PAR

STRATFORD COAL PROJECT

ENVIRONMENTAL IMPACT STATEMENT

VOLUME I

Stratford Coal Pty. Ltd.

September 1994

FORM 2 - SUBMISSION OF ENVIRONMENTAL IMPACT STATEMENT (EIS)
Prepared under the Environmental Planning and Assessment Act 1979 - Section 77 (3) (d)

EIS PREPARED BY

Names:	Peter Anthony Ryan	Christopher Julian Raymond Ellis
Qualifications:	Bachelor of Science, Master of Science Principal, Mining Services AGC Woodward Clyde Pty. Ltd.	Bachelor of Science (Earth Sciences) Development Manager Stratford Coal Pty. Ltd.
Addresses:	49 Park Road, Milton, Brisbane 4000	Level 4, South Shore Centre, 85 The Esplanade, South Perth 6151

DEVELOPMENT APPLICATION

Applicant Name: Stratford Coal Pty. Ltd. ACN 064 016 164

Applicant Address: Level 4, South Shore Centre, 85 The Esplanade, South Perth 6151

LAND TO BE DEVELOPED

Address: Land described in full in the Development Application and and outlined in black in Figure 2-1 of the accompanying EIS.

PROPOSED DEVELOPMENT

Description: Open cut coal mine, coal preparation plant, coal handling facilities and supporting infrastructure as detailed in the accompanying EIS.

Estimated Cost: $28 million

ENVIRONMENTAL IMPACT STATEMENT

An Environmental Impact Statement is attached

CERTIFICATE

We hereby certify that we have prepared the contents of this Statement and to the best of our 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.

Signatures:

Names: for Peter Anthony Ryan — Christopher Julian Raymond Ellis

Date: 12/9/94 — Date: 12TH SEPTEMBER 1994

TABLE OF CONTENTS

Section			Page
EXECUTIVE SUMMARY			ES-1
1.0	INTRODUCTION		1-1
	1.1	BACKGROUND	1-1
	1.2	PROPOSAL OUTLINE	1-1
	1.3	THE STRATFORD JOINT VENTURE PROFILE	1-2
	1.4	SITE DEVELOPMENT HISTORY	1-2
	1.5	SCALE OF PROPOSED OPERATION	1-3
	1.6	REASON FOR THE DEVELOPMENT	1-3
	1.7	CONSULTATION WITH GOVERNMENT AUTHORITIES AND THE COMMUNITY	1-4
	1.8	LEGISLATIVE REQUIREMENTS	1-5
	1.9	STRUCTURE OF THE ENVIRONMENTAL IMPACTSTATEMENT	1-6
	1.10	PROJECT TEAM FOR THE ENVIRONMENTAL IMPACT STATEMENT	1-6
2.0	EXISTING ENVIRONMENT		2-1
	2.1	REGIONAL SETTING	2-1
	2.1.1	Location and Physiography	2-1
	2.1.2	Topography and Slopes	2-1
	2.1.3	Climate	2-2
	2.1.4	Neighbouring Coal Mines and Exploration Areas	2-3
	2.2	LAND CAPABILITY AND LAND USE	2-3
	2.2.1	Soils	2-3
	2.2.2	Land Capability	2-3
	2.2.3	Land Ownership	2-4
	2.2.4	Land Use	2-4
	2.2.5	Land Zoning and Planning	2-7

2.3 HYDROLOGY 2-8
2.3.1 Regional Hydrology 2-8
2.3.2 Surface Waters 2-9
2.3.3 Groundwaters 2-9
2.3.4 Water Quality 2-10
2.3.5 Water Demand 2-15
2.4 AIR QUALITY 2-16
2.5 ACOUSTICS 2-25
2.6 TRANSPORT NETWORK 2-17
2.6.1 Roads and Traffic 2-17
2.6.2 Rail 2-17

2.7 VISUAL FEATURES 2-17
2.7.1 Visual Character 2-17
2.7.2 Landscape Units 2-18
2.7.3 Scenic Quality 2-19
2.8 FLORA AND FAUNA 2-19
2.8.1 Flora 2-19
2.8.2 Terrestrial Fauna 2-20
2.8.3 Avifauna 2-21
2.9 ARCHAEOLOGY 2-22
2.9.1 Aboriginal Heritage 2-22
2.9.2 European Heritage 2-22
2.10 SOCIAL AND ECONOMIC ASPECTS 2-23
2.10.1 Population Statistics 2-23
2.10.2 Employment Statistics 2-23
2.10.3 Economic Aspects 2-24
2.10.4 Education, Housing and Health 2-24

3.0 GEOLOGY AND COAL RESOURCES 3-1
3.1 REGIONAL GEOLOGY 3-1
3.2 GEOLOGY OF THE PROJECT AREA 3-1
3.2.1 Stratigraphy 3-1
3.2.2 Structure 3-2
3.2.3 Coal Reserves 3-2
3.2.4 Coal Quality 3-3
3.3 OVERBURDEN AND INTERBURDEN CHARACTERISTICS 3-5
3.3.1 Mechanical Properties 3-5
3.3.2 Geochemical Properties 3-5
3.3.3 CPP Rejects 3-5

4.0 PROJECT DESCRIPTION 4-1
4.1 MINING 4-1
4.1.1 Mining Plan 4-1
4.1.2 Sequence of Operations 4-2
4.1.3 Mining Equipment 4-3
4.1.4 Production Schedule 4-4
4.2 COAL HANDLING AND PREPARATION 4-5
4.2.1 Overview 4-5
4.2.2 Coal Preparation 4-5
4.2.3 Plant Capacities 4-6
4.3 MANAGEMENT AND DISPOSAL OF CPP REJECTS 4-6
4.3.1 General 4-6
4.3.2 Proposed Co-disposal System 4-7
4.4 COAL TRANSPORTATION 4-7
4.5 MINE SITE INFRASTRUCTURE AND FACILITIES 4-8
4.5.1 Project Infrastructure 4-8
4.5.2 Project Development Works 4-8
4.5.3 Project Access 4-8
4.5.4 Project Power and Water Supply 4-8
4.6 WORKFORCE 4-9
4.6.1 Construction Stage 4-9
4.6.2 Operational Stage 4-9
4.7 MINE OPERATING HOURS 4-9
4.8 PRODUCTS MARKETS 4-9
4.9 WATER MANAGEMENT 4-10
4.9.1 Introduction 4-10
4.9.2 Clean Water Managemen t4-10
4.9.3 Dirty Water Management 4-11
4.9.4 Overburden Dump Runoff Management 4-12
4.9.5 Water Budget 4-13
4.9.6 Post Mining Water Management 4-13
4.10 REHABILITATION 4-14
4.10.1 Introduction 4-14
4.10.2 Objectives 4-14
4.10.3 Timber Removal 4-14
4.10.4 Shaping of Overburden Waste Dumps 4-14
4.10.5 Topsoil Management 4-14
4.10.6 Site Preparation 4-15
4.10.7 Revegetation 4-15
4.10.8 Drainage and Erosion Control 4-16
4.10.9 Rehabilitation of CPP Rejects 4-16
4.10.10 Area of Disturbance 4-16
4.10.11 Staged Rehabilitation 4-16

4.11 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAMME 4-16
4.11.1 Climatic Data 4-17
4.11.2 Overburden Characterisation and Rehabilitation 4-17
4.11.3 Hydrology 4-18
4.11.4 Air Quality 4-19
4.11.5 Acoustics 4-19
4.11.6 Transport Systems 4-19
4.11.7 Visual Impact 4-19
4.11.8 Flora and Fauna 4-19
4.11.9 Archaeology 4-20
4.11.10 Socio-Economics 4-20

5.0 IMPACT OF THE PROJECT ON THE ENVIRONMENT AND PROPOSED CONTROL MEASURES 5-1
5.1 TOPOGRAPHY 5-1
5.2 LAND CAPABILITY AND LAND USE 5-1
5.2.1 Soils 5-1
5.2.2 Land Capability 5-1
5.2.3 Land Ownership and Residences 5-2
5.2.4 Land Use 5-2
5.3 HYDROLOGY 5-3
5.4 AIR QUALITY 5-4
5.4.1 General 5-4
5.4.2 Impact Assessment Methodology 5-5
5.4.3 Dust Emissions 5-5
5.4.4 Dust Deposition 5-6
5.4.5 Total Suspended Particulates 5-6
5.5 ACOUSTICS 5-7
5.5.1 Noise Impact 5-7
5.5.2 Blasting Impact 5-8
5.6 TRANSPORT 5-8
5.6.1 Mine Traffic Aspects 5-8
5.6.2 Road Aspects 5-8
5.7 VISUAL IMPACT 5-9
5.8 FLORA AND FAUNA 5-11
5.9 ARCHAEOLOGY 5-12
5.9.1 Aboriginal Heritage 5-12
5.9.2 European Heritage 5-13
5.10 SOCIO-ECONOMICS 5-13
5.10.1 Employment 5-13
5.10.2 Education, Housing and Health 5-14
5.10.3 Economic Aspects 5-14
5.10.4 Community Contributions Plan 5-15

5.11 SUMMARY OF ENVIRONMENTAL IMPACTS 5-15
5.11.1 Impact on Adjacent Rural Properties andthe Rural Villages of Stratford and Craven 5-15
5.11.2 Impact on Gloucester Township 5-16
5.11.3 Conclusion 5-16

6.0 ALTERNATIVES TO THE DEVELOPMENT 6-1
6.1 ALTERNATIVES TO THE DEVELOPMENT PROPOSAL 6-1
6.2 CONSEQUENCES OF NOT PROCEEDING 6-3

7.0 REFERENCES 7-1

LIST OF TABLES

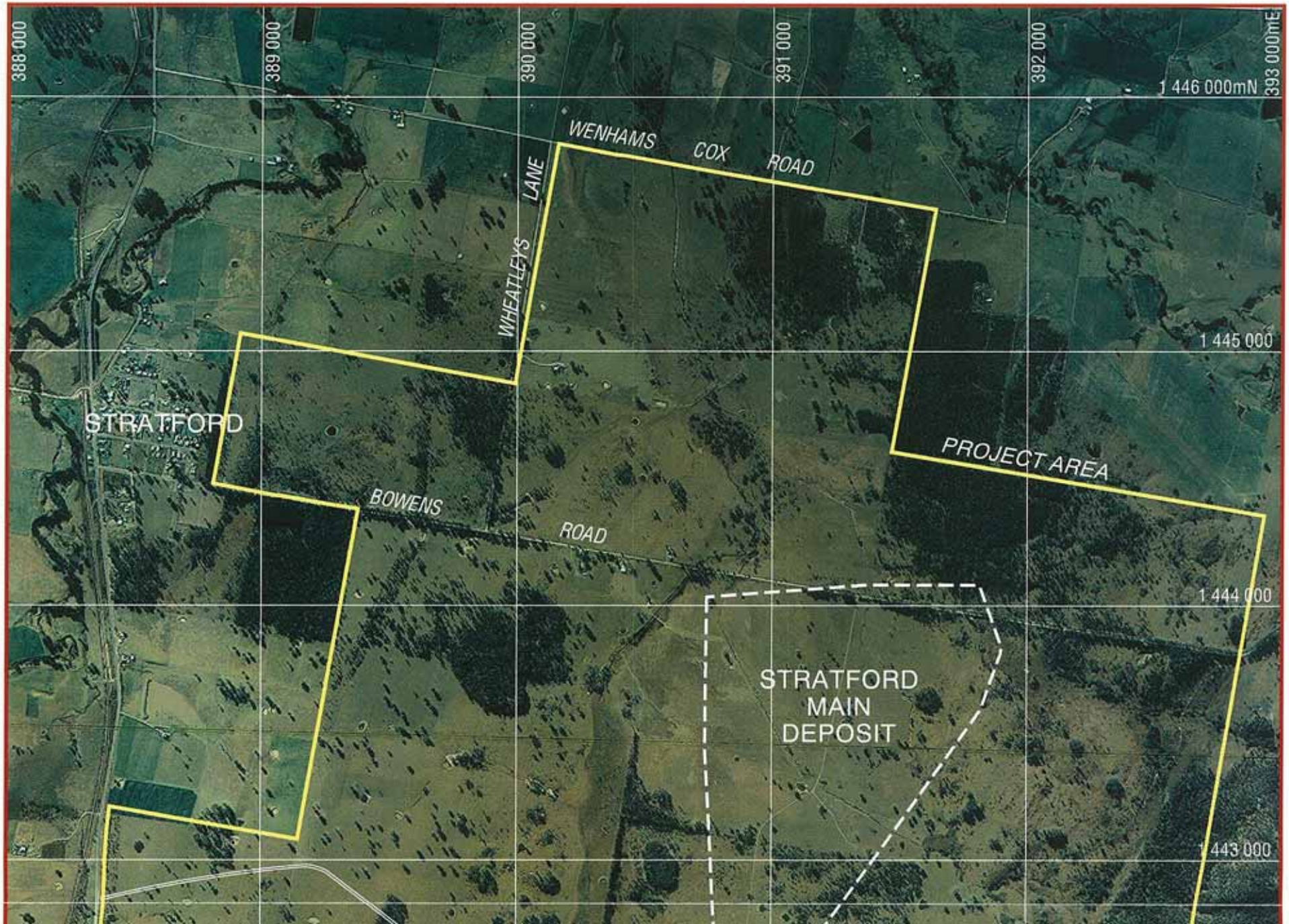
ES-1 Summary of Government Authority Responses Following Planning Focus Meeting of 5 July 1994 ES-7
1-1 Expected Annual Saleable Coal Production 1-3
2-1 Value of Agriculture Production - Gloucester Shire 1992-1993 2-5
2-2 Agricultural Productivity Statistic for Gloucester Shire 1989-1990 2-6
2-3 Surface Water Quality Summary (1981 - 1982) 2-10
2-4 Surface Water Quality Summary (1994) 2-11
2-5 Groundwater Quality Summary (1981 - 1982) 2-13
2-6 Groundwater Quality Summary (1993) 2-14
2-7 Summary of Background Dust Deposition Rates 2-16
2-8 Summary of High Volume Dust Sampling 2-16
2-9 Summary of Monitored Noise Levels 2-16
2-10 Scenic Quality Criteria 2-19
2-11 Vegetative Classification 2-20
3-1 Coal Resources - Stratford Main Deposit 3-3
3-2 Coal Reserves - Stratford Main Deposit 3-3
3-3 Indicative Coal Quality - Stratford Main Deposit 3-4
4-1 Mining Contractor's Equipment and Manning 4-3
4-2 Stratford Mine Production Schedule 4-4
4-3 Saleable Coal Products 4-5
4-4 Capacities of Proposed CPP Rejects Co-disposal Sites 4-7
4-5 Operational Workforce at Year 10 4-9
5-1 Summary of Predicted Dust Emissions 5-6
5-2 Predicted Noise Impacts at Local Residences 5-7

LIST OF FIGURES

1-1 Project Location and Tenements
1-2 Relative Scale of Stratford Saleable Coal Production
1-3 Relative Scale of Stratford Mine Size
2-1 Existing Topography
2-2 Soil Types
2-3 Soil Stripping Depths
2-4 Land Capability
2-5 Land Ownership
2-6 Land Use
2-7 Land Zoning Boundaries
2-8 Location of Surface Water Monitoring Sites
2-9 Location of Groundwater Monitoring Sites
2-10 Location of Dust Monitoring Sites
2-11 Location of Noise Monitoring Sites
2-12 Regional Transportation Routes and Traffic Volumes
2-13 Landscape Assessment
2-14 Vegetation Distribution
2-15 Significant Vegetation Remnants
2-16 Location of Identified Aboriginal Heritage Sites
2-17 Location of Identified European Sites, Gloucester
3-1 Regional Geology
3-2 Regional and Local Stratigraphy
3-3 Main Deposit Boreholes and Cross Section Lines
4-1 Operational Mining Landform Year 2
4-2 Operational Mining Landform Year 7
4-3 Post-Mining Landform Year 14
4-4 Pit Design and Operational Criteria
4-5 Typical Cross-section through Rehabilitated Dump
4-6 Typical Cross-section Through Rehabilitated Co-disposal Area
4-7 Simplified Coal Preparation Flowsheet
4-8 Coal Preparation and Handling Site Layout
4-9 Location and Conceptual Design of Rail Loop
4-10 Schematic Layout of Water Management System
5-1 Predicted Dust Deposition Year 7
5-2 Predicted Noise Impacts at Local Residences
5-3 Predicted Blasting Impacts at Local Residences Impacts
5-4 Visual Impact Assessment and Remedial Measures
5-5 Proposed Wildlife Corridor Areas

LIST OF APPENDICES

Appendix 1.1	Geology and Coal Resources
Appendix 1.2	Climate and Meteorology
Appendix 2.1	Soils and Land Capability
Appendix 2.2	Land Ownership
Appendix 2.3	Land Use
Appendix 2.4	Waste Characterisation and Management
Appendix 2.5	Rehabilitation
Appendix 3	Hydrology and Water Management
Appendix 4	Air Quality
Appendix 5	Acoustics
Appendix 6	Transport
Appendix 7	Visual Impact
Appendix 8.1	Flora
Appendix 8.2	Terrestrial Fauna
Appendix 8.3	Avifauna
Appendix 9.1	Aboriginal Heritage
Appendix 9.2	European and Natural Heritage
Appendix 10	Socio-Economics
Appendix 11	Requirements of Director, Department of Planning


388 000
389 000
390 000
391 000
392 000
393 000mE
1 446 000mN
1 445 000
1 444 000
1 443 000
WENHAMS COX ROAD
WHEATLEYS LANE
STRATFORD
PROJECT AREA
BOWENS ROAD
STRATFORD MAIN DEPOSIT

SUMMARY

BACKGROUND

CIM Resources Ltd. (CIM) and Excel Mining Pty. Ltd. (Excel) formed the Stratford Joint Venture (SJV) in May 1994 with the objective of developing the Stratford Coal Project (the Project). The Project involves developing a small open cut coal mine, near Gloucester in New South Wales, which will produce high quality coking and thermal coal for export markets. The SJV has appointed a sole purpose operating company, Stratford Coal Pty. Ltd. (SCPL) as Manager of the Project and, under NSW planning legislation, SCPL is the proponent for the Project.

SCPL is required to obtain a Development Consent and a Mining Lease before proceeding to develop the Project and applications for both must be accompanied by an Environmental Impact Statement (EIS). This document constitutes the EIS for the Project in support of a Development Application which has been lodged with Gloucester Shire Council.

THE PROPOSAL

SCPL proposes to establish the Project in a secluded area of cleared grazing land located east of Bucketts Way, between the townships of Stratford and Craven in the Gloucester Valley (the Project Area, refer Figure 1-1). The Project Area is defined as the area covered by the Mining Lease and the Development Application and covers around 1,500 hectares. All land within the Project Area is owned freehold by the SJV.

The Project will comprise an open-cut mine based on the Stratford Main Deposit with a coal preparation plant (CPP) and associated raw and product coal handling and rail loading facilities. The Project will involve mining approximately 23.5 million tonnes (Mt) of run-of-mine (ROM) coal, for a planned production rate of 1.8 million tonnes per annum (Mtpa) of ROM coal for a 14 year period.

The coal seams of economic interest within the Main Deposit are the range of seams from the Avon Coal Member to the Triple Coal Member. The geological structure of the coal resource has resulted in the Main Deposit being relatively shallow with a low stripping ratio in the southern area, increasing to the north.

Mining operations will commence at the southern end of the Main Deposit, where overburden thickness and strip ratio are at a minimum. This will facilitate a rapid mine start-up and will also minimise the area of land to be disturbed. High quality coking coal and high energy thermal coal will be produced from the southern area during the initial stages of production and throughout the life of the mine. Mining will proceed northwards in a series of strips each approximately 100metres wide and generally parallel to the northern limit of the Main Deposit.

Overburden will be removed to a depth of around 10 metres by backhoe excavators loading into dump trucks. All other overburden material will be blasted. Overburden will be trucked to out-of-pit dumps in the early years of the mine life whilst in subsequent years the majority of overburden will be placed in or over the mined-out pit. The overburden will be spread and

contoured to maintain effective drainage during dump construction and to meet the requirements of the final rehabilitation plan. A total of 67 million cubic bank metres (Mbcm) of overburden will be moved at an average stripping ratio of 2.8 bcm of overburden per 1.0 tonne of ROM coal.

A small amount of coal (325,000 tonnes) will also be extracted from the Bowens Road West Deposit as part of Project construction.

All ROM coal will be washed on site in the CPP to yield around 1.1 Mtpa of saleable coking and thermal coal. All product coal will be railed from site and either shipped through Newcastle Port for export or consumed in the Hunter Valley.

The primary saleable product will be a coking coal which is of superior quality to the majority of coking coals currently exported from Newcastle. As such, it will compete primarily with high fluidity coals from the USA and Queensland.

Development of the mine infrastructure and access to the site by road and rail will take approximately six months. The construction workforce will peak at around 100 whilst the permanent operational workforce will be around 75. The mine and CPP will operate 24 hours per day, 6 days per week.

It is proposed to locate the CPP and coal handling facilities to the west of the mine site along with all associated infrastructure. ROM and product coal will be stockpiled adjacent to the CPP and a rail loop will be constructed to link the CPP with the main rail line to Newcastle. Product coal will be transported solely by rail.

Water supply for industrial usage on site will be drawn from recirculating runoff water from the disturbed areas and from pit dewatering operations. Power supply will be from the feeder line which runs along Bucketts Way and vehicular access into the mine area will also be from Bucketts Way.

ENVIRONMENTAL IMPACT

The Project proposed by SCPL is a relatively small scale mine development which will have a negligible impact on the natural environment. The Project Area has a number of natural environmental advantages which have been supplemented by an engineering design which is aimed at avoiding or minimising any adverse environmental impact.

Significant environmental advantages of the Project are:

(i) A very small operation in comparison to contemporary Hunter Valley coal mines (refer Figures 1-2 and 1-3).

(ii) A much reduced Project scale in comparison to development proposals considered by the previous holders of the Exploration Licences (Authorisations).

(iii) The concentration of mine operations on cleared, low-productivity land which is wholly owned by the SJV.

(iv) The low sensitivity status of the Project Area with respect to faunal, archaeological and visual aspects.

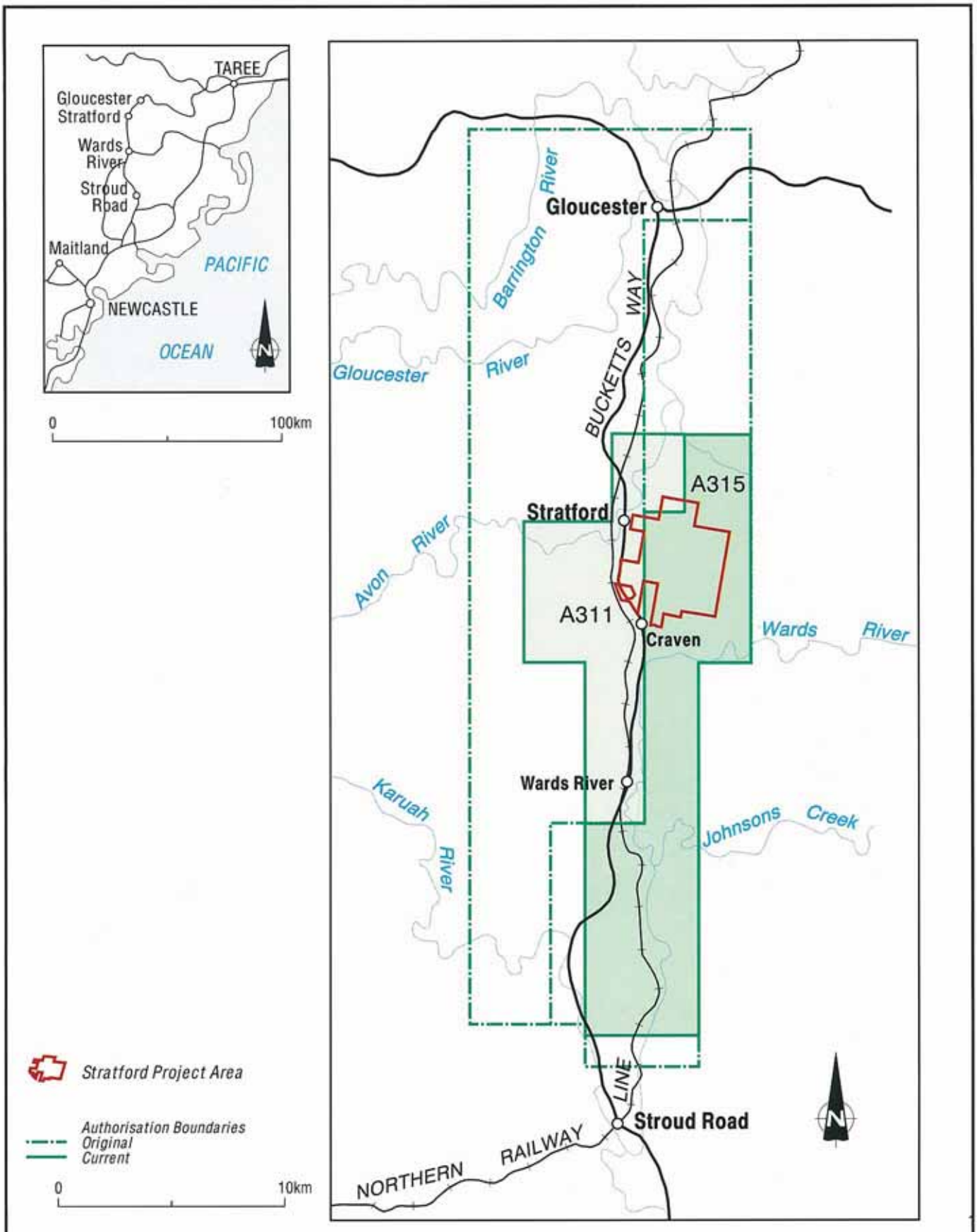
(v) Noise and dust projections that are well within regulatory standards and management proposals to ensure that these impacts are minimised.

(vi) In-pit disposal of the majority of overburden and backfilling of the majority of the pit.

(vii) Co-disposal of CPP reject material, leading to faster and more effective rehabilitation.

(viii) Manageable surface and groundwater regimes with no discharge of dirty water from the Project Area under all but extreme wet conditions.

(ix) Ongoing environmental and rehabilitation programmes throughout mining operations in which the local Landcare and Catchment Groups and State Authorities will play key roles along with SCPL.



STRATFORD COAL

PROJECT LOCATION and TENEMENTS

Figure 1-1

Date September 1994

RELATIVE SCALE OF STRATFORD PROJECT SALEABLE COAL PRODUCTION

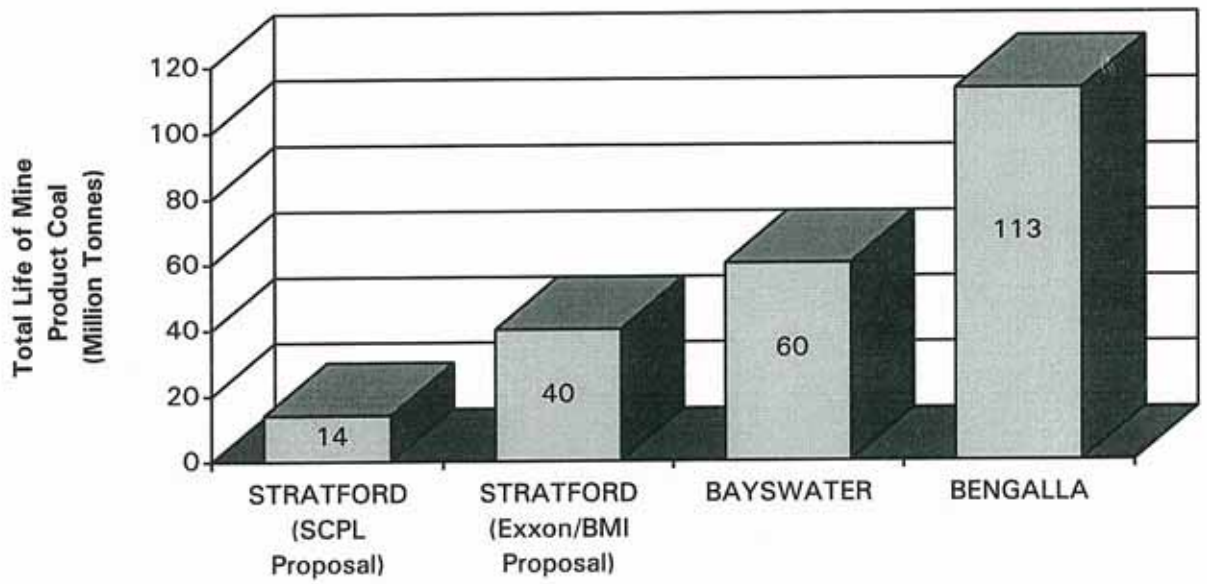


Figure 1-2

RELATIVE SCALE OF STRATFORD PROJECT TOTAL MATERIAL MOVED

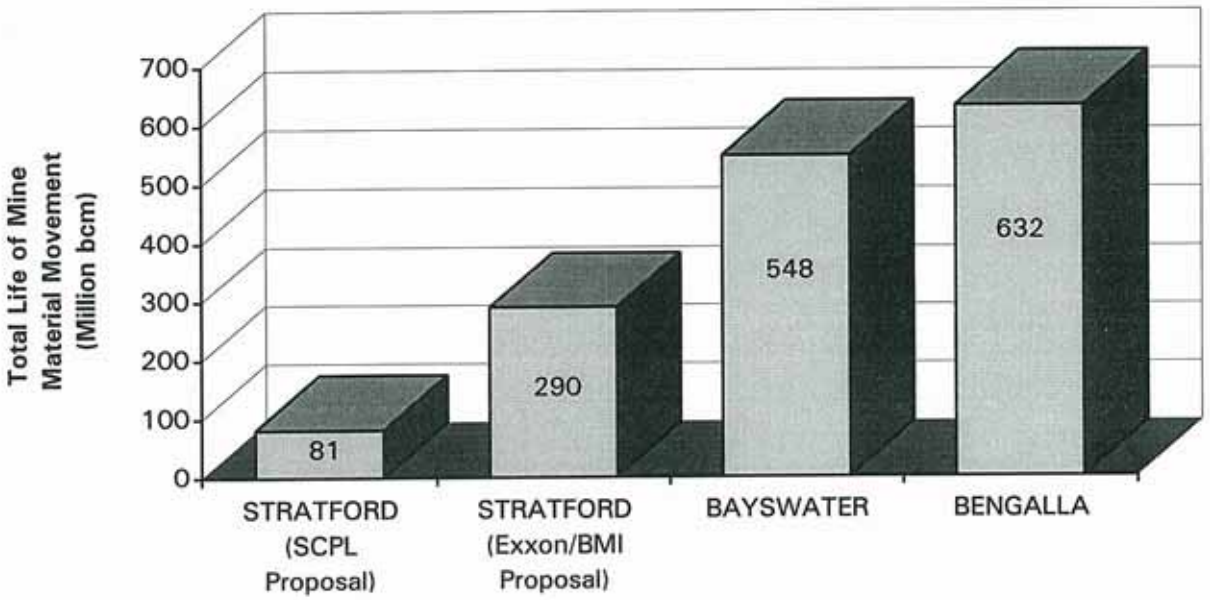


Figure 1-3

Land Rehabilitation

Rehabilitation will involve contouring of the final overburden dumps to a nominal 1 in 6 slope on the outer faces and merging the top of the dump with the topography of the existing foothills to the east. Topsoil previously removed from the area and stored as part of the rehabilitation program will be spread and the dump revegetated with species selected in consultation with local groups, the NSW Department of Mineral Resources (DMR), Conservation and Land Management (CaLM) and the Soil Conservation Service (SCS).

The dumps will be rehabilitated in stages to their final landform so that dirty water catchment is minimised and fully contained. Rehabilitated land will have a land use capability at least as high as at present.

CPP Reject Disposal

The coarse and fine reject material from the CPP will be emplaced by a co-disposal technique into engineered emplacement areas to the north of the CPP and within the overburden dumps. These emplacement areas will be designed to minimise seepage.

This method of reject disposal has significant environmental advantages over conventional tailings dams as it allows fine reject material to drain and be rapidly rehabilitated.

Water Quality Management

The detailed hydrogeological and hydrological studies which have been undertaken for the Project indicate that the proposed mining operation will have negligible impact on surface water and groundwater resources in the area. Water management systems are designed to ensure that the Project has minimal adverse effect on surrounding surface water and groundwater quality.

Rainfall runoff into the mining pit will be retained for use in the CPP, as will groundwater inflow to the mining pit. Clean water runoff from undisturbed areas will be diverted around disturbed areas and allowed to follow the existing drainage system into Dog Trap Creek.

Water storage and management systems have been engineered to ensure that no water from operational areas will be discharged from the Project Area except under extremely wet conditions. Detailed modelling of water volumes over the Project life indicates that in rare periods of abnormally wet weather it may be necessary to discharge water from on-site storage in a controlled manner. If necessary, controlled discharge would only be required late in the mine life (year 11 onward) as on-site storage became more heavily utilised.

No significant adverse impact to local water quality is predicted during any such controlled discharge periods due to the substantial dilution effects associated with the heavy rainfall and streamflow conditions which would occur within receiving catchment areas during such periods.

Any such discharge would need to be approved and licenced by the EPA and would be subject to strict monitoring and control procedures.

Mine operations water will be used on a prioritised basis (dirty water first). Any surplus water generated in the Project Area which is of acceptable quality will be offered to local landholders for stock and irrigation, as the area experiences frequent water shortages.

Dust

The Project has been designed to minimise dust emissions by watering on haul roads and stockpiles, minimisation of the area of disturbed ground during mining operations and prompt revegetation following disturbance. Predictive modelling and assessment has shown operational dust levels at the nearest residences to be negligible and well within the EPA criteria (i.e. well below 2.0 g/m^2/month).

Noise

The Project has been designed to minimise the impact of noise on nearby residents. Noise levels at all residences in the villages of Stratford and Craven are less than half the allowed standard even in adverse weather conditions.

Under worst case weather conditions, with maximum mining equipment in use and without ameliorative action, only one occupied residence beyond the north eastern boundary of the Project Area may be affected by noise levels above the EPA planning levels of 35 dBA LA_{90} at night or 45 dBA LA_{90} by day.

This residence was constructed in full knowledge of the likelihood of mine development and despite objections from the DMR, the Gloucester Shire Council and the coal tenement holders at the time.

Transport

A balloon rail loop will be constructed immediately and all commercial shipments of coal will be transported from the Project Area by rail.

A separate access road will be constructed to the Project Area, intersecting with Bucketts Way at a point with good visibility some 1 kilometre north of Craven.

This intersection will be built to RTA standards, including acceleration, deceleration and turning lanes. The predicted increase in traffic on Bucketts Way from Project workforce and commercial light vehicles is 15%, well within the capacity of the existing road.

Visual Effect

Potential visual impact of the Project will be generally low and very restricted. The mine and infrastructure area is very well shielded from local view by ridges to the west, south and north and hills to the east. Some long distance views of the Project Area may occur from houses on high ground to the north and west at a distance of 6 to 10 kilometres.

Intermittent views of the CPP and overburden dumps may occur for traffic on a section of around 500 metres of Bucketts Way to the south west. This would be an intermittent long distance view within the broad panorama of the valley. Ameliorative measures such as bund construction and tree planting, in addition to the substantial tree planting already undertaken, will be carried out to further screen views of the mine from traffic on the Bucketts Way.

Potential lighting impacts are low. The use of carefully designed uni-directional lighting will further reduce any potential for visual impact of the mine at night.

Flora and Fauna

The Project Area is predominantly cleared and SCPL has taken care to avoid disturbing remnant stands of trees when designing the layout of the Project. The endemic flora and fauna of the Project Area have been considerably modified by clearing and agricultural land use over a period of more than 100 years.

Revegetation with endemic tree species during and following mining will improve floral species diversity and will encourage faunal species to recolonise the area. At present the Project Area has limited floral and faunal values in comparison to regional examples.

A management plan for fauna has been designed in consultation with National Parks and Wildlife Service (NPWS) which offers habitat enhancement and the re-establishment of vegetation corridors.

Archaeology

No sites of archaeological significance are known to occur on the Project Area. An archaeological management plan will be prepared in relation to the protection of any material which may be encountered during the Project. Any treatment of archaeological material will be subject to consent from NPWS.

No properties of European cultural heritage significance occur within the Project Area. Heritage properties in Gloucester township will not be affected by the Project.

ECONOMIC AND SOCIAL IMPACT

The Project will have considerable economic and social benefits for the Gloucester Shire and local community and will generate substantial State and Federal revenue.

Employment Benefits

Development and operation of the Project will result in a significant increase in employment opportunities for the local and regional workforce. During the construction phase, the workforce will peak at around 100. Whilst much of the construction work will be contracted to mining specialists, there will be opportunities for local subcontractors. An example of this can be seen from the recent coal sample excavated by SCPL in the Main Deposit. This contract was let to a Hunter Valley mining contractor who subcontracted local labour and equipment for the job.

The direct on-site Project workforce will total around 75 over the 14 year life of the Project. Whilst a large pool of unemployed mine workers currently exists in the Newcastle and Hunter Valley regions, a significant number of permanent on-site jobs are expected to be drawn from the local workforce. The majority of the permanent workforce are expected to live in the Gloucester region.

Of greater significance to the local community will be the substantial flow-on employment which will be generated in service industries associated with the Project and its employees. It is estimated that a further 150 jobs will be created in these service industries. The majority of flow-on jobs created will be based outside the Gloucester Shire, in areas such as Maitland and Singleton where a number of specialist coal industry equipment service contractors and workshops are established.

A significant number of jobs will, nevertheless, be generated in the Gloucester region in the areas of mine servicing (eg plant maintenance and repairs, light vehicle maintenance, site rehabilitation, environmental monitoring and control, office services) and services for the mine employees and their families (eg home construction, repairs and maintenance, household supplies, entertainment).

In total, the Project is expected to create around 225 new jobs of which around 30% are expected to be in the Gloucester region. This will provide a significant benefit to regional employment with the current full time workforce of the Gloucester Shire being 1,750 (1991 estimate).

Education and Training Benefits

The Project will introduce a range of professions and skills to which people in the Gloucester region are not commonly exposed. These include:

- environmental engineering
- mining engineering
- geology
- metallurgy

Demands for local maintenance and support services will also enhance the opportunities for young people to enter professions and trades which support mining such as surveying, diesel engineering, light vehicle maintenance, steel fabrication and electrical trades.

SCPL intends to work closely with regional authorities to maximise the education, training and employment opportunities generated by the Project. As part of its Community Contributions Plan, SCPL intends to provide financial support for the education and training of young people in the professions and trades which are directly related to mining. The aim of this programme is to enhance local education and training opportunities and to enhance the availability of skilled people for the Project.

Economic Benefits

Project construction will require a capital investment of around $28 million during 1995. A significant proportion of this investment will flow into the local economy through payments to construction workers, local contractors and suppliers.

From late 1995, the Project will expend around $20 million per year in mining, processing and handling product coal onto rail. A further $15 million per year will be expended to transport the coal to the port of Newcastle and load it onto ships.

There will also be substantial flow-on economic activity generated by the Project, with a significant part of this being generated in service industries within the local economy. The economic significance of the Project may be judged by considering that the total agricultural economy of Gloucester Shire currently generates around $20 million per year.

In addition to the direct economic benefits to the Gloucester region, the NSW Government will receive substantial income from the Project via royalties ($2.2 million per year), rail freight payments and various State taxes.

On the broadest level, the Project will generate around $55 million per year in export revenue to assist Australia's trade balance.

At the local level, SCPL is proposing the establishment of a local community support programme for the villages of Stratford and Craven as part of its Community Contributions Plan.

Community Contributions Plan

SCPL is proposing a Community Contributions Plan which is aimed at meeting SCPL's obligations to Gloucester Shire as a developer whilst also providing ongoing benefits from the Project in the areas of education, and training, and support for the local communities of Stratford and Craven. The proposed Plan has three components:

- Developer Contribution
- Education and Training Support
- Local Community Support

The Developer Contribution (in lieu of S.94 contributions) will consist of a capital contribution to Gloucester Shire for the augmentation of Shire services and facilities, based on the number of new residents expected in the Shire as a result of the Project.

The Education and Training Support programme will provide financial support for the education and training of young people in the professions and trades which are directly related to mining. The aim of this programme is to enhance local education and training opportunities and to enhance the availability of skilled people for the Project.

The Local Community Support programme will provide financial support for the augmentation of local community facilities in the villages of Stratford and Craven. The aim of this programme is to provide a direct economic benefit to the communities in the immediate vicinity of the Project, in addition to the general flow-on of regional benefits.

CONSULTATION WITH GOVERNMENT AND THE COMMUNITY

Consultation has been carried out with relevant Government Authorities and Community Groups throughout the preparation of the EIS and is ongoing. Preliminary presentations have been made to public meetings in the Gloucester area hosted by the Chamber of Commerce, the Environmental Group, Avon Valley Landcare and the Anglican and Catholic Fellowships. This EIS attempts to address all of the questions raised in these meetings.

The Project was introduced formally to New South Wales and Local Government Authorities at a Planning Focus Meeting, organised by the Department of Mineral Resources and held at the Project Area on 5 July, 1994. Responses from Government Authorities based on information provided at the Planning Focus meeting are summarised in Table ES-1, together with appropriate comments provided by SCPL and references to relevant sections of the EIS.

TABLE ES-1
SUMMARY OF GOVERNMENT AUTHORITY RESPONSES FOLLOWING PLANNING FOCUS MEETING OF 5 JULY 1994

GOVERNMENT AUTHORITY	REGULATOR QUESTIONS/COMMENTS	SCPL RESPONSE	SECTION	APPENDIX
Environmental Protection Authority (EPA)	Residences adjoining the Project may be adversely affected by dust and noise.	Predicted dust, noise and blasting levels from the proposed development will comply with EPA design goals and mitigative instructions.	5.4 5.5	4 5
	Stormwater runoff may cause erosion, sedimentation and leachate problems.	The rehabilitation plan was redesigned with CaLM's input (i.e. flatter batters and progressive rehabilitation). Diversion drains will be designed in consultation with CaLM - SCS officers prior to construction.	4.9	2.5 3
	The discharge of acidic or saline mine water may affect downstream property owners.	Detailed hydrological studies indicate that the proposed mining operation will have negligible impact on surface water resources. No discharge of acidic or saline mine water is anticipated under normal weather conditions. Should mine water discharge be required under abnormally wet weather, no significant adverse impacts to local water quality are predicted due to substantial dilution effects within the catchments at the time. Mine operations water will be used on a ranked, prioritised basis (dirty water first).	4.9	3
Department of Planning (DOP)	Dust and noise impacts	Predicted dust, noise and blasting levels from the proposed development will comply with EPA design goals and mitigative instructions.	5.4 5.5	4 5
	Hydrological and groundwater studies and monitoring for the mine site must be comprehensive.	Comprehensive hydrological and ground water studies and monitoring for the mine site were conducted.	2.3 4.9	3
	Management of impacts due to seepage of water from CPP rejects co-disposal areas.	Seepage from co-disposal areas will be managed by construction of an impervious layer on all containment embankments and capping of completed structures prior to rehabilitation.	4.3 5.3	2.4 2.5
	During the initial years of the operation, it will not be possible to dispose of poorer quality overburden in an in-pit dump.	Problem overburden volume is minor, and where identified by a forward characterisation management programme, will be selectively placed under at least 5m of benign overburden using the truck and shovel method for handling.	4.1 4.10	2.4 2.5
	Socio-economic impacts	Socio-economic impacts are addressed in the EIS.	2.10 4.12.10 5.10	10
	Land use impacts	Land use impacts are addressed in the EIS.	2.2.4 5.2.4	2.2

TABLE ES-1 (continued)
SUMMARY OF GOVERNMENT AUTHORITY RESPONSES FOLLOWING PLANNING FOCUS MEETING OF 5 JULY 1994

GOV'T AUTH.	QUESTIONS AND COMMENTS	SCPL RESPONSE	SECTION	APPENDIX
National Parks and Wildlife Service (NPWS)	The presence of sub-surface archaeological evidence needs to be further addressed as the 1982 report needs updating.	A new survey was conducted in 1994 which concluded that extensive sub-surface investigations at the site would not be cost or information effective. The survey proposed that some further testing be conducted at a selected site. This is proposed to be done as part of an aboriginal heritage management plan during Project construction.	2.9.1 4.12.9 5.9.1	9.1
	Additional flora and fauna survey work is recommended in order to determine whether the proposal will have a significant effect on the environment of endangered fauna.	Updated fauna surveys were conducted in 1994. These indicated that the mine should not have a significant effect on the environment of any endangered fauna. A further summer fauna survey may be necessary to confirm these indications, pending consultation with NPWS. A management plan for fauna is in the process of being designed with NPWS.	2.8 4.12.8 5.8	8
Department of Mineral Resources (DMR)	The results of supplementary groundwater testing during the bulk sampling activity should be presented.	The results of 1993/94 hydrological and groundwater monitoring are included in the EIS.	2.3	3
	Early consultation between the company and key agencies is necessary to establish the adequacy of the environmental flora, fauna and archaeology previously undertaken.	Close liaison with NPWS and DOP and other Government Authorities has been carried out and is on-going.	2.8 2.9 5.8 5.9	8 9 11
	Develop a programme of dissemination of information and consultation with the local community.	Community consultation has been undertaken and is on-going.	2.10 4.12.10	10
	Rehabilitation of the mine site should include the establishment of native revegetation breaks on slopes and ridgetops as well as reinstating Class IV, V and VI grazing land capability.	Rehabilitation will replace a Land Capability of Class IV, V and VI and a revegetation strategy using native tree species is proposed.	2.2.2 4.10 5.2.2	2.1 2.5
	Treatment of the final void should be addressed throughout the mine life in a conceptual manner.	Mine highwalls and endwalls will be sloped to achieve stability and safety throughout the mine life and to suit post mining options, which include stockwatering, irrigation, recreational waterway, or landfilling. Detailed planning for the final void will be addressed in the second Open Cut Mining Approval (Year 7).	4.9 4.10 5.3	2.5 3
	Co-disposal is a new technology and as yet has not been successfully introduced to NSW coalfields.	Several coal mines in Australia have proven success with co-disposal technology. Co-disposal was selected as the most cost-effective, environmentally appropriate method for the disposal of tailings. For pumping distances in excess of 1km, booster pumps are required along the pipeline. CPP reject disposal would revert to conventional methods, in consultation with DMR, should co-disposal not prove suitable.	4.3 4.10	2.4 2.5

TABLE ES-1 (continued)
SUMMARY OF GOVERNMENT AUTHORITY RESPONSES FOLLOWING PLANNING FOCUS MEETING OF 5 JULY 1994

GOV'T AUTH.	QUESTIONS AND COMMENTS	SCPL RESPONSE	SECTION	APPENDIX
	Noise and blast impacts should be addressed from all non-company owned residences near the mine development.	Predictive dust, noise and blasting modelling has been undertaken and all conditions can be complied with or managed.	5.4 5.5	4 5
	A comprehensive water balance for mine development is required to assure the maintenance of water quality.	A comprehensive water balance has been developed for the mine. No discharge of dirty water is predicted under median and dry conditions for the full 14 years of the mine life. Some discharge of water is predicted late in the mine life under abnormally wet conditions. No significant adverse impacts are predicted under such discharge conditions.	4.9 4.12.3	5.3 3
	Mine storage water may not be of acceptable water quality limits for the irrigation of rehabilitated overburden areas.	Mine water quality is not expected to be significantly lower than water at Avondale swamp (currently used for irrigation).	2.3	2.5 3
Shortland Electricity	Electrical systems must be designed to comply with relevant Mine Regulations and Australian Standards.	Electrical systems will be designed to comply with all regulations and standards.	4.5	-
	The mine plant must comply with the relevant Australian Standards and Shortland Electricity's requirements to minimise the effect of the mine electrical load on the quality of supply to other power consumer in the region to within acceptable limits.	The mine plant will comply with the relevant Australian Standards and Shortland Electricity's requirements to minimise the effect of the mine electrical load on the quality of supply to other power consumer in the region to within acceptable limits.	4.5	-
	The electrical systems must be designed to fit with Shortland Electricity's protection schemes, so that electrical faults in the plant will be isolated and not cause any interruption to supply for other users in the region.	The electrical systems will be designed to fit with Shortland Electricity's protection schemes, so that electrical faults in the plant will be isolated and not cause any interruption to supply for other users in the region.	4.5	-
Department of Conservation and Land Management (CaLM)	Is such a large area for "temporary" co-disposal necessary?	The proposed co-disposal site north of the CPP has been re-designed and will reduce in area by 20%. The remaining area is required to provide efficient use of the available area.	4.3 4.10	2.5
	Reject properties or inappropriate rehabilitation may lead to long term degradation of the area.	Rehabilitation of the area, based on the ongoing overnurden and rejects characterisation and management program, will prevent the long term degradation of the area. Assistance from DMR, SCS, NSW Agriculture is welcomed.	4.3 4.10	2.4 2.5
	Final landforms should be compatible with the adjoining landforms.	Overburden dumps have been designed for stability and slope drainage as well as being compatible with adjoining landforms. Slopes will be planted with trees and pasture.	4.1 4.10	5.1 2.5
	The Project will need to be compatible with the Avon River Catchment management plan (in progress).	A detailed management plan will be developed with CaLM prior to commencement of mining.	4.10 5.2	2.5

TABLE ES-1 (continued)
SUMMARY OF GOVERNMENT AUTHORITY RESPONSES FOLLOWING PLANNING FOCUS MEETING OF 5 JULY 1994

GOV'T AUTH.	QUESTIONS AND COMMENTS	SCPL RESPONSE	SECTION	APPENDIX
Gloucester Shire Council	Dust generation from the Project may have pollution impacts on adjoining residents.	Predictive modelling carried out for the Project indicates that dust levels will be negligible and well within EPA design goals for all adjoining residents.	5.4	4
	There may be potential short and long term impacts on surface and groundwater. Water pollution may be caused by the discharge of contaminated waters.	Based on the hydrological modelling and mitigating techniques, surface water and groundwater should not be adversely affected in the short or long term.	2.3 4.9 4.12.3 5.3	3
	Noise (including blasting) from mine operations may impact surrounding land uses.	Noise and blasting levels are within the EPA design goals except for noise levels at the Fragley residence which may exceed the standard on occasion depending on weather conditions.	5.4 5.5	4 5
	Visual additions such as overburden piles, stockpiles, bund wall, buildings and light may impact the surrounding properties.	The Project is located in a broad, low valley which provides significant natural screening from surrounding properties. A management programme has been developed to mitigate minor visual impacts.	2.7 4.12.7 5.7	7
	Rail and transport routes may have impacts on surrounding land uses.	The Project is not expected to have any significant impacts on road or rail transport routes, or surrounding land uses.	2.6 4.4 4.12.6 5.6	6
	Discuss the positive and negative social and economic impacts of the mine.	Social and economic impacts of the mine are considered in the EIS.	2.10 4.12.10 5.10	10
	The proposed mine may produce excess mine water, coal preparation plant rejects, maintenance residue, spillage and site cleaning.	The overburden and reject disposal and water management methods for the mine are discussed in the EIS. The Project is not expected to have any significant impact on local water resources.	4.3 4.9	5.3 3
	A void will remain at the end of the mine life. Future land use and final void.	Rehabilitation and final land use including the final void are discussed in the EIS.	4.9 4.10	2.5 3
Roads and Traffic Authority (RTA)	Construction and mine operations may increase traffic volume on the State Road Network.	Marginal local increases are expected. Negligible regional impacts are predicted.	5.6	6
	The railway will cross Main Road 90.	Full design details for the under pass to RTA standards are to be submitted to RTA.	4.4	6
Karuah Local Aboriginal Land Council (Karuah LALC)	The archaeological survey did not find any items of significance. However, for cultural purposes, the Karuah LALC, would like to be given all (if any) artefacts dug up during the operation of the mine.	All (if any) artefacts found during the operation of the mine will be given to the Karuah LALC.	2.9.1 4.12.9 5.9.1	9.1
Department of Water Resources	Show design criteria and capacity details on all earthworks, particularly relating to mitigation and rehabilitation of unstable solodic clay soils of the site. Also include the containment of runoff and details on surface site drainage; control of runoff from overburden dumps and co-disposal area; and stockpiling of topsoil.	Solodic clay soils will be selectively buried in the main pit or ameliorated with additives in consultation with SCS and DPI. A detailed topsoil stripping and stockpiling programme is to be developed with CaLM-SCS in Jan. 1995.	4.9 4.10 4.12.2 4.12.3	3 2.4 2.5

TABLE ES-1 (continued)
SUMMARY OF GOVERNMENT AUTHORITY RESPONSES FOLLOWING PLANNING FOCUS MEETING OF 5 JULY 1994

GOV'T AUTH.	QUESTIONS AND COMMENTS	SCPL RESPONSE	SECTION	APPENDIX
	Progressive rehabilitation measures as well as details of proposed tree and pasture trees to be used are discussed in the EIS.	A full design programme is to be developed in consultation with NSW Agriculture, SCS, DWR and NPWS. A program is outlined in this EIS.	4.10	2.5
	Provide detailed information on surface water and ground water requirements, including quality of groundwater, disposal and storage of surface and groundwater.	Detailed information on surface water and groundwater requirements, including groundwater disposal and storage of surface and groundwater is provided in the EIS.	2.3 4.9 5.3	3
	Discuss the control of groundwater accessions into the mine pit.	An advance dewatering system controls groundwater accession.	4.1 4.9	3
	Discuss the effects on downstream water quality (refer to the SAR chemistry) associated with discharges into creeks or the Avon River, particularly as groundwater disposal is potentially a serious problem on the water resources.	No discharge of dirty water is expected. Any controlled discharge in extreme wet weather is not expected to have an impact upon downstream users.	2.3 4.9 4.12.3 5.3	3
	The disposal of contaminatedgroundwateris potentiallya serious problemon the water resources of the Avon Valley	The mine will operate its water usage on a priority basis whereby "dirty" waters are utilised first. No discharge of uch water is expected.	2.3 4.5 4.12.3 5.3	3
	Address the use of co-disposal to dispose of tailings from the proposed development. Also, detail the water balance for the use in the co-disposal process and other purposes.	These aspects are addressed in full in the EIS.	4.3 4.9 4.12.3 5.3	3
Freight Rail	There is no reference to the proposed capacity of the clean coal stockpiles on site. Stock capacity must match cargo assembly requirements at Newcastle, and enable Freight Rail to sustain train loading campaigns.	These requirements are addressed in the EIS.	4.1 4.2 4.4	-
	The EIS report should include the details of the train transport system which is subject to detailed discussion and design consultations with State Rail.	Details of the train transport system (i.e. rail balloon loop; load out bin; a train loading control system; the location of the junction of balloon loop with the North Coast Line; and the associated signalling) is included in the EIS. Detailed plans for these works will be given to State Rail for approval prior to any construction commencing.	4.4 4.5	6
NSW Agriculture	The issue of land degradation processes, such as salinity, soil acidity, or rising water tables should be addressed, including management of saline groundwater and runoff and potential impacts to downstream irrigations.	Detailed hydrological studies indicate that the proposed mining operation will have negligible impact on water resources outside the Project Area. No discharge of acidic or saline mine water is anticipated under normal weather conditions. Should mine water discharge be required under abnormally wet weather, no significant adverse impacts to local water quality are predicted due to substantial dilution effects within the catchments at the time. Mine operations water will be used on a ranked, prioritised basis (dirty water first).	4.9 4.12.3 5.3	3

TABLE ES-1 (continued)
SUMMARY OF GOVERNMENT AUTHORITY RESPONSES FOLLOWING PLANNING FOCUS MEETING OF 5 JULY 1994

GOV'T AUTH.	QUESTIONS AND COMMENTS	SCPL RESPONSE	SECTION	APPENDIX
	Impact of dust, noise, vehicle movements or other adverse factors on local primary producers	Predicted dust, noise and blasting levels from the proposed development will comply with EPA design goals and mitigative instructions. The Project is not expected to have any significant impacts on road or rail transport routes, or surrounding land uses.	2.4 2.5 2.6	4 5 6
	Procedures for erosion control are required.	The site rehabilitation plan has been redesigned with CaLM's input (i.e. flatter batters and progressive rehabilitation). Diversion drains will be designed in consultation with CaLM - SCS officer prior to construction.	4.9 4.10	2.5 3
	Potential impacts on surface water and groundwater should be addressed.	Detailed hydrological studies indicate that the proposed mining operation will have negligible impact on surrounding surface water and groundwater resources.	4.9 4.12.3 5.3	3
	An appropriate weed control program is required.	A revegetation strategy will be developed for each mine area, prior to disturbance, based on a comprehensive plan developed in consultation with CaLM, SCS and NSW Agriculture. This will include weed control and the location of pasture and treed areas.	4.10.7	2.5
	Impacts on native vegetation and faunal habitat should be addressed.	Flora and fauna surveys indicate that the mine should not have significant impact on native vegetation or the environment of any endangered fauna. A management plan for fauna has been developed in consultation with NPWS.	2.8 4.12.8 5.8	8
	Post-mining land capability should be at least equivalent to its former agricultural capability.	The objective of the rehabilitation programme is that post-mining rural land capability classification will be at least equal to pre-mining capability. The proposed final rehabilitated land capability will be nominated in consultation with CaLM.	2.2.2 4.12.2 5.2.2	2.1
	The process of topsoil removal, storage and rehabilitation should be outlined.	A detailed topsoil management plan will be developed in consultation with CaLM/SCS, prior to any disturbance.	4.10.5	2.5

1.0 INTRODUCTION

1.1 BACKGROUND

CIM Resources Ltd. (CIM) and Excel Mining Pty. Ltd. (Excel) formed the Stratford Joint Venture (SJV) in May 1994 with the objective of developing the Stratford Coal Project (the Project). The Project involves developing a small open cut coal mine, near Gloucester in New South Wales, which will produce high quality coking and thermal coal for export markets. The SJV has appointed a sole purpose operating company, Stratford Coal Pty. Ltd. (SCPL) as Manager of the Project and, under NSW planning legislation, SCPL is the proponent for the Project.

SCPL is required to obtain a Development Consent and a Mining Lease before proceeding to develop the Project and applications for both must be accompanied by an Environmental Impact Statement (EIS). This document constitutes the EIS for the Project in support of a Development Application which has been lodged with Gloucester Shire Council.

1.2 PROPOSAL OUTLINE

SCPL proposes to establish the Project in a secluded area of cleared grazing land located east of Bucketts Way, between the townships of Stratford and Craven in the Gloucester Valley (the Project Area, refer Figure 1-1). The Project Area, defined as the area covered by the Mining Lease and the Development Application, covers around 1,500 ha. All land within the Project Area is owned freehold by the SJV.

The Project will involve mining approximately 23.5 million tonnes (Mt) of run-of-mine (ROM) coal, for a planned production rate of 1.8 million tonnes per annum (Mtpa) of ROM coal for a 14 year period.

ROM coal will be washed in a custom built coal preparation plant (CPP) and transported by rail to the Port of Newcastle. Saleable coal production from the 1.8 Mtpa of ROM coal will be approximately 1.1 Mtpa, based on a predicted CPP yield of 60%.

Mining will be by a truck/excavator haul-back method whereby overburden is removed by hydraulic excavator, loaded into trucks and hauled to previously mined out areas of the pit. In the early years, overburden will be placed in external overburden dumps which will be progressively rehabilitated.

Coal will be extracted by hydraulic excavators loading off-highway trucks which will haul the coal to the CPP. The CPP will remove the stone partings and higher ash components from the coal to produce a high quality coking coal. Lesser quantities of higher ash thermal coal will also be produced from the CPP as a middlings product. Stone partings and reject coal from the CPP will be emplaced into dedicated landfill areas which will be subsequently rehabilitated.

Product coal will be delivered to a rail loading bin above a rail loop which will be constructed by developing a short rail spur from the nearby Northern Railway Line.

The Project Area includes a significant buffer zone between Project operations and thenearest residences. All land within the Project Area is owned by the SJV and comprises cleared grazing land of poor to moderate land capability.

The Project will be constructed in a period of approximately six months and will reach full production in a further six months. The Project will have a permanent work-force of approximately 75.

The mine will be developed at a capital cost of around $28 million.

1.3 THE STRATFORD JOINT VENTURE PROFILE

The SJV is an unincorporated joint venture between CIM (70%) and Excel (30%).

CIM is a public company listed on the Australian Stock Exchange with interests in coal, gold and base metals. Excel is a private company, owned by four experienced coal industry executives and Resource Finance Corporation, a Sydney merchant bank.

CIM and Excel have recently reached agreement in principle with ITOCHU Corporation, a large Japanese trading company, whereby ITOCHU will earn a 10% interest in the SJV and have marketing rights for Stratford coal in Japan.

SCPL, a wholly owned subsidiary of CIM, has been established as a sole-purpose operating company for the Project.

1.4 SITE DEVELOPMENT HISTORY

Coal was first discovered in the Gloucester Basin in 1855 and some limited small scale hand mining followed. The first systematic investigation of the Gloucester Basin was completed in 1954 and the first exploration licence in the basin was granted in 1969, to the Gloucester Coal Syndicate. In 1970/71 an extensive drilling programme identified coal in the Stratford area.

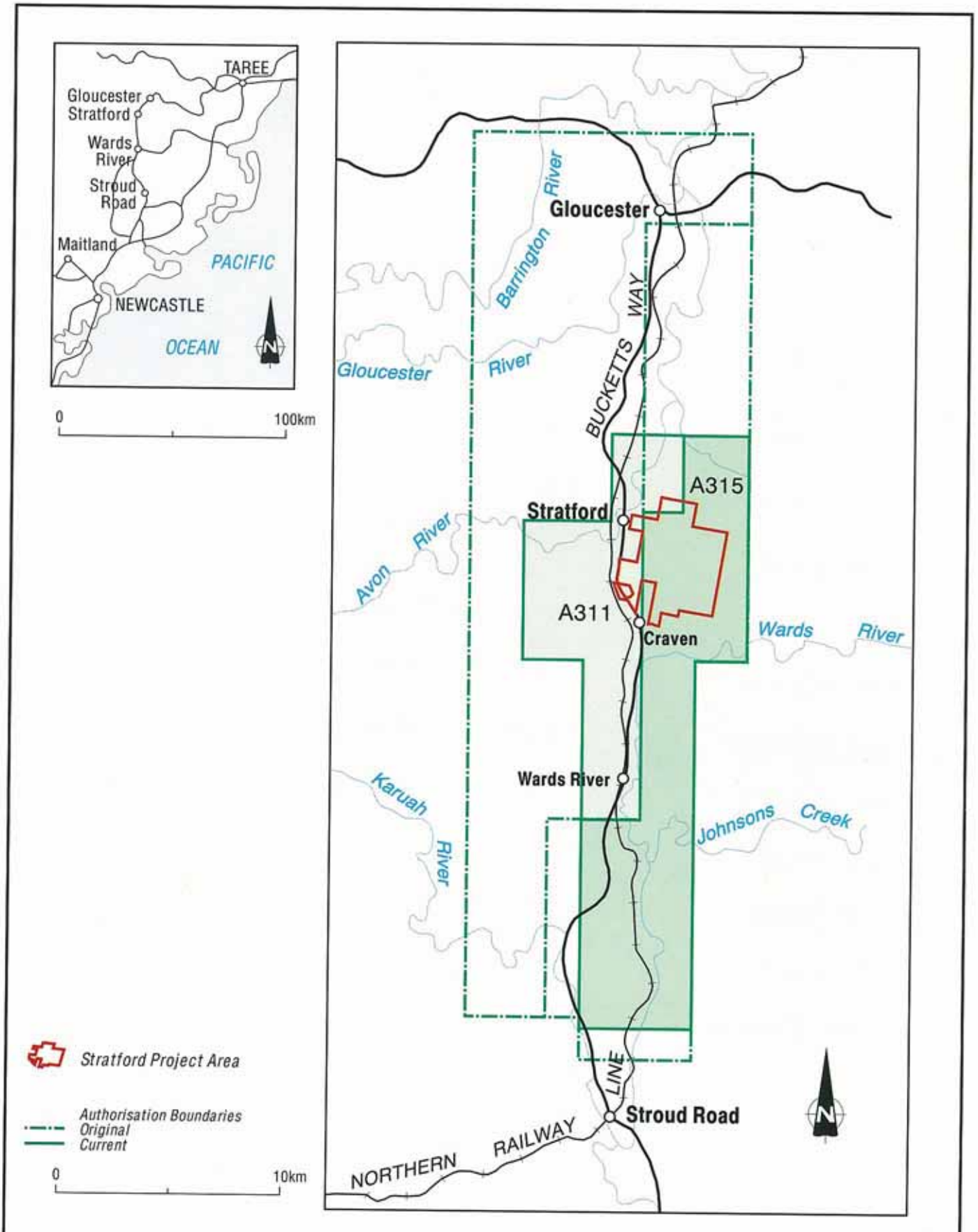
In 1977, BMI Mining Pty. Ltd. (BMI) and two of the previous syndicate formed the Gloucester Joint Venture and BMI commenced an exploration programme. In December 1981, BMI's joint venture partners sold their 49% interest to Esso Australia Resources Limited (EARL), a wholly owned subsidiary of Exxon Corporation.

Extensive environmental investigations took place between 1981 and 1984 over the total area of the coal deposits. The planned development at that stage was of a much larger scale and was based on mining several deposits including Wards River and Stratford, primarily for thermal coal production.

BMI diversified into coal in the early 1980's along with many other non-coal companies, in anticipation of the so-called resources boom. BMI has since followed the trend of reversing this diversification and turning back to its core business.

EARL recently expressed its wish to rationalise its coal assets in Australia and offered a number of undeveloped coal assets for sale, including its interests in the Gloucester and Hail Creek joint ventures.

In early 1993 Excel acquired an option to purchase all of the Gloucester Joint Venture assets from EARL and BMI, including coal tenements, exploration feasibility data and real estate. Subsequently, the SJV was formed in May 1994 between CIM and Excel.



STRATFORD COAL

PROJECT LOCATION and TENEMENTS

Figure 1-1

Date September 1994

1.5 SCALE OF PROPOSED OPERATION

The Project is based on mining 1.8 Mtpa of ROM coal to produce around 1.1 Mtpa of saleable coal for a period of 14 years (refer Table 1-1). By Australian and Hunter Valley open-cut coal mine standards this is a small annual production rate.

TABLE 1-1 EXPECTED ANNUAL SALEABLE COAL PRODUCTION

Product	Ash% (ad)	Tonnage tpa
Coking Coal	10.0	700,000
Thermal Coal	15.0	354,000
Thermal Coal	17.5	81,000
Total Saleable Production		**1,135,000**

At the proposed mining rate of 1.8 Mtpa, a total of 23.5 Mt of ROM coal will be extracted from the Stratford Main Deposit and Bowens Road West Deposit during the 14 year life of mine. This will involve the removal of a total of 67 million bank cubic metres (Mbcm) of overburden, at an average ROM stripping ratio of 2.8 bcm/tonne.

This ratio is amongst the lowest of Australian open-cut coal mines which, in combination with the overall small scale of Stratford coal production, results in the total material moved over the life of the mine being less than 30% of that planned in the original EARL/BMI development proposal.

These life of mine statistics are shown in Figures 1-2 and 1-3, which also include the comparable statistics of two other proposed open cut coal mine developments, near Muswellbrook.

1.6 REASON FOR THE DEVELOPMENT

The demand for high quality coking coal and thermal coal in Asian, European and South American markets is increasing and is forecast to continue increasing into the next century. SCPL proposes to supply suitable quality coal to meet this growing demand.

The Project utilises a small resource which can be worked economically due to the high quality of the coal and the low stripping ratio. Benefits to the regional economy include direct employment opportunities and flow-on economic and employment benefits.

Coal exports are the largest contributor to Australia's trade balance and current account, contributing over $6 billion annually. In 1993, New South Wales coalfields exported approximately 50 Mt of coal to Asia and Europe. The continuing development of projects such as Stratford are vitally important in maintaining Australia's position in world coal supply and, hence, assisting in Australia's balance of payments.

The additional exports provide tax revenue for the Federal Government and significant benefits will accrue at both State and Local levels. Revenue will be generated directly by State taxes, royalties and infrastructure payments whilst decentralised development and improvements in rail and port facilities have long term benefits to the regional community.

At local and regional levels, the Project will provide a major economic stimulus with significant employment will be generated within the local region.

The flow-on employment multiplier of the proposed development is likely to be in a ratio of 2:1, i.e. for every direct Project employee, an additional 2 people will gain employment to provide support services to the mine and mine employees. This will occur particularly in the service, food and entertainment sectors of the labour force. With a permanent mine staff of 75, it is anticipated that an additional 150 jobs will be generated in flow-on service industries.

An important local economic effect will be the increase in retail expenditure by the mining and multiplier workforce. On the basis of experience in the Lower Hunter (The Lower Hunter Region

Lower Hunter (The Lower Hunter Region Commercial Centre, Study Working Paper NSWPEC 1980) it is estimated that in-migrating workers will spend about 40% of their income on retail expenditure per year.

Other benefits will accrue to Commonwealth, State and Local Government. Commonwealth Government revenue will be generated from:

- Company tax
- Employee income tax
- Sales tax
- Export duty
- Fringe benefit tax

State Government revenue will be generated from:

- Mineral royalties
- Port charges
- Rail freight charges
- Payroll tax
- Other State taxes

Local Government revenue will be drawn from the Developer Contribution and rate income for services.

The regional economy will be supplemented by:

- plant maintenance expenses
- sales of fuels and lubricants
- property sales
- plant and construction equipment sales
- food and living expenses
- household expenses
- disposable income i.e. entertainment, vehicles.

The local economy will benefit from employment, industry contracts, maintenance contracts, and the injection of workforce disposable income for household goods, food and entertainment. The local and regional economy will also benefit by the general upgrading of existing services and facilities to cater for the increased population.

1.7 CONSULTATION WITH GOVERNMENT AUTHORITIES AND THE COMMUNITY

On 2 November, 1993, the proponent requested guidelines from the Director, Department of Planning for the preparation of an Environmental Impact Statement for the Project.

The requirements of the Director, Department of Planning regarding the content of the EIS were issued on 2 December, 1993 and are presented in Appendix 11.

The development proposal was presented in more detail to New South Wales and Local Government authorities at a Planning Focus Meeting, organised by the Department of Mineral Resources and held at Stratford on 5 July, 1994. Representatives of the following authorities were present:

- Gloucester Shire Council
- Department of Planning
- Environmental Protection Authority
- Department of Conservation and Land Management
- Department of Mineral Resources
- Department of Water Resources
- Shortland Electricity
- Department of NSW Agriculture
- State Rail Authority/Freight Rail
- National Parks and Wildlife Service
- Coal Compensation Board
- Avon Valley Landcare
- Roads and Traffic Authority

At this meeting, SCPL representatives presented documentation and information relating to the Project and the environmental studies being undertaken to assess the impact of the Project. Following the meeting, comments were received from a number of the attendees. These comments and specific responses and references to relevant sections of the EIS are presented in Table ES-1.

RELATIVE SCALE OF STRATFORD PROJECT SALEABLE COAL PRODUCTION

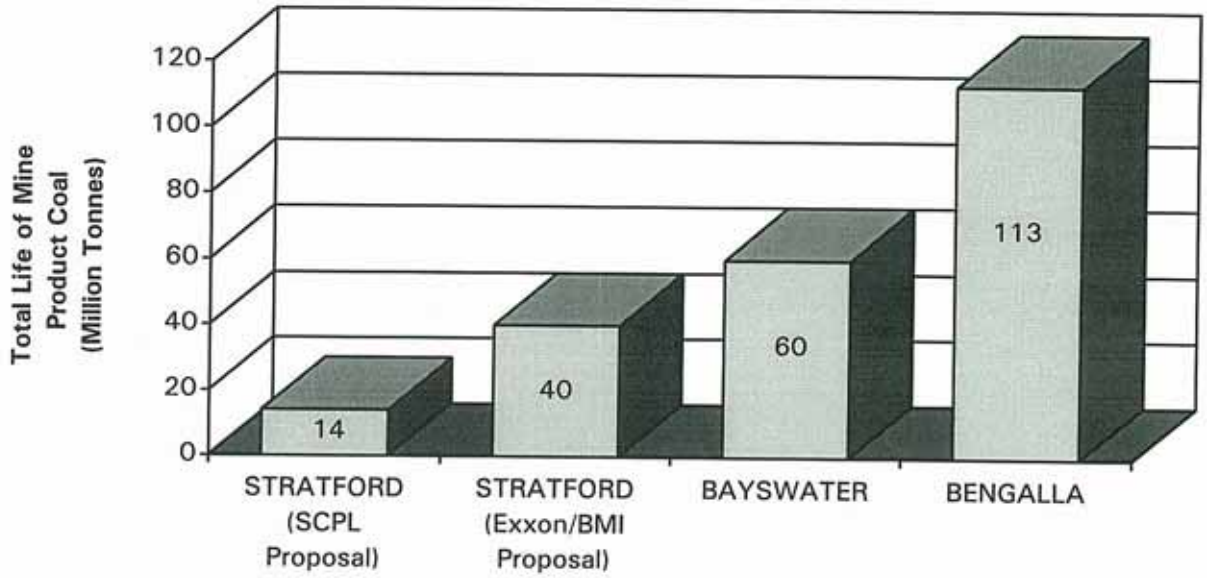


Figure 1-2

RELATIVE SCALE OF STRATFORD PROJECT TOTAL MATERIAL MOVED

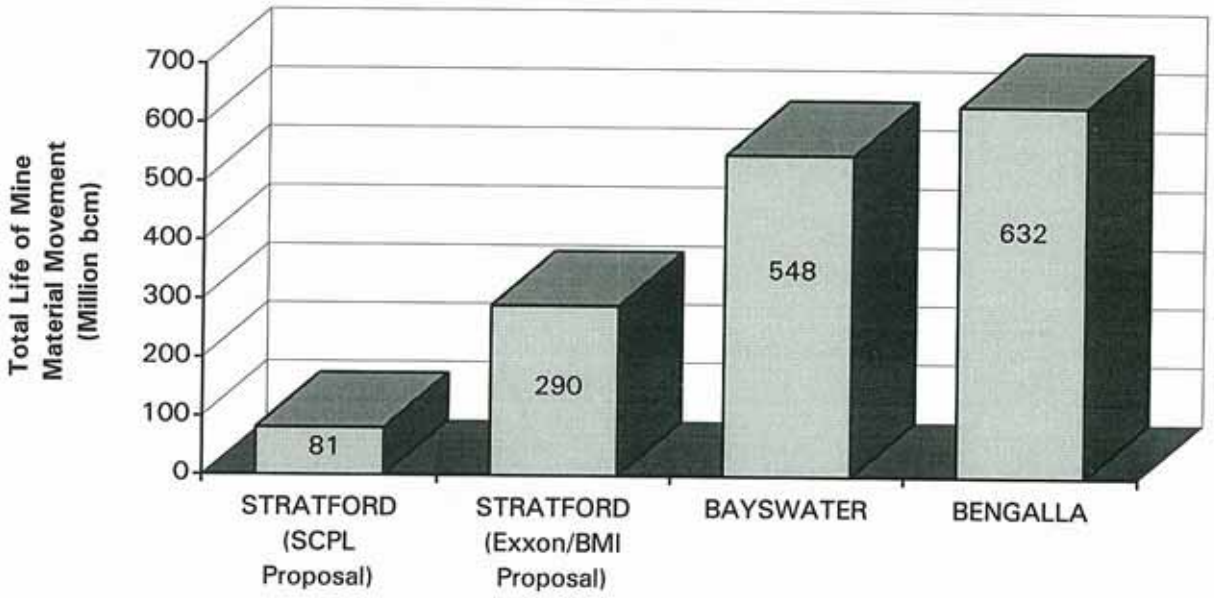


Figure 1-3

Consultation with the Gloucester Shire Council and with the relevant State Government Departments has taken place over the course of the environmental investigations and the preparation of the EIS.

A number of community consultative meetings have also been conducted as outlined below:

- Public meeting, sponsored by Gloucester Chamber of Commerce.
- Presentation to Gloucester Environmental Group.
- Presentation to Avon Valley Landcare with residents from Stratford and Craven in attendance.
- Presentation to Gloucester Anglican and Catholic mens fellowships.

Further public meetings and on-going consultation with Stratford and Craven residents is planned during exhibition of the EIS.

1.8 LEGISLATIVE REQUIREMENTS

Legislation relevant to the development and operation of the Project is discussed below.

Mining Act 1992

The Mining Act 1992 requires a Mining Lease to be issued to control the conduct of the mine, including environmental aspects.

It is also necessary to obtain an Opencut Approval, prior to the commencement of each stage of opencut mining. This approval includes conditions relating to environmental issues.

Environmental Planning and Assessment Act 1979

Under the provisions of the Mining Act 1992, it is necessary to obtain Development Consent from the relevant consent authority, prior to the issuing of a Mining Lease for the Project. Since the Project is a designated development, the development application must also be accompanied by an Environmental Impact Statement.

The development application is required to be lodged with the Gloucester Shire Council, and will be referred to the Minister for Planning, pursuant to Section 101 of the Environment Planning and Assessment Act 1979.

Clean Air Act 1961

The proposed mine will be a "scheduled premises", and, as such, will be required to hold appropriate approvals and licences issued by the Environmental Protection Authority (EPA), under the provisions of Clean Air Act 1961.

Clean Waters Act 1970

Under the provisions of the Clean Waters Act 1970, approval is required from the EPA to install, construct or modify any equipment which will lead to the discharge (by whatever means) of pollutants into any waters. It is anticipated that no contaminated water will be routinely discharged from the site. Controlled discharges of contaminated water, which may be required during periods of abnormally wet weather, late in the mine life, would require relevant approvals and licences from the EPA.

Dangerous Goods Act 1975

The provisions of the Dangerous Goods Act 1975 requires that licences be held for the storage, transport and use of dangerous goods, as defined by the Act.

Environmentally Hazardous Chemicals Act 1985

The provisions of the Environmentally Hazardous Chemicals Act 1985 require that a licence be held for the storage, transport and use of prescribed chemicals.

The Environmental Penalties and Offences Act 1989

Any breach of the previously discussed Environmental Protection Legislation is an offence under the provisions of the Environmental Penalties and Offences Act 1989, for which there are penalties for the company and its officers, which range from $1 million downwards. Under the provisions of this Act, Orders may also be made for:

- the prevention, control or mitigation of environmental harm;
- reimbursement of loss or damage to property;
- reimbursement of expenses incurred by a public authority.

Federal Legislation

The Project will produce coal for export and will therefore require an export licence from the Federal Department of Primary Industry and Energy.

Regulatory Authorities

Regulatory authorities relevant to the Project include the Gloucester Shire Council, the Authorities administering the legislation outlined above and the New South Wales Department of Water Resources.

1.9 STRUCTURE OF THE ENVIRONMENTAL IMPACT STATEMENT

The EIS for the Project has been drawn from extensive studies conducted on site in the 1980's by the previous holders of the Exploration Licences and by studies conducted in the last eight months by SCPL. The EIS is presented in two volumes: Volume 1 contains the text (in seven sections) and appropriate figures, and Volume 2 contains eleven appendices with accompanying figures and attachments.

1.10 PROJECT TEAM FOR THE ENVIRONMENTAL IMPACT STATEMENT

This EIS has been prepared by SCPL, with Woodward-Clyde as the primary environmental consultant and assistance from the following organisations and individuals:

- Brayshaw McDonald Pty Ltd (Archaeology)
- Megan Dewsnap (Visual)
- F.B.N. Consultants (Fauna)
- Heggies & Associates (Acoustics and Blasting)
- Michael Murray (Fauna)
- Sedgman & Associates (CPP Rejects Disposal)
- Zib & Associates (Air Quality)

2.0 EXISTING ENVIRONMENT

2.1 REGIONAL SETTING

2.1.1 Location and Physiography

The Project Area is located in the Gloucester Basin, 95 kilometres north of Newcastle in NSW. The Shire of Gloucester is a farming, timber and tourism based community covering an area of 2918 km^2 and having no history of coal mining.

Barrington Tops National Park and large areas of State Forest are located in the south western part of the Shire with many watercourses traversing the Shire giving it a varied and attractive landscape.

The main rivers are the Manning which rises in the Mount Royal Range and runs east through the centre of the district and then forms part of the north east boundary. The Barnard River flows through the district from the north west corner joining the Manning River at the Council district boundary; the Bowman River rises in the Bowman Range and joins the Gloucester River just north of the Gloucester township.

The Barrington and the Gloucester Rivers rise in the Barrington Tops area and meet just north of town. This is also the confluence point for the Avon River which runs from the south along the valley containing the Bucketts Way (main road) and the Northern Railway Line.

The Gloucester, Barrington and Avon Rivers provide the main water supply for Gloucester. The Gloucester River has a catchment of 260 km^2 and the Avon has a catchment of 167 km^2. The town's potable water supply is drawn from the Barrington River.

2.1.2 Topography and Slopes

The Project Area is located in a secluded part of a linear valley with two major topographic units - steep ridges and intermediate undulating lowlands. The topography of the Project Area is mainly flat to undulating with low hills on the eastern margin and an elevation range from 110 m to 150 m AHD. Existing topography in the Project Area is shown on Figure 2-1.

The ridges trend north-south, and rise 300 to 500 m above the valley floor on slopes ranging from 14 to 45°. The undulating lowlands, with typical slopes of 5° and elevations of 50 to 150 m, form the valley floor. Terracing occurs along the water courses and the lower parts of the valley are subject to periodic flooding.

The lowlands, which have been extensively cleared, primarily for agricultural activity, contrast with the flanking ridges which are almost continuously timbered. The variation in topography and vegetative cover in this long narrow rural valley provides visual contrast to both residents and travellers.

The valley straddles the headwaters of two river systems with the watershed near Craven, about one kilometre south of the Project Area. The Avon River - Gloucester River system drains to the north. The Mammy Johnsons Creek - Karuah River system drains to the south.

The Project Area is flanked on its eastern side by a steep ridge and along the western side by a range of low wooded hills. It is located in a shallow valley and can only be seen from a limited section of Bucketts Way to the south.

2.1.3 Climate

Meteorological Data Sources

Data for the description of climate and meteorology has been provided by long-term Bureau of Meteorology records supplemented by data from an on-site monitoring program between February 1982 and October 1984. Data was collected for the local area (Stratford and Craven) as well as the Gloucester/ Stroud district. In some cases, over a century of data has been collected.

Meteorological data is presented in Appendix 1.2. A summary of relevant information is provided below.

Rainfall and Evaporation

The Project Area can expect to receive rain in most months of the year with the wettest period generally being summer (January to March) and the driest winter (July to September). Average rainfall for the driest month which is August for Gloucester, September for Stroud and July for Craven is 48, 64 and 38 mm respectively.

The wettest month is March for both Gloucester and Stroud, and January for Craven. Average wettest monthly rainfalls are 129 mm for Gloucester, 145 mm for Stroud, and 144 mm for Craven. The mean annual total rainfall for the Project area is approximately 1100 mm.

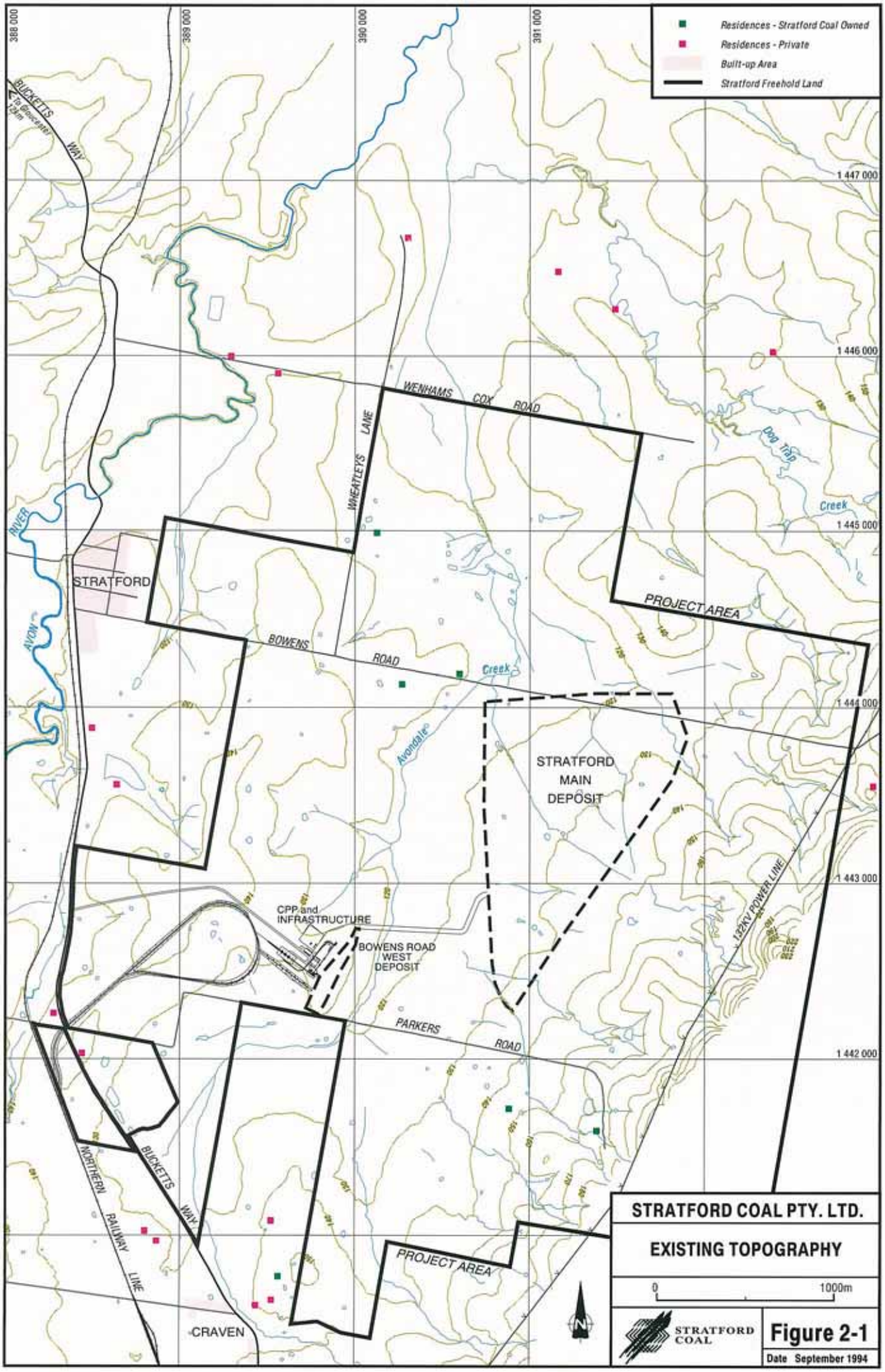
Evaporation rates for the Project Area (long term averages) in January, April, July and October are approximately 169, 89, 59 and 144 mm respectively. The highest evaporation rate of 202 mm occurs in December (based on Bureau of Meteorology 1971 - 1992 data) and the estimated annual evaporation is approximately 1390 mm.

Temperature and Humidity

Long-term temperature data are unavailable for the Gloucester/Stroud region. The closest recording stations are located at Dungog approximately 35 km to the south-west of the Project Area (1966-1975) and at Singleton 85 km to the south-west (1969-1983).

The hottest month is January and July is the coldest month. The average daily maximum temperature recorded by the on-site meteorological station over the 1982/83/84 monitoring period ranged from 26.9°C in February to 14.6°C, in July, whilst the average daily minimum temperature recorded ranged from 17.1°C in February to 4.9°C, in August.

Humidity at Dungog for 9 am ranges from 58%, in September to 80%, in June, and 3 pm data ranges from 37%, in September to 61%, in June.


Residences - Stratford Coal Owned
Residences - Private
Built-up Area
Stratford Freehold Land
388 000
389 000
390 000
391 000
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
To Gloucester 15km
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
RIVER
AVON
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
CPP and INFRASTRUCTURE
BOWENS ROAD WEST DEPOSIT
132KV POWER LINE
PARKERS ROAD
BUCKETTS WAY
NORTHERN RAILWAY LINE
PROJECT AREA
CRAVEN
N
STRATFORD COAL PTY. LTD.
EXISTING TOPOGRAPHY
0
1000m
STRATFORD COAL
Figure 2-1
Date September 1994

Wind Data

Local wind data is not available for the Gloucester/Stroud region except for those collected by the on-site monitoring programme. Regional wind data have little relevance to the Project Area because local wind patterns are strongly influenced by local topography.

In general the Project Area experiences westerly winds in winter, caused by anticyclone and frontal activity occurring over Australia at this time of year. The expected prevailing summer winds would be east to northeast. However, the local topography dominates the surface winds, and prevailing winds over the site are aligned generally north-south (refer Appendix 1.2).

2.1.4 Neighbouring Coal Mines and Exploration Areas

No coal mines presently exist in the Gloucester Shire. All coal exploration licences within the Shire are authorised to the SJV.

CRA has recently applied for an exploration licence for precious gems (diamonds) over a large area some 10 km to the northwest of the Project Area.

2.2 LAND CAPABILITY AND LAND USE

2.2.1 Soils

A soil survey was carried out to assess the nature of the soils in the Project Area with regard to their agricultural capability and availability for use in rehabilitation. The soil survey is presented in Appendix 2 and a summary of the results is presented below.

Four major soil types were identified in the Project Area: yellow podzolic, brown podzolic, alluvial and lithosol. The distribution of the soil types is shown in Figure 2-2. The most common soil type is the Yellow Podzolic, covering 60% of the Project Area.

Soil samples from varying depths were analysed to determine particle size distribution, dispersivity, pH and electrical conductivity (a standard measure of salinity), all of which affect suitability for use as a revegetation medium. The surface soils generally exhibit moderate dispersion characteristics, good moisture holding capacity and pH levels within the range acceptable for revegetation. Some of the subsoil horizons exhibit heavy leaching, with a corresponding low nutrient value. Mid and lower slope saline scalds were identified, especially in the northern part of the Project Area, outside the proposed development area.

Extensive clearing for grazing has resulted in accelerated erosion. Areas of sheet erosion are widespread and gully erosion exists on Dog Trap Creek and other drainage lines over the Project Area. Structural and textural properties will, therefore, be the most significant factors limiting the availability of suitable topdressing material.

The depth of suitable topdressing material ranges from 0.2 m on the slopes and ridges to 0.5m in the alluvium. Sufficient material is available for rehabilitation, with an average thickness of 0.2m of topdressing over the post mining landform. Proposed soil stripping depths for the project are shown on Figure 2-3.

2.2.2 Land Capability

A land capability assessment was carried out in the Project Area in June 1994. Details are presented in Appendix 2.1 and a summary of the results of this assessment is provided below.

The Department of Conservation and Land Management (CaLM) rural land capability system

consists of eight classes based on increasing soil erosion hazard and decreasing versatility of use. It recognises three types of land uses:

- land suitable for cultivation (Classes I -III);
- land suitable for grazing (Classes IV - VI);
- land not suitable for rural production (Classes VII, VIII).

These capability classifications identify the limitations to the use of the land as a result of interaction between the physical resources and a specific land use.

Figure 2-4 illustrates the current rural land capability assessment of the Project Area to be affected by mining operations and associated surface infrastructure development.

Most of the Project Area has been mapped by the Soil Conservation Service of NSW in 1982 (1:100,000 Land Capability Map Series: Dungog) as Class IV, Suitable for Grazing with Occasional Cultivation involving minimal soil conservation techniques. Class IV areas are considered to include the gentle eastern foothills and gently undulating land in the western half of the Project Area. Limitations include shallow soil depth, poor internal drainage, dispersive subsoils and moderate to high erosion hazard.

The majority of the eastern portion of the Project Area is considered to consist of Class V land which is suitable for grazing with occasional cultivation (with structural soil conservation works) for the introduction of fodder crops. The land is not suitable for regular cultivation because of shallow soil depths and moderate to high soil erosion hazard and slope gradients. These lands occur on the footslopes of the hills on the eastern boundary of the site.

The mid to upper slopes of the eastern hills are considered to be Class VI land which are suitable for grazing. However, because of severe erosion hazard and shallow soils these lands are not considered suitable for cultivation.

The central lowlands adjacent to the drainage lines which drain the Project Area are also considered to be Class VI grazing land. This land is not suited to cultivation because of the shallow depths of surface soils, the dispersive nature of sub-soils, poor drainage and evidence of salt accumulation.

2.2.3 Land Ownership

Previous owners of the coal tenements have, over the years, acquired all of properties and residences in the Project Area. The locations of property boundaries and residences in and adjacent to the Project Area are shown in Figure 2-5.

All the land and residences within the Project Area are now owned by the SJV.

A total of five private residences owned by the SJV are situated within the Project Area. Access to two residences is gained via Parkers Road across SJV land. The road does not service any properties or residences to the east. The other three residences are accessed via Bowens Road and Wheatleys Lane. Both roads are public roads which service other properties in the area.

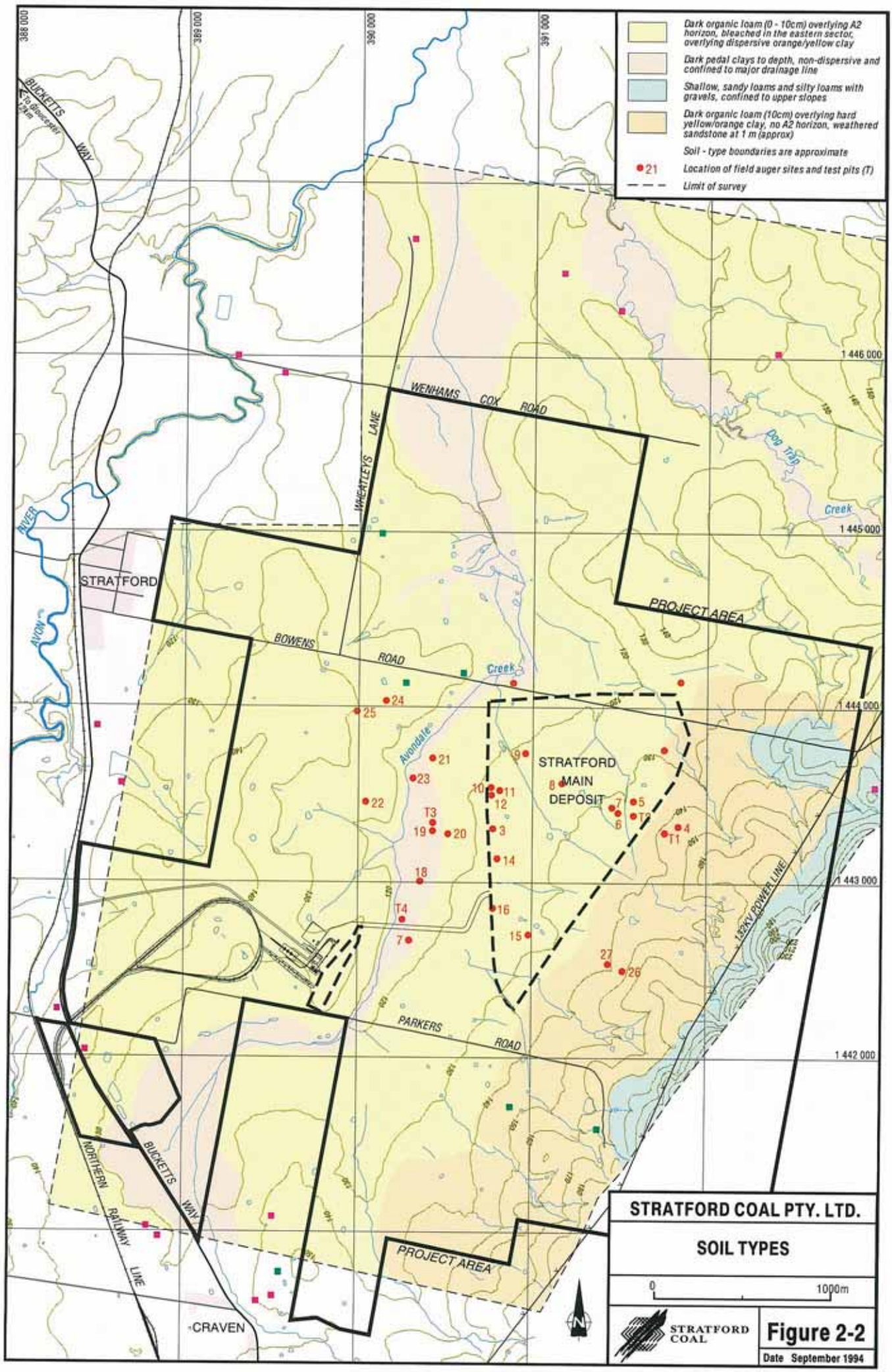
The impact of the mine on residences within and around the Project Area is discussed in Section 5.0.

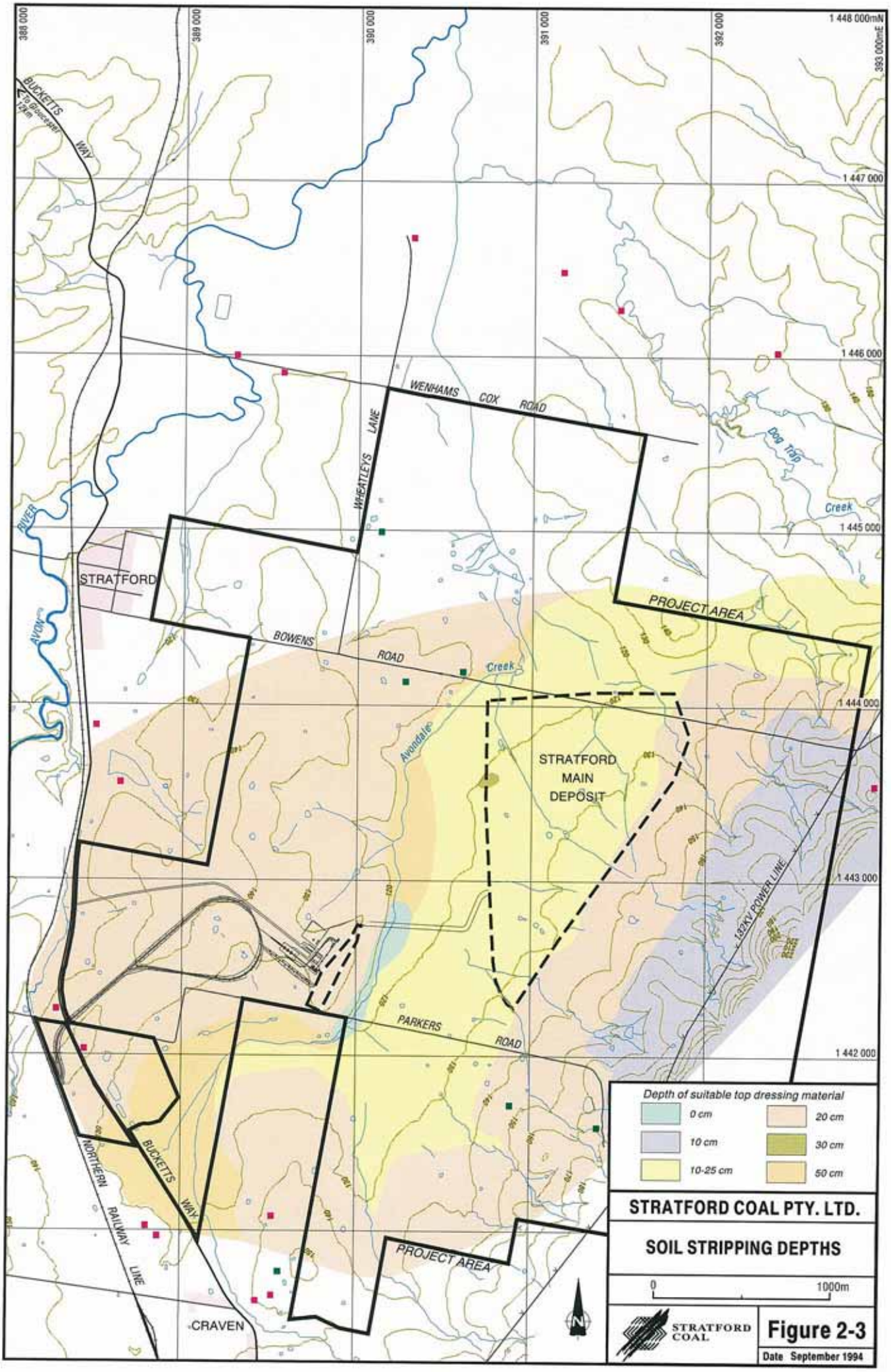
2.2.4 Land Use

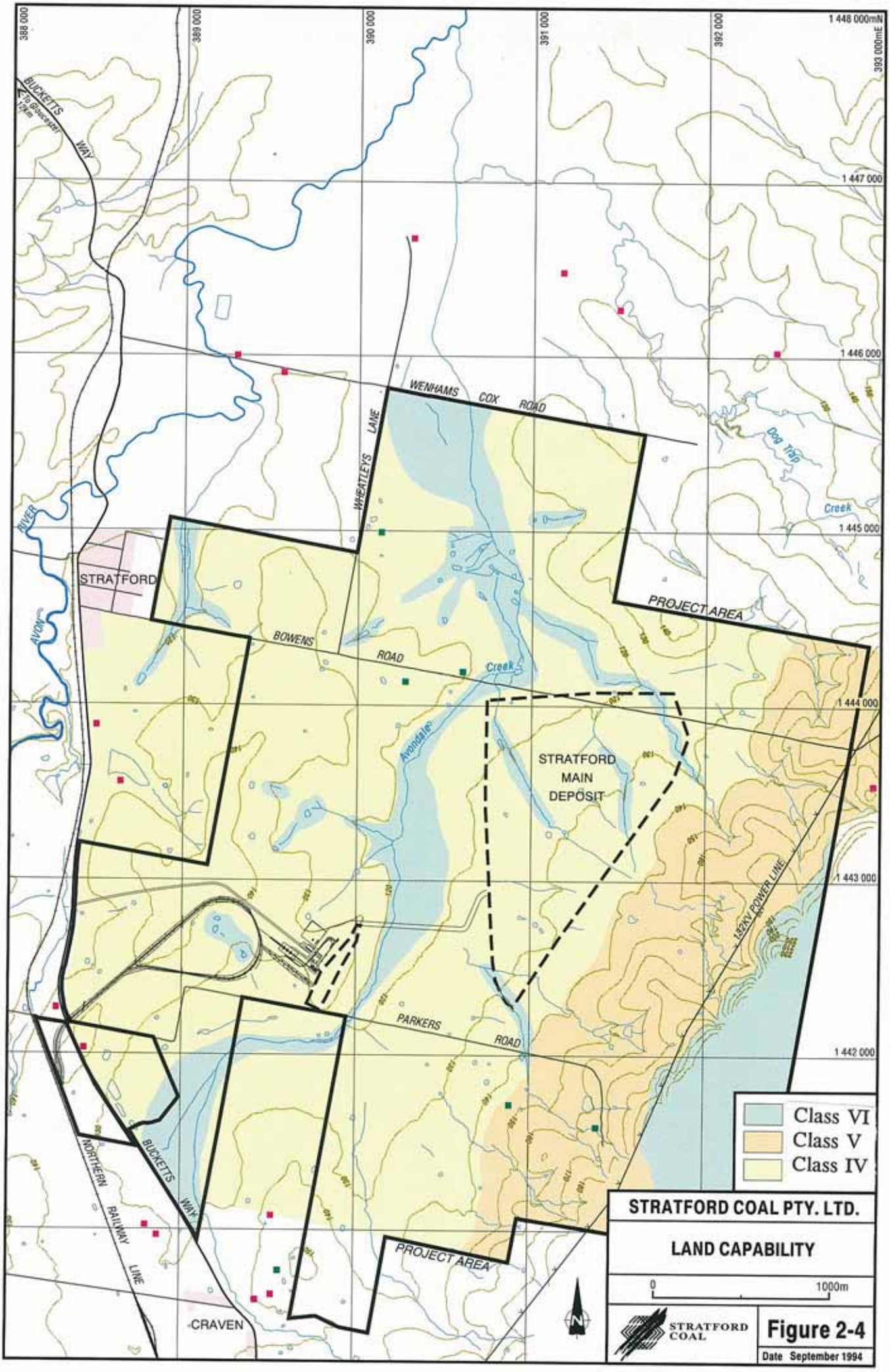
Introduction

The current land use within the Project Area is grazing agistment. Adjoining land within a 2 km radius is also used for agricultural pursuits, primarily grazing, rural residential, and residential development in the villages of Stratford and Craven.

Land within the Project Area comprises gently sloping lands to the alluvial creek banks of Dog Trap Creek to the north. Most of the undulating country


Dark organic loam (0 - 10cm) overlying A2 horizon, bleached in the eastern sector, overlying dispersive orange/yellow clay
Dark pedal clays to depth, non-dispersive and confined to major drainage line
Shallow, sandy loams and silty loams with gravels, confined to upper slopes
Dark organic loam (10cm) overlying hard yellow/orange clay, no A2 horizon, weathered sandstone at 1 m (approx)
Soil - type boundaries are approximate
21 Location of field auger sites and test pits (T)
Limit of survey
388 000
389 000
390 000
391 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
To Gloucester 12km
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
RIVER AVON
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
132KV POWER LINE
PARKERS ROAD
NORTHERN RAILWAY LINE
BUCKETTS WAY
PROJECT AREA
CRAVEN
STRATFORD COAL PTY. LTD.
SOIL TYPES
0
1000m
STRATFORD COAL
Figure 2-2
Date September 1994


388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
To Bloucester 12km
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
RIVER AVON
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
132KV POWER LINE
PARKERS ROAD
NORTHERN RAILWAY LINE
BUCKETTS WAY
PROJECT AREA
CRAVEN
N
Depth of suitable top dressing material
0 cm
10 cm
10-25 cm
20 cm
30 cm
50 cm
STRATFORD COAL PTY. LTD.
SOIL STRIPPING DEPTHS
0
1000m
STRATFORD COAL
Figure 2-3
Date September 1994


388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
To Gloucester 12km
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
RIVER AVON
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
132KV POWER LINE
PARKERS ROAD
BUCKETTS WAY
NORTHERN RAILWAY LINE
CRAVEN
PROJECT AREA
Class VI
Class V
Class IV
STRATFORD COAL PTY. LTD.
LAND CAPABILITY
0
1000m
STRATFORD COAL
Figure 2-4
Date September 1994

has been cleared and consists of unimproved natural pastures historically used for grazing purposes. Agriculture in the Gloucester Shire is predominantly dairying and beef cattle. Some timber milling is also carried out. Much of the pasture land in the Stratford area is classed by the Department of Agriculture as either marginal grazing country or suitable for (urban) development.

Value of Agricultural Production

A study of the agricultural industries and production within the Gloucester Shire is conducted by NSW Agriculture and the ABS annually. The statistics for agricultural production of the Shire are presented in Appendix 2.3.

Statistics for the Agricultural productivity of the Gloucester Shire are shown below in Tables 2-1 and 2-2. Beef cattle are located on the largest area of farms (119, 446 ha in 1989/90) whilst milk cattle are the second most important agricultural practice (22,196 ha in 1989/90).

In 1992/1993, milk cattle produced a value of $11,719,000 and cattle meats produced $7,540,000 of the estimated total value of agricultural commodities produced in Gloucester Shire of $20,616,000.

Land use within the Project Area and adjoining properties is illustrated in Figure 2-6.

TABLE 2-1
VALUE OF AGRICULTURE PRODUCTION - GLOUCESTER SHIRE 1992-1993

Estimated Gross Value of Agricultural Commodities Produced, Gloucester Shire 1992/93

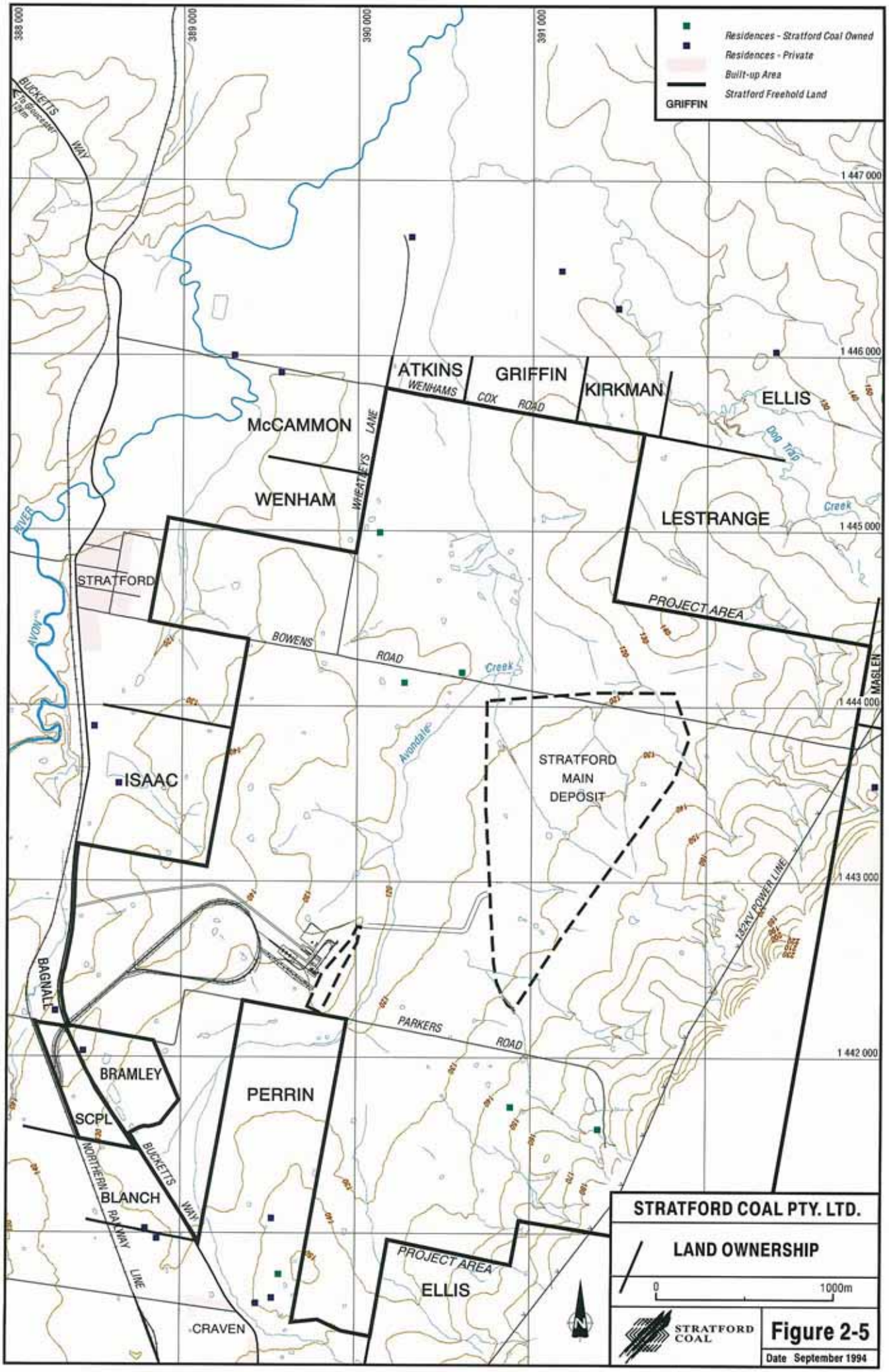
Crop Type	Value $(thousands)
(Wheat, barley, sorghum, rice, sugar, cotton, apples grapes, bananas, vegetables, eggs, honey, poultry meats)	0
Cereal hay & other cereal grain	30
Oilseeds	31
Pasture seeds	9
Lucerne & pasture hay	327
Citrus	14
Other fruit	16
Other crops	346
Wool	1
Milk	11,719
Sheep meats	1
Cattle meats	7,540
Pig meats	582
TOTAL FARM PRODUCTION	**20,616**

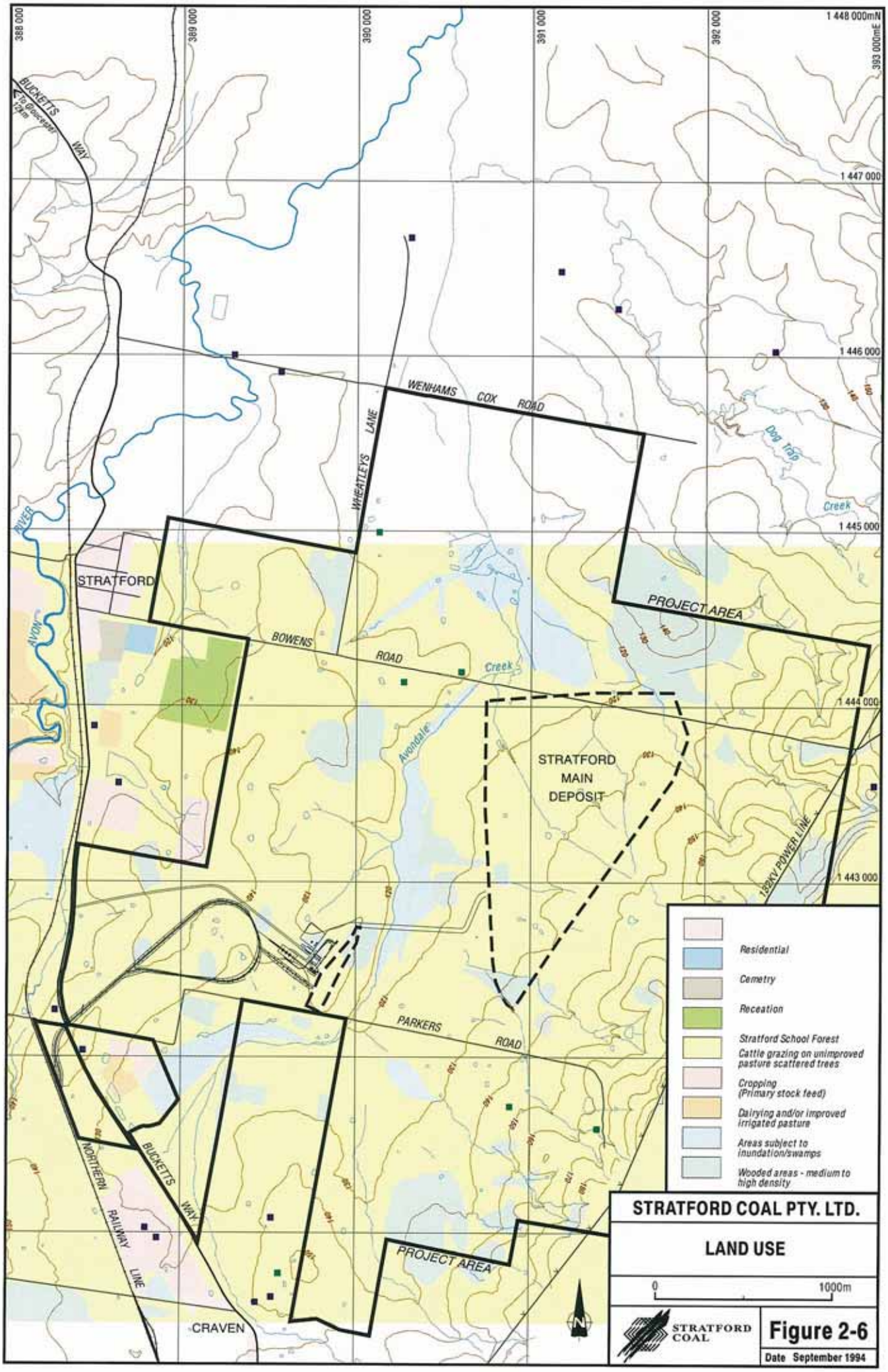
TABLE 2-2 AGRICULTURAL PRODUCTIVITY STATISTICS FOR GLOUCESTER SHIRE 1989-1990

	Estimated Value of Operations ($'000)	Number of Estabs.	Average Value of Produce by Estab ($'000)	Average Area of Estabs. (Ha)	Area of Estabs. (Ha)	Area Irrigated (Ha)	Area of Native Pasture (Ha)	Area of Sown Pasture (Ha)	Area of Lucerne & Fodder Crops (Ha)	Area of Wheat for Grain (Ha)
Cereal Grain	-	-	-	-	-	-	-	-	-	-
Sheep - Cereal	148	2	74	341	682	-	492	30	24	-
Meat Cattle - Cereal	-	-	-	-	-	-	-	-	-	-
Sheep	-	-	-	-	-	-	-	-	-	-
Sheep - Meat Cattle	-	-	-	-	-	-	-	-	-	-
Meat Cattle	8,598	127	68	941	119,446	225	34,767	14,749	74	-
Milk Cattle	9,687	87	111	255	22,196	907	5,183	4,441	692	-
Pigs	394	1	394	209	209	-	-	25	-	-
Broilers	-	-	-	-	-	-	-	-	-	-
Other Poultry	-	-	-	-	-	-	-	-	-	-
Vineyard	-	-	-	-	-	-	-	-	-	-
Fruit	-	-	-	-	-	-	-	-	-	-
Vegetables	-	-	-	-	-	-	-	-	-	-
Nurseries	-	-	-	-	-	-	-	-	-	-
Other Intensive	-	-	-	-	-	-	-	-	-	-
NEC	226	4	56	173	691	-	527	164	-	-
TOTAL	**19,052**	**221**	**86**	**648**	**143,224**	**1,132**	**40,969**	**19,409**	**790**	**-**
Estimated Value of Production Group										
Over $600,000	808	1	808	6,808	6,808	-	6,328	460	-	-
$300,001 to $600,000	1,218	3	406	744	2,231	50	-	75	5	-
$150,001 to $300,000	4,041	21	192	963	20,229	367	3,934	2,782	163	-
$ 80,001 to $150,000	7,164	66	109	800	52,798	428	12,020	9,378	436	-
$ 40,001 to $ 80,000	4,537	78	58	599	46,710	220	12,606	4,889	156	-
$ 20,000 to $ 40,000	1,045	34	31	310	10,531	32	2,728	1,415	16	-
$ 19,999 or less	239	18	13	218	3,917	36	3,353	410	14	-
TOTAL	**19,052**	**221**	**86**	**648**	**143,224**	**1,132**	**40,969**	**19,409**	**790**	**-**

TABLE 2-2 (CONTINUED) - AGRICULTURAL PRODUCTIVITY STATISTICS FOR GLOUCESTER SHIRE 1989-1990

	Area of Other Cereal Grains (Ha)	Area of Field Crops (Ha)	Area of Orchard Inc. Nuts (Ha)	Area of Vines (Ha)	Area of Vegetable (Ha)	Area of Nursery & Cut Flowers (Ha)	No of Beef Cattle	No. of Dairy Cattle	No. of Sheep
Cereal Grain	-	-	-	-	-	-	-	-	-
Sheep - Cereal	3	107	-	-	-	-	424	-	58
Meat Cattle - Cereal	-	-	-	-	-	-	-	-	-
Sheep									
Sheep - Meat Cattle	-	-	-	-	-	-	-	-	-
Meat Cattle	3	-	2	-	3	4	53,147	49	291
Milk Cattle	-	-	-	-	-	-	4,312	11,750	-
Pigs	-	-	-	-	-	-	98	-	70
Broilers	-	-	-	-	-	-	-	-	-
Other Poultry	-	-	-	-	-	-	-	-	-
Vineyard	-	-	-	-	-	-	-	-	-
Fruit	-	-	-	-	-	-	-	-	-
Vegetables	-	-	-	-	-	-	-	-	-
Nurseries	-	-	-	-	-	-	-	-	-
Other Intensive	-	-	-	-	-	-	-	-	-
NEC	-	-	-	-	-	-	431	-	-
TOTAL	**6**	**107**	**2**	**-**	**3**	**4**	**58,412**	**11,799**	**419**
Estimated Value of Production Group									
Over $600,000	-	-	-	-	-	-	5,230	-	-
$300,001 to $600,000	-	-	-	-	-	-	3,384	420	70
$150,001 to $300,000	-	-	-	-	-	-	7,610	3,700	-
$ 80,001 to $150,000	-	80	-	-	-	-	17,067	5,585	104
$ 40,001 to $ 80,000	3	-	2	-	1	-	17,987	2,006	59
$ 20,000 to $ 40,000	3	27	-	-	2	-	5,638	88	106
$ 19,999 or less	-	-	-	-	-	4	1,496	-	80


Residences - Stratford Coal Owned
Residences - Private
Built-up Area
Stratford Freehold Land
GRIFFIN
388 000
389 000
390 000
391 000
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS Via Gloucester WAY
ATKINS
WENHAMS
GRIFFIN
COX ROAD
KIRKMAN
ELLIS
McCAMMON
WHEATLEYS LANE
WENHAM
Dog Trap Creek
LESTRANGE
RIVER
STRATFORD
PROJECT AREA
AVON
BOWENS ROAD
Creek
MASLEN
Avondale
ISAAC
STRATFORD MAIN DEPOSIT
132KV POWER LINE
BAGNALL
PARKERS ROAD
BRAMLEY
PERRIN
SCPL
BUCKETTS WAY
NORTHERN RAILWAY LINE
BLANCH
PROJECT AREA
ELLIS
CRAVEN
STRATFORD COAL PTY. LTD.
LAND OWNERSHIP
0
1000m
STRATFORD COAL
Figure 2-5
Date September 1994


388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
BUCKETTS WAY
To Gloucester 12km
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
AVON RIVER
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
132KV POWER LINE
PARKERS ROAD
BUCKETTS WAY
NORTHERN RAILWAY LINE
PROJECT AREA
CRAVEN
N
Residential
Cemetry
Receation
Stratford School Forest
Cattle grazing on unimproved pasture scattered trees
Cropping (Primary stock feed)
Dairying and/or improved irrigated pasture
Areas subject to inundation/swamps
Wooded areas - medium to high density
STRATFORD COAL PTY. LTD.
LAND USE
0
1000m
STRATFORD COAL
Figure 2-6
Date September 1994

Services

Electric power to the villages of Stratford and Craven is provided from a 33 Kv distributor running along Bucketts Way. Telecom lines along Bucketts Way and Bowens Road service the area.

No town water is available in Stratford and Craven. Domestic water supplies rely on rain-water tanks and private water bores.

2.2.5 Land Zoning and Planning

Development within the Gloucester Shire is controlled under the following statutory provisions:

- Environmental Planning and Assessment Act 1979
- State Environmental Planning Policies
- Hunter Regional Environmental Plan 1989
- Gloucester Local Environmental Plan No. 4 1984

Environmental Planning and Assessment (EPA) Act 1979

The principal purpose of the Act is to institute a system of environmental planning and assessment for the State of New South Wales.

The objects of this Act are:

(a) To encourage

- the proper management, development and conservation of natural and man-made resources, including agricultural land, natural areas, forests, minerals, water, cities, towns, and villages for the purpose of promoting social and economic welfare of the community and a better environment.
- the promotion and co-ordination of the orderly and economic use and development of land.
- the protection, provision and co-ordination of communication and utility services.
- the provision of land for public purposes.
- the provision and co-ordination of community services and facilities.
- the protection of the environment.

(b) To promote the sharing of responsibility of environmental planning between the different levels of government in the State.

(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment (EPA Section 5.0).

State Environmental Planning Policies (SEPP)

No specific SEPP applies to the site. General compliance with all SEPPs within the Shire is required.

Hunter Regional Environmental Plan 1989 (REP)

The Hunter REP provides a policy framework for the Hunter Region's development which deals with social, economic, settlement, access, natural resources and ecological issues. It sets requirements for and gives guidance on, the preparation and processing of Local Environmental Plans and applications for development, on development needs and opportunities and on the management of the Region's growth and development.

The Project is considered to comply with the stated objectives and policies for controlling development within that section of the plan entitled "Part 6 - Natural Resources". In particular, Objective 39 of the Plan states that the objectives in relation to planning strategies concerning mineral resources and extractive materials are to:

"(a) manage the coal and other mineral resources and extractive materials of the region in a co-ordinated manner so as to ensure that adverse impacts on the environment and the population likely to be affected are minimised;

(b) ensure that development proposals for land containing coal and other mineral resources and extractive materials are assessed in relation to the potential problems of rendering those resources unavailable;

(c) ensure that the transportation of coal and other mineral resources and extractive materials has minimal adverse impact on the community."

Provisions within the REP have been used as a guideline in preparing the EIS.

Gloucester Local Environmental Plan 1984 (LEP No. 4)

The Gloucester LEP No. 4 provides regulatory provisions for development control of the Gloucester Shire. "The aims, objectives, polices and strategies of this plan are to provide for the orderly expansion of urban development arising from mining projects in the Shire of Gloucester, and to ensure that the existing rural and natural qualities of the Shire are preserved" (LEP - Page 4819).

The area of land affected by the Project is wholly contained within Rural (1a) Zone, as is the surrounding environment. Stratford village is zoned Rural (1c)(Small Holdings) and closely follows the immediate boundaries of the urban area within the village.

The location and boundaries of the relevant zones are shown in Figure 2-7.

Within the Rural (1a) Zone, "mines" are defined as purposes for which development consent is required before commencement. No other specific provisions of the LEP apply. General provisions for development and subdivision in the zone apply.

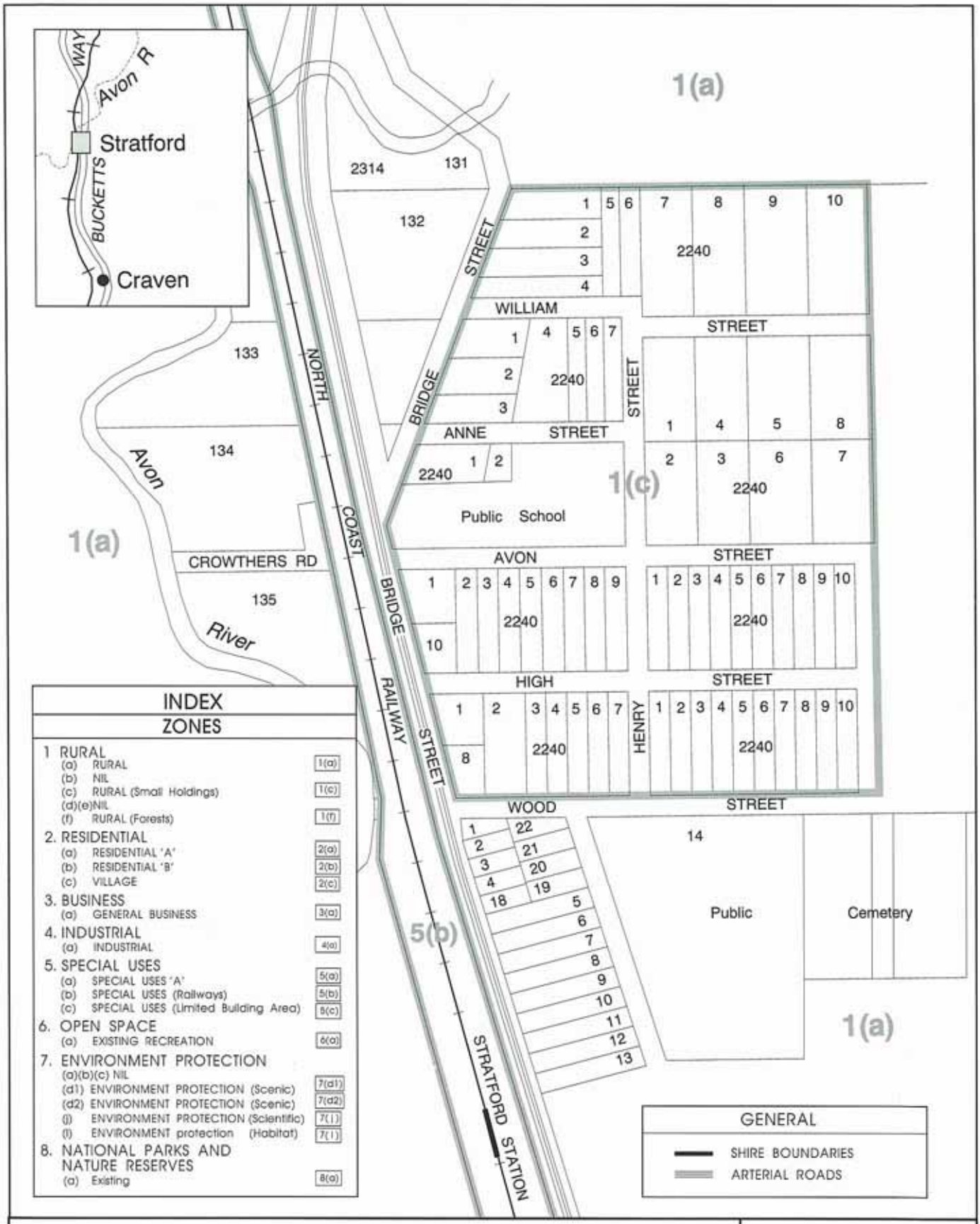
2.3 HYDROLOGY

Detailed hydrological studies have been undertaken in the Project Area with regard to both surface water and groundwater resources. Details are presented in Appendix 3. A summary of relevant information is provided below.

2.3.1 Regional Hydrology

The Project Area is situated in the Gloucester Valley and lies on Avondale Creek, a tributary of Dog Trap Creek, itself a tributary of the Avon River which flows northward past Gloucester. Further downstream the Gloucester and Barrington Rivers join the Avon River, eventually feeding the Manning River which flows eastward to the coast.

Unpublished data from NSW Department of Water Resources (DWR) files indicates that water in the Avon River is of good to excellent quality. pH varies within the relatively narrow range of 6.8 - 7.8. Conductivity varied between 92 and 690 microsiemens/cm from 1971 to 1985, with turbidity ranging from 0.9 to 58 Formazin units.



STRATFORD COAL

LAND ZONING BOUNDARIES

Figure 2-7

Date September 1994

Based on the available data, this water is suitable for all common uses, including potable water, although during extreme drought the salinity might have some affect on very salt-sensitive crops.

Town and domestic water supplies are drawn from major watercourses located in catchments which are adjacent to and downstream of the Project Area catchment. The Hunter District Water Board plans development of these water resources and requires that the existing flow rates and water qualities are maintained. Agricultural water supplies are used for dairy farming, stock grazing and irrigation.

The Manning River flows to the sea near Taree. Taree is a major recreational area, principally for fishing, water skiing and sailing. Important spawning grounds and habitats for migrating and permanent resident birds are nearby. Oyster farming is an important commercial enterprise.

There are a number of water bores in the Stratford area (located mainly in the Stratford village) which are used by local residents and businesses for domestic and commercial purposes. A survey of these water bores was carried out in 1994 to confirm locations, depth, water quality and usage.

A 1994 hydrogeological study indicates that the Project will have no impact on the water bores in the Stratford village.

2.3.2 Surface Waters

The Project Area is located approximately 1 km north of a catchment divide at Craven. Avondale Creek, an ephemeral tributary of Dog Trap Creek, traverses a marsh on the western side of the Project Area. A number of watercourses, some of which are ill-defined, feed this tributary. The catchment area containing the Project Area is approximately 40 km^2. Natural drainage systems in the Project Area are shown on Figure 2-1.

Although these catchments are not particularly large, heavy rain results in characteristic short duration high peak flows and shallow flooding of alluvial lowlands, principally due to rapid runoff from steeper slopes.

Under normal conditions these streams have low to zero flow for long periods. Dog Trap Creek also exhibits periods of prolonged low flow; its water chemistry suggests that it is partly fed by groundwater seepage.

2.3.3 Groundwaters

The groundwater characteristics of the Project Area were studied by Golder Associates (1982). A total of 34 rising/falling head permeability (hydraulic conductivity) borehole tests and 9 well pumping tests were undertaken during these studies.

These studies indicated that the coal seams represent the main aquifer systems in the region. Groundwater is also found within overlying colluvium and fractured sections of overburden. Permeabilities (hydraulic conductivities) of the rock units tested were extremely variable, generally ranging from very low to moderate (0.01 to 2.9 m/day). Transmissivities obtained from well pumping tests ranged from 3.3 to 29 m^2/day (low to moderate).

Available data indicate that there is a sub-regional groundwater flow from the southwest to the northwest at a gradient of about 1 in 100. Along the southeastern edge of the Main Deposit the gradient steepens, suggesting a local reduction in permeability. This may be due to the thrust faulting zone.

The water table approaches ground surface at the swampy northwest corner of the basin. This may be due to reduced permeability related to the east-west fault which forms the northern limit to open cut mining.

The colluvium functions as the principal recharge to the basin. This is due to its higher hydraulic conductivity, the presence of faults along the northwest, northeast and southeast of the basin, and low to very low hydraulic conductivities to the east. In dry times these groundwaters maintain moisture levels in the swampy northwest corner.

2.3.4 Water Quality

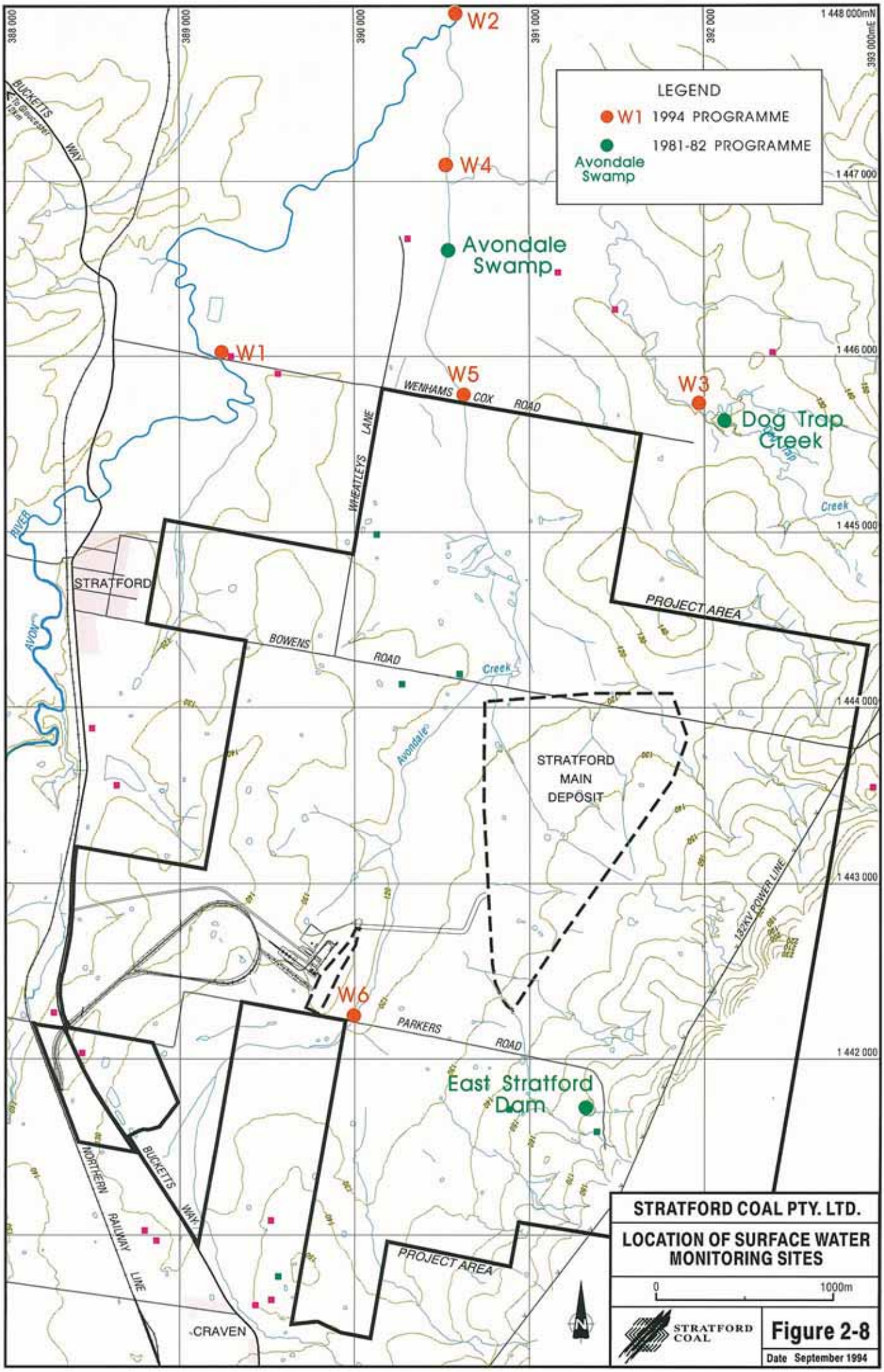
An intensive programme of surface water and groundwater quality monitoring was conducted in the Project Area during 1981/82. Surface water and groundwater quality monitoring was recommenced at the site in 1993/94 and is presently continuing. Results of the surface water quality programme are summarised in Tables 2-3 and 2-4.

Results of the groundwater quality programme are summarised in Tables 2-5 and 2-6. Locations of monitoring site are shown on Figures 2-8 and 2-9.

TABLE 2-3 SURFACE WATER QUALITY SUMMARY (1981 - 1982)

Test	Method*	Units	East Stratford Dam			Avondale Swamp			Dog Trap Creek		
			Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.
General Parameters											
pH	423	-	6.90	8.50	6.30	6.57	8.8	4.2	6.89	7.20	6.10
Conductivity	205	microsiemens /cm (25°C)	336	498	212	1601	7060	520	570	1090	170
Dissolved Solids	209B	mg/L	208	321	32	1069	4380	7	778	225	14
Suspended Solids	209	mg/L	51	288	5	20	436	1.0	26	115	1.0
Turbidity	214A	NTU	19	50	4.0	36	280	4.7	20	95	1.1
Colour		Pt-Co	48	60	33	81	21	200	138	220	25
Alkalinity	403	mg/L	24	39	14	37	81	11	73	210	15
Grease and Oil	503C	mg/L	3.6	8.0	1.0	1.8	7.0	<1.0	5.0	36	1.0
Sulphide		mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Major Anions											
Bicarbonance	403	mg/L	29	52	17	45	99	nil	89	260	18
Chloride	407C	mg/L	71	124	43	534	2680	124	129	225	34
Sulphate	426C	mg/L	8.9	23	1.0	20	110	1.0	15	41	2.7
Major Cations											
Sodium	325A	mg/L	39	70	23	254	1388	61	68	120	22
Potassium	322A	mg/L	4.4	8.0	2.8	5.3	8.4	3.3	4.4	9.1	2.5
Calcium	311C	mg/L	9.1	13.8	4.0	35	130	12.6	22	38	7.4
Magnesium	318B	mg/L	6.7	8.9	3.4	47	220	11	15	39	5.5
Nutrients											
Total Phosphorus	424C, 111,	µg/L	81	143	45	67	130	32	98	490	19
Nitrate	424F	mg/L	2.6	4.5	0.13	1.74	0.09	0.09	2.54	7.9	0.04
Trace Elements											
Iron	302D, 315A	mg/L	3.4	1.4	0.40	1.7	4.4	0.33	2.2	9.8	0.20
Manganese	304	mg/L	0.11	0.20	0.04	0.41	1.63	0.08	1.37	10.80	0.05
Copper	304	µg/L	0.69	2.5	0.20	4.6	37	0.20	4.5	29	0.20
Lead	304	µg/L	0.50	2.0	0.20	1.1	2.7	0.20	1.0	3.6	0.20
Zinc	304	µg/L	21	100	1.0	10	20	1.0	12	22	0.50
Cadmium		µg/L	1.2	0.23	0.02	0.15	0.60	0.05	0.15	0.60	0.02
Arsenic		µg/L	1.75	3.0	1.0	1.5	2.0	1.0	3.25	9.0	1.0
Selenium		µg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Molybdenum		µg/L	0.5	0.5	0.5	7.0	20	0.5	0.5	0.5	0.5
Boron		mg/l	0.12	0.20	0.05	0.06	0.10	0.02	0.10	0.15	0.05

* Standard Methods for the Examination of Water and Wastewater 15th Ed. 1980. APHA, AWWA, WPCF.


LEGEND
W1 1994 PROGRAMME
1981-82 PROGRAMME
Avondale Swamp
W1
W2
W3
W4
W5
W6
Avondale Swamp
Dog Trap Creek
East Stratford Dam
STRATFORD MAIN DEPOSIT
PROJECT AREA
PROJECT AREA
WENHAMS COX ROAD
WHEATLEYS LANE
BOWENS ROAD
PARKERS ROAD
BUCKETTS WAY
To Glenscaber 12km
NORTHERN RAILWAY LINE
132KV POWER LINE
STRATFORD
CRAVEN
AVON RIVER
Avondale Creek
Creek
388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
STRATFORD COAL PTY. LTD.
LOCATION OF SURFACE WATER MONITORING SITES
0
1000m
STRATFORD COAL
Figure 2-8
Date September 1994

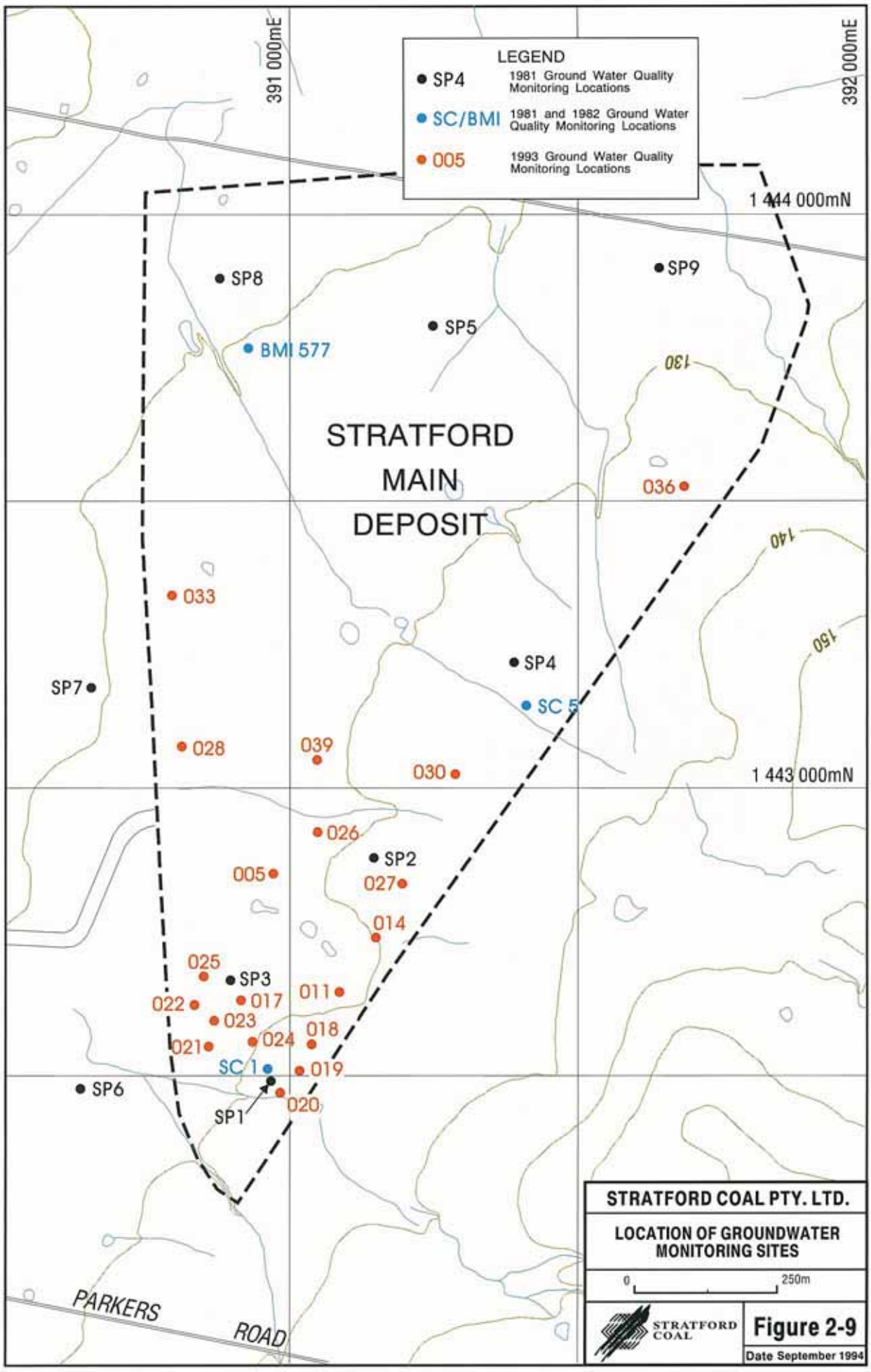

LEGEND
SP4 1981 Ground Water Quality Monitoring Locations
SC/BMI 1981 and 1982 Ground Water Quality Monitoring Locations
005 1993 Ground Water Quality Monitoring Locations
391 000mE
392 000mE
1 444 000mN
1 443 000mN
STRATFORD MAIN DEPOSIT
SP8
SP9
SP5
BMI 577
130
036
140
150
033
SP4
SC 5
SP7
028
039
030
026
SP2
005
027
014
025
SP3
011
022
017
023
018
021
024
SC 1
019
SP6
020
SP1
PARKERS ROAD
STRATFORD COAL PTY. LTD.
LOCATION OF GROUNDWATER MONITORING SITES
0
250m
STRATFORD COAL
Figure 2-9
Date September 1994

TABLE 2-4
SURFACE WATER QUALITY SUMMARY (1994)

Test	Units	Site W1 Avon River Upstream of Confluence of Dog Trap Creek					Site W2 Avon River Below Confluence with Dog Trap Creek					Site W3 Dog Trap Creek Upstream of Confluence with Avondale Creek				
		4/5	10/5	16/5	23/5	2/6	4/5	10/5	16/5	23/5	2/6	4/5	10/5	16/5	23/5	2/6
pH		7.0	7.3	7.2	7.1	7.1	6.9	6.9	7.1	6.9	7.1	6.9	6.8	7.2	6.9	7.0
Electrical Conductivity	µS/cm	330	1260	530	420	420	340	300	450	600	560	650	590	370	570	510
Total Nitrogen	mg/L	1.5	*	*	*	23	1.7	*	*	*	2	0.7	*	*	*	3
Sulphate	mg/L	<1	31	17	2	1	1	<1	7	13	9	7	13	2	18	11
Iron (Filterable)	mg/L	0.72	0.06	0.03	0.57	0.24	0.46	0.68	1.04	0.26	0.48	0.09	<0.01	0.94	<0.01	<0.02
Total Phosphorus	mg/L	<1	*	*	*	<1	<1	*	*	*	<1	<1	*	*	*	<1
Calcium	mg/L	14.1	*	*	*	16.9	13.0	*	*	*	15.8	22.7	*	*	*	21.2
Magnesium	mg/L	8.1	*	*	*	10.4	9.1	*	*	*	12.2	16.0	*	*	*	15.5
Chloride	mg/L	59	313	108	75	112	73	54	95	115	166	142	130	73	120	174
Total Dissolved Solids	mg/L	210	740	280	210	390	260	180	250	340	390	330	340	210	300	460
Total Suspended Solids	mg/L	1	*	*	*	47	24	*	*	*	6	13	*	*	*	<1
Copper	mg/L	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01
Arsenic	mg/L	<0.002	*	*	*	<0.002	<0.002	*	*	*	<0.002	0.003	*	*	*	<0.002
Cadmium	mg/L	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01
Chromium	mg/L	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01
Boron	mg/L	0.05	*	*	*	0.04	0.04	*	*	*	0.01	0.03	*	*	*	0.01
Mercury	µg/L	0.02	*	*	*	0.04	0.04	*	*	*	0.08	0.03	*	*	*	0.02
Manganese	mg/L	0.12	*	*	*	0.31	0.31	*	*	*	<0.01	0.45	*	*	*	<0.01
Lead	mg/L	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01

Standard Method for the Examination of Water and Wastewater 18th Edition, 1992 APHA, AWWA, WPCF

* samples not analysed for parameter

TABLE 2-4 (CONTINUED)
SURFACE WATER QUALITY SUMMARY (1994)

		Site W4 Dog Trap Creek Below Confluence with Avondale Creek					Site W5 Avondale Creek below Site					Site W6 Avondale Creek above Site				
	Units	**4/5**	**10/5**	**16/5**	**23/5**	**2/6**	**4/5**	**10/5**	**16/5**	**23/5**	**2/6**	**4/5**	**10/5**	**16/5**	**23/5**	**2/6**
pH		7.0	6.9	7.2	7.0	6.5	6.3	6.5	6.2	5.8	6.0	6.5	6.6	6.6	6.5	6.5
Electrical Conductivity	µS/cm	520	530	800	590	610	1270	1020	1960	2000	1000	1230	990	1280	1400	1700
Total Nitrogen	mg/L	1.7	*	*	*	31.0	1.6	*	*	*	1.0	2.0	*	*	*	2.0
Sulphate	mg/L	10	9	18	16	18	21	22	22	28	28	<1	19	17	17	14
Iron (Filterable)	mg/L	0.16	0.13	0.11	0.07	0.08	0.16	<0.01	<0.01	<0.01	<0.02	0.26	0.30	0.33	0.04	0.07
Total Phosphorus	mg/L	<1	*	*	*	<1	<1	*	*	*	<1	<1	*	*	*	<1
Calcium	mg/L	17.5	*	*	*	190	25.1	*	*	*	42.7	25.9	*	*	*	18.7
Magnesium	mg/L	12.8	*	*	*	14.0	29.2	*	*	*	53.2	33.1	*	*	*	34.6
Chloride	mg/L	108	110	198	125	166	362	580	572	590	853	342	272	350	380	629
Total Dissolved Solids	mg/L	260	310	420	300	480	750	1140	1000	1090	1430	620	636	710	750	1030
Total Suspended Solids	mg/L	4	*	*	*	4	4	*	*	*	<1	3	*	*	*	15
Copper	mg/L	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01
Arsenic	mg/L	0.002	*	*	*	<0.002	<0.002	*	*	*	<0.002	0.002	*	*	*	<0.002
Cadmium	mg/L	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01
Chromium	mg/L	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01	<0.01	*	*	*	<0.01
Boron	mg/L	0.03	*	*	*	0.02	0.03	*	*	*	<0.01	0.03	*	*	*	<0.01
Mercury	µg/L	0.02	*	*	*	0.02	0.03	*	*	*	0.07	0.02	*	*	*	0.07
Manganese	mg/L	0.27	*	*	*	<0.01	0.39	*	*	*	0.46	0.11	*	*	*	0.46
Lead	mg/L	<0.01	*	*	*	0.01	<0.01	*	*	*	0.01	<0.01	*	*	*	0.01

Standard Method for the Examination of Water and Wastewater 18th Edition, 1992 APHA, AWWA, WPCF

*samples not analysed for parameter

TABLE 2-5 GROUNDWATER QUALITY SUMMARY (1981 - 1982)

Test	Method*	Units	H20 (SC-1)			H20 (SC-5)			H20 (577)		
			Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.
General Parameters											
pH	423	-	3.75	5.3	3.2	5.6	5.7	5.4	6.7	6.9	6.5
Conductivity	205	microsiemens /cm (25°C)	4370	4550	3750	468	486	440	2160	2220	2100
Dissolved Solids	209B	mg/L	2360	2620	1920	305	321	281	1220	1310	1080
Suspended Solids	209	mg/L	30	47	13	40	85	8	19	48	3
Turbidity	214A	NTU	33	65	7.7	26	55	2.5	8.9	14	3.1
Colour		Pt-Co	21	38	10	9.0	12	4.0	9.0	10	8.0
Alkalinity	403	mg/L	0.0	0.0	0.0	25	30	22	172	210	140
Grease and Oil	503C	mg/L	9.2	35	1	8.7	36	1	7.3	39	1
Sulphide		mg/L	0.01	0.01	0.1	0.01	0.01	0.01	0.01	0.01	0.01
Major Anions											
Bicarbonance	403	mg/L	0.0	8.0	0.0	31	37	27	209	250	170
Chloride	407C	mg/L	1395	1560	1140	124	140	106	590	620	540
Sulphate	426C	mg/L	113	120	90	16	18	12	51	57	47
Major Cations											
Sodium	325A	mg/L	680	750	520	59	67	51	370	410	350
Potassium	322A	mg/L	7.4	11	5.1	1.7	2.2	1.2	4.8	6.4	3.0
Calcium	311C	mg/L	66	88	40	10	16	8.2	39	48	32
Magnesium	318B	mg/L	108	150	76	14	16	12	34	39	33
Nutrients											
Total Phosphorus	424C,111,	µg/l	25	52	11	86	180	14	312	1000	62
Nitrate4	424F	mg/L	1.0	2.2	0.04	2.2	7.1	0.04	4.0	5.6	1.2
Iron	302D,315A	mg/L	23	47	16	3.9	13	0.72	0.72	1.6	0.20
Manganese	304	mg/L	1.29	1.41	1.20	0.19	0.38	0.09	0.18	0.22	0.11
Copper	304	µg/L	26	60	2.0	3.0	11	0.20	6.7	14	1.0
Lead	304	µg/L	378	1000	75	17.7	48	0.20	42	75	12
Zinc	304	µg/L	550	580	490	15	25	8.0	20	30	10
Cadmium		µg/L	1.0	2.0	0.30	0.12	0.2	0.02	0.38	0.80	0.10
Arsenic		µg/L	1.25	2.0	1.0	1.25	2.0	1.0	1.25	2.0	1.0
Selenium		µg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Molybdenum		µg/L	8.0	21	0.5	0.6	1.0	0.5	6.0	21	0.5
Boron		mg/L	0.13	0.20	0.10	0.06	0.10	0.05	0.07	0.10	0.02

* Standard Methods for the Examination of Water and Wastewater 15th Ed. 1980. APHA, AWWA, WPCF

Surface Water Quality

1981 - 1982 data indicate surface water quality to be variable. Water sampled from a farm dam at east Stratford was generally of high quality and normally suitable for most uses. Water in Dog Trap Creek was slightly brackish under drought conditions, but normally of good quality. Water from Avondale Swamp was normally moderately saline and unsuitable for use as drinking water and for most irrigation purposes.

A summary of the results of a surface water quality assessment undertaken during 1994 is presented in Table 2-4. Site W5 exceeded the ANZECC (1992) drinking water guidelines in chloride and total dissolved solids. Otherwise, the remaining sites were generally suitable for all uses.

TABLE 2-6 GROUNDWATER QUALITY SUMMARY (1993)

Test	Units	05	011	014	017	018	019	020	021	022	024	025	026	027	028	030	033	036	039
pH		7.7	7.1	8.0	4.1	3.8	4.4	5.8	4.7	4.3	8.0	3.4	8.2	8.3	4.5	8.4	5.4	7.9	8.0
Acidity	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	10	<1	<1	<1	<1	<1	<1	<1
to pH 3.7	mg/L	8	4	15	90	40	22	24	80	140	6	140	4	<1	320	<1	35	10	10
Alkalinity																			
due to CO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	4	<1	1	<1
due to HCO3	mg/L	120	35	420	6	2	10	2	8	6	150	<1	410	360	8	300	<110	170	330
due to OH	mg/L	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	2780	980	4090	930	830	430	1010	480	700	1180	970	2730	2850	2650	550	2110	1340	2310
Sulphate	mg/L	90	27	130	39	60	70	130	13	18	38	33	60	80	75	24	55	23	65
Sodium	mg/L	1390	460	2020	380	380	240	480	160	230	450	360	1150	1170	950	330	750	480	900
Potassium	mg/L	17.0	7.2	18.0	3.9	4.5	3.6	4.9	3.1	3.8	16.0	4.8	14.0	12.0	8.7	6.7	8.3	8.0	12.0
Iron (filterable)	mg/L	0.1	<0.1	0.1	34.0	6.1	5.2	8.9	27.0	50.0	0.1	40.0	<0.1	<0.1	110	0.1	9.7	0.2	<0.1
Calcium	mg/L	200	45	270	25	23	15	36	34	50	150	50	180	170	120	32	190	140	110
Magnesium	mg/L	160	50	180	38	35	12	45	22	30	50	40	120	100	110	21	85	60	95
Total Hardness	mg/L	1160	320	1700	260	250	110	340	210	300	720	340	1170	1030	930	200	1030	730	820
Total Suspended Solids	mg/L	14	14	16	10	14	80	11	3	2	13	21	4	11	18	2	2	1	170
Total Dissolved Solids	mg/L	5300	200	7990	1700	1560	980	1970	990	1390	2400	1900	5150	5240	4700	1180	4660	2670	4280
Langelier Saturation		0.6	-1.1	1.62	-5.2	-6.0	-4.9	-3.0	-4.3	-4.7	0.9	-6.3	1.6	1.7	4.0	1.0	2.8	0.8	1.1
Specific Conductance	µs/cm	8800	3420	12700	2950	2850	1700	3650	1680	2380	4100	3250	8200	8650	7900	2350	6650	4500	7500

Groundwater Quality

Analysis of groundwater quality carried out during hydrogeological investigations in 1981 (Golders 1982) indicated groundwaters in the Project Area to be generally saline, highly mineralised hard water with slightly acidic to highly acidic pH values and unsuitable for domestic consumption and irrigation and, in some, cases livestock consumption.

A summary of groundwater quality data collected from monitoring undertaken during 1981/82 is presented in Table 2-5. The data show that groundwater from boreholes SC-1 and 577 is saline and of moderate to poor domestic/stock quality, whereas that from SC-5 is of good quality.

In general, groundwater in the Project Area is of similar composition; the dominant cation being sodium and the dominant anions being chloride and bicarbonate. Groundwaters are typically slightly more sodic and contain a slightly greater proportion of chloride than surface waters. Water from the north-eastern sector typically has a low sodium hazard, whereas water from the rest of the Project Area has a high sodium hazard. Surface waters, by way of comparison, show considerable overlap between sampling sites.

In the more recent groundwater quality monitoring programme water quality remained variable. A summary of groundwater quality data collected in 1993 is contained in Table 2-6. pH ranged from 3.4 to 8.4 and samples had a slightly high to high concentration of chloride with the exception of boreholes 014, 026, 027, 028 and 033 which had very high chloride concentration (site 014 with a concentration of 4,090 mg/L). Many also had high sodium and total hardness concentrations including sites 026 and 027 with very high levels. Sites 017 and 018 had slightly elevated iron concentrations and site 028 had an extremely elevated iron concentration of 110 mg/L. Groundwater is variably saline with the quality varying from poor to good.

2.3.5 Water Demand

The Project Area site is crossed by a number of watercourses along which numerous small farm dams have been built. These dams are primarily used for stock watering. The colluvium provides a source of green feed except during periods of drought. The lower stretches of Dog Trap Creek, which have more reliable flow, support small-scale spray irrigation for crop and cattle feed. Current water demands within the site are moderate and surface water supplies appear more than adequate.

2.4 AIR QUALITY

Existing air quality in the Project Area and immediate surrounds site has been monitored using a network of dust deposition gauges. Samples were collected on a four-weekly basis for the period of September 1981 to October 1984, and were analysed for insoluble solids, ash and combustible solids. The monitoring programme was recommenced in May 1994. Locations of monitoring sites are shown on Figure 2-10. Details of the work undertaken is presented in Appendix 4.

Results of the dust monitoring program for 1981 to 1984 are presented in Table 2-7. The results indicate that ambient dust fallout levels were generally low and typical of a rural area (i.e. generally less than 1.0 g/m^2/month). The highest and most variable dust fallout rates were observed at Gauge 5, adjacent to an unsealed road. Existing dust levels are from natural sources (i.e. wind erosion of barrier surfaces) residential sources (e.g. domestic burning and building), commercial sources (i.e. burnoffs from farms and timber mills), traffic on both paved and unpaved roads, and the presence of emissions of particulate matters (related to handling and storage of materials, transportation and intensive agriculture).

Results from the first three months of dust deposition monitoring carried out in 1994 confirmed existing background values generally less than

TABLE 2-7
SUMMARY OF BACKGROUND DUST DEPOSITION RATES

Sampling Location[1] Number	Number of Samples	Dust Deposition (g/m^2/month)	
		Mean	Standard Deviation
5	36	2.44	2.64
6	39	0.71	0.52
7	38	1.26	0.99
8	39	0.64	0.51
9	31	0.75	0.87
10	31	1.69	1.52

[1]Refer Figure 2-10 for Locations

TABLE 2-8
SUMMARY OF HIGH VOLUME DUST SAMPLING

Sampling Period	Sampling Locations		Comments
	Stratford HVD1[1]	Craven HVD2[1]	
	Total Suspended Particles ($\mu g/m^3$)		
4 to 5 August 1994	32	23	Fire reduction hazard burning was undertaken in parts of the Shire from 4 to 9 August 1994
5 to 6 August 1994	42	30	
6 to 7 August 1994	52	50	
7 to 8 August 1994	35	15	
8 to 9 August 1994	26	10	
9 to 10 August 1994	23	18	
10 to 11 August 1994	36	<10	
11 to 12 August 1994	60	15	
12 to 13 August 1994	48	24	

[1]Refer Figure 2-10 for Locations

TABLE 2-9
SUMMARY OF MONITORED NOISE LEVELS

Location (Residence)	Daytime (0700-2200 Hours)				Night-time (2200-0700 Hours)			
	Weekday		Saturday		Weekday		Saturday	
	LA_{10}	LA_{90}	LA_{10}	LA_{90}	LA_{10}	LA_{90}	LA_{10}	LA_{90}
Isaac	55	32	56	33	35	30	39	31
Blanch (Craven)	53	33	53	33	40	28	45	29
Atkins	50	31	48	30	40	29	37	28
Van Der Drift (Stratford)	46	32	44	32	34	30	32	31

Values in dBA

1.0 g/m^2/month. High volume dust sampling, to assess levels of total suspended particles (TSP) was also commenced in the Project Area in 1994. Preliminary data on TSP levels is shown in Table 2-8.

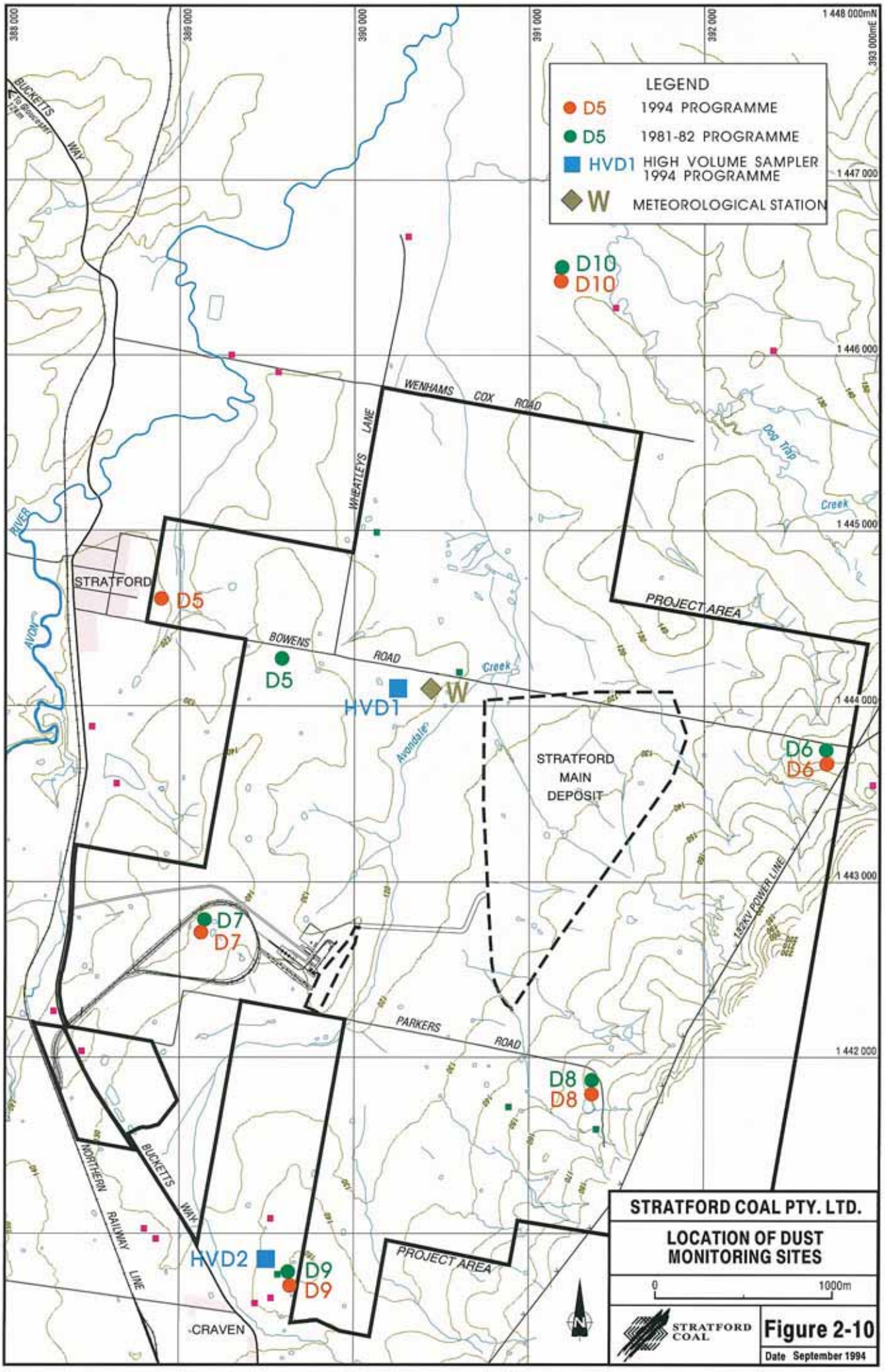
2.5 ACOUSTICS

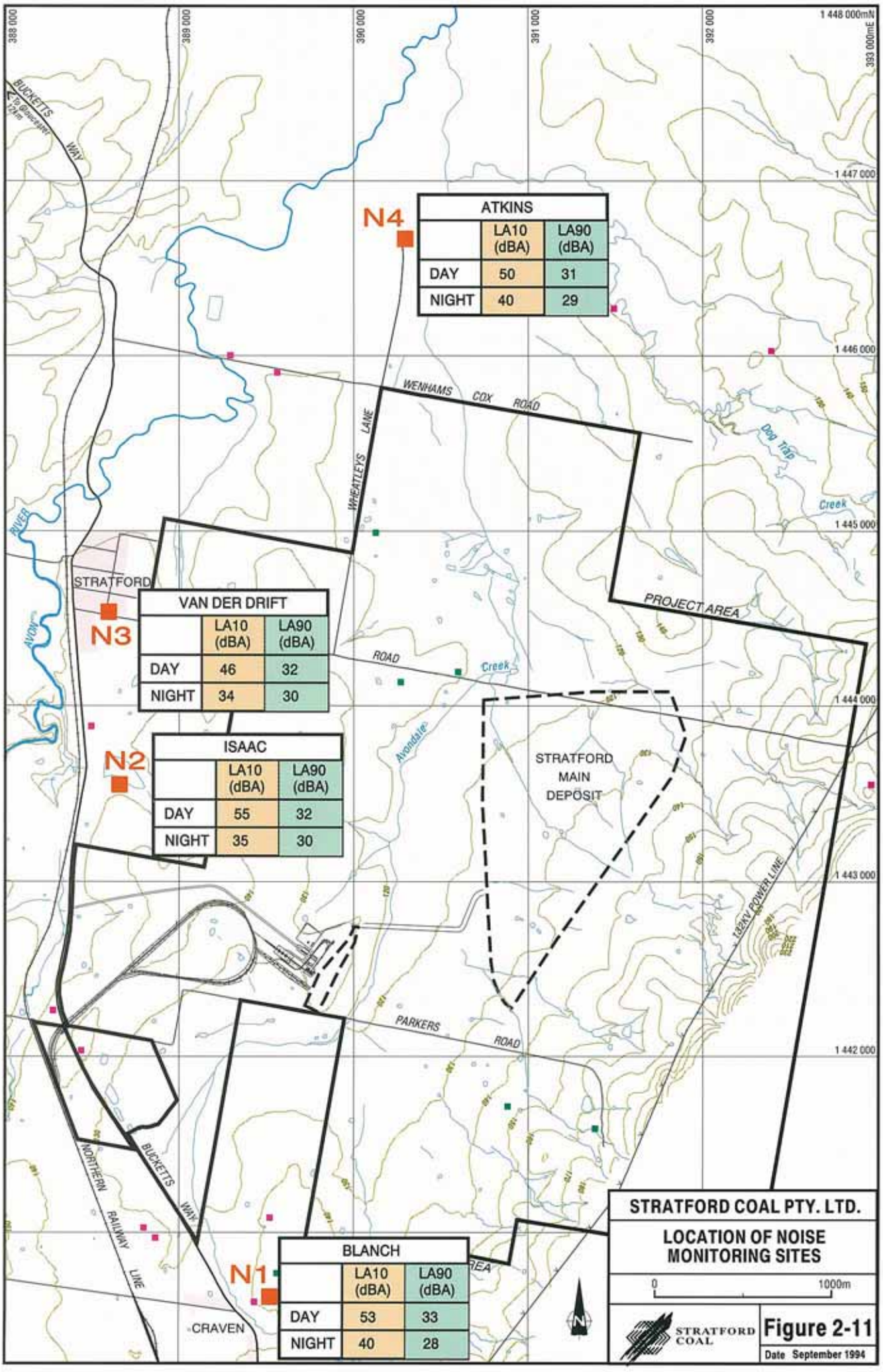
An acoustic survey was carried out at selected local residences in proximity to the Project Area during June 1994 to establish background noise levels. Details of this survey are presented in Appendix 5 and summary of relevant information is provided below.

Noise monitoring was carried out at four locations (refer Figure 2-11). An unattended noise logger and weather station were positioned at the base monitoring location, the Isaac residence, for a period of 11 days. A second unattended noise logger was located at the Blanch residence in the township of Craven throughout this period whilst a third logger was rotated between two other monitoring locations, the Atkins and Van Der Drift (Stratford) residences for approximately half the period each.

In order to supplement the unattended noise logger measurements and to assist identifying the character and duration of ambient noise sources, operator-attended surveys were also conducted at all monitoring locations at various intervals throughout the measurement period. The results of the monitoring results were cross-tabulated with prevailing weather conditions.

A summary of the monitored noise levels is presented in Table 2-9 and Figure 2-11. The LA_{90} designation refers to the noise level which is exceeded for 90% of the sampling period and is referred to as the average minimum, or background noise level. LA_{10} is the noise level which is exceeded for 10% of the sampling period and is referred to as the average maximum noise level.


LEGEND
D5 1994 PROGRAMME
D5 1981-82 PROGRAMME
HVD1 HIGH VOLUME SAMPLER 1994 PROGRAMME
W METEOROLOGICAL STATION
388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
to Bloomfield 12km
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
AVON RIVER
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
132KV POWER LINE
PARKERS ROAD
NORTHERN RAILWAY LINE
CRAVEN
D10
D5
D6
D7
D8
D9
HVD1
HVD2
W
STRATFORD COAL PTY. LTD.
LOCATION OF DUST MONITORING SITES
0
1000m
STRATFORD COAL
Figure 2-10
Date September 1994


388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
To Gloucester 12km
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
RIVER
AVON
STRATFORD
PROJECT AREA
ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
132KV POWER LINE
PARKERS ROAD
NORTHERN RAILWAY LINE
BUCKETTS WAY
CRAVEN
N1
N2
N3
N4
ATKINS
LA10 (dBA)
LA90 (dBA)
DAY 50 31
NIGHT 40 29
VAN DER DRIFT
LA10 (dBA)
LA90 (dBA)
DAY 46 32
NIGHT 34 30
ISAAC
LA10 (dBA)
LA90 (dBA)
DAY 55 32
NIGHT 35 30
BLANCH
LA10 (dBA)
LA90 (dBA)
DAY 53 33
NIGHT 40 28
N
STRATFORD COAL PTY. LTD.
LOCATION OF NOISE MONITORING SITES
0
1000m
STRATFORD COAL
Figure 2-11
Date September 1994

The average minimum, or background monitored noise levels (LA_{90}) ranged from 31 dBa to 33 dBa on weekdays and from 28 dBa to 30 dBa on week nights. Weekend levels were very similar.

Average maximum monitored noise levels (LA_{10}) ranged from 46 dBa to 55 dBa on weekdays and from 34 dBa to 40 dBa on week nights. Weekend levels were similar.

The surveys showed that the background noise level is normal for a rural area apart from passing traffic on Buckets Ways and the Northern rail line, with some instances of insect noise resulting in higher night time background noise levels.

2.6 TRANSPORT NETWORK

The Project Area is serviced by an existing road network and a major railway line. The regional transport network and existing traffic volumes are shown in Figure 2-12. An analysis of the Transport Systems is attached in Appendix 6.

2.6.1 Roads and Traffic

The Bucketts Way (Trunk Road 90) is the principal road servicing the Project Area. It runs south from Gloucester to join the Pacific Highway approximately 20 km north of Raymond Terrace, and north from Gloucester to join the Pacific Highway south of Taree.

Dungog is connected to the Gloucester valley by two low standard roads, Main Road (MR)101 and MR289. A new bridge at Washpool has been completed on MR289 making this the preferred route to Dungog.

The Gloucester Valley is connected to Bulahdelah in the east by a low standard road MR110 which meets Bucketts Way at Booral.

2.6.2 Rail

The Northern Rail Line runs adjacent to the Project Area, approximately 2 kms west. The rail line is a single track and generally parallels the Bucketts Way between Stroud Road and Gloucester.

The State Rail Authority (SRA) reports that the proposed haulage rate of 1.135 Mpta is well within current capacity and no capital works will be required along the main line to carry coal from the Project to the Port of Newcastle.

A passenger train service runs between Brisbane and Sydney, via Newcastle, 7 days per week, passing through Gloucester twice daily. The majority of trains on the line are goods freight, with an existing traffic of 7 Mtpa.

2.7 VISUAL FEATURES

2.7.1 Visual Character

An assessment of the visual character of the Project Area was undertaken in July 1994 and is presented in Appendix 7. A summary of relevant information is provided below.

Since early settlement, much of the Gloucester valley has been cleared for grazing, agriculture and timber. The existing landscape bears the imprint of these activities with cleared slopes forming a major landscape type. Extensive forested landscapes are not common through the settled areas of the region apart from the heavily forested mountains to the east and west of the study area.

The visual catchment of the Project Area is determined by the surrounding topographical features which limit the extent of the views obtained (refer Figure 2-13). The boundaries are a series of rolling hills surrounding the site and steep, forested slopes

immediately to the east. The Barrington Tops National Park forms a dominant, notable feature to the west.

The Project Area has been cleared for cultivation, grazing and settlement for many years, and is visually archetypical of its rural context. The undulating foothills are lightly timbered and clumps of endemic and planted vegetation are located throughout the Project Area. The creek beds and alluvial floodplain of Dog Trap Creek are significantly scarred with bank and sheet erosion. Salt burns to standing vegetation and the ground surface are noticeable in the northern part of the Project Area, beyond the proposed development area.

2.7.2 Landscape Units

Land use, vegetation cover and topography are used to divide the Project Area into landscape units of homogenous visual characteristics. The Project Area contains four landscape units:

Ridgelines

The ridgeline to the east of the Project Area forms a heavily timbered landscape unit. Form is the most dominant visual element; texture and colour are fairly homogenous throughout the unit. Manmade components include the Fragley residence and the access road to that residence. Built elements are subordinate to the strong natural form of the ridgeline.

To the east, the ridgeline forms the dominant feature of the horizon.

Agricultural Lowlands

The main feature of this unit is undulating topography dissected by drainage lines and clumps of vegetation. Form and line are important features of the unit, with variations in slope, orientation and gullies providing a distinctive visual element typical of the Gloucester Basin. Manmade components, principally along Bowens and Parkers Roads are secondary to the natural features of the unit. Views are principally internal with only one limited area of long distance views to the south west.

The low lying alluvial floodplain is an integral part of this unit. Colour and form of the unit are relatively homogenous. The texture is dense and uniform. Views to this unit are principally internal with the only external view shed to the north along the alignment of Dog Trap Creek.

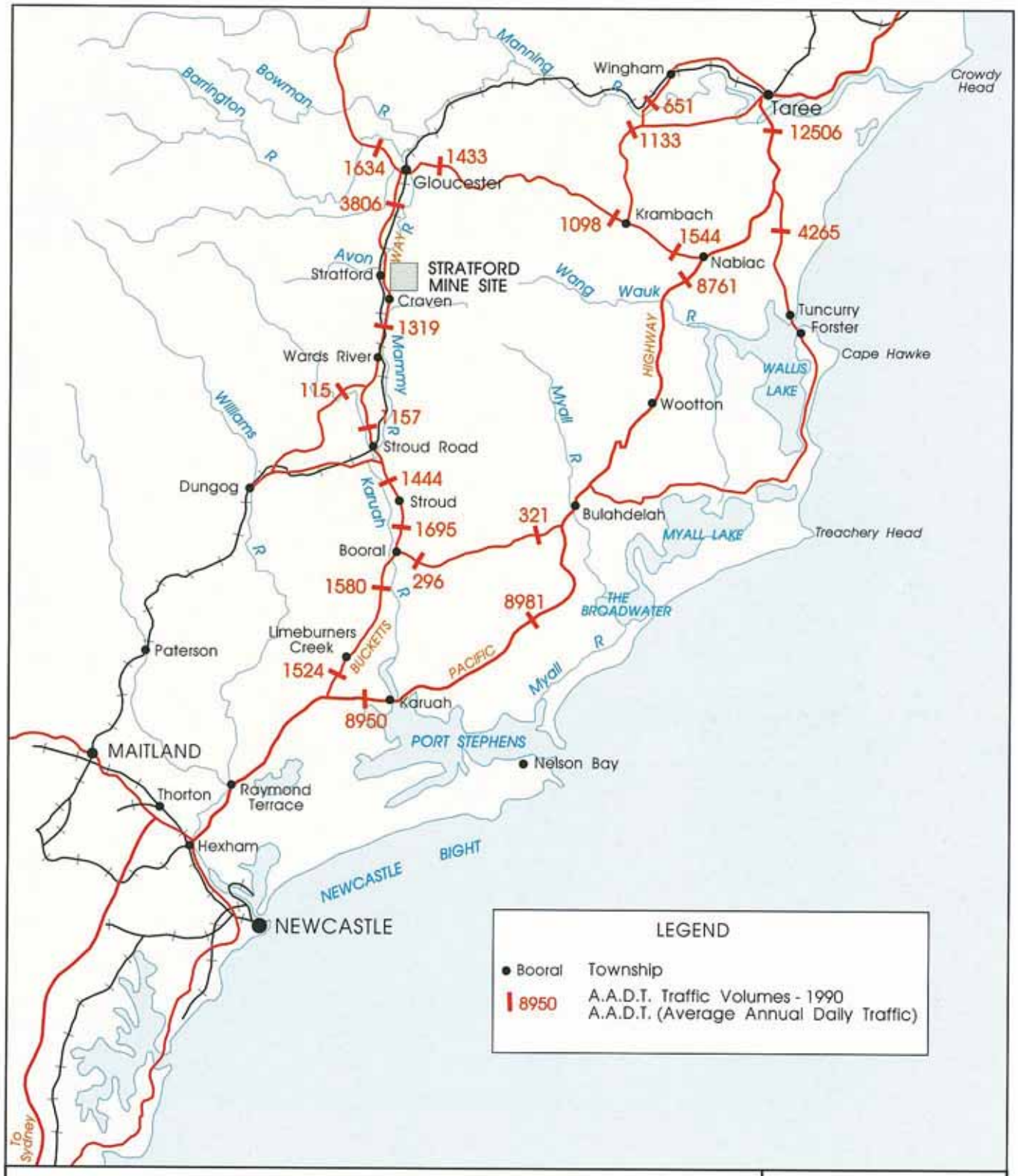
There are a number of rural homesteads and farms situated within this unit. The rural villages of Stratford and Craven contribute to the rural community character of the area.

The area is a visually harmonious rural and agricultural setting with no discordant structures apparent, although the transport corridor running parallel to Bucketts Way introduces an artificial/manmade lineal structure to the rural horizon.

Agricultural lowlands are the predominant landscape unit of the Project Area.

Transport Corridor

The western section of the Project Area forms a linear unit adjacent to Bucketts Way and Northern Railway. The northern and southern boundaries of the Project Area border to townships of Stratford and Craven respectively. Line and form are the dominant landscape components characterised by the road and rail corridor and the adjacent undulating low hills. Manmade components are a strong element within this unit with residences, fences and sheds adding to the influence of the road and rail corridor.

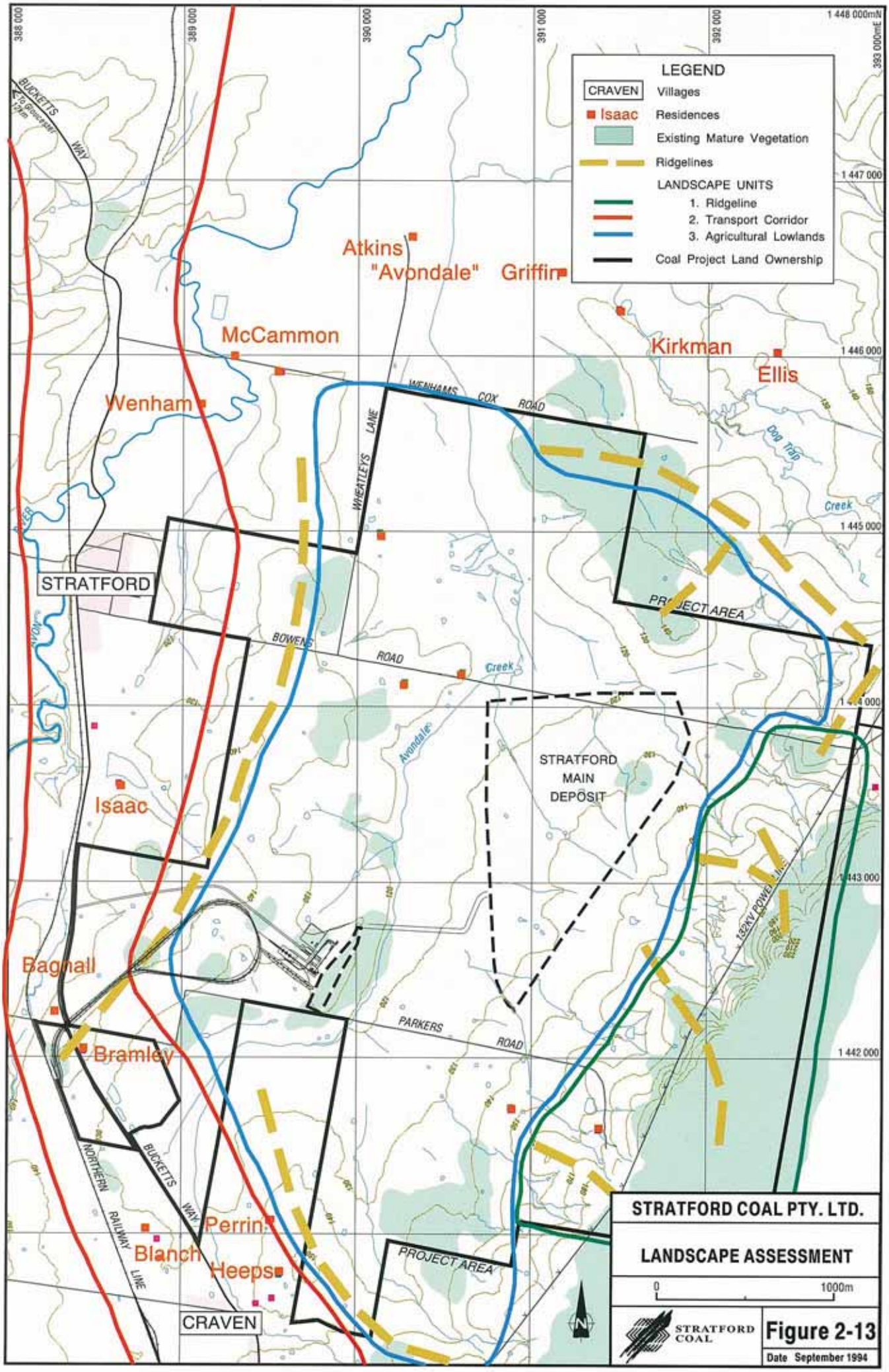


STRATFORD COAL

REGIONAL TRANSPORTATION ROUTES AND TRAFFIC VOLUMES

Figure 2-12

Date September 1994


LEGEND
CRAVEN Villages
Isaac Residences
Existing Mature Vegetation
Ridgelines
LANDSCAPE UNITS
1. Ridgeline
2. Transport Corridor
3. Agricultural Lowlands
Coal Project Land Ownership
388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
To Gloucester 13km
Atkins
"Avondale"
Griffin
McCammon
Kirkman
Ellis
Wenham
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
Isaac
Bagnall
Bramley
PARKERS ROAD
132KV POWER LINE
NORTHERN RAILWAY LINE
BUCKETTS WAY
Perrin
Blanch
Heeps
PROJECT AREA
CRAVEN
N
STRATFORD COAL PTY. LTD.
LANDSCAPE ASSESSMENT
0
1000m
STRATFORD COAL
Figure 2-13
Date September 1994

2.7.3 Scenic Quality

The basic premise of visual quality assessment is that all landscapes have some value but those with the most diversity have the greatest potential for high scenic value. Scenic quality may be said to increase as:

- topographic ruggedness and relative relief increase;
- the presence of waterforms, water edge and water area increases;
- patterns of grasslands and forest become more diverse;
- natural and agricultural landscapes increase and manmade landscapes decrease.
- land use compatibility increases and land use edge diversity decreases.

The three landscape units within the Project Area have been ranked into classes as shown in Table 2-10.

2.8 FLORA AND FAUNA

2.8.1 Flora

The Project Area comprises cleared farmland with isolated low to medium density stands of trees across the site, primarily along drainage lines or dams, or planted as a visual buffer to the west.

A flora study was undertaken in September 1981. An additional survey of fringing forest was conducted in February 1982. A structural rather than floristic approach was taken and results are summarised in Table 2-11. The NPWS data base for rare plants for the area covered by the Dungog and Upper Manning 1:100,000 sheets was examined on 14 July, 1994.

The detailed description of vegetation and list of plant species identified on the Project Area are presented in Appendix 8.1. The original plant communities have been extensively disturbed by grazing animals and land clearing. The vegetation associations present can readily be found at other sites throughout much of the Stroud/Gloucester district.

TABLE 2-10
SCENIC QUALITY CRITERIA

Landscape Unit	Prominence of:				Visual Rating
	Diversity	Landform	Vegetation	Water	
Ridgeline	Moderate	High	High	-	Moderate - High
Agricultural Lowland	Moderate	Moderate	Moderate	-	Moderate
Transport Corridor	Moderate	Low	Low	-	Moderate - Low

TABLE 2-11
VEGETATIVE CLASSIFICATION

Mapping Unit	Comments
1. CLOSED FOREST	Trees 10-15m only with cover 70-90%
1.1 SUBTROPICAL RAINFOREST	Eucalypts absent. Very high species diversity with no specific dominant or character species. Gullies in ranges.
1.2 RIPARIAN (FRINGING FOREST)	Confined to steep banks of primary streams. Primarily rainforest species but with Water Gum and some otherspecies more frequent. Occasional emergent River Oak.
2. OPEN FOREST	Tree heights variable but in the range 15-25m. Cover usually 30-40%, reaching 60% or more in wet areas.
2.1 WET SCLEROPHYLL	
2.1.1 Gully Vegetation	As for 1.1 but cover less and some emergent eucalypts, particularly Tallow Wood
2.1.2 Fringing Forest	As for 1.2 but less well developed and lower species.
2.2 SWAMP SCLEROPHYLL FOREST	In swampy areas at Stratford. Character species for both sub-units is Melaleuca decora, a bottlebrush-teatree. Cabbage Gum is also present in 2.2.1, on swampy edges. Ground cover is cutting grass (Gahnia spp.) and sedges
2.2.1 Melaleuca/Eucalyptus Open Forest	
2.2.2 Melaleuca low open forest or open scrub	
2.3 DRY SCLEROPHYLL FOREST	Trees 15-25m tall with cover 30-40%. Unit is subdivided to distinguish between relic
2.3.1 ,Sclerophyll understorey (with layering of vegetation)	stands of trees in cleared areas, in which most understorey and layering has been removed, and areas which still retain a significant native understorey. A number of floristic associations are represented, as a patchwork within the distribution of the structural unit.
2.3.2 Grassy understorey (grazed)	
3. INDUCED WOODLAND AND GRASSLAND	
3.1 OPEN WOODLAND	Variable tree cover from scattered individuals to small copses, but with overall cover less than 10%. Characteristic tree species for any given area usually determined by the nature of the forest originally occuring on that site.
3.2 Dryland Pasture	Division between 3.1 and 3.2 diffuse.
3.2.2 Sedgeland	Mixed native and alien grass and herbaceous pasture species. Swamp areas formerly possessing Melaleuca cover (2.2).

Vegetation distribution in the Project Area is shown on Figure 2-14. Significant vegetation remnant areas are shown on Figure 2-15.

The areas of closed fringing forest and subtropical rainforest together provide a high proportion of the floristic diversity for the region, despite their small area. The sub tropical rainforest in the eastern foothills may have conservation significance. The dry sclerophyll forest are not of great regional significance. Locally, however, these areas of dry sclerophyll forest with native understorey possess some conservation value as they assist in maintaining local plant diversity and providing faunal habitats not available in the more heavily degraded or modified areas.

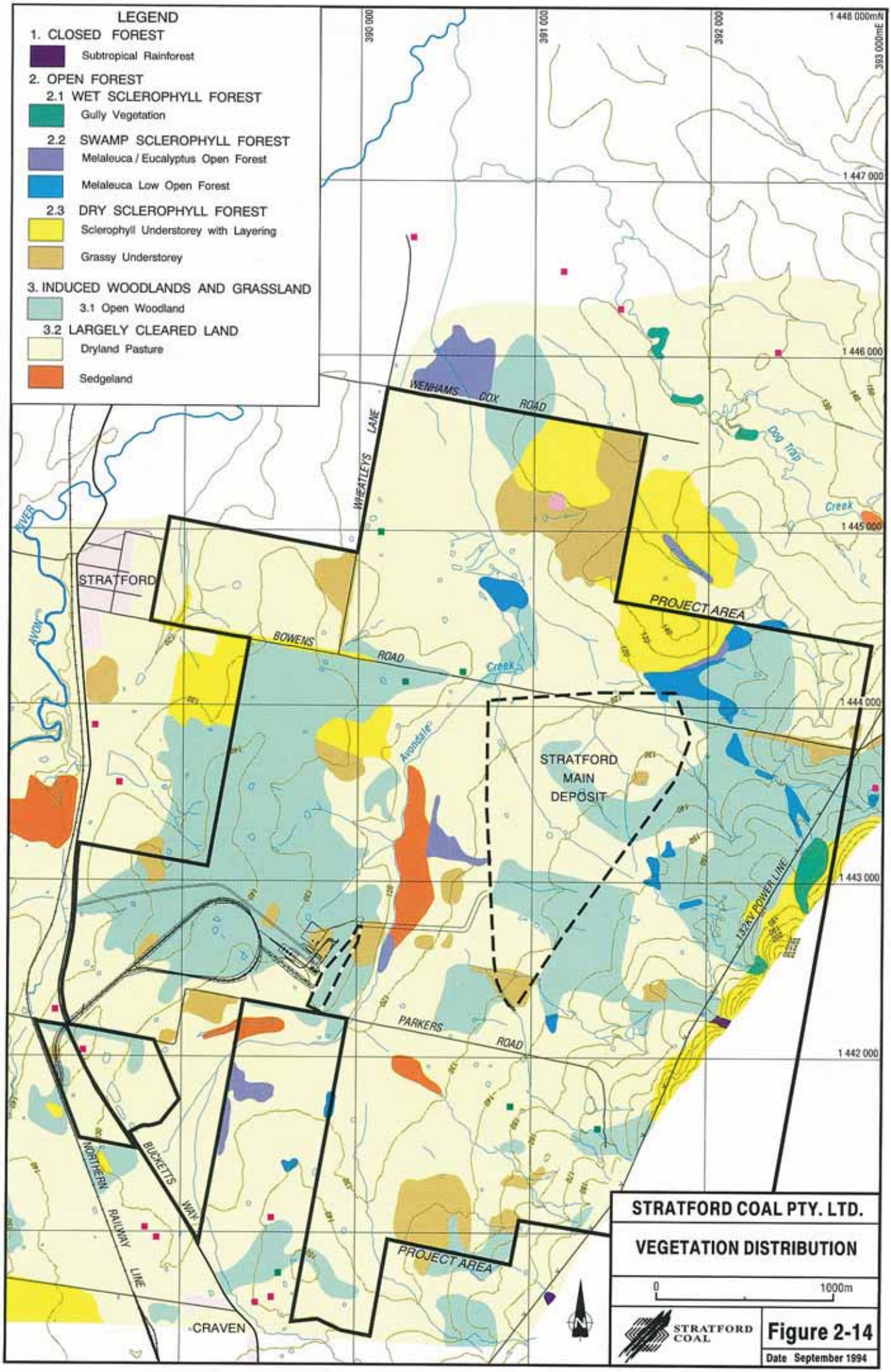
The poor density and lack of structural variation in the flora is reflected in the low conservation value of the Project Area. No endangered plant species were observed in the 1981-1982 Studies.

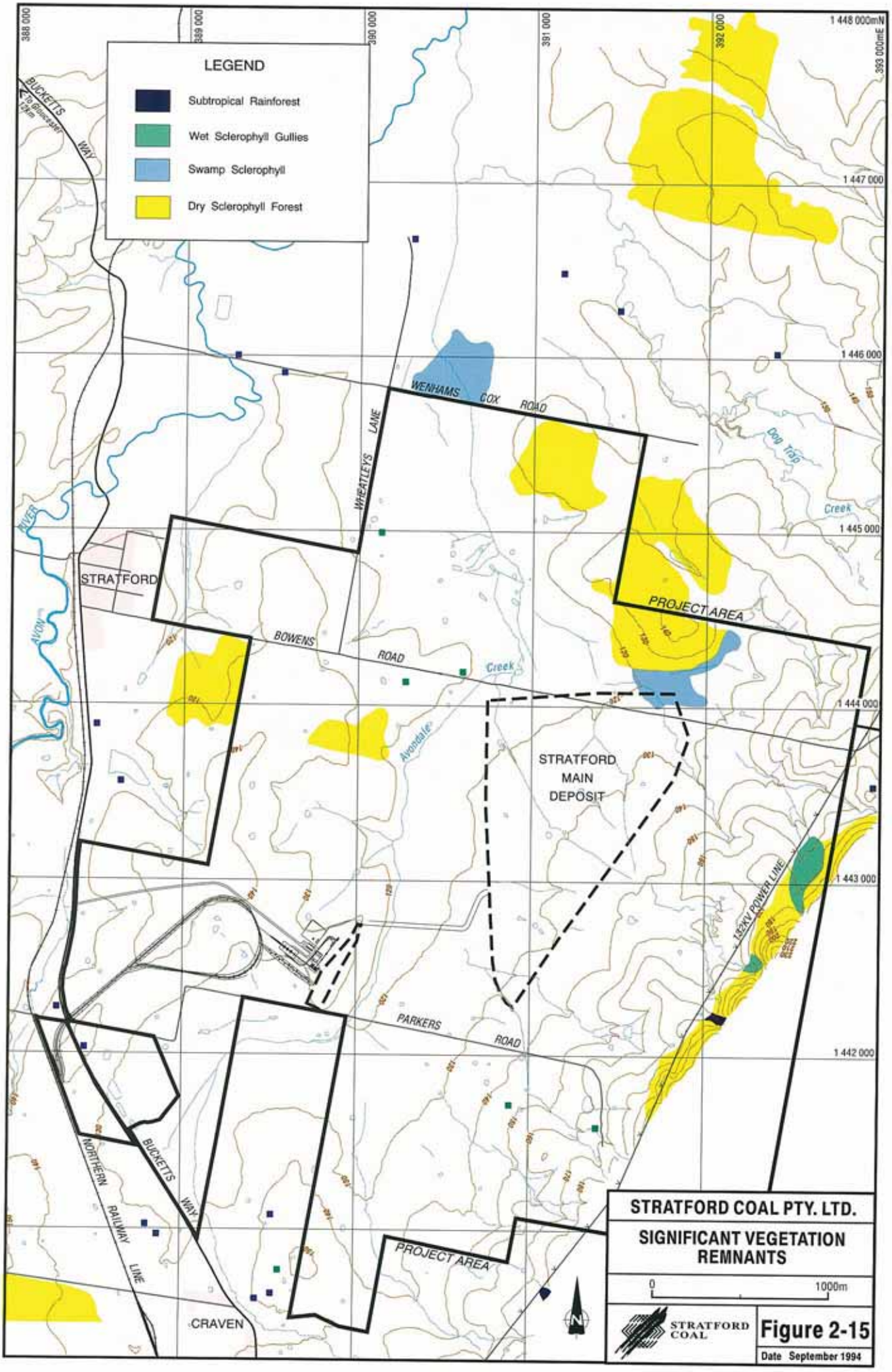
NPWS (1994) data base records did not indicate any species of significance that may be likely to occur on the site.

2.8.2 Terrestrial Fauna

Terrestrial fauna surveys within and about the proposed Stratford mine site have been undertaken and were more recently followed by bat and amphibian surveys in July 1994.

In the initial survey six principal habitat types were identified - gully, wet sclerophyll forest, dry sclerophyll forest, open ground, sedgeland and creek bed


LEGEND
1. CLOSED FOREST
Subtropical Rainforest
2. OPEN FOREST
2.1 WET SCLEROPHYLL FOREST
Gully Vegetation
2.2 SWAMP SCLEROPHYLL FOREST
Melaleuca / Eucalyptus Open Forest
Melaleuca Low Open Forest
2.3 DRY SCLEROPHYLL FOREST
Sclerophyll Understorey with Layering
Grassy Understorey
3. INDUCED WOODLANDS AND GRASSLAND
3.1 Open Woodland
3.2 LARGELY CLEARED LAND
Dryland Pasture
Sedgeland
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
RIVER
AVON
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
132kV POWER LINE
PARKERS ROAD
BUCKETTS WAY
NORTHERN RAILWAY LINE
PROJECT AREA
CRAVEN
N
STRATFORD COAL PTY. LTD.
VEGETATION DISTRIBUTION
0
1000m
STRATFORD COAL
Figure 2-14
Date September 1994


LEGEND
Subtropical Rainforest
Wet Sclerophyll Gullies
Swamp Sclerophyll
Dry Sclerophyll Forest
388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
To Bloomsbury 12km
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
AVON RIVER
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
132KV POWER LINE
PARKERS ROAD
NORTHERN RAILWAY LINE
BUCKETTS WAY
PROJECT AREA
CRAVEN
STRATFORD COAL PTY. LTD.
SIGNIFICANT VEGETATION REMNANTS
0
1000m
STRATFORD COAL
Figure 2-15
Date September 1994

and banks. Fauna was surveyed within each habitat at each site.

Techniques utilised during the mammal survey included placing Elliott Traps, spotlighting and general observation. Reptiles and amphibians were caught by hand, in Elliott traps and recognised during spotlighting transects. Details of subsequent bat and amphibian methodologies are given in Appendix 8.2.

In the initial survey, direct and indirect evidence were obtained for the presence of ten mammal species, five of which are native; ten reptile species and four amphibian species.

The animals identified were typical of the fauna of the north-eastern slopes of the Great Dividing Range and are regarded as common within their broader distribution. No rare or endangered animals were found. Several patterns of habitat use were exhibited - some species were found in many habitats, some were restricted to one habitat type, others utilised one type of habitat during the day and another at night.

A bat survey undertaken by FBN Bat surveys on 25 - 29 July 1994 identified five bats for the Project Area. One of these, the large Bent-wing Bat (*Miniopterns schreibersii*) is on Schedule 12 of the National Parks and Wildlife Act, being listed as Vulnerable or Rare. It is unlikely to be nesting on the site but could utilise it for purposes such as foraging.

It is proposed that a summer sampling programme is undertaken to gain a better understanding of bat species inhabiting the Project Area. SCPL intends to undertake this prior to any disturbance and if required utilise specialist assistance to plan and manage the control of impacts. A management plan has been drawn up in consultation with NPWS in August 1994.

In addition another Schedule 12 species, the Squirrel Glider (*Petaures norfolcensis*) was observed on one occasion.

A frog survey was undertaken on 23 and 24 July 1994. Four habitats were identified and three frog species located at the time of survey. An expected list was prepared to indicate likely species to be found on the Project Area during other seasons and conditions. One Schedule 12 species, the Green-thighed Frog (*Litoria brevipalmatra*) is considered as potentially occurring in lowland parts of the Project Area in close proximity of wet sclerophyll forest, which are not to be disturbed by mining operations.

SCPL is committed to a further survey and if necessary the development of management plans to control impacts.

The NPWS data base for the Dungog and Upper Manning 1:100,000 sheets contains a number of Schedule 12 species. It is unlikely that any is significantly dependent on the Project Area.

2.8.3 Avifauna

A survey of avifauna was undertaken in late September 1981 and March 1982. Results of this survey are presented in Appendix 8.3 and summarised below.

A total of 85 bird species were encountered in the Project Area. All species found are considered common or abundant within mid coastal NSW except the Channel-billed Cuckoo (uncommon) and Brown Goshawk and Glossy Black Cockatoo (both moderately common although the latter is on Schedule 12 of the NPWS Act).

Dry sclerophyll forest and induced savannah woodland supported the most species and the few viable remnants of dry sclerophyll forest are locally and regionally significant since the number of species recorded within it was equal to that of the woodland despite the far greater proportion of the study area occupied by the latter.

The relic patches of dry sclerophyll forest play an important role in maintaining species numbers and diversity and SCPL intend that these remain. Subtropical rainforest and riparian forest (off the Project Area) supported only moderate numbers of species. Swamp sclerophyll and freshwater both supported few species. However, the dense canopy of the swamp sclerophyll (also off the Project Area) would provide nesting and roosting sites for numerous woodland species and surface water is clearly an important resource for a majority of terrestrial species.

Some Schedule 12 species were identified in the NPWS data base for the Gloucester region, however, it is unlikely that the Project Area in its present condition would provide significant habitat for any such species.

2.9 ARCHAEOLOGY

2.9.1 Aboriginal Heritage

An assessment of the aboriginal heritage of the Project Area was carried out by Dr Helen Brayshaw over a period between 1981 and 1984, culminating in a report dated October 1984. Dr Brayshaw carried out an updated survey in August 1994. The Archaeology Survey Reports are presented in Appendix 9.1 (1984 and 1994).

An isolated artefact site and an open site were identified in the 1984 survey, on the eastern perimeter of the Project Area. The artefacts consisted of 2 broken blades; one resembling a backed blade and the other resembling a flake. Both artefacts were considered to be likely to be implements. Another blade artefact was found 300 m to the south of the artefact site. This artefact appeared to be fractured by excessive use, and both it and a nearby fragment were mudstone. These sites are not expected to be disturbed by Project construction or operation.

The isolated artefact site is listed on the NPWS Cultural Heritage Register in the Gloucester/Stratford area. No other sites in the Gloucester Shire are included on the Register.

Dr Brayshaw identified an additional artefact to the west of the mine site in the 1994 survey. The location of sites identified by Dr Brayshaw are shown on Figure 2-16. The Karuah Local Aboriginal Land Council undertook a site investigation at the same time and did not identify any sites of significance.

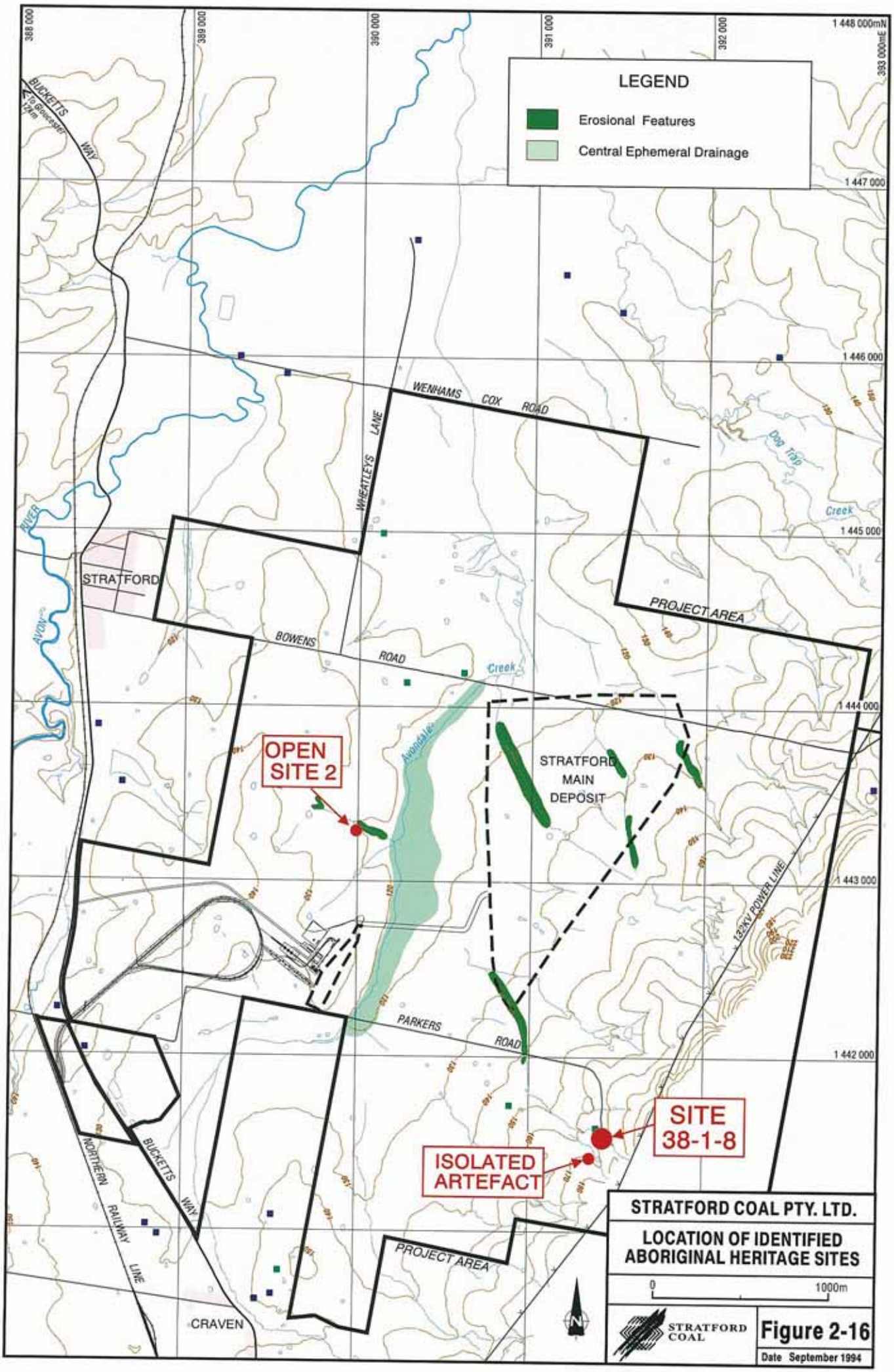
2.9.2 European Heritage

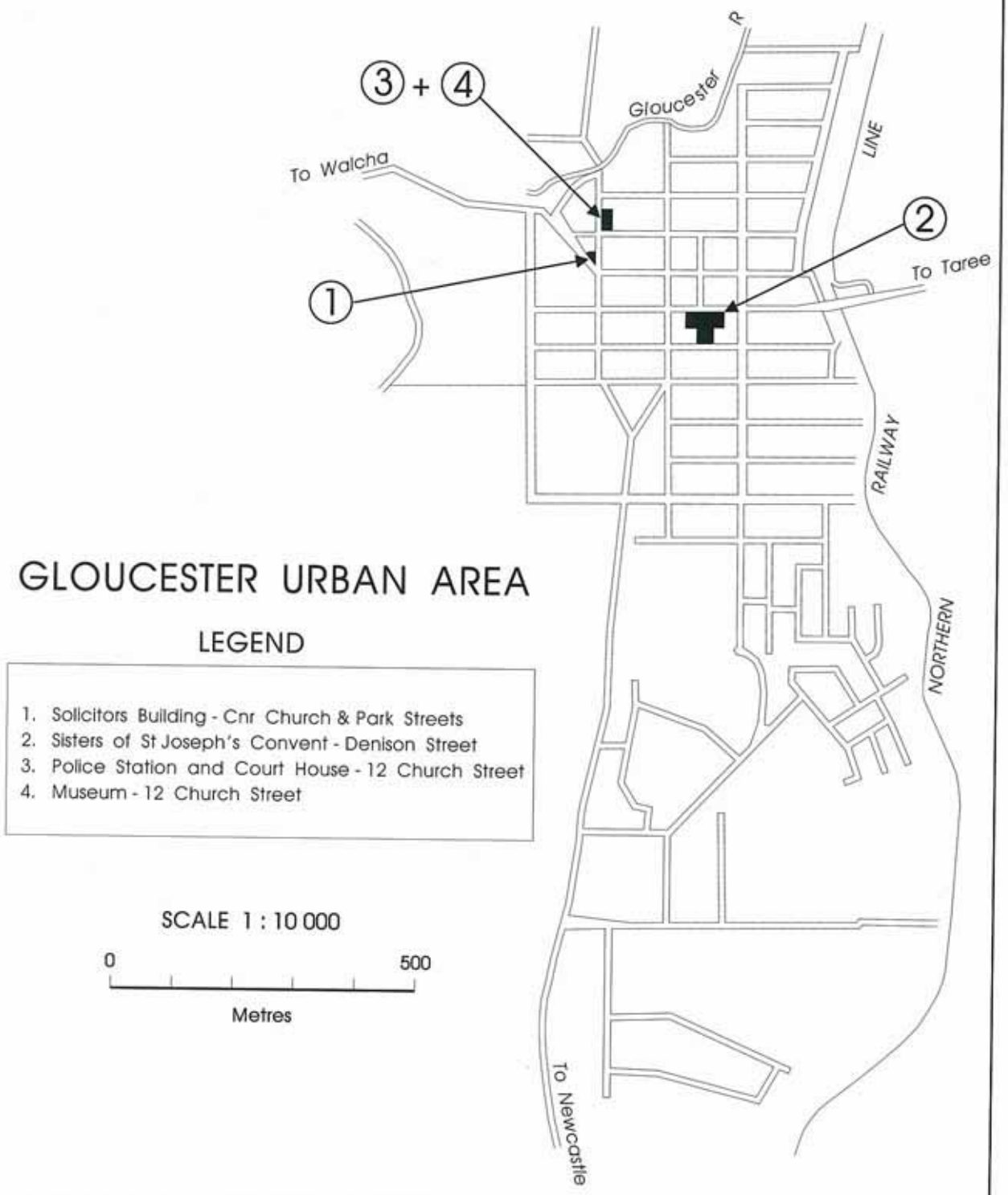
An assessment of the European heritage of the Stratford and Gloucester areas was conducted for the Project and is presented in Appendix 9.2.

Of the heritage items listed in the Heritage Act Register of Heritage Orders, the National Trust Register, the Register of the Australian Heritage Commission and the Gloucester Shire Council List of Historic Buildings, none occur within or in close proximity to the Project. Gloucester Local Environmental Plan No. 4 1984 contains a schedule of Historic Buildings. The locations of significant heritage items are shown in Figure 2-17.

None of the heritage buildings or items listed in the Gloucester Shire are located within or adjacent to the Project Area. Most of the items and buildings are located within the Gloucester township, 15 kms to the north.

The Heritage Council of NSW (Department of Planning) advises that there are no heritage items effected by this proposal or in Gloucester Shire Council area that came within the provisions of the Heritage Act.


LEGEND
Erosional Features
Central Ephemeral Drainage
388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
To Gloucester 17km
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
RIVER AVON
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
OPEN SITE 2
STRATFORD MAIN DEPOSIT
132KV POWER LINE
PARKERS ROAD
SITE 38-1-8
ISOLATED ARTEFACT
NORTHERN RAILWAY LINE
BUCKETTS WAY
PROJECT AREA
CRAVEN
N
STRATFORD COAL PTY. LTD.
LOCATION OF IDENTIFIED ABORIGINAL HERITAGE SITES
0
1000m
STRATFORD COAL
Figure 2-16
Date September 1994



GLOUCESTER URBAN AREA

LEGEND

1. Solicitors Building - Cnr Church & Park Streets
2. Sisters of St Joseph's Convent - Denison Street
3. Police Station and Court House - 12 Church Street
4. Museum - 12 Church Street

SCALE 1 : 10 000

0 500

Metres

STRATFORD COAL

LOCATION OF IDENTIFIED EUROPEAN HERITAGE SITES GLOUCESTER

Figure 2-17

Date September 1994

2.10 SOCIAL AND ECONOMIC ASPECTS

A detailed assessment of the socio-economic situation in the Gloucester Shire is presented in Appendix 10. A summary of relevant issues relating to population, community facilities and economic activity are discussed below.

2.10.1 Population Statistics

The population of Gloucester Shire in 1991 was 4,624. Gloucester Shire is essentially a rural shire with some 30% of the workforce engaged in rural agricultural occupations (A.B.S. Data, 1981 and 1986 Census). The Shire has enjoyed a sustained, but slow growth in population.

The overall population growth has averaged 0.574% between 1976 and 1991 increasing from 4,280 persons to 4,664 persons. 1991 census data indicates that approximately 53% of the Shire population resides within the Gloucester town area and some 47% resides within the rural areas, including the rural villages of Barrington, Stratford and Craven.

The Gloucester Township has experienced a slow annual growth rate (between 1.26% and 1.5% increase) since 1966 with the rate of growth between 1981 and 1991 declining. The population has increased from 2,032 in 1966 to 2,473 in 1991. The average annual growth rate for Gloucester township between 1966 and 1991 is calculated at 0.81% compared to 0.54% for the Shire.

The Gloucester Township population structure for 1991 exhibits an influx of the 5 to 9 years, 30 to 34 years and 75+ years age groups. The 25 to 29 year and 70 to 74 year age groups were less dominant. There is a marked trend in both the Shire and the Township for the retirement age group to increase and for the 15 to 29 year age group to decrease as they leave the area in search of employment in larger rural or urban centres, or to pursue tertiary education. Recent increases in populations and dwelling construction has occurred in the rural residential areas, especially the village of Barrington where town water is available. The villages of Stratford and Craven have not experienced this growth although a conservative growth rate of 4% has been adopted for the rural residential areas.

The estimated population (at 1992) of the rural villages is 125 persons for Stratford and Craven combined, and 300 at Barrington, inclusive of the village and rural residential areas (150) and the water supply areas (150).

2.10.2 Employment Statistics

The Gloucester Shire employment statistics exhibit a slow, natural growth between 1966 and 1991, from a total employment figure of 1687 to 1750. The proportion of people in the total labour force, however, decreased from 50% in 1981 to 44.1% in 1991 and the number of employed people similarly decreased from 1879 to 1750, over this period.

Gloucester Shire has maintained a stable employment structure, with agriculture and forestry as the major employers (28 - 29% of workforce). The next largest sector is the Wholesale/Retail Trading area, which demonstrates the service orientation of the economy. It is significant that, in 1991, the Agricultural sector had decreased to 25% of the workforce whilst Wholesale/Retail Trade had increased to 16% and Community Services increased to 13.4%. All other sectors remained relatively constant.

A breakdown of unemployed persons by occupation for the Taree employment district indicates that the highest proportions occur in clerical, sales and service (34.9%), manufacturing and construction (29.5%) and basic manual (14.8%) sectors.

The mining sector has never contributed to any degree in the workforce, and remained constant at less than 1% of the workforce. This workforce is likely to be currently commuting to the mining industry in the Hunter Valley.

2.10.3 Economic Aspects

Agriculture is the major economic activity in the Gloucester Shire and generated a total value of production of $20 million in 1992/93.

The local economy of Gloucester experienced growth in the wholesale and retail industries and in community services from 1986 to 1991. The construction and communication industries declined during the some period.

2.10.4 Education, Housing and Health

There is scope for housing development to occur through infill development or new housing construction in the town of Gloucester. Two main areas in Gloucester are awaiting development for residential purposes. The current number of equivalent allotments available for development is 179, including a Council owned area of 13.5 hectares.

Rental accommodation is limited within Gloucester Shire. Temporary accommodation is available in caravan parks (75 sites, 30 permanent residents), hotels (14 units) and one motel (24 units). Temporary accommodation is also available at Stroud and Dungog in caravan parks, hotels and motels.

There are 8 schools in the Gloucester area, including a high school in Gloucester, 4 primary schools in the rural villages, a primary school in Gloucester, a Catholic primary school in Gloucester and a preschool in Gloucester. Approximately 1800 students attend schools in the Shire, the majority attending those in Gloucester.

With the exception of some courses offered on a part-time basis in Gloucester by the Taree TAFE College, there are no tertiary education facilities in the area. The closest university is located at Newcastle.

Health care is provided by Gloucester District Hospital, Gloucester Soldiers Memorial Hospital, the Dungog District Hospital and regional hospitals at Taree and Newcastle.

3.0 GEOLOGY AND COAL RESOURCES

A detailed review of the regional and local geology and the coal resources is presented in Appendix 1.1. A summary of relevant information is provided below.

3.1 REGIONAL GEOLOGY

The coal resources of the Gloucester Basin lie within a north-south trending synclinal structure, some 40 km long by 13 km wide (Refer Figure 3-1). The Basin is of Permian age and contains conglomerate, sandstone, siltstone, mudstone and coal. The underlying rocks are folded acid volcanics of Carboniferous age, which are resistant and form the hills on either side of the Gloucester Valley, whilst the Permian Coal Measures occupy the valley floor.

The Permian succession is divided into three groups (oldest to youngest): the Stroud Volcanics, the Dewrang Group and the Gloucester Coal Measures.

The Gloucester Basin has been little affected by igneous activity - dykes were rarely encountered during exploration.

3.2 GEOLOGY OF THE PROJECT AREA

3.2.1 Stratigraphy

The Project Area lies in the central eastern flank of the Gloucester Basin, the stratigraphy of which is shown in Figure 3-2.

Apart from a very small quantity of coal (325,000 tonnes) which will be extracted from the Bowens Road West Deposit during mine construction, the entire life of Project production will be from the Stratford Main Deposit. The locations of these coal deposits are shown on Figure 2-1.

The seams of economic interest within the Stratford Main Deposit are the range of seams from the Avon Coal Member to the Triple Coal Member. The Avon Coal Member, which forms the majority of the coal reserve, has a normal stratigraphic thickness of around 15 metres and is divided into 3 sections known as the AC1, AC2 and ALM seams. The AC1 and AC2 coals are invariably bright and contain a high proportion of vitrinite which results in good coking properties. The ALM seam is duller and higher in ash and produces predominantly thermal coal.

The Triple Coal Member (TC) comprises three plies of coal developed over an interval of approximately 2 metres thickness separated by intervening shale part-

ings from 15 cms to 40 cms in thickness. The coal is invariably bright and highly cleated and has good coking characteristics.

A thin layer of recent alluvial deposits, up to 6 metres thick is present over the southern part of the Main Deposit. These unconsolidated sediments range from clays to coarse river gravels and will provide a source of construction materials for the Project development.

The Bowens Road West Deposit contains the Bowen Road seam, which varies from 12 to 19 metres in thickness. This seam contains bright, good quality coal, at its base, but the majority of the seam is dull and high in inherent ash.

3.2.2 Structure

The Main Deposit forms a syncline plunging gently to the north, with the coal outcropping at fairly steep dips (up to 45 degrees) on the eastern and western limbs and at the southern end of the deposit, where the core of the syncline outcrops. The eastern flank and southern core of the deposit are significantly affected by low-angle thrust faulting which has caused coal members to be stacked on top of each other, often with several repetitions of the main coal seams. This has produced large thicknesses of coal (up to 60 metres) below relatively thin cover in some areas, which enhances the economic viability of the Project. The geological structure of the deposit is best illustrated in the cross-sections shown in Figure 3-3.

Normal faulting has also been interpreted within the Main Deposit, but is generally minor, with the exception of an east-west fault which has approximately a 50 metre throw and forms the northern limit of the Main Deposit. No dykes, sills or other intrusives occur within the Main Deposit.

The Bowens Road West Deposit dips to the west at approximately 45°. The deposit is restricted to the south by faulting and to the north by seam thinning and steepening dips.

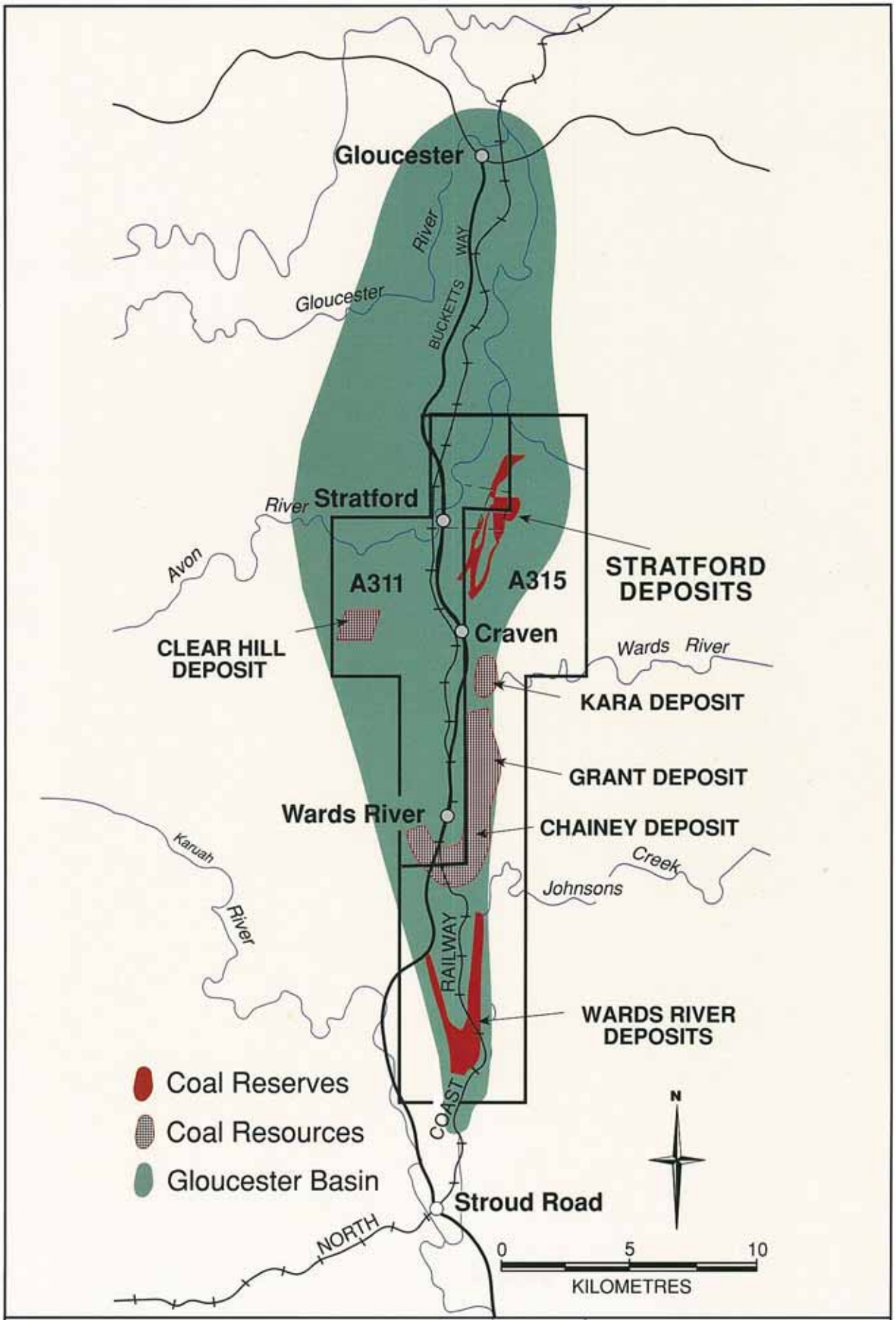
3.2.3 Coal Reserves

Extensive exploration has been carried out on the Main Deposit, predominantly by EARL/BMI, with around 250 boreholes and 30 line-kilometres of seismic survey completed. The in-situ coal resources of the Main Deposit have been assessed in numerous studies carried out by EARL/BMI. A further drilling programme was completed during 1993 and comprised five 150 mm, large diameter (LD) coreholes and 37 open holes, all of which were geophysically logged.

Geological in-situ reserves were calculated using the criteria of a minimum separable parting thickness and minimum mineable coal thickness each of 300 mm. Coal relative densities were calculated from an ash versus RD relationship derived from the EARL/BMI analytical data. This resulted in an average RD of 1.49 for an average mineable in-situ ash content of 25%.

The in-situ coal resources and mineable reserves of the Main Deposit are summarised in Tables 3-1 and 3-2, respectively.

The steeply dipping nature of the Bowens Road West seam and limited strike length results in a limited mineable reserve of 325,000 tonnes in this deposit.

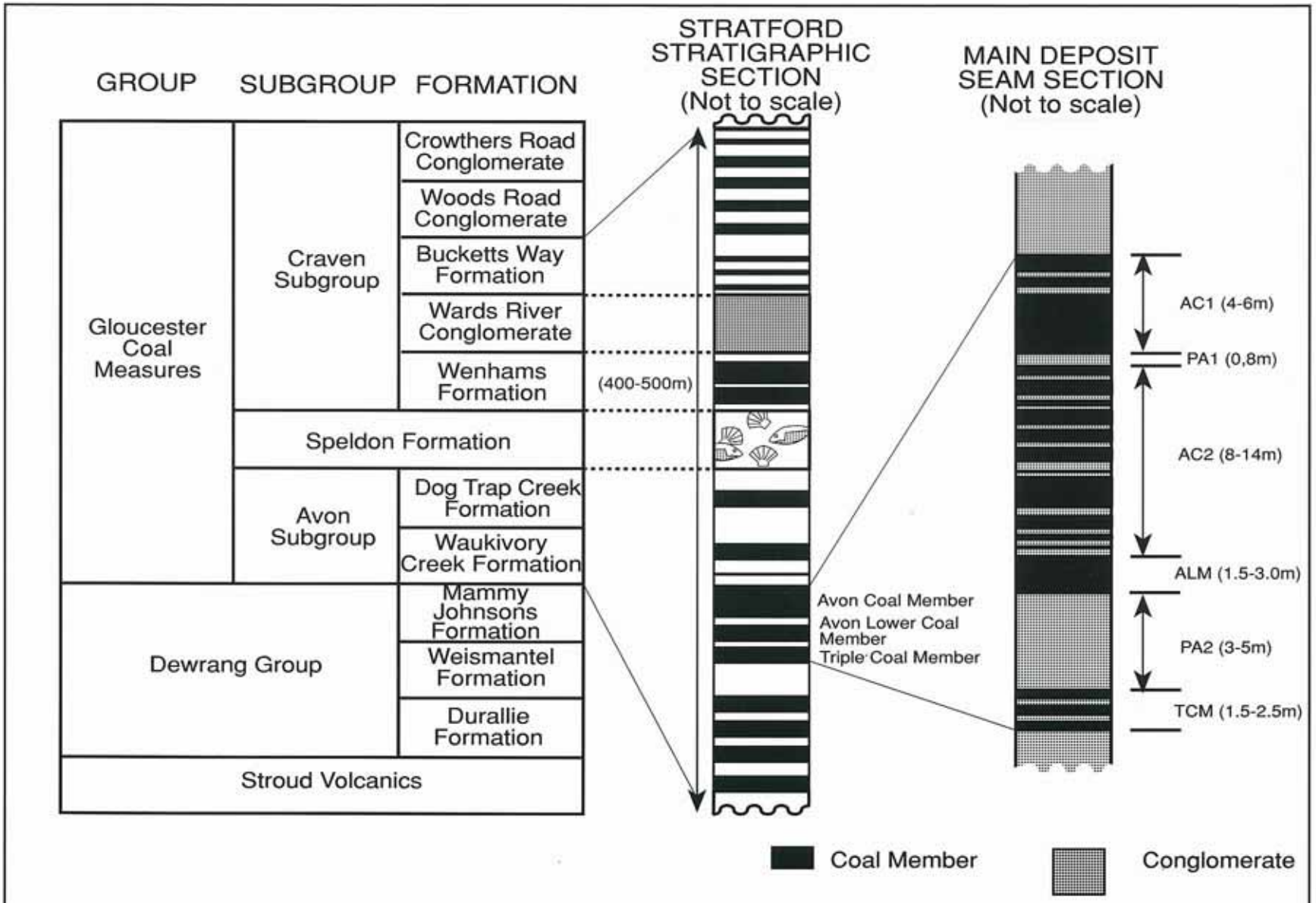


STRATFORD COAL

Regional Geology

Figure 3-1

Date: September



STRATFORD COAL

Regional & Local Stratigraphy

Figure 3-2

Date: September 1994

TABLE 3-1
COAL RESOURCES - STRATFORD MAIN DEPOSIT

Seams	Code	In-situ Resource (k tonnes adb)
Avon Coal Upper	ACU	236
Avon Coal Member 1	AC1	8,793
Avon Coal Member 2	AC2	13,566
Avon Lower Member	ALM	2,936
Triple Coal Member	TC	2,500
Total		**28,031**

Criteria for Resource Calculations

Coal volumes calculated from Mincom Geological Model:

Model sampling density 0.02 Hectares

Depth of Oxidation 10 metres

Coal RD(adb)= 1.21+0.009* Ash(adb):-

Average Coal Density=1.49

Non-coal plies within coal members

>300 mm assigned to separable partings

Boreholes used in model

118 open holes with geophysical logs

26 coreholes with geophysical logs

Total 144 boreholes

Average borehole density=150hole s/sq.km

Criteria for Reserve Calculations

Mineable In-situ Reserves based on MineConsult May 1994 Mine Plan

Coal below Pit-base (approx 100 metres depth) not mineable

Mining Loss = 3% general loss + 10 cms on each working section (Average 9%)

Dilution = 5 cms on each working section (Average 4%)

Moisture basis of Mineable In-situ Reserves = 2%

Moisture basis of ROM Reserves = 6%

TABLE 3-2
COAL RESERVES - STRATFORD MAIN DEPOSIT

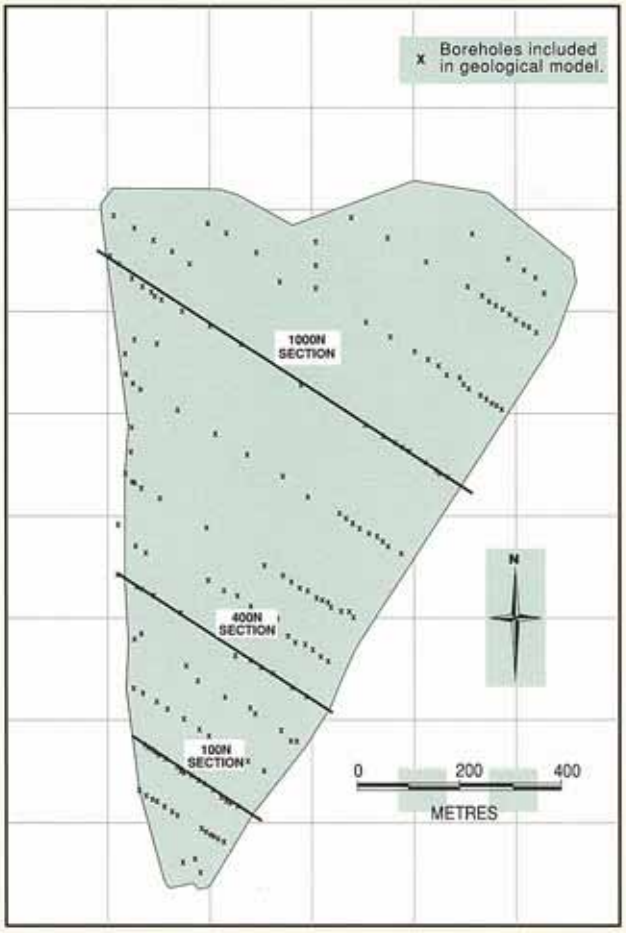
Seams	Code	Mineable Insitu (k tonnes adb)	Coal Loss (k tonnes adb)	Dilution (k tonnes adb)	ROM (k tonnes adb)	ROM (k tonnes 6% Moist)
Avon Coal Upper	ACU	229	(21)	9	218	226
Avon Coal Member 1	AC1	7,403	(629)	222	6,996	7,276
Avon Coal Member 2	AC2	11,428	(1,143)	571	10,857	11,291
Avon Lower Member	ALM	2,472	(198)	124	2,398	2,494
Triple Coal Member	TC	2,104	(198)	105	2,020	2,101
Total		**23,636**	**(2,180)**	**1,031**	**22,488**	**23,387**

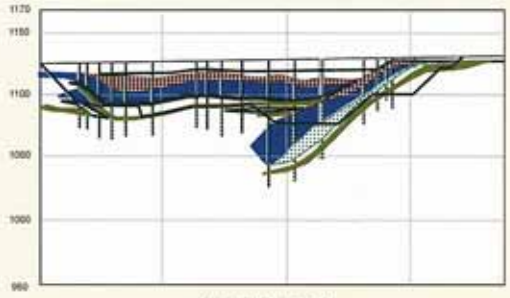
3.2.4 Coal Quality

The Stratford Main Deposit is classified as a medium-high volatile bituminous coal and is of higher rank than the Hunter and Newcastle coalfields. The high rank and the fact that the seams contain a high proportion of vitrinite (bright coal) results in the product coal having excellent coking properties (high swell and fluidity) and makes it superior to the majority of other coals currently shipped through the port of Newcastle. The ash content of the raw coal is approximately 25% and this needs to be reduced by washing. The CPP is being designed to produce predominantly a 10% ash coking coal, but it will have the flexibility to produce a range of product coal ash levels from 8.5% to 17.5%. The indicative qualities of a range of products are presented in Table 3-3.

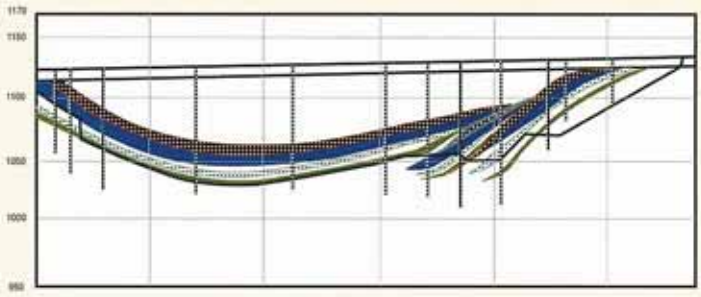
TABLE 3-3
INDICATIVE COAL QUALITY - STRATFORD MAIN DEPOSIT

	10.0% Ash Coking Coal	15.0% Ash Thermal Coal	17.5% Ash Thermal Coal
Proximate (adb)			
H_20 %	1.5	1.5	1.5
Ash %	10.0	15.0	17.5
VM %	28.6	27.3	26.9
FC %	59.9	56.2	54.1
Total Sulphur %	0.6	0.6	0.6
Phosphorus %	0.05	0.05	0.05
Chlorine %	0.04	0.04	0.04
Coking Properties			
CSN	9	7	6
Gieseler Fluidity	>1500 ddpm	-	-
Total Dilation	190%	-	-
Gray King	G8	-	-
% Reactive Macerals	+85%	-	-
Ro(max)	0.98	-	-
Thermal Coal Properties			
Specific Energy (gad)	7400 kcal/kg	7000 kcal/kg	6800 kcal/kg
HGI	71	71	71
AFT°C			
def	1370	1400	1400
sph	1530	1570	1570
hsph	1600	1600	1600
flow	1600	1600	1600
Ash Analysis			
SiO_2 %	68.8	70.9	72.0
Al_2O_3 %	23.0	21.9	21.3
Fe_2O_3 %	2.0	1.9	1.8
CaO %	1.10	0.80	0.65
MgO %	0.36	0.35	0.34
Na_2O %	0.50	0.46	0.44
K_2O %	1.80	1.79	1.78
TiO_2 %	1.20	1.03	0.95
P_2O_5 %	1.20	0.85	0.68
SO_3 %	0.07	0.05	0.04
Ultimate (daf)			
Carbon %	86.3	86.3	86.3
Hydrogen %	5.50	5.50	5.50
Nitrogen %	2.00	2.00	2.00
Sulphur %	0.70	0.70	0.70
Oxygen %	5.45	5.45	5.45

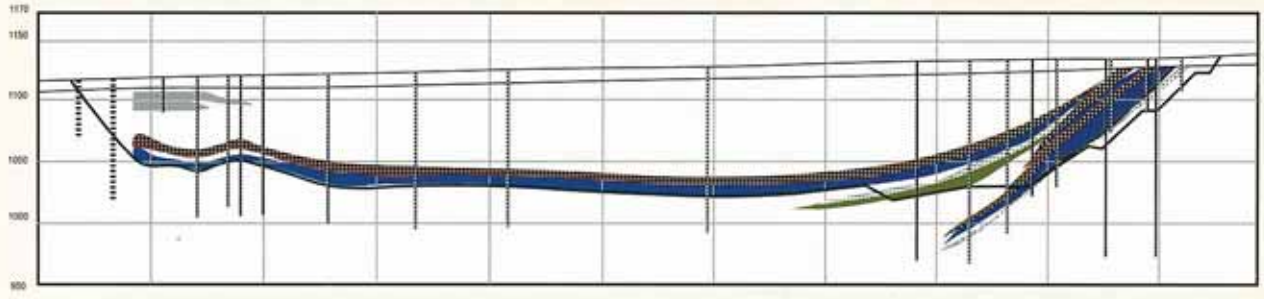




SECTION 100N



SECTION 400N



SECTION 1000N

STRATFORD COAL

Main Deposit Boreholes and Cross Sections

Figure 3 - 3

Date: September 1994

3.3 OVERBURDEN AND INTER BURDEN CHARACTERISTICS

Detailed studies of overburden and interburden characteristics have been carried out and are presented in Appendix 2.4. These studies are based on assessing both the physical (mechanical) and chemical nature of the overburden so that on effective management plan can be implemented to emplace the materials in an environmentally acceptable way. A summary of relevant information is provided below.

3.3.1 Mechanical Properties

A minor proportion (approximately 20%) of the overburden mined by the Project has the potential to exhibit moderate to severe slaking on weathering and will, therefore, require appropriate management techniques in dump design and construction. This weathered overburden tends to slake rapidly and completely, has low to very high plasticity, and because of its clay mineral content, it is unsuitable as an engineering foundation material. Unweathered mudstones and claystones show a moderate slaking reaction and are moderately weak, whereas sandstones and siltstones are generally stable and moderately strong.

3.3.2 Geochemical Properties

Overburden and interburden samples from the Main Deposit mostly exhibit saturation extract pH values of 5.6 to 8.6, within the range of most natural waters. Some near surface overburden exhibits pH in the range of 4 to 5.5, which is the range of soils in the region. The roof of the Avon 1 seam showed variable pH, with one sample recording pH of 4.8, in association with relatively higher total sulphur and total dissolved solids. Testwork suggests minor sections of the Avon 1 roof material may be acid generating; these sections will be identified pre-mining and selectively handled and buried. Proportionally, they appear to be very minor.

The salinity level in the overburden and interburden is generally very low. Electrical conductivity values, with one exception, ranged between 0.3 and 4.4 mS/cm, indicating that soils from these rocks would be non-saline to marginally saline.

Sodium Adsorption Ratios (SAR) are generally low. Some materials in the surface to 30 metres depth display a SAR greater than 6, however, these will be managed by selective placement and, if required, amelioration measures as detailed in Appendices 2.4 and 2.5. A rigorous programme of overburden testing is proposed ahead of mining together with fine tuning of the overburden handling and rehabilitation plan.

In comparison to some contemporary coal projects in the Hunter Valley and Bowen Basin, the Stratford Main Deposit overburden materials are relatively benign and the small volumes that may be problematic display favourable stratigraphic position for placement and isolation. Consequently, a workable overburden handling and rehabilitation strategy is proposed which is integrated with mine operations. Progressive backfilling of the pit with overburden is a key environmental enhancement of the Project, leaving a relatively small final void and a smaller overburden dump to be rehabilitated, which is located and designed to abut the footslopes to the east of the mining area.

3.3.3 CPP Rejects

The CPP rejects are not expected to create acid or sodic leachate conditions. All CPP rejects will be co-disposed in engineered emplacement areas (refer Section 4.4). Composite samples of CPP reject material have a low average total sulphur level of 0.3%. All saturation extracts were less than pH 5.5, although only the AC1 seam reject material was considered significant, in terms of potential acid production. Similarly, only the AC1 material had a higher salinity. There was no sodium hazard associated with any reject material. Trace element levels were generally low. The innovative co-disposal handling and emplacement procedure is designed to blend and isolate CPP rejects.

4.0 PROJECT DESCRIPTION

4.1 MINING

The Project is based on mining 1.8 Mtpa of ROM coal to produce 1.1 Mtpa of saleable coal for a period of 14 years. The pit will be mined by a conventional truck/shovel haulback method whereby overburden is removed and the underlying coal extracted in 100 metre wide strips. Overburden is initially hauled by truck to an external overburden dump to the east of the pit. As soon as sufficient space (pit room) has been developed, overburden is placed back into the mined out void.

Because the overburden material swells by approximately 25%, and the need to retain sufficient pit room to extract the coal, not all of the overburden can be replaced into the pit. The surplus (approximately 20%) is placed in the external overburden dump, which is contoured to blend with the existing landform and progressively rehabilitated so that the extent of disturbed ground at any one time is always minimised.

Mining operations will be carried out by an independent contractor under strict supervision of SCPL staff. Both the Mine Manager and Senior Mining Engineer will be professionally qualified engineers appointed by SCPL to manage all aspects of the operations. They will fulfil the statutory positions required by the NSW Mining Act and be responsible for all aspects of mine safety and environmental management.

4.1.1 Mining Plan

Apart from a small amount of coal extracted from the Bowens Road West Deposit as part of the construction activities and Year 1 operations, all mining will take place in the Main Deposit.

Site layout at Year 2 and Year 7 of the Project is shown in Figures 4-1 and 4-2, respectively. Figure 4-3 shows the rehabilitated Project site at the end of the Project life, in Year 14.

Main Deposit

The location and outline of the Main Deposit is shown on Figure 3.3, Section 3.0. The southern limit of the Main Deposit is the closure of the syncline just north of Parker's Road and the eastern and western limits are defined by the coal subcrops on the flanks of the syncline. The northern limit of the mineable deposit is a fault roughly aligned with Bowens Road which downthrows the coal seams to the north.

The 14 year mine plan calls for extracting the entire mineable reserve of 23.5 Mt from the Main Deposit to a maximum depth of 100 metres. This requires moving 67 Mbcm of overburden and parting at an average stripping ratio of 2.8 bcm of overburden per tonne of ROM coal. The mining operations will commence at the southern end of the Main Deposit, where overburden and stripping ratios are at a minimum,

and will progress to the north in 100 metre wide strips. Low wall batters on the eastern and western flanks will be designed according to geotechnical criteria defined by Golder Associates as shown in Figure 4-4. This figure also shows a schematic north-south section through the advancing face which defines the advancing wall excavation batters and the design of the in-pit overburden as it is dumped behind the advancing coal face.

Access to the pit for overburden and coal trucks will be provided by a series of ramps at a grade of 1 in 10. The mine is designed to maintain a substantial inventory of a variety of coal types which will be available for mining directly or at short notice with the removal of minor quantities of parting. The development of the excavation, internal and external dumps and ramp systems at Year 2 and Year 7 of the Project are shown in Figures 4-1 and 4-2 respectively.

Bowens Road West Deposit

During the construction of the Project and in the first year of operations, it is planned to extract a small amount of coal from one of the Minor Deposits, the Bowens Road West Deposit adjacent to the CPP area. This deposit is being mined at this stage because:

(i) The overburden contains a suitable source of construction material.

(ii) The resulting void adjacent to the CPP can be used as an environmental dam and for emergency CPP reject disposal.

(iii) The coal resource would otherwise become sterilised once the ROM stock piles and handling facilities are established.

The Bowen's Road seam subcrops at around 5 m depth on the eastern flank of the deposit and dips steeply to the west at around 45°. An access ramp will be developed in the seam from the north reaching the base of the pit at around 35 m depth about midway along the deposit. The southern limit of the deposit is constrained by Parkers Road and the land owned by the SJV.

The proposed pit contains a total of 325,000 tonnes of coal and 495,000 bcm of overburden at a ROM ratio of 1.5 bcm/tonne. The coal quality of the Bowen's Road seam is inferior to that of the Main Deposit, allowing only a low yield of high ash thermal coal to be produced.

4.1.2 Sequence of Operations

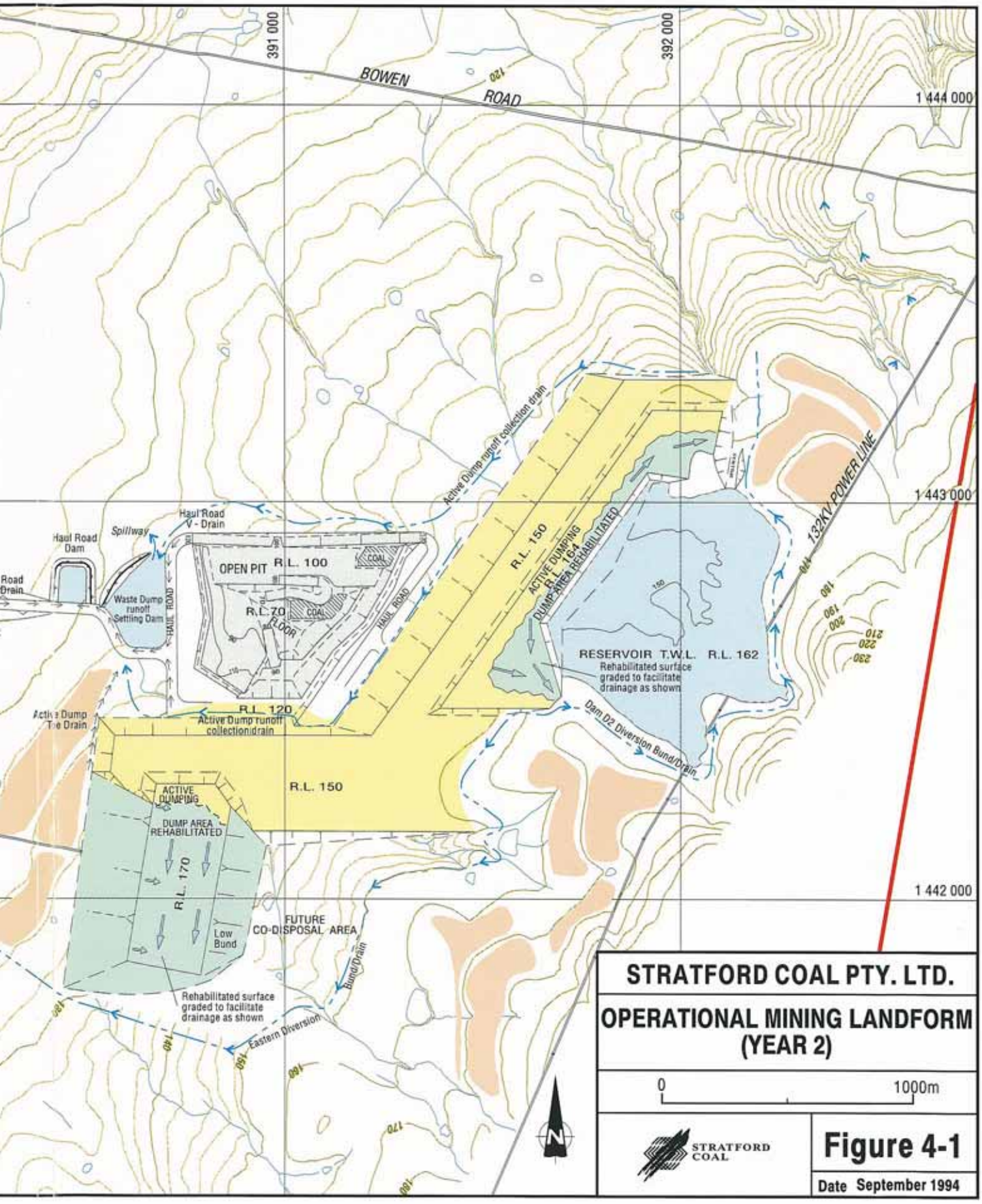
Topsoil Stripping

Topsoil will be stripped to SCS specifications by graders or dozers, loaders and trucks, depending on equipment availability. Soil removed from the initial strips will be stockpiled to the south of the initial excavation and reseeded to maintain soil viability prior to use in future rehabilitation. Topsoil stripped after year 2 will be placed directly on overburden dumps, as part of the progressive rehabilitation programme.

The thickness of suitable topsoil over the area varies from 100 to 500 mm, and sufficient material is available to replace a 200 mm (average) layer over all disturbed areas.

Overburden Removal

Operations for overburden removal will be undertaken by hydraulic excavators in backhoe configuration. An excavator, permanently assigned to overburden stripping, will load most of the overburden material. Generally, the first 10 metres of overburden will be free-dug or ripped. All other overburden will need to



STRATFORD COAL PTY. LTD.

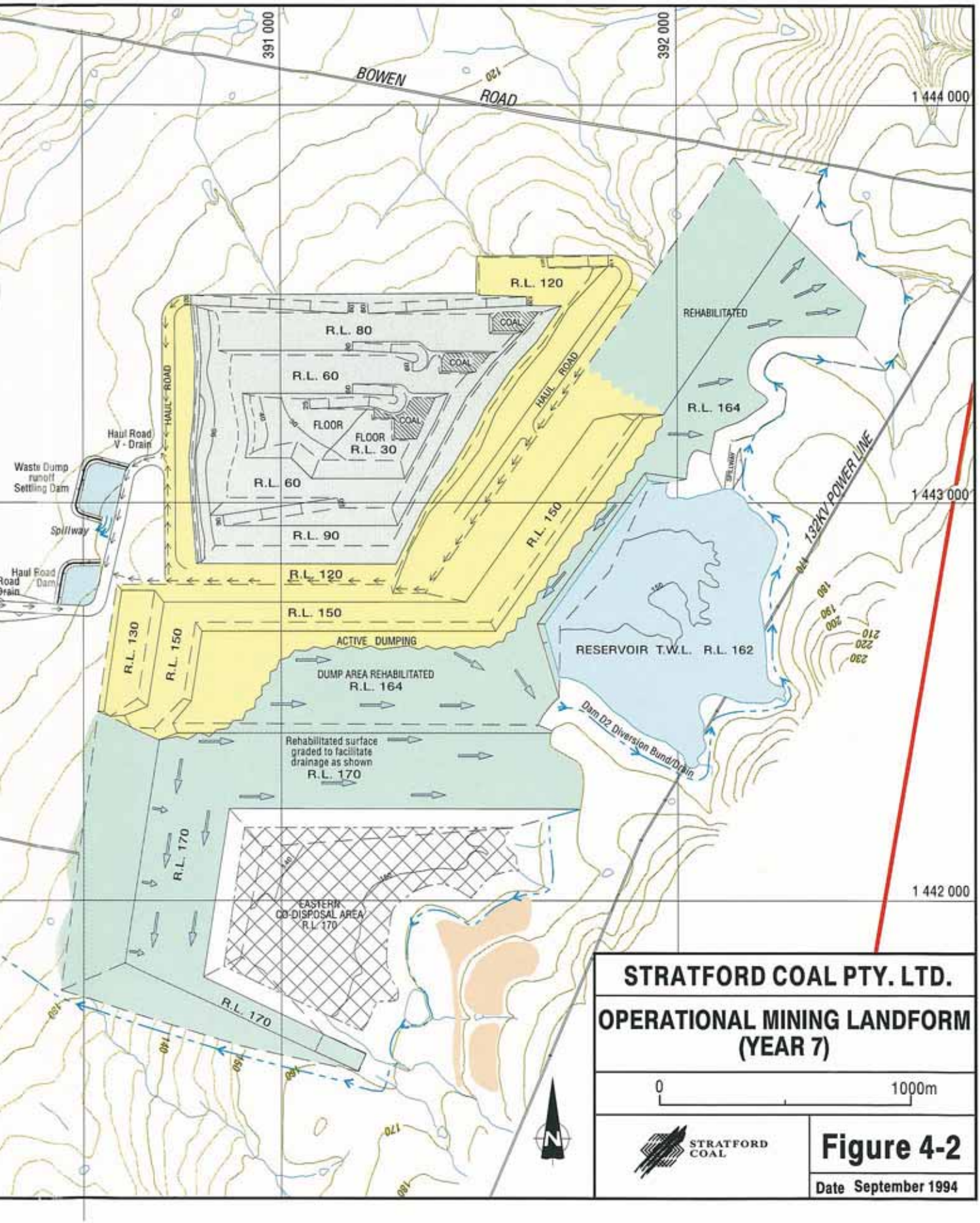
OPERATIONAL MINING LANDFORM (YEAR 2)

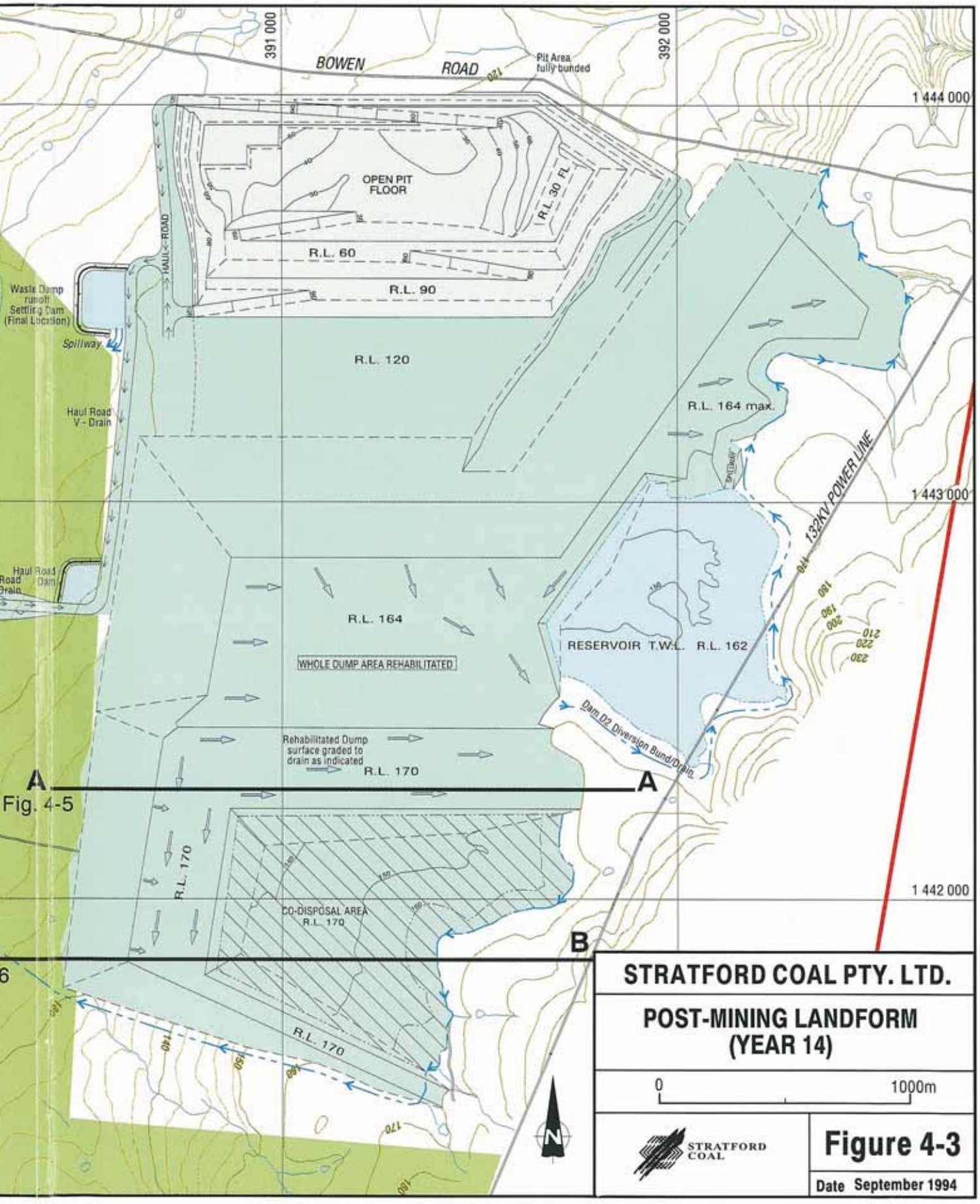
0 1000m

STRATFORD COAL

Figure 4-1

Date September 1994


391 000
392 000
BOWEN ROAD
1 444 000
1 443 000
1 442 000
R.L. 120
R.L. 80
R.L. 60
R.L. 30
R.L. 90
R.L. 150
R.L. 130
R.L. 170
COAL
FLOOR
HAUL ROAD
REHABILITATED
R.L. 164
132KV POWER LINE
Haul Road V - Drain
Waste Dump runoff Settling Dam
Spillway
Haul Road Dam
ACTIVE DUMPING
DUMP AREA REHABILITATED
R.L. 164
RESERVOIR T.W.L. R.L. 162
Dam D2 Diversion Bund/Drain
Rehabilitated surface graded to facilitate drainage as shown
R.L. 170
EASTERN CO-DISPOSAL AREA
R.L. 170
N
STRATFORD COAL PTY. LTD.
OPERATIONAL MINING LANDFORM (YEAR 7)
0
1000m
STRATFORD COAL
Figure 4-2
Date September 1994


391 000
392 000
BOWEN ROAD
Pit Area fully bunded
1 444 000
OPEN PIT FLOOR
R.L. 30 FL
R.L. 60
R.L. 90
HAUL ROAD
Waste Dump runoff Settling Dam (Final Location)
Spillway
R.L. 120
R.L. 164 max.
Haul Road V - Drain
132KV POWER LINE
1 443 000
Haul Road Road Drain
Haul Road Dam
R.L. 164
WHOLE DUMP AREA REHABILITATED
RESERVOIR T.W.L. R.L. 162
Dam D2 Diversion Bund/Drain
Rehabilitated Dump surface graded to drain as indicated
R.L. 170
A
A
Fig. 4-5
R.L. 170
CO-DISPOSAL AREA R.L. 170
1 442 000
B
R.L. 170
N
STRATFORD COAL PTY. LTD.
POST-MINING LANDFORM (YEAR 14)
0
1000m
STRATFORD COAL
Figure 4-3
Date September 1994

be blasted prior to excavation. The overburden will be drilled on a 6m by 6m pattern in 10 m benches. A mixture of ANFO (dry hole) and water gel (wet hole) explosives will be used at a powder factor of 0.33 kg/m^3. Overburden will generally be trucked for placement in out-of-pit dumps in the early years of the mine life, whilst in subsequent years, the majority of overburden will be placed in or over the mined-out pit. A bulldozer will be used to spread and contour the dumped material to maintain effective drainage during dump construction and to meet the requirements of the final design (refer Figure 4-5).

Coal Mining

Coal mining will be undertaken by a variety of techniques dependant on the dip of the coal seam. An hydraulic excavator will load coal into dump trucks without blasting. The coal seam will be mined by taking multiple passes along 5 metre benches.

Dilution and coal losses will be minimised by the use of the excavator. Coal will be hauled to the ROM dump hopper for either direct dumping into the ROM coal handling facility or stockpiling and subsequent feeding to the ROM hopper. Partings greater than 300 mm in thickness will be selectively mined by the excavator and hauled to in-pit overburden dumps.

Rehabilitation

Rehabilitation will involve the contouring of the final overburden dumps to a nominal overall slope of 1 in 6 on the outer faces and merging the top of the dump with the topography of the existing foothills. Topsoil previously stripped from the area will be stored on-site before being spread to an average thickness of 200 mm and revegetated.

The overburden dumps will be rehabilitated in progressive increments to their final landform so that contaminated water catchment areas are minimised. Details of rehabilitated overburden dump and co-disposal areas are shown on Figures 4-5 and 4-6 and discussed in Section 4.10. A detailed review of the proposed rehabilitation strategy is presented in Appendix 2.5.

4.1.3 Mining Equipment

The proposed mine plan requires two small fleets of mining equipment, one exclusively working on overburden and the other predominantly mining coal and providing supplementary overburden capability on night shift. A number of pieces of support equipment to construct and maintain haul roads and dumps are also required. The actual types of equipment used will be ultimately at the discretion of the mining contractor and may be influenced by the equipment the selected contractor has available. Nine contractors have recently submitted proposals to undertake the Project's mining operations from which a typical equipment fleet and manning numbers have been compiled (refer Table 4-1).

TABLE 4-1
MINING CONTRACTOR'S EQUIPMENT AND MANNING

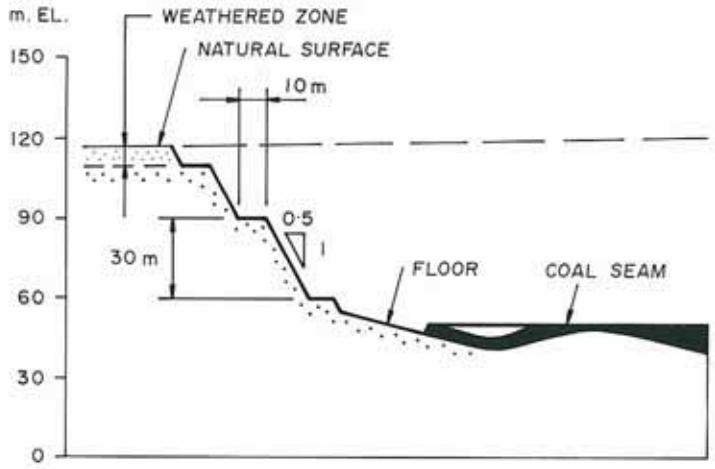
Item	Description	Number	Crew
Hyd-Excavator	200t	1	3
Hyd-Excavator	100t	1	3
Rear Dump Truck	136t	3	9
Combi Truck	85t	2	6
Track Dozer	Cat D10	1	3
R.T. Dozer	Cat 834	1	2
Track Dozer	Cat D7	1	2
Grader	Cat 14G	1	2
Water Cart	20,000 l	1	2
FEL	Cat 980	1	3
Drill	150 mm	1	2
Service Truck		1	2
Tool Carrier		1	-
Light Vehicles		7	-
Maintenance		-	7
TOTAL		**23**	**46**

4.1.4 Production Schedule

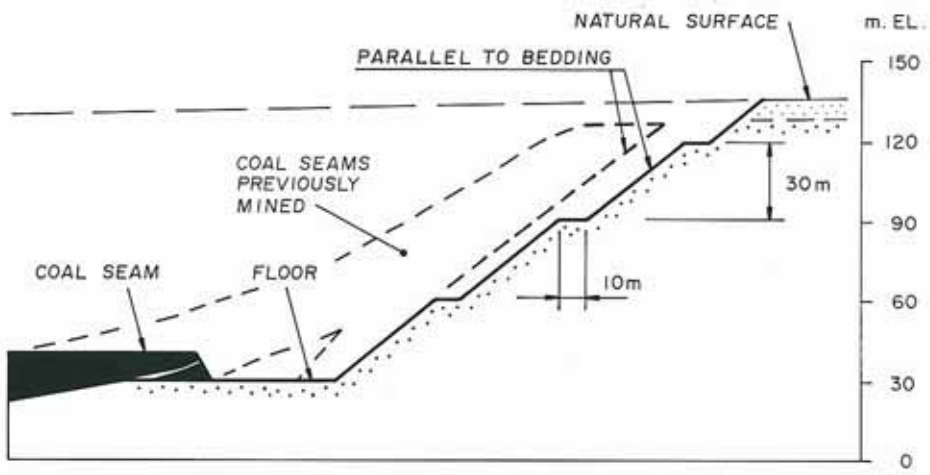
The production schedule and pit and ROM inventories are shown below in Table 4-2.

TABLE 4-2
STRATFORD MINE PRODUCTION SCHEDULE

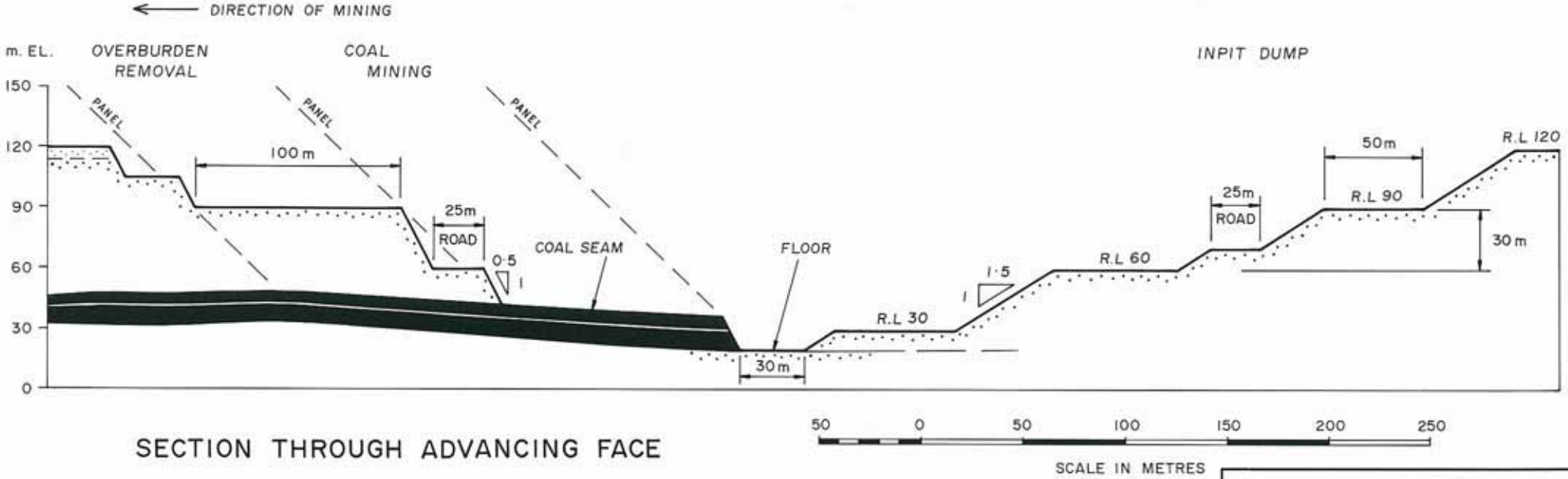
Year	Overburden kbcm	Coal Exposed kt	Coal Mined kt	Coal Stocks kt	Coal Processed kt	Pit Inventory kt
1	2,500	1,510	1,180	50	1,130	330
2	3,500	1,800	1,800	50	1,800	330
3	4,750	1,750	1,800	50	1,800	280
4	4,750	1,860	1,800	50	1,800	340
5	5,000	1,850	1,800	50	1,800	390
6	5,500	1,720	1,800	50	1,800	310
7	5,500	1,830	1,800	50	1,800	340
8	6,000	1,800	1,800	50	1,800	340
9	6,250	1,680	1,800	50	1,800	220
10	6,250	1,770	1,800	50	1,800	190
11	5,750	1,820	1,800	50	1,800	210
12	5,000	1,800	1,800	50	1,800	210
13	5,000	1,800	1,800	50	1,800	210
14	400	320	530	0	580	0
Total	**66,650**	**23,560**	**23,560**	**0**	**23,560**	**0**
Bowens Road West Deposit						
0	200	100	30	30	0	70
1	294	226	296	0	326	0
Total	**494**	**326**	**326**	**0**	**326**	**0**



WESTERN WALL



EASTERN WALL



SECTION THROUGH ADVANCING FACE

SCALE IN METRES

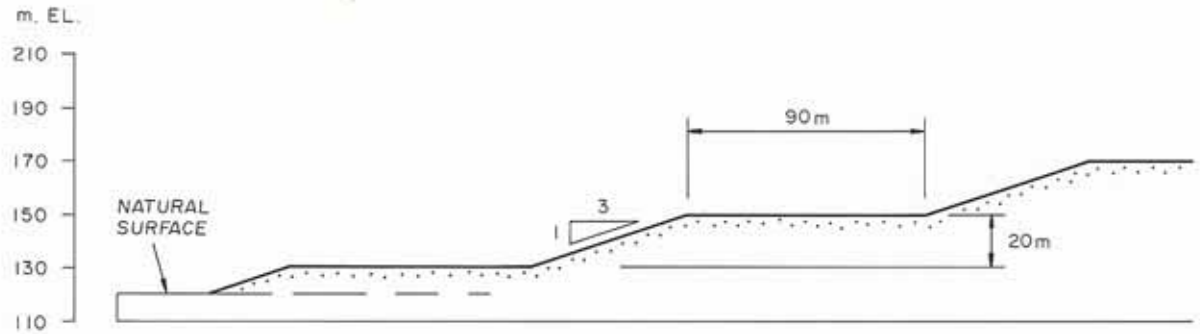
STRATFORD COAL PTY. LTD

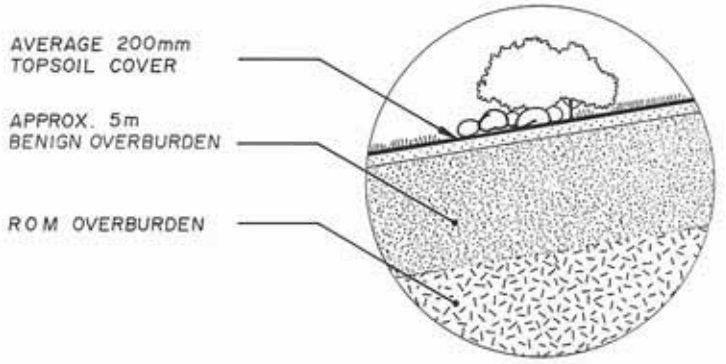
PIT DESIGN AND OPERATIONAL CRITERIA

STRATFORD COAL

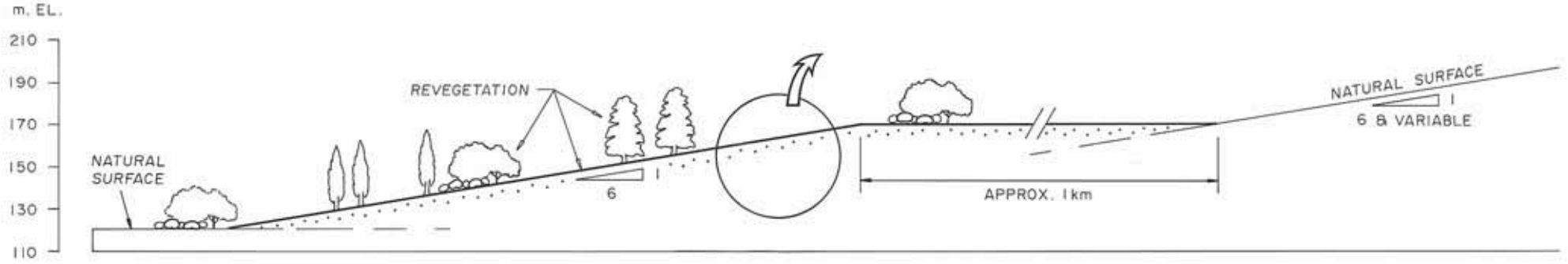
Figure 4-4

Date September 1994



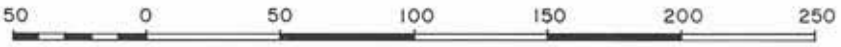


OPERATING DUMP SLOPE

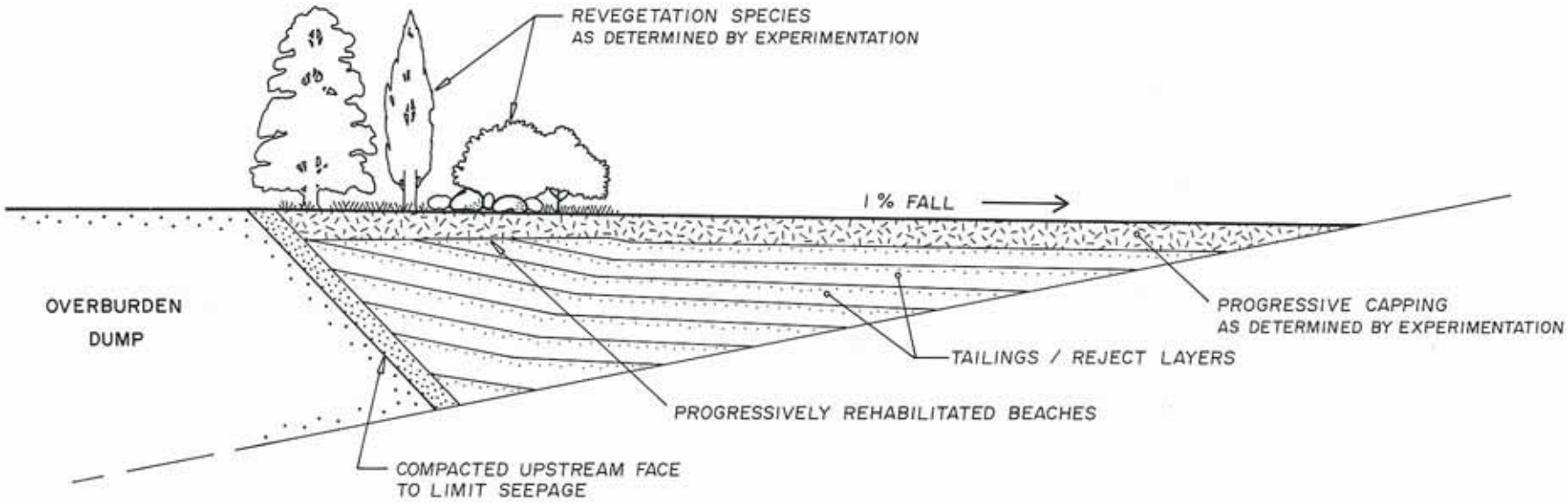


FINAL DUMP SLOPE

(SECTION A-A FIGURE A16-4)



STRATFORD COAL PTY. LTD	
TYPICAL CROSS-SECTION THROUGH REHABILITATED DUMP	
STRATFORD COAL	Figure 4-5
	Date September 1994



(SECTION B - B THROUGH FIGURE A16 - 4)

STRATFORD COAL PTY. LTD	
TYPICAL CROSS-SECTION THROUGH REHABILITATED CODISPOSAL AREAS	
STRATFORD COAL	**Figure 4-6**
	Date September 1994

4.2 COAL HANDLING AND PREPARATION

4.2.1 Overview

An evaluation has been undertaken of the coal preparation and materials handling requirements for the development of the Project.

It is proposed to mine 1.8 Mtpa of raw coal to produce the saleable coal products shown in Table 4-3.

TABLE 4-3
SALEABLE COAL PRODUCTS

Product	Tonnage tpa
Coking Coal - 10% Ash	700,000
Thermal Coal - 15% Ash	354,000
Thermal Coal - 17.5% Ash	81,000
Total	**1,135,000**

The design of the CPP has incorporated the following principles:

- Flexibility to process coal feeds of widely ranging quality.
- High process efficiency to maximise coking coal yield, featuring dense medium cyclones for coarse coal processing and two stage spirals for fine coal processing.
- Compact, highly automated design with an emphasis on low manpower.
- The use of best quality material and modern processing concepts to provide high plant availability. The design features good access for operation and maintenance.

A simplified coal preparation flowsheet is presented in Figure 4-7. The proposed layout of the coal preparation and handling site is shown on Figure 4-8.

4.2.2 Coal Preparation

The CPP and coal handling system has been designed to achieve the following objectives:

- To receive and handle up to 1.8 Mtpa of ROM coal. The coal will be simultaneously produced from multiple horizons within the Main Deposit.
- All ROM coal production will be beneficiated in the CPP prior to railing to Newcastle for export. Approximately 1.135 Mt of product coal will be produced annually.
- The coal handling and preparation systems are required to produce a blended product to meet consignments of 30,000 to 60,000 tonnes for the following products:

  (i) 10.0% ash (ad) coking coal
  (ii) 15.0% ash (ad) export steaming coal
  (iii) 17.5% ash (ad) export steaming coal

- The product stockpile and equipment are required to satisfy the planned export capacity of 1.135 Mtpa. The stockyard must meet requirements placed on it by the rail authority, the port authorities, shipping movements and ship sizes.
- Rejects from the CPP will be placed using the co-disposal method which ensures the containment of rejects, a stable landform and rehabilitation.

ROM Coal Blending

The widely varying ROM coal quality will necessitate blending the ROM coals into a high ash blend and a low ash blend to minimise process yield variation and provide easier control of the CPP. The high ash blend will produce a low coking coal yield, while the low ash blend will produce a high coking coal yield.

ROM coal will be fed to the CPP either directly to the ROM dump hopper or by reclaim from blended ROM stockpiles by front end loaders.

Product Coal Quality and Yield

The size analysis and consequently the total moisture content of the washed coal is dependent on the quantity of fines included in the product. The spirals product will be directed to coking coal , whilst the steaming coal product will be dependant on the yield of product coal from the primary DMC circuit and the fine coal spirals. The steaming coal product contains a low level of fines and will consequently be of lower total moisture.

Product coal is stockpiled using tripping conveyors on an overhead structure. Reclaim is via variable rate feeders to an underground reclaim tunnel and hence to the rail loadout bin by high speed conveyor.

4.2.3 Plant Capacities

The coal handling and CPP capacity has been based on three shift, six days per week operation. The essential elements of the plant and their design capacities are as follows:

ROM coal production	1.80 Mtpa as mined
ROM coal stockpiles	two (2) x 15,000 t
ROM coal crushing	400 tph
CPP feed	300 tph
Product coal production	1.135 Mtpa as received
Product coal stockpiling	300 tph
Product stockpile capacity	three (3) 30,000 t
Train loadout	3,000 tph

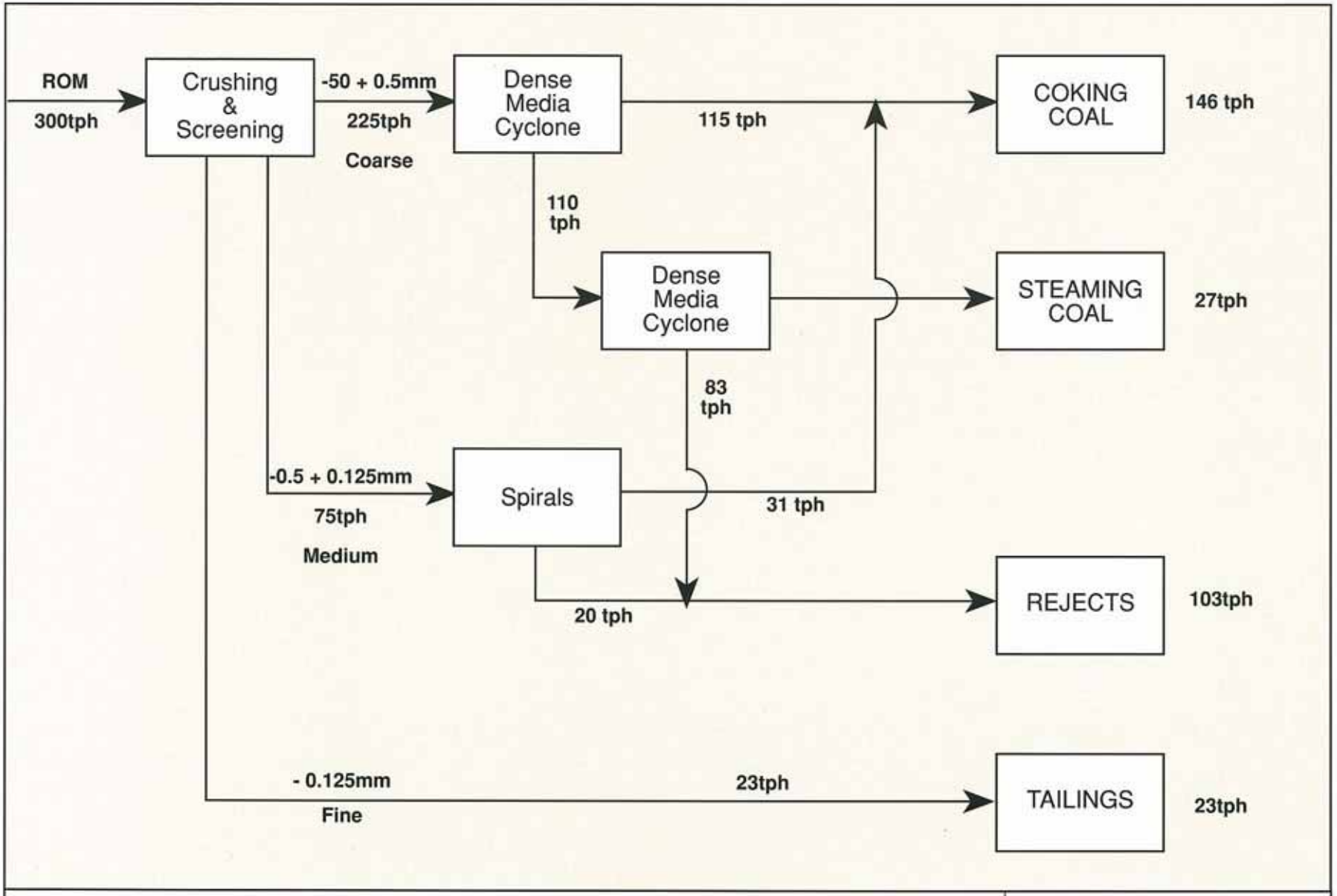
4.3 MANAGEMENT AND DISPOSAL OF CPP REJECTS

4.3.1 General

In addition to the production of coal, the processing of ROM coal will generate reject materials. Of these, the coarse CPP reject is relatively easy to dispose of whereas fine CPP tailings are more difficult to handle. Conventionally, the fine tailings leave the CPP as a slurry and are placed in wet storage containment. However, problems with this disposal method can arise as the fine particle size of the slurry can limit dewatering, resulting in extended periods before rehabilitation is possible.

The conventional practice of disposing of mine tailings slurry in wet storage has been under review, due to the increase in environmental and economic costs. Many alternatives have been attempted with variable success and considerable costs. The main alternatives for the disposal of tailings are: mechanical dewatering - using either centrifuges, flocculants or belt press filters; or disposal within valleys formed between successive overburden piles.Technical problems, potential environmental impact, as well as high disposal and rehabilitation costs, make these alternatives less attractive. Dewatering tailings with belt press filters has had some success but results in very high operating costs.

New coal mines have to meet very tight environmental criteria for environmental impact and the final landform. These constraints have encouraged the development of a technique of disposing of CPP tailings known as co-disposal, which has an advantage over conventional disposal and has been successful in a number of Queensland coal mines. Co-disposal involves combining tailings and coarse CPP rejects to produce a heterogeneous mixture of fine and coarse material. The resulting material is relatively easy to transport by pipeline. Rehabilitation costs are also reduced.



STRATFORD COAL

Simplified Coal Preparation Flowsheet

Figure 4 - 7

Date: September 1994

At Jeebropilly, Gordonstone and North Goonyella, co-disposal is used as an alternative to conventional tailings disposal. The tailings, coarse CPP reject and water are combined and then pumped by pipeline at about 30% solids by weight. Testing has shown that pumping a low solids concentration at high velocity reduces pipe wear, however, excessive segregation occurs which would no longer create a heterogeneous material which is relatively easy to rehabilitate.

Segregation of the fines particles can be reduced by pumping at a higher solids concentration and at a lower velocity and varying the geometry of deposition. Co-disposal is recognised as an environmentally preferable alternative to conventional disposal.

4.3.2 Proposed Co-disposal System

Reject material from the fine coal spirals and desliming cyclones will be thickened and mixed with coarse reject from the dense media cyclone circuits. This mixture will be pumped through a pipeline and emplaced in dedicated areas.

The geotechnical characteristics of the reject mixture will create a stable dump with a low retention (5-10%) of process water. Excess water will be collected for return to the CPP.

During the first 5 years of mine operation, an area to the north of the CPP and the mined-out Bowens Road West deposit will be used for co-disposal emplacement (refer Figure 4-1). From year 6 onwards, the material will be pumped into a dedicated void left in the overburden dumps on the eastern side of the Project Area (refer Figures 4-2 and 4-3).

The total volume of CPP rejects to be disposed of during the project is approximately 7 million cubic metres. The capacities of the proposed co-disposal areas are shown in Table 4-4. A diagram of the method of emplacement and rehabilitation of co-disposal rejects is shown in Figure 4-6 and discussed in Appendix 2.5.

TABLE 4-4
CAPACITIES OF PROPOSED CPP REJECTS CO-DISPOSAL SITES

Site	Average Depth (m)	Approximate Volume (m3)
Northern Disposal Area	6	2,900,000
Bowens Road West Pit	35	440,000
Overburden Dump	15	5,000,000
Total Volume Available		**8,340,000**
Total Rejects Requirements		**7,000,000**

4.4 COAL TRANSPORTATION

Coal will be transported by rail from the Project Area to Newcastle. The majority of the coal will be exported, although some coal may be used in domestic steel mills and power stations.

Coal will be loaded onto trains utilising a rail loop designed and constructed to State Rail Authority (SRA) requirements. The location and conceptual design of the proposed rail loop is shown in Figure 4-9. This currently requires trains of 42 wagons, each 75 tonnes capacity, to be loaded within 1 hour. To achieve this, the trains are kept moving through the facility whilst being loaded.

A chute discharges coal from the rail load out bin into the wagon at a rate compatible with the speed of the train and automatically adjusts the contents of the wagon to a predetermined height. The storage bin will be filled prior to train loading with the required product by a conveyor from the product stockpile. The conveyor will continue to fill the storage bin as the train is being loaded.

The facility is required to be capable of loading coal at any hour of the day, six days a week, depending on SRA scheduling requirements. The loading section of the rail loop will, therefore, be equipped with lighting to cater for night loading.

To transport the Project's planned annual production of 1.135 Mtpa will require around 350 trains per year,

approximately one per day on average. In practice, the Port of Newcastle shipping schedules and stockpile capacity limitations will result in periods when there will be 3 or 4 trains per day for a period of a few days, followed by periods of no traffic. The increase in rail traffic along the main line as a result of the Project development will be relatively small.

The rail loop will be constructed from the main rail line approximately 1 km north of Craven, crossing under the main road (Bucketts Way) and branching into an anticlockwise loop of 2.9 km in length passing under a 400 tonne loading bin adjacent to the CPP. The loop will accommodate 1 x 42 wagon train on the approach side of the bin and one such train on the departure side. Apart from the road crossing, the construction of the loop is straight-forward being on generally flat ground. A gentle uphill grade will be maintained to the bin, allowing the wagons to be loaded under tension.

4.5 MINE SITE INFRASTRUCTURE AND FACILITIES

4.5.1 Project Infrastructure

The following buildings and structures will be located in the infrastructure area, generally as shown in Figure 4-8.

- Office
- Bathhouse
- Workshop
- Store
- Truck Washing Facility
- Coal Preparation Plant
- ROM and Product Stockpiles
- Rail Loop and Load Out Bin
- Car Parks
- Water Storage Tanks
- Hard Stand Areas

4.5.2 Project Development Works

Project development will commence with construction of the road from Bucketts Way to provide access to the site. Construction of the CPP is anticipated to take around six months. Earthworks for the mine facilities and site works such as dams, roads and drainage will start following construction of the access road, followed by development of the bathhouse, workshop and site offices.

4.5.3 Project Access

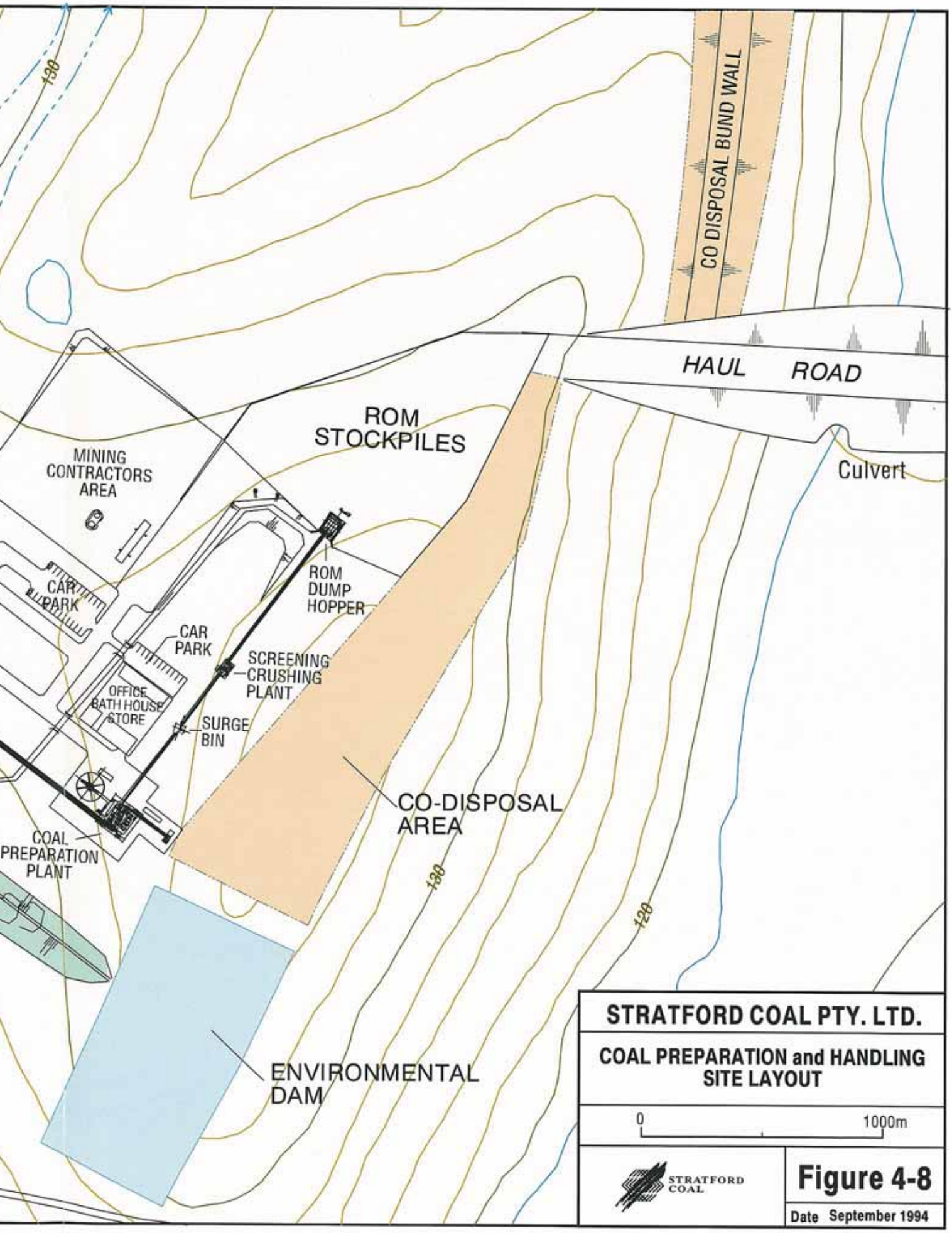
Access to the site will be from the Bucketts Way. The access road will be a two-lane, 7 m wide, unsealed road. The junction of the link road with Bucketts Way will include acceleration, deceleration and turning lanes, according to RTA specifications.

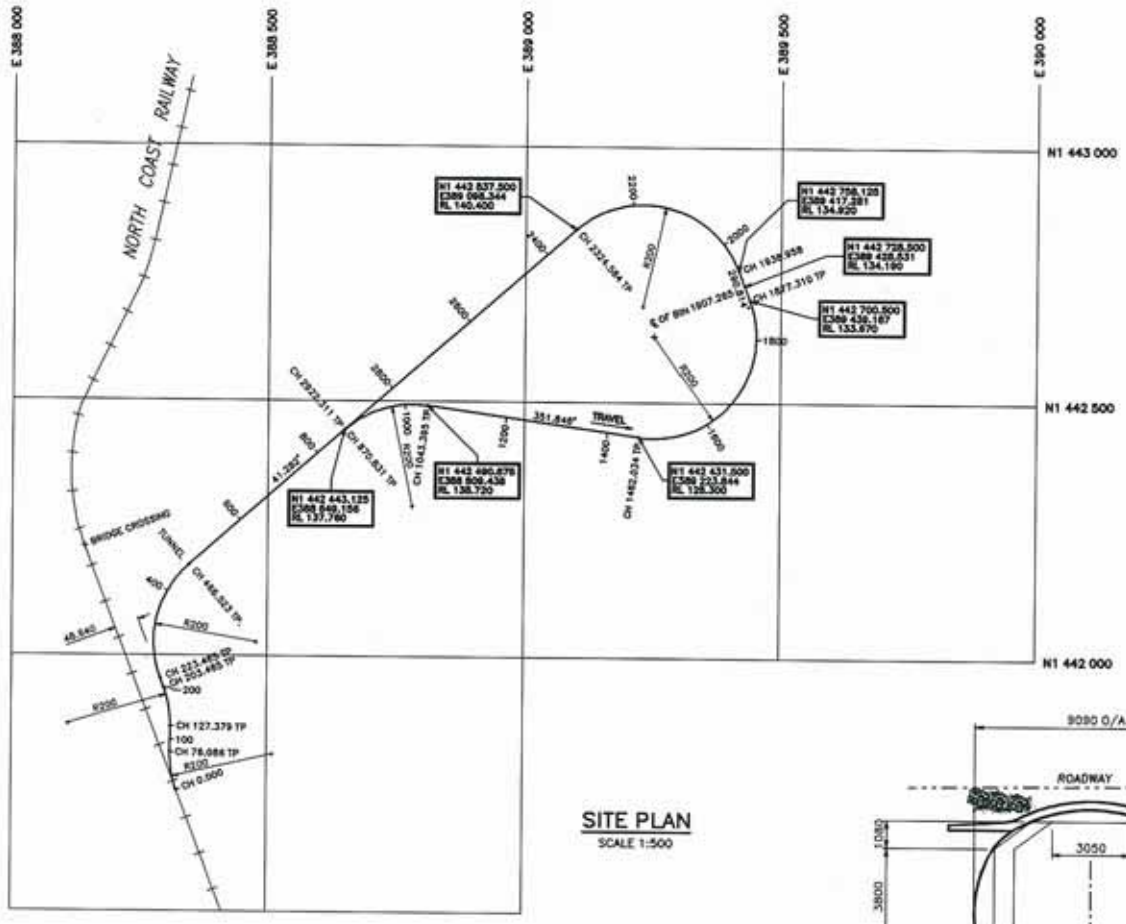
Within the site, a road will provide access to the workshop and office. A service road from the office and workshop area to the pit will run along the southern mining limit to the mine area. This will limit the area of disturbance during mining stages. All service roads will be gravel surfaced and will be kept watered to minimise dust generation.

4.5.4 Project Power and Water Supply

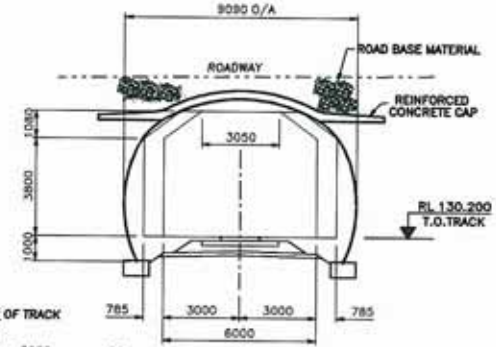
Electrical power to the Project will be provided from the two existing 33 Kv distributors running along Bucketts Way. A 1.2 km aerial will be constructed to the Project substation where transformation to 11 Kv, 415 v and 240 v will occur and these voltages distributed within the site.

Water for the CPP, dust suppression, fire fighting and vehicle washdowns will be provided from the following sources (in order of usage priority - refer Section 4.9 and Appendix 3):

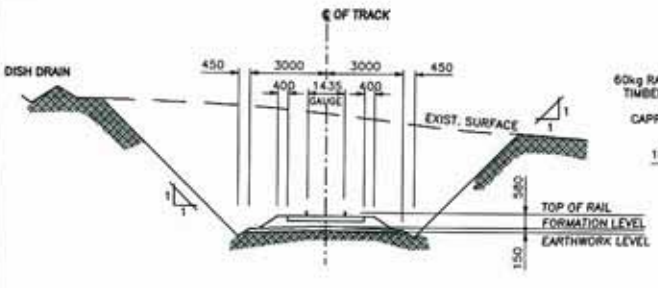

CO DISPOSAL BUND WALL
HAUL ROAD
ROM STOCKPILES
MINING CONTRACTORS AREA
Culvert
ROM DUMP HOPPER
CAR PARK
CAR PARK
SCREENING CRUSHING PLANT
OFFICE BATH HOUSE STORE
SURGE BIN
CO-DISPOSAL AREA
COAL PREPARATION PLANT
ENVIRONMENTAL DAM
130
120
STRATFORD COAL PTY. LTD.
COAL PREPARATION and HANDLING SITE LAYOUT
0
1000m
STRATFORD COAL
Figure 4-8
Date September 1994



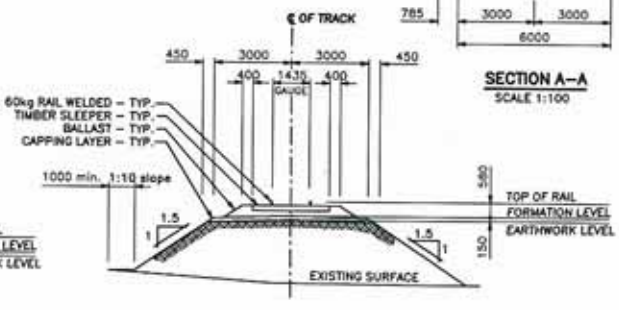
SITE PLAN
SCALE 1:500



SECTION A–A
SCALE 1:100



TYPICAL CUT CROSS SECTION
SCALE 1:100



TYPICAL EMBANKMENT CROSS SECTION
SCALE 1:100

- Rejects disposal return water.
- Groundwater from mine pit dewatering.
- Dirty runoff water.
- Dirty water storage dam.

Water for use in the office and bathhouse (potable water) will be trucked to the site.

4.6 WORKFORCE

4.6.1 Construction Stage

The estimated workforce during the 6 month construction period will rise from 20 at the start of construction to a peak of 100. The majority of the construction workforce will be drawn from regionally based contractors who are familiar with and work regularly in the coal industry. Local subcontractors are also expected to be required.

4.6.2 Operational Stage

The anticipated workforce during mine operations is 75. Details of the operational workforce are given in Table 4-5.

TABLE 4-5
OPERATIONAL WORKFORCE AT YEAR 10

Production	46
Coal Preparation & Handling	20
Administration	9
Total	75

4.7 MINE OPERATING HOURS

The mine will operate 24 hours a day, 6 days a week. Workforce numbers have been calculated on the basis of a three shift operation. Routine maintenance will be undertaken during the week or on weekends, as necessary.

The CPP will operate 24 hours a day, 6 days a week, again on a three shift system.

The coal loadout on the rail loop will be ready to load trains at any time of the day or night, as required by the SRA.

Lighting will be needed to allow operations to take place safely during night hours in both the mine and the CPP area. The lighting will be designed to maximise the workplace lighting levels but minimise the visibility of the lights from outside the site. The impact of night lighting is likely to be minimal, however measures to reduce any potential impact are discussed in more detail in Appendix 7.

4.8 PRODUCT MARKETS

The Project can produce coking coal with excellent coking properties. The fluidity, rank, swell and dilatation of the coal are significantly higher than the majrity of competitor coals available from the Port of Newcastle and are comparable with a number of Queensland coals. These coking quality characteristics fit within the "hard coking" category in Japan, Korea and other Asian markets, and in the "mid/high volatile coking" category in Europe and other export markets (e.g Pakistan, Brazil).

The excellent coking properties of the coal will provide a range of market opportunities in Asian export markets including Japan, Taiwan, Pakistan and Malaysia.

The Project can also produce thermal coal which has high energy, along with favourable ash chemistry and ash fusion temperatures. This thermal coal will compete in the industrial and cement markets in Asia which tend to buy coal on a competitive tender or spot market basis. Coals in these markets are sold largely on energy value within standard quality criteria. Some 80 coal brands are handled through

Newcastle with blending accounting for a significant proportion of these. The 15% ash and 17.5% ash thermal coals produced by the Project will have access to these blending opportunities and the high energy of the coal will offset its relatively high ash.

4.9 WATER MANAGEMENT

A detailed discussion of the proposed water management system for the Project is presented in Appendix 3. A summary of relevant information is provided below.

4.9.1 Introduction

The major features of the Project's water management system are as follows:

- A prioritised, ranked system of water usage, which uses dirty water first and clean water last. This system minimises the potential for dirty water discharge and leachate issues. The prioritised system works as follows: (in decreasing order of priority use)
  - Rejects disposal return water
  - Groundwater from pit dewatering (quality dependent)
  - Dirty runoff water
  - Dams D1 and D2
  - Dump runoff water
  - Clean catchment water
- The interception, diversion and control of clean runoff from rehabilitated landforms and around proposed mining activities including creek diversions.
- The collection, treatment and subsequent reuse or storage on site of dirty water generated within the open cut pit, coal preparation and industrial areas, rejects disposal areas and disturbed surface areas.
- Groundwater control strategies.
- The collection of runoff/leachate from out-of-pit overburden/interburden emplacements.

The main physical elements to the overall water management scheme are (refer Figures 4-1 and 4-2):

- Two water storage dams (D1 and D2).
- A rejects disposal water reclaim system.
- An overburden dump runoff settling dam.
- A haul road water storage dam.
- Stormwater drainage diversion and flood control embankments.
- A mine pit dewatering system.

Under New South Wales legislation, all dams and diversions within the water management system will be licensed.

4.9.2 Clean Water Management

The proposed surface water controls aim to prevent clean runoff water from entering the open-cut mining, overburden/interburden dumping areas and rejects disposal areas, at various stages of the mine life. The main structures are:

- a diversion drain/bund on the eastern hill side, designed to divert clean water runoff around disturbed areas;
- a flood control embankment west of the open pit which is designed to reduce the likelihood of floodwaters entering the pit;
- a culvert under the haul road which connects the CPP area to the main mining area and allows passage of a main drainage channel through the site;

- a diversion drain/bund upslope of the rejects disposal area, north of the CPP, designed to divert clean water runoff around this disturbed area;

- a diversion drain and culvert to the west of the CPP area, designed to divert clean water runoff around the CPP area;

- various runoff control drains/bunds on the surface and at the toe of rehabilitated over burden dumps designed to divert clean water runoff around active mine areas.

Preliminary design criteria for these structures are presented in Appendix 3. Final design of these structures will be refined in consultation with DWR.

4.9.3 Dirty Water Management

Dirty water management, in the overall context of the proposed mining operation, refers to the control, collection and re-use of water which may become contaminated by the presence of the mining operation and its associated activities (e.g. haul road runoff) or which by its nature is considered to be undesirable for immediate release into the environment.

Normal mining operations will generate a variety of so-called "dirty" waters. Dirty waters may be potentially characterised by higher salinity, potentially low pH (available data from overburden characterisation and management studies - refer Appendix 2.4 - indicates that Project overburden materials are largely non-acid producing), high turbidity and the presence of hydrocarbons (from mining operations).

The main design objectives for dirty water control facilities are:

- no release of dirty waters from the Project Area, except after abnormally prolonged wet weather (eg: 1 in 10 wet 14 year period);

- segregation of clean water from dirty water by the measures outlined in Section 4.9.2;

- maximum recycling of dirty water to reduce build up of stored dirty water.

The principal potential sources of dirty water will be:

- Rainfall runoff in the mine open pit be coming contaminated with particulate matter and mixing with relatively saline groundwater.

- Groundwater flowing into the open pit.

- Rainfall from the overburden/interburden dump area within the pit mixing with in-pit waters (out of pit dump area runoff /leachate is discussed in Section 4.9.4).

- Rainfall runoff from CPP and industrial areas.

- Rainfall runoff from haul roads, potentially contaminated by mine traffic.

- Rainfall runoff from rejects disposal areas.

- Direct rainfall on dirty water storage dams.

Sewage/wastewater from the office, workshop and personnel amenities in the CPP area will be disposed of into on-site treatment systems, prior to land application/discharge of treated effluent.

The principal water usages will be as follows:

- Loss of water to co-disposed rejects (water locked up in rejects voids, lost as seepage or evaporation).

- Evaporation and seepage losses from water storages.

- Haul road and coal stockpile dust suppression.

A minor amount of water will be lost to product coal in the CPP.

The schematic layout of the dirty water management system is shown in Figure 4-10. The main elements comprise the dams D1 and D2, the reclaim water pond at the CPP rejects emplacement areas, pit dewatering sumps and pumps and haul road runoff collection dam. Minor elements comprise various internal runoff collection channels within the overburden dump areas, along the haul road and at the CPP.

The capacities of these dirty water storages through the life of the Project are provided in Appendix 3. The layout of these minor elements will generally depend upon specific infrastructure layouts developed during final design and/or during the actual mining operation itself (eg: active overburden dump area drainage).

4.9.4 Overburden Dump Runoff Management

A proportion of mine overburden is to be disposed of by out-of-pit disposal in a dump area (refer Appendix 2.5 for details). The dump will generally advance from south to north and is to be situated to the south and east of the Main Deposit. As the dump advances northwards, completed dump areas will be progressively rehabilitated (refer Appendix 2.5). These areas will be graded to drain away from "active" dump areas and will not contribute to either the dirty water or overburden dump water management systems.

On the basis of overburden geochemical testwork undertaken to date, runoff from areas of active overburden dumping is likely to be of relatively good quality compared to other mine waters. The runoff is likely to be only moderately saline (within irrigation standards) although it may have elevated turbidity. It will, therefore, be separated from the overall dirty water management system, in order to not place undue stress on that system from significant volumes of relatively clean runoff water.

Overburden dump runoff management will essentially involve directing runoff, via a progressively changing system of drains and bunds within and around the perimeter of the "active" dump areas, to a dedicated runoff settling dam located west of the "active" overburden dump. The size of the settling dam will be based on the following criteria:

- Sufficient capacity to hold runoff from a 1 in 20 year, 72 hour duration rainfall event falling over the full "active" dump area.

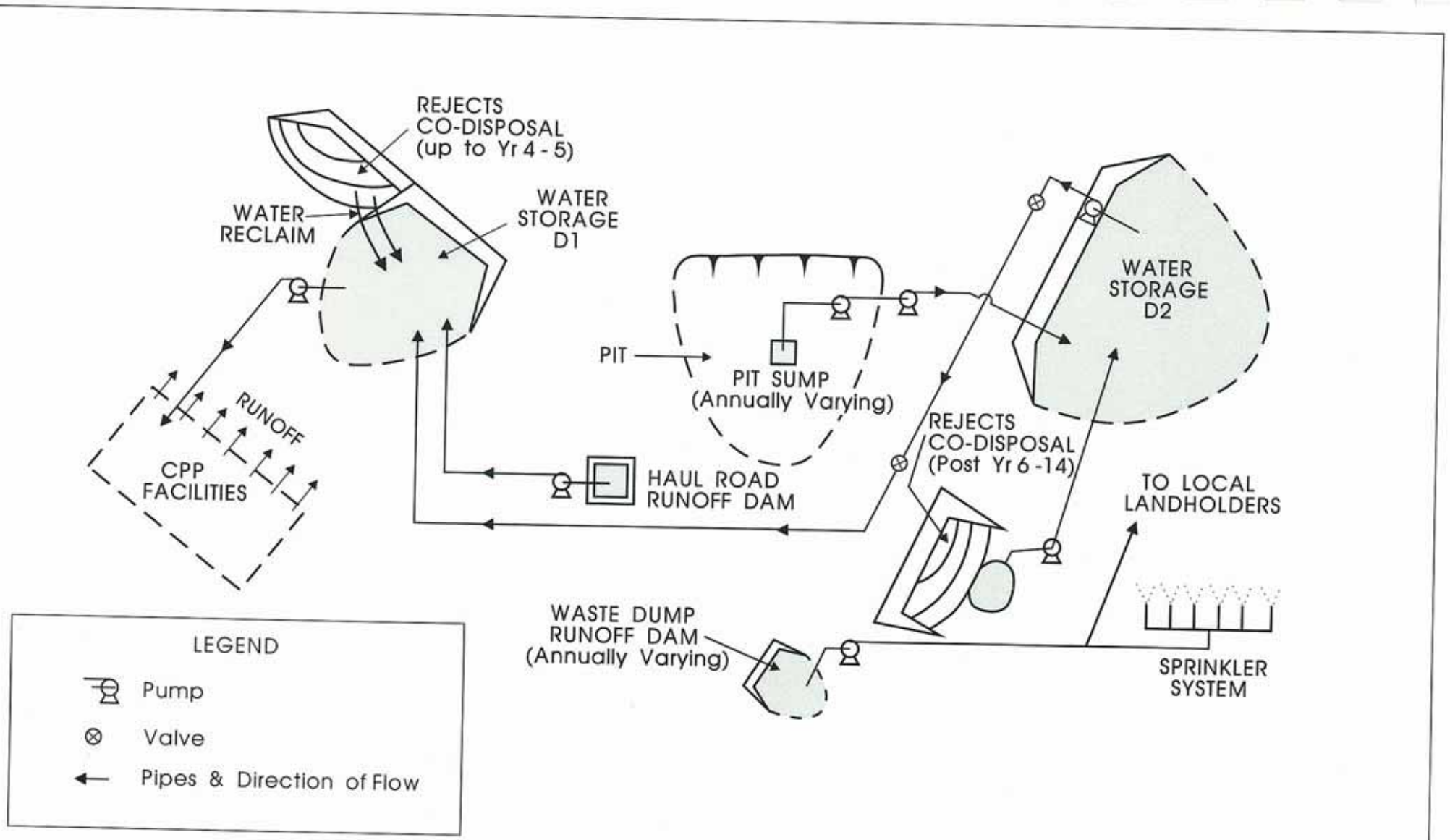
- Sufficient area to provide for settling/ sedimentation of any particles coarser than fine silt size in a 1 in 10 year, 72 hour duration rainfall event.

The dam will be reconstructed periodically in order to remain adjacent to current dumping operations. It is envisaged that the dam will be formed by cut-to-fill techniques using a bulldozer. A spillway will be provided on one abutment sufficient to pass runoff from a 1 in 100 year critical duration storm.

The following potential disposal techniques are planned for settled overburden dump runoff waters:

- Spray irrigation/disposal over areas of "active" overburden dump during dry weather, to enhance dust control works.

- Pumping of water to local landholders for use in crop/pasture irrigation and stock watering.



STRATFORD COAL

SCHEMATIC LAYOUT OF WATER MANAGEMENT SYSTEM

Figure 4-10

Date September 1994

- Irrigation of rehabilitated mine areas to promote growth.

- Pumping to the rejects disposal area north of the CPP for disposal by evaporation.

4.9.5 Water Budget

A comprehensive monthly water budget model has been prepared for the proposed dirty water management system (all clean water is to be diverted around the site - refer Section 4.9.2), for each of three 14 year "life of mine" scenarios. This is presented in Appendix 3 and summarised below:

- A historical 14 year rainfall period with a probability of being exceeded of 10% (1 in 10 wet period).

- A median historical 14 year rainfall period.

- A historical 14 year rainfall period with a probability of not being exceeded of 10% (1 in 10 dry period).

Results of this modelling work indicate:

- No discharge of "dirty" water is predicted under median and "1 in 10" dry conditions for the full 14 year mine life. Some discharge of water is predicted late in the mine life under abnormally ("1 in 10") wet conditions (maximum of 663 ML in one year). The consequences of release in such a situation are discussed in Section 5.3.

- Make-up water is required for the initial years of operation. It is envisaged that these requirements will be met by pre-commissioning the water storages (Dams D1 and D2) some time ahead of commencement of mining. The dams could be commissioned without upslope diversions in place initially in order to harvest clean water runoff from their respective catchments (more than 2 km^2 in the case of Dam D2). Detailed design studies will be conducted during Project development to determine the volume of water to be harvested prior to CPP commissioning.

4.9.6 Post Mining Water Management

After mining ceases, the remaining open pit void (refer Figure 4-3) will be bunded around its perimeter to minimise inflow of surface water runoff into the pit. It is anticipated that the pit will fill to the approximate level of the regional water table. The water quality in the pit is likely to change as a result of reactions with rock and overburden. It is expected that there will be a change from a chloride to a sulphate/bicarbonate water chemistry as the pit fills. A detailed plan for management/use of the final void will be developed in concert with DWR and DMR at the time of the second Open Cut Mining Approval (Year 7).

The flood embankment, haul road and diversion banks will be removed after mining ceases. By this time the overburden dump and rejects disposal areas will have been fully rehabilitated.

Dam D2 will remain in place (with upslope diversions removed) to serve as a local source of good quality water for post mining land use. Should dam reservoir water quality at cessation of mining prove to be poor, the water will be disposed of by pumping to the open pit final void, where it will be diluted by mixing with inflowing ground and surface waters. The dam D2 spillway will be extended to form a rock-lined or grassed, stable channel to connect to the downstream watercourse.

The rehabilitated landform has been designed to

specifically cater for long term drainage needs (refer Appendix 2.5).

4.10 REHABILITATION

4.10.1 Introduction

Rehabilitation works will be closely integrated with mine production and will be undertaken progressively as mining proceeds. Disturbed land will be returned to a stable condition and to a land capability at least equal to that which existed prior to mining. Revegetation will result in the establishment of legumes and endemic grasses with extensive tree covered areas.

Recontouring, topsoil handling and revegetation techniques are addressed in detail below.

4.10.2 Objectives

Rehabilitation is a prescribed condition under the Mining Act and is subject to regulatory authority agreement and approval.

The primary objectives of the rehabilitation programme are minimisation of erosion and reinstatement of pre-mining land capability . Other objectives are:

- the generation of a final rehabilitated landform which is consistent with general landforms in the area and which will blend unobtrusively with the hills to the east;
- to provide a landform which is suitable for the primary final land uses of grazing, forestry and faunal habitat enhancements;
- to plan mining and overburden handling operations to minimise rehandling, reshaping and contouring;
- to minimise the amount of disturbed land awaiting rehabilitation;
- to provide for the safe and environmentally acceptable disposal of CPP rejects and any saline overburden.

Details are provided in Appendix 2.5. The input of local Landcare Groups and SCS, NSW Agriculture, NPWS and DMR will be welcomed in the trialing and implementation of rehabilitation.

4.10.3 Timber Removal

A management plan for the assessment of faunal habitat (especially bats) in isolated timber areas or mature individual trees within the Project Area, has been carefully designed in consultation with NPWS and specialists (refer Section 5.8, and Appendix 8). There is little standing timber on the mine site and infrastructure areas and the commercial value of the timber is negligible.

4.10.4 Shaping of Overburden Dumps

Overburden dumps will be progressively recontoured as described in Section 4.1 and Appendix 2.5, and as shown on Figure 4-5.

4.10.5 Topsoil Management

Suitable topsoil material will be stripped from areas to be disturbed. The location, depth and volumes of suitable materials have been identified (refer Sections 2.2.1 and Appendix 2.1).

Most topsoiling material will be derived from areas ahead of the advancing mine. The recovery of all suitable topsoil material will be a prerequisite to any soil disturbance.

Topsoil will be removed from no further than 100 m ahead of the advancing mine. Strict control will be kept over the depth of stripping to ensure only suitable quality material is removed. A detailed topsoil survey and management plan (including physical and chemical analysis) will be undertaken prior to commencement of mining to accurately identify stripping depths in particular areas.

Material will be pushed into heaps and removed by front-end loaders and trucks or removed by scraper. Materials will either be immediately respread onto recontoured areas, or stockpiled in accordance with SCS specifications.

For the first 2 years of mining, stockpiling will be necessary until suitable recontoured overburden dump areas are available. Where possible after the second year of operation, topsoiling material would be sourced directly ahead of the mine path. Stockpiling will be avoided where possible.

Topsoil stripping and subsequent stockpiling can result in a decline in structural and biological attributes of soil. To minimise degradation of soil quality, the following procedures will be adopted:

- stockpiling time will be kept to a minimum;
- topsoil will be stripped in an optimum moisture condition to prevent destruction of soil structure;
- stockpiles will not exceed 1.0 m depth;
- stockpiles will be seeded with suitable grass and legume species immediately after deposition in order to restrict the invasion of weeds encourage soil microbial activity, decrease the leaching of nutrients and reduce the erosion of stockpiles.

Following recontouring of overburden dumps, which will consist of final placement of a benign layer, topsoil material will be spread to an average depth of 200 mm; sufficient material is available for up to 200 mm of topsoil to be placed on most areas. This will provide an adequate rooting medium for pasture and tree growth and for the reinstatement of Land Capability Class IV and V lands.

4.10.6 Site Preparation

Following topsoiling, the surface will be chisel ploughed and shallow ripped (200 mm) along the contour as a pre-requisite for revegetation. Deep ripping would occur on areas to be established with trees and shrubs.

4.10.7 Revegetation

Revegetation will immediately follow topsoiling and site preparation and will include either pasture and/or tree establishment. A number of options exist for revegetation, including pasture, tree belts, habitats enhancement, wildlife corridors and plantations.

A revegetation strategy detailing weed control measures and the location of pasture and treed areas will be developed for each area prior to disturbance and would be based on a comprehensive plan developed in consultation with the Department of Conservation and Land Management, Soil Conservation Service (SCS), NPWS and NSW Agriculture.

Trees will also be established to achieve maximum aesthetic and screening affect as well as providing functional windbreaks and woodlots for stock shelter. The revegetation strategy will result in the establishment of many more trees than currently exist on the site. Endemic tree species will be used and seed from remnant trees will be collected prior to tree destruction and either sown directly or propagated in a nearby nursery.

Establishment of native tree lots would be planned for up to 20 percent of revegetation on breaks on slopes and ridgetops. Advanced seed collection ahead of mining has been successfully used in mines throughout New South Wales.

4.10.8 Drainage and Erosion Control

Drainage and erosion control have been discussed under Water Management in Section 4.9.

4.10.9 Rehabilitation of CPP Rejects

Co-disposal reduces the need for major containment structures and require only minimal earthworks to facilitate rehabilitation, given the location of the main co-disposal area within the overburden dump.

CPP rejects will be initially placed in the northern co-disposal area and covered with prestrip overburden, topsoiled and rehabilitated. The final thickness of overburden cover would be determined by trials on early completed beach areas on the northern boxcut open-cut void and eastern co-disposal areas. Cover thickness would also be based on the results of the ongoing overburden characterisation (including co-disposal material) and water monitoring programmes which would be initiated at mine commissioning.

Co-disposal of tailings and coarse CPP rejects will produce a heterogeneous mixture of fine and coarse material more conducive to rehabilitation than wet storage areas. Disposal of CPP rejects is discussed in detail in Section 4.3.

Of paramount importance in the chosen rehabilitation design will be the control of saline or acidic seepage. Seepage control measures (if required) will include initial compaction of the upstream dam wall and capping of the final surface with impervious materials to prevent water infiltration. A pasture - only based revegetation scheme would be used on these areas to maximise the integrity of the cover system adopted (refer Figure 4-6).

4.10.10 Area of Disturbance

Bare ground will be kept to a minimum. This will be achieved by minimising the area of vegetation stripped ahead of mining and by ensuring revegetation follows mining as closely as practicable (see Section 4.1).

4.10.11 Staged Rehabilitation

Figures 4-1, 4-2 and 4-3 show the area rehabilitated after 2, 7 and 14 years respectively. Initial revegetation of mined areas will commence after the first 2 years following the preparation of a detailed plan in consultation with DMR, SCS, NPWS and NSW Agriculture. Within the initial 2 year period, prestrip material will be used to achieve approximate final levels on the southern margin of the main dump and the initial area to be rehabilitated. Topsoiling and revegetation will then remain approximately in sequence with the active overburden dump face.

4.11 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAMME

It is proposed that a comprehensive environmental management and monitoring programme will be carried out throughout the duration of the Project to monitor potential environmental impacts and to provide data on which to base any necessary ameliorative measures. This programme was commenced in 1993/94 with respect to air quality, surface water and groundwater resources and will be developed fully during the Project construction phase.

The environmental monitoring programme for the Project will monitor various elements of the environment including:

- climatic data from a site meteorological station;
- overburden and CPP rejects management;
- rehabilitation performance/fauna habitat enhancement performance;
- surface water and groundwater quality;
- dust/air quality;
- noise/blasting;
- graphic record of the mining operations visual effects;
- fauna surveys before construction (focussing on bats);
- fauna and flora;
- archaeological surveying during construction and operations; and
- socio-economics.

The programme will be finalized in consultation with the relevant Federal, State and Local Government authorities after the assessment of this impact statement has been completed. The monitoring programme will be designed in concert with relevant environmental licenses issued by the EPA. Details of the proposed monitoring programme are outlined below.

4.11.1 Climatic Data

An automatic meteorological station will be re-established at the site to monitor and record, windspeed, wind direction, maximum and minimum temperature, precipitation and relative humidity. The station will add to the meteorological data base for Stratford and be used to refine water balances, and rehabilitation design criteria.

4.11.2 Overburden Characterisation and Rehabilitation

Overburden Characterisation

Whilst the presence of potentially hazardous overburden and interburden material at the site appears from testwork to be minimal, an ongoing highwall and drill core sampling and analysis programme will be conducted ahead of mining. Parameters measured will include those which assess the material for its acid, sodic and geotechnical stability properties.

Monitoring of standing water levels and water quality in unmined and rehabilitated areas will be conducted regularly throughout the Project life (refer Appendix 3).

The following studies are proposed to be undertaken during the mining operations:

- Determination of the weathering behaviour and soil forming properties of overburden/interburden material.
- Determination of the hydrological behaviour of overburden. Results of these studies will be used to design micro-relief characteristics for the final graded surface, aid soil erosion and drainage control and refine the water management programme to achieve quality and quantity control.
- Forward (ahead of mining) geochemical studies of overburden and interburden to incorporate analysis for SAR, E.C., pH and trace elements Se, Mo and Zn. The overburden management plan (incorporating the mine rehabilitation and water management programmes) will be reviewed in the light of these results at frequent intervals. The input of DMR, NSW Agriculture, SCS, DWR in the review of the plan is welcomed.

Rehabilitation

The overall rehabilitation aim is to at least equal pre-mining land capability. The proposed investigations are outlined below:

- Determination of the erodability of soil and overburden to help design erosion control structures and determine drainage densities.
- The effectiveness of mixed A and B horizon material to create a more suitable topsoil.
- Pasture and tree species with special emphasis on initial erosion control and subsequent livestock grazing, habitat enhancement, forestry.
- Pasture planting techniques, broadcast versus direct sowing.
- Fertilizer trials.
- Assess the effectiveness of deep ripping, contour ploughing and surface mulching techniques on erosion and vegetation establishment.
- Determine feasibility of using rip rap in major drainage ways.
- Assess tree and shrub natural regeneration under various topsoil depths and develop techniques for increasing the seed pool and encouraging germination.
- Tree and shrub species trials incorporating species suggested in Appendix 8.1.

4.11.3 Hydrology

The prioritised system of water usage has been outlined in Section 4.9 and Appendix 3. In addition, surface water and groundwater quality and quantity will be monitored throughout the Project life.

This programme re-commenced in 1993/94 (after a period of monitoring between 1980 and 1984) and water samples have been collected from surface water locations and monitoring bores throughout the Project Area. Details of this programme are set out in Appendix 3.

During the construction and operation of the Project, water use will be supervised through licensing procedures with the Department of Water Resources.

Any activity with potential for water pollution will be controlled by the EPA's licensing procedures.

The effects of the Project on water have been considered during the early planning stages. No problems are anticipated with excessive water use or pollution. Any excess waters of suitable quality will be offered to regional landholders for use in irrigation activities.

Regular monitoring of water quality will be conducted. This will initially comprise monthly monitoring of surface water and groundwater for turbidity, conductivity and pH, with more detailed chemical analysis conducted on an annual basis, or more frequently at the request of New South Wales authorities (EPA and DWR).

As part of EPA licensing, the water management model developed for the Project will be used in conjunction with water quality data to assist in detecting areas of mine operation that may contribute to water quality issues.

In addition to reporting to EPA, the following information will be provided, in report form, to the DWR, on an annual basis:

- the results of the monitoring program;
- highlight any variance between the predicted impacts shown in the Environmental Impact Statement and observed outcomes and provide an explanation of this variance;

- offer an interpretation of the results;
- provide revised groundwater inflow predictions, if any variance with the model occurs; and
- suggest any proposed changes to the monitoring program for the following 5 year period.

The use of water on site will be monitored by meters to provide information on consumption and indicate areas where water conservation measures could be implemented, maximising the potential for the Project to offer excess water to regional landholders.

4.11.4 Air Quality

A detailed dust/air monitoring programme has commenced in the Project Area comprising both static and high-volume sampling equipment. Under the mine environmental management proposals, no adverse air quality impacts are predicted with respect to surrounding residences.

The programme results will be used to confirm and refine the predictions of the detailed modelling conducted for the EIS.

4.11.5 Acoustics

Adverse noise and blast impacts are expected to be minimal and well within EPA design limits. The detailed plan for the monitoring of potential noise and blasting impacts will be determined following discussions with the EPA. It is expected that these programmes will include the following:

- Regular monitoring of noise levels at residences in the vicinity of Stratford and Craven.
- Regular monitoring of noise levels from noisy items of equipment including mobile and fixed plant.
- Monitoring of vibration and overpressure levels for typical blasts at locations representative of the residential areas to the north, west and south of the mine.

These monitoring studies will enable any noise problems to be identified quickly and appropriate corrective action to be taken.

4.11.6 Transport Systems

The Project presents very limited potential for adverse impact on local and regional transport systems because of the small volume of traffic to be generated by the proposal, as outlined in Section 5.6 and Appendix 6. Monitoring will be carried out to confirm the expected minimal impacts during Project construction and operation.

4.11.7 Visual Impact

The Project presents very limited potential for adverse visual impact. A conceptual landscape plan of the site has been presented in Appendix 7. Ongoing monitoring will be carried out to ensure that the nominated ameliorative measures are effective.

4.11.8 Flora and Fauna

Several surveys and meetings with regional authorities have concluded that the Project Area is of relatively low significance with respect to flora and fauna. Notwithstanding, a management plan is to be implemented focussing on the following aspects:

Bats

(i) Bat habitat and presence surveys in 1994 summer to better assess the use of the area by roosting bats.

(ii) A management plan has been developed in consultation with NPWS (at a meeting in Raymond Terrace on 18/8/94). This will focus on the regional and site specific identification of any roost sites in relation to the mine area, relocation programmes if required by (i), and the establishment of additional habitat via the introduction of roost sites (e.g. artificial, and new wildlife corridors) at alternative locations within the Project Area, should those be required.

(iii) Regular monitoring and progress assessment, in consultation with NPWS.

(iv) The establishment of two major wildlife corridors/forage areas, commencing with a tree planting programme in 1995 and extending throughout the Project life (refer Appendix 8.2 Bat Report).

Amphibians

(i) Confirmatory summer - time surveys to confirm the indicated absence of frog species (as discussed in Appendix 8.2) in areas to be disturbed by the Project.

(ii) Preservation of any identified, important habitat.

The National Parks and Wildlife Service have expressed their satisfaction with the above programmes.

Mammals, Avifauna

Periodic surveys to confirm no adverse impacts upon mammals, avifauna, etc, are proposed as a component of on-going Project environmental auditing.

4.11.9 Archaeology

A management plan for the identification and presentation to Karuah Local Aboriginal Land Council (Karuah LALC) of any artefacts unearthed by activities is proposed.

Whilst the extremely low incidence of surface artefacts has been confirmed, and the expectation for incidence of sub-surface artefacts is similarly low, the SCPL has undertaken to confirm this via:

(i) inspection of some areas stripped of topsoil;

(ii) on-going periodic inspection of areas by Karuah LALC representatives whose report is attached in Appendix 9.1.

4.11.10 Socio-Economics

Community liaison and monitoring of social and economic indicators will determine the effect of the Project on the lifestyle of the workforce and the non-mining community, and the effect on local services, such as education, community welfare and health. It will draw early attention to any problems which may arise in the community and enable planning to be undertaken to ameliorate any adverse effects.

A survey of the community and mine employees will be conducted on an annual basis and changes monitored and analysed over time. Consultation with the Gloucester Shire Council and the communities of Stratford, Craven and Gloucester will be ongoing.

5.0 IMPACT OF THE PROJECT ON THE ENVIRONMENT AND PROPOSED CONTROL MEASURES

5.1 TOPOGRAPHY

Opencut mining will modify the existing topography within the Project Area. New topography will be formed with the overburden which will be contoured to blend in with the surrounding landscape. Small scale topographic variations will be built into the surface profile to ensure that the final surface is similar to the surrounding land rather than perfectly smooth.

The final rehabilitation contours are shown in Figure 4-3, and provide for a variety of land uses ranging from pasture, treelots, forest, and wildlife corridors. The involvement of the local Landcare Group, DMR, NPWS, SCS and NSW Agriculture will be sought in the design and implementation of rehabilitation options.

5.2 LAND CAPABILITY AND LAND USE

5.2.1 Soils

The soils in the infrastructure, emplacement and mining areas will be removed. The rehabilitation programme is designed to provide a soil profile which will sustain a variety of land uses including grazing, forestry, wildlife habitat and endemic forest.

Soil from the disturbed areas will be stripped prior to disturbance. Suitable soils will be stockpiled separately from those which are unsuitable for revegetation but suitable for construction purposes. Where possible, soil will be used directly for topdressing rehabilitation areas to avoid the need to stockpile. In the first few years this will not be possible and soil will have to be stockpiled. Soil will be stockpiled in mounds no higher than 1 metre for long term storage and vegetated to minimise textural degradation, erosional losses and to maintain the viability of the soil, in accordance with the CaLM - SCS recommendations. Short term stockpiles will be 1 to 2 metres in height.

The short term stockpiles will be positioned to ensure that they will not need relocating. All stockpile batters will be contoured with maximum batters of 1 in 4 and sown with rapidly growing pasture.

The soil survey (refer Section 2.2.1 and Appendix 2.1) has indicated that there is suitable topdressing material available to cover the rehabilitation areas with an average of 200 mm of topdressing. Some amelioration of the soil in the form of fertiliser and gypsum will be required. All topdressed areas will be rapidly stabilised with sown pastures.

5.2.2 Land Capability

The objective of the rehabilitation programme is that post mining rural land capability classification will be at least equal to pre-mining capability. The proposed final rehabilitated land capability will be nominated in consultation with CaLM. The gently sloping crest

of the rehabilitated overburden dump will have a land capability of Class IV with the moderately sloping batters (16%) Class V. The final void is designed to have a land capability of Class VI if a final land use of agricultural water storage is adopted. This will represent a net land capability for this area approximately equal to the pre-mining capability.

The crest of the rehabilitated northern co-disposal dam will have a land capability of Class V or Class VI (subject to ongoing overburden characterisation and research). Overburden characterisation results to date suggest that the cover profile required to rehabilitate the co-disposal area will be capable of occasional cultivation (Class V).

5.2.3 Land Ownership and Residences

Land Ownership

SCPL owns all properties within the Project Area which will provide adequate buffer zones around the mining operations (refer Figure 2-11).

Residences

The residences located within the Project Area are owned by SCPL and are currently leased. The two residences owned by SCPL on Parkers Road are within the external overburden dump and will be moved or demolished. Access to all other residences would be unaffected by the proposed mining operations.

Outside the Project Area only one residence (Fragley) may receive some limited impact from the development (noise, visual - refer Sections 5.5 and 5.7). The Fragley residence was constructed by the owner in full knowledge of likely Project development and after objections to the building application by previous coal tenement owners, the DMR and the Gloucester Shire Council.

5.2.4 Land Use

The land in the Project Area is presently used for light grazing. All areas not required for mining and infrastructure purposes will continue to be utilised for grazing purposes.

At the end of Year 14 the coal reserves in the Main Deposit will be mined out, leaving a final void. During the last year of operation, the pit will be tightened-up to minimise the size of the excavation, however, a substantial void at the end of the mine life is inevitable. The likely area of this void at ground level will be around 50 ha with a maximum depth of 100 m (refer Figure 4-3).

A number of options exist for the use or treatment of the final void and these will be reviewed as mining progresses and presented in a detailed plan well before the end of the mine life. In the event that no beneficial uses of the final void can be developed, a plan would be implemented which would ensure that the void was left in a safe and environmentally acceptable condition. As a minimum, the following measures would be taken:

- fencing and bunding to ensure safety;
- drainage and bunding to ensure the void is self contained with no water discharge;
- visually blend the void into the landscape with bunding and revegetation.

Possible beneficial uses of the final void could include:

- A large water storage facility for agricultural use (subject to suitable water quality).
- An aquatic recreational facility (subject to suitable water quality, Council approval and community wishes).

The rehabilitated overburden dump areas and remaining land not substantially changed by the mining activities may be sold as grazing property. The assistance of NSW Agriculture, DMR, SCS and DWR specialists will be sought in the re-establishment of land capability and land use options.

5.3 HYDROLOGY

SCPL recognises that water management is an important aspect of the establishment of an environmentally acceptable Project. The proposed development is subject to site specific constraints, particularly topography, water supply, and available space.

The major water quantity/environmental safeguards are separation of clean water from dirty water by means of diversion drains, mine pit dewatering, collection and containment of potentially contaminated water, progressive rehabilitation works, and the reuse of all dirty water to supply Project water needs.

Make-up water will be used in the following strict order of priority:

- CPP and co-disposal return water;
- any saline groundwaters and runoff water;
- dirty water dam excess water;
- mine and un-rehabilitated area water;
- clean catchment water.

Any excess water of suitable quality will be offered to regional landholders - a potential major benefit in a region subject to frequent water shortage.

Water balance modelling has indicated that under normal rainfall conditions all dirty water can be used and stored by the Project. The Project Area is to be protected against flood waters and surface runoff by dams, diversion drains and a protecting embankment for the open pit. In abnormally wet weather, some change to the flood characteristics of the surface run-off may occur. This will comprise slightly reduced total flow, a decreased flow peak and a slightly longer flow period when compared to the flood situation without Project development.

In a "1 in 10" wet period the on-site storage capacity for dirty water could be exceeded and a controlled discharge from the Project Area may be required. In order to assess the environmental impact on surface waters downstream of the site, a mass dilution study was undertaken to evaluate the electrical conductivity (and hence salinity) downstream of dam D2 in the event of a discharge of 340 ML in one month (as predicted by the water budget model - refer Section 4.9.5 and Appendix 3).

The calculated electrical conductivity (E.C.) of the Avon River downstream of the Dog Trap Creek confluence was (under the above scenario) 630 µS/cm. This compares to a calculated 520 µS/cm if no release from dam D2 occurred during such a high rainfall month (a net increase from 200 to 520 µS/cm would occur in the Avon River because the E.C. of the local streams is naturally higher than that of the Avon River).

The predicted E.C. values of 630 µS/cm and 520 µS/cm classifies the water as medium salinity (Class 2) and suitable for stock and irrigation of all but the most sensitive crops/pasture species (ANZECC, 1992). Thus, only a small incremental increase in E.C. in the Avon River would result from a controlled discharge.

The mass dilution study undertaken was based on average monthly rainfalls and average monthly run-off co-efficients. Controlled discharges would, however, only be expected to be required during shorter duration, high intensity rainfall events, which would produce a higher proportion of run-off from rainfall (and hence a greater downstream dilution) than would be expected based on the approach used.

The results of modelling work undertaken are, therefore, considered to represent a conservative estimate of the dilution conditions which are likely to prevail downstream of the Project during any controlled discharge periods.

Consultation with DWR and EPA will be undertaken to confirm appropriate water discharge management procedures and licencing requirements. Sizing of discharge pumps and pipelines would be undertaken as part of detailed Project design studies, in consultation with DWR.

A similar mass dilution calculation was performed to evaluate the consequences of controlled discharge from the overburden dump settling dam. A net volume of discharge of 200 ML was calculated from a 1 in 20 year, 72 hour rainfall event, assuming the dam was full at the start of the rainfall event and that the mine was at the stage of having the maximum active overburden dump area (i.e. a worst case scenario).

Again assuming a 5500 µS/cm settling dam water E.C., the calculated E.C. of the Avon River downstream of Dog Trap Creek was 530 µS/cm. This compares to some 490 µS/cm predicted if there was no discharge from the settling dam during such a high rainfall event.

This represents only a minor E.C. increase and again classifies the water as medium salinity (Class 2) according to ANZECC (1992), suitable for stock and irrigation of all but most sensitive crops.

In all modelled scenarios, it should be noted that the Avondale Swamp, located immediately downstream of the Project Area (W5) is a natural water depression which is used for stock watering and irrigation of pastures/crops. The natural E.C. range of the Swamp is 520 to 7000 µS/cm. This is compared to a predicted discharge E.C. of 5500 µS/cm ex-site, with dilution to 530 to 690 µS/cm at the Avon River confluence. This corresponds to the existing upper E.C. range in the Avon River.

A management/land use strategy for the final void will be developed in conjunction with DWR and DMR during the Project and confirmed at the time of the second Open Cut Mining Approval (Year 7). Post-mining water management strategies have been developed to provide for no residual impact to local water resources/systems. These strategies are outlined in Section 4.9.6.

The control of seepage from co-disposal areas is addressed in Section 4.3 and Appendix 2.5. Overburden characterisation assessments to date indicate that in general seepage quality should be acceptable. Co-disposal areas will be capped followed by rehabilitation.

A 1994 hydrogeological study indicated that the Project will have no impact on bores used by local residents in the Stratford village for domestic/commercial purposes.

In summary, operation and cessation of mining in accordance with the EIS strategies will not jeopardise local or regional water quality and uses. Continual monitoring of water quality and quantity, and of specialist assistance from DMR, DWR and EPA, is proposed to enable fine-tuning of management programmes.

5.4 AIR QUALITY

5.4.1 General

The impact of the Project on air quality has been assessed in some considerable detail (refer Appendix 4). Negligible impacts are predicted.

Atmospheric dust will be the main component of air emissions from the Project. Other sources of air emissions include exhaust fumes from mobile equipment and fumes from blasting. These emissions will be very minor.

A number of features of the Project will ensure that the mine will produce relatively little dust per tonne of ROM coal compared with the majority of mines in New South Wales. These features include:

- low overburden to coal ratio;
- small area of disturbance at any time.

A range of air quality safeguards will be implemented in the mine CPP and coal handling systems to minimise the generation of atmospheric dust from the Project. These safeguards are based on current control techniques as recommended in New South Wales by the EPA and will be prescribed in the licence to operate to be issued following the approval process.

A full set of dust control practices, as currently employed in New South Wales, will be implemented by the Project as follows:

- regular watering of disturbed surface and access roads;
- minimising topsoil stripping ahead of the prestrip to minimise the area of exposed ground;
- restricting the extent of area exposed to dust generation by wind erosion;
- prevention of truck overloading and the resulting spillage of overburden and coal during loading and hauling;
- drills will be fitted with dust suppression equipment;
- regular maintenance of all haul roads;
- use of water sprays on product coal stockpiles;
- reclaim of product coal using an underground tunnel;
- rehabilitation of disturbed ground will take place at the earliest possible opportunity.

5.4.2 Impact Assessment Methodology

The impact of dust on air quality is assessed by predicting the rate of dust deposition around the mining area and the quantity of finer dust particles which remain suspended in the air (Total Suspended Particles). To calculate these factors the amount of dust generated by the mining activities (Dust Emission) is first calculated and computer modelled along with meteorological data to determine the extent that the dust will be dispersed.

5.4.3 Dust Emissions

Mining plans for Years 2, 7 and 14 were used to model and assess the air quality impacts of the Project. Detailed dust emission inventories were prepared for each specified year using a range of dust emission factors for individual types of mining activities.

Table 5-1 summarises the generation of dust by the Project. The loading and hauling of overburden accounts for the bulk of yearly dust emissions.

Annual variations in the total quantities of overburden moved and the haul distances for both overburden and coal result in total dust generated by the Project ranging from 1210 to 1961 tonnes per year.

Dust emission rates between 0.67 and 1.08 (kg dust/tonne coal) lie within the range which has been established for other coal mines in the Hunter region.

TABLE 5-1
SUMMARY OF PREDICTED DUST EMISSIONS

Operation Year	Amount of Overburden Disposal (Mbcm)	Total Generation of Dust Tonnes /Year	Major Dust Generation Activities (Tonnes/Year)			Emission Rate Dust (kg)
			Loading and Handling Overburden	Loading and Handling Coal	CPP Operations	
2	3.5	1210.46	556.40) (45%	213.13	109.96	0.67
7	5.5	1960.93	1181.29 (60%)	280.93	109.96	1.08
14	5.0	1758.76	955.52 (54%)	314.78	109.96	0.98

5.4.4 Dust Deposition

The predicted rates of dust deposition from Year 7 of the operation (when dust generation is peaking) are shown in Figure 5-1. The contours show that the villages of Stratford and Craven will experience dust deposition rates of <0.2 and 0.25 g/m^2/month respectively. These compare with existing background dust deposition rates which averaged 0.9 (1982) and 0.3 (1994).

The EPA has recently adopted more stringent criteria on dust levels. For residential and rural areas with background dust levels of less than 2.0 g/m^2/month the maximum acceptable increase allowed over existing levels is 2.0 g/m^2/month. Previously up to 4.0 g/m^2/month was allowed regardless of the background level.

The additional dust deposited in the villages of Stratford and Craven as a result of mining is, therefore, predicted to be:

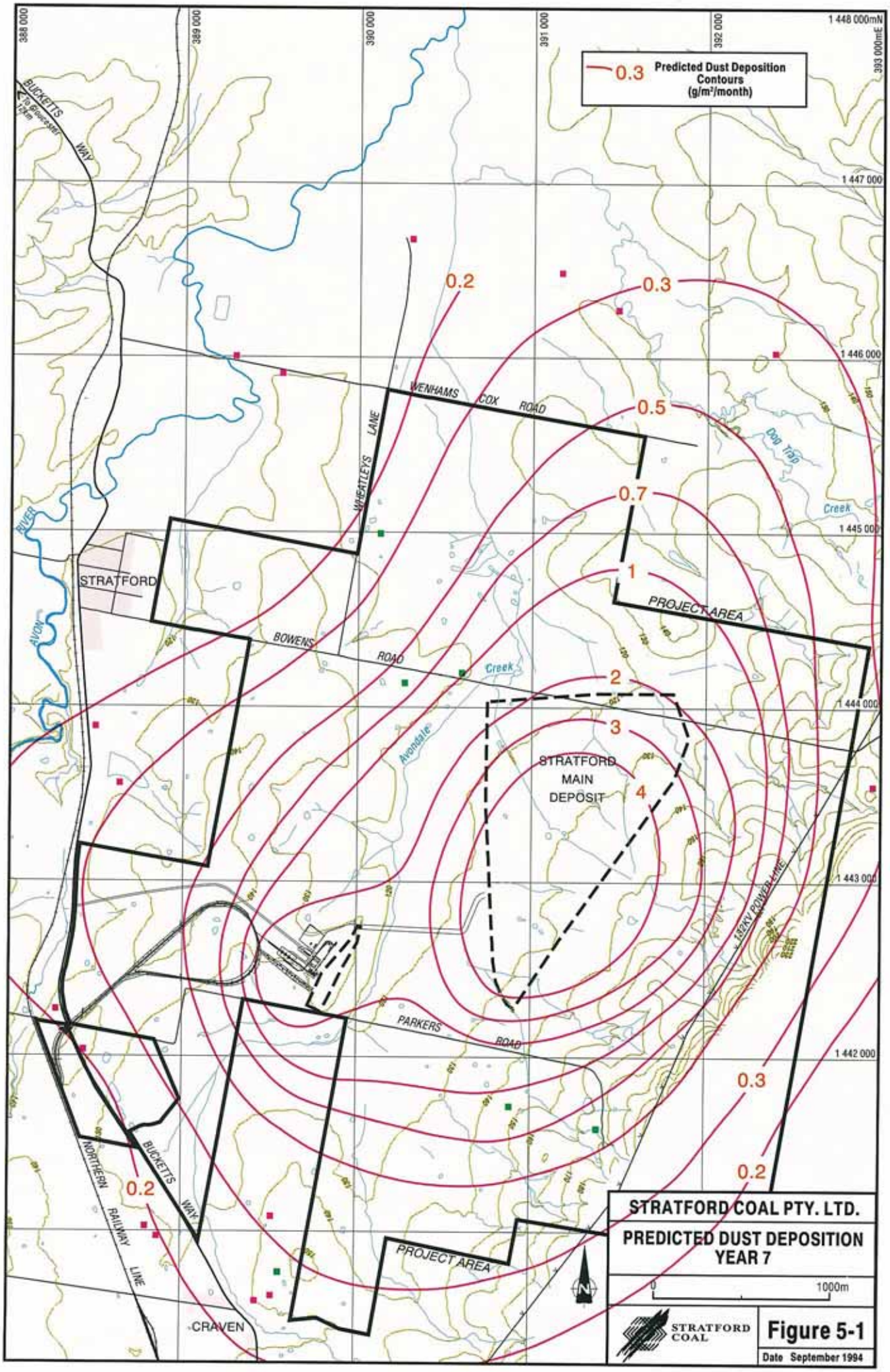
- less than the existing background levels;
- 10 times lower than the new EPA limits.

Dust deposition levels on rural land outside the Project Area are similarly low averaging 0.5 g/m^2/month with only a small area to the north-east receiving up to 1.5 g/m^2/month in the final years of mining. No agricultural activities including beef and dairying farming, pig farming or cropping will be adversely affected by dust deposition.

5.4.5 Total Suspended Particles

Dispersion modelling of total suspended particles (TSP) in the ambient air showed that increases in the mean annual concentrations at locations outside the Project Area will generally be restricted to less than 10 µg/m^3. When added to the existing background concentration of between 20 and 40 µg/m^3 a total mean annual concentration of 40 to 50 µg/m^3 is predicted. At Stratford and Craven the increase in TSP concentration from the mining operation is predicted at be less than 5 µg/m^3 (12 - 25% of existing TSP levels).

The National Health and Medical Research Council (NHMRC) recommend a maximum mean annual concentration of TSP of 90 µg/m^3, approximately twice that of the total (background and increase from mining) mean annual TSP concentration prediction.


0.3 Predicted Dust Deposition Contours (g/m²/month)
388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
To Gloucester 17km
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
AVON RIVER
STRATFORD
PROJECT AREA
BOWENS ROAD
Avondale Creek
STRATFORD MAIN DEPOSIT
132KV POWERLINE
PARKERS ROAD
NORTHERN RAILWAY LINE
CRAVEN
0.2
0.3
0.5
0.7
1
2
3
4
STRATFORD COAL PTY. LTD.
PREDICTED DUST DEPOSITION YEAR 7
0
1000m
STRATFORD COAL
Figure 5-1
Date September 1994

5.5 ACOUSTICS

5.5.1 Noise Impact

The effect of the Project on the acoustic environment has been assessed by Richard Heggie and Associates. The noise impact assessment report is presented in full in Appendix 5. Potential noise impacts are minimal and manageable.

Impact Assessment

The noise impact assessment is based on predictions of future noise levels from the Project operating in realistic worst case conditions. At each stage of the mining development the total noise level from the simultaneous operation of each piece of mining equipment and the coal preparation plant was assessed. This data was modelled along with cross-sections of the terrain topography to derive the maximum noise levels $LA_{(max)}$ at the locations of 5 residences surrounding the proposed mining operation (refer Figure 5-2). These $LA_{(max)}$ levels were calculated for both day time and night time (when there would be reduced vehicle activity) conditions. Experience from monitoring noise emissions from other mine developments shows that the LA_{10} noise level (the level used in EPA guidelines) is up to 10 dBA below the $LA_{(max)}$ level. A conservative reduction of 5 dBA was, therefore, applied to convert the $LA_{(max)}$ levels to LA_{10} levels. The predicted LA_{10} level was then increased by 5 dBA to account for potential occasional noise propagation enhancements due to adverse winds or temperature inversions.

The predicted LA_{10} noise contributions from the mining operations at the 5 residences assessed are shown in Table 5-2. These are compared with the EPA LA_{10} design goals which are established at a level of 5 dBA above the LA_{90} background levels measured at the residences.

With the exception of the Fragley residence (recently constructed with full knowledge of the proposed development) the predicted noise levels at all residences are within the EPA design goals.

All residences in the villages of Stratford and Craven are within the design goal by at least 4 dBA (less than half the allowed noise) both day and night even in adverse weather conditions.

Product coal will be transported to port by rail, mainly in campaigns of 30,000 to 60,000 tonnes (per ship load). There will probably be around 25 to 35 campaigns each involving 3-4 trains per day over a period of 4-5 days. On a yearly basis, there may be a total of around 330 trains - 660 train movements - entering and leaving the rail loop.

The noise levels of rail traffic is predicted at 49 dBA (LA_{eq} 24 hour) and 71 dBA $LA_{(max)}$, well below

TABLE 5-2
PREDICTED NOISE IMPACTS AT LOCAL RESIDENCES

Location (Residence)	Predicted LA_{10} (dBA) Noise Contribution				LA_{10} Design Goal (dBA)			
	Day-time		Night-time		Day-time		Night-time	
	Normal Weather	Adverse Weather	Normal Weather	Adverse Weather	Weekday	Saturday	Weekday	Saturday
Perrin	31	36	28	33	38	39	33	33
Craven	25	30	24	29	38	38	33	33
Isaac	24	29	24	29	37	38	33	33
Stratford	24	29	24	29	37	37	33	33
Fragley	35	40	34	39	36	35	33	33

the EPA recommended criteria of 60 dBA (LA_{eq} 24 hour) and 85 dBA $LA_{(max)}$ respectively. These noise levels are predicted at the nearest residence likely to be effected by the Project.

5.5.2 Blasting Impact

Richard Heggie and Associates undertook the blasting assessment study. The full blasting assessment report is presented in Appendix 5.

Blasting Impact

Blasting to be carried out during the mining operation will be of a relatively small scale and low frequency (i.e. 2 to 3 blasts per week carried out during daytime).

The largest explosive charges (172 kg of ANFO) will be associated with overburden blasting operations and smaller charges of 62 kg of ANFO for partings and interburden.

Measures that will be employed to reduce any potential impacts of blasting include:

- designing the blast to minimise the maximum instantaneous charge while achieving the desired degree of fragmentation;
- keeping strict control of drill hole spacing and orientation;
- proper stemming of holes and the use of Nonel initiation to reduce air overpressure.

The impact of blasting can be felt as ground vibration and noise (air-blast). These impacts have been predicted from Australian Standard formulae based on distance attenuation at a number of residences surrounding the Project Area (refer Figure 5-3 and Appendix 5).

The EPA's general human comfort level is set at 5 mm/sec ground vibration and 115 dBA airblast. The predicted levels of ground vibration and airblast at all the residences assessed are comfortably within these limits. At Stratford and Craven the ground vibration is predicted to be 20 times below the EPA limits and the airblast 10 - 13 dBA (approximately 4 times) below the EPA limits.

5.6 TRANSPORT

The noise aspects of the proposed development are discussed in Section 5.5 and in more detail in Appendix 5. Traffic impact is discussed below.

5.6.1 Mine Traffic Aspects

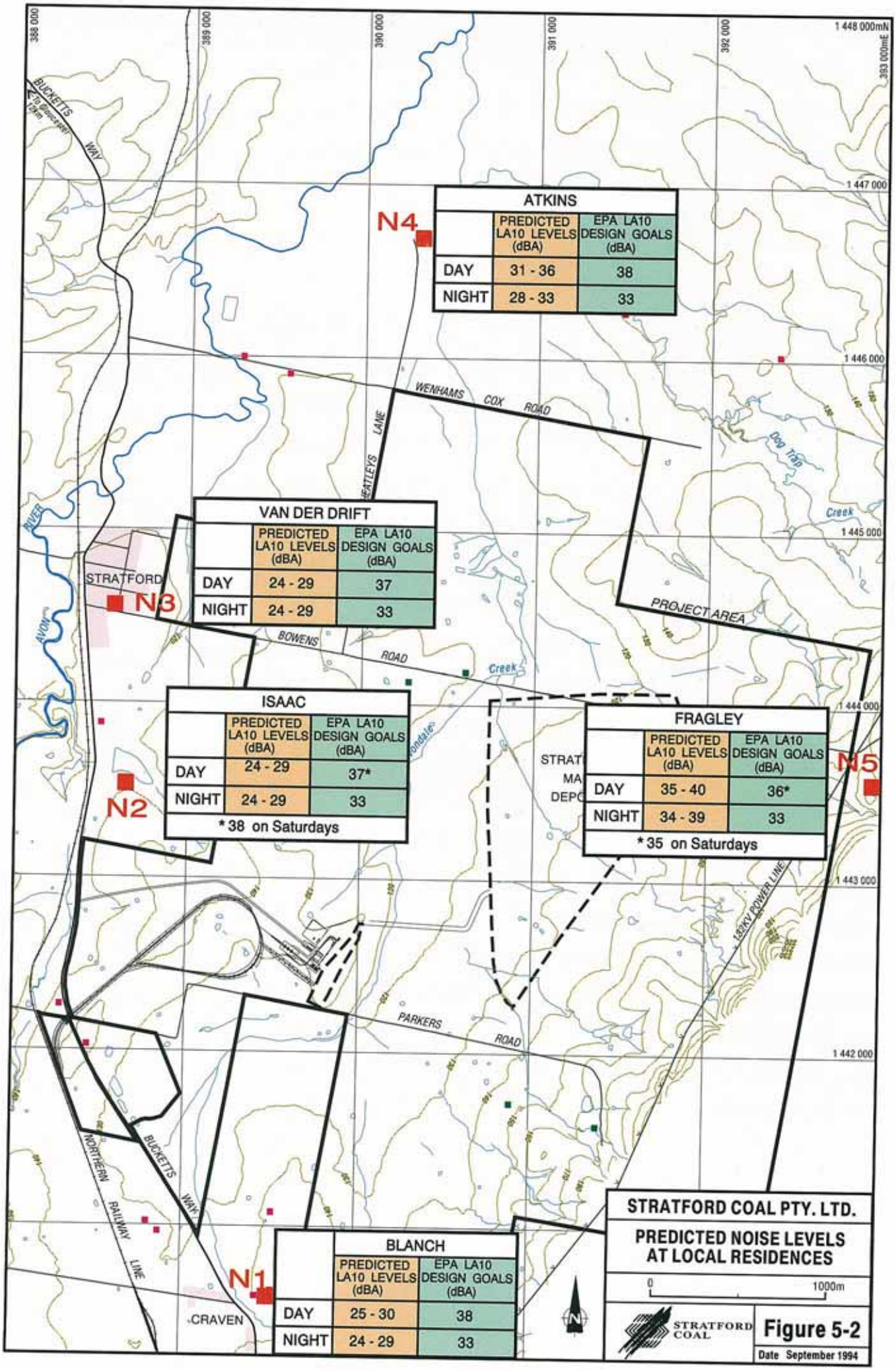
It is assumed that the Project will generate approximately 25 to 30 car trips to the site per shift. Some of the workforce is expected to commute from the rural areas of Gloucester, whilst some long distance commuters may commute from urban and rural areas in nearby Shires. Gloucester township will accommodate a proportion of the workforce. Shift workers in the New South Wales coal industry tend to operate car pools; a ratio of 1 car to every 2 - 3 workers is typical.

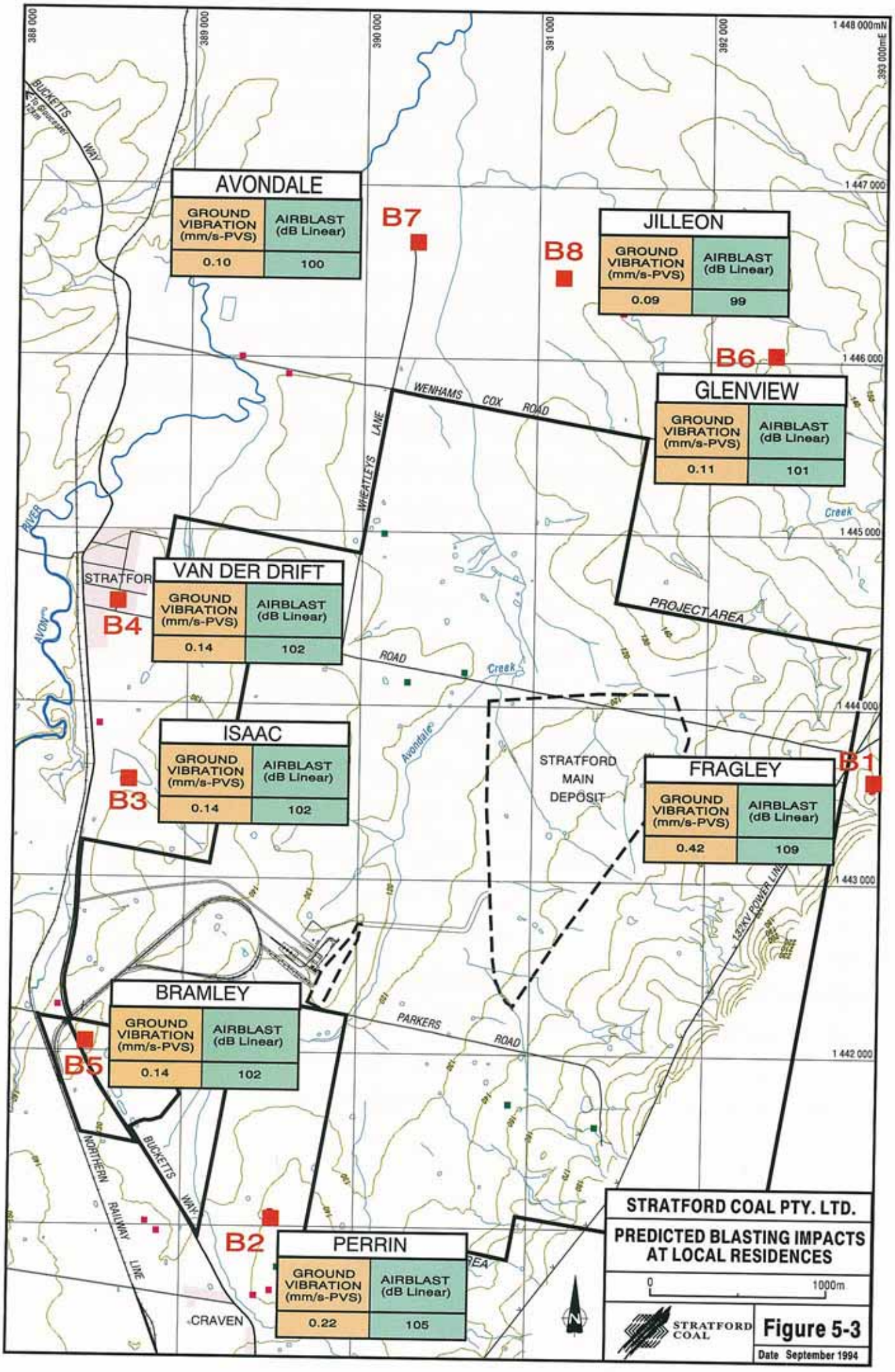
Commercial and industrial traffic generated by the mine is expected to be approximately 10 to 15 vehicle trips per day. This traffic is likely to be sporadic and continue over the normal working day, between 8 am - 5 pm.

It is planned to transport all commercial shipments of coal to Newcastle by rail. Coal product will be stored adjacent to the coal loading bin and CPP.

5.6.2 Road Aspects

Vehicular access to the site will be provided by a new road connecting Bucketts Way with the infrastructure


388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
To Gloucester 13km
WENHAMS COX ROAD
HEATLEYS LANE
Dog Trap Creek
PROJECT AREA
BOWENS ROAD
Creek
RIVER
AVON
STRATFORD
N1
N2
N3
N4
N5
ATKINS
PREDICTED LA10 LEVELS (dBA)
EPA LA10 DESIGN GOALS (dBA)
DAY 31 - 36 38
NIGHT 28 - 33 33
VAN DER DRIFT
PREDICTED LA10 LEVELS (dBA)
EPA LA10 DESIGN GOALS (dBA)
DAY 24 - 29 37
NIGHT 24 - 29 33
ISAAC
PREDICTED LA10 LEVELS (dBA)
EPA LA10 DESIGN GOALS (dBA)
DAY 24 - 29 37*
NIGHT 24 - 29 33
*38 on Saturdays
FRAGLEY
PREDICTED LA10 LEVELS (dBA)
EPA LA10 DESIGN GOALS (dBA)
DAY 35 - 40 36*
NIGHT 34 - 39 33
*35 on Saturdays
BLANCH
PREDICTED LA10 LEVELS (dBA)
EPA LA10 DESIGN GOALS (dBA)
DAY 25 - 30 38
NIGHT 24 - 29 33
PARKERS ROAD
132KV POWER LINE
NORTHERN RAILWAY LINE
CRAVEN
STRATFORD COAL PTY. LTD.
PREDICTED NOISE LEVELS AT LOCAL RESIDENCES
0
1000m
STRATFORD COAL
Figure 5-2
Date September 1994


AVONDALE
GROUND VIBRATION (mm/s-PVS) 0.10
AIRBLAST (dB Linear) 100
B7
JILLEON
GROUND VIBRATION (mm/s-PVS) 0.09
AIRBLAST (dB Linear) 99
B8
B6
GLENVIEW
GROUND VIBRATION (mm/s-PVS) 0.11
AIRBLAST (dB Linear) 101
VAN DER DRIFT
GROUND VIBRATION (mm/s-PVS) 0.14
AIRBLAST (dB Linear) 102
B4
ISAAC
GROUND VIBRATION (mm/s-PVS) 0.14
AIRBLAST (dB Linear) 102
B3
FRAGLEY
GROUND VIBRATION (mm/s-PVS) 0.42
AIRBLAST (dB Linear) 109
B1
BRAMLEY
GROUND VIBRATION (mm/s-PVS) 0.14
AIRBLAST (dB Linear) 102
B5
PERRIN
GROUND VIBRATION (mm/s-PVS) 0.22
AIRBLAST (dB Linear) 105
B2
STRATFORD MAIN DEPOSIT
PROJECT AREA
WENHAMS COX ROAD
WHEATLEYS LANE
PARKERS ROAD
BUCKETTS WAY
NORTHERN RAILWAY LINE
CRAVEN
132KV POWER LINE
Avondale Creek
388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
STRATFORD COAL PTY. LTD.
PREDICTED BLASTING IMPACTS AT LOCAL RESIDENCES
0
1000m
STRATFORD COAL
Figure 5-3
Date September 1994

area. The capacity of Bucketts Way as a main road is adequate to cater for the relatively small number of additional vehicles generated by the project. The intersection of the access road with Bucketts Way is in an area of good visibility and will include acceleration, deceleration and turning lanes.

The existing traffic volumes on Bucketts Way in the vicinity of the Project Area are relatively low (between 1000 to 1320 AADT). The predicted incremental increase in the traffic volumes of approximately 15% is well within the capacity of the existing road.

The impact on the minor roads adjacent to the Project Area will be a reduction in traffic volumes. At present, the main access to the site is via Bowens Road but this will cease as soon as the site access road from Bucketts Way is completed early in the construction programme.

5.7 VISUAL IMPACT

The visual impact assessment for the Project has been carried out by Dewsnap Landscape Design and is presented in Appendix 7. The report includes an assessment of the visual impact of the proposed mine facilities, opencut area and infrastructure and recommends measures to ameliorate any the impacts. The report concludes that the visual impact of the Project will be minimal providing remedial measures (tree planting) are implemented.

The greater Gloucester area and its surroundings, including the Stratford and Craven villages, have been identified by the National Trust of Australia as man-modified landscapes of particular merit. Areas such as these require care and management when new developments are proposed. The development of the Project within an undulating valley adjacent to the Bucketts Way and surrounded by agricultural activity is fortunate in that direct views are minimal.

The majority of surrounding residences to the Project Area are buffered by low ridgelines and groves of mature vegetation. Properties which are directly affected by the Project have all been acquired by SCPL. Some minor remedial measures for other properties or view sheds are outlined below.

Remedial measures have been proposed to limit views from the Bucketts Way and from Wenham Cox Road and adjoining landholders (refer Figure 5-4).

Implementation of further tree planting programmes are to be undertaken and these, allied with proposed bunding wall measures, will alleviate visual impact for visitors and the local community.

Visual mitigation measures can be divided into two categories:

(i) Point source measures - screening and earth bunding at the closest point to the proposed Project activity i.e. the source of visual impact.

(ii) Viewer position measures - located close to the viewer i.e. adjacent to residences or along travel routes.

Several treatments will be adopted:

- forward tree planting;
- massed tree planting;
- earthworks and bunding;
- amenity and specimen planting.

The early establishment of tree planting is proposed in the Project Area to ensure an effective tree screen is provided at the identified (minor) locations.

Bunding proposed around the CPP and the infrastructure will be constructed as an extension of the existing land surface and be undulating in form. Bund slopes will vary and drainage lines meander rather than conform to strict angular lines.

Revegetation programmes on the bunds will replicate existing vegetation patterns and species e.g. denser growth along drainage lines, more scattered groves of trees along ridges and slopes. Southern slopes of the bund adjacent to Parkers Road will be given emphasis with tree planting as will the western slopes of the perimeter bund wall adjacent to the CPP. Additional tree planting will be undertaken within the existing groves established in two locations adjacent to Bucketts Way.

Proposed species are:

Shrubs

Acacia cardiophylla	Wyalong Wattle
Banksia spinulosa	Honeysuckle
Callistemon linearis	Narrow-leaved Bottlebrush
Callistemon salignus	Pinktip Bottlebrush
Leptospermum petersonii	Lemon-scented Tea Tree

Trees

Acacia phycnantha	Golden Wattle
Eucalyptus crenulata	Buxton Silver Gum
Eucalyptus scoparia	Willow Gum
Casuarina cristata	Belah
Melaleuca bracteata	White Cloud Tree

Subject to the landholders request, a forward plant grove will be undertaken along Wenham Cox Lane and Wheatleys Lane intersection to screen the minor, intermittent views to the proposed mine site possible from "Avondale" (Atkins residence). Planting along Wenham Cox Lane will extend from the road intersection to the existing vegetation occurring on the knoll opposite Griffin residence. The Wheatley Lane planting will extend for 200 m south at a width of 10 m.

Lighting Mitigation Measures

The need for lighting mitigation on the Project is expected to be very minor given the natural shielding effect of the topography surrounding the Project Area.

Lighting fixtures throughout the CPP and industrial area are to be served by directional lighting only i.e. oriented to a particular area and shields attached to restrict emission of long-range rays.

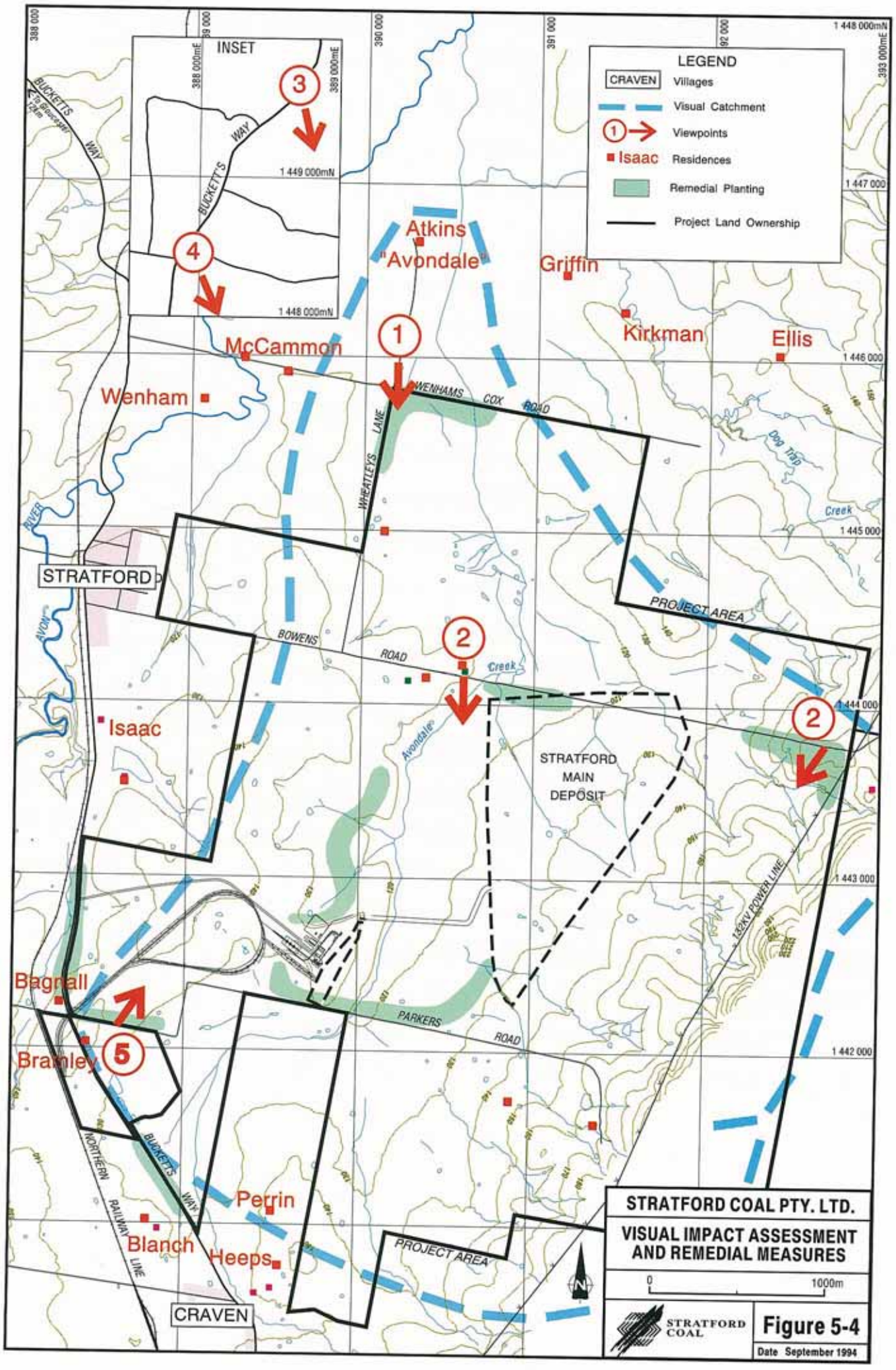
Forward tree planting and bund wall construction will further minimise any impacts of the overhead lighting on surrounding areas. The two closest residences to the industrial area are limited from direct views by low ridgelines and existing vegetation. Interior bund walls around the industrial area will minimise the impact further.

In the unlikely event that lighting issues do occur, the following engineering and operational ameliorative measures would be investigated:

- Use of low brightness lights in selected areas (e.g. workshop).
- Minimisation of the use of translucent panels for buildings in the CPP area.
- Use of blinds and louvre shielding to reduce light emissions from selected locations (e.g. offices, car park).
- Use of dipped head lamps on haul trucks.

Monitoring of mine lighting from selected viewpoints outside of the Project Area would be carried out to assess lighting impacts during Project construction and operation.

SEE INSET FOR ADJOINING INFORMATION



5.8 FLORA AND FAUNA

Although the majority of the Project Area is already cleared, care has been taken by the SCPL to integrate the Project with existing remnant tree stands. In addition, a commitment has been made by the SCPL to conduct and design regular management plans for fauna and flora, in consultation with NPWS.

The existing overall "low significance" status of Project Area is a result of modification by grazing animals and land clearing. A detailed management plan for the further assessment of presence and, if necessary, management of any Schedule 12 species of fauna (notably bats) to minimise impact on these populations by the Project has been devised in consultation with NPWS in August 1994. These plans incorporate the following:

(i) Evaluation of existing trees for potential as diurnal roosts for bat species. Those mature trees identified will be marked, their position accurately fixed and particulars such as species and size noted. This will be undertaken September /October 1994.

(ii) A further survey will be undertaken in the summer months targeting tree-roosting endangered bat species. Any individuals captured will be fitted with transmitters for tracking back to roost sites, and the position of these roosts, their type and size noted.

(iii) Roosts of any endangered bat species determined by (ii) will be observed to record bats leaving and if feasible individuals will be captured on exit of roosts at dusk for relocation to suitable roosts outside the area to be affected. Removal of those scattered potential roost trees in the mine development area identified in (i) will take place under the supervision of the bat fauna specialist. Any further bats recovered will also be relocated to potential roosts outside the area to be directly affected by the Project.

(iv) Loss of foraging habitat due to clearance prior to mining will be offset by the planting of currently cleared areas (refer Figures 4-3 and 5-5) to form corridors to link remnants on the Project Area not cleared during mining with larger areas of natural vegetation to the east of the Project Area.

Whilst these vegetated corridors will not provide roosts for most species in the short term (most eucalyptus do not develop hollows for at least 100 years), they should provide foraging habitat for many species in the shorter term.

These vegetated corridors are to be planted with suitable tree species currently occurring on the Project Area from seed material collected from individuals on site. They are to be fenced to exclude stock to promote growth and to encourage development of an understorey. Where these corridors do not interfere with proposed activities they are to be established prior to or early in the Project life.

(v) Monitoring of bat populations will be undertaken to confirm the continued presence of bats in remnants on the Project Area and to establish the usage of corridors by various bat species. Fixed monitoring points to be established along corridors and in existing remnants to monitor changes in bat populations during the establishment of corridors.

The above actions should assist in firstly confirming the presence of any endangered tree-roosting bat species on the Project Area, minimising impact on these populations from proposed mining activities and in the longer term provide an enhanced degree of both foraging and roosting habitat on the site.

Habitat for native fauna will be encouraged through planting of a greater number of trees then presently exist on the Project Area. Two Schedule 12 fauna species have been recorded foraging on the Project Area and 2 to 4 more may occur. However, given their likely habitat and transitory use of site, no significant impacts on species habitat or numbers are expected.

One such species, the Squirrel Glider (*Petaurus norfolcenis*) was identified in remnant vegetation along a track adjacent to Parker's Road. The proposed mine haul road to be located in this area will be designed to minimise impact on this potential habitat. Detailed consultation with NPWS and a fauna specialist on these issues has taken place.

The flora shows relatively low diversity and lack of structural variation. The area of vegetation removed at any one time would be limited as vegetation removal and soil stripping would take place 100 m ahead of the advancing mine face.

Disturbed areas will be revegetated as quickly as possible using techniques described in Section 4.10. The rehabilitation strategy will be designed to return land to the current capability or better and to provide greater tree cover.

Increased tree cover will provide functional windbreaks and woodlots for stock shelters, wildlife corridors/habitats (refer Figure 5-5), and will improve the overall appearance of the land. Endemic tree species will be utilised to rehabilitate land. Seeds will be collected from trees prior to vegetation clearance for use in revegetation.

The vegetation associations present on the Project Area are well represented elsewhere in the Gloucester Valley. The Project Area is typical of the highly modified ecosystem of the rural agricultural areas which support a relatively diverse avian fauna and a rather less diverse population of ground dwelling species.

The Project will not destroy any unique ecosystems or habitats of conservation value and rehabilitation proposals will increase habitat diversity and value.

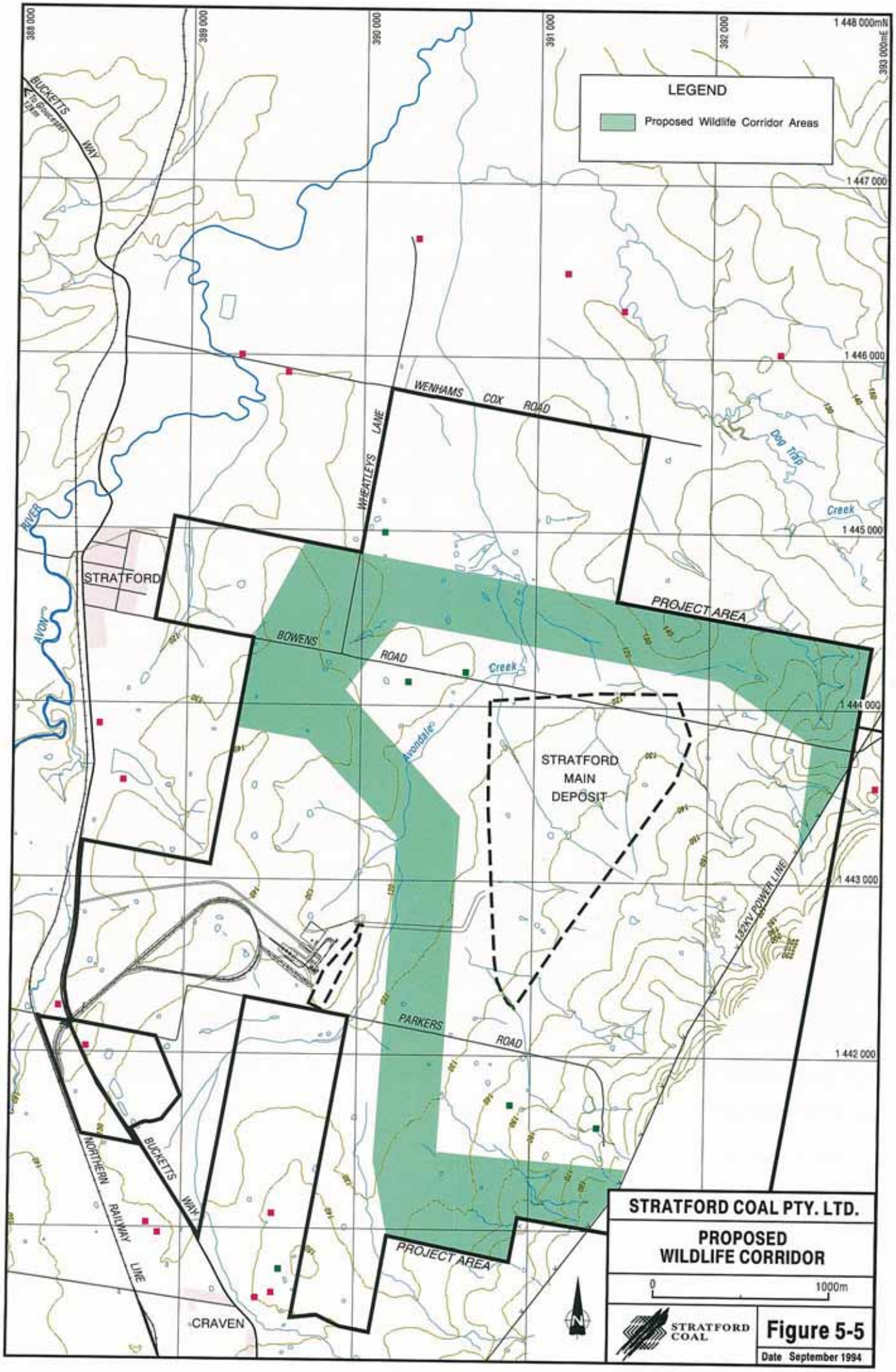
The impact of the proposal has been assessed in terms of the Endangered Fauna (Interim Protection) Act 1991 (Appendix 8.2). This assessment concludes that there will be no significant adverse effects on the survival of protected fauna. The planned rehabilitation works will result in a more extensive wildlife habitat than presently exists. Further pre-EIS studies, including a Fauna Impact Study, are therefore not considered to be warranted.

5.9 ARCHAEOLOGY

5.9.1 Aboriginal Heritage

An isolated artefact was identified in a 1984 survey of the Project Area by Dr Helen Brayshaw and is discussed in Section 2.9.1 and in more detail in Appendix 9.1.

The artefact site is not located within an area which will be disturbed by either the construction or operation of the Project. A study carried out by the relevant Aboriginal authorities; the Karuah Local Aboriginal Land Council and the Kow-Inha Regional Aboriginal Sites Protection Committee recommended that the Project should "proceed without impediment", conditional on ameliorative measures being put into place should further artefacts be unearthed.


LEGEND
Proposed Wildlife Corridor Areas
388 000
389 000
390 000
391 000
392 000
393 000mE
1 448 000mN
1 447 000
1 446 000
1 445 000
1 444 000
1 443 000
1 442 000
BUCKETTS WAY
WENHAMS COX ROAD
WHEATLEYS LANE
Dog Trap Creek
RIVER AVON
STRATFORD
PROJECT AREA
BOWENS ROAD
Creek
Avondale
STRATFORD MAIN DEPOSIT
132KV POWER LINE
PARKERS ROAD
NORTHERN RAILWAY LINE
BUCKETTS WAY
PROJECT AREA
CRAVEN
N
STRATFORD COAL PTY. LTD.
PROPOSED WILDLIFE CORRIDOR
0
1000m
STRATFORD COAL
Figure 5-5
Date September 1994

The Karuah Local Aboriginal Land Council and Dr Brayshaw carried out further investigations in August 1994 to update the earlier studies. The Karuah Local Aboriginal Land Council raised no objection to the development of the Project subject to any artefacts found during mining operations being returned to the Council. SCPL is pleased to comply with this request.

Dr Brayshaw identified an additional two artefacts towards the west, and recommended limited sub-surface investigations in that area only. NPWS inspected the Project Area on 26 August 1994 and advised that no further sampling would be warranted. Dr Brayshaw and the Karuah Local Aboriginal Land Council's 1994 reports are contained in Appendix 9.1A. The locations of the sites are indicated in Appendix 9.1A.

An ongoing management plan for aboriginal heritage has been designed in consultation with NPWS following their site inspection on 26 August 1994. This will involve some inspection of pre-strip areas, and avoidance of the two isolated artefact sites where possible.

5.9.2 European Heritage

There are no European heritage items located within the Project Area or adjacent (refer Appendix 9.2). The closest items are located in Gloucester township, 15 kms to the north of the Project Area. There will be nil impact on these heritage items.

5.10 SOCIO-ECONOMICS

5.10.1 Employment

The construction workforce for the Project will vary over the 6 month construction period and peak at approximately 100. This workforce is expected to be largely drawn from specialist workforces in the existing Newcastle and Hunter Valley coal mining construction industry with some drawn from the local community.

The operational workforce is expected to remain constant over the Project life of the mine at approximately 75. This workforce is expected to be drawn from a mixture of existing Newcastle and Hunter Valley mining areas and from local areas. The majority of the permanent workforce are expected to live locally.

The flow-on employment effects are expected to stimulate approximately 150 additional positions in the mine service areas of Maitland and Singleton and in the service and maintenance industry of the nearest town of Gloucester. This anticipated flow-on employment effect has been calculated based on similar mining projects providing 2 flow-on positions in the local/regional workforce for every 1 permanent mine employee.

The NSW Coal Association advises that the flow-on effects of mining operations in the Hunter Valley range between 1:1 and 3:1. The influential criteria in determining this flow-on relate to the state of the local/regional economy, the proximity to larger urban centres, the range of services already available, unemployment levels and the employability of the labour force.

The figure of 2:1 stated above is a relatively conservative figure. The Coal Association advises that in a community with high unemployment (especially in the unskilled or semi-skilled and service sectors), no history of mining and a narrowly focussed economy, the flow-on effects are more likely to trend towards the higher end of the scale.

Education and Training

The Project will introduce a range of professions and skills to which people in the Gloucester region are not commonly exposed. These include:

- environmental engineering
- mining engineering
- geology
- metallurgy

Demands for local maintenance and support services will also enhance the opportunities for young people to enter professions and trades which support mining such as surveying, diesel engineering, light vehicle maintenance, steel fabrication and electrical trades.

SCPL intends to work closely with regional authorities to maximise the education, training and employment opportunities generated by the Project. As part of its Community Contributions Plan, SCPL intends to provide financial support for the education and training of young people in the professions and trades which are directly related to mining. The aim of this programme is to enhance local education and training opportunities and to enhance the availability of skilled people for the Project.

5.10.2 Education, Housing and Health

It is likely that between 30 and 50 employees and their families will migrate to the Gloucester Shire during the operational phase of the Project. Assuming that approximately half the employees are married with children, a likely increase to the Shire's population is approximately 80 persons, 40 of which are children.

The current supply of rental accommodation in the Gloucester Shire is limited, however, there is a sufficient supply of land suitably zoned for residential development in Gloucester township, the rural villages and rural areas of the Shire to cater for the number of employees (and their families) expected to migrate to the Shire. It is difficult to predict precisely future housing options for expected employees but on the basis of similar studies and projects it is expected that housing demand is likely to be apportioned equally between the Gloucester township, the rural villages and the rural areas.

Due to a period of migration out of the Gloucester Shire in the 1981 to 1986 intercensal period, and the subsequent modest proportional increase in overall population numbers, the education and health facilities in the Gloucester Shire currently have spare capacity. Indeed, in recent years a number of small rural schools have closed due to declining enrolments i.e. Bundock, Craven and Waukivory.

5.10.3 Economic Aspects

Economic Benefits

Construction of the mine, CPP, coal handling, rail loading and rail loop will require a capital investment of around $28 million during 1995. A significant proportion of this investment will flow into the local economy through payments to construction workers, local contractors and suppliers.

From late 1995, the Project will expend around $20 million per year in mining, processing and handling product coal onto rail at the site. A further $15 million per year will be expended to transport the coal to the port of Newcastle and load it onto ships.

There will also be significant flow-on economic activity generated by the Project in service industries within the local economy. The economic significance of the Project may be judged by considering that the total agricultural economy of Gloucester Shire generates around $20 million per year.

In addition to the direct economic benefits to the Gloucester region, the NSW Government will receive substantial income from the Project via royalties ($2.2 million per year), rail freight payments and various taxes.

On the broadest level, the Project will generate around $55 million per year in export revenue to assist Australia's trade balance.

At the local level, SCPL is proposing the establishment of a local community support programme for the villages of Stratford and Craven as part of its Community Contributions Plan.

5.10.4 Community Contributions Plan

SCPL is proposing a Community Contributions Plan which is aimed at meeting SCPL's obligations to Gloucester Shire as a developer while also providing ongoing benefits from the Project in the areas of education, training and support for the local communities of Stratford and Craven. The proposed Plan has three components:

- Developer Contribution
- Education and Training Support
- Local Community Support

The **Developer Contribution** (in lieu of S.94 contributions) will consist of a capital contribution to Gloucester Shire for the augmentation of Shire services and facilities, based on the number of new residents expected in the Shire as a result of the Project.

The **Education and Training Support** programme will provide ongoing financial support for the education and training of young people in the professions and trades which are directly related to mining. The aim of this programme is to enhance local education and training opportunities and to enhance the availability of skilled people for the Project.

The **Local Community Support** programme will provide ongoing financial support for the augmentation of local community facilities in the villages of Stratford and Craven. This programme is designed to provide direct economic benefits to the communities in the immediate vicinity of the Project, in addition to the general flow-on of regional benefits.

5.11 SUMMARY OF ENVIRONMENTAL IMPACTS

The impact of the Project on the different areas around the Project Area are summarised from information presented in Section 5.0 and the EIS Appendices.

5.11.1 Impact on Adjacent Rural Properties and the Rural Villages of Stratford and Craven

The physical impacts of dust, noise and blasting in the villages of Stratford and Craven will be minimal.

In the case of noise the predicted increases in day and night noise levels are 2 to 3 times below the recommended EPA limit.

In the case of dust and blasting, the predicted impacts are approximately 10 times lower than the recommended EPA limits.

The Project Area is located in a shallow valley and is not visible from the majority of adjoining properties and from most of Bucketts Way. The visual impact from a limited area to the south west for traffic along Bucketts Way is low, except at night when an intermittent view of the lit CPP and mine workings will be seen.

A considerable increase in day time traffic volumes will be noticed during the construction phase, but this will be of limited duration of around 6 months. The overall increase in traffic volume on Bucketts Way during the Project is expected to be some 15% above existing levels. This will be predominantly cars and light vehicles.

The positive economic effects of the Project are likely to be for food and service commodities in Stratford and Craven.

The established service station and general store at Stratford would be expected to benefit.

5.11.2 Impact on Gloucester Township

The impacts on the town of Gloucester are primarily economic and employment based, and are expected to be beneficial in direct and indirect effects. The direct impacts relate to the introduction of economic benefits into the local economy from construction and operation of the Project.

In addition, the indirect impacts will include the bolstering of the existing maintenance and service industry located at Gloucester. The disposable income of the workforce attracted by the Project is likely to be expended primarily in the town of Gloucester, for entertainment, food and household items.

The Project will not strain the capacity of existing services or facilities in Gloucester. There is adequate supply of land for residential purposes which is appropriately zoned with access to urban services.

There will be no adverse environmental impacts on the town of Gloucester due to its distance from the Project.

5.11.3 Conclusion

Based on the information in the EIS, the following conclusions can be drawn regarding the impact of the Project on the surrounding environment.

- The Project is a relatively small and discrete mining Project designed on a low impact, minimal disturbance philosophy to minimise any adverse impacts to the local community and to optimise Project economics.
- All standards for dust, noise and vibration are well below EPA standards.
- The Project is likely to produce relatively small increases in traffic volumes.
- The impacts on Aboriginal Heritage is not considered to be of significance by the Karuah Local Aboriginal Land Council. Any artefacts found on site are to be reserved for the Land Council's cultural purposes.
- There are no anticipated impacts on the European Heritage items located primarily in the township of Gloucester.
- The additional workforce generated by the Project is within the existing capacities of the rural areas, villages and Gloucester township to accommodate with respect to requirements for housing, educational, medical and recreational facilities and services.
- The Project is anticipated to have a significant positive impact on direct and indirect employment opportunities in the Shire.
- The Project will have a significant positive impact on the local, regional and state economics.

6.0 ALTERNATIVES TO THE DEVELOPMENT

6.1 ALTERNATIVES TO THE DEVELOPMENT PROPOSAL

The Environmental Planning and Assessment Act requires that a proponent consider feasible alternatives for any of the major components of a development and to state reasons for adopting the preferred alternative.

The alternatives considered and discussed below include:

- The scale of the Project.
- The mining method and equipment used.
- The mine layout.
- The coal preparation process.
- The location of the CPP and Infrastructure.
- The transportation systems.

Project Scale

The scale of the Project has been carefully planned to an optimal level whereby the development is large enough to be economically viable yet small enough to have easily managed environmental impacts. Coal is a low margin commodity which typically has to be produced in large volumes to be viable. This is even more so in the case of a new development requiring significant capital expenditure before production can commence.

The only way that a significantly smaller scale mine could be viable would be to avoid the CPP and rail loop construction costs and truck raw coal to a Hunter Valley CPP. This alternative was considered to be unlikely to be acceptable to the Shire and local community.

A larger scale Project is not suitable for the coal resources available. It would create larger physical environmental impacts and would deplete the resource in a time-frame that would produce unsatisfactory socio-economic effects.

Mining Methods and Equipment

The truck/shovel haulback method is the only viable method to mine the Stratford Main Deposit and also minimises the environmental impact. Underground mining would be unsafe because of very poor roof conditions and would only allow a small fraction of the coal resource to be recovered. The geometry of the Main Deposit would not enable a dragline to be used efficiently.

The proposed mining equipment is in the mid size range and is typical of that used by contract mining

companies. Smaller mining equipment has higher operating costs and larger equipment would be inappropriate for the geometry and size of the resource.

Mine Layout

The mine layout was chosen:

- to minimise interruption or alteration to the existing hydrological and hydrogeological systems and balances;
- to avoid placement of facilities or components of the mine plan in low lying or flood prone areas;
- to avoid disturbance to the existing vegetation and/or fauna habitats;
- to avoid disturbance to the current visual amenity of adjoining landowners, tourists or users of Bucketts Way.

CPP Process

The raw ash content of Stratford coal is relatively high, averaging 25%, and must, therefore, be reduced by washing before the coal can be sold into export markets. The washability characteristics of the coal dictate that a dense-media/spirals plant is required. Alternative plant process would result in lower washing yields and/or inferior economics and would have no environmental benefits.

Co-disposal of CPP reject material has been selected in preference to conventional tailings disposal because of the environmental benefits of rapid rehabilitation.

Location of the CPP and Infrastructure

The location of the CPP and infrastructure area was chosen:

- to avoid location over the coal reserves;
- to minimise the gradient between the rail loop and the existing railway line and subsequent noise impacts for neighbouring properties;
- to be a flood free location for major infrastructure and buildings;
- to avoid visual intrusion for neighbouring properties and traffic on the Bucketts Way.

Alternative locations for the CPP and industrial area were considered but due to the space requirements of these facilities, the need for close proximity to the Stratford Main Deposit, the environmental constraints of the Project Area, and the boundaries of the site, the proposed location was considered the most appropriate.

Transportation Systems

Road transportation of coal to Newcastle is competitive with rail in operating costs and would enable large savings in capital expenditure to be made. However it was considered that road transport would be likely to have significant noise, dust and safety impacts on the regional traffic network.

The high volume of trucks required to transport the coal product to Newcastle would distribute those impacts along Bucketts Way and through a number of rural villages, before connecting with the Pacific Highway. Accordingly, rail transport of coal product was considered to be the most appropriate transport mode.

The location of the rail loop and loading facilities were chosen:

- to provide efficient access to the main Northern Rail Line and the CPP;
- to provide a safe and efficient means of transporting coal product to the Port of Newcastle;
- to minimise the environment impact of dust, noise and visual issues to adjoining properties and the local community.

The access road to the Project Area is located west of the CPP in the shortest possible connection to Bucketts Way. It also provides access to the site with long distance sight lines and relatively flat cross sections at the intersection with Bucketts Way.

Alternatives were considered via the existing rural roads; Bowens Road and/or Parkers Road. However, it was considered that the existing rural roads in the local area were not adequate for the predicted traffic and would require substantial upgrading, and that the intrusion of commercial traffic into a rural road network would have significant impacts on road users and properties adjacent to those roads.

The location of the access road was chosen:

- to provide a direct access point to the CPP and infrastructure area;
- to minimise the use of adjacent rural roads and the likely conflict with rural road users;
- to provided adequate sight lines and decelerating/accelerating and turning lanes at its intersection with Bucketts Way;
- to avoid traffic conflict at the village of Stratford via Bowens Road intersection;
- to avoid safety concerns at Parkers Road intersection (short sight distances and intersection at crest of hill).

6.2 CONSEQUENCES OF NOT PROCEEDING

The Environmental Planning and Assessment Act requires that a proponent presents the consequences of not proceeding with the development.

If the Project does not proceed:

- 100 construction phase and 75 operational phase direct job opportunities, along with some 150 flow-on (indirect) job opportunities a significant number of which will be in the Gloucester region, will not be created;
- $750 million of export income will not be created;
- the major boost to the regional economy arising from direct and indirect income derived from the Project will not occur;
- $120 million of State and Federal government taxes and royalties will not be generated;
- the economic opportunity of developing a high quality coal resource which is viable and in demand for export will be not be realised;
- the undeveloped coal resource and expectation of its future development will continue to create uncertainties for the rural development of the area;
- the freehold land will remain a low quality cattle grazing property.

7.0 REFERENCES

Australian Bureau of Statistics (1993)
Basic Community Profiles,
ABS Catalogue No. 2722.1 Muswellbrook, Merriwa, Murrurundi, Singleton LGAS.

ANZECC (1992)
"Australian Water Quality Guidelines for Fresh and MarineWaters".

Australian and New Zealand Environment and Conservation Council, November.

Dames and Moore (1981 - 1984)
Numerous Internal and Draft EIS Reports produced for BMI Mining Ltd.

Golder Associates (1981)
Geotechnical Investigations for Open Cut Mining,Stratford Area (2 Vols).

Report to BMI Mining Ltd, October.

Golder Associates (1982)
"Gloucester Coal Project Groundwater Investigations for Open Cut Mining - Stratford".

Report to BMI Mining Pty Limited, September.

NPWS (1994).
New South Wales Rare, Vulnerable or Threatened Flora andFauna Database Records (Dungog and Upper Manning 1:100,000 sheets), August.

NSWPEC (1980).
The Lower Hunter Region Commercial Centre, Study Working Paper.