

THE SHELL COMPANY OF AUSTRALIA LIMITED

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MOUNT NICHOLAS COAL PROJECT

Tasmania

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EXECUTIVE SUMMARY

EL 5/61

94-3662

Draft (7 December 1982)

FLUOR AUSTRALIA PTY. LIMITED

(INCORPORATED IN VICTORIA)

ENGINEERS & CONSTRUCTORS
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Ref: MLC-1204/1504.01

7 December 1982

The Shell Company of Australia Limited,
Coal Division,
30th Floor,
Marland House,
570 Bourke Street,
MELBOURNE VIC 3000.

Attention: Mr. W.N. Darby

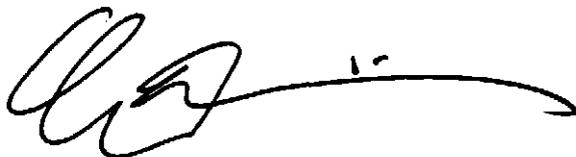
Dear Sir,

Re: MOUNT NICHOLAS COAL PROJECT

We are pleased to present 15 copies of our draft Executive Summary of the Feasibility Study, for use in your Joint Venture meeting on 8 December 1982.

The Executive Summary will be issued in final form on completion of our detailed report.

Yours faithfully,
for and on behalf of
FLUOR AUSTRALIA PTY LIMITED



C.E. MILES
Study Manager

CEM:mh

Enc.

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APPENDIX A Drawings

20-MG-001	Rev B	Surface Layout and Location Plan
10-MG-002	Rev A	Mine Layout - L1/L2 Horizon
20-MG-002	Rev A	Surface Area Layout
20-MF-002	Rev B	Coal Processing - Equipment Flowsheet

1.0 INTRODUCTION

The Shell Company of Australia Limited (SCOA) and Industrial Mining Investigations Pty Ltd are Joint Venturers (60%, 40% respectively) holding an exploration licence for coal, EL5/61 (Gray), over an area of north-eastern Tasmania. A prospective mining area has been identified, covering part of a coal deposit under the Nicholas Range, near the town of St Mary's.

On 27 August 1982, SCOA Coal Division, on behalf of the Joint Venture, commissioned Fluor to undertake a Feasibility Study for the development of an underground mine at this site to supply coal to the Tasmanian market. The objective of the Feasibility Study was to examine the technical feasibility of mining coal from the deposit and determine the capital cost, and operating cost per tonne of saleable product, to enable an investment decision to be made.

The scope of the Feasibility Study included appraisal of work undertaken by SCOA and by others on behalf of SCOA, notably:

- exploration of the deposit by SCOA and the Tasmania Department of Mines (DOM);
- analysis and testing of exploration samples by Australian Coal Industry Research Laboratories Pty Ltd (ACIRL), Cargo Superintendents Company (Australasia) Pty Ltd (CASCO) and the University of Melbourne;
- geological assessment of the deposit by SCOA;
- pre-feasibility study by Dames & Moore (D&M), and evaluation of same by SCOA;
- geotechnical assessment of mining conditions by Fuller;
- tunnelling study by Marshall for Fuller;
- review of roof support requirements by Fuller;
- description of statutory planning procedures and guide to environmental information by SCOA.

This Executive Summary is a condensed version of Fluor detailed Report of the Feasibility Study. Sections 4.0 and 12.0, pertaining to marketing and product transportation, were prepared by SCOA. Mining engineering aspects of the Study incorporate advice by Mr D G Robertson, of Mineplan Pty Limited, who was retained by Fluor in a consulting capacity.

Financial evaluation of the project is to be undertaken by SCOA.

2.0 SUMMARY

The Mount Nicholas deposit contains 30 Mt of mineable medium quality thermal coal. The Feasibility Study takes into account the need to extract the maximum proportion of the economically mineable reserves within the deposit. To assure economy in project development and in mining, coal processing and support operations, a utilitarian approach has been taken consistent with sound, cost effective engineering and safe, industrially and environmentally acceptable operating practices.

The location of the project is shown in Figure 2.1.

It is proposed in the Feasibility Study that an underground mine and coal processing facilities be developed, to produce a total quantity of 7.1 Mt of saleable steaming coal over a twenty year production period. Full production is attained in Year 6, and averages 418 000 t/a thereafter.

Initial capital cost to develop the mine and infrastructure, including capitalisation of pre-production operating cost, but excluding Joint Venture home office and site office costs and project financing costs, is estimated to be \$22 million at 1 November 1982 pricing. Deferred and replacement capital expenditure during the 20 year design life of the mine is estimated to total \$13 million. This amount excludes allowance for the salvage value of capital assets and the cost of mine site rehabilitation at the end of the design mine life, since total mine life expectancy at the planned rate of production is predicted to be at least 45 years and possibly in excess of 60 years.

Once full production is attained, operating cost per tonne of saleable product, loaded into trains at the point of dispatch from the mine, is estimated to average \$20.80, including probable government charges but excluding any future special taxes or concessions. Marketing costs are excluded.

Copy 1 15.5 \$ 21.52

Rail transportation cost at full production is estimated to average \$8.15/t, on the basis that 50% of production will be railed 180 km and the balance 260 km on average. This estimate excludes unloading costs, and no allowance has been made for railway demurrage/dispatch charges or any costs attributable to force majeure circumstances.

In the Feasibility Study, geological and geotechnical evaluation was based on drillhole log data and slim core test results from exploration by SCOA up to mid-1982 only. The number of drillholes was restricted - notably in the central area of the prospect, due to high drilling cost because of the rough terrain and thick dolerite capping. Also, significant information from the current large diameter cored drilling programme was not available in time for appraisal by Fluor, as had been envisaged. Consequently, it must be understood that reserve estimation, mine planning and coal processing evaluation, as presented in this Report, have been based necessarily on limited knowledge of the properties of the deposit. However, in devising the proposed mining and coal processing concepts, and in cost estimation - notably with respect to contingency and accuracy - Fluor has made reasonable allowance for likely variation when more reliable information becomes available, both before project development and during mine operation.

There is scope to increase the rate of buildup of production in the early years of mine operation, and/or to increase the full production rate, should marketing expectations change.

5 cm

LOCALITY MAP

0 50 100 Km.

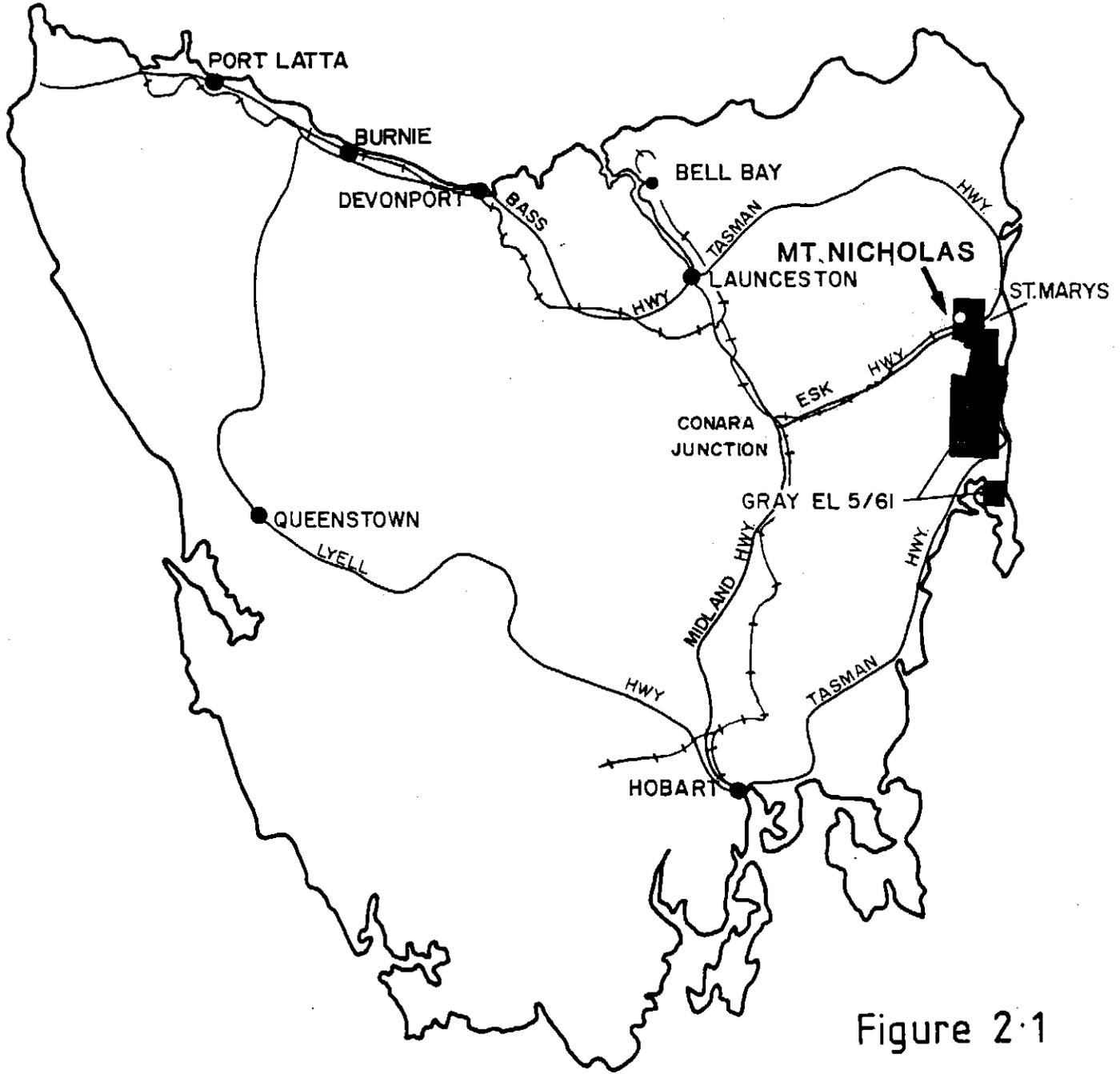


Figure 2.1

3.0 REGIONAL ASPECTS

3.1 General

The mine site is located in the northern margin of the Fingal Valley, as shown in Drawing 10-MG-001 Locality and Site Plan. The surrounding district is shown in Tasmania Lands Department 1:100 000 Topographic Map 8514 : Break O'Day. The proposed surface facilities area is accessible from the bitumen sealed Esk Highway via 2 km of gravel road, which also gives access to a network of unsealed roads and tracks supporting timber felling and reforestation to the north and west of the prospective mining area. Hobart and Launceston are respectively 210 km and 125 km distant by road. The Launceston - St Mary's railway line passes 1.4 km south of the proposed portal entry to the mine.

The Break O'Day river flows westerly through the Fingal Valley, 2 km to the south.

3.2 Topography

Natural surface elevations of the mine site rise from about 250 m above Australian Height Datum (AHD) at the northern edge of the Break O'Day flood plain to 857 m AHD on the summit of Mount Nicholas. The uppermost 200 m of the Nicholas Range is a scarp bounded dolerite remnant; the lower slopes are moderately graded and mantled by doleritic colluvium containing large boulders. The symmetry of the range is disrupted by Huntsmans Cap, a dolerite protrusion on the northern slope.

3.3 Industry

Coal has been mined in the region since 1886. Today, there are two operating collieries.

Blackwood Mine, owned by Cornwall Coal Company Ltd (CCC), a subsidiary of Goliath Portland Cement Company Ltd (Goliath), adjoins the eastern boundary of the prospect.

CCC also operates Duncan Mine, located in the south-eastern margin of the Fingal Valley.

Coal from both Blackwood and Duncan collieries is trucked to the CCC owned preparation plant at Fingal, which is the only operating coal preparation plant in Tasmania. Product is railed from Fingal to local industrial users, of which the Goliath owned cement works at Railton is the major consumer.

Tin was mined in the region from 1891 until recently.

Farming, grazing and forestry, including woodchipping, are the other main primary industries, along with fishing in the nearby coastal waters. Secondary and tertiary industries are restricted mainly to those servicing the primary industries of the region, and tourism on the coast.

3.4 Land Tenure

The prospective mining area occupies approximately 15 km² of naturally forested land controlled by the Tasmania Forestry Commission (TFC). The proposed surface facilities occupy another 20 ha which is partly TFC controlled and partly within the privately owned Millbrook grazing property.

3.5 Demography

The nearest towns are:

	Population	Distance by Road
• Cornwall	200	7 km east
• St Mary's	700	9 km east
• Fingal	400	16 km south-west
• Scamander	400	27 km north-east
• Avoca	200	43 km south-west
• St Helen's	800	46 km north-east
• Bicheno	400	52 km south-east

Total population of the Municipality of Fingal is around 3000.

3.6 Climate

The climate of the area is cool and temperate. In the 18 year period 1964-1981, annual rainfall at Millbrook averaged 826 mm, varying from 439 mm to 1605 mm. Monthly averages over that period range from 41 mm (January) to 93 mm (August). Heaviest monthly fall was 506 mm (April 1974). Heavy rains can occur at any time due to prevailing moist onshore winds.

Flooding of the Break O'Day plain typically occurs several times a year, occasionally disrupting road and rail transport. Fogs extending to west of Fingal, and covering the slopes of the Nicholas Range, are common during autumn and winter. Snow falls occasionally on the range. Mean maximum daily temperature varies between 21°C mid-summer and 9°C mid-winter.

4.0 MARKETING

4.1 General

The quality of the Mount Nicholas coal restricts it to Tasmanian consumption.

4.2 The Potential Tasmanian Market

The total potential domestic market for coal available in Tasmania has been assessed by SCOA to be:

Industrial Market	340 000 - 650 000 t/a
Market for Power Generation	200 000 - 660 000 t/a
Total	540 000 - 1 310 000 t/a

This assessment of the market has been confirmed by the Tasmania Government Energy Policy Unit, which recently assessed the total potential of the Tasmanian market as 1.8 Mt/a by the year 2000. *Who are they?*

Six major users or potential users dominate the Tasmanian market, including Goliath.

A likely target market for Mount Nicholas coal is:

Associated Pulp and Paper Mills (APPM)	100 000
Tioxide	50 000
Australian Newsprint Mills (ANM)	40 000
Savage River Mines	20 000
Other industrial users	40 000
Bell Bay Power Station	200 000
TOTAL	450 000 t/a

4.3 Quality Requirements

The forecast quality parameters of Mount Nicholas coal are generally acceptable to current and prospective users of Tasmanian coal and in fact appear to be generally superior to the product supplied by CCC.

equal

The major quality parameters which would need to be maintained in practice are:

Specific energy (as received)	22.5 MJ/kg minimum
Ash content (as received)	22.5%
Total moisture (as received)	13% maximum
Volatile matter (as received)	24% minimum

5.0 OPERATIONAL PARAMETERS

5.1 General

In the Feasibility Study, planning of mining and coal processing operations has been governed by the following overall constraints and criteria.

5.2 Production Strategy

From market research by SCOA, target production was set at:

150 000 t product by end Year 2 (1985)
250 000 - 350 000 t/a product by end Year 5
300 000 - 500 000 t/a product in Years 6-20

Target product specification was set at:

Ash content	25% maximum
Ash deformation	1200°C minimum
Sulphur content	1% maximum
Specific energy	23 MJ/kg minimum
Total moisture	12% maximum
Size	50 x 0 mm

5.3 Maintenance Strategy

The main objective of the maintenance strategy is to minimise the facilities that must be provided, and labour employed, at the mine.

Continuous miners and other major underground equipment will be maintained by modular replacement methods whereby spare major components are kept in stock at the mine. Replacement of modules, and other major repair, will be carried out in a centrally located underground workshop. A mobile workshop in each production unit will cater for routine maintenance and minor repair.

5.4 Labour Conditions

SCOA policy is to conform to established local coal industry practice in respect of labour conditions. Accordingly, the Feasibility Study is based on remuneration and other employment conditions equivalent to those prevailing in the neighboring coal mining and processing operations.

5.5 Operating Schedules

Conceptual planning of mining and coal processing operations is based on two-shift operation, 9 days/fortnight, which is the practice at Blackwood and Duncan mines. Scheduling of coal extraction and coal preparation for 2 shifts/day is reasonably economical for the proposed scale of mine, and suits the preference by Australian National Railways (ANR) that product be loaded into trains during daylight hours. It is planned that the third shift will be utilised for maintenance and, when necessary, for making up production to the scheduled level. There is scope for varying coal preparation plant operating times to suit fluctuations in the rate of coal extraction. Also, the third shift could be used for additional production if required in the future.

6.0 GEOLOGY AND GEOTECHNOLOGY

6.1 General

The Mount Nicholas coal deposit occurs in Late Triassic aged sediments of the Parmeener Super Group. The coal measures dip approximately 1° southwards, and outcrop on the northern and southern lower slopes of the Nicholas Range. The range is dolerite capped, and mantled by doleritic colluvium.

Three coal groups have been identified and named by SCOA as the Upper, Middle and Lower groups, amongst which four seams are of economic interest. In descending order of occurrence, they are the Middle 1 and 2 and Lower 1 and 2 seams (M1, M2, L1, L2 respectively). All four seams are composed predominantly of dull coal suitable for steam raising.

The prospective mining area is bounded by the northern and southern L2 subcrops, the EL5/61 boundary in the west, and the lease of the neighbouring Blackwood Mine in the east. The major part of the prospect is contained in a north-south trending graben.

Geological and geotechnical evaluation of the prospect has been based on information from 17 uncored drillholes and 28 slim coreholes drilled by SCOA, and from 2 cored holes drilled by DOM.

The sediments exhibit considerable lateral changes in facies. All four seams of interest have large variations in thickness and quality; mineable thicknesses range up to nearly 3 m in the Lower group, and theoretical yield reaches as high as 100% in the M2 seam. Overall average theoretical yield of the deposit is approximately 85%.

Although no major geohydrological problems are predicted, the small displacement east-west faults will cause local water entrapment. Also, precautionary measures will have to be taken to guard against slope failure and surface subsidence above portals and surface facilities.

6.2 Roof Conditions

Fluor has broadly classified roof conditions thus, in descending order of competence:

Class 1 Massive sandstone; unconfined compressive strength (UCS) from 12.5 MPa to 50 MPa (moderately strong rock); joint spacing ≥ 1 m.

Class 2 Variable strata; composition ranging from massive bedded mudstones, through silty mudstones and siltstones to well jointed sandstones; UCS 5 to 50 MPa (moderately weak to moderately strong rock); low slaking tendency; low structural deformation.

This class can be subdivided into:

2A Roof with satisfactory anchorage; basal part of roof mudstone, often laminated; upper part sandstone, siltstone or coal, suitable for bolt anchorage.

2B Roof with poor anchorage; generally composed wholly of laminated mudstones.

Class 3 Poorly bedded mudstones and structurally deformed sediments; UCS generally below 5 MPa (weak rock); high slaking potential.

A degree of overlap exists between these classes.

Of the order of 90% of the seam areas to be mined, as planned in the Feasibility Study, are represented by Classes 1 and 2.

Fluor considers that roof bolting will be necessary throughout the mine, but no reserves have had to be excluded from the mine plan due to roof instability.

6.3 Floor Conditions

Potential floor problems are:

- deterioration caused by water impoundment;
- breakup due to continual vehicle passage.

Adequate drainage, including some local pumping, must be provided.

Roadway breakup can be controlled by surfacing with aggregate, with additional measures taken in roadway construction in wet areas. Regular maintenance will be required, as the proposed rubber tyred equipment is particularly detrimental to roadway surfaces.

Floor heave is expected to be minimal, if any, as:

*dependent
up*

- no swelling clays are known in the floor material;
- it has not been reported from neighboring mines; nor is it evident in the entries to the adjacent old workings;
- pillars are designed with high pillar to entry ratio;
- good natural drainage exists for the bulk of the proposed workings.

7.0 RESERVES

Reserves within the prospective mining area have been estimated by Fluor, based on fault locations, theoretical yield contours and mining thickness isopachs developed by SCOA from drillhole information. An overall conservative approach was adopted, with reserve calculation being restricted to areas available for mining. Reserves were calculated for those parts of the L1 and L2 seams included in conceptual mine planning, as well as for areas of the M1 and M2 seams where mining criteria are met.

Estimated total reserves, in terms of marketable coal at the target 22.5% ash, are (thousand t):

	Available	Recoverable	Marketable
Middle 1 seam	9 202	5 857	4 886
Middle 2 seam	3 363	2 354	2 188
Lower 1 seam	5 391	3 774	2 475
Lower 2 seam	28 562	19 994	16 380
Total	46 518	31 979	25 929
Adjusted *	43 236	29 682	24 280

* The adjusted reserves correspond to the proposed mine plan, and lie entirely within the graben.

The L2 seam contributes 67% to the adjusted recoverable reserve, at an average theoretical yield of 86%.

The reserves are considered overall to be of measured status, with a global accuracy within $\pm 20\%$.

Available Reserves are the reserves remaining after application of seam height and barrier width parameters to the in situ reserve.

Recoverable Reserves are those remaining after the application of mining recovery and minimum yield parameters to the available reserves. They represent extractable raw coal; corresponding run-of-mine (ROM) quantities can be calculated by adding dilution.

Marketable Reserves correspond to saleable product at the target specification, except that moisture has not been adjusted and remains at in situ level (air dried). They were derived by applying the theoretical yield, at 22.5% ash, to the mineable reserve, then multiplying by 0.95 to account for expected processing efficiency.

8.0 MINING,

8.1 General

It is proposed that coal will be extracted by bord and pillar methods, using three continuous mining units. Allowance has been made in the estimates for a fourth continuous miner and associated equipment and services to be installed underground shortly after the third unit is commissioned, to assure continuity of production at the scheduled rate.

All production during the 20 year design life of the mine will come from the Lower seam group - mainly from the L2 seam. Mine life expectancy is predicted to be 46 years in this Lower horizon, with possible extension, by exploitation of the M1 and M2 seams in the Middle group, to at least 60 years.

Because of the limited geological data, particularly for the central area of the prospect, the conceptual mine plan has been based on a broad, flexible approach, in order that mine planning may be varied, as mining progresses, to suit geological conditions encountered.

8.2 Mining Methods

The Mount Nicholas deposit lends itself to bord and pillar methods of working, employing the Wongawilli system of pillar extraction. The shortwall mining technique offers itself as a possible alternative, and as a probable means of increasing the percentage recovery of available resources.

Bord and pillar methods can cope with most situations likely to arise underground. At this stage, there is no valid reason to depart from the previously proposed bord and pillar concept. Fluor recommends an initial mine plan based on the Wongawilli system of pillar extraction, which is a well tried and dependable method of work with the added advantage of being familiar to the local workforce.

The Mount Nicholas deposit is neither large enough in reserves nor sufficiently uniform to justify the capital investment involved in a modern longwall installation.

Shortwall mining combines the flexibility of bord and pillar with the increased productivity associated with longwall mining. Shortwall methods cannot be evaluated adequately until the coalfield has been explored in greater detail; they should be given further consideration in detailed mine planning, say at the time it is proposed to introduce the third continuous mining unit.

8.3 Mine Layout and Design

From evaluation of the pre-feasibility study by D&M and other earlier work, SCOA proposed that mine planning be based primarily on extraction of the L2 seam. Fluor endorses this proposal because:

- L2 seam holds the majority of the reserves.
- It is well placed with respect to economical provision of portals, surface facilities and services.
- Overall mining conditions are favourable.
- Mining of this seam will be relatively economical, especially during the 20 year mine design life.

Two mine entry portals - No 1, for personnel, equipment, materials and coal transport, services and general access; No 2, for ventilation air exhaust and emergency access - will be located on the south-east border of the prospect, where previously proposed by SCOA, but at the elevation of the L1 seam subcrop. Choice of this location was influenced by:

- Decision to concentrate on mining the L2 seam.
- Intention to initially mine the L1 seam in this area.

- Proximity to:
 - the existing railway line, which minimises coal handling costs on the surface;
 - the existing gravel road from the highway - and shorter distance from the highway than other locations - minimising road access costs;
 - sources of power and water supply, and telephone lines, resulting in more economical installation and operation of trunk services than for other locations.
- Suitable terrain around the proposed mine mouth for the establishment of surface facilities.

The advantages of the proposed portal entry location outweigh the disadvantage of its remoteness from the thicker, better quality areas of L2 seam.

In the vicinity of the proposed portal entry location, expected mining conditions in L2 seam are inferior to those further north in the deposit, where this seam is thicker and of better quality. Main development drivages of sufficient height to support servicing of a relatively long life underground operation would involve considerable brushing of roof and floor over the first 1.4 km of advance. This would not only seriously reduce development advance rates; the cutting of up to 0.8 m of roof/floor material would adversely affect performance of the coal preparation plant.

In this vicinity, drill hole information indicates that:

- L1 seam thickness is greater than L2 over the initial 1.8 km of drivage.
- Roof and floor for L1 seam are more competent than for L2.
- Parting thickness between L1 and L2 seams is less than 2 m.

Therefore, it is proposed that initial main development will advance in L1 seam to a point where it is feasible to grade the headings through to intersect L2 seam.

Drivage of two headings will proceed from the entry portals through boulder clay and weathered coal on a bearing of 310° to the Australian Map Grid (AMG) and on the horizon of L1 seam floor.

The two adits will be opened into four main development drivages, at a point where competent roof and floor conditions are met in L1 seam. Main headings will be developed at 30 m centres, with 60 m cut throughs; anticipated roof conditions for L1 seam suggest a heading width of 5 m. Main development will proceed in L1 seam for a distance of approximately 1.5 km.

The main headings will then be realigned on bearing 27° AMG, towards the area of thin scree cover on the northern subcrop, thus opening up the possibility of establishing main intake portals in that area.

After the main headings are established in the new direction, they will be advanced to a suitable point for grading down to L2 seam. Drillhole information indicates that approximately 150 m beyond GY151:

- the interseam parting is at least 1.5 m thick, and therefore the roof of L2 seam should be readily supportable;
- the thickness of L2 seam is at least 2.0 m, which is regarded as the minimum acceptable height for long term drivages equipped with coal clearance and men/materials transport systems.

The proposed alignment of the four main headings, on bearing 27° AMG, misses the area of possible cindered coal around the dyke.

This main development will result in initial production buildup, which will be reinforced by a second continuous mining unit established in the southern reserves of L1 seam. A third continuous mining unit will be established on the western side of the main headings in Year +6.

There are also considerable reserves of M1 and M2 seams to be considered for future exploitation. The vertical interval between the Lower and Middle seam groups is sufficient to avoid damage to working conditions in the Middle horizon due to prior extraction of coal from the Lower horizon.

Broad conceptual examination suggests southern entry on M1 seam with coal headings advancing north to a point at which M1 is no longer considered viable in terms of thickness and/or quality. Interseam drifts will then be set off to exploit M2 seam. This seam contains relatively small reserves of high quality coal.

General mine design is directed at high rates of development as a means of achieving the target initial production tonnages, but, of equal importance, to form a basis for gaining more detailed understanding of geological features of the coalfield. This is imperative as a foundation for detailed planning of the mine. The design concept provides flexibility to vary the mine plan as mining progresses.

8.4 Coal Transport

Coal will be transported from the production units via panel transfer points and main trunk conveyors to a 1000 t bin on the surface. Belt drives will be standard in-seam type units, and will be standardised, thus facilitating installation and minimising spare parts inventories.

Future development of the mine might entail ore-pass type transport raises between the Lower and Middle horizons. Provision can be made for disposal of these quantities of waste rock by laying out and adequately supporting a panel system to accommodate stowing of waste rather than transporting it to surface dump areas.

Future planning directed at extraction of M1 and M2 seams should address the feasibility of raise drill connections between the Lower and Middle horizons as a means of utilising the established trunk conveying system for coal clearance from the Middle seams.

8.5 Men and Materials Transport

It is proposed that men and materials will be transported by rubber tyred multi-purpose vehicles (MPVs), which are ideally suited to the project and are readily available from several manufacturers. The MPV consists of a diesel powered prime mover, with variously adapted trailers suited to most underground transport requirements. Range of trailers varies from personnel transport (say, 14 men per trailer); materials transport (palletised); road grader and stone dusting units. Further adaptations such as mobile workshops, crib rooms, first aid stations and drainage tank/pump units are only a few of the possible additions to this versatile transport system. Operation of each MPV will involve only one man.

Use of the MPVs will expedite conveyor extension and retraction and services relocation.

Roadways are designed, and roadway maintenance is planned, on the basis that MPVs will travel at speeds up to 8 km/h.

8.6 Mine Scheduling

Scheduling of mine development was directed at three major goals:

- Rapid development of main headings as a major production source and as a means of gaining access to the central part of the deposit, to facilitate progressive underground exploration.
- Early establishment of production panels to cater for increased production if required.
- Scope for establishing main intake airways on the northern side of the mining area.

Salient points in the proposed schedule are:

- Excavation and construction of the twin entry portals commences at the start of Year +1, and is followed by drivage of the two adits through boulder clay to an area of workable thickness of L1 seam with competent roof. This work is proposed to be carried out by a contractor, and is scheduled for completion four weeks after mid Year +1.
- No 1 continuous miner is installed six calendar weeks into the second quarter of Year +1 to carry out initial development required to establish the proposed four main development headings.
- Coal extraction commences five working weeks before the end of the second quarter of Year +1. Estimated 350 t/shift production is reached by the end of this quarter.
- No 1 unit enters L2 seam mid Year +2.
- No 2 continuous miner operates in L1 seam from mid Year +3 through Year +9, and in L2 seam thereafter.
- No 3 continuous miner operates in L2 seam from the start of Year +6.
- Total extracted tonnage to end Year +2 is 200 000 t.
- Annual extracted tonnage by Year +5 is 320 000 t.
- Annual extracted tonnage after Year +5 is 480 000 t (except in Years +6 and +10 only, when it is 460 000 t).

TABLE 8.1
PRODUCTION SCHEDULE
(thousand t)

	Seam	YEAR +1	YEAR +2	YEAR +3	YEAR +4	YEAR +5	YEAR +6	YEAR +7	YEAR +8	YEAR +9	YEAR +10	YEAR +11	YEAR +12	YEAR +13	YEAR +14	YEAR +15	YEAR +16	YEAR +17	YEAR +18	YEAR +19	YEAR +20	Total
Coal Extracted *																						
Continuous Mining Unit No 1	L1	80	60																			
	L2		60	140	140	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	
Continuous Mining Unit No 2	L1			70	160	160	160	160	160	160												
	L2										140	160	160	160	160	160	160	160	160	160	160	
Continuous Mining Unit No 3	L2						140	160	160	160	160	160	160	160	160	160	160	160	160	160	160	
TOTAL	L1	80	60	70	160	160	160	160	160	160												1170
	L2		60	140	140	160	300	320	320	320	460	480	480	480	480	480	480	480	480	480	480	7020
		80	120	210	300	320	460	480	480	480	460	480	480	480	480	480	480	480	480	480	480	8190
Run-of-mine Coal **		84	126	221	315	336	483	504	504	504	483	504	504	504	504	504	504	504	504	504	504	8600
Product Coal ***		56	99	179	247	265	392	405	405	405	405	422	422	422	430	430	422	422	422	422	422	7094

* At in situ moisture (air dried)

** Including 5% dilution

*** At 22.5% ash; 12.0% total moisture

9.0 COAL PROCESSING

The selected coal preparation and handling processes are portrayed in Drawing 20-MF-002.

Conceptual engineering of the coal preparation plant includes provision for variations and options to allow for the likely influence on process design of additional test results and for the production, if required, of relatively small quantities of alternative products.

The proposed coal handling facilities are suited to, if required:

- delivering ROM coal from other sources, eg, Harefield, to the coal preparation plant;
- transporting product coal by truck.

The product stockpiling arrangement is suited to the use of a transportable screening/stacking plant for separate stockpiling of alternative minor products, if required. Cost of such a unit would be of the order of \$350 000 additional to the capital cost estimate.

10.0 SURFACE FACILITIES

The proposed surface facilities are:

- ROM coal bin (1000 t capacity), crusher feed conveyor, primary screening and crushing station and preparation plant feed conveyor. ROM coal can be diverted from the discharge chute of the trunk coal clearance conveyor to a stockpile area beside the bin; similarly, waste from the underground workings can be diverted from the conveyor onto the ground beside the bin. There is a hopper, over the tail end of the crusher feed conveyor, into which ROM coal from the stockpile, or coal from other sources, can be placed by front end loader.
- Coal preparation plant and coarse reject bin. Coarse reject material from the plant is trucked to a dump area north of the coal processing and support facilities area.
- Product ash analyser, product conveyor and stockpile, loadout conveyor and train loadout. Product coal is handled from the stockpile into a hopper over the tail end of the loadout conveyor by front end loader.
- Administration/bath house/laboratory complex.
- Workshop and store, with adjacent paved, open storage compound for underground mining materials and large items.
- Tailings dam, across the creek to the east of the coal processing and support facilities area, into which fine reject material from the coal preparation plant is pumped, and from which decanted water is recovered into the plant water system.
- Water storage reservoir, formed by a dam on the creek east of the coal processing and support facilities area, from which water is pumped to two head tanks on the hillside.
- Water treatment plant and sewage treatment plant.

The feasibility of economically establishing the surface facilities, suitably located in relation to the mine mouth, was taken into consideration in selecting the portal entry location.

The proposed location and layout of the coal processing and support facilities is shown in Drawing 20-MG-002. An alternative site for the coal processing facilities - between the foot of the range and the existing railway line - was examined, but had no overall economic advantage. For the adopted site, the relative proximity of mining and coal processing operations will enhance supervision. Support facilities will be more central to both groups of operations than they would be for the alternative site. Also, the surface facilities will be less visible from the highway. Careful design and well managed construction will ensure that they are screened by, or blended into, the natural vegetation.

11.0 PRODUCT TRANSPORTATION

11.1 General

An earlier report by SCOA in August 1981 showed that the Australian National Railways (ANR) rail system in Tasmania had adequate capacity to handle a total mine production of 500 000 t/a.

SCOA has now reviewed the previous transport plans, with particular attention to:

- new layout of surface facilities, including the train loadout bin, as proposed by Fluor;
- elimination of road haulage of any product coal;
- revised tonnages;
- any changes in ANR policy.

11.2 Transport Task

The ranges of tonnages to be transported and the distances involved are:

Delivery Point	Volume (thousand t/a)	Distance (km)	Comment
Bell Bay Power Station	200-400	179	Block train
Tioxide (Burnie)	25- 50	258	Part train
APPM (Burnie)	50-120	270	Part train
Savage River (Burnie)	20	272	20 t containers
ANM (Boyer)	30	221	Part train

The locations of the various delivery points and the connecting railway system are shown in Figure 11.1.

11.3 Rolling Stock

ANR would require 37 QF wagons (33 operational and 10% spare) to handle 400 000 t/a; currently available spare wagons could carry up to 250 000 t/a of Mount Nicholas coal. The new QF class wagons have a tare weight of 14.2 t and an official gross weight of 65.2 t, ie, 51 t nett.

ANR has a surplus of Z and ZA class locomotives sufficient to haul the projected tonnages from Mount Nicholas.

11.4 Mount Nicholas Terminal

ANR requires that a block train of 33 wagons (1716 t nett) be loaded in approximately 2 hours, which corresponds to an average loading rate of 858 t/h.

Initial consideration was given to a balloon loop, but this concept was discarded in favour of a rail siding on the basis of cost, tonnage requirements and the amount of farming land alienated. A single rail siding has ample capacity for the planned movement of one or two trains per day.

It is proposed that a passing siding, parallel to the main line, will be constructed on ANR property at ANR cost except that earthworks for a 150-200 m extension will be constructed by the Joint Venture at an estimated cost of \$214 000.

The proposed new loading siding has a maximum downhill slope of 1 in 200 to ensure that the locomotives continuously pull the wagons through the loading point.

The important track length criteria are:

Mount Nicholas Road to loadout bin	500 m
Loadout bin to end of siding	500 m
Mount Nicholas Road to end of passing siding	500 m

The arrangement for construction of the loading siding would be that the Joint Venture would provide the earthworks, drainage and fencing, to ANR specification and under ANR supervision; ANR would lay the track, including ballast and steel sleepers.

11.5 Freight Rates

The freight rates quoted by ANR (November 1982) are volume sensitive as shown below. They reflect a component for repayment of capital involved in providing rolling stock and infrastructure.

Delivery Point	Volume (thousand t/a)		Freight Rate (\$/t)	
Bell Bay Power Station	200		6.30	
		400		6.00
Tioxide (Burnie)	25		11.25	
		50		11.00
APPM (Burnie)	50		11.05	
		120		11.05
Savage River (Burnie) *	20		11.80	
ANM (Boyer)	30		8.45	

* 20 t containers

Rail System Coal Carrying Capacities

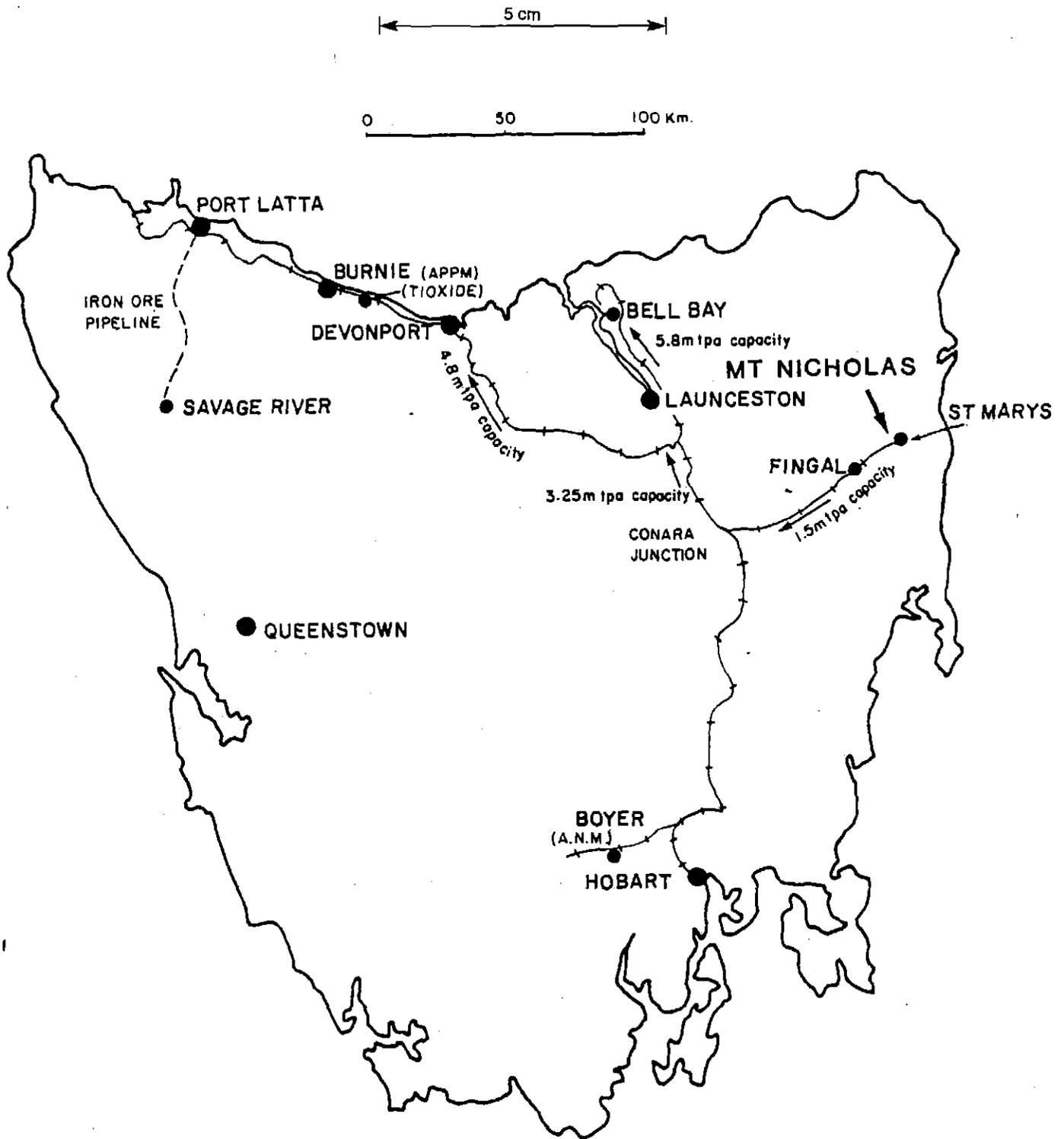


Figure 11.1

12.0 INFRASTRUCTURE

12.1 Access

It is proposed that the existing Mount Nicholas Road be upgraded, involving some realignment and regrading, and bitumen sealing, from its junction with the Esk Highway to the entrance to the surface facilities area.

Responsibility for this work has not been resolved. It is understood that ANR will install warning devices at the level crossing.

12.2 Power Supply

Power will be supplied by HEC at 22 kV from an existing 22 kV feeder connecting Avoca and St Mary's.

HEC plans to establish a new terminal substation at St Mary's by April 1985.

The main 22 kV overhead line to the mine, including HEC metering station, will be provided by HEC, at Joint Venture cost.

12.3 Communications

Telecom Australia will provide the required telephone and telex lines to the mine. No problems are foreseen by Telecom in providing telephone lines into the mine; however, appropriately 3 months lead time will be required.

12.4 Workforce Accommodation

It is proposed to build five houses, for senior staff, probably in both St Mary's and Fingal.

No allowance has been made for the provision of accommodation for other staff or for wages employees. Sufficient numbers of the present pool of unemployed, suitable workers, and other prospective employees, live within driving distances over which residents of the region are accustomed to commuting daily.

It is understood that the provision of housing for senior staff only is in line with current practice by CCC with respect to employees of Blackwood and Duncan collieries.

13.0 MANNING

13.1 General

At full production, the operational workforce employed at the mine will total 149 people, comprising 17 managerial, supervisory and other salaried staff and 132 wages employees, as listed in Table 13.1.

13.2 Workforce Availability

Local observation by SCOA, and discussion between Fluor and the Commonwealth Employment Service, indicate that at present there are sufficient members of unemployed, suitably skilled, as well as unskilled, workers in the district from which a large proportion of the proposed workforce could be recruited.

TABLE 13.1
MANNING SUMMARY - YEARS +6 - +20

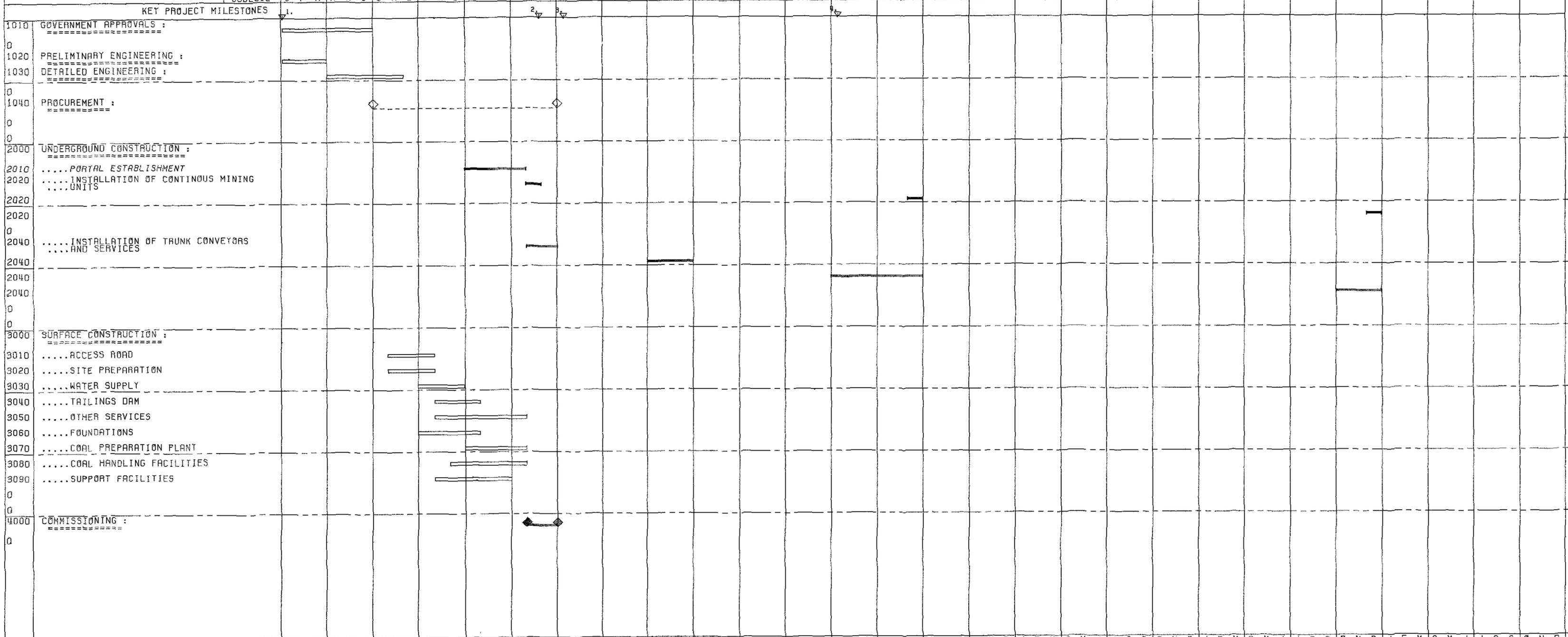
	Number of Employees			TOTAL
	DAY SHIFT	AFTER- NOON SHIFT	NIGHT SHIFT	
Staff				
Mine Manager	1			1
Undermanager	1	1		2
Mining Engineer	1			1
Coal Preparation and Handling Supervisor	1			1
Maintenance Supervisor	1			1
Assistant Maintenance Supervisor		1		1
Surveyor and Assistant	2			2
Assayer	1			1
Safety/Ventilation/Training Officer	1			1
Paymaster/Accountant	1			1
Stores Officer	1			1
Clerk	2			2
Secretary/Receptionist	1			1
Clerk/Typist	1			1
TOTAL	15	2	-	17
Wages Employees				
Mining				
• Operation	31	29	12	72
• Maintenance	10	9	7	26
Coal Preparation and Handling	7	5	-	12
Surface				
• Operation	3	3	1	7
• Maintenance	12	3	-	15
TOTAL	63	49	20	132

14.0 PROJECT DEVELOPMENT

The proposed master schedule for development of the project is shown in bar chart form in Figure 14.1.

The development schedule is based on a project management company being appointed to undertake preliminary engineering, detailed design, procurement of major equipment and materials, and construction, and to assist in commissioning. Specialist consultants will be engaged by the project manager for appropriate portions of the engineering. Construction of the surface facilities and initial underground development, including installation of the main coal clearance conveyor and services, will be awarded to several prime contractors. Certain items, such as buildings, could be let on a design-and-construct basis.

- 1. PROJECT START
- 2. COMMENCE COAL EXTRACTION
- 3. COMMENCE PRODUCT RAILING
- 4. TWO-SHIFT COAL PREPARATION



J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

CLIENT : THE SHELL COMPANY OF AUSTRALIA LTD.
 PROJECT : MOUNT NICHOLAS COAL PROJECT
 PROJECT NO.: 1504.01

TITLE : MT. NICHOLAS FEASIBILITY STUDY
 PROJECT DEVELOPMENT SCHEDULE
 REVISION : 1 DATE 06/12/82 BY: DSU

15.0 ESTIMATES

15.1 General

Costs are reported in Australian dollars, in 1 November 1982 terms.

Capital costs have been estimated for areas:

100	General Expense
200	Underground
300	Coal Preparation and Handling Facilities
400	Support Facilities
500	Infrastructure

For each area, costs are divided into initial and long term capital.

Operating costs have been estimated by cost centre and by cost element.

15.2 Capital Costs

Initial and long term capital costs are summarized, by cost code within each area, in Table 15.1.

Initial capital comprises:

- all capital expenditure incurred up to the end of Year +1;
- operating costs incurred prior to the commencement of coal extraction.

Long term capital comprises:

- capital expenditure after Year +1, including purchase, installation and commissioning of additional equipment and materials to achieve the scheduled production buildup;
- replacement of equipment and materials during the design life of the mine.

Capital

Contingency allowances were estimated for each area, to cover items not specifically identified in the conceptual engineering. In each instance, the contingency percentage is a function of the level of detail and degree of confidence in the conceptual engineering for each cost code.

Overall accuracy of the capital cost estimate is predicted to be $\pm 10\%$.

This accuracy range:

- Allows for likely (but not drastic) changes in market conditions with respect to procurement and construction.
- Reflects the overall level of detail of the conceptual engineering.
- Covers foreseeable minor scope changes, within the present project concepts.

15.3 Operating Costs

Annual operating costs are summarized in Table 15.2, for Years +1 through +7, both by cost centre and by cost element.

The contingency allowance was estimated by applying separate percentage factors to the labour and materials components of the operating costs.

TABLE 15.1
CAPITAL COST SUMMARY
(\$ thousand, 1 November 1982)

Cost Code		INITIAL CAPITAL	LONG TERM CAPITAL	TOTAL
100	General Expense			
110	Land Acquisition	100	-	100
120	Fees, Permits and Licenses	30	-	30
130	Further Investigation	350	-	350
140	Engineering, Procurement and Construction Management	2 400	-	2 400
150	Temporary Facilities and Services	250	-	250
160	<u>Capitalised Initial Operating Cost</u>	210	-	210 <i>Low?</i>
		3 340	-	3 340
200	Underground			
210	Portal Establishment	500	-	500
220	Trunk Conveyors	590	2 080	2 670
230	District and Panel Conveyors	-	660	660
240	Ventilation	200	-	200
250	Electrical System	600	1 430	2 030
260	Drainage and Other Services	118	722	840
270	Mining Equipment	1 820	4 280	6 100
280	Fourth Continuous Miner and Associated Equipment and Services		2 100	2 100
290	Initial Spares and Consumables	200	-	200
		4 028	11 272	15 300
300	Coal Preparation and Handling Facilities			
310	ROM Coal Handling Facilities	820	-	820
320	Raw Coal Handling Facilities	545	-	545
330	Coal Preparation Plant	3 275	-	3 275
340	Product Handling Facilities	2 270	-	2 270
350	Coarse Reject Disposal	250	-	250
360	Tailings Disposal and Water Recovery	275	280	555
380	Mobile and Transportable Equipment	495	645	1 140
390	Initial Spares and Consumables	125	-	125
		8 055	925	8 980

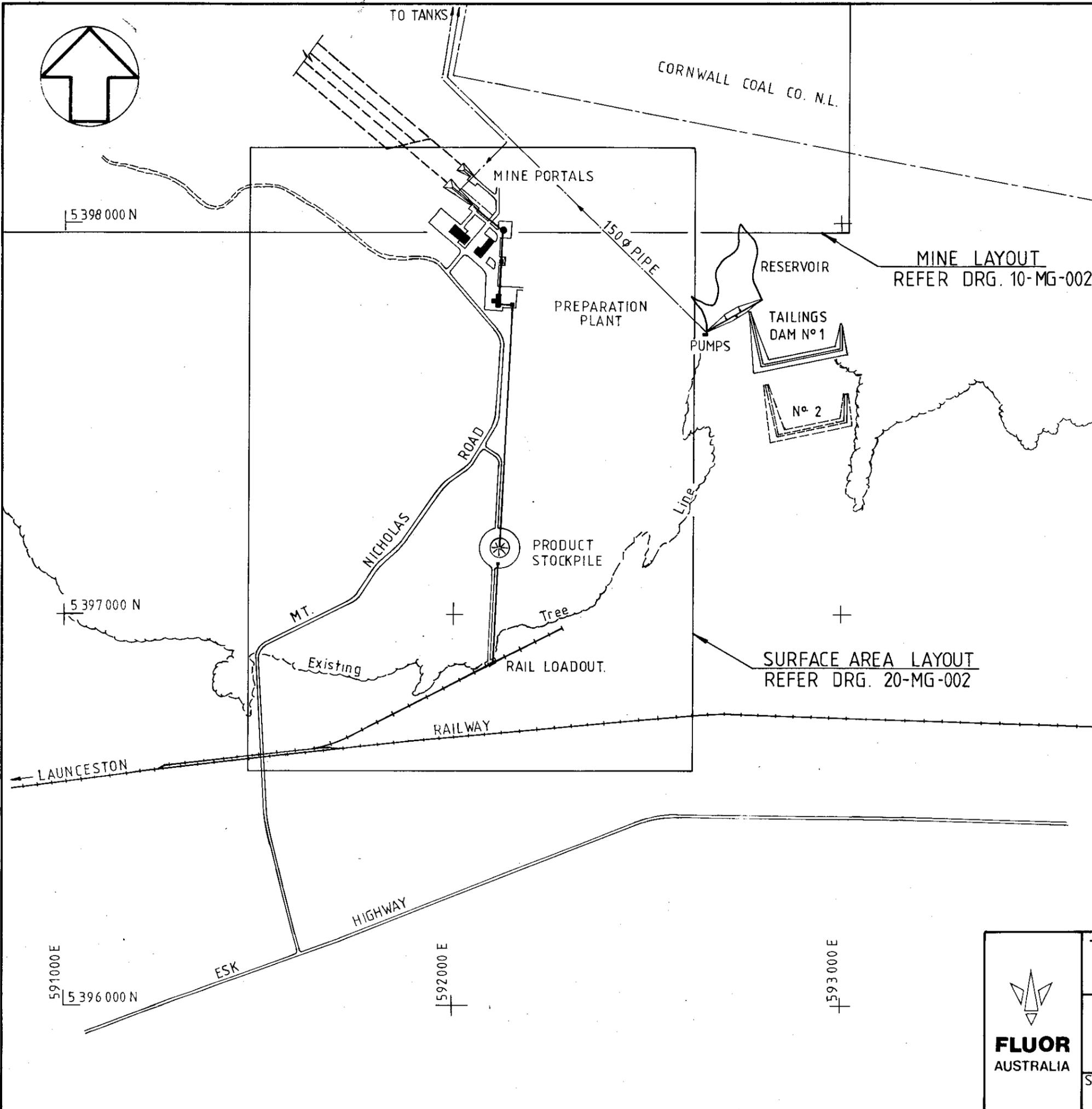
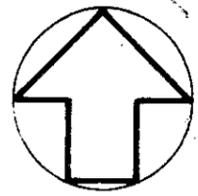
TABLE 15.1
(Continued)

Cost Code		INITIAL CAPITAL	LONG TERM CAPITAL	TOTAL
400	Support Facilities			
410	Administration/Bath House/Laboratory Complex	860	-	860
420	Workshop and Store	770	-	770
430	Power Distribution and Communications	800	-	800
440	Water Supply and Reticulation	1 100	-	1 100
450	Sewerage	130	-	130
460	Other Surface Area Services	200	-	200
470	Surface Area Works	660	-	660
480	Mobile and Transportable Equipment	330	520	850
490	Initial Spares Consumables	50	-	50
		4 900	520	5 420
500	Infrastructure			
510	Access Road	160	-	160
520	Power Supply	50	-	50
530	Communications	30	-	30
540	Accommodation	400	-	400
550	Railway Sidings	Excluded	-	-
		640	-	640
	Contingency	1 270	250	1 520
	TOTAL CAPITAL EXPENDITURE	22 233	12 967	35 200

TABLE 15.2
OPERATING COST SUMMARY
(\$ thousand, 1 November 1982)

YEAR	+1	+2	+3	+4	+5	+6	+7
By Cost Centre							
Mining	1215	2084	2865	3774	3941	5420	5447
Coal Preparation and Handling	271	418	580	649	728	757	762
Maintenance	321	679	716	716	716	795	795
Administration	496	939	1010	1064	1069	1121	1121
Contingency	161	288	362	434	452	567	569
Research Levy (\$0.05/t product)	3	5	9	12	13	20	20
TOTAL OPERATING COST	2467	4413	5542	6649	6919	8680	8715
Cost per product tonne	44.05	44.58	30.96	26.92	26.11	22.14	21.52
By Cost Element							
Supervisory Labour	295	585	624	646	646	646	646
Award Labour	1205	2403	2991	3627	3696	4721	4721
Fuel and Lubricants	55	54	72	90	102	128	132
Spare Parts	3-6	381	537	663	775	959	985
Power	117	152	212	261	272	336	345
Miscellaneous	315	545	735	916	963	1303	1297
Contingency	161	288	362	434	452	567	569
Research Levy (\$0.05/t product)	3	5	9	12	13	20	20
TOTAL OPERATING COST	2467	4413	5542	6649	6919	8680	8715
Cost per product tonne	44.05	44.58	30.96	26.92	26.11	22.14	21.52

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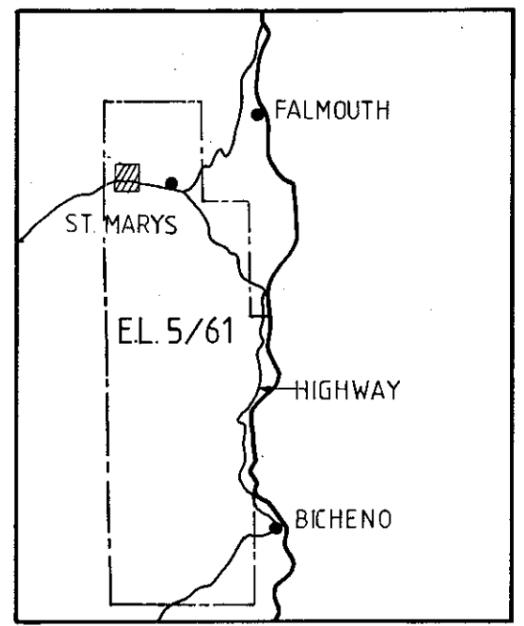


MINE LAYOUT
REFER DRG. 10-MG-002

SURFACE AREA LAYOUT
REFER DRG. 20-MG-002



TASMANIA

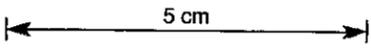
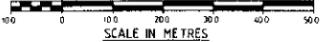
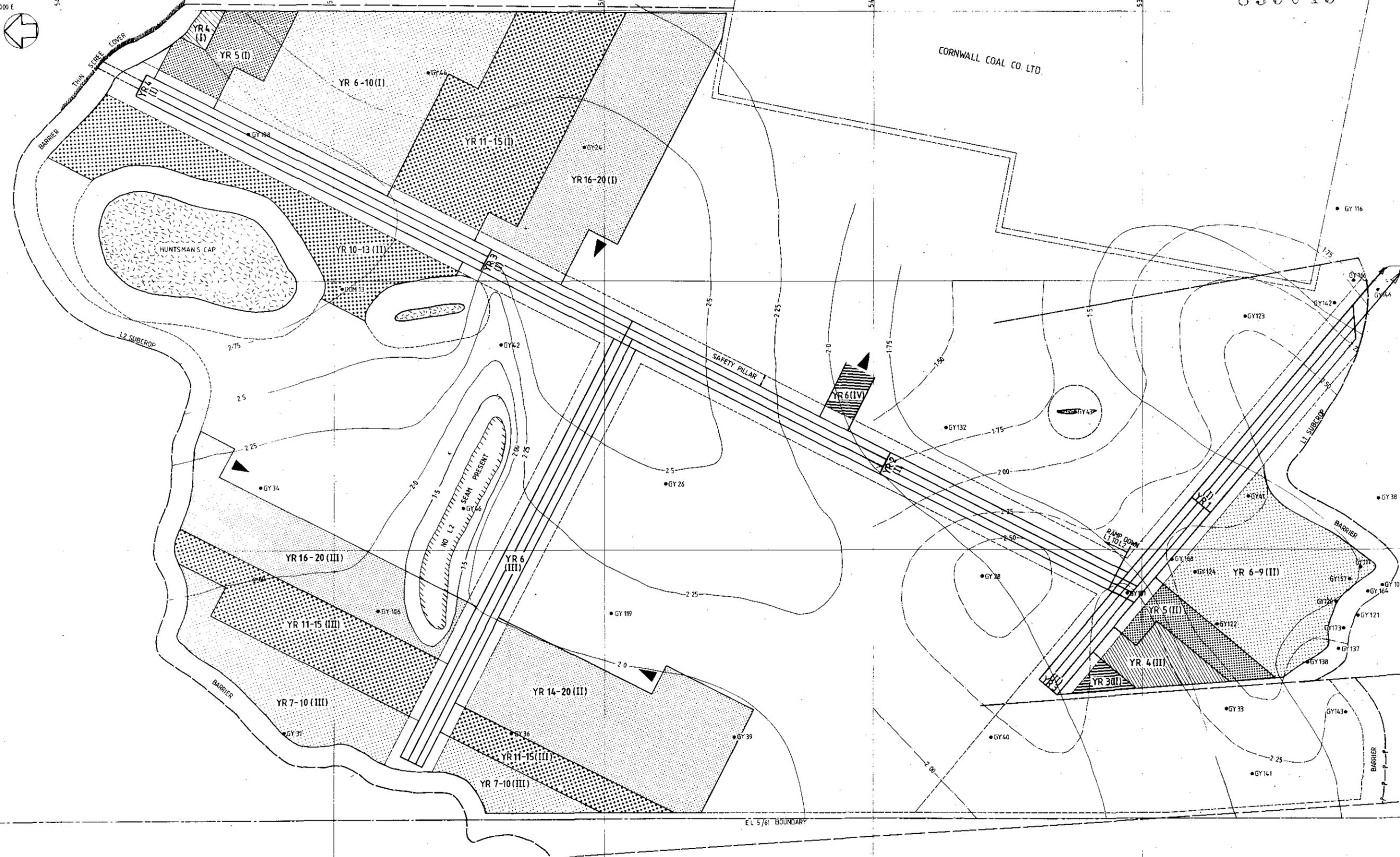


5 cm

 FLUOR AUSTRALIA	THE SHELL COMPANY OF AUSTRALIA LTD EL 5 / 61 (GRAY)		
	MT. NICHOLAS FEASIBILITY STUDY SURFACE LAYOUT & LOCATION PLAN		
SCALE 1:10 000	APP	PROJECT N° 1504-01	DRG N° 20-MG-001

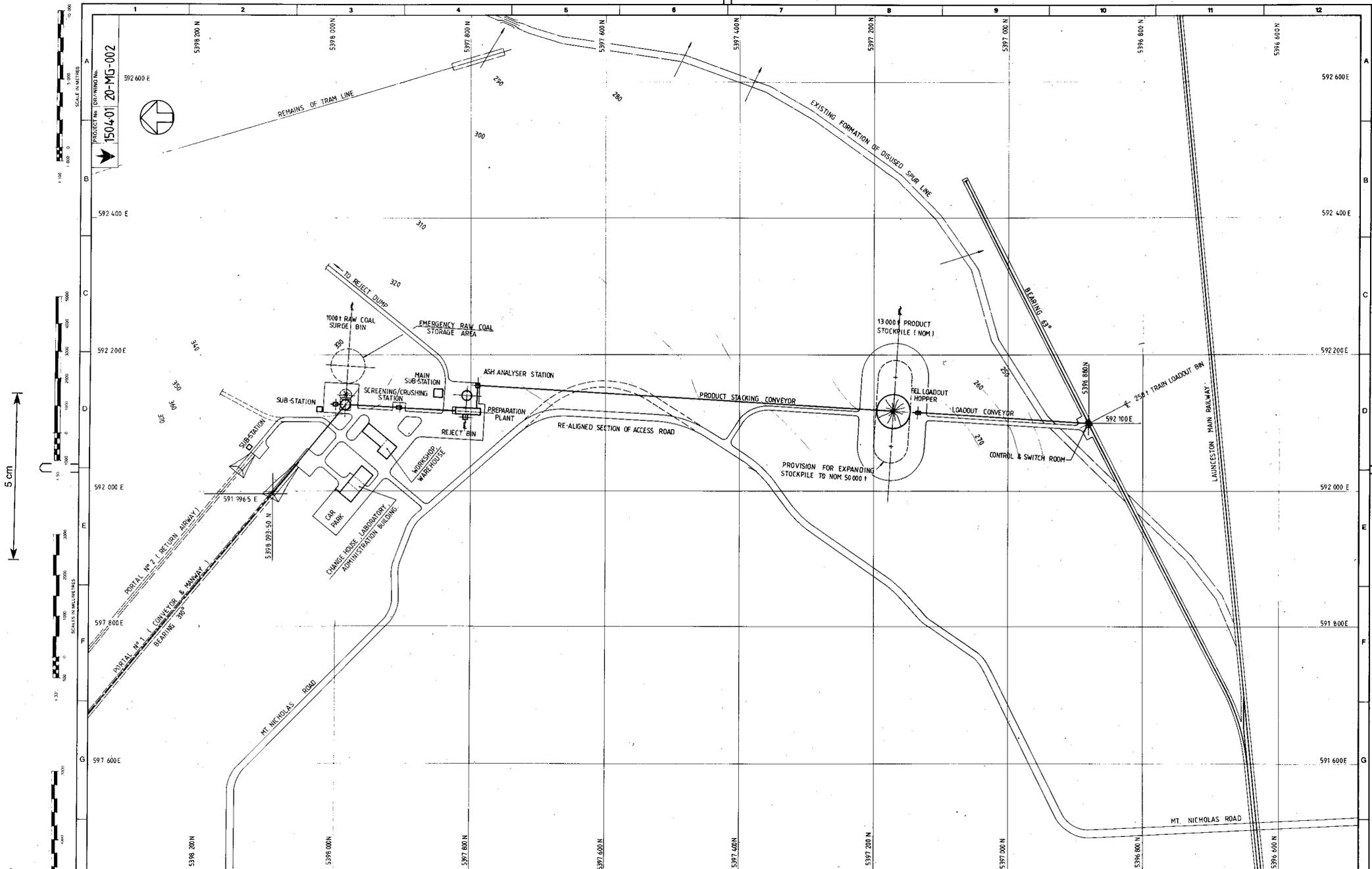
1504-01
10-MG-002

839049



- EXPLANATION**
- - - L1 SEAM ISOPACH
 - - - L2 " "
 - - - L1 SEAM YIELD
 - - - L2 " "
 - ▨ DOLERITIC INTRUSION
 - MAJOR FAULT
 - GY 40 DRILL HOLE
 - ▲ MINING DIRECTION
 - MINING LIMIT
 - (II) NO OF CONTIGUOUS MINER UNIT

DESIGNED J PARKER	OFFICE MELB.	CLIENT THE SHELL COMPANY OF AUSTRALIA LTD	TITLE MT NICHOLAS FEASIBILITY STUDY MINE LAYOUT L1/L2 HORIZON	PROJECT NO 1504-01	DRAWING NO 10-MG-002
DRAWN R B	DATE OCT 1982	ENGINEERS AND CONSTRUCTORS			
CHECKED <i>[Signature]</i>	SCALE				
APPROVED <i>[Signature]</i>					



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SCALE IN METRES
SCALE IN MILLIMETRES

PROJECT No. 1504-01
DRAWING No. 20-MG-002

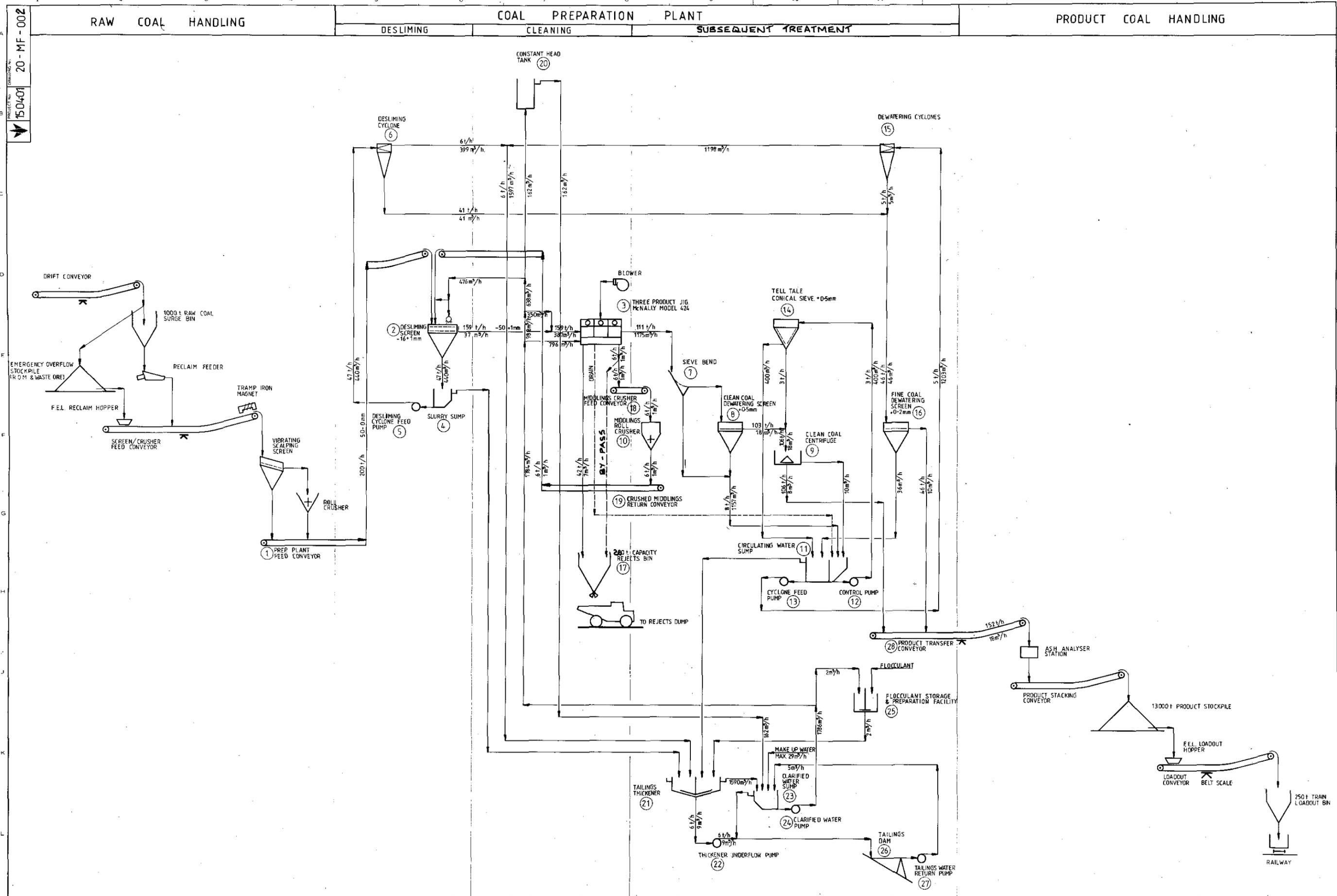


DESIGNED DRAWN CHECKED		B. POLLARD		OFFICE M. DATE NOV 82	<p>FLUOR AUSTRALIA PTY. LIMITED ENGINEERS AND CONSTRUCTORS</p>	<p>CLIENT THE SHELL COMPANY OF AUSTRALIA LTD</p>	<p>TITLE MT. NICHOLAS FEASIBILITY STUDY SURFACE AREA LAYOUT</p>	<p>PROJECT No. 1504-01</p>	<p>DRAWING No. 20-MG-002</p>		
APPROVED				SCALE 1:2000						<p>THE INFORMATION CONTAINED IN THIS DOCUMENT IS CONFIDENTIAL AND IS NOT TO BE REPRODUCED IN ANY FORM OR BY ANY MEANS WITHOUT THE WRITTEN PERMISSION OF FLUOR AUSTRALIA PTY. LIMITED TO BE REPRODUCED IN ANY FORM OR GIVEN TO ANY OTHER PERSON WHATSOEVER.</p>	REV.
1	2	3	4	5	6	7	8	9	10	11	12

RAW COAL HANDLING

COAL PREPARATION PLANT
DESLIMING CLEANING SUBSEQUENT TREATMENT

PRODUCT COAL HANDLING



5 CMT

PROJECT NO. 150401
 DRAWING NO. 20-MF-002
 SCALE METERS

DESIGNED Z. OPALINSKI		CHECKED H. ATHANALEAS		DATE 25-11-82		SCALE		FLUOR AUSTRALIA PTY. LIMITED ENGINEERS AND CONSTRUCTORS		CLIENT THE SHELL COMPANY OF AUSTRALIA LTD		TITLE MT. NICHOLAS FEASIBILITY STUDY COAL PROCESSING EQUIPMENT FLOW SHEET		PROJECT NO. 1504-01		DRAWING NO. 20-MF-002	
APPROVED		APPROVED		APPROVED		APPROVED		APPROVED		APPROVED		APPROVED		APPROVED		APPROVED	
NO.		BY		DATE		CHKD		APPROVED		REVISION		REVISION		REVISION		REVISION	
20-MF-003 PREP PLANT FLOOR PLANS		20-MF-002 ELEVATIONS		20-MF-001 SURFACE AREA LAYOUT		REFERENCE DRAWINGS											

BELT SCALES ADDED
PRELIM CLIENT ISSUE