EIS 473

AB019139

Introducing the Ironbark Colliery project

R.W. MILLER & COMPANY PTY. LIMITED

Avalon Estate

IRONBARK COLLIERY

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JUNE, 1985

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1. INTRODUCTION

During 1984, R.W. Miller & Company Pty. Limited (RWM) completed a detailed technical and economic feasibility study for a combined underground and surface mine development of the coal resources within the Tomago Coal Measures at Ironbark for a period of 20 years. This study has been made under the terms of an Agreement between RWM and Mitsui Coal Development (Australia) Pty. Ltd. and Mitsui Mining Australia Pty. Ltd. and is based on a production level of 2.3 million tonnes per annum of steam coal.

The coal resource at Ironbark can also be beneficiated to provide a soft coking coal and steam coal.

This document provides details of the proposed development, its scope and present status.

2. GEOGRAPHY

2.1 LOCATION

Figures I and 2 show the location of the colliery holding in relation to the port facilities at Newcastle, the main arterial roads and railways, and the nearby urban areas of Maitland and Beresfield. Trunk lines for water and electricity supply traverse the Ironbark area.

Areas of the colliery holding lie within the boundaries of three local government authorities - the Cities of Newcastle, Maitland and Greater Cessnock and is most conveniently located with respect to infrastructure services. The proposed railhead for delivery of coal is approximately 30 rail km from the Port Waratah Shiploading facility.

Figure 3 shows the location of the proposed surface and underground mines, the pit heads, and the coal handling, preparation and rail loading facilities in relation to the topography and existing services.

2.2 CLIMATE, TOPOGRAPHY & LAND USE

The climate of the area is mild with an average annual rainfall of approximately 890 mm, fairly evenly distributed throughout the year. Mean minimum temperatures range from 4°C in July to 16°C in February and mean maximum temperatures from 18°C in July to 31°C in February.

As shown in Figure 3, the area is drained to the north east by Viney Creek and its tributaries and to the north by Quart Pot Creek. Both of these streams rise in the south and west of the area on the relatively steep slopes of the Black Hill Range which culminates at an elevation of some 210 m ASL.

John Renshaw Drive, the main road extending across the gentle slopes of the valley of Viney Creek, marks the boundary of the surface and underground mine areas. The surface mine area extends along a strike ridge forming the north western slopes of the valley between elevations of 10m to 40m ASL. The southern slopes of the Black Hill Range are drained to the Hexham Swamp and Viney Creek drains north of Beresfield into the Woodberry Swamp.

The colliery holding occurs in part of a large eucalypt forest which extends south to the Mount Sugarloaf Range. As shown in Figure 4, all of the surface mine and pit head area retains its bushland vegetation, which continues to be exploited as a valuable source of timber, for use as supports in coal mines in the region. In the south and the north east, the original bushland has been cleared for primary production, including:

- Commercial poultry farming in the centre of the area between John Renshaw Drive and the Black Hill Road.
- Citrus and stone fruit orchards south of Blackhill road
- Dairy and beef cattle grazing, mainly in the south.

In the north east, a small light industrial and residential area has been developed and an asphalt batch plant is operating in the north eastern part of the colliery holding. To the north west, the Tomago Coal Measures are currently being mined by both underground and surface mining methods at Bloomfield Colliery. To the south west, the West Borehole Seam of the Newcastle Coal Measures is being exploited in Stockrington No.2 Colliery by Coal & Allied Industries Limited.
A rock quarry operates in the Black Hill Range.

3. HISTORICAL BACKGROUND

The Ironbark region has long been associated with the NSW Coal Industry, coal mining in the area being first recorded in the 1830s. Immediately south west of the Ironbark Colliery Holding, the West Borehole Seam of the Newcastle Coal Measures is being mined in Stockrington No. 2 Colliery. This is the continuation of underground coal mining initiated by J & A Brown at Stockrington in the Nineteenth Century.

Underground mining of the Tomago Coal Measures in the Hartley Colliery which was located in Authorisation No. 134 is reported as ceasing in 1880. Two other underground mines worked the Donaldson and Big Ben Seams in this area:

- Woodfull, which closed in 1944, and
- Kent which closed in 1959.

The maximum development of the Tomago Coal Measures occurred to the west of Ironbark in many small pits which generally consolidated into larger colliery holdings. Of these only Bloomfield Colliery continues to operate, as a large underground and surface mine. Buchanan-Maitland Colliery and Dagworth Greta closed in 1972 and the RWM Delta No. 1 closed in 1983.

In the Black Hill Range area the Borehole Seam of the Newcastle Coal Measures was extensively exploited in the following collieries:

Name	Year of Closure
Hilltop Borehole	1949
Mountain Borehole(Open Cut)	1953
Black Hill Borehole	1956
Rosewood Borehole	1957
Taylors Borehole	1962

Exploration within the Ironbark Colliery Holding area commenced with a steam driven cored bore hole in 1885. By 1908 five holes had been completed by the Department of Mines for a total drilling meterage of 1166.75 in which several seams of minable thickness were noted. Another two holes were drilled between 1912 and 1915 and until the advent of the post World War II demand for coal had arisen, there was no incentive to pursue exploration in the Ironbark area.

RWM association with the Ironbark area began in 1933, with the purchase of the original colliery holding which covered an area of 515.5 hectares. Since then, additional areas have been progressively acquired and the colliery holding and associated authorisations now involve a total area of approximately 3019 hectares. The company has continually reviewed the timing of development in relation to the international market for coking coal and, more recently, steam coal to help decide the appropriate time for development of the coal reserves.

Joint Coal Board (JCB) records include a summary log of coal intersected in a shaft in Portion 46, Parish of Alnwick together with analysis data for samples collected in July 1941. The shaft sinker is not known.

Reconnaissance exploration of the area began in 1949 when three holes of a regional drilling program were drilled by the JCB. The Commonwealth Bureau of Mineral Resources (BMR) drilled two holes, Thornton 1 & 2, in the area, in a 1951-52 drilling program to locate open cut coal in the Bloomfield area. No further exploration occurred until 1959, when the Electricity Commission of NSW (ELCOM) drilled at three sites in the area. This was followed by a drilling program by RWM in 1961-62. The RWM drilling was reported by the JCB in 1962 but recommendations for further exploration were not acted upon until 1967-68 when RWM undertook further drilling in the colliery holding.

Meanwhile, in 1969, before RWM extended its mining titles, other companies showed interest in the area as a result of rising coal export market expectations. Vapon Industries of Australia and Latec Investments Ltd each drilled a hole in the north eastern part of the area. In 1970, Belmont Constructions Pty Ltd excavated a test pit on the western side of the area in Portion 12, Parish of Stockrington. In 1971 a test pit was excavated in Authorisation No. 94 by the owner of Delta Colliery, before RWM acquired the mining titles in this area.

Following favourable results of the 1967-8 drilling RWM decided in 1970, to establish an underground mine to produce 660 000 tonnes of raw coal annually. Statutory approvals were obtained to establish an underground mine, a coal preparation plant with disposal of reject on site, an entry drift, shaft and civil works. The construction of the coal preparation plant and drift entry commenced. However, with a sudden downturn in the economy and the subsequent reduction in demand for export coal in the latter part of 1971, it was decided to discontinue, for the time being, the active development of the mine. Meanwhile, the Company continued further exploration to define and quantify the economic potential of the coal resource in sufficient detail for open cut and underground development planning.

In March, 1975, an Environmental Impact Statement (prepared by J. B. Croft and Associates) was lodged in support of Company applications, in which the Councils of the Cities of Newcastle, Maitland and Greater Cessnock were involved, for approval to undertake open cut as well as underground mining at a raw coal production rate of 2000 tonnes and 3000 tonnes/day respectively.

In 1979, Maitland City Council granted development consent for open cut operations to commence in Authorisation No. 94. This consent has now lapsed.

In 1981 RWM established an Ironbark Colliery Project Team to undertake the detailed studies required for technical and economic evaluation of the project. The company commenced negotiations and liaison with Mitsui and Co. for the joint venture development to the optimum capacity of the Ironbark Coal resources consistent with export market projections.

An agreement between RWM and Mitsui & Co., defining the scope of this study was signed in 1983.

In 1983, in recognition of the need to expedite and reduce the cost of the granting of coalmining leases and issue of development consent, the NSW Minister for Mineral Resources announced a new concept to facilitate these objectives. This concept - 'Planning Focus' provides for the early meeting of the developer and representatives of the various statutory authorities involved, co-ordinated by the chairman of the (joint statutory - private industry) Coal Resources Development Committee.

The principal aims of Planning Focus are to:

- enable statutory authorities to establish early contact with the developer and familiarity with the project.
- readily identify all environmental impacts, and ensure satifactory impact control measures with co-ordination of the requirements of the various statutory bodies in the briefing for and review of environmental impact statements,

thereby enabling the proper planning of the development and the earliest possible granting of the required approvals.

The Ironbark Colliery Project is the first development to be considered under the 'Planning Focus' concept, with initial meetings held in September and October 1983.

4. MINING TENEMENT & REAL PROPERTY

The mining tenement property, comprising authorisations (to prospect for coal) and coal leases are located as shown on Figure 5, together with coal lease application areas.

In May, 1981, the Company requested the Minister for Mineral Resources that it be invited to apply for coal leases in respect of areas contained within Authorisation No.s 93, 94 and 134. The Company has subsequently requested that the area within Authorisation No. 272 be similarly considered.

The Minister for Mineral Resources pursuant to the provisions of Section 31 of the Coal Mining Act 1973 has given notice of his intention to invite the Company under Section 34 of the said Act to apply for the grant of coal leases. This refers to an area of about 515 hectares embraced in Authorisation No.s 94, 134 and 272 and an area of about 928 hectares embraced in Authorisation No. 93. This notice of intention to invite was published in the Government Gazette dated 15th June, 1984.

The coal leases will enable, with the granting of development consent, the proposed mining to proceed within the terms and conditions of the coal leases and the statutory consents.

The Ironbark area is located within the Land District of Maitland/Newcastle, in the County of Northumberland and the Parishes of Alnwick, Hexham and Stockrington.

RWM owns all of the land required for the Ironbark Underground Mine Entry and Pithead, the Surface Mine area and Pithead and the Coal Handling & Preparation plant. The total surface land owned within the Ironbark area covers approximately 895 hectares, of which 880 hectares fall within the colliery holding (i.e: in Authorisation No. 305).

The required additional land includes property owned by:

- Ashtonfields Coal Mining Company,
- Hooker Rex Estates,
- Carrington Developments

Ashtonfields Coal Mining Company owners of land immediately north west of the Colliery Holding have indicated their agreement in principle for RWM to use part of their land for the disposal of the initial surface mine out-of-pit spoil. The other land will either be purchased, or suitable compensation agreements negotiated with the owners.

5. GEOLOGY AND COAL RESOURCES

5.1 REGIONAL GEOLOGY

The general geological structure of the area has been known for a considerable period, having been the subject of investigations since 1885. The coal seams within the Ironbark area belong to the Tomago Coal Measures of Permian geological age and are located stratigraphically between the overlying Newcastle Coal Measures and the underlying marine sediments of the Maitland Group (refer Figure 6).

The Tomago Coal Measures, which attain a total thickness of 550 metres, consist of three distinct formations designated, in descending order, as the Dempsey, Four Mile Creek, and Wallis Creek Formations.

The measures within the Colliery Holding form part of the western flank of the Thornton Syncline, a minor fold structure within the East Maitland Coalfields.

The general structure of the area has been interpreted and the beds strike in a south-west to north-east direction, dipping to the south-east at an approximate gradient of 1 in 15.

The Four Mile Creek Formation which contains the principal coal seams within the measures outcrops across the north-western zone of the Ironbark area. This formation contains interbedded sandstones, shales and fine grained argillaceous sediments.

5.2 EXPLORATION - COAL RESOURCES AND LOCAL GEOLOGY

Exploration within the Ironbark area to define the coal resources dates back to 1885 and by 1915, 7 holes had been drilled. Sub-surface exploration lapsed until the area was included in general drilling programs covering the Tomago Coal Measures undertaken by the Joint Coal Board (1949) and NSW Electricity Commission (1959-60).

R. W. Miller commenced exploration in the area in 1961/62 and further intensified programs followed in 1968/69, 1971, 1978, 1980-82.

The exploration by the Company has included geophysical, hydrological, photogeological surveys and extensive drilling (refer figure 7).

To indicate the presence and extent of faulting and igneous activity within the Ironbark area, an airborne magnetometer survey has been made over some 500 line kilometres. Surface magnetic surveys totalling 8 line kilometres have also been undertaken. These surveys have been supplemented by ground resistivity, photogeological, and structural interpretation studies.

A total of 131 slim core boreholes (principally 61mm) have been drilled, representing a total length of 11,216 metres, to provide sub-surface information on the structural geology, to quantify insitu and recoverable coal reserves, and to provide base data for mine planning.

In the area north of John Renshaw Drive containing reserves amenable to open cut mining, three (3) large diameter (200mm) cored holes were drilled to obtain the coal cores. Testing of these cores has included detailed particle size and washability testing for preparation plant process design and evaluation of both steam and coking coal quality.

The geological and coal quality data accumulated from the drilling programs have been computerised. This has involved in sequence:

- . data processing and verification
- . generation of section and isopach plans showing geological and quality data over the area
- . production of a deposit model to assist in detailed mine planning and scheduling
- . calculation of open cut and underground reserves of coal.

The results of the exploration programs have confirmed that the Four Mile Creek Formation contains coal seams which can be practically mined within the Ironbark area.

These seams, in descending order, are the Beresfield, Upper Donaldson, Lower Donaldson, Big Ben, Buchanan and the Ashtonfields seams. The seam thicknesses vary from 0.4m to 5.0m.

The exploration also confirmed that all of the seams crop out in the north-western corner of the Ironbark area and dip with the strata, at about 1 in 15 to the south-east over most of the area. To the south towards the western boundary, the dip direction is more southerly.

The seams split, coalesce and thicken within the Ironbark area as shown in the representative sections illustrated in Figures 8, 9, and 10. A total of 20 seam sub-sections encompassing the 6 seams present were identified and used for seam correlation purposes.

The mining of all seams along the line of strike of the outcrop to a depth set by a realistic overburden to coal ratio can be carried out by open cut methods. This line of maximum overburden to coal ratio generally conforms to the main arterial roadway, John Renshaw Drive. Thus this roadway marks the boundary between the surface mine area to the north and the underground mine area to the south. Only the Upper Donaldson, Lower Donaldson and Big Ben seams are suitable for mining due to seam thickness limitations in the underground mine area, south of John Renshaw Drive.

There are indications of minor faulting and intrusions traversing the area with a general trend south-east/north-west. However, it is considered that these geological features will not present a serious impediment to mining operations.

The structure, working thickness and the cover to the Upper Donaldson Seam within the defined underground mining area are shown on Figures 11, 12 and 13 respectively.

5.3 COAL RESERVES

5.3.1 In Situ

The in situ reserves of measured status, determined using criteria established by the Department of Mineral Resources in Authorisation areas No. 305 (existing colliery holding), 93, 94 and 134 are summarised in Text Table 5.3.1.1.

The total measured in situ reserves in the Ironbark area are 153.2 million tonnes of which 64.3% are reserves designated for underground mining and 35.7% are within the planned surface mining area. Only the Upper and Lower Donaldson and the Big Ben seams are of sufficient thickness for underground mining.

5.3.2 Recoverable - Surface Mine

Although there are essentially six seams accessible to open cut mining, seam splitting results in the need to consider fifteen (15) seam section horizons when estimating the recoverable reserves. In the mining of any discrete seam section, irrespective of its thickness, it has been assumed that there will be both a coal loss and an addition of roof and floor material.

It is estimated that 85% of the insitu reserves will be recoverable during open cut mining.

5.3.3 Recoverable - Underground

The estimates of insitu underground reserves summarised in Text Table 5.3.1.1 include coal seams where the thickness is greater than or equal to 1.5 metres in accordance with the criteria established by the Department of Mineral Resources. In the detailed planning of the mine for a 20 year period of operation, the mining of the Upper Donaldson seam at a reduced working thickness has been contemplated, thus providing for the continued winning of coal of improved quality. With the inclusion of the reserves mined from the reduced working height it is anticipated that a mining recovery of 68% will be achieved from the Upper Donaldson Seam.

TEXT TABLE 5.3.1.1

MEASURED INSITU RESERVES (Tonnes x 10^6)

(Air-dried basis at 2.5% inherent moisture content)

	INSITU RESERVES Open Cut Area (O/C)				INSITU RESERVES Underground Area (U/G)				TOTAL INSITU RESERVES O/C & U/G
AUTHORISATION AREA	305	94	134	TOTAL O/C	305	93	134	TOTAL U/G	
Seam									
Beresfield	0.98	0.09	0.21	1.28					1.28
Upper Donaldson	6.92	3.58	2.34	12.84	18.41	4.59	1.74	24.74	37.58
Lower Donaldson	7.52	4.10	2.39	14.01	18.56	20.81	-	39.37	53.38
Big Ben	8.09	6.94	3.25	18.28	12.10	20.28	1.96	34.44	52.72
Buchanan	1.83	0.59	0.03	2.45					2.45
Ashtonfields	2.98	2.38	0.43	5.79					5.79
TOTALS	28.32	17.68	8.65	54.65	49.07	45.78	3.70	98.55	153.20

Detailed mine plans have not been developed for the mining of the Lower Donaldson and Big Ben Seams. However, geological aspects related to the lower seams have been examined and provision made for their development.

It is considered that a mining recovery of about 60% could apply to the Lower Donaldson Seam and slightly lesser recovery for the Big Ben Seam. These estimates of mining recovery will be confirmed as further detailed mine planning proceeds.

6. MINING & COAL PRODUCTION

6.1 Mining & Coal Production Concepts & Criteria

The RWM approach to colliery development places paramount importance on maximising the recovery of the available coal while minimising all adverse impacts on the environment. This is achieved by adopting design concepts and impact control procedures of proven application.

To fully exploit the available coal reserves at Ironbark both underground and surface mine developments are necessary, sequentially or in combination.

For the feasibility study, annual production in the order of 2.3 Mt of salable steam coal delivered over a 20 year period has been evaluated using simultaneous open cut and underground mining.

At the end of the initial 20 year period of colliery operations - the subject of the feasibility study, underground reserves in the Upper Donaldson Seam will have been virtually fully exploited, and underground mining will need to proceed in the Lower Donaldson Seam.

After 20 years of surface mining, the total remaining surface mine reserves in the colliery are estimated at approximately 16.62Mt ROM, capable of yielding 9.56Mt, of salable steam coal for a continuing shovel/truck operation.

The variable quality of the raw coal, together with the multiplicity of seams available for surface mine development has dictated that processing is required to produce a salable coal.

As an alternative to a steam coal only product, ROM coal can be beneficiated to produce a low rank, low ash, high yielding coking coal with a reduced quantity of steam coal. Consequently the coal handling and preparation plant has been designed to enable both steam and coking coal to be produced as commercially appropriate.

The nature of the coal seams will restrict underground mining initially to the Upper Donaldson Seam and, in a later development, the Lower Donaldson and Big Ben Seams. The overlying Beresfield Seam and the underlying Buchanan and Ashtonfields seams are generally too thin for underground development. On the other hand, all seams encountered in the open cut will be mined as far as practicable. Seam horizons less than 0.3m thick have been excluded from the quantity estimates and production schedules. However much of the coal in these thinner occurrences is of good quality and will be mined as far as practicable.

To ensure optimum underground mine productivity, a longwall ranging drum shearer complete with ancillary equipment will be used, together with continuous miners, to meet the required ROM production.

With production from a single seam, the underground ROM coal is of relatively consistent quality with a significantly lower raw coal ash content than ROM coal from the surface mine. This consistent lower ash quality coal provides almost 37% of the total ROM and approximately 40% of the normal steam coal product. It also is capable of providing the bulk of any required coking coal production, and with separate stockpiling, facilitates preparation plant raw feed blending for maintenance of consistent product quality.

The surface mine concept considered is a shovel/truck 'open pit' operation whereby the overburden and thicker interburden will be removed by a large electric mining shovel and hauled to in pit disposal or out of pit spoil dumps.

6.2 UNDERGROUND MINE DEVELOPMENT

6.2.1 Development Basis, Criteria & Constraints

The initial 20 years of operation of the proposed underground development, operations will be confined to the better quality Upper Donaldson Seam. This seam comprises plies C,D,E,F,G and H. Ply B developes towards the east of the mine area (Figure 8). These plies generally range in total thickness from 2.5m to 3.5m. Towards the south east Plies F, G, and H split away and only the reduced thickness (some 1.5m) encompassing plies C, D and E is minable.

The proposed development plan for an annual production of some 1.1 to 1.5 Mt ROM is shown in Figure 14.

The development plan involves continuous miner bord and pillar headings extending down dip and across strike. This system continuously extends the mine, enables ready access for longwall equipment and provides a sound basis for the detailed planning and layout of the longwall panels.

In the latter part of development a 'Wongawilli' system is proposed for extraction of the coal in the area enclosed by the south and west development headings.

It is noted that the proposed development layout is conceptual and subject to re-orientation if exploration and geomechanics investigations for detailed design show this to be appropriate.

6.2.2 Mine Access

It is tentatively proposed that access to the mine will be effected by multiple entries from a box cut located immediately north of John Renshaw Drive and west of the main entrance to the Ironbark Colliery Holding. The mine entry is integrated with the remaining pit head facilities as shown in Figure 3.

The conceptual design of the mine entry provides adequate space for water storages flood sump, compressor shed, fan housing, five mine entries, electricity sub station and conveyor interchange. Maximum access road gradient from the pithead to the mine entry is 1v:10h.

It is proposed to excavate the box cut initially as a trial pit for the auxiliary purpose of providing a large bulk ROM sample for processing at RWM coal preparation plant and comprehensive testing at the RWM laboratory.

6.2.3 Continuous Miner Development

Continuous Miner development headings will be 5.5m wide, with parallel headings spaced on 26m centres and cross cuts, 5.5m wide, spaced at 40m centres, thus providing pillars 20.5m by 34.5m. The parallel gate roads developed by continuous miner (Figure 3) for the longwall and 'Wongawilli' system panels are 5.5m wide with cross cuts at 60m centres.

Continuous miners will be basically of two types - one a 'high seam' type - Jeffrey 1036 HP for development of the full seam mining section, the other a low seam type - Jeffrey 1028 HP low profile for operating in the thinner mining section.

The ROM production schedules have been formulated on the basis that, at full production levels, productivity is estimated at 390t*/unit shift for the high seam machines and 250t*/unit shift for the low seam units. The high seam continuous miner productivity is assumed to increase from 250t*/unit shift, when mining commences through 350t*/unit shift during the second half of Year 1. (*air dried tonnes).

Two electric shuttle cars will be employed with each working continuous miner - an ultimate total of eight machines being employed (four Joy 15SC22 types for the 'high seam' and four Joy 10SC22 types for the 'low seam' units). A Fox diesel shuttle car (Torkar) is employed as a standby unit for use when an electric drive unit becomes unavailable. Five Fox feeder breakers will alternately break and feed the continuous miner production to the conveyors.

6.2.4 Longwall Development

A longwall mining unit comprising ranging drum shearer, face conveyor, hydraulic roof supports and stage loader will be introduced during Year 3. For this unit, operating on a 180 metre face length, productivity has been estimated at 5 000* ROM tonnes per day using 3 shifts in the high seam area, and 3 000* ROM tonnes per day in the low seam area. Thirty days have been allowed for face changeover from longwall panels. A face change occurs each year with the exception of years 10 (2 face changes) and year 14 (no face change). (* air-dried).

The Longwall unit incorporates:

1. Shield support system consisting of 125 hydraulically controlled sets, including 3 main gate support sets and 2 tail gate support sets extending over a length of 187.5m. Each set is 1.5m wide, with height range 1.6m-3.2m, 600t yield load, four leg chock shield type

2. Ranging drum shearer - double drum type complete with chainless haulage and ancillary equipment with a productive capacity range - 1 500 t/h normal - 1 800t/h peak and working heights of 1.6 to 3.2m.

3. Armoured face conveyor capable of handling the peak production and fully integrated with the shearer and a crusher and stage loader.

4. Stage loader of chain conveyor type having a maximum capacity of 2 000t/h.

5. Crusher - of impact roll type having a maximum capacity of 3 000t/h in reducing the coal size to passing 300mm.

6. Hydraulic power system - pantechnicon mounted for mobility.

7. Compressed air reticulation system

8. Water supply reticulation system.

9. Electric power system, incorporating gas cooling and flame proofing, gas monitoring, fluorescent lighting, meeting all statutory requirements and safety standards.

6.3 OPEN PIT MINING CONCEPT

This involves a conceptual mine layout plan as shown in Figure 15, whereby overburden is removed from systematically developed 40m wide benches along the coal seams and hauled in large rear dump trucks for disposal in previously mined out benches or in a disposal area located to the north of the pit head facilities. The area in the western part of the Colliery Holding and immediately north of John Renshaw Drive having surface mine potential has not been considered in the study due to the limited area.

The initial eastern mine area encompasses a strike ridge of the coal bearing Four Mile Creek Formation which is dissected by Scotch Dairy Creek in the north and by two easterly flowing tributaries of Viney Creek which is directed generally north towards Weakleys Flat. As shown in Figure 15, Scotch Dairy Creek will be dammed to prevent surface water flow through the mine area and to provide a suitable site for disposal of waste water. The smut line of the Big Ben Seam horizon OPQ marks the up dip (north western) and the western limits of the mine area. The total area to be mined is 329 ha or some 93% of the available surface mine area (354 ha).

The mine development involves ROM production totalling some 41.6 Mt over the 20 year period, leaving some 8.6 Mt of potential surface ROM production remaining in the initial surface mine area to be exploited. Overburden ratio averages 3.25 m^3/t ROM and 4.85 m^3/t salable over the 20 year period. The annual average ratio ranges from 2.33 m^3/t ROM to 3.75 m^3/t ROM.

The proposed conceptual mine plan has been designed to achieve the annual coal sales targets as rapidly as possible. This involves the commencement of mining in the north eastern part of the mine area, where favourable overburden ratios enable rapid increase in coal production to be effected. Overburden removal operations are planned to commence well in advance of the first coal production target date with ROM production totalling 1 752 500 tonnes in Year 1 and 2 502 500 in Year 2. In the later part of Year 1, the overburden removal operations are transferred to the south western end of the initial area and the mine is advanced in an easterly direction as shown in Figure 15.

An electric mining shovel is the major mining equipment item and will be used to remove the overburden, supported by:

- self loading auger scrapers for stripping and stockpiling top soil and for stripping extremely weathered softer material,
- large bulldozers with single tine hydraulic rippers for general pit clean-up, ripping and dozing coal seams and thin overburden partings between coal seams (midburden and interburden).
- blast hole drill rigs for drilling and blasting overburden,
- hydraulic shovels for removal of thinner overburden and of partings between seams, clean up of seam roof and floor areas and controlled selective mining and loading of coal.
- front-end loaders for loading coal and overburden as required.
- large rear dump trucks for hauling overburden to spoil and coal to the ROM dump station.

In Figure 16, a typical cross section through the mine benches diagrammatically illustrates the mining equipment operating on benches formed along the coal seams, with spoil disposal advancing along the pit floor as the Ashtonfields seam becomes progressively mined.

In general, coal seam sections are of limited thickness and will not need drilling and blasting before mining. Coal seams from 0.6m to 2.5m thick will be ripped before loading. Separate coal plies between 0.2m and 0.6m thick will be dozed into piles before loading. In this operation, emphasis will be placed on careful mining to recover as much coal as practicable - minimizing both coal losses and dilution of the coal with roof and floor material. Although coal seams less than 0.3m thick have not been accounted in coal quantity calculations all such coal will be mined as far as practicable.

Equipment used for loading and hauling coal to the ROM dump hopper at the coal handling plant will be similar to that selected for the interburden and partings removal. Interchangeability of wheel loaders, hydraulic shovels and rear dump trucks, is planned for these mining operations to enable optimum utilization of the selected equipment.

Haul distances for rear dump coal trucks will range from 1150m to 3500m, one way, to the ROM hopper using the haul road system shown in Figure 15 for the 20 year mining period. Haul distances to out of pit spoil areas and backfill dumps for the eventual rehabilitation of the mined out areas will range from 2100m to 1050m, one way, depending on the bench location being mined. In planning the bench system, the void remaining in the surface mine area at the end of the 20 year mining period has been reduced to the most practicable minimum, consistent with production scheduling requirements.

The selected mining equipment will be progressively introduced until year 13. Over the 20 year mine life, replacement of equipment has been planned in accordance with experience of the average operational life of the particular equipment item.

6.4 PRODUCTION SCHEDULES

The ROM coal production has been determined by making provision for coal losses and stone dilution. In addition, the air dried raw material was adjusted to 6% total moisture.

The salable coal quantity has been derived after discounting the washing yield determined on an air dried basis by 3% and adjusting the resultant air dried quantity to 9% total moisture. The 3% yield discount is made in the absence of plant performance prediction data to derive a suitable preparation plant recovery factor.

Based on the planned development of both the underground and surface mine commencing simultaneously, the ROM with corresponding salable steam coal only and the alternative coking coal and steam coal production schedules are shown in Text Table 6.4.1.

TEXT TABLE 6.4.1

PRODUCTION SCHEDULES
(THOUSANDS OF TONNES as received)

R.O.M.

SOURCE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEARS 6-20	TOTAL
U/G ROM	279	445	1 230	1 417	1 520	1 287 av.	24 201
O/C ROM	1 753	2 503	2 041	2 065	1 964	2 087 av.	41 635
TOTAL ROM	2 032	2 948	3 271	3 482	3 484	3 374 av.	65 836

STEAM COAL ONLY

U/G STEAM	155	365	988	1 140	1 173	969 av.	18 354
O/C STEAM	1 058	1 446	1 300	1 374	1 310	1 426 av.	27 882
TOTAL STEAM	1 213	1 811	2 288	2 514	2 483	2 395 av.	46 236

COKING AND STEAM COAL ALTERNATIVE

U/G COKING	119	265	784	836	873	706 av.	13 471
U/G STEAM	36	100	204	304	300	263 av.	4 883
O/C STEAM	1 058	1 446	1 300	1 374	1 310	1 426 av.	27 882
TOTAL STEAM	1 094	1 546	1 504	1 678	1 610	1 689 av.	32 765
TOTAL PRODUCTS	1 213	1 811	2 288	2 514	2 483	2 395 av.	46 236

7. COAL HANDLING, PREPARATION AND QUALITY

7.1 COAL HANDLING AND LOADING

A modern modular coal handling and preparation plant has been conceptually designed to fulfill the adopted coal production concepts.

The location and layout of the plant for the nominal production level of 2 300 000t of salable steam coal are shown on Figures 15 and 17.

Two raw coal stockpiles have been adopted with complete interchangeability of feed sources. These circular stockpiles have capacities of 50 000t and 20 000t and each can receive coal from the underground or open cut mine.

A nominal capacity of 3 500 000 tonnes of raw coal throughput/ year has been adopted in the preliminary design of the plant.

Two product stockpiles are also planned each having a live capacity of 125,000t with a capability for blending to meet specification compliance. In addition provision has been made for an emergency stockpile area.

Product outloading will be carried out using a bucket-wheel reclaimer at a design rate of 2 750 tph to the 500t capacity rail loading bin.

The outloading facility will meet the State Rail Authority scheduled requirement of 12 800 tonnes in 4.5 hours.

Supervision will be carried out using modern aids including PLC controls and communication systems.

7.2 COAL PREPARATION

The 880 tph coal preparation plant will be housed in a low noise level building with all equipment arranged in a neat geometrical pattern for ease of access, supervision, and maintenance. It is planned to use Programmable Logic Control (PLC) systems for complete process control, including start up, shut down, fault detection and protection, control of process variables and monitoring by logging of process data.

Design philosophies adopted include minimisation of the generation of fine coal, washing coal at the largest sizes to minimise operation cost and product moisture and full utilisation of all equipment while producing multiple products at the desired qualities.

Modular dense medium systems have been adopted for treatment of coarse coal and water washing cyclones for fines treatment, with rotary breaking of the coarse ROM coal to provide a 125mm x 0 preparation plant raw feed (Figure 18). The 125mm x 12.7mm fractions will be processed in a dense medium bath, the 12.7mm x 0.5mm (ww) fractions in dense media cyclones and the 0.5mm (ww) x 0.1 mm fractions in water washing cyclones after desliming the 0.5 mm (ww) x 0 fraction in classifying cyclones.

The modular arrangement of the process systems, together with two stage - primary and secondary dense medium cyclone processing, satisfies the criteria for simultaneous production of steam and coking coal from the nominal annual raw feed throughput (880 t/h).

7.3 QUALITY CONTROL

It is planned to supplement past exploration programs by further drilling and coal testing of cores to confirm the final mining plan. A test pit operation is also planned to obtain bulk samples for coal washing and testing to ensure the optimum coal preparation plant design.

After the commencement of development, regular in pit samples will be taken and analysed. Production quality control will be professionally managed by a chemist.

Rotating disc type sample cutters are provided at the head of each preparation plant raw feed conveyor, to enable adequate sampling of the raw feed coal. A sampling tower is provided at the head of the preparation plant product conveyors for cutting of clean coal product samples. These samplers have been selected as the most appropriate available. They will meet international standards now applied to ensure unbiased fully representative sampling. A continuous automatic on line analyser/recorder is provided in the sample tower. This uses nuclear radiation technology which is now capable of reliably determining ash and moisture content from which specific energy is calculated.

A sample cutter is also provided at the transfer station to the train load out bin for sampling to ensure maintenance of specified export quality.

The chemist will maintain the quality control equipment, collect and dispatch routine feed and product samples to the RWM Central laboratory at Carrington and conduct rapid check testing, as required for efficient quality control, using the basic on site facilities provided for this purpose.

7.4 COAL QUALITY

The proposed preparation plant will have the flexibility to produce a range of coal qualities for both a steam coal and coking coal market.

A typical analysis of the washed products for steam coal and coking coal are:-

STEAM COAL

As received basis:		
Total Moisture	%	9.0
Air dried basis:		
Moisture	%	2.8
Ash	%	13.0-16.0
Volatile Matter	%	30.0-31.0
Fixed Carbon	%	54.2-50.2
Sulphur	%	1.0 (Max)
Specific Energy	MJ/kg	27.62-28.64
	kcal/kg	6600-6835
Ash Fusion (reducing atmosphere) flow	°C	>1500
Hardgrove Grindability Index		48
Dry ash free basis:		
Specific Energy	MJ/kg	34.02
	kcal/kg	8130

COKING COAL

As received basis:		
Total Moisture	%	9.0
Air dried basis:		
Moisture	%	2.8
Ash	%	8.5
Volatile Matter	%	35.0
Fixed Carbon	%	53.7
Sulphur	%	0.90
Crucible Swelling No.		5.5
Gray-King Coke Type		G1
Max. Fluidity	d.d.p.m	150
$\bar{R}_o$max. of vitrinite	%	0.80

8. COAL TRANSPORT

The Company commissioned a detailed coal transport study to indicate the most technically, environmentally and economically appropriate means of transporting coal to the port. Nine alternatives were identified and compared in this study and included - rail only, conveyor and rail, truck and rail, conveyor truck and rail with more than one option in each of these.

From this transport study it was concluded that the provision of a rail spur line into the mine was the most appropriate. The adopted route for the rail spur and the location of the rail loop is shown in Figure 3. The route involves a bridge over the New England Highway, with a total distance from the Main Northern Line including the rail loop at Ironbark of 9.03 km.

9. PIT HEAD FACILITIES

The conceptual planning of the proposed development provides for a colliery administration centre separated from individual underground mine and surface mine pit heads, and the coal handling and preparation facilities. These are all individually located as shown in Figure 3.

The pit head facilities are all located north of John Renshaw Drive from which access will be effected via a standard 3-Way intersection conforming with Department of Main Roads (DMR) and local government requirements.

The main access road is approximately 3 km long, extending as shown in Figure 3 around the western side of the colliery holding between the coal preparation plant and rail loop, thence to the surface mine pit head.

A 400m long branch road provides access to the underground mine pit head. The administration centre is located on the northern side of the entrance to the colliery.

A period of 24 months has been allowed for design and construction of the surface facilities (including coal handling and preparation plant). The construction workforce is estimated to peak at 358 during this period.

10. OPERATIONS MANAGEMENT & WORKFORCE

The proposed operations management for the development is structured such that the underground mine operations, surface mine operations and coal handling and preparation are separately managed in their separate locations.

The required workforce at full production levels totals some 524 personnel, including:

. Underground Mine	218
. Surface Mine	235
. Coal Handling & preparation	56
. Colliery Headquarters	15

11. ENVIRONMENTAL IMPACT & CONTROL

11.1 GENERAL

The impact of the development will be virtually confined to the immediate locality, with no significant impact on the regional environment except in terms of a very significant general economic benefit to the regional community, arising from an increase of permanent employment exceeding 500 people at full development level.

An impact on the environment will occur due to the clearing of the forested area for the mining operation.

After the shovel-truck surface mining operation, the land form will be slightly modified but the area could be re-afforested. Financial and environmental cost/benefit factors should dictate future land use after the coal resource has been exploited. Obviously if the coal resource remains unexploited and is alienated by an alternative land use, the regional community would lose both the economic benefit of the exploitation and the amenity of the existing environment. In environmental terms, such losses are more significant than the accompanying loss to the national revenue.

11.2 ENVIRONMENTAL IMPACT CONTROL

11.2.1 Location and Orientation

The preparation plant is located in the north west of the colliery holding, an area most remote from public roads and living areas. The plant, at elevations ranging from RL 50 to RL 60, is largely masked by forest covered hills at elevations of RL 66 to RL 70 which occur to the south and east, between the plant and the mines.

The relatively dusty ROM coal is stored in circular stockpiles to minimise the area of exposure to wind, generation of dust and and to minimise the amount of water sprayed for prevention of dust movement.

The product stockpiles will be oriented east-west for minimum exposure to prevailing winds, to minimise wind blown dust.

11.2.2 Dust Suppression

De-dusting water sprays will be provided at the ROM dump station at all transfer points and for the ROM and product stockpiles.

11.2.3 Run-off Drainage and Water Conservation

Both for environmental impact reduction and the economy of conserving a valuable resource, a closed circuit water drainage system is incorporated in the preliminary design of the preparation plant. Surface run off from the eastern and southern sides of the plant area will be drained, in peripheral drains, to the tailings ponds where the decanted water will be pumped to the preparation plant for re-circulation with tailings thickener overflow. Surface run off from the northern and western sides is drained along and inside, the access road to a collecting sump for pump return to the preparation plant and periodic clean out of solid waste. A dam is also provided for emergency dumping of the tailings thickener tank contents.

11.2.4 Reject Disposal

Truck disposal, as part of the surface mine reclamation procedure, offers the most environmentally satisfactory means of disposal of the coarse reject.

11.2.5 Tailings Disposal

Studies by RWM's coal preparation consultants showed that techniques involving solids concentration were both unreliable and uneconomic. Consequently it is proposed to stage dispose of tailings using tailings dams. Decanted water will be pumped back to the preparation plant and collected in a downstream settlement dam to control siltation of Viney's Creek. The valley area between John Renshaw Drive and the plant provides a large surface area suitable for construction of earth embankments using mine spoil. It is amenable to continuous surface revegetation measures and to periodic removal of solid tailings for disposal in the surface mine area.

Because of the uncertainty of groundwater supply and its probably high dissolved salts content, preparation plant water needs are assumed to be met from a HDWB potable water source of good quality. Thus tailings water should remain of satisfactory pH. Where required, either addition of lime or alkaline ground water should correct any excess acidity in the tailings water caused by oxidation of pyrites in the coal.

Small settlement dams will be provided downstream of the tailings dams and the stream channel will be diverted as shown in Figure 15, to enable surface mine reserves to be fully exploited. If necessary, water flow from this catchment can be pumped to the dam required to divert Scotch Dairy Creek from the surface mine area. This dam provides a general holding pond for all run-off from the preparation plant and surface mine.

There are no prohibitive permanent environmental impacts that cannot be controlled by sound environmental practice, as proposed for the development. The groundwater is alkaline with a relatively high salinity and may need to be stored in a disposal dam in Scotch Dairy Creek. This dam is required to divert Scotch Dairy Creek around the surface mine area. Hydrological and meteorological studies indicate that this dam should never overtop and deleterious groundwater and tailings effluent could be diverted safely to the dam, making a closed circuit drainage system for the development. Nevertheless, provision has been made for piping any excessive amount of poor quality groundwater from the underground mine to the Hunter River. The temporary impacts occurring during mining and resulting in dust generation can be controlled by sound mining practice including continuous haul road and disposal area maintenance and water spraying.

12. PORT FACILITIES

Three ship loading facilities are available for exporting coal through Newcastle. These are located as shown on Figure 2 and comprise:

- The Carrington Basin Coal Loader, owned by the Maritime Services Board of NSW, (MSB),
- The Steel Works Channel Coal Loader, owned by Port Waratah Coal Service Limited (PWCS),
- The Kooragang Island Coal Loader, owned by Kooragang Coal Loader Ltd. (KCL)

The Carrington Basin Coal Loader is alongside the Steelworks Channel Loader and can be loaded from stockpiles in the latter. Ship loading functions are conducted by the MSB at both loaders.

PWCS, responsible for train unloading and stacking only, is a consortium of private companies:

. Buchanan Borehole Collieries Pty Limited	25.5%
. Gollins Loader Holdings Pty Limited	19.5%
. Coal & Allied Industries Limited	12.5%
. R. W. Miller & Company Pty Limited	10.0%
. Bloomfield Collieries Pty Limited	2.5%
. Japanese Companies	30.0%
	100.0%

KCL is a private company operating the Kooragang Island facility on behalf of a consortium of:

BHP	30.0%
NSW Maritime Services Board	20.0%
* Howard Smith Ltd	12.5%
Japanese Trading Companies	10.0%
Hunter Valley Coal Mining Companies	27.5%

The existing annual shiploading capacity of the port of Newcastle is 43 million tonnes.

Train unloading and ship loading data for the available facilities are summarised in Text Table 12.1.

* R. W. Miller & Company Pty. Limited is a fully owned subsidiary of Howard Smith Ltd.

TEXT TABLE 12.1
PORT OF NEWCASTLE TRAIN UNLOADING & SHIP LOADING CAPACITY

FACILITY SITE AREA ha	PWCS 40	BASIN 8.5	KCL 154	
			EXISTING	PLANNED
RAIL RECEIVAL STATIONS No.	2	2	1	3
Unit Capacity t/h	3 200	1 000	6 600	6 600
Total Capacity t/h	6 400	2 000	6 600	19 800
ROAD RECEIVAL STATIONS No.	1	-	-	-
Capacity t/day	8 000	-	-	-
STACKERS No.	4	2	4	7
Type	RRASL	RRASL	RRASL	RRASL
Unit Capacity t/h	2 500	1 000	6 600	6 600
Total Capacity t/h	10 000	2 000	26 400	46 200
RECLAIMERS No.	4	1	2	5
Type	RBWSL	RBWSL	RBWSL	RBWSL
Unit Capacity t/h	2 500	2 000	8 000	8 000
Total Capacity t/h	10 000	2 000	16 000	40 000
STOCKPILES No.	4	4	2	4
Unit Length m	1 000	240	1 400	2 800
Total Length m	4 000	960	2 600	11 200
Stacker Height m	11-15	8	21	21
Stacker width m	44	24	52	52
Approx. Max. Unit Capacity kt	200	22.5	600	1 200
Approx. Max total Capacity kt	800	90	1 200	2 400
SHIPLOADERS No.	3	2	1	3
Type	RLB	RLB	RLB	RLB
Unit Capacity t/h	2 500	1 000	10 500	10 500
Total Capacity t/h	7 500	2 000	10 500	31 500
SHIP BERTHS No.	2	1	1	3
Ship Length m	290	250	335	1 005
Max Ship Beam m	43	32.5	55	55
Max depth LWOST m	16.5	11.6	16.5	21.5
Ship dwt max. kt	125	55	140	180
min. kt	25	10	40	40
ANNUAL SHIPPING CAPACITY kt	20 000	8 000	15 000	50 000

NOTE: LWOST - LOW WATER ON SPRING TIDE
RRASL - RAIL MOUNTED RADIAL ARM, SLEWING, LUFFING
RSLBW - RAIL MOUNTED, SLEWING, LUFFING BUCKET WHEEL
RLB - RAIL MOUNTED, LUFFING BOOM

13. DEVELOPMENT PROGRAM

13.1 GENERAL

Table 1 presents as a bar chart, the proposed program for development of Ironbark Colliery.

More detailed bar chart programs have been prepared for the design and construction of the coal handling and preparation plant and for design and construction of the pithead facilities and services.

The development program involves a period of 48 months from 1 March 1985 to 1 March 1989, when salable coal production begins. The program is formulated on the premise that the shortest probable time for obtaining the necessary statutory consents covers 24 months, and should issue by 1 March, 1987. Although major expenditure cannot be committed before development consent is confirmed, high level NSW government indication of development approval will enable planning to proceed and exploration for detailed design to commence. If there is ample time available to implement the development and, if advantage can be taken of an earlier market, implementation can be effected earlier with expeditious statutory consideration and prompt decision taking by the NSW government. However any delay in obtaining development consent will delay the commencement of coal production at Ironbark.

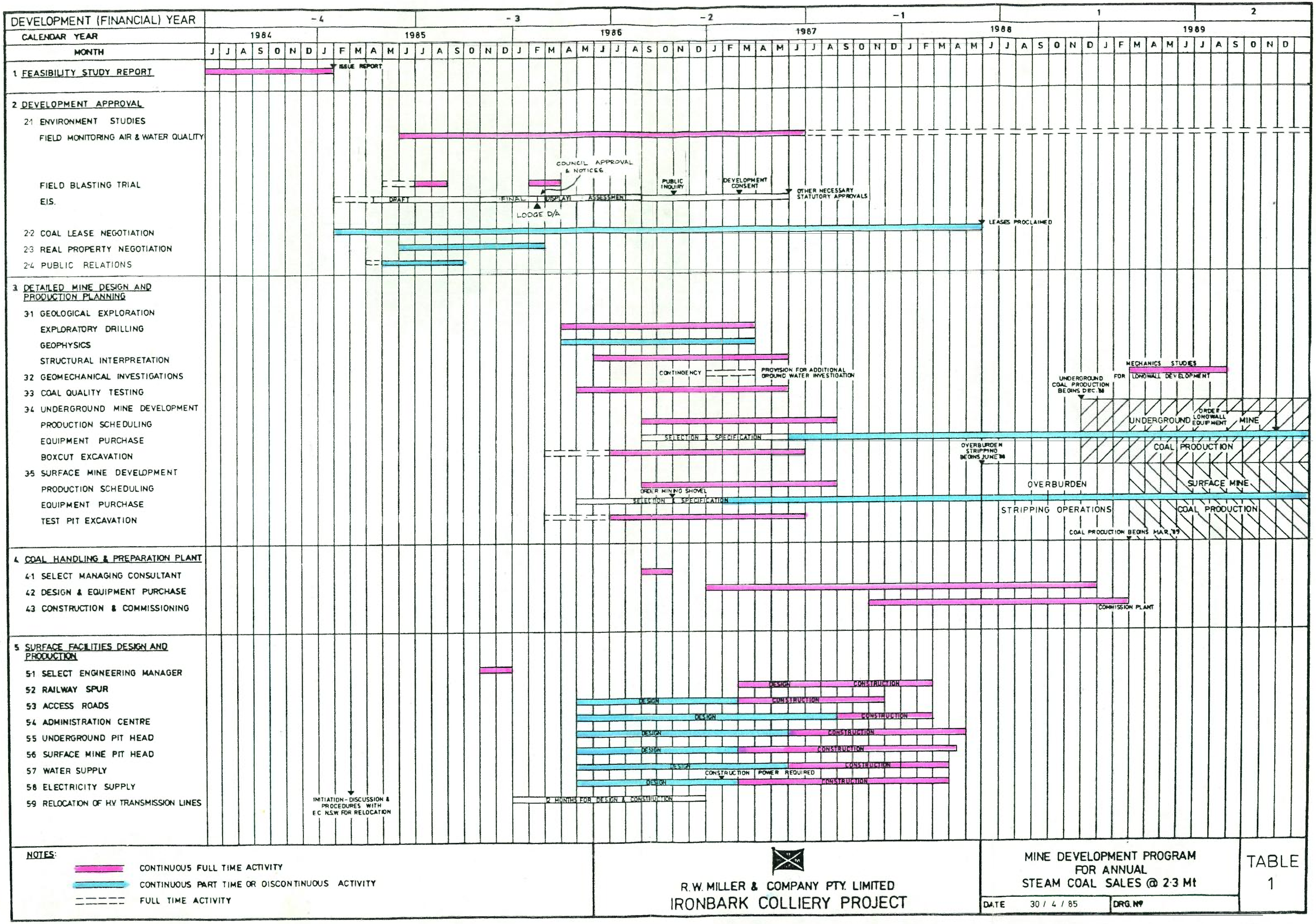
13.2 DEVELOPMENT CONSENT - ENVIRONMENTAL IMPACT

Under the NSW Environmental Planning and Assessment Act, 1979, the consent of the Minister for Planning and Environment must be obtained before the colliery is established and mining proceeds.

To obtain development consent, it is mandatory that an Environmental Impact Statement (EIS) be prepared and submitted with the application for Development Approval.

It is proposed to continue the EIS studies. The program provides for monitoring of water and air quality to ensure an adequate data base for the EIS. The draft EIS is proposed for completion by 1 November 1985 for submission to the Department of Environment and Planning and after discussion with that Department and other Statutory Bodies, submission of the final EIS in February 1986. Following submission of the EIS and Development Application, 10 months is allowed in the program for consideration of the development by the NSW Government and for the holding of a Commission of Inquiry if necessary. During this period, the coal lease terms and conditions (including royalties and capital payments) will be established.

It is anticipated that development consent will be granted on the 1st March, 1987.


DEVELOPMENT (FINANCIAL) YEAR
-4
-3
-2
-1
1
2
CALENDAR YEAR
1984
1985
1986
1987
1988
1989
MONTH
1 FEASIBILITY STUDY REPORT
ISSUE REPORT
2 DEVELOPMENT APPROVAL
2.1 ENVIRONMENT STUDIES
FIELD MONITORING AIR & WATER QUALITY
FIELD BLASTING TRIAL
EIS.
COUNCIL APPROVAL & NOTICES
DRAFT
FINAL
DISPLAY
ASSESSMENT
LODGE D/A
PUBLIC INQUIRY
DEVELOPMENT CONSENT
OTHER NECESSARY STATUTORY APPROVALS
2.2 COAL LEASE NEGOTIATION
LEASES PROCLAIMED
2.3 REAL PROPERTY NEGOTIATION
2.4 PUBLIC RELATIONS
3 DETAILED MINE DESIGN AND PRODUCTION PLANNING
3.1 GEOLOGICAL EXPLORATION
EXPLORATORY DRILLING
GEOPHYSICS
STRUCTURAL INTERPRETATION
3.2 GEOMECHANICAL INVESTIGATIONS
CONTINGENCY
PROVISION FOR ADDITIONAL GROUND WATER INVESTIGATION
3.3 COAL QUALITY TESTING
3.4 UNDERGROUND MINE DEVELOPMENT
PRODUCTION SCHEDULING
EQUIPMENT PURCHASE
SELECTION & SPECIFICATION
BOXCUT EXCAVATION
3.5 SURFACE MINE DEVELOPMENT
PRODUCTION SCHEDULING
EQUIPMENT PURCHASE
ORDER MINING SHOVEL
SELECTION & SPECIFICATION
TEST PIT EXCAVATION
MECHANICS STUDIES FOR LONGWALL DEVELOPMENT
UNDERGROUND COAL PRODUCTION BEGINS DEC. 88
UNDERGROUND MINE COAL PRODUCTION
ORDER LONGWALL EQUIPMENT
OVERBURDEN STRIPPING BEGINS JUNE 88
OVERBURDEN STRIPPING OPERATIONS
SURFACE MINE COAL PRODUCTION
COAL PRODUCTION BEGINS MAR. 89
4 COAL HANDLING & PREPARATION PLANT
4.1 SELECT MANAGING CONSULTANT
4.2 DESIGN & EQUIPMENT PURCHASE
4.3 CONSTRUCTION & COMMISSIONING
COMMISSION PLANT
5 SURFACE FACILITIES DESIGN AND PRODUCTION
5.1 SELECT ENGINEERING MANAGER
5.2 RAILWAY SPUR
5.3 ACCESS ROADS
5.4 ADMINISTRATION CENTRE
5.5 UNDERGROUND PIT HEAD
5.6 SURFACE MINE PIT HEAD
5.7 WATER SUPPLY
5.8 ELECTRICITY SUPPLY
5.9 RELOCATION OF HV TRANSMISSION LINES
DESIGN
CONSTRUCTION
POWER REQUIRED
INITIATION - DISCUSSION & PROCEDURES WITH E.C. N.S.W. FOR RELOCATION
12 MONTHS FOR DESIGN & CONSTRUCTION
NOTES:
CONTINUOUS FULL TIME ACTIVITY
CONTINUOUS PART TIME OR DISCONTINUOUS ACTIVITY
FULL TIME ACTIVITY
R.W. MILLER & COMPANY PTY. LIMITED
IRONBARK COLLIERY PROJECT
MINE DEVELOPMENT PROGRAM FOR ANNUAL STEAM COAL SALES @ 2.3 Mt
TABLE 1
DATE 30 / 4 / 85
DRG. Nº

With RWM participation in the Planning Focus concept, the time normally taken to assess the EIS could be reduced, thus advancing the development consent date.

With the granting of development consent, the coal lease documents are prepared and executed by the NSW government under Sections 41 and 47 of the NSW Mining Act, 1973.

The other consents necessary for the development of the mine, which will be pursued concurrently with obtaining development consent are:

- consent from the Joint Coal Board (JCB) under Orders 27 and 28, Coal Industry Act, 1946 to open a mine and market open cut coal,

- approvals to construct under the Clean Waters Act 1970, the Clean Air Act 1961 and the Noise Control Act 1975 from the State Pollution Control Commission.

13.3 DETAILED MINE DESIGN & OPERATIONS PLANNING

This will involve the detailed mining engineering for development of underground and surface mine production and the associated additional geological exploration and coal quality evaluation for final mine and production planning. This phase also includes the detailed specification, selection and ordering of mine plant and equipment, and the design and supervision of construction of the surface mine haul roads.

The exploratory drilling and coal quality testing for detailed mine design and production planning has been programmed to be completed over a 12 month period to enable detailed interpretation of geological structure and evaluation of coal quality to be be completed in adequate time for final design.

The engineering involved in definitive mine and operations planning, equipment selection and ordering extends through 1987-88, as shown on the bar chart, to enable surface mining operations to begin in June, 1988 and underground mining to start on 1 December 1988.

Geotechnical investigations for final selection of longwall unit equipment and operations planning will proceed during 1989. This is before the longwall equipment is installed and after sufficient underground mining is completed for effective in situ testing and monitoring.

13.4 TRIAL MINING & UNDERGROUND BOX CUT EXCAVATION.

Excavation of trial pits, one in the surface mine area and one constituting the box cut which, later, will accommodate the entry to the underground mine have been planned.

It is anticipated that consent for this initial mine operation can be obtained from the Department of Mineral Resources within a period of 3 months.

Selected ROM production will be transported for processing at other RWM coal preparation plants and subjected to comprehensive testing, thus providing details for the coal preparation plant definitive design.

A blasting trial is programmed as shown on the bar chart, to enable input to the EIS in time for submission of the draft on 1 November 1985.

13.5 COAL HANDLING & PREPARATION PLANT - DETAILED DESIGN ENGINEERING & IMPLEMENTATION.

This phase is programmed to begin on 1 January 1987. Completion of the plant will involve a design and construction time of 26 months with a fully commissioned plant operating on 1 March, 1989.

13.6 PIT HEAD FACILITIES & SERVICES, RAILWAY SPUR LINE IMPLEMENTATION.

This phase is programmed to commence in March 1986 when the selected engineering manager/managing contractor can be given notice to proceed with implementation including:

- design and supervision of construction of the rail spur line,
- design and supervision of construction of access roads, water supply and high voltage electricity supply,
- design and supervision of construction of the administration centre and pit head facilities for the underground and surface mines,
- in consultation with the coal handling & preparation consultant, detailed design and construction of the civil works for the coal handling and preparation plant, including all earthworks and concrete foundation structures, plant administration buildings and amenities.

A period of 24 months for completion of the underground mine and surface mine pit heads are available in advance of mining operations. These periods should provide ample time to implement all facilities on schedule.

14. INITIAL DEVELOPMENT CAPITAL

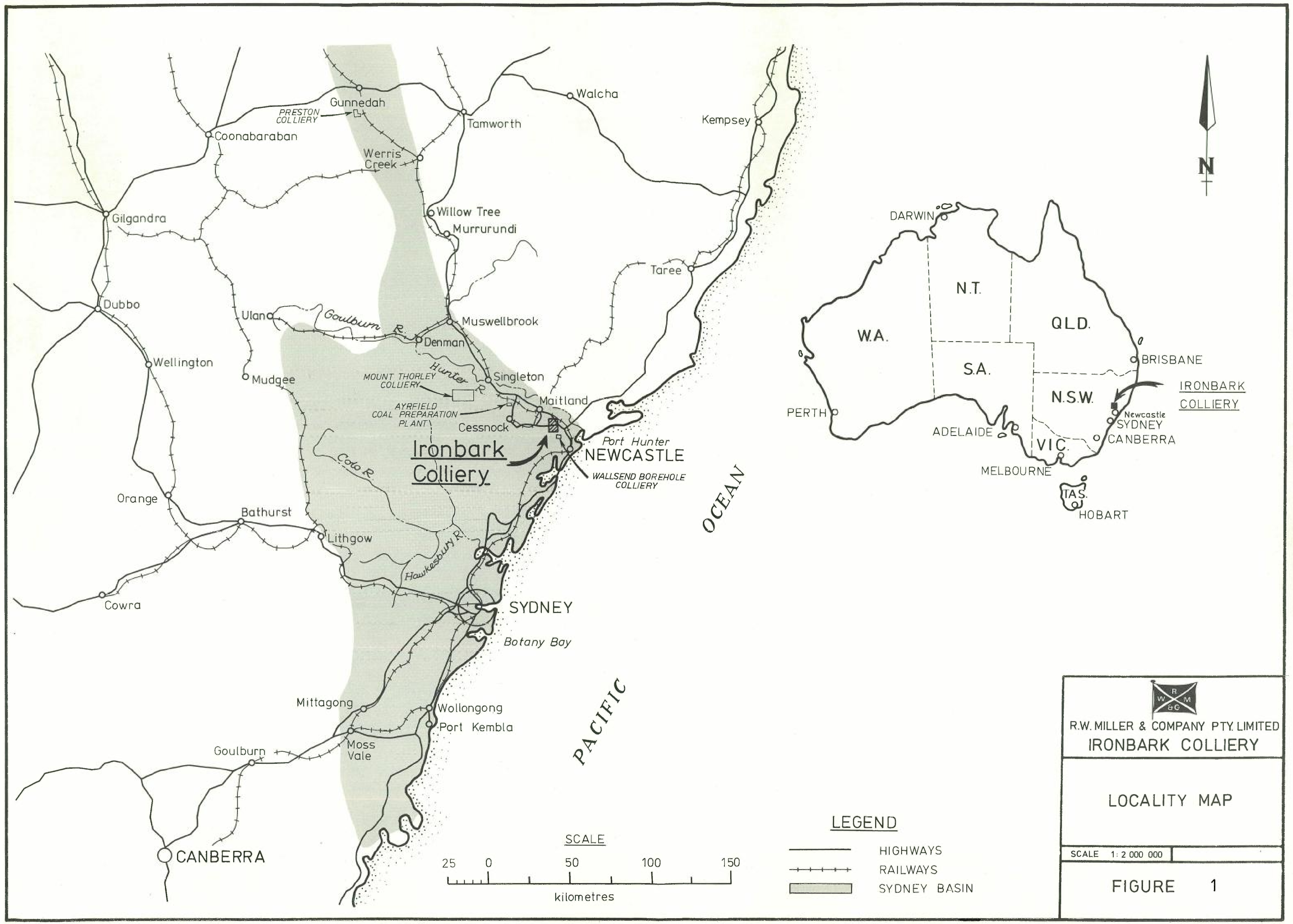
The total initial capital requirement for the development based on constant June, 1984 dollars is A$157.4 million. This capital requirement fully establishes all surface facilities and infrastructure which includes coal handling and preparation plant, pit head facilities, rail spur line, access roads, electricity and water supplies and all mining equipment to obtain the fully designed production capacity of the mine.

The following summarises the establishment and equipment capital requirement:-

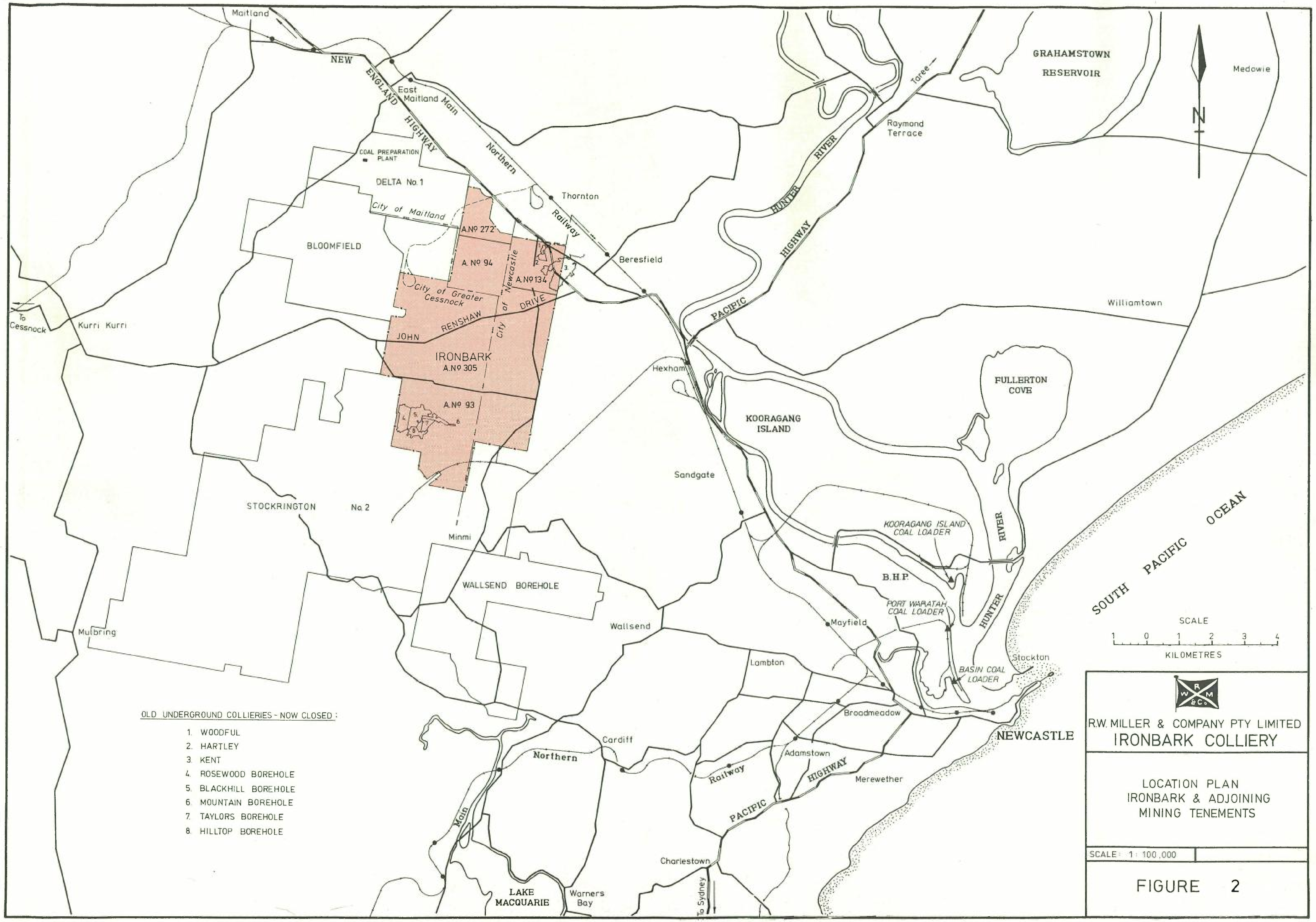
Establishment	99.8
Underground Equipment	19.0
Surface Mine Equipment	38.6
	A$ 157.4 million

Based upon the average annual ROM coal production for years 3 to 20 the initial capital cost per annual ROM tonne is A$47. On a salable coal production basis the initial capital cost per annual tonne is A$66. These capital costs are most competitive with other recently opened mines.

FIGURES



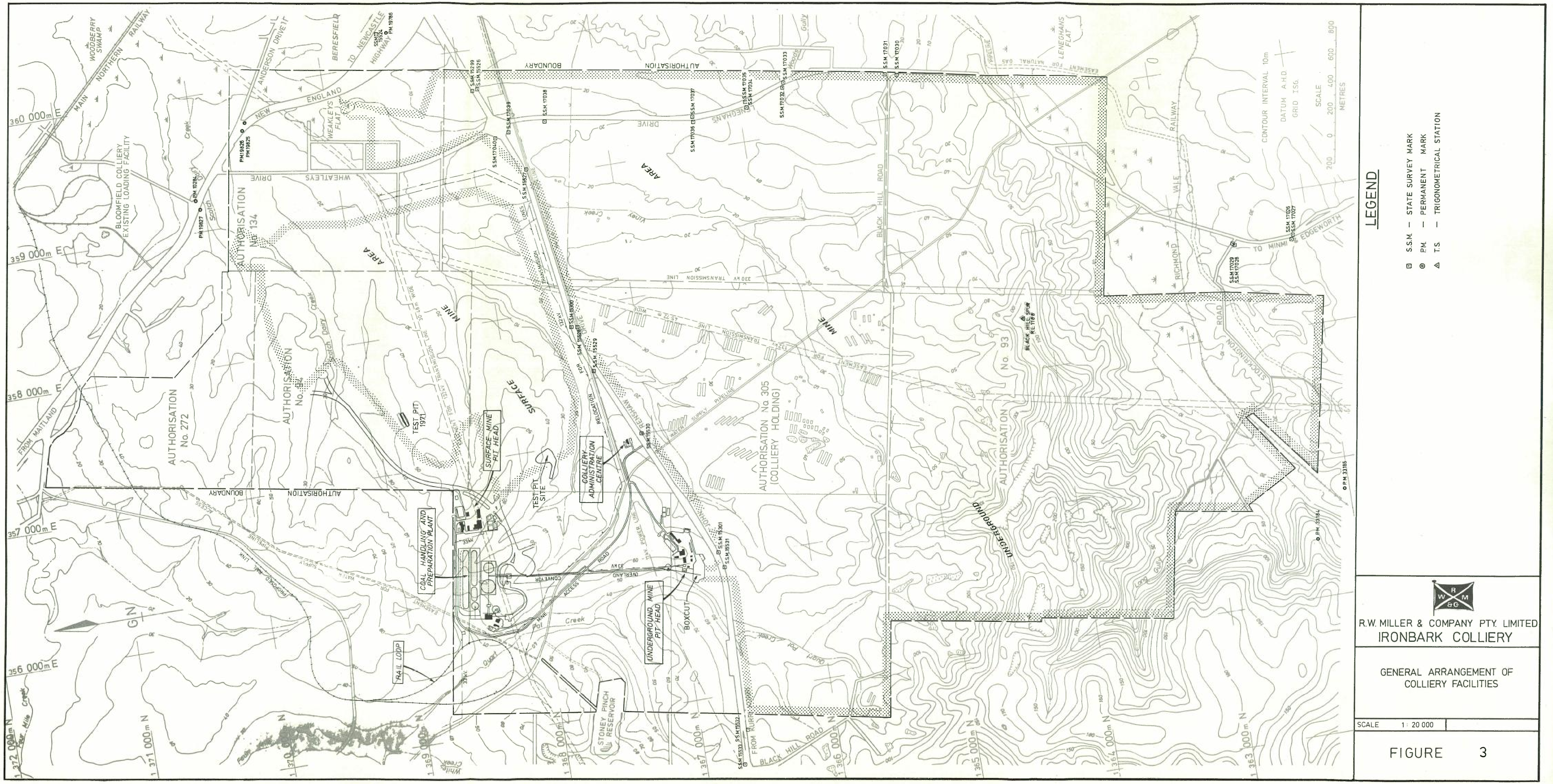
N
Gunnedah
PRESTON COLLIERY
Walcha
Tamworth
Kempsey
Coonabarabran
Werris Creek
Willow Tree
Murrurundi
Gilgandra
Taree
Dubbo
Ulan
Goulburn R.
Muswellbrook
Denman
Wellington
Hunter R.
Singleton
Mudgee
MOUNT THORLEY COLLIERY
AYRFIELD COAL PREPARATION PLANT
Maitland
Cessnock
Port Hunter
Ironbark Colliery
NEWCASTLE
WALLSEND BOREHOLE COLLIERY
Colo R.
Orange
Bathurst
Lithgow
Hawkesbury R.
OCEAN
Cowra
SYDNEY
Botany Bay
PACIFIC
Mittagong
Wollongong
Port Kembla
Goulburn
Moss Vale
CANBERRA
SCALE
25 0 50 100 150
kilometres
LEGEND
HIGHWAYS
RAILWAYS
SYDNEY BASIN
DARWIN
N.T.
W.A.
QLD.
S.A.
BRISBANE
N.S.W.
IRONBARK COLLIERY
PERTH
ADELAIDE
Newcastle
SYDNEY
CANBERRA
VIC.
MELBOURNE
TAS.
HOBART
R.W. MILLER & COMPANY PTY. LIMITED
IRONBARK COLLIERY
LOCALITY MAP
SCALE 1: 2 000 000
FIGURE 1

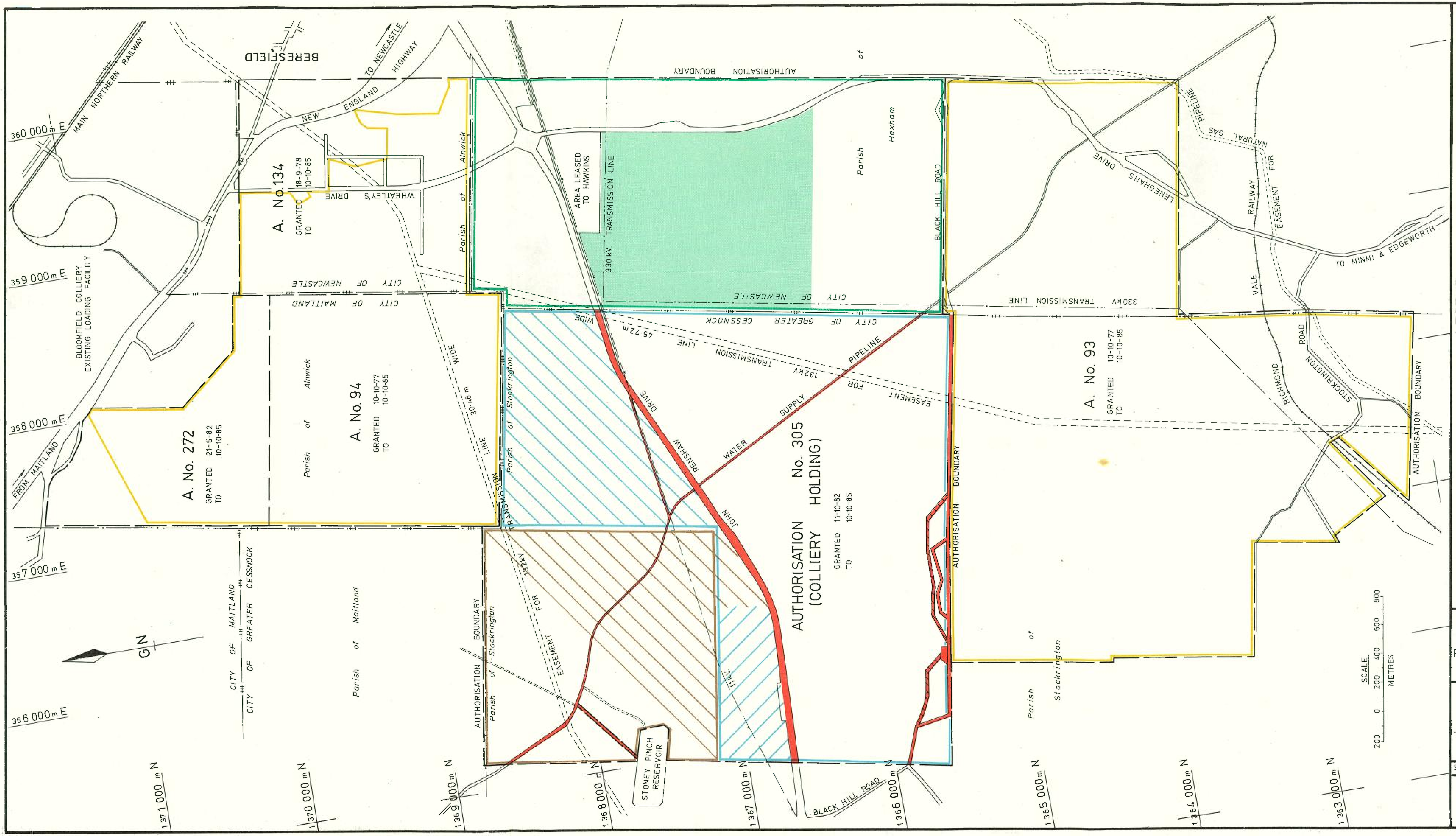


R.W. MILLER & COMPANY PTY LIMITED
IRONBARK COLLIERY

LOCATION PLAN
IRONBARK & ADJOINING
MINING TENEMENTS

FIGURE 2


LEGEND
S.S.M. — STATE SURVEY MARK
P.M. — PERMANENT MARK
T.S. — TRIGONOMETRICAL STATION
CONTOUR INTERVAL 10m
DATUM A.H.D.
GRID ISG
SCALE
200 0 200 400 600 800
METRES
R.W. MILLER & COMPANY PTY. LIMITED
IRONBARK COLLIERY
GENERAL ARRANGEMENT OF COLLIERY FACILITIES
SCALE 1: 20 000
FIGURE 3
AUTHORISATION No. 134
AUTHORISATION No. 272
AUTHORISATION No. 305 (COLLIERY HOLDING)
AUTHORISATION No. 93
AUTHORISATION BOUNDARY
SURFACE MINE AREA
UNDERGROUND MINE
COLLIERY ADMINISTRATION CENTRE
COAL HANDLING AND PREPARATION PLANT
SURFACE MINE PIT HEAD
UNDERGROUND MINE PIT HEAD
BOXCUT
TEST PIT 1971
TEST PIT SITE
RAIL LOOP
STONEY PINCH RESERVOIR
BLOOMFIELD COLLIERY EXISTING LOADING FACILITY
MAIN NORTHERN RAILWAY
WOODBERRY SWAMP
NEW ENGLAND HIGHWAY
TO NEWCASTLE
FROM MAITLAND
ANDERSON DRIVE
BERESFIELD
WEAKLEYS FLAT
WHEATLEYS DRIVE
LENEGHANS DRIVE
LENEGHANS FLAT
BLACK HILL ROAD
RICHMOND VALE RAILWAY
STOCKRINGTON ROAD
TO MINMI EDGEWORTH
330 kV TRANSMISSION LINE
WATER SUPPLY PIPELINE
CONVEYOR
ACCESS ROAD
BLACK HILL SPUR
Long Gully
Viney Creek
Scotch Dairy Creek
Quart Pot Creek
Four Mile Creek
White Creek
360 000m E
359 000m E
358 000m E
357 000m E
356 000m E
1 372 000m N
1 371 000m N
1 370 000m N
1 369 000m N
1 368 000m N
1 367 000m N
1 366 000m N
1 365 000m N
1 364 000m N
1 363 000m N



LEGEND

COAL LEASES

- CL 67 — GRANTED 15-12-75 TO 15-12-96 SURFACE AND TO 15·24m DEPTH EXCEPTED
- CL 68 — GRANTED 15-12-75 TO 15-12-96 SURFACE AND TO 15·24m DEPTH EXCEPTED
- CL 201 — GRANTED 15-12-79 TO 15-12-2000 SURFACE AND TO 15·24m DEPTH EXCEPTED
- CL 572 — GRANTED 9-5-83 TO 31-12-2002 SURFACE EXCEPTED / INCLUDES SURFACE

LEASE APPLICATIONS

- PLL. A. 1106 — APPLICATION 6-8-70 EMBRACES SURFACE TO DEPTH 15·24m.
- PLL. A. 1107 — APPLICATION 27-8-70 EMBRACES SURFACE TO DEPTH 15·24m.
- MPL. A. 1153 — APPLICATION 15-2-73 EMBRACES SURFACE TO DEPTH 15·24m.
- MINISTER ADVISED 14-9-83 THAT INVITATION TO APPLY FOR COAL LEASE WAS BEING ISSUED OVER THIS AREA.

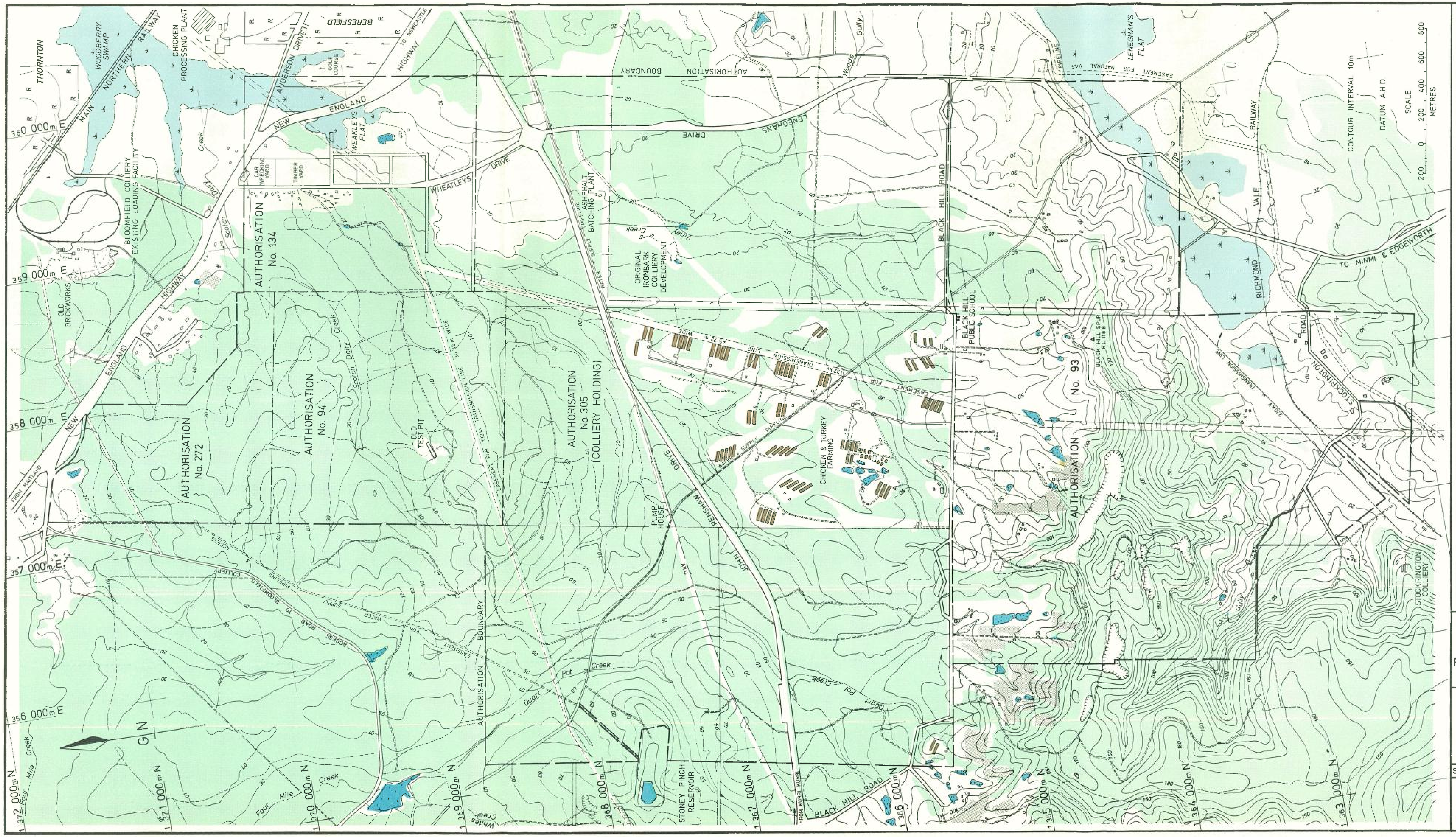
R.W. MILLER & COMPANY PTY. LIMITED

IRONBARK COLLIERY

COAL MINING TENEMENT PLAN

SCALE: 1 : 20 000

FIGURE 5



LEGEND

- RESIDENCES & IMPROVEMENTS
- POULTRY SHEDS
- DAMS
- SWAMPS
- GOLF COURSE
- BUSHLAND
- RESIDENTIAL
- QUARRY OR EXCAVATION
- ORCHARDS
- TRACKS
- NURSERY
- POWERLINE
- CLEARED BUSHLAND, GRAZING & DAIRY OPEN SPACE & ROADWAYS

CONTOUR INTERVAL 10m

DATUM A.H.D.

SCALE 200 0 200 400 600 800 METRES

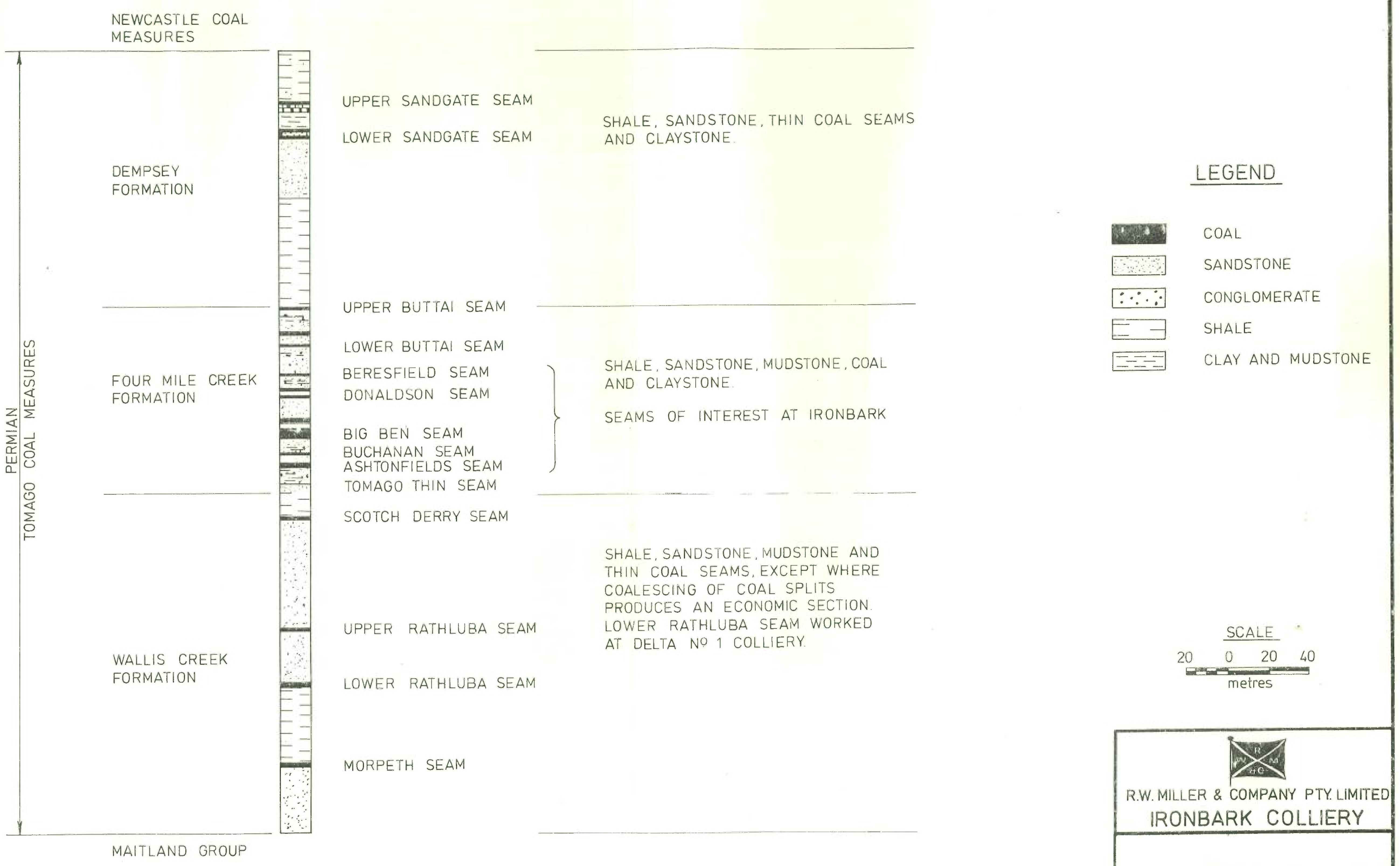
R.W. MILLER & COMPANY PTY LIMITED

IRONBARK COLLIERY

TOPOGRAPHY AND LAND USE PLAN

SCALE 1 / 20,000

FIGURE 4

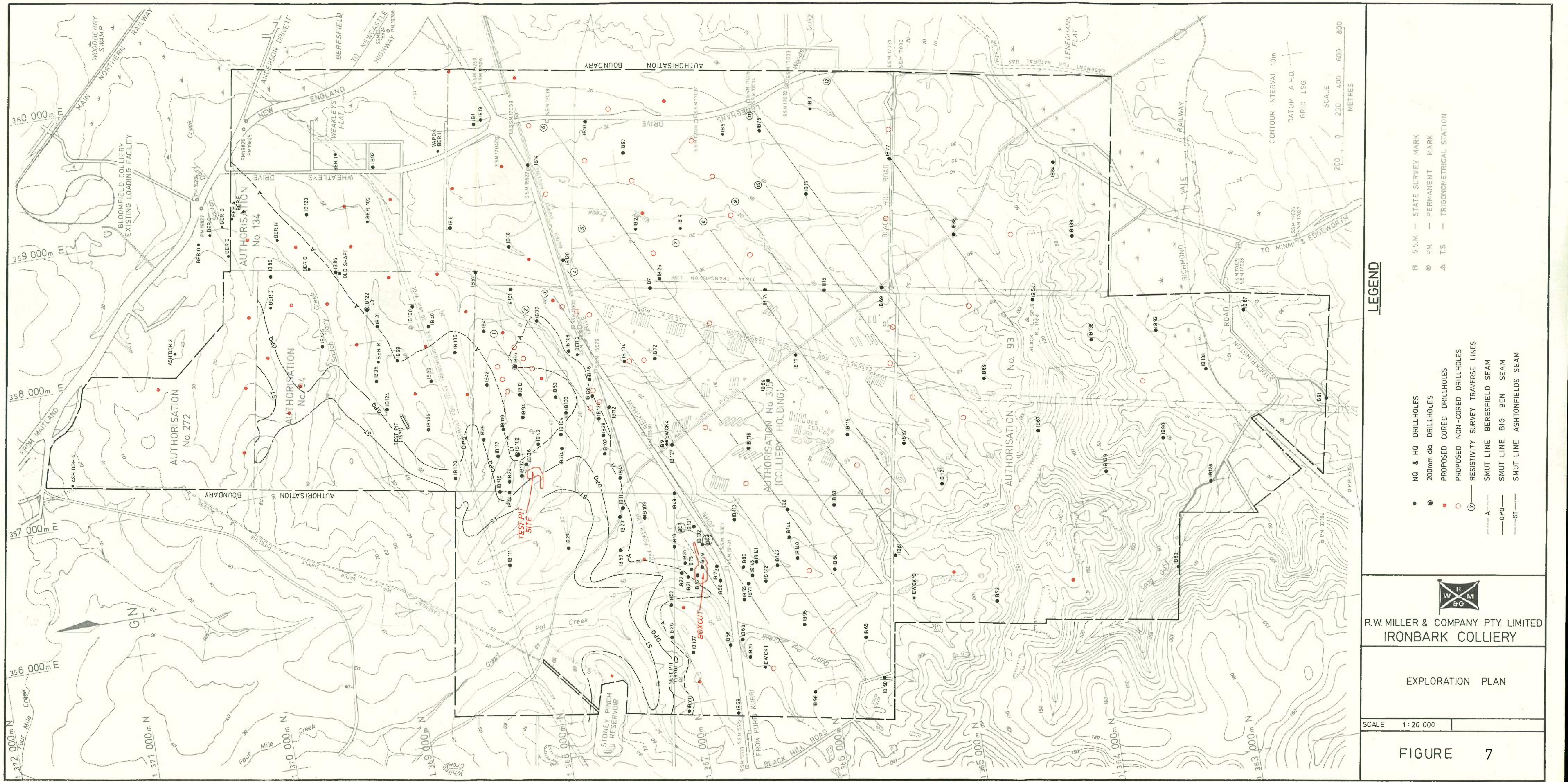


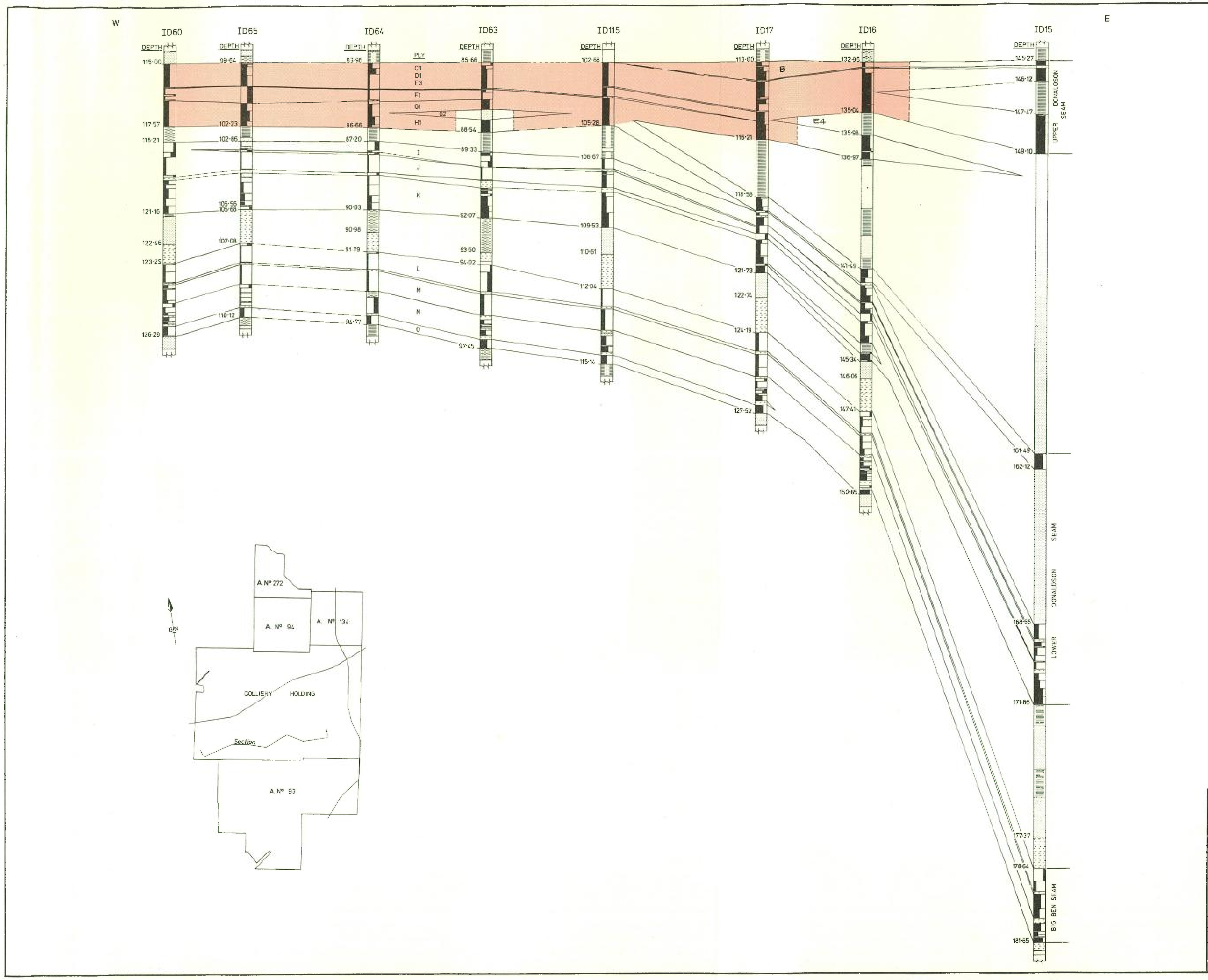
R.W. MILLER & COMPANY PTY. LIMITED
IRONBARK COLLIERY

TOMAGO COAL MEASURES STRATIGRAPHIC COLUMN

SCALE AS SHOWN

FIGURE 6


LEGEND
NQ & HQ DRILLHOLES
200mm dia. DRILLHOLES
PROPOSED CORED DRILLHOLES
PROPOSED NON-CORED DRILLHOLES
RESISTIVITY SURVEY TRAVERSE LINES
SMUT LINE BERESFIELD SEAM
SMUT LINE BIG BEN SEAM
SMUT LINE ASHTONFIELDS SEAM
S.S.M. — STATE SURVEY MARK
P.M. — PERMANENT MARK
T.S. — TRIGONOMETRICAL STATION
CONTOUR INTERVAL 10m
DATUM A.H.D.
GRID ISG
SCALE
METRES
AUTHORISATION BOUNDARY
AUTHORISATION No. 134
AUTHORISATION No. 94
AUTHORISATION No. 272
AUTHORISATION No. 93
AUTHORISATION No. 305 (COLLIERY HOLDING)
BLOOMFIELD COLLIERY EXISTING LOADING FACILITY
MAIN NORTHERN RAILWAY
NEW ENGLAND HIGHWAY
TO NEWCASTLE
FROM MAITLAND
WOODBERRY SWAMP
WEAKLEYS FLAT
WHEATLEYS DRIVE
ANDERSON DRIVE
BERESFIELD
BLACK HILL ROAD
RICHMOND VALE RAILWAY
TO MINMI & EDGEWORTH
STOCKRINGTON ROAD
LENEGHANS FLAT
STONEY PINCH RESERVOIR
FROM KURRI KURRI
TEST PIT SITE
BOXCUT
OLD SHAFT
360 000m E
359 000m E
358 000m E
357 000m E
356 000m E
1 372 000m N
1 371 000m N
1 370 000m N
1 369 000m N
1 368 000m N
1 367 000m N
1 366 000m N
1 365 000m N
1 364 000m N
1 363 000m N
R.W. MILLER & COMPANY PTY. LIMITED
IRONBARK COLLIERY
EXPLORATION PLAN
SCALE 1:20 000
FIGURE 7



LEGEND

LITHOLOGY REFERENCE:

- NOT LOGGED
- SHALE
- SANDSTONE
- MUDSTONE
- SILTSTONE
- CLAYSTONE
- CONGLOMERATE
- IGNEOUS ROCK
- COAL
- COAL WEATHERED
- COAL CINDERED
- COAL, SHALEY
- SHALE COALY

SEAM SECTIONS REFERENCE:

- COAL - UNDIFFERENTIATED
- COAL - BRIGHT
- COAL - BRIGHT WITH DULL BANDS
- COAL - INTERBANDED DULL AND BRIGHT
- COAL - MAINLY DULL FREQ. BRIGHT BANDS
- COAL - DULL WITH MINOR BRIGHT BANDS
- COAL - DULL
- COAL - WEATHERED

UNDERGROUND WORKING SECTION UPPER DONALDSON SEAM WORKING THICKNESS 1·8 - 3·0 m.

METRES
0 100 200 300 400 500 600
HORIZONTAL SCALE

METRES
0 1 2 3 4 5 6
VERTICAL SCALE

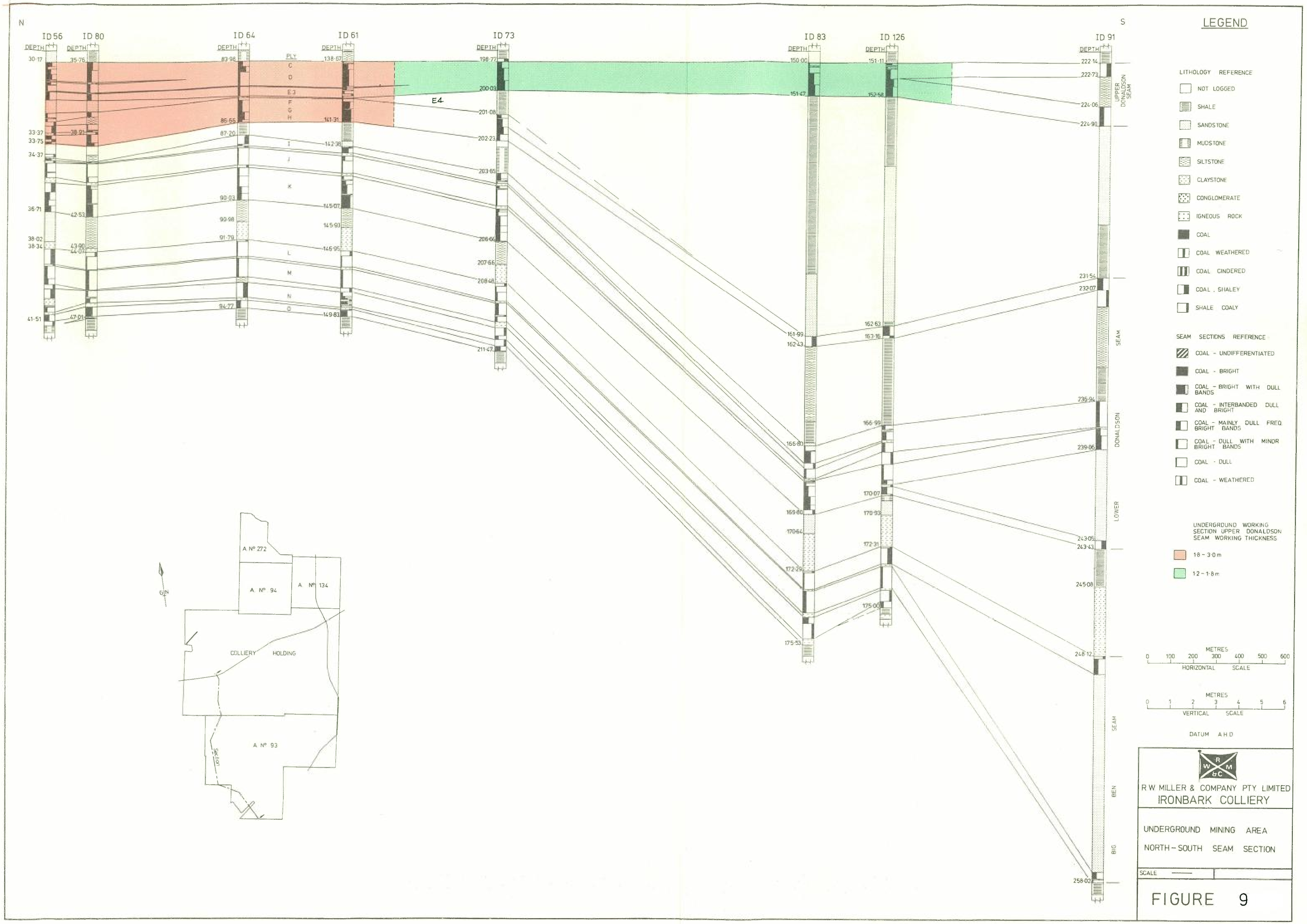
DATUM A.H.D.

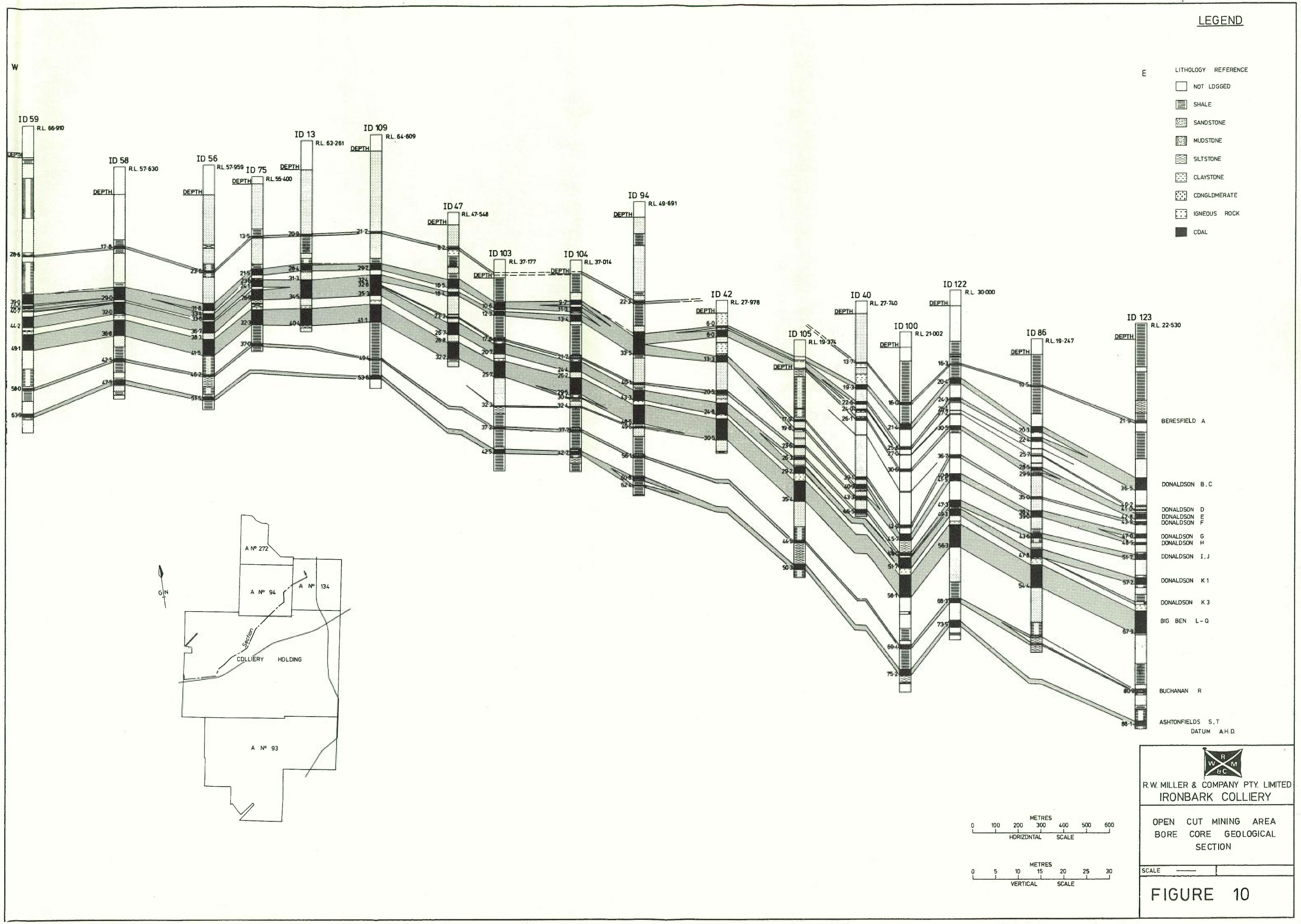
R.W. MILLER & COMPANY PTY LIMITED
IRONBARK COLLIERY

UNDERGROUND MINING AREA
WEST-EAST SEAM SECTION

SCALE ——

FIGURE 8


N
S
ID 56
ID 80
ID 64
ID 61
ID 73
ID 83
ID 126
ID 91
E4
UPPER DONALDSON SEAM
LOWER DONALDSON SEAM
BIG BEN SEAM
A Nº 272
A Nº 94
A Nº 134
COLLIERY HOLDING
A Nº 93
LEGEND
LITHOLOGY REFERENCE
NOT LOGGED
SHALE
SANDSTONE
MUDSTONE
SILTSTONE
CLAYSTONE
CONGLOMERATE
IGNEOUS ROCK
COAL
COAL WEATHERED
COAL CINDERED
COAL , SHALEY
SHALE COALY
SEAM SECTIONS REFERENCE
COAL - UNDIFFERENTIATED
COAL - BRIGHT
COAL - BRIGHT WITH DULL BANDS
COAL - INTERBANDED DULL AND BRIGHT
COAL - MAINLY DULL FREQ BRIGHT BANDS
COAL - DULL WITH MINOR BRIGHT BANDS
COAL - DULL
COAL - WEATHERED
UNDERGROUND WORKING SECTION UPPER DONALDSON SEAM WORKING THICKNESS
1·8 - 3·0 m
1·2 - 1·8 m
METRES
0 100 200 300 400 500 600
HORIZONTAL SCALE
METRES
0 1 2 3 4 5 6
VERTICAL SCALE
DATUM A H D
R W M & C
R W MILLER & COMPANY PTY LIMITED
IRONBARK COLLIERY
UNDERGROUND MINING AREA
NORTH - SOUTH SEAM SECTION
SCALE
FIGURE 9



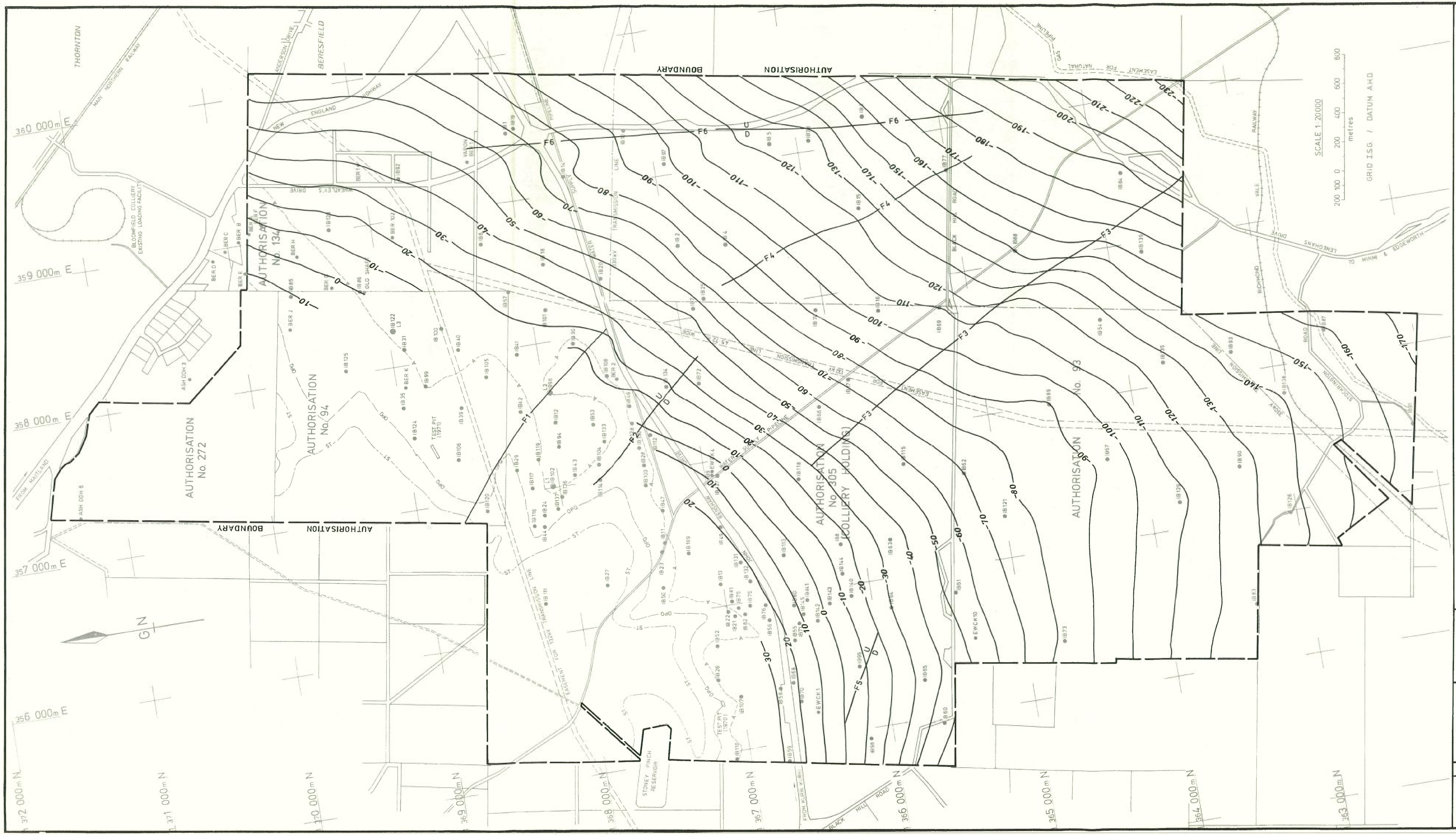
R.W. MILLER & COMPANY PTY. LIMITED

IRONBARK COLLIERY

OPEN CUT MINING AREA BORE CORE GEOLOGICAL SECTION

SCALE

FIGURE 10



SCALE 1:20000
metres
GRID I.S.G. / DATUM A.H.D.

LEGEND

- HQ & NQ DRILLHOLES
- 200mm dia DRILLHOLES
- SMUT LINE BERESFIELD SEAM
- SMUT LINE BIG BEN SEAM
- SMUT LINE ASHTONFIELDS SEAM
- -70- STRUCTURE CONTOUR FLOOR OF SEAM (COMPUTER PLOT)
- F6 INFERRED FAULT FROM DRILLING & GEOPHYSICS (SHOWING DISPLACEMENT DIRECTION)

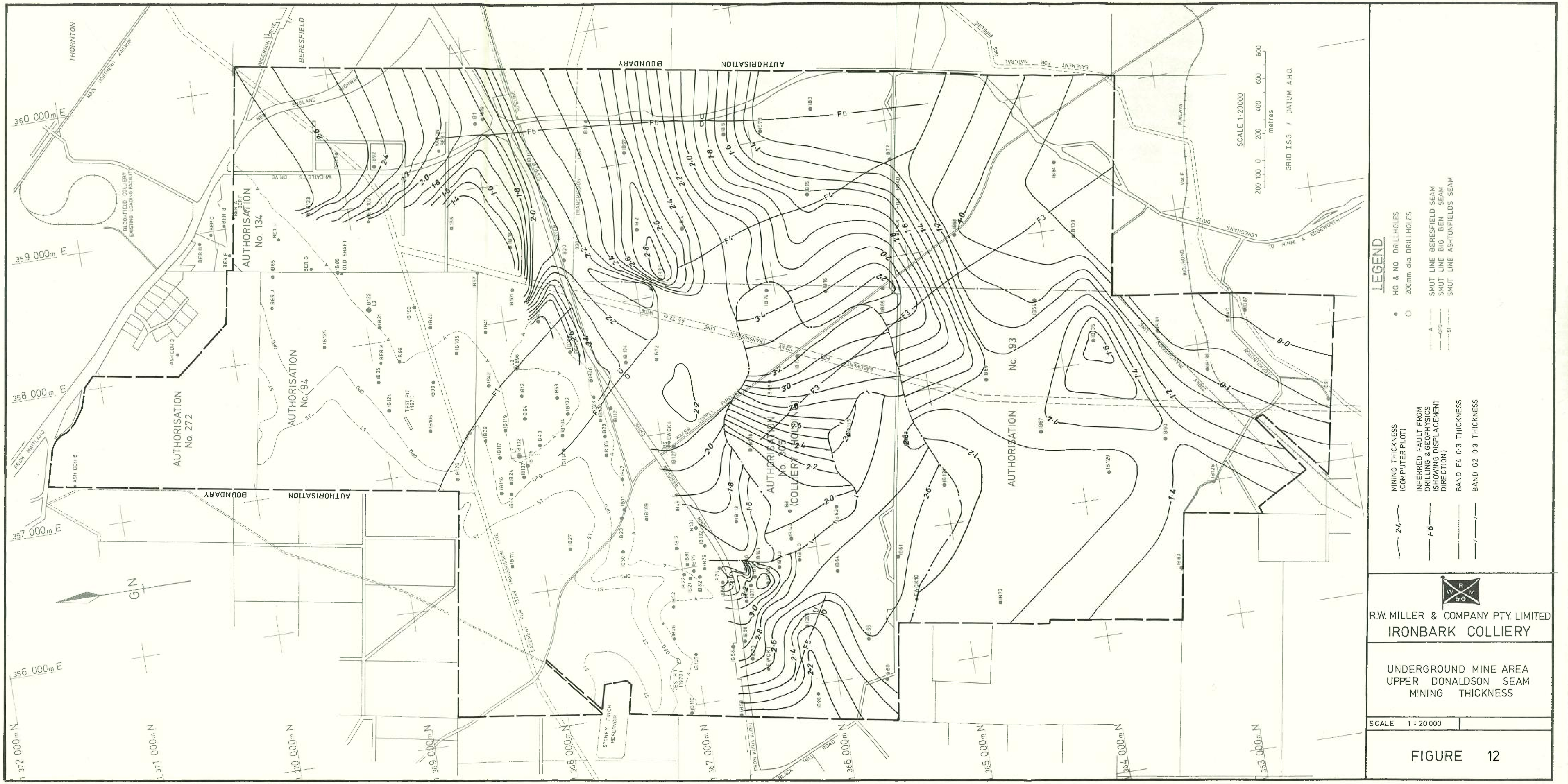
R.W. MILLER & COMPANY PTY. LIMITED

IRONBARK COLLIERY

UNDERGROUND MINE AREA
UPPER DONALDSON SEAM
FLOOR STRUCTURE CONTOURS
(PRELIMINARY INTERPRETATION)

SCALE 1:20000

FIGURE 11



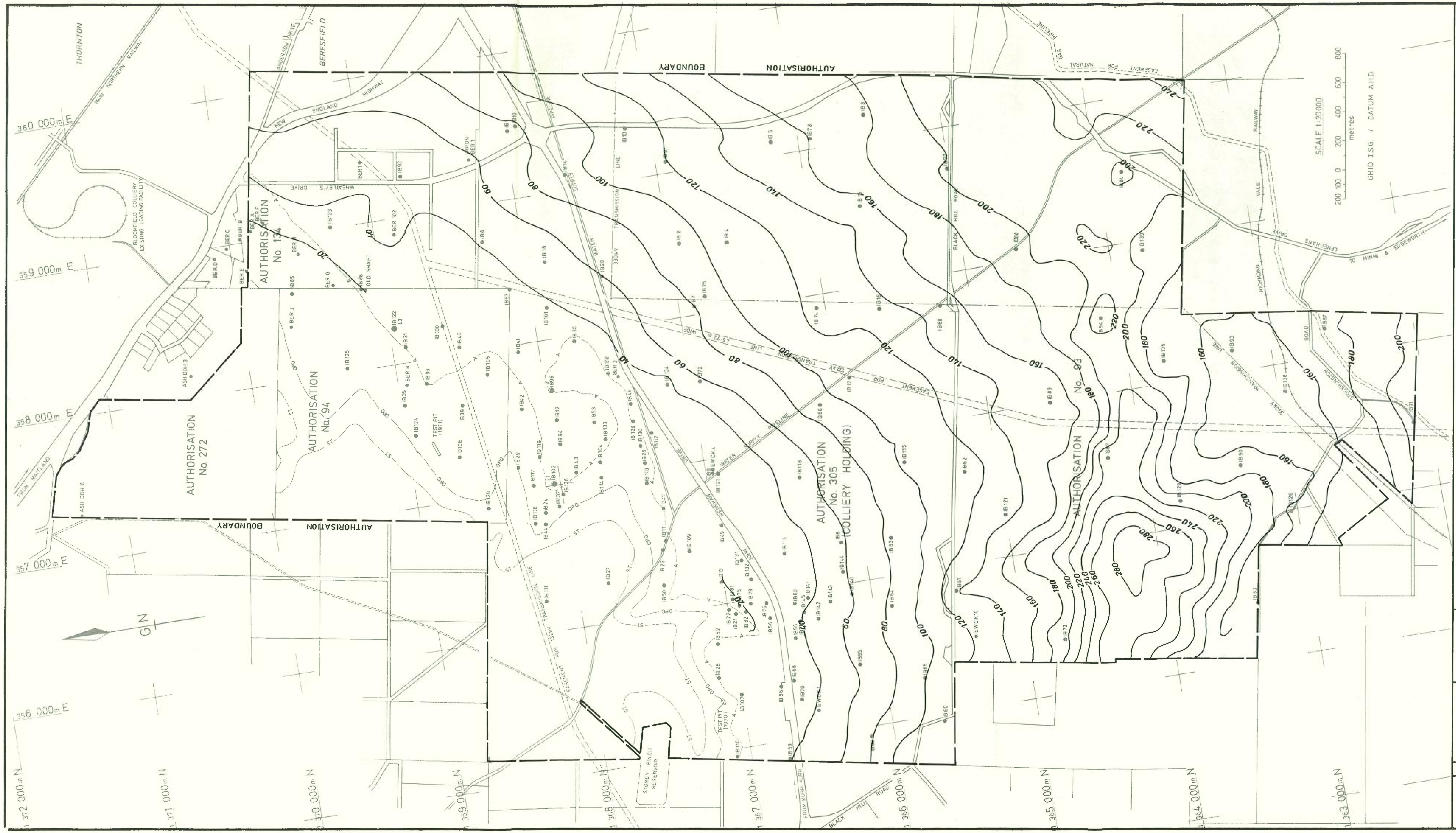
R.W. MILLER & COMPANY PTY. LIMITED

IRONBARK COLLIERY

UNDERGROUND MINE AREA
UPPER DONALDSON SEAM
MINING THICKNESS

SCALE 1:20 000

FIGURE 12



LEGEND

- • HQ & NQ DRILLHOLES
- ○ 200mm dia. DRILLHOLES
- --- A --- SMUT LINE BERESFIELD SEAM
- --- OPQ --- SMUT LINE BIG BEN SEAM
- --- ST --- SMUT LINE ASHTONFIELDS SEAM
- — 60 — COVER ISOPACHS (COMPUTER PLOT)

SCALE 1:20 000

200 100 0 200 400 600 800 metres

GRID I.S.G. / DATUM A.H.D.

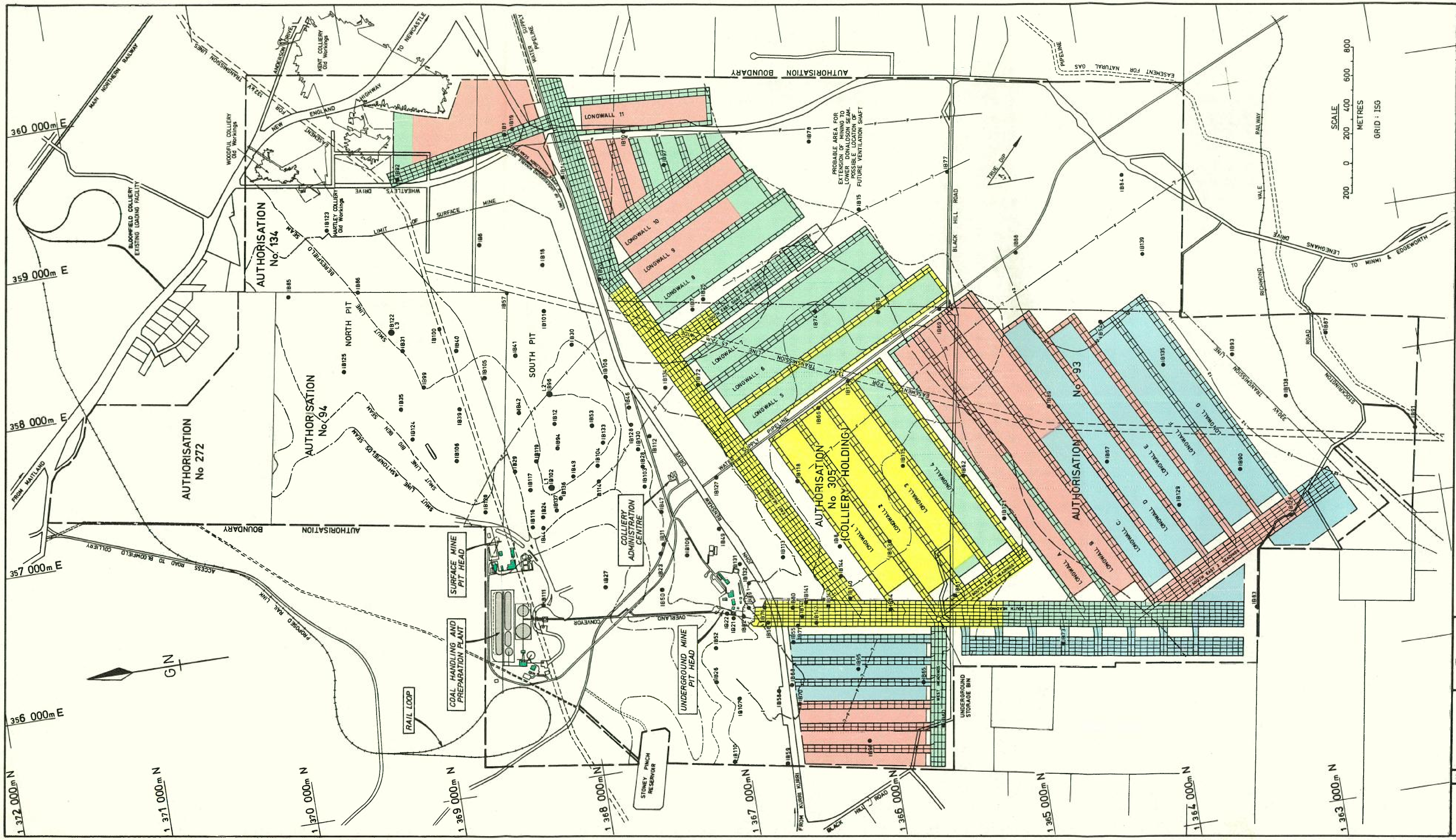
R.W. MILLER & COMPANY PTY. LIMITED

IRONBARK COLLIERY

UNDERGROUND MINE AREA
UPPER DONALDSON SEAM
COVER ISOPACHS

SCALE 1 : 20 000

FIGURE 13



LEGEND

MINE DEVELOPMENT TO THE END OF:

- YEAR 5
- YEAR 10
- YEAR 15
- YEAR 20

• HQ & NQ DRILLHOLES
○ 200mm dia DRILLHOLES

UNDERGROUND MINING SECTION
UPPER DONALDSON SEAM

SEAM AVERAGE DIP - 1 in 16·2 (3·5°)
DIRECTION OF DIP - S 47° E

10m INTERVAL BETWEEN FLOOR OF UPPER DONALDSON SEAM & ROOF OF LOWER DONALDSON SEAM
UPPER DONALDSON 1·8 m WORKING THICKNESS.
30m COVER LINE TO UPPER DONALDSON SEAM.
PROJECTED FAULT
INFERRED FAULT
1·2m WORKING THICKNESS
BAND E4 0·3m THICKNESS
BAND G2 0·3m THICKNESS

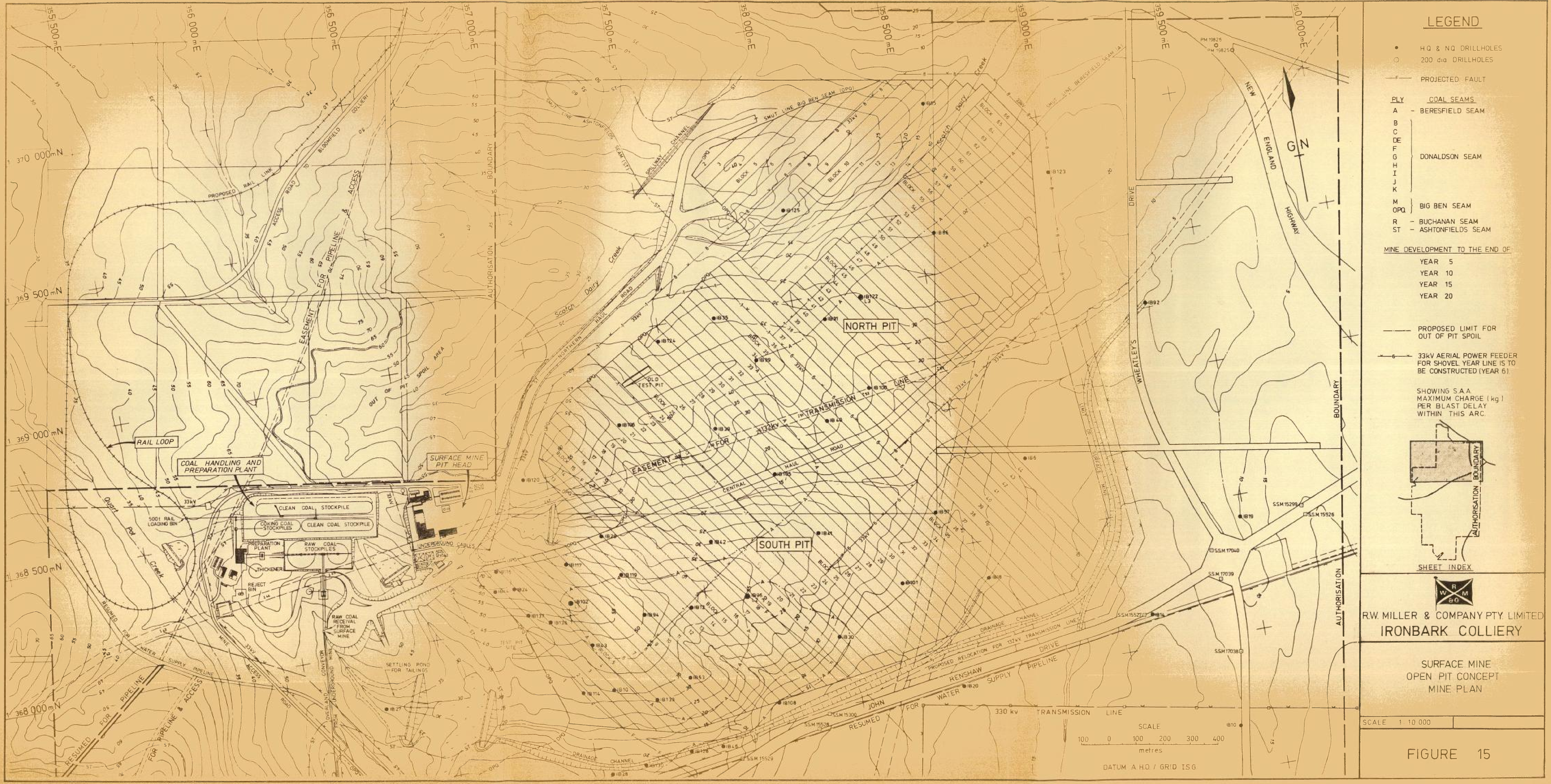
SCALE
200 0 200 400 600 800
METRES
GRID : ISG

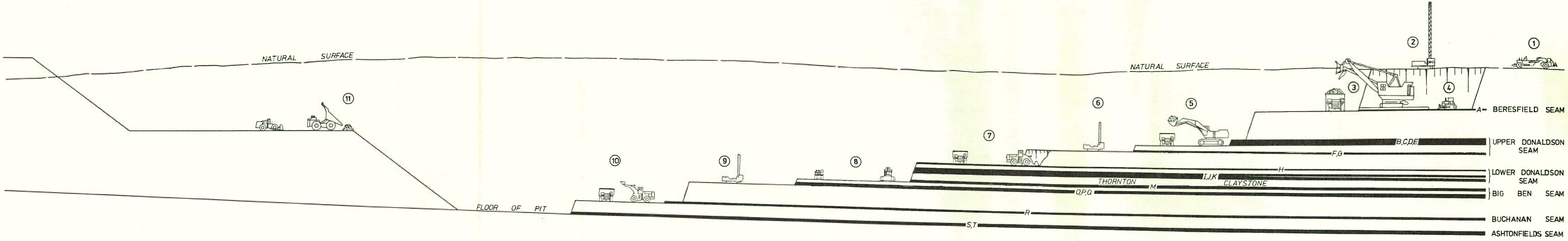
R.W. MILLER & COMPANY PTY. LIMITED
IRONBARK COLLIERY

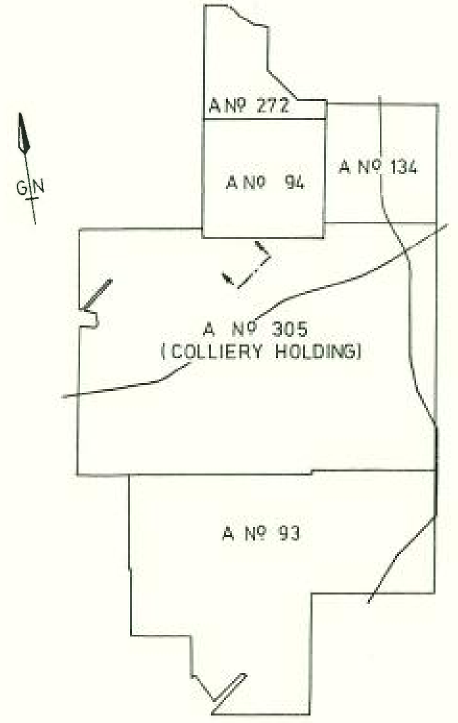
CONCEPTUAL UNDERGROUND
20 YEAR MINE PLAN

SCALE : 1:20 000

FIGURE 14


LEGEND
HQ & NQ DRILLHOLES
200 dia DRILLHOLES
PROJECTED FAULT
PLY
COAL SEAMS
A - BERESFIELD SEAM
B C DE F G H I J K
DONALDSON SEAM
M OPQ
BIG BEN SEAM
R - BUCHANAN SEAM
ST - ASHTONFIELDS SEAM
MINE DEVELOPMENT TO THE END OF
YEAR 5
YEAR 10
YEAR 15
YEAR 20
PROPOSED LIMIT FOR OUT OF PIT SPOIL
33kV AERIAL POWER FEEDER FOR SHOVEL YEAR LINE IS TO BE CONSTRUCTED (YEAR 6)
SHOWING S.A.A. MAXIMUM CHARGE (kg) PER BLAST DELAY WITHIN THIS ARC.
SHEET INDEX
AUTHORISATION BOUNDARY
R.W. MILLER & COMPANY PTY LIMITED
IRONBARK COLLIERY
SURFACE MINE
OPEN PIT CONCEPT
MINE PLAN
SCALE 1 10 000
FIGURE 15
NORTH PIT
SOUTH PIT
RAIL LOOP
COAL HANDLING AND PREPARATION PLANT
SURFACE MINE PIT HEAD
CLEAN COAL STOCKPILE
COKING COAL STOCKPILES
RAW COAL STOCKPILES
PREPARATION PLANT
THICKENER
REJECT BIN
5001 RAIL LOADING BIN
RAW COAL RECEIVAL FROM SURFACE MINE
SETTLING POND FOR TAILINGS
UNDERGROUND CABLES
OLD TEST PIT
EASEMENT FOR 132kV TRANSMISSION LINE
EASEMENT FOR PIPELINE & ACCESS
CENTRAL HAUL ROAD
NORTHERN HAUL ROAD
OUT OF PIT SPOIL AREA
PROPOSED RAIL LINK
BLOOMFIELD COLLIERY
Scotch Dairy Creek
Quart Pot Creek
NEW ENGLAND HIGHWAY
WHEATLEY'S DRIVE
JOHN RENSHAW DRIVE
RESUMED FOR WATER SUPPLY PIPELINE
RESUMED FOR PIPELINE & ACCESS
DRAINAGE CHANNEL
SPILLWAY CHANNEL
PROPOSED RELOCATION FOR 132kV TRANSMISSION LINES
330 kV TRANSMISSION LINE
SCALE
100 0 100 200 300 400
metres
DATUM A.H.D. / GRID I.S.G.
GN
370 000mN
369 500mN
369 000mN
368 500mN
368 000mN
355 500mE
356 000mE
356 500mE
357 000mE
357 500mE
358 000mE
358 500mE
359 000mE
360 000mE





SCHEMATIC SEQUENCE OF TYPICAL OPERATING MODE

(1) TOPSOIL REMOVAL
(2) OVERBURDEN DRILLING & BLASTING ABOVE BERESFIELD SEAM (A)
(3) OVERBURDEN REMOVAL ABOVE BERESFIELD SEAM (A)
(4) CLEAN UP ON TOP OF BERESFIELD SEAM (A)
(5) MINING OF UPPER DONALDSON SEAM (B,C,D,E)
(6) MIDBURDEN DRILLING & BLASTING ABOVE LOWER DONALDSON SEAM (H)
(7) MIDBURDEN REMOVAL ABOVE LOWER DONALDSON SEAM (H)
(8) PARTING REMOVAL TO UNCOVER BIG BEN SEAM (O,P,Q)
(9) MIDBURDEN DRILLING & BLASTING ABOVE BUCHANAN SEAM (R)
(10) MINING OF BUCHANAN SEAM (R)
(11) BURDEN DUMPED IN SPOIL AREA

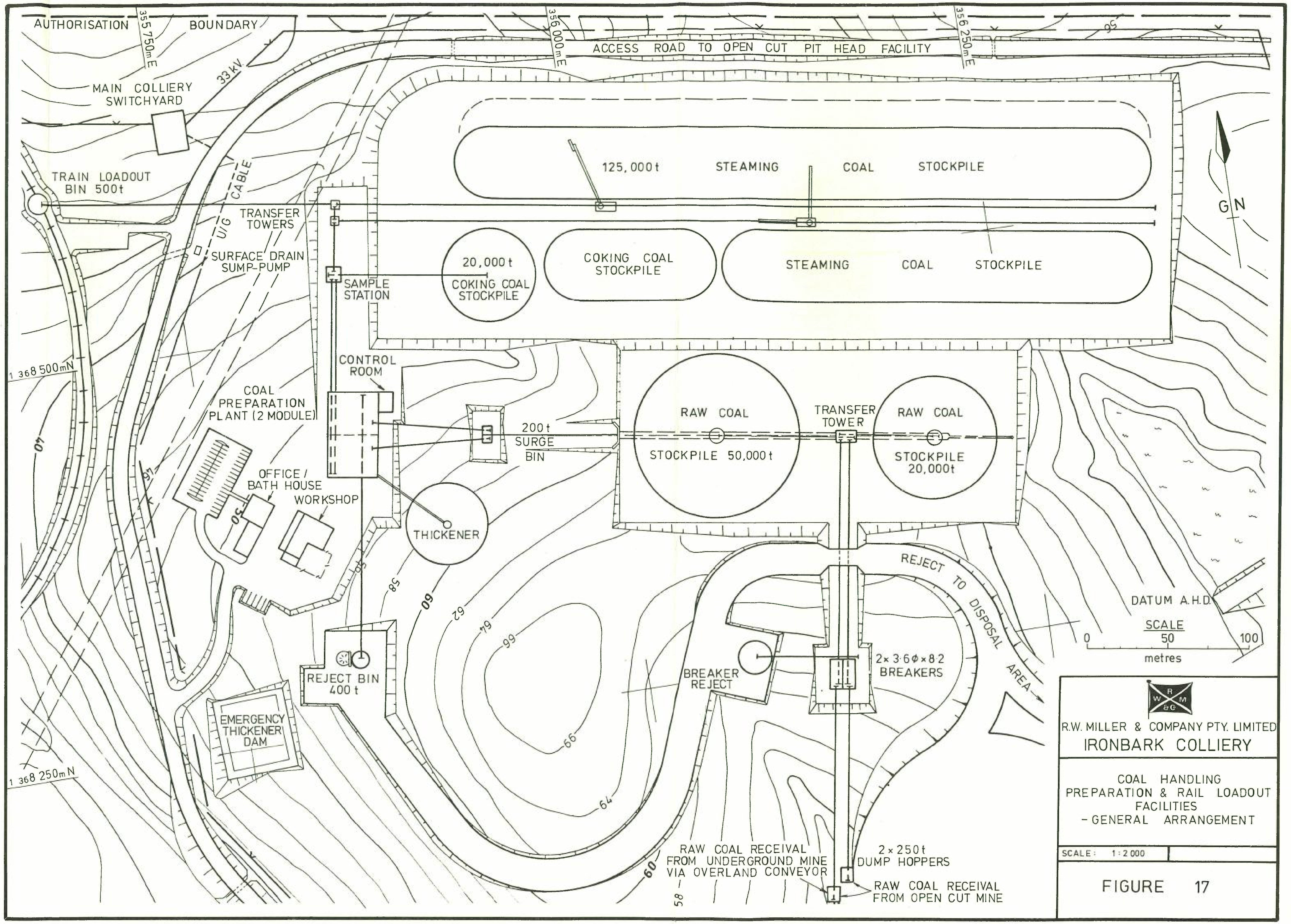
SCALE
10 0 10 20 30 40
metres

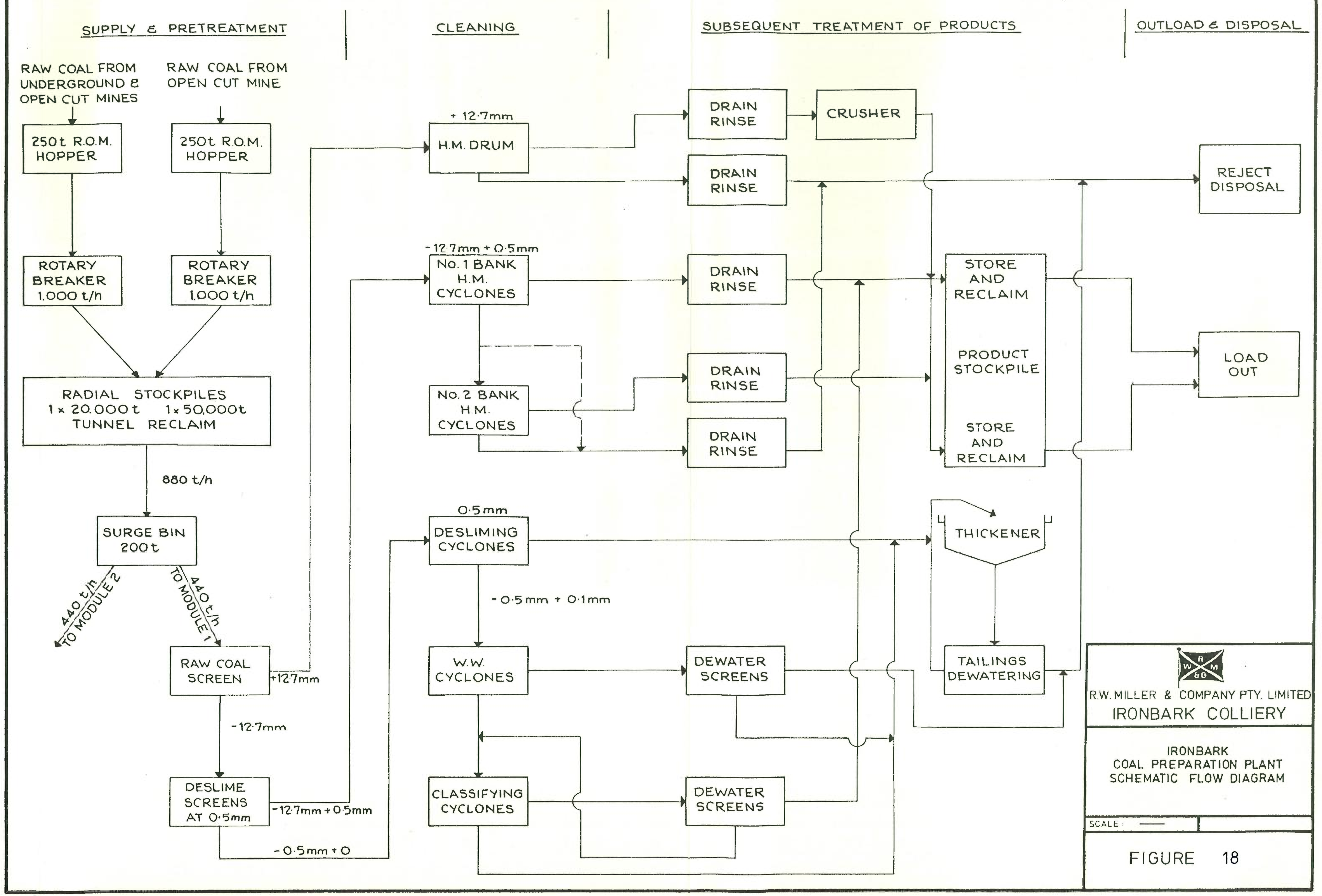
R.W. MILLER & COMPANY PTY. LIMITED
IRONBARK COLLIERY

SURFACE MINE OPEN PIT CONCEPT
SCHEMATIC CROSS SECTION OF
MINING OPERATIONS

SCALE 1:1000 (NAT.)

FIGURE 16


AUTHORISATION BOUNDARY
355 750m E
356 000m E
356 250m E
ACCESS ROAD TO OPEN CUT PIT HEAD FACILITY
MAIN COLLIERY SWITCHYARD
33kV
TRAIN LOADOUT BIN 500t
U/G CABLE
TRANSFER TOWERS
SURFACE DRAIN SUMP-PUMP
SAMPLE STATION
125,000t STEAMING COAL STOCKPILE
20,000t COKING COAL STOCKPILE
COKING COAL STOCKPILE
STEAMING COAL STOCKPILE
G N
1 368 500m N
CONTROL ROOM
COAL PREPARATION PLANT (2 MODULE)
200t SURGE BIN
RAW COAL STOCKPILE 50,000t
TRANSFER TOWER
RAW COAL STOCKPILE 20,000t
OFFICE / BATH HOUSE
WORKSHOP
THICKENER
REJECT TO DISPOSAL AREA
DATUM A.H.D.
SCALE
0 50 100
metres
REJECT BIN 400t
BREAKER REJECT
2× 3·6φ×8·2 BREAKERS
EMERGENCY THICKENER DAM
1 368 250m N
RAW COAL RECEIVAL FROM UNDERGROUND MINE VIA OVERLAND CONVEYOR
2×250t DUMP HOPPERS
RAW COAL RECEIVAL FROM OPEN CUT MINE
R.W. MILLER & COMPANY PTY. LIMITED
IRONBARK COLLIERY
COAL HANDLING PREPARATION & RAIL LOADOUT FACILITIES - GENERAL ARRANGEMENT
SCALE: 1:2000
FIGURE 17



R.W. MILLER & COMPANY PTY. LIMITED
IRONBARK COLLIERY

IRONBARK
COAL PREPARATION PLANT
SCHEMATIC FLOW DIAGRAM

SCALE: —

FIGURE 18

Borrower's name	Date	Ext

R W MILLER & CO PTY LTD EIS 473

Ironbark colliery