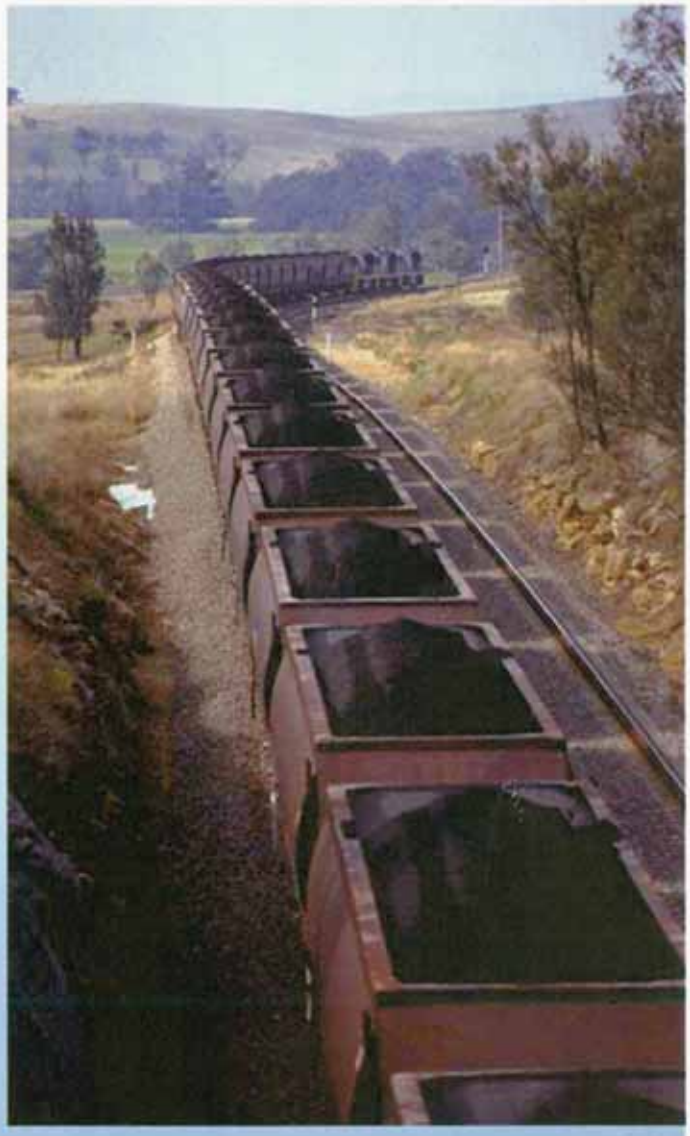
Drayton Coal Pty Ltd &
Coal Operations Australia Limited

Antiene Joint User Rail Facility Environmental Impact Statement



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COAL
COAL OPERATIONS
AUSTRALIA LIMITED

Report No. 1323/R01

Prepared for:

COAL OPERATIONS AUSTRALIA LIMITED & DRAYTON COAL PTY LTD

ANTIENE JOINT USER RAIL FACILITY ENVIRONMENTAL IMPACT STATEMENT

VOLUME 1

Umwelt (Australia) Pty Limited
Environmental and Catchment Management Consultants

PO Box 838
Toronto NSW 2283

Ph. (02) 4950 5322

Fax (02) 4950 5737

EXECUTIVE SUMMARY

BACKGROUND

Coal Operations Australia Limited (COAL) and Drayton Coal Pty Ltd propose to develop the Antiene Joint User Rail Facility, located approximately eight kilometres south of the Muswellbrook Post Office, in the Upper Hunter Region of New South Wales. The facility will incorporate use of the existing Antiene Rail Spur by the existing Drayton Rail Loading Facility and a new Bayswater Rail Loading Facility. The facility will be used to transport coal from the Drayton and Bayswater open cut coal mines, as well as any future mines, such as Mount Arthur North and Saddlers Creek, that may be approved in the area.

COAL operates the Bayswater open cut coal mine, which currently transports coal by road to Ravensworth Coal Terminal, and then by rail to the Port of Newcastle. A modification to the Bayswater No. 3 1994 development consent, granted in December 1999, requires that road haulage of coal cease by 1 July 2001. The Antiene Joint User Rail Facility is the most environmentally and economically feasible alternative method of coal transportation from Bayswater mine to the Port of Newcastle and other locations.

Drayton Coal Pty Ltd operates the Drayton open cut coal mine, adjacent to Bayswater mine. Coal produced by Drayton mine is transported by rail to the Port of Newcastle via the existing Drayton Rail Loading Facility, Antiene Rail Spur and Main Northern Railway. The Drayton Rail Loading Facility and Antiene Rail Spur are wholly owned by Drayton Coal. The existing 1980 development consent for Drayton mine limits transportation of coal via this route to 3.3 million tonnes per annum, which is insufficient for the mine production capacity. The Antiene Joint User Rail Facility will provide Drayton Coal with the capacity to transport the projected maximum annual tonnage of product coal using existing rail and loading infrastructure.

Various alternative strategies to meet the transport objectives of both applicants were considered, including use of the existing Drayton Rail Loading Loop to transport coal from both Drayton and Bayswater mines. However, the Drayton Rail Loading Facility has insufficient capacity to transport the projected annual coal product from both COAL and Drayton Coal operations. Other options such as overland conveyor to Ravensworth Coal Terminal and alternative rail alignments were considered to have significantly greater economic and environmental costs than the proposed option.

THE PROPOSAL

This EIS supports two development applications: construction and operation of the Bayswater Rail Loading Facility and increased use of the existing Drayton Rail Loading Facility to enable export coal transportation via the Antiene Rail Spur and Main Northern Railway.

The COAL development application seeks approval to construct and operate the proposed Bayswater Rail Loading Facility to transport up to 20 million tonnes per annum (Mtpa) via the Antiene Rail Spur and the Main Northern Railway. This maximum tonnage will allow capacity to transport coal from the current Bayswater No. 3 mine and the Mount Arthur North coal mine, if approved.

The COAL proposal involves construction of:

- approximately 7270 metres of rail track and associated infrastructure over a four kilometre rail corridor;
- a 1500 tonne loadout bin,

- a 40000 tonne product stockpile and reclaim tunnel in the coal stockpile area approved under the 1994 development consent, but not yet constructed;
- a transfer conveyor from the coal stockpile to the loadout bin;
- two rail over road bridges over Thomas Mitchell Drive; and
- a new entrance road to Bayswater approximately 500 metres east of the existing entrance.

The Drayton Coal development application seeks development consent to operate the existing Drayton Rail Loading Facility to transport up to 7 Mtpa of coal from the loop, and for use of the Antiene Rail Spur up to a limit of 20 Mtpa. This approval will provide capacity for increased saleable export production from the Drayton mine and from the proposed Saddlers Creek mine, if and when approval is sought and granted. No additional rail infrastructure is required for the Drayton proposal.

The combined effect of the application, if granted, is to approve a total tonnage to be transported on the Antiene Rail Spur of 20 Mtpa with Drayton Coal having priority for 7 Mtpa and COAL for 13 Mtpa. To the extent that one mine does not utilise its allocated tonnage the shortfall will be made available to the other mine.

CONSULTATION

Extensive consultation with government agencies and the local community was undertaken throughout the environmental impact assessment process for this proposal. Community consultation included information packages, interviews and briefings to community groups and individuals. Government agencies were briefed on the proposal at the planning focus meeting for the Bayswater Rail Loading Facility and through presentation of a number of briefing documents. Extensive consultations were held with Muswellbrook Shire Council, including technical presentations to Council's environment committee, comprising Councillors, staff and community representatives.

ENVIRONMENTAL ASSESSMENT

The proposed Antiene Joint User Rail Facility is located in the upper reaches of the Ramrod Creek catchment. The topography in this vicinity is such that no residences have views of the proposed rail infrastructure. The nearest non-mine property is located approximately 300 metres north of the existing Antiene Rail Spur, in an area referred to as the Antiene subdivision. Vegetation to be disturbed by the proposed Bayswater Rail Loading Facility is dominated by pasture, with approximately 5.75 hectares of remnant woodland.

The key potential environmental issues identified through the consultation and environmental impact assessment process are summarised below.

Traffic

The proposed development will have a negligible impact on traffic during the construction period. During operation, there will be a significant improvement in the road traffic environment by elimination of the need for road haulage of coal from Bayswater mine to Ravensworth Coal Terminal. Operational impacts on the rail network include increased traffic on the Antiene Rail Spur and Main Northern Railway. The projected increase in rail traffic is within the capacity of the existing infrastructure and is not considered significant.

Air Quality

Air quality impacts associated with construction of the Bayswater Rail Loading Facility and operation of the Antiene Joint User Rail Facility are predicted to be low. Dust mitigation measures are proposed for both the construction and operation stages of the development.

Noise and Vibration

Extensive monitoring of the existing noise environment and modelling of the predicted noise levels associated with the development were undertaken for this project. Noise assessment indicates that there will not be a significant noise impact as a result of the proposed development provided that appropriate noise abatement measures are adopted. These measures include enclosure of conveyors and loadout bins and construction of acoustic screens along critical sections of the rail corridor.

Water Quality

During construction of the Bayswater Rail Loading Facility there is potential for water quality impacts to occur. Comprehensive soil and water management controls will be adopted to minimise these impacts. Mitigation measures are also proposed for the operational stage of the development including containment of all runoff from loading areas and sizing of culverts to minimise flooding.

Flora and Fauna

The area to be disturbed by construction of the Bayswater Rail Loading Facility is vegetated with grassland and approximately 5.75 hectares of remnant woodland. The flora and fauna surveys conducted for this project indicate that there will be no significant adverse impacts associated with the proposed development. A proposed habitat compensation area will lead to an increase in the total area of woodland, once established.

Archaeology

Archaeological investigations conducted in conjunction with representatives of the local Aboriginal community identified a number of Aboriginal sites. The proposed rail alignment has been selected to minimise the impact on archaeological sites within the vicinity of the proposed development. The sites that will be disturbed by construction of the Bayswater rail Loading Facility will be subject to Consent to Destroy applications with salvage excavation of the most significant sites.

In addition, one European heritage site was identified, however, this site is not considered to be significant and will be subject to an Excavation Permit application to NSW Heritage Office.

Visual

The proposed Bayswater Rail Loading Facility is located in an area with high surrounding topography. This topographic relief ensures that the facility is not visible from any residence. Visual impacts from train headlights on a public road adjacent to the proposed development will be mitigated through the provision of visual screens and vegetation corridors. There are no significant visual impacts associated with the existing rail facilities.

Socio-economic

The construction phase of the development will provide economic benefits to the region as a result of capital expenditure of approximately $40 million. Operation of the facility will ensure that Bayswater and Drayton mines are able to transport coal to market to support continued employment and services in the area.

Cumulative Impacts

Cumulative impact assessment of the proposal in conjunction with existing and approved activities within the area has been undertaken in accordance with the recommendations of the Upper Hunter Cumulative Impact Study and Strategy (DUAP 1997). This assessment indicates that there will be no significant adverse cumulative impacts as a result of the development.

JUSTIFICATION

The proposed Antiene Joint User Rail Facility will have substantial short term economic benefits to the region as a result of the considerable capital investment required during the construction phase. Once the facility is operational there will be immediate benefits to the local community through removal of coal haulage traffic from the public road system. In addition, the proposal will improve the long term efficiency and economics of the Bayswater and Drayton coal transport systems, ensuring ongoing product flexibility and competitiveness in the coal market. If the development does not proceed these opportunities will be lost.

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1.0 INTRODUCTION

1.1 BACKGROUND AND BRIEF DESCRIPTION OF THE PROPOSAL

1.1.1 Background to the Proposal

The Bayswater and Drayton open cut coal mines are located in the Upper Hunter Valley, NSW, approximately eight kilometres south of the Muswellbrook Post Office. As shown on **Figure 1.1**, these adjacent mines are both accessed from Thomas Mitchell Drive, off the New England Highway. The Antiene Rail Spur provides a rail link between the existing Drayton Rail Loop and the Main Northern Railway to the east. The Antiene Rail Spur was originally established in 1982 to service the Drayton mine and the Mount Arthur North mine proposed at that time.

1.1.1.1 Bayswater Coal Transportation

Bayswater mine is owned by the Bayswater Joint Venture and is managed and operated by Coal Operations Australia Limited (COAL). Current Bayswater operations are conducted in two main areas referred to as the Bayswater No. 2 and Bayswater No. 3 sites (refer to **Figure 1.1**). Mining is no longer undertaken at the Bayswater No. 2 site, however, infrastructure such as the coal preparation plant and office is still in use. COAL will also be seeking approval during 2000 for the proposed Mount Arthur North mine, adjacent to its existing operations (refer to **Figure 1.1**).

Open cut mining commenced in the Bayswater No. 2 area in 1968. Mining has ceased at the Bayswater No. 2 site and these former mining areas are now subject to progressive rehabilitation. The surface facilities at the Bayswater No. 2 site, including the coal preparation plant, workshops, administration buildings, and workforce amenities continue to be utilised for the Bayswater No 3 operation.

The Bayswater No. 3 mine was granted development consent by the Minister for Planning on 12 September 1994 and mining commenced in this area during 1995. Development consent for the Bayswater No. 3 mine authorises open cut coal mining within the Bayswater No. 3 mining lease (ML 1358) and use of the coal preparation plant, stockpiles and other surface facilities at the Bayswater No. 2 mine site. It was proposed at that time to transport export coal to port via the Drayton Rail Loop but development consent conditions provided flexibility to consider alternative rail loading options. Since late March 1997, all Bayswater export coal has been hauled by road to the Ravensworth Coal Terminal, located approximately 12 kilometres to the southeast (refer to **Figure 1.1**), for loading onto trains and transport by rail to the Port of Newcastle. There have been extensive discussions between COAL and Drayton Coal regarding commercial arrangements for the export coal from Bayswater No. 3 mine to be transported via the Drayton Rail Loop and Antiene Rail Spur to the Main Northern Railway. In late August 1999, it was resolved that the existing Drayton Rail Loop did not have sufficient capacity to transport coal from the Drayton mine, the proposed Saddlers Creek mine, Bayswater No. 3 Mine and the proposed Mount Arthur North mine.

On 14 December 1999, the Minister for Urban Affairs and Planning granted a modification to the 1994 development consent for the Bayswater No. 3 mining operation. This modification to Condition 17 of the 1994 consent states that *COAL "shall undertake to transport all coal from Bayswater Colliery by rail or conveyor as soon as practicable and, at the latest, by 1 July 2001".*

In order to meet this commitment, Coal Operations Australia Limited proposes to construct and commission the Bayswater Rail Loading Facility by mid 2001, to enable all export coal to be railed via the Antiene Rail Spur, and the Main Northern Railway to the Port of Newcastle and other locations.

Commercial agreement has been reached between Drayton Coal and COAL for the use by COAL of the Antiene Rail Spur to transport existing Bayswater coal production and potential future production from Mount Arthur North and other projects.

1.1.1.2 Drayton Coal Transportation

Drayton mine is owned by the Drayton Joint Venture and is managed and operated by Drayton Coal Pty Limited. Development consent for Drayton mine was granted by Muswellbrook Shire Council on 25 September 1980 and approves coal production of 3.3 Mtpa. This consent provides for open cut mining, coal preparation, product stockpiles and a Rail Loading Facility presently on the Drayton Coal mining lease. In addition, the Drayton Coal consent authorised construction and operation of the Antiene Rail Spur as a joint venture between Drayton Coal and the then Electricity Commission of NSW (ELCOM), now Pacific Power, to connect the Drayton Rail Loading Facility to the Main Northern Railway.

The Antiene Rail Spur was constructed by the Antiene Joint Venture, which comprised Drayton Coal and ELCOM as the then owner of the Mount Arthur North Project. The Antiene Joint Venture, which operated under a former joint venture agreement, constructed the spur and it has been operated under the management of Drayton Coal since 1982. The Antiene Joint Venture Agreement provided for an additional loop for a Mount Arthur North Project to utilise the Antiene Rail Spur. This loop was never constructed or formalised by ELCOM in any way. Drayton Coal has now purchased the interest of Pacific Power in the Antiene Joint Venture and is the sole owner of its assets including the Antiene Rail Spur.

The existing Drayton Coal development consent is to be subject to an application to Muswellbrook Shire Council for modification in order to approve production of 5.0 Mtpa. Having regard to a need to provide for increased tonnage from the Drayton mine and the proposed Saddlers Creek project (located to the southwest of Drayton mine), Drayton Coal has decided to prepare a development application to transport an increased tonnage of coal through the Drayton Rail Loop and via the Antiene Rail Spur and Main Northern Railway to the Port of Newcastle. The total combined tonnage produced by Drayton mine and the proposed Saddlers Creek operation will not exceed 7 Mtpa.

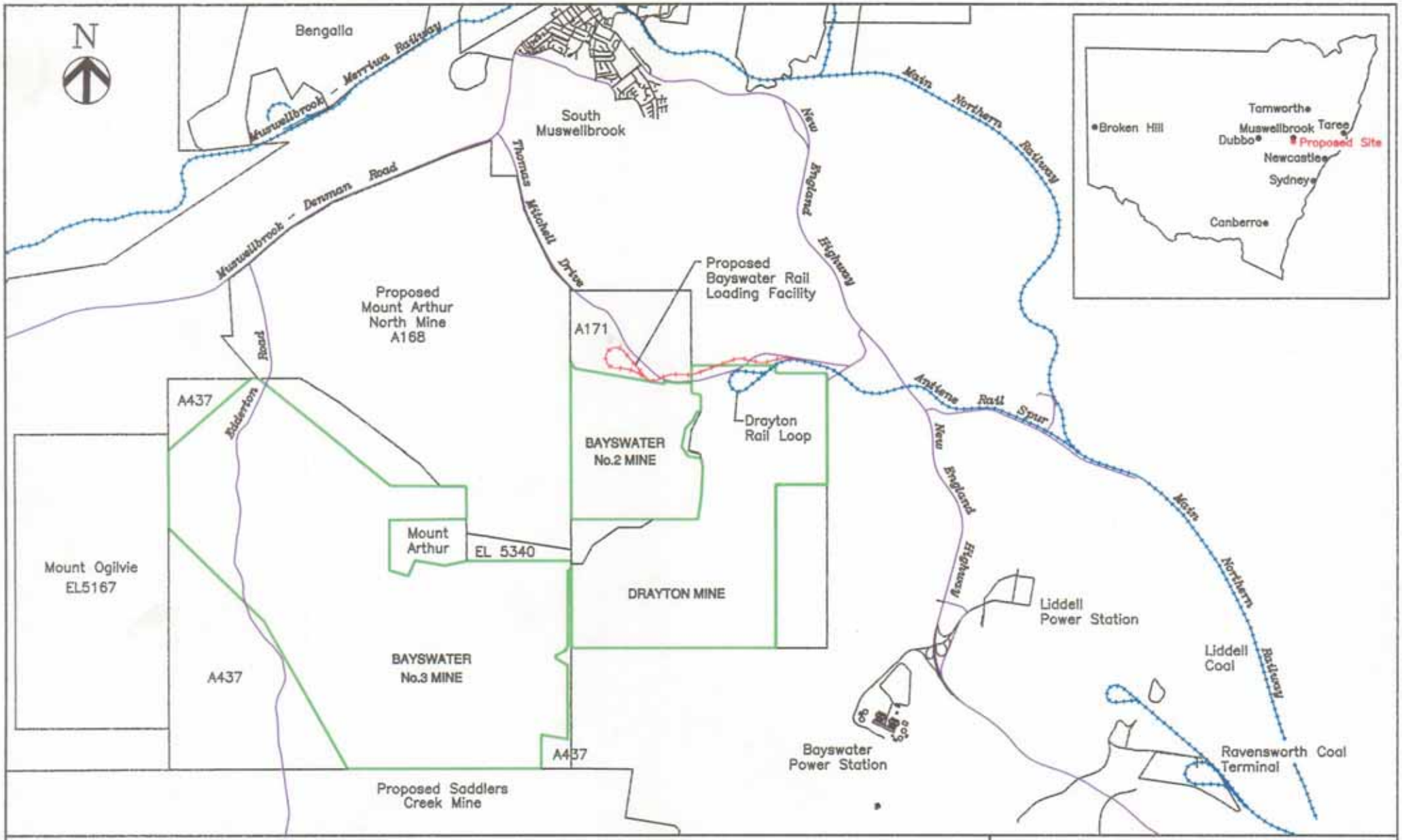
1.1.1.3 Development Applications

Two development applications will be supported by this Environmental Impact Statement, which addresses the following two components of the Antiene Joint User Rail Facility:

- construction and operation of the Bayswater Rail Loading Facility to enable product coal transportation via the Antiene Rail Spur and Main Northern Railway to the Port of Newcastle and other locations; and

- increased use of the existing Drayton Rail Loading Facility to transport coal along the Antiene Rail Spur and the Main Northern Railway to the Port of Newcastle and other locations.

Further details of the proposed development are provided in the following sections. The assessment of both development applications in one Environmental Impact Statement ensures total assessment of the project and its two components under common environmental goals enabling effective cumulative assessment.


N
Bengalla
Muswellbrook – Merriwa Railway
South Muswellbrook
Main Northern Railway
New England Highway
Thomas Mitchell Drive
Muswellbrook – Denman Road
Proposed Bayswater Rail Loading Facility
Proposed Mount Arthur North Mine A168
A171
Ridgerton Road
A437
Drayton Rail Loop
Antiene Rail Spur
BAYSWATER No.2 MINE
Mount Arthur
EL 5340
Mount Ogilvie EL5167
DRAYTON MINE
Liddell Power Station
Liddell Coal Railway
BAYSWATER No.3 MINE
A437
A437
Bayswater Power Station
Ravensworth Coal Terminal
Proposed Saddlers Creek Mine
Broken Hill
Tamworth
Taree
Muswellbrook
Dubbo
Proposed Site
Newcastle
Sydney
Canberra
Legend
Existing Rail Loading Infrastructure
Proposed Rail Loading Infrastructure
Operating Mine Lease Boundary
0 1km 2km 3km 4km
Umwelt (Australia) Pty Limited
FIGURE 1.1
Locality Plan
A4 Scale: 1:100 000
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As the Bayswater proposal incorporates new infrastructure, the environmental assessment and mitigation measures discussed in this document address impacts on all affected aspects of the environment. The Drayton proposal, however, does not involve any new infrastructure and therefore the environmental impacts are principally related to noise and dust associated with increased train movements on the existing Drayton Rail Loop and Antiene Rail Spur.

1.1.2 Key Components of the Proposed Development

1.1.2.1 Coal Operations Australia Limited Development Application

The COAL development application seeks approval to construct the proposed Bayswater Rail Loading Facility and to transport up to 20 million tonnes per annum (Mtpa) of coal from the proposed Bayswater Rail Loading Facility using the Antiene Rail Spur to access the Main Northern Railway for coal transportation to the Port of Newcastle and other locations.

The location of the proposed Bayswater Rail Loading Facility is shown on **Figure 1.2**. The facility comprises:

- a total of 7270 metres of railway and associated infrastructure over a distance of approximately four kilometres, of which approximately two kilometres will be double track and the remainder single track;
- a balloon rail loop with a 1500 tonne train loading bin situated in the area immediately to the north of the existing Bayswater No. 2 mine lease boundary and south of Thomas Mitchell Drive;
- a double track rail bridge over Thomas Mitchell Drive approximately 150 metres east of the existing Bayswater Colliery entrance;
- a single track rail bridge over Thomas Mitchell Drive approximately 200 metres north of the existing Drayton Rail Loop;
- connection to the Antiene Rail Spur east of the Drayton Rail Loop;
- a 40000 tonne stockpile, truck dump station and reclaim tunnel within the product stockpile area approved under the 1994 Bayswater No. 3 development consent, but not yet constructed, and a transfer conveyor to the train loading bin on the Bayswater Rail Loop; and
- a new entrance road to Bayswater mine approximately 500 metres east of the existing entrance.

This facility will initially provide coal loading and transport infrastructure for the existing Bayswater No. 3 mine and then, if approved, the Mount Arthur North mine and other potential coal mines in the area. The facility has been designed to operate at 4500 tonnes per hour (tph) with a maximum capacity of 20 Mtpa.

1.1.2.2 Drayton Coal Development Application

The Drayton Coal development application seeks development consent to operate the existing Drayton Rail Loop to transport up to 7 Mtpa of coal from the loop, along the Antiene Rail Spur and for the use of the Antiene Rail Spur to a limit of 20 Mtpa (refer to **Figure 1.2**). This approval will provide capacity for increased saleable export production from the Drayton mine and from the proposed Saddlers Creek mine, if and when approval is sought and granted.

There will be no additional rail infrastructure or construction work as a result of any approval of the Drayton Coal development application, however, continued track maintenance will be undertaken. There would be no increase in peak train movements, however, the number of days on which train movements occurred would increase. Additional noise mitigating cladding will be installed on the existing train loading bin as discussed in **Sections 4.5.3.2** and **5.2.4**.

The Drayton Coal proposal will excise the Drayton Rail Loop from its existing mining lease and establish the Drayton Rail Loop and Antiene Rail Spur as a Common User Facility. Drayton mine and the proposed Saddlers Creek mine will be common users of the Drayton Rail Loop. The Antiene Rail Spur will be used by those mines as well as the Bayswater Rail Loading Facility which will handle coal from the Bayswater No. 3 mine and the proposed Mount Arthur North mine.

1.2 THE APPLICANTS

1.2.1 Coal Operations Australia Limited

The existing Bayswater coal mine, comprising the Bayswater No. 2 and Bayswater No. 3 mining leases, is owned by the Bayswater Joint Venture. COAL is the major owner (83.3 per cent) of the Bayswater Joint Venture and through a service agreement with Bayswater Colliery Company Pty Ltd, provides management services to the Bayswater Joint Venture. COAL is also the proponent for the proposed Mount Arthur North coal mine.

COAL is a wholly owned subsidiary of Billiton Coal Australia Pty Limited, the Australian arm of Billiton Coal. Billiton Coal is part of Billiton Plc, a major international resource company listed on the London stock exchange. Billiton Coal is involved in fifteen mining operations around the world, with eleven located in South Africa and four in Australia.

1.2.2 Drayton Coal Pty Ltd

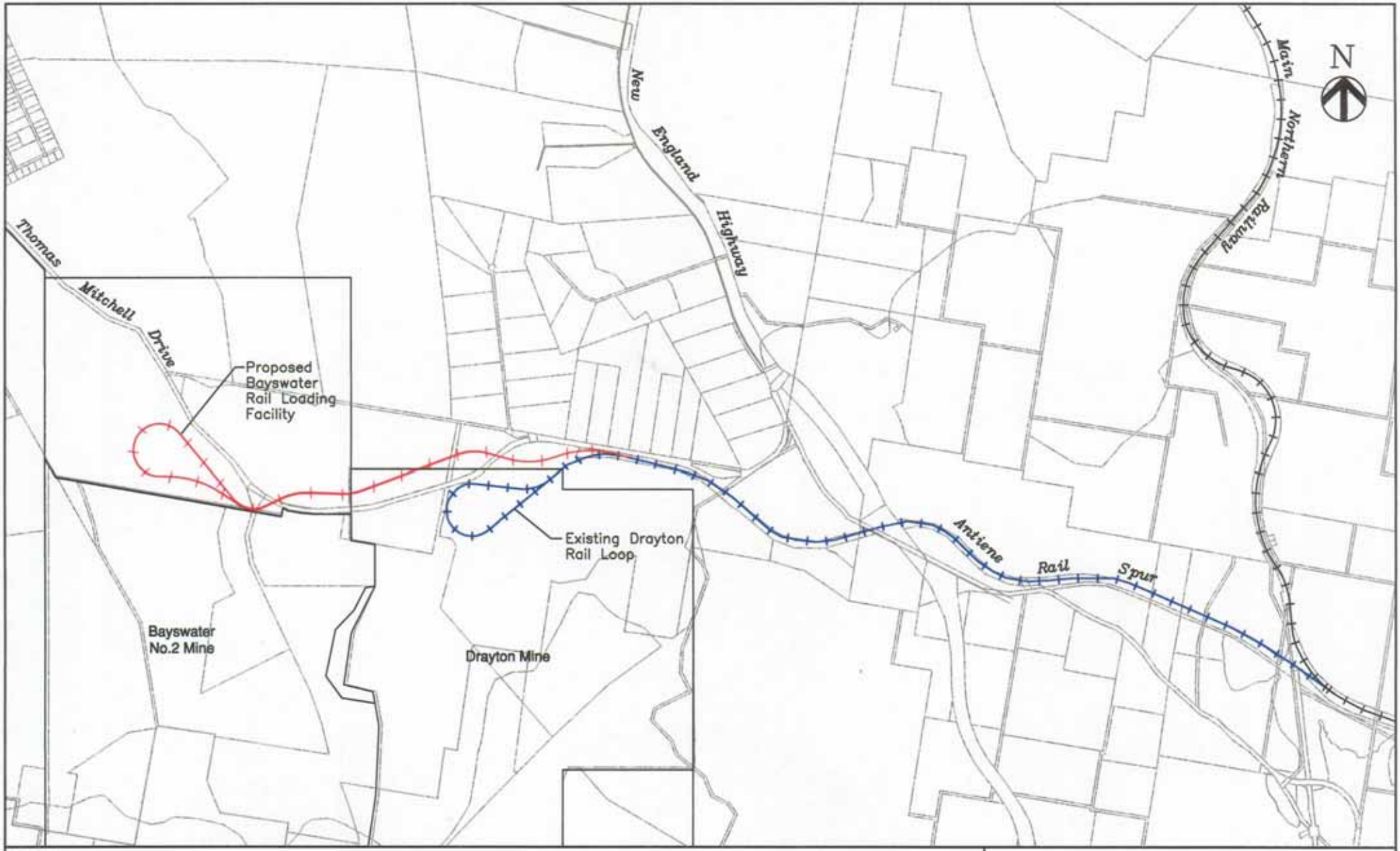
The existing Drayton coal mine is operated by Drayton Coal Pty Ltd, a wholly owned subsidiary of the Drayton Joint Venture. Shell Coal (Drayton) Pty Ltd is the major participant (75 per cent) of the Drayton Joint Venture, and provides project development support to Drayton Coal Pty Ltd.

The Drayton Joint Venture partners also own the Drayton Rail Loop and the Antiene Rail Spur.

1.3 OBJECTIVES OF THE PROPOSAL

Drayton Coal will seek consent for a Common User Facility that will use the existing loading infrastructure and rail loop, and transport up to 7 Mtpa along the Antiene Rail Spur using the existing Drayton Coal rail loading infrastructure. Consent will also be sought for the common use of the Antiene Rail Spur for up to 20 Mtpa. The existing Drayton Rail Loop will be excised from the Drayton Coal mining lease.

Coal Operations Australia Limited will seek consent to construct and operate rail loading infrastructure with capacity for 20 Mtpa adjacent to the Bayswater No. 2 mine and to transport between 13 and 20 Mtpa along the Antiene Rail Spur. The opportunity for COAL to transport over 13 Mtpa and up to 20 Mtpa is contingent on the rate of transportation from Drayton Rail Loop.



Legend

- Existing Infrastructure covered by Drayton Coal Development Application
- Proposed Infrastructure covered by Coal Operations Australia Development Application
- Mine Lease Boundary
- Cadastral Boundary

0 500 1000m

FIGURE 1.2
Development Application Areas

A4 Scale: 1:40 000

Ref No.:1323/R01/dra_014.dwg

Umwelt (Australia) Pty Limited

The objectives of these proposals are to:

- enable efficient and cost-effective transportation of coal from the mines to the Port of Newcastle and other locations;
- establish infrastructure with sufficient capacity to avoid the need for road haulage of coal from the Bayswater mine after mid 2001. In order to meet this deadline and allow sufficient time for the twelve month construction, development consent for the works is sought by early July 2000;
- ensure integrated utilisation of existing rail infrastructure for current and future mining operations in the area;
- ensure that infrastructure has sufficient capacity to cater for projected mine production in the area;
- ensure that the considerations of relevant government agencies, the community and other stakeholders are taken into account in the design and operation of future rail loading activities; and
- design and implement effective environmental management to protect the environment, including the health and amenity of the surrounding community.

1.4 COMMUNITY AND AUTHORITY CONSULTATION

1.4.1 Community Consultation

In September/October 1999, a series of semi-structured interviews were undertaken with residents living within two kilometres of the proposed Bayswater Rail Loop and existing Drayton Rail Loop. A total of 19 households were identified in the areas of Hassall Road, Pamger Drive, Antiene Estate and Balmoral Road. Of the 19 households identified, 10 were contacted directly and participated in a personal interview. The remaining nine households that could not be contacted by phone, were mailed an information package on the proposed rail loop development.

As part of the interview process, residents were asked to identify impacts from existing rail traffic on the rail line and to highlight any concerns or issues they may have in relation to the development of a new rail loop facility. It was outlined that the Bayswater Rail Loading facility would replace the current road haulage of coal from Bayswater to Ravensworth, and should the Mount Arthur North Project be approved, the rail loop would be used to transport coal from the Mount Arthur North mine to the Port of Newcastle and other locations.

Analysis of the interview data revealed a number of key issues across most households. These included:

- a preference for transport of coal by rail rather than by road;
- few impacts associated with rail traffic on the Antiene Rail Spur;
- the main impacts related to the movement of trains on the Drayton Rail Loop facility, with residents often hearing noises associated with the shunting of carriages, screeching of brakes, loading of rail cars and idling of locomotives; and

- preference for Bayswater Colliery Company to develop a new rail loop facility rather than use the existing Drayton infrastructure.

Residents also raised issues associated with the development of the Mount Arthur North mine. These included potential impacts of dust and blasting.

Further community consultation was undertaken during October and November, 1999. Letters were forwarded to residents of the remaining households in the nearest rural-residential area (Antiene) who could not be contacted by phone to arrange meetings as well. Discussions held with responding residents indicated that the issues described above were relevant to the majority of nearby residents. A further round of interviews with residents was conducted in February 2000 to specifically address the two proposals discussed in this document. This round included an additional two residences in Antiene village, near the junction of the Antiene Rail Spur and Main Northern Railway. A total of nine households were interviewed, of which three had not been involved in previous rounds of consultation. These interviews revealed that all residents were happy that coal haulage trucks would no longer use the road network if the Bayswater proposal were approved. However, most residents were concerned that an increase in the number of trains on the Antiene Rail Spur and Drayton Rail Loop would have adverse noise and vibration impacts.

In addition, formal community groups that were consulted in relation to this project included:

- Wanaruah Local Aboriginal Land Council, which attended the Planning Focus Meeting;
- Wonnarua Tribal Council, which was involved in the archaeological survey undertaken for this project;
- Muswellbrook Shire Council Environment Committee, to whom a presentation was given on 15 November 1999; and
- Bayswater Community Consultative Committee, to whom a presentation describing the project was given on 28 October 1999.

Consultation with the surrounding community will be ongoing throughout the construction and operation of the facility. Coal Operations Australia Limited is conducting an ongoing community consultation program for the Mount Arthur North Project and the proposed rail loop development will be specifically addressed during this ongoing program. This project will also be regularly discussed at Bayswater and Drayton Community Consultative Committee meetings.

1.4.2 Authority Consultation

A Planning Focus Meeting was held on 3 November 1999 in respect of the COAL application. In December 1999, a briefing paper was forwarded to all relevant government agencies to provide details of the Drayton application. This briefing paper also explained the plan to address both applications as an integrated project (the Antiene Joint User Rail Facility) within a single EIS. The project has been discussed with:

- Department of Urban Affairs and Planning;
- Muswellbrook Shire Council;

- Environment Protection Authority;
- Department of Mineral Resources;
- Roads and Traffic Authority;
- Rail Access Corporation;
- Freight Corp;
- Energy Australia;
- National Parks and Wildlife Service;
- Mine Subsidence Board;
- Department of Land and Water Conservation;
- Hunter Rural Lands Protection Board;
- NSW Agriculture;
- Hunter Catchment Management Trust; and
- NSW Heritage Office.

A number of meetings have been held with Muswellbrook Shire Council regarding this matter and the draft Environmental Impact Statement was provided to Council for review.

The feedback received from the various authorities during the consultation process has been considered in preparation of this Environmental Impact Statement. Correspondence received from various government authorities is provided in **Appendix 1**. The requirements of these authorities have been identified and addressed in this document. **Section 6.0** provides a checklist of requirements from the Director-General of the Department of Urban Affairs and Planning, which incorporates the written requirements received from the above authorities.

1.5 PROJECT TEAM

Umwelt (Australia) Pty Limited prepared this Environmental Impact Statement on behalf of Coal Operations Australia Limited and Drayton Coal Pty Ltd. A number of organisations undertook specialist studies as part of infrastructure design and environmental impact assessment. A full listing of all project team members is provided in **Appendix 2.**

1.6 LAYOUT OF THE DOCUMENT

This Environmental Impact Statement has been prepared in accordance with Clauses 54A and 55 of the *Environmental Planning and Assessment Regulation 1994* (refer to Form 2 in **Appendix 2**). An overview of the layout of this document is provided below.

The **Executive Summary** provides a brief overview of the project, key environmental assessment results and an outline of proposed environmental management procedures.

Section 1.0 is an introduction to the document, providing background to, and an overview of, the proposal for which development consent is sought. The objectives of the proposal are stated and an overview of authority and community consultations provided. Also included is an outline of the structure of the Environmental Impact Statement.

Section 2.0 describes the planning and environment context of the proposed development. This information includes discussion of relevant planning instruments and general environmental features of the affected area.

Section 3.0 provides a description of existing operations and the proposed development. The existing operations include both Bayswater and Drayton mining operations and transportation systems. The proposed development is described in detail including the proposed infrastructure associated with the Bayswater development application and consent to increase coal transportation tonnage sought by Drayton. A discussion of alternatives and justification of the proposal is also provided as well as the application of ecologically sustainable development principles.

Section 4.0 contains a comprehensive analysis and assessment of environmental impacts and mitigation measures relating to the construction and operation of the Bayswater Rail Loop and the transportation of increased tonnages of coal along the Drayton Rail Loop and Antiene Rail Spur. Cumulative impact assessment is also discussed in this section.

Section 5.0 outlines the existing environmental management systems already implemented by the applicants at Bayswater and Drayton mines, provides a summary of the ongoing monitoring program to be adopted for the proposed development, and identifies additional approvals required prior to commencement, or during operation of the development.

Section 6.0 is a checklist of Director-General's requirements considered in preparation of the Environmental Impact Statement and the section of the Environmental Impact Statement in which each matter is addressed.

Section 7.0 is a list of reference documents referred to throughout this Environmental Impact Statement.

The **Appendices** include technical reports relied on in preparation of the Environmental Impact Statement. Each of the appendices is referred to in the relevant section of the Environmental Impact Statement.

2.0 PLANNING AND ENVIRONMENTAL CONTEXT

2.1 SITE DESCRIPTION AND LOCALITY

2.1.1 Site Location and Land Uses

The proposed Antiene Joint User Rail Facility is located approximately eight kilometres south of Muswellbrook, in the upper catchment of Ramrod Creek (**Figure 2.1**). The predominant land uses of the surrounding area include coal mines, agricultural properties, travelling stock routes and rural-residential holdings (**Figure 2.2**). Drayton and Bayswater coal mines adjoin the site along its southern boundary. The site itself is currently utilised for agricultural purposes, principally cattle grazing, with vegetation dominated by pasture and woodland species. Land in the vicinity of the Bayswater and Drayton Rail Loops is zoned Rural 1(a). Land immediately south of the Antiene Rail Spur is zoned 5(a), and land to the north is zoned Rural 1(a).

The proposed Bayswater Rail Loop will turn out from the Antiene Rail Spur near the Drayton Rail Loop and traverse in a generally westerly direction towards Bayswater Colliery Company's A171 mine authorisation area (refer to **Figure 1.1**, **Figure 2.3** and **Section 2.1.2**), a distance of approximately four kilometres. The loadout facility and rail balloon loop will be located at the western extremity of the rail corridor, in the A171 area. The majority of the railway is located north of Thomas Mitchell Drive, however, the balloon loop and connection to the Antiene Rail Spur are located on the southern side of Thomas Mitchell Drive at the western and eastern extremities of the rail loop, respectively.

The nearest residences to the proposed Antiene Joint User Rail Facility are located in the Antiene rural-residential area, with the closest residence located approximately 100 metres to the north of the existing Drayton Rail Loop and 400 metres northeast of the proposed Bayswater Rail Loop. This residence is accessed from Thomas Mitchell Drive and is owned by Drayton Coal Pty Ltd (refer to **Figure 2.3**). The next nearest residences to the north are located along Thomas Mitchell Drive and Balmoral Road, between 300 metres and 1500 metres from the nearest existing and proposed rail infrastructure. The topography within and surrounding the proposed Rail Loading Facility ensures that no existing residences have views to either the existing Drayton Rail Loop or the proposed Bayswater Rail Loop.

Muswellbrook Shire Council was consulted about the nature and location of the proposed South Muswellbrook urban expansion area understood to be approximately one kilometre north of the proposed Bayswater Rail Loop. Council advised that the draft urban release strategy was not available for review as it was still being completed.

2.1.2 Property Description, Land Ownership and Mining Titles

The proposed Antiene Joint User Rail Facility is to be located on land in the Parish of Brougham, County of Durham. Real property descriptions of the affected land are provided in Schedule 1 of **Appendix 2**. The proposed facility also crosses Thomas Mitchell Drive, which is a public road located approximately eight kilometres south of Muswellbrook. Land ownership within and surrounding the site is shown on **Figure 2.4**. Land traversed by existing and proposed rail infrastructure includes land owned by Drayton Coal Pty Ltd, Coal Operations Australia Limited, Bayswater Colliery Company Pty Ltd, Muswellbrook Shire Council, Macquarie Generation and the Crown (a Travelling Stock Reserve).

From east to west, the proposed Bayswater Rail Loop traverses 1.65 kilometres of A173 (Drayton), crosses into Drayton mine (CL 229) for approximately 0.6 kilometres, traverses approximately 0.7 kilometres of Bayswater mine (CL 744), and traverses approximately 1.2

kilometres of A171 (Bayswater). The transfer conveyor from the Bayswater coal stockpile to the loadout facility is located within the Bayswater mining lease. The proposed new road access to Bayswater mine is located on Crown Land.

2.1.2.1 Crown Land Exchange

The entire balloon loop of the proposed Bayswater Rail Loop and the proposed new access road to Bayswater mine are located on Crown Land that is currently designated as a Travelling Stock Reserve (refer to **Figure 2.4**).

In principle agreement has been reached with Hunter Rural Lands Protection Board to exchange these areas of land for equivalent land owned by COAL in the immediate vicinity of the proposed development (refer to **Appendix 1** for correspondence on this matter). The areas of land proposed to be exchanged are shown in **Figure 2.5**. A dedicated Travelling Stock Route will be maintained through the A171 area in order to provide access to Mount Arthur, as shown in **Figure 2.5**.

2.2 PLANNING INFORMATION AND PERMISSIBILITY

2.2.1 State Environmental Planning Policies

The State Environmental Planning Policies (SEPPs) that are potentially relevant to the proposed development include SEPP 34 – Major Employment Generating Industrial Development, SEPP 33 – Hazardous and Offensive Development, SEPP 44 – Koala Habitat Protection and SEPP 45 – Permissibility of Mining. The applicability of these SEPPs to the proposed development is discussed below.

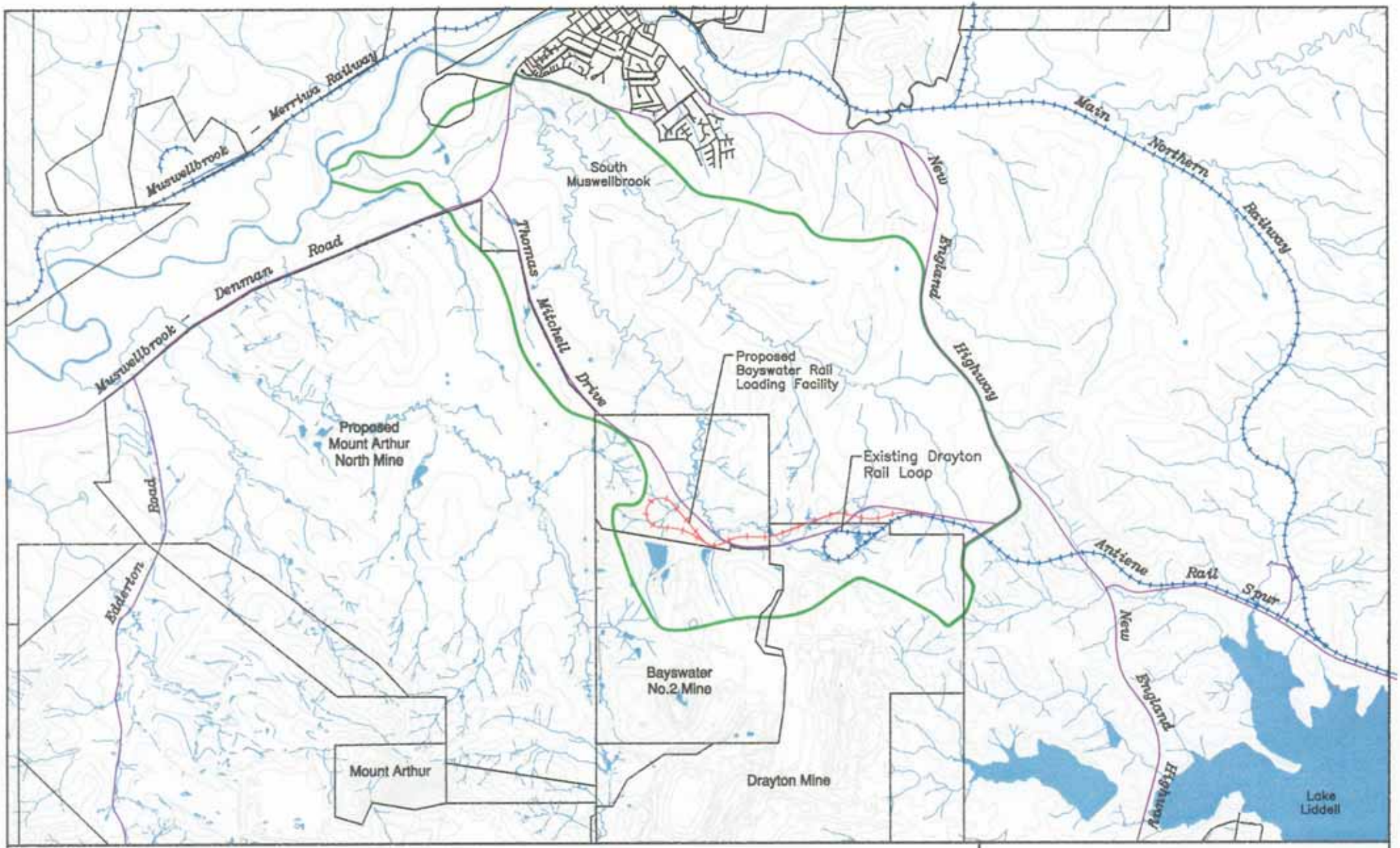
2.2.1.1 State Environmental Planning Policy 34

SEPP No. 34 – Major Employment Generating Industrial Development prescribes that the Minister for Urban Affairs and Planning is the consent authority in respect of development to which the policy applies. The SEPP applies to this project in relation to capital investment (Clause 7 and Schedule 1), as the project involves capital expenditure in excess of $20 million (ie State Significant development). The requirements of the Director-General of Department of Urban Affairs and Planning in relation to preparation of this Environmental Impact Statement have been obtained in accordance with the provisions of this planning instrument. The development applications will be lodged with DUAP and determined by the Minister for Urban Affairs and Planning.

2.2.1.2 State Environmental Planning Policy 33

SEPP No. 33 – Hazardous and Offensive Development requires the consent authority to consider whether an industrial proposal is a potentially hazardous industry or a potentially offensive industry. Under Clause 3 a potentially hazardous industry is defined as a development that "*would pose a significant risk in relation to the locality: to human health, life or property; or to the biophysical environment, and includes a hazardous industry and a hazardous storage establishment*" and a potentially offensive industry is defined as a development that "*would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment*" (Department of Planning 1994).

As this planning instrument applies only to those proposals that are either potentially hazardous or offensive and the proposed development does not constitute a potentially



Legend

- Ramrod Creek Catchment Boundary
- Existing Rail Loading Infrastructure
- Proposed Rail Loading Infrastructure
- Surface Contours
- Drainage Lines
- Water Bodies

Umwelt (Australia) Pty Limited
Source: Dames & Moore

FIGURE 2.1
Ramrod Creek Catchment

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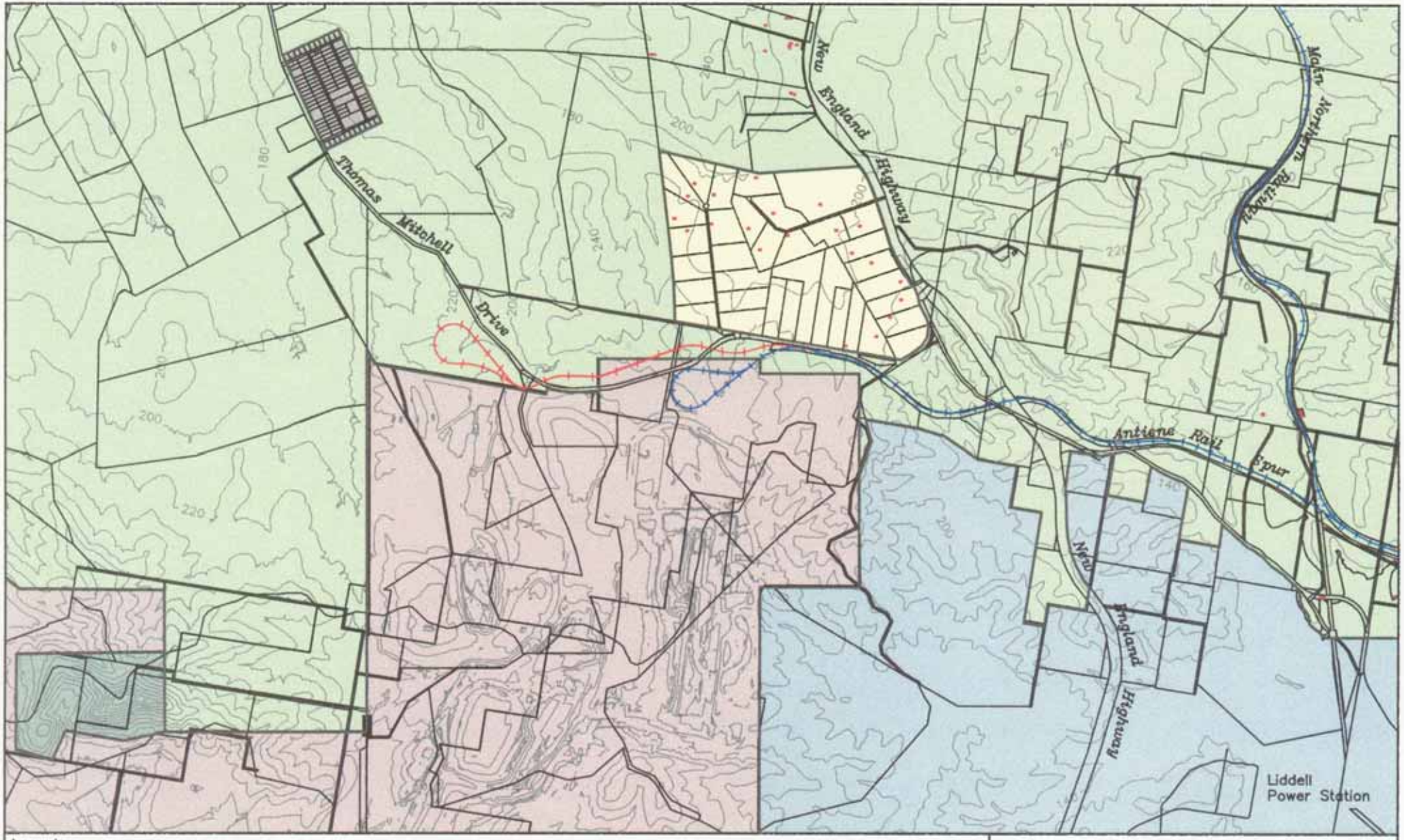

Umwelt (Australia) Pty Limited
Source: Dames & Moore

FIGURE 2.2
Land Use

A4 Scale: 1:52 000

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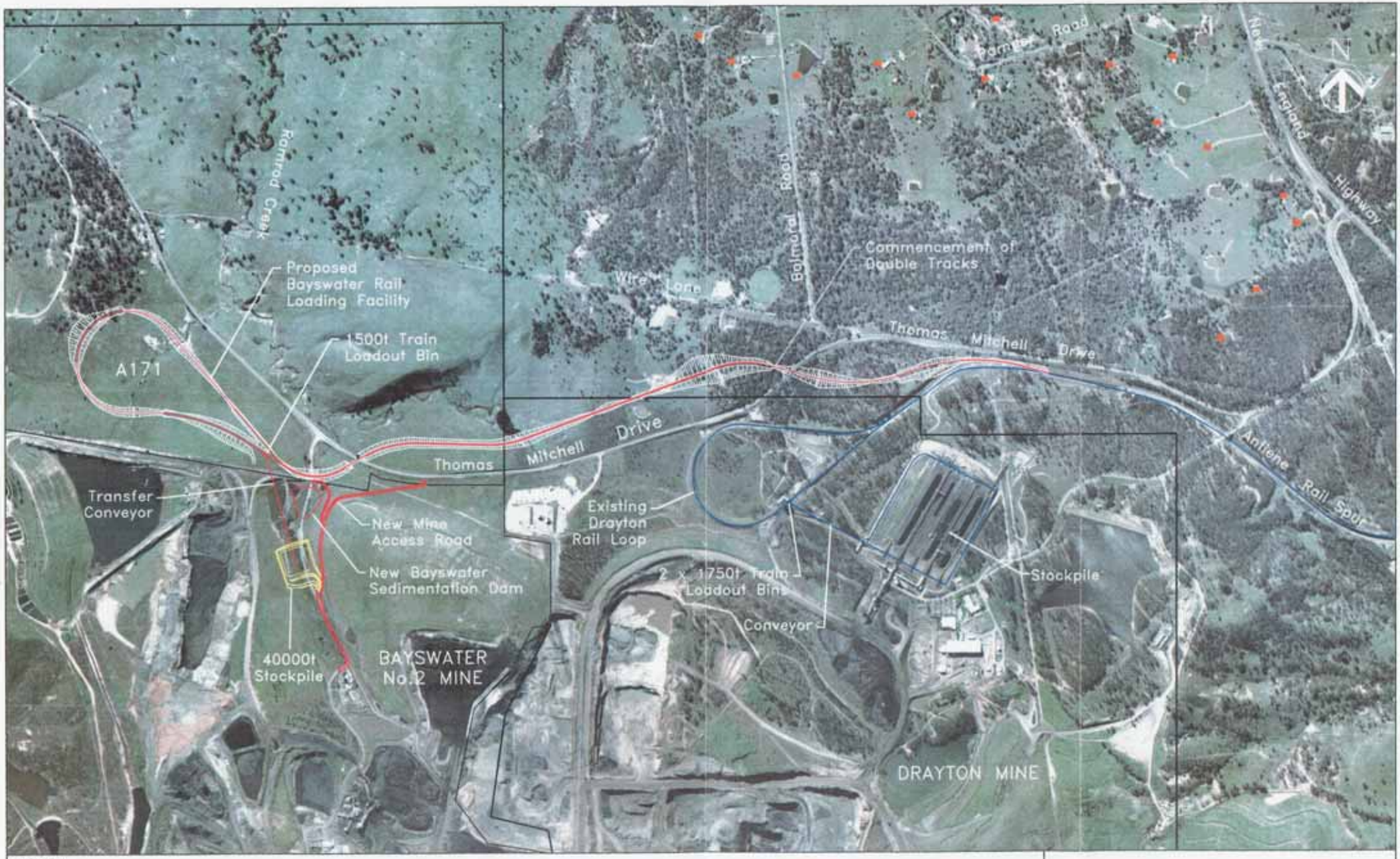

Umwelt (Australia) Pty Limited

FIGURE 2.3
Layout of Existing and Proposed Rail Infrastructure

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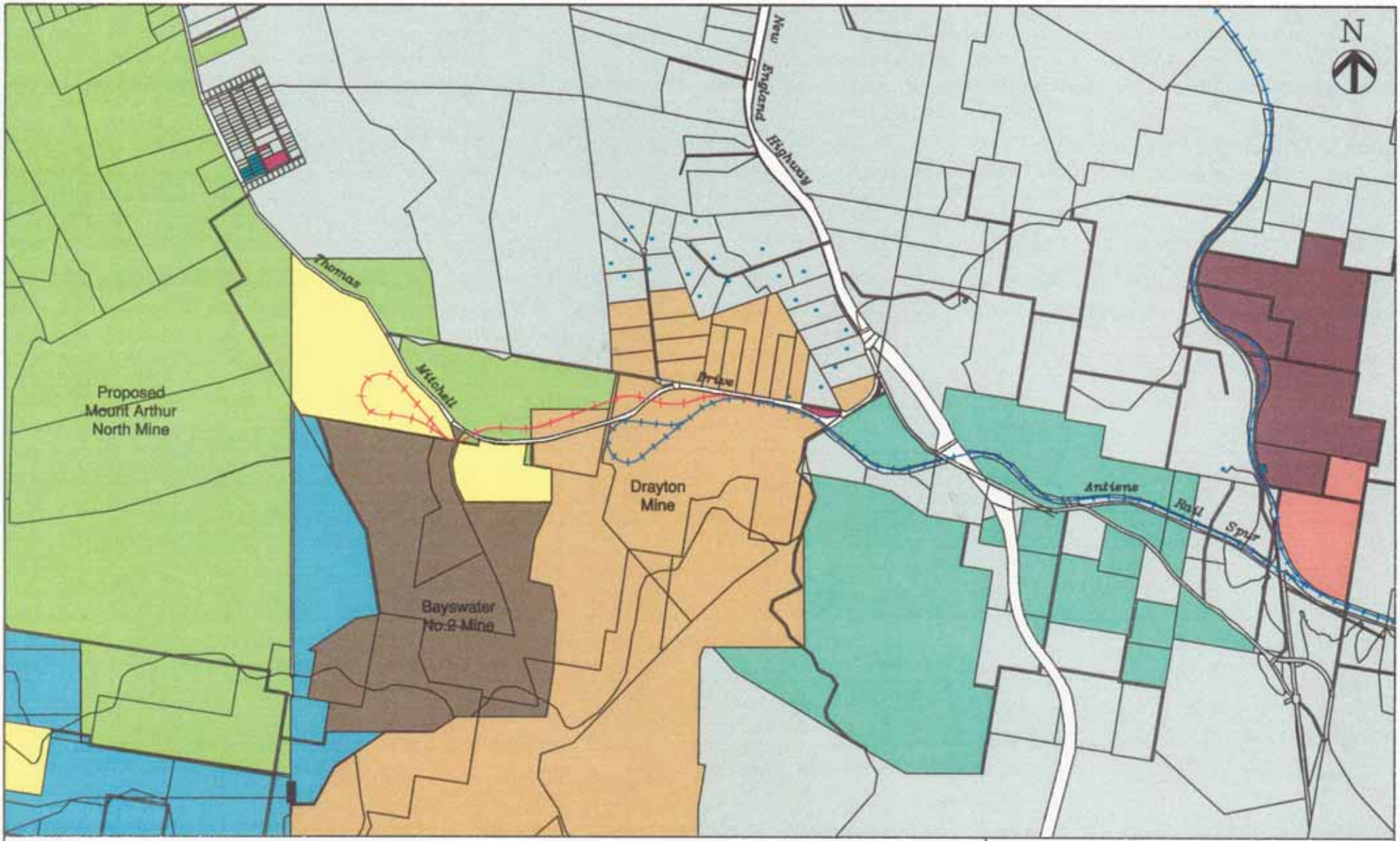

FIGURE 2.4
Land Ownership

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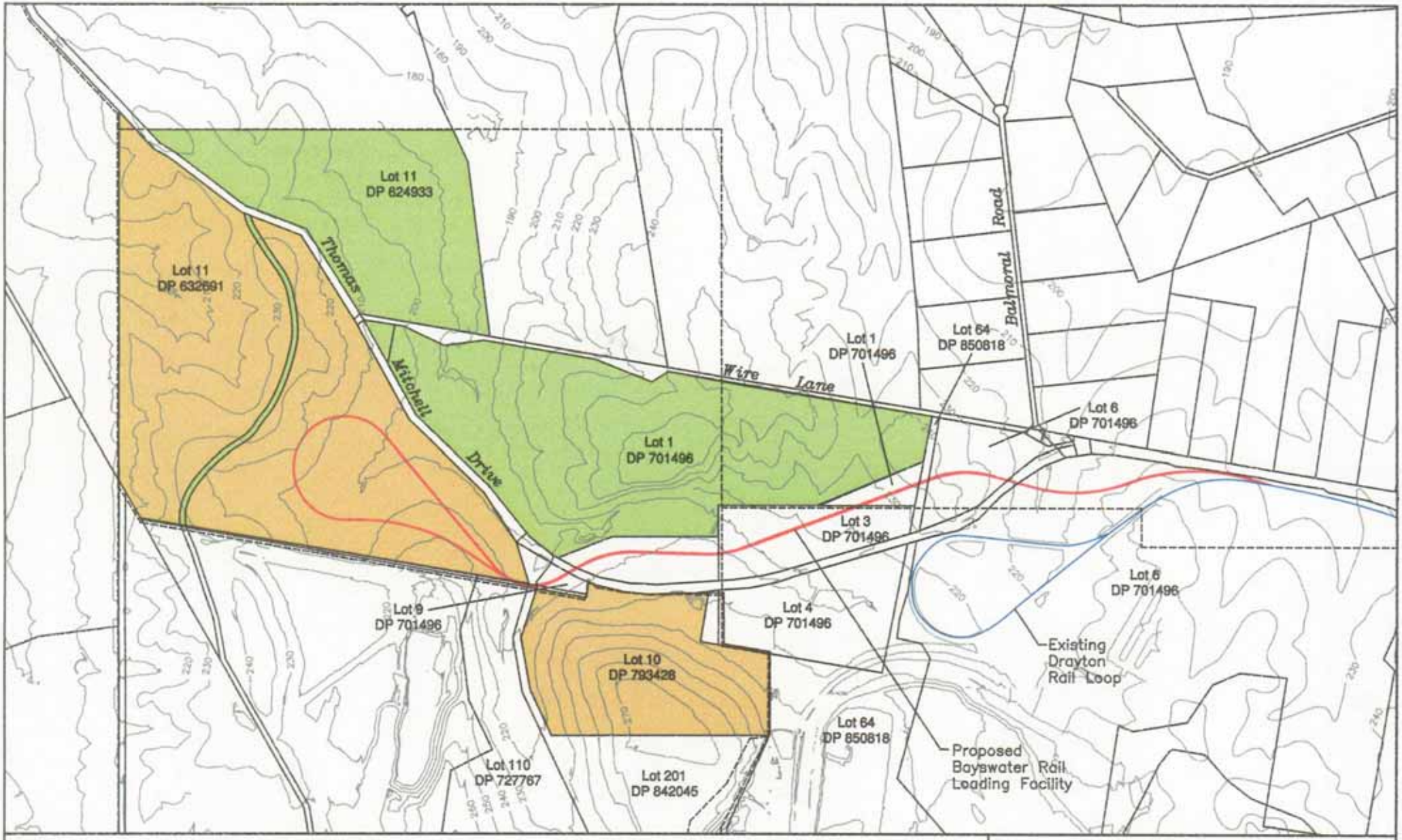

Lot 11
DP 624933
Lot 11
DP 632691
Thomas
Mitchell
Drive
Wire
Lane
Balmoral
Road
Lot 1
DP 701496
Lot 64
DP 850818
Lot 6
DP 701496
Lot 1
DP 701496
Lot 3
DP 701496
Lot 6
DP 701496
Lot 9
DP 701496
Lot 4
DP 701496
Lot 10
DP 793426
Existing
Drayton
Rail Loop
Lot 64
DP 850818
Proposed
Bayswater Rail
Loading Facility
Lot 110
DP 727767
Lot 201
DP 842045
Legend
Proposed New Travelling Stock Reserve
(Currently owned by Coal Operations Australia Ltd)
Existing Travelling Stock Reserve
(Crown Land)
Mine Lease Boundary
Cadastral Boundary
0
250
500m
Contour Interval 10m
Umwelt (Australia) Pty Limited
FIGURE 2.5
Proposed Land Exchange Areas
A4 Scale: 1:20 000
Ref No.:1323/R01/dra_028.dwg

hazardous or offensive industry under Clause 3, SEPP 33 does not apply to this development.

2.2.1.3 State Environmental Planning Policy 44

SEPP 44 – Koala Habitat Protection applies to the extent that a Council is restricted from granting development consent for proposals on land identified as core koala habitat without preparation of a plan of management. A detailed assessment has been conducted to determine whether the site contains core koala habitat. As discussed in **Section 2.3.4** and **Appendix 3**, no core koala habitat was found to occur at the site.

2.2.1.4 State Environmental Planning Policy 45

SEPP 45 – Permissibility of Mining provides that if mining is permissible on land with development consent if provisions of a local planning instrument are satisfied, mining is permissible on that land without those provisions having to be satisfied. However, as this proposed development does not involve mining, SEPP 45 does not apply, and the proposed development is permissible under the current Rural 1(a) zoning.

2.2.2 Hunter Regional Environmental Plan

Relevant objectives of the Hunter Regional Plan (1989) for management and transportation of regional coal resources are:

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

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

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

The Regional Plan specifies that land use planning in areas where coal with open cut mining potential has been identified should provide only for development that is compatible with mining or extractive activity. Mining is regarded as a priority land use in these areas.

The Hunter Regional Plan (1989) stresses the importance of environmental management of mining sites, and sets out issues that should be considered by consent authorities. The following relevant issues relating directly to assessment of developments involving mining are also outlined in the Hunter Regional Plan (1989):

- the conservation value of the land and appropriate post-mining land use;
- progressive rehabilitation of mined areas;
- minimising any adverse effects on groundwater and surface water quality and flow characteristics;
- consideration of any likely impacts on air quality and the acoustical environment;
- provision of environmentally acceptable transport; and
- reference to Total Catchment Management strategies.

The likely impact of infrastructure on the availability of coal resources is also an important consideration in determination of a proposed development in areas underlain by coal resources. As outlined in **Section 2.3.1**, the proposed development will not sterilise any economically viable open cut coal deposits.

The proposed rail loop, including the environmental management procedures outlined in this document, is considered to meet the objectives of the Hunter Regional Plan. In particular, the Antiene Joint User Rail Facility will ensure that future coal transportation from the Bayswater No. 3 and Drayton coal mines (as well as Mount Arthur North and Saddlers Creek, if approved) will be confined to the railway and will not involve any road haulage, except under emergency situations. This will greatly increase the future environmental acceptability of coal transport from the Bayswater mine site and ensure that rail transport is continued at Drayton.

The requirements of the Hunter Regional Plan - Heritage (1989) are addressed in **Appendix 5**.

2.2.3 Local Environmental Plans

The Antiene Joint User Rail Facility is located within Muswellbrook Local Government Area. The relevant considerations from the Muswellbrook Local Environmental Plan are outlined below. The entire route is zoned Rural 1(a).

Objectives of this zone, according to Muswellbrook Local Environmental Plan (1985) are:

"(a) to regulate the subdivision of rural land to ensure that actual or potentially productive land is not withdrawn from production;

(b) to encourage continued growth in the Shire's rural economic base;

(c) to ensure that building development in rural areas is carried out in a particular manner, that minimises risk from natural hazards, functions efficiently, does not unreasonably increase demands for public services or reduce existing levels of service and does not detract from the scenic quality of rural areas;

(d) to enable mining to occur in an environmentally acceptable manner;

(e) to enable development to occur that will serve the needs of rural communities;

(f) to enable development to occur which requires a rural or isolated location or has a nexus with agricultural uses including tourist oriented development and rural industry; and

(g) to minimise the economic disadvantages to farmers from unjustified speculative increases in land values."

The proposal is consistent with the objectives of the Rural 1(a) zone and is permissible with development consent. Specifically, in regard to objectives (a), (b), (c), (d), and (f), the following key features of the development ensure compatibility with the land zoning:

- the proposed development does not impact on prime agricultural land and occupies only a relatively minor area of potentially productive rural land;

- the proposed modifications to the coal transportation system will encourage continued growth in the Shire's economic base in regard to capital costs, construction activities and

consequent employment, and ongoing improved economics of the mine due to more efficient and competitive coal transportation arrangements;

- proposed site infrastructure is not at risk from natural hazards; has been designed to function efficiently; will not involve any long term increase in public services; and is not visible from existing residences in the vicinity;

- the proposed development will improve the environmental acceptability of the Bayswater No. 3 mining project in terms of eliminating all road haulage; and

- potential off-site environmental impacts of the operation are very low to negligible due to the substantial buffer of rural and mining land surrounding the proposed route.

2.2.4 Development Control Plans

Muswellbrook Shire Council has no development control plans relevant to this proposal.

2.2.5 Hunter Valley Railway Programs Task Force

The Hunter Valley Railway Programs Task Force was formed to identify the impacts of rail traffic on residents within 200 metres of the rail network. The report of the Task Force (Trudeau & Associates 1997) made 22 recommendations aimed at improving:

- the regulatory environment in which the rail network is operated, in particular the noise and vibration criteria applied to rail operations in residential areas;

- baseline data collection relating to environmental amenity;

- operation of the rail network, particularly mitigation of primary sources of noise and vibration;

- management of community relations; and

- safety of rail operations.

These recommendations for action are directed towards government agencies and corporations, such as Rail Access Corporation, FreightCorp and EPA, charged with managing the operational and environmental amenity of the rail network. The Task Force concluded that:

"The conveyance of freight (including coal) remains the safest, most efficient, most economic and most environmentally responsible means of transport.....The current policy and practice of rail encouragement and development should therefore be maintained".

The proposal is consistent with this conclusion as it will transfer a significant volume of existing and future coal freight from the road network to the rail network.

2.2.6 Upper Hunter Cumulative Impact Study and Strategy

The Upper Hunter Cumulative Impact Study was commissioned by the Department of Urban Affairs and Planning to consider the cumulative impacts of current and proposed major land uses and activities within the Upper Hunter Region (DUAP 1997). The study focused on impacts on air quality, water quality, catchment conditions and social conditions. The key findings of the study were that:

- air quality is generally within the relevant criteria for community health;
- improved environmental practices are required in sensitive areas where agricultural and riparian activities are undertaken;
- a decline in water quality is evident;
- data collection could be refined to allow better assessment of cumulative impacts; and
- assessment of cumulative impacts should be more effectively incorporated into the decision-making process.

In order to address these key findings, the Upper Hunter Cumulative Impact Action Strategy was formulated to provide an integrated and strategic framework for cumulative impact assessment and management in the Upper Hunter. The strategy comprises 39 actions to be implemented by the relevant government agencies.

Both of these documents have been considered in the preparation of this EIS. An assessment of cumulative impacts is included in **Section 4.16** to assist the relevant government agencies in consideration of the development applications within the cumulative impact framework discussed above.

2.2.7 Upper Hunter Sub-Regional Strategy

Preparation of an Upper Hunter sub-regional strategy for the local government areas of Muswellbrook, Merriwa, Murrurundi, Scone and Singleton was an action recommended by DUAP in the Upper Hunter Cumulative Impact Study and Strategy (1997). The objectives of the sub-regional strategy defined by the broader regional strategy were to:

"strengthen the framework for environmental planning and the co-ordination of actions taken by various stakeholders within that agreed framework; to promote improved practices for land and water management based on cumulative impact considerations; and to facilitate an effective link between catchment management and environmental planning process."

However, the sub-regional strategy is still in preparation and a draft is not currently available. As a consequence, it is not possible to consider the specific objectives and relevant provisions of the strategy at this stage.

2.2.8 Heritage Items and Environmental Protection Areas

2.2.8.1 Heritage Items

The proposed development area does not contain any heritage items with interim heritage orders or listings on the State Heritage Register in accordance with the Heritage Act 1977 as amended by the Heritage Amendment Act 1998. Further details regarding site heritage features are provided in **Sections 2.3.5** and **4.11**.

2.2.8.2 Environmental Protection Areas

There are no defined environmental protection areas, such as national parks, State recreation areas or nature reserves, located within, or in close proximity to, the proposed development area.

An area of land owned by Drayton Coal to the north of the Drayton mine has been proclaimed to be part of a Wildlife Refuge under Section 68 of the *National Parks and Wildlife Act 1974* (refer to **Figure 3.1** of **Appendix 3**). This proclamation does not restrict the occurrence of other activities in the area, provided that landowners consent is obtained. The proclamation will be amended in order to enable disturbance of approximately three hectares of woodland in this area. Further details regarding flora and fauna assessment and the proposed areas for habitat compensation are provided in **Section 4.9.7**.

2.3 OVERVIEW OF THE AFFECTED ENVIRONMENT

2.3.1 Geology and Coal Resources

The Antiene Joint User Rail Facility traverses sedimentary rocks belonging to the Early to Middle Permian Greta Coal Measures and overlying Maitland Group. The stratigraphy and lithology of these groups are summarised in **Table 2.1**.

Table 2.1 – Stratigraphy[1] and Lithology of the Area Traversed by Antiene Joint User Rail Facility

Geological Period	Stratigraphy		Lithology
Quaternary	Alluvium		Silt, sand, gravel
Middle to Late Permian	Maitland Group	Mulbring Siltstone	Siltstone, claystone, minor fine-grained sandstone
		Branxton Formation	Conglomerate, sandstone, siltstone
Early to Middle Permian	Greta Coal Measures	Rowan Formation	Coal seams, sandstone, siltstone
		Skeletar Formation	Pellet claystone, siltstone, chert

[1] *Glen and Beckett (1993).*

The rocks are folded over the Muswellbrook Anticline which trends across the proposed Bayswater Rail Loop route in a north - south direction (**Figure 2.6**). The area traversed by the proposed Bayswater Rail Loop has been faulted as well as folded, with the Aberdeen Thrust trending parallel to the Muswellbrook Anticline approximately 500 m to the east of the anticline and an unnamed thrust with a similar trend located approximately 700 m to the west of the anticline (**Figure 2.6**). The area traversed by the existing Drayton Rail Loop and Antiene Rail Spur is also structurally complex with several thrust faults and folds affecting the rocks.

The Greta Coal Measures is the oldest coal-bearing sequence in the Hunter Valley. It consists of the Skeletar Formation and the overlying Rowan Formation, with the Balmoral Coal Member marking the boundary between the two formations (Beckett 1988). The Skeletar Formation lacks coal and consists of pellet claystone, siltstone and chert. The Rowan Formation consists of coal seams, siltstone and sandstone. The overlying Maitland Group was deposited in marine conditions and lacks coal.

Consequently, the only potential open cut coal resources in the area affected by the proposed Bayswater Rail Loop occur in the Rowan Formation, which crops out entirely within Authorisation 171 (A171), at the western end of the balloon loop. Between 1979 and 1986, Bayswater Coal Company carried out exploration drilling within A171 to determine the quality and reserves of coal in the Rowan Formation. Drilling showed that the main target seam, the Balmoral Coal Member, has been devolatilised by intrusions in this area and is not suitable for mining. Without this major seam, the smaller overlying seams are not economic to mine, given the significant overburden:coal ratio in the area and the intrusion of some of

the smaller seams. Consequently, there is little likelihood that the coal seams in this area will ever be economically viable to mine. On this basis, the location of this section of the rail loop will not sterilise any significant open cut coal reserves.

Underground coal reserves may exist beneath the Maitland Group sediments exposed along the eastern half of the proposed Bayswater Rail Loop. Coal seams belonging to the Rowan Formation of the Greta Coal Measures will occur at depth in this area. However, at this stage, there are no recognised in situ mineable reserves of coal within the rail corridor route east of the Bayswater No. 2 infrastructure (G. Salter, pers. comm., 1999). Consequently, the location of this section of the proposed Bayswater Rail Loop will not sterilise any significant underground coal reserves.

Similarly, the existing Drayton Rail Loop and Antiene Rail Spur are located on land which is not suitable for open cut coal mining due to the deep working depths and high overburden to coal ratios as well as the occurrence of igneous intrusions in the coal seams in this area (Dames and Moore 1980). Due to the igneous intrusions, the existing section of the Antiene Joint User Rail Facility does not sterilise any significant underground coal reserves.

2.3.2 Meteorology

2.3.2.1 Rainfall

The closest Bureau of Meteorology data collection station to the proposed Antiene Joint User Rail Facility is at Muswellbrook, approximately eight kilometres north of the site. Rainfall data was collected at Muswellbrook between 1870 and 1996. Mean rainfall based on this data is shown in **Table 2.2**.

Table 2.2 - Rainfall Data – Muswellbrook

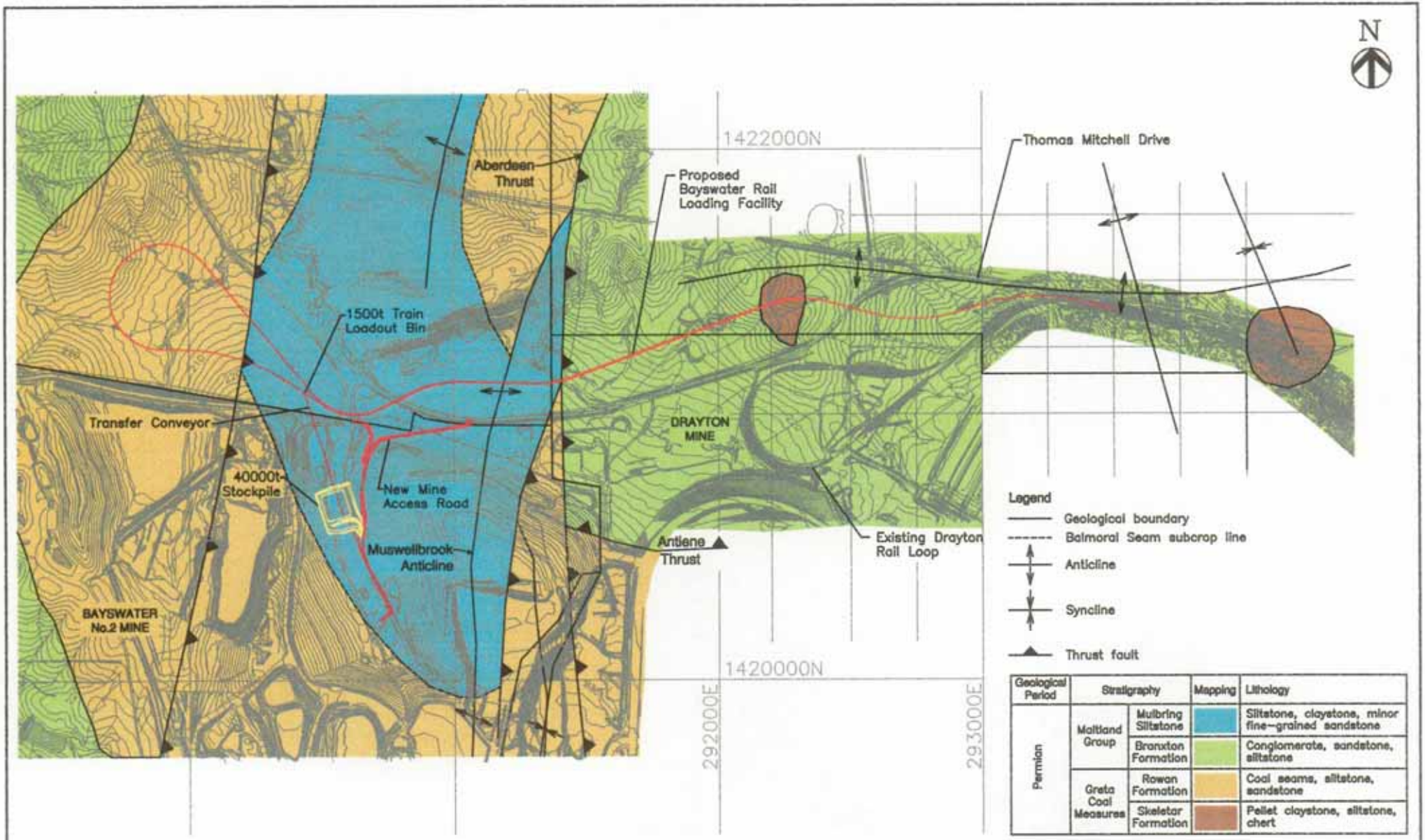
Month	Mean Rainfall (mm)
January	71.2
February	63.3
March	52.5
April	44.1
May	41.9
June	49.7
July	45.1
August	39.2
September	41.2
October	48.5
November	53.1
December	66.4
Total	**617.4**

Source: Bureau of Meteorology, December 1999.

2.3.2.2 Temperature

Temperature and evaporation data have not been recorded at Muswellbrook on a regular basis. However, temperature and evaporation data are recorded at Scone, approximately 30 kilometres north of the rail infrastructure.

The climate of the Hunter Valley, as recorded at Muswellbrook and Scone, is warm temperate and the seasonal climate varies from hot, wet summers to cool, mild winters. The highest mean daily maximum temperatures at Scone range from 18.5°C in July to 34°C in



Geological Period	Stratigraphy		Mapping	Lithology
Permian	Maitland Group	Mulbring Siltstone		Siltstone, claystone, minor fine-grained sandstone
		Branxton Formation		Conglomerate, sandstone, siltstone
	Greta Coal Measures	Rowan Formation		Coal seams, siltstone, sandstone
		Skeletar Formation		Pellet claystone, siltstone, chert

0 250m 500m 750m 1000m

Contour interval 2m

Umwelt (Australia) Pty Limited
Base Source: Bateman Australia Dwg No.60-M-135
Geology Source: Department of Mineral Resources Glen & Beckett (1993) Hunter Coalfield Regional Geology, Geological Series Sheet 9033

FIGURE 2.6
Geology of Proposed Bayswater Rail Loop Alignment

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January. The lowest mean daily minimum temperatures range from 7.4°C in July to 19°C in February. Mean daily maximum and minimum temperatures are listed in **Table 2.3**.

Table 2.3 – Mean Daily Temperature Recorded at Scone (Station 61089)

Month	Mean Daily Maximum Temperature (°C)	Mean Daily Minimum Temperature (°C)
January	30.7	16.9
February	29.5	16.7
March	27.8	14.6
April	24.4	11.4
May	19.9	8.4
June	16.7	6.1
July	16.1	4.6
August	18.0	5.6
September	21.0	7.9
October	24.6	10.9
November	27.4	13.1
December	30.2	15.8
Annual	**23.9**	**11.0**

Source: Bureau of Meteorology, December 1999.

2.3.2.3 Evaporation

Pan evaporation data is only collected by a small number of the meteorological stations, including the station at Scone in the Upper Hunter Valley. It is anticipated that the pan evaporation data from the Scone meteorological data collection station given in **Table 2.4** closely resembles the daily evaporation rate experienced within the proposed development area.

Table 2.4 - Evaporation Data – Scone Meteorology Station

Month	Mean Daily Pan Evaporation (mm/day)
January	7.0
February	6.1
March	5.1
April	3.6
May	2.2
June	1.6
July	1.8
August	2.8
September	3.9
October	5.0
November	6.2
December	7.3
Annual	**4.4**

Source: Bureau of Meteorology, December 1999.

2.3.2.4 Fog Days

The Muswellbrook meteorological station does not record temperature inversion data, however, inversion data were obtained from Bengalla mine for use in noise modelling (refer to **Appendix 6**). In addition, the number of fog days per year can be used as an indicator of the number of inversions that occur. Data supplied by the Bureau of Meteorology for the Singleton region shows that for the period 1969 to 1987 there was an average of five fog days per year. The peak number of fog days in any one year was 15.

2.3.2.5 Wind Speed and Direction

Seasonal variation in wind speed and direction at the Bayswater Colliery meteorological station is shown on **Figure 2.7**. Dominant winds are from the northwest and southeast, with northwesterly winds being particularly dominant in winter and southeasterly winds in summer. Wind speed is an important factor in determining the potential for generation of dust from wind erosion. Holmes Air Sciences advises that the critical parameter for determining wind erosion potential is the percentage of time that wind speed is above 5 m/s (refer to **Appendix 4**). Further information regarding potential air quality impacts is provided in **Section 4.4**.

2.3.3 Topography, Drainage and Groundwater

2.3.3.1 Topography

Bayswater Rail Loop

The general topography of the study area is characterised by rolling hills with relief of up to 50 metres. The proposed Bayswater Rail Loop corridor traverses mostly gentle slopes (5-10 per cent) at elevations ranging from 200 to 245 mAHD (refer to **Figure 2.1**). At the eastern end of the rail loop, slopes in excess of 10 per cent but generally less than 15 per cent occur.

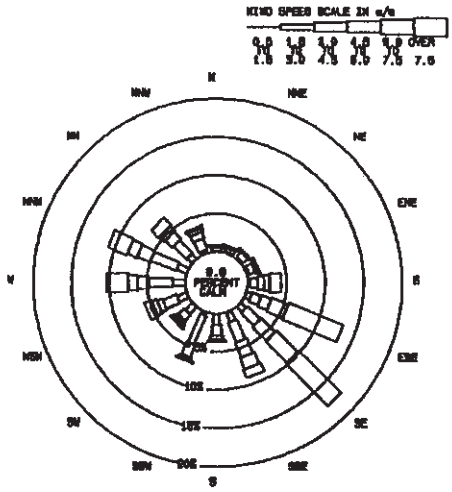
The proposed rail route crosses Ramrod Creek upstream of a dam, approximately 2.1 kilometres from the Antiene Rail Spur. The middle section of the route traverses gently inclined lower slopes on the southern side of Ramrod Creek. In this vicinity, steep hillslopes border the northern side of Ramrod Creek. The flattest section of the rail loop is at the western end where the balloon loop traverses the lowland plain associated with an unnamed tributary of Ramrod Creek.

Existing Drayton Rail Loop and Antiene Rail Spur

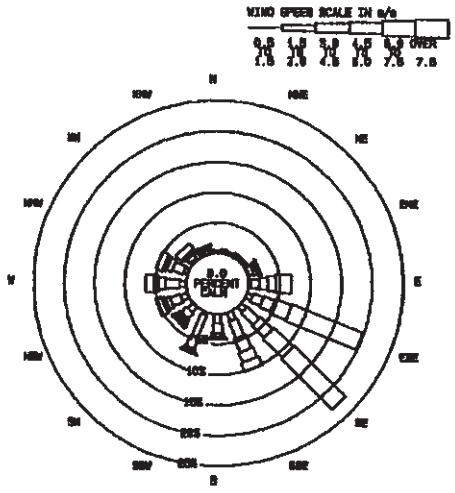
The existing Drayton Rail Loop is located on undulating, gently inclined midslopes, ranging from 210 to 240 mAHD in elevation and with slopes generally less than 10 per cent. The eastern end of the Antiene Rail Spur, at its junction with the Main Northern Railway, is located on very gently sloping lowland plains bordering the northwestern arm of Lake Liddell, at an elevation of approximately 135 mAHD. The remainder of the Antiene Rail Spur traverses undulating hills ranging in elevation from 140 to 220 mAHD and with slopes generally between 10 and 20 per cent.

2.3.3.2 Surface Hydrology

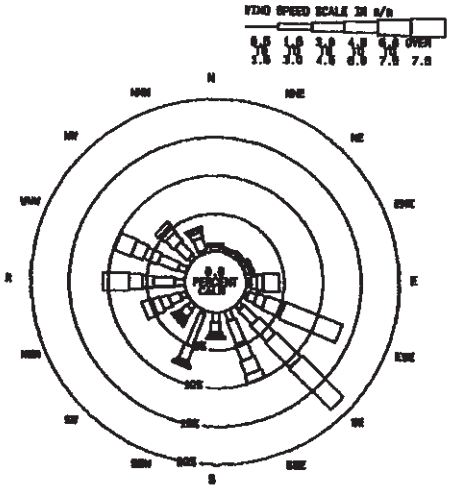
The proposed Bayswater Rail Loop and Drayton Rail loop are located in the upper reaches of the Ramrod Creek catchment, which has an area of approximately 2975 hectares and drains to the Hunter River approximately five kilometres south of Muswellbrook (refer to **Figure 2.1**). The Antiene Rail Spur is located in the Lake Liddell catchment. As there is no proposed infrastructure development within the catchment of Lake Liddell, further



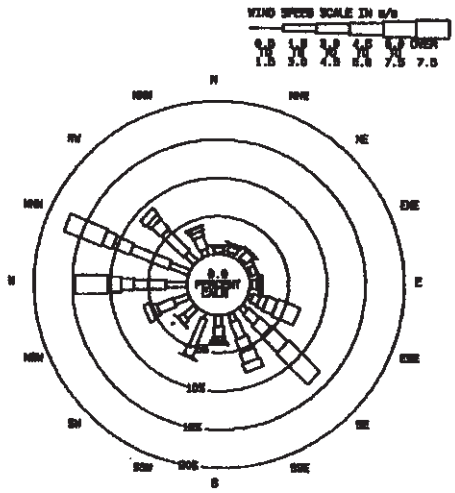
DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Bayswater - Annual 1998



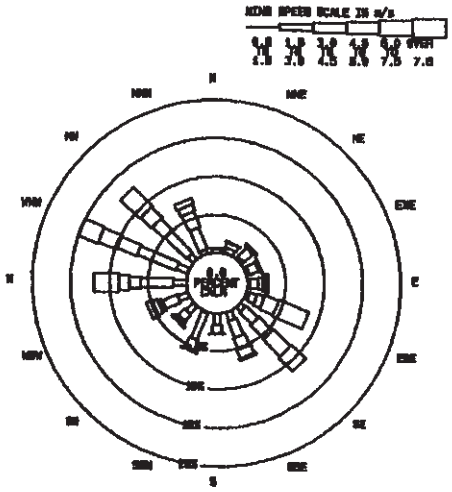
DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Bayswater - Summer 1998



DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Bayswater - Autumn 1998



DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Bayswater - Winter 1998



DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Bayswater - Spring 1998

FIGURE 2.7
Seasonal and Annual Windroses
for Bayswater Colliery 1998

Umwelt (Australia) Pty Limited
Source: Bayswater Colliery Company

Scale: N.T.S

Ref No.:1323/R01/dra_002.dwg

discussion of this catchment is not included in this document. Average annual rainfall in the area is approximately 617 mm with annual runoff from vegetated areas being approximately 15 per cent of average annual rainfall (Umwelt 1997). The first 1400 metres from the Antiene Rail Spur of the proposed Bayswater Rail Loop are located on generally north, east and west facing slopes, which are drained by an unnamed tributary of Ramrod Creek. The rail corridor then traverses the narrow west facing valley of Ramrod Creek, which is bordered to the north by slopes of up to 35 per cent and to the south by rehabilitated overburden stockpiles associated with Drayton and Bayswater mines.

The catchment of Ramrod Creek in the vicinity of the proposed development has been substantially disturbed by pastoral and mining activity. The catchment area of the creek has been reduced by mining activity associated with Drayton and Bayswater No. 2 mines, including formation of the mine overburden stockpiles on the southern side of Thomas Mitchell Drive. Two culverts, one located near the Bayswater access road and the other near Wire Lane, discharge flows from the southern side of Thomas Mitchell Drive to Ramrod Creek and an unnamed tributary, respectively. Soils along the route are slightly to highly dispersive, with dispersibility generally increasing with depth. Areas of gully erosion are found along creek lines and where subsoils have been exposed. Soils are described further in **Section 4.6**.

A number of off-stream water storages are found along the rail corridor (**Figure 2.8**). There are three farm dams located in the central area of the corridor, one of which is located in Ramrod Creek (Dam 3). All of these are likely to be drained and filled during construction of the rail embankment. There are a further two dams and a constructed wetland in the vicinity of the proposed development associated with Bayswater Colliery Company mining operations and one dam associated with the Drayton Rail Loop. In addition to these water storages, an open septic tank and two sewage polishing ponds are located within the area of disturbance (refer to **Figure 2.8**). This sewage treatment facility was associated with a Bayswater Power Station construction camp that has been disbanded for over fifteen years. Management of this area is discussed further in **Section 4.7.3.1**.

2.3.3.3 Groundwater

No significant groundwater reserves have been identified within or adjacent to the proposed development area. Generally, groundwater that does occur is characterised by low quality (ie moderate to high salinity) and low yield, as groundwater is derived from fractured rock aquifers. Watertable depths at the nearest bores, located on the Drayton mine site (**Figure 2.8**), typically range from 23 to 36 metres below ground. The proposed development is unlikely to impact on groundwater as the only area in which excavation will occur to greater than 10 metres below ground level is where the rail loop will pass through a cutting at the top of the Ramrod Creek valley. As the elevation in this vicinity is approximately 50 metres higher than the valley floor, it is unlikely that the watertable would be intercepted during excavation. In addition, geotechnical investigation undertaken for this proposed development by Douglas Partners (1999) indicated that no free water was encountered during auguring in the vicinity (maximum bore hole depth of 14.9 metres).

2.3.3.4 Water Quality

Ramrod Creek and its tributaries are degraded in the vicinity of the study area, primarily as a result of overgrazing, overclearing and the inherently dispersive soils. Water quality monitoring of Ramrod Creek and on-site water supplies has been undertaken on a monthly basis by Bayswater Colliery Company since January 1995 and Drayton Coal since 1981. Monitoring sites in close proximity to the proposed development are shown on **Figure 2.8**. The two monitoring sites on Ramrod Creek (Bayswater site W20 and Drayton site W2120) and the dam in the Drayton Rail Loop (W2114), have been selected as the sites within the

Bayswater and Drayton monitoring programs that are most relevant to the proposed development. Results for these sites are summarised in **Table 2.5**.

Table 2.5 - Water Quality Data

Monitoring Site	Monitoring Period	Analyte														
		pH			Conductivity (µS/cm)			Total Suspended Solids (mg/L)			Total Dissolved Solids (mg/L)			Sulphate (mg SO_4/L)		
		Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Drayton Rail Loop Dam (W2114)	1995	7.6	8.1	8.3	2750	3988	5150	1	9.5	26	1890	2860	3700	787	1092	1430
	1996	7.7	8.1	8.4	1490	3622	4990	3	16	38	978	2581	3670	430	1011	1320
	1997	7.6	8.0	8.3	2540	4623	5610	1	8.6	23	1770	3320	4170	739	1285	1690
	1998	7.7	8.2	8.6	1210	3131	5380	2	16.6	71	830	2253	4000	340	920	1570
Ramrod Creek (W2120)	1995	7.2	7.9	9.4	1820	5536	8320	7	258	1780	1240	4500	7340	515	2097	3540
	1996	7.5	8.3	9.7	1230	6236	12000	3	34	120	851	4090	8240	176	2087	5240
	1997	7.4	8.1	9.3	3420	7535	11920	4	88	798	2685	6190	10200	1220	2865	4460
	1998	7.5	8.4	9.2	2380	6978	15300	2	37	163	1820	6056	13850	953	3011	6630
Ramrod Creek (W20)	1995	7.4	7.7	7.9	2400	6100	8300	4	22	85	1500	4400	5800	600	1500	2400
	1996	7.5	7.7	8.0	5700	6570	7100	5	48	140	4200	4800	5300	1700	1800	2000
	1997	7.6	7.8	8.3	5700	7370	12000	7	100	700	4040	5400	8600	230	1400	2200
	1998	7.8	8.0	8.3	800	4540	6400	3	380	2900	470	3850	5500	230	1800	2800

*Note: Shaded values are in excess of ANZECC (1992) guidelines for livestock drinking water, summarised in **Table 2.6**.*

Source: Bayswater Colliery Company and Drayton Coal Pty Ltd

As can be seen from **Table 2.5**, water quality at both the sampling locations on Ramrod Creek is weakly to moderately alkaline with moderate to high conductivity, salinity (Total Dissolved Solids) and sulphate levels rendering the water unsuitable for drinking and unsuitable for most agricultural purposes including stock watering. For comparison, guideline values (ANZECC 1992) for these parameters in potable, irrigation and livestock drinking water are given in **Table 2.6**.

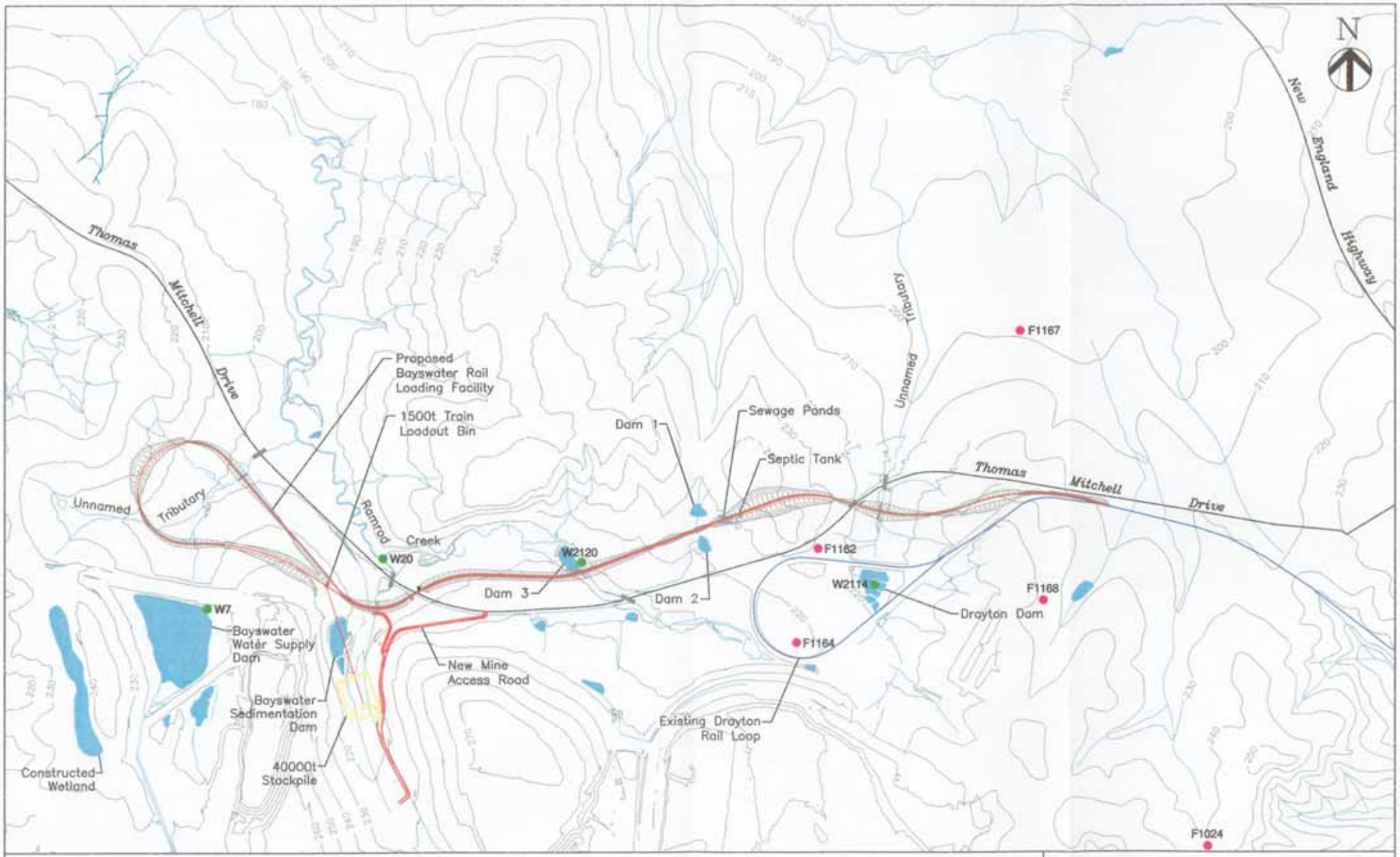
Table 2.6 – Water Quality Guidelines (ANZECC 1992)

	pH		Conductivity (µS/cm)	Total Dissolved Solids (mg/L)	Sulphate (mg SO_4/L)
	Min	Max	Max	Max	Max
Potable Water	6.5	8.5	1500	1000	400
Irrigation Water	4.5	9.0	800	500	N/A
Livestock Drinking Water	N/A	N/A	7300	5000	1000

N/A – Not available

2.3.4 General Description of Existing Flora and Fauna

The Antiene Joint User Rail Facility is located in an area dominated by pastoral and mining activity. Both of these activities have resulted in widespread clearing of native vegetation and introduction of non-endemic pasture and weed species. The majority of the site is vegetated with pastoral grassland containing a mix of native and introduced grass and groundcover species. Small areas of remnant overstorey species remain, particularly at the eastern end of the proposed Bayswater Rail Loop and between the Drayton Rail Loop and the New England Highway. A small forested area also occurs at the western end of the proposed Bayswater Rail Loop. However, shrub and herb layers within these forested areas


N
Thomas Mitchell Drive
New England Highway
Proposed Bayswater Rail Loading Facility
1500t Train Loadout Bin
Dam 1
Sewage Ponds
Septic Tank
Unnamed Tributary
Ramrod Creek
W20
W2120
Dam 3
Dam 2
F1162
W2114
F1168
Drayton Dam
F1164
F1167
F1024
W7
Bayswater Water Supply Dam
New Mine Access Road
Bayswater Sedimentation Dam
40000t Stockpile
Constructed Wetland
Existing Drayton Rail Loop
Legend
Proposed Rail Loading Infrastructure
Existing Rail Loading Infrastructure
Approved Infrastructure
Existing Culverts
Surface Water Monitoring Points
Groundwater Monitoring Bores
0 250m 500m 750m 1000m
Contour interval 10m
Umwelt (Australia) Pty Limited
Source: Bateman Australia Dwg No.60-M-135_B
FIGURE 2.8
Existing Water Control Structures
A3 Scale 1:14 000
Ref No.:1323/R01/dra_007.dwg

are highly disturbed, primarily as a result of grazing pressure. The structure of forested areas found at the site ranges from woodland to open forest, with floristics dominated by a number of eucalypt species. Small areas of aquatic vegetation, comprising grasses, sedges and rushes, are also found along watercourses and fringing dams within the study area. Further details of the vegetation communities recorded in the study area are contained in **Section 4.9.2** and **Appendix 3**.

These vegetation communities provide habitat for a number of native and exotic fauna species including the Eastern Grey Kangaroo (*Macropus giganteus*) and the Common Brushtail Possum (*Trichosurus vulpecula*). Assessment in accordance with the requirements of SEPP 44 indicates that no core koala habitat exists in the study area (refer to **Appendix 3**). The diversity and density of fauna species was found to be highest in the forested areas of the site, with fewer species occurring in the pastoral and aquatic vegetation communities. Three threatened species were recorded at the site: Common Bent-wing Bat; Yellow-bellied Sheathtail Bat; and Squirrel Glider. Further details of fauna recorded in the study area are contained in **Section 4.9.5** and **Appendix 3**.

2.3.5 Heritage Considerations

The affected environment in relation to Aboriginal and European heritage is restricted to the area of the proposed Bayswater Rail Loop. There is no disturbance proposed along the Drayton Rail Loop and Antiene Rail Spur.

2.3.5.1 Aboriginal Heritage

Archaeological investigations undertaken for this project identified 271 scattered artefacts located in 14 Aboriginal heritage sites, of which seven sites will be affected by the proposed development. Artefact density appeared to be higher along watercourse, particularly within 50 metres of Ramrod Creek. Further details of Aboriginal heritage are provided in **Section 4.11.1** and **Appendix 5**.

2.3.5.2 European Heritage

No significant items of European heritage occur within the study area, however, one historical feature consisting of glass and ceramic fragments was found within proximity of the Bayswater balloon loop. No items with permanent or interim conservation orders were found. Further discussion of European heritage is provided in **Section 4.11.2** and **Appendix 5**.

2.3.6 Existing Visual Amenity

2.3.6.1 Regional Scenic Quality

The general region has a diversity of landforms, vegetation patterns and land uses resulting in considerable variation in scenic quality within the area. In general terms, scenic quality is considered to improve with increasing diversity of topographic ruggedness, vegetation patterns, natural and agricultural landscapes and waterbodies. **Table 2.7** characterises visual landscape units for the Upper Hunter, based on the Department of Planning (1991) and US Forestry Service (1974) guidelines.

Table 2.7 - Visual Landscape Units - Upper Hunter

Landscape Unit	Scenic Quality
Undulating cleared/semi-cleared grazing land	Moderate
Floodplains adjacent to the Hunter River	High
Open cut coal mine areas, power stations and associated infrastructure	Low
Rugged, forested escarpments forming a visual boundary to the region	High

2.3.6.2 Local Scenic Quality

The majority of the area affected by the proposed development is undulating cleared and semi-cleared grazing land with isolated patches of woodland and extensive views of current coal mining activities and associated service infrastructure. This area is considered to have low scenic quality. Areas of high scenic quality, such as Mount Arthur, will not be affected by the proposed development. Detailed visual impact assessment is provided in **Section 4.12**.

2.3.7 Land Capability and Agricultural Suitability

2.3.7.1 Land Capability

Rural land capability is classified into eight classes by the Department of Land and Water Conservation (DLWC), based on an assessment of the biophysical characteristics of the land and the extent to which these will limit a particular type of land use. The classification outlines the types of land uses appropriate for a particular area of land and the land management practices needed to prevent soil erosion and maintain productivity of the land.

The area traversed by the existing Drayton and Antiene facilities and the proposed Bayswater Rail Loop are suitable for grazing and has been mapped as Class V and VI land at a scale of 1:100,000 (DLWC undated). This classification indicates that the land is suitable for grazing with occasional cultivation. Structural soil conservation works such as absorption banks, diversion banks and contour ripping, together with soil conservation practices such as pasture improvement, stock control, application of fertiliser, and minimal cultivation for the establishment or re-establishment of permanent pasture, are necessary.

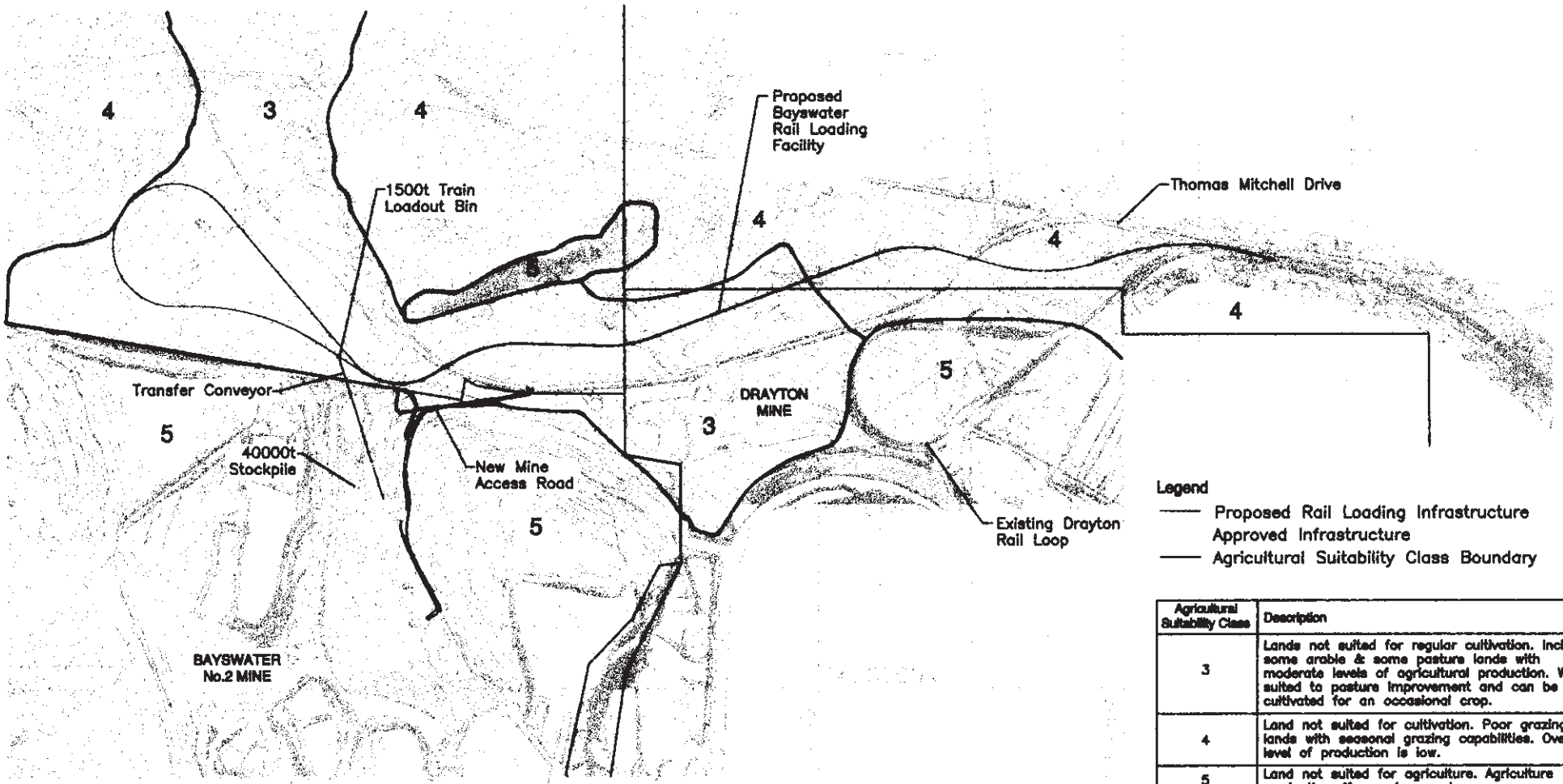
2.3.7.2 Agricultural Suitability

To assist planners in recognising land suitable for agriculture, NSW Agriculture (now NSW Agriculture and Fisheries) devised a 5-class mapping classification system for agricultural suitability (Riddler 1990). Agricultural suitability mapping is available for the rail loop at a scale of 1:50,000 (Reed and Hanley, undated). This broad scale mapping has been modified following field survey work.

The proposed Bayswater Rail Loop, existing Drayton Rail Loop and Antiene Rail Spur traverse land ranging from Class 3 to Class 5 (**Figure 2.9**).

Class 3 land is suitable for grazing but not suitable for regular cultivation. It includes some arable and some pasture lands with moderate levels of agricultural production. This land is well suited to pasture improvement and could be cultivated for an occasional crop.

Class 4 land is not suitable for regular cultivation. It offers poor grazing or seasonal grazing and overall production level is low.



Agricultural Suitability Class	Description
3	Lands not suited for regular cultivation. Includes some arable & some pasture lands with moderate levels of agricultural production. Well suited to pasture improvement and can be cultivated for an occasional crop.
4	Land not suited for cultivation. Poor grazing or lands with seasonal grazing capabilities. Overall level of production is low.
5	Land not suited for agriculture. Agriculture production, if any, is very low

0 250m 500m 750m 1000m

Contour interval 2m

FIGURE 2.9
Agricultural Suitability of Proposed Bayswater Rail Loop Alignment

A4 Scale: 1:20 000 | Ref No.:1323/R01/dra_010.dwg

Umwelt (Australia) Pty Limited
Source: Bateman Australia Dwg No.60-M-135

Class 5 land is not suitable for agriculture.

2.3.8 Social and Economic Aspects

The following section outlines the socio-economic and demographic characteristics of the assessment area, namely the local government area of Muswellbrook.

2.3.8.1 Geographic Location

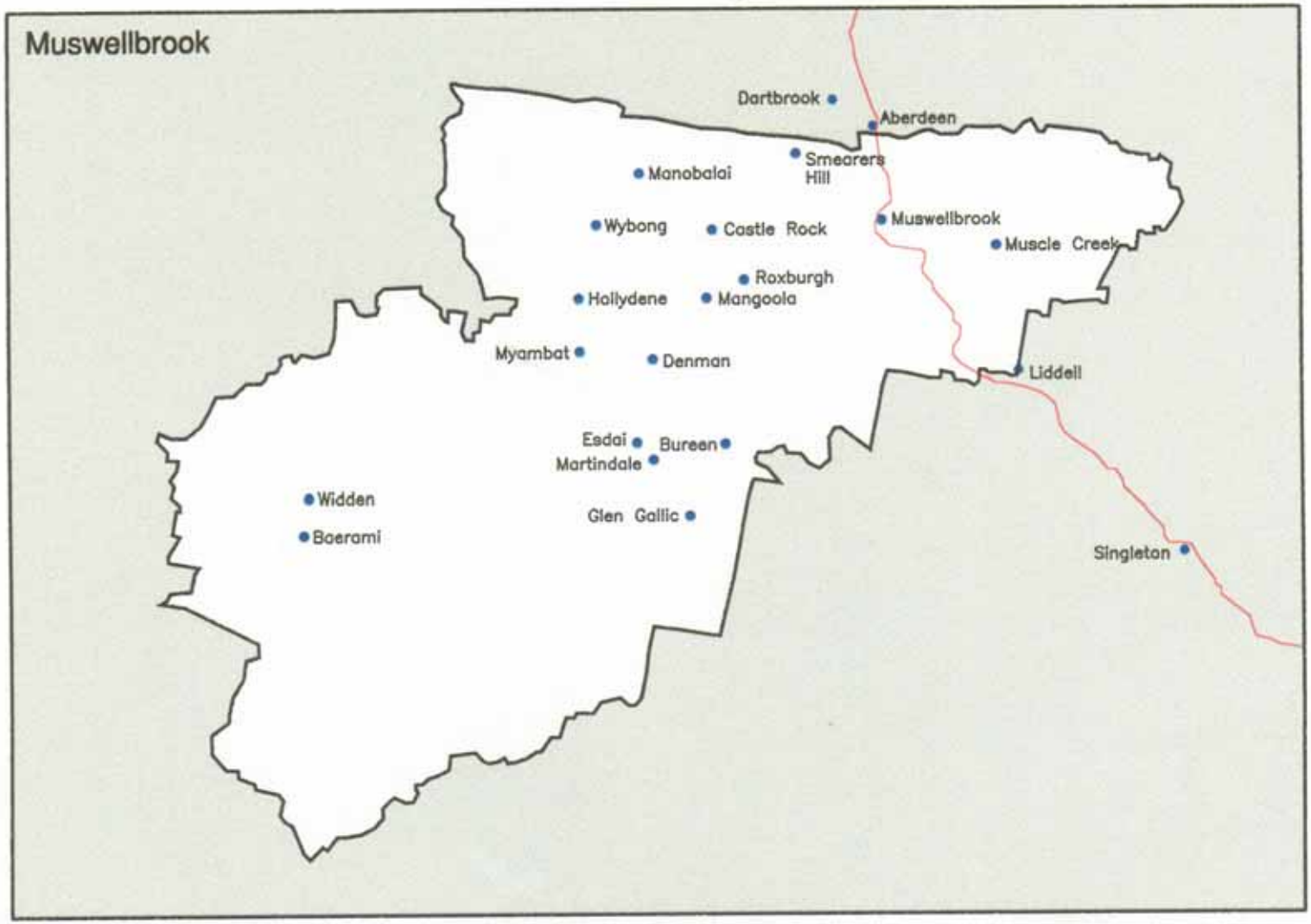
The Muswellbrook Shire covers an area of approximately 3400 square kilometres in the Upper Hunter Valley (**Figure 2.10**). The area has a diverse economic base featuring a successful blend of agriculture, commerce and industry. In 1986 the Shire had a population of 15,562 people, the majority of whom lived in Muswellbrook (67 per cent), the central service centre of the Upper Hunter sub-region. A smaller proportion of the population lived in the township of Denman (10 per cent) and surrounding rural area (23 per cent).

In 1979, the Muswellbrook Municipality and the Denman Shire were amalgamated to form the Shire of Muswellbrook, and a new Shire Council was appointed. While early industries were largely pastoral, with cattle grazing and the production of wool and wheat, the development of small rural holdings saw the establishment of the dairy industry in the 1890s along the rich alluvial flats of the Hunter River. Coal mining also commenced in the 1890s with small underground operations including Muswellbrook Underground. Muswellbrook Coal Open Cut commenced in 1930, and in the late 1960s, development of large open cut coal mines began in the Muswellbrook area, including the Bayswater Open Cut in 1968 and the Drayton operation in 1982. Both the presence of mining and the associated development of the Liddell and Bayswater Power Stations have resulted in rapid growth within the Shire.

2.3.8.2 Demographic Profile

In 1986, Muswellbrook LGA had a resident population of 15,562 persons, and this figure has increased marginally during the period until 1996. Time series analysis between 1986 and 1996 reveals that there is an increasing trend in the Shire in the percentage of people aged 65 years and above and in the number of Aboriginal and Torres Strait Islanders (**Table 2.8**). Unemployment rates, particularly among males aged 15-64 years, and the percentage of people within the locality who are separated or divorced, have also increased quite significantly. In relation to mining, there has been an increase in the number of males and females employed in the sector since 1986 (refer to **Table 2.8**).

Decreasing trends are evident in relation to occupancy rates, and in the percentage of rental accommodation and public housing available (refer to **Table 2.8**). This could be due to the development of mines in the area and the subsequent influx of new construction and operational workforces. The number of labourers and related workers has also decreased since 1986. Interestingly, the percentage of children attending pre-schools and high schools has declined, though this finding is consistent with a reduction in the number of children within the Shire aged 14 years and below.



Legend

- Local Government Area Boundary
- New England Highway
- Towns

0 5 10 15 20km

Umwelt (Australia) Pty Limited
Source: 1:1500000 N.S.W Local Government Areas CMA Map Sheet

FIGURE 2.10
Muswellbrook Local Government Area

A4 Scale: Approx 1:600 000 | Ref No.:1323/R01/dra_026.dwg

Table 2.9 - Demographic Profile of Muswellbrook LGA, Muswellbrook Township and Denman Township (cont)

Demographic Profile	Muswellbrook LGA	Muswellbrook Town	Denman Town	Rural NSW
Per cent separated or divorced	9.33	9.89	8.99	10.33
Per cent speaking English not at all or poorly	3.32	4.55	0.01	3.71
Per cent left school aged less than 15 years or never attended	37.38	36.95	40.91	38.03
Per cent aged 15 years and over with no qualifications	58.71	58.92	65.36	60.67
Per cent one parent families	9.63	15.36	11.89	14.15
Per cent of one family households with no vehicle	5.46	7.14	3.83	5.15
Per cent of labourer and related workers	13.11	10.79	20.14	10.55
Per cent attending pre-schools	1.50	1.62	1.06	1.71
Per cent attending primary schools	11.89	11.98	11.02	11.80
Per cent attending secondary schools	7.27	7.36	7.17	8.22
Per cent Aboriginal and Torres Strait Islanders	2.49	2.68	1.86	2.99
Per cent males employed in mining	24.61	26.84	27.22	1.89
Per cent females employed in mining	2.20	2.01	1.33	0.23
Per cent employed in mining	16.34	17.79	17.42	1.20

Source: ABS 1996

2.3.8.3 Employment

In 1996, 76.30 per cent of the male population in the Muswellbrook township were employed in full-time work, 12.86 per cent were employed in part-time work, and 9.18 per cent were unemployed and looking for work (see **Table 2.10**). In contrast, 40.62 per cent of the female population were employed in full-time work, 45.62 per cent were employed in part-time work, and 11.78 per cent were unemployed and looking for work (ABS, 1996). Considering the total labour force, 89.85% were employed and 10.15% were unemployed (see **Table 2.10**).

Table 2.10 - Labour Force Status Muswellbrook Township (1996)

Labour Force Status		Male (%)	Female (%)	Persons (%)
Employment Status	Full-time	76.30	40.62	62.98
	Part-time	12.86	45.62	25.11
	Total Employed (% of labour force)	*90.82*	*88.22*	*89.85*
Unemployment Status	Looking for full-time work	8.13	8.15	8.14
	Looking for Part-time work	1.50	3.63	2.01
	Total Unemployed (% of labour force)	*9.18*	*11.78*	*10.15*

Source: ABS (1996)

An examination of the indigenous population employment statistics within the area indicates that Muswellbrook's Aboriginal community has a workforce participation rate of only 57.26 per cent, and an overall unemployment rate of 32.84 per cent, compared with 10-15 per cent

for the total labour force. The unemployment rate is particularly pronounced for the 15-24 year age group (49.02 per cent) and less pronounced, but still very high, for the 25-44 year old age group (19.70 per cent). Such figures suggest that in relation to employment, indigenous people living in the Muswellbrook area are considerably disadvantaged. It should also be noted that ABS data does tend to underestimate actual Aboriginal and Torres Strait Islander numbers.

In 1996, the major industries in the Muswellbrook township included Mining (17.79 per cent) and Retail (14.24 per cent) (**Figure 2.11**). A significantly higher proportion of Muswellbrook residents were employed in Mining (17.79 per cent) and Electricity, Gas and Water (8.52 per cent) industries, than in NSW as a whole (0.84 per cent and 0.86 per cent respectively).

In relation to occupation, in 1986 Muswellbrook township had a relatively high proportion of tradespersons and related service workers (20.10 per cent), as well as production and transport workers (17.01 per cent). However, between 1986 and 1996, the number of tradespersons and related workers has declined (4.56 per cent).

In comparison to NSW, the number of manual, blue-collar workers in Muswellbrook is significantly higher, with a lower proportion of people employed in clerical and professional positions. However, of those Muswellbrook residents with qualifications, most were classified as possessing skilled vocational qualifications (35.66 per cent). This figure was slightly higher than the Hunter Region (32.55 per cent), and significantly higher than NSW as a whole (24.49 per cent).

Although the Muswellbrook Shire unemployment rate has been consistently lower than both the Hunter region and NSW, the level of unemployment has increased gradually over the past ten years. In 1996, the unemployment rate for the Shire (9.17 per cent) exceeded the rate for NSW (8.82 per cent), and unemployment in the township was particularly pronounced for the younger sectors of the workforce, in particular, 15-19 year olds (25.73 per cent) and people aged between 20 and 24 years (16.87 per cent). However, while youth unemployment is well above the NSW average of 18.43 per cent, unemployment rates in the older age groups in Muswellbrook are lower than NSW.

In September 1998, a total of 1023 people were registered with the Muswellbrook Regional Centrelink Office and of those registered, 1017 were receiving the Newstart Allowance (Centrelink, 1998). An examination of employment status by qualification for the Muswellbrook LGA reveals that of those unemployed in the Shire, the majority (76 per cent) have no post-school qualifications, with 8.6 per cent possessing skilled vocational qualifications and 4.2 per cent with basic vocational qualifications. These figures are similar at a township level.

2.3.8.4 Social Infrastructure

The Muswellbrook LGA has a variety of different services and facilities available to people living within the locality. Muswellbrook township is the key service centre for the Upper Hunter sub-region and as a result many services are located in Muswellbrook. Denman, the other main township within the Shire, although significantly smaller, has a number of services in the township

Table 2.11 outlines the types and number of key services located within the Muswellbrook Shire in the townships of Muswellbrook and Denman.

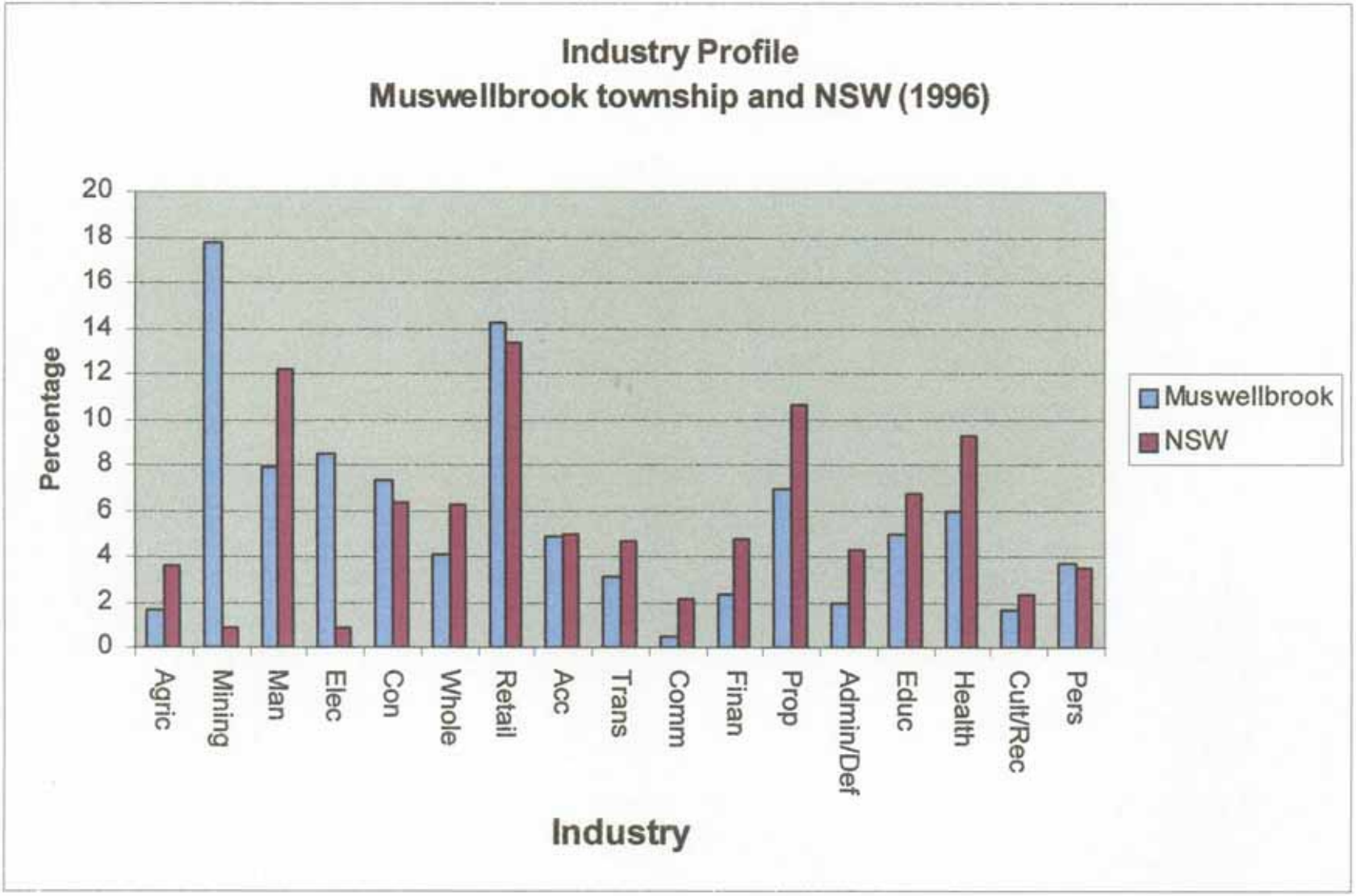


Chart Index

Agri = Agriculture, Forestry & Fishing
Man = Manufacturing
Elec = Electricity, Gas & Water Supply
Con = Construction
Whole = Wholesale Trade
Acc = Accommodation, Cafes & Restaurants
Trans = Transport and Storage
Comm= Communication Services
Finan = Finance and Insurance
Prop = Property and Business Services
Admin/ Def = Government Administration & Defence
Health = Health and Community Services
Cult/Rec = Cultural and Recreational Services
Pers = Personal and Other Services

FIGURE 2.11
Industry Profile for Muswellbrook Township and N.S.W (1996)

Scale: N.T.S | Ref No.:1323/R01/dra_020.dwg

Umwelt (Australia) Pty Limited
Source: Coakes Consulting

Table 2.11 - Services Located within the Muswellbrook Shire

Service	Muswellbrook	Denman
Accommodation		
Caravan Parks	2	2
Hotels	6	2
Motels	9	
Emergency Accommodation	4	
Housing	2	
Aged and Disability Services	15	5
Children's Services		
Childcare/Daycare	3	
Playgroups	8	
Pre-schools	1	
Early Childhood Centres	1	1
Churches	12	2
Community Services		
Community Centre	1	
Neighbourhood Watch and Safety House	1	
Aboriginal Land Council	1	
Library	1	1
Swimming Pool	1	1
Art Gallery	1	
Tourist Information	2	1
Education		
Primary Schools	4	4
High Schools	1	
Technical and Further Education	2	
Government Departments	12	
Media	4	
State and Federal Representatives	1	
Health Services		
Community Health Centre	1	
Dentists	4	
Other health services e.g. chiropractor, osteopath	3	
Emergency Services		
Doctors Surgery	2	1
Ambulance	1	
Hospital	1	1
Fire Brigade	1	1
Police	1	1
State Emergency Service	1	1
Legal Services	5	
Court House	1	
Solicitors	3	
Recreation		
Arts, crafts and special interest groups	21	
Sporting groups	34	13
Youth groups	9	2
Service Clubs	16	11
Transport		
Airport		
State Rail	1	
Bus Services	2	3

Source: Community Contacts Booklet (September 1999).

The socio-economic impact of the proposed Antiene Joint User Rail Facility is assessed in **Section 4.15**.

3.0 DESCRIPTION OF THE PROPOSAL

3.1 BRIEF HISTORY OF OPERATIONS AND APPROVALS

3.1.1 Bayswater No. 2 and No. 3 Mines

Bayswater Colliery Company Pty Limited operates the Bayswater coal mine on behalf of the Bayswater Joint Venture. The broad layout of the Bayswater No. 2 and No. 3 mines is shown on **Figure 3.1**. Mining has been undertaken at the Bayswater No. 2 mine for in excess of three decades, whilst mining in the Bayswater No. 3 area commenced in 1995.

The existing Bayswater No. 2 Colliery is located on Consolidated Coal Lease No. 744, which occupies an area of approximately 568 hectares. The Bayswater No. 2 coal mine adjoins Drayton Colliery to the east and south as shown on **Figure 3.1**.

The Bayswater No. 2 coal mine expanded considerably since production began in 1968 and at peak operation employed approximately 210 people. In 1994, as coal reserves in the Bayswater No. 2 area were nearing depletion, Bayswater Colliery Company sought approval to extend into the area termed Bayswater No. 3, which is located to the southwest of the Bayswater No. 2 operations (refer to **Figure 3.1**).

Bayswater No. 3 coal mine project was the subject of an Environmental Impact Statement prepared by Resource Planning Pty Limited (1993). Development consent for this project was granted by the Minister for Planning on 12 September 1994. The Minister for Mineral Resources granted mining Lease 1358 on 21 September 1994. Development consent for the Bayswater No. 3 project included mining within four pits within the Bayswater No. 3 lease area. These pits are named Saddlers Pit, McDonalds Pit, Belmont Pit and Calool Pit. It also included upgrading the existing coal preparation plant (CPP) at the Bayswater No. 2 site and construction of a 350000 tonne stockpile and conveyors to the existing Drayton Rail Loop. Development consent conditions for the Bayswater No. 3 operation provided flexibility to consider alternative rail loading facilities, but required implementation of rail transport of coal within three years of commencement of mining.

During 1994, haul roads and other infrastructure were established within the Bayswater No. 3 lease and mining commenced in early 1995. The combined Bayswater No. 2 and Bayswater No. 3 operations produced approximately 2.6 million tonnes of product coal in 1996 and 4.0 million tonnes of product coal in 1997, the last year of operation at Bayswater No. 2. Bayswater No. 3 currently produces approximately 4.0 million tonnes of product coal per annum. Approximately 0.5 million tonnes per annum of product coal is conveyed directly to Bayswater Power Station and the remainder is exported to markets in Japan and Korea via Ravensworth Coal Terminal. Export coal is both steaming and PCI/semi soft coking coal.

Bayswater No. 3 was the subject of a further Environmental Impact Statement, prepared by Umwelt (Australia) Pty Limited (1997), which addressed modified coal preparation and transport arrangements from Bayswater No. 3 as well as a coal stockpile and modifications to infrastructure at Ravensworth Coal Terminal. Development consent for a new coal preparation plant and transportation system was granted by the Minister for Urban Affairs and Planning on 14 September 1997. A further development consent was granted for the proposed works at Ravensworth Coal Terminal. This consent process provided for an additional two years of road haulage, in order to allow time for construction of the coal preparation plant and transport system proposed at that time.

During 1998 initial planning and design studies were conducted for the Mount Arthur North Project. These studies identified significant gains in efficiency and economy from use of rail infrastructure on the Antiene Rail Spur for transport of coal from Bayswater mine initially and later for integration with Mount Arthur North mine, if approved. An Environmental Impact Statement for the Mount Arthur North Project is currently being prepared, with rail transport of coal via a new Bayswater Rail Loop and the Antiene Rail Spur as the preferred method of transportation.

A Statement of Environmental Effects was lodged in September 1999 in order to seek modification of the 1994 Development Consent, to allow road haulage of coal to continue until mid 2001. This modification was sought to allow time to construct infrastructure for an alternative means of rail transportation of coal. This modification was granted on 14 December 1999 and requires that, apart from exceptional circumstances, there should be no further road haulage of coal by Bayswater Colliery Company after mid 2001. The proposed rail transportation of coal via the proposed Bayswater Rail Loadout Facility is the subject of this Environmental Impact Statement.

3.1.2 Drayton Mine

Drayton Coal Pty Limited operates the Drayton mine and rail loading facilities, including the Antiene Rail Spur. The broad layout of Drayton mine is shown on **Figure 3.1**. Development consent for Drayton mine to operate on Coal Lease 229 was approved by Muswellbrook Shire Council on 25 September 1980. This approval allows production of 3.3 Mtpa and provides for open cut mining, coal handling, product stockpiles and a Rail Loading Facility presently on the Drayton Coal mining lease. In addition, the Drayton Coal consent authorised construction and operation of the Antiene Rail Spur as a joint venture between Drayton Coal and the then Electricity Commission of NSW (ELCOM) to connect the Drayton Rail Loop and a potential Mount Arthur North operation to the Main Northern Railway.

Further development consents were granted by Muswellbrook Shire Council to construct and operate the Drayton to Bayswater Power Station overland conveyor and extend mining operations into Coal Lease 395, which was formerly held by Bayswater Colliery Company as part of Coal Lease 744. Mining leases held by Drayton Coal are due to expire on 3 February 2003 and 21 January 2008 for CL 229 and CL 395, respectively.

Drayton Coal is nearing completion of a feasibility study for the proposed Saddlers Creek mine, adjoining Drayton mine to the south. Drayton Coal is also seeking approval from Muswellbrook Shire Council to modify its existing consent to increase coal production from 3.3 Mtpa to 5.0 Mtpa.

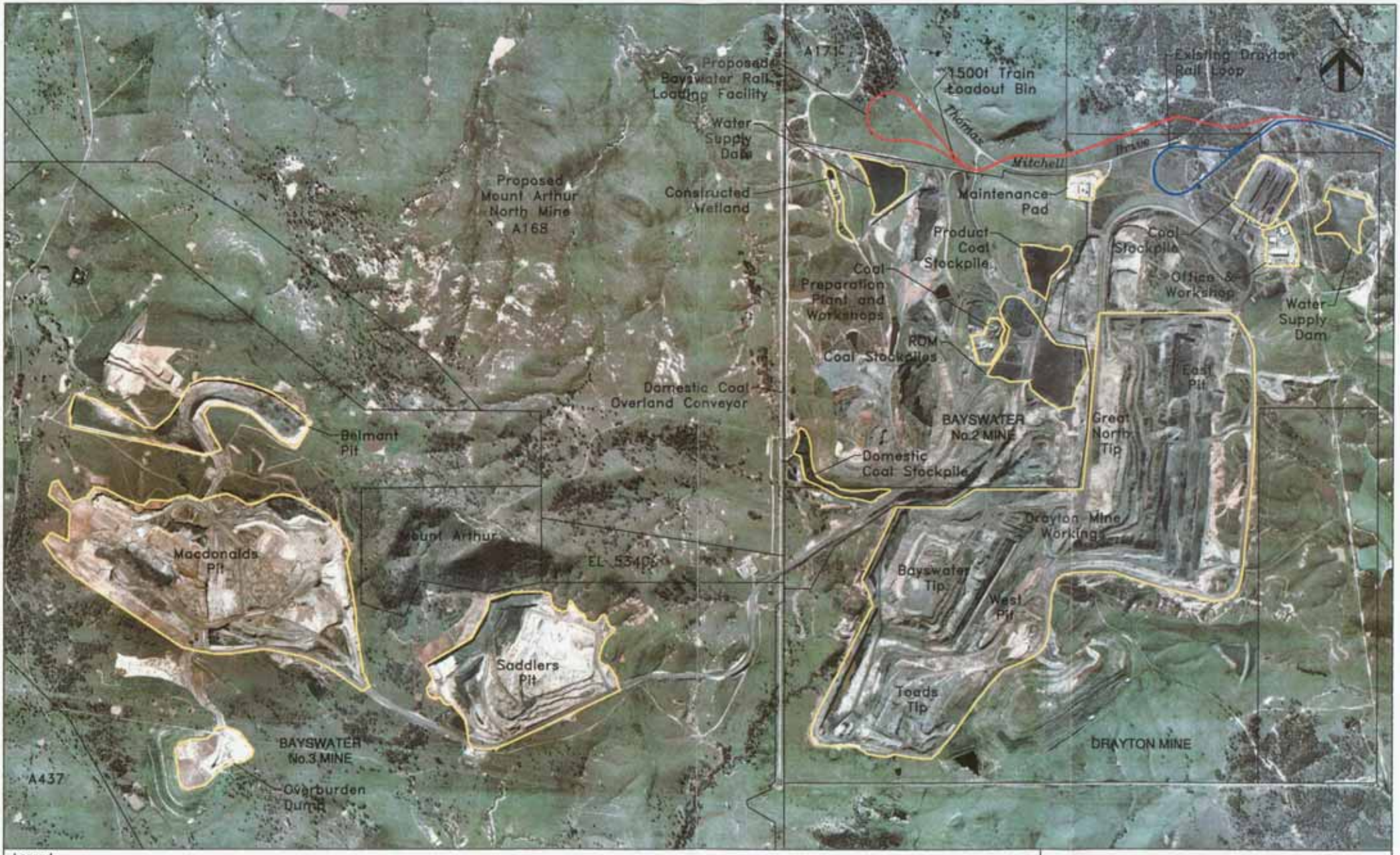
The increased usage of the Drayton Rail Loading Facility, up to a capacity of 7 Mtpa, is the subject of this EIS.

3.2 EXISTING COAL TRANSPORTATION SYSTEM

3.2.1 Bayswater Mine

3.2.1.1 Existing Coal Transportation System

Coal mined at the Bayswater No. 3 site is transported by truck to the Bayswater coal preparation plant (CPP), located on the Bayswater No. 2 mine lease. Run-of-mine (ROM) coal is tipped to receival hoppers or stockpiled for feeding to the plant by front end loaders.



Umwelt (Australia) Pty Limited

FIGURE 3.1
Existing Facilities of Bayswater and Drayton Mines

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The current storage area is sufficient for approximately 60000 tonnes of ROM coal. From the CPP, coal is transported to on-site stockpile areas by 85 tonne capacity rear dump trucks.

In 1996, Bayswater produced approximately 2.6 million tonnes of coal with coal production increasing to approximately 4.0 million tonnes in 1999. Of this, approximately 500,000 tonnes per annum is delivered via the Macquarie Generation conveyor to Bayswater and Liddell power stations for domestic consumption. Domestic coal is usually transported by rear dump trucks to the Macquarie Generation Coal Receivals Facility, which feeds the Macquarie Generation conveyor. The Receival Facility is located within and adjacent to the western boundary of the Bayswater No. 2 mine and has an available stockpile capacity of 75000 tonnes.

Export coal is stockpiled according to product type at the existing Bayswater No. 2 CPP in an area with sufficient storage for 400000 tonnes. Shipments are batched according to quality requirements as the coal is loaded for transport to the Port of Newcastle. All export coal is currently road hauled from the site to the Ravensworth Coal Terminal (RCT), then by rail from the RCT to the Port of Newcastle. All export coal has been transported via this route since commissioning of the RCT in late March 1997.

Coal transportation for the existing operation is not undertaken on a continuous basis but occurs in campaigns. Campaigns range in length from one day to fifteen consecutive days, depending on shipping demands. Road transport is generally performed by 80 to 90 trucks with an average capacity of 28 tonnes. Peak truck numbers associated with road haulage are 30 truck trips or 60 truck movements per hour.

3.2.1.2 Existing Workforce and Hours of Operation

The Bayswater No. 3 mine operations employ approximately 300 personnel, including administration staff, miners, operators, fitters and electricians. Currently, all administration offices, amenities and mining personnel facilities are located on the Bayswater No. 2 coal lease area. In addition to the mine personnel employed directly by Bayswater Colliery Company, the current operation provides contract employment for truck drivers for export coal delivery.

Mining is conducted on a 24 hours, six days per week basis. Three eight hour shifts are undertaken for mining operations. The night shift is not a full production shift with most routine maintenance carried out during this time. The coal processing plant operates three eight hour shifts, five days per week.

3.2.1.3 Existing Development Consent Constraints Regarding Coal Transportation

Development consent for the Bayswater No. 3 mine, managed by COAL, authorises open cut mining within the Bayswater No. 3 lease, coal preparation activities and stockpiles at the Bayswater No. 2 mine site, and utilisation of the Drayton Coal rail loop. Development consent conditions for the Bayswater No. 3 operation provide flexibility to consider alternative rail loading options. Since late March 1997, all Bayswater export coal has been hauled by road to the Ravensworth Coal Terminal, loaded onto trains and transported by rail to the Port of Newcastle. The modification of Condition 17 of the Bayswater No. 3 1994 Development Consent (refer to **Section 3.1.1**), allowed COAL to continue road haulage of coal until the new rail loop is operational, but not later than 1 July 2001. This time frame should be sufficient to establish the proposed Bayswater Rail Loading Facility.

3.2.2 Drayton Mine

3.2.2.1 Existing Coal Loading and Transportation System

Coal from the open cut pits is transferred to the Coal Handling Facility by rear dump truck, where it is crushed and stockpiled adjacent to the Drayton Rail Loop (**Figure 3.1**). The mining operation produces high quality steaming coal that does not require washing. Consequently, Drayton Coal does not operate a coal preparation plant.

Export coal is transferred by conveyor from the stockpile to twin 1750 tonne train loading bins at a rate of 2500 tonnes per hour. Loadout of coal at 2500 tonnes per hour allows the facility to operate at a sub-Class 5 level. At this rate of operation, a maximum of 38000 tonnes may be loaded per day, and 120000 tonnes per week, and transported by rail to the Port of Newcastle via the Antiene Rail Spur and the Main Northern Railway.

Domestic coal is transported to Bayswater Power Station by overland conveyor.

No coal is transported by road.

3.2.2.2 Existing Transport Volumes and Train Movements

Export (66 per cent) and domestic (34 per cent) coal is produced at Drayton mine. Export coal is transported by rail on a campaign basis, with a typical maximum duration of 70 hours per campaign. The peak train traffic volume associated with transport of coal along the Antiene Rail Spur is six train trips per day or twelve train movements and nineteen trains per week.

3.2.2.3 Existing Workforce and Hours of Operation

Drayton mine operations employ approximately 250 personnel, including administration staff, miners, operators, mechanics, electricians and apprentices. In addition to the mine personnel employed directly by Drayton Coal, the current operation provides employment to a number of contractors.

Mining is conducted on a 24 hours, five days per week basis, while the Coal Handling Facility operates 24 hours per day, six days per week. Maintenance is undertaken 24 hours per day, six days per week.

3.2.2.4 Existing Development Consent Constraints Regarding Coal Transportation

The existing development consent restricts train haulage to 3.3 Mtpa.

3.3 PROPOSED RAIL TRANSPORTATION SYSTEMS

3.3.1 Bayswater Rail Loading Facility

The Bayswater Rail Loading Facility will initially transport export coal produced by Bayswater No. 3 mine. Should the Mount Arthur North Mine be approved, transport of coal from the combined operations is expected to be approximately 13 Mtpa. It is proposed to construct the facility with capacity to transport 20 Mtpa, in order to provide sufficient capacity to make use of any priority access to 7 Mtpa not utilised by Drayton Coal operations (refer to **Section 1.1.2**).

3.3.1.1 Location

The Bayswater Rail Loop will turn out from the Antiene Rail Spur near the Drayton Rail Loop and traverse in a generally westerly direction towards the A171 mine lease area (refer to **Figures 1.1**, **2.3** and **3.2**), a distance of approximately four kilometres. The loadout facility and rail balloon loop will be located at the western extremity of the rail corridor, in the A171 area, located north of the Bayswater mining lease. The majority of the railway is located north of Thomas Mitchell Drive, however the balloon loop and connection to the Antiene Spur are located on the southern side of Thomas Mitchell Drive at the western and eastern extremities, respectively.

3.3.1.2 Railway and Loadout Facilities

Railway

The railway and loadout facilities will occupy an area of approximately 55 hectares, over a four kilometre corridor. The railway alignment and location of facilities are shown in **Figure 3.2**. The total length of track is calculated to be 7270 metres.

The Antiene Rail Spur may be defined as the section of rail track between the Main Northern Railway and the boundary of the Drayton mining lease (refer to **Figures 1.1**, **2.3** and **3.2**). A catch point is to be installed immediately west of the turnout point to provide a safe derailment point, should a potential train conflict occur.

The railway will be an eight metre wide single track configuration until commencement of the double track rail loop, approximately 1100 metres from the Antiene Rail Spur. The double tracks will run parallel to and along the northern side of Thomas Mitchell Drive on a 12 metre wide embankment for approximately 1600 metres. Once the railway crosses over to the southern side of Thomas Mitchell Drive, the tracks will split to form the 200 metre radius balloon loop, with an anti-clockwise direction of train travel.

The majority of the track will be located on fill, with grassed batters constructed at 1V:1.75H. Embankments constructed along the floor of the Ramrod Creek valley will have a minimum buffer distance of 40 metres from the toe of the embankment to the meander channels of Ramrod Creek in order to minimise archaeological and hydrological impacts. There are four areas where the rail line will be located in cuttings at the turn out from the Antiene Rail Spur; across the hill at the eastern end of the Ramrod Creek valley; immediately west of the rail loadout bin; and at the western extremity of the balloon loop (**Figure 3.2**). The cutting across the hill at the eastern end of the Ramrod Creek valley will be the largest, with a maximum width of 125 metres and a maximum depth of 16 metres.

In addition, three level crossings will be constructed along the rail corridor to provide access across the rail line.

Bridges and Culverts

Two rail-over-road bridges will be constructed over Thomas Mitchell Drive (refer to **Figure 3.2**). Both bridges will have a vertical clearance of 5.5 metres, which is in excess of the existing minimum bridge height of 5.0 metres for traffic travelling to the site via the New England Highway. The eastern bridge will be constructed as a single track rail overpass, while the western bridge will be a double track rail overpass. The bridges will be constructed with pre-cast concrete spans and concrete abutments and designed to meet Roads and Traffic Authority standard clearances. The bridges have been located to maximise sight distances for traffic turning onto Thomas Mitchell Drive from Wire Lane and the relocated

Bayswater access road. Road traffic issues associated with construction and operation of the rail loadout facility are discussed in more detail in **Section 4.3.1**.

The rail loop traverses Ramrod Creek and two unnamed intermittent tributaries (refer to **Figures 2.9** and **3.2**). A total of eight culverts will be constructed at the locations where the rail line crosses Ramrod Creek and each of the tributaries. The culvert at Ramrod Creek will be sized to convey peak flows from the 1 in 100 year average recurrence interval (ARI) design storm event, in order to ensure that there is no flooding of Thomas Mitchell Drive. The culverts at the three unnamed tributaries are located upstream of Thomas Mitchell Drive and will be sized to convey peak flows from the 1 in 20 year ARI design storm event. Water management is discussed in more detail in **Section 4.7**.

Loadout Facilities

A loadout bin with 1500 tonne capacity is to be located at the south-eastern end of the balloon loop. The loadout bin will be mounted below the end of the conveyor on a steel frame clad with profiled metal sheeting. The height of the conveyor and loadout bin is approximately 35 metres. Directly below the bin will be a concrete spillage pit incorporating bobcat access ramp and sump. Train loading will be managed from a control room located below the loadout bin. The control room will be equipped with control console, closed circuit TV, land telephone, telemetry system and computer. Coal will be loaded using a telescoping loading chute and Long Airdox shut-off gates operated by a hydraulic power pack.

Loadout of coal will allow train loading at a rate of 4500 tonnes per hour. At this rate of operation, a maximum of 76500 tonnes may be loaded per day, which is equivalent to nine 8500 tonne trains. Trains of this capacity are 1600 metres in length and consist of 91 wagons and three Class 90 locomotives. As train loading is undertaken on a campaign basis to meet shipping demand, the maximum number of trains per week is likely to be 14, which is the number required to transport one 120000 tonne ship. The loadout facility is designed to service 2000 metre long, 9000 tonne capacity trains in the long term. Use of these trains would enable a train loading rate of 81000 tonnes per day. A process flow diagram of the proposed rail loading operation is shown in **Figure 3.3**.

3.3.1.3 Transfer Conveyor and Coal Stockpile

Coal will be transferred from a 40000 tonne stockpile located at the northern end of the 350000 tonne stockpile area approved under the 1994 Development Consent, but not yet constructed (refer to **Figure 3.2**). The 40000 tonne stockpile will be approximately 90 metres wide, 100 metres long and 10 metres high. Formation of this stockpile will be undertaken by a single D11 dozer operating at a rate of approximately 2100 tonnes per hour. Coal will be delivered to the stockpile from Bayswater No. 3 mine by dump truck. Dump trucks will deliver coal to a truck dump station located at the northern end of the stockpile and directly to the stockpile. A coal collection valve and chutework located beneath the dump station will allow transfer of coal to a north-south running reclaim tunnel and conveyor. The reclaim tunnel will be constructed of reinforced concrete, 2.4 metres high and 5.1 metres wide, with a 1.8 metre bobcat access on one side and an 0.6 metre maintenance area on the other side. A ventilation fan in the reclaim tunnel will allow 11 air changes per hour. As well as the dump station, two reclaim points will be constructed beneath the coal stockpile to transfer coal to the conveyor.

Coal will be transferred from the stockpile to the loadout bin via a 500 metre conveyor. Approximately 200 metres of conveyor will be located above ground, with the remaining 300 metres housed within the reclaim tunnel. The majority of the above ground section will be mounted on steel frames at ground level. As the conveyor approaches the loadout bin it

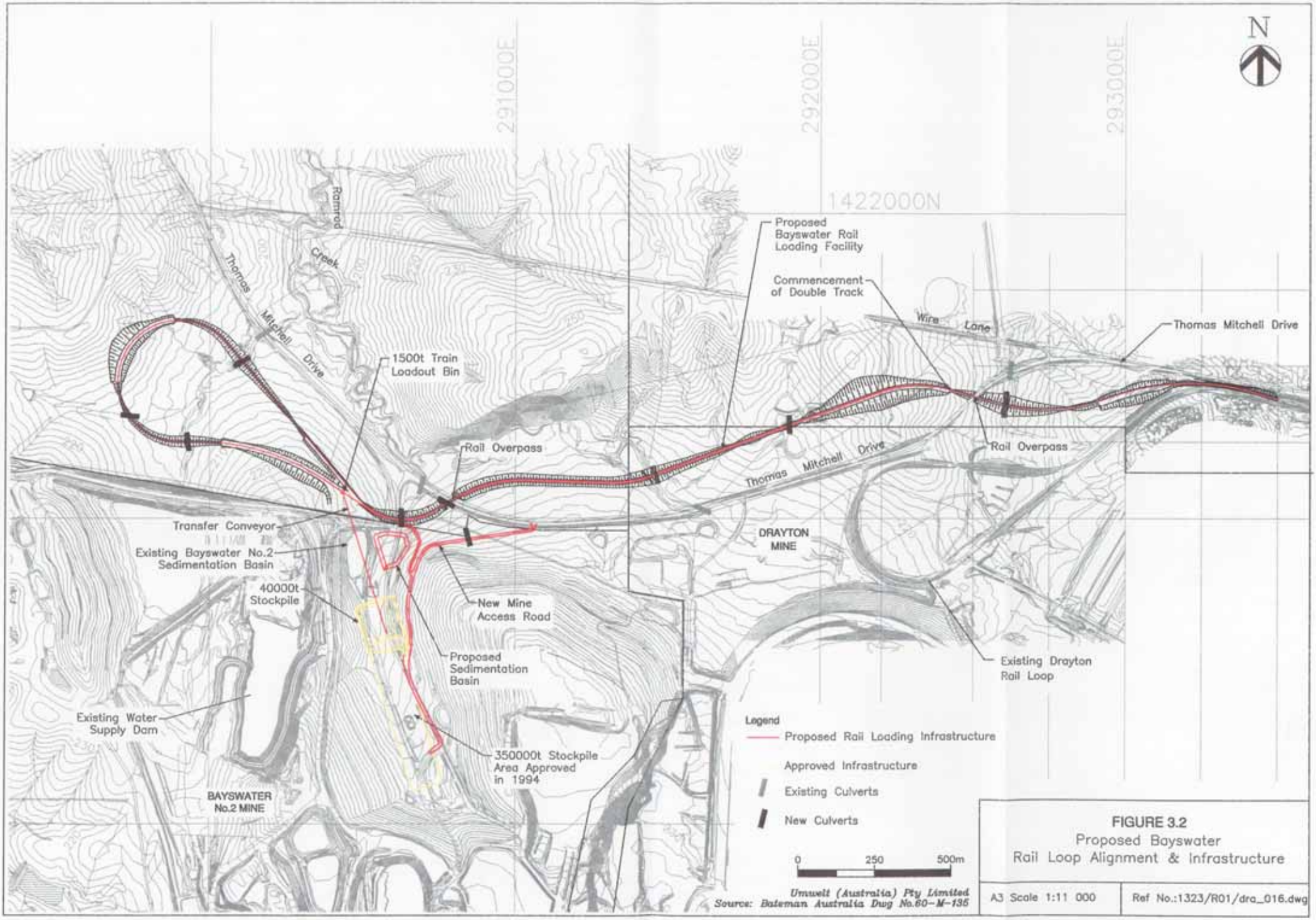

FIGURE 3.2
Proposed Bayswater
Rail Loop Alignment & Infrastructure

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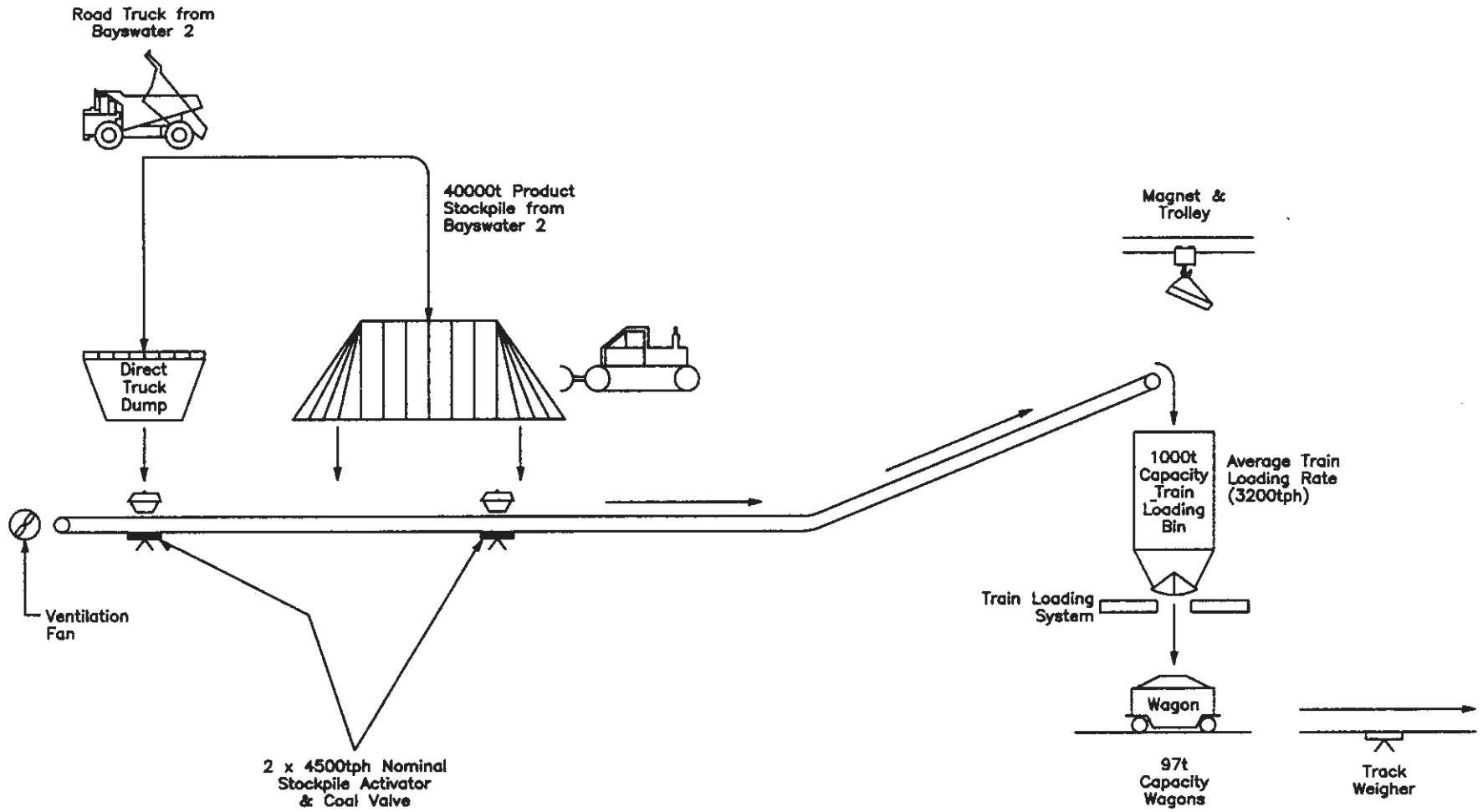


Legend

	Coal Valves
	Belt Weigher
	Magnet
	Tunnel Ventilation Fan

Umwelt (Australia) Pty Limited
Source: Bateman Brown & Root Dwg No.60-M-038

FIGURE 3.3
Process Flow Diagram of Bayswater Loading Facility

Scale: N.T.S	Ref No.:1323/R01/dra_004.dwg

will rise to an elevation of approximately 35 metres. This elevated section will be completely enclosed.

The conveyor will be driven by up to three drives with a combined maximum power of 1600 kW housed in a drive station located approximately 50 metres before the loadout bin. These drives will provide a coal transfer rate of 4500 tonnes per hour. The elevated section of the conveyor will be a steel frame construction with profiled metal sheet cladding and a suspended concrete slab floor. The drives will be enclosed in profiled sheet metal with acoustic lining on the inside.

Electricity to power the drive motors will be supplied to the drive station from a 33 kilovolt substation located near the drive station.

3.3.1.4 Access Road Alterations

The existing Bayswater mine access road is to be relocated to the east of its present location (**Figure 3.2**). The new access road will be a two lane all weather road with similar design characteristics to the existing road. The location of the intersection of the new access road and Thomas Mitchell Drive has been selected to allow a sight distance of 250 metres to the double track rail overpass bridge for traffic turning onto Thomas Mitchell Drive. Road traffic impacts are discussed in more detail in **Section 4.3.1**.

3.3.1.5 Water Supply and Dust Suppression

Water for dust suppression and operational requirements is expected to be in the order of 100-150 ML per year. This demand will be met by the existing Bayswater No. 2 and No. 3 water supply dams and a new 23 ML sedimentation basin to replace the existing Bayswater No. 2 sedimentation basin (refer to **Figure 3.2**). The existing sedimentation basin will be drained and filled in order to allow construction of footings for the transfer conveyor.

Stockpile dust suppression will be provided by pole-mounted agricultural sprinklers. Operation of the sprinkler system will be automated through a telemetry connection to an on-site weather system. Water will be pumped to the sprinklers from a storage tank next to the stockpile. A branch line from existing pumps in the Bayswater No. 2 water supply dam will feed this tank.

Water supply for fire protection and washdown purposes will also be supplied from this storage tank.

3.3.1.6 Lighting

Floodlights will be mounted on dust suppression sprinkler poles around the coal stockpile, which will provide safe working conditions for coal stockpile formation and train loading to operate 24 hours per day whilst a coal loading campaign is underway. In addition, the rail loadout bin will be lit with sufficient floodlights to allow safe working conditions around the bin.

3.3.1.7 Fuel Storage

A small diesel storage area will be located near the crib room (refer to **Section 3.3.1.9**) to provide fuel for water supply pumps in the event of a power failure. The above ground diesel tank will be bunded to contain 120 per cent of tank storage capacity in accordance with EPA recommended practice and the provisions of the *Dangerous Goods Act 1975*.

3.3.1.8 Services

Electricity is to be provided by a 33 kilovolt substation located near the conveyor drive station. The existing telephone, telex, fax and dataline services provided by Telstra Corporation will be extended to the new facilities.

3.3.1.9 Office and Amenities

A small crib room and amenities will be located between the coal stockpile and the loadout bin.

3.3.1.10 Employment and Hours of Operation

Approximately two personnel (one dozer driver and one loadout operator) will operate the facility. Administration and non-rail maintenance tasks will be conducted from the existing Bayswater No. 2 facilities using currently employed staff. In addition, the loadout facility will provide contract employment for train drivers and track maintenance workers.

The delivery of coal to the stockpile will be conducted 24 hours per day, seven days per week. The conveyor and loadout bin will be operated 24 hours per day, seven days a week, during a coal loading campaign. It is estimated that 30 campaigns each of 60 hours duration will be conducted in an average year, in order to transport production from the current Bayswater Colliery operations. Should the Mount Arthur North Project or other mines be approved, the average annual number of campaigns is likely to increase to 108 for transport of 13 Mtpa, or 167 for transport of 20 Mtpa.

3.3.1.11 Public Infrastructure Considerations

The proposed railway will cross electricity and telecommunication easements and other existing service infrastructure such as Thomas Mitchell Drive, as well as roads and pipelines associated with Bayswater and Drayton mines (refer to **Section 4.14** for further details).

3.3.1.12 Sanitary and Waste Disposal Arrangements

Effluent from the on-site amenities will be piped to an on-site package sewage treatment plant or similar. The plant will have a capacity to treat 1800 L/d and will be gravity fed from a header tank located on the roof of the amenities building. Treated effluent from the package treatment plant will be gravity fed to a 250 m^2 spray irrigation area. The plant and irrigation area will be located upslope of the sedimentation dam to provide an additional level of control in the event of accidental failure of the system.

Solid waste will be collected regularly by a licensed contractor and consolidated with solid waste generated by the Bayswater No. 2 and No. 3 operations. This consolidated waste will be transported regularly to Muswellbrook Shire Council's approved landfill.

3.3.1.13 Site Preparation, Staging and Construction Schedule

Construction of the Bayswater Rail Loading Facility will be staged over a period of 12 months. Therefore, in order to meet Bayswater's consent conditions requiring cessation of road haulage by 1 July 2001, COAL is seeking development consent by early July 2000 to accommodate the required 12 month construction period. Major earthworks will be preceded by the establishment of erosion and sediment control structures to control and treat contaminated runoff from the site prior to discharge to Ramrod Creek. Revegetation will be undertaken progressively once sections of earthworks are completed. Once earthworks are completed, the laying of track and installation of signalling will commence.

It is estimated that construction activities will be conducted during daylight hours, seven days per week for a period of approximately twelve months, although minor tasks may be undertaken outside these hours. Approximately 55 to 66 personnel will be employed during construction. The plant proposed to be used during construction is listed in **Table 3.1**. Construction activities will include:

1. Establishment of environmental controls such as temporary sedimentation dams and silt fences.

2. Establishment of temporary construction facilities including offices, stores and amenities adjacent to the stockpile pad.

3. A new access road to Bayswater mine east of the current location.

4. Relocation of the 11 kilovolt and 33 kilovolt transmission lines presently located over the proposed stockpile area (**Figure 3.4**)

5. Clearing of vegetation and stockpiling of topsoil along the rail corridor, as well as the delivery of approximately 30000 m^3 of select overburden from Bayswater No. 3 mine workings to meet the net fill deficit for the railway earthworks.

6. Cut and fill earthworks along the rail corridor. This phase may include some blasting within the balloon loop.

7. Two bridges over Thomas Mitchell Drive, eight culverts along Ramrod Creek and its tributaries and an impermeable pavement layer along the rail line to prevent ingress of water.

8. Construction of the stockpile pad with approximately 93000 m^3 of mine overburden supplied by COAL from Bayswater No 3.

9. Reclaim tunnel, conveyor, train loading bin, rail ballast and track infrastructure.

10. Provision of electricity, lighting, signalling and telemetry.

Table 3.1 - Construction Plant

Type of Plant	Number of Plant
Bulldozer	4
Grader	3
Backhoe	2
Front End Loader	4
Rockbreaker	1
Dump Truck	4
Roller	1
Compactor	3
Watering Truck	3
Pile Driver	As required
Drilling Rig	As required
Hydraulic/Pneumatic Drills	1
Semitrailer	1
Crane	2
Welding Equipment	As required
Generator	As required

3.3.1.14 Site Rehabilitation

Existing rehabilitation at the Bayswater No. 2 and No. 3 mines has proved to be successful and is reported to the Department of Mineral Resources and other relevant agencies in the Annual Environmental Management Reports. The rehabilitation methods used at Bayswater are based on Department of Land and Water Conservation guidelines and the recommendations of NSW State Forests. They include the reuse of sewage effluent from the Muswellbrook Sewage Treatment Works, for which Bayswater Colliery won a Gold Award at the Rivercare 2000 Awards. These proven methods will be adopted in the rehabilitation works for the proposed Bayswater Rail Loop.

Rehabilitation of disturbed areas will be undertaken progressively as earthworks are completed. The rehabilitation program will include reshaping of slopes other than the railway embankments to less than 10° where possible, construction of soil conservation works and re-establishment of vegetation. Revegetation will primarily involve establishment of a good surface cover of grass, particularly on railway embankments where the potential for revegetation with trees and shrubs is limited due to safety considerations. Belts of vegetation consisting of trees, shrubs and groundcover will, however, be established along Thomas Mitchell Drive in order to reduce the visual impact of the railway including the impact of train headlights on road traffic (refer to **Section 4.12** for further details).

3.3.1.15 Energy Conservation Measures

The proposed rail loading facility will be constructed using modern energy efficient equipment and energy conserving methods. This includes effective project management to minimise rehandling of materials and idling of machinery. Energy efficient features of the operation include the use of electric conveyors rather than trucks to transport material from the coal stockpile to the rail loadout bin and the use of rail rather than road transportation. In addition, ongoing maintenance of equipment will ensure that the design efficiency will be perpetuated in the long term.

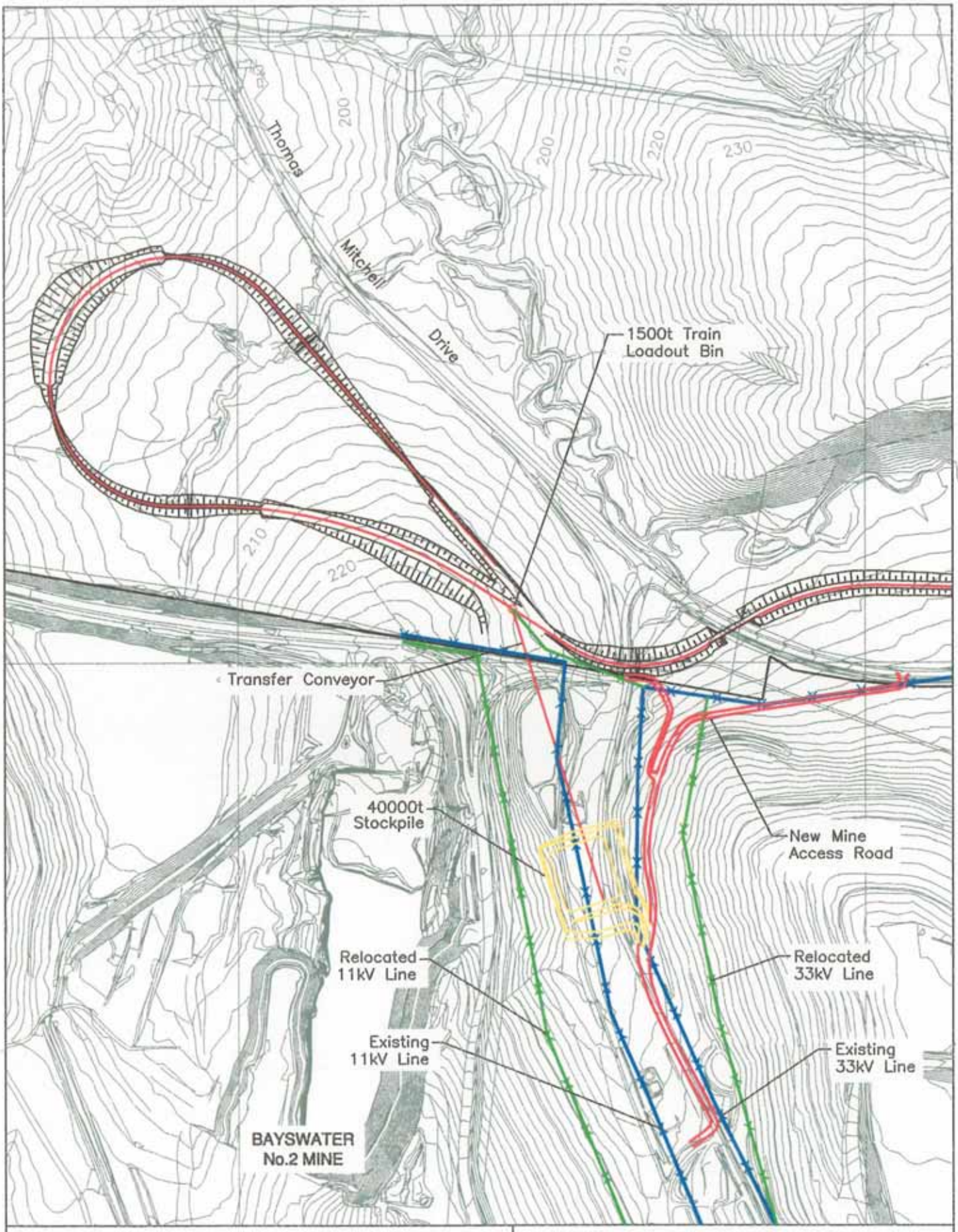
3.3.2 Drayton Rail Loading Facility

3.3.2.1 Continued Use of Existing Infrastructure

Drayton Rail Loop

As discussed in **Section 3.1.2**, the approved production of Drayton mine is presently 3.3 Mtpa. The Drayton Coal development application will seek planning approval to operate the Drayton Rail Loop to transport up to 7 Mtpa of coal from the loop to the Antiene Rail Spur, and for the use of the Antiene Rail Spur up to a limit of 20 Mtpa. This approval will provide capacity for increased saleable export production from the Drayton mine and from the proposed Saddlers Creek mine, if and when approval is sought and granted.

There will be no additional infrastructure or construction work as a result of any Drayton Coal approval, however, ongoing track maintenance will be required. This work involves regular inspections of the tracks and replacement of wooden sleepers with concrete sleepers on a progressive basis, as required. This maintenance activity is restricted to the rail track and does not involve any site disturbance. There would be no increase in peak train movements, however, the number of days on which train movements occurred would increase.



Legend

Existing 11kV & 33kV Overhead Line

Approximate Alignment of Relocated 11kV & 33kV Overhead Line

Umwelt (Australia) Pty Limited
Source: Bateman Brown & Root Dwg No.'s 20-E-052 & 20-E-053

FIGURE 3.4

Proposed High Voltage Transmission Line Relocation

A4 Scale: 1:8 000

Ref No.:1323/R01/dra_029.dwg

The Drayton Coal proposal will excise the existing Drayton Rail Loop from its existing mining lease and establish the Drayton Rail Loop as a Common User Facility for use by Drayton mine and the proposed Saddlers Creek mine.

Antiene Rail Spur

The Antiene Rail Spur was constructed, pursuant to the Drayton Coal development consent, by the Antiene Joint Venture, which comprised Drayton Coal and Electricity Commission of NSW as the then owner of the Mount Arthur North Project. The Antiene Joint Venture, which operated under a former joint venture agreement, constructed the spur and it has operated under the management of Drayton Coal since 1982. The Antiene Joint Venture Agreement provided for an additional loop for a Mount Arthur North Project to utilise the Antiene Rail Spur. This loop was never constructed or formalised in any way. Drayton Coal has now purchased the interest of the Electricity Commission of NSW in the Antiene Joint Venture and is the sole owner of its assets including the Antiene Rail Spur. The proposal addressed in this EIS includes the use of the Antiene Rail Spur by Drayton mine and the proposed Saddlers Creek mine, as well as by the Bayswater Rail Loading Facility.

3.3.2.2 Proposed Future Rail Loading Capacity

There will be no additional rail infrastructure or construction work as a result of the Drayton Coal proposal and ongoing track maintenance will be continued. There will be no increase in peak train movements on the Drayton Rail Loop, however, the number of days on which train movements occur will increase from approximately 107 up to approximately 227.

3.3.2.3 Coal Stockpile Arrangements

There will be no change to the existing coal stockpile arrangements at Drayton coal mine.

3.3.2.4 Workforce and Hours of Operation

There will be no change to the existing workforce and hours of operation at Drayton Mine. However, the number of days of operation of the Drayton Rail Loadout Facility will increase from approximately 107 up to approximately 227.

There will be no change to the existing operational requirements, such as water supply and waste disposal, described in **Section 5.2**.

3.3.2.5 Energy Conservation Measures

There will be no change to the existing energy conservation measures adopted at Drayton mine. These include regular maintenance of equipment, replacement of faulty equipment, and use of energy efficient machinery and methods.

3.3.2.6 Construction

No construction activity is required for the Drayton proposal. Noise control works involving minor modifications to the cladding on the rail loadout bin are discussed in **Section 4.5**.

3.4 ALTERNATIVES AND JUSTIFICATION FOR THE PROPOSAL

3.4.1 Alternatives

3.4.1.1 Alternative Coal Transport Technologies

Use of the Antiene Joint User Rail Facility by COAL and Drayton Coal mines for export coal haulage is preferred because:

- it utilises the existing rail infrastructure which has been established at substantial capital cost; and
- it removes Bayswater coal trucks from the public road system, thereby minimising potential environmental impacts associated with this haulage.

Continuation of coal haulage by road from Bayswater mine to Ravensworth Coal Terminal is not considered a viable alternative except under emergency circumstances. Both the community and government agencies have a strong preference for haulage of coal via the rail system.

It is also proposed to continue transport of domestic coal by the existing Macquarie Generation overland conveyor to the Macquarie Generation power stations. The capital cost associated with upgrading the overland conveyor from Bayswater mine to Bayswater power station and extending the conveyor from Bayswater power station to Ravensworth Coal Terminal in order to transport the likely future export coal production from Bayswater mine and Mount Arthur North mine, if approved, is not economically viable. Similarly extension of the Drayton overland conveyor to Ravensworth Coal Terminal or another loading point on the Main Northern Railway is neither cost effective or an efficient use of existing rail infrastructure.

As discussed in **Section 3.4.1.3**, alternative transport arrangements involving use of the Drayton Rail Loop for rail loading of Bayswater coal, such as road haulage via private haul road or overland conveyor from Bayswater No. 2 to Drayton mine are not considered viable as Drayton Rail Loop does not have sufficient capacity to transport the required tonnage from both Bayswater and Drayton mines, and the proposed production from Mount Arthur North and Saddlers Creek mines, if approved.

Alternatives have been considered for increasing the capacity of the existing Drayton Rail Loading Facility for export coal transported to the Port of Newcastle or other locations. However, there are a number of limitations to this approach. Firstly, the use of one rail loop to transport coal to port places greater restrictions on the ability of both mines to meet shipping schedules than the concurrent use of two loops. Secondly, as the existing rail loop has restricted throughput capacity, a second concentric rail loop would be required to meet the projected throughput tonnages from both COAL and Drayton Coal operations. The construction of this second loop on the Drayton site would result in COAL's saleable product being controlled by an industry competitor, which is not considered to be a commercially acceptable outcome. It would also require realignment of Thomas Mitchell Drive at considerable expense. On this basis, use of the Drayton Rail Loading Facility by COAL is not considered economically feasible.

COAL plans to increase both the stockpile capacity and method of reclamation of the proposed Bayswater Rail Loading Facility if the Mount Arthur North mine is approved. Expansion plans include increasing the stockpile capacity from 40000 tonnes to 1000000 tonnes and changing from reclamation by bulldozer to reclamation by luffing stacker. Such

expansion of the stockpile and conveyor capacity will be addressed in the Mount Arthur North EIS.

3.4.1.2 Alternative Rail Alignments

During feasibility investigations for this project, three alternative alignments were considered for the Bayswater Rail Loading Facility (**Figure 3.5**). One of these options was an alignment located entirely along the southern side of Thomas Mitchell Drive (Option A). This option was desirable as no railway bridges or creek crossings were required. However, on more detailed analysis this option was discarded because the narrow corridor between Thomas Mitchell Drive and the Drayton Rail Loop would require realignment of Thomas Mitchell Drive in order to allow construction of the Bayswater Rail Loop. In addition, due to the nature of the topography along this alignment, extensive quantities of fill would be required and a substantial rail overpass or underpass would be required to allow continued access to the Drayton maintenance pad (refer to **Figure 3.1**). These design constraints made this option cost-prohibitive.

The second option was an alignment located mainly on the northern side of Thomas Mitchell Drive, with the balloon loop located over Thomas Mitchell Drive, east of the A171 area (Option B). This alignment had the advantage of a shorter track length and a more favourable cut and fill balance. However, two railway bridges and one underpass were required. Despite the shorter rail length, there was no significant cost advantage associated with this alignment.

The third option also involved the majority of the rail line being north of Thomas Mitchell Drive, with the balloon loop situated in the A171 area (Option C), as outlined for the preferred route (refer to **Section 3.3.1**). Although the track length was considerably longer with this alignment, only two railway bridges were required and an acceptable cut and fill balance was achievable. However, in order to minimise the grade and curvature of the track, the rail corridor was located in the drainage line of Ramrod Creek. After more detailed consideration of archaeological and water management issues, this option was modified to the preferred option discussed above, to ensure that a minimum buffer of 40 metres was maintained from the Ramrod Creek bank, apart from the creek crossing location.

Options involving use of existing service corridors, such as Thomas Mitchell Drive or Wire Lane, were not considered viable due to the cost of relocating Thomas Mitchell Drive and the steep grades along Wire Lane. All other options involve disturbance of woodland vegetation.

Road over rail bridges are not a viable alternative due to the cost of realigning Thomas Mitchell Drive and the resultant steep grades along the rail line.

3.4.1.3 Alternative Rail Loading Infrastructure, Site Layout, Mine Access Road and Stockpile Arrangements

The locations of rail loading infrastructure, site layout, mine access road and stockpile for the proposed Bayswater Rail Loading Facility are guided by:

- the distance from the existing Bayswater mine facilities; which is minimised by the existing locations;
- optimisation of proximity to existing facilities and road safety factors in selection of the location of the new access road intersection with Thomas Mitchell Drive;
- minimal visual exposure;

- minimal impact on archaeology; and

- selection of locations which do not cause unacceptable environmental impact in terms of surface disturbance and off-site impacts such as noise, dust and visual considerations.

The alternative of loading Bayswater coal using a new loadout bin on the existing Drayton Rail Loop is not viable as the existing Drayton Rail Loop does not have adequate capacity to transport the existing annual coal production from both Drayton and Bayswater mines, as well as the projected production from Mount Arthur North mine and Saddlers Creek, if approved.

Determination of the preferred rail alignment discussed in **Section 3.4.1.2** has largely governed the location of the rail loading infrastructure. The location of the coal stockpile has been selected to coincide with the area approved under the 1994 development consent for the Bayswater No 3 mine. The adopted site layout optimises the environmental and operational considerations by locating infrastructure within or adjacent to the existing mining lease, which is close to existing operations; primarily in disturbed areas with low habitat value; within the existing water management system; and close to the existing rail infrastructure.

All alternative locations for the rail infrastructure are not considered preferable in comparison to use of the Bayswater No. 2 site, in either environmental or operational terms.

3.4.1.4 Alternative Electricity Supply

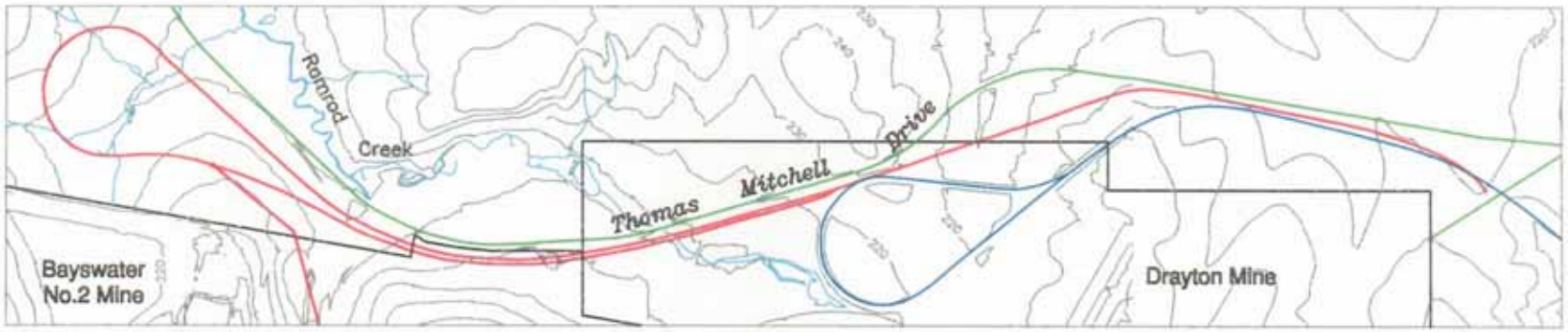
The proposed means of electricity supply for the proposed Bayswater Rail Loading Facility is to utilise the existing New South Wales electricity grid high voltage transmission lines that pass through the Bayswater No. 2 site, as described in **Section 3.3.1.8**. Diesel generators will provide emergency power supply, however it is expected that this backup system will be rarely required. Utilisation of centrally produced electricity is considered to be preferable to on-site generation of electricity fuelled by either diesel or petrol as there are lower maintenance costs and less potential for environmental impacts associated with bulk storage of fuel and operational noise.

The capital cost to establish alternative sources of electricity generation such as solar, wind or biomass is considered to be prohibitive given the relatively small amount of electricity required and the current price structure of commercially available systems.

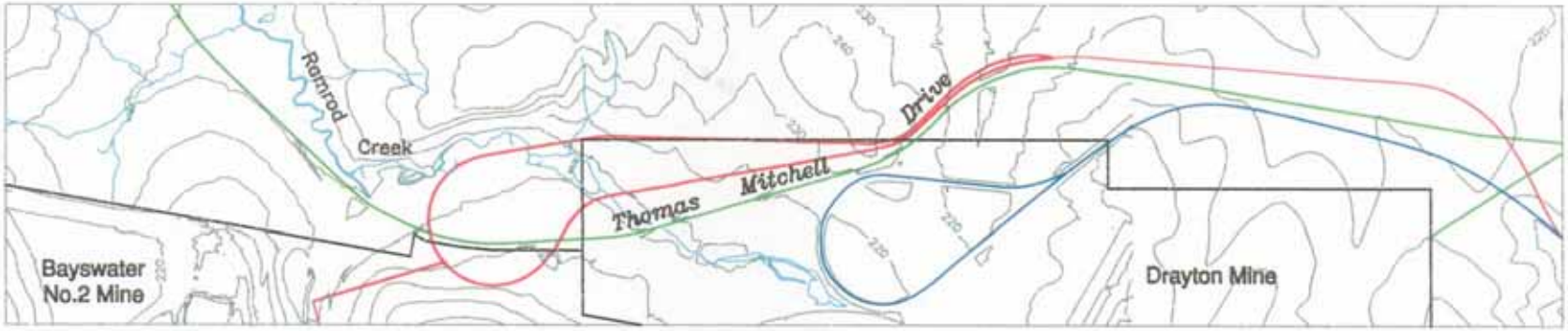
The capital cost to convert the Drayton Rail Loading Facility's existing mains power supply to any alternative method of power generation is prohibitive.

3.4.1.5 Alternative Waste Disposal Arrangements

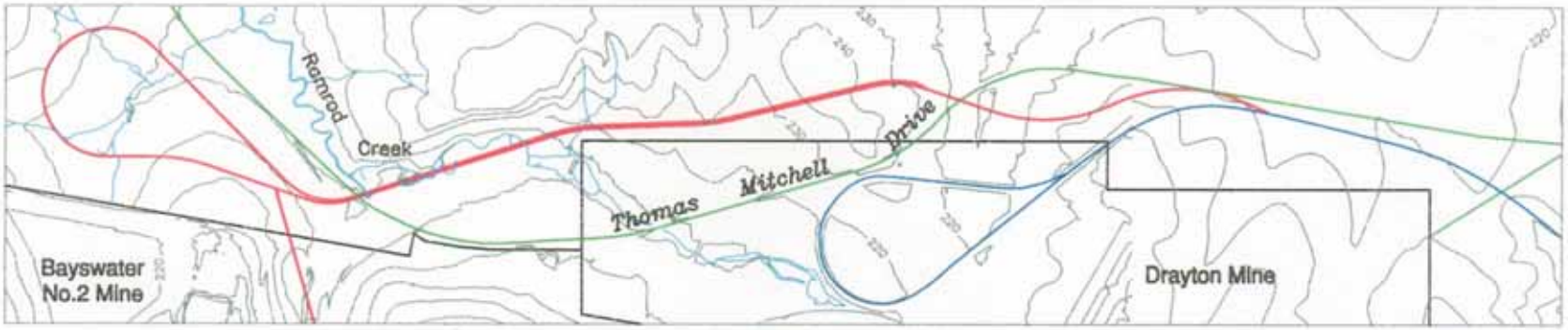
The proposed Bayswater Rail Loading Facility will generate very little waste, as there are no production processes involved in the transport of coal and only two employees will operate the facility. Sewage generated by these employees will be treated on-site, while solid waste will be disposed of to a Council approved landfill. Similarly, at the existing Drayton Rail Loading Facility very little waste is generated by the transport of coal. At the Drayton facility, collection and treatment of sewage and solid waste is incorporated into the existing waste management system for the entire site. Waste oil and grease generated at both mines is collected for recycling.



Option A



Option B



Option C

Legend

- Existing Rail Loading Infrastructure
- Proposed Rail Loading Infrastructure
- Mine Lease Boundary
- Creeks
- Surface Contours

0 0.25 0.5km

Contour Interval 10m

FIGURE 3.5
Alternative Rail Alignments

A4 Scale: 1:22 000

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Alternative waste disposal methods, such as disposal in-pit or disposal to an unapproved landfill off-site, are not considered acceptable from either an environmental or operational perspective.

3.4.1.6 Alternative Staging and Rehabilitation Measures

The proposed staging and rehabilitation methods to be employed during construction of the Bayswater Rail Loading Facility are described in **Sections 3.3.1.13** and **3.3.1.14**. Staging of construction is yet to be finalised, but will be designed to minimise the area of soil exposed at any given time. The rehabilitation methods employed at Bayswater mine have been developed over a number of years in response to site specific trials and conditions. The resultant rehabilitation program for the Bayswater Rail Loading Facility is based on this prior knowledge. Continual improvement in the rehabilitation methods adopted at Bayswater mine are expected as the results of ongoing trials become available. This adaptive rehabilitation program based on site-specific experience is considered preferable.

As there will not be any additional site disturbance at the Drayton rail facility rehabilitation will be restricted to the existing mining operation, which is not the subject of this EIS.

3.4.1.7 Alternative of Not Proceeding

If the Antiene Joint User Rail Facility were not to proceed, there would be the following implications:

- Drayton mine would not be able to fully utilise the capacity of existing rail transport infrastructure to transport the projected coal production to markets. This would restrict the production from the mine, potentially reducing the economic viability of the mine; and

- Bayswater mine would not have ongoing consent to transport export coal after 1 July 2001, when the requirement to cease road haulage becomes effective. This could cause either temporary or permanent closure of the mine.

The implications of not proceeding are not in the local, regional or national interest.

3.4.2 Justification for the Preferred Option

3.4.2.1 Coal Transportation Needs, Approvals and Market Demand

Both Drayton and Bayswater mines produce coal for domestic and export markets. Domestic coal is currently transported directly to Macquarie Generation power stations by overland conveyor, while export coal must be transported to the Port of Newcastle or other locations via the public transport network. Transportation of coal by rail provides an efficient and reliable method of getting coal to Port, while still providing sufficient flexibility to enable the mines to meet often erratic shipping schedules.

Both the Drayton and Bayswater mines have approvals to undertake open cut mining operations, however operation of the mines is contingent upon the ability to sell the product. Without an effective method of transportation, the respective mining companies will be unable to continue to supply their market demand and would be unable to operate.

3.4.2.2 Socio-economic Considerations

Social and economic impacts of the proposal are discussed in **Section 4.15**. Analysis of these impacts indicates that the proposed Antiene Joint User Rail Facility will have little impact on

social infrastructure of the Muswellbrook area, including housing and accommodation services, as there will be approximately 60 short term construction jobs and no permanent jobs created as a result of the proposal. The temporary population increase of approximately 18-45 individuals that may occur during construction is marginal and thus will not place any strain on existing social services.

An increase in population of any magnitude, however, will result in a positive economic impact, through employee and industry expenditure and municipal and state finances. In addition, the significant capital expenditure associated with construction of the Bayswater Rail Loading Facility will generate revenue for rail supply and service industries and State and Federal governments, and have a positive effect on local businesses and communities both through direct supply of services and indirect flow-on effects.

3.4.2.3 Environmental Considerations

This assessment has comprehensively addressed potential environmental impacts associated with the Antiene Joint User Rail Facility. Environmental impacts have been assessed for each project component, being increased coal transportation using the existing Drayton Rail Loop and construction and operation of the Bayswater Rail Loading Facility, as well as the cumulative impacts associated with the entire project and adjoining development (**Section 4.0**).

These investigations have determined that there are aspects of the project that will require careful management to minimise environmental impacts. Management principles and ongoing monitoring procedures are summarised in **Sections 4.0** and **5.0**. Legislative controls are also discussed in **Section 5.0**. The environmental impact assessment has determined that all potential environmental constraints can be appropriately managed to enable operation of the Antiene Joint User Rail Facility.

3.4.2.4 Ecologically Sustainable Development

The principles of ecologically sustainable development, which must be considered in the environmental impact assessment process, are:

- the precautionary principle;
- inter-generational equity;
- conservation of biodiversity and ecological integrity; and
- valuation and pricing of resources.

The Precautionary Principle

The Intergovernmental Agreement on the Environment 1992 defines the precautionary principle as:

> *"Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation".*

Application of the precautionary principle to rail transport proposals needs to ensure that there has been careful evaluation of the proposal and that decision making for the proposal has been predictable and transparent. This environmental impact statement documents the extensive and careful evaluation of project components. Detailed assessment of all potential

impacts and necessary management procedures has been conducted and is also comprehensively documented in this Environmental Impact Statement.

The decision making process for the design of the proposed development and proposed management procedures has been predictable and transparent in the following respects.

- All relevant government authorities and landholders potentially affected by the proposed development were consulted during environmental impact statement preparation. This enabled comment and discussion regarding potential environmental impacts and proposed environmental management procedures (refer to **Section 1.4**).

  A Planning Focus Meeting was held to facilitate adequate government authority consultation. The Planning Focus Meeting involved presentation of available project details and environmental impact assessment. Key issues of concern were discussed and mechanisms were established to enable further discussion with individual authorities, in order to resolve any outstanding matters.

  The community was initially consulted through direct mailing which provided project detail in addition to an invitation to provide comment on the proposal and issues to be considered in Environmental Impact Statement preparation. Individual consultations were also held with residents within the immediate vicinity of the proposed development and a number of community groups. This process enabled potential issues of concern to be raised and progressively reported and discussed during Environmental Impact Statement preparation. Specific meetings were also held with key government agencies or landholders with particular concerns in order to resolve details regarding particular issues of concern.

- Annual Environmental Management Reports are prepared for the current operations at Drayton and Bayswater mines (refer to **Section 5.0**). These reports incorporate details of site environmental management, monitoring and environmental response procedures. Current environmental management and monitoring at Bayswater and Drayton mines is consistent with best management practice and the proposed Antiene Joint User Rail Facility will incorporate these standard practices together with the additional controls proposed in **Sections 4.0** and **5.0**. The responsibilities of the proponents and government agencies for environmental management and enforcement of the proposed development are clearly identified in **Section 5.0** of this document.

Inter-generational Equity

A key objective in project construction and operation will be overall project management and investment in plant and equipment that minimises pollution and waste and is energy efficient. The implementation of this objective will help to ensure that the current standard of environmental amenity is maintained or improved for future generations.

Conservation of Biodiversity and Ecological Integrity

All environmental characteristics and habitat values that could be affected by the proposal are described in this document. Likely environmental impacts on these characteristics and values have been assessed and measures proposed to be implemented to minimise these potential impacts are also described in **Sections 4.0** and **5.0**.

Compensatory habitat will be provided to mitigate the impact of habitat loss due to construction of the proposed Bayswater Rail Loading Facility. Areas disturbed during construction of this rail loading facility will be revegetated in order to minimise the long term effects on biological diversity. Where possible, recyclable and recycled materials and

water will be used in the operation and all employees will be educated regarding waste minimisation, reuse and recycling.

Improved Valuation and Pricing of Resources

The proposed development will improve the valuation and pricing of the Bayswater and Drayton mines' coal resources by:

- providing for optimal transportation of currently available resources to existing markets;
- providing coal transportation infrastructure for future coal mining operations within the area, which will enable COAL and Drayton Coal to compete for long term supply contracts;
- transporting all possible saleable coal within the working areas within economic, technical and environmental constraints;
- reduced haulage costs through increased tonnages and use of the more efficient rail transport methods will improve profitability and competitiveness of these export orientated resources, and mining areas;
- avoiding isolation and sterilisation of coal through the appropriate route selection and location of surface infrastructure; and
- continually reviewing coal transportation and environmental factors in order to optimise coal transport, value and price.

4.0 ANALYSIS OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 IDENTIFICATION AND PRIORITISATION OF ENVIRONMENTAL ISSUES

4.1.1 Proposed Bayswater Rail Loadout Infrastructure

Identification and prioritisation of environmental issues for the proposed Bayswater Rail Loading Facility is based on consideration of the key features of the locality, community and authority consultation, review of previous investigations conducted in the area, and completed environmental studies. On this basis, key issues for this project that have been addressed in detail as part of the environmental impact assessment process are:

- justification of the need for the project and why the Drayton Rail Loading Facility cannot be used (refer to **Section 3.4**);
- potential noise and air quality impacts (refer to **Sections 4.4** and **4.5**);
- potential flora and fauna impacts, particularly within the eastern section of the proposed rail corridor which traverses woodland (refer to **Section 4.9**);
- potential visual/lighting impacts for users of Thomas Mitchell Drive (refer to **Section 4.12**);
- archaeology impacts on identified sites within A171 and potential sites within the remainder of the proposed rail corridor (refer to **Section 4.11**);
- soil and water management, particularly during construction activities and for the section of the proposed rail loading infrastructure that traverses Ramrod Creek and existing water management structures on the Bayswater No. 2 mine site (refer to **Section 4.7**); and
- roads and traffic management during construction of the railway overpasses across Thomas Mitchell Drive (refer to **Section 4.3**).

4.1.2 Increased Tonnage through Drayton's Existing Rail Loop

The key issues associated with the proposed operation of Drayton Coal joint user facility and the transport of coal from Drayton mine are:

- potential noise and vibration impacts (refer to **Section 4.4**);
- potential air quality impacts (refer to **Section 4.5**); and
- potential coal transport impacts (refer to **Section 4.3**).

Environmental issues for the increased tonnage through the existing Drayton transport infrastructure are limited to these issues as no additional areas of land will be disturbed and there will be no change to the current daily coal loading rate.

4.2 ENVIRONMENTAL PERFORMANCE OF EXISTING TRANSPORTATION OPERATIONS

Existing air quality data indicate that the performance of both Drayton and Bayswater transport operations is in compliance with relevant goals for dust deposition and concentration. Further details of air quality goals and the existing air quality environment in the vicinity of the proposed development are provided in **Sections 4.4.1** and **4.4.2**.

The existing noise environment associated with the transport of coal by road from Bayswater mine is below the relevant noise criteria. Noise associated with the loading of trains from the Drayton Rail Loading Facility requires reduction to achieve the EPA noise design goals for the currently proposed operation (refer to **Section 4.5**).

Road and rail coal haulage from both Bayswater and Drayton mines utilises existing internal haul roads, the existing public road route to Ravensworth Coal Terminal and the existing rail route to the Port of Newcastle. The haulage of coal along these existing transportation routes has a negligible impact on soils, flora and fauna, hydrology and water quality, visual amenity, and Aboriginal and European heritage.

Existing road transportation from Bayswater coal mine, along the public road network to Ravensworth Coal Terminal is not preferred on a long term basis due to the ongoing road and traffic impacts. The proposed construction and operation of the Bayswater Rail Loading Facility will rectify this situation (refer to **Section 4.3**).

4.3 TRANSPORT AND TRAFFIC ISSUES

4.3.1 Road Traffic Impacts

4.3.1.1 Traffic Impacts During Construction

Traffic Volume

As discussed in **Section 3.3.1.13**, construction of the Bayswater Rail Loop and associated infrastructure will be undertaken over a period of approximately 12 months. Traffic impacts associated with construction activity will include increased traffic volumes due to transport of labour, materials and equipment to and from the site. In addition, there will be interruptions to traffic flow on Thomas Mitchell Drive during construction of the two rail-over-road bridges and transport of approximately 30000 tonnes of excavated material from the northern side of Thomas Mitchell Drive to form the railway embankment at the turnout from the Antiene Rail Spur.

The construction workforce is estimated to be 55-66 employees. Based on the conservative assumption that each member of this workforce travels to the site by private motor vehicle, the peak one-way passenger movements in and out of the Bayswater mine site will be 66 vehicles per hour. Heavy vehicle traffic during construction is estimated to be 70 vehicle movements per day, or 11 peak hour vehicle movements. In addition, the existing peak Bayswater traffic consists of 90 passenger car movements and 60 coal haulage truck movements per hour (Umwelt 1999).

Comparison of existing peak hourly traffic volumes (**Table 4.1**) with the level of service (LOS) of Thomas Mitchell Drive (**Table 4.2**) indicates that Thomas Mitchell Drive currently operates at LOS C, as determined by the method detailed in AUSTROADS (1998a). The level of service is a measure of the percentage of time delayed and the average travel speed

based on factors such as the sight distances, terrain, lane and shoulder width, and percentage of heavy vehicles on a particular road. The percentage increase in traffic volumes on Thomas Mitchell Drive during the construction period is also shown in **Table 4.1**. This percentage does not affect the level of service of Thomas Mitchell Drive, which will remain at existing levels during the construction phase (**Table 4.3**).

Table 4.1 - Daily Traffic Flows - Thomas Mitchell Drive during Bayswater Rail Loop Construction

Location	Existing Traffic			Construction Traffic			Percentage Increase		
	Average Daily Traffic Volume[1]	Peak Hourly Traffic Volume[2]	Average Weekly Traffic Volume	Average Daily Traffic Volume[3]	Peak Hourly Traffic Volume	Average Weekly Traffic Volume	Average Daily Traffic Volume	Peak Hourly Traffic Volume	Average Weekly Traffic Volume
Denman side of Bayswater mine access road	1102	165	7714	60	24	420	5.4	14.5	5.4
Highway side of Bayswater mine access road	2041	306	14287	142	47	994	7.0	15.4	7.0

1 *Traffic counts undertaken during 1998-9 for Bayswater Statement of Environmental Effects (Umwelt 1999)*
2 *15% of AADT in accordance with Figure 2.11, Part 3, AUSTROADS 1988*
3 *Assuming 35% of workforce and 20% of heavy traffic approaches from the Denman side and 65% of workforce and 80% of heavy traffic approaches from the highway side, based on Muswellbrook District Mining Industry and Employee Survey (COAL 1999).*

Table 4.2 - Existing Road Capacity Thomas Mitchell Drive

Level of Service	Per cent Time Delayed	Average Speed (km/h)	Road Capacity (vph)
A	<30	>93	71
B	<45	>88	164
C	<60	>83	301
D	<75	>80	448
E	>75	>72	879

Note: *vph is vehicles per hour*
Source: *AUSTROADS (1988a)*

Table 4.3 - Level of Service before and during Construction

Location	Scenario	Traffic Volume (vph)	Level of Service
Denman side of Bayswater mine access road	Existing Traffic	165	C
	Construction + Existing Traffic	189	C
Highway side of Bayswater mine access road	Existing Traffic	306	D
	Construction + Existing Traffic	353	D

vph - vehicles per hour

New Access Road

Based on the traffic data reported in Umwelt (1999), peak hourly traffic volumes at the intersection of Thomas Mitchell Drive and the existing Bayswater mine access road, are 90 vehicles per hour for passenger vehicles and 60 vehicles per hour for coal haulage traffic. During the construction phase, it is estimated that peak hourly traffic at this intersection may increase to approximately 156 and 71 for passenger and heavy vehicles, respectively. All traffic will use the new access road, once constructed (refer to **Figure 3.2**). To accommodate estimated peak traffic volumes, particularly during the construction phase, and to offset restricted sight distance for east-bound traffic approaching the intersection, it is proposed that a NAASRA Type B intersection will be constructed to provide access to the proposed new mine access road from Thomas Mitchell Drive (**Figure 4.1**) (refer to **Section 4.3.1.2**).

Temporary Road Closures

During emplacement of the bridge centre spans it will be necessary to temporarily close Thomas Mitchell Drive. It is anticipated that one closure will be required for each bridge and that each closure will last approximately four hours. Notification of road closure will be co-ordinated with Muswellbrook Shire Council and will include notification of emergency services and posting of signs on the New England Highway and Denman Road, at least one week prior to closure.

Temporary road closures will also be required to transfer approximately 30000 tonnes of fill from the northern side of Thomas Mitchell Drive to the southern side. It is estimated that road closures during transport of this material will be of approximately five minutes duration.

Appropriately qualified traffic controllers will be employed to direct traffic during these closures.

4.3.1.2 Traffic Impacts to Thomas Mitchell Drive Following Construction

Bridges

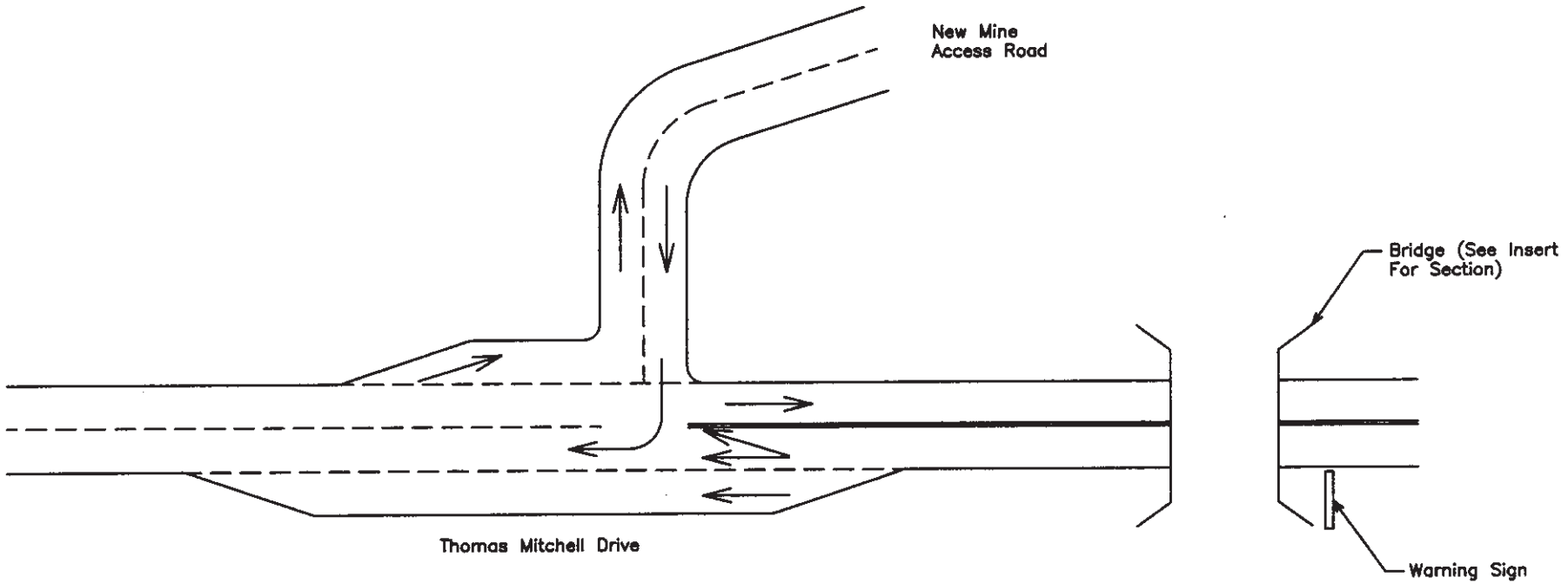
As discussed in **Section 3.4.1.2**, two rail-over-road bridges will be constructed at the locations where the rail line intersects Thomas Mitchell Drive (refer to **Figure 3.2**). The construction of these bridges over Thomas Mitchell Drive will provide additional traffic constraints. Sight distances for vehicles turning from the new Bayswater access road into the east-bound lane of Thomas Mitchell Drive will be reduced from in excess of 500 metres to approximately 250 metres.

Both bridges across Thomas Mitchell Drive will have a minimum vertical clearance of 5.5 metres and a minimum horizontal clearance to the bridge pylons of 25 metres. The horizontal clearance to the bridge abutments will be a minimum of 40 metres (refer to **Figure 4.1**).

On the approach to the bridge near the new Bayswater access road, sight distance along Thomas Mitchell Drive will be in excess of 300 metres.

Access Road Intersection

The proposed intersection of the new Bayswater access road and Thomas Mitchell Drive will be located approximately 500 metres east of the existing intersection, as shown on **Figure 3.2**. Sight distance to the intersection for vehicles travelling west along Thomas Mitchell



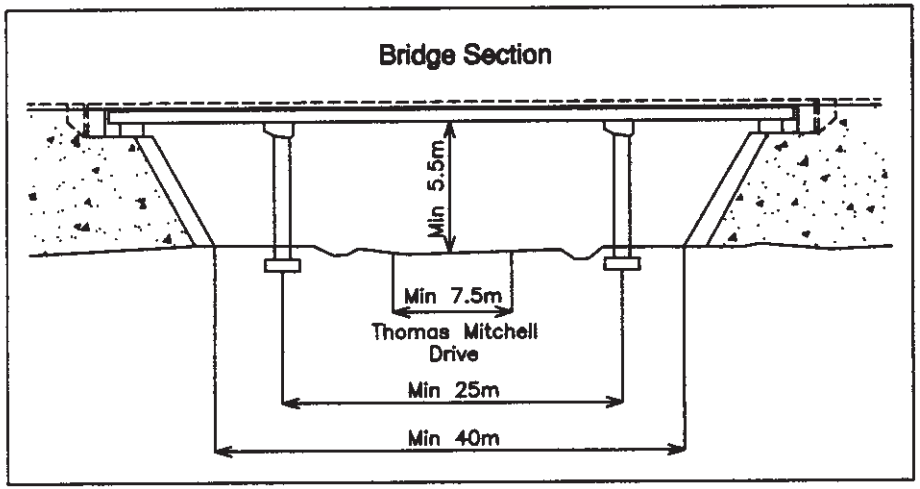


FIGURE 4.1
Proposed Bayswater Access Road
Intersection Treatment &
Typical Bridge Clearance

Scale: N.T.S

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Umwelt (Australia) Pty Limited
Source: Bateman Brown & Root

Drive will be in excess of 500 metres, however, sight distance for east-bound traffic approaching the intersection will be limited to approximately 250 metres by the double track rail-over-road bridge. This sight distance complies with minimum requirements for safe intersection sight distance (SISD) of 250 metres, detailed in AUSTROADS (1988b). In addition, it is proposed that a sign be erected on the western side of the bridge to alert east-bound vehicles to the presence of the new access road intersection.

Haulage of Coal

Once the Bayswater Rail Loading Facility is established, coal will no longer be hauled by road between Bayswater mine and Ravensworth Coal Terminal. It is anticipated that it will take 12 months to commission the new transportation system. Up until this time, coal haulage trucks will continue to use the existing access route and the traffic impacts associated with the continuation of coal haulage by road will be the same as the existing situation described in **Section 3.2.1**.

Commissioning of the Rail Loading Facility for transportation of Bayswater coal will significantly reduce the volume of traffic on Thomas Mitchell Drive between the Bayswater access road and the New England Highway (**Tables 4.4** and **4.5**).

Table 4.4 - Daily Traffic Flows on Thomas Mitchell Drive during Operation

Location	Existing Traffic			Post-Commissioning Traffic			Percentage Decrease		
	Average Daily Traffic Volume[1]	Peak Hourly Traffic Volume[2]	Average Weekly Traffic Volume	Average Daily Traffic Volume[3]	Peak Hourly Traffic Volume	Average Weekly Traffic Volume	Average Daily Traffic Volume	Peak Hourly Traffic Volume	Average Weekly Traffic Volume
Denman side of Bayswater mine access road	1102	165	7714	1102	165	7714	0	0	0
Highway side of Bayswater mine access road	2041	306	14287	975	146	6825	47.7	47.7	47.7

1 Traffic counts undertaken for Bayswater Statement of Environmental Effects (Umwelt 1999)
2 15% of AADT in accordance with Figure 2.11, Part 3, Austroads 1988
3 Assuming 35% of workforce and 20% of heavy traffic approaches from the Denman side and 65% of workforce and 80% of heavy traffic approaches from the highway side

Table 4.5 - Level of Service of Thomas Mitchell Drive before and after Commissioning

Location	Scenario	Traffic Volume (vph)	Level of Service
Denman side of Bayswater mine access road	Existing Traffic	165	C
	Post-commissioning Traffic	165	C
Highway side of Bayswater mine access road	Existing Traffic	306	D
	Post-commissioning Traffic	146	B

4.3.1.3 Traffic Impacts to New England Highway Following Construction

Current road haulage from Bayswater mine is estimated to generate approximately 257480 truck movements annually on the New England Highway between Thomas Mitchell Drive and Ravensworth Coal Terminal. Based on the 1999 traffic estimates, articulated heavy vehicles account for approximately 26 per cent of all traffic on this stretch of the New England Highway, of which 10 per cent of total traffic may be attributed to Bayswater mine during a coal haulage campaign. The New England Highway is constructed and maintained at a sufficient standard and capacity for these levels of heavy traffic.

As a result of construction of the Bayswater Rail Loading Facility as proposed, Bayswater mine will no longer haul coal by road to Ravensworth Coal Terminal and as such there will be a substantial reduction in the number of heavy vehicles currently using the New England Highway. This will be of significant benefit to other users of the New England Highway and those residing adjacent to the highway, as well as potentially reducing expenditure on highway maintenance. It is estimated that, based on 1999 traffic levels, after planned commission of the facility in 2001, the percentage of articulated vehicles using the New England Highway at Ravensworth will decrease from 26 per cent to approximately 17 per cent.

4.3.1.4 Contingency Provisions

In the event of breakdown on the rail system, contingency provisions to avoid the need for road haulage involve the establishment of substantial coal stockpile areas at Bayswater No. 2 approved under the 1994 development consent (refer to **Section 3.1.1**). As such, considerable flexibility exists in terms of stockpiling coal to allow for continuation of mining during breakdown in the conveyor or rail system. If the conveyor or rail spur were required to cease operation for repairs, it would generally be only for a matter of days and for such a period there would be adequate stockpile capacity at Bayswater to allow continued operations. In extreme situations, such as breakdowns during a ship loading campaign, if the need to employ alternative means of coal transport does arise, written permission will be sought from Council, Roads and Traffic Authority and the Department of Urban Affairs and Planning.

4.3.2 Rail Traffic Impacts

Under the *Transport Administration Amendment (Rail Corporatisation and Restructuring) Act 1996*, four government authorities are responsible for managing various components of the rail system in NSW (Trudeau & Associates 1997):

- FreightCorp provides coal haulage services;
- Rail Access Corporation is responsible for rail infrastructure;
- Rail Services Australia supplies goods and services to the rail industry; and
- State Rail Authority operates passenger services.

An assessment of the ability of the rail network to absorb the projected increase in coal transport volumes was undertaken by the Hunter Valley Railway Task Force in late 1997 (refer to **Section 2.2.5**). The report of the Task Force estimated that a 30 per cent increase in coal haulage by rail is likely within the next five years and this increase can be accommodated with moderate growth in train numbers due to the increasing use of longer trains (Trudeau & Associates 1997).

Rail Access Corporation advises that the current coal transport on the Main Northern Railway is 68 Mtpa and that the projected increase to 84.7 Mtpa as a result of the additional 16.7 Mtpa (as 3.3 Mtpa is already contributed by Drayton Coal) proposed to be transported along the Antiene Rail Spur can be accommodated using the existing rail network (Neill Bencke, Rail Access Corporation, pers. comm., 2000). However, it should be noted that this maximum annual tonnage of 20 Mt will only be achieved if the Mount Arthur North project is approved, and even if approved will not be achieved for approximately five years from the date of approval. Should the proposed Antiene Joint User Rail Facility be approved, the combined maximum tonnage transported from Bayswater No. 3 and Drayton coal mines is likely to be 8.5 Mtpa (5 Mtpa from Drayton and 3.5 Mtpa from Bayswater). Of this 8.5 Mtpa, 5.2 Mtpa will be additional to the existing 3.3 Mtpa transported by Drayton Coal on the rail network north of Ravensworth Coal Terminal, and 1.7 Mtpa will be additional to the existing 6.8 Mtpa transported by Drayton Coal and COAL south of Ravensworth Coal Terminal.

4.3.2.1 Rail Traffic Impacts During Construction

During construction, rail traffic impacts will be limited to the connection of the proposed Bayswater Rail Loop to the Antiene Rail Spur, the installation of signalling equipment and the transportation of some construction materials (rail track and sleepers) to the site.

The turn out from the Antiene Rail Spur to the Bayswater Rail Loop will be constructed after completion of bulk earthworks, approximately six months after commencement of construction, and will take approximately one week. During this period it will not be possible for coal haulage traffic to enter the Drayton Rail Loop. Agreement has been reached with Drayton Coal that this construction activity will be undertaken during a period when Drayton is not engaged in a coal haulage campaign. As there will be no trains travelling on the Antiene Rail Spur during this period, construction of the turn out point will not result in any impacts to rail traffic, including rail safety and maintenance.

It is anticipated that there will not be any delays to rail traffic during installation of signalling. As the signalling system is to be integrated with the Rail Access Corporation's (RAC) existing network, installation will be co-ordinated with RAC, and will conform to RAC's stringent safety requirements.

The transportation of construction materials to the site by rail is expected to have a negligible impact on rail traffic as only one train will be required to deliver materials to the site.

4.3.2.2 Rail Traffic Impacts During Operation

Antiene Rail Spur and Main Northern Railway

The proposed development will lead to an increase in peak daily train trips of nine (18 train movements) as a result of the Bayswater Rail Loading Facility. There will be no increase in the peak number of trains per day on the Drayton Rail Loop due to the limited capacity of the existing rail loadout infrastructure (refer to **Section 3.2.2.1**). The existing number of peak train trips per day on the Antiene Rail Spur is six, or 12 train movements, with an average of 107 days of train movements per year. The peak number of trains per day on the Antiene Rail Spur during concurrent operation of the Bayswater and Drayton rail loops will be 15 train trips, or 30 train movements. The peak hourly train traffic on the Antiene Rail Spur will be two train trips, or four train movements. Assuming that 20 Mtpa of coal are transported along the Antiene Rail Spur in 120000 tonne campaigns to meet shipping demands, a total of 167 campaigns per year will be undertaken. These 167 campaigns will generate 6346 train movements per annum. With concurrent loading on both loops, and assuming the average number of trains per day during a campaign is 75 per cent of the peak

daily train traffic, these 6346 train movements on the Antiene Rail Spur will occur on approximately 282 days per year.

This increased number of days of operation of the Antiene Rail Spur has the potential to restrict access to residences on the northern side of Antiene Road, near the junction of the Antiene Rail Spur and the Main Northern Railway (refer to **Figures 2.4** and **4.22**), as access to these residences is via a level crossing. Interviews with residents in the area revealed that access is occasionally blocked at this location when trains travelling east on the Antiene Rail Spur are stopped at a signal (Signal No. 58) prior to entering the main Northern Railway. Rail Access Corporation has agreed to amend the signal procedures manual so that the signal located to the west of the level crossing (Signal No. 60) is the priority signal for access to the Main Northern Railway, which will prevent trains from stopping across the level crossing.

The capacity of the existing rail network, and the existing and proposed traffic volumes are given in **Table 4.6** and **Table 4.7**, respectively. Comparison of these data indicates that the proposed increase in rail traffic as a result of the development will significantly increase the volume of coal traffic on the Main Northern Railway between Antiene and Singleton, with a lesser increase between Singleton and Newcastle. This decreased impact further down the line is due to the larger volume of rail traffic contributed by mines in the lower Hunter Valley, including 3.3 Mtpa of coal from Bayswater mine, which is transported by rail south of Ravensworth Coal Terminal. Rail Access Corporation has advised that it has no concerns relating to the proposed increase in rail traffic, as this increase is within the capacity of the existing rail network. (Neill Bencke, Rail Access Corporation, pers. comm., 2000).

Table 4.6 - Capacity of Existing Rail Network

Section of Line	Total daily train paths in each direction	Current allocation of train paths in each direction			
		Coal	Grain	Other Freight	Passenger
Muswellbrook – Antiene	28-30	11-12	5-6	7	5
Antiene – Singleton	52-53	35	5-6	7	5
Singleton – Maitland	67-68	50	5-6	7	5
Maitland – Newcastle	126-127	53	5-6	19	49

Source: ERM Mitchell McCotter (1997)
Note: Other freight includes cotton, minerals and general freight

Table 4.7 - Existing and Proposed One-way Coal Traffic Volumes

Section of Line	Capacity	Peak Coal Traffic Volume (trains per day)			Percentage Increase
		Existing	Proposed	Projected Total	
Muswellbrook – Antiene	10-12	10	0	10	0
Antiene – Singleton	35	16	9	25	56
Maitland – Newcastle	53	35	9	44	26

Source: Trudeau & Associates 1997

Port Waratah Coal Terminal

In February 2000, Port Waratah Coal Services Pty Ltd (PWCS) advised that the existing capacity of the Port Waratah Coal Terminal (PWCT) is 77 Mtpa and that an expansion program is currently underway to increase capacity to 89 Mtpa. The current expansion is

scheduled for completion in September 2001 (Vic Duggan, PWCS, pers. comm., 2000). On the basis of coal transport data provided by RAC, the PWCT has adequate capacity to accommodate the short term increase in coal tonnage from 68 Mtpa to 71.7 Mtpa (the additional 3.7 Mtpa proposed to be transported from the Drayton loader). Once the current expansion is completed, PWCT will have adequate capacity to accommodate the sum of the existing coal tonnage and the maximum coal haulage tonnage from the Antiene Joint User Rail Facility (ie 84.7 Mtpa) (refer to **Section 4.3.2**). The location of the PWCT in relation to the proposed development is shown in **Figure 4.2**.

In addition, PWCS advise that there is adequate space at the PWCT to accommodate any future increase in coal production from other mining operations within the Hunter Valley. However, as expansion at the PWCT is undertaken on an as-needs basis, approval to further expand the facility has not yet been sought.

4.4 AIR QUALITY

A comprehensive assessment of air quality impacts as a result of the proposed development is provided in **Appendix 4** and summarised in this section.

4.4.1 Air Quality Goals

The NSW Environment Protection Authority (EPA) specifies two classes of air quality goal relevant to coal transport operations. These relate to dust deposition and dust concentration levels. Dust deposition levels refer to the quantity of dust particles, which settle out from the air as measured in grams per square metre per month (g/m^2/month) at a particular location. Dust concentration refers to airborne dust and is measured in micrograms per cubic metre ($\mu g/m^3$). Further discussion of the various classes of dust is provided in **Appendix 4**.

4.4.1.1 Dust Deposition

The EPA expresses dust deposition criteria in terms of an acceptable increase in dust deposition over the existing background deposition levels. These EPA goals are summarised in **Table 4.8**. For example, in residential areas with annual average dust deposition levels of between 0 and 2 g/m^2/month an increase of up to 2 g/m^2/month would be permitted before it is considered that a significant degradation of air quality had occurred.

Table 4.8 - EPA Goals for Dust Deposition (Insoluble Solids)

Existing dust fallout level (g/m^2/month)	Maximum acceptable increase over existing fallout levels (g/m^2/month)	
	Residential	Other
2	2	2
3	1	2
4	0	1

4.4.1.2 Dust Concentration

Relevant EPA criteria for dust concentration are defined in terms of two classes of dust concentration, those being total suspended particulate matter (TSP) and PM_{10}. TSP relates to all suspended particles which are usually in the size range of zero to 50 micrometres (μm). Particle sizes larger than 50 micrometres are measured in dust deposition levels. PM_{10} refers to particulate matter with a diameter less than 10 μm. TSP measurements include PM_{10} particles.

$PM_{2.5}$ particles refer to dust in the particle size range of 0 to 2.5 µm. In recent studies in the United States, it has been found that exposure to $PM_{2.5}$ dust particles is most strongly correlated to health effects. In situations where mining is the dominant dust source, it has been shown that PM_{10} particles generally comprise 50 per cent of TSP and $PM_{2.5}$ particles generally comprise 6 per cent of TSP (refer to **Appendix 4**).

NSW EPA goals for dust concentration are referred to as long term (annual average) and short term (24 hour maximum) goals. The NSW EPA refers only to goals in relation to TSP and PM_{10} and these are outlined in **Table 4.9** in relation to both current standards and interim goals proposed for future implementation at a regional level. The US EPA has adopted goals in regard to $PM_{2.5}$ particles (refer to **Table 4.9**) and these have also been used in assessment of this project.

Table 4.9 - Air Quality Standards/Goals for Particulate Matter Concentrations

Parameter	Air Quality Goal
TSP – Total suspended particulate matter	Long Term Goal (annual mean) • 90 µg/m^3 - maximum level that should not be exceeded in urban environments. • No short term goals are applied.
PM_{10} - Particulate matter less than 10 µm	Long Term Goal (annual mean) • 50 µg/m^3 – current standard. • 30 µg/m^3 - NSW EPA long term reporting goal. Short Term Goal (24 hour maximum) • 150 µg/m^3 - current standard - should not be exceeded more than once per year. • 50 µg/m^3 – NEPM reporting goal - should not be exceeded more than five times per year.
$PM_{2.5}$ - Particulate matter less than 2.5 µm	Long Term Goal (3 year average) • 15 µg/m^3 - US EPA goal. Short Term Goal (24 hour maximum) • 65 µg/m^3 - US EPA goal.

4.4.2 Existing Air Quality

Monitoring programs conducted as part of the environmental management for the existing Bayswater and Drayton operations have produced a substantial database on existing ambient air quality conditions. In addition, six high volume samplers were used to calibrate the predictive model for this project. The locations of these sampling sites are shown in **Figure 4.3**. This section reviews these data and discusses appropriate air quality goals.

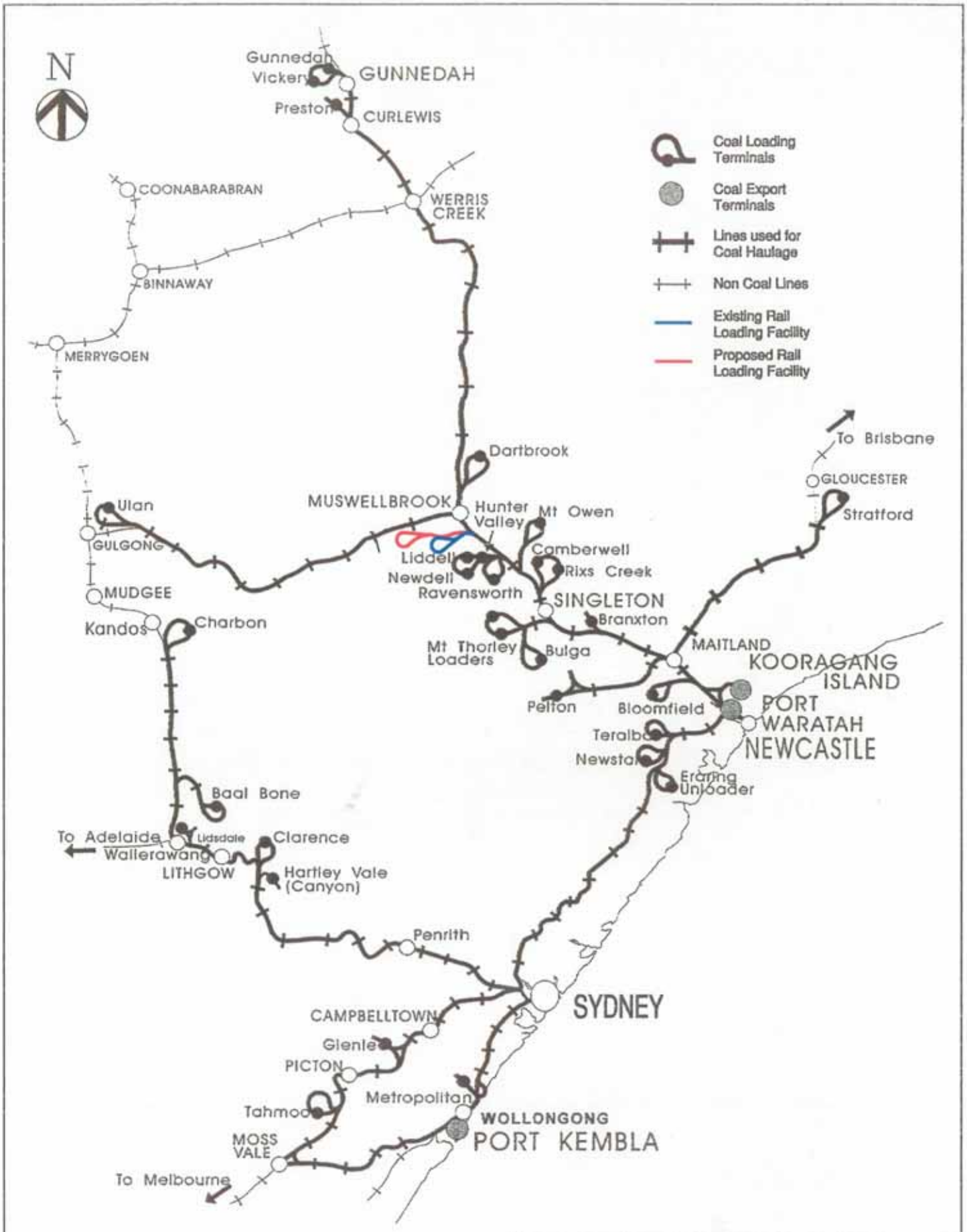


FIGURE 4.2
N.S.W Rail Coal Network

Umwelt (Australia) Pty Limited
Source: Trudeau & Associates

Scale: N.T.S

Ref No.:1323/R01/dra_036.dwg

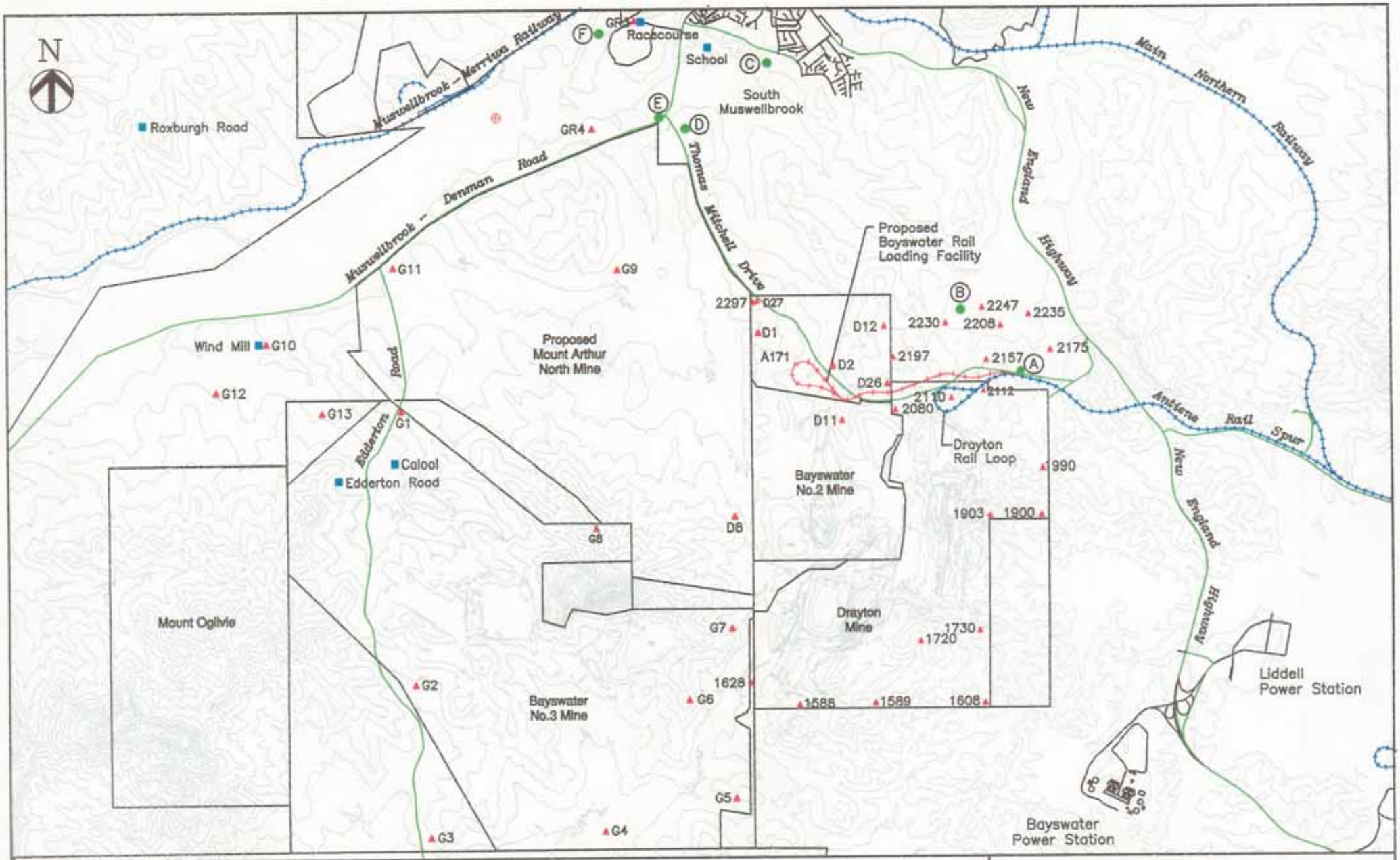


FIGURE 4.3
Air Quality and
Noise Monitoring Locations

A4 Scale: 1:86 000 | Ref No.:1323/R01/dra_009.dwg

4.4.2.1 Dust Deposition

Dust deposition levels have been measured at 14 locations surrounding the proposed Antiene Joint User Rail Facility (refer to **Figure 4.3**). Results of the dust monitoring program from January 1994 to October 1999 are detailed in **Appendix 4** and summarised in **Table 4.10**.

Table 4.10 - Dust Deposition Data for Bayswater No. 2 (1994-8) and Drayton (1994-9) mines (g/m^2/month)

Year	D1	D2	D8	D11	D12	D18	D26	D27	2197	2230	2247	2208	2235	2175
1994	3.2	2.4	2.3	3.5	2.0	1.6	1.9	1.9	2.46	1.85	1.31	2.71	1.45	2.82
1995	2.1	1.8	2.3	3.0	1.5	-	2.9	1.8	2.97	1.02	1.02	1.49	2.19	1.56
1996	2.5	1.8	2.3	1.8	1.2	-	2.2	1.5	3.08	1.60	0.95	1.86	1.69	1.50
1997	2.1	3.2	2.5	2.9	2.9	-	3.7	1.9	2.10	1.43	1.22	2.60	0.98	1.43
1998	3.2	3.5	3.5	3.3	2.2	-	3.0	1.9	1.87	1.08	2.11	2.29	1.00	2.03
1999									3.16	1.18	1.15	1.50	1.10	1.61

The majority of monthly and annual averages are below 3 g/m^2/month, which is below the EPA goal for annual average dust deposition of 4 g/m^2/month reported in **Table 4.8**. Increases of between 1 and 2 g/m^2/month due to the proposed facility would therefore be acceptable given existing dust deposition levels.

4.4.2.2 Concentration

Average 24 hour dust concentration levels from three stations within the Drayton monitoring network are reported for the period 1996-9 (**Table 4.11**). This sampling program measured total suspended particulates (TSP), from which PM_{10} data were inferred. The highest annual average dust concentration was 87.5 $\mu g/m^3$ recorded at the Drayton meteorological station in 1997, whilst the lowest annual average dust concentration was 13.3 $\mu g/m^3$ recorded at Antiene Lot 9 in 1998. All annual TSP and PM_{10} concentrations are within the EPA air quality goals of 90 $\mu g/m^3$ and 50 $\mu g/m^3$, respectively.

Table 4.11 - Annual Average 24 hour TSP (inferred PM_{10}) Concentrations ($\mu g/m^3$)

Site	1996	1997	1998	1999
Oval	-	51.9 (20.7)	42.3 (16.9)	51.1 (20.4)
Lot 9 (Antiene)	57.9 (23.2)	25.0 (10.0)	13.3 (5.3)	19.3 (7.7)
Meteorological Station	58.1 (23.2)	87.5 (43.8)	42.7 (17.1)	48.0 (19.2)

4.4.2.3 Bayswater Operations

Bayswater mine currently transports coal by truck to Ravensworth Coal Terminal for rail loading. The majority of the internal roads from the product coal stockpile area to Thomas Mitchell Drive are sealed. These roads are regularly washed down to remove accumulated dirt and coal deposited from truck tyres. This minimises the amount of material tracked onto Thomas Mitchell Drive, in addition to minimising potential dust generation from trucks travelling over accumulated sediment on the sealed road during dry periods. The roads surrounding the product coal stockpiles are not tar sealed but are regularly watered, when subject to haul traffic, as required by Bayswater Colliery Company's EPA licence.

Bayswater Colliery Company has an automatic weighbridge, which will not register the truck load if it is over the maximum allowable load weight. This is a very effective means of ensuring that the contract truck drivers do not overload their trucks, as they are only paid for the weighbridge registered loads. Ensuring that the trucks are not overloaded minimises coal

spillage from trucks, which in turn reduces the potential for air quality impacts whilst also reducing the potential road safety hazards associated with coal spillage. In accordance with EPA licence conditions and industry best practice, all truck loads that exit the site are also covered by tarps to avoid coal spillage and potential for dust impacts along the haul route.

4.4.2.4 Drayton Operations

Coal is transported by truck to the coal stockpile and transferred from there to the Drayton Rail Loop. Dust generation from the Drayton coal transportation operations is minimised by regular application of water to internal haul roads and the coal stockpile. The wagons used in the FreightCorp fleet have been designed with a narrow aperture, which assists in limiting dust generation during rail transportation.

4.4.3 Air Quality Impact Assessment

The proposed development essentially involves two phases: construction and operation. The earthworks construction phase will be of nine months duration (excluding the last three months of the 12 month construction period, during which no earthworks will be undertaken). During this phase air emissions will be generated from the excavation, loading, transportation, emplacement and shaping of fill material.

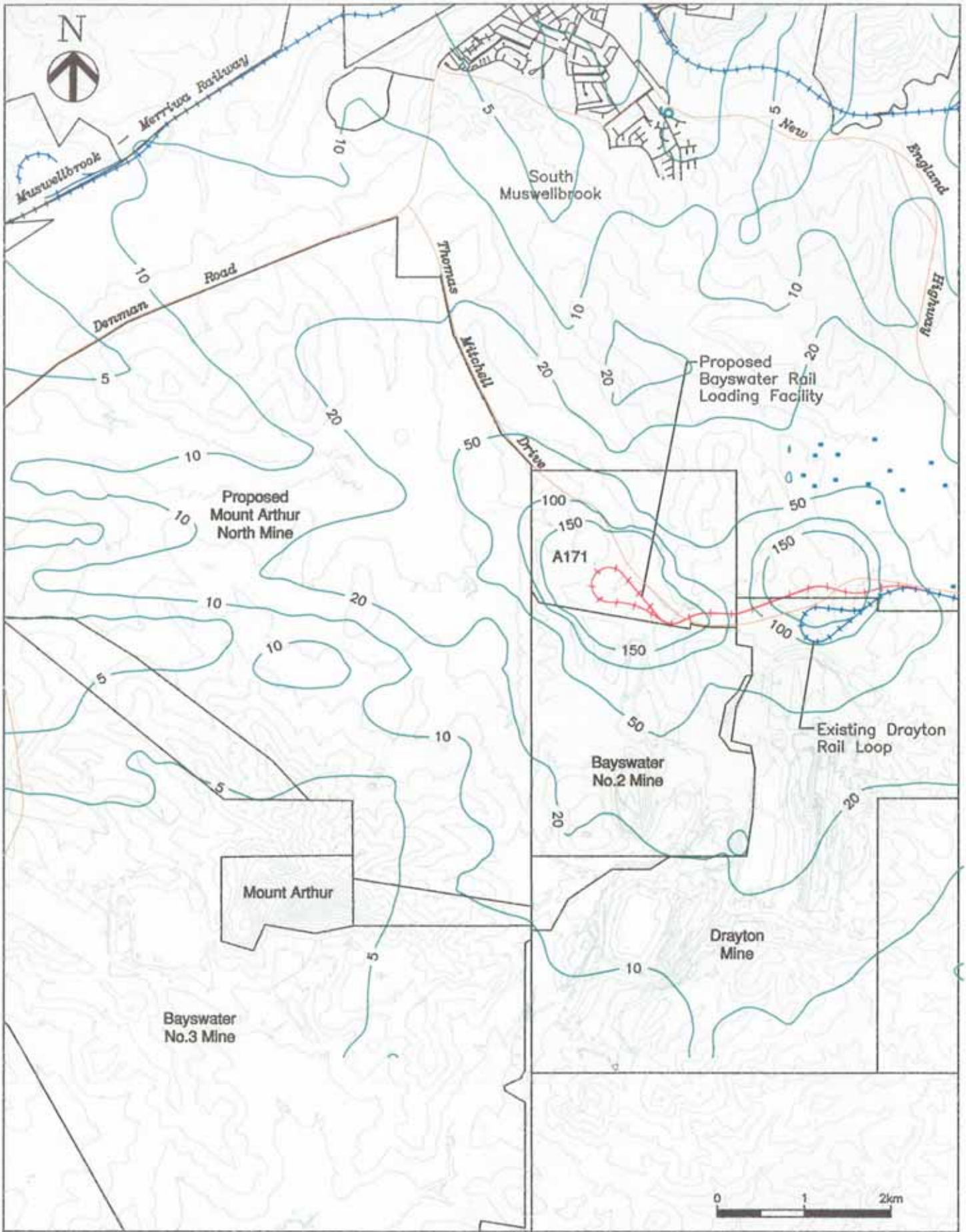
Assessment of air quality impacts as a result of the proposed development was undertaken using the short term industrial source complex model (ISC3-ST – Version 99155). Time-varying emission rates from wind erosion sources during the loading and unloading of coal, overburden and construction materials were used as input variables to the model. The adopted emission rates assume standard practices for dust suppression are implemented.

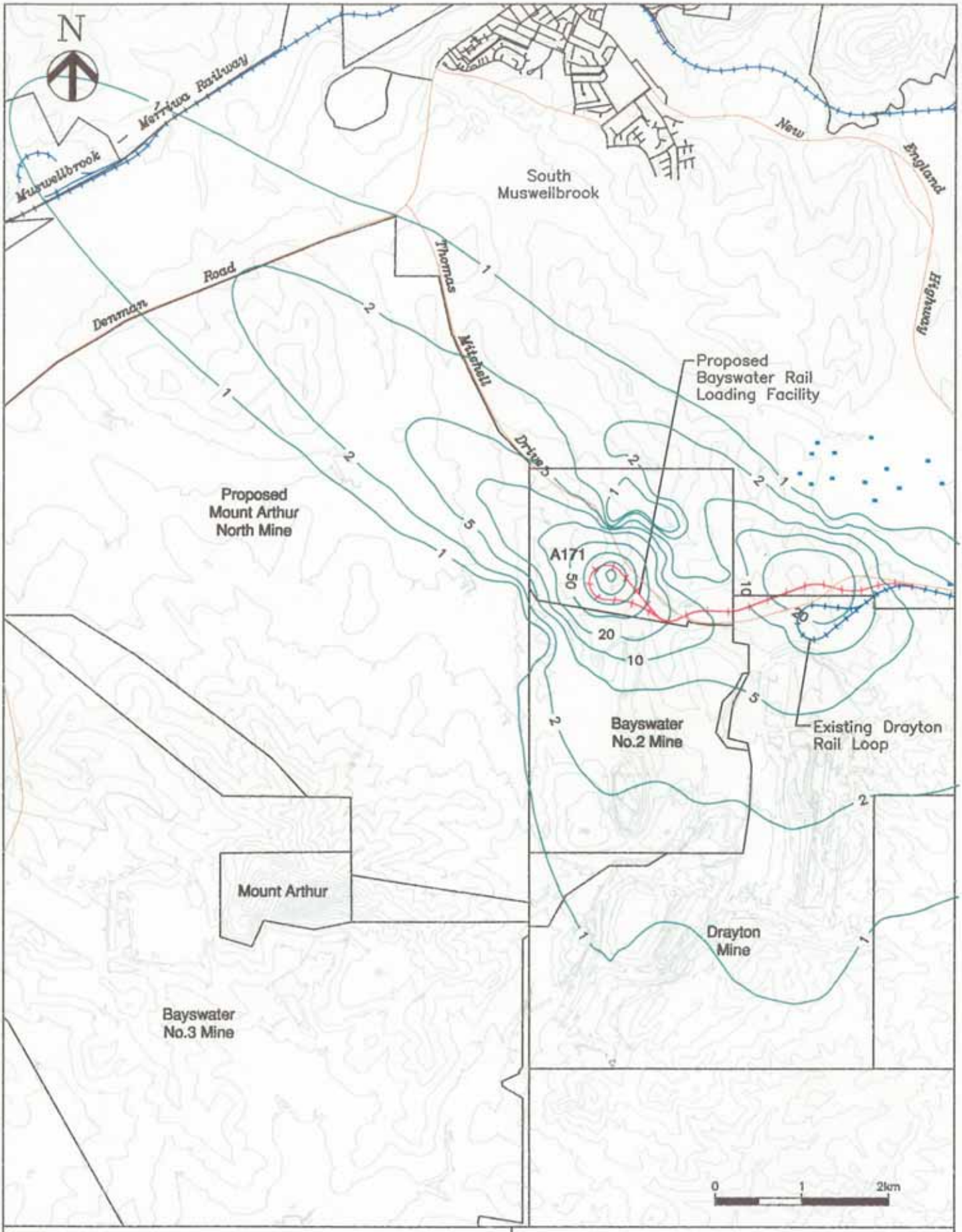
The impact of these emissions on surrounding residences is shown in **Table 4.12**. Predicted dust deposition and concentration contours for the construction period, which has the widest impact envelope, are shown in **Figures 4.4-4.7**. Contours showing the impact envelope during the operational period of the facility are contained in **Appendix 4**. Analysis of these results indicates that all long term and short term air quality goals will be met during construction of the Bayswater Rail Loop and operation of the Antiene Joint User Rail Facility.

Table 4.12 – Predicted Air Quality Impacts on Surrounding Residences

Variable	Maximum Predicted Impact at Nearest Residence		Background Level	Criterion
	Construction	Operation		
Maximum 24-hour average PM_{10} concentration ($\mu g/m^3$)	55	0.5	95	150
Annual average PM_{10} concentration ($\mu g/m^3$)	2	<0.05	23	50
Annual average TSP concentration ($\mu g/m^3$)	4	<0.05	58	90
Annual average dust deposition (g/m^2/month)	0.2	<0.01	2-3	4

Dust control measures are discussed in **Sections 5.1.3** and **5.2.3**.


N
Merriwa Railway
Muswellbrook
South Muswellbrook
New England Highway
Denman Road
Thomas Mitchell Drive
Proposed Bayswater Rail Loading Facility
Proposed Mount Arthur North Mine
A171
Existing Drayton Rail Loop
Bayswater No.2 Mine
Mount Arthur
Drayton Mine
Bayswater No.3 Mine
0
1
2km
Legend
PM10 Contours (µg/m³)
Nearest Residences
Existing Rail Loading Infrastructure
Proposed Rail Loading Infrastructure
Surface Contours
Umwelt (Australia) Pty Limited
Source: Holmes Air Sciences
FIGURE 4.4
24-hour Average PM10 Dust Emissions during Construction (µg/m³)
A4 Scale: 1:58 000
Ref No.:1323/R01/dra_046.dwg



Legend

PM10 Contours ($\mu g/m^3$)

Nearest Residences

Existing Rail Loading Infrastructure

Proposed Rail Loading Infrastructure

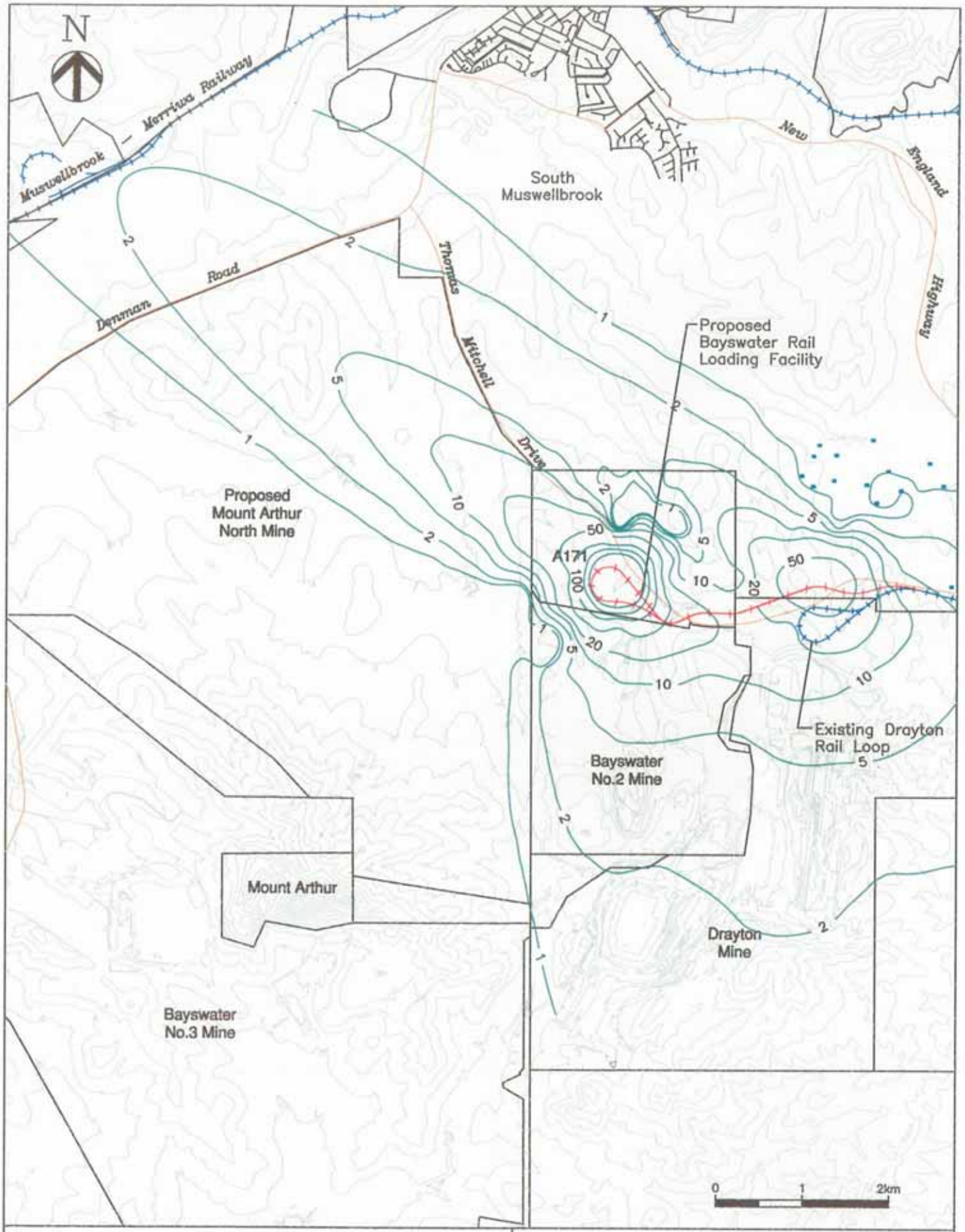
Surface Contours

Umwelt (Australia) Pty Limited
Source: Holmes Air Sciences

FIGURE 4.5

Annual Average PM_{10} Dust Emissions during Construction ($\mu g/m^3$)

A4 Scale: 1:58 000 | Ref No.:1323/R01/dra_018.dwg



Legend

PM10 Contours (µg/m³)

Nearest Residences

Existing Rail Loading Infrastructure

Proposed Rail Loading Infrastructure

Surface Contours

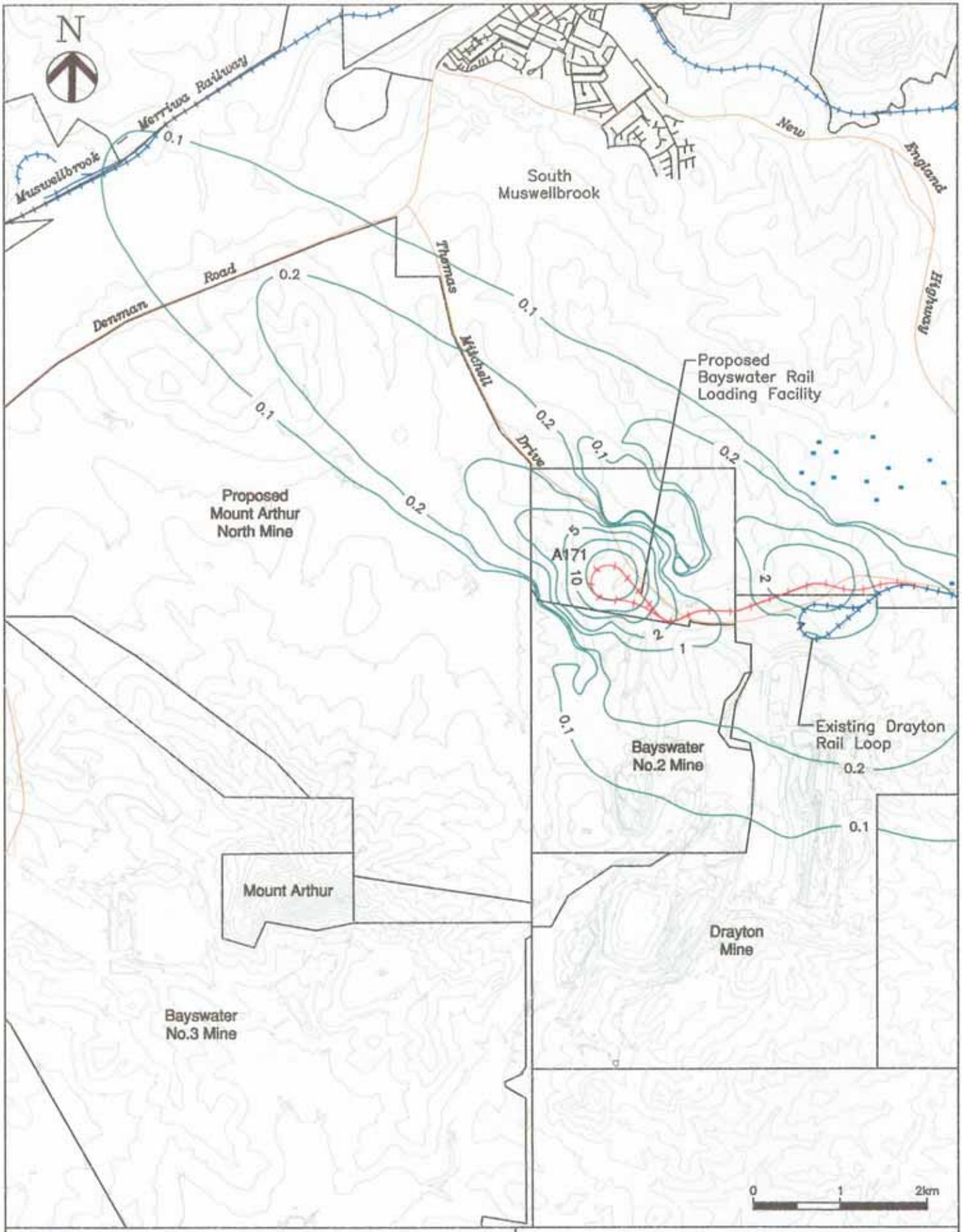
Umwelt (Australia) Pty Limited
Source: Holmes Air Sciences

FIGURE 4.6

Annual Average TSP Concentrations during Construction (µg/m³)

A4 Scale: 1:58 000

Ref No.:1323/R01/dra_019.dwg


N
Merriwa Railway
Muswellbrook
South Muswellbrook
New England Highway
Denman Road
Thomas Mitchell Drive
Proposed Bayswater Rail Loading Facility
Proposed Mount Arthur North Mine
A171
Existing Drayton Rail Loop
Bayswater No.2 Mine
Mount Arthur
Drayton Mine
Bayswater No.3 Mine
0.1
0.2
1
2
5
10
0
1
2km
Legend
PM10 Contours (µg/m³)
Nearest Residences
Existing Rail Loading Infrastructure
Proposed Rail Loading Infrastructure
Surface Contours
Umwelt (Australia) Pty Limited
Source: Holmes Air Sciences
FIGURE 4.7
Annual Average Dust Depositions during Construction (g/m²/month)
A4 Scale: 1:58 000
Ref No.:1323/R01/dra_047.dwg

4.5 NOISE AND VIBRATION IMPACT ASSESSMENT

A comprehensive assessment of noise and vibration impacts as a result of the proposed development is provided in **Appendix 6** and summarised in this section.

4.5.1 Noise Level Criteria

4.5.1.1 Operational Noise Levels

The relevant criteria for operational noise of a new development are prescribed by the NSW EPA's Industrial Noise Policy (INP) (EPA 2000). This policy defines the noise criteria for intrusiveness and amenity. The intrusiveness criterion specifies that the total L_{Aeq} noise emissions from a proposed development should not exceed the Rating Background Level (RBL) by more than 5 dBA. The amenity criterion determines the allowable noise level from a proposed development in the context of existing noise sources. In other words, the noise level that will ensure that the cumulative impact of the proposal is within acceptable limits. For rural residential areas the recommended amenity noise levels are 50 dBA, 45 dBA and 40 dBA for day, evening and night times, respectively. These levels have been reduced by 3 dBA in order to account for noise emissions from existing mining operations within the area. By ensuring that noise levels emitted by the proposed development are 3 dBA below the amenity criteria, the cumulative impact of the proposed development and existing operations will be below the amenity criteria specified above.

The appropriate guideline for noise assessment of rail traffic is the Environmental Noise Control Manual (EPA 1994), which specifies a maximum $L_{Aeq,24hr}$ criterion of 60 dBA.

4.5.1.2 Construction Noise Levels

As the construction period for the Bayswater Rail Loading Facility exceeds 26 weeks, the intrusiveness criterion for a continuously operating source applies. That is, the L_{Aeq} noise levels should not exceed the RBL by more than 5 dBA.

4.5.2 Existing Traffic Noise

Existing noise levels were monitored at six locations (refer to **Figure 4.3**) using Environmental Noise Loggers set to A-weighted, Fast Response. These loggers monitored background noise levels in blocks of 15 minutes continuously for two weeks (with the exception of location B, which was vandalised on day 6) (**Table 4.13**).

The measured Rating Background Levels and overall L_{Aeq} noise level for the existing noise environment are shown in **Table 4.14** as well as the relevant noise criteria (refer to **Section 4.5.1** for a description of these noise criteria). These results indicate that the existing transportation operations associated with Bayswater mine comply with the relevant criteria, but that transportation of coal from Drayton mine generates noise levels in excess of the relevant criteria (refer to **Sections 4.5.2.1** and **4.5.2.2** for further details).

Table 4.13 - Noise Monitoring Locations

Location	Monitoring Period(s)	Noise Sources
A: Thomas Mitchell Drive near Drayton Mine (40m from road)	15/6/99–30/6/99	Heavy vehicles on Thomas Mitchell Drive; Drayton mine
B: Balmoral Road, Antiene	10/8/99–15/8/99(1)	Heavy vehicles on Thomas Mitchell Drive; Drayton mine
C: Barnett residence, Skeletar Stock Route	15/6/99-30/6/99; 10/8/99-26/8/99	Heavy vehicles from Bayswater No 3 mine; highway trucks
D: Weber residence, Thomas Mitchell Drive & Denman Road	15/6/99-30/6/99; 10/8/99-26/8/99	Animal noises; mine noise very faint
E: Yaminee residence, Thomas Mitchell Drive & Denman Rd	15/6/99-30/6/99; 10/8/99-24/8/99	Heavy vehicles on Denman Road; occasional noise from Bengalla mine
J(2): Roxburgh residence, South Muswellbrook	10/12/99-16/12/99	Mining noise; highway trucks

(1) *Measurements truncated due to vandalism of logger*
(2) *Site numbering is based on that used for the Mt Arthur North environmental studies*

Table 4.14- Measured Rating Background Noise Levels (RBL) and L_{Aeq} Levels

Location	Period	RBL (dBA)	Overall L_{Aeq} Noise Level (dBA)	Amenity Criterion (dBA)	Intrusiveness Criterion (dBA)
A (Thomas Mitchell Drive)	Day	39	62	47	44
	Evening	42	58	43	47
	Night	47	58	37	52
B (Antiene)	Day	33	51	47	38
	Evening	36	48	43	41
	Night	33	45	37	38
C (Skeletar Stock Route)	Day	32	45	47	37
	Evening	34	45	43	39
	Night	32	40	37	37
D (Thomas Mitchell Drive & Denman Road)	Day	36	53	47	41
	Evening	33	48	43	38
	Night	32	47	37	37
E (Thomas Mitchell Drive & Denman Road)	Day	33	56	47	38
	Evening	32	53	43	37
	Night	33	55	37	38
J (South Muswellbrook)	Day	30	50	47	35
	Evening	33	55	43	38
	Night	31	44	37	36

4.5.2.1 Bayswater Operations

The movement of coal haulage trucks along Thomas Mitchell Drive is the principal contributor to noise at residential receptors as a result of the existing Bayswater coal transportation operations. However, the noise levels generated by these movements are intermittent in nature and do not exceed the relevant noise criteria

4.5.2.2 Drayton Operations

The principal contributors to noise associated with the existing method of coal transportation from the Drayton Rail Loop are the loading of rail wagons from the loadout bin and the squealing of brakes as trains approach the bin and position consecutive wagons beneath the loadout chute. Brakes are also applied on the downhill slope heading from the Drayton Rail Loop towards the railway bridge over the New England Highway. Noise levels associated with the loading of coal into wagons exceed the relevant criterion of 37 dBA at seven residences in the Antiene area. Proposed mitigation measures to reduce noise levels from the rail loading activities are discussed in **Section 4.5.3.2**. Noise levels associated with squealing of brakes do not exceed 37 dBA at any residential location.

4.5.3 Noise Impacts

4.5.3.1 Construction Impacts

Noise levels during the construction period for the proposed Bayswater rail loop were calculated using the ENM computer model and criteria detailed in the EPA's Environmental Noise Control Manual (1994). The sound power level of construction equipment and the noise level at nearby residences from short and long term construction activities are shown in **Tables 4.15, 4.16, and 4.17**, respectively.

Table 4.15 - Equipment used in Construction

Location	Equipment	Assumed L_{A10} Sound Power Level, dBA
Stockpile	Bulldozer	116
	Grader	107
	Front End Loader	113
	Dump truck	107
	Compactor	107
	Water Truck	107
	Welding Equipment	97
	Generator	103
Loadout facilities	Bulldozer	116
	Grader	107
	Front End Loader	113
	Dump truck	107
	Compactor	107
	Water Truck	107
	Crane	112
Bridge at chainage 1000	Bulldozer	116
	Backhoe	102
	Front End Loader	113
	Dump truck	107
	Crane	112
	Welding Equipment	97
	Generator	103
Rail loop construction	Bulldozer	116
	Grader	107
	Backhoe	102
	Front End Loader	113
	Dump truck	107
	Roller	106
	Compactor	107
	Water Truck	107

Table 4.15 - Equipment used in Construction (cont)

Location	Equipment	Assumed L_{A10} Sound Power Level, dBA
Short term activities	Rockbreaker	120
	Pile driver	122
	Drill	112

Table 4.16 - Noise Levels From Long Term Construction Activities

Residence	L_{Aeq} Noise Level from Construction Activities, dBA – "Neutral" Met. Conditions
1	23
2	28
3	29
4	30
5	32
6	29
7	32
8	29
9	30
10	31
11	28
12	33
13-21	< 28
CRITERION	41

Table 4.17 - Noise Levels from Short Term Construction Activities

	Calculated L_{A10} Noise Level from Construction Activities, dBA – "Neutral" Met. Conditions		
Residence	Rail Loop Construction	Rock-Breaking	Piling
1	34	34	22
2	35	36	29
3	40	41	29
4	43	44	31
5	45	46	33
6	39	39	31
7	45	46	33
8	39	39	31
9	41	41	31
10	44	45	32
11	40	41	28
12	46	47	34
13-21	< 40	< 40	< 28
CRITERION	46		

These results indicate that construction noise will be within the relevant noise criteria of 41 dBA and 46 dBA for long term and short term construction activity, respectively.

4.5.3.2 Impacts During Operation

Analysis of noise levels generated by the proposed development indicate that the night time noise criterion of 37 dBA (reduced from 40 dBA due to presence of existing industrial noise sources) will not be exceeded at any residences during operation of either the proposed Bayswater (**Figure 4.8**) or Drayton (**Figure 4.9**) loading facilities. When both loaders operate simultaneously, noise levels are within the relevant criterion of 37 dBA, with the exception of four residences (**Figure 4.10**). Exceedances at these residences are at the most 1 dBA and are considered acceptable given that these noise levels would occur only under worst-case conditions – with both loaders operating simultaneously, locomotives at worst-case locations on both loops, and under 10 per cent worst case meteorological conditions at night during winter.

The impact mitigation measures that have been included in the noise modelling are shown in **Figure 4.11** and include:

- construction of sheet steel enclosures around the train loadout bins;
- construction of an acoustic screen along a portion of the northern section of the Bayswater Rail Loop;
- use of concrete in construction of the rail-over-road bridges; and
- enclosure of the conveyors to both loadout bins.

In addition to the noise impacts of the proposed development on residences in the Antiene rural-residential area, it is anticipated that additional trains on the Main Northern Railway will increase noise levels by approximately 0.7 dBA, which meets the relevant criteria.

4.6 SOIL EROSION AND STABILITY CONSIDERATIONS

4.6.1 Soils

From east to west, the rail loop traverses the Roxburgh and Bayswater Soil Landscapes mapped on the Singleton 1:250 000 Soil Landscape Sheet (Kovac 1991). The Roxburgh Soil Landscape contains Yellow Podzolic Soils on upper to midslopes and Red Solodic Soils on more rounded hills. Lithosols occur on crests while Brown Podzolic Soils occur on slopes with conglomerate outcrop. The Bayswater Soil Landscape contains Yellow Solodic Soils, Red and Yellow Podzolic Soils and Brown Podzolic Soils on slopes while Alluvial Soils occur in drainage lines.

Field investigations confirmed the presence of these soil types and allowed definition of four soil landscapes along the rail loop route (**Figure 4.12**). Field survey methods and results are detailed in **Appendix 7**.

4.6.2 Soil Landscapes

Soil Landscape A, at the eastern end of the rail loop, is characterised by shallow, stony, yellowish duplex soils developed on sandstone and conglomerate belonging to the Branxton Formation (**Figure 4.12**). These soils comprise very dark greyish-brown, hardsetting, moderately acidic, loamy sand to fine sandy loam topsoils with well-structured medium to heavy clay subsoils. Stone content varies from less than 10 per cent to approximately 50 per

cent in some areas, depending on whether the underlying rock type is sandstone or conglomerate. Principal Profile Forms include Dy 2.21 and Dy 3.21. This soil material is only marginally suitable for topdressing because of coarse grainsize and stone content in the topsoil. However, if the top 0.3m were stripped, the combination of sandy topsoil and clayey subsoil would make a useable topdressing material.

Soil Landscape B, on gentle slopes leading down to Ramrod Creek (**Figure 4.12**), is characterised by shallow, grey-brown and red-brown duplex soils developed on sandstone, siltstone and minor conglomerate belonging to the Branxton Formation. These soils comprise dark greyish brown to dark reddish brown, hardsetting, moderately acidic sandy loam to fine sandy loam topsoils with well-structured medium to heavy clay subsoils. Principal Profile Forms include Db 2.11, Db 2.21, Dr 3.22 and Dy 3.12. Compared with the soils in Soil Landscape A, these soils are generally less stony and their topsoil texture is generally finer. Suitable material for topdressing is limited to the top 0.3m.

Ephemeral drainage lines within Soil Landscape B contain sandy loam developed on colluvial/alluvial deposits. This material is unlikely to be suitable for topdressing purposes because of its coarse grainsize and poor water-holding capacity.

Soil Landscape C, on gentle slopes bordering the southern side of Ramrod Creek, is characterised by yellow duplex soils developed on colluvial/alluvial deposits of stony silt and clay derived largely from the Skeletar Formation of the Greta Coal Measures. These soils comprise dark greyish brown, friable, slightly acidic, stony, silty clay loam topsoils underlain by well-structured, stony, light medium clay subsoils. Because of more than 60% stones in soil below the A1 horizon, only the top 0.1 to 0.2 m is suitable for topdressing material. However, local variations will occur and suitable material may extend down to 0.5m in places.

Soil Landscape D is developed on gentle to moderate slopes on the southern side of Thomas Mitchell Drive, where the balloon loop is proposed. The landscape is characterised by red and yellowish red duplex soils developed on the Rowan and Skeletar formations of the Greta Coal Measures. These soils comprise dark reddish grey to dark brown, hard-setting, slightly acidic, loam, clay loam and silty clay loam topsoils underlain by well-structured, light medium to heavy clay subsoils. Principal Profile Forms include Dr 2.12, Dy 3.12, Dy 3.31 and Dr 3.13. Stone content is variable in these soils, being generally less than 10%, but up to 30% in the topsoil in some areas. Subsoils generally lack stones. These soils are suitable for use as topdressing material, to a depth of approximately 0.3 m.

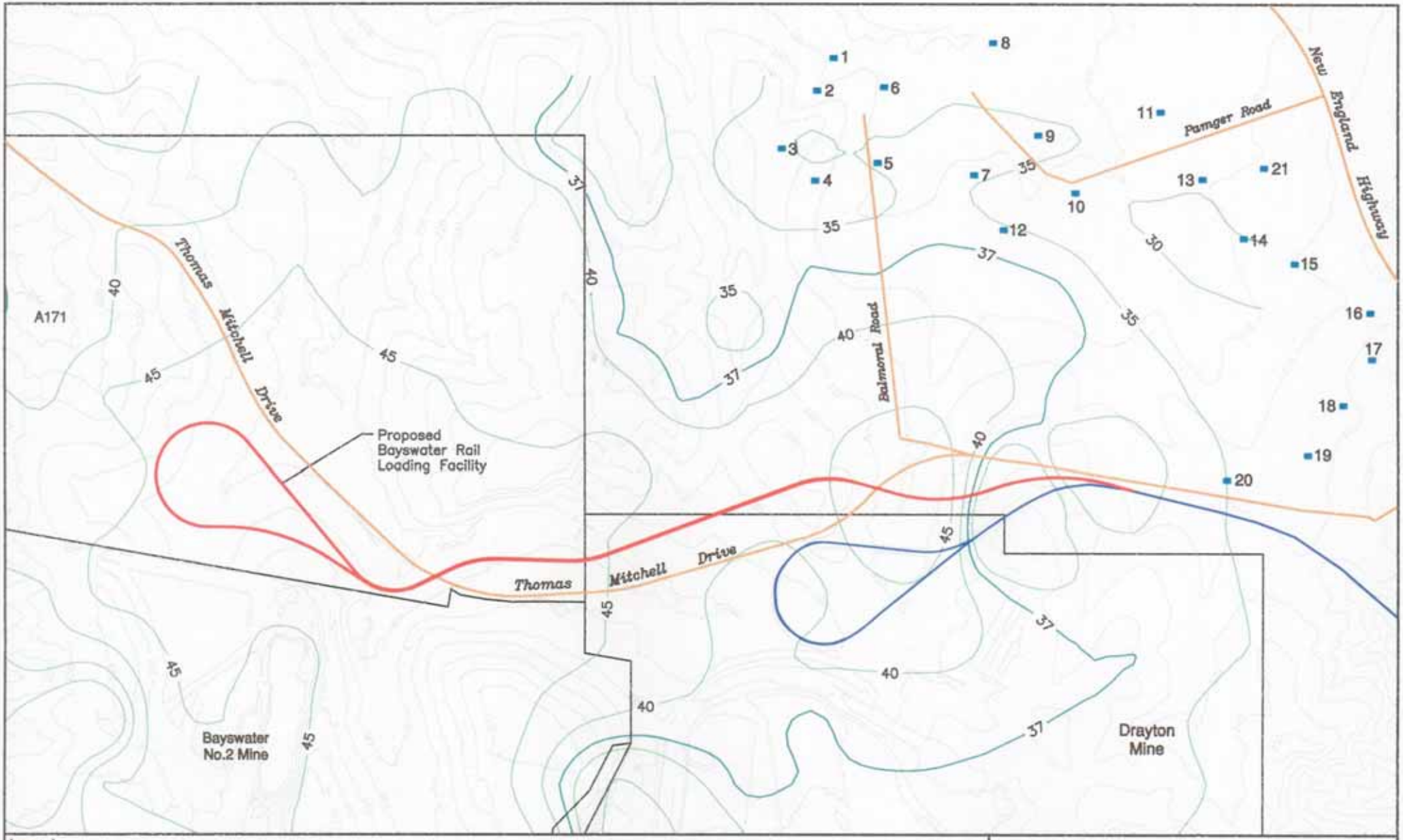
Gully erosion is developed along drainage lines associated with the unnamed tributary of Ramrod Creek, which flows in a northeasterly direction across Soil Landscape D. Testing of soil from colluvial deposits bordering this creek, indicated negligible dispersibility in the topmost 0.09 m, but high to moderate dispersibility in the underlying 0.1 to 0.8m. (Refer to Soil Profile DM08 in Table 2 of **Appendix 7**.)

4.6.3 Soil Constraints to Development

Two aspects of the soils are significant for this development:

- suitability for topdressing purposes; and
- erodibility.

As discussed in **Section 4.6.2**, most soils along the rail loop route are suitable for topdressing purposes, based on criteria developed by Elliot and Veness (1981). These criteria require coherent, structured soils which lack mottling, have peds less than 10 cm in diameter with

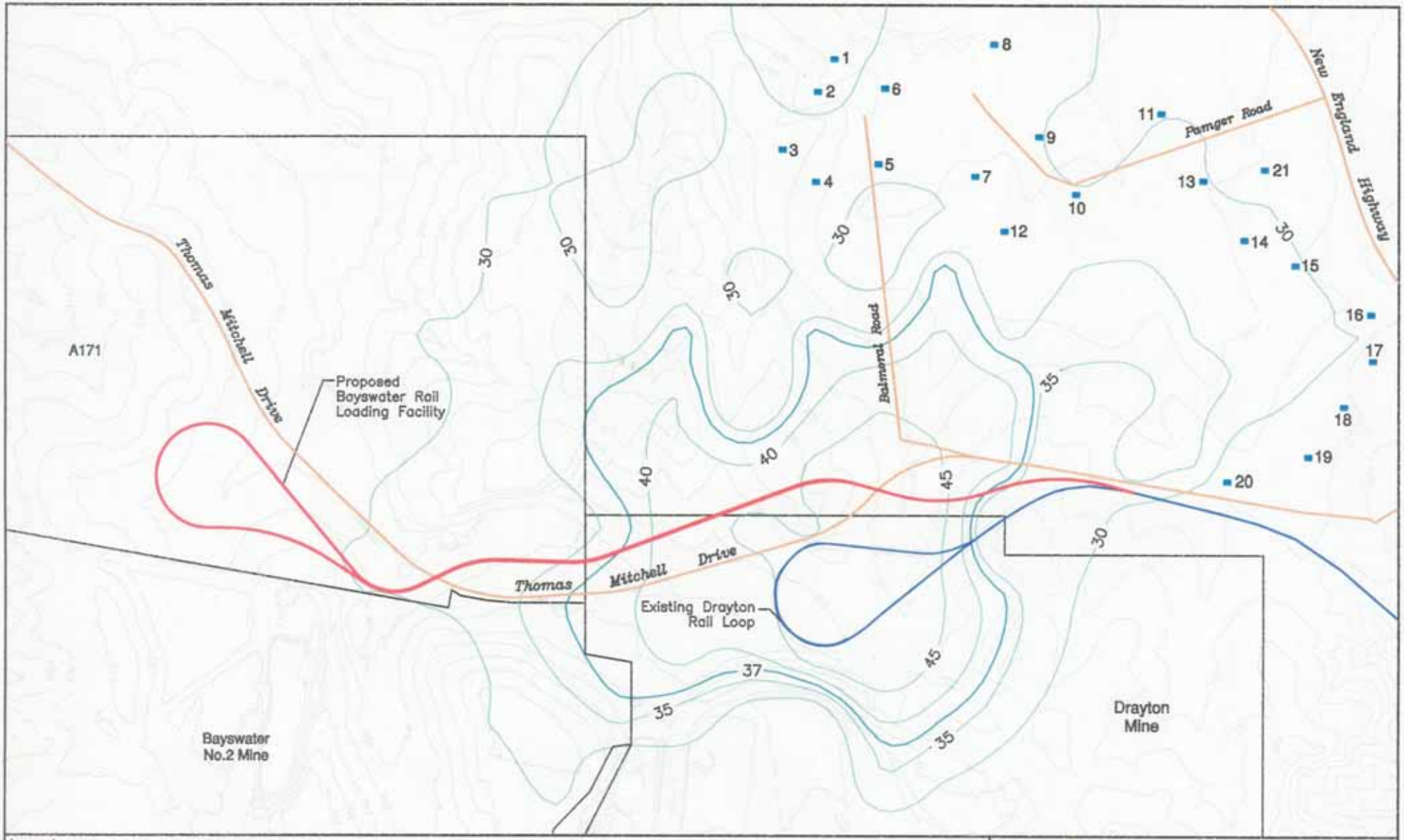


Umwelt (Australia) Pty Limited
Source: Wilkinson Murray

FIGURE 4.8
Noise Levels due to the Bayswater Rail Loading Facility (dBA)

A4 Scale: 1:20 000

Ref No.:1323/R01/dra_008.dwg



Umwelt (Australia) Pty Limited
Source: Wilkinson Murray

FIGURE 4.9
Noise Levels due to the Drayton Rail Loading Facility (dBA)

A4 Scale: 1:20 000

Ref No.:1323/R01/dra_044.dwg

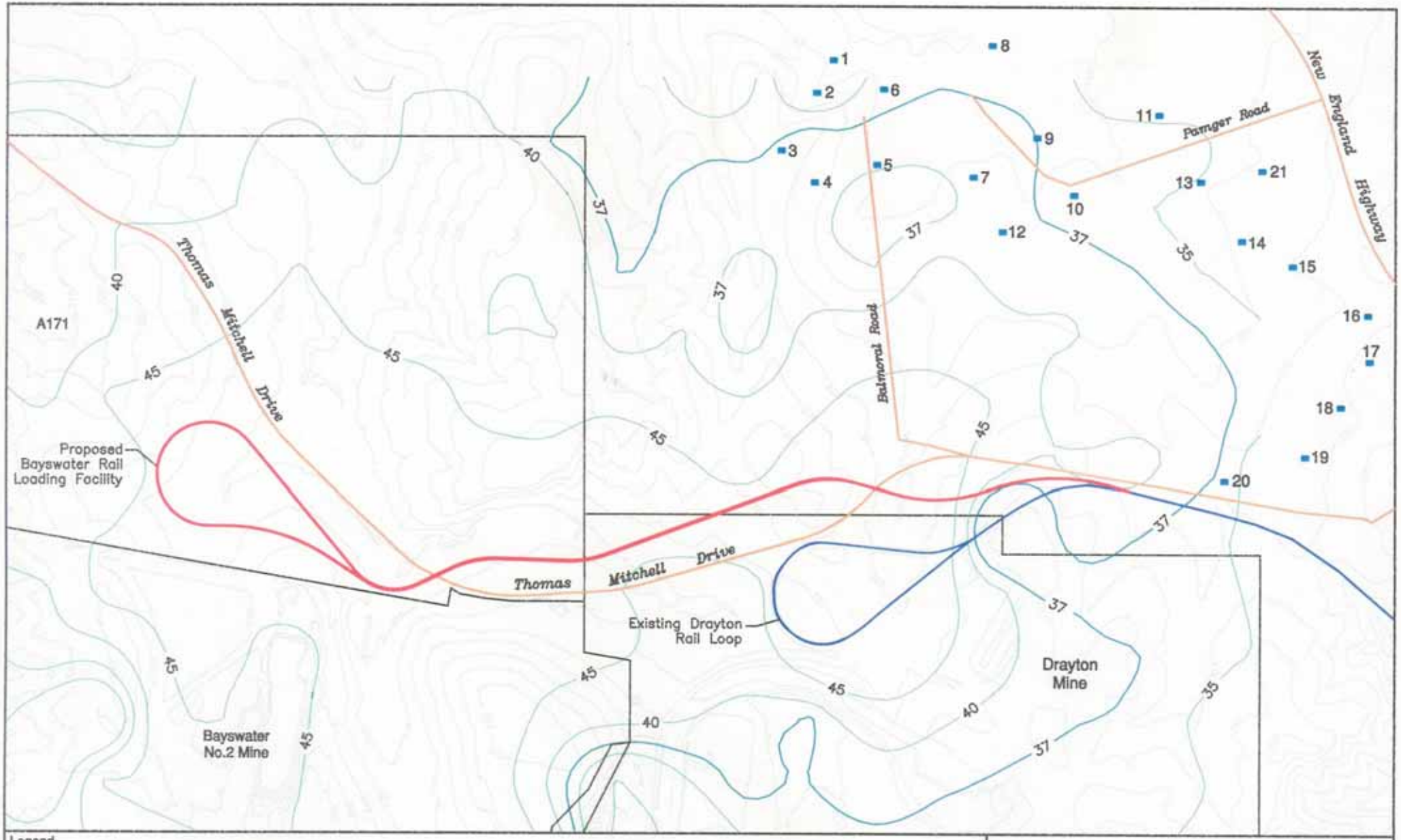


FIGURE 4.10
Noise Levels due to Bayswater & Drayton Rail Loading Facilities (dBA)

Umwelt (Australia) Pty Limited
Source: Wilkinson Murray

A4 Scale: 1:20 000

Ref No.:1323/R01/dra_045.dwg

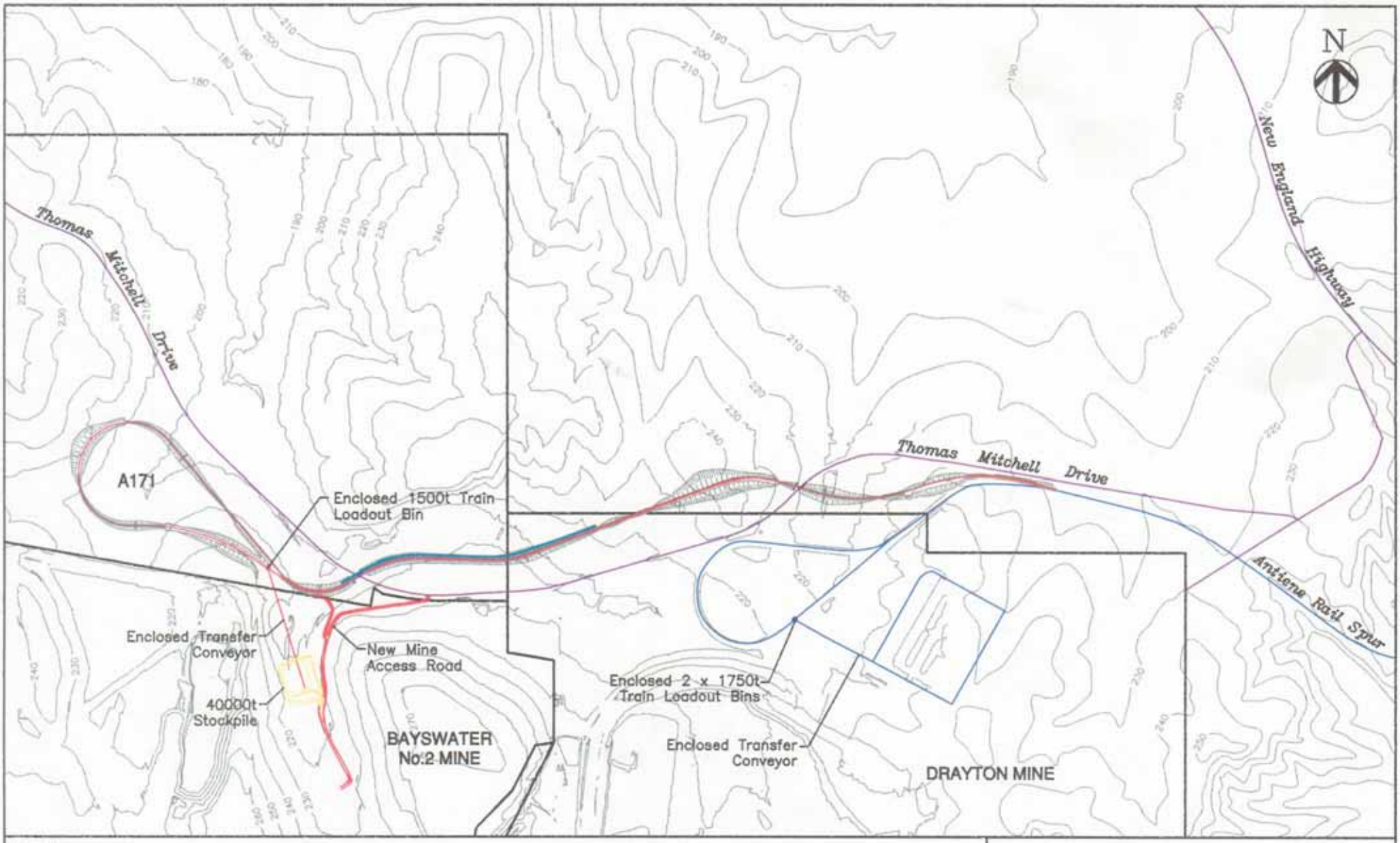


FIGURE 4.11
Noise Mitigation Measures

Umwelt (Australia) Pty Limited
Source: Bateman Australia Dwg No.60-M-135_B

A4 Scale: 1:20 000

Ref No.:1323/R01/dra_055.dwg

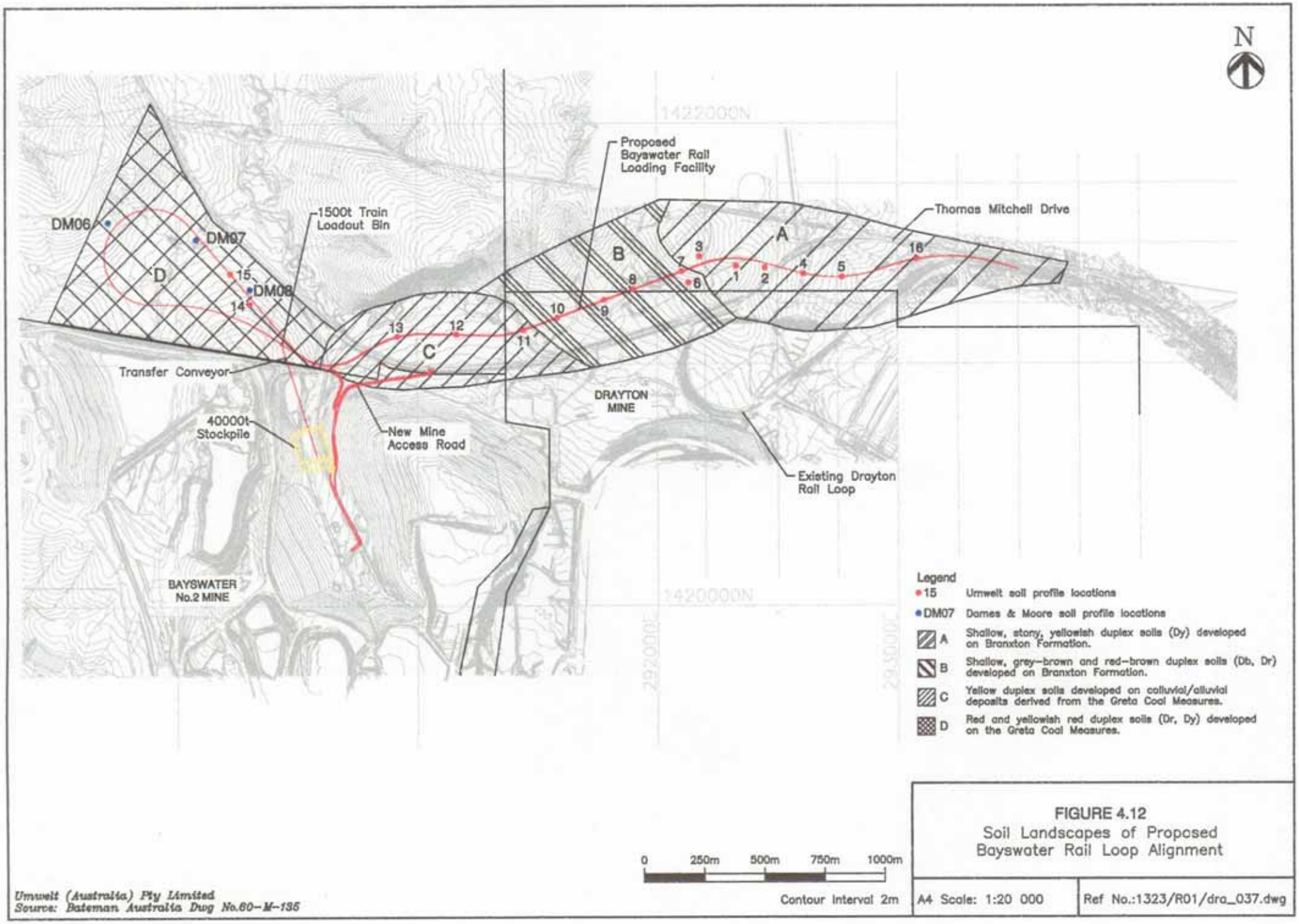


FIGURE 4.12
Soil Landscapes of Proposed Bayswater Rail Loop Alignment

A4 Scale: 1:20 000 | Ref No.:1323/R01/dra_037.dwg

Umwelt (Australia) Pty Limited
Source: Bateman Australia Dwg No.60-M-135

moderate ped strength, have texture as fine or finer than fine sandy loam, have less than 60% gravel and sand, have pH between 4.5 and 8.4, and have low salinity. In areas such as Soil Landscape A, where topsoils are too coarse to be considered suitable for topdressing purposes, they can be mixed with underlying clayey subsoil to improve the texture and provide material potentially suitable for topdressing.

Erodibility of the soils is important in considering earthworks and drainage for the rail loop. Emerson Aggregate Tests (EAT) are a measure of soil dispersion and indicate the likely erodibility of soils used in earthworks. Results of Emerson Aggregate Tests (EAT) on selected soils indicate that soils (both A and B horizons) in the top 0.30m of Soil Landscapes B and C have slight to negligible dispersibility. In contrast, although topsoils in Soil Landscapes A and D have only slight dispersibility, subsoils (A2 and B horizons) have high to moderate dispersibility (Table 2 of **Appendix 7**). Consequently, dispersible subsoils in Soil Landscapes A and D will require careful handling and sediment and erosion control measures (refer to **Section 4.7.3.4**).

4.7 HYDROLOGY AND WATER QUALITY

4.7.1 Potential Surface Water Impacts

The proposed development has the potential to impede surface drainage through the construction of access infrastructure over drainage lines, diversion of runoff away from existing drainage lines and increased peak discharge and runoff volumes through earthworks altering catchment boundaries and through the construction of hardstand areas. Environmental control measures to minimise these potential impacts include:

- construction of appropriately sized culverts to convey runoff under transport infrastructure and prevent flooding of public roads and rail infrastructure up to the 1 in 100 year average recurrence interval design storm event;
- construction of clean water diversion drains to divert clean runoff away from the proposed infrastructure;
- construction of dirty water catch drains to collect sediment laden runoff;
- construction of a new sedimentation dam to collect runoff from the coal stockpile and rail loadout area;
- implementation of soil and water management controls, including stabilisation and revegetation of exposed areas, during the construction period; and
- maintenance and monitoring of erosion and sediment control structures throughout the life of the operation.

These environmental control measures are discussed in detail in **Section 4.7.3**.

The proposed development has the potential to impact on water quality through:

- increased turbidity (Total Suspended Solids) through erosion from disturbed areas during construction and any inadequately stabilised areas during operation;
- contaminants from oil and fuel spills;

- contaminants and pathogens from both the proposed new effluent disposal system and during disturbance of the disused effluent system located along the rail corridor (refer to **Sections 2.3.3.2** and **4.7.3.1**).

Water quality controls to be incorporated into the development to minimise the above potential water quality impacts are detailed in **Section 4.7.3**.

The greatest potential for hydrological impacts is likely to occur during the construction phase when up to 20 hectares of soil may be exposed at any time, excluding mine overburden stockpiles of up to 93,000 m^3 (refer to **Section 3.3.1.13** for construction details). As the soils of the site are dispersive, comprehensive sediment and erosion controls will be required in order to minimise off-site environmental impacts. Soil and water management practices to control sediment and erosion during the construction period are discussed in **Section 4.7.3.4**.

There will be no significant impact on flood liability of surrounding land, including Thomas Mitchell Drive and the proposed Bayswater rail infrastructure, as a result of the proposed Antiene Joint User Rail Facility. Although there has not been any detailed flood modelling of Ramrod Creek, due to the small contributing catchment upstream of the site and the size of culverts under the rail embankments, it is anticipated that neither Thomas Mitchell Drive or the rail line will be inundated by the peak duration 1 in 100 year average recurrence interval storm event.

4.7.2 Potential Groundwater Impacts

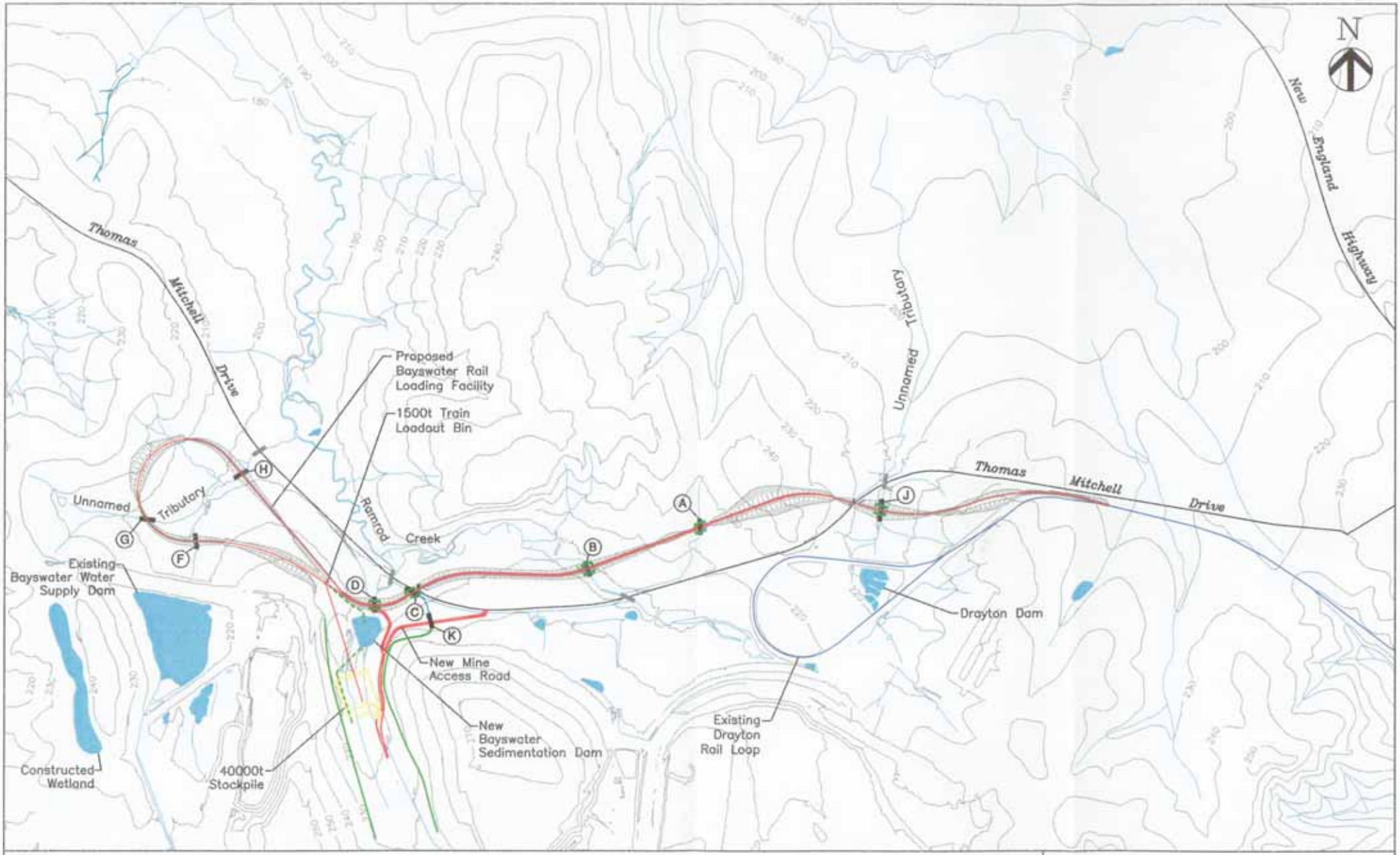
The proposed development is not likely to have any impacts on groundwater due to the relatively shallow depth of disturbance in relation to the watertable depths typically encountered in the vicinity of the site (refer to **Section 2.3.3.3**). Seepage from the coal stockpile is not likely to impact on groundwater as coals from Bayswater are relatively clean and the stockpile will be located on a compacted mine overburden hardstand of limited permeability.

No extraction of groundwater will be required to service the proposed development and no significant reduction in groundwater recharge is expected.

4.7.3 Mitigation Measures

4.7.3.1 Ramrod Creek Catchment

The alignment of the proposed development traverses Ramrod Creek and a number of unnamed intermittent tributaries. Culverts will be constructed at eight locations where the rail line crosses Ramrod Creek and each of the tributaries (**Figure 4.13**). Details of required culvert sizes have been calculated by the design engineers, Bateman Brown and Root, and are shown in **Table 4.18**. The culvert at Ramrod Creek (Culvert B) and the roadside table drain (Culvert C) have been sized to convey peak flows from the 1 in 100 year average recurrence interval (ARI) design storm event in order to ensure that there is no flooding of Thomas Mitchell Drive during events of this magnitude or less. The culverts at the remaining tributaries, with the exception of Culvert J, have been sized to convey peak flows from the 1 in 20 year ARI design storm event. Culvert J is located upstream of an existing culvert under Thomas Mitchell Drive. It is proposed to construct Culvert J with the same dimensions as the existing culvert. In addition, a culvert will be constructed under the new access road to transfer clean water runoff that will be diverted away from the coal stockpile area to Ramrod Creek. Culvert K will be designed to pass flows from the 1 in 20 year ARI design storm event, however, final design details for this culvert are subject to finalisation of the access road design.



Legend

- Proposed Infrastructure
- Existing Infrastructure
- Approved Infrastructure
- Clean Water Diversion Drain
- Dirty Water Drain
- Embankment Bunding
- Existing Culverts
- New Culverts

Note:
There will be additional temporary sediment and erosion control structures and devices utilised during the construction phase of the development.

0 250m 500m 750m 1000m

Contour interval 10m

Umwelt (Australia) Pty Limited
Source: Bateman Australia Dwg No.60-M-135_B

FIGURE 4.13
Proposed Permanent Water Management Structures

A3 Scale 1:14 000 | Ref No.:1323/R01/dra_038.dwg

Table 4.18 – Required Culvert Sizes

Culvert Location	Design Recurrence Interval (years)	Peak Flow (m^3/s)	Culvert Size
A	1:20	2.4	1x1200 mm RCP
B	1:100	11.3	3x1350 mm RCP
C	1:100	6.1	2x1000 mm CTD
D	1:20	1.2	1x900 RCP
F	1:20	3.2	1x750 RCP
G	1:20	4.7	1x1350 RCP
H	1:20	8.9	2x1350 RCP
J	Duplication of pipe under Thomas Mitchell Drive		1x1500 RCP
K	1:20	To be determined	To be determined

Notes *RCP = reinforced concrete pipe*
CTD = concrete table drain, dimension specified is width

It is considered that residual contamination from polishing ponds and septic tank discussed in **Section 2.3.3.2** is likely to be negligible due to the length of time that the facility has been abandoned and the fact that the ponds and tank are exposed to ultraviolet radiation. This natural disinfection process is likely to have removed any pathogens that may have been present. Water in the ponds will be analysed for faecal coliforms to determine whether it is safe to dispose of the water by irrigation of surrounding land. If the water is found to contain faecal coliforms, it will be transferred to the constructed wetlands located on the Bayswater No. 2 site for further treatment. Once the water is removed from the ponds and tanks, the area will be excavated and incorporated into the railway embankment.

4.7.3.2 Modifications to Existing Bayswater Water Management System

The proposed Bayswater Rail Loading Facility water management system is schematically illustrated in **Figure 4.14**. The existing Bayswater No. 2 sedimentation dam will be drained and filled in order to allow construction of footings for the overland conveyor. Prior to draining this dam, a new dam will be constructed approximately 40 metres east of the present location (**Figures 2.9** and **4.13**). This dam will have a 23,000 m^3 operating capacity at a depth of 4 metres (RL 209) and maximum capacity at spillway level of 40,000 m^3, at a depth of 5 metres (RL 210). The spillway will be designed to safely convey flows from a 1 in 100 year ARI design peak flow event. Internal batters on the dam will be 1V:2.5H, with 1V:3H external batters. The primary outlet from the dam will be a pump line to the Bayswater water supply dam. The pump will have a pump out rate of 432 m^3 per hour, when operating at 80 per cent efficiency, and be fitted with an automatic level control. The pump level control will maintain sufficient water storage capacity in the new basin to cater for a 1 in 20 year ARI design storm event. In addition, the pump intake will be sized to extract peak flow from the 1 in 100 year event. The sedimentation dam will be maintained in proper working order and will be periodically desilted to ensure that sufficient capacity to contain the design storm event is maintained. Sediment and silt excavated from the sedimentation basin will be incorporated into the final landform at Bayswater No. 3 and/or Bayswater No. 2.

In addition to the existing dirty water management system, which conducts runoff from around the coal processing area to the existing sedimentation dam, dirty water from around the train loadout bin, conveyor and stockpile will be collected. All these sources of dirty runoff will be directed to the new sedimentation dam. The new dirty water drains will be 1500 mm wide by 300 mm deep trapezoidal concrete drains. The coal stockpile drain length

will be approximately 130 metres, while the coal loadout facility drain will be approximately 75 metres. The existing drainage channel will be redirected into the coal stockpile drain.

Clean water diversion drains with 1V:3H grassed batters and designed to convey peak discharge from the 1 in 20 year ARI storm event at velocities of 1.6 m/s or less will be constructed along the eastern and western sides of the coal stockpile (**Figures 4.13** and **4.14**). The western drain will be approximately 315 metres in length and will discharge to the existing culvert under Thomas Mitchell Drive. The eastern drain will be approximately 375 metres long and will discharge to the Thomas Mitchell Drive table drain via Culvert K, prior to discharge to Ramrod Creek via the existing culvert under Thomas Mitchell Drive.

Water Supply Infrastructure

a) Dust Suppression and Fire Fighting

Coal stockpile dust suppression infrastructure includes 12 pole-mounted agricultural sprinklers. Overhead sprinklers will also be installed along the length of the conveyor (525 metres) to provide washdown water and fire protection. In addition, fire reels, hydrants and extinguishers will be located at the loadout bin, at site facilities and along the conveyor. Operation of the sprinkler system will be automated through a telemetry connection to an on-site weather system. Water will be pumped to the sprinklers from a 580 m^3 storage tank next to the coal stockpile. A branch line from existing pumps in the Bayswater No. 2 water supply dam will feed this tank, with additional pumps to provide pressure to fire fighting and dust suppression water supply lines.

b) Potable Water

Potable water will be supplied by tanker, which will deliver water to an on-site potable water storage tank.

c) Effluent Disposal

Effluent from the amenities will be piped to an on-site package sewage treatment plant or similar. The plant will have a capacity to treat 1800 L/d and will be gravity fed. Treated effluent from the package treatment plant will be gravity fed to a 250 m^2 spray irrigation area. The plant and irrigation area will be located upslope of the sedimentation dam to provide an additional level of control in the event of accidental failure of the system (see **Figure 4.13**).

The package treatment plant will include a balance tank that will allow daily peak hydraulic loadings to be uniformly discharged to the treatment plant over a 24 hour period.

4.7.3.3 Bayswater Water Balance Considerations

Water for the rail load out facility will be drawn from water available to the total Bayswater coal operation, which has an integrated water supply system. On-site water supply is generated by collection of runoff and groundwater in pits and dams. Pit water is pumped to dams and used for on-site dust suppression. Excess water is pumped to the main water supply dam, which feeds the coal washery. Sewage effluent from Muswellbrook STW is filtered and chlorinated prior to discharge to the wetlands, which gravity feed the main water supply dam. Water is used on site for dust suppression, coal processing and miscellaneous uses such as vehicle washdown and amenities.

Projected water balance for the total Bayswater operation for the period 1998 to 2014 for dry, average and wet year scenarios is presented in **Tables 4.19 - 4.21**. The total Bayswater

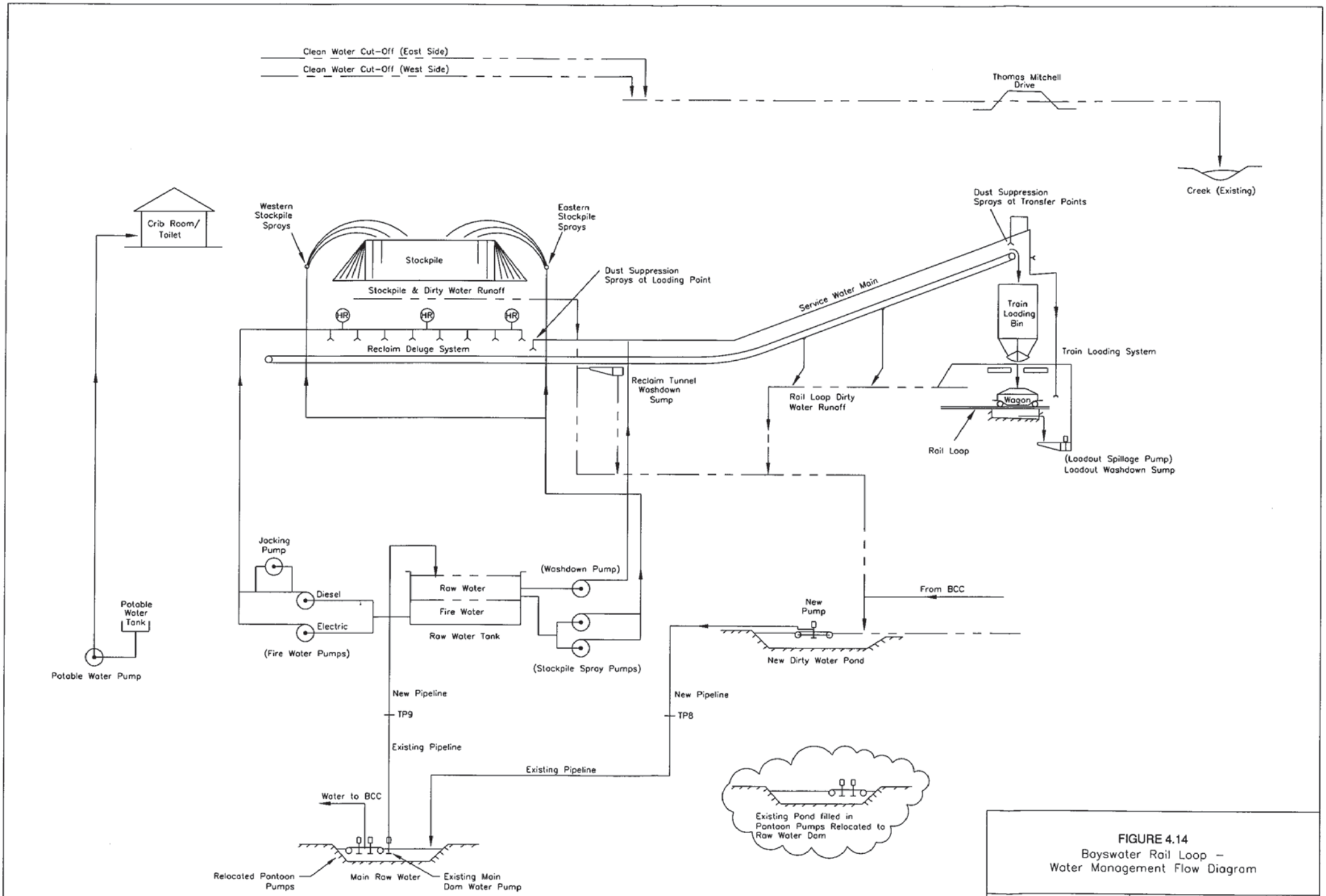


FIGURE 4.14
Bayswater Rail Loop –
Water Management Flow Diagram

Scale N.T.S | Ref No.:1323/R01/dra_060.dwg

Umwelt (Australia) Pty Limited
Source: Barclay Mowlem Dwg No.MHN9925_05_C

coal operation is a net water user with a projected average annual water demand of approximately 1350 to 1790 megalitres and average annual water yield from surface runoff, groundwater from the open cut pits and sewage effluent of approximately 790 to 1160 megalitres. As can be seen from **Tables 4.19 - 4.21**, estimates of the shortfall or annual deficit in the water balance range from approximately 470 megalitres (2004 Wet Year) to approximately 1040 megalitres (2014 Dry Year).

Table 4.19 - Water Balance (Dry Year)

YEAR	INPUT		CONSUMPTION				DEFICIT (ML)
	Total Make (Surface & Groundwater) (ML)	Sewage Effluent (ML)	Water Carts (ML)	Washery @ 170L/tonne (ML)	Stockpile and Conveyor (ML)	Other Uses (ML)	
1998	94.0	700.0	480.0	837.2	150.0	200.0	873.2
1999	130.8	700.0	504.0	917.0	150.0	200.0	940.2
2004	228.2	700.0	504.0	1088.0	150.0	200.0	1013.8
2009	223.9	700.0	504.0	1088.0	150.0	200.0	1018.1
2014	195.4	700.0	480.0	1105.0	150.0	200.0	1039.6

Table 4.20 - Water Balance (Average Year)

YEAR	INPUT		CONSUMPTION				DEFICIT (ML)
	Total Make (Surface & Groundwater) (ML)	Sewage Effluent (ML)	Water Carts (ML)	Washery @ 170L/tonne (ML)	Stockpile and Conveyor (ML)	Other Uses (ML)	
1998	141.0	700.0	400.00	837.2	100.0	180.0	676.2
1999	196.2	700.0	420.00	917.0	100.0	180.0	720.8
2004	342.3	700.0	420.00	1088.0	100.0	180.0	745.7
2009	335.8	700.0	420.00	1088.0	100.0	180.0	752.2
2014	293.1	700.0	400.00	1105.0	100.0	180.0	791.9

Table 4.21 - Water Balance (Wet Year)

YEAR	INPUT		CONSUMPTION				DEFICIT (ML)
	Total Make (Surface & Groundwater) (ML)	Sewage Effluent (ML)	Water Carts (ML)	Washery @ 170L/tonne (ML)	Stockpile and Conveyor (ML)	Other Uses (ML)	
1998	188.0	700.0	320.00	837.2	50.0	150.0	469.2
1999	261.6	700.0	336.00	917.0	50.0	150.0	491.4
2004	456.4	700.0	336.00	1088.0	50.0	150.0	467.6
2009	447.7	700.0	336.00	1088.0	50.0	150.0	476.3
2014	390.8	700.0	320.00	1105.0	50.0	150.0	534.2

To supplement water supply for the site, Bayswater Colliery Company is currently able to obtain up to 400 megalitres per year from Drayton mine. Temporary licences to extract water from the Hunter River may also be available in periods of high flow. In addition to these off-site sources, on-site water storage capacity will be increased by the use of mine pits to provide approximately 1000 megalitres of storage on the Bayswater No. 3 site. Provision of this additional storage will increase on-site capacity to approximately 2500 megalitres and will enable water available during wet periods to be stored for use during dry periods. Water

generation potential will be limited to that associated with the coal stockpile and accidental or minor spills of coal that may occur along the conveyor alignment and during coal loadout.

As previously discussed, all runoff from the stockpile and loadout facility will be channelled via a series of catch drains to the 30 megalitre sedimentation dam. The sedimentation dam will be designed and constructed to contain a runoff volume in excess of that from a 1 in 20 year ARI, 1 hour duration storm event with an additional 17 megalitres of surcharge capacity also available to collect runoff from higher recurrence interval design rainfall events. Water collected in the dam will be used in processing and dust suppression. As such it is not expected that runoff from the proposed coal stockpile area will be discharged off-site. The sedimentation dam will be regularly maintained with excess sediment build-up being removed to ensure that the design capacity is maintained.

Operation of the reclaim conveyor from the stockpile (approved under the 1994 Development Consent) to the loadout bin will have a number of controls to minimise environmental impacts. These controls will include regular inspections by Bayswater Colliery Company personnel to ensure adequate conveyor operation; to undertake service and maintenance; and to clean up any accidental coal spillages, if they occur. The potential for coal spillage from the conveyor is low as it is a single flight, cable belt with no transfer stations. In addition, as the conveyor is located wholly within the catchment of the sedimentation dam, all runoff from the conveyor system will be contained within the dirty water management system. The area around the conveyor will be maintained in a stable and vegetated condition in order to ensure that overland flow from the conveyor to the sedimentation dam does not lead to concentrated flow and subsequent erosion.

Spillage of coal from trains leaving the Bayswater and Drayton facilities will be minimised by the configuration of the coal wagons and the use of track weighbridges to ensure wagons are not overloaded. In the unlikely event of a spillage on the Bayswater or Drayton rail loops, all sediment will be contained on site as both loadout bins are contained within the respective water management systems. Any spillage on the Antiene Rail Spur will be identified during regular maintenance inspections and the affected area promptly remediated. In addition, a two-level sediment/spillage control system will be installed at the top of the railway embankment on both sides of the railway tracks where loaded coal trains cross Ramrod Creek and its tributaries. The first level of control will be a bunded catch drain that extends for 20 metres on either side of the creek crossing to contain runoff during low flow events. The second level will include minor silt traps (approximately 5 m^3) located at the base of the embankment to collect runoff from both ends of the catch drains during high flow events. The silt traps will discharge through silt fence via a level spreader to ensure that any spillage of coal from laden wagons at this location is contained and does not enter the creek. This system will be regularly inspected and sediment removed by shovel when capacity is reduced by 30 per cent. Further details will be included in the Soil and Water Management Plan.

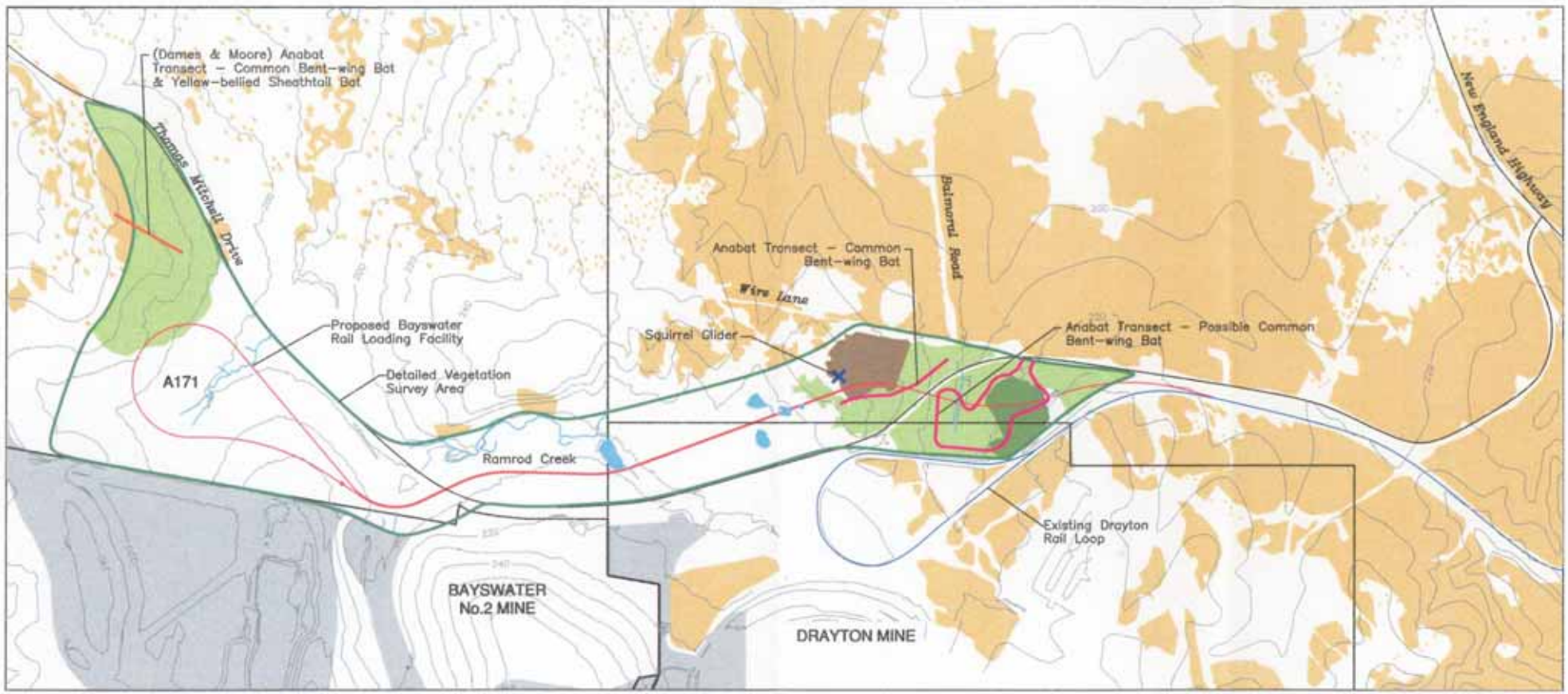
4.7.3.5 Drayton Water Management

No modifications will be made to the existing water management system at Drayton described in **Section 5.2.2**.

4.8 LAND USE

4.8.1 Agricultural Viability

As noted in **Section 2.3.7**, the areas to be affected by construction of the Bayswater Rail Loop are located on land that is suitable only for grazing. The land is not suitable for regular



Legend

- Mixed Eucalypt Woodland
- Pastoral Grasslands
- *Eucalyptus tereticornis* Woodland–Open Forest
- *Corymbia maculata* Woodland
- Undifferentiated Woodland–Open Forest
- Disturbed Areas
- Areas containing patches of Aquatic Vegetation
- Detailed Vegetation Survey Area

0 250m 500m 750m 1000m

Contour Interval 10m

FIGURE 4.15
Vegetation Community Distribution & Threatened Species Locations

A3 Scale 1:15 000 | Ref No.:1323/R01/dra_021.dwg

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cultivation and agricultural productivity is generally low. Construction of the proposed rail loop will affect approximately 13.9 hectares of pastoral grassland and approximately 5.8 hectares of forested land. The rail loop will not affect the agricultural capability and viability of the remaining land and consequently its impact, including water and dust, will be limited to the area occupied by the rail loop. Removal of this relatively minor area of land from agricultural productivity is not considered significant in either a local or regional context. Arrangements have been made with the Hunter Rural Lands Protection Board to ensure that the remainder of the land to be designated as future Travelling Stock Reserve is managed in an appropriate manner to enable use for this purpose.

As discussed in **Section 3.3.1.2**, three level crossings will be constructed across the Bayswater Rail Loop to provide access to land to the north. The rail loop will not sever any land holding, other than COAL and Drayton Coal land. Severance of Drayton Coal land is not considered significant as adequate access is provided from both Thomas Mitchell Drive and Wire Lane. It is anticipated that the proposed development will not significantly affect agricultural property values.

4.8.2 Residential Land

Residential land within the vicinity of the proposed development is shown in **Figure 2.4**. The assessment undertaken for this project indicates that impacts will be within acceptable levels. As a consequence, it is anticipated that the proposed development will not significantly affect residential property values.

4.9 FLORA AND FAUNA

A comprehensive flora and fauna survey was undertaken in the study are in October and November 1999. A full flora and fauna assessment is included in **Appendix 3**, with a summary of the main findings of the report outlined below.

4.9.1 Flora Survey Methods

A flora survey was undertaken in the study area to identify the vegetation communities occurring at the site, and to locate any threatened species or potential habitat for threatened species in the study area. The flora field surveys were undertaken in October 1999 and commenced with eight walking transects to determine species composition and level of disturbance of the vegetation, and to identify any threatened flora species occurring in the study area. Following completion of the walking transects, a number of standard 20 x 20 metre vegetation survey plots were completed in randomly selected areas within each of the vegetation community areas (refer to Figure 2.1 in **Appendix 3**). The results of the Umwelt (Australia) Pty Limited surveys were supplemented with the results of the Dames and Moore Pty Limited survey of the A171 Mining Exploration Licence Area which was completed as part of the Mount Arthur North project. These surveys included two 20 x 20 metre terrestrial flora sampling plots completed in the A171 area (refer to Figure 2.1 in **Appendix 3**).

4.9.2 Vegetation Communities

Five vegetation communities were recorded in the study area with the distribution of these communities being shown on **Figure 4.15**. Three of the communities were forested, with the remaining two being pastoral grassland and aquatic vegetation. No threatened flora species were recorded in the study area with none being considered likely to occur based on the known distribution and habitat requirements of the threatened species occurring in the region.

Pastoral Grassland

The majority of the study area is vegetated with pastoral grassland containing a mix of native and introduced grasses and groundcover species. These grassland areas generally lacked tree and shrub vegetation with scattered immature eucalypt and she-oak individuals occurring. The communities showed great variability in species composition and abundance throughout, with the variability appearing to be generally dependent on the level of grazing and farming pressure applied to the land. A high proportion of introduced species generally occurred, with the community being dominated by Spear Thistle (*Cirsium vulgare**), *Eragrostis brownii* (Browns Lovegrass), Barrel Medic (*Medicago truncatula**), Subterranean Clover (*Trifolium subterraneum**), *Themeda australis* (Kangaroo Grass) and *Stipa aristiglumis* (Speargrass).

Mixed Eucalypt Woodland

This community covers the majority of the forested portion of the study area and consists of a varied mix of a number of Eucalypt species, with *Corymbia maculata* occurring throughout the eastern forested portion of the study area (refer to **Figure 4.15**). The upper storey of the community consists primarily of *Eucalyptus crebra, E. albens, E. moluccana E. tereticornis, E. blakelyi* and *Corymbia maculata* to a height of 10 to 15 metres. A range of other canopy species also occurred in this community including *Eucalyptus dawsonii* and *Brachychiton populneus*. Mature individuals were scattered throughout the community with the apparent dominance of a particular canopy species in any localised area being generally related to the presence of one mature tree and a number of immature individuals.

The shrub layer was generally absent throughout the community with scattered shrub or low shrub layer species occurring, including *Acacia* sp., *Notelaea microcarpa* and *Maireana microphyllum*. An open ground layer also occurred, including a range of native grasses and groundcovers, and a number of introduced species.

Eucalyptus tereticornis Woodland - Open Forest

This community was primarily composed of *Eucalyptus tereticornis*, with a small number of scattered *E. crebra, E. blakeyi* and *E. moluccana* individuals also occurring. The upper storey of the community was typically to a height of 9 to 16 metres, with occasional taller individuals to 20 metres. The community was composed primarily of immature trees with some scattered mature trees also occurring. The shrub layer was generally absent, however, a number of eucalypt saplings did occur in this layer. An open groundcover layer, consisting of native grasses and groundcovers, also occurred, with a number of introduced species also occurring.

Corymbia maculata Woodland

The upper storey of the community consists almost entirely of *Corymbia maculata* to a height of 10 to 20 metres, with a small number of scattered *Eucalyptus crebra* also occurring. The community generally contained trees of a mixed age, with several mature and medium sized trees occurring along with a number of immature trees. The shrub layer was generally absent, with a few scattered *Corymbia maculata* juveniles occurring. The ground layer was very open, consisting of native grass and groundcover species with scattered introduced species also present.

Aquatic Vegetation

Aquatic vegetation occurs in the study area in both natural and constructed waterways. The vegetation ranges from grasses and rushes in intermittent waterways, to fully aquatic vegetation. Typically occurring species include Cumbungi, Watermillfoil, Common Reed and the introduced Water Couch, Spiny Rush, Umbrella Sedge and Water Buttons. Other species also occur in intermittently wet areas including Paspalum (*Paspalum distichum**), Kikuyu (*Pennisteum clandestinum**), Couch (*Cynodon dactylon*) and Beard Grass (*Agrostris avenaceus*).

4.9.3 Flora Impacts

The proposed rail loop development has been designed to avoid areas of woodland – open forest vegetation where possible, with the majority of the disturbance area being restricted to pastoral grassland. The areas of each vegetation community to be affected by the proposed development are indicated in **Table 4.22** below, with a total of 5.75 hectares (approximately 12.4 per cent of the total forested portion of the study area) of forested areas being affected. Approximately 13.9 hectares of pastoral grassland will also be affected by the development, however a large area of this community will remain, with significant areas of pastoral land also occurring throughout the region.

In addition to the portion of the study area that will remain unaffected by the development, large areas of similar vegetation occur in adjacent areas. These adjoining areas include substantial areas of pastoral grassland and several areas of aquatic vegetation. A large area of interconnected woodland – open forest vegetation also adjoins the study area, with approximately 235 hectares existing in the area bound by Thomas Mitchell Drive to the south and the New England Highway to the east. Additional areas of similar vegetation also exist to the south of Thomas Mitchell Drive and to the east of the New England Highway. The area of vegetation affected by the proposed development is therefore considered to be relatively small in the context of the wider study area.

The forested vegetation communities found in the study area are generally characteristic of the communities found in the region, with *Eucalyptus crebra / Corymbia maculata* and *Eucalyptus crebra / E. albens* vegetation associations being recorded throughout the area (Dames and Moore, 1999; Resource Planning, 1993; Gunninah, 1997; ERM Mitchell McCotter, 1997). The floral diversity of the vegetation remnants in the study area is similar to other vegetation remnants in the region, with the communities not being considered to be floristically significant. The forested vegetation areas do however have some significance due to a large portion of the region being cleared of native vegetation.

Although each patch of remnant vegetation in the study area has some significance due to the generally high regional percentage of cleared pastoral areas, only a small area of approximately 5.75 hectares will be cleared under the proposal. It is not considered that the removal of this small area of vegetation is significant on a local or regional scale.

Table 4.22 – Area of Vegetation Communities Affected by the Proposal

Community Type	Existing Area (in vegetation study area)	Area Affected	% Area Affected
Pastoral Grassland	105.3 ha	13.9 ha	13.2%
Mixed Eucalypt Woodland	37.8 ha	4.25 ha	11.2%
Corymbia maculata Woodland	4.5 ha	0.5 ha	11.1%
Eucalyptus tereticornis Woodland – Open Forest	4 ha	1 ha	25%
Aquatic habitat	4.4 ha	0.46 ha	10.5%

4.9.4 Fauna Survey Methods

A range of fauna survey methods was used in the study area including methods to specifically target threatened species known to occur in the region (a full description of flora survey methods is present in **Appendix 3**). The relevant results from the Dames and Moore survey of the Mount Arthur North Project area have also been included.

The fauna survey completed within the Mount Arthur North Project area included:

- mammal trapping including both arboreal and terrestrial trapping (292 trap nights);
- approximately 14 person hours spotlighting;
- three owl call playback sessions;
- five ultrasonic bat detection walking transects (four for 45 minutes and one for 30 minutes);
- one fixed point Anabat site with delay switch to record all night;
- one mist net site;
- four diurnal person hours of amphibian survey;
- three and a half nocturnal person hours of amphibian survey;
- four person hours of reptile survey plus two additional reptile search areas (Dames & Moore);
- six person hours stagwatching; and
- fourteen person hours of bird survey.

The locations of the fauna survey sites are shown in Figure 2.2 of **Appendix 3**.

4.9.5 Fauna Habitats

Three general habitat areas occur in the study area, being pastoral grassland habitat, woodland / open forest habitat and permanent and ephemeral waterbody habitat. Each of these habitat areas is generally degraded due to disturbances from the surrounding agricultural and mining related activities, and through other human activities such as clearing, rubbish dumping and fire wood cutting. The habitat areas do, however, provide habitat for a range of locally occurring native species as well as domestic and pest species.

Pastoral Grassland Habitat

The high level of disturbance in the pastoral grassland vegetation community results in an area of poor potential fauna habitat and limits the use of the community by native fauna species. Potential fauna habitat in these areas is suitable only for species able to exist in degraded areas, including a number of bird species such as the Australian Magpie (*Gymnorhina tibicen*), Australian Raven (*Corvus coronoides*) and Noisy Miner (*Manorina melanocephala*), and grazing mammals such as the Eastern Grey Kangaroo (*Macropus*

giganteus). Several domestic and pest species were also observed to occur in this area, with the area being grazed by cattle. Pest species present included the European Red Fox (*Vulpes vulpes*) and the Rabbit (*Oryctolagus cuniculus*).

Waterbody Habitat

A range of permanent and ephemeral waterways exist in the study area, including farm dams, effluent treatment ponds and natural waterways. These waterways offer habitat to a number of birds and other fauna species. Several frog species were recorded in the study area, as were eels and birds including the Australian Wood Duck (*Chenonetta jubata*) and Masked Lapwing (*Vanellus miles*). In general greater fauna species abundance and diversity were observed in the constructed waterways. This is likely to be due to the constructed waterways offering a larger area of permanent water than the natural waterways. The majority of natural waterway areas were observed to be affected by erosion, particularly due to stock impacts.

Woodland / Open Forest Habitats

The habitat quality of the woodland vegetation in the A171 area is generally low, with the vegetation being relatively highly disturbed, and very open in nature. The community area lacks significant hollow resources, with a general lack of fallen timber, rocks, dense groundcover, dense shrub vegetation and other such habitat resources occurring. The area forms part of a Travelling Stock Route and the movement of cattle through the area has generally degraded the vegetation and consequently the fauna habitat value. The site has also been used for illegal rubbish dumping, with evidence of this activity being observed throughout the community area.

The eastern forested areas generally provide better quality fauna habitat than that present in the A171 area with a number of hollow bearing trees scattered throughout the area. The open nature of the shrub and groundcover layers generally limit the habitat quality for ground dwelling fauna, however areas of cut and fallen timber did provide some fauna habitat. Evidence of fire wood cutting and other disturbances were observed throughout the area, with substantial noise and light impacts also being evident in some areas from the nearby Drayton mine.

4.9.5.1 Fauna Species Recorded

Avifauna

A total of 66 bird species were recorded in the study area, including one nocturnal species (Tawny Frogmouth – *Podargus strigoides*), seven water birds, four wading birds, four raptors and a number of forest and habitat generalist species. No threatened bird species were recorded in the study area. A large number of species occurred in the forested portions of the site, with generally greater species abundance and diversity being found in the eastern forested areas, where a total of 42 species was recorded. The forested portion in A171 at the western end of the proposed rail loop had lower species diversity, with a total of 14 species being identified. A relatively high diversity of species (33 species) was also recorded in the pastoral grassland community and associated wetlands, within the study area. A complete list of species recorded is provided in **Appendix 3**.

Herpetofauna

Seven amphibian species were identified in the study area, with all species being recorded, with one exception, in permanent or temporary aquatic habitat areas. The exception was one Smooth Toddle (*Uperoleia laevigata*) which was located beneath fallen bark, however, this

species was also located in some of the aquatic habitats present in the area. The most commonly occurring amphibian species occurring in the study area were the Spotted Grass Frog (*Lymnodynastes tasmaniensis*), the Common Eastern Froglet (*Crinia signifera*) and the Eastern Dwarf Tree Frog (*Litoria fallax*). Species diversity and abundance was generally observed to be greatest in areas containing permanent standing water including farm dams and the larger pools in drainage lines.

Nine reptile species were also identified in the study area, including one tortoise (Long-necked Tortoise – *Chelodina longicollis*), seven lizards and one snake. Of these species only one, the Eastern Water Skink (*Eulamprus quoyii*), was recorded in the pastoral grassland community area.

Mammals

A total of 22 mammal species were recorded in the study area, including two probable identifications (Swamp Wallaby – *Wallabia bicolor* [scat] and Sugar Glider – *Petaurus breviceps* [hair]), and five introduced species (Fox, Rabbit, House Mouse, Brown Hare and Cattle). Of these 22 species, three are listed as Vulnerable on the Threatened Species Conservation Act 1995: Squirrel Glider (*Petaurus norfolcensis*), Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*) and Common Bent-wing Bat (*Miniopterus norfolkensis*). The most commonly occurring mammal species recorded in the area were the Eastern Grey Kangaroo (*Macropus giganteus*) and the Common Brushtail Possum (*Trichosurus vulpecula*), with the most commonly recorded microchiropteran bat species including the Southern Freetail Bat (*Mormopterus planiceps*), Gould's Wattled Bat (*Chalinolobus gouldi*) and the Chocolate Wattled Bat (*Chalinolobus morio*).

Mammal diversity and density were higher in forested communities than in pastoral grasslands, particularly in the forested communities at the eastern end of the study area.

4.9.6 Threatened Fauna Species

Three threatened fauna species were recorded in the study area during field surveys completed for the proposed development: the Common Bent-wing Bat, Yellow-bellied Sheathtail Bat and Squirrel Glider (**Figure 4.15**). Part 5A assessments (Environmental Planning and Assessment Act, 1979) were undertaken for each of these species and for several other threatened species known to occur locally. Further discussions regarding these species, including Part 5A assessments, are present in the Flora and Fauna Assessment report included in **Appendix 3**. The main findings of this report are outlined below.

Squirrel Glider

One male Squirrel Glider (*Petaurus norfolcensis*) was captured in the *Eucalyptus tereticornis* Woodland – Open Forest community during field surveys conducted on site. The Part 5A assessment undertaken for the Squirrel Glider (refer to **Appendix 3**) found that although an area of known habitat will be removed, the proposed development is unlikely to have a significant impact on the species due to the retention of a significant area of adjacent habitat. It is also considered unlikely that the removal of a hollow-bearing tree will have a significant impact on the nesting requirements of the species, given the occurrence of a significant number of potential nesting hollows in proximate areas. No Squirrel Gliders were observed to nest in the one hollow-bearing tree to be removed by the proposed development; however, up to four Brushtail Possums occupied this tree.

Common Bent-wing Bat

The Common Bent-wing Bat was recorded at three locations in the study area: in the forested portion of the A171 Mining Exploration Area by Dames and Moore; in the eastern forested area to the north of Thomas Mitchell Drive; and possibly also recorded in the forested area south of Thomas Mitchell Drive by Umwelt. Assessment under Part 5A of the Environmental Planning and Assessment Act 1979 has indicated that the proposed development is unlikely to have a significant impact on the Common Bent-wing Bat (refer to **Appendix 3**). No potential roosting sites will be disturbed by the proposed rail loop, with a minimal area of potential foraging habitat being removed (approximately 12.4 per cent of the Woodland – Open Forest in the study area).

Yellow-bellied Sheathtail Bat

Dames and Moore also recorded the Yellow-bellied Sheathtail Bat in the A171 area during a walking Anabat II transect, with the species being recorded a relatively small number of times. The species was not recorded in the remainder of the study area. The Part 5A assessment completed for the Yellow-bellied Sheathtail Bat found that the proposed development is unlikely to have a significant impact on the species due to the limited area of potential habitat being removed from the study area. There are also no potential roosting hollows in the portion of the A171 area to be affected by the proposal, with only one hollow bearing tree being removed from the eastern forested area. The proposed development will therefore not resulting in a significant reduction in potential roosting sites for the species.

Other Threatened Species

As discussed above, Section 5A assessments were also completed for a number of other species known to occur in the region of the study area (refer to **Appendix 3**). Each of these assessments found that the proposal was unlikely to have a significant impact on the species assessed, with habitat for the majority of species being absent or marginal. None of these additional threatened species were recorded in the study area.

4.9.7 Fauna Impacts

The proposal is generally considered unlikely to have a significant impact on the fauna habitat in the region, with only a relatively small area of forested habitat (approximately 5.75 hectares) and pastoral grassland habitat (13.9 hectares) being affected. The development will also have a minimal impact on the aquatic habitats in the study area as discussed below.

Pastoral Habitats

The pastoral grassland areas offer poor quality fauna habitat and are typically only used by species able to adapt to degraded habitat areas. These areas are not considered to provide core habitat for the majority of locally occurring native fauna species. A range of introduced fauna species also use the pastoral grassland area. Although approximately 13.9 hectares of pastoral grassland will be affected by the proposed rail loop, large areas of similar pastoral grassland vegetation will remain undisturbed in the study area and surrounding areas. The removal of approximately 13.9 hectares of this pastoral vegetation is therefore considered to be insignificant on both a local and regional scale from a fauna habitat perspective.

Forested Habitats

A comparatively small area of forested habitat will be affected by the proposed development, with the construction of compensatory habitat likely to further reduce any potential impacts (**Figure 4.16**). These forested areas provide habitat for a range of fauna species, however

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FIGURE 4.16
Habitat and Visual Impact Mitigation

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the habitat provided in the areas to be impacted is not considered to be significantly different to the adjacent habitat areas which will be retained. There are also substantial areas of similar Woodland – Open Forest vegetation outside the study area which result in the small area of forested vegetation to be removed being insignificant at a regional scale.

It is also considered that there will not be a significant loss of forest fauna habitat on a local scale with only approximately 12.4% of the Woodland – Open Forest vegetation within the study area being affected. As discussed previously, the study area is also connected to an area of approximately 235 hectares of Woodland – Open Forest vegetation resulting in the area of vegetation to be removed being approximately 2% of the local forested habitat area. The proposed path of the rail loop has also been designed to avoid hollow-bearing trees, with only one hollow-bearing tree being located in the area proposed to be cleared for the rail loop construction. The re-erection of the hollows which are removed, combined with the use of nest boxes will result in there being no net loss of tree hollow roosting and nesting sites in the study area.

The establishment of a 35.2 hectare compensatory habitat area, including 15.2 hectares of existing vegetation, is also considered likely to further reduce any local loss of fauna habitat. The establishment of this compensatory habitat area will result in a net long term gain of fauna habitat in the local area with the proposed development considered unlikely to have an impact on the long term availability of fauna habitat within the study area. In addition, a habitat corridor of 21.1 hectares will be established to link the habitat compensation area to existing forest vegetation at the eastern end of the study area.

The proposed development is also considered unlikely to significantly affect the ability of local fauna to move through the forested portions of the proposed development area, with the vegetation in the study area currently being of a generally discontinuous nature. The eastern forested portion of the study area is currently dissected by the Drayton Rail Loading Facility, Wire Lane and Thomas Mitchell Drive. The proposed path of the rail loop is between these existing structures, and is therefore considered unlikely to significantly add to the discontinuity of the vegetation in the area.

Aquatic Habitats

The development will have a minimal impact on aquatic habitats in the study area with the majority of existing aquatic habitats to be retained. The only areas to be affected by the development are the effluent treatment ponds located in the pastoral grassland community area, and some areas of periodic aquatic habitat occurring in the ephemeral drainage lines in the study area, including Ramrod Creek. The removal of the effluent treatment ponds is not considered to be significant due to their degraded nature and the presence of two large farm dams in close proximity. The more defined ephemeral drainage lines contain areas of periodic aquatic habitat following rainfall periods, with a dam also occurring in Ramrod Creek. The proposed rail loop will cross these ephemeral drainage lines using culverts that have been designed to ensure that the existing periodic flow will not be obstructed. The ephemeral drainage lines were observed to provide habitat for a small number of amphibian species, however it is considered to be poor quality habitat compared to the more permanent aquatic habitat areas on site, which contained greater species diversity and abundance. The majority of ephemeral drainage lines in the study area will however remain unaffected by the proposed development, ensuring that a significant area of this periodic aquatic habitat remains.

4.10 BUSHFIRE HAZARD

4.10.1 Method of Assessment

The bushfire hazard potential of the site has been assessed in accordance with the Department of Planning Circular No. C10 "Planning in Fire Prone Areas" (1984). This assessment provides an indication of the long term fire hazard and does not consider the variability of fuel due to management, time since last fire or day to day climatic effects. The assessment assumes that there has been little or no hazard reduction management, the vegetation carries maximum fuel load and the fire danger is extreme.

In determining the bushfire hazard of the site, the following factors were considered:

- State Fire Zone - the site is assigned to one of the three state fire zones which have different characteristics of fuel type, topography, climate and fire behaviour;
- Land Units - the area is divided into units that are uniform for vegetation type and slope; and
- Rating of Fire Hazard - the land units are given a rating of high, medium or low fire hazard based on fuel (vegetation type) and slope.

4.10.2 Bushfire Hazard Assessment

The proposed development site is located in the Eastern fire zone. In this fire zone, forest and shrub fires predominate and the main fire season is from September or October through to January or February (Luke and McArthur, 1978).

Two land units occur on the development site: woodland on slopes ranging from 5 to 20% and native and improved pasture on slopes ranging from 3 to 20%. The woodland will be partially removed during construction of the proposed rail loop.

The fire hazard rating is the product of the vegetation hazard index and the slope index as shown in **Table 4.23**.

Table 4.23 - Calculation of Fire Hazard Rating

Slope	Slope Index	Woodland Hazard Index	Woodland Fire Hazard Rating	Native Pasture Hazard Index	Native Pasture Fire Hazard Rating
0 - 5%	1	0.43	0.43	1.65	1.65
5 - 10%	1.5	0.43	0.65	1.65	2.48
10 - 20%	2	0.43	0.86	1.65	3.30
			LOW		MEDIUM

As shown in **Table 4.23**, the fire hazard rating for woodland areas on slopes ranging from 0 to 20% ranges from 0.43 to 0.86 which is considered to be a low hazard rating.

The fire hazard rating for native pasture is higher, ranging from 1.65 to 3.30, depending on the slope. These values indicate a medium fire hazard.

Fires burning uphill pose the most significant hazard. The western half of the rail loop is generally located within 200 metres of Ramrod Creek or its tributaries and therefore has limited potential for fires to accelerate over long uphill distances. However, the eastern half

of the rail loop is more vulnerable to fire with an 800 metre long uphill slope on the eastern side of Ramrod Creek and a 400 metre long slope between 0.9 and 1.3 kilometres from the start of the rail loop.

By its nature, the Antiene Joint User Rail Facility provides access for rail-mounted fire-fighting equipment, should the need arise. Construction and operation of the Bayswater Rail Loading Facility are not considered to significantly increase the risk of bushfire in the surrounding area.

Details of the bushfire management systems for Bayswater and Drayton mines are described in **Sections 5.1.7** and **5.2.7**, respectively.

4.11 HERITAGE ASSESSMENT

Comprehensive Aboriginal and European archaeological assessments have been conducted by South East Archaeology on behalf of Umwelt (Australia) Pty Limited. These assessments are included in **Appendix 5a** and **5b** respectively, and an overview is provided in the following sections. These investigations were only undertaken within the proposed disturbance area associated with the Bayswater Rail Loading Facility. Increased usage of the Drayton Rail Loading Facility does not require any additional site disturbance and therefore no heritage assessment was required for this part of the development.

The archaeological assessment was undertaken in the western portion of the Bayswater Rail Loop (A171 area) between January and March 1999, as a component of a separate investigation for the Mount Arthur North Project. In addition, specific investigation of additional areas disturbed by this project was completed in October 1999. The South East Archaeology reports included in **Appendix 5** integrate both of these investigations, as relevant to the proposed Bayswater Rail Loading Facility.

4.11.1 Aboriginal Heritage Assessment

The principal aims of the archaeological investigation were to identify and record Aboriginal heritage evidence or locations of potential evidence within the study area, assess the impacts of the proposal on this evidence, assess the significance of this evidence, and formulate recommendations for the conservation and management of this evidence, in consultation with the local Aboriginal community.

A field survey of the A171 portion of the study area was undertaken by South East Archaeology and the Wonnarua Tribal Council in January and February 1999, involving a total of 8 person-days. Field investigations of the proposed rail link were undertaken in October 1999, using a similar methodology. Survey areas are shown on **Figure 4.17**.

The survey identified 14 Aboriginal heritage sites in the study area (refer to **Figure 4.17**), all scatters of stone artefacts. The identified sites occupy 92 hectares or 53% of the study area. No types of Aboriginal evidence other than artefact scatters were identified during the survey.

A total of 271 artefacts have been identified within the fourteen sites. Artefacts are widely distributed across the study area, but can only be identified through surface inspection where visibility conditions permit. Artefact density tends to be higher along watercourses, particularly higher order streams and within fifty metres of watercourses.

The artefacts comprise eight different stone materials, with indurated rhyolitic tuff being dominant and silcrete also common. The assemblages indicate that tool production was

mostly casual and opportunistic, meeting the requirements for tools on an 'as needed' basis. From the existing circumstantial evidence it would appear that most, if not all, of the cultural evidence within the study area relates to the past 5,000 years of human occupation.

The results of the survey support prediction that there is a low or very low potential for scarred tree, mythological/spiritual or stone arrangement sites to occur. There remains some potential, albeit low to very low, for skeletal remains to occur within alluvial sediments along Ramrod Creek. Minimal sandstone bedrock was identified within the study area, hence the potential for grinding groove sites is revised to very low. Outcrops of stone suitable for lithic procurement are also limited, indicating a low potential for this site type.

In general terms, the evidence is typical of that from the Central Lowlands of the Hunter Valley, although specific differences may exist with evidence reported from other localities. Taken individually, none of the items or contexts located within the study area appear to be unique in the region.

The scientific significance of the evidence is provisionally assessed, using a 'cultural landscape' approach, based on archaeological terrain units. Criteria used to assess scientific significance include the potential usefulness of the heritage evidence to address further research questions, the representativeness of the evidence, the nature of the evidence and its state of preservation. The scientific value of evidence within the ten archaeological terrain units is assessed as ranging from moderate to high within a local context and low to moderate within a regional context.

The Aboriginal heritage evidence recorded within the study area is protected under the terms of the *National Parks and Wildlife Act 1974*. Recommendations are presented for each of the archaeological terrain units (potential resource) and identified heritage sites within the study area. The recommended strategies involve a combination of avoidance of impacts, unmitigated destruction and salvage, in relation to an application for a Consent to destroy and Permit to Salvage to be submitted to the National Parks and Wildlife Service that covers all of the evidence and land to be impacted by the proposal. The proposal will directly affect seven identified Aboriginal sites and potential resources within ten archaeological terrain units. Wonnarua Tribal Council advises that it supports the proposed development (refer to Attachment A of **Appendix 5a**). Further consultation will be undertaken with the Wonnarua Tribal Council and National Parks and Wildlife Service in relation to any future Consent application. COAL will also consider any reasonable request by the Wonnarua Tribal Council to monitor the initial removal of topsoil from within the alluvial soil deposits along several watercourses, for the presence of skeletal remains, and to collect surface artefacts that will be affected by the proposal.

4.11.2 European Heritage Assessment

The principal aims of the European Heritage investigation were to identify and record any historical (non-Aboriginal) heritage sites within the study area, assess site significance and formulate recommendations for the conservation and management of any heritage resources present.

The historical background of the locality was investigated, followed by a field survey initially involving a team of two persons (a qualified archaeologist and an Aboriginal community representative) systematically traversing the A171 portion of the study area on foot. The survey of the 1.55 square kilometre A171 portion involved eight person-days. The remainder of the study area (the rail link) was investigated to a similar level of detail in one day.

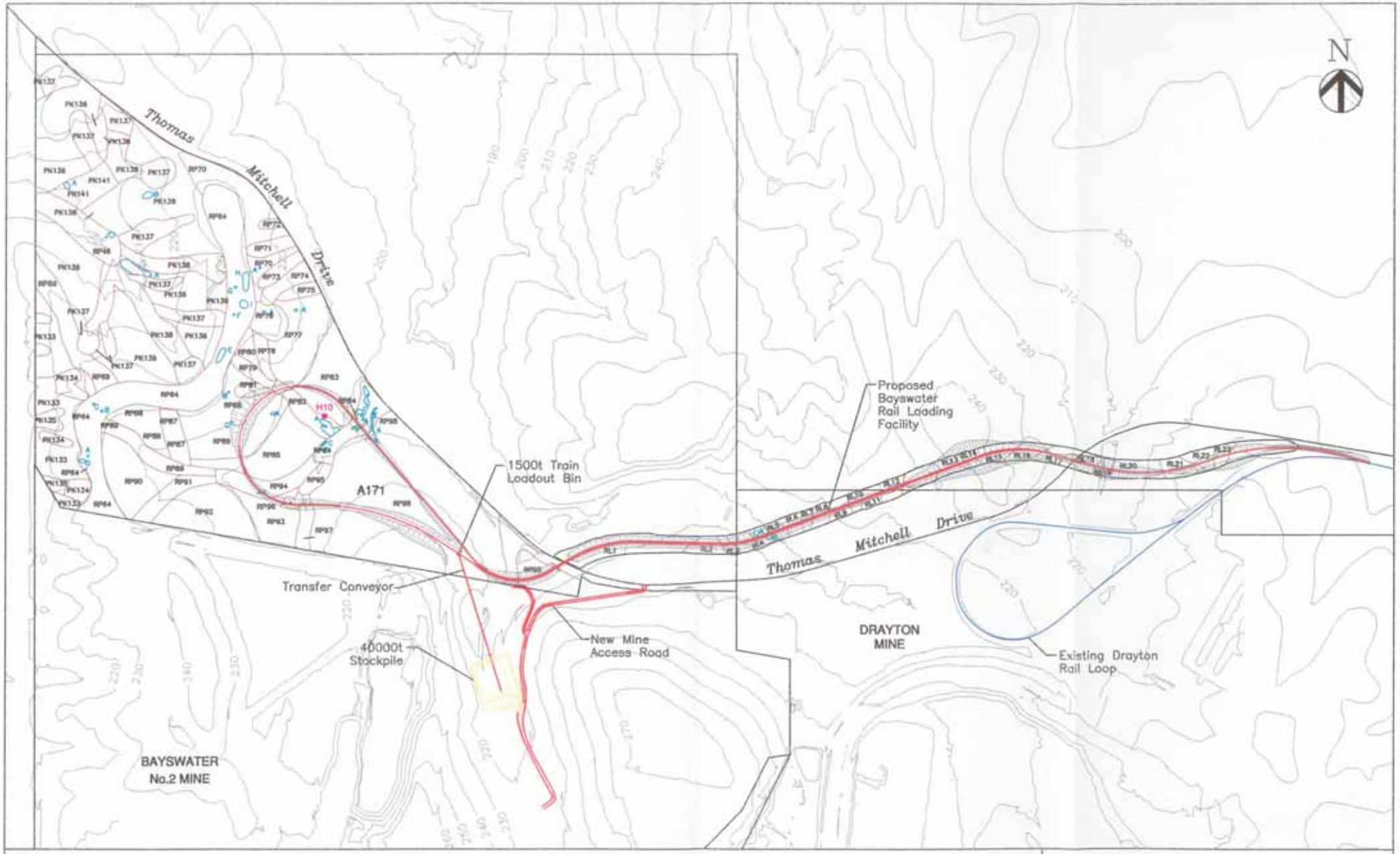


FIGURE 4.17
Archaeology Survey Areas and Sites

A3 Scale 1:12 000 | Ref No.:1323/R01/dra_006.dwg

Umwelt (Australia) Pty Limited
Source: Bateman Australia Dwg No.60-M-135

Only one historical feature assessed as being over fifty years of age was identified in the study area (H10 shown on **Figure 4.17**). It consists of a scatter of fragments of glass and ceramics, located within proximity of the rail loop in A171. This site is assessed as being of low significance within a local context.

All relevant heritage registers were examined, including Schedules 1, 2, 3 and 4 of the Hunter Regional Environmental Plan 1989, the Australian Heritage Commission's Register of the National Estate, the Register of National Trust (NSW), Register of Significant Twentieth Century Architecture (RAIA), Department of Public Works' Heritage and Conservation Register, Heritage Council registers, NSW Government Department Heritage Register, NPWS Historic Sites Register and Institution of Engineers (NSW) Heritage Register, along with the *Muswellbrook Shire-wide Heritage Study* (Turner 1996). No items listed on these heritage registers or reported in the *Muswellbrook Shire-wide Heritage Study* lie within the present study area.

Management proposed to mitigate the impacts of the proposal on European heritage, includes:

- obtaining excavation permits from the Heritage Council of New South Wales prior to the excavation and removal of the items located within the study area;
- recording the relics within the study area in greater detail prior to their removal;
- monitoring areas adjacent to the relics identified within the study area during their excavation and removal in order to identify any further cultural material that may exist in a sub-surface context; and
- disposing of excavated items in a manner approved by the Heritage Council of New South Wales and following consultation with the Muswellbrook and Upper Hunter Historical Society and Muswellbrook Shire Council.

4.12 VISUAL ASSESSMENT

4.12.1 Regional Scenic Quality

As described in **Section 2.3.6**, the general region is relatively diverse in terms of landforms, vegetation patterns and land uses. The visual landscape units that characterise the Upper Hunter are described in **Table 2.7**. The majority of the area affected by the proposed development is undulating cleared and semi-cleared grazing land with extensive views of current mining operations. Areas dominated by views of current coal mining and associated service infrastructure have low scenic quality. Areas of high scenic quality, such as Mount Arthur, will not be affected by the proposed development.

4.12.2 Visual Impact

Visual impact analysis for the proposed Antiene Joint User Rail Facility has been undertaken for all potentially affected surrounding residences and viewing locations. Visual transect locations are shown in **Figure 4.18**. **Figure 4.19** shows the visual transects which have been constructed for the potentially most affected residences to the north of the site in addition to one location on Thomas Mitchell Drive.

4.12.2.1 Bayswater Rail Loadout Facility

The rail loadout facility is not visible from any residence due to intervening topography, however, it is visible from Thomas Mitchell Drive for a road length of approximately 3.5 kilometres.

Transect A-A^1 shows the potential visual impact of the new facility from the Antiene Lot 23 residence on Balmoral Road, approximately 2.4 kilometres north of the site. This residence and a number of other residences on Balmoral Road are the nearest residences to the proposed development, although due to the nature of the upper Ramrod Creek topography, views to the proposed development are obscured. It can be seen from Transect A-A^1 that the rail loadout facility is not visible from Antiene Lot 23 due to the location of an intervening high elevation area. Other residences on Balmoral Road will also experience no visual impact from the proposed new rail loadout facility due to the visual shielding provided by hills to the north and east of Ramrod Creek.

Transect B-B^1 shows the potential visual impact of the loadout facility from Thomas Mitchell Drive, at a location approximately 1.1 kilometres east of the site.

4.12.2.2 Drayton and Bayswater Rail Loops and Antiene Rail Spur

The residence with most potential for visual impact from the proposed rail turnout area is Antiene Lot 8 located on Thomas Mitchell Drive approximately 0.2 kilometres northeast of the proposed rail alignment. As shown on Transect E-E^1 and **Plate 1**, this residence does not have views of the turnout area from the dwelling itself, but does have short distance views from the front gate across Thomas Mitchell Drive to the rail turn out area. This residence is owned by Drayton Coal Pty Ltd and is located on a property with existing low visual quality due to views of the Drayton Rail Loop. Consequently, it is considered that the proposed visual impact at this residence is consistent with the existing visual amenity of the area and will not significantly disrupt the amenity of residents.

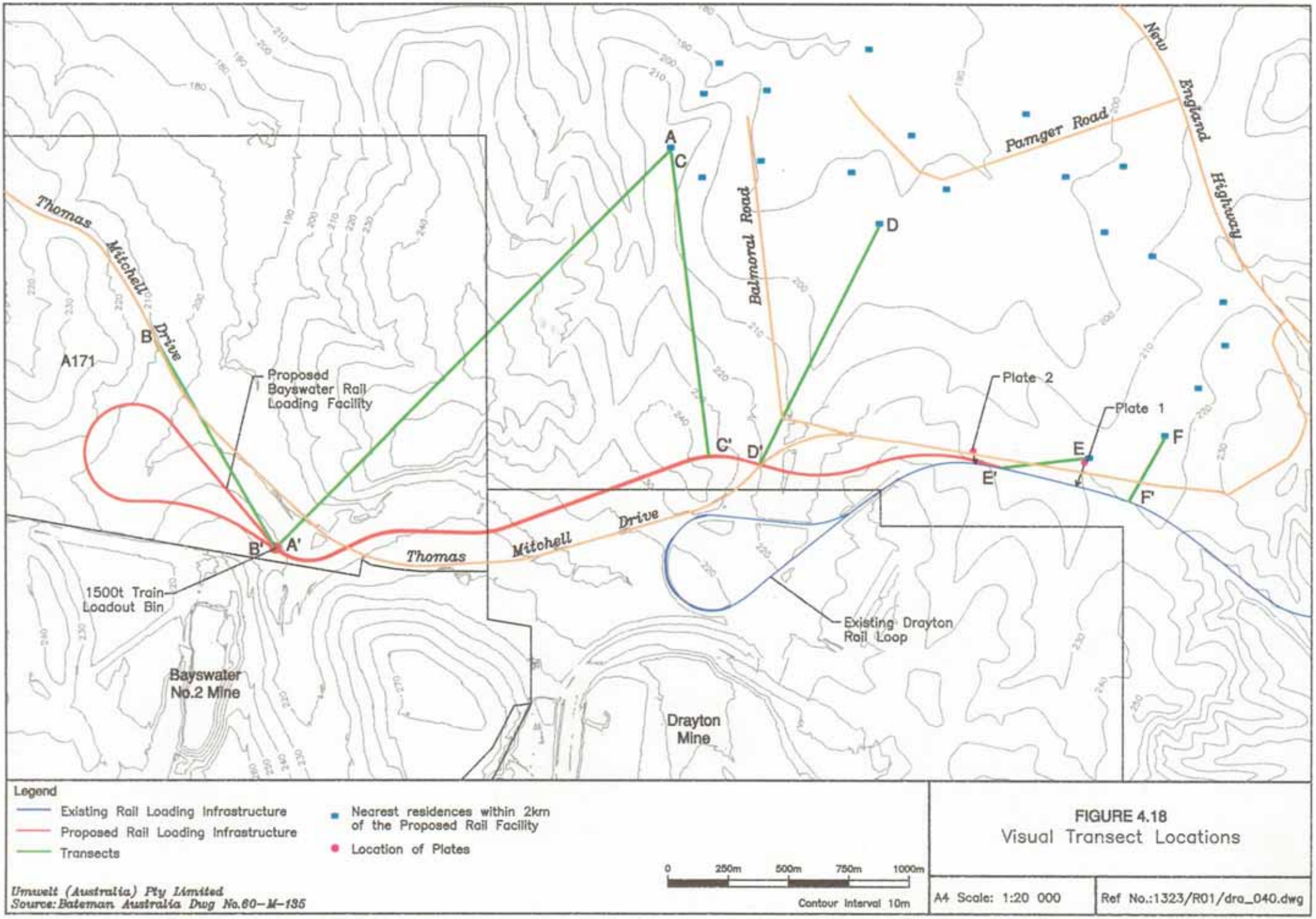
Residents at more distant locations to the north of the spur line, such as those residing along Balmoral Road and Antiene Lot 7 on Thomas Mitchell Drive, will experience no visual impact from the proposed Antiene Joint User Rail Facility as shown on Transect C-C^1, D-D^1 and F-F^1. These and other residences surrounding the proposed rail loop have no views to the site due to intervening topography and vegetation.

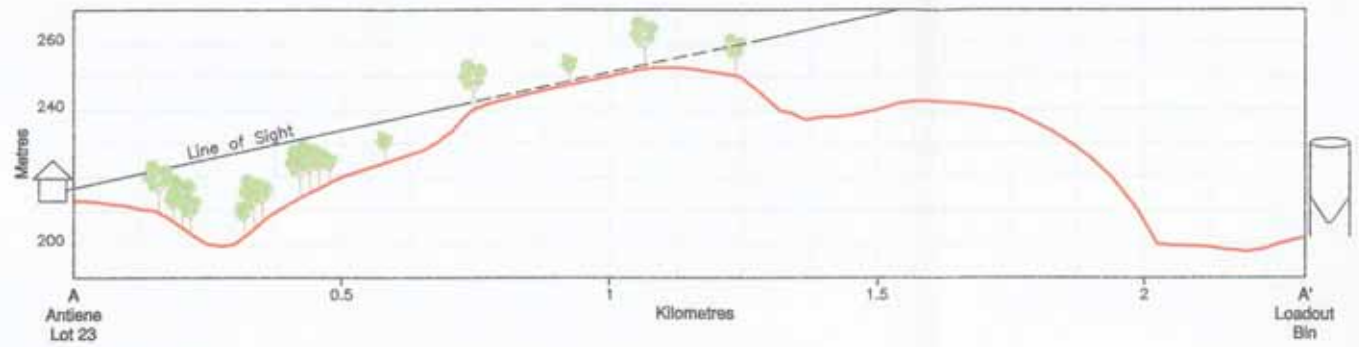
The Antiene Joint User Rail Facility will also be visible to users of Thomas Mitchell Drive. The view to the rail loop from Thomas Mitchell Drive occurs over almost the entire length of the rail line, with the exception of the section where the rail line passes through an approximately 0.5 kilometre cutting at the eastern end of the Ramrod Creek valley. These views would involve relatively long glimpses of the site at short distance (<1 kilometre) from vehicles travelling on the road. The existing views of the Drayton Rail Loop and Antiene Rail Spur are limited by the intervening vegetation between Thomas Mitchell Drive and the railway line (**Plate 2**).

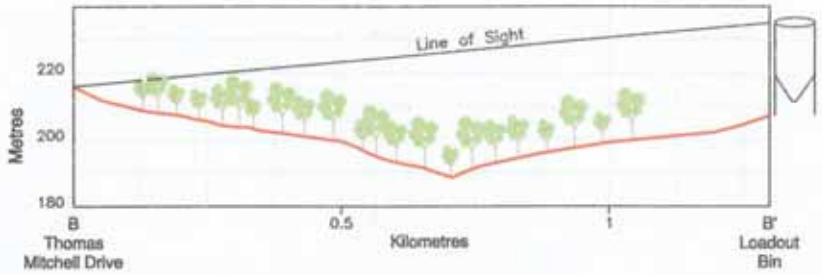
The increase in peak rail traffic from six to fifteen train trips per day will not significantly affect the visual amenity of the area.

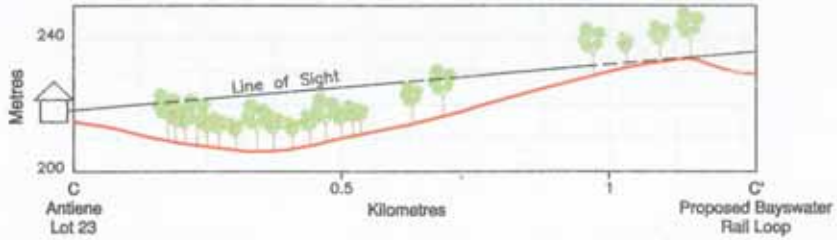
4.12.3 Lighting Impacts

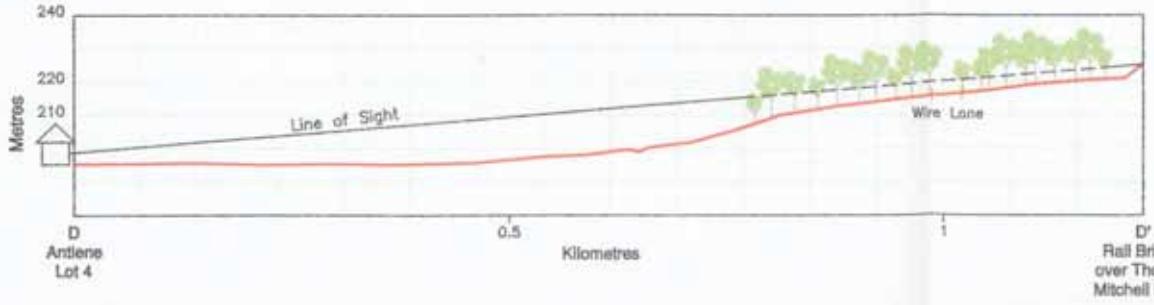
Headlights from trains travelling along the proposed Bayswater Rail Loop will impact on road traffic travelling on Thomas Mitchell Drive. These impacts will primarily affect vehicles travelling in both directions towards the rail-over-road bridge near the Bayswater balloon loop (**Figure 4.20**). The potential impact of train lights on vehicles at a number of

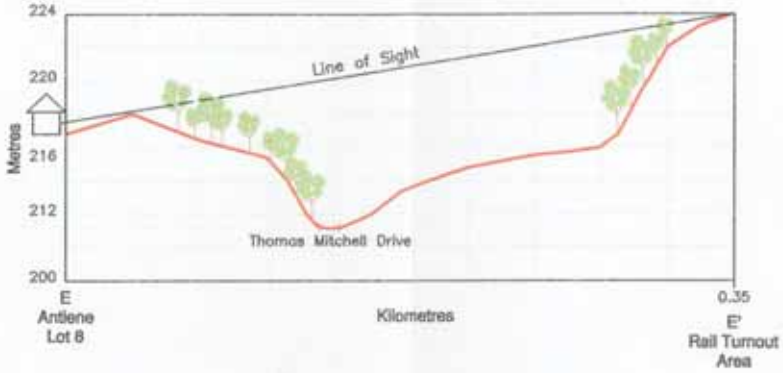

Thomas Mitchell Drive
A171
B
B'
A
A'
C
C'
D
D'
E
E'
F
F'
Balmoral Road
Pamger Road
New England Highway
Plate 2
Plate 1
Proposed Bayswater Rail Loading Facility
1500t Train Loadout Bin
Existing Drayton Rail Loop
Bayswater No.2 Mine
Drayton Mine
Thomas Mitchell Drive
Legend
Existing Rail Loading Infrastructure
Proposed Rail Loading Infrastructure
Transects
Nearest residences within 2km of the Proposed Rail Facility
Location of Plates
0 250m 500m 750m 1000m
Contour Interval 10m
Umwelt (Australia) Pty Limited
Source: Bateman Australia Dwg No.60-M-135
FIGURE 4.18
Visual Transect Locations
A4 Scale: 1:20 000
Ref No.:1323/R01/dra_040.dwg











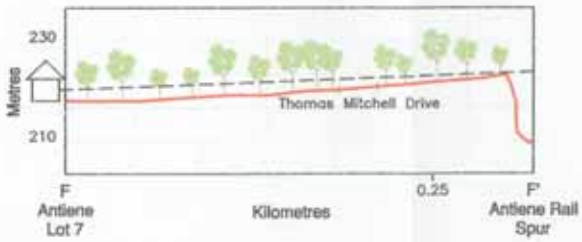


FIGURE 4.19
Visual Transects

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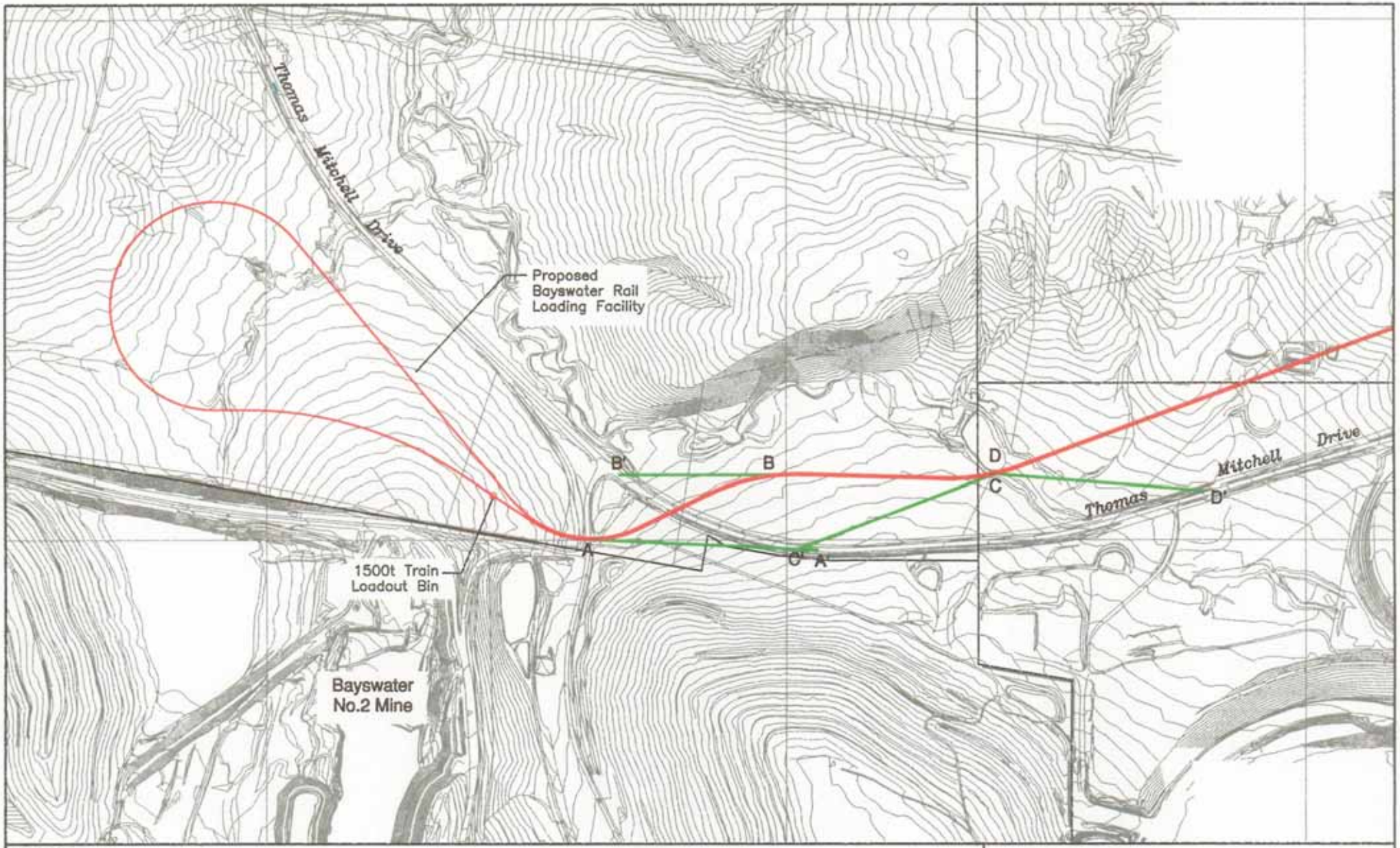

Legend

Proposed Rail Loading Infrastructure

Transects

Umwelt (Australia) Pty Limited
Source: Bateman Australia Dwg No.60-M-135

FIGURE 4.20
Train Lighting Transect Locations

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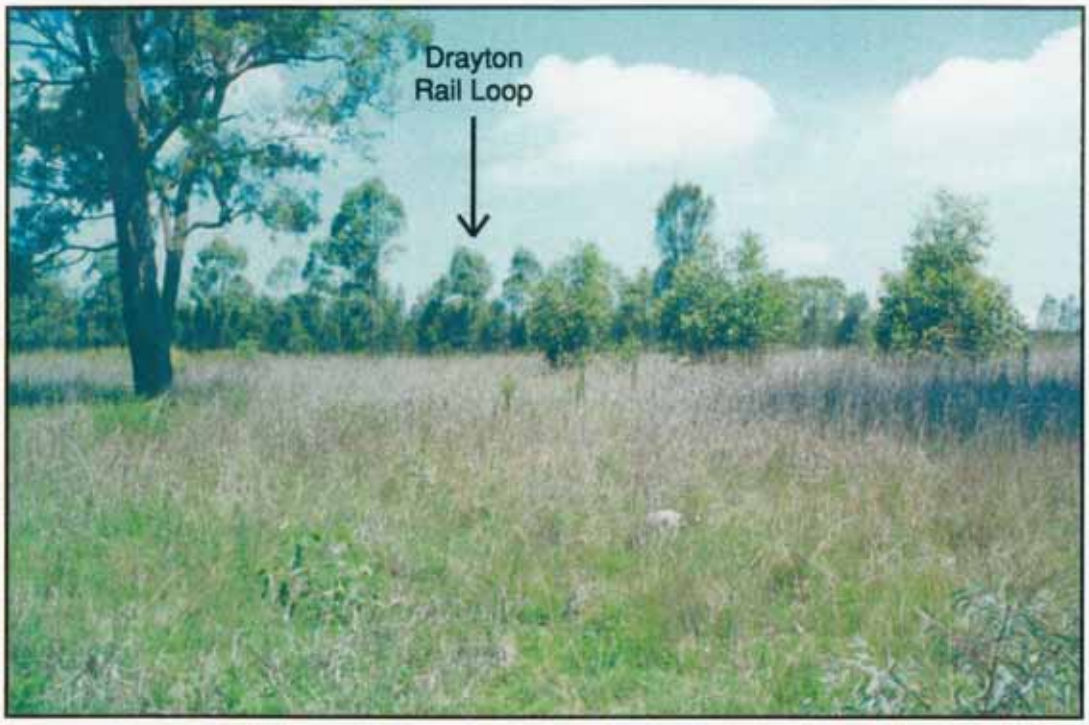


PLATE 1
View towards Drayton Rail Loop from Antiene Lot 8 Residence

PLATE 2
View towards Drayton Rail Loop from Thomas Mitchell Drive

locations along Thomas Mitchell Drive and the effect of proposed screening measures is illustrated in **Figure 4.21**. Implementation of the visual controls discussed in **Section 4.12.4** will ensure that train lights do not cause a safety hazard to vehicle users on Thomas Mitchell Drive. The impact of lighting on the stockpile and train loadout area is considered to be negligible due to the nature of topography in the vicinity. The train loadout bin is located within a cutting and the stockpiles are shielded by intervening ridgelines from Thomas Mitchell Drive. In addition, once the vegetation corridors are established, this infrastructure will be effectively screened from users of Thomas Mitchell Drive.

There will be no visual impact on nearby residences from train headlights or lighting of infrastructure for security or night operations, as there are no residences that have direct views of the proposed rail loop.

Train headlight impact on the Antiene Rail Spur and the Drayton Rail Loop will continue to be negligible, as existing vegetation and landform features between the rail lines and Thomas Mitchell Drive provide effective screening (refer to **Plate 2**).

4.12.4 Visual Controls

In order to minimise the lighting impacts of trains travelling along the Bayswater Rail Loop it is proposed to plant vegetation corridors between the rail line and Thomas Mitchell Drive, and construct visual screens along the top of the railway embankment as shown in **Figures 4.16** and **4.21**. The vegetation corridor will be planted with trees, shrubs and groundcover to provide an effective visual barrier to road traffic travelling along Thomas Mitchell Drive. The visual screens will provide immediate mitigation of lighting impacts. The vegetation corridors will not mitigate the impact of train headlights on road vehicles for approximately 5-10 years due to the height of the rail embankment above the surrounding topography, however, the vegetation corridors will soften the view of the rail infrastructure and enhance the general visual amenity of the area within 12 months of planting.

4.13 SPONTANEOUS COMBUSTION IN COAL STOCKPILES

Previous mining at the Bayswater No. 2 mine was in the Greta Coal Measures which have a relatively high propensity for spontaneous combustion. Coal mined from the Wittingham Coal Measures at Bayswater No. 3 mine has a low propensity for spontaneous combustion due to the low pyrite content of the coal resource. As a consequence, spontaneous combustion is readily controlled by minimising the duration of coal stockpiling.

Although the coals mined at Drayton have a high propensity for spontaneous combustion due to the specific characteristics of coal from the Greta Coal Measures, the detailed monitoring and maintenance measures adopted at the site effectively control the incidence of spontaneous combustion in the product coal stockpile.

The principal methods used to control spontaneous combustion at both mines is to ensure that coal in the stockpile is transferred to the Port of Newcastle on a regular basis. If coal can not be transferred to the dock due to delays in shipping or rail schedules and the stockpile begins to generate heat, coal in the stockpile is spread out to allow the heat to dissipate.

4.14 PUBLIC UTILITIES AND SERVICE INFRASTRUCTURE

4.14.1 Electricity

The proposed railway and loadout facility is currently traversed by 11 kV and 33 kV transmission lines and associated easements. The 11 kV line will be relocated to the west of the current location and the 33 kV line relocated to the east of the current location (refer to **Figure 3.4**). The exact locations of the transmission line and easement relocation will be determined in consultation with energyAustralia, prior to commencement of construction activities. The relocated transmission lines will traverse previously disturbed and rehabilitated areas and consequently there will be no impacts on natural flora/fauna and archaeological features.

New electricity infrastructure that will be required includes: a 33 kV/415 V transformer to replace the existing 11 kV/415 V transformer that supplies power to the dirty water dam pumps; a 33 kV substation; and a 33 kV transmission line to supply the conveyor.

4.14.2 Telecommunications

The Bayswater No. 2 telecommunication facilities will be extended to the rail loadout facility site office.

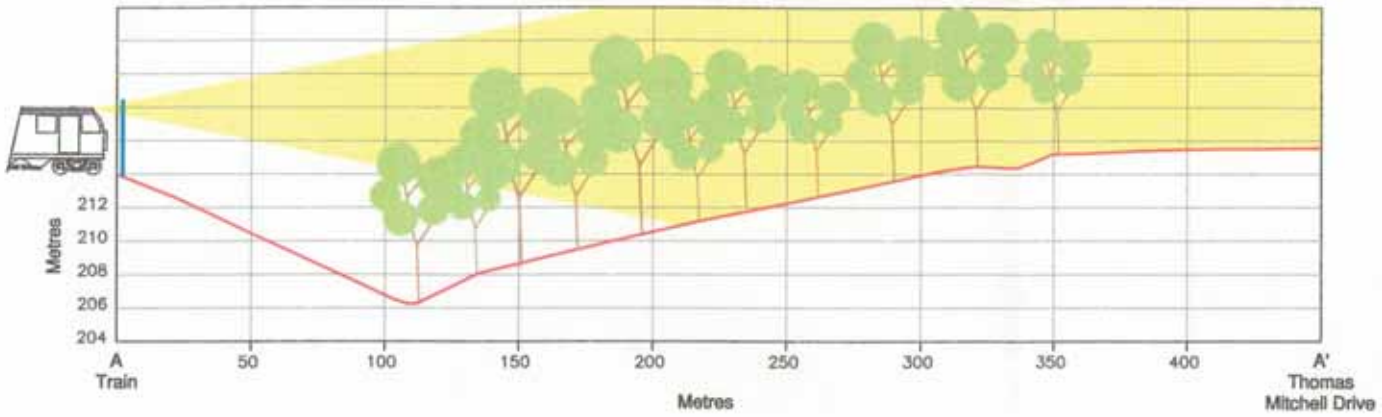
Access to these towers is currently provided by a Crown road form the existing Crown Land in the A171 area (refer to **Figure 2.4**). A new Crown road will be surveyed and dedicated to ensure continued access from Thomas Mitchell Drive to the existing Crown road. The route of this new Crown road will follow the existing access road across the Travelling Stock Reserve in the A171 area (refer to **Figure 2.5**).

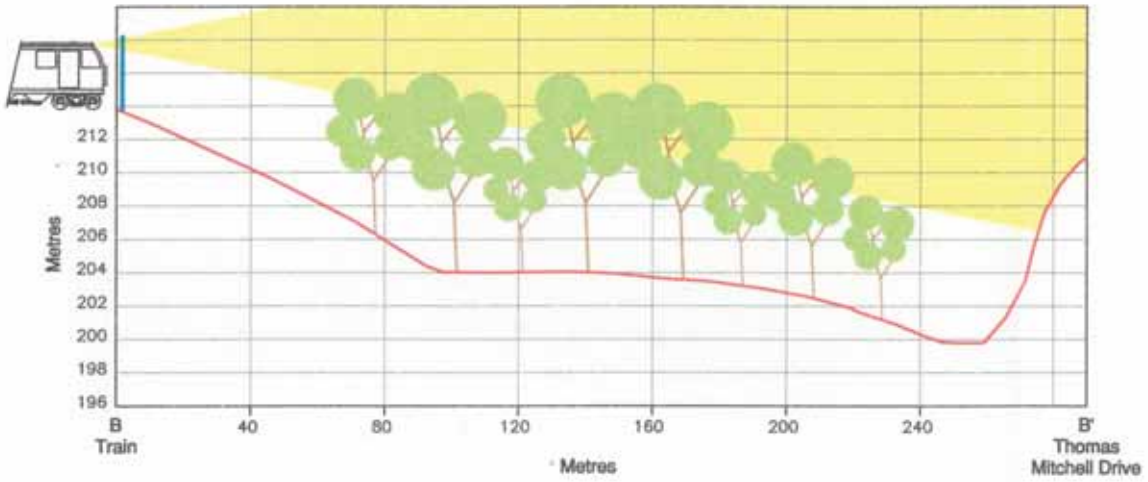
4.14.3 Water Supply and Sewerage

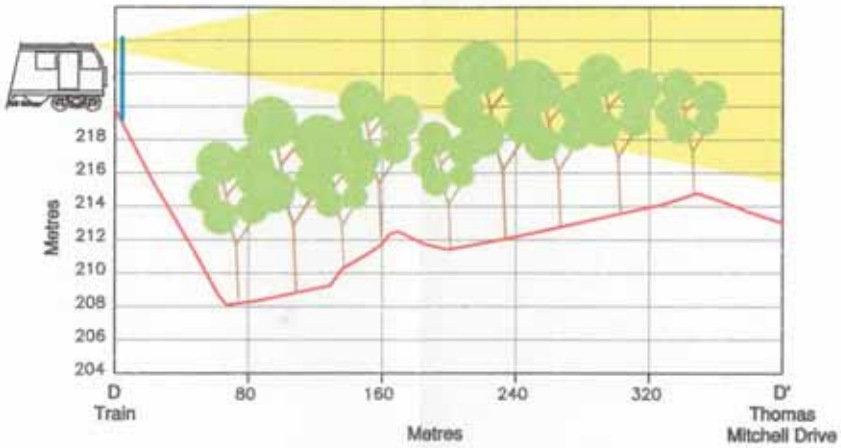
No public water supply or sewerage systems occur within the areas of proposed development. Bayswater Colliery Company has an agreement with Muswellbrook Shire Council for use of up to 700 megalitres per year of treated sewerage effluent from the Council treatment system. Use of this water has a major beneficial impact on the local community in terms of re-use of potentially low quality water that would otherwise be discharged to the Hunter River. This positive aspect of the mining operation is proposed to continue for future operations at the Bayswater site.

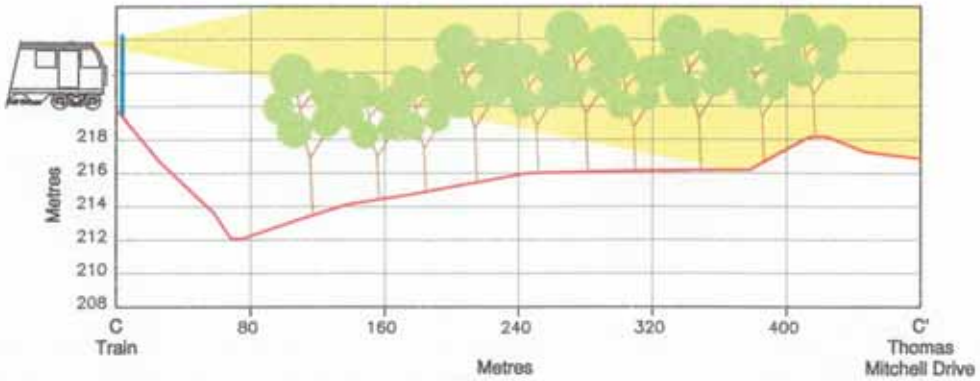
4.14.4 Other Service Infrastructure

The proposed railway will cross electricity and telecommunication easements and other existing service infrastructure such as Thomas Mitchell Drive and roads and pipelines associated with Bayswater and Drayton mines. The detailed design of the railway and loadout facility will be undertaken in a manner which ensures minimal disruption to existing easements and infrastructure and approved future infrastructure. Consultation has been initiated with energyAustralia in relation to the relocation of 11 kV and 33 kV powerlines. Further consultation with relevant parties will be undertaken at the detailed design phase to ensure, for example, adequate clearance over or under existing infrastructure and consideration of existing operations.









Legend

- Surface
- Visual Screens
- Zone of Lighting without Mitigation
- Proposed Vegetation Corridor

FIGURE 4.21
Train Lighting Transects

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4.15 SOCIAL AND ECONOMIC ENVIRONMENT

4.15.1 Community Attitudes

As discussed in **Section 2.3.8**, consultation was undertaken with a number of residents in the vicinity of the proposed development. The locations of the properties included in the consultation process are shown in **Figure 4.22**.

Qualitative analysis of the interview data revealed the following issue themes:

- transportation;
- environmental impacts; and
- information provision and involvement.

4.15.1.1 Transportation

In relation to transportation, residents were accepting of the proposal to terminate road haulage of coal from Bayswater mine to the Ravensworth Coal Terminal by mid 2001. Residents outlined that transport of coal by rail was greatly preferable than truck haulage due to issues of safety and road damage.

4.15.1.2 Environmental Impacts

Residents raised a number of environmental issues associated with the proposal, particular issues relating to noise and dust.

In relation to noise, residents expressed concern over the movement of coal trains on the existing Antiene Rail Spur, particularly noise associated with the shunting of carriages east of the Drayton Rail Loop, screeching of brakes along the spur east of the two loops due to movement of trains down a particularly steep gradient of track, and the loading and idling of locomotives at the changeover point. These impacts appeared greatest for those properties located directly opposite the facility on Thomas Mitchell Drive due to their geographical location. While some residents had complained of noise associated with 82 class locomotives, noise and vibrations from this source appeared to have been prevented through new train muffler installation. In relation to the proposed Bayswater Rail Loadout Facility, the location of the proposed loop was considered acceptable due to its distance from residential properties, and thus noise impacts were not expected to be a problem from this facility. Noise mitigation measures proposed for the Antiene Joint User Rail Facility are detailed in **Section 4.5** and **Appendix 6**.

The issue of dust from coal loading and stockpiles was also raised by residents. Many spoke of an increase in the amount of dust around the house, in backyard pools, on the roof and in surrounding vegetation due to increasing mining activity in the area. Many of the residents consulted have water tanks on their properties, as they are not connected to town water, and described what they perceived as dust residue present in the bottom of these tanks. Issues associated with further mine development were discussed, particularly cumulative impacts should the Mount Arthur North and Saddlers Creek proposals be approved.

Impacts of vibration were also identified; these impacts appeared to be largely from existing mine operations rather than the Rail Loading Facility.

4.15.1.3 Information Provision and Involvement

A general theme among residents related to the provision of information from mining companies and involvement in decision making. Residents requested improved protocols for working with neighbours and greater information regarding mine and rail loop facility operation. Feedback of information to residents appeared particularly poor.

4.15.1.4 Summary

Overall, the majority of residents appeared accepting of the termination of coal haulage by truck and the proposal to use rail as an alternative haulage method. Impacts of noise from the proposed Bayswater Rail Loadout Facility appeared minimal due to its geographic location, however issues of dust from this facility and the existing Drayton coal loop were of concern. Properties in close proximity to the Drayton loop also were concerned about noise impacts due to an increase in haulage capacity. However, should the proposal be approved a commitment has been made to residents for ongoing consultation during the construction and operational phases.

4.15.2 Mining in the Community

4.15.2.1 Regional Profile

The major coal resources of New South Wales are located in the area known as the Sydney-Gunnedah Basin. This basin extends from south of Wollongong to north of Newcastle and northwesterly through Narrabri into Queensland. This area is broken up into five main coalfields, namely the Hunter Coalfield, the Newcastle Coalfield, the Southern Coalfield, the Western Coalfield and the Gunnedah Coalfield. Coal mining provides employment for 13,286 people across these five coalfields, and in 1997-98 contributed approximately $4 billion to NSW from the export of high grade thermal and metallurgical coals (DMR Coal Industry Profile, 1999). While low prices for coal on international markets have placed increased pressure on regional producers' profit levels and provided more pressure for further productivity improvements, the Australian Bureau of Agricultural and Resource Economics (ABARE) forecast that domestic producers will increase the production and export of thermal coal used for power generation (Hunter Region Economic Indicators, September 1999).

The Hunter Coalfield, the area relevant to this assessment, is the largest coal producing area in NSW, and over the past decade has been the fastest growing area of coal production in the State. In 1997-98, saleable coal production from the Hunter Coalfield totalled approximately 61 Mt; this equated to 57% of the total saleable production across the five coalfields in NSW (Coal Industry Profile, 1999).

There are approximately 20 operating open cut mines between the townships of Broke and Aberdeen, five operating underground mines, and nine new mine proposals (five open cut and four underground). The greatest expansion of mining operations, particularly open cut, has been in the Singleton-Muswellbrook area.

In the Muswellbrook area, there are five active mines surrounding the township, four of which are open cut, with one underground mine located to the north west of the town. **Table 4.24** provides details of the open cut mining operations in the area, namely, Bayswater No. 3, Bengalla, Drayton and Muswellbrook No. 2.

Table 4.24 - Open Cut Mining Operations in the Muswellbrook Area

Mine	No. of Employees	Raw Production (Mt)	Saleable Production (Mt)	Recoverable Reserves (Mt)
Bayswater No. 3	312	6.0	4.80	160.0
Bengalla	91	2.0	1.5	361.0
Drayton	377	4.49	4.49	42.8
Muswellbrook No. 2	146	1.73	1.73	51.0

Source: DMR Coal Industry Profile (1999)

In addition to those mines currently operating, there are two proposed open cut mining projects, these include Mount Pleasant and the current proposal for Mount Arthur North. The Mount Pleasant development has recently been approved by the NSW Government (11 February 2000) and will be located approximately three kilometres west of Muswellbrook. With a proposed capacity of 10.5 Million tonnes per annum (Mtpa), the mine is anticipated to have an average operational workforce of 320 employees during the 20 years of coal production. Shell is currently evaluating the Saddlers Creek area, to the south of Mount Arthur, and Muswellbrook Coal Company and Powercoal are in the process of evaluating the Rosehill area and Anvil Hill areas, to the northwest and west of the Muswellbrook township respectively.

4.15.2.2 Profile of Mine Employees in the Muswellbrook Area

A survey of four mining operations in the Muswellbrook area (Mining Industry and Employee Survey, 1999) has revealed there is a total of 795 full-time employees across these operations, with 303 employees at Bayswater, 91 at Bengalla, 245 at Drayton and 156 at Muswellbrook Coal Operations. The average yearly income of mine employees was found to be between $70,000 per annum and $80,000 per annum.

Forty-eight per cent of all employees were found to reside in Muswellbrook, 14% in Singleton, 12% in Scone, 8% in Denman, 6% in Aberdeen and 12% across other towns such as Cessnock, Maitland and Newcastle, as illustrated in **Figure 4.23**.

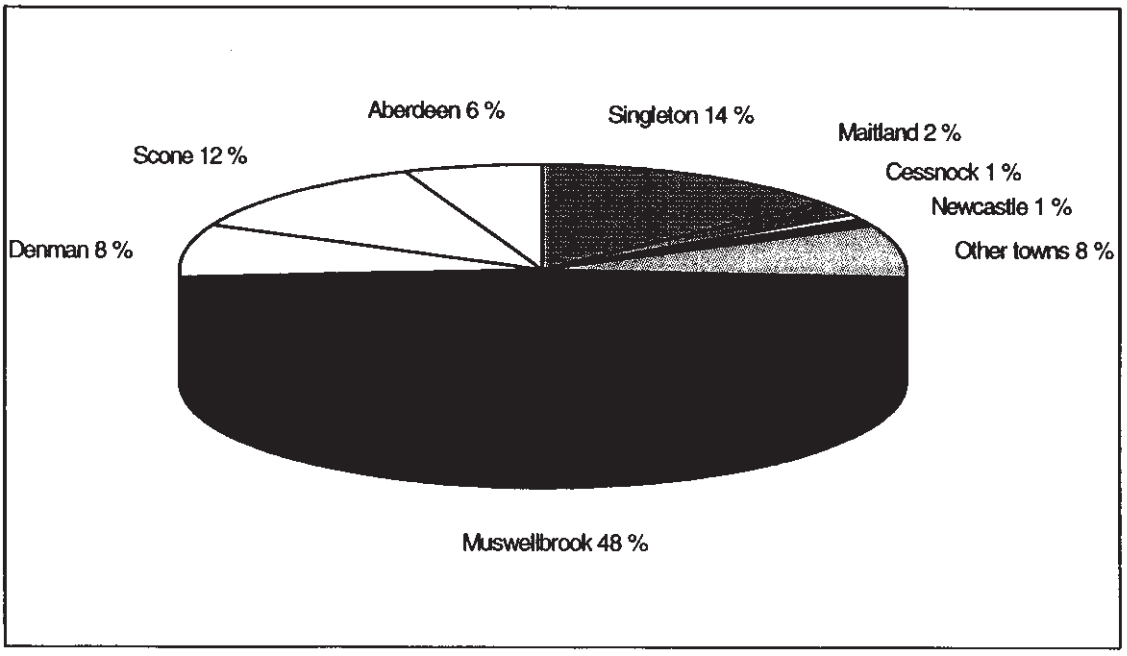

Figure 4.23: Residential Location of Mine Employees across Four Operations

Across all employees, mine workers are largely employed full time, have been working with their respective companies for over 10 years and in the industry for on average 15 years. The mean age of employees was 41 years with the majority being male (96%). Fifty-one per cent of employees were found to have a mortgage and had resided in their current townships for, on average, 22 years. Twenty-three per cent were found to have an education to Year 10 level with 65% possessing a certificate, degree or diploma qualification.

An analysis of the household expenditure of mine employees (after tax) estimated there to be approximately $40 million dollars in available annual household expenditure across the region. As **Table 4.25** shows, the township of Muswellbrook obtained approximately $19.6 million in annual household expenditure from employees across the four mining operations, with Singleton obtaining $4.8 million and Scone $4.3 million.

Table 4.25 - Location of Household Expenditure (All mine operations)

Towns	Annual Household Expenditure ($,000)
Muswellbrook	19,589
Singleton	4,758
Scone	4,285
Newcastle	3,512
Maitland	2,465
Denman	1,628
Aberdeen	917
Sydney	745
Cessnock	383
Other Towns	1,735
Total Household Expenditure	**40,017**

Source: Mining Industry and Employee Survey (1999)

Therefore, it is evident that the mining industry contributes significantly to the local and regional economy, particularly to the Shire of Muswellbrook ($21.2 Million), but also to other Shires in the Upper Hunter Region.

4.15.3 Antiene Joint User Rail Facility

4.15.3.1 Profile of Construction and Operational Workforces

Subject to development consent being granted, the construction schedule for the development of the proposed new rail loop facility is anticipated to commence in mid 2000 and continue for a period of approximately 12 months.

The anticipated site work force, from mobilisation through to completion of construction, is outlined is likely to be in the order of 55-66 personnel. It is anticipated that contractors will carry out the construction work for the project. The source of the construction workforce will largely depend on the construction companies selected to complete the work. However, where possible, employment will be maximised from local sources.

Should development approval be granted, the Bayswater loadout facility will employ approximately two personnel (one dozer driver and one loadout operator).

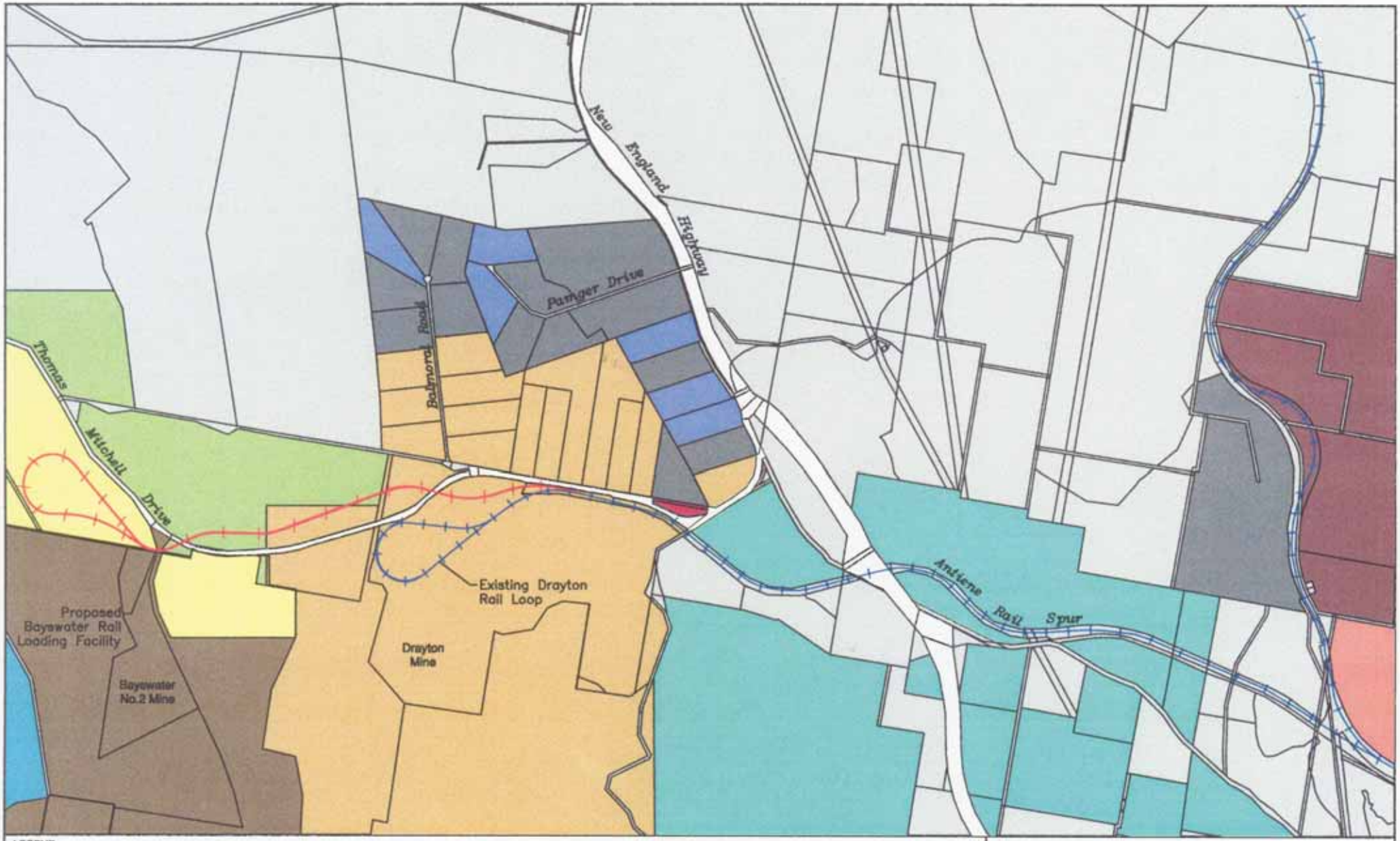

FIGURE 4.22
Locations of Properties in which Residents were Interviewed

A4 Scale: 1:35 000

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It is not possible to precisely predict the proportion of the construction workforce that will temporarily relocate to the Muswellbrook area to take up employment on the project. In order to assess the potential social impacts resulting from the in-migration of a construction workforce for the rail loadout project, two potential scenarios were assessed.

A review of previous social impact assessment literature indicates that a scenario of 20 per cent in-migration and 80 per cent employment absorption from the local area is considered a realistic estimate of possible construction workforce relocation. As outlined by Mitchell McCotter (1989), these figures appear representative of other mining developments in the Hunter region developed during the late 1980s. It is consistent with the in-migration of the construction workforce for the Bengalla mine. However, in order to be conservative, it was also considered necessary to assess a further scenario of 50 per cent in-migration and 50 per cent employment absorption from the local area. Using the peak construction workforce figure of 66 personnel, **Table 4.26** summarises workforce origin based on these two scenarios.

Table 4.26 - Construction Workforce Migration Scenarios

Scenario	Local	Migrant	Family Impact	Population Increase
80:20	53	13	5	18
50:50	33	33	12	45

Note: Family impact assumes 15% of workers bring families to the area, with an average family size of 3.5 (Mining Industry and Employee Survey, 1999), and excludes the migrant worker.

Source: SCC (2000)

Due to a relatively short construction phase period, it is anticipated that only a relatively small associated population, in the form of family, would accompany construction workers who in-migrate to the area. Discussions with mining contractors in the area have revealed that approximately 15 per cent of workers who in-migrate bring their wives or families to their work location (pers. comm., 2000).

Contractors, working on other mining operations in the region, have indicated that workers are predominantly young single males who choose to reside close to the site of the mining operation (pers. comm., 1999). Applying the 15% proportion to the migrant construction workforce, between 2 and 5 workers may consider moving their families to the Muswellbrook area, resulting in an increase in population of between 18 to 45 persons in total.

A review of employment statistics in the Muswellbrook area and interviews with local employment agencies have revealed that there are a range of employees in the locality to fill available construction and operational positions (pers. comm., 1999). It was suggested that these workers might be sourced from local unemployed or employed labour, who possess relevant qualifications, or from workers who choose to relocate to the area to take up positions. Occupations of relevance may include tradesman, production and transport and labour related workers.

Since personnel for the Bayswater and Drayton rail-loading facilities will be sourced from existing mine operations, no in-migration scenarios have been assessed.

4.15.3.2 Impact of Construction Workforce

Economic Impacts

The Bayswater Rail Loadout Facility has the potential to deliver economic benefits to the local community through employment, income and output.

A survey of four existing mining operations in the area (Mining Industry and Employee Survey, 1999) has revealed that substantial industry expenditure occurs locally, in the townships of Muswellbrook and Singleton, but is also likely to be directed to the broader region, particularly the cities of Newcastle and Sydney. Interviews with local businesses located at the Muswellbrook Industrial Estate (pers. comm. 1999) also reveal that any additional development will yield benefits for the business sector, particularly those businesses that service the mining industry.

Furthermore, the in-migration of between 13 to 33 additional workers to the local community will result in additional expenditure within the locality. Based on gross average weekly earnings of $1,250.00 ($65,000 per annum) and assuming taxation on earnings of $406.76 per week, the after tax weekly income for each worker is estimated to be $843.23. As a result, an estimated total of $2,893,968 would be generated in available annual household expenditure for a peak workforce of 66 employees in the construction period (June 2000 to June 2001). Based on expenditure patterns of mine employees (Mining Industry and Employee Survey, 1999), it is likely that a significant proportion of this amount would be spent in Muswellbrook and other townships such as Scone, Singleton, Newcastle, Denman and Maitland.

The land area where development is proposed for the new Bayswater Rail Loadout facility is Crown Land owned by the Rural Land Protection Board. This area has been used for agistment of cattle and as a reserve for travelling stock. The area is not located in close proximity to any other residential or private land holdings. Discussions with the Rural Land Protection Board have been undertaken to negotiate exchange of this area for a replacement area. This action has been agreed in principle subject to some conditions e.g. fencing upgrades, development of stock water dams. One lessee currently uses the land to agist approximately 40-50 head of cattle, it is anticipated that the current lessee will be provided with the opportunity of using this new area, and as a result no economic impact will be experienced in this regard.

Issues of property value were not raised by residents in the consultation process, however it is acknowledged that for those properties in close proximity to the existing Drayton Coal Loop, such as those located on Thomas Mitchell Drive, property values may be influenced by the presence of this facility, which has been in operation for approximately 17 years.

Benefits will also be experienced by the public sector from the transport of coal. For example, the Federal government receives revenue in the form of company tax and other taxes such as fuel excises.

The State Government also receives revenue from taxes, and payments for services provided by statutory bodies, such as rail freight for the transportation of coal to the Newcastle Port and port charges.

At a local level, Local Government benefits may include rates and charges paid by both companies, COAL and Shell Australia, plus increases in rate revenue from employees who choose to relocate to the area.

Housing and Accommodation Impacts

During the rail loadout construction period between 13 and 33 workers will require temporary accommodation. As has been highlighted in **Section 4.15.2**, the Muswellbrook Local Government Area has a large range of hotel, motel, and guest house and caravan park accommodation.

Between September 1997 to September 1998, hotels, motels and guest houses across the Muswellbrook LGA had an average room occupancy rate of 48%, and 50% between September 1998 and September 1999 (ABS, 1997,1998,1999). Site occupancy rates for caravan parks are only available for the March to December 1997 quarters, with an average site occupancy rate of 51.1%.

Table 4.27 outlines occupancy rates for hotels, motels, guest houses and serviced apartments (with 15 or more rooms) for the March, June and September Quarters of 1999.

Table 4.27 - Accommodation Establishment Statistics (March to September 1999)

Quarter (1999)	Muswellbrook LGA	
	No. of Rooms	Occupation Rate %
March	203	46.9
June	201	50.1
September	202	45.4

Source: ABS (1999)

Interviews undertaken with 18 hotel/motel/caravan park owners across the assessment area, in which the construction scenario was presented, indicated that any temporary increase in population could be easily absorbed by current service infrastructure. The majority of operators commented on how occupancy rates vary according to industry development and the seasonal nature of the accommodation industry. In relation to industry, many operators spoke about the construction periods of other mine developments in the area, particularly the recent Bengalla mine development, noting that during construction phase for this operation occupancy rates were between 85-100%. Although considerably larger construction workforces are required for the development of mining operations, the influx of contractors for the rail loadout facility was considered favourably.

Surveys of real estate agents across the Muswellbrook LGA also revealed a current oversupply of rental accommodation, with between 300-400 properties available across the area. Some decrease in rental prices appeared to have occurred due to relatively high vacancy rates. Some agents attributed this to job losses in the area and to the completion of the Bengalla construction period.

Overall, it was evident that any increase in population, as a result of the Antiene Joint User Rail Facility construction, could be absorbed relatively easily by existing residential and rental property in the Muswellbrook area.

Social Infrastructure Impacts

A range of services are available across the Muswellbrook Shire. These have been previously highlighted in **Section 2.3.8.4**. Interviews undertaken with service providers in the areas of education, health, children's services and recreational services, as part of the Mount Arthur North Community Participation program have revealed that any increase in

population due to mining development activity could be easily absorbed. This is largely due to declining enrolment numbers and client usage in many of these sectors. The influx of workers and their families, as a result of the construction of the Bayswater Rail Loadout Facility, is relatively minimal and thus social infrastructure impacts are not anticipated.

4.15.4 Impact Summary

Overall, it is evident that the construction of the Bayswater Rail Loadout Facility will have little impact on social infrastructure and housing and accommodation services within the Muswellbrook area. The increase in population in the order of 18-45 additional persons, that may occur as a result of the in-migration of workers to the area, is marginal and thus will not place any strain on existing social services.

An increase in population of any magnitude, however, will result in a positive impact economically, through employee and industry expenditure and municipal and state finances.

Interviews with residents in the area have revealed concerns over environmental impacts, particularly dust and noise associated with the Joint User Rail Facility. However, these concerns were particularly pronounced for two households located on Thomas Mitchell Drive in close proximity to the existing Drayton Coal Loop. Residents have requested ongoing consultation in regard to the proposal, and further consultation with residents is planned to identify appropriate mitigation strategies to address these issues.

4.16 CUMULATIVE IMPACTS

Potential cumulative impacts associated with many aspects of the proposed development have been considered in the environmental impact analysis and assessment presented in **Section 4.0**. This section synthesises this information whilst also assessing potential cumulative impacts associated with:

- interaction of each project component assessed in **Section 4.0**. That is, the cumulative impacts associated with the combination of:
  - transportation of increased tonnages of coal via the existing Drayton Rail Loading Facility; and
  - the construction and operation of the proposed Bayswater Rail Loading Facility.
- interaction of the proposed development components with other surrounding existing or proposed activities. This interaction also includes potential cumulative impacts of the proposed development when considered in conjunction with continuing operations within the existing Drayton and Bayswater mine holdings.

4.16.1 Hydrology and Water Quality

4.16.1.1 Surface Hydrology and Water Quality

Construction of the proposed Bayswater Rail Loading Facility, as well as existing agricultural and mining activities in the area, has potential to have a cumulative impact on flows and water quality in Ramrod Creek.

Adoption of water quality controls proposed for the Bayswater Rail Loading Facility (see **Section 4.7.3**), combined with the existing Bayswater and Drayton water management

systems, will minimise the potential for the existing development and proposed modifications to contribute to adverse water quality impacts on the Ramrod Creek system.

The existing water management system at the Drayton Rail Loading Facility includes an 18 megalitre sedimentation dam, while the new sedimentation dam proposed for the Bayswater Rail Loading Facility will be 30 megalitre. These sedimentation basins provide for the collection and reuse of runoff from the respective rail loading areas so as to maintain nil discharge from both these areas to Ramrod Creek. Containment of runoff from these areas combined with:

- greater reuse of water on site for dust suppression and irrigation of rehabilitated areas;
- treatment and reuse of Muswellbrook's sewage effluent in constructed wetlands at Bayswater No. 2; and
- continued monitoring and refinement of the effectiveness of the water quality control system.

will ensure that the proposed development does not significantly contribute to further deterioration of the condition of Ramrod Creek or the Hunter River.

In terms of flow considerations, there will be no reduction in the catchment area of Ramrod Creek as a result of the development. Culverts to convey flows from one side of the railway embankment to the other have been designed to safely convey peak flows to ensure that there is no increase in flooding of surrounding lands, including Thomas Mitchell Drive.

To minimise sediment generation potential, a detailed Soil and Water Management Plan will be prepared and implemented for the construction phase of the Bayswater Rail Loop. Works will be undertaken over an approximately nine month period with only a short section of the creek system disturbed at any point in time. Works within the creek bed will be restricted to a length of approximately 60 metres at the location where the proposed rail embankment crosses Ramrod Creek (refer to **Figure 3.2**). Works at this location will be subject to a Part 3A Permit from the Department of Land and Water Conservation, which will need to be obtained prior to such works being implemented. The Soil and Water Management Plan will establish protocols to ensure that care will be taken to minimise the area of disturbance at any point in time and all disturbed areas will be revegetated as soon as possible. These commitments are reinforced in **Section 4.7.3.4**.

In summary, it is considered that construction of the Bayswater Rail Loop and operation of the Antiene Joint User Rail Facility will not have significant off-site hydrological or water quality effects. Similarly, continued mining operations on adjacent colliery holdings will not substantially affect the hydrology of the Ramrod Creek drainage system. During operation of the facility, surface drainage will be adequately managed through implementation and continual improvement of the existing water management systems at both Drayton and Bayswater mines.

4.16.1.2 Groundwater

Potential groundwater impacts within the area proposed for the Antiene Joint User Rail Facility are addressed in **Section 4.7.2**. There is no major regional groundwater resource in the area of the proposed development or adjoining areas. The proposed development will not utilise any groundwater resources and construction activity is not likely to intersect the watertable. In summary, as the depth of cover to the watertable is considerably greater than the predicted depth of impact associated with the construction and operation of the proposed Bayswater Rail Loop, and operation of the existing Drayton Rail Loop, the potential for 'off-

site' or cumulative impacts on the groundwater system downstream of the proposed Life Extension Area will be minimal.

4.16.2 Dust and Noise

Potential dust and noise impacts associated with the Antiene Joint User Rail Facility have been assessed in **Sections 4.4** and **4.5**. The methodology for assessment of future dust and noise levels is based on consideration of existing background levels. Therefore the dust and noise impact assessment for this project has considered the cumulative impact of the Antiene Joint User Rail Facility in conjunction with other existing land uses in the area. Extensive noise and dust controls and an ongoing noise monitoring program are proposed in order to minimise the cumulative dust and noise impacts.

The Drayton and Bayswater rail loadout bins are approximately two kilometres apart. Each operation is required to meet amenity criteria at residences in its vicinity, although there is some overlap in noise impacts. The cumulative noise impacts associated with simultaneous operation of the Drayton and Bayswater facilities are discussed in **Section 4.5.3**. There is no overlap in dust impacts during simultaneous operation of both facilities. On this basis, there is negligible potential for cumulative noise and dust impacts from these operations. Predicted noise and dust levels outlined in previous sections indicate that there will be no perceptible cumulative amenity impact on any residence as a result of noise and dust emissions from these two components of the proposed development.

There are proposals to undertake mining on the Mount Arthur North and Saddlers Creek mining leases adjacent to Bayswater mine (refer to **Figure 1.1**). Future environmental assessment of these projects will need to consider any potential noise and dust cumulative impacts with the Antiene Joint User Rail Facility operations. It is understood that a future urban expansion area in South Muswellbrook is being considered by Muswellbrook Shire Council, but is still at the early strategic planning stage. Similarly, future environmental assessment of this proposal will need to consider cumulative impacts with existing and proposed operations at the time the assessment is undertaken.

4.16.3 Visual

The Upper Hunter area has a diverse range of landscapes, although scenic quality is low to moderate due to the extensive views of mining operations. As discussed in **Section 4.12.2**, the visual impact of the proposed development is expected to be low, as the development is not discernible in most areas due to the topographical features between the development area and surrounding lands. There will, however, be extensive views of the proposed Bayswater Rail Loading Facility from Thomas Mitchell Drive for a distance of approximately four kilometres.

As discussed in **Section 4.12.4**, there are a number of features of the project and proposed management procedures, which will assist in protection of the scenic amenity of the area. These features include establishment of vegetated screens between Thomas Mitchell Drive and the railway embankment to provide mitigation of lighting impacts and improved visual amenity of the area.

Progressive rehabilitation of all disturbed areas will ensure that the proposed development does not cause long term cumulative impact on the scenic quality of the area.

4.16.4 Traffic

All traffic assessment undertaken for this project (refer to **Section 4.3**) has been undertaken on a cumulative basis considering existing traffic volumes in addition to projected traffic from this project. As it is not proposed to significantly increase employment numbers and this project aims to transfer a significant volume of coal transport from road to rail, there is expected to be a positive cumulative impact on traffic volumes on the public road system.

4.16.5 Flora and Fauna

Potential impacts on vegetation communities and particular flora/fauna species as a result of the Antiene Joint User Rail Facility have been considered in a local and regional context in **Section 4.9** and **Appendix 3**.

Minor effects are expected on vegetation communities in the proposed Bayswater Rail Loop area, however, the vegetation communities proposed to be disturbed are well represented in the local region. Despite this, it is recognised that flora and fauna resources are progressively being impacted locally and on a State and national basis and there is a need to minimise cumulative impacts as far as possible whilst also meeting the community's development needs. To minimise the potential cumulative impacts of minor losses of forested vegetation, it is proposed to establish a habitat compensation area and vegetation corridor in the vicinity of the proposed Bayswater Rail Loop (refer to **Figure 4.16**), which will be 7.1 times larger than the area proposed to be disturbed. This area will be fenced to exclude stock and maintained by Bayswater Colliery Company. Establishment of this habitat compensation area, as well as the vegetated screens between Thomas Mitchell Drive and the railway embankment discussed above, will lead to a positive cumulative impact on flora and fauna in the long term.

4.16.6 Aboriginal Archaeology

An analysis of the archaeological potential and significance of Aboriginal sites within the project area presented in **Section 4.11.1**. In considering the significance of evidence of Aboriginal occupation of the area, the analysis took into consideration a range of criteria relating to scientific value, rarity, site condition and structural integrity, as well as cultural value to the local Aboriginal community. Several of these criteria necessarily involve evaluation of the evidence relative to other known occupation evidence in the regional context.

4.16.7 European Heritage

One item of European heritage occurs within the proposed development area (refer to **Section 4.11.2**) but no sites of significance are proposed to be substantially affected. Implementation of the detailed site documentation, management and monitoring procedures outlined in **Section 4.11.2**, will ensure that the proposed development does not cause cumulative impact on this heritage item. Documentation of the European heritage knowledge gained from these investigations makes a positive contribution to the historical record for the local region.

5.0 ONGOING ENVIRONMENTAL MANAGEMENT

5.1 BAYSWATER MINE

Bayswater Colliery Company has comprehensive environmental management commitments associated with existing development consent, mining lease conditions, mining operations plan and EPA licence conditions. An Annual Environmental Management Report is prepared and details all of Bayswater's commitments to environmental management, monitoring and rehabilitation. It also provides an indication of targets and future initiatives for environmental management. The following overview of environmental management undertaken for the existing Bayswater operation has been sourced from the latest available Annual Environmental Management Report (Bayswater Colliery Company Pty Limited 1998).

The existing comprehensive environmental management system described below will provide the framework for management of the new facility. All existing management plans will be updated to include environmental control and monitoring requirements for the new infrastructure. Annual Environmental Management Reports will continue to be prepared and will include details of Bayswater Colliery Company's commitment to ongoing improvement in environmental management and an assessment of compliance with government regulations and company protocols.

5.1.1 Meteorological Monitoring

Existing Meteorological Monitoring

An automatic weather station was installed at the Bayswater site in early 1995 and measures rainfall, evaporation and wind patterns.

Proposed Meteorological Monitoring

It is proposed to maintain the existing meteorological monitoring system to provide any necessary data for environmental management of the rail infrastructure.

5.1.2 Water Management and Monitoring

Existing Water Management and Monitoring

The Bayswater No. 2 and Bayswater No. 3 sites are divided into a number of subcatchments. Diversion banks and associated dams collect runoff, with design based on a 1 in 20 year average recurrence interval rainfall event. A major portion of the runoff from mining areas drains internally to sumps and pits. This water is then pumped to storages and most particularly the main water supply dam located in the northern portion of the site, which has a storage capacity of approximately 1000 megalitres. The water management principles for the current Bayswater operation were detailed in the Bayswater No. 3 Environmental Impact Statement (Resource Planning Pty Limited 1993). Clean runoff is diverted around the mine pits to reduce the pit water catchments to the minimum possible area. At present clean water is not harvested for on-site use and is allowed to contribute to downstream environmental flows. Pit water dams have been located in strategic positions, generally adjacent to haul ramps to allow ready pumping of accumulated water for dust suppression and other uses. To date there has been no substantial groundwater flow into the Bayswater No. 3 pits and groundwater management has not comprised a major part of the overall water management strategy. Pit dewatering is undertaken as necessary. Bayswater has a nil discharge condition on its Pollution Control Licence and no off-site discharges of water have been recorded.

Bayswater Colliery Company maintains a comprehensive surface water and groundwater monitoring program. Surface water is monitored at a number of sites including dams, creeks and pit water storages in the area shown on **Figure 5.1**. These monitoring sites concentrate on drainage lines that exit the lease area. The comprehensive water analyses include pH, conductivity, total suspended solids, total dissolved solids, iron, nitrate and sulphate. Groundwater is also monitored on a regular basis at locations within the Bayswater No. 3 mining lease (**Figure 5.1**).

Proposed Water Management and Monitoring

The principles adopted in the surface and groundwater management strategy described in above will be extended to the new infrastructure including the sedimentation basin and culverts. This strategy will maximise the separation of clean and dirty water flows and maintain the nil discharge condition of the current EPA Pollution Control Licence. As described in **Section 4.7.3.2**, sediment collected in the new sedimentation basin will be periodically removed to ensure that adequate capacity to contain the 1 in 20 year ARI storm event is maintained. Culverts will also be regularly inspected and cleaned out to ensure that the design flow capacity is maintained.

5.1.3 Air Quality Controls

Existing Air Quality Controls

A detailed Air Quality Management Plan has been developed by Bayswater Colliery Company to ensure implementation of conditions of approval and other controls to maintain acceptable air quality. The Air Quality Management Plan covers details on air quality monitoring procedures, statutory requirements, dust control procedures, responsibilities and actions to respond to dust episodes. Air quality monitoring equipment maintained by Bayswater Colliery Company includes the following:

1. nineteen dust deposition gauges are sampled monthly and analysed for insoluble solids, ash and combustible matter.

2. two PM_{10} high volume dust samplers are run for 24 hours, every six days. These samplers are also triggered automatically by dust and wind parameters or manually following complaints. The locations of these high volume samplers are shown on **Figure 5.1**.

3. a weather station (refer to **Section 5.1.1**) that relays results by telemetry link directly to the environmental officer's computer, which allows constant monitoring of dust episodes caused by particular weather conditions. This equipment also allows calculation of dust risk and relays this information by computer network to the production supervisor's office to enable modification of operations.

4. a laser dispersion real time dust monitor is currently installed west of Edderton Road to continuously monitor total suspended particles and PM_{10} dust levels. This information is relayed by radio telemetry to the mine environmental officer and production supervisors. Location of the real time dust monitor is shown on **Figure 5.1**.

In situations where the dust problems are perceived by mine site personnel or neighbouring landholders to be a problem, the following procedures must be undertaken:

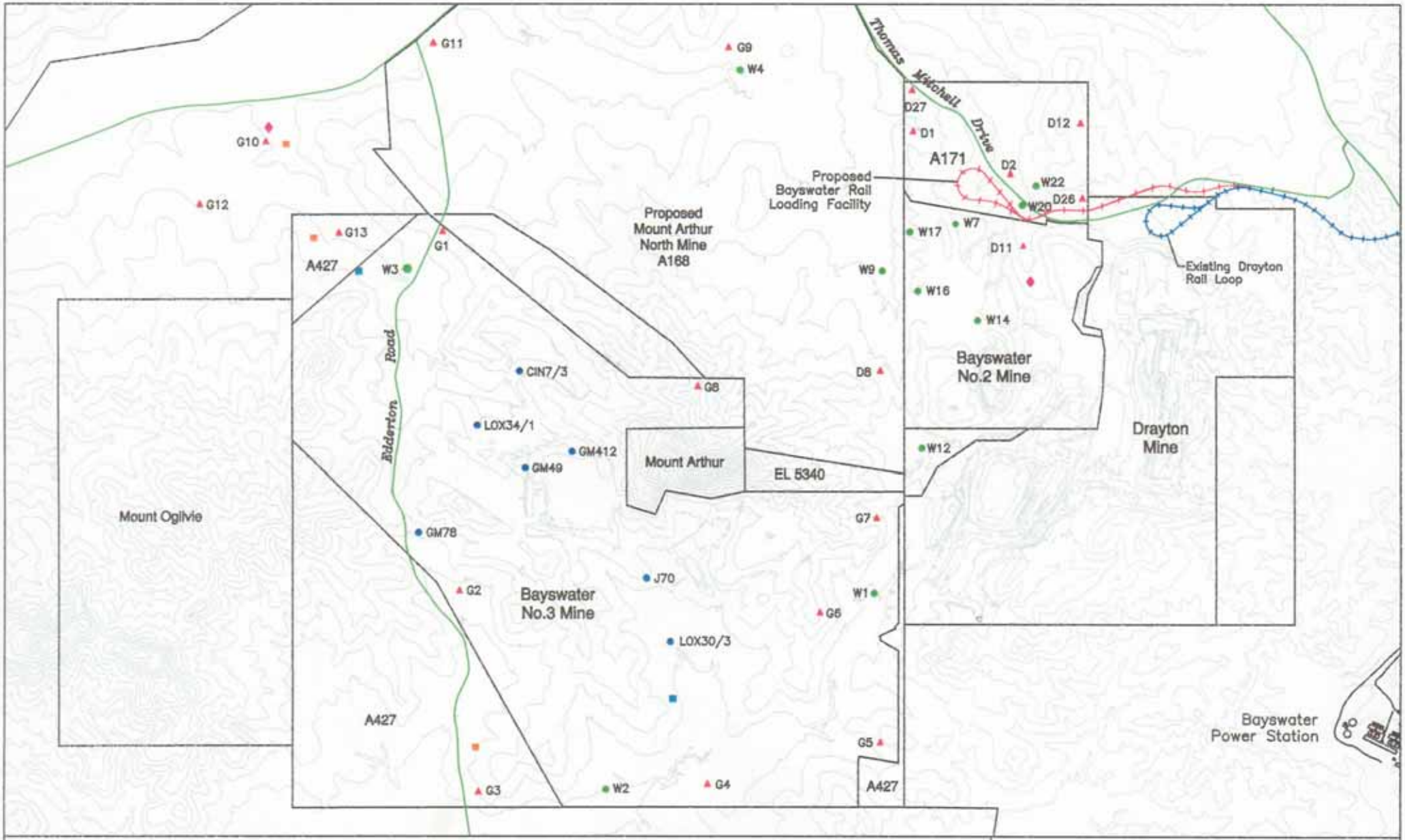


FIGURE 5.1
Current Monitoring Sites at Bayswater Mine

Umwelt (Australia) Pty Limited
Source: Bayswater Colliery Company

A4 Scale: 1:66 000

Ref No.:1323/R01/dra_043.dwg

1. the production supervisor is to investigate the situation to determine any signs of visible dust and possible sources;

2. where a problem source is found, the method of operation is to be altered or a machine deployed elsewhere to alleviate the problem;

3. if the source of dust is from haul road traffic, then an extra water cart is to be used as required; and

4. the environmental officer must be informed of any complaint and details must be recorded in a complaint book.

Proposed Air Quality Controls

Dust suppression will be achieved through installation of dust suppression sprays on the coal stockpile, as described in **Section 4.7.3.2**, and through implementation of Bayswater Colliery Company's existing Air Quality Management Plan. In addition, vegetation corridors to be established along the rail corridor for visual impact mitigation and fauna habitat will provide a sheltering effect between the proposed facility and adjacent properties.

The existing Bayswater monitoring program will be extended to include a high volume sampler to measure PM_{10} dust concentrations to the northeast of the facility. It is proposed that this monitoring station will be jointly managed and operated by Drayton and Bayswater mines. The addition of this high volume sampler will provide satisfactory a monitoring network for the proposed facility when combined with the existing meteorological station and dust gauges. This monitoring network will allow assessment of compliance of the proposed operations.

5.1.4 Noise Controls

Existing Noise Control

Bayswater Colliery Company has developed a Management Plan for noise episodes and this is detailed in their Annual Environmental Management Report. In summary, the following safeguards are incorporated in the project to minimise potential noise impacts:

- all mobile equipment is maintained in good working condition;
- all coal haul trucks are fitted with functional exhaust systems;
- access roads to the pits are constructed with lowest practicable grades and are maintained by periodic grading.
- the CPP is fully enclosed on all sides; and
- all conveyors are covered and regularly checked and maintained to minimise any high or annoying noise emissions from squeaking rollers, rattling bearing and other nuisance noise sources.

Bayswater Colliery Company also maintains an extensive noise monitoring system (**Figure 5.1**). This includes noise monitoring over a period of 72 hours at one month intervals. This monitoring exceeds the EPA requirement for 24 hour periodic monitoring for the life of the mining operation. Any new equipment is tested prior to being commissioned to determine

that sound power levels of the machine conform to the sound power levels specified in the Bayswater No. 3 Environmental Impact Statement (Resource Planning 1993).

In the event of unacceptable noise episodes being indicated by either the monitoring program or by observation of neighbouring landholders, the following procedures are specified within the Bayswater Colliery Company Management Plan:

1. the source of the noise will be identified by further monitoring and observation;

2. if the desired noise level goal has been exceeded, then the following steps will be carried out;

3. the offending machine or operation will be tested to determine the sound power levels and to further identify specific causes;

4. the offending equipment will be modified, relocated or its mode of operation altered to reduce the noise levels;

5. further monitoring will be conducted for 24 hours to confirm that the problem has been rectified; and

6. the neighbouring landholder will be informed of the results of monitoring and testing and the steps taken to rectify the situation.

The following blast control procedures are also implemented as part of the current operation:

- monitoring is undertaken of all blasts;

- blasts are designed to minimise ground vibration and factors such as charge weight per delay and firing sequence are considered;

- loading of all blasts are supervised to avoid overloading and to ensure sufficient stemming;

- records are maintained of blast designs including hole number, depth, stemming, explosive type and type of initiation; and

- the best available means of initiation are used to minimise air blasts.

The location of blast monitors is shown on **Figure 5.1**. Peak particle velocity and air blast overpressure are recorded as well as a trace for each blast showing wave frequency and amplitude.

Proposed Noise Controls

The noise controls detailed above will be applied to the operation of all mobile and permanent plant at the new facility. Noise mitigation measures that have been included in the design of the Bayswater Rail Loading Facility include:

1. covering of the transfer conveyor with profiled metal sheeting;

2. enclosure of the loadout bin tower with profiled metal sheeting;

3. construction of an acoustic screen along the critical section of the rail loop corridor (refer to **Figure 4.11**);

4. location of the rail corridor in a cutting at the most elevated section of the route;

5. location of the signal for trains entering the Antiene Rail Spur from the Bayswater Rail Loop in the cutting mentioned above to avoid locomotives idling in an acoustically exposed area; and

6. planting of vegetation corridors along the rail corridor.

The existing Bayswater noise monitoring system will be utilised to determine compliance, or otherwise, of the proposed facility with current noise criteria and Bayswater's own Environmental Management Plan. Existing remedial procedures and complaints protocols will be followed in the event of an unacceptable noise episode.

5.1.5 Waste Management

Existing Waste Management

Sewage Treatment

Sewage effluent is contained in septic tanks, which overflow into evaporation and transpiration areas. Mobile crib facilities located within mining areas are equipped with chemically treated toilets, which are pumped out by a licensed contractor approved by Council.

Oil and Grease Containment and Disposal

An oil containment system is in place to intercept store, workshop and vehicle washdown waters. Oily water collects in a settlement pit from which solids can be removed. An oil skimmer recovers surface oil and the overflow passes through a plate separator to further collect any oil present within the water. The collected waste oil is pumped to a waste oil collection tank and a licensed operator periodically empties the waste oil tank. Mobile equipment has fittings to allow evacuation of oil for repair work, which may be necessary in the field. All routine oil changes and services are carried out in the workshop.

Proposed Waste Management

Sewage generated by the proposed amenities block will be treated using a package treatment plant and solid waste will be collected regularly by a licensed contractor, as described in **Section 3.3.1.12**.

5.1.6 Cultural Heritage Management

Existing Cultural Heritage Management

Bayswater has developed a plan for the monitoring and protection of 'Edderton' and 'Belmont' homesteads. Bayswater Colliery Company is undertaking ongoing Aboriginal archaeology conservation planning in conjunction with NPWS and the Wonnarua Tribal Council.

Proposed Cultural Heritage Management

As discussed in **Section 4.11**, appropriate permits will be obtained and the Wonnarua Tribal Council will be invited to salvage identified artefacts. In addition, an Excavation permit will be obtained and the identified European heritage relic will be salvaged.

5.1.7 Rehabilitation and Land Use Management

Existing Rehabilitation and Land Use Management

Rehabilitation is carried out at the Bayswater site on a progressive basis, using Department of Land and Water Conservation guidelines and the recommendations of State Forests for tree planting. Details of rehabilitation progress at Bayswater are included in the Annual Rehabilitation Report included in the Annual Environmental Management Report. The rehabilitation program includes: reshaping of slopes to less than 1V:3H, with the exception of railway embankments which will be formed at 1V:1.75H; construction of soil conservation works; and establishment of vegetation on disturbed areas. Revegetation includes establishment of a good surface cover of grasses and legumes and also planting of trees. Trees have been found to persist well with good growth rates and contribute greatly to the aesthetics of the area. The main objective of Bayswater's rehabilitation program is to produce a post-mining landscape which is stable and at least as productive as the dryland native pastures which previously existed within the area. The existing Bayswater No. 2 mining operation has low visibility from public roads and has not required extensive screening. The surrounds of the administration office area have been landscaped using trees and shrubs. Some tree screening has commenced for the Bayswater No. 3 area in accordance with development consent conditions.

Bushfire Management

The company maintains a fire tender as well as three water carts equipped with fire fighting equipment. Effective bushfire fighting capability is provided by the above fire fighting equipment, together with graders and bulldozers used for mining. Firebreaks are also maintained around the Bayswater mine boundary.

Proposed Rehabilitation and Land Use Management

Existing landscaping at the Bayswater No. 2 and No. 3 mines has proved to be successful (refer to Bayswater's Annual Rehabilitation Reports). These proven methods will be adopted in the rehabilitation works for the proposed Bayswater Rail Loop.

Rehabilitation of disturbed areas will be undertaken progressively as earthworks are completed. The rehabilitation program will include reshaping of slopes other than railway embankments to less than 10°, where possible, construction of soil conservation works and re-establishment of vegetation. Revegetation will primarily involve establishment of a good surface cover of grass, particularly on railway embankments where the potential for revegetation with trees and shrubs is limited due to safety considerations. Belts of vegetation consisting of trees, shrubs and groundcover will, however, be established along Thomas Mitchell Drive in order to reduce the visual impact of the railway including the impact of train headlights on road traffic (refer to **Section 4.12.4** for further details).

The combination of the proposed habitat compensation area and habitat corridors discussed in **Section 4.9.7** will result in the total area of habitat establishment for the project being 41.0 hectares. In addition, 15.3 hectares of existing forest will be managed as part of the habitat compensation area. Both the newly established areas will be planted using endemic species which occur in the adjacent vegetation communities and will be fenced to prevent stock assess. Scattered trees and clumps of trees currently occur in the proposed habitat compensation area with this existing vegetation aiding in the natural regeneration of the area and enabling an area of potential habitat for locally occurring fauna to be constructed relatively quickly. Nest boxes will also be used in the habitat compensation area to provide

potential nesting and roosting sites for species including the Squirrel Glider, Common Brushtail Possum, tree roosting bats and a range of bird species.

5.2 DRAYTON MINE

Drayton Coal operates a comprehensive environmental management program in accordance with existing development consent, mining lease conditions and EPA licence conditions. An Annual Environment Management Report (AEMR) is prepared, which outlines all of Drayton's commitments to environmental management, monitoring and rehabilitation. It also provides an indication of targets and future initiatives for environmental management. The following overview of environmental management for the existing Drayton operation was sourced from the latest available AEMR (Drayton Coal Pty Ltd 1998).

As there will be no site disturbance associated with the Drayton Coal proposal, the existing environmental management system including monitoring and maintenance will be continued as described below, with the exception of noise management which will require additional mitigation measures (refer to **Sections 4.5** and **5.2.4**).

5.2.1 Meteorological Monitoring

Existing Meteorological Monitoring

An automatic weather station is installed at the Drayton site (refer to **Figure 5.2**) and measures rainfall, temperature and wind patterns.

Proposed Meteorological Monitoring

It is proposed to maintain the existing meteorological monitoring system.

5.2.2 Water Management and Monitoring

Existing Water Management and Monitoring

Drayton mine is located within the catchments of Saddlers Creek, Bayswater Creek and Ramrod Creek. Areas of undisturbed and rehabilitated land within the Drayton mining lease contribute flows to these creek systems; however, all dirty water flows are contained within the mine water management system as Drayton mine has a nil discharge condition on its Pollution Control Licence. Drayton's water collection system consists of a series of channels and dams that collect runoff from the various sub-catchments of the site and contain it for later use. An extensive network of pumps is maintained to enable water to be distributed around the site to meet on-site requirements and the nil discharge licence condition. On-site water requirements include dust suppression on coal stockpiles, conveyors and haul roads, industrial water for use in the workshop, and equipment washdown water. Annual demand to meet these requirements is approximately 400 megalitres. In addition, water is transferred to Bayswater mine, which operates in net water deficit (refer to **Section 4.7.3.3**), when surplus supply is available at Drayton and surplus capacity is available at Bayswater.

Potable water is obtained from Muswellbrook Shire Council via a pipeline connected to the Muswellbrook reticulated water supply. Approximately 20 ML per annum is obtained from this source to meet requirements for human consumption.

Groundwater is a significant contributor to the annual water balance at Drayton as the watertable is intersected at mine workings in the East and West pits.

An extensive surface water and groundwater monitoring program is maintained by Drayton Coal. Surface water is monitored at a number of sites including dams, creeks and pit workings as shown on **Figure 5.2**. The suite of water analyses undertaken on a monthly basis include pH, electrical conductivity, non-filterable residue (total dissolved solids), total suspended solids, total dissolved solids, sodium, magnesium, chloride and sulphate. Groundwater depth is also monitored on a regular basis at the locations shown in **Figure 5.2**.

Proposed Water Management and Monitoring

It is proposed to maintain the existing water management and monitoring system.

5.2.3 Air Quality Controls

Existing Air Quality Controls

Air quality controls that are implemented at Drayton mine include:

1. clearing and topsoil stripping is restricted to a single strip ahead of the mining operation;
2. overburden drills include water injection facilities;
3. water tankers are operated on haulage roads;
4. overburden is dumped in low lifts;
5. dragline operations minimise dumping heights;
6. overburden blasting is carried out using gravel stemming or drill cuttings to contain blast energy below ground;
7. dust suppression sprays are operated on the Coal Handling Facility, coal stockpiles and conveyors; and
8. progress rehabilitation is undertaken and follows approved open cut mine plans which minimise overburden exposure.

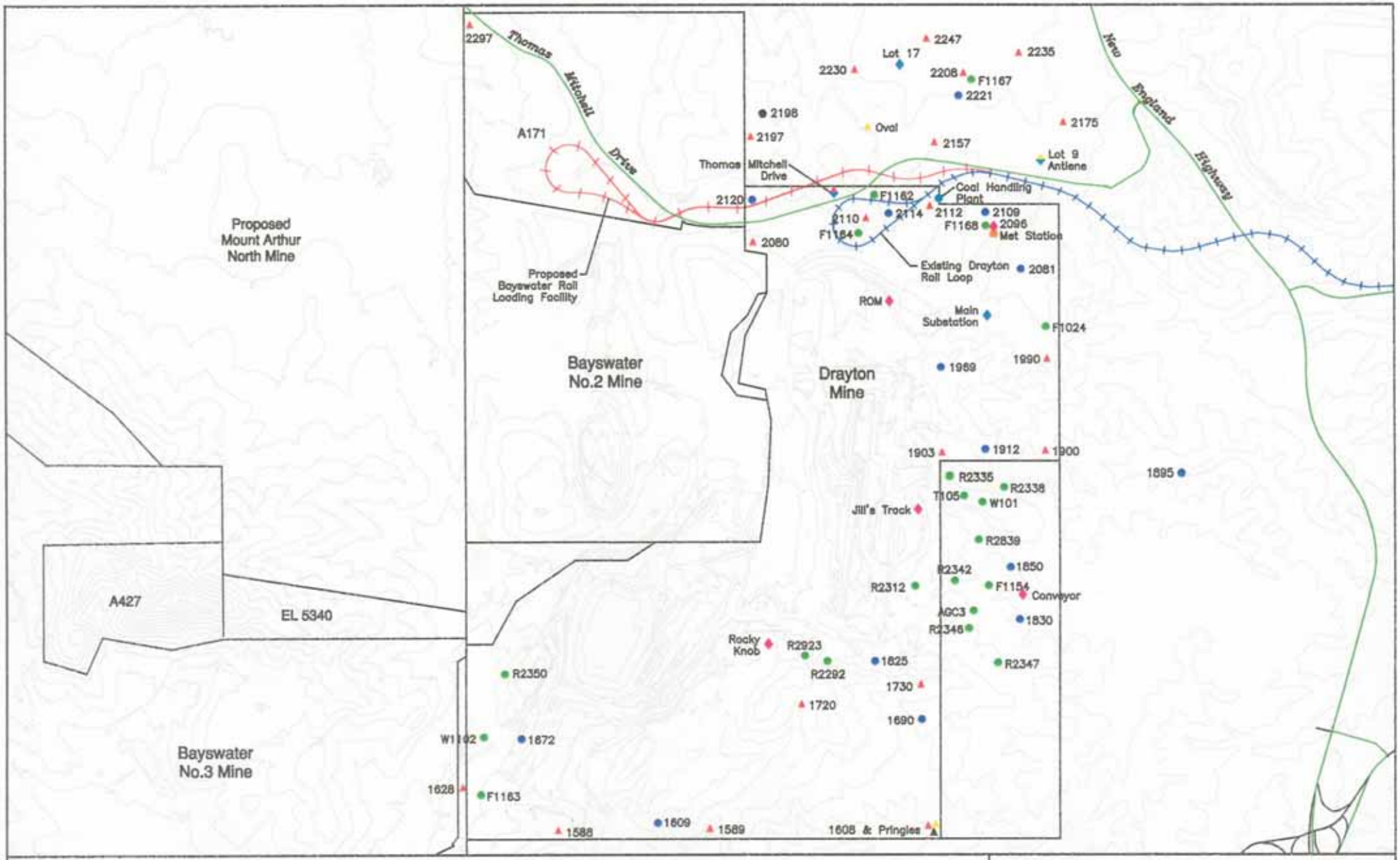
A comprehensive network of air quality monitoring gauges is maintained and includes:

- 20 dust deposition gauges;
- 2 directional dust gauges; and
- 4 high volume air samplers.

The locations of these gauges are shown in **Figure 5.2**.

Proposed Air Quality Controls

It is proposed to maintain the existing air quality management system.


Proposed
Mount Arthur
North Mine
Bayswater
No.2 Mine
Drayton
Mine
Bayswater
No.3 Mine
A427
EL 5340
A171
Thomas Mitchell Drive
New England Highway
Proposed
Bayswater Rail
Loading Facility
Existing Drayton
Rail Loop
Coal Handling
Plant
Met Station
Main
Substation
Lot 17
Lot 9
Antiene
Oval
ROM
Jill's Track
Conveyor
Rocky
Knob
2297
2247
2235
2230
2208
F1167
2221
2198
2197
2175
2157
2120
F1162
2110
2114
2112
2109
F1168
2096
F1164
2080
2081
F1024
1969
1990
1903
1912
1900
1895
R2335
R2338
T105
W101
R2839
R2342
1850
R2312
F1154
AGC3
1830
R2346
R2923
R2292
1825
R2347
R2350
1730
1720
1690
W1102
1872
1628
F1163
1588
1609
1589
1608 & Pringles
Legend
Directional Dust Gauge Locations
Dust Deposition Gauge Locations
Total Suspended Particulates Locations
Blast Monitoring Points
Noise Monitoring Locations
Met Station
Piezometer Locations
Water Sampling Points
Drayton Rail Loop & Antiene Rail Spur
Proposed Bayswater Rail Loop
0
0.5
1km
Contour Interval 20m
Umwelt (Australia) Pty Limited
Source: Drayton Coal Pty Ltd
FIGURE 5.2
Current Monitoring Sites at
Drayton Mine
A4 Scale: 1:43 000
Ref No.:1323/R01/dra_048.dwg

5.2.4 Noise Controls

Existing Noise Controls

Noise management at Drayton mine is designed to comply with the Noise Control Approval issued to the mine by the EPA. This approval allows for a maximum night time noise level of 35 dBA at nearby residences. In order to limit potential noise impacts at these residences the following measures are, or have been implemented:

- all mobile equipment is maintained in good working condition;
- the main western haul road was constructed at the lowest practicable grade to minimise noise from haul traffic;
- the main western haul road also provides a significant noise bund between the active mining areas and residences to the north of the mine;
- the drive station for the overland conveyor to Bayswater power station is located at the power station end of the conveyor; and
- all conveyors are covered and regularly checked and maintained to minimise any high or annoying noise emissions from squeaking rollers, rattling bearing and other nuisance noise sources.

Drayton Coal operates an extensive noise and vibration monitoring system (refer to **Figure 5.2**). This includes weekly noise monitoring during the day and at night.

Proposed Noise Controls

The noise controls described above will be applied to the extended operation of the Drayton Rail Loading Facility. In addition, the loadout bin will be enclosed with profiled metal sheeting and acoustic material such as 50 mm fibreglass in order to ensure that the proposed Antiene Joint User Rail Facility complies with the night time noise criterion of 37 dBA for the currently proposed operations (refer to **Section 4.5.3**).

In addition, the existing blast monitoring station shown in **Figure 5.2**, which will be disturbed by construction of the Bayswater Rail Loading Facility, will be relocated by COAL to a suitable site agreed by Drayton Coal.

5.2.5 Waste Management

Existing Waste Management

Sewage Treatment

Sewage effluent from permanent site amenities is collected in a central sewage treatment plant, which overflows to two settlement ponds. Treated effluent from the settlement ponds is pumped to the East Tip, where it is used to irrigate rehabilitated areas. Mobile crib facilities located within mine pits are equipped with chemically treated toilets, which are pumped out by a local contractor approved by Council.

Oil and Grease Containment and Disposal

An evacuation system is reticulated throughout the workshop area to collect engine oils and hydraulic fluids. This waste is collected regularly by a registered contractor for recycling. An oil and grease containment pond collects any oily water from the workshop area that is not collected by the evacuation system. Oil collected from the surface of the pond is pumped to a waste oil collection tank and periodically collected by a registered contractor for recycling. Mobile equipment has fittings to allow evacuation of oil for repair work, which may be necessary in the field. Evacuated waste is then transferred to the evacuation system at the workshop. All routine oil changes and services are carried out in the workshop.

Proposed Waste Management

It is proposed to maintain the existing waste management system.

5.2.6 Cultural and Natural Heritage Conservation

Existing Cultural and Natural Heritage Conservation

As no Aboriginal or European heritage sites have been identified at Drayton, specific conservation measures have not been implemented.

Natural heritage is conserved in the buffer zone to the north of the active mining areas, particularly on the northern side of Thomas Mitchell Drive. This area has been managed as a wildlife refuge since 1987, however, this does not preclude the construction and operation of the proposed Bayswater rail loop.

Proposed Cultural and Natural Heritage Conservation

It is proposed to maintain the existing natural heritage conservation measures. Areas of the wildlife refuge that are disturbed will be replaced by the compensatory habitat area to be created to the northwest of Drayton Rail Loop (refer to **Section 4.9.7**).

5.2.7 Rehabilitation and Land Use Management

Existing Rehabilitation and Land Use Management

Rehabilitation is progressively undertaken at Drayton to create a post-mining landform that is both compatible with surrounding land uses and productive for post-mining activities. The long term land management objective at Drayton is to create a mix of pasture and forested areas that will provide both grazing and wildlife amenity. To date 248 hectares of the mining lease have been rehabilitated.

Bushfire Management

Preventative bushfire management is undertaken by maintenance of a series of firebreaks along peripheral roads and areas of pasture around the boundary of the mining lease. Water tankers are permanently on hand to provide water for fire fighting, should an outbreak of fire occur on site.

Proposed Rehabilitation and Land Use Management

It is proposed to continue to implement the existing rehabilitation and land use management strategy.

5.3 LEGISLATIVE CONTROLS AND LANDHOLDER REQUIREMENTS

Development and operation of the Antiene Joint User Rail Facility including environmental management and rehabilitation requirements will initially be established by conditions associated with the Environmental Planning and Assessment Act 1979. A wide range of other environmental control legislation also applies to this development and is briefly described in this section.

5.3.1 Environmental Planning and Assessment (Amendment) Act 1997

Under the *Environmental Planning and Assessment (Amendment) Act 1997*, this Environmental Impact Statement will accompany the two development applications described in **Section 1.1.2**. The Antiene Joint User Rail Facility is 'State Significant' development and also 'Integrated Development', under the *Environmental Planning and Assessment (Amendment) Act 1997*. Consequently, the development application and Environmental Impact Statement will be lodged with and exhibited by the Department of Urban Affairs and Planning and the Minister for Urban Affairs and Planning will determine the development applications. The development application and Environmental Impact Statement will be referred to the relevant Approval Bodies for assessment and determination of development consent conditions to be applied if it is approved. In addition, all other relevant government authorities, including Muswellbrook Shire Council, will assess the development application and provide recommendations to the Department of Urban Affairs and Planning regarding determination and relevant development consent conditions, if consent is to be granted. Detailed conditions of consent will be associated with any granting of the development application under this legislation and the applicants, COAL and Drayton Coal Pty Ltd, will be required to demonstrate compliance with these conditions at all times.

5.3.2 Other Environmental Protection Legislation

The applicants will be required to operate in compliance with other environment protection legislation. The *Protection of the Environment Operations Act 1997* provides an integrated environmental protection licensing system, incorporating the former provisions of the *Clean Air Act 1961*, *Clean Waters Act 1970*, *Noise Control Act 1975*, *Pollution Control Act 1970*, *Environmental Offences and Penalties Act 1989*, and *Waste Minimisation and Management Act 1995*. Other legislation also applicable to the proposed development is the *Dangerous Goods Act 1975* and the *Environmentally Hazardous Chemicals Act 1985*. The Environment Protection Authority administers this pollution control legislation in New South Wales and a brief outline of the relevant legislation is provided below.

5.3.2.1 Protection of the Environment Operations Act 1997

This establishes the procedures for issue of licences for environmental protection including waste management and air, water and noise pollution control. The applicants are required to hold licences and there are conditions associated with these licences which must be complied with at all times. Bayswater Colliery Company and Drayton Coal Pty Ltd currently hold Environment Protection Authority licences for the Bayswater and Drayton coal mines, respectively. It is anticipated that if the Antiene Joint User Rail Facility gains approval, these licences will be modified to incorporate future operations.

Any breach of the environmental protection legislation is an offence for which there are penalties for a company and its officers. This legislation ensures that all employees and company directors are directly accountable for site environmental management.

5.3.2.2 Environmentally Hazardous Chemicals Act 1985

A licence is required for any storage, transport or use of prescribed chemicals.

5.3.2.3 Dangerous Goods Act 1975

Dangerous goods include explosives, gases, flammable liquids and radioactive substances. These goods must be labelled with a symbol in accordance with a type and quantity classification. Storage of particular quantities may require a WorkCover Authority licence.

5.3.2.4 Post-EIS Approvals and Licences

COAL and Drayton Coal Pty Ltd will be required to comply with detailed conditions of consent on granting of their respective development applications. In addition, approval and/or licences will be required from various authorities in terms of the legislation outlined in preceding sections, and other requirements.

Coal Operations Australia Limited Development Application

The necessary further approvals and/or licences or following development consent likely to be required for the COAL development application are:

- approval to erect improvements within a Mine Subsidence District in accordance with the *Mine Subsidence Compensation Act 1961* from the Mine Subsidence Board prior to construction of any infrastructure.

- approval from the EPA under the *Protection of the Environment Operations Act 1997* to construct and operate the pollution control works associated with the construction and operation of the proposed facility by modification of the existing EPA licence held by Bayswater mine.

- approval from the Department of Land and Water Conservation for any development within 40 metres of the banks of any prescribed stream pursuant to Part 3A of the *Rivers and Foreshores Improvement Act 1948* (ie Ramrod Creek).

- a Consent to Destroy will be required from the National Parks and Wildlife Service in accordance with the *National Parks and Wildlife Act 1974* prior to destruction of any archaeological sites disturbed by the proposed development.

- detailed consultation, provision of design details and approval from the relevant organisations will be required prior to any works affecting public utilities including electricity, water, sewerage, telephone, or public road infrastructure. Organisations with whom further consultation will be undertaken by COAL prior to undertaking works on the Bayswater Rail Loop will include:

  - energyAustralia in relation to proposed relocation of electricity infrastructure;

  - Rail Access Corporation in relation to approval of design standards for the Bayswater Rail Loop including installation of signalling; and

  - Rural Lands Protection Board approval to swap the affected area of Travelling Stock Reserve for land held by COAL.

Drayton Coal Pty Ltd Development Application

The only necessary further approval likely to be required for the Drayton Coal development application is approval from the EPA. This approval will be required under the *Protection of the Environment Operations Act 1997* to construct and operate the pollution control works associated with the operation of the proposed facility at the proposed annual rate of coal transport tonnage.

6.0 CHECKLIST OF MATTERS RAISED DURING CONSULTATION

As noted in **Section 2.4**, relevant authorities and landholders were consulted regarding the proposed development and a copy of the responding correspondence is provided in **Appendix 1**. Specific matters raised by the Director General's Requirements, Department of Urban Affairs and Planning, for consideration in the EIS are summarised in **Table 6.1** and **Table 6.2** for the COAL and Drayton Coal proposals, respectively. These requirements incorporate the matters raised by other government agencies, including the relevant Approval Bodies.

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal

Matters to be Considered in the Environmental Impact Statement	Section
Specific Issues	
• A comprehensive justification that should undertake consideration and assessment of all possible alternatives, including the potential use of the existing Drayton rail loop	3.4
• Interrelationship of the proposal with any proposed changes to the capacities of the Drayton Rail Loop and the Antiene Spur, and resultant cumulative impacts	Entire document, particularly 1.1, 3.1, 3.2, 3.3, 4.16
• Ensure as far as possible a co-operative and cumulative assessment of key environmental issues is undertaken with Drayton Coal Pty Ltd in relation to any proposals to change the capacities of Drayton Rail Loop and Antiene Spur, to enable DUAP to assess each EIS having full regard to potential cumulative impacts. Specific issues to be addressed during this co-operative assessment should include in particular rail movements, noise and air quality.	Entire document, particularly 4.3, 4.4, 4.5 and 4.16
• The relationship between the proposal and the existing consent and operations at the Bayswater mine	1.1, 3.1, 3.2 and 3.3.1
• Protection of Ramrod Creek and its tributaries during construction and operation of the proposal	4.7.3.1, 4.7.3.2, 4.7.3.4
• Sediment and erosion control management plan	4.7.3.4
• Surface water and groundwater issues, including an outline of proposed water management measures	4.7
• Timing of proposal in terms of meeting deadline of cessation of road haulage required under the existing consent	1.3, 3.3.1.13
• Outline any height restrictions placed on vehicles using Thomas Mitchell Drive as a result of the 2 proposed railway bridge crossings	3.3.1.2
• Consideration of potential mine/coal resource impacted upon as a result of the proposal and provide a discussion of the resource economic viability and provide a justification for the 'sterilisation' of any economically viable coal resources by the proposed development	2.3.1
• Discussion on the proposed relocation and modification of the energyAustralia owned 33 kV transmission line	3.3.1.13, 4.14.1
• Provide an outline of proposed rehabilitation, in particular in regard to the areas where sections of native forest have been disturbed and also existing drainage areas and collection dams	3.3.1.13, 4.7.3.2, 4.7.3.4, 4.9.7, 5.1.7
• Consideration of impacts on Aboriginal Archaeological and Cultural Heritage, which shall include an Aboriginal Cultural assessment and management report to help identify any significant Aboriginal Heritage sites within the development area for salvage, excavation or conservation and provide details on how any salvage, excavation or conservation of any identified Aboriginal Heritage sites will be undertaken	4.11.1 and Appendix 5a
• Details of management of identified European Heritage items	4.11.2 and Appendix 5b

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal (cont)

Matters to be Considered in the Environmental Impact Statement	Section
Specific Issues (cont)	
• Provide a description of the pollution control and environmental management measures to be adopted, including monitoring programs to assess the predicted impacts and the ongoing environmental performance of the facility	4.0, 5.1
• A report on threatened species, populations or ecological communities, or their habitats, with particular consideration of the Squirrel glider, Yellow-bellied Sheathtail Bat and Common Bent-wing Bat, including the following: - A description of the study area, including details of the types and condition of the habitat(s) in and adjacent to, the land to be affected by the proposal - A list of those threatened species, populations or ecological communities known to occur in the same or similar habitats in the region - An assessment of the likelihood of those species, populations or ecological communities identified in (b) occurring within the study area, given their habitat requirements and the habitats present within the study area	4.9.3, 4.9.6 and Appendix 3
• Consideration of the objectives and relevant provisions of State Environmental Planning Policies and Regional Environmental Plans	2.2.1, 2.2.2
• Consideration of the objectives and relevant provisions of the Upper Hunter Cumulative Impact Strategy and Study and the Upper Hunter Sub Regional Strategy	2.2.6, 2.2.7
1. Planning and Environmental Context	
i. Planning Information and Permissibility	
• Zonings, permissibility and any land use constraints	2.2.3, 2.1
• Compatibility of the proposal with any provisions in:	
– Hunter Regional Environmental Plan 1989	2.2.2
– Hunter Regional Environmental Plan 1989 – Heritage	Appendix 5b
– State Environmental Planning Policy No.33 – Hazardous and Offensive Development	2.2.1.2
– State Environmental Planning Policy No.44 – Koala Habitat Protection	2.2.1.3
– State Environmental Planning Policy No.45 – Permissibility of Mining	2.2.1.4
– Muswellbrook Local Environmental Plan 1985	2.2.3
– Any relevant Development Control Plans	2.2.4
• Existing land uses	2.1.1
• Any heritage items or environmental protection areas	2.2.8
ii. Site Description and Locality Information	
• Title details, land tenure, lease details	2.1.2 and Appendix 2
• Site description and maps, plans, aerial photographs clearly identifying the location of the proposal relative to surrounding roads and other communities, dwellings and residences and any land use likely to be affected by the development, utilities including transmission lines, pipelines, cables or easements, sight lines from dwellings or public spaces such as roads. A clear illustration of the development application area should also be included.	Figures 1.1, 2.2, 2.3, 2.4, 2.5, 2.8, 3.1, 3.2, 3.4, 4.18 and 4.20
iii. Overview of the Affected Environment	
• Meteorological characteristics that may influence erosion, dust or noise impacts.	2.3.2
• Surface contours and general topography.	2.3.3
• Presence and condition of watercourses, flood liability, any water storage catchments including groundwater bores within 1 kilometre, watertable and the relationship with the maximum excavation depth	2.3.3.2, 2.3.3.3, 2.3.3.4

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal (cont)

Matters to be Considered in the Environmental Impact Statement	Section
1. Planning and Environmental Context (cont)	
iii. Overview of the Affected Environment (cont)	
• Existing flora and fauna communities and the presence of any threatened species, populations or ecological communities, or their habitats, including the Squirrel glider, Yellow-bellied Sheathtail Bat and Common Bent-wing Bat	2.3.4, 4.9
• Features of heritage, conservation or archaeological value, including potential European heritage items (glass ceramic fragment found) within the site of the proposed rail loop	2.3.5, 4.11, Appendix 5b
• Visual amenity	2.3.6, 4.12
• Suitability of the land for agricultural purposes, including the area of land adjacent to Thomas Mitchell Drive owned by the Rural Lands Protection Board used for travelling stock reserves	2.3.7, 4.8
• Social and economic aspects of the environment	2.3.8, 4.15
2. Description of the Proposal The description of the proposal should provide general information on: i. Proposal Objectives • The proposed rail coal loading bin and rail loop	1.3, 3.3.1
• Quantity and types of coal to be loaded and transported	1.1.1.3, 1.1.2, 1.3, 3.3.1
• Potential conflicts with other users of the rail lines involved (in particular Drayton mine)	4.3.2
• Interrelationship of the proposal with existing development and existing development consent	1.1, 3.1, 3.2, 3.3.1
ii. Existing Coal Loading and Transportation • Existing coal loading methods • Existing throughput volumes at Ravensworth Coal Terminal • Transportation routes which are used in the transportation of Coal Operations Australia Limited existing truck coal movements • Requirements in current planning consent regarding transportation by road, including the date cessation of road haulage is required under existing consent	3.2.1
iii. Proposed Works • The balloon rail loop • 1000 tonne train loading bin • double track rail bridge • connection to existing Antiene rail spur • 40000 tonne stockpile and truck dump station • proposed location of rail loop, train loading bin, double track rail bridge, stockpile and truck dump • details of the management of the total development proposal • staging and construction schedule • works to be undertaken prior to construction and operating commencing	3.3.1

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal (cont)

Matters to be Considered in the Environmental Impact Statement	Section
2. Description of the Proposal (cont)	
iii. Proposed Works (cont)	
• proposal for progressive rehabilitation of any areas disturbed by construction activities	3.3.1
• types of machinery and equipment to be used	
• plans of operation and facilities	
• estimated daily, weekly and annual volumes of material to be transported and loaded, including estimated capacity of the proposed coal loader	
• employment (during construction and operation)	
• hours of operation for construction and operation, including loading, and coal transportation	
• energy requirements	
• quantities and method of storage of any fuels and chemicals on the site	
• Sanitary and waste disposal arrangements	
• Water management and erosion control	4.7
• Details of the proposed land swap with the Rural Lands protection Board in relation to the travelling stock reserve, located within the site of the proposed rail loop, adjacent to Thomas Mitchell Drive	2.1.2.1
iv. Infrastructure Considerations • Electricity supply; measures to protect or the need to relocate easements, cables, pipelines which may be impacted by the proposal, in particular the need to relocate the energyAustralia owned 33 kV transmission line located along the proposed rail route	3.3.1
• Energy conservation measures	
• Water requirements, source of water supply, demands on water resources, proposed supply or storage, identify water recycling and reuse options	3.3.1, 4.7
• Waste disposal requirements, proposed methods and locations for disposal	3.3.1
• Transport requirements	
v. Alternatives and Justification • Coal transportation technology (eg transporting coal by conveyor rather than by the proposed rail loop, use of the existing Drayton rail loop)	3.4
• Location of the proposed rail loop, including investigating utilisation of existing service corridors and avoidance of the woodland area in the vicinity of the proposed rail loop	
• Coal transport, handling and storage techniques or technology, in particular in relation to the proposed train loading bin	
• Electricity generation technology	
• Facility design, site layout and access roads	
• Proposed infrastructure location	
• Disposal methods	
• Alternative rehabilitation	
• Staging	
• Selection of the proposed options should be justified in terms of - Type, quality and quantities of coal to be loaded in relation to market demand - Environmental factors including the bio-physical, economic and social factors	

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal (cont)

Matters to be Considered in the Environmental Impact Statement	Section
3. Analysis of Environmental Impacts and Mitigating Measures i. Existing environmental performance • A review of the environmental performance and identification of existing coal transportation in the Muswellbrook area. Include ways in which the proposed development will enable existing problems, if any, to be remedied, including problems with existing road haulage	4.2
ii. Transport and Traffic Issues • Assessment of transport and traffic issues associated with the proposal during construction and operation of the development taking into account the current and projected traffic on existing coal transportation routes in the Muswellbrook area, including volumes and vehicle types	4.3
During Construction • Estimated average and maximum hourly, daily and weekly transport movements, including movements on Thomas Mitchell Drive, the proposed rail loop and the Antiene spur	3.4.1.2, 4.3.1, 4.3.2
• Proposed transport routes and possible alternative routes or transport modes	
• Adequacy of the local and regional road network to accommodate construction traffic demands	
• Cumulative impacts in terms of other current and potential users, in particular Drayton mine	4.16.4
• The need for any associated road upgrades and potential impacts on maintenance programs	4.3
• The need to provide access for affected land owners	3.3.1.2
• Associated noise, vibration and dust emission impacts on residential and industrial receptors	4.4, 4.5
• Potential impact on the rail maintenance program	4.3
• Rail safety issues	
• Proposed measures to improve safety	
• Associated management and or mitigating measures including possible alternative routes	3.4.1.2, 5.1
During Operation • Estimated average maximum hourly, daily and weekly rail movements to and from the proposed loader	3.3.1.2
• The need for rail bridge crossings over Thomas Mitchell Drive	3.4.1.2
• Impacts of locomotive headlights on opposing road traffic and proposed ameliorative measures	4.12.3
• The need to provide access for affected landowners	3.3.1.10, 4.8.1
• Implications for arrangements for road haulage of coal when emergencies arise	4.3.1

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal (cont)

Matters to be Considered in the Environmental Impact Statement	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont)	
iii. Air Quality	4.4 and Appendix 4
• Identification of fixed and mobile sources of air pollutants such as mining, processing, handling, storage, loading or transport operations	
• Provide a description of existing air quality and meteorology, using information and site representative ambient monitoring	
• Likely impact of the proposal on the local and regional air quality (including baseline data on ambient quality of the air, projected dust emissions and deposition rates and frequency and times of significant emissions)	
• Cumulative effects on sensitive residential or industrial receptors	4.16.2
• Meteorological conditions under which nearby dwellings and sensitive land are likely to be affected	4.4 and Appendix 4
• Mitigation and management to minimise the generation of dust to ensure compliance with air quality objectives especially in the transportation, handling and storage of coal on-site	
• Dust monitoring program	5.1.3
iv. Noise and Vibration Impacts	4.5 and Appendix 6
• Existing acoustic environment including a statistical breakdown of the meteorological conditions (predominant wind, temperature, humidity and inversion conditions) and any topographical features which ill influence noise or vibration impacts	
• Provide details of the land use zoning of the proposed site and surrounding properties	2.1.1
• Proposed hours of transport and loading	3.3.1.10, 4.5, Appendix 6
• Noise levels from fixed and mobile noise sources, including rail	4.5.6
• Predictive noise levels at potentially affected dwellings, industrial receptors and any other noise sensitive locations likely to be affected by the proposal	
• Cumulative effects on sensitive residential and industrial receptors, both in the vicinity of the proposed coal loader and adjacent to the proposed rail loop	4.5, 4.16.2, Appendix 6
• Mitigation and management measures to control the generation of noise to ensure compliance with relevant noise standards including details of noise control measures	4.6, Appendix 6
• Proposed monitoring program	5.1.4
v. Water Quality and Drainage	4.7
• Description of potential sources of water pollution	
• Condition of waterbodies or environmentally sensitive areas which could be impacted by: - Demand on water resources, particularly flow levels and water quality - Any change in surface water resources or groundwater hydrology as a result of the proposal - Any change in the water quality as a result of any activity on the site	
• Drainage and sediment management system	
• Water balance	
• Potential impacts on groundwater	

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal (cont)

Matters to be Considered in the Environmental Impact Statement	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont)	
v. Water Quality and Drainage (cont)	
• Any effects on the local or regional watertable and implications for other users	
• Details of control measures to be implemented to prevent adverse impacts by waste water, leachate and contaminated stormwater on the water quality of local streams and groundwater, in particular Ramrod Creek	
• Adequacy of measures to ensure no contamination of the groundwater	
• Plan for ongoing maintenance and monitoring of water quality controls to ensure their correct installation, operation and effectiveness	
• A water management plan and site water balance shall be prepared for the construction and operational phases of the development proposal. The following principles shall be incorporated into the water management plan: - Maximise on-site reuse of waste water - Minimisation of wet weather overflows of contaminated stormwater - Segregation of contaminated water from non-contaminated water to minimise the volume of polluted water to be dealt with - Examination of options to reuse wastewater from washdown and dust control measures - Details of stormwater diversion works particularly in regard to their capacity and stabilisation	4.7, 5.1
vi. Flood Liability • Determine the potential impact of floods on the proposal (especially rail and road access)	4.7.1
• Any likely effects of the operation on flood liability of surrounding lands	
vii. Infrastructure Constraints • Identify any constraints presented by demand for utility services and other infrastructure and assess the implications on the proposal's construction and operational needs should augmentation not occur at the required time	3.3.1, 4.7.3.2
viii. Cumulative Impacts • On the surrounding area having regard to dust, vibration, visual impacts, water quality issues, traffic impacts, and any loss of heritage items, vegetation or fauna habitat	4.16
• Associated with coal transportation by rail in terms of size and frequency of trains using the rail network compared with the existing situation	
• Address cumulative impacts with the existing operations at the Bayswater mine, Drayton mine, Drayton rail loop and rail movements on the Antiene spur, the approved Mount Arthur North Coal mine, and other mining operations proposed, approved or in operation in the Muswellbrook area, including the proposed coal tonnage modification being sought for the Drayton Loop and Antiene spur.	

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal (cont)

Matters to be Considered in the Environmental Impact Statement	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont)	
ix. Visual Impact • Consideration of the site in relation to any landscapes of local or regional significance as considered from the fore, middle and background	4.12 and Appendix 3
• Visibility from nearby properties and general surrounds	
• Lighting impacts from lights for security and night operations including lighting impacts from train operations	
• Impacts of rail loop on the visual environment	
• Form and bulk of coal loading facility, stockpile, location of access roads and fences	
• Proposed landscaping to reduce visual impacts, layout and species composition of intended screening	
x. Spontaneous Combustion • Consider the likelihood of spontaneous combustion of coal to be stockpiled or stored. Provide details of the proposed management practices	4.13
xi. Risk and Hazard Analysis • A risk analysis should be prepared taking into consideration the provisions of the State Environmental Planning No.33 – Hazardous and Offensive Development, referring to DUAPs Guideline 'Applying SEPP33'	2.2.1.2
xii. Flora and Fauna Impacts • Plant species and communities within the proposal site area and its habitat significance	4.9 and Appendix 3
• Extent of disturbance of flora	
• Details of proposed mitigation methods to protect indigenous plant species	
• Fauna known likely to occur within the proposal area and note occurrence of any endangered fauna	
• Assessment of the effects on fauna and its habitat, in particular in regard to the Squirrel glider, Yellow-bellied Sheathtail Bat and Common Bent-wing Bat	
• Measures to ameliorate impact and to prevent weed invasion, vermin or feral animal problems	
• The 8 part test contained in Section 5A of the Environmental Planning and Assessment Act 1979 and the need to prepare a Species Impact Statement to be prepared in accordance with the Threatened Species Conservation Act, 1995	
xiii. Heritage Aspects • Any likely affection of sites of Aboriginal, archaeological European heritage value (including industrial heritage) if located in the vicinity of operations	4.11 and Appendix 5
• Assessment of significance, including assessment of the significance of glass ceramic fragments found within the site of the proposed rail loop	
• Proposed measures to mitigate impacts or conserve the heritage significance of the sites or items	

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal (cont)

Matters to be Considered in the Environmental Impact Statement	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont)	
xiv. Social Environment	
• Affect on population growth (urban and rural areas) and changes to population location	4.15
• The consequent housing and social service needs and measures to monitor and if necessary, satisfy demand	
• Changes in the amenity of the area	4.0
• Impacts on the health of the community from any potential changes in air quality, water quality, noise and vibration and rail safety	
xv. Economic Environment	
• Changes to local employment patterns	4.15
• Cost of living for employees and non-employees	
• Community growth and commercial development	
• The agricultural viability and the severance of land holdings	4.8.1
• Impact on property values	4.8.1, 4.8.2
• Affect on municipal finances	4.15
xvi. Erosion and Soil Stability Issues	
• Meteorological data, soil properties and characteristics and attributes of soil units	
• Landform characteristics which influence the erosion hazard, ratio of the rate of runoff to rate of rainfall, site history in regard to possible contamination issues, and any stream crossings	4.6, 4.7.3.4
• Integrated erosion and sediment control measures	
• Maintenance program of all erosion control works	
• Brief description of all geology of the area to be traversed by the proposed development	2.3.1
• Provision of a detailed sediment erosion control plan	4.7.3.4
xvii. Agricultural Viability	
• sensitive agricultural uses in the vicinity of the facility, in particular travelling stock reserve located adjacent to Thomas Mitchell Drive	4.8
• any effects on the agricultural viability of the adjoining land holdings; particularly in relation to dust and water	

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal (cont)

Matters to be Considered in the Environmental Impact Statement	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont)	
xviii. Ecologically Sustainable Development Principles • The precautionary principle: show that decisions made for the proposal are predictable and transparent. Including: - Making information available at an early stage and establishing appropriate conflict resolution mechanisms from project stage, assessment and determination process - Discussion of Best Practice Environmental Management techniques including the potential use of environmental management plans and environmental audits - Ensuring that best practice monitoring and enforcement procedures are proposed - Identifying the responsibilities of the proponent and government agencies for environmental management and enforcement	3.4.2.4
• Inter- and intra-generational equity: overall project management and investment in plant and equipment that minimises pollution and waste and is energy efficient	
• Conservation of biodiversity and ecological integrity. Including: - Identification and assessment of all environmental characteristics and habitat values that could be affected by the proposal - likely environmental impacts on these characteristics and values - implementation of measures designed to minimise likely environmental impacts - consideration given to adopting a whole-of-life cycle through use of environmentally benign materials, products and processes (eg fuel efficient motors, use of recyclable and recycled materials) and integrated waste minimisation, reuse and recycling	
• Valuation and pricing of resources	
xix. Rehabilitation Plans for the staged rehabilitation of the stockpile area, screening areas for surface facilities and final landform for the site of the proposed rail loop post operation	5.1.7
xx. On-going environmental management • Demonstrate strategies for sound environmental practice during construction, and operation	5.1
• Identify all government licensing and approval requirements and demonstrate how the plan ill facilitate compliance with these requirements	5.3
• Set out the framework of a monitoring program of all key impacts on the environment	5.1

Table 6.1 – DUAP Director General's Requirements for Bayswater Proposal (cont)

Matters to be Considered in the Environmental Impact Statement	Section
4. Consultation xxi. Government agency consultation • Results of consultation with Environment Protection Authority; Department of Mineral Resources; Department of Land and Water Conservation; NSW Agriculture; National Parks and Wildlife Service; Freight Rail/Rail access Corporation; Mine Subsidence Board; Local Aboriginal Lands Council; Wonnarua Tribal Council; Hunter Catchment Management Trust; Rural Lands Protection Board; Roads and Traffic Authority; energyAustralia and Muswellbrook Shire Council	1.4.2
xxii. Potentially affected landowners • Consideration and review of key issues which emerge from discussion with potentially affected landowners	1.4.1 and 4.15.1
xxiii. Community Consultation • Details of consultation undertaken to date, including any local Aboriginal groups or Aboriginal Lands Councils, including the Wonnarua Tribal Council. Consideration and review of key environmental issues discerned by the community	1.4.1
xxiv. Mines in the area Details of consultation with owners of mines in the area, including Drayton mine	1.1.1

Table 6.2 – DUAP Director General's Requirements for Drayton Proposal

Matters to be Considered	Section
Specific Issues	
• Interrelationship of the proposal with the capabilities of the proposed Bayswater Rail Loading Facility and resultant cumulative impacts	1.1, 3.1, 3.2, 3.3, 4.16
• Ensure as far as possible a co-operative and cumulative assessment of key environmental issues is undertaken with Coal Operations Australia (COAL) in relation to the proposed Bayswater Rail Loading Facility, to enable DUAP to assess each proposal having full regard to potential cumulative impacts. Specific issues to be addressed during this co-operative assessment should include in particular rail movements, noise and air quality	Entire document, particularly 4.3, 4.4, 4.5 and 4.16
• The relationship between the proposal and the existing consent and operations at the Drayton mine	1.1, 3.1, 3.2 and 3.3
• Details of any track upgrading works that may be required and associated environmental impacts	3.3.2, 4.3.2
• A description of the pollution control and environmental management measures to be adopted, including monitoring programs to assess the predicted impacts and the ongoing environmental performance of the facility	4.0, 5.2
• Consideration of the objectives and relevant provisions of State Environmental Planning Policies and Regional Environmental Plans	2.2.1, 2.2.2
• Consideration of the objectives and relevant provisions of the Upper Hunter Cumulative Impact Strategy and the Upper Hunter Sub Regional Strategy	2.2.6, 2.2.7
• A report on threatened species, populations or ecological communities, or their habitats, including the following: - A description of the study area, including details of the types and condition of the habitat(s) in, and adjacent to, the land to be affected by the proposal - A list of those threatened species, populations or ecological communities known to occur in the same or similar habitats in the region - An assessment of the likelihood of those species, populations or ecological communities identified in (b) occurring within the study area, given their habitat requirements and the habitats present within the study area	4.9.3, 4.9.6 and Appendix 3
1. Planning and Environmental Context	
i. Planning Information and Permissibility	
• Zonings, permissibility and any land use constraints	2.2.3 and 2.1
• Compatibility of the proposal with any provisions in: - Hunter Regional Environmental Plan 1989	2.2.2
- Hunter Regional Environmental Plan 1989 – Heritage	2.2.2 and Appendix 5
- State Environmental Planning Policy No.33 – Hazardous and Offensive Development	2.2.1.2
- State Environmental Planning Policy No.34 – Major Employment Generating Industrial Development	2.2.1.1
- State Environmental Planning Policy No.44 – Koala Habitat Protection	2.2.1.3
- Muswellbrook Local Environmental Plan 1985	2.2.3
- Any relevant Development Control Plans	2.2.4
- Hunter Valley Railway Programs Task force 1998	2.2.5
• Existing land uses	2.1.1
• Any heritage items or environmental protection areas	2.2.8

Table 6.2 – DUAP Director General's Requirements for Drayton Proposal (cont)

Matters to be Considered	Section
1. Planning and Environmental Context (cont)	
ii. Site Description and Locality Information	
• Title details, land tenure, lease details	2.1.2 and Appendix 2
• Site description and maps, plans, aerial photographs clearly identifying the location of the proposal relative to surrounding roads and other communities, dwellings and residences and any land use likely to be affected by the development, utilities including transmission lines, pipelines, cables or easements, sight lines from dwellings or public spaces such as roads.	Figures 1.1, 2.2, 2.3, 2.4, 2.5, 2.8, 3.1, 3.2, 3.4, 4.18 and 4.20
iii. Overview of the Affected Environment	
• Meteorological characteristics that may influence erosion, dust or noise impacts.	2.3.2
• Surface contours and general topography.	2.3.3
• Presence and condition of watercourses, flood liability, any water storage or drinking water catchments including groundwater bores within 1 kilometre, watertable and the relationship with the maximum excavation depth	2.3.3.2, 2.3.3.3, 2.3.3.4
• Existing flora and fauna communities and the presence of any threatened species, populations or ecological communities, or their habitats	2.3.4 and 4.9
• Features of heritage, conservation or archaeological value, including potential European heritage items	2.3.5 and 4.11
• Visual amenity	2.3.6 and 4.12
• Suitability of the land for agricultural purposes	2.3.7 and 4.8
• Social and economic aspects of the environment	2.3.8 and 4.15
2. Description of the Proposal The description of the proposal should provide general information on: i. Proposal Objectives	
• Quantity and types of coal to be loaded and transported	1.1.1.3, 1.1.2, 1.3 and 3.3.2
• Details of any track upgrading works that may be required	3.3.2
• Agreement with Coal Operations Australia (COAL) in relation to the joint use of the Antiene Spur	1.3.2
• Potential conflicts with other users of the rail lines involved	4.3.2
• Interrelationship of the proposal with existing development and existing development consent	1.1, 3.1, 3.2 and 3.3.1
ii. Existing Coal Loading and Transportation	
• Existing coal loading methods	3.2.2
• Existing throughput volumes at the Drayton Rail Loading Facility	
• Transportation routes which are used in the transportation of coal	
• Existing coal train movements at the Drayton Rail Loading Facility and on the Antiene Spur	
• Requirements in current planning consent regarding coal transportation	

Table 6.2 – DUAP Director General's Requirements for Drayton Proposal (cont)

Matters to be Considered	Section
2. Description of the Proposal (cont)	
iii. Proposed Works	
• Details of any track upgrading works that may be required	3.3.2.1
• Details of the management of the total development proposal	3.3.2
• Staging and construction schedule if track upgrading works are required	3.3.2.6
• Type of machinery and equipment to be used for track upgrading	
• Plans of operation and facilities	
• Estimated daily, weekly and annual volumes of material to be transported and loaded, including estimated capacity of the existing coal loading facility	
• Employment (during construction and operation)	3.3.2
• Hours of operation for construction and operation, including loading, and coal transportation	
• Energy requirements	3.3.2.5
• Quantities and method of storage of any fuels and chemicals on the site	5.2
• Sanitary and waste disposal arrangements	
iv. Infrastructure Considerations	3.3.2
• Electricity supply; measures to protect or the need to relocate easements, cables, pipelines which may be impacted by the proposal	
• Energy conservation measures	
• Water requirements, source of water supply, demands on water resources, proposed supply or storage, identify water recycling and reuse options	
• Waste disposal requirements, proposed methods and locations for disposal	
• Transport requirements	
v. Alternatives and Justification	3.4
• Coal transportation technology (eg transporting coal by conveyor rather than by the existing coal loading facility)	
• Coal transport, handling and storage techniques or technology	
• Electricity generation technology	
• Disposal methods	
• Staging of track upgrading works, if required	
• Selection of the proposed options should be justified in terms of - Type, quality and quantities of coal to be loaded in relation to market demand - Environmental factors including the bio-physical, economic and social factors	
3. Analysis of Environmental Impacts and Mitigating Measures i. Existing environmental performance	
• A review of the environmental performance and identification of critical problems for existing coal transportation in the Muswellbrook area. Include ways in which the proposal will enable existing problems, if any, to be remedied, including problems with existing road haulage	4.2

Table 6.2 – DUAP Director General's Requirements for Drayton Proposal (cont)

Matters to be Considered	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont)	
ii. Transport and Traffic Issues • Assessment of transport and traffic issues associated with the proposal during construction and operation of the development taking into account the current and projected traffic on existing coal transportation routes in the Muswellbrook area, including volumes and vehicle types	4.3
During Construction • Estimated average and maximum hourly, daily and weekly transport movements, including movements on Thomas Mitchell Drive, the Drayton rail loop and the Antiene spur	3.3.2.6
• Proposed transport routes and possible alternative routes or transport modes	
• Adequacy of the local and regional road network to accommodate construction traffic demands	
• Cumulative impacts in terms of other current and potential users, in particular Bayswater mine	
• The need for any associated road upgrades and potential impacts on maintenance programs	
• Associated noise, vibration and dust emission impacts on residential and industrial receptors	
• Potential impact on the rail maintenance program	
• Rail safety issues	
• Proposed measures to improve safety	
• Associated management and or mitigating measures including possible alternative routes	
During Operation • Estimated average maximum hourly, daily and weekly rail movements to and from the Drayton Rail Loading Facility and Antiene spur	4.3.2
• Impacts of locomotive headlights on opposing road traffic and proposed ameliorative measures	4.12.3
• Implications for arrangements for road haulage of coal when emergencies arise	4.3.1
iii. Air Quality • Identification of fixed and mobile sources of air pollutants such as mining, processing, handling, storage, loading or transport operations	4.4
• Provide a description of existing air quality and meteorology, using information and site representative ambient monitoring	
• Likely impact of the proposed on the local and regional air quality (including baseline data on ambient quality of the air, projected dust emissions and deposition rates and frequency and times of significant emissions)	
• Cumulative effects on sensitive residential or industrial receptors	4.16.2

Table 6.2 – DUAP Director General's Requirements for Drayton Proposal (cont)

Matters to be Considered	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont) iii. Air Quality (cont)	
• Meteorological conditions under which nearby dwellings and sensitive land are likely to be affected	4.4
• Mitigation and management measures to minimise the generation of dust to ensure compliance with air quality objectives especially in the transportation, handling and storage of coal on-site	
• Dust monitoring program	5.2.3
iv. Noise and Vibration Impacts • Existing and acoustic environment including a statistical breakdown of the meteorological conditions (predominant wind, temperature, humidity and inversion conditions) and any topographical features which ill influence noise or vibration impacts	4.5
• Provide details of the land use zoning of the proposed site and surrounding properties	
• Proposed hours of transport and loading	
• Noise levels form fixed and mobile noise sources, including rail	
• Predictive noise levels at potentially affected dwellings, industrial receptors and any other noise sensitive locations likely to be affected by the proposal	
• Cumulative effects on sensitive residential and industrial receptors, both in the vicinity of the Drayton Rail Loop and the Antiene spur	
• Mitigation and management measures to control the generation of noise to ensure compliance with relevant noise standards including details of noise control measures	
• Proposed monitoring program	5.2.4
v. Water Quality and Drainage • Description of potential sources of water pollution	4.7
• Condition of waterbodies or environmentally sensitive areas which could be impacted by: - Demand on water resources, particularly flow levels and water quality - Any change in surface water resources or groundwater hydrology as a result of the proposal - Any change in the water quality as a result of any activity on the site	
• Drainage and sediment management system	
• Water balance	
• Potential impacts on groundwater	
• Any effects on the local or regional watertable and implications for other users	
• Details of control measures to be implemented to prevent adverse impacts by waste water, leachate and contaminated stormwater on the water quality of local streams and groundwater	
• Adequacy of measures to ensure no contamination of the groundwater	
• Plan for ongoing maintenance and monitoring of water quality controls to ensure their correct installation, operation and effectiveness	

Table 6.2 – DUAP Director General's Requirements for Drayton Proposal (cont)

Matters to be Considered	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont)	
v. Water Quality and Drainage (cont) • A water management plan and site water balance shall be prepared for the construction and operational phases of the development proposal. The following principles shall be incorporated into the water management plan: - Maximise on-site reuse of waste water - Minimisation of wet weather overflows of contaminated stormwater - Segregation of contaminated water from non-contaminated water to minimise the volume of polluted water to be dealt with - Examination of options to reuse wastewater from washdown and dust control measures - Details of stormwater diversion works particularly in regard to their capacity and stabilisation	4.7
vi. Flood Liability • Determine the potential impact of floods on the proposal (especially rail access) • Any likely effects of the operation on flood liability of surrounding lands	4.7
vii. Infrastructure Constraints • Identify any constraints presented by demand for utility services and other infrastructure and assess the implications on the proposal's construction and operational needs should augmentation not occur at the required time	3.3.2, 4.7.3.2
viii. Cumulative Impacts • On the surrounding area having regard to dust, vibration, visual impacts, water quality issues, traffic impacts, and any loss of heritage items, vegetation or fauna habitat • Associated with coal transportation by rail in terms of size and frequency of trains using the rail network compared with the existing situation • Address cumulative impacts with the existing operations at the Drayton mine, Bayswater mine, rail movements on the Antiene spur, the proposed Bayswater Rail Loop and any other mining operations proposed, approved or in operation in the Muswellbrook area	4.16
ix. Visual Impact • Consideration of the site in relation to any landscapes of local or regional significance as considered from the fore, middle and background • Visibility from nearby properties and general surrounds • Lighting impacts from lights for security and night operations including lighting impacts from train operations • Impacts of increased rail movements on the visual environment • Proposed landscaping to reduce visual impacts, layout and species composition of intended screening	4.12
x. Spontaneous Combustion • Consider the likelihood of spontaneous combustion of coal to be stockpiled or stored. Provide details of the proposed management practices	4.13

Table 6.2 – DUAP Director General's Requirements for Drayton Proposal (cont)

Matters to be Considered	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont)	
xi. Risk and Hazard Analysis • A risk analysis should be prepared taking into consideration the provisions of the State Environmental Planning No.33 – Hazardous and Offensive Development, referring to DUAPs Guideline 'Applying SEPP33'	2.2.1.2
xii. Flora and Fauna Impacts • Plant species and communities within the proposal site area and its significance • Extent of disturbance of flora • Details of proposed mitigation methods to protect indigenous plant species • Fauna known likely to occur within the proposal area and note occurrence of any endangered fauna • Assessment of the effects on fauna and its habitat • Measures to ameliorate impact and to prevent weed invasion, vermin or feral animal problems • The 8 part test contained in Section 5A of the Environmental Planning and Assessment Act 1979 and the need to prepare a Species Impact Statement to be prepared in accordance with the Threatened Species Conservation Act, 1995	4.9
xiii. Heritage Aspects • Any likely affectation of sites of Aboriginal, archaeological European heritage value (including industrial heritage) if located in the vicinity of operations • Assessment of significance of any items affected • Proposed measures to mitigate impacts or conserve the heritage significance of the sites or items	4.11
xiv. Social Environmental • Affect on population growth (urban and rural areas) and changes to population location • The consequent housing and social service needs and measures to monitor and if necessary, satisfy demand	4.15
• Changes in the amenity of the area • Impacts on the health of the community from any potential changes in air quality, water quality, noise and vibration and rail safety	4.0
xv. Economic Environment • Changes to local employment patterns • Cost of living for employees and non-employees • Community growth and commercial development	4.15
• The agricultural viability and the severance of land holdings • Impact on property values	4.8
• Affect on municipal finances	4.15

Table 6.2 – DUAP Director General's Requirements for Drayton Proposal (cont)

Matters to be Considered	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont)	
xvi. Erosion and Soil Stability Issues	4.6 and 4.7.3.4
• Meteorological data, soil properties and characteristics and attributes of soil units	
• Landform characteristics which influence the erosion hazard, ratio of the rate of runoff to rate of rainfall, site history in regard to possible contamination issues, and any stream crossings	
• Integrated erosion and sediment control measures	
• Maintenance program of all erosion control works	
• Brief description of all geology of the area to be traversed by the proposed development	3.2.1
• Provision of a detailed sediment erosion control plan	4.7.3.4
xvii. Agricultural Viability	4.8
• sensitive agricultural uses in the vicinity of the facility	
• any effects on the agricultural viability of the adjoining land holdings; particularly in relation to dust and water	
xviii. Ecologically Sustainable Development Principles	3.4.2.4
• The precautionary principle: show that decisions made for the proposal are predictable and transparent. Including: - Making information available at an early stage and establishing appropriate conflict resolution mechanisms from project stage, assessment and determination process - Discussion of Best Practice Environmental Management techniques including the potential use of environmental management plans and environmental audits - Ensuring that best practice monitoring and enforcement procedures are proposed - Identifying the responsibilities of the proponent and government agencies for environmental management and enforcement	
• Inter- and intra-generational equity: overall project management and investment in plant and equipment that minimises pollution and waste and is energy efficient	
• Conservation of biodiversity and ecological integrity. Including: - Identification and assessment of all environmental characteristics and habitat values that could be affected by the proposal - likely environmental impacts on these characteristics and values - implementation of measures designed to minimise likely environmental impacts - consideration given to adopting a whole-of-life cycle through use of environmentally benign materials, products and processes (eg fuel efficient motors, use of recyclable and recycled materials) and integrated waste minimisation, reuse and recycling	
• Valuation and pricing of resources	
xix. Rehabilitation	5.2.7
• Address the progressive rehabilitation of the site	

Table 6.2 – DUAP Director General's Requirements for Drayton Proposal (cont)

Matters to be Considered	Section
3. Analysis of Environmental Impacts and Mitigating Measures (cont)	
xx. On-going environmental management • Demonstrate strategies for sound environmental practice during construction, and operation	5.2
• Identify all government licensing and approval requirements and demonstrate how the plan ill facilitate compliance with these requirements	5.3
• Set out the framework of a monitoring program of all key impacts on the environment	5.2
4. Consultation xxi. Government agency consultation • Results of consultation with Environment Protection Authority; Department of Mineral Resources; Freight Rail/Rail Access Corporation; Mine Subsidence Board; Local Aboriginal Lands Council; Wonnarua Tribal Council and Muswellbrook Shire Council	1.4.2
xxii. Potentially affected landowners • Consideration and review of key issues which emerge from discussion with potentially affected landowners	1.4.1 and 4.15.1
xxiii. Community Consultation • Details of consultation undertaken to date, including any local Aboriginal groups or Aboriginal Lands Councils, including the Wonnarua Tribal Council. Consideration and review of key environmental issues discerned by the community	1.4.1
xxiv. Mines in the area • Details of consultation with owners of mines in the area, including Bayswater mine	1.1.1

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