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Dartbrook underground coal mine project : environmental
impact statement

NSW DEPT PRIMARY INDUSTRIES



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DARTBROOK

UNDERGROUND COAL MINE PROJECT

ENVIRONMENTAL IMPACT STATEMENT

Summary Report

Volume 1

Prepared by

ENVIROSCIENCES PTY. LIMITED

Prepared for

DARTBROOK JOINT VENTURE

The Shell Company of Australia Limited

Austen & Butta Limited

622.334099442
DAR

DARTBROOK UNDERGROUND COAL MINE PROJECT
ENVIRONMENTAL IMPACT STATEMENT
VOLUME 1 : SUMMARY REPORT

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VOLUME 1

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1. INTRODUCTION

The Dartbrook Joint Venture proposes to develop an underground coal mine at Dartbrook near Muswellbrook, in the Upper Hunter Valley of NSW, following a favourable feasibility study completed in September, 1989.

This Environmental Impact Statement was prepared in accordance with the Environmental Planning and Assessment Act 1979 and guidelines determined by the Director, Department of Planning. The Statement is summarised in this volume. Volume 1 (Summary Report), Volume 2 (Text), Volume 3 (Figures) and Volume 4 (Appendices) comprise the full Statement.

The Dartbrook Project is based on coal reserves contained in Authorisation 256 (A256) located 11 km northwest of Muswellbrook. The location of the project is shown in Figure 1.

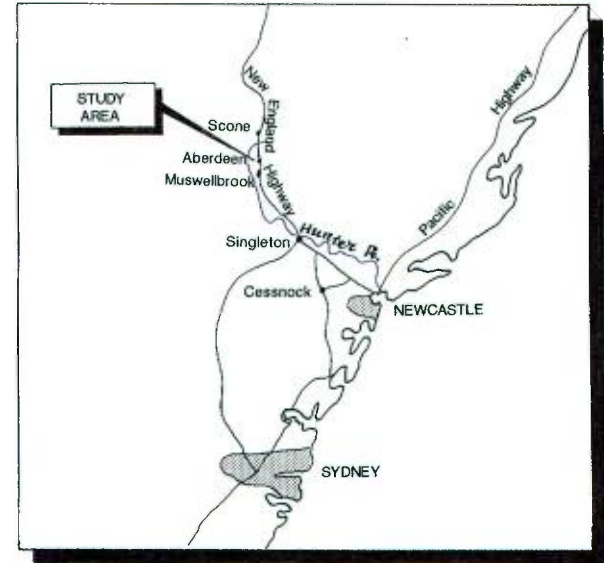
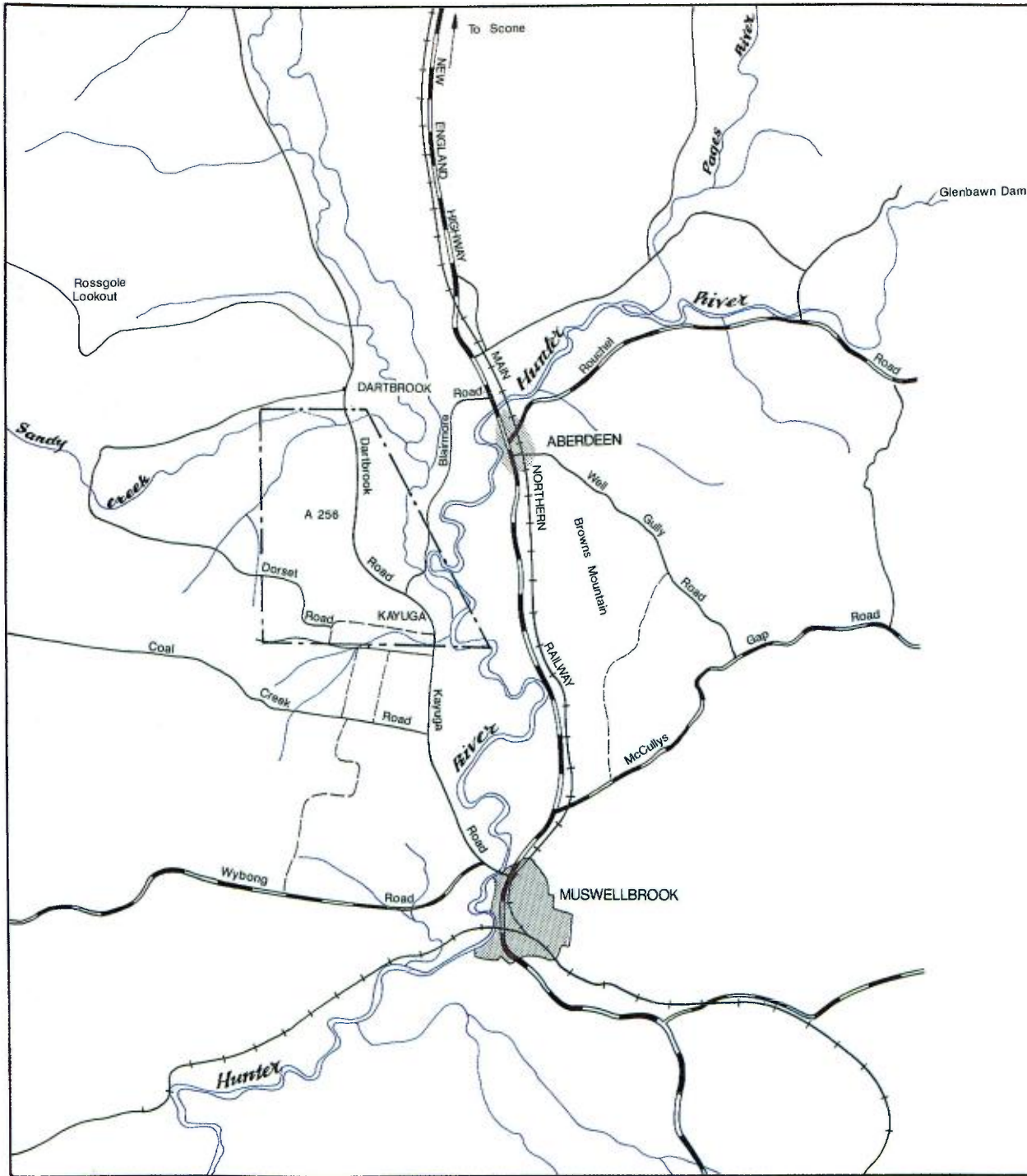
Formerly part of the much larger Authorisation 102 held by the Department of Minerals and Energy, A256 was allocated to The Bellambi Coal Company Pty. Limited in 1980. Title subsequently passed to Austen & Butta Limited following its acquisition of Bellambi in 1985. The Shell Company of Australia Limited and Austen & Butta Limited have entered into a 50:50 Joint Venture and Shell is the Project Manager.

During the period 1981 to 1984, Bellambi examined the feasibility of an open cut mine in the southern part of the Authorisation but, after considering a comprehensive range of options, concluded that such a surface mine was not viable.

Since that study there has been a revival of interest in underground mining in Australia as technological improvements in the new generation of longwall equipment have led to higher productivities and improved reliability. There are now many examples in the coal industry where underground mines using retreat longwall techniques are achieving levels of productivity and costs comparable with surface mines.

Against this background the concept of underground mining at Dartbrook was considered. Exploration and evaluation of the resources at Dartbrook have now identified mineable reserves and favourable geology in the northern part of the Authorisation, which can support a highly productive retreat longwall mining operation. These reserves are outside the limits of the open cut mining area in the south previously considered by Bellambi.

It is planned to mine some 57 Mt of thermal coal over 21 years from in-situ reserves of 174 Mt contained in five seams. Coal will be produced by the conventional longwall mining method at a rate of about 3.0 Mtpa and will be sold on the export market. The main components of the project are shown in Figure 2.




 ENVIROSCIENCES PTY LIMITED DARTBROOK JOINT VENTURE	
<h2>LOCATION PLAN</h2>	
DRAWN: L.J.F. PROJECT No.: 2471	DATE: SEPTEMBER 1990 DB9 16 00 J1

FIG. 1

2. PROJECT DESCRIPTION

2.1 Coal Resources

In total, 211 exploration holes have been drilled within or adjacent to A256. Of these, 83 are cored drillholes at approximately 500 m spacing and 128 are chip drillholes at 250 m spacing. This density of drilling is sufficient to confer a measured status on reserves in the proposed mining area and to enable detailed mine planning to be carried out. Table 1 summarises in situ resources and reserves in the proposed underground mining area.

The coal seams belong to the Wittingham Coal Measures, the source of the bulk of the Hunter Valley's coal exports. Six seams meet the mining and quality criteria for economic extraction with longwall technology and in-situ mineable reserves have been determined in the upper five of these seams. All are characterised by having mineable thicknesses of up to 4 m, the current practical working height for longwall mining, and average ash contents of less than 25%.

Seams beneath the Hunter River flood plain are not available for mining under Department of Minerals and Energy guidelines and are not included in the mineable reserves. However, first workings for development access are permitted.

SEAM	GEOLOGICAL RESOURCES	UNDERGROUND MINEABLE RESERVES	
	Mt	Mt	Ash %
Middle Piercefield	49.4	24.7	19.9
Kayuga	35.8	19.4	20.6
Lower Piercefield	119.5	47.7	21.8
Vaux	44.2	Nil	-
Broonie	54.9	35.0	20.9
Bayswater	167.4	Nil	-
Upper Wynn	115.2	47.3	10.5
Edinglassie	Inferred	Inferred	-
Total	586.4	174.1	

TABLE 1.
IN SITU RESOURCES AND RESERVES
UNDERGROUND MINING AREA

2.2 The Proposed Development

The proposed development will consist of an underground longwall mine with associated surface facilities located mainly on two sites on either side of the Hunter River above the alluvial plain. These are referred to as the Eastern and Western Sites. The two sites will be connected with the underground workings via drifts from the surface and two in-seam tunnels some 100 m beneath the Hunter River alluvial plain. Components of the site facilities are shown in Figures 3 and 4.

Main access to the underground workings for personnel and mining equipment will be from the Western Site. This is a 20 ha site on elevated ground near the western edge of the Hunter River alluvial plain, north of the village of Kayuga. The facilities at this site will include a bath house, an administration block, a maintenance workshop, warehouse and carpark. Small volumes of development coal will be brought to the surface at this site until the in-seam tunnel to the Eastern Site has been completed.

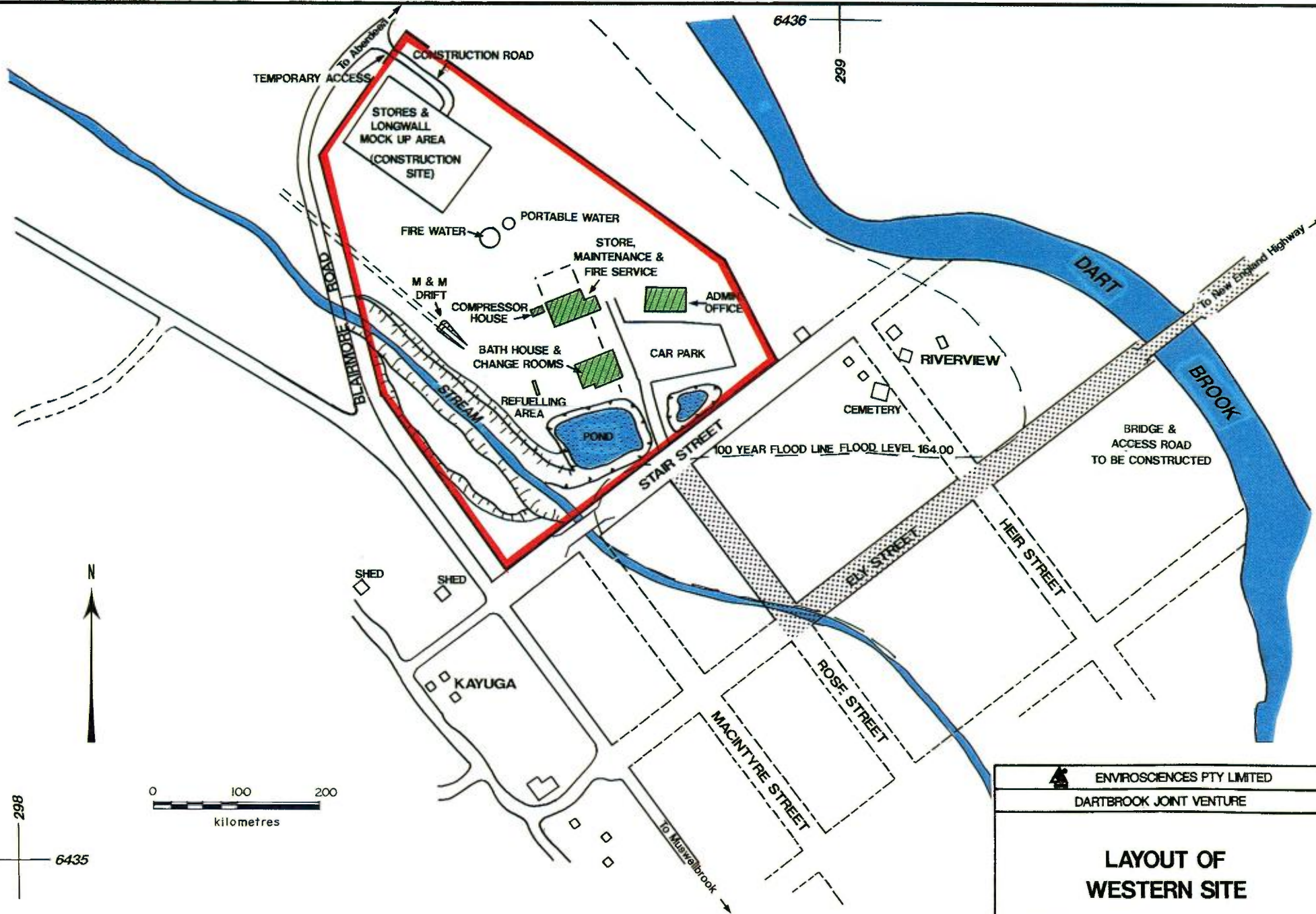
The main ventilation shaft and exhaust fan for the underground workings will be located on a small site some $1\frac{1}{4}$ km northwest of the other facilities. An evaporation pond for disposal of excess mine water from the underground workings will be constructed $2\frac{1}{4}$ km to the west of the Western Site.


The Eastern Site surface facilities will be located on the eastern side of the New England Highway adjacent to Browns Mountain. The principal components will include coal handling, stockpiling and loading facilities enclosed within a rail loop linked to the Main Northern Railway Line. The rail loop will be constructed to State Rail Authority standards and will be capable of handling 84 wagon trains. During Project Year 9 (11 years from start of construction) a coal preparation plant will be built to wash coal. Fine tailings from the plant will be dewatered and mixed with the coarse rejects for disposal at a dedicated rejects emplacement site to be located on the lower slopes of Browns Mountain adjacent to the rail loop.

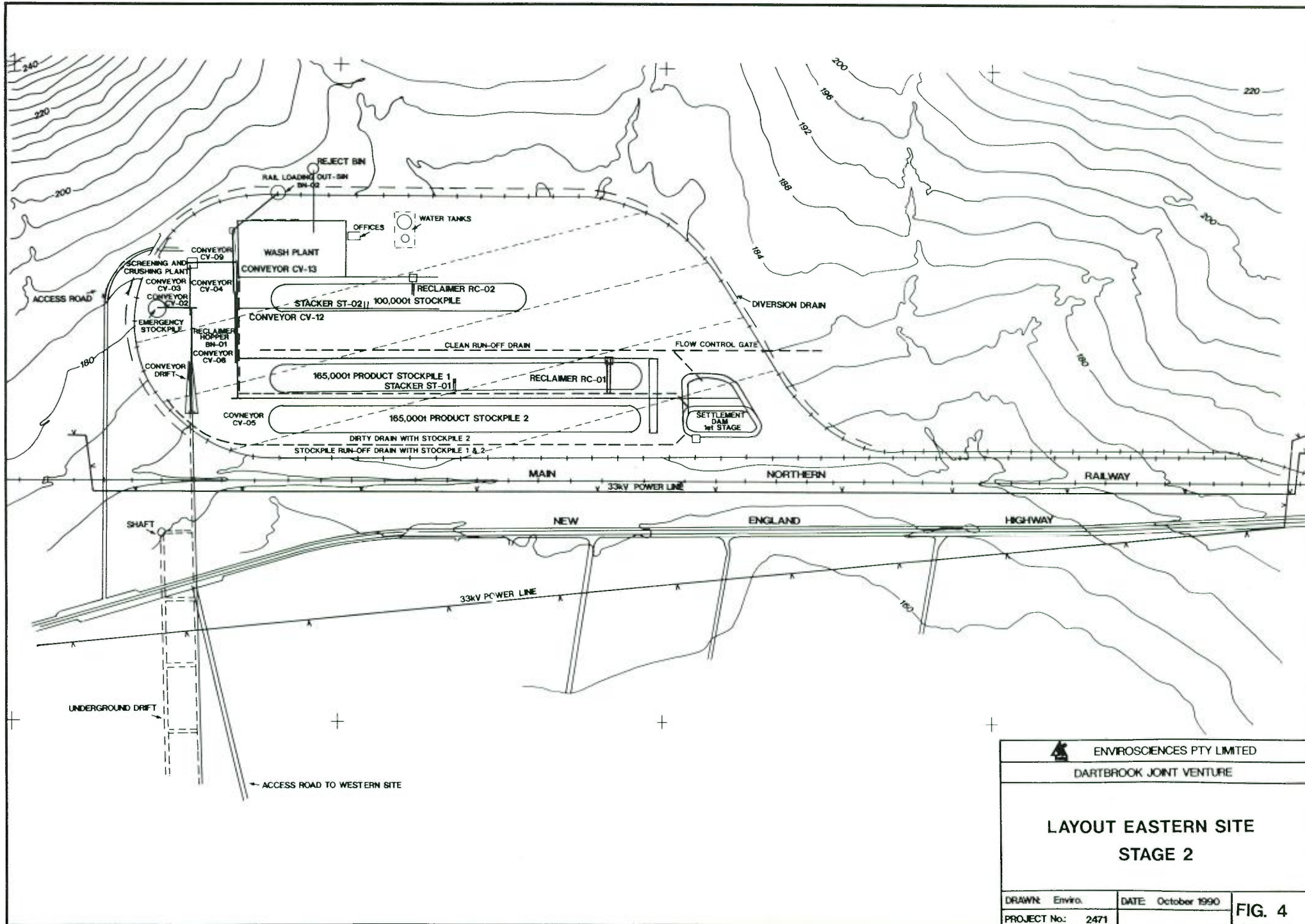
Access to the Western Site will be provided by a new road to be built by the Joint Venture across the alluvial plain from an intersection with the New England Highway opposite the Eastern Site. The road will cross two new low level bridges to be constructed over the Hunter River and Dart Brook. The road will be sealed, with two lanes, and will service the delivery of construction materials to the site, personnel transport to and from the site and early movement of coal from the drift and tunnel development. When the Dartbrook mine is operational, this road will provide the main access for the permanent mine workforce and mine supplies.


A short access road from the New England Highway to the Eastern Site will also be built. This road will cross the Main Northern Railway Line at a level crossing and a bridge will carry it over the rail loop line to give access to the facilities inside the loop.

*with roads elect effects - stock movement
- flow of surface water*



 ENVIROSCIENCES PTY LIMITED	
DARTBROOK JOINT VENTURE	
<h2>LAYOUT OF WESTERN SITE</h2>	
DRAWN: Enviro.	DATE: October 1990
PROJECT No: 2471	FIG. 3



 ENVIROSCIENCES PTY LIMITED DARTBROOK JOINT VENTURE		
LAYOUT EASTERN SITE STAGE 2		
DRAWN: Enviro. PROJECT No: 2471	DATE: October 1990	FIG. 4

A view of the Project Area is shown in Plate 1. This depicts the Eastern Site in the foreground with the active rejects emplacement and the rail loop encircling the wash plant and coal stockpiles, the western access road in the middleground and the Western Site in the background. The Plate is a photograph of a scale model and simulates an aerial perspective of the project from above Browns Mountain.

2.3 Coal Production and Quality

Mining will be by the retreat longwall method. A single longwall unit will be used consisting of a coal shearer, armoured face conveyor and hydraulic roof supports. Continuous miners will be used for development of longwall panels and the main underground roadways. Each longwall panel will be of 200 m face width and have a retreat length of between 1200 m and 3500 m.

Coal from the mining face will be transported to the Eastern Site by an underground conveyor to be installed in one of the two in-seam tunnels under the Hunter River alluvial plain (Figure 5). The twin tunnels, each 5.2m x 2.8m and some 50 m apart, will be driven in the Upper Wynn Seam at depths of 88 m on the eastern side of the river increasing to 108 m on the western side over a distance of some 4 km. They will be connected by cut-throughs at 100 m intervals. The second tunnel will provide access for maintenance and ventilation.

Underground mining will begin in the Upper Wynn Seam, the lowest of the five mineable seams. The other seams are the Middle Piercefield Seam, the Kayuga Seam, the Lower Piercefield Seam and the Broonie Seam. A substantial benefit is obtained by mining the Upper Wynn Seam during the early years of the mine's life because this seam is low in ash and can be marketed without washing. The other seams will require washing to produce an 11% ash, export quality, product.

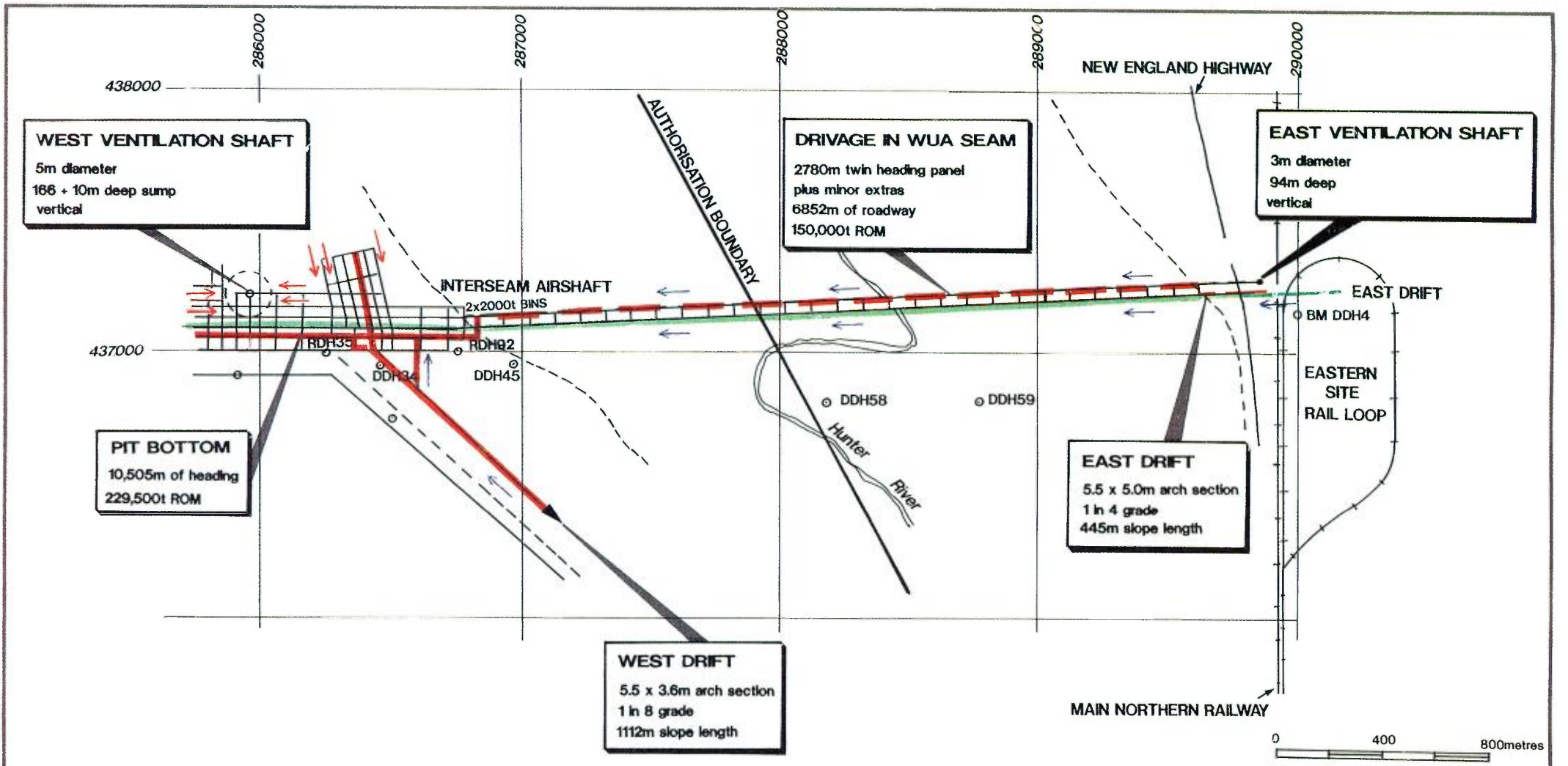
Mining will continue in the Upper Wynn Seam until Project Year 9 when operations will be transferred to the Middle Piercefield Seam, the top seam in the sequence in which economic underground reserves have been identified. Thereafter, each of the target seams will be mined in descending order.

The production schedule for the 21 year mine plan is given in Table 2. At the end of this period, 56.62 Mt will have been extracted and economically recoverable reserves totalling 33 Mt will remain in the Upper Wynn Seam, the Lower Piercefield Seam and the Broonie Seam for future exploitation.

Dartbrook coal is a high volatile bituminous coal with relatively low ash and low sulphur contents and is ideally suited for application as an export grade thermal coal. Product coal quality is given in Table 3.



PLATE 1: SCALE MODEL
DARTBROOK COAL MINE AND ENVIRONS
View from Browns Mountain looking
west during Stage 2 of the project.



Source: Fawcett Mining Consultants

- CONVEYOR ROADWAY
- MAIN MEN & MATERIALS ROUTE
- - - 2nd MEANS OF EGRESS
- VENTILATION
 - ← INTAKE
 - ← RETURN



ENVIROSCIENCES PTY LIMITED	
DARTBROOK JOINT VENTURE	
<h2 style="margin: 0;">UNDERGROUND ACCESS PROVISIONS</h2>	
DRAWN:	DATE: Sept. 1990
PROJECT: 2471	<h1 style="margin: 0;">FIG.5</h1>

Lease Year	Project Year	Upper Wynn Seam	Middle Piercefield Seam	Kayuga Seam	Lower Piercefield Seam	Total
1	-2	-				-
2	-1	0.49				0.49
3	1	1.20				1.20
4	2	2.93				2.93
5	3	3.12				3.12
6	4	2.91				2.91
7	5	2.80				2.80
8	6	2.75	0.10			2.85
9	7	2.40	0.36			2.76
10	8	2.67	0.21			2.88
11	9	1.28	1.80			3.08
12	10		3.21			3.21
13	11		3.26			3.26
14	12		3.11	0.20		3.31
15	13		3.11	0.24		3.35
16	14		0.57	2.59	0.08	3.24
17	15			2.81	0.30	3.11
18	16			0.83	2.03	2.86
19	17				2.92	2.92
20	18				3.09	3.09
21	19				3.25	3.25
Total:		22.55	15.73	6.67	11.67	56.62

**TABLE 2
PRODUCTION SCHEDULE
ROM, Mt**

	Upper Wynn Seam (raw)	Other Seams (washed)
Total Moisture %	11.0	12.0
Air Dried Moisture %	5.0	5.3
Ash Content % (ad)	11.0	11.0
Volatile Matter % (ad)	30.0	32.2
Fixed Carbon % (ad)	54.0	51.5
Sulphur % (ad)	0.27	0.38
HGI	53.0	54.0
Specific Energy MJ/kg (ad)	28.2	28.1

**TABLE 3
PRODUCT COAL QUALITY**

3. ENVIRONMENTAL IMPACT

Extraction of the economic reserves at Dartbrook by underground mining methods will have substantially less effect on the local environment than would surface mining. Surface disturbance is minimal, the visible parts of the operation intrude less into the local scenery and there is considerably less nuisance due to noise and dust than would be expected from a surface mine. By placing the major part of the mining operation underground, disturbance is kept to a minimum.

- what is minimal?

It is proposed to adopt a comprehensive range of environmental controls to minimise the visual impact of the proposed surface facilities, impacts due to noise and dust generation from site operations and vehicle movement, impacts on groundwater and surface water quality and impacts of additional traffic on local roads.

A series of specialist studies on these issues, and on subsidence impacts and Aboriginal and European heritage sites, is summarised here and the reports are reproduced in full in Volume 4. An impact summary map is given in Figure 6 which shows items referred to in the text.

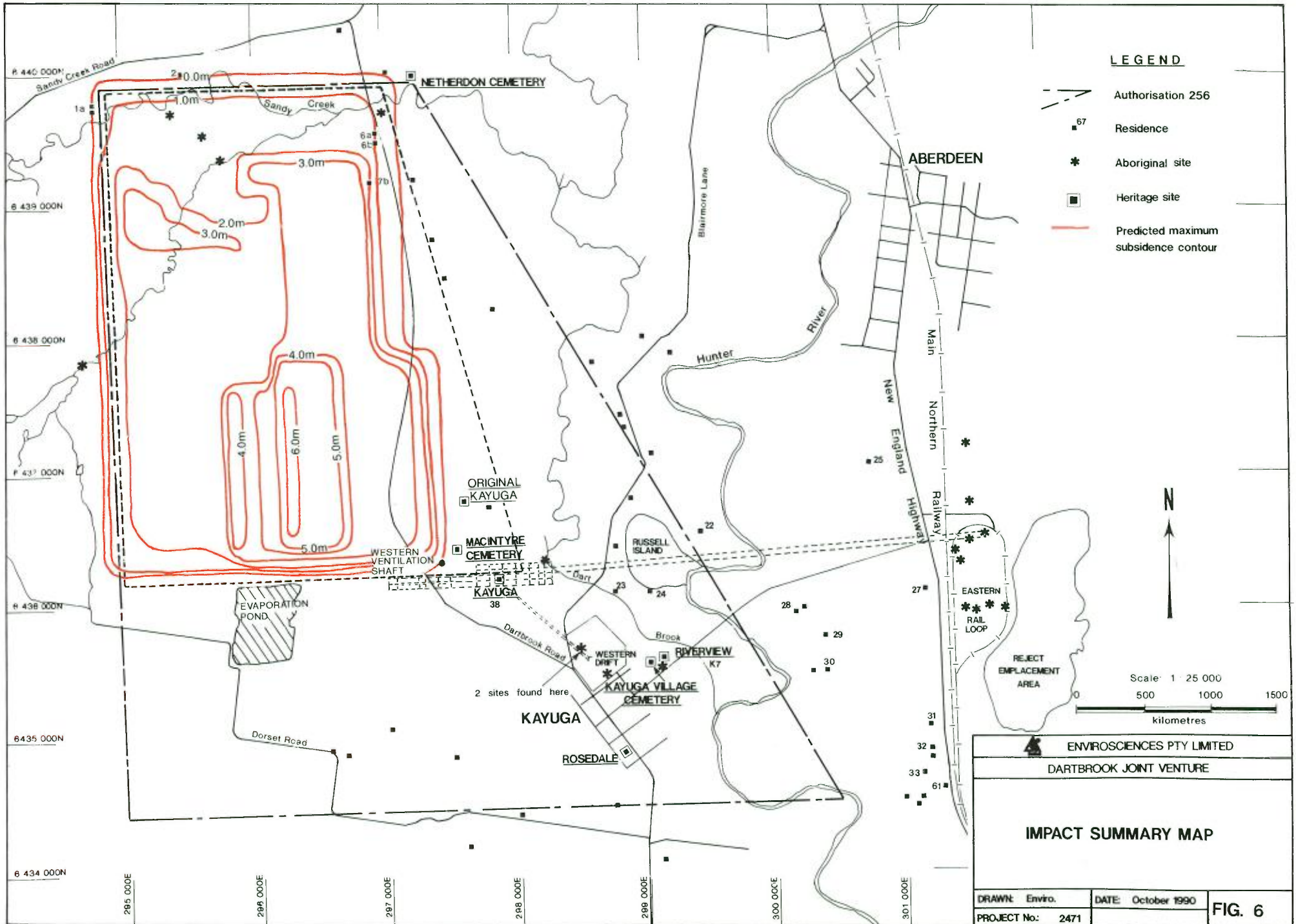
3.1 Surface Water and Groundwater

Surface Water






A water management strategy has been prepared for the pre- and post-wash plant phases of the Dartbrook mine to ensure that there is no adverse effect on surface water, alluvial groundwater or agricultural soils. A comprehensive water management programme will be implemented to separate and treat the four classes of water generated on-site: clean runoff, dirty runoff, saline mine water and sewage. Water will be recycled wherever possible. Water balance calculations show that, for an average rainfall year, water availability and usage are nearly in balance; the only extra water needed will be for potable use.

The management strategy proposes diversion of as much clean runoff as practicable around any mine site facility which could otherwise contaminate it. Dirty runoff will be collected in settlement dams for re-use in the Dartbrook mine and supporting infrastructure, and in surface dust suppression on roads and stockpiles. The settlement dams have been designed with capacities in excess of that required by the State Pollution Control Commission, being sufficient to hold runoff from a 1 in 50 year Average Return Interval storm.

At the Western Site there will be a 10 ML holding dam to store contaminated runoff water and water from an in-ground oil/water separator tank in the vehicle washdown area. Waste oil will be reclaimed for disposal by contractors and the water piped to an evaporation pond.




LEGEND

-  Authorisation 256
-  Residence
-  Aboriginal site
-  Heritage site
-  Predicted maximum subsidence contour



Scale: 1 : 25 000
 0 500 1000 1500
 kilometres

 ENVIROSCIENCES PTY LIMITED		
DARTBROOK JOINT VENTURE		
IMPACT SUMMARY MAP		
DRAWN: Enviro.	DATE: October 1990	FIG. 6
PROJECT No: 2471		

At the Eastern Site contaminated runoff within the rail loop will be contained in a settling pond initially of 12.5 ML capacity but capable of expansion to 20 ML as stockpiles are built-up. The clarified water will be re-used on site for dust suppression, coal washing and general purposes.

On commencement of construction of the emplacement area for the disposal of washery rejects, clean rainfall runoff will be diverted around the emplacement area into the natural drainage. Dirty runoff from the actively worked area will be channelled via decant ponds to a 25 ML settlement dam for reuse as needed. This dam will have the capacity to retain dirty runoff from greater than a 1 in 50 year Average Return Interval storm.

Sewage from the Western Site will be treated in a package treatment plant and the supernatant water held in a 5 ML maturation pond for subsequent disposal by irrigation or evaporation on Joint Venture owned land. The Eastern Site will have a septic tank system for sewage treatment.

Groundwater

Hydrogeological testing on a number of drillholes, shows that the coal measure strata, including the seams, have low permeability. Ingress of groundwater to the mine during normal mining operations will be low. Drillholes near the line of the tunnel beneath the alluvial plain also show low permeability in the bedrock and, given the depth of the tunnel, there will be no interference with the water resources of the Hunter River alluvials. The project will not interfere in any way with the flow of the Hunter River.

It is intended that potable water supplies for the operations will be obtained from existing licensed bores in the alluvium on Joint Venture owned land. Tests are being carried out to identify suitable bores.

Evaporation Pond

Mine water which accumulates in the underground workings will be used for dust suppression underground and the excess, with total dissolved salts of up to 3500 mg/L, pumped to a 24 ha shallow evaporation pond located on land owned by the Joint Venture. This pond will be capable of evaporating up to 180 ML/yr. There will be no discharge of saline mine water into the Hunter River or Dart Brook catchments.

Design and operation of the evaporation pond is addressed conservatively with due recognition of the potential downstream effects from seepage and overflow. To prevent salts leaching into the soil, a clay lining will be used. Up slope runoff will be diverted around the pond which will then have only its own surface area as a catchment. This means that, in a succession of average rainfall years, the pond would never fill to capacity. As an added safety precaution a 400 mm freeboard will be

incorporated into the engineering design to contain rainfall in excess of a 1 in 100 year Average Return Interval storm (300 mm).

The risk of overtopping is therefore considered remote; however, in the event that the emergency spillway level is reached, the large volume of flood water present would dilute any dissolved salts to negligible concentrations.

Following the construction of the coal washing plant and its operation in Project Year 9 (i.e. 11 years after site works commence), mine water will be directed for use in coal washing. The evaporation pond will then be reduced in size to a holding capacity of up to 24 ML and the surplus surface area allowed to dry up. The salt rich layer remaining will be disposed of at an approved site and the area will be rehabilitated and returned to agricultural use.

3.2 Dust

Because coal recovery will take place underground and there will be no handling of overburden, the amount of dust released at the surface will be very much less than for an open cut mine with the same output. Based on regional estimates the Dartbrook Project will produce dust at a rate less than one fifth of that for equivalent open cut mines in New South Wales. It follows that any potential dust nuisance will also be significantly less.

Despite the comparatively low dust emission rate it is still necessary to analyse the project with respect to possible impacts and a dust monitoring network was set up in the Project Area to establish baseline dust fallout levels. Results indicate an average monthly fallout of between 1 and 2 g/m² in the area surrounding the surface facilities sites. State Pollution Control Commission criteria would allow this level to increase by 2 g/m²/month before classifying dust deposition as a nuisance to local residents.

In making predictions of dust emissions from site activities, dust dispersion modelling has been undertaken based on local meteorological conditions. Wind monitoring at the Joint Venture's station at Kayuga show north to north-westerlies predominate in winter and south to south-easterlies in summer.

When fully operational the Western Site and the cross river access road will not involve any significant dust generating activity. During the 30 month construction phase some dust will be generated, but these emissions will be minor and amenable to standard dust control measures as apply on any construction or road making site. These include the use of water sprays and speed limits on vehicles. In addition, vegetation clearing will be controlled to minimise disturbed areas. Where site levelling or earthworks are undertaken sealing or revegetation will immediately follow to prevent soil erosion and dust.

where does dam sediment go?

? what about access to salts.

With these measures, predicted dust concentrations during construction will be below defined nuisance levels.

Similar dust suppression controls to those applied at the Western Site will apply during construction of the Eastern Site. In the pre-washplant operations at the Eastern Site, dust will mainly be generated at conveyor transfer points, coal stockpiles and the rail load-out. After Project Year 9, additional dust will be generated by the ongoing preparation of the emplacement site for reject disposal and the transport of rejects by road to the site. This will be moderated by the use of a water cart and sprays. As both the fine and the coarse rejects will be wet, this material will not in itself contribute significantly to the total dust emission.

Dust likely to be generated at the rail loop/stockpile site has been examined in relation to a dispersion model and prevailing meteorological conditions. In a "worst case" scenario, when all these stockpiles are full and before dust control measures are allowed for, modelling has shown that none of the local residences, including the nearest houses in Aberdeen would be expected to experience problems from long term dust fallout. It follows that, with the dust emission controls proposed by the Joint Venture such as enclosure of coal transfer points and conveyors, mist sprays and chemical suppressants on stockpiles and growing windbreaks, dust concentrations will be maintained well within acceptable standards for air quality as defined by the State Pollution Control Commission.

However, residence 27, which at 170 m is the nearest residence to the stockpiles (Figure 6), is shown by the model to be periodically vulnerable to short-term episodic dust impacts under low frequency extreme weather conditions. This would occur when the wind was from an easterly direction which happens less than 4% of the year. Whether, or not the impact level would be exceeded in practice would depend to a large extent on the effectiveness of stockpile water sprays under dry windy conditions.

The nearest dairy farm milking shed is approximately 675m to the south of the stockpile area near residence 31. The predicted dust fallout levels at this distance are well within State Pollution Control Commission criteria and, with the strict standards of hygiene that already apply in dairy operations, will have no impact. Scott

3.3 Noise

Background noise levels at day and night were recorded to establish the acoustic climate in and around the Project Area. Monitoring locations were grouped into four representative areas:

- * N1 - Kayuga Village/Russel Island (K7, 22, 23, 24)
- * N2 - Aberdeen (southern outskirts)
- * N3 - River Flats/Western Access Road (28, 29, 30)

* N4 - New England Highway/Main Northern Railway Line
(25, 27, 31, 32, 33, 61)

The measured noise levels were then compared with acceptable levels set by the State Pollution Control Commission for these rural areas and adjustments made according to an established method to derive design criteria for the operational phase of the mine. In the construction phase some activities, such as earthworks, have specific criteria not related to background noise levels whilst others such as building and bridge construction normally have a criterion 10 dB(A) above background. Measured and allowable noise levels are summarised in Table 4.

Area	N1		N2		N3		N4	
	Day	Night	Day	Night	Day	Night	Day	Night
Measured Background	35	28	40	31	40	32	45	36
Design Criterion*	40	33	43	33	43	32	48	38
Allowable Level**	45	-	50	-	50	-	55	-

* Mine Operating dB(A)

** Building Constuction L₁₀ dB(A)

TABLE 4
AVERAGE MAXIMUM NOISE LEVEL CRITERIA

Earthworks criteria are as follows:

- * Short term (1 month or less) - 65 dB(A) L₁₀
- * Medium term (1 to 6 months) - 55 dB(A) L₁₀
- * Long term (6 months or more) - 50 dB(A) L₁₀

Mine Construction and Operation

Based on these criteria, predictions of noise impact have been made for all nearby residences likely to be affected by the mine construction and operation using known noise levels for plant and equipment and normal factors for sound attenuation over distance. The results indicate that, in the construction phase, nominated equipment is unlikely to exceed the maximum criteria at any residence near the Project Area except for K7 and 28. At both these properties there will be a temporary noise impact, during the day time only, as the Western Site access road is being built.

No noise impact at any residence will result from the normal operation of the mine and surface facilities either by day or night.

Road and Rail Traffic

Once constructed, the Western Site access road will ensure that mine traffic avoids the rural roads to Muswellbrook, Scone and Aberdeen but, nevertheless, some residences near the new road will experience traffic noise for up to 30 minutes during the night shift changeover.

Noise exceedence for residences 22, 24, 29 and 30 is minimal and with appropriate noise shielding along the road can be reduced to within State Pollution Control Commission criteria. However, residences K7 and 28 will experience more significant impacts.

Residences on the New England Highway will not be affected by noise from employee vehicles at shift change, as the extra vehicle noise at these times will be absorbed by the current traffic flow.

Coal trains will operate during the day and the night. Assessment of coal train noise at residences 27, 31, 32, 33 and 61 shows the criterion will not be exceeded and is only 1 dB(A) L_{eq} 'T' (24 hours) more than noise generated by existing rail traffic.

Safeguards

Surface facilities for night-time operation at the Western Site have a Limiting Noise Criterion of 92 dB(A) Total Acoustic Power, which will maintain operating noise levels within acceptable State Pollution Control Commission limits at rural residences. A vegetated 3.5 metre bund will protect Kayuga residents from noise sources. This also will safely cover daytime working operations.

During the construction period all surface construction will be restricted to daytime hours. Conveyor drives and front-end loaders utilised on the site for the movement of materials during the development phase will be designed and selected for low noise and, if necessary, will be fitted with additional sound attenuating devices to further reduce the noise emission from these items. The western ventilation fan will be designed and selected with a noise emission level to meet the noise criterion.

Construction of the Eastern Site surface facilities will be subject to the same constraints as the Western Site and front end loaders will be similarly modified for use at the temporary loading facility to ensure that relevant noise criteria are not exceeded. The permanent loading facility with its stacker and reclaimers will not create a noise impact at any neighbouring residence during daytime or night time operation.

When the coal wash plant is built in Project Year 9, it will incorporate acoustic design features to prevent noise emissions exceeding the criterion and will not create a noise impact during night time operations at any neighbouring residence.

The sinking of the western ventilation shaft will involve some blasting over a short time period. As the shaft increases in depth, overpressure and noise will decrease at the surface. Blasting design will be in accordance with State Pollution Control Commission Comfort Limitations and blast and vibration monitoring will be carried out at all critical residences including Kayuga Homestead 400 m to the east. No blasting is required throughout the operational life of the underground mine.

Earth bunds and tree clusters will be positioned at critical points along the Western Site access road for noise as well as visual mitigation. This will reduce night shift traffic noise at residences 22, 29 and 30 to acceptable levels. Noise screening of residence 28 which will be the closest dwelling to the road and the most affected by commuter traffic, will be provided by a series of 1.5 m high arboreal bunds arranged en echelon along the road at its nearest approach to the residence.

3.4 Subsidence

The total amount of subsidence at any location will vary according to the extent of extraction of each seam and the amount of vertical interaction between seams. For the four seams scheduled for longwall mining in this proposal, the area of overlapping extraction is approximately 50% of the total underground mining area (approximately 900 ha), the rest being subject only to conventional single seam extraction.

Detailed predictions of the amount of subsidence have been made for the purposes of this study based on experience in the Newcastle Coalfield where field monitoring carried out by the Department of Minerals and Energy has established an empirical relationship between depth of subsidence at the surface and thickness of coal extraction underground. The Department's guidelines are based on single seam mining which will be practised exclusively at Dartbrook for the first half of the mine life. Allowing for local geological conditions and mining method, the guidelines are considered to be the most appropriate for use at Dartbrook and it is assumed that, with the additive effects from later seam extraction, they give a maximum subsidence prediction for the area. As mining proceeds the Joint Venture will develop its own model based on experience gained to refine subsidence predictions before the operation progresses to multiple seam extraction.

Contours of predicted total subsidence at the end of the 21 year mine plan are shown in Figure 6. The maximum effect will be felt in the south central part of the underground mining area where subsidence will aggregate around 4 to 6 m over about 100 ha due

to workings overlapping in three seams. The land affected is used only for grazing and has no significant improvements.

The main north-south development headings (first workings) will extend partly under the Hunter River alluvial plain, however longwall mining will not extend under the plain in any seam and the alluvials and their contained groundwater will not be affected by subsidence. A zone of undisturbed rock strata will be left between the underground mining area and the alluvial plain to prevent leakage. A line of wells will be drilled along the western margin of the alluvials to monitor aquifer integrity. *DWR*

The Upper Wynn Seam is the first and the lowest seam planned for mining and ranges in depth from 200 m in the south to 380 m in the north. Workings in this seam will affect the Dartbrook Road and adjacent properties in the northeast of the underground mining area where three houses (6a, 6b, 7b) will undergo up to 0.5 m of subsidence about 7 years after longwall mining commences. In the northwest, residence 1a will also undergo up to about 0.5 m of subsidence around the same time. Residence 2 is just outside the predicted zero subsidence contour and should be unaffected. It is expected that all these houses will be able to withstand this episode of subsidence without structural damage. *residences?*

Lowering of the downstream end of Sandy Creek will push the 1 in 100 year flood limit a short distance upstream, but no improvements will be affected. Some minor ponding may occur temporarily in meanders in the upper reaches of the unnamed tributary of Sandy Creek, however these can be controlled by normal surface mine rehabilitation practices.

Overall, the impact of lowering the natural topography by up to 2 m is expected to be minimal. Some areas have been identified as requiring erosion control and these will be monitored at the appropriate time and attended to, as will structural effects on windmills, dams, bores and other improvements. Dartbrook Road will be maintained in good repair at all times. *who pays?*

There will be no subsidence above permanent roadways in the Upper Wynn Seam along the eastern side of the underground mining area, the in-seam tunnels beneath the Hunter River, or the Eastern and Western Drifts.

Mining of the Middle Piercefield and Kayuga Seams is confined to the south and west of the underground mining area and will affect only small parts of the area already undermined by the Upper Wynn Seam. Only grazing land will be affected as there are no major surface improvements or houses above the proposed workings in either seam. Up to 4 farm dams could be affected. Similar monitoring and rectification procedures will apply as for the Upper Wynn Seam.

The last seam to be mined is the Lower Piercefield Seam which will be mined over the eastern half of the underground mining area except under Sandy Creek. The entire mining area will have

undergone some subsidence prior to commencement of operations in this seam and the effect of re-activating the area is assumed to be additive.

Apart from the far north of the area, where, to protect Sandy Creek, no mining will take place, the rest of the area will be subsided by up to 2 m additional to subsidence resulting from mining the other seams.

Parts of Dartbrook Road will undergo renewed subsidence of up to 2 m and three houses in the northeast will experience further subsidence about 8 or 9 years after the previous subsidence episode due to the Wynn Seam workings. Residence 7b is predicted to undergo an additional 1.5 m subsidence and will require preventative or remedial action. Residences 6a and 6b will undergo up to 0.75 m which should not cause any more than minor damage. Residences 1a and 2 will be unaffected.

At the end of the 21 year mine plan, total subsidence at the four residences affected is estimated to be:

1a	-	0.5 m
6a, 6b	-	1.0 - 1.25 m
7b	-	2.0 m

The Project Area is in a proclaimed Mine Subsidence District and, as such, property owners affected will be eligible for appropriate compensation and/or repair costs under the provisions of the Mine Subsidence Compensation Act. These statutory provisions extend to all improvements including Council works and roads. The Joint Venture Policy on Subsidence also provides for early identification and rectification of damage to property.

check mine sub area.

3.5 Traffic

Initially Kayuga Road will provide access during daylight hours to the Western Site for construction workforce vehicles and materials. It is projected that this road from Muswellbrook will carry a total load of 15,000 tonnes in 750 loads, or 1500 truck movements. Based on a six day working week it is estimated that over the six month period before the Western Site access road is completed, there will be a peak of 12 truck movements per day. In addition, employee movements along Kayuga Road would add a maximum of 218 car movements per day. North of the site, Blairmore Road would have no truck movements but a maximum of about 186 car movements per day.

With the above level of traffic flow, Kayuga Road would still be operating under a "good" level of service as defined by the National Association of Australian State Road Authorities which suggests that a road with a sealed carriageway width similar to that of Kayuga Road could carry 1000 vehicles per day whilst still maintaining a "good" level of service. When the mine is

in full operation, traffic flows, including the mine traffic, are expected to be less than half this figure.

The movement of coal along the mine access roads from the Western Site to the Eastern Site for the nine month period prior to completion of the underground conveyor tunnel, is estimated at 96 truck movements per day. Employee movements in light vehicles would be in addition. To ensure maximum safety to all mine and through traffic, the intersections of the two site access roads with the New England Highway will be constructed with turning lanes to the recommended standards of the Roads and Traffic Authority.

Until completion of the rail loop and loading facility in Project Year -1, 18 months after site works commence, it is proposed to transport development coal by road from the Eastern Site to the domestic market to the south. This would total some 100,000 tonnes and would be trucked through Muswellbrook. Over the 8 month period involved, this would result in a maximum of 54 truck movements per day. In addition, there would be about 10 truck movements per day of construction materials. Employees resident to the south of the mine would add about 280 car movements per day.

Heavy vehicle movements can cause damage to road pavements and the Joint Venture will negotiate appropriate compensation with the Shire Councils/Roads and Traffic Authority to cover such damage.

Based on a vehicle count on the Highway near the Eastern Site in June 1990, the number of heavy vehicles due to the project would increase by 5.5% and the total traffic by 6.0%. The New England Highway is a National Highway and, as such, is designed for heavy vehicle use. Its design capacity is significantly higher than current usage and the Highway will safely accommodate the increase in traffic due to the project.

3.6 Visual Amenity

The Project Area occupies a site of the Upper Hunter River Valley containing landscapes of undulating cleared foothills, flat alluvial plains and the waterways of the Hunter River and Dart Brook. While the alluvial flats and the waterways provide valuable resources and a pleasant aspect, the foothills, which account for the majority of the area, are rated only to be of low scenic quality.

The visual impact assessment work carried out by the Joint Venture indicates that a number of the proposed facilities will have the potential to create a visual impact on this part of the Hunter Valley.

Although the Western Site and the access road will create new visual features, design of buildings to blend in with the existing rural architecture and the planting of local tree

species along the road and around the surface facilities site, will render them unobtrusive. By placing the coal transport system underground, the visual amenity of the river flats, with their background of rising foothills to the west, will be preserved.

The Eastern Site, with its taller structures and its proximity to the New England Highway and the Main Northern Railway, will present a greater visual impact. Particular attention will be paid to colour schemes for the buildings and methods to soften silhouettes. There will also be a potential for visual impact with the rejects disposal area, although screen plantings can minimise this. Specific landscaping strategies have been suggested to minimise the potential for impact at a number of the surface facilities locations. In particular, for visual mitigation of the coal washery and rejects disposal emplacement which are not scheduled for operation until Project Year 9, works can commence at least 10 years ahead by instituting a forward tree planting programme employing a blend of fast growing native species together with more robust long life species.

In addition to the visual impact of the surface facilities during daylight hours, lighting of the rail loop and the Western Site facilities will result in these developments being conspicuous at night. Lighting placement will be designed with this in mind to minimise the effect consistent with ensuring safety in working areas.

3.7 Fauna and Flora

All the species found in the Project Area are common throughout much of Hunter Valley. Field surveys on the site have found no rare or endangered fauna or flora and the vegetation associations show poor diversity.

3.8 Heritage Sites

Archaeological surveys have located a number of sites showing evidence of early Aboriginal occupation. Although widespread, the sites are not of major significance. Locations of the sites are shown in Figure 6. The local Aboriginal Land Council has been consulted about the project and further meetings are planned. An application for Consent to Destroy the specific sites affected by the proposal will be made in accordance with the National Parks and Wildlife Act.

No items of European heritage will be affected by the proposal. The original Kayuga Homestead (circa 1830) which has been cited by the Department of Planning as requiring further investigation, lies above the main northern development heading. It will not suffer any subsidence. The major European heritage sites are shown in Figure 6.

3.9 Land Ownership

Land ownership in the Project Area including the village of Kayuga, has been established by Title Search and has identified 88 titleholders to rural and residential blocks.

The joint venturers acknowledge the potential for impact at specific locations and have developed a Land Policy to provide a basis for the acquisition of significantly impacted land. At this stage the Joint Venture has identified 15 properties in this category (Table 5) and has sought to negotiate the purchase of these lands through option arrangements based on a premium to ruling rural valuations. One property is owned and nine others are now held under option. The Joint Venture remains prepared to acquire the outstanding properties.

Some 200 ha of diary and agricultural land in the properties currently held under option is surplus to requirements for the surface development proposed for the mine. The Joint Venture is keen to maintain productive use of this land (and any acquired later) and is examining a proposal by the Department of Agriculture and Fisheries and Australian Co-operative Foods Limited involving a consolidated land holding with the potential for improving dairy yields by up to 10%.

*Who?
How?
When?*

Property Number	Status	Source of Impact			
		Surface Develop.	Construct. Noise	Traffic Noise	Dust
K5	Under Option	X			
K6	Under Option	X			
K7	Under Option	X	X	X	
23	Under Option	X			
24	Under Option	X		X	
26	Not Successful	X			
27	Not Successful	X			X
28	Under Option	X	X	X	
29	Not Successful	X		X	
30	Not Successful	X			
31 (part)	Under Option	X			
32 (part)	Not Successful	X			
38 (part)	Under Option	X			
39 (part)	Already Owned	X			
59	Under Option	X			

TABLE 5
PROPERTY ACQUISITION STATUS

3.10 Development Schedule

Construction of the surface facilities of the Dartbrook mine and development of the underground workings, tunnels and drifts will be concurrent. It is estimated that the total construction period to full commercial production will be about 30 months. The development schedule is shown in Figure 7.

3.11 Project Workforce

The construction workforce will be variable in number, building rapidly to a peak of about 350 personnel but averaging 125 over the construction period (Figure 8). This workforce is expected to be drawn from the construction industry within the Hunter Valley region which has a demonstrated capacity to handle similar large development projects.

The operational workforce peaks at 302 in Project Year 2. Thereafter it remains steady at about 275 over the main operational life of the project.

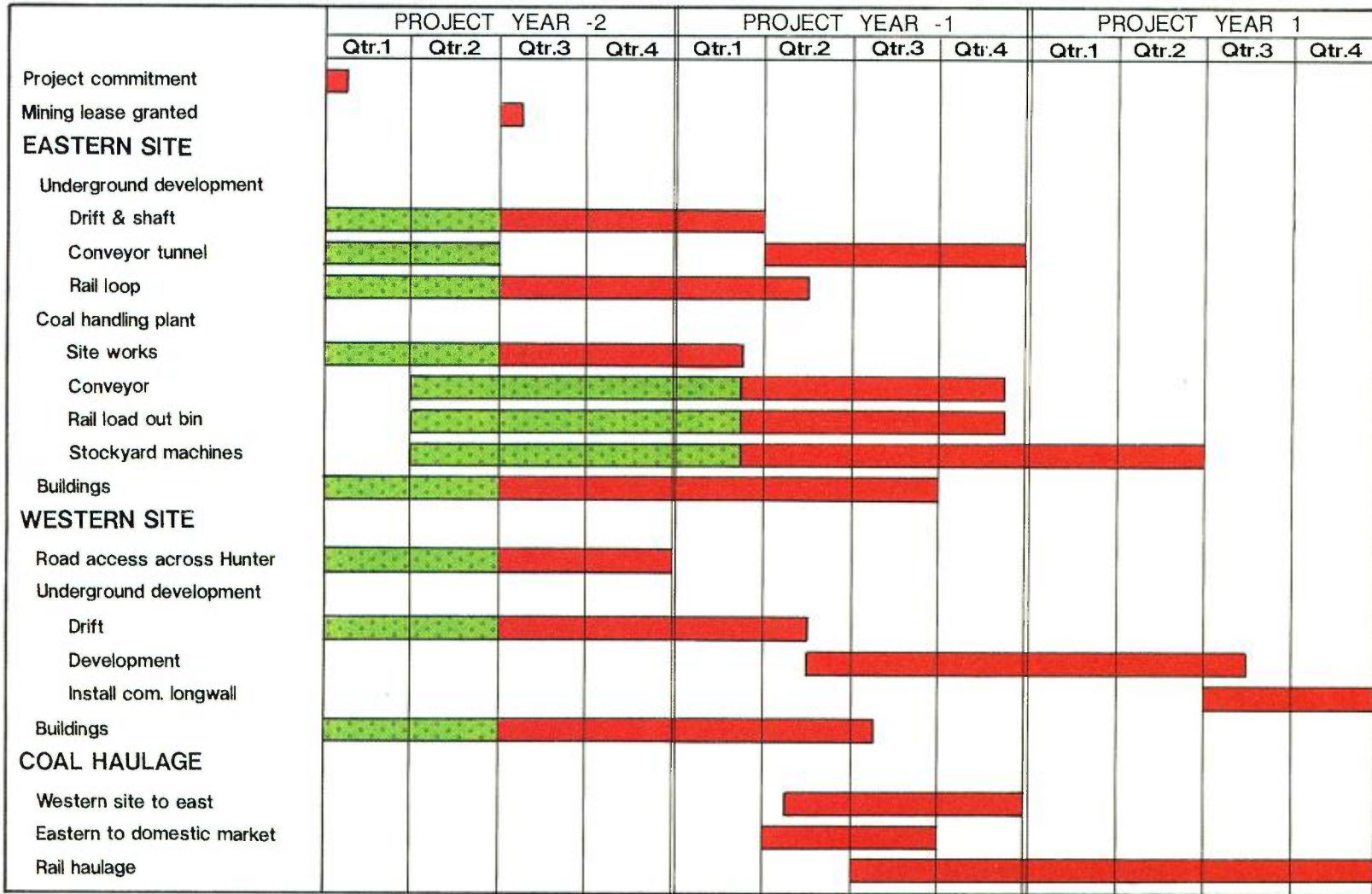
About 60 new mining families are expected to move into the district as a result of the project and sufficient capacity already exists for new housing development to accommodate this in-migration.

The development of the project will result in an additional 275 permanent jobs in the Hunter Region. This will have a highly positive impact on the local economy through additional employment opportunities and a significant wage and salaries bill amounting to more than \$28M which will boost regional household incomes.

There will be a major regional impact due to the multiplier effect and, in total, it is estimated that an additional 670 more jobs will be created, including the 275 directly employed by the mine. There will be a positive economic and social impact to the Upper Hunter community and Australia's balance of trade.

3.12 Environmental Controls

Detailed design and operational safeguards are proposed for the Dartbrook Project. Programs of ongoing environmental investigations and the supervision of safeguards and monitoring will be administered by an Environmental Officer reporting directly to the Mine Manager. The officer will also assist in training operational and management personnel to achieve the levels of control necessary for the project and will be involved in liaison with residents, Councils and Authorities to ensure that the environmental management procedures meet all necessary consent conditions.



ENVIROSCIENCES PTY LIMITED

DARTBROOK JOINT VENTURE

DEVELOPMENT SCHEDULE

DRAWN:

DATE: Sept.1990

PROJECT: 2471

FIG. 7

DARTBROOK WORKFORCE

WORKFORCE

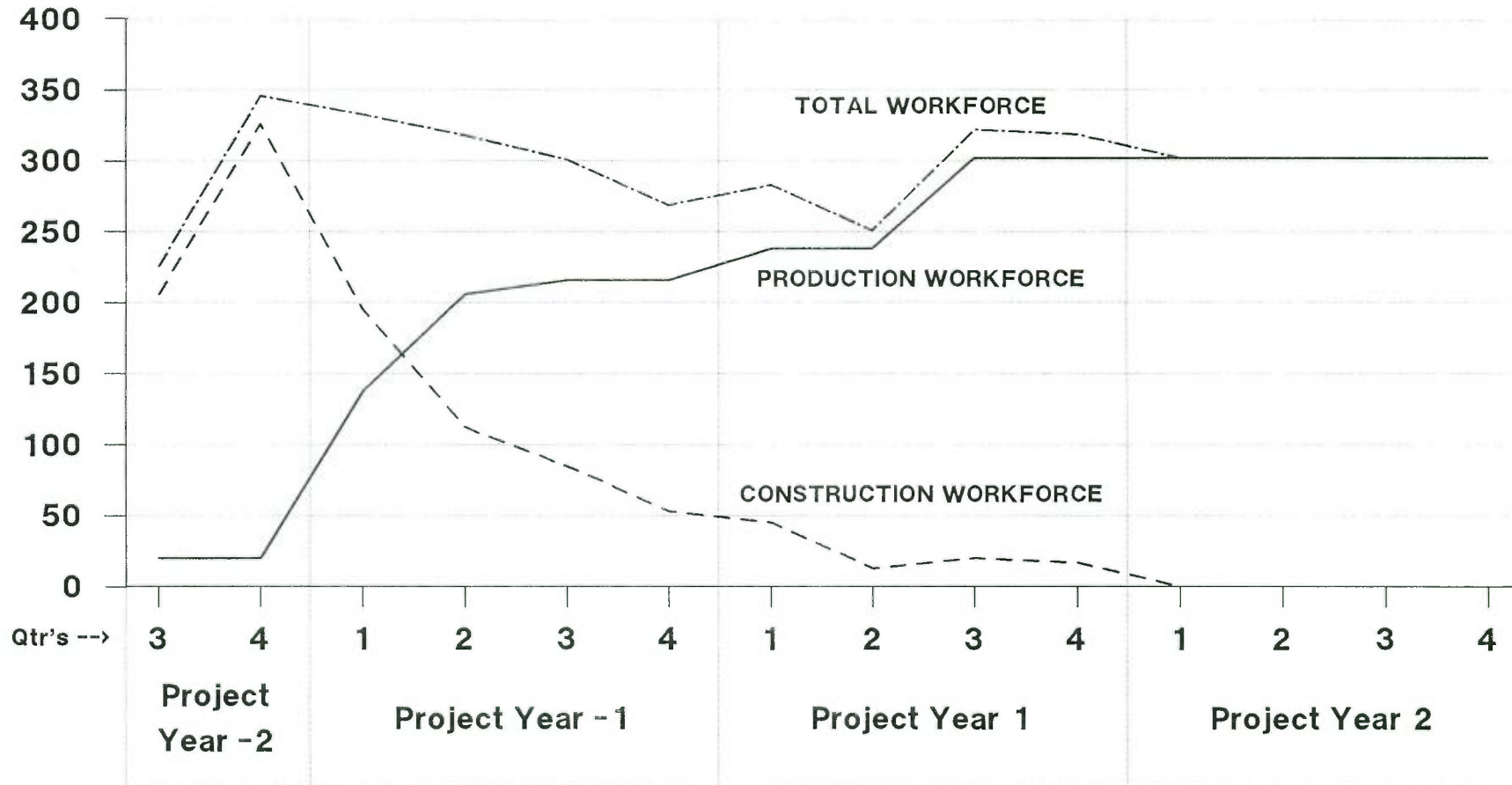


Figure 8

The Environmental Officer will also be responsible for the comprehensive environmental monitoring programme which will be set up for the project. Key areas to be monitored will include:

- * boreholes in the alluvium adjacent to the mine area,
- * dust/noise/water monitoring stations,
- * subsidence effects,
- * tree screen establishment,
- * revegetation growth and rehabilitation trials,
- * weed incursion,
- * rejects emplacement.

4. CONCLUSIONS

The joint venturers believe that the Dartbrook Project can proceed in an environmentally sound fashion and that the project presents considerable advantages and benefits to the broader community. The joint venturers are also determined to see the project developed in a manner consistent with the highest environmental standards and community expectations in addition to meeting the requirements of all the relevant local and State Authorities.

The project provides an opportunity to recover substantial coal reserves in an efficient and environmentally sustainable manner. The extraction of coal, its preparation and its transportation to market can all be undertaken without placing unacceptable burdens on the local community. A number of management and environmental safeguards will be undertaken to minimise the environmental impact associated with the proposal.

The development will be undertaken in accordance with Shell Australia's Policy on Health, Safety and the Environment. The objective of this policy is to protect the environment from unacceptable impact. It has been formulated to assist Shell operating companies in addressing environmental matters in a systematic manner and to give guidance on the practical implementation of a range of controls to protect the environment. It is a corporate commitment that environmental policies are to be implemented effectively with sound management practices.

Both Joint Venture partners are experienced coal mine operators with a history of successful exploration and evaluation to project development, mining, industrial relations and marketing. Together, the joint venturers have management responsibility for three major longwall mines and four open cut mines in Australia and have the demonstrated competence to develop and operate a new mine such as Dartbrook.

It is concluded from the comprehensive range of specialist studies commissioned for this Environmental Impact Statement that there are no unmanageable environmental impacts associated with the proposed development. Some 154 ha of mostly grazing land is required for the surface facilities, affecting 15 properties, and it is recognised that noise and dust

inconvenience will be experienced at three of these. All the affected properties have been the subject of offers to purchase by the Joint Venture.

It is further acknowledged that there will be subsidence effects at four residences and on grazing land and farm improvements on several properties. Dartbrook Road, also, will be periodically affected but the Hunter River, its flood plain and the groundwater contained in the alluvials will remain unaffected. Landowners and occupiers have statutory rights and entitlements under the Mine Subsidence Compensation Act and Coal Mining Act, and will also be protected by the Joint Venture Policy on Subsidence. These compensations also extend to Council improvements such as roads and drains.

The Joint Venture intends to establish a regular consultation process between management, residents and members of the local community and Councils to ensure that standards are maintained and potential problems identified.

The project is seen to have many positive impacts. These include increased direct and indirect employment opportunities, increased service sector activity, revenues to Local, State and Federal Governments and favourable contributions to the Nation's balance of payments.

The Dartbrook Project will be a large nett energy producer. About 0.2% of the total energy produced will be consumed in the form of electrical energy and diesel. The quantity of coal produced annually would be equivalent to about 15% of the electrical energy generated in NSW in 1988/89.

EIS 972