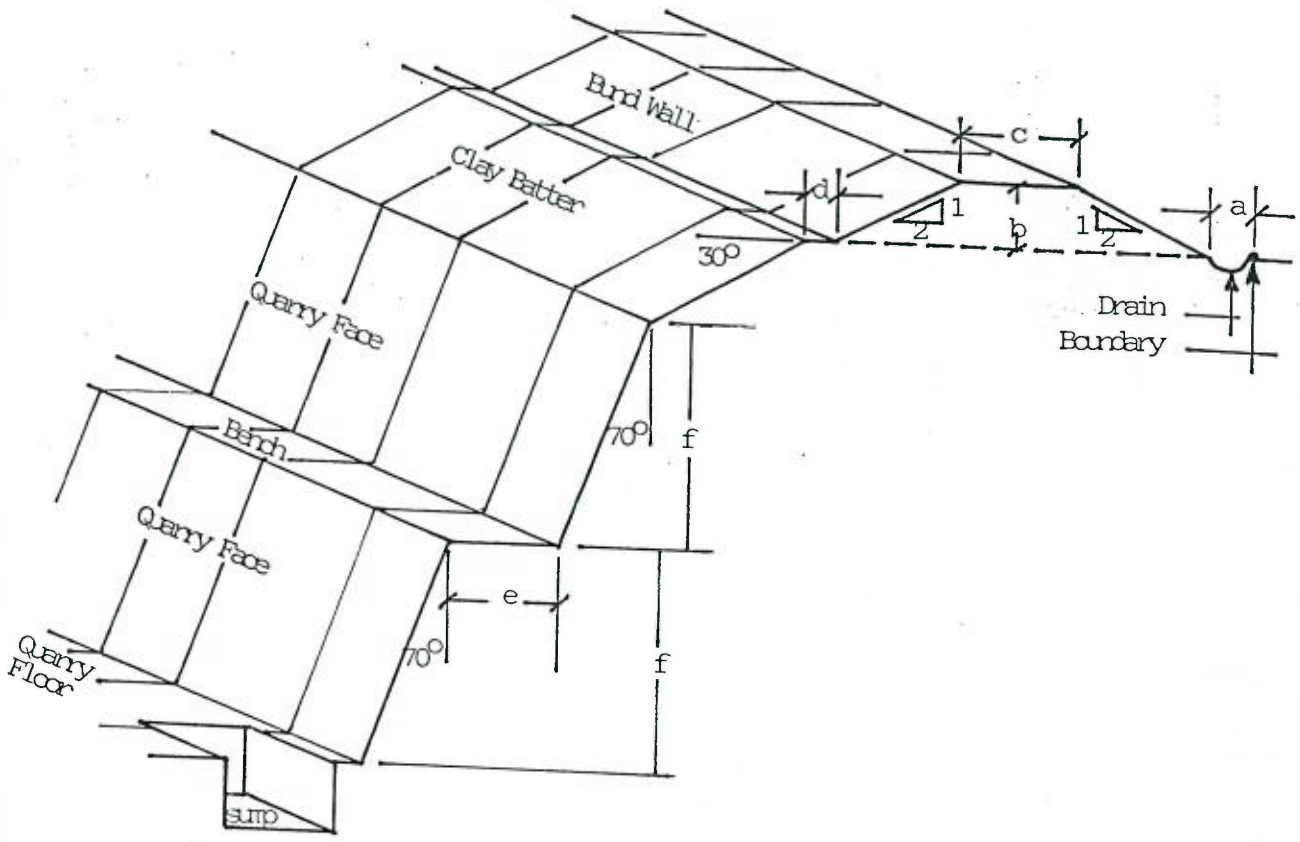
SCALE: 1:4000

DRAWING NO: 5.1d

LOT 3 ADAMS ROAD
LUDDENHAM
CLAY/SHALE RESOURCE
QUARRY STAGE 4

SITE PLAN



KEY

a = 2m

b = 3m for south bundwall
= 4m for north and west bundwalls

c = 5m

d = 5m where b = 3m
= 1m where b = 4m

e = 5m

f = 10m maximum

Figure 5.2

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OURIMBAH NSW 2258
Ph: (043) 892300
Fax: (043) 891600

G B B

N

SCALE:
N.T.S.

DRAWING NO:
9591/1-1

LOT 3 ADAMS ROAD
LUDDENHAM
CLAY/SHALE RESOURCE

SCHEMATIC SECTION
BUNDWALL & QUARRY PROFILE

The final backfilled landform will consist of a gently sloping dormal structure that drains radially from the centre of the backfilled area. Clean fill material (soil, clay, sandstone, etc) will be placed over the edges of the excavation walls as backfilling progresses, to prevent possible entry of run-off waters. Vegetation cover and tail-out drains will be designed to reduce the risk of erosion.

5.2.2 Quarrying Methods

The relatively soft nature of most of the materials, together with its horizontal bedding, will allow the use of rubber tyred scrapers (D631) for most of the winning and stockpiling. A bulldozer (D9) is probably necessary to rip some of the harder bands and to push the scrapers.

Loading from stockpiles onto road transports will be by rubber tyred loaders (D966).

Except for the initial phase of Stage 1 and topsoil stripping from successive stages, all activities will be well below natural ground level, with the added environmental barrier of the three metres high peripheral bund wall.

Road transports will only become visible as they approach natural surface level.

5.2.3 Bund Wall Construction

The bund walls are to be constructed, together with settling ponds, as the initial phase of Stage 1. They will consist of topsoil and clay removed by scrapers from the Stage 1 quarry area, placed in strips parallel to the boundaries on the buffer zones. The walls are to be shaped into a truncated triangular section with slopes of 1V:2H and a height of 3 to 4 metres. They will be continuous except for a small gap near the settling ponds to allow for drainage facilities, although the installation of adequate pipes may be a preferred method of discharging waters beyond the bund walls. During Stage 3 the bund wall along the northern boundary will be increased in height and width to store additional soil, clay, sandstone, etc. for final backfilled surface rehabilitation and landscaping. Figure 5.2 shows a cross section of the bund wall and quarry wall. The slopes of the bund walls are to be seeded and planted immediately upon completion in accordance with the planting program.

5.2.4 Landscaping and Planting

Landscaping of the project area essentially will consist of seeding and planting the bund walls and the strips of natural surface between bund wall and boundary fence and between bund wall and quarry face. Consideration should be given to grassing at least the upper part of the 30° batter along the top edge of the quarry face. The majority of the bund wall will be grassed and the outside face planted with shrubs and ground covers. Any large tree planting will be kept to the lower outer edges of the bunds so this planting can remain when the bunds are removed, for topdressing and forming of the final land form.

Special attention is to be given to the eastern boundary along the creek. A 30 metres wide buffer zone will be maintained, with a lower and narrower bund wall (1 metre

high) along the quarry's edge. The existing vegetation of mainly casuarina trees will be protected and enhanced.

An interceptor/settling pond is to be constructed at the south-east corner of the land to prevent any damage from water flows or siltation.

5.2.5 Rehabilitation

The quarry void will be used for a landfill operation using non-putrescible waste, commencing towards the end of Stage 1 of the quarry management plan.

A separate Environmental Impact Statement has been prepared by ERM Mitchell McCotter for this part of the Development Application and, from approximately year 2 of the quarry, the two activities will operate on the site together.

The Environment Protection Authority has been consulted in respect of the quarry and landfill operations and their reply is enclosed in Appendix 4 of this Statement and in the landfill Environmental Impact Statement.

The reinstatement of the site to the designed land form will allow its future use as an employment area as recommended in the South Creek Regional Environmental Study, being adjacent to the Badgery's Creek Second Sydney Airport.

5.3 SOLID WASTE DISPOSAL

Solid wastes generated by the proposed extractive project are those materials that have no immediate marketable end use. Such materials comprise topsoil, lateritic gravelly clay below the topsoil, bands of hard sandstone and siltstone and bands of shale with recognisable calcite and siderite mineral contents.

The topsoil and some excavated waste materials are to be used to construct bund walls and eventually in final landscaping of the landfilled site; the topsoil therefore is a valuable commodity during and after the extraction and landfill projects.

The solid quarry waste materials are natural rock products with no contaminating attributes. It is therefore intended to use such materials in ongoing backfill and restoration activities of filled quarry areas. Intermediate stockpiling of such materials may be required until sufficient quarry floor area is available for final disposal.

5.4 USE OF EXISTING BUILDINGS

The existing large stable and produce storage shed is to be converted into a workshop and amenities facility. The staging of the quarry operations allows for its useful retention during at least two stages. The amenities will be connected to an appropriate package treatment works with installation to the requirements of the Council and Environment Protection Authority.

A floor plan of this building is shown on Figure 5.4.

Similarly, the residence near the western boundary is to be preserved as a manager's residence and associated office.

A floor plan of the residence is shown on Figure 5.3.

With Stage 3 of the quarry operation the workshop and amenities building will be removed and a demountable shed and amenities provided near the site entry. A new manager's residence, or other suitable accommodation, may be provided with Stage 3.

All other existing structures will be demolished as the quarry extends in area.

5.5 VEHICLE MOVEMENTS

The proposed development is an extractive industry where clay and shale is to be extracted from the site and transported by road. The bulk of the material will be used for brickmaking.

The production will be continuous over each year and the hours of operation will be 7.00am to 5.00pm, Monday to Friday and 7.00am to 4.00pm Saturday, with no work on Sundays or public holidays. In addition, there would be some additional holiday days, such that the total working days would be about 276 per annum.

The material would be transported to nearby brickworks by six-axle articulated trucks, with payloads of 25 tonnes each. Transport would be restricted to the above working hours.

Based on the removal of 350,000 tonnes of clay/shale from the site per year, this would typically represent 51 loads per day (102 truck trips)

Staff on the site would be up to five, plus the truck drivers.

The latter would be local owner-operators. The trucks would not be garaged on the site but would be driven to the site each morning.

The report in Appendix 8 gives a full assessment of the combined quarry and landfill operations.

5.5.1 Parking

Off-street parking for 15 employee and visitors vehicles will be located adjacent to the manager's residence for the quarry and landfill operations.

The excavating equipment will be either left on the quarry floor or parked in the workshop building overnight and at weekends.

Adequate space will be available on-site at all times to provide parking for employee's vehicles and plant so that no interference occurs to the traffic movements around the site.

5.6 BUILDINGS

The following is a summary of the use of existing buildings and new buildings and structures proposed:

5.6.1 Manager's Residence and Office

The existing dwelling on the site will be used as a manager's residence with use of the present dining room as an office.

A floor plan of the building is shown on Figure 5.3.

With stage 3 the manager's residence and office will be demolished and a portable office erected for the duration of the final stages.

5.6.2 Workshop and Amenities

The existing produce store and stable building will be used for a workshop/amenities with overnight use as vehicle storage.

A floor plan of the building is shown on Figure 5.4.

The lunchroom, toilet and office will continue to be used for these purposes. With the excavation of Stage 3, this building will be removed and a demountable building and amenities provided.

The workshop facility will only be used to service and repair vehicles and equipment operation on the site and to store vehicles and equipment used in the quarry's operation.

5.6.3 Weighbridge

A weighbridge will be installed at the commencement of the quarry operation, located near the existing residence at the entry/exit to the main body of the property.

5.6.4 Fencing

The existing rural perimeter fencing will be retained and maintained at all times to ensure that entries by unauthorised persons and wandering stock is prevented.

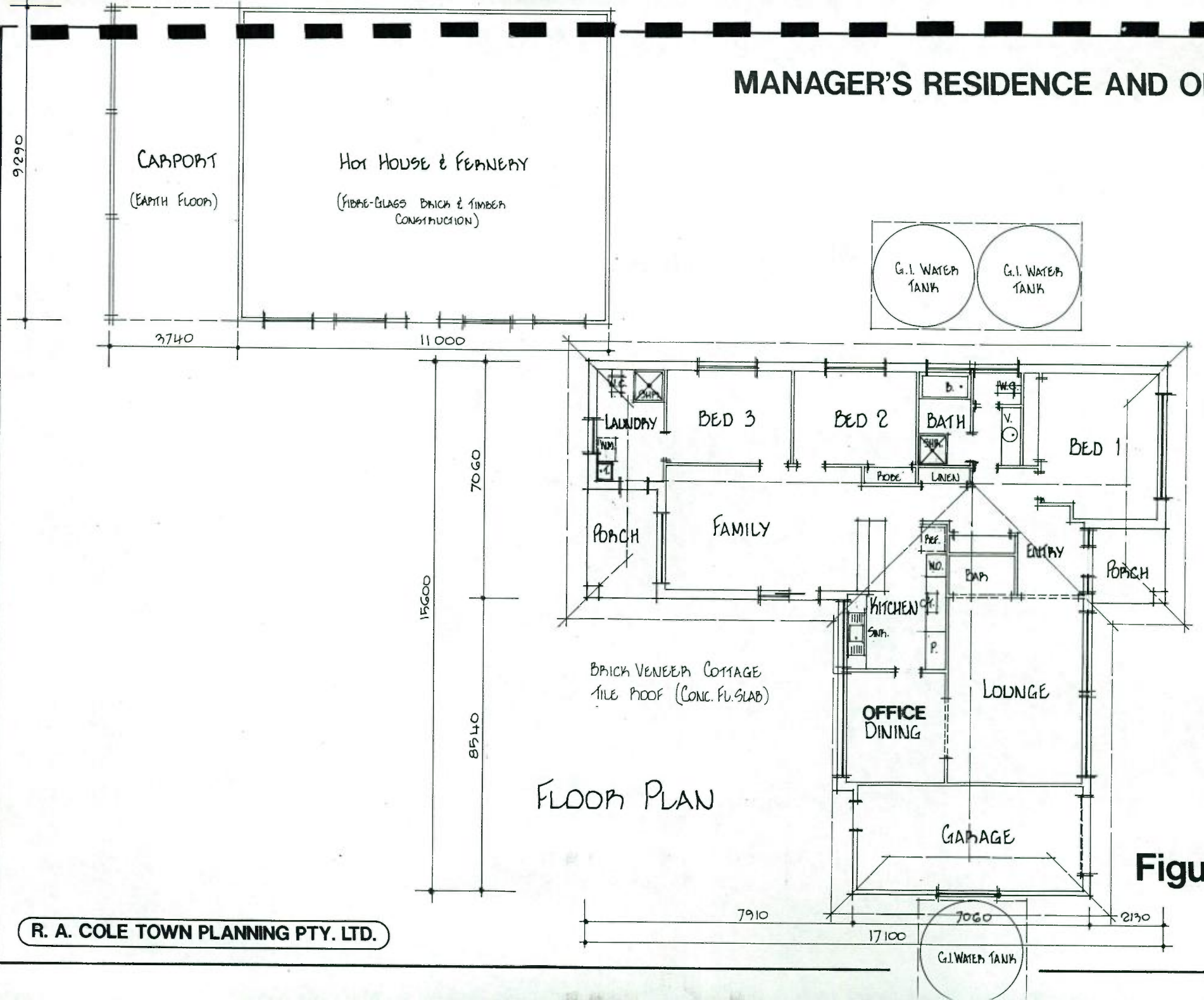
5.6.5 Fuel Storage

No fuel will be stored on the site. Supply to on-site vehicles will be by mobile re-fuelling contactor.

5.6.6 Kiln

A small portable electric kiln will be used on the site to test clay/shale samples.

MANAGER'S RESIDENCE AND OFFICE

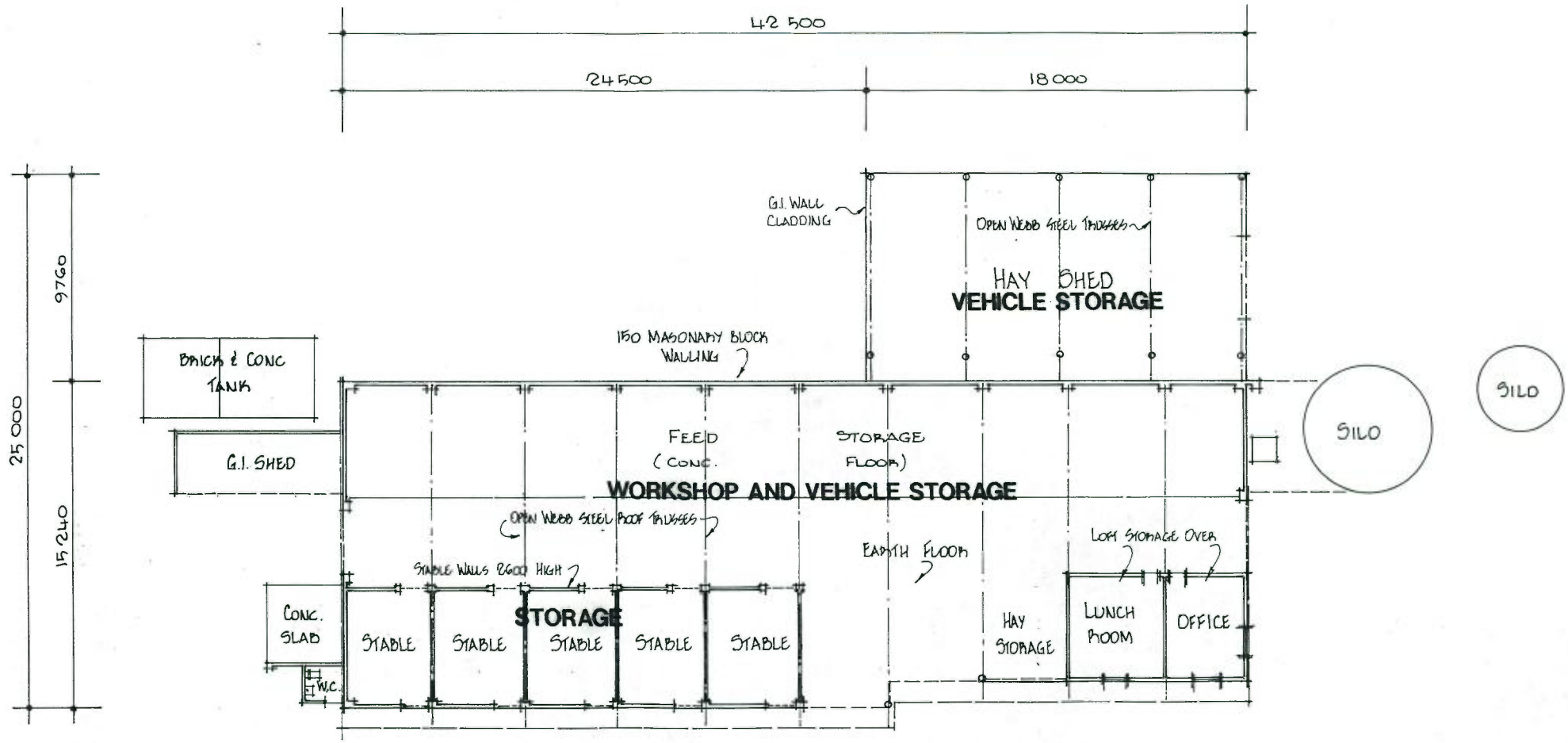


FLOOR PLAN

Figure 5.3

R. A. COLE TOWN PLANNING PTY. LTD.

WORKSHOP AND AMENITIES



FLOOR PLAN

R. A. COLE TOWN PLANNING PTY. LTD.

Figure 5.4

5.7 EMPLOYEES

The proposed clay/shale quarry will generate the following employment opportunities:

Manager
3 operators
1 yard hand

The proposal will also provide employment on a sub-contract basis for 3-4 truck drivers, operating between the quarry and brick/tile manufacturing premises.

Indirect employment will be provided by the establishment of the quarry to:

Maintenance and servicing personnel.
Business services.
Retail premises.
Equipment supplies.
Fuel supplies.

5.8 HOURS OF OPERATION

In view of the fact that the extractive operation essentially consists of the creation of stockpiles within the quarry, there is no need to make provisions for regular operations outside normally accepted working hours. Hence, it is proposed to conduct site operations within the hours of 7.00 am and 5.00 pm for weekdays and 7.00 am and 4.00 pm on Saturdays. Sundays and public holidays will not be operating days under normal conditions.

However, if prolonged wet weather prevents extraction for lengthy periods, it may be necessary to work outside the normal hours to replenish stockpiles. Having to de-commission a brick kiln for lack of raw materials is a serious and costly matter.

5.9 SERVICES

5.9.1 Water

The existing water tank storage facilities, collecting roof water from the residence/office and the workshop and amenities building, will continue at least for 2 of the 4 stages. With the removal of the workshop building, the water tank storage will also be relocated to the demountable building and amenities.

In dry times, when there may be insufficient stored water for use in the manager's residence and workshop and amenities, water will be purchased and imported by water tanker.

Water from the dams will be used to suppress dust on the access road and during quarrying operations.

5.9.2 Sewerage

The existing septic tank facilities will be removed and a new package treatment works installed to the requirements of the Council and Environment Protection Authority. With the removal of the existing building with Stage 3 of the quarry operation, the treatment works will be relocated or a new facility installed for Stage 3 and 4 and the continuing landfill operation.

5.9.3 Electricity

No alteration will be made to the existing power supply for at least 2 of the 4 stages. No power supply is required on the quarry floor and with the removal of the existing shed with Stage 3, the existing supply lines and meter will be relocated to suit this new demountable workshop and amenities.

5.9.4 Telephone

The proposed quarry operation will need the installation of an additional telephone line and an additional line for a facsimile machine. Telecom Australia at Liverpool have advised verbally that, as long as sufficient notice is given, the additional lines can be provided.

5.9.5 Gas

There is no piped gas available at the site and none is needed for the operation of the quarry.

Section 6

Environmental Management

R. A. Cole Town Planning Pty. Ltd.

Brink & Co. Pty. Ltd.

6.0 ENVIRONMENTAL MANAGEMENT

6.1 EROSION AND SEDIMENTATION CONTROLS

6.1.1 Vegetation Clearing

With the exception of a few scattered trees and copses the project site is mainly covered with grasses, with the southern half almost devoid of vegetation.

Hence, clearing of vegetation will require only the removal of some trees as the quarry area expands.

6.1.2 Top Soil Stripping and Stockpiling

The topsoil will be placed in the bund walls where it will assist in the development of a vegetation cover. Stripping will be carried out using scrapers, which will carry the soil, including the grass cover, to the bund wall sites along the boundaries.

Bund walls will be shaped with a dozer to berms of 2H:1V gradients with a flat crest about five metres wide and three metres above natural surface level.

The soil has an inherent moisture content which will suppress the generation of dust. Its clay content is an inbuilt safeguard against erosion, especially after the establishment of a vegetation cover.

The exposed surface below the soil will consist of a dense clay that, on the prevailing gently sloping site, would require very considerable effort to make it yield to erosion.

Nonetheless, in the unlikely event of erosion occurring, it will be confined to the area within the bund walls and sedimentation would then take place in the ponds constructed for that very purpose.

An Erosion and Sediment Control Plan will be prepared prior to work commencing to the requirements of the Department of Land and Water Conservation (Soil Conservation Service). The techniques to be employed will include:

- Limit clearing to stages only;
- Limit the time during which unprotected bunded areas are exposed to wind and rain;
- Intercept, divert and safely dispose of clean runoff flowing onto all disturbed areas, including stockpiles and bunded areas;
- Reduce runoff velocities by minimising the length of flow paths, constructing channels with gentle gradients and providing rough linings to the steeper channels;
- Apply temporary vegetation or mulch to all disturbed areas, including soil stockpiles if such areas are to be exposed for 14 days or more;

- Stabilise immediately all bunded areas with grasses, hydro mulch or similar and with permanent vegetation;
- Trap sediment as close to the source as possible;
- Locate sediment traps and filters below all disturbed areas to intercept and detain sediment laden runoff;
- Locate sediment filters along Oaky Creek at breaks in the 1 metre high bund wall;
- Use sediment basins in the quarry floor to "clean" runoff before disposal to Oaky Creek.

6.1.3 Quarry Operations

Quarry operations will be entirely below natural ground levels. Hence, any erosion and sedimentation resulting from and in the operations will be contained within the quarry. A drainage and sedimentation sump will be maintained in the deepest point of the quarry. It will be cleaned out when necessary and its clear overflow waters are to be discharged into sedimentation ponds and eventually into the large dam at the north-eastern corner of the site.

Similarly, any waters draining off the waste fill will be separately connected in quarry floor ponds. Regular monitoring of water discharged to surface ponds will ensure that no significant contamination can occur.

Hence, a comprehensive sedimentation process will treat any quarry waters prior to its release into Oaky Creek.

6.1.4 Site Management

A full time, competent and responsible manager will be in charge of the operations. The manager will live on the premises and develop an intimate knowledge of all aspects of the project.

Responsibilities of the position will include orderly and efficient extraction, upkeep of stockpiles, supervision over road transports while on the site, general cleanliness, drainage and upkeep of the site and liaison with neighbours and relevant authorities.

6.1.5 Maintenance of Controls

Maintenance of controls will be the responsibility of the site manager, who, by dint of overall presence, will be the most qualified person.

However, the erosion and sedimentation controls, once constructed and operational, should operate without difficulties, provided that regular inspections are carried out and rectification attended to.

6.2 WATER MANAGEMENT

6.2.1 Objectives

It is recognised and accepted that the extraction project must be designed and executed so that the surrounding ecology is affected to the absolute minimum.

Water management is the most sensitive aspect of possible ecological effects; both surface and sub-terranean waters may be polluted but a draw down effect of a large excavation can also affect the water table outside the boundaries of the project site.

As the water management of the quarry is linked with the future landfill development, and both activities will operate together for some time, this section is given coverage in both proposals. The water management in the Environmental Impact Statement for the landfill will therefore contain similar information.

Management of water on site will be aimed at:

- ensuring water is available for operational requirements;
- using the poorest quality of available water acceptable for each particular task;
- preventing deterioration of water quality in surface waterways and ground water external to the site; and
- ensuring compatibility between quarry and landfill operations.

A management plan will specifically address:

- provision of an adequate water supply for operational and domestic uses;
- potentially turbid runoff from disturbed areas;
- leachate generation, groundwater inflow and runoff from uncovered waste;
- sewage treatment and effluent disposal; and
- workshop wastes.

6.2.2 Staged Controls for the Quarry

The specific topographic parameters of the site will cause the peripheral bund wall to be a highly effective erosion and sedimentation control feature.

The bund wall will retain all run-off from any workings on the land within its boundary. The north-eastern corner is the lowest natural surface area. A shallow contour drain along the inside toe of the bund wall along the eastern boundary will intercept all run-off waters and discharge them into the reconstructed ponds.

With Stages 1, 2 and 3 of the quarry, overflow from the two in-series connected ponds will enter the Oaky Creek system by means of a spillway through the break in the bund wall. A drainage sump in the quarry floor, which acts as a primary sedimentation pond, will be pumped into the settling ponds. No water can leave the quarry void unless pumped out and this water will not leave the quarry unless its quality is such that no pollution will occur to downstream creeks.

During Stage 4, a 1 megalitre storage dam will be excavated in the quarry floor of the Stage 3 before decommissioning the surface ponds. Overflow from these quarry floor ponds is to be pumped to the large dam which partly occupies the north-eastern corner of the site.

Some run-off from the southern adjacent land is expected to run along the outside toe of the southern bund wall towards Oaky Creek. To prevent direct entry into the creek such waters are to be collected in a small interceptor pond at the south-east corner, with an overflow into Oaky Creek.

With these measures in place, no siltation and erosion of any water ways outside the project area is likely to occur. Furthermore, the simplicity of the preventative measures will allow easy maintenance and rectification where necessary.

6.2.3 Sub-Terranean Waters

The water table in the area lies between three and five metres below natural ground level. Generally the greater depths occur at topographic highs, eg. DDH 2 and DDH 5, while the topographic lows show shallower water depths, eg DDH 3.

The dense, fine grained nature of the sedimentary strata cause them to be both poor aquifers and poor conductors. Hence, the draw down gradient within these strata is bound to be significantly steeper than that within a coarser grained Hawkesbury Sandstone. Based on such observations and experience with a variety of sedimentary strata, the expected draw down gradient surrounding the excavation faces will be about 30°. This means that, given the benched quarry walls, the width of the buffer zones and the poor permeability of the strata, a draw down effect will not be noticed outside the project site boundaries.

The essentially impervious nature of the quarry floor and lower quarry walls together with the fact that the quarry will act as sump (with draw down gradients as discussed above) with a negative hydraulic gradient means that water cannot flow from the quarry to the surrounding groundwater table.

Moreover, the brackish nature of the ground water is unlikely to stimulate much deep rooted vegetation and renders it unsuitable for bore water purposes.

6.2.4 Water Usage and Available Supply

6.2.4.1 Water Demands

Water will be required for staff amenities, dust suppression and irrigation of areas undergoing revegetation.

Employees will use potable water at an average rate of about 200 litres per person per day. Employee numbers will be highest during simultaneous quarry and landfill operations and potable water demand is estimated to be 2000 litres per day or 0.7 megalitres per year. This will decrease to about 800 litres or 0.3 megalitres once quarry operations are finished.

Dust suppression will be required during dry weather on unsealed sections of the internal road and active quarry and landfill work areas. Highest demands will occur during simultaneous quarry and landfill operations which will occur for approximately 11 years. The demand will be substantially less following completion of quarry operations. Based on a water application rate of 1.5 times the average evaporation rate (1.5 metres per year), water demands are estimated to range from 14 megalitres down to two megalitres per year.

Landscaping and quarry rehabilitation areas will require some watering, however the proposal is to use endemic plant species which are adapted to regional climatic conditions. Watering will therefore be restricted to the first few months of plant or grass growth. It is anticipated that watering will be at the rate of 5000 litres per day. For an average of 283 non rain days this is equivalent to a demand of 1.4 megalitres per year.

6.2.4.2 Water Supply

Water for potable use will be sourced from rainwater tanks and supplemented with water imported by tanker. The principal source of water for non-potable uses will be runoff collected from the quarry catchment. This will be stored in a dam located in the quarry and the existing three megalitre dam on Oaky Creek.

6.2.4.3 Water Balance

A water balance was calculated to determine the availability of a sufficient quantity of water to meet water demands under dry climatic conditions and during highest operational demands. Rainfall data from Badgerys Creek meteorological station was used to provide rainfall information for a dry year which is defined as the driest 10% of annual rainfalls (or a probability of occurring once in 10 years). A dry year was calculated to have precipitation of about 500 millimetres which compares to the average rainfall of 760 millimetres per year.

An historical year reflecting this rainfall was selected and a water balance calculated to simulate the monthly variability of potable and non-potable water demands and storage characteristics under dry conditions.

a. Potable demands

The potable water catchment includes roof areas of the manager's residence and work shop building which combined provides an area of about 1000 square metres. Total tank storage will be 10,000 litres. Based on a dry year and a maximum potable water demand as described above a water balance is given in the table on the following page.

WATER BALANCE RESULTS (Cubic Metres)

MONTH	STORAGE (max. 10 cu.metres)	SURPLUS	DEFICIT
January	10	31	
February	9.9	-	
March	10	120	
April	10	82	
May	10	26	
June	10	10	
July	10	7	
August	10	34	
September	10	20	
October	10	38	
November	10	74	
December	10	6	

From the above analysis it is concluded that sufficient potable water is available to meet anticipated demands during most climatic conditions. If necessary water can be imported by tanker, however this is unlikely to be necessary for potable use during most climatic conditions.

b. Non-Potable Demands

Runoff from the quarry catchment will be collected in a storage dam and used for non potable water uses. An additional surface storage of about 200 cubic metres will be available in the early years and when final contours in the southern part of the site are substantially reached. However, during stages 3 and 4 of the quarry development all runoff from the site will drain to the quarry dam. For calculation purposes storage capacity was taken to include one third the capacity of the dam on Oaky Creek and the storage capacity of the quarry dam which combined gives a total volume of about two megalitres. Storages were assumed to be half full at the beginning of the year. Water demands were based on simultaneous quarry and landfill operations when demands are expected to be greatest. It was assumed that half the available runoff would be available for water use on the site or to replenish dam storages. Results are presented in the following table.

WATER BALANCE RESULTS (megalitres)

MONTH	STORAGE (max. 2.0 megalitres)	SURPLUS	DEFICIT
January	2	0.9	
February	0.9		
March	2	9.35	
April	2	6.8	
May	2	1.5	
June	1.9		
July	1.6		
August	2	1.8	
September	2	0.8	
October	2	2.5	
November	2	7.2	
December	1.5		

It was determined that during an unusually dry year a sufficient quantity of water would be available to meet non potable demands. Drawdown of dam storages would occur during four months of the year. If required water could also be tankered to the site and under exceptionally dry conditions operations would cease until a sufficient water source is made available.

6.2.5 Water Quality Objectives

The site drains to Oaky creek and then to South Creek which are not classified water ways under the Clean Waters Act and therefore no specific water quality criteria apply for industry discharges (SPCC 1980). It is expected that water quality guidelines published by the Environment Protection Authority (SPCC 1990) will form the basis for new water quality standards. Guidelines are based on protection categories which define beneficial uses of a waterway and appropriate water quality standards. Also to be considered are more recent national water quality standards (ANZECC, 1992).

Water from Oaky Creek is occasionally used for irrigation when salinity levels are not excessive. This usage and aquatic systems further downstream have been considered in proposing water quality criteria for these beneficial uses, as shown in the following table.

PROPOSED WATER QUALITY CRITERIA

PARAMETER	PROPOSED LIMITS	
	Irrigation	Aquatic Systems
pH	4.5 - 9.0	6.0 - 9.0
Salinity (mg/L)	<500	not more than 10% of background.
Suspended solids (mg/L)		10+ 6N (Where N = background = <25)
Dissolved oxygen (mg/L)		>6
Turbidity		Does not decrease photosynthetic activity by more than 50%

Assuming a background suspended solids concentration of about 10 milligrams per litre, the maximum discharge limit would be about 70 milligrams of suspended solids per litre. The Environment Protection Authority generally applies a suspended solids limit of between 30 and 50 milligrams per litre for most industry discharges. For the proposed development the best practical means of pollution control will be employed. It is anticipated that this will achieve the above criteria and a suspended solids limit of 50 milligrams per litre.

6.2.6 Surface Water Management

Stormwater from the quarry workings will drain to a sedimentation/storage dam located in the north east corner of the quarry. Where necessary diversion drains will be installed to prevent runoff from undisturbed areas from entering the pit. A permeable barrier will be positioned in the dam such that sediment loads are further reduced prior to pump out to the dam located on Oaky Creek. This barrier will consist of 5-20 millimetre sized gravel and would be effective in retaining a large proportion of sediments not already settled. Where runoff cannot easily be directed to the dam, temporary sumps will be installed. Collected runoff will then be pumped to the quarry dam.

The quarry dam will have sufficient volume to accommodate a once in 10 year, six hour duration storm (Department of Conservation and Land Management Guidelines, 1992) without interfering with site operations. For a site catchment area of about 17 hectares approximately three megalitres would be required. Additional storage of about one megalitre will also be provided.

To maintain sufficient air space for stormwater collection, settled and filtered water will be pumped to the dam on Oaky Creek and the south-east corner of the site as

required. Based on a conservative percolation rate of 1.0 millimetre per second (Uni. Sydney 1981) it was estimated that water filtering through the permeable barrier has the potential to flow into the pump area considerably faster than a typical pump rate of about 20 litres per second. For larger storms a greater area of the quarry floor could be affected by stormwater and site operations would be curtailed until sediment has sufficiently settled and excess water pumped to Oaky Creek.

Completed landfill areas will drain to temporary sedimentation ponds which will remain in position until these areas are sufficiently stabilised. Storage capacity of ponds will be based on Department of Land and Water Conservation Guidelines which equates to approximately 160 cubic metres of storage for each hectare of disturbed catchment. Sedimentation ponds will have filter outlets and water will drain directly to storage dam located on the south eastern section of the site. The storage dam will be a source of water once the quarry dam is filled with waste.

An independant report titled "Geotechnical Assessment" by Robert H Amaral, Consultant Geotechnical/Landfill Engineer, is included in the application to address specific water management issues.

6.2.7 Sewage Treatment and Disposal

A proprietary aerobic sewage treatment and disposal system will be installed to Council requirements. These systems produce a high quality effluent suitable for spray irrigation. Effluent will be irrigated around the manager's residence over a landscaped area of about 600 square metres. When required the system will be relocated closer to site entrance or a similar area irrigated.

6.2.8 Workshop Runoff

All runoff arising from the workshop and adjoining hardstand will drain to a collection sump which will be regularly emptied by a licensed waste contractor.

6.3 SOLID WASTE DISPOSAL

The solid wastes generated by the proposed operation are natural rock products with no contaminating attributes.

These wastes will be used in ongoing backfill and restoration of depleted quarry areas.

Intermediate stockpiling of such materials may be required until sufficient quarry floor area is available for final disposal and shaping of the final landform.

The stockpiled topsoil (within bunds) will be spread over the completed solid waste landform and grassed. The perimeter of the waste fill stages will be progressively topsoiled and grassed such that the later, central mound area to be filled will be carried out behind a grassed batter.

6.4 AIR QUALITY CONTROLS

6.4.1 Dust

Dust control measures are designed to:-

* restrict dust levels to below those which would cause interference to employees, contract truck drivers and surrounding residents and land uses.

* not reduce existing air quality.

* prevent damage to existing vegetation and proposed planting undertaken as part of the development.

Potential sources of dust emission that could arise from the quarry and associated operations are as follows:-

(i) soil removal and handling;
(ii) ripping, pushing and loading of clay/shale material;
(iii) open quarry void;
(iv) site traversing by heavy equipment, eg scraper, front end loader;
(v) transport vehicles on unsealed quarry roads removing material from the site and returning to unload;
(vi) clay/shale stockpiles.

Air quality will be protected by preventing or minimising the quantity of dust produced at the above generation points and the following gives the corresponding controls for each of these generation points:-

(i) Soil stripping and handling would be undertaken on relatively calm days and watering would be undertaking prior to the handling of the topsoil into bund walls and stockpile areas.

(ii) Due to the relatively high clay content, the clay/shale materials are quite resistant to degradation by wind and little dust is expected to be generated by the ripping, pushing and loading of these materials. The working surfaces, due to ground water, are expected to be damp or wet at most times and, at other times, when dry conditions are prevalent, watering will be undertaken.

Most of the quarry workings will be below ground level which will shield the quarry floor from prevailing winds. The bund walls and their planting will also shield the quarry operations from winds.

(iii) The quarry void will be protected from prevailing winds by the fact that it is below ground level and the provision of the bund walls and landscaping.

(iv) Due to the moisture content of the clay/shale and the presence of ground water flowing into the quarry it is not expected that excessive dust will be generated by the site traversing of heavy plant and equipment. In dry times and when required, watering will take place at an application rate to suit the conditions.

(v) Unsealed haulage roads and trafficked areas will be regularly watered during dry periods. The access road from Adams Road to the bottom of the quarry will be constructed and sealed. This access road and the sealed Adams Road will be kept free of spilled material at all times to ensure that no dust is generated from this source.

(vi) It is unlikely that watering of the clay/shale stockpiles will be required due to the water content and composition of the material. The raw material stockpiles will be located on the flat quarry floor, well below the level of the surrounding natural terrain and protected by the bund walls and planting.

6.4.2 Vehicles

Vehicles and plant operating on the site will be fitted with standard exhaust filter systems so as to minimise discharge of fumes.

All vehicle and plant exhausts will be directed away from the ground so as not to stir up dust.

6.5 NOISE CONTROL MEASURES

The results of a detailed noise impact assessment of the proposed clay/shale quarry and landfill operation is included in Appendix 6.

6.5.1 Original Recommended Criteria

Guidance in relation to appropriate criterion to adopt for this site was provided by the then State Pollution Control Commission (SPCC) in 1992. The recommended criterion was an $L_{90,15\text{-min}}$ level of 43 dB(A) and an $L_{10,15\text{-min}}$ level of 48 dB(A). These criteria were based on an assumed existing background noise level of 40 dB(A) for a rural land use zoning.

In addition, the SPCC specifically noted that, due to the proposals for the Badgerys Creek Airport, the proposed noise criterion would be reviewed and possibly relaxed in subsequent years due to the potential for increased ambient noise levels in the locality.

The Environment Protection Authority (EPA) has advised that reference should be made to the latest EPA guidelines for landfill sites and environmental noise control (Refer to Appendix C in Appendix 6). The benchmark noise control criteria of 50dB(A) L_{10} specified in these guidelines is similar to the 48 dB(A) L_{10} criteria originally recommended by the SPCC.

6.5.2 Current Quarry Noise Criteria

Guidance relating to noise from quarrying operations is provided in the EPA's Environmental Noise Control Manual. In general, it is recommended that L_{10} noise levels from any new source should not exceed the existing L_{90} background noise level by more than 5 dB. Given that the detailed noise data obtained as part of this study

recorded a typical minimum $L_{90,15\text{-}min}$ noise level of 34 dB(A), this implies that the L_{10} noise level from quarrying operations should not exceed 39 dB(A) at any residence.

Where the existing background noise level is already high, the EPA recommends further restrictions to ensure that it is not increased further. However, in this case the existing level of 34 dB(A) is well below the EPA's maximum acceptable level of 45 dB(A) for a rural area during the daytime, and hence these additional considerations are not relevant.

The above criterion is 9 dB(A) below the limit of 48 dB(A) L_{10} originally recommended by the SPCC for the proposed quarrying operations.

6.5.3 Vehicle Movements

The EPA in its Environmental Noise Control Manual indicates that for low or intermittent traffic flow in rural areas, the noise level at residences as a result of traffic movements should not exceed an L_{eq} value of 50 dB(A) during the worst hour, for new developments. This criterion takes into account both the maximum noise level of passing vehicles and the number of events per hour.

6.5.4 Summary

In summary, the following criteria are adopted for assessment of potential noise impacts at nearby residential properties.

- *Quarrying phase only*: During the initial phase of operations when landfilling has not commenced, an L_{10} noise criterion of 39 dB(A) is adopted;

- *Vehicle movements*: For vehicles accessing the site via the site haul road a maximum L_{eq} noise criterion of 50 dB(A) is adopted.

6.5.5 Control Measures

6.5.5.1 Quarry

To control noise from these operations, earth bunds will be constructed, 4 metres high on the northern and western boundaries and 3 metres high on the southern boundary.

6.5.5.2 Vehicles

To control noise from vehicles entering and leaving the site, the bund on the northern boundary of the site will be extended using a barrier at least 100m along the northern side of the access road. The barrier could consist of an earth bund or a solid timber fence.

With the above measure, predicted noise levels from trucks entering and leaving the site will be within the recommended criterion of 50dB(A) $L_{eq,1hr,}$ and are therefore considered acceptable.

6.6 PROTECTION OF NATURAL AND MAN-MADE FEATURES

The environmental investigation undertaken and presented in Section 4.0 have shown that there are no unique or unusual natural features occurring on the subject site that would be disturbed by the quarry operation.

In regard to the one Aboriginal archaeological site identified during this survey, the following recommendations are made for the management of the archaeological site:-

(a) No further archaeological investigation is required for the site, or the remainder of the property before development can proceed.

(b) The developer should apply to the National Parks and Wildlife Service for Consent to Destroy the archaeological site. The Consent application should include a collection of surface artefacts.

(c) The Gandangarra Local Aboriginal Land Council should be responsible for collection of all artefacts from the site, and for safe storage of the archaeological material. The artefacts should form part of a regional interpretive display being developed by the Land Council.

6.7 VISUAL CONTROLS

6.7.1 Quarrying Method

Except for the initial phases of the removal of the topsoil, all activities will be below natural ground level with the added visual barrier of the 3 metre and 4 metre high bund walls on 3 sides and 1 metre high and existing vegetation along Oaky Creek.

The transport vehicles will be visible once they leave the quarry floor and reach natural surface near the access way to Adams Road.

6.7.2 Bund Walls

The bund walls will be constructed 3 metres and 4 metres high around the 3 sides within the 20m boundary set back areas and 1 metre high in the 30m creek boundary set back area. The bund walls with associated planting will be both a visual screen and an acoustic screen. The bund walls will be grassed, hydro mulched or similar immediately they are formed to ensure soil erosion does not occur.

6.7.3 Landscaping

Prior to excavating for the Stage 1 quarry, topsoil will be removed and stockpiled on site as bund walls for future use on the final soil layer. This will enable the grass seed to germinate and stabilise the walls, thus preventing erosion and run-off into the creek.

Existing debris along the creek will be removed and in particular, the concrete banked against the trunks of some casuarinas.

If the natural grasses do not regenerate then the mounds should be hydroseeded with the following mix:

Grass Seed	Application Rate
Perennial Rye	25kg/hectare
Japanese Millet (if sown Sept. to March)	25kg/hectare
Rye Corn (if sown April to August)	25kg/hectare
Hard Fescue SR3000	10kg/hectare
Tall Fescue	20kg/hectare
Unhulled Couch	10kg/hectare
White Clover	5kg/hectare
Rhodes or Pioneer	5kg/hectare

Plant species on the bund walls will be limited to a minimum number of species to provide the desired effect of screening and soil stabilisation. The recommended species are:

Allocasuarina torulosa
Casuarina cunninghamiana
Acacia floribunda
Acacia parramattenis
Melaleuca armillaris

The above species will provide a graduated canopy.

There will also be planting provided between the bund wall and the existing vegetation along the creek.

Plants will be grown in "longtom" pots and planted at approximately 2 metre centres. The addition of gypsum may be required if the excavated material has a high clay content.

The position of plant species of the bund walls has been considered in relation to their moisture requirements.

Details of location of the bund walls and the proposed planting are shown on Figures 6.7 and 6.8 as recommended in the Landscape Report, Appendix 5.

6.8 FIRE, HEALTH AND SAFETY CONTROLS

6.8.1 Buildings

For the first 2 stages, approximately 6 years, the existing dwelling will be used as a manager's residence and office and the produce store and stables will be used as a workshop and amenities facilities with overnight vehicle storage.

With Stage 3, the manager's residence and office will be replaced by a portable site office and the workshop and amenities building will be removed and a demountable workshop and amenities erected on the completed landfill area of Stage 1.

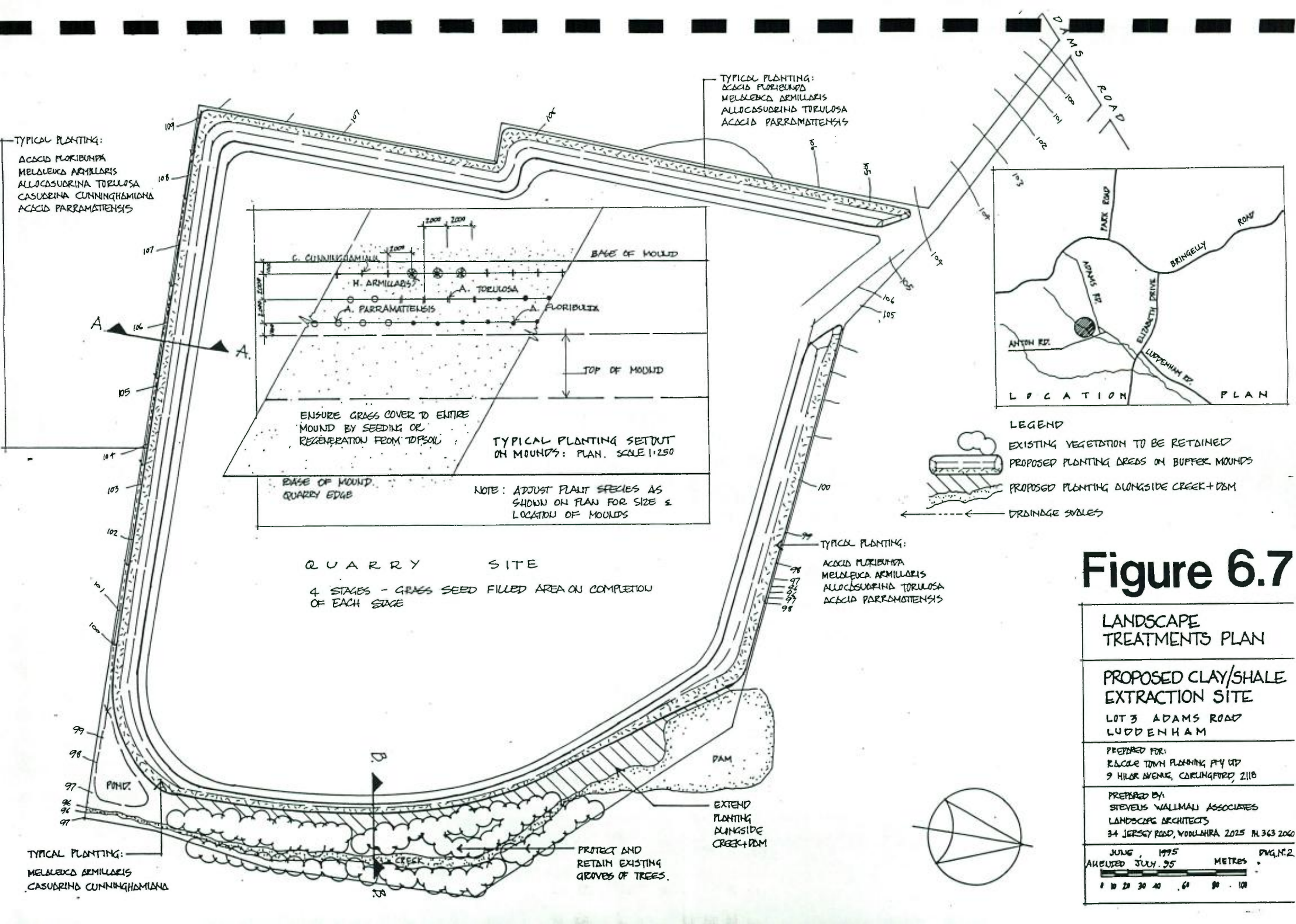


Figure 6.7

LANDSCAPE TREATMENTS PLAN

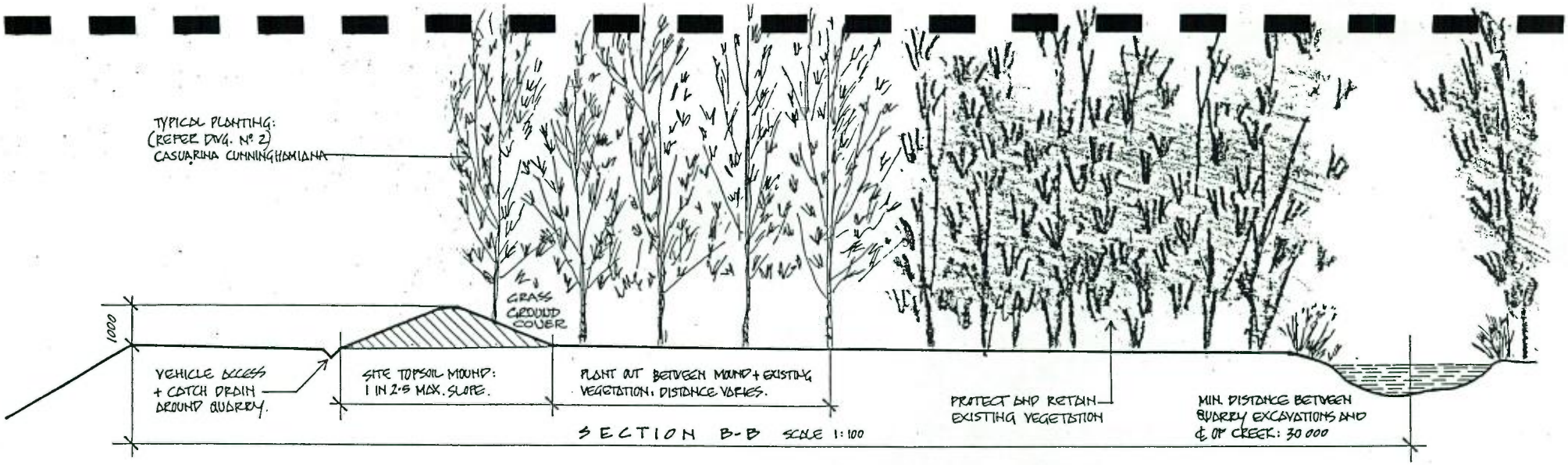
PROPOSED CLAY/SHALE EXTRACTION SITE

LOT 3 ADAMS ROAD
LUDDENHAM

PREPARED FOR:
RACOE TOWN PLANNING PTY LTD
9 HILOR AVENUE, CARLINGFORD, 2118

PREPARED BY:
STEVELIS VALLIMALI ASSOCIATES
LANDSCAPE ARCHITECTS
34 JERSEY ROAD, WOOLLAHRA 2025 PH. 363 2060

JUNE, 1995 DWG. NO. 2
AMENDED JULY. 95
METRES
0 10 20 30 40 60 80 100



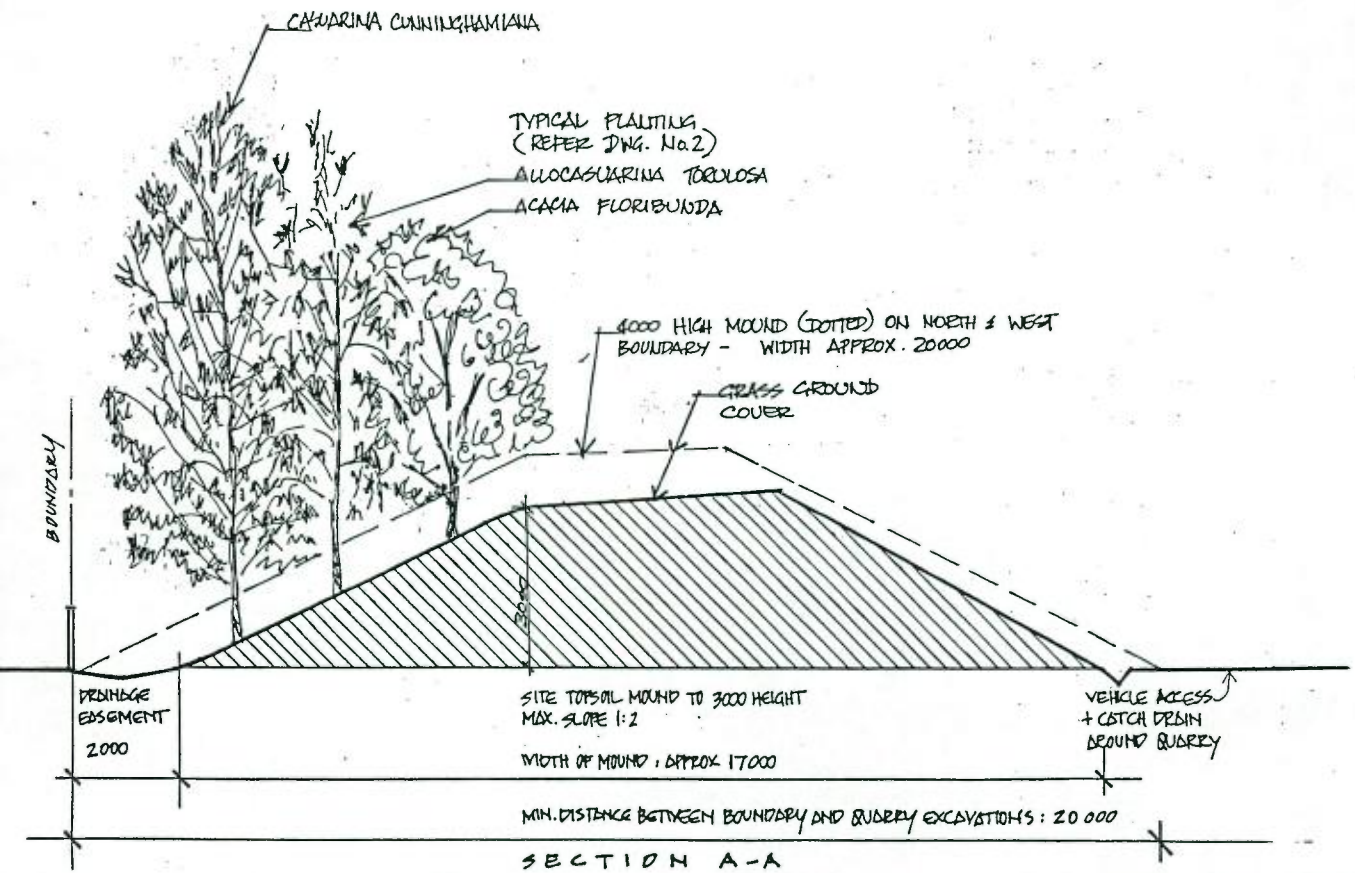


Figure 6.8

LANDSCAPE TREATMENTS: SECTIONS

PROPOSED CLAY/SHALE EXTRACTION SITE
LOT 3 ADAMS ROAD
LUDDENHAM

PREPARED FOR:
R.A. COLE TOWN PLANNING PTY LTD
9 HILDA AVENUE CARLINGFORD 2118

PREPARED BY:
STEVENS WALLMAN ASSOCIATES
LANDSCAPE ARCHITECTS
34 JERSEY ROAD, WOOLLAHRA 2025 Ph 363 2060

JULIE, 1995 DWG.N°3

AMENDED: JULY 95

Suitable fire extinguishers will be installed in the workshop and amenities building and diesel fuel will be only kept in an approved above ground storage tank.

There will be adequate fire separation between the various site structures and buildings with good clear access around all structures and buildings at all times.

6.8.2 Bushfire Control

In Section 4.12 it was assessed that the site has a medium bushfire hazard and appropriate control measures need to be implemented to ensure that danger to persons and property is minimised.

The control measures proposed include the following:-

* regular mowing or control of grassed areas in unexcavated and rehabilitated areas;

* hazard reduction and control of fuel loads in landscaped areas on bund walls and along Oaky Creek;

* installation of appropriate fire extinguishers in the workshop;

* creation of bare fuel free perimeter strips around the workshop building and manager's residence;

* use of road watering tanks as an initial response fire tanker;

* use of earthmoving equipment for fire fighting purposes.

6.8.3 Fencing and Security

The proposed extractive area is isolated from public access; its only "exposure" to public roads is the narrow driveway that runs from the north-western corner to Adams Road.

Currently the entire property is surrounded by good quality rural boundary fences and it is intended to maintain those in good order and condition. They are considered adequate to keep out stock, while signs are to be erected along the boundaries to alert people to the excavations within the boundary. The bund wall will be an additional safeguard and alert.

A stout gate is to be erected to mark the entrance at Adams Road. Suitable warning signs are to be attached to such gates, which will be closed during times of non-operation.

The resident manager will also be a considerable factor in maintaining safety and security.

6.8.4 Internal Traffic Control

All internal truck traffic will be required to travel at a maximum of 10km per hour while in the quarry area and on the access way to Adams Road. Suitable signs will be erected at appropriate locations to ensure all drivers are aware of the speed restrictions.

A stop sign will be erected in the access way immediately adjacent to Adams Road to ensure no traffic hazard is created by trucks leaving the site.

6.9 ENERGY CONSERVATION

All quarry plant and equipment operating on the site, including transport vehicles, will use diesel fuel. To ensure efficient energy management, all plant and equipment will be maintained in good condition and operate only as required.

The workshop equipment, kiln and lighting will be powered by electricity and will only be used as required and no energy will be wasted.

6.10 ROADS AND ACCESS UPGRADING

As part of the previous application, Liverpool City Council officers recommended certain draft conditions be imposed on the proposal with respect to traffic. After a review of these conditions and in light of the findings of traffic assessment, the following road improvements are proposed:

- reconstruction of the intersection of Adams Road and Elizabeth Drive to provide a right turn bay for vehicles turning right into Adams Road as well as a deceleration lane for vehicles turning left into Adams Road. Some shoulder widening is proposed for vehicles turning into Elizabeth Drive and to assist eastbound vehicles on Elizabeth Drive to pass eastbound trucks accelerating from Adams Road.

- reconstruction of Adams Road north of the site access to an acceptable standard. Austroads (1988) suggests a seven metre pavement with two metre shoulders for a road carrying in excess of 1000 vehicles per day.

Section 7

Assessment of

Environmental Impact

R. A. Cole Town Planning Pty. Ltd. *Brink & Co. Pty. Ltd.*

7.0 ASSESSMENT OF ENVIRONMENTAL IMPACT

7.1 CHANGES TO TOPOGRAPHY

The existing topography is different from the natural topography in that dams have been excavated near the north-east corner, a channel has been excavated parallel to the creek and filled with water to a level about 1.5m above creek level and a trotting track has been constructed, incorporating minor cutting and filling.

However, the proposed quarry project will have a more pronounced effect on the topography. Firstly, bund walls will mark the periphery of the site. Secondly, the quarry excavations will culminate in a depression with a horizontal floor some 25m to 30m below surface levels and it will affect most of the project area (Refer to Figure 5.1a, b, c, d and 5.2).

When the quarry void is filled with solid waste materials and covered eventually with soil stored in the bund walls, the ultimate change in topography will include a gently sloping (5% gradient) mound having a top elevation after settlement at about the same level as Adams Road and consistent with the surrounding gently rolling landscape.

7.2 GEOLOGY

The sedimentary strata are part of the Bringelly Shales. This geological formation is several hundred metres thick and occurs over at least 200 sq. km. Hence, the proposed extraction will affect an infinitesimal fraction of the volume contained within the formation. Hence, there will essentially be no change in geology.

7.3 SOILS

Although the topsoil is to be stripped, it will be stored for rehabilitation purposes in the future. Hence, there is no net loss or destruction of arable soil. The underlying B and C horizon soils are dense, heavy clays with virtually no agricultural values. They are to be extracted as plastic bonding clays in brick manufacture and waste materials used as intermittent cover over layers of compacted waste materials.

7.4 SOIL EROSION

The storage of the topsoil in the bund walls and the planned grassing and vegetation cover will form effective safeguards against soil erosion. The bund wall per sé will prevent the loss of soil from the site in that it acts as a levee bank or dyke.

7.5 HYDROLOGY

With the erection of the bund walls, no external run-off waters will enter the project site. The existing natural surface will not be disturbed until the quarry operation extends to each stage and run-off from the undisturbed parts of the site will continue to drain to the dams and Oaky Creek, as presently occurs. All surface and ground waters in the quarry void will be collected in sedimentation ponds for purification, prior to being released to the natural drainage regime, Oaky Creek. Apart from an area of approximately 0.75 ha along the south western boundary (see Figure 4.4) this site has no external, upstream catchment.

Because of the practically impervious nature of the shale bedrock and the maintenance of a negative hydraulic gradient within the pit, there can be no movement of water within the pit to the surrounding groundwater.

7.6 WATER QUALITY

A number of water samples were collected from drill holes as well as creek and dam. The samples were submitted to the Australian Government Analytical Laboratories for evaluation. On the basis of the analysis results, it is considered responsible to state that the proposed water management system is expected to be capable of maintaining the equivalent water quality at its discharge point.

Regular sampling and testing will be undertaken to monitor water quality in Oaky Creek and at the discharge point to ensure the site's operations meet the stringent quality controls required by the applicant Company.

7.7 AIR QUALITY

Dust is not expected to impact on the local residences or the rural activities in the surrounding area, particularly with the implementation of the safeguards described in Section 6.4. The greatest potential for dust generation is from the haulage and quarry access roads and the unsealed sections will be regularly watered as required to ensure that existing air quality is maintained.

As an additional precaution, the bund walls and their planting would assist in reducing dust leaving the quarry.

7.8 VEGETATION AND FAUNA

Very little vegetation will need to be removed for the quarry excavation and the impact of this removal of the vegetation will be negligible, in both local and regional context.

It is intended to plant the outside faces of the bund walls and between the bund wall and Oaky Creek. This planting will considerably increase the quantity of vegetation presently existing on the site. The site is surrounded by grazing and hobby farms where little wildlife remains.

Very little native fauna exists on the site generally, with the creek area being the predominant habitat. This area will be retained and the additional planting around the site may attract more fauna back to the area.

7.9 BUSHFIRE POTENTIAL

The measures proposed in Section 6.8.2 to prevent the outbreak and spread of bushfires or accidental fires at the site will ensure that any fires are quickly attended to and extinguished. Impacts will be low.

7.10 NOISE IMPACTS

A detailed noise impact assessment has been prepared by ERM Mitchell McCotter and is enclosed in full in Appendix 6.

7.10.1 Quarrying Operations

Details of the plant to be used for the quarrying operations are provided in the table below along with assumed sound power levels. There are no proposals to undertake blasting as part of the quarrying operations.

QUARRYING PLANT AND ASSUMED SOUND POWER LEVELS

Equipment	Sound Power Level, dB(A)
Caterpillar 631 scraper	118*
Caterpillar 966 front-end loader	110*
Water cart	102
25 tonne truck	108

** This equipment is fitted with a residential class muffler.*

For the purposes of the assessment a worst case operating scenario is assumed in which the scraper, loader and water cart are continuously operated.

7.10.2 Predicted Noise Levels

On the basis of the proposed operating schedule for the lifetime of the quarry/landfill, noise levels have been calculated for the following representative scenarios:

- Scenario 1: Area 1, quarrying only.
- Scenario 2: Landfill area 1, quarrying area 2.
- Scenario 3: Landfill area 2, quarrying area 3.
- Scenario 4: Landfill area 3, quarrying area 4.
- Scenario 5: Area 4, landfill only.

For each of the scenarios, noise levels will vary depending on the height at which equipment is operating. To indicate the range of expected noise levels in each case, calculations have been performed for a series of likely operating schedules:

- Schedule 1: both quarry and landfill plant operating at existing ground height (absolute worst case).
- Schedule 2: quarry plant operating at existing ground height and landfill plant operating at the bottom of the quarry pit, 30 metres below existing ground height.

- Schedule 3: landfill plant operating at existing ground height and quarry plant operating at the bottom of the quarry pit, 30 metres below existing ground height.

- Schedule 4: both quarry and landfill plant operating at the first bench level, approximately 10-15 metres below existing ground level.

- Schedule 5: both quarry and landfill plant operating at the bottom of the quarry pit, 30 metres below existing ground level.

On the basis of the assumed noise levels and the proposed operating schedule for the site, noise level predictions have been performed using the Environmental Noise Model (ENM) computer programme. This noise prediction methodology is approved by the EPA. In the modelling, factors such as the distance separating the noise source and receptor, shielding by bunds and topographic features, and the "ground effect" have all been taken into consideration. The predicted L_{10} noise levels at three neighbouring residential properties have been calculated for neutral atmospheric conditions as recommended by the EPA.

The receptors considered in the modelling are as follows:

- Receptor 1:285 Adams Road;

- Receptor 2:265 Adams Road; and

- Receptor 3: residential property off Jacksons Road.

Results of the noise modelling are presented in Tables 4.1 to 4.5 in Appendix 6.

The predictions demonstrate that, in almost all cases, the relevant criteria are achieved at the nearest residential receptors.

For scenario 1, exceedances of the 39 dB(A) L_{10} criterion for quarry noise are predicted to occur at receptors 1 and 2 during the initial quarrying stages. However, the duration of the exceedance is expected to be limited to less than three months, approximately only 2% of the life of the quarry, and maximum exceedance is 6.4 dB(A). Maximum noise levels are 5 dB(A) below the criterion of 50 dB(A) for noise from landfill sites which applies for subsequent stages of the work.

For model scenarios 2 to 5, predicted L_{10} noise levels are within the criterion of 50 dB(A) for landfill operations in all cases.

Throughout the operation, liaison would be maintained with neighbouring residents, who would be informed prior to the commencement of any activities on the site which would generate unusually high noise levels.

The fact that future land use changes may occur in the locality as a result of the development of Badgerys Creek Airport may also influence the potential for impacts at later stages of the project. As a result, it may be appropriate to review the potential

noise impact of the quarry prior to commencement of the more intense stages of operation (model scenarios 3 and 4).

4.10.3 Vehicle Noise

Maximum truck movements associated with the development will occur when quarrying and land filling operations are carried out simultaneously. During this phase of operations it has been estimated that there will be an average of 48 truck movements per hour.

Elizabeth Drive is one of the main arterial roads of the area. The additional truck movements from the quarrying and filling operation will cause negligible noise impact along Elizabeth Drive.

The main area of noise impact due to truck movements from the quarrying and landfilling operation will be at residences adjacent to the site access road. Residences worst affected by truck noise from the access road are receptors 1 and 2.

The United States Federal Highways Traffic Noise Prediction methodology was used to model $L_{eq,1hr}$ noise levels due to truck operations at the nearest residences. Results of the predictions are shown in the Table below. The noise calculations take account of the effect of bund walls around the site as described above.

CALCULATED TRUCK NOISE LEVELS

Location	$L_{eq\ 1hr,}$ dB(A)	Criterion	Complies Yes/No
Receptor 1	62	50	No
Receptor 2	50	50	Yes

The calculated noise levels significantly exceed the recommended criterion at receptor 1 (285 Adams Road). To protect this residence from truck noise from the access road, the four metre bund wall to the north of the site will be extended along the roadway, either as a bund or as a fence constructed from solid lapped and capped timber, masonry or similar material. To provide adequate shielding, the barrier will extend at least 100 metres along the access road toward Adams Road.

7.11 VISUAL IMPACT

The initial phase of the quarry, removing the top soil and other material and forming the bund walls, will be visible from adjoining properties and Elizabeth Drive.

However the construction of these visual and acoustic bund walls and the provision of planting will provide a visual buffer for surrounding properties and will limit views into the site. Once the trees and shrubs have matured, the views into the site will be a treed hedge, densely underplanted with various shrubs.

Once the quarry depth is greater than the height of the excavating equipment, the quarry operations will not be visible from surrounding or distant properties or Elizabeth Drive.

The transport vehicles entering and exiting the site along the access way will be visible from adjacent properties and Elizabeth Drive.

Overall visual impacts are rated as low.

7.12 ABORIGINAL RELICS

A full archaeological report is included in the Statement as Appendix 7.

A field survey of the proposed quarry area identified one archaeological site, an open surface scatter of flaked stone artefacts. The surface scatter is not in situ and the ground surface with which it is associated has been considerably disturbed.

It is proposed that the developers will apply to the National Parks and Wildlife Service for consent to destroy the site and the artefacts should be collected by the Gandangarra Local Aboriginal Land Council for storage and later museum display.

The impact of the proposed development on the cultural resources of the Luddenham area is considered to be minimal.

7.13 PLANNING

The proposed extractive industry is an allowable use with Council's consent and the development as proposed conforms to the Council's planning policies and requirements.

The site is included in Sydney Regional Environmental Plan No. 9 (Extractive Industry) and Draft Sydney Regional Environmental Plan No. 9(2) - Extractive Industry as a potential for Bringelly clay/shale of regional significance.

The site falls within the area covered by Sydney Regional Environmental Plan No. 20 - Hawkesbury-Nepean River and matters in need of consideration under that Plan have been considered in this Statement.

The South Creek Valley Regional Environmental Study has recommended the site be part of an employment area in conjunction with the adjacent Badgerys Creek Second Sydney Airport. Following the extraction of the clay/shale and rehabilitation by land fill to designed ground levels, the site would be available for its proposed future use under the Study.

The Draft Regional Environmental Plan - South Creek Valley has been exhibited and does not specifically re-zone the site at this time for any future land use. The site's future use as proposed under the Study can be achieved once the clay/shale material has been excavated and the land restored, with an appropriate compaction to take future employment development.

7.14 LAND USE

The proposed quarry will operate for the next 12 years until the available clay/shale is extracted in accordance with the staging plan (Figure 5.1).

The applicant's proposed project will not adversely affect surrounding land uses, primarily due to the range of control measures to be instigated in order to prevent siltation and dust emission from the site.

The adjacent landowners will be aware of the quarry operation by:-

* traffic movements along the access way and Adams Road by material transport vehicles;

* noise emulating from the site but within stated criteria;

* periodic visibility of machinery when quarrying is undertaken on the top section within the quarry perimeter.

7.15 SERVICES

The applicant's requirements for power, water, telephone and sewerage will not have any impact on existing services.

7.16 ROADS AND TRANSPORT SYSTEM

A full transport and traffic impact assessment has been undertaken by ERM Mitchell McCotter and is enclosed in full at the rear of this Statement as Appendix 8.

Traffic volumes generated by the combined landfill and clay extraction traffic would not be realised until after the year 1996 at the earliest by which time the background traffic volumes of the road network would have begun to change to reflect airport development. The impacts of the proposed development traffic should be considered in the context of traffic generated by other major developments such as Badgerys Creek Airport and South Creek Valley residential development.

A summary of future base traffic volumes and traffic volume increases from other developments is presented in Table 4.1 in Appendix 8. It can be seen that the future clay extraction and landfill traffic volumes are relatively minor in comparison to other traffic volume increases on major roads in the locality. To satisfy council conditions of consent, trucks will not be permitted to turn south from the site on Adams Road.

The intersection of Adams Road and Elizabeth Drive is one of the few remaining unimproved intersections on Elizabeth Drive. It currently requires construction of a right turn lane, deceleration lane and some shoulder widening. The future quarry and landfill development will contribute traffic flows to the intersection however no additional improvements to those already necessary will be required.

Traffic delays were calculated for the intersection based on gap acceptance theory using estimated increased traffic generated by the proposal. Increases in delays of

less than one second were calculated for traffic turning at the intersection after development. For all turning vehicles the calculated increases in delay due to the development is insignificant.

7.17 ENERGY IMPACTS

The proposed quarry will use diesel fuel for all vehicles and plant and will use electricity for lighting and power in the existing buildings.

All energy will be productively used and any wastage will be minimal, if at all. The proposed quarry will have a negligible impact on energy generally.

7.18 CUMULATIVE IMPACTS

The closest other similar clay/shale quarries are located at Badgerys Creek, approximately 8km south of the site, and at Cecil Park, approximately 12 km east of the site. Neither of these quarries have commercial qualities of cream burning materials.

The distance between these quarries and the subject site will ensure that there will not be any cumulative impacts.

7.19 IMPACT ON THE VILLAGE OF LUDDENHAM

The subject site is located approximately 2.3km in a direct line from the Village of Luddenham and the site cannot be seen or activities will not be heard at the Village.

The development could have some beneficial impacts for the retail and services industries in the Village of Luddenham.

7.20 IMPACTS ON SECOND SYDNEY AIRPORT

The development of the Airport will substantially alter the drainage pattern of the catchment area of Oaky Creek. The design of the stormwater drainage system for the proposed quarry has incorporated suitable features to ensure that the quality of stormwater to be discharged into Oaky Creek meets acceptable standards so that no pollution or siltation of the Creek occurs.

The operation of the quarry will be such that no adverse impact is likely on the amenity of the tenants of the acquired airport lands. The quarry and landfill operations are likely to be minor compared to the construction activity of the airport in approximately 12 months time.

7.21 ECONOMIC CONSIDERATIONS

It is beyond doubt that the project site contains several million tonnes of light firing brickmaking clays and shales, in addition to a similar quantity of darker firing materials.

Light coloured bricks have been in demand in the Sydney Metropolitan region for several decades and there are no indications that such demand is abating.

Light firing clays and shales have a low iron content and, as iron is an almost ubiquitous element in sedimentary strata, they are relatively rare. Ironically, it is highly probable that the Sydney urban spread has covered and sterilised significant deposits.

In recent years the search for light firing clays and shales has concentrated on the Bringelly Shales, with mixed results.

The reserves contained within the project site are of relatively high quality, within reasonable distance from manufacturing sites and in close proximity to a good road system. Hence, the deposit is considered to be of good economic merit; similar quality materials may not be available within economic distances.

7.22 SOCIAL CONSIDERATIONS

The proposed quarry will provide employment for 5 people which are likely to come from local residents. Given the rapid population increase expected in the Liverpool City area, the relative employment contribution by the quarry will be positive, but modest.

The operation of an independent clay/shale quarry will allow the maintenance of comparatively low material costs for the receiving brickworks with the resultant containment of cost for the finished products to the entire community.

The proposed operation will provide a positive and beneficial impact on the local community base.

7.23 SECTION 90(1) HEADS OF CONSIDERATION

Section 90(1) of the Environmental Planning and Assessment Act, 1979 provides that a consent authority shall take into consideration the matters (a) to (s) inclusive as are relevant to the development, the subject of the Development Application. Each head of consideration is listed below with comments for Council's consideration.

(a) the provisions of:

(i) any environmental planning instrument;
(ii) any draft environmental planning instrument that is or has been placed on exhibition pursuant to Section 47(b) or 66(1)(b).
(iii) any draft State environmental planning policy which has been submitted to the Minister in accordance with Section 37 and details of which have been notified to the consent authority;
and
(iv) any development control plan in force under Section 51A or 72, applying to the land to which the development application relates.

Comment

(i) The proposed extractive industry is permitted in the Non Urban 1(a) zoning under Interim Development Order No. 74, Liverpool.

The proposed development conforms to Clauses 18(b) and 21 of the Order.

(ii) The Draft Regional Environmental Plan - South Creek Valley has been on exhibition and the proposed development will conform to the requirements of this Draft Plan particularly in relation to air quality, water quality and the special considerations of the Draft Plan.

The Draft Sydney Regional Environmental Plan No. 9(2) - Extractive Industry has been on exhibition for public comment and the site has been identified in the Draft as being of regional significance.

The Draft Liverpool Local Environmental Plan 1995 has been on exhibition and an extractive industry and a landfill operation are allowable uses with Council's consent. The proposal conforms to the other provisions of this Draft Plan.

(iii) no known relevant matter.

(iv) the proposal will conform to the Liverpool Development Control Plan No. 3 Car Parking Policy and Liverpool Development Control Plan No. 6 Industrial Development Policy.

(a1) the provisions of:-

(i) any conservation agreement entered into under the National Parks and Wildlife Act 1974 and applying to the whole or part of the land to which the development application relates; and

(ii) any plan of management adopted under that Act for the conservation area to which the agreement relates;

Comment

No know relevant matters.

(b) the impact of that development on the environment (whether or not the subject of an environmental impact statement) and, where harm to the environment is likely to be caused, any means that may be employed to protect the environment or to mitigate that harm;

Comment

The proposed development will have some adverse impact on the environment particularly in the initial phase of extraction before the equipment and plant are operating below the level of the bund walls and the natural surface. The transport vehicles will also create an impact on the immediately adjoining residents, as material is removed from the site, by the noise of the vehicles and the actual activity in this rural area. The control measures incorporated in the

overall proposal are such that any adverse impact on the environment will be kept to acceptable levels.

(c) the effect of that development on the landscape or scenic quality of the locality;

Comment

Initially the operations will adversely affect the existing landscape or scenic quality of the site however, with the construction of the bund walls and the planting, the site will be screened from adjoining and distant locations and the impact will be minimised.

(c1) the effect of that development on any wilderness area (within the meaning of the Wilderness Act 1987) in the locality;

Comment

No known wilderness area in the locality.

(c2) whether there is likely to be a significant effect on the environment of endangered fauna;

Comment

The proposal is not likely to have an effect on the environment of any endangered fauna or the environment of any fauna due to the disturbed and occupied nature of the site.

(d) the social effect and the economic effect of that development in the locality;

Comment

The proposed development will provide five direct employment opportunities and will indirectly provide employment for support services. The inclusion of the site and its clay/shale resource in the Sydney Regional Environmental Plan No. 9 (Extractive Industry) and Draft Sydney Regional Environmental Plan No. 9(2) - Extractive Industry means the resource should be extracted for use in the manufacture of bricks etc. If the resource is not extracted then adverse economic consequences could result.

(e) the character, location, siting, bulk, scale, shape, size, height, density, design or external appearance of that development;

Comment

The proposed development is not similar to any other development in the immediately surrounding area. Other quarries exist to the south and east.

(f) the size and shape of the land to which that development application relates, the siting of any building or works thereon and the area to be occupied by that development;

Comment

The site is adequate in size and shape to undertake the proposed development and to allow an economically sustainable quarry operation on the site.

(g) whether the land to which that development application relates is unsuitable for that development by reason of its being, or being likely to be, subject to flooding, tidal inundation, subsidence, slip or bushfire or to any other risk;

Comment

None of the above affect the land as far is known at this time.

(h) the relationship of that development to development on adjoining land or on other land in the locality;

Comment

The proposed quarry and its operation does not relate to any adjoining land however it does relate to other quarries and industries in the area.

(i) whether the proposed means of entrance to and exit from that development and the land to which that development application relates are adequate and whether adequate provision has been made for the loading, unloading, manoeuvring and parking of vehicles within that development or on that land;

Comment

Access between the site and Adams Road is satisfactory and sight distances are adequate at both the access to Adams Road and Adams Road and Elizabeth Drive.

Adequate space is available for the loading of materials onto transport vehicles and to provide off street parking for employees' vehicles.

(j) the amount of traffic likely to be generated by the development, particularly in relation to the capacity of the road system in the locality and the probable effect of that traffic on the movement of traffic on that road system;

Comment

The traffic generated by the proposed development will not be beyond the capacity of the local road, Adams Road, or the main road, Elizabeth Drive.

(k) whether public transport services are necessary and, if so, whether they are available and adequate for that development;

Comment

No public transport services are necessary for the proposed development. All employees, residing external to the site, are expected to use private motor vehicles to and from the site.

(l) whether utility services are available and adequate for that development;

Comment

Existing available utility services are adequate for the proposed development.

(m) whether adequate provision has been made for the landscaping of the land to which that development application relates and whether any trees or other vegetation on the land should be preserved;

Comment

The existing vegetation along Oaky Creek is to be retained and enhanced with additional planting. The bund walls will be landscaped and overall there will be a considerable increase in vegetation on the site with the proposed development.

(m1) whether the development is likely to cause soil erosion;

Comment

Because of the composition of the material on the site and in the proposed quarry, soil erosion is unlikely to occur. The bund walls will be seeded, grassed and planted to ensure these surfaces do not erode.

(n) any representations made by a public authority in relation to that development application, or to the development of the area, and the rights and powers of that public authority;

Comment

Public Authorities were consulted in respect of the proposed development and their replies are contained in Appendix 3. Comments on their representations are given in Section 7.26.

(o) the existing and likely future amenity of the neighbourhood;

Comment

In the initial phases of the quarry operation, approximately 3 months, removing top soil, construction of bund walls and the removal of the top layer of clay/shale, the existing amenity of the neighbourhood will be adversely affected. However when the quarry is established the adverse impact will be minimised.

In the long term, the Second Sydney Airport on adjoining lands will have a much greater impact on the amenity of the neighbourhood. The site will be available as part of the employment centre proposal when the landfilling is completed.

(p) any submission made under Section 87;

Comment

Any submissions under Section 87 on this current development application are not known at this time however the submission on the previous application are addressed in Section 7.25.

(p1) without limiting the generality of paragraph (a), any matter specified in an environmental planning instrument as a matter to be taken into consideration or to which the consent authority shall otherwise have regard in determining the development application;

Comment

Council will need to consider the matters contained in Section 4.16 of the Environmental Impact Statement.

(q) the circumstances of the case;

Comment

The circumstances of the case as they relate to the owners and applicants are that they wish to operate a clay/shale quarry on the site. Rehabilitation is to be carried out by use of the quarry void as a land fill site, being part of this development application.

The circumstances of the case as they relate to brickyards in the area are that the quarry will ensure a supply of clay/shale material for brick making for the Sydney building industry.

(r) the public interest;

Comment

The overall public interest for the supply of clay/shale material for bricks etc is ensured in the short term with the establishment of the proposed quarry. Any adverse public interest would be localised and restricted to those adjoining properties who may suffer an adverse impact from the operations of the quarry.

(s) any other prescribed matter.

The following additional matters, contained in Clause 65 of the Regulations, are required to be considered as part of this Clause:

(a) whether adequate provision has been made to enable disabled persons to gain access to the development or to the land on which the development is proposed to be carried out;

(b) the Government Coastal Policy, in the case of development on land in the area of a council referred to in Schedule 1;

(c) the effect of the development on:

(i) any protected or endangered fauna (within the meaning of the National Parks and Wildlife Act 1974); and
(ii) the habitat of any such protected or endangered fauna,

and the means to be employed to protect them from harm, or to mitigate the harm, if the development is likely to cause them harm;

(d) whether the development will endanger any species of animal, plant or other form of life, whether living on land, in water or in the air;

(e) the matters set out in the document entitled "Planning for Bush Fire Protection" (published by the Department of Bush Fire Services) or in any other publication of that Department published in substitution for that document and approved for the time being by the Director.

Comment

(a) Provision will be made for access to the land and buildings on the land for disabled persons.

(b) Liverpool City Council's area is not included in Schedule 1.

(c) Due to the disturbed, cleared and developed nature of the property, no detailed fauna study was undertaken or considered warranted. The development will not have any adverse impact on any protected or endangered fauna or the habitat of any protected or endangered fauna.

(d) The development will not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air.

(e) Bushfire prevention measures are to be taken as detailed in Section 6.8.2 of this environmental impact statement.

7.24 CLAUSE 51 ENVIRONMENTAL PLANNING AND ASSESSMENT REGULATIONS, 1994

Clause 51 requires that the contents of an environmental impact statement must include:

(a) for development of a kind for which specific guidelines are in force under this clause, the matters referred to in those guidelines; or
(b) for any other kind of development:
  (i) the matters referred to in the general guidelines in force under this clause; or
  (ii) if no such guidelines are in force, the matters referred to in Schedule 2.

The EIS Practice Guidelines Extractive Industries Quarries, July 1994 were used in the preparation of the EIS and the contents of Part 4 are reviewed in Section 7.26 of this EIS.

In regard to Schedule 2 of the Regulation the following comments are given:

1. See Section 1.0 for summary of the EIS.

2. See Section 2.2 for the objectives of the development.

3. See Section 8.0.

4. See Sections 5.0, 6.0 and 7.0.

5. See Sections 3.0, 5.0, 7.26.6 and 8.0.

6. See Section 6.0, assessment given in Section 7.0.

7. Once development consent is obtained, approval will be required from the Environment Protection Authority, Department of Land and Water Conservation and Roads & Traffic Authority under their respective Acts and Regulations. Consultation will be required with various government agencies prior to consideration by Council.

8. (a) With control measures proposed, there is no threat of serious or irreversible environmental damage.
  (b) There is no reason to presume that the proposal will adversely affect the health, diversity or productivity of the environment for future generations. The proposal is relatively short term and will provide a source for a clay/shale that is currently in demand.
  (c) The proposal is not likely to adversely affect the biological diversity and ecological integrity of the site or of surrounding lands.
  (d) There is a demand for the type of clay/shale available on the site and the extraction of the resource is likely to keep prices for the finished products within acceptable limits. However, if the resource is not extracted, then raw materials may need to be transported from further afield which could increase prices for finished products.

The relevant matters (a) to (k) for Clause 4(c) are covered in Sections 5.0, 6.0 and 7.0.

7.25 CLAUSE 52 ENVIRONMENTAL PLANNING AND ASSESSMENT REGULATIONS, 1994

The Director has been consulted and the reply is enclosed in Appendix 1. The Director has required the matters in Clause 4 of the reply letter to be addressed in the EIS. In reply to these requirements the following is given.

- consideration of relevant matters raised in submissions to the exhibition of the previous EIS;

Comment

A Freedom of Information application was required by Liverpool City Council to release copies of the submissions and the following addresses the submissions provided by Council.

Department of Planning

The following details the issues raised by the Department followed by comments of these issues.

Proximity of the site to the proposed Badgerys Creek Airport and the need to ensure that the height of buildings and ongoing management of traffic, litter, dust and bird hazard issues do not interfere with the safe and efficient operation of the airport and associated landuses;

Comment

These matters are covered in the EIS's.

Erosion and sediment control measures are needed during first stages of clearing vegetation and constructing the bund wall.

Comment

An Erosion and Sediment Control Plan will be prepared prior to any works commencing, see Section 6.1.2 in this EIS.

Potential deterioration of water quality (both surface and ground) in South Creek. Details required on how the water management system is capable of maintaining water quality at the discharge point.

Comment

Details of the water management controls are given in both EIS's.

Effects of proposal on Oaky Creek in terms of water quantity and flow regime, water quality and instream and riparian flora and fauna.

These matters are covered in detail in the EIS's.

Leachate generation has potential to be greater than predicted in the EIS. Leachate needs to be monitored for pollution and odour, if polluted or causing an odour problem it should be treated and removed off site;

Comment

These matters are covered in the landfill EIS.

Buffer zones appear inadequate for management of runoff water;

Comment

Buffer zones 20m and 30m wide contain earth bund walls for visual and noise buffers to adjacent properties. They also ensure that all runoff water in the quarry void remains in the void until treated for discharge to Oaky Creek.

Need for a monitoring program, to address concerns such as noise generation, control of landfill gas, and minimisation of litter and dust so as to not pose a hazard to future aircraft operations;

Comment

These matters are covered in the EIS's.

Egress and fire protection concerns - need for a detailed fire study.

Comment

A detailed fire study could be submitted following issue of the development consent to the requirements of the Council and the NSW Fire Brigades. Fire control measures are included in the EIS's.

Additional water demands associates with fire suppression activities cannot be met by the Water Board.

Comment

The existing and proposed dams will be available for fire suppression purposes.

Sewage treatment arrangements - sewage facilities cannot be provided by the Water Board;

Comment

Employee numbers for the quarry and landfill operations are not high and the installation of a suitable treatment works will cater for the needs of the site. Such installation will be to the requirements of Council and the Environment Protection Authority.

Rehabilitation of site to former agricultural potential, including revegetation and weed control practices;

Comment

Rehabilitation will be undertaken to allow for resumption of agricultural uses or for a use in conjunction with the adjacent airport.

The Department advised that the above issues could be addressed by way of conditions and any approval should incorporate all relevant requirements of the following:

- the Department of Mineral Resources specifically the Mines Inspection Act, 1901 (as amended).
- the draft revised Sydney Regional Environmental Plan No. 9 (the waste disposal aspects of the proposal would require the concurrence of the Department of Mineral Resources).
- the Sydney Regional Development Advisory Committee advice of 30 March, 1994.
- The Health Department (particularly in relation to clinical waste);
- the EPA's approval under the Pollution Control Act prior to work commencing on the site.
- the Federal Airports Corporation (concurrence should be obtained before any construction proceeds).

NSW Waste Service

The Waste Service has no concerns regarding the development as all powers have been taken over by the Environment Protection Authority.

Department of Mineral Resources

The Department strongly support the proposed clay/shale extraction as the proposal will significantly increase the amount of pale firing clay/shale available to the Sydney market.

In regard to the ceramic testing undertaken, 7 fully cored drill holes were fired and a copy of the report prepared by Brink & Co Pty Ltd, can be made available to the Department if required.

NSW National Parks and Wildlife Service

The Service was unable to respond to the application at that time.

Sydney Regional Development Advisory Committee

The Committee recommend the following works should be undertaken:

1. At the Elizabeth Drive/Adams Road intersection a left turn deceleration lane be provided for the movement from Elizabeth Drive East into Adams Road, and

2. Widening of Elizabeth Drive to provide a seagull island in Elizabeth Drive to provide a right turn bay into Adams Road with an acceleration lane for right turning vehicles out of Adams Road as the speed limit on Elizabeth Drive is 100 km/hour.

3. Road shoulder widening on the left hand side of Adams Road at the intersection with Elizabeth Drive to allow left hand turn vehicles to pass right hand turning vehicles. All the above are to be carried out at no cost to the RTA.

4. Consideration should be given to imposing an indexed levy rate of three cents per payload tonne kilometre to major truck movements where appropriate for road maintenance purposes.

The matters are dealt with in the Transport report in Appendix 8.

Pacific Power

Pacific Power has no objections to the proposal.

NSW Fire Brigade

The Brigades require that the minimum requirements of the Building Code of Australia be complied with, the Environmental Impact Statement should address egress and fire protection and following development consent, a detailed fire study should be submitted.

These matters have been addressed in the application.

Department of Conservation and Land Management

The Department stated that the previous Environmental Impact State failed to provide specific information on:

1. erosion and sediment control measures;

2. revegetation operations.

These matters are now covered in the EIS's.

Environment Protection Authority

The Authority's submission details the future approvals needed following issue of the development consent and has concerns over the landfill gas and leachate. These matters are addressed in the landfill EIS.

Water Board

The Board's submission requested Council give consideration to treatment of water prior to discharge to Oaky Creek, leachate collection and storage system, potable water, fuel storage, fire suppression activities and sewerage facilities. All these matters are addressed in the EIS's.

Department of Transport

The Department relied on the Federal Airports Corporation to reply to the application.

Federal Airports Corporation

The Corporation raised the following issues:

1. Trucks are not to use roads on the airport property for access to or from the landfill.

2. The operation must remain a non-putrescible landfill. Any putrescible rubbish is likely to attract birds and thus become a danger to aircraft.

3. Litter and dust must be strictly controlled. Because of the proximity of the landfill to the airport, windblown litter and dust could pose a hazard to aircraft operations.

4. Height restrictions apply to all developments in the vicinity of the airport. For Lot 3 DP 623799 there would be a restriction on any developments likely to exceed 15m in height. These require the consent of council and the concurrence of the FAC.

The proposal does not conflict with any of the above issues.

Hawkesbury-Nepean Catchment Management Trust

The Trust addressed the following issues:

Water quality
Extractive materials
Post completion and management
Monitoring

Commencement of landfill
Landfill day to day management
Recycling.

The Trust expressed the need for a detailed management plan which will be prepared before the extraction and landfill commences.

Department of Water Resources

The Department has no objections in principal to the proposal provided soil erosion, sedimentation and water control measures are implemented and maintained to ensure no polluted runoff water left the site.

Letters of Objection

There were five letters of objection received from the Council from private people and organisations. The following is a summary of the concerns given:

- access to the site and turning movements
- traffic generation and main road system
- Adams Road upgrading
- number of trucks per day
- fencing
- dust generation and air quality
- noise from operation and trucks
- visual quality in rural area
- character of the area
- water quality and management
- leachate control
- contrary to the public interests
- loss of land value in area
- already landfills in the area
- plenty of suitable material at other quarries
- no benefit to the surrounding residents.

All the above matters are addressed in the EIS's.

Letters of Support

There were 28 letters of support received from Council from residents of the area. The following is a summary of the matters expressed:

- land to be restored to original state
- beneficial to local business
- create employment for local people
- compatible with proposed airport
- adverse effects negligible
- boost local economy
- provide brick manufacturers with natural resource to allow continuation of operations

- valuable resource for construction of the airport
- progress for the area.

Council Business Papers

Copies of the Council's Ordinary Meeting Reports of 25 July 1994 (Item 5) and 27 October 1994 (Item 6) were obtained from Council with both recommendations being for approval.

- consideration of relevant provisions of the following statutory planning instruments:

  - Sydney Regional Environmental Plan No. 20 - Hawkesbury-Nepean River;
  - Draft Sydney Regional Environmental Plan No. 20 (Amendment No. 2);
  - Sydney Regional Environmental Plan No. 9 - Extractive Industry;
  - Sydney Regional Environmental Plan No. 9 - Extractive Industry (Draft Amendment No. 2).

Comment

See Sections 4.16.7 and 4.16.8.

- assessment of likely impact on the proposed Badgerys Creek Airport. This should particularly address potential bird hazard;

Comment

The quarry operation does not have any extensive water areas other than those that presently exist on the land and along Oaky Creek. The filling operation proposes using only non-putrescible wastes and these waste materials would not attract any bird life that could be a hazard to the proposed airport.

- assessment of water quality impacts with specific reference to the impacts on Oaky Creek and Cosgroves Creek. this should include means to prevent loss of water quality to both surface waters and groundwater inflows, and proposals for establishing a riparian buffer zone.

Comment

Assessment of water quality impacts are given in Sections 6.0 and 7.0. The vegetated area along the creek is not to be disturbed and additional planting is to be provided to improve this creek buffer zone.

- assessment of cumulative impacts of this proposal with other quarries/landfills in the area;

Comment

See Section 7.18.

- assessment of traffic and transport impacts, particularly in relation to impacts on the Northern Road and Elizabeth Drive;

Comment

See report in Appendix 8.

- assessment of impacts of proposal on items of archaeological or heritage significance, particularly the Luddenham Public School, or the Lawsons Inn;

Comment

See Report in Appendix 7. In regard to Luddenham Public School and Lawsons Inn, due to the distance from the quarry to those heritage items, no adverse impact is likely on these buildings or their heritage significance.

- results of consultation with:

  - Department of Land and Water Conservation (including Soil Conservation Service)
  - Environment Protection Authority
  - Sydney Water
  - Roads and Traffic Authority
  - NSW Health
  - NSW Agriculture
  - National Parks and Wildlife Service
  - Department of Mineral Resources
  - Federal Airport Corporation
  - Commonwealth Department of Transport and Communications
  - Hawkesbury-Nepean Catchment Management Trust
  - South Creek Catchment Management Committee

Comment

The above agencies were consulted by letter dated 4 June 1995 and those replies received are contained in Appendix 3 and discussed in Sections 2.4 and 7.28.

The Liverpool City Council has also been consulted as required by the Director's letter.

7.26 EIS PRACTICE GUIDELINES - EXTRACTIVE INDUSTRIES QUARRIES

Clause 51 of the Regulation requires that an environmental impact statement must include the specific guidelines which are in force for an extractive industry. Part 4 of the Guidelines gives the following specific requirements for an environmental impact statement and comments are given on each requirement.

1. Clearly identify objectives and characteristics of the proposal

   Comment

   See Section 2.2

2. Characteristics of the resource:

   Comment

   See Sections 4.4 and 4.5

3. Description of Quarry Operations

   Comment

   See Section 5.0

4. Site layout plans:

   Comment

   See Section 5.0

5. Site preparation works to establish the quarry:

   Comment

   See Section 5.0

6. Infrastructure considerations:

   Comment

   See Section 5.0

7. Rehabilitation:

   Comment

   See accompanying environmental impact statement for landfilling.

8. Previous operations on the site:

   Comment

   No previous extractions on the site except for existing dams.

9. Consideration of the alternatives and justification for the preferred proposal:

Comment

See Sections 3.0 and 8.0

The Guidelines also require information about the location and the following comments are given on each item.

1. Planning information:

Comment

See Sections 4.1 and 4.16.

2. Site Description and locality information:

Comment

See Section 4.0

3. Overview of the affected environment:

Comment

See Section 4.0

In regard to specific issues critical for the decision making, the Guidelines give the following items. Comments are given on each in relationship to the contents of the environmental impact statement.

1. Cumulative impacts:

Comment

See Sections 4.2 and 7.18.

2. Economic impacts:

Comment

See Sections 3.1 and 7.21.

3. Traffic and road impacts:

Comment

See traffic impact study in Appendix 8.

4. Erosion and soil stability issues:

Comment

See Sections 4.0 and 5.0

5. Water issues:

Comment

See Sections 4.0, 6.0 and 7.0.

6. Air quality issues:

Comment

See Sections 4.10, 6.4 and 7.7.

7. Noise and blasting issues:

Comment

See the report in Appendix 6. No blasting is proposed on the site.

8. Flora issues:

Comment

See the report in Appendix 5.

9. Fauna issues:

Comment

See Sections 4.11 and 7.8. No FIS has been prepared due to the existing disturbed and cleared nature of the site.

10. Heritage issues:

Comment

There is no item of environmental heritage on the site or on lands adjoining the site.

See report in Appendix 7 for Archaeological Survey.

11. Geological heritage issues:

Comment

No relevance to the proposed site.

12. Visual impacts:

Comment

See Sections 4.14, 6.7 and 7.11.

13. Flooding issues:

Comment

Site is not flood liable and is above the 1 in 100 year flood frequency level for the area. Minor local flooding does occur along the Creek in times of heavy rain.

14. Coastal impacts:

Comment

Not relevant to this proposal.

15. Acid sulphate soils:

Comment

Site is not located in a coastal area. See Section 4.8 for analysis of ground water.

16. Bushfire issues:

Comment

See Sections 4.12, 6.8 and 7.9.

17. Hazard issues:

Comment

Diesel full only to be stored on the site, see Section 5.6.5.

18. Social and Health issues:

Comment

See Sections 6.8 and 7.0 and transport impact assessment in Appendix 8.

7.27 LIVERPOOL CITY COUNCIL'S REFUSAL

The previous development application for the establishment of a clay/shale quarry and the rehabilitation of the proposed quarry by landfilling was refused by Liverpool City Council and the applicant notified by letter dated 28 October 1994. The four reasons of refusal are given below with comments on each reason.

(1) The adverse advice received from the Department of Planning wherein they advised deficiencies in the Environmental Impact Statement as follows:

- Proximity of the site to Badgerys Creek Airport,
- Potential deterioration of water quality (both surface and ground) in South Creek,
- Water quality damage and also flow regime damage to Oaky Creek,
- Leachate pollution,
- Inadequate buffer zones for the management of run-off,
- Fire protection management including egress and additional water demand capability,
- The inability of the Water Board to provide sewerage facilities

Comment

- The site is adjacent to the site of the proposed Second Sydney Airport however the quarry operation and subsequent landfill is not likely to have any adverse impact on the operation, safety or efficiency of the airport. The F.A.C. have no objections to the proposal subject to certain conditions. See their letter in Appendix 3.

  The existing buildings will be used for stages 1 and 2 and no new high buildings are proposed with stages 3 and 4. Elizabeth Drive has the capacity to handle the increased traffic from the quarry and landfill operation. Litter and dust will be controlled at all times to ensure no adverse impact occurs. There is not expected to be any bird problem from the quarry or the landfill operation, involving only non-putrescible wastes.

  The site and its operations may be seen by aircraft taking off or landing at the airport, but since the airport has not yet commenced construction, the quarry and landfill may be completed before extensive use is made of this new airport facility.

- This new development application has amended the procedures for water management. The water quality in Oaky Creek will be monitored to the Environment Protection Authority's requirements at all times to ensure that the existing water quality is not worsened by the proposed operations. The combination of an essentially "tight" quarry (essentially impervious base and walls) together with the "sump action" of the quarrying operation (creating a negative hydraulic gradient) means that this water cannot leave the quarry area except by pumping. All waters will be monitored/tested before leaving the surface sedimentation ponds.

Under the Company's quality control requirements, no water will leave the quarry unless it meets the criteria. Erosion and sediment control measures will be employed at all times including the commencement of each stage.

- Leachate pollution is covered in the accompanying landfill environmental impact statement.

- The surrounding bund walls will "isolate" the site from external run off water and run off water from the quarry and landfill areas will be controlled at all times.

- Fire potential from a quarry operation is considered low and the existing dams and future sedimentation ponds can be used for fire fighting services should such an emergency occur.

- Sewer services are not available for this site, for other quarries in the area or for quarries generally in rural areas. A suitable treatment plant will be installed to the requirements of Liverpool City Council and the Environment Protection Authority. The treatment of leachate is covered in the accompanying environmental impact statement.

Conclusion

These matters can be fully addressed by conditions of approval to the requirements of Council and the Government agencies.

2. The overall effect of the development on surrounding residential amenity and environment.

Comment

- The site is located in a rural area and bordered on 2 sides by the proposed Second Sydney Airport site. While there are dwellings on the lots in the area, many will be removed with the development of the airport and provision has been made in the overall management plan to protect the remaining dwellings from adverse impact beyond acceptable limits.

3. The application is contrary to:

- The draft revised Sydney Regional Environmental Plan No. 9,
- Sydney Regional Development Advisory Committee Advice of 30 March 1994,

Comment

- There is no evidence in the Draft Plan to indicate that the proposal is contrary to the revised S.R.E.P. No. 9, in fact the site has been specifically identified as being of regional significance,

- This advice and recommendations could be incorporated in the traffic measures, see report in Appendix 8.

4. The Public Meeting of 15 October 1994 on site was not truly representative of local residents.

Comment

- The Summary of Meeting in the Council Business Paper of the Ordinary Meeting of 27 October 1994 (page 13) states that those present were from the local area and only 7 out of the 80 or so people attending were against the proposal.

7.28 CONSULTATION LETTERS

Section 2.4 gives details of the consultation with authorities and summarises the replies received. These replies are given in full in Appendix 1 and 3. The following shows how the contents of each letter has been addressed in the Environmental Impact Statement.

7.28.1 Department of Land and Water Conservation

This Department incorporates the former Department of Conservation and Land Management, Department of Water Resources and Soil Conservation Service.

CALM letter dated 19 June 1995

The matters outstanding in the previous landfill EIS will be addressed in the new EIS prepared by ERM Mitchell McCotter.

Department of Water Resources letter 15.6.95

The six recommended documents were reviewed in the preparation of the EIS.

Soil Conservation Service letter 4.10.91

The recommendations of the Service have been incorporated in the quarry plan and erosion and sediment control has been given its rightful important environmental consideration in the overall management program for the development.

CALM letter dated 15.11.93

These matters will be addressed in the landfill EIS.

7.28.2 Roads and Traffic Authority

The matters (i) to (v) are covered in the EIS and transport impact assessment report contained in Appendix 8.

The items 1-4 in the Authority's letter to Liverpool City Council are also addressed in the EIS and report in Appendix 8.

7.28.3 NSW Department of Mineral Resources

Mineral Resources required the matters previously detailed to be addressed in the new EIS's.

Letter dated 3.10.91

Items 1-7 contained in this letter are detailed in the EIS.

Letter dated 29.11.93

This letter is addressed in the landfill EIS.

7.28.4 Federal Airports Corporation

The Corporation require the comments in their letter of 24 November 1993 to be addressed in the EIS. This letter relates primarily to the rehabilitation of the site however the general principles are also addressed in this quarry EIS.

7.28.5 NSW Agriculture

The Department requires the matters in their previous letter to be addressed in the new development application.

Letter dated 19.11.91

In answer to the points in the letter:-

Land Resources

* The clay/shale resources on the site with the topsoil are directly responsible for the Class 3 classification of the land. The retention of this site as a prime agriculture land would stop the excavation of the clay/shale material. The rehabilitated quarry will be restored to allow its use for grazing again.

* The extractive industry will be developed in 4 stages and will cover the entire site except for the set backs to 3 boundaries and the set back to Oaky Creek.

* The extractive industry in time will stop all the agricultural pursuits on the site, but it will have minimal adverse effect on agricultural industries in the local district.

* These items are covered in the EIS.

Water and Aquatic Resources

* The impact on surface and ground water is covered in the EIS.

* Aquatic habitats have been identified and measures outlined in the EIS to prevent any adverse effects, both on-site and down stream.

Rehabilitation

* The end use of the quarry will be as a land fill depot.

* Retention of top soil is covered in the Statement.

* Rehabilitation program is covered in this Statement and the landfill Statement by ERM Mitchell McCotter.

Cumulative Impact

Due to the distance between the site and other quarries in the area there is not likely to be any adverse cumulative impact. The clay/shale resource has been identified in Sydney Regional Environmental Plan No. 9 (Extractive Industry) and should be extracted for the regional markets.

Letter dated 24.11.93

The matters in this letter are addressed in the landfill EIS.

7.28.6 Hawkesbury-Nepean Catchment Management Trust

In reply to the items given in the letter dated 15.6.95, the following is given:

1. One of the primary objectives of the environmental management of the quarry operation is to ensure that the water quality in Oaky Creek and the quality of the groundwater is not decreased. Full details of the control measures are given in the EIS.

   Details of the monitoring programme for the landfill operation are given in the accompanying EIS.

2. The impacts on flora and fauna are addressed in the EIS and in the report in Appendix 5. Details of the proposed rehabilitation along Oaky Creek is given in the report in Appendix 5.

3. Due to the distances to other quarries in the area, there is not likely to be any adverse cumulative impact.

4. The EIS details the quarry operation and brick making clay/shales will be separated from waste materials which will be used in the landfill operation.

5. These matters are dealt with in the landfill EIS.

6. These matters are dealt with in the landfill EIS.

7. An environmental management plan will be prepared prior to the commencement of Stage 1 of the quarry operation and will incorporate the environmental management controls detailed in the EIS.

   The provision of Sydney Regional Environmental Plan No. 20 Hawkesbury-Nepean River and the proposed Amendment No. 2 are considered and addressed in the EIS.

Code of Practice

The following addresses Section 5 of the Trust's Code of Practice for Developments which require consultation with the Trust as contained in Sydney Regional Environmental Plan No. 20 Hawkesbury-Nepean River Amendment No. 2.

Ecologically Sustainable Development

The following is an acceptable definition of ecologically sustainable development (ESD):

> 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.'

Put more simply, ESD is development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations. To do this, it is necessary to develop ways of using those environmental resources which form the basis of our economy in a way which maintains and, where possible, improves their range, variety and quality. At the same time is a need to utilise those resources to develop industry and generate employment.

The proposed quarry with the detailed environmental management guidelines and procedures is unlikely to impact on the local or regional ecosystems and conforms to the general objectives and principles of ESD.

Impacts of the Proposal

The matters detailed under this section are contained within the EIS.

Environmental Measures

The environmental management controls are detailed in the EIS.

7.28.7 Department of Urban Affairs and Planning

See Sections 7.24 and 7.25 in regard to Clauses 51 and 52 of the Regulations and letter of 26 June 1995.

7.28.8 Environment Protection Authority

The following matters are required to be addressed by the Authority's letters of 26 November 1993 and 22 June 1995.

Protection of the Environment

See Sections 6.0 and 7.0.

Landfill Management

See accompanying landfill EIS.

Atmospheric Emissions

See Sections 5.0 and 6.0 and accompanying landfill EIS.

Water

See Sections 5.0, 6.0 and 7.0 and accompanying landfill EIS.

Noise

See report in Appendix 6 for quarry operation and accompanying landfill EIS.

7.28.9 NSW National Parks and Wildlife Service

The survey for Aboriginal relics is contained in Appendix 7 and the description of existing vegetation is contained in Appendix 5.

7.28.10 NSW Department of Health

The Department requested that certain matters be addressed in the EIS for the quarry and landfill operation.

Health Issues

The operations on the site will be conducted to the requirements of the Department and the WorkCover Authority.

Landfill Operations

This matter is covered in the accompanying EIS.

Water Quality and Management

This matter is covered in Section 6.0 and 7.0 of this EIS and in the landfill EIS.

Air Quality and Management

Sections 6.0 and 7.0 of this EIS and the landfill EIS deal with this matter.

Erosion Control Measures

Sections 6.0 and 7.0 and the landfill EIS deal with these measures.

Noise and Vibration

The report in Appendix 6 gives a full noise impact assessment.

Miscellaneous

1. Landscaping is covered in the EIS and report in Appendix 5.

2. Indiscriminant dumping is addressed in the landfill EIS.

3. Windblown papers and plastic bags are addressed in the landfill EIS.

4. No scavenging will be permitted at the site.

7.28.11 Liverpool City Council

The matters indicated by the Department of Urban Affairs and Planning are covered in Section 7.24 and 7.25 of this EIS and the accompanying landfill EIS.

In regard to the matters listed in the Statement of Issues, the following comments are given.

1. See Section 7.27.

2. Erosion and sediment control measures are covered in Sections 5.0, 6.0 and 7.0 of this EIS and the landfill EIS.

3. See Section 7.27.

4. See Sections 5.0, 6.0, 7.0 and 7.27.

5. See landfill EIS.

6. The buffer zones are considered adequate and their treatment is covered in Sections 5.0 and 6.0.

7. The noise report is included in Appendix 6 which deals with noise generation from the quarry and landfill operations.

8. See landfill EIS.

9. Fire protection measures are covered in Section 6.0.

10. See Sections 6.0 and 7.27.

11. Suitable waste water treatment plants will be installed to the requirements of the Council and the Environment Protection Authority.

12. See landfill EIS.

13. See Sections 6.0 and 7.0 of this EIS and the landfill EIS.

14. See Section 7.27.

15. Due to the disturbed nature of the site and its uses, a fauna impact study was not considered warranted.

16. The circumstances of the case are such that the site contains a regionally significant resource, in demand for light firing bricks and should be extracted to cater for the needs of the regional markets. The landfill operation will restore the site such that future rural or employment uses can be undertaken on the site in 15 years time.

17. The overall public interest will be served by both the quarry and the landfill operations.

The above issues, relating to water management, are addressed in the assessment by Robert H. Amaral accompanying the development application.

Section 8

Alternatives to the Proposed Development

8.0 ALTERNATIVES TO THE PROPOSED DEVELOPMENT

8.1. ALTERNATIVE RESOURCES

As no other deposits of similar size and quality are known to occur and be available in the general district, or for that matter within the Bringelly Shale, the only alternative is not to extract the clays and shales.

This will result in a drastic reduction of light firing bricks in the Sydney area. This in turn would lead to either importation of such bricks at inflated prices or a reduction in the use of light coloured bricks. Future buildings and suburban developments would ultimately be of a darker demeanour.

8.2 ALTERNATIVE QUARRYING PLAN

An alternative quarrying plan could be the initial development of a conical pit near the north-west corner. A bulldozer could then "shave" the batter of the pit, expanding it radially to the south and east.

This would have the benefit of a smaller disturbed initial area, but it would result in a single, poor grade product, suitable only for producing reddish bricks.

The light firing materials occur in distinct horizontal layers that must be extracted carefully and selectively.

Hence, there is no practical alternative to the proposed quarrying plan if the highest value of the resources is to be preserved.

8.3. CONSEQUENCES OF NOT PROCEEDING

The consequences of not proceeding with the clay/shale quarry are as follows:

(a) A clay/shale resource in excess of 4 million tonnes would not be available for use in the brick making industry and would not be extracted, resulting in the loss of this quantity of material to the brick making industry and ultimately the loss of the end products to the building and construction industries. If the quarry is not developed, material may have to be brought from further afield, resulting in increased transportation costs and therefore increased costs of the end product. The major portion of this material would provide light firing bricks which are of particular significance and in short supply.

(b) The employment opportunities would be lost and the local community would not have the prospective economic benefit from the proposed quarry.

(c) The existing rural activities on the site will continue until a higher land use is permitted, probably after the development of the second Sydney airport. This future use of the land will be possible anyway following the extraction and rehabilitation of the site.

Given the strategic importance of the site, the extensive reserves of high quality of clay/shale, and proximity of future population growth areas, at the second Sydney Airport and the labour market, the consequences of not proceeding with the quarry cannot be either justified or warranted.

BIBLIOGRAPHY

Cameron McNamara, PLAN OF MANAGEMENT EXTRACTIVE INDUSTRIES for Baulkham Hills Shire Council, 1987.

R W Corkery & Co Pty Limited, SITE MANAGEMENT PLAN FOR THE PROGRESSIVE REHABILITATION OF A CLAY/SHALE QUARRY AT KEMPS CREEK on behalf of Kari & Ghossayn Pty Limited, 1991.

Department of Aviation, SECOND SYDNEY AIRPORT FINAL SITE SELECTION.

Department of Bush Fire Services, DISCUSSION DOCUMENT, PLANNING FOR BUSH FIRE PROTECTION, 1991.

Department of Environment and Planning, HAWKESBURY/NEPEAN VALLEY REPORT, 1983.

Department of Environment and Planning, SYDNEY'S EXTRACTIVE INDUSTRY REGIONAL ENVIRONMENTAL STUDY, 1984.

Department of Environment and Planning, DRAFT SYDNEY REGIONAL ENVIRONMENTAL PLAN - EXTRACTIVE INDUSTRY, TECHNICAL WORKING PAPERS, 1986.

Department of Environment and Planning, SYDNEY REGIONAL ENVIRONMENTAL PLAN NO. 9 - (EXTRACTIVE INDUSTRY) AND PLANNING REPORT (1986).

Department of Environment and Planning, SYDNEY REGIONAL ENVIRONMENTAL PLAN NO. 13 MULGOA VALLEY, 1987.

Department of Environment and Planning, MULGOA CLAY/SHALE RESOURCE PLAN OF MANAGEMENT, 1989.

Department of Mineral Resources and Development, THE GEOLOGY AND RESOURCE POTENTIAL OF THE WIANAMATA GROUP, 1979.

Department of Mineral Resources, MANAGEMENT OF CLAY/SHALE RESOURCES IN THE SYDNEY REGION, 1980.

Department of Mineral Resources, A BIBLIOGRAPHY OF STRUCTURAL CLAY/SHALE RESOURCES IN THE SYDNEY AND ILLAWARRA REGIONS, 1989.

Department of Minerals and Energy, BADGERYS CREEK SECOND SYDNEY AIRPORT SITE CLAY/SHALE DRILLING PROGRAMME, 1990.

Department of Mineral Resources in conjunction with the Department of Planning, MANAGEMENT PLAN FOR SAND EXTRACTION ON LAND AT PITT TOWN, 1990.

Department of Planning, SYDNEY REGIONAL ENVIRONMENTAL PLAN NO. 9(2) - EXTRACTIVE INDUSTRY, 1993.

Department of Planning, SYDNEY REGIONAL ENVIRONMENTAL PLAN NO. 20 HAWKESBURY-NEPEAN RIVER (AMENDMENT NO. 2), 1994.

Department of Planning, SYDNEY REGIONAL ENVIRONMENTAL PLAN NO. 20 HAWKESBURY-NEPEAN RIVER, 1989.

Department of Planning, BLUE MOUNTAINS EASTERN ESCARPMENT STUDY, 1989.

Department of Planning, DRAFT REGIONAL ENVIRONMENTAL PLAN SOUTH CREEK VALLEY, 1991.

Department of Planning, SOUTH CREEK VALLEY REGIONAL ENVIRONMENTAL STUDY, 1991.

Department of Transport and Communications, SECOND SYDNEY AIRPORT BADGERYS CREEK - CONCEPT DESIGN REPORT, Project Summary, 1991.

Department of Water Resources, GENERAL REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENTS.

Hawkesbury Shire Council, SOUTH CREEK WETLANDS STUDY.

Joint Councils' River Committee, HAWKESBURY - NEPEAN RIVER ENVIRONMENTAL MANAGEMENT STUDY, 1984.

Lake Illawarra Management Committee, SEMINAR NOTES ON SEDIMENT TRAPS, 1988.

NSW Agriculture, DRAFT CONSERVATION STRATEGY, KEY PLANNING AND ENVIRONMENTAL ISSUES, 1991.

Soil Conservation Service, GUIDELINES TO MEET REQUIREMENTS FOR INFORMATION ON SOIL AND LAND STABILITY IN PROPOSALS FOR OPEN-CUT MINING AND REHABILITATIONS, 1985.

State Pollution Control Commission, EXTRACTIVE INDUSTRIES IN THE HAWKESBURY REGION, 1977.

State Pollution Control Commission, WATER QUALITY IN THE HAWKESBURY-NEPEAN RIVER, 1983.

State Pollution Control Commission, A STRATEGY FOR THE MANAGEMENT OF THE WATER QUALITY OF THE HAWKESBURY-NEPEAN RIVERS, 1985.

State Pollution Control Commission, POLLUTION CONTROL IN SYDNEY'S WATERWAYS.

State Pollution Control Commission, POLLUTION CONTROL MANUAL FOR URBAN STORMWATER, 1989.

Water Board, LIVING IN A WATER CATCHMENT AREA, 1991.

GLOSSARY OF TECHNICAL TERMS AND SYMBOLS

TECHNICAL TERMS

attenuation - reduction in sound pressure levels between two locations

background noise levels - the level of the ambient sound indicated on a sound level meter in the absence of the sound under investigation (eg sound from a particular noise source; or sound generated for test purposes)

batter - receding slope from ground upwards

bench - a step in the face of a quarry

bulldozer - an item of tracked mobile earth moving equipment fitted with a front blade and with rear rippers used for pushing and ripping soil and rock

catchment - drainage area of a reservoir, river, creek, etc.

clay - a size term denoting particles, regardless of mineral composition, with a diameter less than 0.004 mm

development application - an application to the local Council for approval of an activity deemed to require an approval prior to commencement

dust - particles of mostly mineral origin generated by erosion of surfaces and the mining and handling of materials

environmental constraints - limitations on a project by components of the physical or cultural environment

exotic - introduced or foreign, not native

extraction - a term synonymous with quarrying

face - sub-vertical quarry feature generally forming limits of benches

fill - material imported and emplaced to raise the general surface level of a site

grader - an item of earthmoving equipment, rubber tyred and fitted with a centrally mounted blade and rippers used to shape and trim the ground surface

groundwater - water contained in voids such as fractures and cavities in rocks and inter-particle spaces in sediments

haul road - road used in quarry for haulage from the face and for general site access

intermittent - not continuous or steady

inversion - weather term for surface defining boundary between two layers of air of different temperatures

loam - loose soil composed of clay and sand, especially a kind containing organic matter and of great fertility

Local Environmental Plan - a plan developed by a council to control development in part or all of their shire or municipality

monitoring - the regular measurement of components of the environment to establish environmental standards are being met

morphology - physical form

mulch - an organic material formed by the natural accumulation of leaves, twigs, etc. or mechanical disintegration of vegetation

operational constraints - limitations upon a project by equipment or machinery

overburden - in the quarrying context refers to non-economic material to be removed to allow access to the resource

quarry - the area from which material is extracted

Regional Environmental Plan - a plan prepared by the State Government Department responsible for planning where controls on development are considered on a regional and statewide basis

rehabilitation - the preparation of a final landform after quarrying and its stabilisation with grasses, trees and shrubs

reserves - in the mining context refers to an estimated quantity of useable material

revegetation - replacement of vegetation, principally grasses and legumes on areas disturbed by quarrying activities

ripping - breaking up of ground with a bulldozer using an action similar to a rake

road base - road pavement usually made up of densely graded crushed rock in varying sizes

road grades - the longitudinal slope of a road surface commonly expressed in per cent gradient (i.e. 10 per cent is a gradient of 1 vertical in 10 horizontal)

sedimentation dam - an earth embankment or excavation constructed so as to catch surface runoff and thus allow sediment carried to be deposited by reduction in runoff velocity

shale - fine grained sedimentary rock types such as siltstone or mudstone which part readily along well-defined bedding planes

sump - a dam within the lowest point of a quarry or processing plant site designed to collect the first runoff

topography - landform

topsoil - the surface layer of a poorly-developed or well-developed soil profile containing the main percentage of organic material

vehicle movement - a one-way trip

Wianamatta Group - a geological term for a group of rocks, predominantly shales that are common in Sydney's western and southwestern suburbs and on the margins of the Sydney Basin.

SYMBOLS

AHD	Australian Height Datum
A-Scale	A sound level measurement scale. It disseminates against low frequencies. It approximates the human ear.
dB(A)	the unit of measurement of sound pressure level heard by the human ear - decibel expressed in "A" scale
ha	hectare (100m x 100m)
km	kilometre (= 1 000 metres)
km^2	kilometres square
km/hr	kilometres per hour
l	litre
l/s	litres per second
L_{eq}	the L_{eq} is the "equal energy" average noise levels, and is used in some instances for the assessment of traffic noise effects or the risk of hearing impairment due to noise exposures
L_{10}	sound level exceeded 10 per cent of the sampling time
L_{90}	sound level exceeded 90 per cent of the sampling time
m	metre
m^2	square metre
m^3	cubic metre
m^3ha	cubic metres per hectare
mg/l	milligrams per litre (parts per million)
Ml	megalitre
mm	millimetre (= 0.001 metres)
Mtpa	Million tonnes per annum
t	tonnes
t/m^3	tonnes per cubic metre
tpa	tonnes per annum
'000t	multiples of one thousand tonnes

Appendix 1

Department of Urban Affairs and Planning Letter

New South Wales Government

Department of Urban Affairs and Planning

R A Cole Town Planning Pty Ltd
9 Hilar Avenue
CARLINGFORD NSW 2118

Governor Macquarie Tower,
1 Farrer Place, Sydney 2000
Box 3927 G.P.O. Sydney 2001
DX 15 Sydney

Telephone :(02) 391 2000 Ext: 2078

Fax No. :(02) 391 2111

Contact : M. Beveridge

Our Reference : P91/02045

Your Reference :

Dear Sir,

Proposed Clay/Shale Extraction and Landfill
Lot 3, DP623799, Adams Road, Luddenham

Thank you for your letter of 4 June, 1995 indicating that you are consulting with the Director again with regard to the preparation of an environmental impact statement (EIS) for the above development. The Department is taking the opportunity to re-issue the Director's requirements for the proposal. It is noted that your firm will be undertaking an EIS for the extraction component, and ERM Mitchell McCotter is preparing the EIS for the land filling. The advice included in this letter has been issued to both parties.

2. If development consent is required for the proposal and it is a designated development within the meaning of Schedule 3 of the Environmental Planning and Assessment Regulation, 1994, an EIS must accompany the development application to Liverpool City Council. The EIS shall be prepared in accordance with clause 51 of the Regulation (see Attachment No. 1) and shall bear a certificate required by clause 50 of the Regulation.

3. The attached documents provide comprehensive guidance on the information most likely to be relevant to the development you propose; not all of the matters raised therein may be appropriate for consideration in the EIS for your proposal; equally, the guide is not exhaustive.

4. In addition, pursuant to clause 52 of the Regulation, the Director requires that the following matters be specifically addressed in the EIS:

- consideration of relevant matters raised in submissions to the exhibition of the previous EIS;
- consideration of relevant provisions of the following statutory planning instruments:
  - Sydney Regional Environmental Plan No. 20 - Hawkesbury-Nepean River;
  - Draft Sydney Regional Environmental Plan No. 20 (Amendment No. 2);

  - Sydney Regional Environmental Plan No. 9 - Extractive Industry;
  - Sydney Regional Environmental Plan No. 9 - Extractive Industry (Draft Amendment No. 2);
- assessment of likely impact on the proposed Badgerys Creek Airport. This should particularly address potential bird hazard;
- assessment of water quality impacts with specific reference to the impacts on Oaky Creek and Cosgroves Creek. This should include means to prevent loss of water quality to both surface waters and groundwater inflows, and proposals for establishing a riparian buffer zone;
- assessment of cumulative impacts of this proposal with other quarries/landfills in the area;
- assessment of traffic and transport impacts, particularly in relation to impacts on the Northern Road and Elizabeth Drive;
- assessment of impacts of proposal on items of archaeological or heritage significance, particularly the Luddenham Public School, or the Lawsons Inn;
- results of consultation with:
  - Department of Land and Water Conservation (including Soil Conservation Service)
  - Environment Protection Authority
  - Sydney Water
  - Roads and Traffic Authority
  - NSW Health
  - NSW Agriculture
  - National Parks and Wildlife Service
  - Department of Mineral Resources
  - Federal Airport Corporation
  - Commonwealth Department of Transport and Communications
  - Hawkesbury-Nepean Catchment Management Trust
  - South Creek Catchment Management Committee

5. In preparing your EIS you should approach Liverpool City Council and take into account any comments Council considers may apply to its determination of the proposal.

6. Should you require any further information regarding this matter please do not hesitate to contact us again.

Yours sincerely,

Debbie Osborne
for Stephen Brown 26/6/95
Acting Manager
Assessments and Major Hazards Branch
As Delegate for the Director

Department of Urban Affairs and Planning

ATTACHMENT NO 1

STATUTORY REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENTS

Pursuant to clauses 51 and 84 of the Environmental Planning and Assessment Regulation, 1994, the contents of an EIS must include:

SCHEDULE 2

1. A summary of the environmental impact statement.
2. A statement of the objectives of the development or activity.
3. An analysis of any feasible alternatives to the carrying out of the development or activity, having regard to its objectives, including:
   (a) the consequences of not carrying out the development or activity; and
   (b) the reasons justifying the carrying out of the development or activity.
4. An analysis of the development or activity, including:
   (a) a full description of the development or activity; and
   (b) a general description of the environment likely to be affected by the development or activity, together with a detailed description of those aspects of the environment that are likely to be significantly affected; and
   (c) the likely impact on the environment of the development or activity, having regard to:
      (i) the nature and extent of the development or activity; and
      (ii) the nature and extent of any building or work associated with the development or activity; and
      (iii) the way in which any such building or work is to be designed, constructed and operated; and
      (iv) any rehabilitation measures to be undertaken in connection with the development or activity; and
   (d) a full description of the measures proposed to mitigate any adverse effects of the development or activity on the environment.
5. The reasons justifying the carrying out of the development or activity in the manner proposed, having regard to biophysical, economic and social considerations and the principles of ecologically sustainable development or activity in the manner proposed, having regard to biophysical, economic and social considerations and the principles of ecologically sustainable development.
6. Compilation, (in a single section of the environmental impact statement) of the measures referred to in item 4 (d).
7. A list of any approvals that must be obtained under any other Act or law before the development or activity may lawfully be carried out.
8. For the purposes of this Schedule, **"the principles of ecologically sustainable development"** are as follows:
   (a) The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
   (b) Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
   (c) Conservation of biological diversity and ecological integrity.
   (d) Improved valuation and pricing of environmental resources.

Note: The matters to be included in item (4) (c) might include such of the following as are relevant to the development or activity:

(a) the likelihood of soil contamination arising from the development or activity;
(b) the impact of the development or activity on flora and fauna;
(c) the likelihood of air, noise or water pollution arising from the development or activity;
(d) the impact of the development or activity on the health of people in the neighbourhood of the development or activity;
(e) any hazards arising from the development or activity;
(f) the impact of the development or activity on traffic in the neighbourhood of the development or activity;
(g) the effect of the development or activity on local climate;
(h) the social and economic impact of the development or activity;
(i) the visual impact of the development or activity on the scenic quality of land in the neighbourhood of the development or activity;
(j) the effect of the development or activity on soil erosion and the silting up of rivers or lakes;
(k) the effect of the development or activity on the cultural and heritage significance of the land.

EXTRACT FROM DRAFT ENVIRONMENTAL ASSESSMENT GUIDELINES FOR LANDFILL PROPOSALS

PART 4 : PREPARING THE EIS

4.1. GENERAL

The purpose of the EIS is to enable the proponent, members of the public, the consent authority (usually Council) and other relevant Government agencies to properly understand the environmental consequences of the proposed development.

In the preparation of the EIS, key environmental issues should be identified early in the process. The consultation process identified above should facilitate this. The focus of the investigation should be on assessing the impacts and identifying options to mitigate or manage them. The level of analysis in the EIS should reflect the scale of the proposal and the significance of the impacts. Information provided in the EIS should be clear, succinct and objective, and where appropriate be supported by maps or other descriptive detail.

Section 4.2 of the Guidelines summarises the main points which should be included in the EIS. Section 4.3 includes matters which may be relevant for inclusion as conditions of consent for a landfill proposal.

4.1.1. The Structure Of An EIS

The EIS should be structured to include the following:

- **Executive Summary**
- **Summary of Key Issues and a page reference stating where in the EIS these issues are addressed.**
- **Objectives of the proposal, particularly in terms of it satisfying any regional waste management strategies**
- **Justification of the proposal, particularly the location. This should include the results of site selection studies and a consideration of alternatives**
- **Overview of the environment likely to be affected**
- **Description of the potential impacts. The focus should be on a full analysis of the key impacts**
- **Outline of the principles of environmental management and ongoing monitoring**

4.1.2. Summary Of Specific Matters That Should Be Addressed In An EIS

The Environmental Planning and Assessment Regulation includes matters which must be addressed in an EIS. These requirements are included in Clause 51 of the Regulation for EISs prepared under Part 4 of the Act, and Clause 84 for EISs prepared under Part 5. In addition to these mandatory requirements, the EIS should address all issues relevant to a proposal at a particular location. It will also be necessary for the EIS to address the matters included in the EPA Guidelines relevant to the particular class of landfill. Section 4.2 reviews in detail the specific environmental, social and economic issues which are important in assessing the impact of landfill proposals. The following summary outlines the information which is likely to be relevant for inclusion in the EIS, or Statement of Environmental Effects if an EIS is not required.

a. Information about the location

- Site description and locality information
- Planning information
- Overview of the affected environment

b. Information about the proposal

- Types of wastes to be accepted
- Site preparation issues
- Site layout issues
- Operational and Management Issues

c. Specific issues likely to require assessment

A summary of the issues which may require assessment in an EIS is listed below.. The list is not exhaustive and the degree of relevance of each will vary.

- Groundwater impacts, particularly leachate management
- Surface water issues
- Flood issues
- Methane gas control
- Social and amenity issues, particularly noise, dust, odour and visual impacts
- Road and traffic issues
- Erosion and soil stability issues
- Flora and fauna issues

- Acid sulphate soils
- Hazard impacts
- Health impacts
- Heritage impacts
- Economic impacts
- Matters raised in EPA Guidelines
- Matters in Section 90 of the Environmental Planning and Assessment Act

d. Information about the ongoing management of the site

- Draft Environmental Management Plan
- Proposals for Ongoing Monitoring

These issuea are discussed in more detail in the following section of these Guidelines.

4.2. SPECIFIC MATTERS WHICH SHOULD BE ADDRESSED IN AN EIS

The following list of issues may be relevant for inclusion in an EIS for landfills. In addition to issues listed below, an EIS should also address the matters included in the relevant EPA Guideline.

4.2.1. Information About The Location

Information about the location should be provided as follows.

a. Description of the site

The site should be described in terms of:

i. real property description;
ii. tenure details;
iii. existing and previous use;
iv. existing buildings and other development on site;
v. details of topography, soils, geology, vegetation, significant environmental features, groundwater and conservation value; and
vi. maps, plans and aerial photos showing the significant features on the site, and showing its location in relation to nearby land uses.

b. Planning Context

The following information should be provided:

i. zonings, permissibility and land use constraints;
ii. existing and previous use on the site;
iii. any easements or other restrictions affecting the site;
iv. any regional strategy or plan of management for the area;
v. relevant provisions of any State Environmental Planning Policy, Regional or Local Environmental Plans, or Development Control Plan for existing and proposed development and
vi. any heritage matteres or environmental protection areas, or areas affected by a Conservation Agreement.

c. Surrounding Environment

The characteristics of the site and surrounding environment should be reviewed. It is likely that the information collected to establish site suitability could be adequate for this purpose. This information should be presented in summary form, and reproduced in full in an Appendix. Nearby land uses likely to be affected by the proposal should also be described.

4.2.2. Information About The Proposal

The following information should be provided.

a. Background

This should review the background to the proposal, and present a sound justification for the proposal, including alternative sites (including the results of preliminary investigations), alternative means of waste disposal or uses of waste and intended life of the operation should be stated.

b. The Nature of the Wastes to be Accepted at the Landfill

A thorough assessment of the types of wastes to be accepted at the landfill should be provided. This should be considered in terms of the following:

i. nomination of the types of wastes to be accepted at the facility, and an identification of the wastes which will be specifically excluded. Identification also of the testing procedures which will be in place to ensure that excluded wastes are not accepted, and procedures for handling such wastes should they be discovered;
ii. the quantity and characteristics of each type of waste to be accepted. This should include the decomposition products of the wastes, any damaging properties, or any pathogens it may contain;

iii. procedures for the reception of the wastes, including how the wastes will be inspected, identified, tested and sorted;
iv. procedures for identifying and handling wastes which can be recycled or reused;
v. procedures for waste recovery, and whether any wastes will need further processing when received. If so, the nature of such reprocessing and associated impacts;
vi. description of proposals for record keeping of wastes received, their types and quantities.

c. Site Preparation Issues

Site preparation should be considered in terms of the following issues:

i. whether any site clearing will occur and the significance of any vegetation which will be cleared;
ii. description of extraction to create the voids necessary for landfilling. This should consider the following issues:
    - the amount of material to be extracted;
    - the intended use of the extractive resource;
    - its suitability to be used as a cover material;
    - noise, dust, traffic and blasting impacts;
    - proposals for water management;
    - description of any processing of extracted material which is to occur on site;
    - assessment of erosion and soil stability issues. Note: if the slope of the natural land is more than 18 degrees, a permit for clearing may be required from CaLM under the Protected Lands provisions of the Soil Conservation Act;
    - description of Site Layout, including location of cells, the sequence they will be filled, location of reception facilities, offices, washdown facilities etc., schematic overview of water management system and leachate collection system and
    - description of pre commencement monitoring to be undertaken.

Other matters which it may be appropriate to address in this regard are to be found in the Department of Planning publication entitled "Practice Guideline on Extractive Industries and Quarries" (dated July 1994).

d. Site Layout Plans

Plans indicating the location of the following should be provided:

i. site contours;
ii. significant environmental features (particularly watercourses);
iii. locations of groundwater;
iv. areas to be cleared, including any significant vegetation communities which will be cleared;
v. stockpiles of cover material;
vi. areas associated with waste reception, including reception depots, sorting and recycling areas;
vii. the internal road system, including parking areas;
viii. dangerous goods such as fuels, chemicals or explosives;
ix. drainage network, bunds, and sedimentation ponds;
x. fencing and other safety features;
xi. landscaping, bunding and other on-site areas to remain undisturbed;
xii. monitoring locations.

e. Operation and Management of the Landfill

This should be considered in relation to the following issues:

i. Sequence of filling in the cells;
ii. Need for pit liners;
iii. Identification of the tipping face;
iv. Height of the wastes;
v. Compaction density and compaction mechanisms;
vi. Depth of cover material and capping;
vii. Proposals for collection and treatment of leachate;
viii. Proposals for progressive rehabilitation and
ix. Identification of management of the facility.
x. Proposals for controlling vermin
xi. Site security issues, including fencing
xii. Site operating hours
xiii. Litter reduction patrols

4.2.3. Identification And Assessment Of Significant Environmental Issues Associated With Landfills

A number of issues are relevant for consideration of the environmental impact of the proposal when it is in operation. The relevance of these issues to a particular proposal will depend upon the location of the landfill, its size, the type of wastes involved, and the sensitivity of the surrounding environment. Where relevant, the following issues should be addressed according to the following framework:

- a description of the existing environmental conditions;
- an analysis of the potential impacts of the proposal on the environment and
- proposed impact mitigation and management strategies.

a. Water Management Issues

This should be considered in relation to:

i. Groundwater Impacts: the most critical issue in relation to groundwater impacts relates to the generation, control and management of leachate to avoid the contamination of groundwater. The following issues should be considered:
   - review of the characteristics of the existing groundwater regime, in terms of it's location, constituents, present quality, current uses, the significance of this use and rates and directions of water movement;
   - assessment of the potential of the landfill to generate leachate, particularly the rates of leachate generation over time, the major constituents of the leachate and any particular hazards associated with the leachate;
   - assessment of the need for landfill liners to prevent transmission of leachate to the groundwater. The liners should be described in terms of their constituents, thickness, permeability , efficacy in containing the leachate, and events which may result in failure of containment. The EIS should demonstrate that the particularly hazardous components of the leachate will remain immobilised by the liner. This may require assessment by way of a Toxicity Characteristic Leaching Procedure Test (TCLP);
   - proposals for remedial action should containment of the leachate fail;
   - proposals for the collection treatment and disposal of leachate. This should include the volume of leachate that will be allowed to accumulate over the liner, the design and location of leachate drains and holding tanks and pits, and their capacities. The impact of high rainfall events on the generation and collection of leachate should be addressed. Proposals for the treatment of the leachate prior to disposal should be clearly identified. If the leachate is to be disposed of to sewer, the effluent quality standards should be described. Proposals also for recycling and reusing the treated leachate on site where possible ;and
   - demonstration that the proposed method of leachate treatment will not result in significant adverse impacts upon the groundwater, or upon users of the groundwater . This should also include aquifer recharge areas, and should also address impacts arising from alterations to groundwater movements.

ii. Control and Management of Stormwater: this should be considered in terms of:
   - potential sources of water pollution such as:
     - turbidity due to run off from stockpiles, roads, landfill cells or other disturbed areas;
     - treatment areas, parking areas and
     - contaminated leachate either by surface movement or movement through groundwater.
   - identification of surface waterbodies which could be impacted upon by the proposal;
   - drainage and stormwater management system. The system should ensure that uncontaminated stormwater is diverted away from the landfilling area, and that stormwater running off from the landfilling area is collected and treated on site. The management system should demonstrate site contours and channelisation works, sedimentation dams to contain runoff to ensure that these objectives are met. The capacity of the system should be described in terms of its capacity to handle runoff from major flood events;
   - proposals to prevent soil erosion due to stormwater runoff. (Refer to Section on Erosion and Soil Stability);
   - assessment of the need for treatment of stormwater, and if necessary, proposed method of treatment and
   - proposal for the minimisation of water use, including proposals for the collection and reuse of water (following) treatment if necessary.

It would be appropriate to prepare a site Water Management Plan which addresses all water related matters in an integrated manner.

b. Flooding Issues

For landfilling proposals undertaken on flood prone areas, the following issues should also be considered:

i. flooding status;
ii. means to prevent breakthrough during floods from any pits, slime or settlement into waterways or the groundwater;
iii. any likely effects of the operation on flood liability of surrounding lands and

iv. any proposed future flood mitigation schemes that may influence the impact of the proposal on the environment.

c. Methane Gas Control

This should be considered in terms of the following:

i. assessment of the likely rate of generation of methane, and how this will vary over time;
ii. assessment of the feasibility of using the methane gas
iii. proposals for the collection, treatment, storage use and or disposal of methane;
iv. proposals for the monitoring of methane gas levels at strategic positions on site, and off site if necessary;
v. nomination of an acceptable level of methane at various locations ;. and
vi. proposals for remedial action if these levels are exceeded.

d. Social and Amenity Issues

Impacts on the surrounding community should be considered, including community attitudes about the proposal, including social equity considerations such as a means to offset any inequities (for example proposed post closure uses which may benefit the host community). Impact on values of nearby properties should also be considered. More specific issues include:

i. noise impacts should be addressed in terms of the noise generators operating at the landfill, the amount of noise likely to be generated, an assessment of the sensitivity of the nearby environment, noise mitigation measures;
ii. odour impacts: should consider the nature of the receiving environment, effects of different wind and weather conditions, mitigation measures (such as frequent covering of wastes) and an assessment of the impacts. For some proposals, it may be necessary to develop odour contours. Consideration should also be given to on-site separation distances to help minimise impacts;
iii. dust impacts: this should particularly address impacts from the stockpiling of cover material and truck movements. Mitigation measures (such as spraying) should be identified and
iv. visual impacts: should be considered from strategic viewpoints adjacent to and in the vicinity of the site, and particularly from higher elevations. Mitigation measures such as planting and screening should be identified.

e. Road and Traffic Impacts

This should be considered in relation to both internal and external roads and should address the following issues:

i. current traffic conditions on roads leading to the depot, including volumes and vehicle types;
ii. amount of traffic likely to be generated by the facility, an assessment of the adequacy of the road network to deal with this traffic, and an identification of any road upgradings which may be required;
iii. layout of internal road system, parking areas and associated facilities such as truck washdown areas etc. and
iv. measures to mitigate impacts such as noise, dust and safety on internal and external roads
v. proposals if relevant for the transport of hazardous materials.

f. Erosion and Soil Stability Issues

Issues to consider include:

i. description of the characteristics of the soil including its physical and chemical properties;
ii. landform characteristics which influence the erosion hazard and rainfall/runoff rate;
iii. outline of erosion and sediment control measures including:
    - selection of techniques for stripping topsoil and subsoil which will minimise erosion;
    - proposed water diversion banks and channels stabilisation works for cuttings, embankments, channels and ponds stockpile management measures, including:
        - wind and water erosion control measures
        - identification of surface stabilisation measures for stockpiles (such as mulching or temporary vegetation), and proposed stockpile batter grades
        - maintenance of erosion control works.

g. Acid Sulphate Soils

The following applies to landfills located in areas where acid sulphate soils (including potential acid sulphate soils, sulphidic clay or sulphidic sands) are likely to occur. In some areas, maps have been prepared by CaLM or the local council which identifies areas where acid sulphate soils are potentially located. In areas where there is a likelihood of a problem, testing should be undertaken, and includes:

i. identification of a potential acid soil problem, including:

- field observations;
- peroxide effervescence test;
- water analysis of the surface and groundwater and
- soil sampling and analysis, with emphasis on the material at or below the watertable.

ii. management program (including Monitoring) to manage the potential impacts:
- from the release of acid water or soils from the landfill;
- from the storage or use of the material (example, as cover material) and
- from any change to the watertable.

h. Flora and Fauna Impacts

Matters which should be considered in relation to this issue include:

i. reviewing the existing environment in relation to flora and fauna and an assessment of its significance. This could be done either by reviewing existing information, or in some cases by site specific survey;

ii. extent of any clearing which will occur during the construction phase, and whether any species of rare or threatened flora, or important habitat species will be removed;

iii. identification of any areas which serve an important function as habitat, food source, or wildlife corridor, and proposals for the protection of these areas and

iv. Other impacts on flora and fauna including the likelihood of introducing exotic species (particularly Vermin) and the impact of this on native populations.

v. Consideration of the need for a Fauna Impact Statement (FIS). If an FIS is warranted, this could be incorporated into the EIS to avoid the need for subsequent information and assessment by ensuring relevant identification of all issues.

i. Separation Distances

The requirement for separation distances to be addressed as an integral part of the site selection process was referred to in Section 2c. Separation distances to adjacent land uses should also be addressed as part of the impact assessment process.

The EIS should assess the extent to which impacts can be ameliorated by the use of separation distances. It should also consider the extent to which this may result in land sterilisation due to unacceptable environmental effects on future land uses (of more sensitive nature).

j. Hazard Impacts

The proposal should be assessed in terms of its hazard potential. This should focus on hazardous occurrences which could arise from atypical events, such as:

i. fire (including bushfire hazard and controlled burning);

ii. explosion (including methane gas and any other explosive material used on site and

iii. release of toxic substances including leachate.

Hazards from natural events, such as earthquakes, landslip, flooding and subsidence should also be addressed.

Hazard to any nearby airports should also be considered in relation to birdstrike. In carrying out this assessment, an inventory of all dangerous goods to be used or stored on site should be included, and the need for a preliminary hazard analysis should be considered. If warranted, the PHA should be prepared in accordance with the Department of Planning publication entitled Hazardous Industry Planning Advisory Paper No 6 - Guidelines for Hazard Analysis.

k. Rehabilitation and End Use Issues

This should be considered in relation to the following:

i. end use objectives for the site.

ii. site rehabilitation and landscaping plan, showing final contours for the site and the timing of the rehabilitation. This should relate to the end use objectives for the site;

iii. proposals for gas collection and reuse;

iv. proposals for drainage, irrigation and leachate collection and

v. proposals for ongoing monitoring

vi. proposals for aftercare arrangements for the site.

l. Health Impacts

This should be considered in relation to the potential for transmission of disease organisms, carcinogens, mutagens, or teratogens likely to affect health. It would be expected that this analysis would focus primarily on human health. Animal and plant health should also be considered where relevant.

m. Archaeological Impacts

Proposals to protect the archaeological heritage should be proposed. This should include European, Aboriginal and maritime archaeological issues. This may require site

excavations or the preparation of an archaeological management plan.

n. Economic Considerations

The EIS should address the following economic issues:

i. **Cost Benefit Analysis:** of the proposal should be included. This should include an economic and financial analysis of why wastes which might be put to another use (such as building wastes for example) are being landfilled.

ii. **Need for a Performance Bond:** The EIS should consider the need for the operator to enter into a bond with the consent authority to guarantee a high standard of operation. The bond could cover the following issues.

iii. appropriate site rehabilitation and site closure arrangements following completion of the landfill.

iv. failure of safeguards resulting in a significant environmental impact

v. compensation for the sterilisation of any land should this occur.

vi. **Section 94 contributions:** The EIS should consider whether any upgradings to services, infrastructure or community facilities are required as a consequence of the landfill. Such contributions could be levied by the consent authority as a condition of consent, and might cover the following issues:

- necessary buffer areas to be provided as parks or landscaped areas
- road upgradings
- water and sewage services

o. Consideration of Relevant Legislation

The legislative provisions affecting the operation of the landfill proposal should be identified and the proposal assessed for compliance with this legislation.

p. Planning and Land Use issues

Issues which need to be considered include:

i. assessment of consistency with any current or draft planning instruments

ii. any constraints to future land use as a result of the landfill.

iii. identification of any land sterilisation (including sterilisation of future uses)which may occur

q. Environmental Monitoring

A continuous environmental monitoring proposal should be devised, which address the requirements of relevant Government agencies, particularly the requirements of the EPA. Such a plan should be based upon the following parameters:

i. the needs of the relevant government agencies;

ii. pre-commencement baseline data of relevant parameters, including: soil, groundwater, surface water, flora and fauna, run off water, leachate;

iii. a sampling and testing protocol of what, where and how often the relevant parameters are to be sampled. This testing procedure should be verified;

iv. recommendations of what to do if there are unforeseen results of the monitoring;

v. there should be a committee to oversee the monitoring and

vi. reporting procedure should be established and the information made public.

r. Draft Environmental Management Plans

An environmental Management Plan is a tool which may be implemented for proposals once development applications are approved. They are usually detailed and technical plans. Whilst detailed plans are not needed in the EIS, it should include the outline of the plans and demonstrate that a final plan can be prepared which will adequately address the relevant issues. Such a plan could then be incorporated into the conditions of development consent.

The draft plan should provide a comprehensive framework for managing or mitigating environmental impacts over the life of the landfill and should address the following issues:

i. water management (groundwater and surface water);

ii. rehabilitation ;

iii. day to day operations;

iv. archaeology;

v. noise and odour;

vi. ongoing environmental monitoring;

vii. performance bond conditions and

viii. reporting requirements. This should propose how the EPA reporting requirements and EIS reporting requirements are to be integrated.

s. Consistency With EPA Guidelines:

The EIS should address all relevant matters included in the EPA document entitled "Environmental Management Guidelines for Solid Waste Landfills". It should

demonstrate that the landfill will comply with all EIS requirements specified in the EPA Guidelines.

t. Heads Of Consideration In Section 90 Of The Environmental Planning And Assessment Act:

The EIS should ensure that there is sufficient information for the consent authority to consider the proposal in relation to S.90 of the Act. If the EIS addresses all relevant matters the proposal should satisfy the requirements of S.90.

4.3 CONDITIONS OF CONSENT

If a consent authority wishes to grant consent to a landfill proposal, it is recommended that the following matters be considered for inclusion as conditions of consent:

- A monitoring program. This should be based around the monitoring requirements included in item (q) of Section 4.2;
- A monitoring committee should be established to administer the monitoring program. It should include representatives of relevant Government departments, as well as Council and the local community;
- A community consultation program. This should provide for such things as a complaints register to record the details of complaints made by the public about the facility(and the action taken in response to such complaints), and a telephone service to enable the public to lodge such complaints;
- Independant environmental auditing. Independant auditing should be undertaken regularly (every 12 months). It should be done in accordance with relevant Guidelines, and should cover all aspects of the environmental performance and monitoring of the facility. The applicant should comply with all reasonable requirements resulting from the auditing.
- Health impact assessment. It may be appropriate for the applicant to participate in a health impact assessment of the proposal.
- Energy conservation. An energy conservation plan should be submitted to the consent authority
- An environmental management plan as referred to in item (r) of Section 4.2.3 should be prepared.
- Hazard assessment. Appropriate hazard studies should be undertaken.
- Section 94 contributions. Relevant contributions should be included as conditions of consent.

Extractive Industries Quarries

EIS PRACTICE GUIDELINE

July 1994

(minor revisions May 1995)

Key Factors in preparing an EIS

- early effective consultation
- early assessment of the suitability of the location
- early analysis of alternative sites, quarry layout, management and processing practices and justification for the preferred options taking into consideration biophysical, social and economic factors
- early identification of key environmental issues. The EIS need not be long. Focus the analysis only on key issues relevant to the location
- the level of analysis in the EIS to reflect the level of significance of the impacts
- early identification of the environmental costs and benefits of the proposal
- clearly and concisely presented information

PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT

New South Wales
Department of Urban Affairs and Planning

PART 1: BACKGROUND INFORMATION

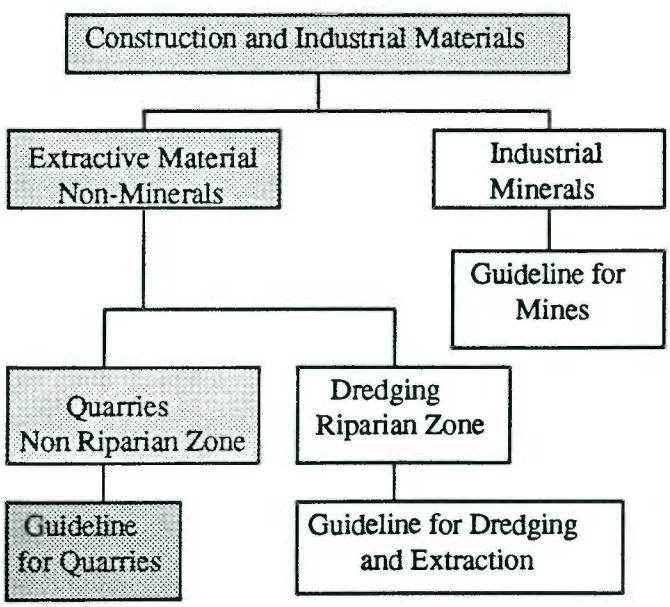
THE PURPOSE AND SCOPE OF THIS PRACTICE GUIDELINE

The purpose of this Practice Guideline is to present a clear and comprehensive statement of the matters which may need to be included in an EIS to fulfil the information requirement for the assessment and determination of quarry or excavation proposals. In particular it is emphasised that details in the EIS should reflect the level of significance.

Not all matters outlined in this guideline will be applicable to every proposal. The EIS should be tailored to suit the potential impacts of the proposal. It is essential to focus only on key issues. If the relevant matters identified in this guideline are addressed, there should be sufficient information for the appraisal of most extractive industry proposals. Early identification of issues relevant to government agencies will also be facilitated by the guideline.

This Practice Guideline deals with the information requirements for an EIS for quarries or other excavation proposals which are not located close to or within rivers, streams, other waterbodies or wetlands. A separate guideline is being prepared for mineral extractive proposals and extractive industry involving dredging proposals (Figure 1).

Figure 1



WHEN IS AN EIS REQUIRED FOR A QUARRY?

An EIS must be prepared for developments which have the potential to significantly affect the environment. In the past, some extractive industries have prompted considerable public concern.

Under Part 4 of the Environmental Planning and Assessment Act 1979, extractive industries may require development consent under a local environmental plan or other planning instrument. If this is the case, then Schedule 3 of the Environmental Planning and Assessment Regulation (EP&A Regulation) 1994 applies. Schedule 3 introduces thresholds based on the volume of material obtained, the area disturbed and the sensitivity of the affected environment. Extractive industry in sensitive locations such as in or near waterbodies, near the coastline, on steep land or close to residential land if blasting undertaken are designated and an EIS must be prepared. Certain types of extractive industry activities such as small scale maintenance dredging and extraction undertaken under an approved rivercare or river management plan, are exempted from designation (See Appendix 1 for full designation). If a development is designated, then an EIS must be lodged with a development application.

Under Part 5 of the Act, a government authority prior to determining an application for an extractive industry activity which does not require development consent, must first consider whether an extractive industry activity has the potential to cause significant environmental impacts. If significant impacts are likely to result, then an EIS must be considered prior to any approval being granted. The level of public concern is one of the criteria along with size, sensitivity of location and predictability of impacts, used for deciding if an extractive industry project has the potential to significantly affect the environment (see Appendix 2 for the assessment process under Part 4 & 5).

When an EIS will not be required, this Practice Guideline is equally applicable for identifying the range of issues which may need to be addressed in a Statement of Environmental Effects when a development application is being prepared.

WHAT ARE EXTRACTIVE MATERIALS?

Extractive materials are principally used as construction material in pre-mixed and bituminous concrete, road base, foreshore protection, land formation and landfill material, building stone, building products (eg bricks, pavers, blocks) and landscaping.

The materials can be categorised as follows:

- crushed and broken stone principally used as coarse aggregate and road base
- gravel generally used as coarse aggregate
- construction sand largely used for fine aggregate
- unprocessed materials mostly used for road-making, fill, soil and landscaping materials
- dimension stone principally used for decorative purposes in building and landscaping

Extractive materials used in construction must be clean, strong, durable and of a suitable shape, density, strength, porosity and permeability to meet the technical specifications or standards for example by Standards Australia, the NSW Roads and Traffic Authority and other authorities.

Construction sand, soil, stone, gravel, rock or similar materials(which are not prescribed as minerals within the meaning of the Mining Act 1992) are defined as `extractive materials'. The following materials are included within the definition:

> *aggregate (fine and coarse), andesite, basalt, breccia, blue metal, bush rock, conglomerate, dacite, dolerite, gabbro, gravel, greywacke, hornfels, latite, loam, monzonite, phyllite, picrite, porphyry, rhyolite, sand, sandstone (including dimensional and flagging stone), schist and tuff.*

A number of materials which may be regarded as extractive materials, are not extractive materials for purpose of this guideline (and Schedule 3 of the EP&A Regulation) as they are defined as minerals in the Mining Act. These materials include:

> *chert, clays (including bentonite, bloating clay, brick clay, clay/shale, fire clay, kaolin, pottery clay and pipe clay), granite, limestone, marine aggregate, peat, quartzite, slate and syenite.*

There is a separate guideline for industrial mineral quarries.

WHAT ARE EXTRACTIVE INDUSTRIES?

The definition of extractive industries for the purpose of this guideline (and in Schedule 3) is as follows:

Extractive industries are those which obtain extractive materials by methods including excavating, quarrying, dredging or tunnelling or that store, stockpile or process extractive materials by methods including washing, crushing, sawing or separating.

Quarries range in size from large operations with many employees, producing more than 1 million tonnes of material per year supplying regional markets to small operations with one or two employees intermittently working borrow pits and supplying local markets.

Extraction activities from quarries and pits usually involve:

Removal of overburden:

stripping involving bulldozers, scrapers or excavators (some blasting may be required) and storage of overburden and top soil for rehabilitation;

Extraction of material:

extraction including fragmentation of the material by drilling and blasting or mechanical methods such as hammers, ripper, bulldozer, excavators, front end loaders or hydraulic methods; material is often temporarily stockpiled at the extraction site; Dimension stone quarries may employ blasting, trenching or other methods of cutting or separating the blocks and cranes to lift the cut blocks;

Loading and transport:

transport to processor or market involving front-end loaders, excavators, trucks, elevators, conveyors, slurry pumps;

Processing:

processing equipment may be permanent or portable and may involve:
screening and washing plant for the removal of unwanted material;
primary, secondary or tertiary crushers to reduce the material to the required particle size;
screening, sieving or other equipment with vibratory feeders and connecting conveyors for separating the material into size fractions and conveying it to stockpiles or storage bins;
blending with other extractive materials to achieve the required characteristics;
cutting or sawing of dimension stone.

Progressive rehabilitation:

rehabilitation programs should be integrated into the extraction sequencing plans.

PART 2: FACTORS TO CONSIDER IN PREPARING AN EIS

The purpose of this Practice Guideline is to outline a broad range of issues which may need to be addressed in an EIS for extractive industries. Further details about each of these areas is included in the later sections of this guideline. However the following broad general issues should be taken into consideration in the preparation of an EIS include the following:

1. Early Effective Consultation

Early consultation with the local community, councils and government authorities can be of great assistance in identifying key issues and in consideration of alternatives which should be addressed in the EIS. As quarries (particularly those using blasting methods) are often controversial, it is important to inform the community in the vicinity of the proposal and to seek their comments. If consultation of government authorities and the community is undertaken at an early stage, concerns can often be addressed and mitigated in the design of the quarry and its operations. For major quarries, a planning focus meeting involving all relevant government agencies, the council and representatives of the community will greatly benefit the preparation of the EIS.

The EIS will also benefit from focusing on issues of community concerns, including:

- methods of public consultation such as planning focus meetings, public meetings, letters or newsletters;
- results of this public consultation;
- identification of any means of addressing issues identified by the community.

2. Early assessment of the suitability of the location

The geological distribution of extractive material and its proximity to urban markets or construction sites (eg major infrastructure projects) are the prime factors which attract extractive industries into certain areas, often close to urban expansion. Transportation costs are a critical factor in the economic viability of extractive industries as the materials which are high in volume, are relatively low valued resources. Extractive materials tend not to be transported over distances greater than 60 kilometres because of the transport costs.

However, environmental factors are also important in the decision where a quarry should be located. By selecting sites where the environmental risks are lower, the cost of environmental mitigation and management can be minimised and the level of public controversy and the potential for delays in the approval process can be reduced. The greater the potential for adverse effects, the more stringent the environmental controls. Schedule 3 identifies locations where the environmental impacts associated with extractive industries have the potential to be most significant. Extractive industries if proposed in these types of locations will need to pay particular attention to measures to protect the environment and to minimise the impacts on sensitive locations.

These locations include areas:

- near natural waterbodies or wetlands including rivers, streams with established beds, streams artificially modified, lakes, lagoons, mangroves, billabongs, swamps or tidal waters such as bays, estuaries, inlets or wetland meadows, heathlands or sedgelands;
- near an `environment protection zone' in an environmental planning instrument for the protection

of habitat, plant communities, escarpment, wetlands, littoral rainforest or foreshore or near to a national park, aquatic reserve or a Crown reserve for the preservation of flora, fauna, geological formation or other environmental protection purposes or to an area declared as wilderness;

- where relatively intact native vegetation stands may contain endangered flora or serve as a habitat to endangered fauna;
- where Aboriginal or non-Aboriginal heritage items are found and are likely to be found;
- near to a coastline or coastal dune field;
- where the soil is contaminated or where acid sulphate soils are located;
- steep slopes such as greater than 18 degrees;
- near to a residential zone or dwelling not associated with the development; or in an area identified for future urban settlement;
- where cumulative impacts are likely to be an issue because of operating or previous extractive industries in the vicinity;
- where the land is classified as an arid or semi-arid zone (eg lunette sand dunes);
- where road safety is an issue in relation to transport and access;
- where the land is suitable for agricultural purposes.

Conflicts commonly arise when the environmental amenity of rural residential communities is threatened with blasting, dust impacts or road safety concerns from truck movements. At the time of site selection, any conflicts and possible options for reducing or preventing additional conflicts should be considered.

3. Early analysis of options and alternatives

Early consideration of the options for the quarry methods of operation, processing practices, access routes and the site layout and their potential impacts on the community and the biophysical environment at the concept design stage could lead reduced conflicts and reduced cost of environmental mitigation measures.

4. Focus on key impacts

In the preparation of the EIS, key environmental issues should be identified early in the process. The primary focus of the investigation should be directed at assessing their impacts and identifying options to mitigate or manage them. The level of analysis in the EIS should reflect the level of significance of the impacts and their importance in the decision making process for the quarry application

All issues outlined in this Practice Guideline will not have the same degree of relevance to all proposals. While complying with the general requirements for an EIS prescribed in the EP&A Regulation (see Appendix 3), the applicant should identify and address as fully as practicable, the key issues relevant to the specific development proposal and focus the analysis on those key issues.

The major part of the EIS should be given to those environmentally significant issues which are most important in the decision making. Less attention should be given to other issues which have lesser significance. There may be other important issues relevant to particular quarry proposals, not included in this guideline that may need to be considered in the EIS.

5. Information in the EIS should be concise and clear; the EIS need not be a long wordy document

Information provided should be clear, succinct and objective and where appropriate be supported by maps or other descriptive detail. Repetitive or general non-specific data is distracting and is not relevant to the decision making process. The purpose of the EIS is to enable the proponent, members of the public, the consent authority(usually the Council) and other relevant government agencies to properly understand the environmental consequences of the proposed development.

PART 3: GENERAL REQUIREMENTS FOR AN EIS

WHAT ARE THE GENERAL REQUIREMENTS FOR AN EIS?

Key elements of the EIS include:

- Executive Summary
- Clearly stated objectives of the proposal
- Description of the development including consideration of alternatives and justification of the preferred options of location, quarry layout and management approaches
- An overview of the environment likely to be affected
- Description of the potential impacts; the focus should be on a full analysis of the key impacts
- Outline of the principles of environmental management and rehabilitation measures and the proposed end use of the site

WHAT INFORMATION IS NEEDED ABOUT THE PROPOSAL?

1. Clearly identified objectives and characteristics of the proposal
2. Characteristics of the resource
3. Description of quarry operations
4. Site layout plans
5. Site preparation works to establish the quarry
6. Infrastructure consideration
7. Rehabilitation
8. Previous operations on the site
9. Consideration of alternatives and justification for the preferred proposal

WHAT INFORMATION IS NEEDED ABOUT THE LOCATION?

1. Planning information
2. Site description and locality information
3. Overview of the affected environment

WHAT INFORMATION IS REQUIRED ON SPECIFIC ISSUES CRITICAL FOR DECISION MAKING?

The following specific issues are nominated as indicators of potential impact to the environment. Issues are not exhaustive and the degree of relevance of each will vary. The EIS should only deal with relevant issues as applicable to the particular proposal.

1. Cumulative impacts
2. Economic impacts
3. Traffic and road impacts
4. Erosion and soil stability issues
5. Water issues
6. Air quality issues
7. Noise and blasting issues
8. Flora issues
9. Fauna issues
10. Heritage issues
11. Geological heritage issues
12. Visual impacts
13. Flooding issues
14. Coastal impacts
15. Acid sulphate soils
16. Bushfire impacts
17. Hazards issues
18. Social and health issues

WHAT INFORMATION IS REQUIRED ABOUT THE ON-GOING MANAGEMENT OF THE SITE?

1. Draft Environmental Management & Rehabilitation Plan

PART 4: SPECIFIC REQUIREMENTS FOR AN EIS

WHAT INFORMATION IS NEEDED ABOUT THE PROPOSAL?

1. Clearly identified objectives and characteristics of the proposal:

There should be a clear statement of the proposal having regard to the following characteristics:

(a) extent of the quarry;
(b) quantity and types of material to be extracted and processed;
(c) products to be marketed;
(d) duration of the operation;
(e) proposed future of the site following the expiration of the proposal and any proposal for future expansion including staging and proposed timing.

2. Characteristics of the resource:

The following information should be provided:

(a) the geological characteristics, size and quality of any proven, possible or probable reserves;
(b) exploration methods (boreholes, test excavations) and summary of results;
(c) depth of overburden and topsoil.

3. Description of quarry operations:

A description of the proposed extraction and processing operations should include:

(a) removal of overburden;
(b) staging of extraction;
(c) number of benches; slope, height, depth and width of benches; depth of excavation; rate of extraction; estimated daily, weekly and annual volumes of the material to be extracted and transported; identify constraints on increased volumes including equipment, market demand, etc;
(d) employment (construction and operation);
(e) hours of operation (construction, extraction, processing, transport, maintenance);
(f) quantities and management of topsoil, overburden, tailings and extractive material to be stockpiled or stored;
(g) details of processing to be undertaken on site;
(h) methods of loading and transport of material within the site and from the site; access roads; any conveyors, loaders or rail links;
(i) quantities and method of storage of fuels and chemicals including explosives on the site; security and bunding arrangements;
(j) sanitary and waste disposal arrangements;
(k) system of sediment dams and drains.

4. Site layout plans:

Plan or plans clearly indicating the location of the following:

(a) maximum area to be disturbed at the various stages of the quarry;
(b) any significant vegetation communities to be cleared;
(c) processing, storage, loading or transport plant;
(d) storage areas for topsoil, overburden, extractive material;
(e) storage of waste, fuels, chemicals and explosives;
(f) drainage network, bunding, sedimentation dams;
(g) safety fencing and other safety mechanisms;
(h) landscaping;
(i) parking, queuing and turning areas, weighbridge, truck wash-down areas.

5. Site preparation works to establish the quarry:

Description of works prior to the quarry operations commencing:

(a) clearing including any burning, chipping or mulching, removal and storage of overburden, if the slope of the natural land is more than 18 degrees, a permit may be required for clearing from the Department of Water and Land Conservation under the Protected Lands provisions of the Soil Conservation Act;
(b) construction of access roads, dams, drainage and sediment control systems;
(c) construction of processing, loading or storage plant.

6. Infrastructure considerations:

The following factors should be considered:

(a) electricity supply; measures to protect any easements, cables, pipelines which may be impacted by the proposal;
(b) energy conservation measures;
(c) water requirements, proposed supply or storage, identify water recycling and reuse options;
(d) waste disposal requirements; proposed methods and locations for disposal;
(e) transport requirements.

7. Rehabilitation:

The following issues should be addressed:

(a) proposed final use of the site including: final land formation plan for the site (including any sedimentation dams, drains or access roads); assess the general suitability of the quarry characteristics for the proposed final use and proposed rehabilitation strategy; compatibility of the proposed use with the surroundings;
    (i) if landfill, materials recycling facility or contaminated soil treatment works are proposed: then consideration of the suitability of the site with regard to groundwater, permeability of soil, type of material to be introduced onto the site; identify any constraints on the suitability of the site for this purpose and the final landform, landscaping and proposed final use of the completed landfill area;
    (ii) if a recreation lake is proposed: then consideration of the appropriateness of the grading of the slopes, potential groundwater impacts, potential water quality issues because of the catchment or soil types; any potential long term management problems of the lake;
    (iii) if agricultural purposes are proposed, then consideration of the agronomic suitability of the proposed subsurface/topsoil profile and the drainage patterns;
(b) assess the general suitability of the soil material for rehabilitation purposes; proposed length of storage of top soil and management to maintain viability; measures to separate less fertile subsoil overburden from more fertile topsoil; progressive erosion control strategy during and after rehabilitation; proposed use of any waste from the operation in land formation;
(c) revegetation of all disturbed areas, during and after completion of the extractive operation; including surface preparation, sowing techniques, propagation, species, rates and staging of the propagation program, any requirement of fertiliser, need for temporary vegetation;
(d) consideration of final drainage patterns;
(e) other matters such as provision for fencing and security;
(f) monitoring and maintenance program.

8. Previous operations on the site:

If applicable outline:

(a) history of previous extraction from the site;
(b) review of past environmental performance including the impacts of the operation on the environment and the effectiveness of any site rehabilitation;
(c) previous controls which applied on the site;
(d) integration of the proposed development with operations previously carried out;
(e) restoration or rehabilitation works proposed for areas previously disturbed and the integration of these works into rehabilitation plans for the proposed operations.

9. Consideration of alternatives and justification for the preferred proposal:

Consideration should include an assessment of the environmental impacts or consequences of adopting alternatives including:

(a) quarry methods or technology;
(b) quarry design, site layout or access roads;
(c) management or administrative practices;
(d) other resource sources or locations;
(e) alternative rehabilitation and end use options.

The selection of the preferred options should be justified in terms of :

(a) type, quality and quantities of products in relation to market demand;
(b) environmental factors including bio-physical, economic and social factors.

WHAT INFORMATION IS NEEDED ABOUT THE LOCATION?

1. Planning information:

The following information should be provided:

(a) zonings, permissibility and any land use constraints;
(b) compatibility of the proposal with:
  (i) any regional strategy or Resource Plan of Management for extractive industries in the area;
  (ii) provisions of any State Environmental Planning Policy, Regional or Local Environmental Plans or Development Control Plans for existing and proposed development;
  (iii) existing land uses; and
  (iv) any heritage items or environmental protection areas or areas affected by conservation agreements;

2. Site description and locality information:

The following information should be provided:

(a) title details; land tenure including Crown tenure, (form of lease, reserve, vacant Crown land etc); owner's consent;
(b) site description and maps, plans or aerial photographs clearly identifying the location of proposal relative to surrounding roads, adjoining communities or dwellings and any land use likely to be affected by the development; utilities including transmission lines, pipelines, cables or easements; sight lines from dwellings or public places such as roads;

3. Overview of the affected environment:

Baseline information should be provided on the following:

(a) meteorological characteristics which may influence erosion, dust or noise impacts. These may include prevailing wind and intensity; average yearly rainfall, seasonal distribution, storm intensity, storm return period (that is average interval between storms of a specific magnitude);
(b) surface contours and general topography (these may include slope gradient, slope length, catchment size, drainage);
(c) presence and condition of watercourses, flood liability, any water storage or drinking water catchments including groundwater bores within 1 kilometre, watertable and the relationship with the maximum excavation depth;
(d) predominant native vegetation communities, any vegetation communities and their habitat value or other items of conservation value;
(e) suitability of the land for agricultural purposes.

WHAT INFORMATION IS REQUIRED ON SPECIFIC ISSUES CRITICAL FOR DECISION MAKING?

THE FOCUS OF THE EIS SHOULD BE ON KEY ENVIRONMENTAL ISSUES.

Depending on the location and the environmental management practices, quarries affect the visual amenity, raise dust, pollute waterways and cause disturbance through noise, blasting and heavy vehicle movements.

All issues nominated will not have the same degree of relevance to all proposals. The following should only be included for any significant potential environmental impact which has been identified as relevant to a specific proposal:

- **a description of the existing environmental conditions (baseline conditions);**
- **a detailed analysis of the potential impacts of the proposal on the environment;**
- **the proposed mitigation and management strategies to mitigate the impacts.**

1. Cumulative impacts:

Cumulative impacts may result from a number of activities with similar impacts interacting with the

environment in a region. Issues to consider that relate to extractive industries include:

(a) identify other existing extractive industries in the area or on the site within the last five years; identify other forms of industry in the vicinity;
(b) identify any advantages or disadvantages from clustering quarries in this area;
(c) identify any likely cumulative impacts having regard to truck movements, dust, noise, vibration and visual impacts, water quality issues and loss of heritage items, vegetation or fauna habitat.

2. Economic impacts:

Issues to consider include:

(a) market demand for the proposed materials in a local and regional context; analysis of regional supply, future demand for the types of material present on the site;
(b) any additional employment, as a result of the proposal, at the site and in the community;
(c) potential economic impacts, as a result of this proposal proceeding, on the availability and cost of building or construction material.

3. Traffic and road impacts:

A traffic impact study should be undertaken for all operations involving significant numbers of truck movements including:

(a) estimated average and maximum hourly, daily and weekly truck movements; indicate proposed truck types and sizes; indicate if trucks will arrive or leave in convoy or queue to enter the site or need to wait outside the quarry gate.
(b) proposed truck routes and possible alternative routes or transport modes eg. conveyer belts, rail;
(c) physical condition of the roads or bridges on the proposed routes and upgrading proposals;
(d) measures to prevent sediment transport off site via transport vehicles including shakedown areas or properly controlled truck wash facilities;
(e) potential impact on the road maintenance program;
(f) road safety issues;
  (i) identify other major road users, peak periods of use and potential conflicts; use of the truck routes by school buses and the location of schools and bus stops;
  (ii) identify any sight distance constraints for:
    - turning traffic into or from the quarry access road;
    - any relevant uncontrolled intersections, road junctions or railway crossings;
  (iii) proposed measures to improve safety including:
    - any possible realignment of roads;
    - any need to improve sight distance or intersections or crossings;
    - any need to restrict hours of truck movement, the number of trucks per day or the load size on certain routes;

4. Erosion and soil stability issues:

Issues to consider include:

(a) meteorological data, soil properties and if applicable a map of soil units [soil characteristics of the area determine the erosion potential and suitability for rehabilitation (soil attributes may include physical properties such as soil depth, particle size, water holding properties, hydraulic conductivity or aggregate stability and chemical properties such as pH or nutrient deficiencies)];
(b) landform characteristics which influence the erosion hazard, ratio of the rate of runoff to rate of rainfall;
(c) overall outline of integrated erosion and sediment control measures;
  (i) measures to minimise the area denuded at any one time; selection of appropriate techniques for stripping topsoil and subsoils which will minimise erosion;
  (ii) proposed water diversion banks and channels outlined in the following section on `water issues';
  (iii) stabilisation works for cuttings, embankments and open channels;
  (iv) stockpile management measures including :
    - wind and water erosion control measures; identify surface stabilisation measures for stockpiles such as mulching or temporary vegetation to prevent erosion; proposed stockpile batter grades;
    - minimising stockpiling of soil with the direct transfer of soil and biomass;
(d) maintenance program of all erosion control works.

5. Water issues:

Issues to consider include:

(a) description of potential sources of water pollution such as:
  (i) increased turbidity due to sediment loss and erosion from stockpiles, haul roads or other disturbed areas;
  (ii) sewage;
  (iii) workshop, vehicle wash facilities, plant and equipment, fuel storage;
  (iv) impurities, incidental minerals or other leachates from the disturbed rocks and soil;

(b) condition of any natural waterbodies, wetlands, coastline or environmentally sensitive areas which could be impacted by:
  (i) any change in the surface or groundwater hydrology as a result of the proposal ;
  (ii) any change in the water quality as a result of any activity on the site;
  (iii) dust from the quarry or traffic;

(c) drainage and sediment management system including:
  (i) drainage system to divert uncontaminated surface water including stormwater or streams around or away from the quarry and other disturbed areas;
  (ii) measures to control water flow within the impacted area with given `intensity-frequency duration' assumptions to minimise the volume, slope and speed of water flow and the transmission of sediment (these may include water diversion banks or canals, settlement ponds, sediment or pollution traps, trickle pipes or flumes);
  (iii) sedimentation dams to contain runoff from the quarry or any processing area including water from storm events and the non-filterable residues from stormwater overflows. The system should be designed to minimise the risk of discharge of contaminated water;
  (iv) assessment of the need to treat (chemically or by other methods) contaminated stormwater or process water because of the level of fines or other pollutants prior to reuse or discharge;
  (v) proposed maintenance works including method of dewatering slimes or fines ponds; proposal to store sludge, fines or slimes and use of the area;
  (vi) temporary sediment controls including a sequence of sediment traps and filters to effectively allow for increased retention time of drainage water during construction to maximise settling time of sediment laden runoff;
  (vii) controls to prevent contamination of water from accidental spillages of petroleum products or other chemicals;

(d) water balance including:
  (i) outline the dependence on off-site water sources and the potential impact of water usage from any river or stream or groundwater sources;
  (ii) wastewater storage and reuse including irrigation of landscaping, truck wash down, etc. demonstrating an ability to avoid dry weather discharge; Outline a strategy of water use and reuse so that the water level is reduced in the dam to restore its capacity as quickly as possible;

(e) potential impacts on groundwater:
  (i) quantity, quality and depth of the watertable;
  (ii) any adverse effects on groundwater recharge areas;
  (iii) likely transference of any pollutants to groundwater;
  (iv) if extraction below the watertable:

(f) when dewatering of the quarry or pit is proposed to facilitate extraction, any effects on the local or regional watertable;

(g) adequacy of measures to ensure no contamination of the watertable during and after extraction because of the final reuse of the area;

(h) impact on the aquifer intake area and the adequacy of the protection of this area;

(i) plan for ongoing maintenance and monitoring of water quality controls to ensure their correct installation, operation and effectiveness.

6. Air quality issues:

Issues to consider include:

(a) identification of fixed and mobile sources of air pollution such as extraction, processing, handling, storage or transport operations;

(b) likely impact of the proposal on the local and regional air quality;

(c) if a significant issue, then include
  (i) baseline data on ambient quality of the air;
  (ii) projected dust emission and deposition rates;
  (iii) frequency and times of emissions;

(d) meteorological conditions under which nearby dwellings and sensitive land are likely to be affected;
(e) mitigation and management measures to control the generation of dust and to ensure compliance with air quality standards including:
  (i) ceasing dust generating activities during certain meteorological conditions;
  (ii) sealing or watering of roads;
  (iii) dust control measures on open stockpiles, processing and loading areas;
  (iv) planting of landscaping to reduce the wind impacts;
(f) dust monitoring programme.

7. Noise and blasting issues:

Issues to consider include:
(a) existing acoustic environment including a statistical breakdown of the meteorological conditions (predominant wind, temperature, humidity and inversion details) and any topographical features which will influence the noise or vibration impacts;
(b) proposed hours of operation and traffic movements;
(c) noise levels (including 1/3 octave spectra and sound power levels) from fixed and mobile noise sources;
(d) predictive noise levels at potentially affected dwellings;
(e) mitigation and management measures to control the generation of noise and to ensure compliance with relevant noise standards including details of noise control measures such as
  (i) suppressors or silencers on equipment;
  (ii) any bunding (size, type and location) or noise shield proposals;
  (iii) alternative locations of plant, weighbridges, parking, queuing or truck routes to reduce noise;
  (iv) alternative grading of the road to reduce sharp transitions of gradient to reduce the impacts from brake and gear change noise;
  (v) management strategies to reduce impacts including truck speed, air brakes, etc.
(f) for proposals involving blasting :
  (i) identification of any dwellings or residential zones within approximately 2 kilometres of the site;
  (ii) outline management strategies for drilling and blasting including maximum instantaneous charge, site factors, firing patterns and delays, frequency of blasting; results of trial blasts;
  (iii) predicted overpressure and ground vibration at neighbouring dwellings;
  (iv) mitigation and management measures to control the generation of blasting impacts and to ensure compliance with relevant blast overpressure and ground vibration standards; proposed mitigation measures such as:
    - management criteria of suitable weather conditions for blasting;
    - notice of blasting;
    - controls to reduce blasting impacts including the size of blast, blast hole patterns, depth and direction of blast holes;
    - measures to minimise fly rock;
(g) proposed monitoring program.

8. Flora issues:

Issues to consider where native vegetation is to be disturbed or cleared:
(a) list of the plant species and communities within the proposed development area, identifying any rare or endangered species or vegetation communities and their incidence on the site; indicate how common these species or communities are in the vicinity of the site or in the region;
(b) extent of disturbance of flora; sensitivity of species or communities to be disturbed by the proposal;
(c) assessment of the suitability of the area for rehabilitation with indigenous plant species;
(d) any proposals to use indigenous species in landscaping; details of proposed mitigation methods to protect indigenous plant species including the seed stock in topsoil stockpiles.

9. Fauna issues:

Issues to consider where potential fauna habitats are to be disturbed or cleared:
(a) list fauna known likely to occur within the development site, note occurrence of any endangered fauna (as per Schedule 12 National Parks and Wildlife Act 1974);
(b) assessment of effects of the proposal on fauna and its habitat. The following factors in relation to

endangered species set out in Section 4A of the EP&A Act, must be considered:

(i) the extent of modification or removal of habitat, in relation to the same habitat type in the locality;
(ii) the sensitivity of the species of fauna to removal or modification of its habitat;
(iii) the time required to regenerate critical habitat, namely, the whole or any part of the habitat which is essential for the survival of that species of fauna;
(iv) the effect on the ability of the fauna population to recover, including interactions between the subject land and adjacent habitat that may influence the population beyond the area proposed for development or activities;
(v) any proposal to ameliorate the impact;
(vi) whether the land is currently being assessed for wilderness by the Director of National Parks and Wildlife under the Wilderness Act, 1987;
(vii) any adverse effect on the survival of that species of endangered fauna or of populations of the fauna.

(c) Under Section 77 and 112 of the EP&A Act, a Fauna Impact Statement (FIS) must accompany any proposal where there is likely to be a significant effect on the environment of endangered fauna; (Note: an FIS can be prepared as a separate document or be incorporated into an EIS); Under the National Parks and Wildlife Act, the Director of National Parks and Wildlife must be consulted in writing for requirement for the preparation of a FIS which must "include to the fullest extent reasonably practicable":

(i) full description of fauna affected and the habitat used by the fauna
(ii) assessment of the regional and state-wide distribution of the species and the habitat to be affected by the actions and any environmental pressures on them
(iii) description of development proposals and how they will modify the environment and affect the essential behavioural patterns of the fauna in the short and long term where long term encompasses the time required to regenerate essential habitat components
(iv) details of the measures to be taken to ameliorate the impact
(v) details of the qualifications and experience in biological science and fauna management of the person preparing the statement and of any other person who has conducted research or investigations relied upon.

(d) measures to prevent vermin or feral animal problems;
(e) assessment of the impacts on aquatic species if there is increased sedimentation in a natural waterbody as a result of the proposal.

10. Heritage issues:

Issues to consider when potential heritage locations are to be disturbed:

(a) identification of any sites or relics (including relics under water) of heritage significance (Aboriginal or non-Aboriginal) on the site and in the area affected by the proposal. This should include two steps.

Step 1 Information from existing reference material or sources; These may include existing comprehensive heritage studies or conservation plans for the area or site but may need to be supplemented with additional information from the following sources:

(i) historical research of the development of the area;
(ii) consultation with the local Aboriginal Land Council, local historical societies and the local council may be of assistance;
(iii) inspection of heritage registers, schedules or lists in Local or Regional Environmental Plans or held at the Heritage Branch of the Department of Urban Affairs and Planning supplemented by further information from the following sources:, the National Trust, the Australian Heritage Commission, Institution of Engineers, Australia, Royal Australian Institute of Architects;

Step 2: survey of the area to identify items of potential heritage significance

(b) assessment of significance of any non-Aboriginal sites or relics identified on the site, using criteria for assessing heritage significance established for the development of the State Heritage Inventory.
(c) proposed measures to mitigate impacts or to conserve the heritage significance of the sites or items.

[Note: Non-Aboriginal heritage sites, protected under the Heritage Act 1977 by Division 9 or a conservation instrument will require the approval of

the Heritage Council before they can be modified including excavation, full or partial demolition, new structures or land formation. Items identified in planning instruments will also require consent of the nominated consent authority. Shipwrecks protected under the Historical Shipwrecks Act, 1976 will require the approval of the Director of Urban Affairs and Planning before such disturbance can be undertaken].

(d) assessment of the archaeological and anthropological significance of any Aboriginal sites or relics identified on the site in consultation with the relevant authorities; potential impact of the proposal on the heritage significance;
(e) proposed measures to mitigate impacts or to conserve the heritage significance of the sites or items.

[Note: Aboriginal sites or relics cannot be disturbed, destroyed, removed or defaced without written consent of the Director of National Parks and Wildlife Service.]

11. Geological heritage issues:

For extractive industries undertaken in areas of outstanding geological features including cave systems, the following issues should be considered:

(a) description of geological features on the site including any caves and an assessment of their heritage value;
(b) potential impacts of the development on the geological heritage values including palaeontology.

12. Visual impacts:

For extractive industries undertaken in areas where visual impacts are a concern, issues to consider include:

(a) consideration of the site in relation to any landscapes of local or regional significance as considered from the fore, middle and background;
(b) visibility from adjoining properties and the surrounding areas;
(c) lighting impacts from lights for security and night operations;
(d) visual impacts from the clearing of vegetation; exposure of rock faces; shape, location or size of stock piles; location, colour;
(e) form and bulk of plant; location of access roads and fences;
(f) location of waste dumps or derelict equipment;
(g) orientation of quarry face relative to sighting lines;
(h) proposed landscaping to reduce visual impacts; location, layout and composition of intending screening species.

13. Flooding issues:

For extractive industries undertaken on flood prone areas, the following issues should be considered:

(a) flooding status. If flood liable, direction of flood flow and potential impacts from inundation (including off site impacts);
(b) means to prevent breakthrough during floods from any pits, slime or settlement ponds into adjacent waterways;
(c) any likely effects of the operation on flood liability of surrounding lands;
(d) any future proposed flood mitigation schemes that may influence the impact of the proposal on the environment.

14. Coastal impacts:

For extractive industries undertaken within the coastal zone, the following issues should be considered:

(a) any relevant issues in the New South Wales Coastal Policy;
(b) impacts from extractive industry activities on the beach or coastal dune fields including from short term erosion or long term recession;

15. Acid sulphate soils:

The following applies to extractive industries located in coastal areas where acid sulphate soils (this includes potential acid sulphate soils, sulphidic clay or sulphidic sands) are likely to occur (in areas inundated by marine water during the past 6000 years). In some areas, maps have been prepared by Department of Land and Water Conservation or the local council which identify areas where acid sulphate soils are potentially located. In areas where there is a likelihood of a problem, testing should be undertaken and includes:

(a) Identification of a potential acid soil problem for the quarry including:
    (i) Field observations;

(ii) Peroxide effervescence test;
(iii) Water analysis of the surface and groundwater;
(iv) Soil sampling and analysis (samples of soil profiles to be disturbed or impacted by the development with emphasis on the material at or below the watertable) ;

(b) management program (including monitoring) to manage the potential impacts
(i) from the release of acid water from the quarry;
(ii) from the storage or use of the material (corrosion of metal and concrete and acid water leachate from any site);
(iii) from any change in the watertable from the quarry operation (acidification of surrounding soil or loss of water quality in bores in the vicinity of the quarry).

16. Bushfire issues:

For extractive industries undertaken in areas of high bushfire hazard, the following issues should be considered:

(a) measures to reduce the risks of bushfire during the establishment and operation of the quarry;
(b) provision for firefighting on the site including access.

17. Hazards issues:

For extractive industries storing significant quantities of fuels, chemicals and explosives on the site, the following issues should be considered:

(a) list of dangerous goods to be used and the rate of usage (fuels or explosives), details of quantities stored and storage and transport arrangements for materials, with safeguards proposed to control their impact on the environment;
(b) a brief description of procedures involving dangerous goods;
(c) comprehensive identification of possible causes of potentially hazardous incidents and their consequences to public safety or the environment from the storage and/or use of hazardous chemicals; include an outline of all operational and organisational safety controls.

18. Social and Health issues:

For extractive industries located so as to result in potential impacts on residential communities, the following issues should be considered:

(a) social impacts as a result of changes in employment patterns;
(b) social impacts resulting from changes in the amenity of the area;
(c) impacts on the health of the community from any potential changes in the air quality, noise and vibration regime and safety on the roads.

WHAT INFORMATION IS REQUIRED ABOUT THE ON-GOING MANAGEMENT OF THE SITE?

Draft Environmental Management and Rehabilitation Plan

An environmental management and rehabilitation plan is a tool which may be implemented for proposals once development applications are approved. They are usually detailed and technical plans. **This level of detail is not considered necessary for preparation of an EIS.** However, the concept of identifying information that contributes to rehabilitation and ongoing management of development proposals, and placing it into a draft plan or outline, is considered very important.

A draft plan for the quarry should take into consideration any existing plan of management for the whole resource. It should provide a comprehensive framework for managing or mitigating environmental impacts for the life of the quarry's operation. The plan should:

(a) demonstrate strategies for sound environmental practice during the construction, operation and decommissioning of the site including :
(i) energy and water management;
(ii) management of impacts and effects on surrounding land use including transport, air, blasting, noise, water, erosion, flora and fauna, heritage and visual;
(iii) progressive rehabilitation of the site and final end use;

(b) identify all government licensing and approval requirements and demonstrate how the plan will facilitate compliance with these requirements; (see Appendix 4)
(c) set out the framework of a monitoring program of all key impacts on the environment. This framework should indicate what specific information will be monitored; the monitoring intervals; procedures to be undertaken should the monitoring indicate an environmental problem; and the reporting procedures to relevant authorities and if appropriate to the consent authority, the community or a community committee;
(d) set out any proposed performance bond conditions and the criteria for satisfying the bond conditions.

ACKNOWLEDGMENTS

The following agencies have participated in the development of these requirements:

- Department of Mineral Resources (DMR)
- Public Works Department (PWD)
- Department of Water Resources (now the Department of Land and Water Conservation)
- Conservation and Land Management (now the Department of Land and Water Conservation)
- Environment Protection Authority (EPA)
- National Parks and Wildlife Service (NPWS)
- NSW Agriculture
- NSW Fisheries
- Roads and Traffic Authority (RTA)
- Chamber of Mines, Metals & Extractive Industries NSW (now the NSW Minerals Council)
- Total Environment Centre Inc.
- Blacktown City Council
- Camden Council.

REFERENCES

The following are some references that may be of assistance to those preparing EISs. This list is by no means exhaustive.

APHA, (1992). *Standard Methods for the Examination of Water and Wastewater including Bottom Sediments and Sludges.* 18 ed., New York: American Public Health Association, American Society Water Works Association and the Water Environment Federation.

Briggs, J.D. and Leigh, J.H., (1988). *Rare and Threatened Australian Plants.* Special Publication 14. NPWS, Canberra, ACT.

CSIRO, (1993). *Treatment and Containment of Potential Acid Sulphate Soils. Formation, distribution, properties and management of potential acid sulphate soils.* I. White and M.D. Melville (ed.).

Department of Conservation and Land Management, (1992). *What do all the Numbers Mean?* P.A. Hazelton and B.W. Murphy (ed.).

James, D. and Boer, B., (1988). *Application of Economic Techniques in Environmental Impact Assessment, Preliminary Report.* Prepared for the Australian Environment Council.

Harden, G.J., (1990+). *Flora of New South Wales.* Volumes 1-4. New South Wales University Press.

McDonald, R.C., Isbell, R.F., Speight, J.G., Walker, J. and Hopkins, M.S., (1990). *Australian Soil and Land Survey Field Handbook.* Inkata Press, Melbourne.

Northcote, K.H., (1979). *A Factual Key to the Recognition of Australian Soils.* CSIRO. Rellim Technical Publications, Glenside, SA.

Soil Conservation Service of NSW, (1985). *Guidelines to Meet Requirements for Information on Soil and Land Stability in Proposals for Open-Cut Mining and Rehabilitation.* 29p.

York, A., Binns, D. and Shields, J., (1991). *Flora and Fauna Assessment in NSW State Forests.* Survey Guidelines. Procedures for sampling flora and fauna for Environmental Impact Statements. Forestry Commission of NSW

APPENDIX 1

EXTRACT FROM SCHEDULE 3 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT REGULATION 1994

EXTRACTIVE INDUSTRIES

The category of extractive industry in Schedule 3 is described below with the current definitions for designation.

Extractive industries that obtain extractive materials by methods including excavating, dredging, tunnelling or quarrying or that store, stockpile or process extractive materials by methods including washing, crushing, sawing or separating and:

(1) obtain or process for sale, or reuse, more than 30,000 cubic metres of extractive material per annum; or

(2) disturb or will disturb a total surface area of more than 2 hectares of land by:
- (a) clearing or excavating; or
- (b) constructing dams, ponds, drains, roads or conveyors; or
- (c) storing or deposition overburden, extractive material or tailings; or

(3) are located:
- (a) in or within 40 metres of a natural waterbody, wetlands or an environmentally sensitive area; or
- (b) within 200 metres of a coastline; or
- (c) in an area of:
  - (i) contaminated soil; or
  - (ii) acid sulphate soil; or
- (d) on land that slopes at more than 18 degrees to the horizontal; or
- (e) if involving blasting, within:
  - (i) 1,000 metres of a residential zone; or
  - (ii) 500 metres of a dwelling not associated with the development; or
- (f) within 500 metres of the site of another extractive industry that has operated during the last 5 years.

This designation of extractive industries does not include:

(a) extractive industries on land to which the following environmental planning instruments apply:
- (i) *Sydney Regional Environmental Plan No. 11 - Penrith Lakes Scheme;*
- (ii) *Western Division Regional Environmental Plan No. 1 - Extractive Industries;* or

(b) maintenance dredging involving the removal of less than 1,000 cubic metres of alluvial material from oyster leases, sediment ponds or dams, artificial wetlands or deltas formed at stormwater outlets, drains or the junction of creeks with rivers provided that:
- (i) the extracted material does not include contaminated soil or acid sulphate soil; or
- (ii) any dredging operations do not remove any seagrass or native vegetation; or
- (iii) there has been no other dredging within 500 metres during the past 5 years; or

(c) extractive industries undertaken in accordance with a plan of management (such as river, estuary, land or water management plans) provided that:
- (i) the plan is:
  - prepared in accordance with guidelines approved by the Director of Urban Affairs and Planning and includes consideration of cumulative impacts, bank and channel stability, flooding, ecology and hydrology of the area to which the plan applies; and
  - approved by a public authority and adopted by the consent authority; and
  - reviewed every 5 years; and
- (ii) less than 1,000 cubic metres of extractive material is removed from any potential extraction site that is specifically described in the plan; or

(d) continued operations within the meaning of *State Environmental Planning Policy No. 37 - Continued Mines and Extractive Industries* in respect of which an application for development consent has been made before the end of the moratorium period prescribed under that Policy; or

(e) artificial waterbodies, contaminated soil treatment works, turf farms, or waste management facilities or works, specifically listed elsewhere in this Schedule.

ARE ALTERATIONS OR ADDITIONS DESIGNATED DEVELOPMENT?

Is there a significant increase in the environmental impacts of the total development?

(a) Development involving alterations or additions to development (whether existing or approved) is not designated development if, in the opinion of the consent authority, the alterations or additions do not

significantly increase the environmental impacts of the total development (that is the development together with the additions or alterations) compared with the existing or approved development.

Factors to be taken into consideration

(b) In forming its opinion, a consent authority is to consider:

(i) the impact of the existing development having regard to factors including:

- previous environmental management performance, including compliance with:
  - conditions of any consents, licences, leases or authorisations by a public authority; and
  - any relevant codes of practice; and
- rehabilitation or restoration of any disturbed land; and
- the number and nature of all past changes and their cumulative effects; and

(ii) the likely impact of the proposed alterations or additions having regard to factors including:

- the scale, character or nature of the proposal in relation to the development; and
- the existing vegetation, air, noise and water quality, scenic character and special features of the land on which the development is or is to be carried out and the surrounding locality; and
- the degree to which the potential environmental impacts can be predicted with adequate certainty; and
- the capacity of the receiving environment to accommodate changes in environmental impacts; and

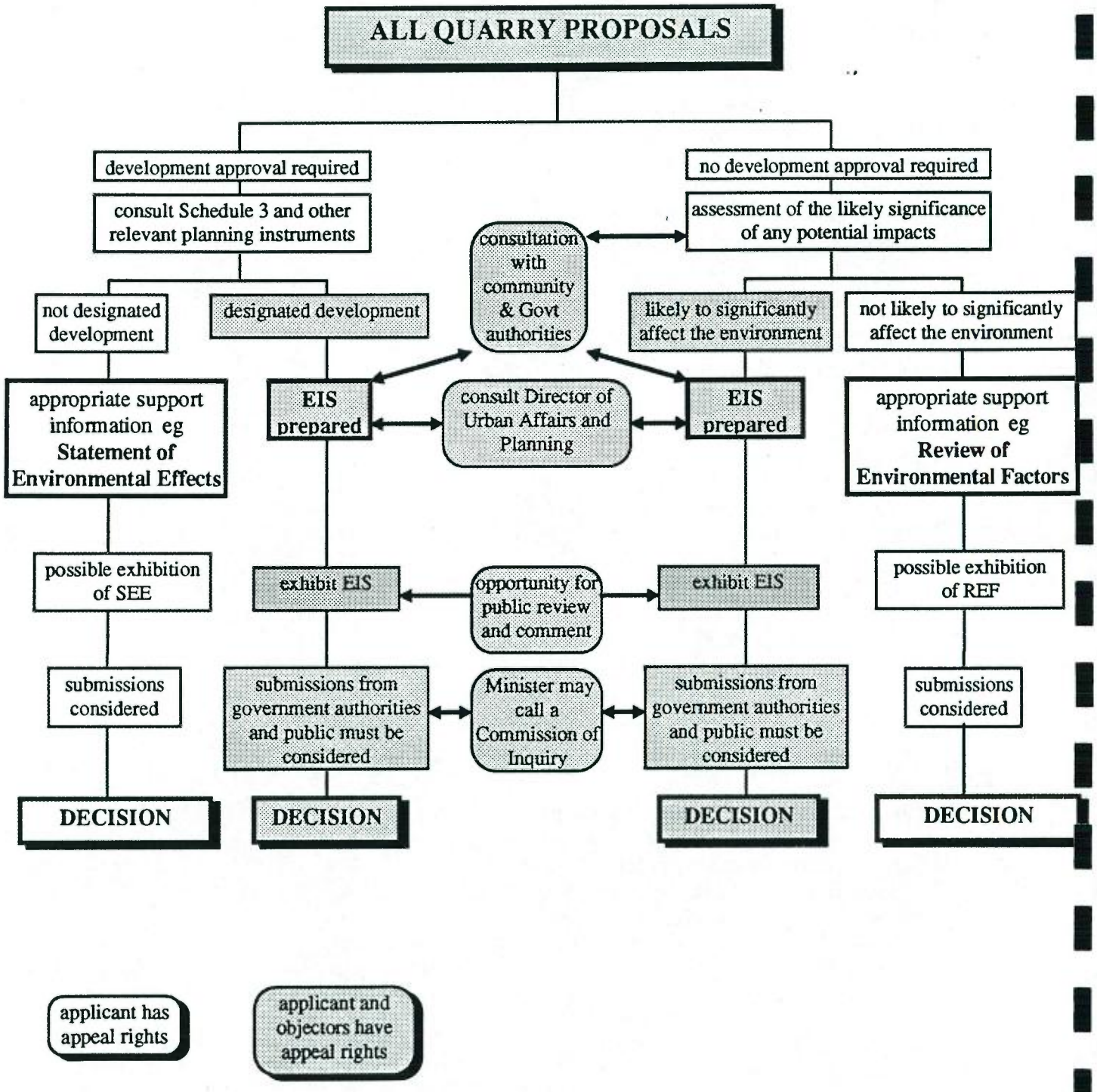
(iii) any proposal:

- to mitigate the environmental impacts and manage any residual risk; and
- to facilitate compliance with relevant standards, codes of practice or guidelines published by the Department of Urban Affairs and Planning or other public authorities.

APPENDIX 2

Approvals required under Part 4 of the EP&A Act

Approvals required under Part 5 of the EP&A Act



APPENDIX 3

SCHEDULE 2 - ENVIRONMENTAL IMPACT STATEMENTS (EIS)

This appendix is an extract from the Environmental Planning and Assessment Regulation, 1994. Schedule 2 outlines the matters that must be addressed in an EIS pursuant to clauses 51 and 84 of the EP&A Regulation.

(1) A summary of the environmental impact statement.
(2) A statement of the objectives of the development or activity.
(3) An analysis of any feasible alternatives to the carrying out of the development or activity, having regard to its objectives, including:
  (a) the consequences of not carrying out the development or activity; and
  (b) the reasons justifying the carrying out of the development or activity.
(4) An analysis of the development or activity, including:
  (a) a full description of the development or activity; and
  (b) a general description of the environment likely to be affected by the development or activity, together with a detailed description of those aspects of the environment that are likely to be significantly affected; and
  (c) the likely impact on the environment of the development or activity, having regard to:
    (i) the nature and extent of the development or activity; and
    (ii) the nature and extent of any building or work associated with the development or activity; and
    (iii) the way in which any such building or work is to be designed, constructed and operated; and
    (iv) any rehabilitation measures to be undertaken in connection with the development or activity; and
  (d) a full description of the measures proposed to mitigate any adverse effects of the development or activity on the environment.
(5) The reasons justifying the carrying out of the development or activity in the manner proposed, having regard to biophysical, economic and social considerations and the principles of ecologically sustainable development.
(6) Compilation, (in a single section of the environmental impact statement) of the measures referred to in item 4 (d).
(7) A list of any approvals that must be obtained under any other Act or law before the development or activity may lawfully be carried out.
(8) For the purposes of this Schedule, **"the principles of ecologically sustainable development"** are as follows:
  (a) The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
  (b) Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
  (c) Conservation of biological diversity and ecological integrity.
  (d) Improved valuation and pricing of environmental resources.

Note: The matters to be included in item (4) (c) might include such of the following as are relevant to the development or activity:

(a) the likelihood of soil contamination arising from the development or activity;
(b) the impact of the development or activity on flora and fauna;
(c) the likelihood of air, noise or water pollution arising from the development or activity;
(d) the impact of the development or activity on the health of people in the neighbourhood of the development or activity;
(e) any hazards arising from the development or activity;
(f) the impact of the development or activity on traffic in the neighbourhood of the development or activity;
(g) the effect of the development or activity on local climate;
(h) the social and economic impact of the development or activity;
(i) the visual impact of the development or activity on the scenic quality of land in the neighbourhood of the development or activity;
(j) the effect of the development or activity on soil erosion and the silting up of rivers or lakes;
(k) the effect of the development or activity on the cultural and heritage significance of the land.

APPENDIX 4

APPROVALS REQUIRED UNDER OTHER LEGISLATION AND REGULATIONS:

It is the responsibility of the person preparing the EIS to determine what approvals will be required as a result of the proposal and to demonstrate that the extractive industry development, as proposed, can meet the licensing requirements. Approvals may be required from:

- Environment Protection Authority for air, water and noise licences under relevant pollution control legislation
- Department of Mineral Resources concerning its responsibilities under Sydney REP No 9 Extractive Industry and for safety and blasting
- Department of Land and Water Conservation concerning responsibilities under the Water Administration Act and the Rivers and Foreshores Act
- Department of Land and Water Conservation concerning the Soil Conservation Act (protected lands provisions) and Crown Lands Act and Western Lands Act (quarry licences and leases, access via Crown roads)
- Heritage Council of NSW if the proposal is likely to affect any place or building having State heritage significance
- Public Works Department concerning responsibilities under the Rivers and Foreshores Act and under the Coastal Policy
- National Parks and Wildlife Service if aboriginal places or relics or endangered fauna or flora are likely to be affected
- WorkCover for responsibilities regarding handling of hazardous substances.

Appendix 2

Log of Drill Holes

LOG OF DRILLHOLE No:DDH1 Sheet 1 of 1

Drilling Method: Diamond Core	Project: Ferndale Feeds Property
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 14-2-91	Angle: Vert. Direction:
Date Completed: 14-2-91	Collar Level: 99.2 m (66 m AHD)

Interval (m)	Sample	Graphic Log	DESCRIPTION
0.00 - 0.40			Soil, dark, clayey, organic
0.40 - 1.40	DDH1/1		Clay, light grey with orange bands-extremely weath. silty shale, plastic
1.40 - 2.22	2		Shale, extr. weath., silty (siliceous), light grey & orange mottled with lateritic patches
2.22 - 2.80	3		Shale, extr. weath, clayey (argillaceous), grey with orange and yellow
2.80 - 4.10	4		Shale, weath., argillaceous, mainly dark grey, some orange & yellow staining, laminated, smooth fractures, plastic
4.10 - 4.60	5		Siltstone, light grey hackly fracture, some min, carbor
4.60 - 9.65	6		Shale, weath., dark grey to brown, smooth fracture, mainly argillaceous, thin carbonaceous (coal) plies and numerous plant fossils on bedding planes. Some harder, silty bands
	7		
9.65 - 11.80	8		Shale, as above, with increasing intervals of lighter grey harder siltstone/shale and less carbonaceous matter
11.80 - 13.40	9		Shale, as above
13.40 - 13.90	10		Siltstone, light grey hard (sideritic?) lithic, micaceous
13.90 - 14.65	11		Shale, as for (8), sideritic nodule at 14.35 m
14.65 - 17.80	12		Shale, brown black, very carbonaceous, some siderite? nodules at 1470 m. Coal plies and patches, increasing silt content towards base, but soft from 15.4 m onward.
			END OF HOLE

LOG OF DRILLHOLE No: DDH2 Sheet 1 of 1

Drilling Method: Diamond Core	Project: Ferndale Feeds Property
Driller: Steward Bros.	Location: Lot 2 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 15-2-91	Angle: Vert. Direction:
Date Completed: 18-2-91	Collar Level: 103.4 m (70 m AHD)

Interval (m)	Sample	Graphic Log	DESCRIPTION
0.00 - 0.40			Soil, dark, organic, clayey
0.40 - 2.68	DDH2/1		Clay, grey with yellow/orange/red bands and patches, slightly silty with silty bands. (plastic) (1.16 m core lost)
2.68 - 5.00	2		Shale, extremely weathered, mainly dark grey with some yellow and brown staining, carbonaceous fossils on bedding planes
5.00 - 6.90	3		Shale, very weathered, dark grey with some brown/ black carbonaceous bands and brown/yellow staining. Siderite at 5.35 - 5.37 m
6.90 - 11.85	4		Shale, as above, slightly silty with hard sandstone/ siltstone bands at 9.0 m and 9.3 m (each 10 cm thick). Crystalline siderite at 9.1 m. Black shiny coal at 8.5m. Softer argillaceous shale in lower part
11.85 - 14.45	5		Shale, harder and fresher, generally slightly siliceous with bands of softer argillaceous carbonaceous shale. Mainly grey with brown/grey bands, some siderite? at 13.85 m
14.45 - 18.45	6		Siltstone, light grey, hard, quartz/lithic, some fine white mica and dark carbon on bedding planes, siderite nodules at 15.4 m and 16.8 m. Some bands of softer, dark grey carbonaceous shale. Note clay pebble at 17.0 m
18.45 - 19.40	7		Shale, slightly weathered, with softer carbonaceous, argillaceous bands.
			END OF HOLE

3

LOG OF DRILLHOLE No: DDH3 Sheet 1 of 1

Drilling Method: Diamond Core	Project: Ferndale Feeds Property
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 15-2-91	Angle: Vert. Direction:
Date Completed: 15-2-91	Collar Level: 99.2 m (66 m AHD)

Interval (m)	Sample	Graphic Log	DESCRIPTION
0.00 - 0.40			Soil, dark, clayey, organic (core loss)
0.40 - 2.60	DDH 3/1		Clay, grey with orange/red bands, some laterite nodules, plastic
2.60 - 4.60	2		Clay, extremely weath., shale, mainly grey with orange and yellow bands diminishing towards base, slightly siliceous with bands of plasti argillaceous and black coal plies. Laterite nodules at 3.2 m
4.60 - 5.90	3		Shale, v.weathered, interbedded siliceous & argillaceous, dull to dark grey with plies of shiny coal. Laminated & cross bedded at base
5.90 - 8.60	4		Shale, weathered, mainly dull grey with brown/black carbonaceous bands & patches. Generally slightly silty with bands of plastic argillaceous shale. No discolouration on nodules
8.60 - 10.40	5		Shale, as above
10.40 - 12.40	6		Shale, as above, with siderite nodules at 11.1 m and 12.3 m
12.40 - 15.00	7		Shale, as above, with very siliceous band from 14.7 m to 15.0 m
15.00 - 17.30	8		Shale, as above.
			END OF HOLE

LOG OF DRILLHOLE No:DDH 4 Sheet 1 of 2

Drilling Method: NMLC core	Project: Ferndale Feeds Property
Driller: Stewart Bros.	Location: Lot 2 Adam Rd. Luddenham
Logger: G.B.Brink	Coordinates:
Date Commenced: 10-4-91	Angle: Vertical Direction:
Date Completed: 10-4-91	Collar Level: 103.3m

Interval (m)	Sample	Graphic Log	DESCRIPTION
0.00 - 0.45			Soil & Clay with black heamatite, red laterite nodules.
0.45 - 2.17			Clay, grey with orange/red laminae, slightly silty at top to silty at base, plastic. Few laterite nodules.
2.17 - 3.71			Shale, very weathered, light grey to grey/black at base, orange/yellow laminae & bedding plane stains. Thin bands of siderite/laterite at 2.63m, 2.95m, 3.28m, 3.49m.
3.71 - 5.63			Shale, dark grey, slightly silty with bands of silty shale (e.g. 4.0 - 4.25m). Increasingly dark & carbonacious towards the base. Few laminae of orange/yellow staining, siderite/latreite at 3.95m. Note expansion cacks upon drying.
5.63 - 6.07			Sandstone, grey/white, very fine grained, slightly micacious, hard.
6.07 - 9.78			Shale, mainly dark grey with bands ofnear black, very carbonacious (coaly) shale. Generally slightly silty with bands of silty shale (note difference in cracking).
9.78 - 11.41			Shale, dark grey to black, slightly silty with laminae of lighter, silty shale. Rare siderite nodules (e.g. 10.07m).
11.41 - 12.01			Siltstone/sandstone, very fine grained, hard, siderit[illegible]
12.01 - 14.53			Shale/claystone, dark grey, numerous fossil plants on bedding planes, bands of light grey silty shale, some nodules of siderite (e.g. 12.48m, 13.24m). Note: Lateral expansion of core.
14.80 - 15.35			Siltstone, hard, slightly micacious with dark bioturbatiou tracks (common in the siltstone & sandstone bands).
15.35 - 19.63			Shale/claystone, dark grey, slightly silty with many black carbonacious bands & laminae. Some siderite bands & nodules (e.g. 15.4m, 16.4m, 18.85m, 19.35m) Probably light firing with darks spots.
			see sheet 2

LOG OF DRILLHOLE No:DDH 4 Sheet 2 of 2

Drilling Method: NMLC core	Project: Ferndale Feeds Property
Driller: Stewart Bros.	Location: Lot 2 Adam Rd, Luddenham
Logger: G.B.Brink	Coordinates:
Date Commenced: 10-4-91	Angle: Vertical Direction:
Date Completed: 10-4-91	Collar Level: 103.3m

Interval (m)	Sample	Graphic Log	DESCRIPTION
19.63 - 20.58			Sandstone/siltstone, light grey, hard with plies of dark, carbonacious shale/claystone.
20.58 - 21.75			Shale/claystone, mainly dark grey with black carbonacious bands & some thin bands of hard siltstone. White mineral (calcite?) plies at 20.7m & 21.0m.
21.75 - 22.32			Siltstone/sandstone, as before.
22.32 - 27.00			Shale/claystone, mainly dark grey, slightly silty with bands of grey/black coaly shale & some thin bands of fine sandstone/siltstone. Ply of white mineral in coaly shale at 24.07m. Sandstone bands between 25.0m - 25.2m with increasing incidence of fine sandstone bands downwards. Soft clay at 25.7m & 26.0m. Rare limonite nodules in upper part of interval.
			End of hole.

GBB

LOG OF DRILLHOLE No: DDH 5 Sheet 1 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B.Brink	Coordinates:
Date Commenced: 24-10-91	Angle: Vertical Direction:
Date Completed: 25-10-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
0.00 - 0.40			Soil, clayey, lateritic
0.40 - 0.95		1	Clay, orange/red, sandy, lateritic nodules
0.95 - 1.70		2	Core loss
1.70 - 3.13		2 3	Sandstone, weathered, clayey to 2.03m, then hard, qz/lithic fine grained, slightly carbonaceous limonite coatings, bioturbated
3.13 - 4.00		4	Clay, dark grey to black, extemely weath. shale, some orange/yellow bands
4.00 - 6.83		5 6	Shale, weath. at top, grades into fresh, blue/black shale towards base, siderite nodules, eg. at 4.3m and 5.3m, Black plant fossils on bedding planes, cracking (unloading, drying). END BOX 1 = 6.24 m
6.83 - 7.23		7	Siltstone, hard, laminated, sideritic, bioturbated
7.23 - 11.68		8 9 10 1	Shale/Claystone, dark grey to blue/black, carbonaceous, slightly silty, cracking, some bands of harder, siliceous shale (eg. 9.20 - 9.60 m) siderite nodules at 9.40 m, 10.9 - 11.1 m, Very soft at 11.3 m with thin band of white mineral (calcite?) END BOX 2 = 11.68 m
11.68 - 15.95		2 3 4 5	Shale/Claystone, blue/black, slighlty silty with bands of very carbonaceous, soft shale, some siderite nodules, eg. 13.5 m, cracking
15.95 - 16.62		6	Siltstone, grey, hard, numerous siderite nodules
16.62 - 21.00		7 8 9 20 1	Shale/Claystone, blue/black, laminite, END BOX 3 = 17.1 claystone pellets eg. at 17.98 m, generally silty, band of siltstone from 19.66 - 20.05 m
21.00 - 24.82		2 3	Shale/Claystone, blue/black, carbonaceous, cracked, thin plies of claystone (dickite?) eg. at 21.60 m

LOG OF DRILLHOLE No: DDH 5 Sheet 2 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 24-10-91	Angle: Vertical Direction:
Date Completed: 25-10-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
		24	END BOX 4 = 23.63 m
24.82 - 25.76		5	Shale, mainly blue/black, soft, but numerous plies of calcite and siderite nodules near base
25.76 - 26.73		6	Siltstone/Sandstone, quartz/lithic, fine grained, slightly carbonaceous, siderite at base
		7	Laminite, carb. shale and harder grey siltstone, some calcite near base in carb. shale,
26.73 - 28.87		8	END BOX 5 = 28.87 m
		9	Laminite, dark carb. shale and grey siliceous shale/ siltstone, "ribbed" core, separates into discs, coaly shale between 32.75 m and 33.75 cracking siderite at 30.0 m
28.87 - 33.65		30	
		1	END BOX 6 = 33.65
		2	
		3	
		4	Shale, dark grey, carbonaceous, increasingly hard and siliceous, plies of calcite.
			END OF HOLE

G B B

9

LOG OF DRILLHOLE No: DDH 6 Sheet 1 of 2

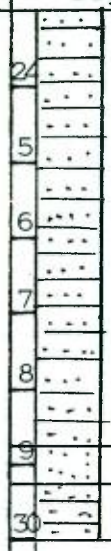
Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 25-10-91	Angle: Vertical Direction:
Date Completed: 28-10-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
0.00 - 0.50		SS	Core loss, top soil, road gravel
0.50 - 0.85		1	Clay, brown, silty, lateritic
0.85 - 4.30		2 3 4	Clay, orange/grey mottled, slightly silty, plastic, bands of laterite nodules, eg. at 1.45 m and 2.7 m. At 2.6 m recognisable extremely weath. shale, cracking, brown ironstone/limonite from 3.05 - 3.30 m and 4.20 - 4.25 m
4.30 - 6.26		5 6	Claystone/Shale, weath., black, carb. bands of siderite nodules, hard ironstone between 5.25 and 5.35 m, coaly plie near base. END BOX 1 = 5.88 m
6.26 - 6.54			Sandstone, hard, grey, fine grained
6.54 - 11.72		7 8 9 10 1	Claystone/Shale, dark grey to black, carbonaceous, cracks, some coal plies and shards, lighter grey from 9.7 - 10.9 m, hard siderite bands from 10.75 - 10.85 m and nodules between 10.35 and 10.95 m. END BOX 2 = 11.40 m
11.72 - 12.22		2	Siltstone/Shale, light grey, dark band at base, hard
12.22 - 14.60		3 4	Claystone/Shale, dark grey to dark brown, increasing carbonaceous, cracks, slightly silty, coal at base
14.60 - 16.55		5 6	Shale/Claystone, laminite, light grey and dark grey bands, plant fossils on bedding planes. END BOX 3 = 16.55 m
16.55 - 19.00		7 8 9	Claystone/Shale, dark grey to black, cracks, some coaly plies, some lighter siliceous bands
19.00 - 19.51			Siltstone, siderite band at top, coal ply at base
19.51 - 22.28		20 1 2	Claystone/Shale, laminated bands, some siltstone, siderite at 20.0 m, some very fossiliferous to coaly, cracks END BOX 4 = 21.96 m
22.28 - 22.86		3	Sandstone, very fine grained, hard, some carb. plies

G B B

LOG OF DRILLHOLE No: DDH 6 Sheet 2 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 25-10-91	Angle: Vertical Direction:
Date Completed: 28-10-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
22.86 - 28.85			Laminite, carb. shale/silty shale, few bands of harder carb. siltstone, 20 mm siderite at 27.0 m cracks, core swell. END BOX 5 = 27.15 m
28.85 - 29.30			Sandstone, grey, qz/lithic, fine grained, hard
29.30 - 30.00			Laminite, silty shale/carb. shale plies
			END OF HOLE

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LOG OF DRILLHOLE No: DDH 7 Sheet 1 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 28-10-91	Angle: Vertical Direction:
Date Completed: 29-10-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
0.00 - 2.12		1 2	Clay, orange/yellow, lateritic nodules 1.95 core loss
2.12 - 2.65			Clay, grey/orange, laterite nodules
2.65 - 6.10		3 4 5 6	Claystone/Shale, extremely weath. to weathered, grey/yellow to drak brown (carbonaceous), cracks, siderite/limonite bands at 3.9 m, 4.9 m, 5.2 m
6.10 - 6.43			Laminite, siltstone/shale, drak grey/grey, bioturbated
6.43 - 7.80		7	Claystone/Shale, dark brown to black in upper part wi siderite nodules and bands, cracks. END BOX 1 = 7.43 m
7.80 - 9.90		8 9 10	Shale/Claystone, silty, grey with dark carbonaceous bands, cracks, siderite nodules at 8.5 m and 8.65 m
9.90 - 10.27			Sandstone, grey, fine grained, qz/lithic, carbon on pa ings
10.27 - 11.23		1	Claystone/Shale, thin coaly plies, dark grey, cracks, harder towards base, siderite at 10.
11.23 - 11.69			0.5 m loss
11.69 - 13.70		2 3	Sandstone, grey, drak plies, fine grained, qz/lithic Claystone/Shale, dark grey, some coaly bands, cracks, dark and light laminations END BOX 2 = 13.70 m
13.70 - 15.61		4 5	Claystone/Shale, dark brown, carbonaceous, grey and l carbonaceous towards base, cracks, small siderite nodules near base
15.61 - 18.84		6 7 8	Siltstone/Shale, hard siltstone band at top, laminated below, grey to dark grey, siderite ban from 17.45 - 17.59 m
18.84 - 20.50		9 20	Siltstone/Shale, light and dark grey laminations, calcite?, claystone bands at top and base. END BOX 3 = 20.0 m
20.50 - 23.00		1 2 3	Claystone/Shale, dark brown to black, thin bands of harder shale, increasing towards base, siderite at 20.67 m 0.25 m loss

LOG OF DRILLHOLE No: DDH 7 Sheet 2 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3, Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 28-10-91	Angle: Vertical Direction:
Date Completed: 29-10-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
23.00 - 25.57		24 5	Laminite, siltstone/carb. shale, grades into sandstone with carbonaceous plies
25.57 - 26.25		6	Claystone/Shale, dark grey, fossils on bedding planes, siderite at top, some pyrite on beddin planes. END BOX 4 = 26.0 m
26.25 - 27.10		7	Laminite, siltstone/shale
27.10 - 29.45		8 9	Claystone/Shale, dark grey to black with coaly bands and yellow pyrite eg. 27.60 m
29.45 - 30.15		30	Laminite, siltstone/shale, light and dark grey.

END OF HOLE

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LOG OF DRILLHOLE No:DDH 8 Sheet 1 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 29-10-91	Angle: Vertical Direction:
Date Completed: 31-10-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
0.00 - 3.00		1 2 3	Clay, orange/yellow, lateritic, 2.55 m loss
3.00 - 4.20		4	Clay, grey/orange/yellow, lateritic to limonite at base Sandstone band from 4.10 - 4.20 m, 0.6 m loss
4.20 - 4.87		5	Claystone, dark grey, carbonaceous, weathered at top
4.87 - 7.65		6 7	Laminite, siliceous shale/carbonaceous shale, disturbed bedding, generally slightly silty
7.65 - 11.75		8 9 10 1	Claystone/Shale, some laminite sections, sideritic shale band from 8.08 - 8.20 m and at 11.2 m, cracks, some silty bands. END BOX 1 = 8.85 m
11.75 - 14.25		2 3 4	Laminite, siltstone/shale, some coaly bands, carbonaceo fossils on bedding planes, calcite at 13.3. siderite at 12.85 m
14.25 - 17.50		5 6 7	Claystone/Shale, carbonaceous and coaly at top, grade into light and dark grey laminite with some silty bands up to 5 cm thick, siderite at 17.5 m. END BOX 2 = 14.70 m
17.50 - 18.00		8	Laminite, siltstone/shale, light and dark grey
18.00 - 20.60		9 20	Claystone/Shale, increasing carbonaceous and coaly ba towards base. END BOX 3 = 20.60 m
20.60 - 22.73		1 2 3	Laminite, claystone/shale, hard, light and dark grey, more siliceous towards base, siderite at 20.7 m, 21.6 m and in lower 0.5 m

LOG OF DRILLHOLE No: DDH 8 Sheet 2 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 29-10-91	Angle: Vertical Direction:
Date Completed: 31-10-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
22.73 - 24.85		24 5	Claystone/Shale, carbonaceous to coaly with some harder, shaley bands
24.85 - 26.00		6	Laminite, sandstone/shale, with carbonaceous plies, some disturbed bedding
26.00 - 27.40		7	Claystone/Shale, dark grey with light grey bands, some coaly bands, 0.25 m loss. END BOX 4 = 26.6 m
27.40 - 30.30		8 9 30	Laminite, siltstone/shale grading into claystone/shale, some carbonaceous plies and bands.
			END OF HOLE

LOG OF DRILLHOLE No: DDH 9 Sheet 1 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 31-10-91	Angle: Vertical Direction:
Date Completed: 1-11-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
0.00 - 3.00		1 2 3	Clay, silty, yellow/orange/grey mottled, 2.55 m loss
3.00 - 5.20		4 5	Clay, as above, grades into extremely weathered silty shale with carbonaceous plies, 1.45 m loss
5.20 - 6.00		6	Shale, carbonaceous, extremely weathered
6.00 - 8.50		7 8	Claystone/Shale, carbonaceous fossils on bedding planes and carbonaceous bands
8.50 - 8.90		9	Siltstone/Shale, carbonaceous fossils, bioturbated
8.90 - 9.60			Claystone/Shale, as before, END BOX 1 = 9.60 m
9.60 - 11.65		10 1	Claystone/Shale, carbonaceous as before, cracks, coal plies (0.33 m swell)
11.65 - 13.80		2 3	Siltstone/Shale, siliceous with bands of carbonaceous shale, 5 cm band of calcite/siderite near base. 4 cm siderite at 13.45 m
13.80 - 15.26		4 5	Claystone/Shale, grey to dark grey, some coaly plies, END BOX 2 = 15.10 m
15.26 - 15.61			Siltstone/Shale, dark grey to black, sideritic
15.61 - 20.60		6 7 8 9 20	Claystone/Shale, dark grey with carbonaceous fossils on bedding planes, cracks, some coaly plies at 18.0 m and 18.4 m, some hard silty bands in lower metre. END BOX 3 = 20.2 m
20.60 - 21.37		1	Laminite, siltstone/shale, sideritic and calcitic
21.37 - 23.97		2 3	Claystone/Shale, black claystone grades into shaley laminite, increasingly siliceous, some distinct cross beddi

LOG OF DRILLHOLE No: DDH 9 Sheet 2 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 31-10-91	Angle: Vertical Direction:
Date Completed: 1-11-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
		24	
23.97 - 27.00		5 6 7	Laminite, siltstone/shale with bands of carbonaceous claystone. END BOX 4 = 26.00 m
		8 9 30	END OF HOLE

LOG OF DRILLHOLE No: DDH 10 Sheet 1 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 1-11-91	Angle: Vertical Direction:
Date Completed: 2-11-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
0.00 - 3.00		1 2 3	Clay, no core recorded
3.00 - 5.05		4 5	Clay, orange/grey/yellow, silty, lateritic, 1.75 m loss
5.05 - 6.80		6 7	Claystone/Shale, light grey, weathered at top, grades into dark grey carbonaceous claystone 0.35 m loss
6.80 - 8.40		8	Shale, slightly silty with silty bands, carbonaceous downwards siderite from 8.35 - 8.40 m
8.40 - 9.50		9	Claystone/Shale, dark grey, carbonaceous with coaly pl
9.50 - 10.55		10	Shale, dark grey, slightly silty to silty, carbonaceou fossils on bedding planes. END BOX 1 = 10.55 m
10.55 - 13.75		1 2 3	Claystone/Shale, grey to dark grey, carbonaceous, calcite plies at 12.05 m, cracks, siderite from 13.70 - 13.75 m
13.75 - 14.30		4	Laminite, siltstone/shale, carbonaceous fossils, sideri at 14.1 m
14.30 - 16.32		5 6	Claystone/Shale, grey to dark grey, carbonaceous partin some coaly plies
16.32 - 17.03		7	Laminite, siltstone/shale, sideritic, disturbed bedding END BOX 2 = 17.30 m
17.03 - 18.83		8	Siltstone/Shale, grey to dark grey, some carbonaceous plies and fossils on partings
18.83 - 20.30		9 20	Claystone/Shale, carbonaceous with coaly bands
20.30 - 23.25		1 2 3	Shale, siliceous, carbonaceous plies and fossils on partings, calcite at 20.85 m siderite nodules between 22.04 and 22.40 m. END BOX 3 = 23.25 m

LOG OF DRILLHOLE No: DDH 10 Sheet 2 of 2

Drilling Method: Coring	Project: Clay/Shale Investigation
Driller: Stewart Bros.	Location: Lot 3 Adams Rd, Luddenham
Logger: G.B. Brink	Coordinates:
Date Commenced: 1-11-91	Angle: Vertical Direction:
Date Completed: 2-11-91	Collar Level:

Interval (m)	Sample	Graphic Log	DESCRIPTION
23.25 - 25.55		24 5	Laminite, claystone/shale, black and carbonaceous at top, increasingly siliceous downward, fossils on partings, siderite at 25.10 m
25.55 - 28.23		6 7 8	Laminite, shale/siltstone, carbonaceous plies and fossils on partings, some disturbed bedding
28.23 - 28.80			Sandstone, quartz/lithic, fine grained, siderite at bas
28.80 - 29.30		9	Laminite, siltstone/shale, carbonaceous partings, disturbed bedding, sideritic. END BOX 4 = 29.20
29.30 - 29.90		30	Claystone/Shale, some coaly bands, some siderite nodule
			END OF HOLE

G B B

Appendix 3

Consultation Letters

The Department of Land and Water Conservation incorporates the former Departments of Conservation and Land Management and Water Resources.

Director
R.A. Cole Town Planning Pty Limited
9 Hilar Avenue
CARLINGFORD NSW 2118

SOIL CONSERVATION SERVICE

Neale Court
311 High St
Penrith NSW 2750
PO Box 651
Penrith NSW 2751

Phone (047) 21 0188
Fax (047) 21 0181

Contact: Marwan El-Chamy

Our Ref: (M:CLAYLUDD.COL)

Your Ref: EVEI 91/6 93/04

Attention: Mr R.A. Cole

Dear Sir,

RE: PROPOSED CLAY/SHALE EXTRACTION AND LANDFILL
LOT 3 DP 623799 ADAMS ROAD, LUDDENHAM
KOLBACK ENVIRONMENTAL SERVICES LIMITED

I refer to your letter of 4 June 1995, requesting confirmation of requirements given by this Department on soil conservation matters.

The requirements given in the letters of 4 October 1991 and 15 November 1993 will still apply to the new development application and accompanying environmental impact statements.

The previous Environmental Impact Statement (EIS) was reviewed by an officer from this office on the 21 April 1994 and sent to Liverpool City Council.

The Department has no objections to the overall intent of the proposal, as described in the previous Environmental Impact Statement. The EIS however failed to provide specific information on:

i) erosion and sediment control measures these were referred to in broad terms in section 3.3.7 (Post quarry operations) and 3.4.4.

ii) revegetation operations, timing, sowing rates etc.

2

The requirements mentioned above have not changed. It is important that these issues are addressed in the EIS.

Please contact me if you would like further discussions on this matter.

Yours faithfully,

MARWAN EL-CHAMY
for NEVILLE PAVAN
District Soil Conservationist
PENRITH

19 June 1995

New South Wales Government

DEPARTMENT OF LAND & WATER CONSERVATION
formerly Department of Conservation & Land Management
and Department of Water Resources

Water Resources

R.A. Cole Town Planning Pty Limited
9 Hilar Ave
CARLINGFORD NSW 2118

DX: 28360 Parramatta
Facsimile: (02) 895 7281
Telephone: (02) 895 6211
Ext: 7441
Contact Name: John Ross
Our Reference: 0045243
[KMIN929#]

15 · 6 · 95

Attention: Mr R.A. Cole

Dear Sir ,

Re: EIS - Quarry, Adams Road, Luddenham

Thank you for your letter of 4 June 1994 seeking this Department's comments and requirements for the above EIS.

This Department has no special comment or advice on the subject proposal. However, in the conduct of the investigations it is recommended that you make full use of the six documents sent to you with the Department's letter of 10 March 1994 (copy attached). All appropriate matters discussed in these guideline documents should be addressed in the above study.

I trust the above and enclosed information will prove helpful.

Yours sincerely,

John A. Ross
for
J.F. Clarke
Regional Director
Sydney South Coast
15 June, 1995

R.A. Cole Town Planning Pty. Limited
9 Hilar Ave
CARLINGFORD NSW 2118

Telex: 121188
Facsimile: (02) 895 7281
Telephone: (02) 895 6211
Ext: 7441
Contact Name: John Ross
Our Reference: 0092962
Your Ref: [AKW4621#]

Attention: Mr R.A. Cole, Director

10 · 3 · 94

Dear Sir/Madam,

Re: EIS - Poultry Plant, Park Rd, Luddenham.

Thank you for your letter of 7 March 1994 seeking this Department's comments and requirements for the above EIS.

Enclosed for your information and retention are the following Departmental documents:

a) "Amendments to the NSW Rivers and Foreshores Improvement Act";

b) "The 7-Step Method of controlling Bank Erosion and Sediment Build-up";

c) "The importance of the Riparian Zone in Water Resource Management - A Literature Review";

d) "NSW State Rivers and Estuaries Policy";

e) "Minimum Standards for Works in Rivers and Lakes"; and

f) a revised "General Requirements for Environmental Impact Statements". (This is essentially a checklist of water resources matters to be addressed in the assessment of environmental impacts).

I trust the above and enclosed information will prove useful.

Yours sincerely,

John A. Ross
for J.F. Clarke, Regional Director
Sydney-South Coast

Encl.

Incorporating the **Soil Conservation Service**

R.A. Cole Town Planning Pty Ltd
Planning & Drafting Consultants
9 Hilar Avenue
CARLINGFORD NSW 2118

P.O. Box 651
PENRITH NSW 2751

Phone: (047) 21 0188
Fax: (047) 21 0181

Contact: Lawrie Kirk

Our reference: EVEI 91/6 (L\LUDD)

Your reference:

Attention: Mr R. Cole

Dear Sir,

RE: PROPOSED CLAY/SHALE EXTRACTION
LOT 3 DP 623799 ADAMS ROAD, LUDDENHAM

Reference is made to your letter dated 23 September 1991, seeking comment on matters relevant to this section of the Department of Conservation and Land Management, which should be considered during the preparation of an Environmental Impact Statement for the subject proposal.

Relevant N.S.W. Legislation:

i) The Soil Conservation Act, 1938 and amendments, makes provision for the conservation of soil and farm water resources and for the mitigation of erosion within New South Wales. Any activity which disturbs the natural ground surface or the protective vegetation cover can constitute an erosion hazard. It is therefore necessary to adopt adequate control measures to minimise environmental degradation. The Commissioner has specific powers under section 15A of the Soil Conservation Act, 1938, where an erosion hazard exists or has the potential to develop.

ii) The NSW Government is actively promoting the concept of Total Catchment Management (TCM). This concept involves the **coordinated** use and management of land, water, vegetation and other natural resources on a catchment basis. A TCM council exists for the Hawkesbury and Nepean River comprising of State government authorities and landholders. The Committee at this stage is in its formative stages with working parties being established to clarify roles, as well as collecting data and formulating recommendations.

6

Existing Use and Potential Limitations:

i) The Service recently completed a study of the soil landscapes of the area. This has been published as Bannerman, S.M. and Hazelton, P.A. (1990). *Soil Landscapes of the Penrith 1:100 000 Sheet.* Soil Conservation Service of NSW, Sydney.

Identification of the characteristics of the relevant soil landscape(s) can be of assistance in the preparation of an EIS.

Erosion and sediment control is an important environmental consideration prior to and during any activity and/or development. It is essential to minimise on-site erosion, and offsite sedimentation of adjacent properties, streams, waterbodies and the like.

A progressive erosion and sediment control program should be implemented from the initial operation stage until the proposal has been completed and the site fully stabilised and/or landscaped.

Such a program should consider:

1. control of surface drainage (especially in main watercourses)

2. early revegetation of completed development areas (i.e., plant redevelopment and pit development areas)

3. the construction of Sediment Trapping Structures (e.g., sediment basins, hay bale and geo-textile fences).

This program is usually presented in the form of an Erosion and Sediment Control Plan (ESCP).

I enclose for your information:

i) *Guidelines to meet Soil Conservation Service Requirements for Environmental Impact Statements - Mining* - outlining specific areas that need to be addressed in the EIS

ii) *Soil Conservation Guidelines for Urban Developments* - outlining the components of an Erosion and Sediment Control Plan.

This Department would welcome the opportunity to discuss erosion and sediment control in more detail. For further information or advice, please do not hesitate to contact me at the Departments Penrith Office on (047) 21 0188.

Yours faithfully,

L.R. KIRK
A/District Soil Conservationist
PENRITH

4 October 1991
(Encl. 2)

RECEIVED 1 9 NOV 1993

Environmental Scientist
Mitchell McCotter & Associates Pty Ltd
P.O. Box 943
CROWS NEST NSW 2065

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
Neale Court
311 High St
Penrith NSW 2750
PO Box 651
Penrith NSW 2751
Phone (047) 21 0186
Fax (047) 21 0181

Contact: Peter Lowery

Our Ref: EVEI 93/04 (P\QUARRY.LUD)

Your Ref: 93217L3

Attention: Stephanie Fikkers

Dear Sir,

RE: PROPOSED QUARRY REHABILITATION ADAMS ROAD, LUDDENHAM

I refer to your letter of 9 November 1993, seeking comment on matters relevant to this Department, which should be considered during the preparation of an Environmental Impact Statement for the subject proposal.

The Soil Conservation Act, 1938 makes provision for the conservation of soil and farm water resources and for the mitigation of erosion within New South Wales. Any activity which disturbs the natural ground surface or the protective vegetation cover constitutes an erosion hazard necessitating the adoption of adequate control measures to minimise environmental degradation.

As you are aware, erosion and sediment control is an important environmental consideration prior to and during any activity and/or development. It is essential to minimise on-site erosion, and offsite sedimentation of adjacent properties, streams, waterbodies and the like.

In this context, a progressive erosion and sediment control program should be implemented from the initial operation stage until the proposal has been completed and the site fully stabilised and/or landscaped.

Such a program should consider:

1. Control of surface drainage (especially in main watercourses)

2. Early revegetation of completed development areas

3. The construction of Sediment Trapping Structures (e.g., sediment basins, strawbale and geotextile fences).

I have enclosed a copy of the Department's *Guidelines for Environmental Impact ~~Statement~~ - Mining* which includes a section on topics to be covered in the rehabilitation section of the EIS.

In respect to the subject proposal, the Department would welcome the opportunity to discuss erosion and sediment control in more detail. For further information or advice, please do not hesitate to contact me at the Department's Penrith Office on (047) 21 0188.

Yours faithfully,

P Lowery

PETER LOWERY
for NEVILLE PAVAN
District Soil Conservationist
PENRITH

15/11/93

10

Our reference 259.5390
Mr Richards 831 0988

Roads and Traffic Authority
Sydney Region

R T A

R.A. Cole Town Planning Pty Ltd
Environmental and Town Planning Consultants
9 Hilar Ave
CARLINGFORD NSW 2118

19 JUN 1995

83 Flushcombe Road
Blacktown
New South Wales 2148
Telephone (02) 831 0911
Facsimile (02) 831 0926
PO Box 558
Blacktown NSW 2148
DX 8120

PROPOSED CLAY/SHALE EXTRACTION AND LANDFILL, LOT 3 DP 623799 ADAMS ROAD, LUDDENHAM. KOLBACK ENVIRONMENTAL SERVICES LIMITED.

Dear Mr Cole

I refer to your letter of 4 June 1995 requesting the RTA's comments on issues for inclusion in an EIS for the subject operation.

The RTA would like to see an E.I.S. give consideration to :-

(i) the proposed point(s) of access to the State Road network and the likely traffic movements per day, including tonnage, (an assessment would be sufficient) to assist in assessing the impact on the road network,

(ii) where existing intersection layout (in the vicinity of the current site) is poor, what improvements are required, or proposed, in terms of traffic safety and efficiency. Items including turning movements, street lighting, street signs and parking restrictions could be addressed,

(iii) the location for vehicle access to the site,

(iv) the likely hours of operation, number of employees and (where the number of employees may exceed 50) the possibility of developing a transport management plan to reduce the total number of car dependant journey to work trips, and

(v) on site parking arrangements, including trucks, company and employee vehicles and provision for cycle parking (or storage).

The issues raised by the RTA and Police representatives when this development was presented to the Sydney Regional Development Advisory Committee in March 1994 should also be addressed. A copy of the Committee's reply to Liverpool Council is enclosed.

Should you require additional information please contact Mr Ken Moon, telephone 831 0965.

Yours faithfully

A. Ross

Annette Ross
Environmental Manager

cc

12

Our Reference: RDC 94/521 LP:amc
Mr Pickard
831 0937

The General Manager
Liverpool City Council
DX 5030
Liverpool

Liverpool City Council Proposed clay/shale quarry on Lot 3 DP 623799 Adams Road, Luddenham.

Dear Sir,

I refer to your letter of 22 February 1994 (reference: P30.720 B Millwood.) The proposal was considered by the Sydney Regional Development Advisory Committee on 16 March 1994.

The Local Government Representative was not present for this item, however the Police and Roads & Traffic Authority (RTA) representatives recommended that should Council approve the application the following works should be undertaken

1. At the Elizabeth Drive/Adams Road intersection a left turn deceleration lane be provided for the movement from Elizabeth Drive East into Adams Road, and

2. Widening of Elizabeth Drive to provide a seagull island in Elizabeth Drive to provide a right turn bay into Adams Road with an acceleration lane for right turning vehicles out of Adams Road as the speed limit on Elizabeth Drive is 100 km/hour.

3. Road shoulder widening on the left hand side of Adams Road at the intersection with Elizabeth Drive to allow left hand turn vehicles to pass right hand turning vehicles. All the above are to be carried out at no cost to the RTA.

4. Consideration should be given to imposing an indexed levy rate of three cents per payload tonne kilometre to major truck movements where appropriate for road maintenance purposes.

Council's determination on the proposal (conditions of consent if approved) would be appreciated in due course.

Yours faithfully

K.E. Moon
Chairman
Sydney Regional Development Advisory Committee

leigh\lpa338

MINERAL RESOURCES

NSW DEPARTMENT OF MINERAL RESOURCES
Minerals and Energy House, 29-57 Christie Street
(P.O. Box 536), St Leonards, NSW 2065, Australia
Phone (02) 901 8888 · Fax (02) 901 8777
DX 3324 St Leonards

Our Ref: L91/0489

Mr R Cole
RA Cole Town Planning
9 Hillar Avenue
CARLINGFORD NSW 2118

Dear Mr Cole

Proposed Clay/shale Extraction and Landfill, Lot 3 DP623799 Adams Road, Luddenham

I refer to your letter of 4th June 1995 concerning this Department's requirements with respect to the new development application for the above proposal.

As you indicated in your letter that the new application will be essentially the same as the previous one, the Department's requirements for the environmental impact statements will be as specified in our previous letters of 3 October 1991 and 29 November 1993.

If you have any queries concerning this matter, please contact Mr I Paterson of the Geological Survey branch on (02) 901 8368.

Yours faithfully

S R Lishmund
for Director-General

16/6/95

DEPARTMENT OF MINERAL RESOURCES

NEW SOUTH WALES GOVERNMENT

MINERALS AND ENERGY HOUSE
29-57 CHRISTIE STREET
CORRESPONDENCE PO BOX 536
ST LEONARDS NSW 2065
DX 3324 ST LEONARDS
TELEPHONE (02) 901 8888
FACSIMILE (02) 901 8777

R.A. Town Planning Pty Ltd
9 Hilar Ave,
CARLINGFORD NSW 2118

Our Ref: L91/0487

Attention: Mr Raymond Cole

Dear Sir,

PROPOSED CLAY/SHALE EXTRACTION
LOT 3 DP 623799 ADAMS ROAD, LUDDENHAM

I refer to your letter of 23rd September, 1991 seeking this Department's requirements regarding the abovementioned proposed clay/shale quarry.

Clay/shale is a mineral under the Mining Act 1973 and extraction generally requires a mining lease except in certain cases where the clay/shale is classified as privately-owned mineral. In such cases extraction can be undertaken by way of a private agreement.

As noted by you the subject property lies within an area identified under Sydney Regional Environmental Plan No. 9 - (Extractive Industry). Therefore, the provisions of that plan apply to this proposal.

With respect to the environmental impact statement (EIS) to be prepared the Department requires that the following points be addressed.

1. The amount of clay/shale available for extraction and the method or methods used to determine this amount (e.g. drilling).

2. Anticipated yearly production and life of the operation.

3. Characteristics of the clay/shale to be extracted, i.e. plasticity, green strength, fired colour, etc.

4. Details of any testing carried out to determine the qualities of the clay/shale.

5. Proposed uses and markets for the products.

6. Alternative sources and their availability.

7. Justification for the proposal in terms of local and, if applicable, regional context.

The Department's Statistical Section compiles production data for all mining operations in the State. It would be appreciated if you could contact the Statistical Officer on (02) 901 8436 in order that production from this operation can be recorded.

If you have any queries on this matter please contact Mr G. MacRae of the Geological Survey on (02) 901 8369.

Yours faithfully,

S.R. Lishmund
for **Director-General**

3/10/91

16

93217

DEPARTMENT OF MINERAL RESOURCES

NEW SOUTH WALES GOVERNMENT

MINERALS AND ENERGY HOUSE
29-57 CHRISTIE STREET
CORRESPONDENCE PO BOX 536
ST LEONARDS NSW 2065
DX 3324 ST LEONARDS
TELEPHONE (02) 901 8888
FACSIMILE (02) 901 8777

Mitchell McCotter
PO Box 943
CROWS NEST NSW 2065

RECEIVED - 2 DEC 1993

Our Ref: L91/0487
Your Ref: 93217L3

Dear Sir/Madam,

PROPOSED QUARRY REHABILITATION
ADAMS ROAD, LUDDENHAM

I refer to your letter of 9th November, 1993 seeking this Department's requirements for an environmental impact statement (EIS) to be prepared for the abovementioned proposal. The Department has previously commented on the EIS prepared for the extraction of clay and shale from this site (letter dated 23rd July 1992 - copy attached).

Clay/shale is a prescribed mineral under the Mining Act, 1992. A mining lease application (MLA 67 SY 1973) by Ferndale Resources is currently pending over the subject site.

The site is partly within a large area of land identified in Schedule 1, Division 2 of Sydney Regional Environmental Plan No. - (Extractive Industry) (SREP 9) as containing potential clay/shale resources. The plan is currently under review and this Department has recommended that the subject site be included in Schedule 1, Division 2 of the plan as a clay/shale resource of regional significance. If this recommendation is adopted, then development of the subject site for waste disposal will require the concurrence of the Director-General of this Department under Clause 11 of SREP 9.

The operator must observe all relevant requirements of the Mines Inspection Act, 1901 (as amended). Advice on these requirements should be sought from Mr Peter Diamantes, Regional Inspector of Mines - telephone (02) 901 8455.

The Department of Mineral Resources has no specific requirements for the EIS regarding rehabilitation. However, the Department considers it important that the rehabilitation of the proposed quarry not result in undue sterilisation of valuable clay/shale resources, particularly pale-firing clay and shale.

If you have any queries on this matter please contact Mr Greg MacRae of the Geological Survey on (02) 901 8369.

Yours faithfully,

29.11.93

I.B.L. Paterson
for Director-General

Federal Airports Corporation

HEAD OFFICE
LOCKED BAG No 28
BOTANY NSW 2019
2 LORD STREET, BOTANY
N.S.W. 2019
PHONE: (02) 207 7777
FAX: (02) 316 5606

21 June 1995

Mr. R. Cole,
Director,
R.A. Cole Town Planning P/L.,
9 Hilar Avenue,
CARLINGFORD N.S.W. 2118

Dear Sir,

PROPOSED CLAY/SHALE EXTRACTION AND LANDFILL
LOT 3 DP 623799 ADAMS ROAD, LUDDENHAM
KOLBACK ENVIRONMENTAL SERVICES LIMITED

I refer to your letter and attachments dated 4 June 1995.

Comments made in the FAC letter dated 24 November 1993 remain appropriate.

You should also note that lighting of the site should conform to appropriate standards required for developments close to airports.

Yours faithfully,

Sandy White.

SANDY WHITE
Airport General Manager
Sydney West

Federal Airports Corporation

HEAD OFFICE
LOCKED BAG No 28
BOTANY NSW 2019
2 LORD STREET, BOTANY
N.S.W. 2019
PHONE: (02) 207 7777
FAX: (02) 316 5606

RECEIVED 29 NOV 1993

24th November, 1993.

Mitchell McCotter,
Level 1,
24 Falcon Street,
CROWS NEST NSW 2065

Attention: Ms. Stephanie Fikkers

Dear Ms. Fikkers,

I refer to your enquiry of 9th November, 1993, in relation to the Environmental Impact Statement on rehabilitation of a quarry in Adams Road, Luddenham.

The Corporation is concerned about any landfill depot within the vicinity of any airport, and we raise the following issues in relation to Badgerys Creek airport which should be addressed in the EIS.

1. Height restrictions

   Approximately 45m above ground level for Lot 3 DP 623799.

2. Pollution control

   - Air (dust and smoke pollution)
   - Water Quality flowing into Oaky Creek
   - Noise

3. Access via airport's roads to quarry to be restricted

4. Birds and wildlife populations to be controlled.

If you need to discuss any of these issues please contact Darius Olczak on 207 7782.

Yours sincerely,

DARRELL MORROW,
DEVELOPMENT MANAGER.

Head Office
ORANGE

NSW Agriculture

161 Kite Street,
Locked Bag 21
ORANGE NSW 2800

Telephone (063) 91 3100

AKJAO131
P6/0462

Mr RA Cole
9 Hilar Avenue
CARLINGFORD NSW 2118

7 June, 1995

Dear Ray

Proposed Clay/Shale Extraction and Landfill. Lot 3 DP 623799 Adams Road, Luddenham. Kolback Environmental Services Ltd

The Department's requirements for the preparation of an Environmental Impact Statement for the above development are as previously advised.

Yours faithfully

A Kennedy
Agricultural Environment Officer

cc. John Wilson, AEO, Windsor

New South Wales Government

NSW Agriculture

DAS 16/50
AK:DS
(063) 91 3479

R.A. Cole Town Planning Pty Ltd
Planning & Drafting Consultants
9 Hilar Ave
CARLINGFORD NSW 2118

Dear Ray,

Proposed Clay/Shale Extraction
Lot 3, DP 623799 Adams Road, Luddenham

I refer to your letter of 23 September 1991 requesting advice from NSW Agriculture on matters the Department wishes to see addressed in the Environmental Impact Statement (EIS) for the proposed clay/shale extraction at the above location. The Department believes the EIS should address the following issues.

Land Resources

* A full description of the existing landuses on site and within the surrounding properties. An examination of the Department's Agricultural Land Class maps indicates that the property in question has been classified as Class 3. It is the policy of NSW Agriculture to seek to divert non-agricultural pursuits away from prime crop and pasture land (Class 1,2 and 3).

* The size of the proposed extractive development in relation to the property as a whole.

* The effects of the proposed development on the agricultural viability of the property and on the agricultural industries within the local district.

* Identification of potential impacts on adjoining landholders; for example, access, transport, dust, noise, water (surface and groundwater) and visual factors and a description of measures proposed to mitigate these effects.

DIVISION OF AGRICULTURAL SERVICES
Postal Address: Locked Bag 21, Orange NSW 2800
Street Address: 161 Kite Street, Orange NSW 2800
Phone - (063) 91 3100 **Fax - (063) 91 3527**

Water and Aquatic Resources (for detailed advice on these matters please consult with Principal Fisheries Manager (Habitat) NSW Fisheries, PO Box 356, St Leonards NSW 2065)

* An assessment of the impact on surface and underground water. This should include a description of water quality and measures which would be taken to mitigate any potential impacts.

* Aquatic habitats should be identified along with measures proposed to prevent any adverse effects both on-site and downstream. This is an important consideration, given that the site is adjacent to Oaky Creek which is part of the Upper Catchment of South Creek.

Rehabilitation

* Description of the proposed end use and justification for this land use.

* Measures proposed to maintain viability of the topsoil which may be needed for rehabilitation of the site.

* Outline of the rehabilitation plan showing design criteria for the rehabilitation program.

Cumulative Impact

The Environmental Impact Statement should also examine the cumulative impact of the development proposal in the context of regional land and aquatic resources.

Thank you for bringing this matter to the attention of the Department.

Yours sincerely,

ANDREW KENNEDY
for K.P. SHERIDAN
DIRECTOR GENERAL
19 November 1991

93217

RECEIVED 2 0 NOV 1993

Head Office
ORANGE

NSW Agriculture

161 Kite Street,
Locked Bag 21
ORANGE NSW 2800

Telephone (063) 91 3100

AKJAO071
16/50
16/425

Mitchell McCotter
PO Box 943
CROWS NEST NSW 2065

Attention: Stephanie Fikkers

24 November 1993

Dear Ms Fikkers

Proposed Quarry Rehabilitation, Adams Road, Luddenham

I refer to your letter of 9 November 1993 requesting advice from NSW Agriculture on matters the Department wishes to see addressed in the Environmental Impact Statement (EIS) for the proposed quarry rehabilitation at the above location. As identified in your letter, the Department did provide a submission on the proposed quarrying operations. Given the overlap in the operation of the quarry and the proposed landfill site, the Department's concerns are similar for both activities and it would be assumed that such concerns are re-evaluated during the current assessment process.

Additional issues of particular concern to the Department include:

- Measures to be implemented which ameliorate the impact of increased dust, noise and vehicle movements on surrounding primary producers;
- Site management practices which will enable effective weed control; and
- A rigorous assessment of the cumulative impact of the development proposal in the context of regional land and agricultural resources.

Thank you for bringing this matter to the attention of the Department.

Yours faithfully

A Kennedy
Agricultural Environment Officer (Environmental Planning & Management)

cc J Wilson, AEO, Windsor

23

HAWKESBURY-NEPEAN CATCHMENT MANAGEMENT TRUST

68 Mileham Street, Windsor
Postal Address: PO Box 556, Windsor 2756

Please address all communications to the Chief Executive Officer

Telephone: (045) 77-4243
Facsimile: (045) 77-4236

15 June 1995

Our Reference: LM|P
Your Reference:

R.A. Cole Town Planning
9 Hilar Avenue
Carlingford NSW 2118

Contact: Rosalind Batten

Attention: R.A. Cole

Dear Sir

Proposed clay / shale extraction and landfill, lot 3 DP 623799 Adams Rd, Luddenham

Thank you for your letter dated 4 June, 1995 seeking our requirements for the EIS on the above proposal. The Trust's general requirement for the EIS is for it to address the proposal's impact upon the Hawkesbury-Nepean River and specifically South Creek and its catchment.

Specifically the Trust would like to see the following addressed in the EIS:

1. How the proposal will comply with the Trust's policy on water quality which states that:

   - if the quality of the water emanating from the site is satisfactory, then the development should not result in a decrease in this quality; and
   - if the quality of the water emanating from the site is not satisfactory then the development should result in an improvement in this quality.

   This policy relates to both surface and groundwater.

   The EIS needs to provide details of the current water quality within Oaky Creek as well as the water quality emanating from the site and how the proposal will impact upon this quality. Determinants should include but not be limited to nutrients, suspended solids, heavy metals, toxic substances, salinity, oils and grease. Details of the proposed monitoring regime and proposed monitoring personnel should be included in the EIS.

   Also the flow regime should be determined, so that assessment of impact upon flow can be assessed.

   Special attention should be given to assessment of leachate quality, treatment and disposal as well as mechanisms available that may reduce leachate production, such as the use of impervious capping material.

2. The impacts on flora and fauna of the proposal and any proposed rehabilitation measures. In particular, an assessment should be provided of the impacts upon instream and riparian flora and fauna and any mitigating measures proposed. The Trust believes that there should be a buffer zone between Oaky Creek and the proposal and that there is an opportunity to rehabilitate the riparian vegetation corridor along Oaky Creek as part of this buffer zone.

3. The cumulative impacts of the proposal specifically in relation to other existing industries (both quarrying and landfill) in the area. The EIS should identify the advantages or disadvantages of clustering quarries and / or landfill operations as well as identify any likely cumulative impacts upon water quality, vegetation and fauna habitat of these industries.

4. The use of scarce resources. The EIS should outline whether the pale firing shales will be separated during quarrying to ensure that this resource is not wasted.

5. Post completion and management issues including but not restricted to discussion of the responsibility and management of the landfill itself as well as the leachate collection, treatment and disposal system.

6. Day-to-day management of the landfill including discussion of recycling opportunities and the measures that will be in place for ensuring that toxic materials are not disposed in the landfill. The EIS should outline how the operator would handle these materials should they enter the site.

7. The opportunity to develop an environmental management plan. Although not required in detail at the development application stage, the EIS should outline the general measures proposed that may be incorporated in an environmental management plan. Such a plan can address the following:

   - all permits
   - water cycle management
   - on-site materials management
   - day to day operating procedures
   - environmental monitoring
   - erosion and sediment controls
   - emergency / contingency plans
   - site rehabilitation details
   - after care and final use options

   The management plan should be updated annually. The Trust considers that the management plan would be a particularly effective tool in ensuring the site is managed effectively from day to day and impacts upon the environment are minimised.

The EIS should also address the provisions of Sydney Regional Environmental Plan No. 20 Hawkesbury Nepean River and in particular the consistency of the proposal with the Plan's aims, objectives and criteria.

With the gazettal of the amended REP 20 the Trust will have a consultative role for extractive industries and a concurrence role for waste management facilities as defined in Schedule 3 EP&A Act. Copies of the relevant draft Codes of Practice have been appended and your attention is drawn Section 5 of these documents for further details of what should be included in the EIS.

If you wish to discuss any matter raised in this letter please do not hesitate to contact Malcolm Hughes or Rosalind Batten on the above number.

Yours faithfully

Robert B. Crawford
Chairperson
HAWKESBURY NEPEAN CATCHMENT MANAGEMENT TRUST

cc. Erich Wellar
Chairperson
South Creek Catchment Management Committee

cc. Deb Tkachenko
Co-ordinator
South Creek Catchment Management Committee

5.0 ISSUES OF INTEREST TO THE TRUST

The Trust will have regard to the principles of ecologically sustainable development when considering any application. These principles are as follows:

S 6(2) of Protection of the Envt. Admin. Act 1991

a. the precautionary principle - namely, that if there are threats of serious or irreversible environmental damage; lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;

b. inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;

c. conservation of biological diversity and ecological integrity; and

d. improved valuation and pricing of environmental resources.

Specifically the Trust will take into account where relevant, the following:

a. the impacts of the proposal upon:

- the total water cycle - catchment yield, water consumption, water quality, drainage, flooding and stormwater. Groundwater will also be considered, as well as any relevant water quality objectives;
- the ecosystem of streams and riparian areas within and adjacent to the site;
- native vegetation on and adjacent to the site;
- state and regionally significant scenic landscapes;
- the soil environment and whether erosion and sedimentation are likely to be issues;
- regional air quality;
- existing land uses on and adjacent to the site; and
- other environmental issues.

b. the environmental measures proposed by the applicant including:

- physical works e.g: water quality and quantity control structures;
- conservation practices e.g: recycling of waste waters;
- contingency plans to address failures and emergencies; and
- monitoring programmes.

c. the orderly use of land;

d. any relevant catchment management plan, and

e. the consistency of the proposal with the aims and objectives of the REP.

The Trust may also take into account a number of other factors. In particular, the Trust is currently investigating procedures for measuring and assessing cumulative impact which may be used in the future to assist in the consideration of an application.

In some cases the Trust may advise the Council that in its opinion the applicant has provided insufficient information with the application to enable a proper assessment.

During its consideration the Trust may discuss the proposal with:

- the applicant;
- the Council;
- the relevant Catchment Management Committee; and
- government agencies.

The Trust may consider the views expressed by the applicant and these organisations.

In some cases the Trust may seek outside specialist advice to assist in assessing the application.

At the conclusion of the above the Trust will advise the Council in writing as to its view as to whether:

a. the development should proceed as proposed by the applicant; or

b. the development should proceed but only if the proposal is modified in some way and/or if conditions are imposed by the Council; or

c. the development should not proceed.

If the Trust advises either (b) or (c) it will explain why it has this position.

The Council must not determine the development application until it has considered the comments of the Trust, or if 28 days have elapsed after a copy of the application has been forwarded to the Trust, and a written response has not been received.

EPA

Environment
Protection
Authority
New South Wales

Civic Tower
Cnr of Jacobs Street
and Rickard Road
Locked Bag 1502
Bankstown
NSW 2200

Telephone .02. 795 5000
Facsimile .02. 795 5002

Mr R.A. Cole
Director
R.A. Cole Town Planning Pty Limited
9 Hilar Avenue
CARLINGFORD NSW 2188

Our Reference:

Your Reference:

Contact: Paul Elton

Dear Mr Cole,

Re: Proposed Clay/Shale Extraction and Landfill, Luddenham

I refer to your letters of 4 June 1995 regarding preparation of an EIS for the above project.

As advised by telephone on 22 June 1995, the matters outlined in the EPA's letter of 26 November 1993 should still be addressed in any EIS prepared (and any other issues regarding protection of the environment). As advised however, the EIS should also be prepared in accordance with the performance criteria outlined in the EPA's draft Guidelines for the Establishment and Operation of Landfill Depots.

The EPA will assess the proposed operation in more detail during the processing of Approval, Licence and Certificate of Registration applications, as previously advised.

You should note that previous advice from the Waste Management Authority and the State Pollution Control Commission is no longer relevant as these agencies no longer exist.

If you have any questions regarding this matter, please do not hesitate to contact me on (02) 795 5255.

Yours faithfully,

Paul Elton 22.6.95

PAUL ELTON
Head Regional Operations Unit
Southern Sydney Region
for Director-General

93217 G...

EPA

Environment Protection Authority
New South Wales

PO Box 1135 Chatswood NSW 2057
Tel .02. 795 5000 Fax .02. 325 5678

The Manager
Mitchell McCotter and Associates Pty Ltd
PO Box 943
CROWS NEST NSW 2065

Attention : Luke Palfreeman

Our Reference: DS : CH1277/ds

Your Reference: 93217L3

Contact: Daniel Strosberg

RECEIVED - 1 DEC 1993

Dear Sir,

RE Waste Disposal Act, 1970:
Environmental Impact Statement (EIS) for the extraction of clay/shale and backfilling with Waste at Lot 3, DP 623799, Adams Road, Luddenham.

I refer to your letter dated 9 November, 1993, to the Environment Protection Authority (EPA) regarding the issues to be addressed in an EIS being prepared by your Company for Ferndale Pty Ltd. The Statement, following another earlier EIS prepared by R.A. Cole Town Planning Pty Ltd, concerns the rehabilitation of a proposed shale/clay quarry at Adam Street, Luddenham.

The EPA considers that, for the proposed shale/clay extraction and subsequent backfilling with waste, the occupier of the site is required to hold a Certificate of Registration under the Waste Disposal Act, 1970, as well as air, noise and water licences under the Pollution Control Act, 1970. The EIS should address the environmental controls to be implemented to prevent degradation of the environment as a result of the land rehabilitation operation.

With regard to the disposal of waste under the Waste Disposal Act, 1970, the EPA considers that the environmental impact statement should include, and not be limited to, consideration of the following issues:-

Landfill Management

1. The types of wastes to be accepted for disposal at the site, ie. whether the landfill depot is to be registered for non-putrescible and demolition waste, or demolition waste only.

2. The size and location of all stockpiles of material, including recyclable materials, cover, and excavated product.

3. Any proposed recycling activities, the types of materials, fire and/or other hazard prevention, and destinations of materials disposed of offsite.

4. Management controls for incoming loads of wastes, and for preventing disposal of unapproved wastes.

5. Volumes of waste expected on a yearly basis.

6. Methods to control litter generated onsite as a result of the landfill operation.

7. Engineering drawings of the site, including locations of all leachate collection ponds, sedimentation basins and water storage facilities.

8. Plan of progress across the site, including the path for extraction activities and subsequent rehabilitation.

9. Management of traffic flow onsite, particularly for large and small vehicle separation at the tipping face, and separation of extraction and backfilling operations.

With regard to the Pollution Control Act, 1970, the EPA considers that the environmental impact statement should include, and not be limited to, consideration of the following issues:-

Atmospheric emissions

10. Means of controlling landfill gases, provided that such gases are likely to be generated at the site.

11. The methods used to control dust on the site.

12. Details of any crushing or milling activities to be carried out on the site.

Water

13. Details of any onsite irrigation, or discharge of contaminated water from the site, including the quantity and quality of leachate and groundwater generated prior to discharge from the site.

14. The likelihood of leachate to be generated as a result of filling, and the means of preventing such leachate from contacting ground water and/or surface water.

15. The monitoring of groundwater quality around the site

during and after the life of the landfill.

16. A hydrogeological assessment of
    - ground water quality, flow direction and velocity,
    - the levels of the groundwater table in relation to the lowest point of any waste disposal cell excavated on the site.

17. The management of leachate generated at the site during and after the life of the landfill.

18. Vehicle wheel wash activities.

19. The planned progressive rehabilitation of the site, and the final plan for the rehabilitated site.

20. Planned surface water management on the site to take into consideration:
    - flooding,
    - surface water, and
    - separation of contaminated and uncontaminated water/s
    - sedimentation and erosion controls.

21. The method of storage of any materials that could cause environmental harm. This should include the storage of hydrocarbon fuels.

Noise

22. Methods to control noise generated as a result of the landfill operation.

If you would like to discuss any of the suggested EIS components please contact the EPA's Messrs Paul Fuller of the Southern Sydney Region on 7955252, or Daniel Strosberg of the Waste Registration and Licensing Section on 3255683.

Yours faithfully,

26/11/93

Don Brunton
Acting Manager - Waste Registration and Licensing Section
for Director-General.

Attachments:

1. Standard Conditions of Approval to the Establishment and Operation of Controlled Landfill Solid Waste Disposal Depots. (S.W. 1A)

2. Standard Conditions Applicable to the Operation of a Solid Waste Landfill Depot.

The Director
R A Cole Town Planning Pty Ltd
9 Hilar Avenue
CARLINGFLORD 2118

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

Our reference: JG:AS EA1-20(343)
Your reference:

Dear Sir,

Re: Proposed Clay/Shale Extraction and Landfill
Lot 3 DP623799 Adams Road, Luddenham
Kolback Environmental Services Limited

I write to confirm that our earlier letters under reference on the proposal are still valid, provided the new Development Plan and Environmental Impact Statement contain no changes of any significance, the Service will have no objections to the project.

A final comment will be made on receipt of a copy of those documents.

Yours faithfully,

Wayne Dornbusch
for ROBYN KRUK
Director-General
3rd July, 1995

South Metropolitan
District
Royal National Park
Audley
PO Box 44
Sutherland 2232
Fax: (02) 542 1420
Tel: (02) 542 0666

Head Office
43 Bridge Street
Hurstville NSW
Australia
PO Box 1967
Hurstville 2220
Fax: (02) 585 6555
Tel: (02) 585 6444

37

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

The Director
R A Cole Town Planning P/L
9 Hilar Avenue
CARLINGFORD NSW 2118

Our reference: EA1.20 (343) (BL:JT)
Your reference:

Dear Sir,

Re: PROPOSED CLAY/SHALE EXTRACTION
LOT 3 DP623799 ADAMS ROAD, LUDDENHAM

Thank you for your letter dated 23 September, 1991 requesting the Service's advice on matters to be included in the Environmental Impact Statement (EIS) for this proposal. The Service would like to offer the following comments in this regard.

The area proposed for development should be surveyed for Aboriginal relics by a qualified Archaeologist, and a report of the survey should be included in the EIS.

The EIS should include a description of the vegetation on the site. This description should include details of the vegetation communities and a list of all plant species on the site.

The Service would appreciate receiving a copy of the EIS when it is prepared.

Yours faithfully,

J.C. Govan,
for W.J. Gillooly,
Director.
22 November, 1991.

South Metropolitan
District
Royal National Park
Audley
PO Box 44
Sutherland 2232
Fax: (02) 542 1420
Tel: (02) 542 0666

Head Office
43 Bridge Street
Hurstville NSW
Australia
PO Box 1967
Hurstville 2220
Fax: (02) 585 6555
Tel: (02) 585 6444

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

Mitchell McCotter
PO Box 943
CROWS NEST NSW 2065

ATTENTION: Felicity Smith

Our reference: EA1/20 (343) (SL:JT)
Your reference:

Dear Ms. Smith,

PROPOSED QUARRY REHABILITATION
ADAMS ROAD, LUDDENHAM

The National Parks and Wildlife Service has an interest in the rehabilitation of development sites to ensure that efforts are made to return the site to as new a natural condition as possible.

Plants endemic to the local area should be used in rehabilitation. I refer to our letter to Council dated 30 July, 1992, commenting on the Environmental Impact Statement for the proposed quarry. This stated that contact should be made with the Royal Botanic Gardens for advice on suitable species. It also stated that the perimeter of water bodies should be planted with endemic rush and sedge species.

Thank you for the opportunity to comment in this preliminary stage. We look to receiving a copy of the Environmental Impact Statement when available.

Yours faithfully,

J.C. Govan,
for **NEIL SHEPHERD**,
Director General.
23 NOV 1993

South Metropolitan
District
Royal National Park
Audley
PO Box 44
Sutherland 2232
Fax: (02) 542 1420
Tel: (02) 542 0666

Head Office
43 Bridge Street
Hurstville NSW
Australia
PO Box 1967
Hurstville 2220
Fax: (02) 585 6555
Tel: (02) 585 6444

South Western Sydney Area Health Service
Public Health Unit - A Unit of the Division of Public Health

Mr R.A. Cole
R.A. Cole Town Planning Pty Ltd
9 Hilar Ave
CARLINGFORD NSW 2118

10 July 1995

Dear Mr Cole,

RE : Proposed Clay/Shale Extraction and Landfill
Lot 3 DP 623799 Adams Road, Luddenham
Kolback Environmental Services Ltd

Thankyou for requesting the comments of the South Western Sydney Public Health Unit, on behalf of the NSW Health Department, regarding the preparation of the Environmental Impact Statement (EIS) for the above proposal. Given the short time frame in which to respond to this request for the preparation of the EIS, the following response has been prepared in line with previous requests for comments for this type of development.

As only a map and a short description of the proposal were supplied, it is difficult to provide specific comments on both the extractive industry and the landfill without more details. Nevertheless, the following comments have been provided for both developments.

The Public Health Unit has a number of considerations for the proposal, that could impact on the health of the community and employees on the site. The following is a list of health and related issues that should be addressed in the preparation of the EIS. A number of these issues may overlap with the requirements of other statutory authorities, or may only pertain to one of the developments but nonetheless, have been provided for completeness of this response.

Health Issues

Environmental Health Impact Assessment
This involves a formal assessment of the actual and potential health effects of the proposed development and how these could impact on the health of the local community. Health aspects include hazard identification, exposure-response relationships, risk assessment and the development of risk management options and/or contingencies. Risk assessment is primarily concerned with long term, low level exposure to environmental contaminants. This type of assessment may be used for leaching from chemical compounds from landfills, contaminated sediment and construction waste materials to list a few. This could also include the management of Occupational Health and Safety of employees and visitors on the site.

Recycling of Treated Timber
The recycling of this material is supported however, careful consideration of the end re-use of these materials needs to be considered. Some of the wooden materials are treated with various toxic chemicals such as arsenic compounds (and similar chemicals) which are used as preservatives in the timber. The Public Health Unit has two concerns regarding this timber:-

Hugh Jardine Building Liverpool Hospital
Locked Mail Bag No. 17 Liverpool NSW 2170
Telephone: (02) 828 5944 Facsimile: (02) 828 5955

1. If such treated timber is combusted, this has a potential to expose people in close proximity to toxic fumes; and
2. If pulped treated timber is allowed to be used for gardening or landscaping, people will unknowingly introduce material with the potential to leach toxic chemical compounds to an uncontaminated site e.g., home environment

Therefore, the management of the recycling of such timber needs to be addressed in the EIS.

Landfill Operations

An assessment of the impact of the landfill operations on the site and surrounding area should be detailed in the EIS. This should include a plan of management to cover continual monitoring and control of the waste accepted as well as contingencies to deal with situations where prohibited waste is found to have been accepted on site e.g. hazardous materials, asbestos. To ensure that the plan of management is operating effectively, the option to have independent sampling and analysis of samples collected from recently compacted cells on the site should be discussed. Also, the ramifications of the results of the sampling program on the plan of management should be covered. The disposal of putrescible waste must NOT be allowed, unless approval is granted by the EPA.

Water Quality and Management

The following issues should be addressed:-

1. Assessment of leachate from the site infiltrating into ground waters
2. Treatment and disposal of leachate formed as a consequence of the proposal
3. Provisions for de-watering site, especially after heavy rain and effects on operations
4. Provisions for siltation traps/ponds on the development site to prevent turbidity of the receiving waters
5. Site drainage and flood liability
6. Assessment of potential pollutants caused either by overland flows or ground water contamination into nearby watercourses

Air Quality and Management

Measures to control potential sources of air pollution will be required in the EIS. This should include control measures to suppress windborne matter, dusts arising from stockpiles and noxious odours. Also, methods of de-odourising noxious smells and/or their removal should be discussed.

Erosion Control Measures

Detail soil control measures to prevent land degradation and pollution of nearby water courses and the surrounding catchment.

Noise and Vibration

The impact of noise and vibration from landfill operations and traffic movements to and from the site should be assessed in relation to nearby land uses. An outline of proposed mitigation measures also needs to be discussed.

Miscellaneous

1. Details need to be provided on proposed landscaping and its effect to ameliorate the visual impact of the operation.

2. The indiscriminant dumping of waste along roadside perimeters of landfill sites, up to 2-3 kilometres from the site, are always ongoing problems with landfill sites. It is always a problem for Council Officers to catch the perpetrators of illegal dumping around nearby roads and vacant lands. The proprietors of the landfill site should commit resources to discourage this practice and this commitment should be ongoing for the life of the site.

3. Wind blown papers and plastic bags around the perimeter fences, affecting neighbouring properties as well as access roads to site are always a concern. What procedures will be instigated to stop, or minimise this type of situation from arising?

4. People should not be allowed to scavenge around this site for health and safety reasons so appropriate security measures will be required and need to be discussed.

The following conditions have been standard requirements of the NSW Health Department for the approval of waste depots in the past, but are still applicable to this type of development, although there may be a need for modification, to meet other more specific EPA requirements.
These conditions are provided for your information:-

1. All surface and seepage water from higher levels shall be effectively diverted from the waste disposal area. Wastes shall not be tipped directly into accumulated run-off water. Each cell or disposal area shall be de-watered before tipping is commenced and maintained dry during tipping operations. Should a cell or disposal area become flooded by heavy rain during filling operations, the water shall be pumped to a contaminated run-off treatment pond and held for a minimum of sixty (60) days prior to discharge.

2. Upon completion of disposal operations of waste at the site, the Council shall make application to the Environmental Protection Authority to have the Site notified under the provisions of the Unhealthy Building Land Act, 1991.

I hope this information will be of assistance; should you have any further inquiries please contact John Birkett on telephone 828-5944.

Yours faithfully,

J. Birkett per

(Dr) Mitchell Smith
Medical Officer of Health

Liverpool City Council

1 Hoxton Park Road,
Liverpool NSW 2170
Tel: 821 9222
Fax: 821 9333
D.X. 5030 Liverpool

Your reference:
Our reference P 30.720
Contact Mr P Flynn: ac
821 9284

10 July 1995

R A Cole Town Planning P/L
9 Hilar Avenue
CARLINGFORD 2118

Dear Mr Cole

PROPOSED CLAY/SHALE EXTRACTION LANDFILL
LOT 3, D.P. 623799, ADAMS ROAD, LUDDENHAM

Reference is made to your letter requesting Council's comments on the proposal. In addition to the matters indicated by the Department of Urban Affairs and Planning to be addressed, the matters listed in the Statement of Issues filed in the Land and Environment Court in respect of the discontinued appeal of the previous determination by Council on development of the subject site should be specifically considered.

Yours faithfully

for Peter Flynn
SENIOR DEVELOPMENT PLANNER

LIVERPOOL THIS IS OUR CITY NOW!

IN THE LAND AND ENVIRONMENT COURT
OF NEW SOUTH WALES

No. 10577 of 1994

FERNDALE RESOURCES PTY LIMITED

Applicant

LIVERPOOL COUNCIL

Respondent

RESPONDENT'S STATEMENT OF ISSUES

Applicant's Address
for Service:

ABBOTT TOUT
Solicitors
Level 50, MLC Centre
19-29 Martin Place
SYDNEY 2000

DX : 129
TEL: 231 8555
REF: LRF:441083

The Respondent says that the following matters arise for determination in the appeal, namely, whether the proposed development should be approved having regard to:-

1. The proximity of the subject site to Badgery's Creek Airport.
2. Inadequate erosion and sediment control measures.
3. The likely deterioration of surface and ground water quality in South Creek.
4. The likely adverse affects on water quantity, flow regime and water quality in Oakey Creek and adverse affect on end stream and riparian flora and fauna.
5. The likely adverse affects of leachate generation.
6. The inadequate buffer zones proposed.
7. The likely impact of noise generation.
8. The likely impact of:
   - 8.1 The emission of land fill gas.
   - 8.2 Dust and litter generation.
9. Inadequate fire protection measures.
10. Inadequate water supply available.
11. Inadequate measures for disposal of sewerage.

12. Inadequate and inappropriate rehabilitation of site and inappropriate final landform.

13. The likely adverse impact on:

13.1 Surrounding residential amenity.

13.2 Surrounding agricultural uses.

13.3 Surrounding rural environment.

13.4 Visual quality of the surrounding environment.

14. The application is contrary to the draft Revised Sydney Regional Environmental Plan No. 9.

15. The absence of a Fauna Impact Study.

16. Circumstances of the case.

17. The public interest.

DATED: 18.11.94

Richard Graham by his employed

Solicitor for the Respondent solicitor Lesley R Fri

X:\LRF\426011.DOC 1 PG

Appendix 4

Letters of Refusal

LIVERPOOL CITY COUNCIL
1 Hoxton Park Road, Liverpool, N.S.W. 2170 Telephone: (02) 821 9222

PROUD OF OUR PAST, CONFIDENT IN OUR FUTURE

P 30.720
Mr P Flynn: ac
821 9284

30 October 1992

Ferndale Resources P/L
c/- 43 Norfolk Avenue
COLLAROY 2097

Dear Sir

LOT 3, D.P. 623799, ADAMS ROAD, LUDDENHAM

Council at its meeting held on 12th October, 1992 considered your application for a clay/shale quarry on the above property. It was resolved to advise you that Council will not determine the application until full details are received and considered of proposed reinstatement works for the site.

Your further advice as to proposed reinstatement works would be appreciated.

Yours faithfully

Peter Flynn
STATUTORY TOWN PLANNER

LIVERPOOL CITY COUNCIL

1 Hoxton Park Road, Liverpool, N.S.W. 2170 Telephone: (02) 821 9222

'PROUD OF OUR PAST, CONFIDENT IN OUR FUTURE'

Your Reference:
Our Reference: P 30.720
Enquiries: Mr P Flynn: ac
821 9284

23 April 1993

TO: Ferndale Resources P/L
c/- 43 Norfolk Avenue
COLLAROY 2097

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979.

NOTICE TO APPLICANT OF DETERMINATION OF A DEVELOPMENT APPLICATION.

Being the applicant in respect of Development Application No. 430/92 and pursuant to Section 92 of the Act, Notice is hereby given of the determination by the Consent Authority of the Development Application No. 430/92 relating to:

PROPERTY: LOT 3, D.P. 623799, ADAMS ROAD, LUDDENHAM

The Development Application for a clay/shale quarry has been determined by **refusing of consent** for the undermentioned reasons:

(1) inadequacy of road;

(2) detriment to the amenity of the area;

(3) adverse environmental consequences; and

(4) proximity of the airport.

Note: Section 97 of the Act confers on an applicant who is dissatisfied with the determination of a Consent Authority a right of appeal to the Land and Environment Court exercisable within twelve (12) months after receipt of this Notice.

JMcK

Judy McKittrick
SOUTH/WEST AREA TEAM

COPY

Liverpool City Council

Your reference:
Our reference: P 30.720
Contact: Mr M Carlon: ac
821 9379

1 Hoxton Park Road,
Liverpool, NSW 2170
Tel: 821 9222
Fax: 821 9333
D.X. 5030 Liverpool

28 October 1994

Ferndale Resources Pty Ltd
275 Adams Road
LUDDENHAM 2745

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979.

NOTICE TO APPLICANT OF DETERMINATION OF A DEVELOPMENT APPLICATION.

Being the applicant in respect of Development Application No. 53/94 and pursuant to Section 92 of the Act, Notice is hereby given of the determination by the Consent Authority of the Development Application No. 53/94 relating to:

PROPERTY: LOT 3, D.P. 623799, ADAMS ROAD, LUDDENHAM

The Development Application for establishment of a clay/shale quarry and associated activities and the rehabilitation of the proposed quarry has been determined by **refusing of consent** for the undermentioned reasons:

(1) The adverse advice received from the Department of Planning wherein they advised deficiencies in the Environmental Impact Statement as follows:

- Proximity of the site to Badgerys Creek Airport,
- Potential deterioration of water quality (both surface and ground) in South Creek,
- Water quality damage and also flow regime damage to Oakey Creek,
- Leachate pollution,
- Inadequate buffer zones for the management of run-off,
- Fire protection management including egress and additional water demand capability,
- The inability of the Water Board to provide sewerage facilities,

(2) The overall effect of the development on surrounding residential amenity and environment,

(3) The application is contrary to:

- The draft revised Sydney Regional Environmental Plan No. 9,
- Sydney Regional Development Advisory Committee Advice of 30 March 1994,

(4) The Public Meeting of 15 October 1994 on site was not truly representative of local residents.

Note: Section 97 of the Act confers on an applicant who is dissatisfied with the determination of a Consent Authority a right of appeal to the Land and Environment Court exercisable within twelve (12) months after receipt of this Notice.

Mark Carlon
PRINCIPAL PLANNER

Appendix 5

Landscape Report

R. A. Cole Town Planning Pty. Ltd.

Brink & Co. Pty. Ltd.

LANDSCAPE REPORT

FOR

PROPOSED CLAY/SHALE EXTRACTION

LOT 3 ADAMS ROAD

LUDDENHAM

Prepared for: R.A. Cole Town Planning Pty Ltd
9 Hilar Avenue, Carlingford 2118

Prepared by: Stevens Wallman Associates
Landscape Architects
34 Jersey Road, Woollahra 2025
Telephone: (02) 363.2060 Fax: (02) 363 2725

Date: June 1995

1.0 SITE ANALYSIS (To be read in conjunction with Landscape Analysis Plan Drawing No. 1)

The site slopes gently from the ridge of a hill on the western boundary down to Oakey Creek which defines the eastern boundary.

Approximately one third of the site is occupied by horse yards, stables, sheds and the cleared trotting track.

Slope:

The grades range between 1:20 and 1:40 slope with the exception of the trotting track area which is generally flat except for a centrally located dam.

Vegetation:

Existing vegetation consists of:

1. Grassland of improved pasture and weed growth.
2. Indigenous vegetation consists of small groves of Eucalyptus moluccana (Grey Box) near the existing house and Casuarina cunninghamiana in the stockyards with a dense buffer of the latter either side of the creek. Remnant and occasional on-site examples of trees associated with E. moluccana are E. paniculata and E. tereticornis.

Site Debris:

The area between the trotting track and the creek contains a vast amount of rubbish including disused vehicles and equipment, large plastic bottles, scrap metal, timber and large amounts of reinforced concrete rubble, some of which has been pushed up against tree trunks causing a change in the existing ground level.

Views:

Views out of the site are in the main confined to the adjacent hill line on the eastern and northern boundaries. Views to west are restricted due to the ridge of the hill and views to the south are restricted by vegetation.

2.0 PLANT COMMUNITIES (To be read in conjunction with Landscape Analysis Plan Drawing No. 1)

Existing vegetation will be identified in relation to the functional areas on the site where a plant community no longer exists as such. These areas are as follows:

Area 1 – Stockyards
Area 2 – Trotting Track and Dam
Area 3 – Creek and Associated Dam.

LIST OF PLANT SPECIES

Area 1 – Stockyards

Casuarina cunninghamiana (grove in stock yards)
Eucalyptus moluccana (grove near house)
Grevillea robusta (occasional specimens).

Area 2 – Trotting Track & Dam

Casuarina cunninghamiana (few and poor specimens)
Acacia parramattensis (few in number)
Eucalyptus paniculata (one only)
Juncus bufonius (dam surrounds)

Area 3 – Creek

Casuarina cunninghamiana (dense screens 20 to 30 metres wide. Trees at 1.5 to 2.0 metre centres.)
Eucalyptus tereticornis (2 specimens only)

A former association with Melaleuca linariifolia is evident but this species has died.

– Dam

Absence of Casuarina with aquatic plants only including:

Juncus acutus
Juncus bufonius
Paspalum paspalodes
Triglochin procerum
Typha orientalis

3.0 RECOMMENDATIONS (To be read in conjunction with Landscape Treatments Plan Drwg No. 2 & Landscape Treatments - Sections Drwg No. 3)

3.1 Prior to excavating for the quarry, a maximum amount of site topsoil should be removed and stockpiled separately on site for future use as the final soil layer on all mounds. This will enable the grass seed to germinate and stabilise the mounds, thus preventing erosion and run-off into the creek.

If the natural grasses do not regenerate then the mounds should be hydroseeded with the following mix:

Grass Seed	**Application Rate**
Perennial Rye	25kg/hectare
Japanese Millet (if sown Sept. to March)	25kg/hectare
Rye Corn (if sown April to August)	25kg/hectare
Hard Fescue SR3000	10kg/hectare
Tall Fescue	20kg/hectare
Unhulled Couch	10kg/hectare
White Clover	5kg/hectare
Rhodes or Pioneer	5kg/hectare

3.2 In accordance with recommendations contained in the report, "Clay/Shale quarry & Rehabilitation", prepared by Robert H. Amaral, the mounding to perimeter of the excavation should be a maximum slope of 1:2.5 for 1 metre high mounds and 1:2 for 3 and 4 metre mounds, to ensure stability and plant growth. (Refer Drwg No. 3 for mound details.)

3.3 Plant species on the mounds should be limited to a minimum number of species to provide the desired effect of screening and soil stabilization. The recommended species are:

- Allocasuarina torulosa
- Casuarina cunninghamiana
- Acacia floribunda
- Melaleuca armillaris
- Acacia parramattensis.

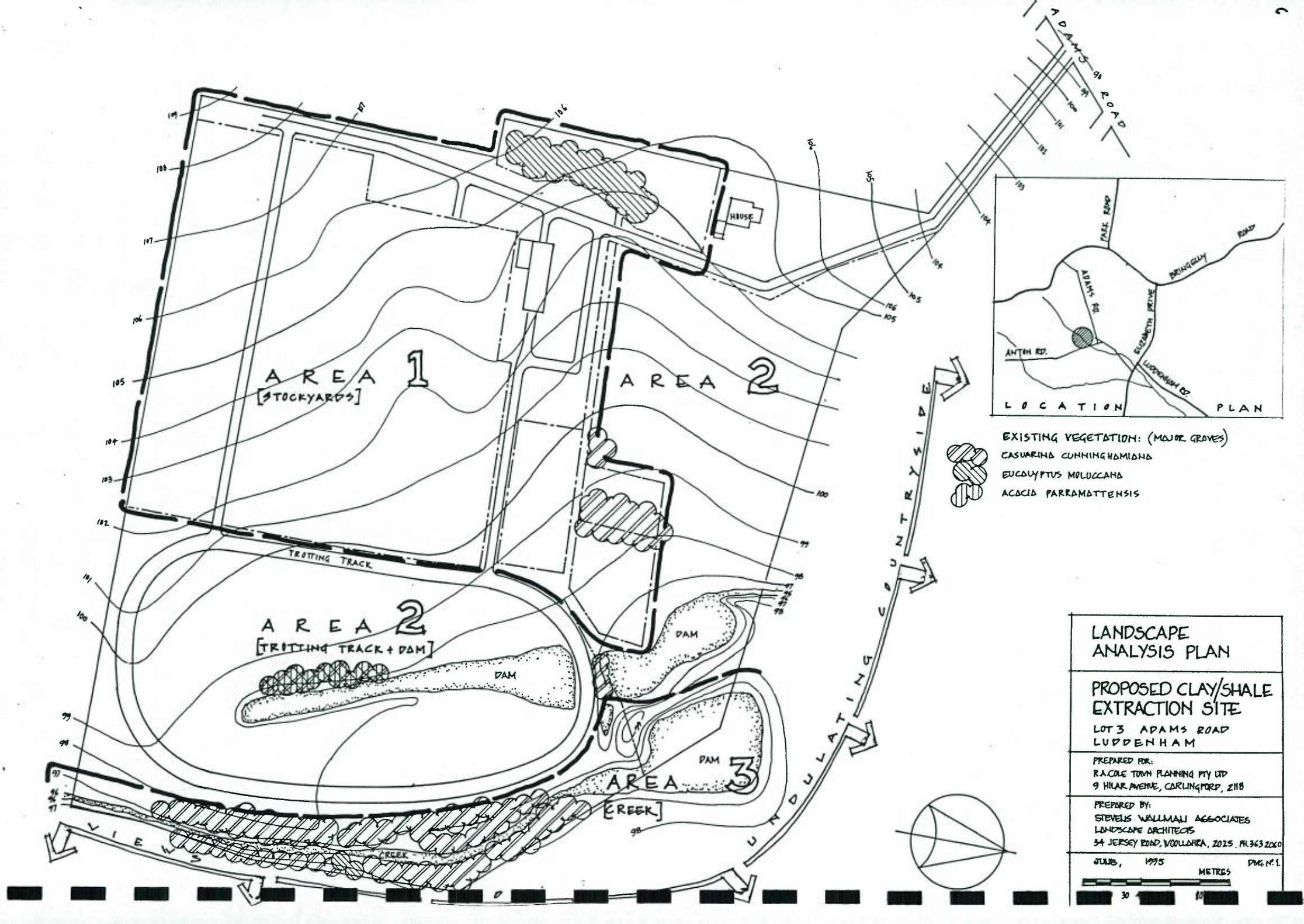
The above species will provide a graduated canopy.

Plants should be grown in 'Longtom' pots and planted at approximately 2 metres centres. The addition of gypsum may be required if the excavated material has a high clay content.

The position of plant species on the top or bottom of the mounds has been considered in relation to their moisture requirements. (Refer Drwg No. 2).

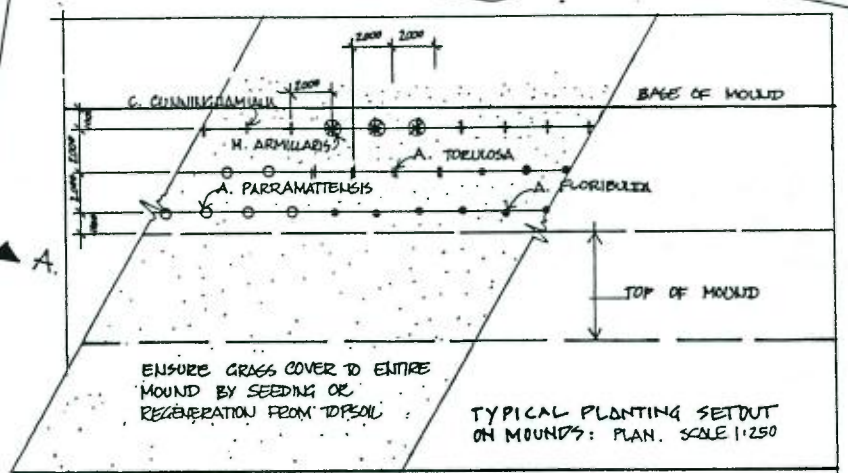
3.4 The filled quarry areas shall be grass seeded on completion of each of the four stages.

3.5 Existing debris along the creek should be removed and in particular, the concrete banked against the trunks on some Casuarinas.


ADAMS ROAD
HOUSE
AREA 1
[STOCKYARDS]
AREA 2
TROTTING TRACK
AREA 2
[TROTTING TRACK + DAM]
DAM
DAM
DAM
AREA 3
[CREEK]
CREEK
UNDULATING COUNTRYSIDE
VIEWS
FAKE ROAD
BRINGELLY ROAD
ADAMS RD
ELIZABETH DRIVE
ANTON RD.
LUDDENHAM RD.
LOCATION PLAN
EXISTING VEGETATION: (MAJOR GROVES)
CASUARINA CUNNINGHAMIANA
EUCALYPTUS MOLUCCANA
ACACIA PARRAMATTENSIS
LANDSCAPE ANALYSIS PLAN
PROPOSED CLAY/SHALE EXTRACTION SITE
LOT 3 ADAMS ROAD
LUDDENHAM
PREPARED FOR:
R.A.COLE TOWN PLANNING PTY LTD
9 HILAR AVENUE, CARLINGFORD, 2118
PREPARED BY:
STEVENS WALLMAN ASSOCIATES
LANDSCAPE ARCHITECTS
34 JERSEY ROAD, WOOLLAHRA, 2025. PH.363 2060
JULIB, 1995
DWG. N°. 1.
METRES
30

TYPICAL PLANTING:
ACACIA FLORIBUNDA
MELALEUCA ARMILLARIS
ALLOCASUARINA TORULOSA
CASUARINA CUNNINGHAMIANA
ACACIA PARRAMATTENSIS

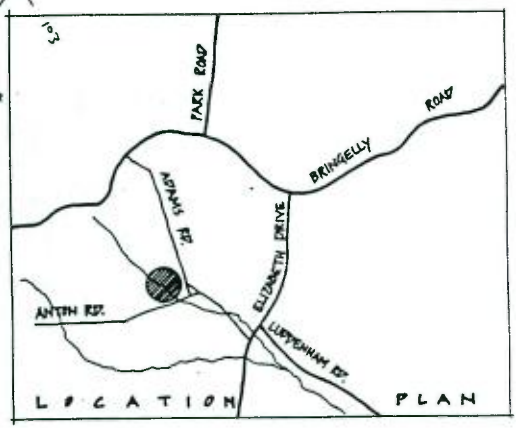
TYPICAL PLANTING:
ACACIA FLORIBUNDA
MELALEUCA ARMILLARIS
ALLOCASUARINA TORULOSA
ACACIA PARRAMATTENSIS



TYPICAL PLANTING SETOUT ON MOUNDS: PLAN. SCALE 1:250

QUARRY SITE

4 STAGES - GRASS SEED FILLED AREA ON COMPLETION OF EACH STAGE



LEGEND

EXISTING VEGETATION TO BE RETAINED

PROPOSED PLANTING AREAS ON BUFFER MOUNDS

PROPOSED PLANTING ALONGSIDE CREEK + DAM

DRAINAGE SWALES

TYPICAL PLANTING:
ACACIA FLORIBUNDA
MELALEUCA ARMILLARIS
ALLOCASUARINA TORULOSA
ACACIA PARRAMATTENSIS

TYPICAL PLANTING:
MELALEUCA ARMILLARIS
CASUARINA CUNNINGHAMIANA

EXTEND PLANTING ALONGSIDE CREEK + DAM

PROTECT AND RETAIN EXISTING GROVES OF TREES.

DAM

CREEK

LANDSCAPE TREATMENTS PLAN

PROPOSED CLAY/SHALE EXTRACTION SITE

LOT 3 ADAMS ROAD
LUDDENHAM

PREPARED FOR:
RAECLE TOWN PLANNING PTY LTD
9 HILOR AVENUE, CARLINGFORD, 2118

PREPARED BY:
STEVELIS VALLIMALI ASSOCIATES
LANDSCAPE ARCHITECTS
34 JERSEY ROAD, WOOLLAHRA 2025 PH. 363 200

JUNE 1995
AMENDED JULY 95

DWG. NO. 2

METRES
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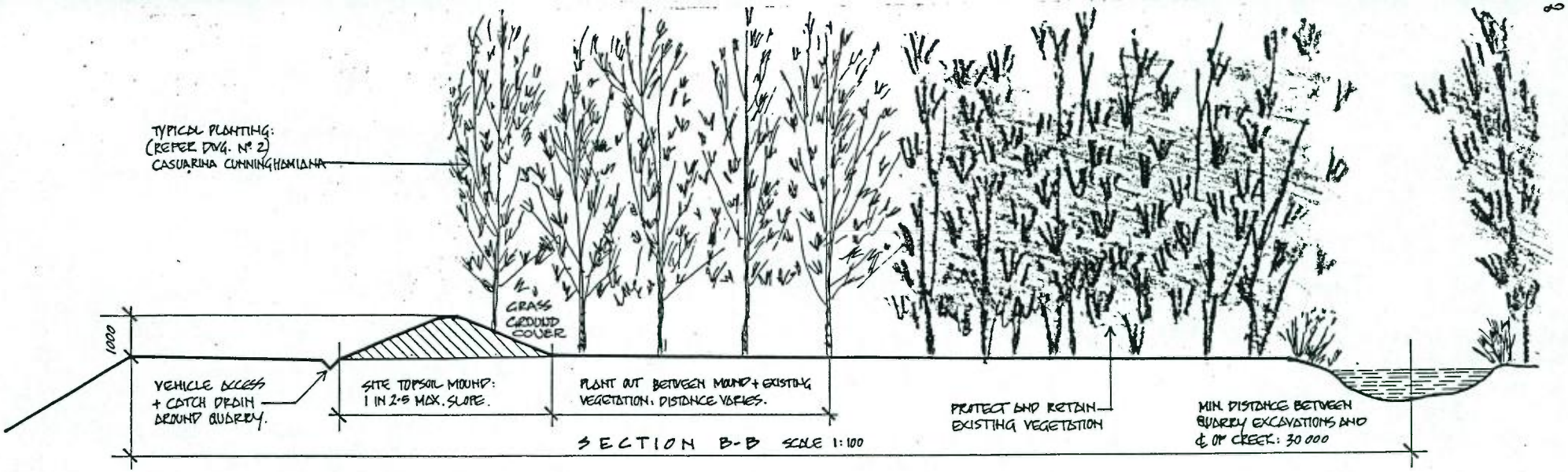

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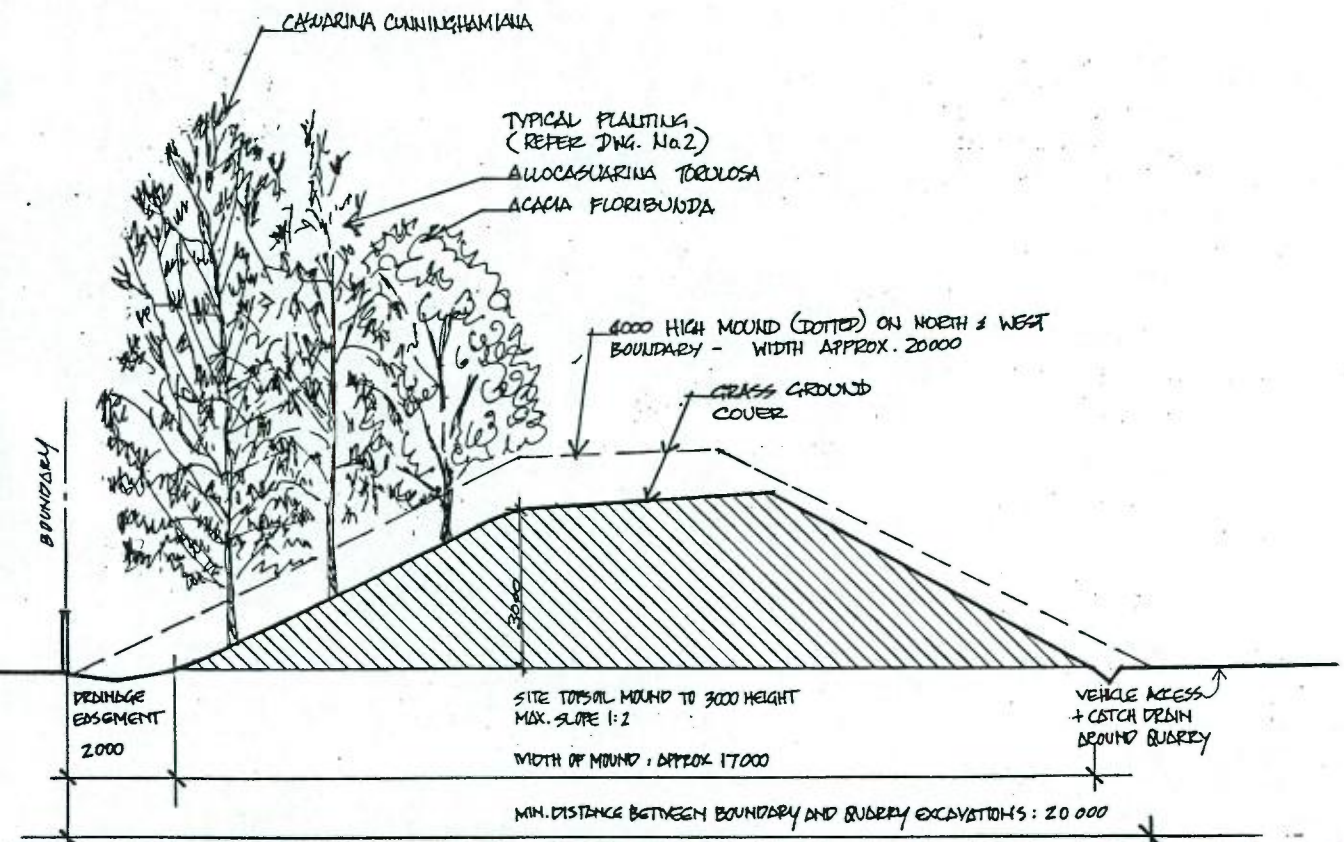

SECTION A-A

LANDSCAPE TREATMENTS: SECTIONS

PROPOSED CLAY/SHALE EXTRACTION SITE

LOT 3 ADAMS ROAD
LUDDENHAM

PREPARED FOR:
R.A. COLE TOWN PLANNING PTY LTD
9 HILGA AVENUE, CARLINGFORD, 2118

PREPARED BY:
STEVENS WALLMAN ASSOCIATES
LANDSCAPE ARCHITECTS
34 JERSEY ROAD, WOOLLAHRA 2025 Ph 363 2060

JUNE, 1995 DWG. Nº 3

REVISED: JULY 95

Appendix 6

Noise Impact Assessment

R. A. Cole Town Planning Pty. Ltd. *Brink & Co. Pty. Ltd.*

PROPOSED QUARRY
and
LANDFILL

Adams Road,
Luddenham

Noise Assessment

For:
Kolback Environmental Services Limited

Approved by:	*Terry Perram*
Position:	*Project Director*
Signed:	
Date:	*28 July 1995*

Prepared by:	*Claire Richardson*
Position:	*Associate, Acoustics*
Signed:	
Date:	*28 July 1995*

July 1995
95142RP2

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EXISTING ACOUSTIC ENVIRONMENT

NOISE ASSESSMENT

1

INTRODUCTION

1.1 BACKGROUND

The purpose of this study is to update two noise assessments performed previously for proposed quarrying and landfill operations at Lot 3 D.P. 623799, Adams Road, Luddenham. These noise assessments were reported in two Environmental Impact Statements - Cole 1994, and ERM Mitchell McCotter, 1994.

When compared with the previous proposals, the current quarry/landfill proposals involve intensified operations at the site. Further detailed assessment of the potential for noise impacts is therefore necessary. In addition, since the earlier noise investigations, revised noise criteria have been issued by the EPA. These changes have also been taken into account in the following assessment.

Details of the proposed operations at the site are set out in report no. 95142RP1 - "Proposed Quarry Rehabilitation, Adams Road, Luddenham: Environmental Impact Statement".

1.2 POTENTIAL NOISE IMPACTS

In terms of noise impacts from the quarry/landfill operations there are two issues of potential concern. Firstly, noise will be emitted by mobile plant excavating the quarry and depositing and consolidating landfill material. Secondly, noise from vehicles accessing the site via the existing site access road may lead to impacts at nearby properties.

Both of these issues are considered in detail in the noise assessment and factors such as existing background noise levels and proximity to sensitive receptors are taken into account.

2

EXISTING ACOUSTIC ENVIRONMENT

2.1 POTENTIALLY SENSITIVE RECEPTORS

The proposed site is located in a predominantly rural area with very few properties in the immediate surroundings. The nearest residential receptors to the site are identified in *Figure 2.1.* In addition, owing to the proposal to develop Badgerys Creek Airport, many of the existing nearby properties have been purchased by the Federal Airports Corporation (FAC).

A sports facility, the Hibernian Shooting Club, is located immediately west of the proposed site. A six metre earth bund has recently been erected to the rear of the shooting club which would provide some acoustic shielding for noise emitted from the quarry/landfill. Although some activities which take place in the clubhouse could be considered to be noise-sensitive, these are likely to be restricted to evenings and possibly weekends. With the exception of Saturdays between 7.00 am and 4.00 pm operations will not take place at the quarry/landfill site during these periods. Hence this location will not be considered for the purpose of noise assessment.

2.2 EXISTING NOISE CLIMATE

2.2.1 Introduction

Two datasets of baseline noise levels are available for the proposed site and the immediate surrounding area. Short-term ambient noise measurements were undertaken in 1991 for the original quarry EIS (Cole 1994). In relation to the current proposals, more extensive continuous monitoring over a five day period was carried out in June 1995. These datasets are discussed in *Sections 2.2.2 and 2.2.3* respectively.

Since environmental noise levels vary with time, statistical descriptors are adopted to describe the noise environment. The L_{10} noise level represents the level which is exceeded for 10 per cent of the time, and is approximately the average of the maximum noise levels. The L_{90} level is the level which is exceeded for 90 per cent of the time, and is approximately the average of the minimum noise levels. The L_{90} level is often referred to as the background noise level. The L_{eq} level represents the average noise energy during a measurement period. These statistical descriptors are used in the following discussion of baseline noise levels and in the subsequent noise assessment.

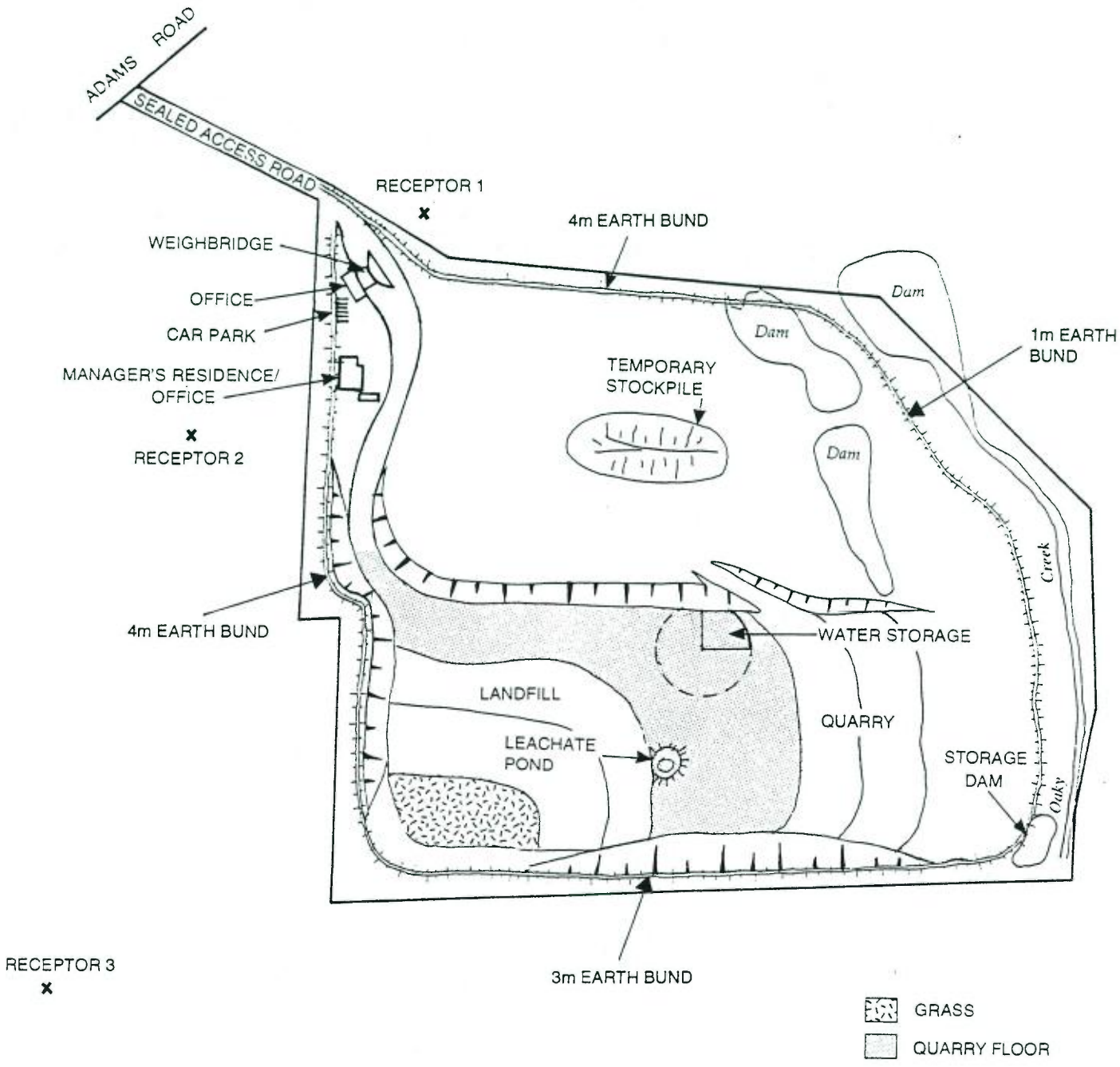

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Figure 2.1 RECEPTOR POSITIONS AND MITIGATION MEASURES

N

0 100m

2.2.2 *Preliminary Sample Measurements*

A summary of the monitoring performed for the original quarry EIS (Cole, 1994) follows. The original report should be referred to for more detailed information.

Noise measurements took place on 18, 23 and 24 December 1991. 15-minute sample measurements were conducted at the following four locations:

- Location M1, 285 Adams Road;
- Location M2, 265 Adams Road;
- Location M3, residence located off Jackson Road and since purchased by the Federal Airports Corporation as part of the Badgery's Creek Airport proposals;
- Location M4, residence located off Elizabeth Drive and since purchased by the Federal Airports Corporation as part of the Badgery's Creek Airport proposals.

Table 2.1 presents the noise levels recorded at the four measurement locations.

Table 2.1 SUMMARY OF MEASURED NOISE LEVELS

Location	Date	Start Time	Statistical Noise Levels, dB(A)		
			L_{eq}	L_{10}	L_{90}
M1 and M2	18/12/91	0955	44.2	45.0	36.5
	23/12/91	1335	46.4	48.0	38.0
	23/12/91	1740	51.1	50.5	43.0
	24/12/91	0845	53.6	47.0	38.0
M3	18/12/91	1205	43.7	47.5	36.5
	23/12/91	1314	55.5	52.0	35.5
	23/12/91	1800	48.2	48.0	42.0
	24/12/91	0829	59.3	55.0	41.5
M4	23/12/91	1214	42.5	46.0	37.0
	23/12/91	1715	48.7	51.5	45.5
	24/12/91	0920	45.0	47.5	40.5
M4 [(a)]	23/12/91	1214	65.8	69.5	42.8
	23/12/91	1646	65.7	69.0	45.5
	24/12/91	0808	63.2	67.5	42.0

[(a)] *Additional monitoring position at Elizabeth Drive.*

2.2.3 *Continuous Measurements*

More extensive monitoring was undertaken over the period 22nd - 26th June 1995 at three positions in the vicinity of the proposed site (refer to *Figure 2.2)*:

- Position 1: western boundary of site to the rear of Hibernian Shooting Club;
- Position 2: adjacent to existing access road; and
- Position 3: northern boundary of Hibernian Shooting Club site, adjacent to 265 Adams Road.

These positions were selected to provide data representative of the locality.

Acoustic Research Laboratories noise loggers were used for the 1995 measurements and were calibrated before and after the monitoring took place. Continuous sample measurements were obtained over the five-day monitoring period with results stored for each 15-minute period. Observations made during the noise monitoring exercise indicate that the existing noise climate is rural. The predominant noise sources were distant traffic noise from Elizabeth Drive and vehicles accessing the produce/stabling business currently occupying the site.

The results of the monitoring are presented graphically in *Appendix A*. It can be seen that the recorded noise levels are similar to those observed during the previous monitoring. Taking account of data from all three monitoring positions, a typical minimum background L_{90} noise level of approximately 34 dB(A) was recorded during the daytime. This is a little lower than the minimum value of 35.5 dB(A) in *Table 2.1*, which is based on a more limited sample of measurement periods.

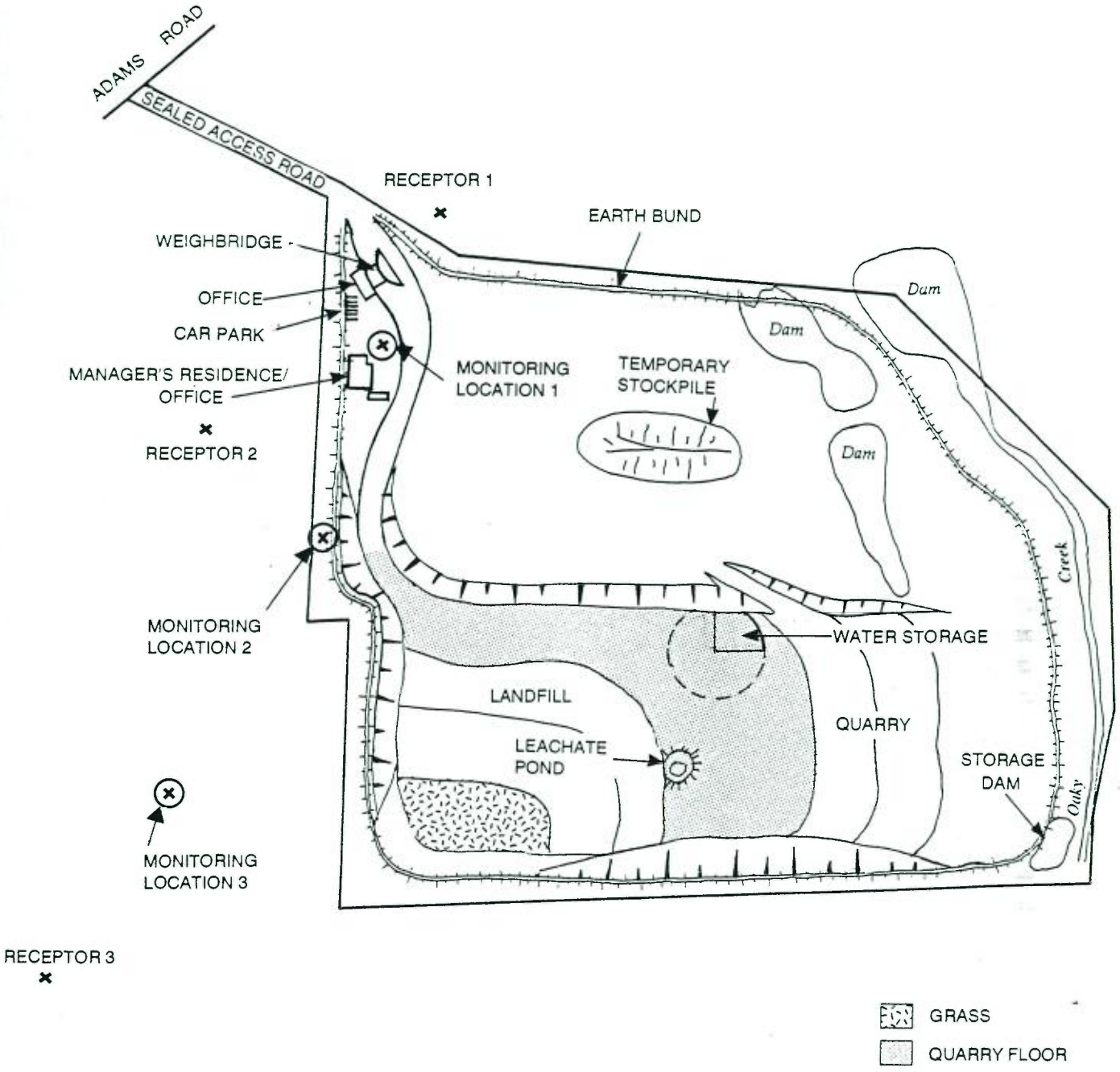

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Figure 2.2 NOISE MONITORING POSITIONS

3

ASSESSMENT CRITERIA

3.1 QUARRY/LANDFILL OPERATIONS

3.1.1 Original Recommended Criteria

Guidance in relation to appropriate criterion to adopt for this site was provided by the then State Pollution Control Commission (SPCC) in 1992 (refer to *Appendix B*). The recommended criterion was an $L_{90,15\text{-min}}$ level of 43 dB(A) and an $L_{10,15\text{-min}}$ level of 48 dB(A). These criteria were based on an assumed existing background noise level of 40 dB(A) for a rural land use zoning.

In addition , the SPCC specifically noted that, due to the proposals for the Badgerys Creek Airport, the proposed noise criterion would be reviewed and possibly relaxed in subsequent years due to the potential for increased ambient noise levels in the locality.

The Environment Protection Authority (EPA) has advised that reference should be made to the latest EPA guidelines for landfill sites and environmental noise control (Refer to Appendix C). The benchmark noise control criteria of 50dB(A) L_{10} specified in these guidelines is similar to the 48 dB(A) L_{10} criteria originally recommended by the SPCC.

3.1.2 Current Quarry Noise Criteria

Guidance relating to noise from quarrying operations is provided in the EPA's Environmental Noise Control Manual. In general, it is recommended that L_{10} noise levels from any new source should not exceed the existing L_{90} background noise level by more than 5 dB. Given that the detailed noise data obtained as part of this study recorded a typical minimum $L_{90,\ 15\text{-min}}$ noise level of 34 dB(A), this implies that the L_{10} noise level from quarrying operations should not exceed 39 dB(A) at any residence.

Where the existing background noise level is already high, the EPA recommends further restrictions to ensure that it is not increased further. However, in this case the existing level of 34 dB(A) is well below the EPA's maximum acceptable level of 45 dB(A) for a rural area during the daytime, and hence these additional considerations are not relevant.

The above criterion is 9 dB(A) below the limit of 48 dB(A) L_{10} originally recommended by the SPCC for the proposed quarrying operations.

3.1.3 Landfill Noise Criteria

The EPA has recently issued revised draft guidelines relating to environmental management at landfill sites (EPA, June 1995). In terms of noise impacts, unless other criteria are specified under an existing Noise Control Act Licence, the noise generated from the site must not exceed an L_{10} sound pressure level of 50 dB(A) (daytime) measured one metre from any residential boundary or other noise sensitive area. In addition, the operator is required to ensure that the noise emanating from the site does not exceed an L_{10} sound pressure level of 70 dB(A) at the site boundary.

3.2 VEHICLE MOVEMENTS

The EPA in its Environmental Noise Control Manual indicates that for low or intermittent traffic flow in rural areas, the noise level at residences as a result of traffic movements should not exceed an L_{eq} value of 50 dB(A) during the worst hour, for new developments. This criterion takes into account both the maximum noise level of passing vehicles and the number of events per hour.

3.3 SUMMARY

In summary, the following criteria are adopted for assessment of potential noise impacts at nearby residential properties.

- *Quarrying phase only:* During the initial phase of operations when landfilling has not commenced, an L_{10} noise criterion of 39 dB(A) is adopted;
- *Landfilling phases:* During subsequent phases of the operations when landfilling occurs - often in conjunction with quarrying - an L_{10} noise criterion of 50 dB(A) is adopted for all noise from the site;
- *Vehicle movements:* For vehicles accessing the site via the site haul road a maximum L_{eq} noise criterion of 50 dB(A) is adopted.

4

NOISE ASSESSMENT

4.1 INTRODUCTION

Prior to commencing operations at the site, earth bund walls would be constructed on the site boundaries. The bunds will be constructed to a minimum effective height of four metres on the northern and eastern perimeters three metres along the southern boundary and one metre on the eastern boundary. It is envisaged that the bund walls will be constructed over a three week construction period using materials excavated from the first quarrying area.

The proposed hours of operation for the quarry/landfill are Monday to Friday between 7.00 am and 5.00 pm, and Saturday between 7.00 am and 4.00 pm.

4.2 QUARRYING OPERATIONS

Details of the plant to be used for the quarrying operations are provided in *Table 4.1* along with assumed sound power levels. There are no proposals to undertake blasting as part of the quarrying operations.

Table 4.1 QUARRYING PLANT AND ASSUMED SOUND POWER LEVELS

Equipment	Sound Power Level, dB(A)
Caterpillar 631 scraper	118*
Caterpillar 966 front-end loader	110*
Water cart	102
25 tonne truck	108

* *This equipment is fitted with a residential class muffler.*

For the purposes of the assessment a worst case operating scenario is assumed in which the scraper, loader and water cart are continuously operated.

4.3 LANDFILLING OPERATIONS

Noise associated with filling operations will be generated by a bulldozer, a compactor, a water cart and approximately two trucks moving around the site. Assumed sound power levels for these are given in *Table* 4.2, below.

Table 4.2 LANDFILL PLANT AND ASSUMED SOUND POWER LEVELS

Equipment	Sound Power Level, dB(A)
Bulldozer, D6	114*
Compactor, 816	114*
Water Cart	107
Truck	108

* *This equipment is fitted with a residential class muffler.*

On the basis of proposed operational conditions, as in the previous assessments (Cole 1994, ERM Mitchell McCotter), it is assumed that the bulldozer will not operate at the same time as the compactor or the water cart. In calculating noise levels at the residences, the maximum expected noise level is taken as that due to the compactor and two trucks emitting their maximum noise level.

For both the quarry and landfill plant, the L_{10} noise level will be somewhat lower than the maximum level due to the fact that items of equipment will not operate at the maximum noise level simultaneously. Typically, the difference between maximum and L_{10} noise levels for plant of this type is 5 dB. Hence, in calculating the L_{10} noise levels, 5 dB was subtracted from the maximum levels presented above.

4.4 PREDICTED NOISE LEVELS

On the basis of the proposed operating schedule for the lifetime of the quarry/landfill, noise levels have been calculated for the following representative scenarios:

- Scenario 1: Area 1, quarrying only.
- Scenario 2: Landfill area 1, quarrying area 2.
- Scenario 3: Landfill area 2, quarrying area 3.
- Scenario 4: Landfill area 3, quarrying area 4.

- Scenario 5: Area 4, landfill only.

Details of the working areas are presented in *Figure 4.1.*

For each of these scenarios, noise levels will vary depending on the height at which equipment is operating. To indicate the range of expected noise levels in each case, calculations have been performed for a series of likely operating schedules:

- Schedule 1: both quarry and landfill plant operating at existing ground height (absolute worst case).

- Schedule 2: quarry plant operating at existing ground height and landfill plant operating at the bottom of the quarry, 30 metres below existing ground height.

- Schedule 3: landfill plant operating at existing ground height and quarry plant operating at the bottom of the quarry, 30 metres below existing ground height.

- Schedule 4: both quarry and landfill plant operating at the first bench level, approximately 10 - 15 metres below existing ground level.

- Schedule 5: both quarry and landfill plant operating at the bottom of the quarry, 30 metres below existing ground level.

On the basis of the assumed noise levels and the proposed operating schedule for the site, noise level predictions have been performed using the Environmental Noise Model (ENM) computer programme. This noise prediction methodology is approved by the EPA. In the modelling, factors such as the distance separating the noise source and receptor, shielding by bunds and topographic features, and the "ground effect" have all been taken into consideration. The predicted L_{10} noise levels at three neighbouring residential properties have been calculated for neutral atmospheric conditions as recommended by the EPA.

The nearest receptors to the proposed site are considered in the modelling, as follows:

- Receptor 1: 285 Adams Road;

- Receptor 2: 265 Adams Road; and

- Receptor 3: residential property off Jacksons Road.

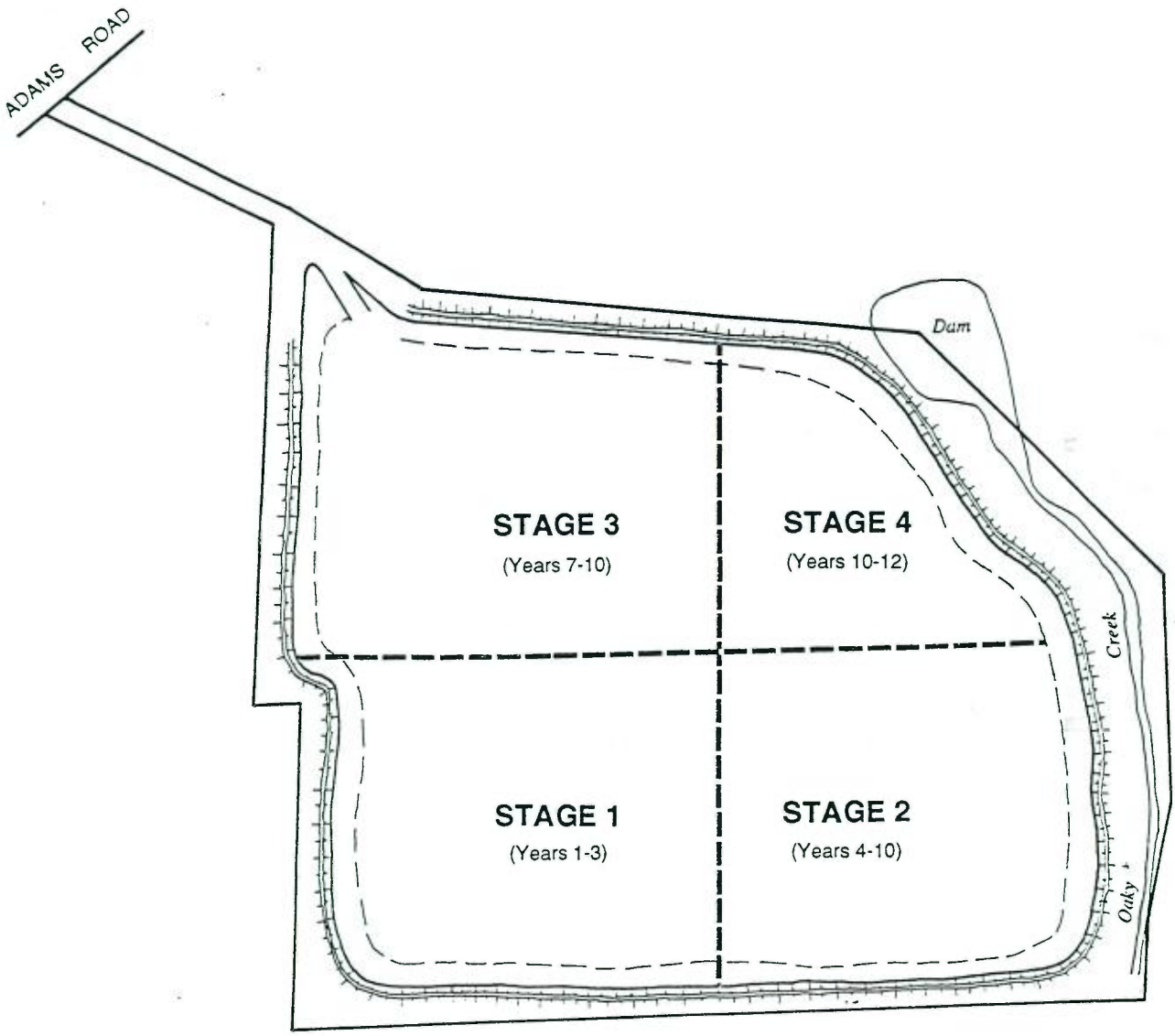

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Figure 4.1 STAGES OF OPERATION

These receptor positions are identified on *Figure 2.1.*

Results of the noise modelling are presented in *Tables 4.1 to 4.5.*

Table 4.1 CALCULATED NOISE LEVELS, dB(A) - SCENARIO 1

Plant Schedule	Receptor 1	Receptor 2	Receptor 3	Criterion
Schedule 1 (Quarry Plant only)	41.2	45.4	38.5	39
Schedule 4 (Quarry Plant Only)	37.5	33.7	26.0	39
Schedule 5 (Quarry Plant Only)	34.1	31.3	25.5	39

Table 4.2 CALCULATED NOISE LEVELS, dB(A) - SCENARIO 2

Plant Schedule	Receptor 1	Receptor 2	Receptor 3	Criterion
Schedule 1	41.3	44.0	37.2	50
Schedule 2	39.1	32.7	32.6	50
Schedule 3	39.3	37.1	35.9	50
Schedule 4	38.8	42.6	29.9	50
Schedule 5	35.1	39.6	27.1	50

Table 4.3 CALCULATED NOISE LEVELS, dB(A) - SCENARIO 3

Plant Schedule	Receptor 1	Receptor 2	Receptor 3	Criterion
Schedule 1	49.2	49.4	36.4	50
Schedule 2	49.2	36.4	35.7	50
Schedule 3	37.9	39.5	30.2	50
Schedule 4	41.1	37.4	30.4	50
Schedule 5	36.9	49.4	25.9	50

Table 4.4 CALCULATED NOISE LEVELS, dB(A) - SCENARIO 4

Plant Schedule	Receptor 1	Receptor 2	Receptor 3	Criterion
Schedule 1	46.3	48.3	35.8	50
Schedule 2	39.5	36.2	31.1	50
Schedule 3	45.8	38.6	34.4	50
Schedule 4	39.1	48.1	27.0	50
Schedule 5	35.9	38.5	24.2	50

Table 4.5 CALCULATED NOISE LEVELS, dB(A) - SCENARIO 5

	Receptor 1	Receptor 2	Receptor 3	Criterion
Landfill at existing ground level	39.5	40.8	35.0	50
Landfill at finished height	43.4	49.0	42.9	50

The predictions demonstrate that, in almost all cases, the relevant criteria are achieved at the nearest residential receptors.

For scenario 1, exceedances of the 39 dB(A) L_{10} criterion for quarry noise are predicted to occur at receptors 1 and 2 during the initial quarrying stages. However, the duration of the exceedance is expected to be limited to less than three months, and maximum exceedance is 6.4 dB(A). Maximum noise levels are 5 dB(A) below the criterion of 50 dB(A) for noise from landfill sites which applies for subsequent stages of the work.

For model scenarios 2 to 5, predicted L_{10} noise levels are within the criterion of 50 dB(A) for landfill operations in all cases.

Throughout the operation, liaison would be maintained with neighbouring residents, who would be informed prior to the commencement of any activities on the site which would generate unusually high noise levels.

The fact that future land use changes may occur in the locality as a result of the development of Badgerys Creek Airport may also influence the potential for impacts at later stages of the project. As a result, it may be appropriate to review the potential noise impact of the quarry prior to commencement of the more intense stages of operation (model scenarios 3 and 4).

4.5 VEHICLE NOISE

Maximum truck movements associated with the development will occur when quarrying and land filling operations are carried out simultaneously. During this phase of operations it has been estimated that there will be an average of 48 truck movements per hour.

Elizabeth Drive is one of the main arterial roads of the area. The additional truck movements from the quarrying and filling operation will cause negligible noise impact along Elizabeth Drive.

The main area of noise impact due to truck movements from the quarrying and landfilling operation will be at residences adjacent to the site access road. Residences worst affected by truck noise from the access road are receptors 1 and 2 (*Figure 2.1*).

The United States Federal Highways Traffic Noise Prediction methodology was used to model $L_{eq,1hr}$ noise levels due to truck operations at the nearest residences. Results of the predictions are shown below in *Table 4.6*. The noise calculations take account of the effect of bund walls around the site as described above.

Table 4.6 CALCULATED TRUCK NOISE LEVELS

Location	$L_{eq,1hr}$, dB(A)	Criterion	Complies Yes/No
Receptor 1	60	50	No
Receptor 2	48	50	Yes

The calculated noise levels significantly exceed the recommended criterion at receptor 1 (285 Adams Road). To protect this residence from truck noise from the access road, it is necessary that the four metre bund wall to the north of the site be extended along the roadway, either as a bund or as a fence constructed from solid lapped and capped timber, masonry or similar material. To provide adequate shielding, the barrier should extend at least 100 metres along the access road toward Adams Rd.

5

CONCLUSIONS

5.1 QUARRYING AND LANDFILL OPERATIONS

To control noise from these operations it is necessary for earth bunds at least 4 metres high to be constructed on the northern and western boundaries of the site, as indicated in *Figure 2.1.*

Appropriate noise criteria for each phase of operations have been derived on the basis of EPA guidelines. Noise predictions for each phase of the proposed operations have been performed and indicate that with the recommended noise control measures, the relevant long-term criterion will generally be met at all surrounding residences. During the initial phase of quarrying operations, the criterion for noise from these operations is predicted to be exceeded by up to 6.4 dB. However, this exceedance is predicted to be limited to at most three months, and predicted noise levels are within the criterion for landfill operations which will apply for subsequent phases of the development.

For other stages of the propsoed development, predicted noise levels are within the relevant criteria in all cases.

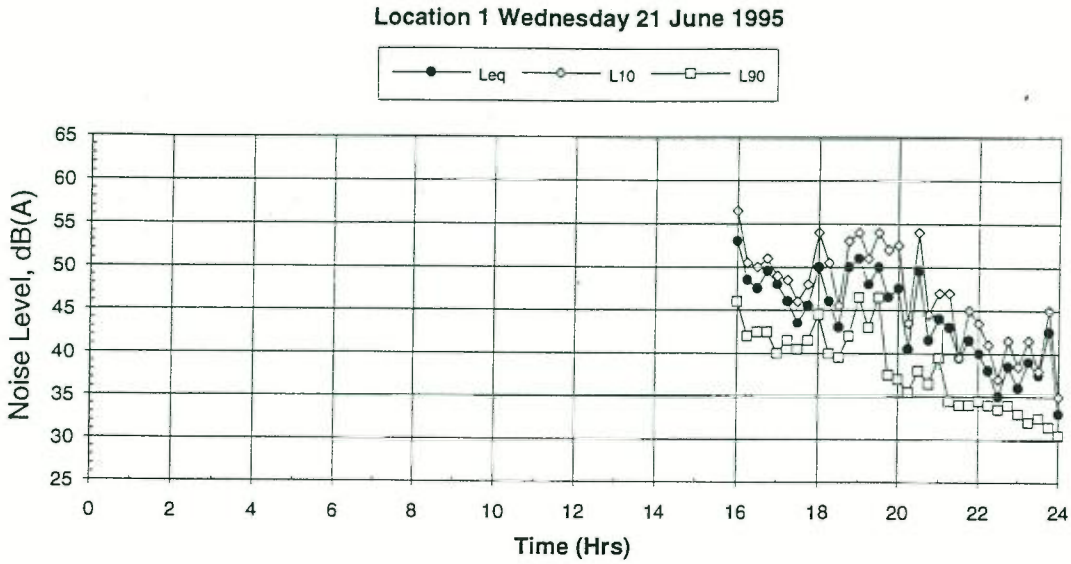
5.2 VEHICLE NOISE

To control noise from vehicles entering and leaving the site, it is necessary for the earth bund on the northern boundary of the site to be extended using a barrier at least 100 m along the northern side of the access road, as indicated in *Figure 2.1.* The barrier could consist of an earth bund or a solid timber fence.

With the above measure, predicted noise levels from trucks entering and leaving the site will be within the recommended criterion of 50 dB(A) $L_{eq,1hr}$ at all residences, and are therefore considered acceptable.

Appendix A

BASELINE NOISE MONITORING RESULTS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L10
L90
Noise Level, dB(A)
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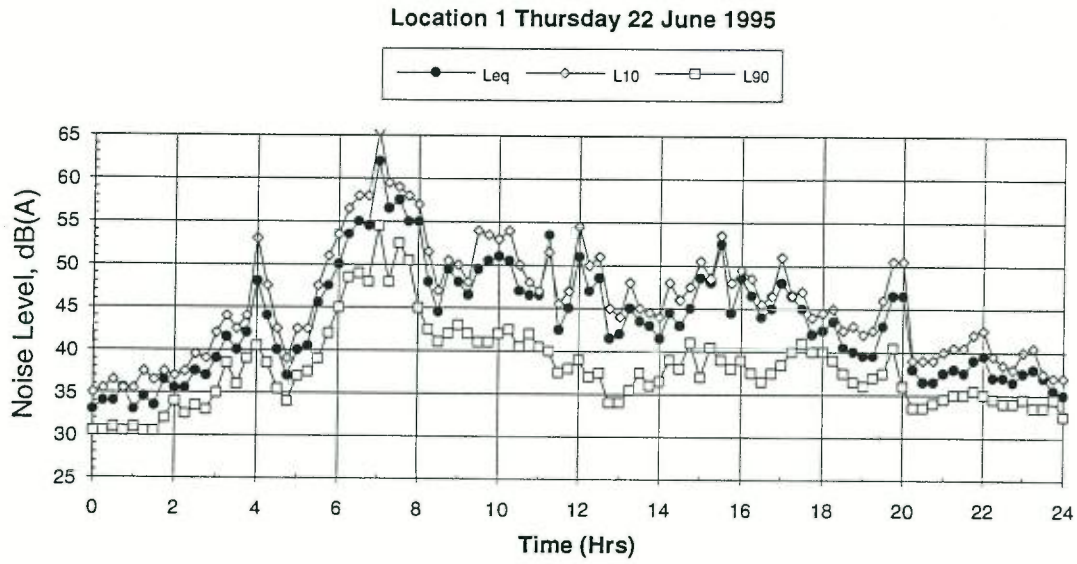
6
8
10
12
14
16
18
20
22
24
Time (Hrs)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L90
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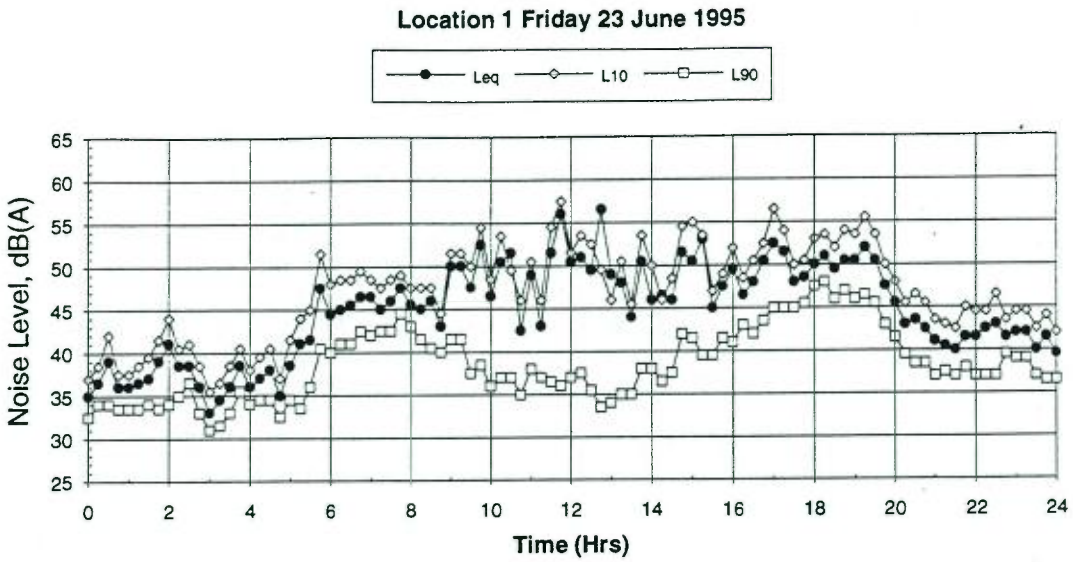
Time (Hrs)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L10
L90
Noise Level, dB(A)
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10
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20
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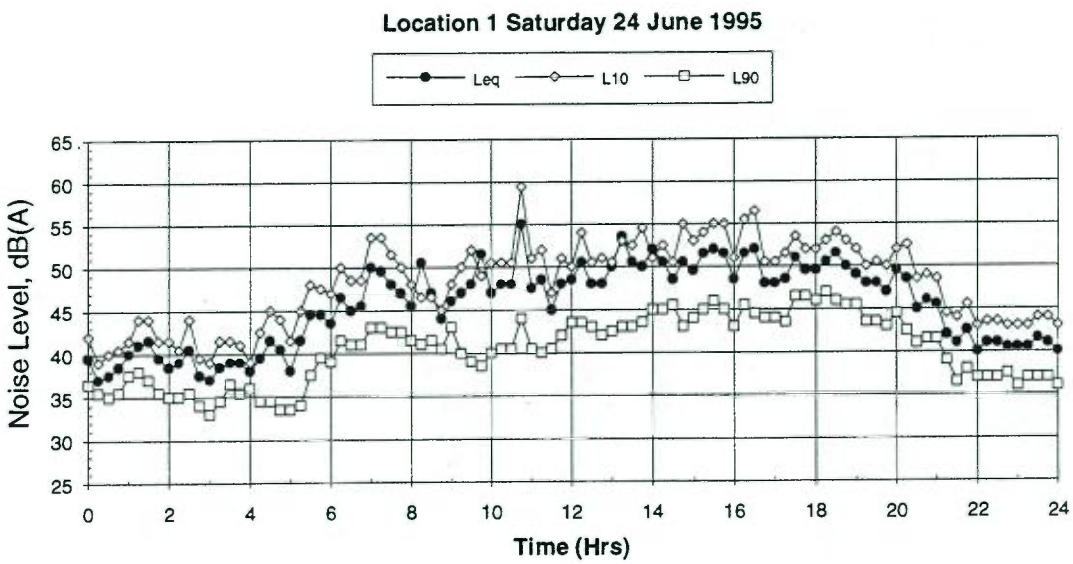
24
Time (Hrs)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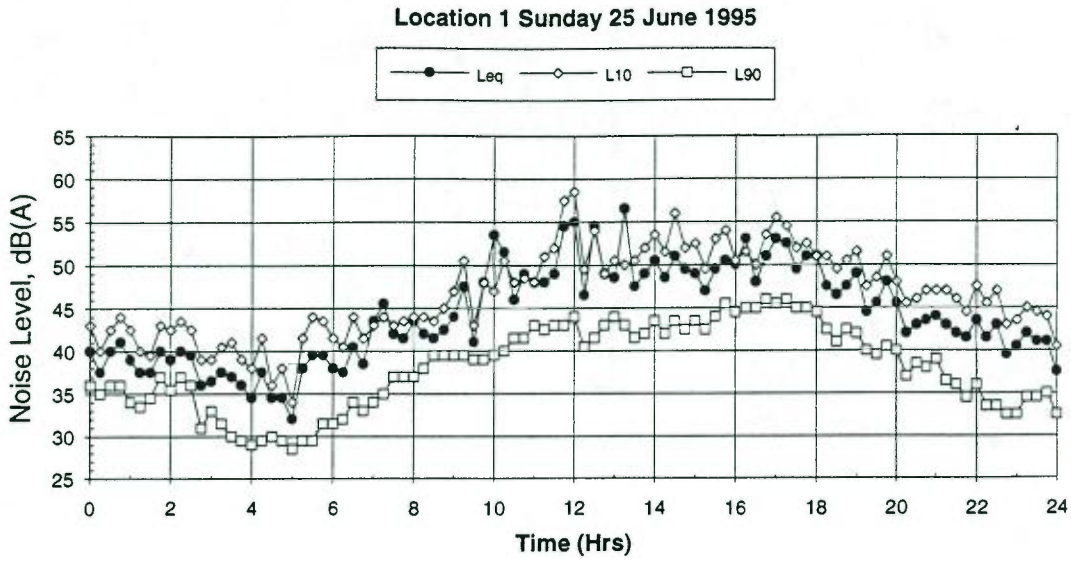
Time (Hrs)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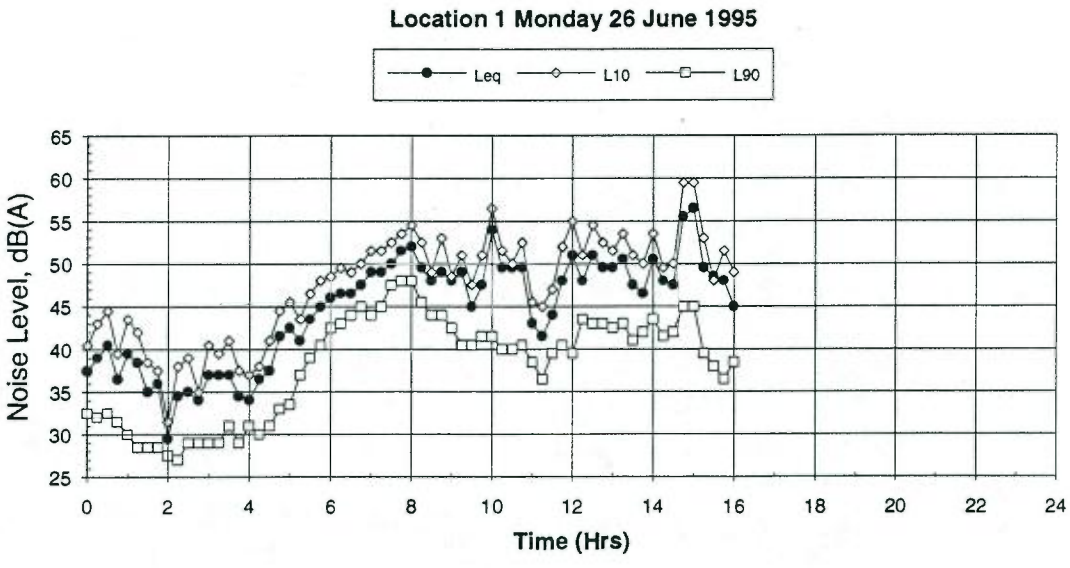
18
20
22
24
Time (Hrs)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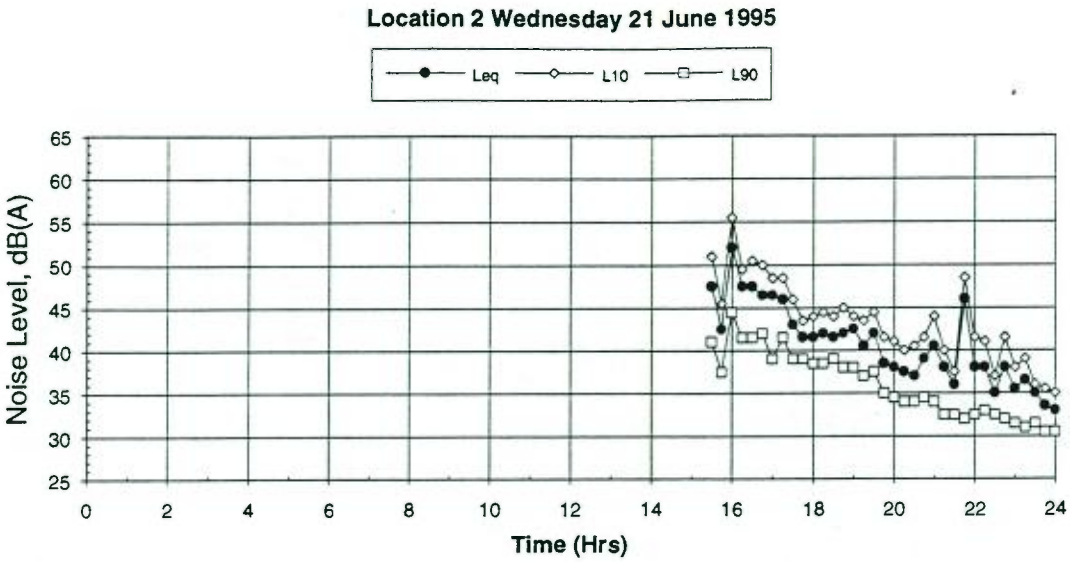
24
Time (Hrs)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L10
L90
Noise Level, dB(A)
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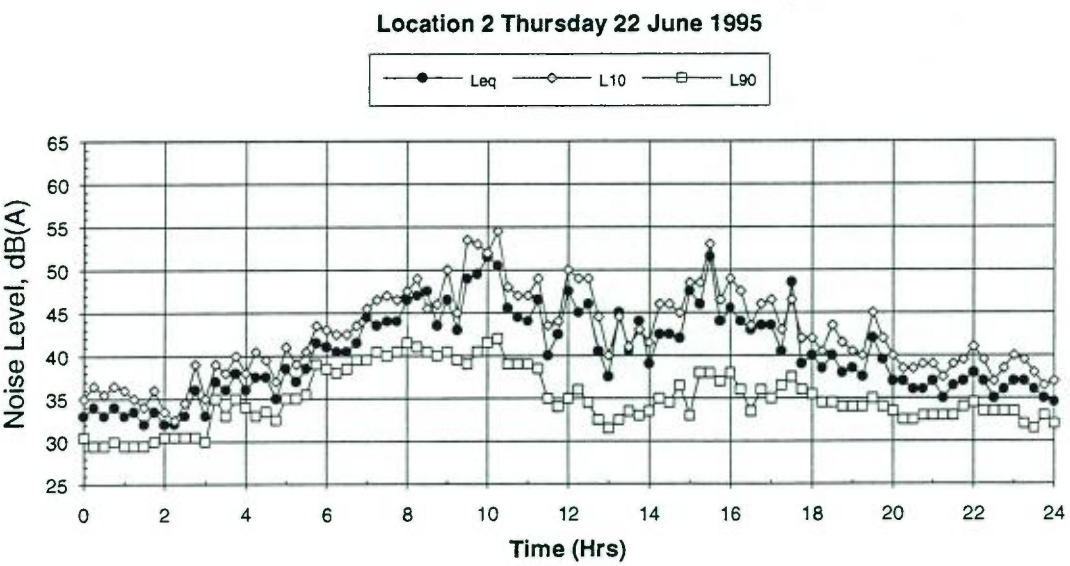
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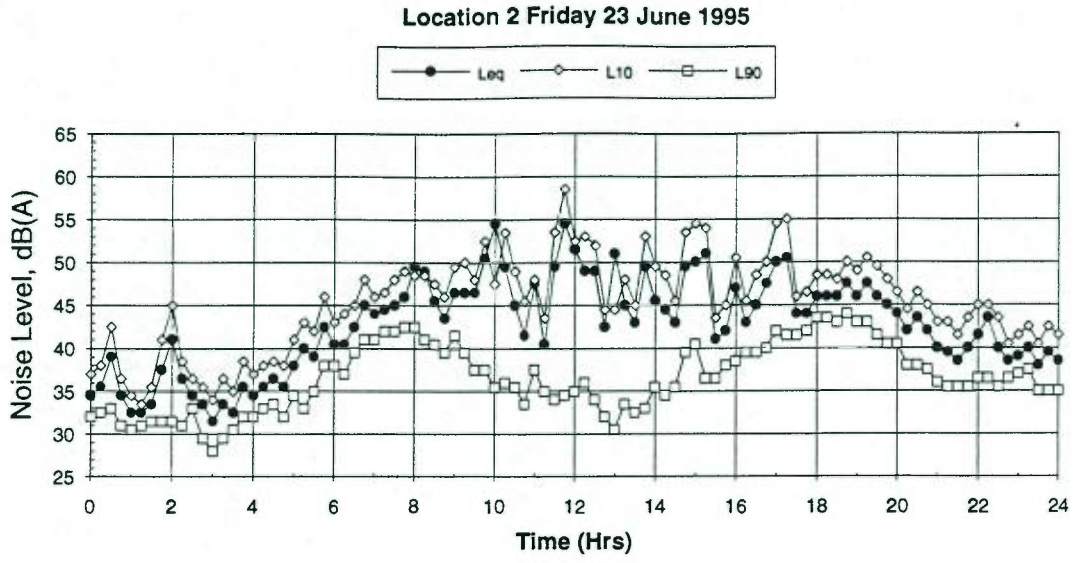
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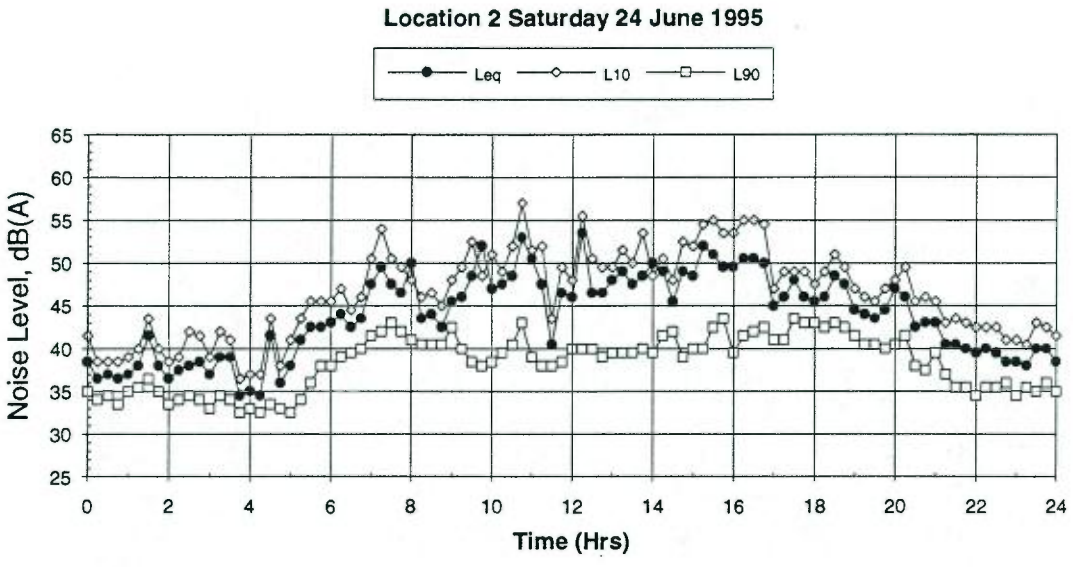
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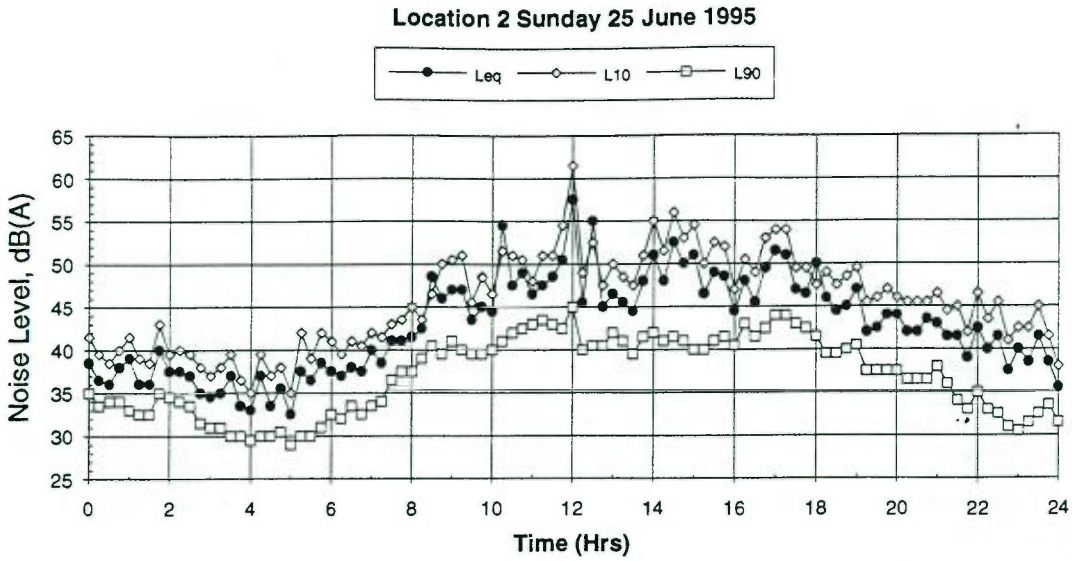
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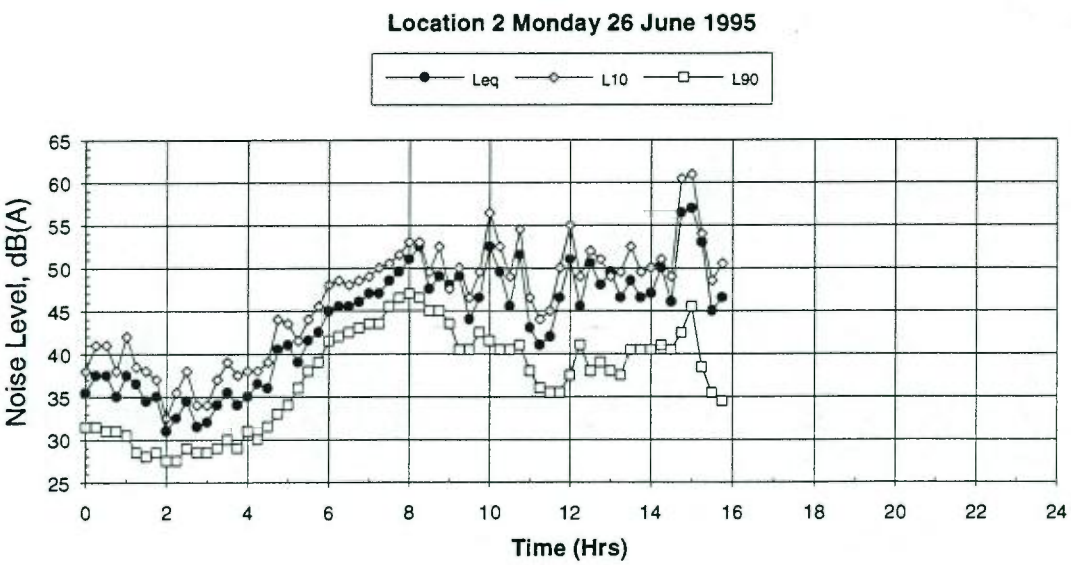
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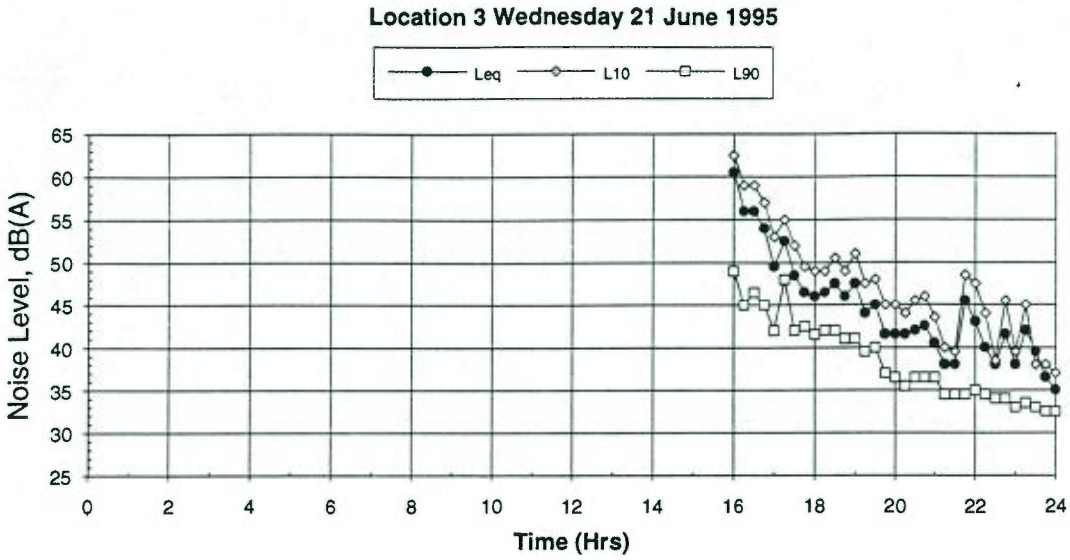
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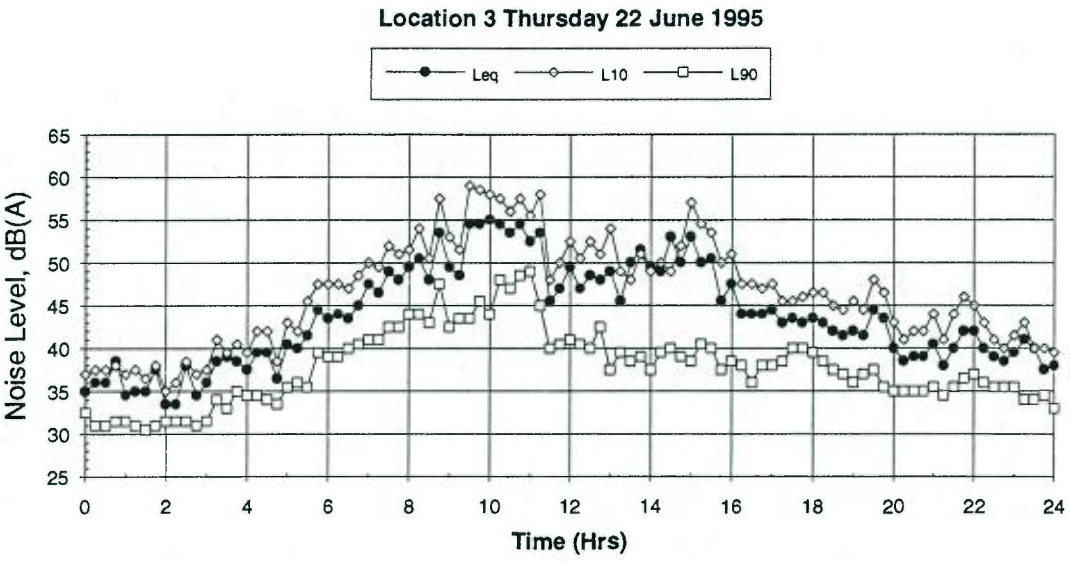
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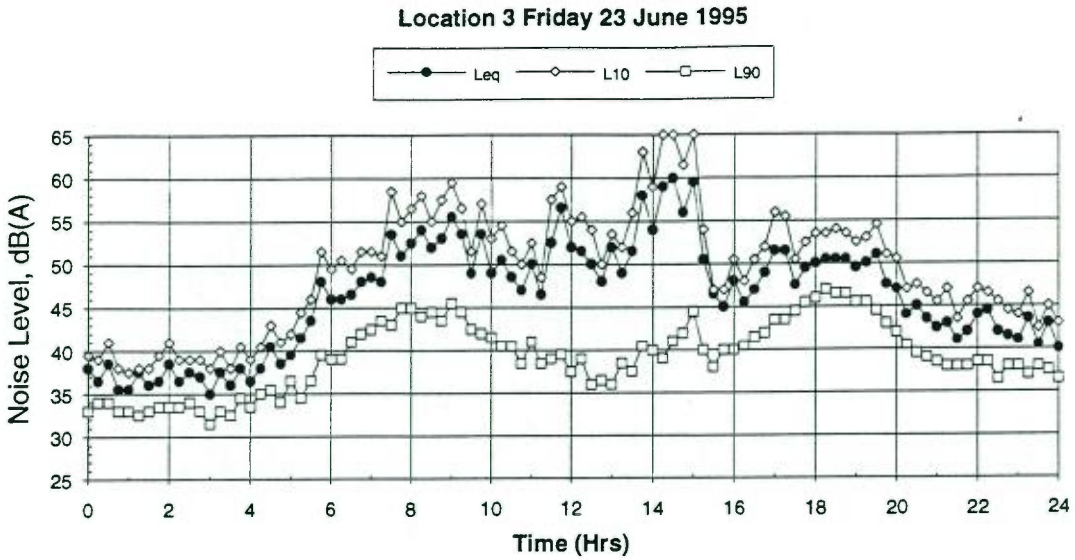
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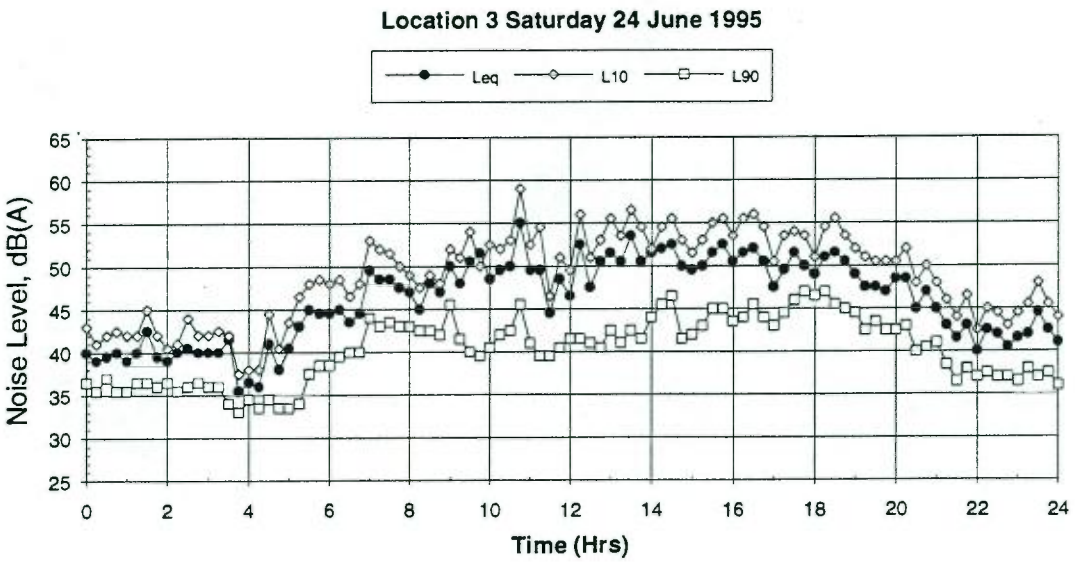
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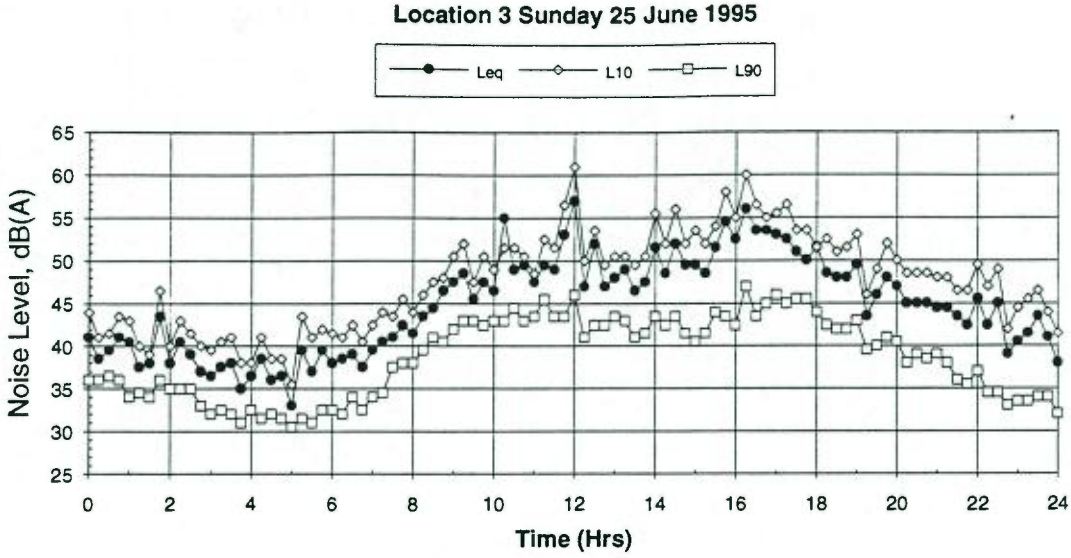
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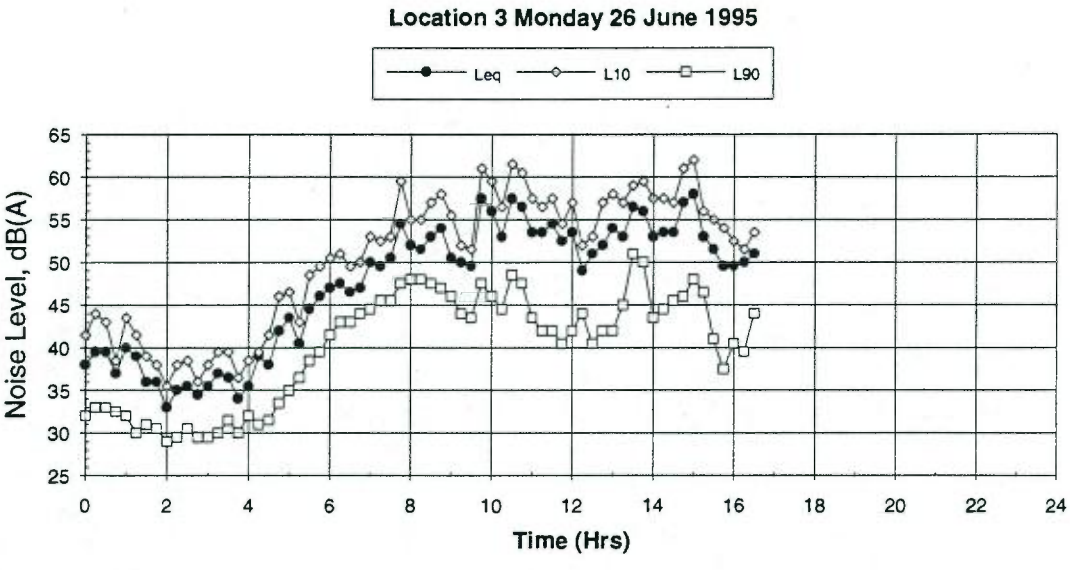
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Appendix B

SPCC RECOMMENDED CRITERIA

New South Wales Government

State Pollution Control Commission

Civic Tower
Jacobs Street and Rickard Road
Bankstown 2200
PO Box 367
Bankstown 2200

The Director
R A Cole Town Planning Pty Ltd
9 Hilar Avenue
CARLINGFORD NSW 2118

Our reference: 711574 AJ

Your reference:

Telephone: (02) 793 0000
Fax: (02) 793 0002

Dear Sir,

PROPOSED CLAY/SHALE EXTRACTION
Lot 3, DP623799, Adams Road, Luddenham

I refer to your letter of 4 February 1992, with the attached James Madden Cooper Atkins Pty Ltd letter of 3 February 1992, and wish to present the Commission's design criteria for the proposed clay/shale extraction.

At present, the area likely to be affected by the proposed extraction is zoned "Rural" within the meaning of chapter 21 of the SPCC's Environmental Noise Control Manual. Based on the recommended and existing background noise levels, respectively 45dB(A) and 40dB(A), **the initial day-time operation planning levels for residential premises are: $L_{A90,\ 15min}$ of 43dB(A) and $L_{A10,\ 15min}$ of 48dB(A).**
The Commission intends to impose such restrictions in its pollution control approval and first operational year licence, if development consent is granted.
Future possible growth of activities in the area includes construction and operation of the Second Sydney Airport and urban development of South Creek Valley sector. These activities are expected to raise the background noise level and under the circumstances, the Commission may relax the initial restrictions in subsequent, yearly renewable licences.

Together with the restrictions on noise from the extraction operation, movement of trucks arriving at and leaving the operational site should conform to the "Preferred Times of Truck Movements" from chapter 24 of the Environmental Noise Control Manual and the $L_{Aeq,\ 11hr}$ level of noise from the trucks should not exceed 55dB(A), when measured at any residential premises.

For any further information regarding the matter, please contact our Mr Alex Jochelson on 793 0173.

Yours faithfully,

19.2.92

A R G HEWETT
Regional Manager - Southern Sydney Region.

cc Mr Graham F Atkins
James Madden Cooper Atkins Pty Ltd
Suite 3, 8-10 Wharf Road,
Gladesville, NSW 2111.

[5AJSS102.1.TR]

Appendix C

EPA LANDFILL CRITERIA

EPA

Environment
Protection
Authority
New South Wales

Civic Tower
Cnr of Jacobs Street
and Rickard Road
Locked Bag 1502
Bankstown
NSW 2200

Telephone .02. 795 5000
Facsimile .02. 795 5002

Mr R.A. Cole
Director
R.A. Cole Town Planning Pty Limited
9 Hilar Avenue
CARLINGFORD NSW 2188

Our Reference:

Your Reference:

Contact: Paul Elton

Dear Mr Cole,

Re: Proposed Clay/Shale Extraction and Landfill, Luddenham

I refer to your letters of 4 June 1995 regarding preparation of an EIS for the above project.

As advised by telephone on 22 June 1995, the matters outlined in the EPA's letter of 26 November 1993 should still be addressed in any EIS prepared (and any other issues regarding protection of the environment). As advised however, the EIS should also be prepared in accordance with the performance criteria outlined in the EPA's draft Guidelines for the Establishment and Operation of Landfill Depots.

The EPA will assess the proposed operation in more detail during the processing of Approval, Licence and Certificate of Registration applications, as previously advised.

You should note that previous advice from the Waste Management Authority and the State Pollution Control Commission is no longer relevant as these agencies no longer exist.

If you have any questions regarding this matter, please do not hesitate to contact me on (02) 795 5255.

Yours faithfully,

Paul Elton 22.6.95

PAUL ELTON
Head Regional Operations Unit
Southern Sydney Region
for Director-General

5.4.4 Environmental Goal: Noise Control

Landfill design, monitoring, management and rehabilitation must ensure that noise emissions from the landfill operation do not detract from local amenity.

Benchmark Techniques

Noise Control

Unless specified under an existing Noise Control Act licence, the noise generated during the operation of the landfill depot must be managed so that the following criteria can be met:

(a) The landfill operator must ensure that the noise emanating from the site must not exceed a $L_{A,10T}$ sound pressure level of 50 dB(A) (daytime) or 40 dB(A) (night time) when measured or computed at any point within one metre of any residential boundary or other noise sensitive areas such as schools, hospitals, etc in the vicinity of the premises.

(b) The landfill operator must ensure that the noise emanating from the site must not exceed a $L_{A,10T}$ sound pressure level of 70 dB(A) when measured or computed at any point within one metre of any boundary of the premises.

For the above criteria, the $L_{A,10T}$ is taken as the dB(A) level measured using a sound level meter set on the "FAST" response over a period between 10 and 15 minutes. 5 dB(A) must be added to the measured or computed level of noise if the noise is substantially tonal or impulsive in nature. Daytime is defined as between 7:00 am and 10:00 pm on Monday to Saturday, and between 8:00 am and 10:00 pm on Sunday and Public Holidays, and night time as between 10:00 pm and 7:00 am on Monday to Saturday, and between 10:00 pm and 8:00 am on Sunday and Public Holidays.

Acceptable noise attenuation measures include buffer zones, acoustical barriers, and acoustical treatment of equipment. Particular attention must be made to the design of items such as speed humps and vibration grids to prevent noise generation. Guidance on noise planning and control techniques can be found in the EPA's Environmental Noise Control Manual.

Appendix 7

Archaeological Survey

Pam Dean-Jones
Archaeological Services
137 Skye Point Road Coal Point 2283
Phone 049 592630

R.A COLE TOWN PLANNING PTY LTD.

PROPOSED CLAY/SHALE EXTRACTION, LOT 3 DP 623799, ADAMS ROAD LUDDENHAM. ARCHAEOLOGICAL SURVEY

DECEMBER 1991

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Figures

PROPOSED CLAY SHALE EXTRACTION, LOT 3 DP623799 ADAMS RD, LUDDENHAM ARCHAEOLOGICAL SURVEY

1.0 INTRODUCTION

This report documents the results of an archaeological survey undertaken at Lot 3 DP623799, Adams Rd, Luddenham. The location of the study area is shown in **Figure 1.** The owners of the property propose to extract clay shale for brick making. The archaeological survey has been carried out by Pam Dean-Jones at the request of R.A Cole Town Planning Pty Ltd, following advice from the National Parks and Wildlife Service.

1.1 PROPOSED DEVELOPMENT

The property which is the subject of this study is one of few remaining accessible clay shale resources in the Sydney region. It is proposed to extract the material in stages, commencing in the north western part of the property. A bund wall will be constructed around the quarry to reduce runon to the extraction area. A dam will be constructed in the northeastern corner of the property to collect runoff from the quarry area.. Access to the quarry will be along an existing gravelled driveway..

A detailed plan of the site is provided in **Figure 2.**

The property is on the western boundary of the new Badgerys Creek airport, and the drainage line which forms the boundary between the two development areas will be severely modified in the process of airport construction.

1.2 AIMS OF THE SURVEY

The survey has been carried out to meet the requirements of the National Parks and Wildlife Act. It has several specific aims.

(a) To identify any evidence of Aboriginal occupation of the study area.
(b) To assess the scientific and cultural significance of any such evidence.
(c) To assess the impact of the proposed development on the cultural resources of the area.
(d) To make appropriate recommendations for management of Aboriginal archaeological sites which will be affected by the proposed development. Management recommendations are made with reference to the Local Aboriginal Land Council, and the developer.

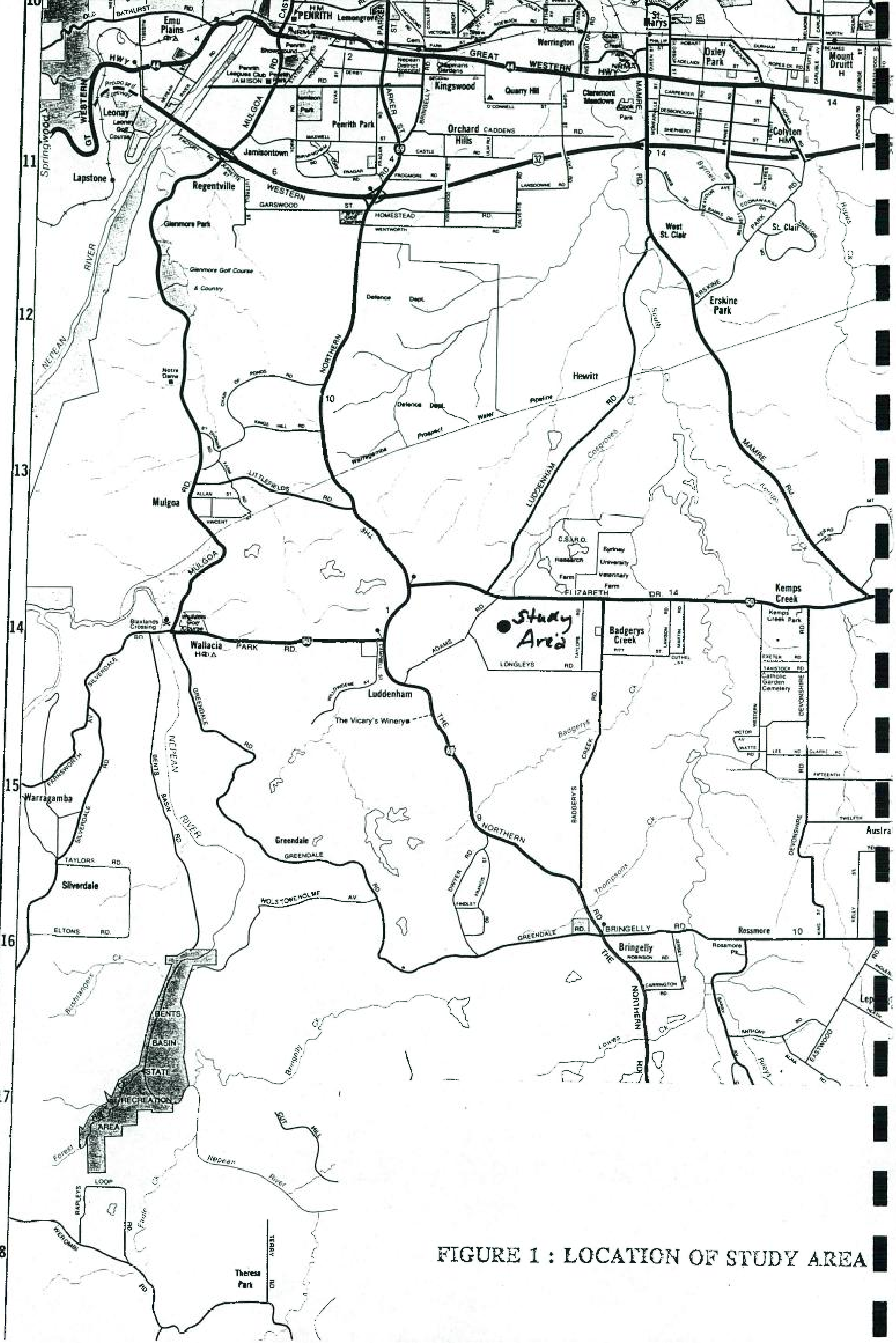

FIGURE 1 : LOCATION OF STUDY AREA

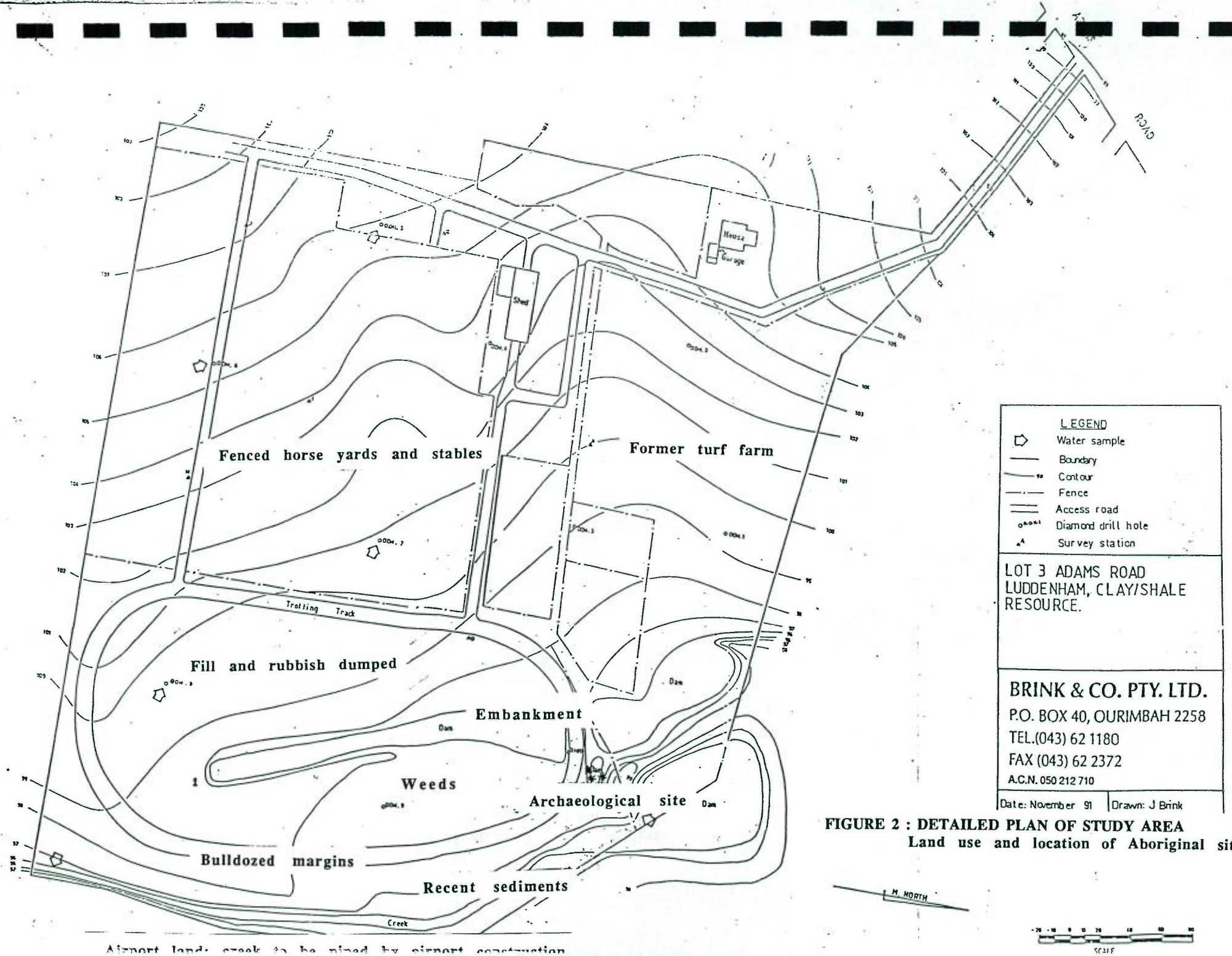

FIGURE 2 : DETAILED PLAN OF STUDY AREA
Land use and location of Aboriginal site

Airport land: creek to be piped by airport construction

1.3 SUMMARY OF RESULTS

One archaeological site, an open surface scatter of flaked stone artefacts, was located during the survey. It is located in the north eastern corner of the study area. Much of the ground surface within the study area has been disturbed by previous land use, and the probability of other sites is considered to be low.

1.4 SUMMARY OF RECOMMENDATIONS

The surface scatter identified during this survey is not in situ, and the ground surface with which it is associated has been considerably disturbed. It is recommended that the developer apply to the National Parks and Wildlife Service for consent to destroy the site. The artefacts should be collected by the Gandangarra Local Aboriginal Land Council, and stored for later display and interpetration in a local Aboriginal museum.

2.0 ABORIGINAL CONSULTATION

The study area lies within the boundaries of the Gandangarra Local Aboriginal Land Council. The Land Council was contacted prior to the field inspection, and Mr Warren Carroll inspected the site with the archaeologist. Discussions about appropriate management for the archaeological site were held in the field.

A copy of the survey report has been forwarded to the Land Council, and comments will be sent to the National Parks and Wildlife Service

3.0 ENVIRONMENTAL CONTEXT

The study area is situated on a low ridge which forms the drainage divide between creeks flowing west directly to the Nepean river, and those flowing north in the South Creek valley. The area is approximately five kilometres east of the Nepean River gorge.

The eastern boundary of the property follows an intermittent drainage line known as Oaky Creek. At the time of inspection, Oaky Creek was a series of pools, mostly formed where water backs up behind dams

downstream. The natural channel of the creek appears to be narrow (approximately two metres) and slightly incised. The creek catchment is small and water does not persist in the creek more than a few weeks after rain. A narrow alluvial fill has developed along the banks of the creek, and there is evidence of continuing sediment deposition. The flat along the creek is colonised by a moderately dense stand of Casuarina cunninghamiana. The size of the trees suggests that they are only about twenty years old. Within the stand of Casuarina, there are occasional Eucalypts (Forest Red Gum?). The natural vegetation of the entire area would have been dry sclerophyll woodland.

The remainder of the property comprises low angle hillslopes and footslopes, with gradients of approximately 5%. The terrain of the property is shown in **Figure 2,** which has a contour interval of 1 metre. The underlying bedrock is shale, but there is no rock outcrop on the property. Duplex soil profiles have developed on the hillslopes and footslopes. The topsoil comprises buff fine sandy loam (weakly pedal, brittle), and topsoil depths range from less than 10cm on the upper slopes, to about 20cm on the lower footslopes. Sheetwash would be the most important surface process affecting topsoil depth. The subsoil is moderate to strongly pedal orange clay, and there is a sharp horizon boundary.

3.1 LAND USE HISTORY

The study area lies within a property which has been cleared and farmed for at least sixty years. There are few trees remaining on the site except along the creek. The area was originally part of a dairy farm, and is currently used for horses. The south western part of the property is occupied by a series of horse yards and stables. A trotting track has been constructed on the lower slopes adjacent to the creek. Construction of the track involved excavation of a large dam, building up an embankment at the eastern end, and filling along the southern side near the creek. No natural ground surface remains within the trotting track area.

At one time attempts were made to grow kikuyu turf on the north western slopes of the property.

In addition to these rural land uses, part of the site has been used for disposal of demolition rubbish. This is mostly confined to the western end of the trotting track.

Because of this land use history, preservation of archaeological evidence is considered unlikely over almost the entire property. A small area of

relatively intact lower footslope colluvium remains in the north eastern corner, surrounded by earthworks associated with dam consruction.

4.0 ARCHAEOLOGICAL CONTEXT

About 300 archaeological sites are known from the Cumberland Plain, of which the Nepean River forms the western margin. The present study area lies towards the western edge of the Cumberland Plain, and is about five kilometres from the Nepean. Most of the previously recorded archaeological evidence is in the form of open artefact scatters, but there are also carved and scarred trees, and at Plumpton Ridge (Riverstone), a quarry site for artefact raw materials. This site has been investigated in some detail. Raw materials utilized for artefacts throughout the district include quartzite, silcrete, basalt and chert. These derive from the gravels of the Nepean Terraces as well as from outcrop of in situ rocks. Grinding grooves have been identified in creek beds where the outcrop is sandstone, rather than shale which is the dominant rock type in the area.

In addition to the sites on the Cumberland Plain,a number of rockshelters and open sites has been identified and excavated along the eastern margin of the Blue Mountains. The Shaws Creek shelter, for instance, has evidence of occupation dating to about 14000 years ago, and at Jamieson Creek (Emu Plains), a terrace site containing a hearth, backed blades and edge ground tools (10000 stone artefacts altogether) has amaximum age of 7000 years (Kohen 1979, 1984). The Cransbrook Terrace, which is abouit 5km north of Penrith, is the site of possible archaeological evidence dating to 41-47000 years BP. At this site, a few artefacts have been identified in the basal gravel deposits of the terrace (Nanson, Young and Stockton 1987).

There appears to have been little previous archaeological investigation undertaken in the immediate vicinity of the Luddenham area. Sites included in the NPWS Register for this area are open campsites (sites 45-5-0213, 45-5-0214, 45-5-0517, and a carved tree(45-5-0496).

The nearest development for which an archaeological survey would have been carried out is the proposed new Badgerys Creek airport. The site of the airport adjoins the present study area. A check was made of National Parks and Wildlife Service records of previous surveys, but no copy of the report of the survey carried out for the airport was available at either the Central Region or Head Office of the Service. The report contained

within the Environmental Impact Statement for the airport does not include descriptions of any sites recorded or details of their locations, so this document could not provide useful information for comparison with the results of the present survey.

A survey at the Bringelly Brick Works, approximately eight kilometres to the south, located only isolated artefacts (Dean-Jones 1990). The artefacts were located within a remnant of Eucalypt woodland on the brickworks site, and occurred both adjacent to a small drainage line, and on the lower slopes of a hill. All were found on the sheet eroded surfaces of tracks. No evidence of Aboriginal occupation was found in parts of the site which had been cleared and cultivated in the past, even though some of the cleared area would have been attributed higher occupation potential on environmental grounds.

A survey at Penrith (Dean-Jones 1989) recorded four artefacts scattered around the excavated margin of a dam in high terrace deposits associated with the Nepean River.

Also around Penrith, Dallas (1985) reported a survey of part of the Cranebrook Terrace. She located a number of small and frequently disturbed open sites, which did not appear to include raw materials derived from the river gravels. Similar small, disturbed scatters were found in a survey at Cecil Park (1985). Haglund (1984) reported 120 small silcrete flakes/blades and flaked pieces from two areas along a disturbed creek bank at South Werrington. Kohn (1981) identified 28 localities where small scatters of artefacts were present in the Penrith Lakes area. Most of these sites were located on terraces and ridges.

The available evidence suggests that occupation of the Cumberland Plain, and particularly of the river terraces along its western margin, is of considerable antiquity, and that occupation evidence ranging in age from the Late Pleistocene to the recent is possible.

4.1 ARCHAEOLOGICAL POTENTIAL

Previous records of Aboriginal occupation in the Nepean and western Cumberland Plain districts indicate that the most likely form of occupation evidence in the present study area is surface scatters of artefacts. The size and density of these scatters cannot be predicted on the basis of the existing evidence. Although open sites are most common along drainage lines (particularly on lower footslopes and terrace alluvium), they also occur on hillslopes and ridge crests, particularly where slope gradients are low, and the distance from the drainage line to the drainage divide is not great. This landscape context occurs in the present study area, and archaeological material could be expected in all substrates and geomorphic locations.

The landuse history of the property is such that although there is potential for occupation to have occurred throughout the property, there is potential for preservation of occupation evidence in only a restricted area. Small areas on relatively undisturbed ground surface remain in the northeastern part of the property, around the margins of existing dams. Ground surface exposures also occur in this area because of past earthworks and fluctuating water levels in the dams.

5.0 SURVEY METHOD

A field inspection of the property was conducted on 18th December 1991. The entire inspection was carried out on foot. A reconnaissance inspection was made by the archaeologist, accompanied by the property owner, to establish the locations of past land use activities, and the staging and infrastructure requirements of the proposed quarry. A second general reconnaissance was made with Warren Carroll from Gandangarra Local Aboriginal Land Council. A more detailed site inspection of relatively undisturbed areas was made by the archaeologist.

Good ground surface visibility pertains in the area of the horse yards (70%), but this area has been substantially disturbed by recent landuse. Surface visibility along Oaky Creek was reduced to 20% by casuarina needles and recent sediment. This area appears to be regularly inundated, and has also been disturbed by bulldozer tracks and some rubbish disposal. The north western paddock is well grassed, with approximately 40% surface visibility. A small area with 90% visibility occurs along the bank of the dam. The exposed substrate here is colluvial duplex soil, with a scatter of clay ironstone. This exposure comprises about 40% of the area where potential for archaeological sites was predicted.

In the north eastern corner of the land, there is some surface exposure around the margins of a shallow pond between mounds of fill. The total exposure in this area is 140 square metres (with 100% surface visibility). The substrate appears to be lower footslope colluvium with a duplex soil profile. This area comprises less than 1% of the entire study area, but about 60% of the area where land use history suggested that archaeological evidence might be preserved.

6.0 RESULTS

One surface scatter of artefacts was found during the survey. The location of the scatter is shown in **Figure 2.** The site is illustrated in **Photo 1**. The scatter comprised 22 pieces of flaked stone. Recording sheets showing basic artefact characteristics are provided in Appendix 1.

The artefacts were scattered around the shoreline of a small pond created by fill and dam construction . The pond is within an area which would have originally been on the edge of the floodplain of Oaky Creek. It appears to be filled only by direct rainwater, and water levels are highly

PHOTO 1 : Exposed surface with artefacts, around dam margins.

variable. The surface on which the artefacts were located would regularly be below water level

The exposure around the pond totals 140 square metres.. This gives a mean artefact density across the exposure of 1 per 6.4 square metres. There were no concentrations of artefacts.

The raw materials used included dark red indurated fine sandstone (most common), pink and grey variants of the same lithology, pink and grey chert/tuff, and cream and pink mudstone (some banded). Seven artefacts retained small amounts of cortex.

The basic composition of the assemblage is set out below.

	number	percentage
Flakes	**8**	**36.4%**
Flaked pieces	**12**	**54.5%**
Cores	**2**	**9.1%**

The two artefacts identified as cores utilized pik/red indurated fine sandstone, and pink/grey chert/tuff. These raw materials are common amongst the other artefacts, but no conjoins were identified, nor were they considered likely given the amount of substrate disturbance. The maximum length of flakes removed from the cores was 30mm (red ind. sandstone), and 25mm (chert/tuff). The chert/tuff core had been rotated, with a total of five feather termination flakes removed.

The size range of artefacts recorded was 8mm to 40mm (length), with a mean length of 18.9mm. The distribution of artefact size characteristics is shown in **Figure 3.**

None of the artefacts displayed any form of retouch.

Seven of the artefacts retained some cortex. In all but one, the cortex occurred on 10% or less of the possible surfaces. One core retained 20% cortex.

Although no specific diagnostic forms are included in the assemblage, these artefacts appear to fit within the range of Mid-late Holocene flaked stone inplements. The main reason for this is their generally small size, and the presence of flake scars from micro blades. It is not possible to offer specific interpretation of the artefact assemblage, except to note that it is probably the remnant of a much larger site. Other parts of the site have been destroyed by past earthworks.

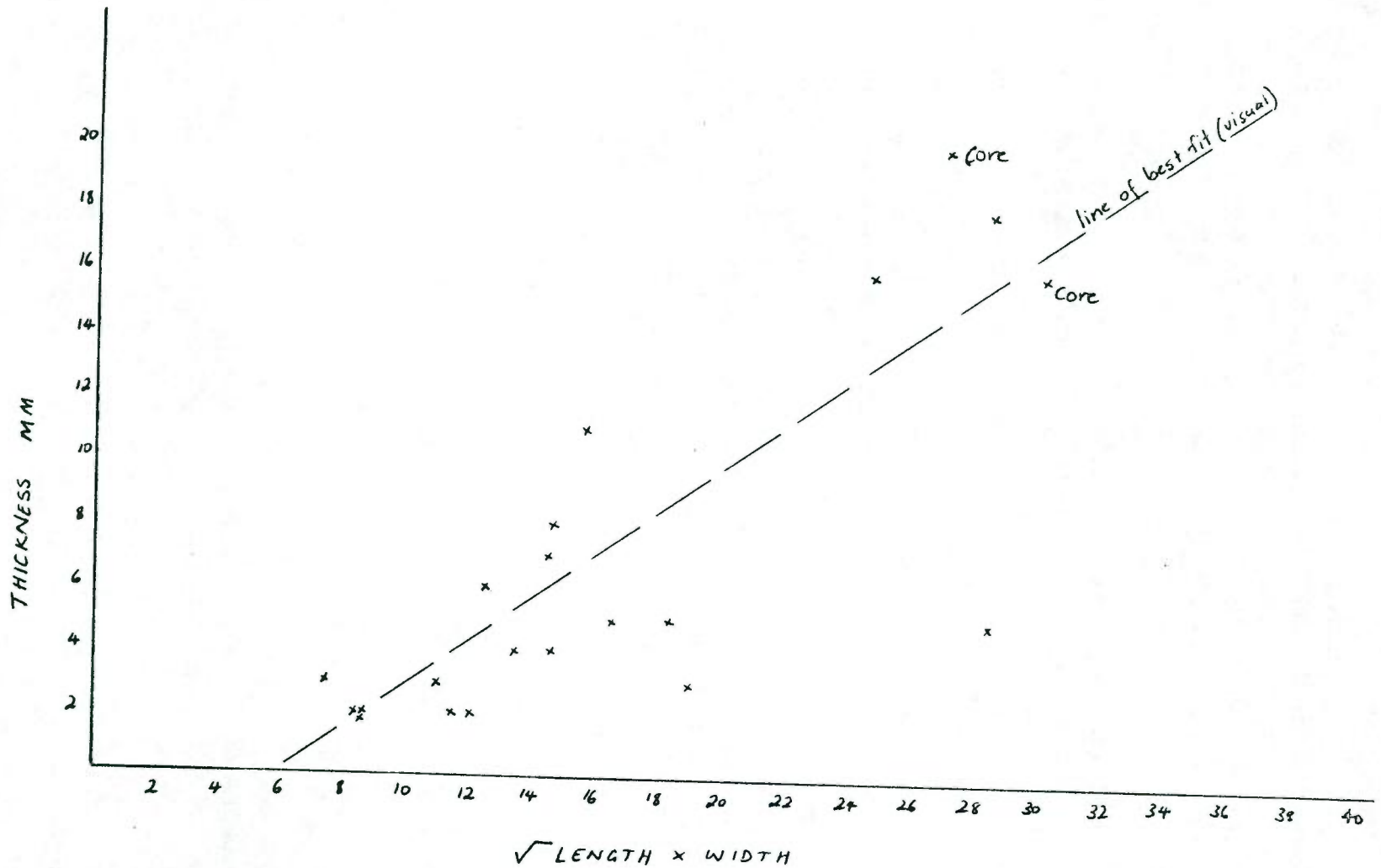

FIGURE 3 DISTRIBUTION OF ARTEFACT SIZE CHARACTERISTICS

7.0 DISCUSSION

7.1 SIGNIFICANCE OF THE SITE

The archaeological site identified during this survey appears to be the remnant of a more extensive site. The artefacts were distributed around the margins of a small dam, whose banks are formed by mounds of soil placed by bulldozer. Only a small area of the natural soil material remains, and this is promarily an exposure of clay subsoil. The artefacts are scattered as alag across the subsoil exposure. None of the material is considered to be in situ, and there is very little potential for any in situ material to remain beyond the margins of the exposure. The site is in poor condition, and the natural substrate of the artefacts is unclear.

On this basis, the archaeological material is not considered to be of scientific significance.

The educational and cultural significance of the site are considered to be relatively low, because of the disturbed landscape context. The artefacts themselves could be used as part of an educational and interpretation programme incorporating archaeological material from other sites in the district. Mr Warren Carroll, representing Gandangarra Local Aboriginal Land Council, has suggested that the Land Council would be interested in collecting the artefacts, and that the collection process could be of educational value for members of the Aboriginal community, as a cultural resources management exercise.

7.2 IMPACT OF DEVELOPMENT ON THE ABORIGINAL SITE.

The archaeological site recorded during this survey is situated in the north eastern corner of the property. Plans for runoff control and visual/noise controls for the quarry show a new settling pond in this area, and a bund wall around the margin of the property. Existing dams in the northeastern corner will be removed and replaced by a new structure.. The archaeological site lies within the area where extensive earthworks will be necessary for effective management of the quarry runoff. Extensive earthworks are also proposed along the creek as part of site works for the new airport . The airport site adjoins the quarry site, and it is proposed to pipe Oaky Creek.

It is considered likely that the earthworks required for the developments will result in the destruction of the archaeological evidence remaining in this area.

8.0 RECOMMENDATIONS

One Aboriginal archaeological site was identified during this survey. The site is in a highly disturbed condition. It is considered unlikely that archaeological material is preserved elsewhere in the study area because of the land use history of the area.

The followinf recommendations are made for management of the archaeological site.

(a) No further archaeological investigation is required for the site, or the remainder of the property before development can proceed.

(b) The developer should apply to the National Parks and Wildlife Service for Consent to Destroy the archaeological site. The Consent application should include a collection of surface artefacts.

(b) The Gandangarra Local Aboriginal Land Council should be responsible for collection of all artefacts from the site, and for safe storage of the archaeological material. The artefacts should form part of a regional interpretive display being developed by the Land Council.

9.0 NPWS ADMINISTRATIVE REQUIREMENTS

The developer should be aware that all Aboriginal sites and relics in NSW are protected under the National Parks and Wildlife Service Act, and that it is illegal to knowingly destroy any such material or sites. This means that no collection of archaeological material can take place without a permit from the Service.

Permits for salvage collection of artefacts under a Consent to Destroy application usually take several weeks to process.

Although it is considered unlikely that other archaeological material remains within the study area, the developer should note that if any object suspected to be of Aboriginal origin is found in the course of development, the National Parks and Wildlife Service must be notified immediately. The Service will arrange for inspection and assessment of such finds.

Four copies of this report are required by the National Parks and Wildlife Service, and one copy by the Gandangarra Local Aboriginal Land Council.

REFERENCES

Dallas M, 1985. Archaeological reconnaissance at MT Druitt. Report to Sterling Homes Group.

Dallas M, 1985. An archaeological survey at North Richmond, NSW. Report to Gutteridge, Haskins and Davey.

Dallas M, 1985. Archaeological survey at North Cranebrook, NSW. Report to Penrith City Council.

Dallas M and Hankel M, 1985. An archaeological survey at Cecil Park, Penrith. Report to Douglas Sanger Pty Ltd.

Dallas M and Witter D, 1983. Investigation of an Aboriginal open site at Plumpton, NSW. Report for Landcom.

Dean-Jones P, 1989. Report of an archaeological survey of a 20ha site proposed as a mobile home village, near Penrith, NSW.

Dean-Jones P, 1990. Archaeological survey for extensions to Boral Bringelly Brickworks.(Resource Planning Pty Ltd)

Haglund L, 1984. Archaeological survey of the proposed Caddens Release area, near Penrith, NSW. Report to Penrith City Council.

Kohen J, 1979. Report on the excavation of a test trench into an open site at Jamieson Creek, NSW. Report for Macquarie University.

Kohen J, 1981. Archaeological survey of proposed Penrith Lakes scheme. Report for Kinhill Pty Ltd.

Kohen J, 1984. Excavations and surface collections at an Aboriginal campsite at Jamieson Creek, Emu Plains, NSW. Report to NPWS.

Nanson G, Young R and Stockton E, 1987. Chronology and palaeo-environment of the Cranebrook Terrace (near Sydney), containing artefacts more than 40000 years old. Archaeology in Oceania 22(2), 72-78.

APPENDIX 1 ARTEFACT LISTS

No.	Raw Material	type	L	W	mm T	% cortex	retouch	F / B platform	prev. flake scars	rotation	comments.
1.	dark red silcrete / indurated fine ss.	f	16	22	4	—	—	broad	yes	no	longitudinally snapped
2	red indurated fine sandstone	f	16	13	4	—	—	—	yes	yes	transverse snapped flake, distal end, step termination
3.	red indurated fine ss	fp	16	9	2	—	—	—	—	—	
4	red fine tuff	f	22	15	5	10%	—	broad	yes	no	step termination
5	red indurated fine sandstone	fp	40	20	5	10%	—	—	—	—	two small blade flakes removed from thicker end.
6	pink-red indurated fine sandstone	fp/core	30	platform 30	platform 16	—	—	single broad	yes	no	1 feather, 1 step flake removed.
7	grey/pink indurated fine sandstone	fp	18	15	5	—	—	—	—	—	
8	red ind. fine ss	fp blocky	20	12	11	5%	—	—	—	—	
9	red ind. fine ss	fp	16	11	4	—	—	—	—	—	
10	pink ind. fine ss	fp	17	12	7	—	—	—	—	—	
11.	grey chert / tuff	fp with pot lid	30	20	16	—	—	—	—	—	
12.	pink-grey chert / tuff	core	28	26	20	20%	—	broad	yes	rotated	5 feather flakes removed, max length 25mm. Also one pot lid

No.	Raw Material	type	L	W	T (mm)	% cortex	retouch	F&B platform	prev. flake scars	rotation	comments.
13	grey indurated fine sandstone	fp	40	20	18	10%	—	broad	yes	?	two fine blade flake scars, feather terminat
14	pink indurated fine sandstone	fp	12	11	8	—	—	—	—	—	
15	orange – cream mudstone/tuff	broken flake	8	15	3	—	—	—	yes	?	distal end
16	pink – buff chert	f	10	13	2	—	—	crushed	yes	?	platform crushed, step flakes.
17.	cream mudstone	f	9	17	6	10%	—	broad	yes	yes	rejuvenation?
18	banded pink/red mudstone	f	18	9	6	10%	—	focal	yes	?	step termination on cortex.
19.	cream-grey mudstone	f	12	6	2	—	—	—	—	—	
20	cream mudstone	f	12	6	2	—	—	focal	yes	no	
21	dark red indurated fine SS.	fp	12	6	2	—	—	—	—	—	
22	pink indurated SS.	fp	9	6	3	—	—	—	—	—	

Appendix 8

Transport Impact Assessment

R. A. Cole Town Planning Pty. Ltd. *Brink & Co. Pty. Ltd.*

PROPOSED QUARRY
and
LANDFILL

Adams Road,
Luddenham

Traffic Assessment

For:

Kolback Environmental Services Limited

Approved by:	*Terry Perram*
Position:	*Project Director*
Signed:	
Date:	*28 July 1995*

Prepared by:	*Tim Rogers*
Position:	*Traffic Engineer*
Signed:	
Date:	*28 July 1995*

July 1995

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INTRODUCTION

This report has been prepared on behalf of Kolback Environmental Services Limited to assess the traffic impacts of a proposed clay/shale extraction and landfill operation at Adams Road, Luddenham. While the extraction and landfill operations will be addressed in separate environmental impact statements it is appropriate to assess the traffic impacts of both operations together.

The proposed site has been the subject of a previous application for a similar extraction and landfill operation in 1994. The application was refused by Liverpool Council, but not on traffic grounds. With respect to traffic impacts the development was considered appropriate by Council officers subject to the following conditions of consent:

- at the Elizabeth Drive/Adams Road intersection, a left turn deceleration lane be provided for the movement from Elizabeth Drive east into Adams Road;
- widening of Elizabeth Drive to provide a seagull island in Elizabeth Drive and a right turn bay into Adams Road with an acceleration lane for right turning vehicles out of Adams Road, as the speed limit on Elizabeth Drive is 100 km/hour;
- road shoulder widening on the left hand side of Adams Road at the intersection with Elizabeth Drive to allow left turning vehicles to pass right turning vehicles. All of the above works to be carried out at no cost to the Roads and Traffic Authority.
- consideration given to imposing an indexed levy rate of three cents per payload tonne kilometre to major truck movements where appropriate for road maintenance purposes;
- no truck movements to or from the site along Adams Road south of the site access; and
- reconstruct Adams Road to a suitable standard between the site access and Elizabeth Drive at no cost to Liverpool Council.

The surrounding area is the subject of significant development proposals which will have a major impact on the surrounding road network. These are the proposed second airport for Sydney at Badgerys Creek, located immediately east of the site, and the proposed South Creek urban release area in which the site is located. The traffic impacts of both of these proposals are discussed.

This report is structured as follows: Section 2 describes the existing traffic conditions and proposed development in the area; Section 3 describes the proposed development in terms of traffic generation and distribution; Section 4 assesses the impacts of the proposed extraction operation; and Section 5 presents a summary and the conclusions of the investigation.

2

EXISTING CONDITIONS

This section of the report describes and assesses the existing road conditions, with respect to road geometry, road capacity, intersection operation, and road safety. A review and assessment of the impacts of future development on the road network is also undertaken.

2.1 ROAD NETWORK

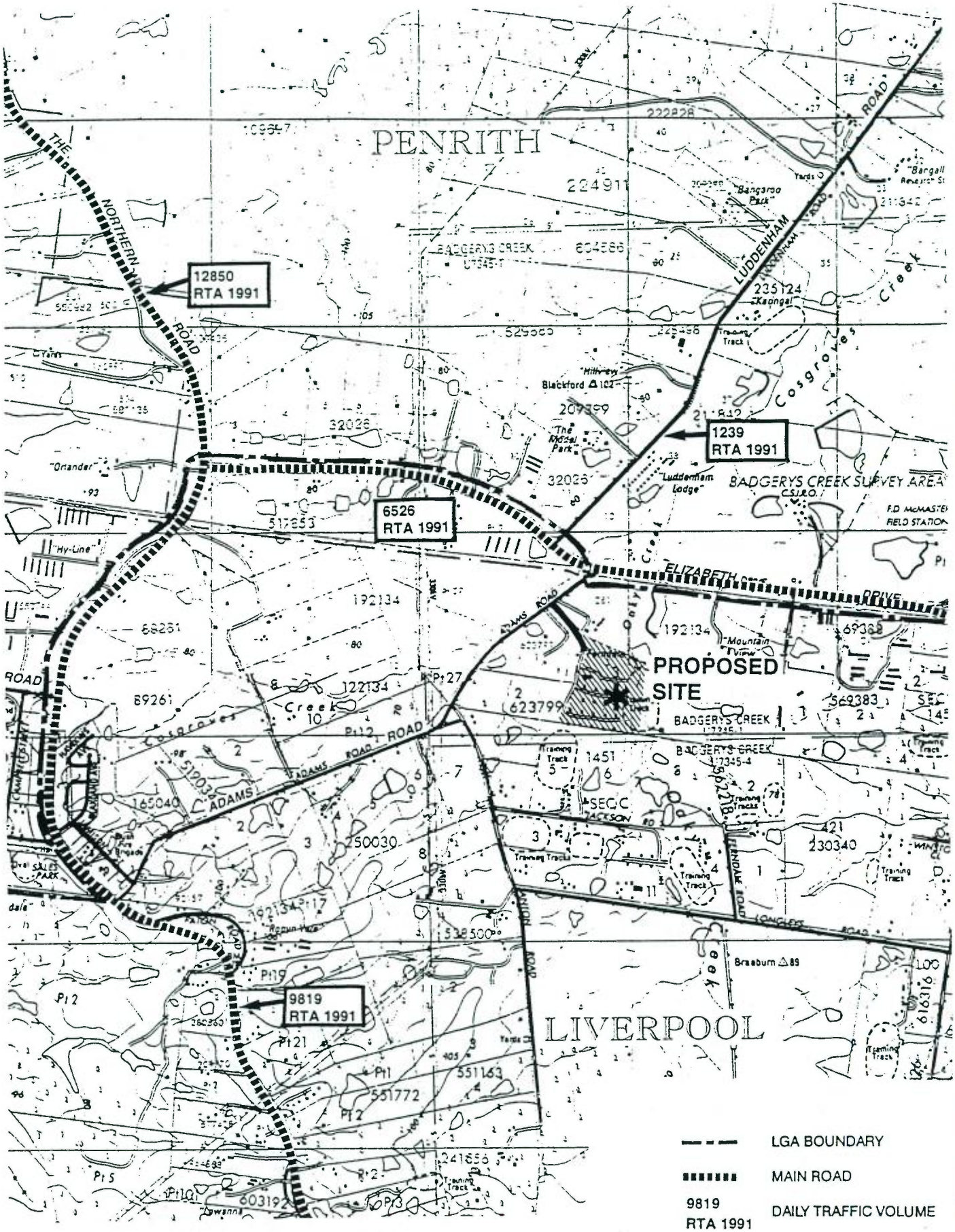
The road network in the vicinity of the proposed development is illustrated in *Figure 2.1*. Major roads in the locality are Elizabeth Drive and the Northern Road which are both classified main roads. The site is about 0.5 kilometres south of Elizabeth Drive and 2.0 kilometres east of the Northern Road, near the village of Luddenham.

The site access road connects with Adams Road about 230 metres south of Elizabeth Drive. Adams Road is a local collector road under the control of Liverpool City Council. Luddenham Road connects with Elizabeth Drive from the north about 250 metres west of the Adams Road intersection.

i. Elizabeth Drive

Elizabeth Drive is a major east-west arterial route. A number of recent road improvements including construction of three roundabouts, other intersection improvements and pavement resurfacing have been funded by the Commonwealth Government. Discussions with the Sydney region planning section of the Roads and Traffic Authority of New South Wales have indicated that the condition of the road pavement on Elizabeth Drive is now considered to be adequate and a requirement for a section 94 levy per tonne kilometre for heavy vehicle movements would not be applicable for Elizabeth Drive.

To the west of Adams Road on Elizabeth Drive there is a two lane roundabout at the intersection with the Northern Road which has recently been constructed and has adequate spare traffic capacity for the foreseeable future. At the intersection with Luddenham Road, Elizabeth Drive has a right turn bay for traffic turning north into



Source: Department of Conservation & Land Management

Figure 2.1 ROAD NETWORK AND TRAFFIC VOLUMES

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Luddenham Road (classified as a rural Type C intersection for right turns). There is also a left turn deceleration lane for eastbound traffic at this intersection traffic (classified as a rural Type B intersection for left turns).

At the intersection of Elizabeth Drive and Adams Road there are currently no additional turning lanes for either left or right turning traffic, although these lanes are arguably required for existing turning traffic volumes.

To the east of Adams Road, at the intersection of Elizabeth Drive with Badgerys Creek Road a high standard rural T-intersection with left and right turning lanes has recently been constructed as part of the federally funded program of road improvements for Badgerys Creek Airport.

Similarly, high-capacity "two-lane-entry" roundabouts have been recently constructed at the intersections with Elizabeth Drive at both Mamre Road and Wallgrove Road. These roundabouts have adequate traffic capacity for the short to medium term, prior to the development of the major international airport facility at Badgerys Creek, at which time major widening of Elizabeth Drive east of Badgerys Creek through to Liverpool would be required.

To the east of Wallgrove Road, Elizabeth Drive becomes progressively more urbanised, being widened to four lanes and six lanes respectively as it passes through the existing outer suburbs of Fairfield and Liverpool. There is currently a major traffic signal controlled intersection on Elizabeth Drive at Cowpasture Road. The sections of Elizabeth Drive between Wallgrove Road, Cowpasture Road and Cabramatta Road have daily traffic volumes at or approaching capacity limits for a two-lane road. The general traffic growth in these areas would result in a need for widening of these sections to four lanes within the next few years.

ii. The Northern Road

The Northern Road is a major north-south arterial route. To the north of Elizabeth Drive, the Northern Road is a high standard rural arterial road with generally good lane widths, sealed shoulders and an appropriate pavement construction standard to accommodate the major regional heavy vehicle traffic flows that use this road between Windsor, Penrith and Camden.

South of the intersection of the Western Motorway, which is grade separated, the Northern Road has major intersections at Elizabeth Drive, Park Road, Badgerys Creek Road and Bringelly Road. High-capacity two-lane-entry roundabouts have recently been constructed at the intersections with Elizabeth Drive and Badgerys Creek Road as part of the Commonwealth Government program of road works for

Badgerys Creek Airport. The intersections at Park Road and Bringelly Road are rural type intersections with turning lanes.

iii. Adams Road

Adams Road has a relatively narrow seal width of 5.8 metres at the site access road junction. The seal has fairly extensive patching at the edges where heavy vehicles would have a tendency to damage the pavement. Adams Road is in a similar condition throughout its 2.5 kilometre length except for a small section at the southern end which has a wider sealed width of 9.3 metres in the village of Luddenham.

The intersection at the south end of Adams Road in the village of Luddenham is in an urban type environment with kerb and gutter along the side of Adams Road.

iv. Luddenham Road

Luddenham Road is classified as a regional road and is under the joint control of Penrith City Council and the Roads and Traffic Authority. It provides the most direct route from the locality of Luddenham to the urban areas of Erskine Park, St Marys and Blacktown. Its use however is subject to a three tonne load limit because of the weak pavement and narrow width. Consequently its potential use by traffic from the proposed clay extraction and landfill development site at Luddenham is restricted.

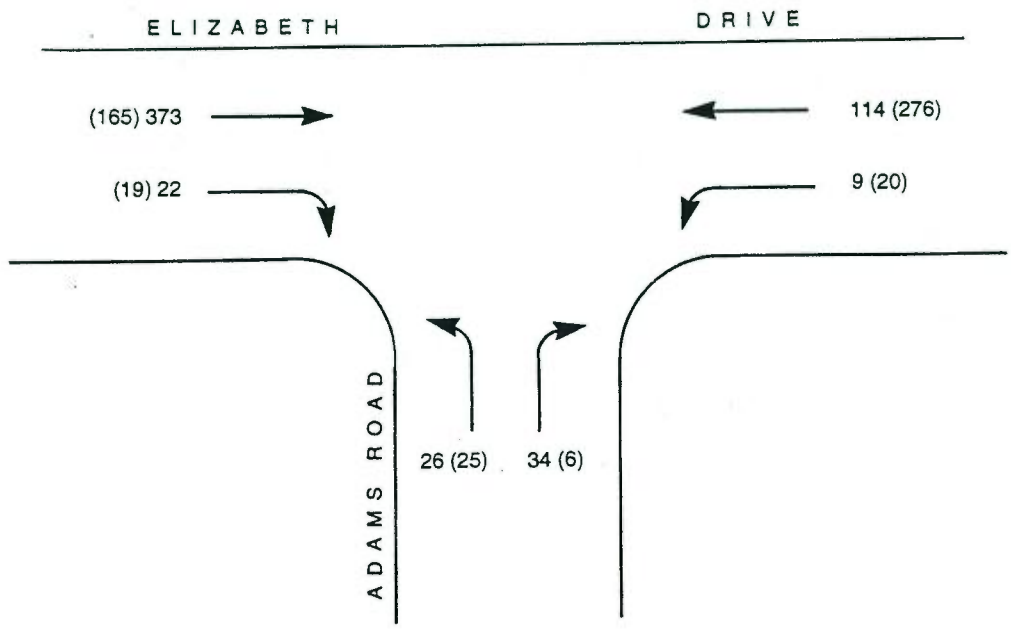
2.2 TRAFFIC VOLUMES

A summary of daily traffic volumes on the local road network surveyed by the Roads and Traffic Authority during the past decade is presented in *Table 2.1*. Daily traffic volumes on sections of Elizabeth Drive increase progressively to the east. The daily traffic volume at the western end at the Northern Road was approximately 6,500 vehicles per day in 1991.

Table 2.1 ANNUAL AVERAGE DAILY TRAFFIC VOLUMES (AADT)

Location	1981	1983	1985	1987	1989	1991
Elizabeth Drive						
E of the Northern Road	4800	4860	5100	4868	5829	6526
W of Mamre Road	7920	8330	8408	9264	10330	10530
W of Wallgrove Road	11010	12010	15510	16070	16527	16980
E of Wallgrove Road	17620	19530	20872	19200	20970	21890
W of Cabramatta Road	23530	24820	27768	25672	30707	35698
The Northern Road						
S of Western Motorway	10230	10230	13863	14265	14533	16602
N of Elizabeth Drive	7310	7490	9346	8447	10206	12850
S of Eaton road	4480	5110	6019	6559	7935	9819
Luddenham Road						
N of Elizabeth Drive	880	1150	1110	1239	-	-
Mamre Road						
N of Elizabeth Drive	5750	7190	8550	8346	-	-

Morning peak hour traffic volumes were surveyed in December 1991 at the intersection of Adams Road and Elizabeth Drive from 7.00 am to 8.00 am (Cole, 1994). These traffic counts were repeated in June 1995 along with afternoon peak period counts by ERM Mitchell McCotter. The results of the 1991 and 1995 surveys are summarised in *Table 2.2*. Results of the 1995 survey are illustrated in *Figure 2.2*.



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26-AM 0715-0815

(26) -PM 1545-1645

Figure 2.2 ESTIMATED PEAK HOUR TRAFFIC FLOWS 21/6/95

Table 2.2 EXISTING PEAK HOUR TRAFFIC FLOWS

Road	Traffic flows (vehicles per hour)		
	1991	1995	
	AM (0700-0800)	AM (0715-0815)	PM (1545-1645)
Elizabeth Drive			
- west of Adams Rd	457	535	485
- east of Adams Rd	458	530	467
Adams Road			
- south of Elizabeth Drive	67	91	70

The Roads And Traffic Authority counts along Elizabeth Drive include a full 24 hourly interval counting station (West of Mamre Road) which indicates morning peak hour traffic volumes are about 8.2 percent of total daily traffic. The peak hour volumes surveyed on Elizabeth Drive and Adams Road correspond to the daily traffic volumes shown in *Table 2.3*.

Table 2.3 ESTIMATED EXISTING DAILY TRAFFIC FLOWS

Road	Traffic flows (vehicles per day)	
	1991	1995
Elizabeth Drive		
- west of Adams Rd	5600	6530
- east of Adams Rd	5600	6470
Adams Road		
- south of Elizabeth Dr	820	1110

These daily traffic volumes are well below the maximum daily traffic capacity limit (approximately 26,000 AADT) for a high standard two lane rural road with these traffic patterns.

The general proportions of existing truck traffic on relevant roads are available from traffic surveys undertaken for the RTA on Elizabeth Drive and the Northern Road (RTA, 1992) and the 1995 peak hour survey on Adams Road as follows:

- The Northern Road, north of Elizabeth Drive = 11.8 per cent heavy vehicles

- Elizabeth Drive, east of Badgerys Creek Road = 7.2 per cent heavy vehicles
- Adams Road, south of Elizabeth Drive = 5 per cent heavy vehicles

2.3 INTERSECTION OPERATION

The operation of the Elizabeth Drive/Adams Road intersection has been assessed using standard gap acceptance techniques and Austroads (1988) guidelines to determine the appropriate intersection configuration.

The assessment found that the intersection currently operates with minimal delays and that there is sufficient capacity for all turning movements. The results of the analysis are summarised in *Table 2.5* along with level of service as determined by the assessment criteria for intersection operation shown in *Table 2.4*.

Table 2.4 LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS

Level of service	Average delay per vehicle (secs)	Expected delay to traffic
A	0<14	Little or no delay
B	15-28	Short traffic delays
C	29-42	Average traffic delays
D	43-56	Long traffic delays
E	57-70	Very long traffic delays
F	>70	Extreme delay

Source: RTA Guide to Traffic Generating Developments, 1993

Table 2.5 EXISTING OPERATION OF ADAMS ROAD/ELIZABETH DRIVE INTERSECTION

Movement		Degree of Saturation	Average delay (seconds)	Level of service
Right turn into Adams Road	AM	0.02	0.3	A
	PM	0.02	0.9	A
Right turn into Elizabeth Drive	AM	0.04	1.6	A
	PM	0.01	1.5	A

An assessment of the existing intersection configuration using "Guide to Traffic Engineering Practice-Part 5: Intersections at Grade" (Austroads, 1988) found that the following intersection improvements are required:

- Provision of a right turn bay on Elizabeth Drive with a storage length of 30 metres;
- Provision of a left turn deceleration lane on Elizabeth Drive with a length of 162 metres; and
- Widening of the Adams Road approach to the intersection to allow left turning vehicles to pass vehicles waiting to turn right. The widening needs to accommodate semi-trailers.

Whilst not necessary it would be appropriate to provide an acceleration lane for the right turns onto Elizabeth Drive from Adams Road. Such an acceleration lane would require a length of 440 metres.

2.4 ROAD SAFETY

The accident history for the intersection of Elizabeth Drive and Adams Road has been obtained from Liverpool Council records. Six accidents have occurred at the intersection since April 1990. Two of these accidents were fatal however they occurred early in the morning and did not involve collision with another vehicle. They are therefore unlikely to be a result of the design of the intersection. Remaining accidents involved collisions with vehicles waiting to turn right at the intersection. Implementation of improvements to the intersection as suggested above should improve traffic safety.

2.5 REGIONAL CHANGES

The traffic impact assessment is required to be undertaken for the combined effect of clay extraction and landfill generated traffic. Because of the relatively long term nature of the development it is appropriate to also consider the future traffic growth resulting from other developments in the area such as the Badgerys Creek Airport and proposed South Creek Valley residential development.

The short term construction traffic for Stage I of Badgerys Creek Airport is anticipated to require the transport to the site of 100,000 cubic metres of crushed rock

roadbase and 15,000 cubic metres of aggregates for concrete. These materials would either be transported from the Penrith area or the southern highlands and south coast with stockpiling at Wallgrove quarry. The materials would be transported to the airport site over the two year period 1995 to 1996 approximately.

Planning for airport construction is in progress with construction approximately 12 months away. No details of construction traffic routes are currently available. However, it is considered unlikely that any construction traffic would be permitted to use Adams Road because the recent major access improvements to the airport site have been developed from Badgerys Creek Road. Furthermore, the areas of the airport site where Stage 1 construction would take place are also more readily accessible from Badgerys Creek Road than from Adams Road. The future operational traffic resulting from Stage 1 of the Badgerys Creek airport would also be unlikely to use Adams Road.

The Commonwealth Government has now completed its program of road works for Stage 1 of Badgerys Creek Airport. No further road works would be undertaken prior to construction work and commissioning of Stage 2 of the airport which, on current passenger demand projections is most likely to be required around the year 2005.

Future operational traffic from the South Creek Valley development has also been considered for the initial stage of that development. The report for the initial stage of development (DoP, 1990) indicated that the future residential growth was not anticipated to generate additional traffic on Elizabeth Drive but was expected to generate significant additional traffic on the Northern Road by the year 2000.

A summary of future traffic volumes on the adjacent road network is presented in *Table 2.6.*

Table 2.6 FUTURE TRAFFIC VOLUME INCREASES (AADT)

Location	Future Base Traffic Years 2000-2011	Future Badgerys Creek Airport Traffic	Future South Creek Valley Traffic Year 2000
Elizabeth Drive			
E. of the Northern Road	6000-9000	+3000	0
W. of Wallgrove Road	21000-24000	+17000	0
E. of Wallgrove Road	25000-35000	+11000	0
The Northern Road			
N. of Elizabeth Drive	11000-15000	+3000	+3000
S. of Elizabeth Drive	9000-10000	+1000	+4000

Note: 1. *future base traffic volumes are taken from (DoP 1990) and (Kinhill Stearns, 1985)*

2. *AADT for combined clay extraction and landfill traffic = 2 x actual truck numbers to reflect axle totals.*

3

THE PROPOSED DEVELOPMENT

3.1 PREVIOUS APPLICATION

The proposed site has been the subject of a previous application for a similar extraction and landfill operation in 1994. The application was refused by Liverpool Council, but not on traffic grounds. With respect to traffic impacts the development was considered appropriate subject to a number of conditions, which are detailed in Section 1 of this report.

In summary, conditions included:

- improving the intersection of Elizabeth Drive/Adams Road;
- reconstructing the section of Adams Road between the site access and Elizabeth Drive;
- preventing truck movements to or from the site along Adams Road south of the site access; and
- giving consideration to imposing an indexed levy on major truck movements where appropriate for road maintenance purposes.

3.2 TRAFFIC GENERATION AND DISTRIBUTION

The future clay extraction and landfill traffic volumes generated by the proposal would be primarily truck traffic. The volumes of employee and other light vehicle traffic would be much lower than truck traffic volumes and comparatively of little significance.

3.2.1 Clay Extraction

The clay extraction truck traffic has been assessed as comprising semi-trailers with an average payload of 25 tonnes. An average extraction rate of 500,000 tonnes per

annum of which 350,000 tonnes per annum would leave the site would equate to an average of 51 loads per day (102 truck movements) which would travel exclusively to and from destinations at a range of brickwork sites to the east of Adams Road along Elizabeth Drive.

3.2.2 Landfill Operation

The landfill truck traffic would comprise a combination of truck types, primarily rigid trucks. The typical payload has been estimated as 4.7 tonnes per vehicle from existing records of truck movements at waste landfills at Eastern Creek and Lucas Heights (Mitchell McCotter, 1992). An annual landfilling rate of 230,000 tonnes per annum would require approximately 160 incoming loads per day (320 truck movements).

Table 3.1 shows the estimated number of truck movements generated by the combined operations per day and during peak hour.

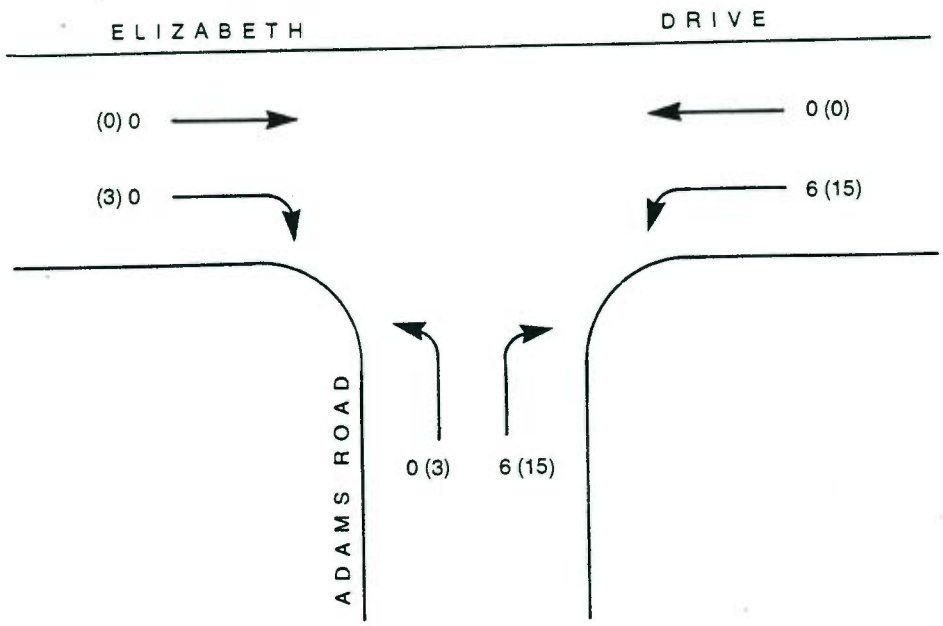
Table 3.1 ESTIMATED AVERAGE VEHICLE MOVEMENTS FOR COMBINED OPERATIONS

Year of operation	Truck Movements Per Day from Combined Operations	Peak Hour Vehicle Movements (vehicles per hour)	Peak Hour Movement East (vehicles per hour)	Peak Hour Movement West (vehicles per hour)
1	102	12	12	0
2	422	48	42	6
3	422	48	42	6
4	422	48	42	6
5	422	48	42	6
6	422	48	42	6
7	422	48	42	6
8	422	48	42	6
9	422	48	42	6
10	422	48	42	6
11	422	48	42	6
12	422	48	42	6
13	320	36	30	6
14	320	36	30	6
15	320	36	30	6

Note: 1. Flows rounded up to the nearest whole number

The precise distribution of landfill truck traffic is not known because of the influence of potential future developments in the region which would require a non-putrescible waste landfill depot. It is provisionally estimated that landfill truck traffic would be distributed 85% to and from the east and 15% to and from the west on Elizabeth Drive.

Peak traffic flows would occur during years 2 to 12 when extraction and landfill operations occur concurrently. Volumes generated by combined operations during the life of the project are illustrated in *Figure 3.1.*



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63 EXTRACTION TRAFFIC

(27) LAND FILL TRAFFIC

Figure 3.1 ESTIMATED PEAK HOUR TRAFFIC FLOWS TO AND FROM THE SITE FOR COMBINED OPERATIONS

4

TRAFFIC IMPACTS

4.1 TRAFFIC VOLUME

Traffic volumes generated by the combined landfill and clay extraction traffic would not be realised until after the year 1996 at the earliest by which time the background traffic volumes of the road network would have begun to change to reflect airport development. The impacts of the proposed development traffic should be considered in the context of traffic generated by other major developments such as Badgerys Creek Airport and South Creek Valley residential development.

A summary of future base traffic volumes and traffic volume increases from other developments is presented in *Table 4.1.* It can be seen that the future clay extraction and landfill traffic volumes are relatively minor in comparison to other traffic volume increases on major roads in the locality. To satisfy council conditions of consent, trucks will not be permitted to turn south from the site on Adams Road.

Table 4.6 FUTURE TRAFFIC VOLUME INCREASES (vehicles per day)

Location	Future Base Traffic Years 2000-2011	Future Badgerys Creek Airport Traffic	Future South Creek Valley Traffic Year 2000	Future Combined Clay Extraction & Landfill Traffic
Elizabeth Drive				
E of the Northern Road	6000-9000	+3000	0	+48
W of Wallgrove Road	21000-24000	+17000	0	+374
E of Wallgrove Road	25000-35000	+11000	0	0
The Northern Road				
N of Elizabeth Drive	11000-15000	+3000	+3000	+32
S of Elizabeth Drive	9000-10000	+1000	+4000	+16
Adams Road	1100	0	0	+422

Note: future base traffic volumes are taken from (DoP 1990) and (Kinhill Stearns, 1985)

**AADT for combined clay extraction and landfill traffic =2 x actual truck numbers to reflect axle totals.*

4.2 INTERSECTION OPERATION

The intersection of Adams Road and Elizabeth Drive is one of the few remaining unimproved intersections on Elizabeth Drive. It currently requires construction of a right turn lane, deceleration lane and some shoulder widening. The future quarry and landfill development will contribute traffic flows to the intersection as discussed above however no additional improvements to those already necessary will be required.

Traffic delays were calculated for the intersection based on gap acceptance theory using estimated increased traffic generated by the proposal. Increases in delays of less than one second were calculated for traffic turning at the intersection after development. For all turning vehicles the calculated increases in delay due to the development is insignificant.

4.3 PROPOSED ROAD IMPROVEMENTS

As part of the previous application, Liverpool City Council officers recommended certain draft conditions be imposed on the proposal with respect to traffic. After a review of these conditions and in light of the findings of this investigation, the following road improvements are proposed:

- reconstruction of the intersection of Adams Road and Elizabeth Drive to provide a right turn bay for vehicles turning right into Adams Road as well as a deceleration lane for vehicles turning left into Adams Road. Some shoulder widening is proposed for vehicles turning into Elizabeth Drive and to assist eastbound vehicles on Elizabeth Drive to pass eastbound trucks accelerating from Adams Road.

- reconstruction of Adams Road north of the site access to an acceptable standard. Austroads (1988) suggests a seven metre pavement with two metre shoulders for a road carrying in excess of 1000 vehicles per day.

As indicated in Section 2, the Roads and Traffic Authority has advised in discussions that the condition of the road pavement on Elizabeth Drive is considered to be adequate such that a Section 94 levy for heavy vehicles movement would not be applicable for this road.

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SUMMARY AND CONCLUSIONS

The proposed development is a clay/shale extraction and landfill operation at Adams Road, Luddenham. While the quarry and landfill operation are the subject of separate EISs, the traffic impacts of both operations have been assessed together.

It is expected that the combined extraction operation and landfill process will generate peak traffic movement and this will result in an average of 48 vehicle trips during morning and evening peak hours or 422 vehicle trips per day.

Combined traffic generation predictions for the extraction and landfill operations are significantly less than the predicted increases in traffic volumes from other developments in the area such as Badgerys Creek Airport and South Creek Valley residential development.

Detailed analysis of the effects of the existing traffic on the operation of the Adams Road/Elizabeth Drive intersection indicate that improvements to the intersection are needed. These would require the construction of a right turn bay, deceleration lane and some shoulder widening. The proposed development would not cause any significant delays or loss in the degree of service to turning traffic.

Although it is considered that potential landfill truck traffic on Adams Road south of the site would be minimal, it is proposed that usage of this section of road by vehicles from the development be restricted.

REFERENCES

Austroads, 1988

Guide to Traffic Engineering Practice Part 5: Intersections at Grade.

R A Cole Town Planning Pty Ltd, 1994

Transport Impact Assessment of Proposed Clay/Shale Extraction, Lot 3, DP 623799, Adams Road, Luddenham, Prepared by Stapleton & Hallam.

Department of Planning, 1990

South Creek Valley Transport Study, report prepared by Travers Morgan Pty Ltd.

Kinhill Stearns, 1985

Draft EIS for Sydney's Second Airport Site Selection Program.

Roads and Traffic Authority, 1991

Traffic Volumes and Supplementary Data, Sydney, Parramatta and Blacktown Divisions.

Roads and Traffic Authority, 1992

Western Sydney Truck Survey, report prepared by Denis Johnson and Associates.

Roads and Traffic Authority, 1993

Guide to Traffic Generating Developments.