



WAMBO COAL MINE MODIFICATION

STATEMENT OF ENVIRONMENTAL EFFECTS



WAMBO COAL PTY LIMITED

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ResourceStrategies

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EXECUTIVE OVERVIEW

Wambo Coal Pty Limited (WCPL) proposes to modify the Development Consent for the Wambo Coal Mine (Wambo) located near Warkworth, in New South Wales (NSW).

The proposed modifications comprise the staged construction of the North Wambo Creek Diversion (the Diversion), a temporary North Wambo Creek pipeline and construction of gas drainage and dewatering infrastructure for the North Wambo Underground Mine. The proposed modifications are described in more detail below.

Staged Construction of the North Wambo Creek Diversion

The Diversion was assessed in the *Wambo Development Project Environmental Impact Statement* (the Project EIS) (WCPL, 2003). The objective of the Diversion is to divert flows in North Wambo Creek around the western limit of the open cut operations.

It is proposed to construct the Diversion in two stages:

- Stage 1 – Initially the upstream portion of the Diversion would be constructed generally along the alignment shown in the Project EIS and would connect to the existing North Wambo Creek channel upstream of the Wollemi Underground Mine Boxcut.
- Stage 2 – This stage would comprise an extension of the Stage 1 Diversion in a south-easterly direction to connect to the existing North Wambo Creek channel downstream of the Wollemi Underground Mine Boxcut.

Depending on open cut mine economics, Stage 2 of the Diversion may not be constructed as mining may be less extensive than originally planned.

Each stage of the Diversion would retain all of the engineering and hydrological features for the Diversion as described in the Project EIS.

Temporary North Wambo Creek Pipeline Over the North Wambo Underground Mine

The potential for connective cracking between the North Wambo Underground Mine workings and the North Wambo Creek was identified in the Project EIS and the North Wambo Underground Mine Subsidence Management Plan (SMP). In accordance with the outcomes of the SMP risk assessment, it is proposed to construct a temporary pipeline to convey low flows in a section of North Wambo Creek where the depth of cover above the North Wambo Underground Mine is less than 100 metres (m).

The temporary pipeline would comprise a pipe (or pipes), and inlet and outlet structures and would be located predominantly within the ultimate extent of the approved open cut workings.

Following subsidence associated with the North Wambo Underground Mine, the temporary pipeline would be removed and disturbed areas would be rehabilitated and/or subject to open cut mining.

Prior to the temporary pipeline being removed, either of the following would be undertaken:

- remediation of the section of the North Wambo Creek channel traversed by the temporary pipeline in accordance with the Project EIS and flow in the remediated creek channel would be re-established; or
- Stage 2 of the Diversion would be constructed over the subsided landform and North Wambo Creek flows would be permanently diverted to the Diversion.

North Wambo Underground Mine Gas Drainage and Dewatering Infrastructure

Investigations conducted during the development of first workings of the North Wambo Underground Mine have indicated that the installation of a number of gas drainage wells and a limited number of ventilation boreholes is required to regulate the level of gas in the mine. In addition, a limited number of dewatering boreholes and associated pipelines and pumps are required. While these components are minor in nature, they were not specifically described in the Project EIS and have therefore been included in this Statement of Environmental Effects (SEE).

Conclusion

Environmental reviews that have been conducted to evaluate the proposed modifications have concluded that any potential additional environmental impacts of the proposed modifications are minor in nature. Based on this and a comparative analysis of the key Project elements (ie. the Project as modified compared to that originally approved) it is considered that the Project as modified is substantially the same as the Project originally approved by the Minister for Infrastructure and Planning under Development Application (DA) 305-7-2003-i in February 2004.

1 INTRODUCTION

1.1 GENERAL

The Wambo Coal Mine (Wambo) is situated approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, New South Wales (NSW) (Figure 1). The mine is surrounded by grazing land and Wollombi Brook to the south, other coal mining operations to the east and north, grazing land to the north-west and Wollemi National Park to the west (Figures 1 and 2).

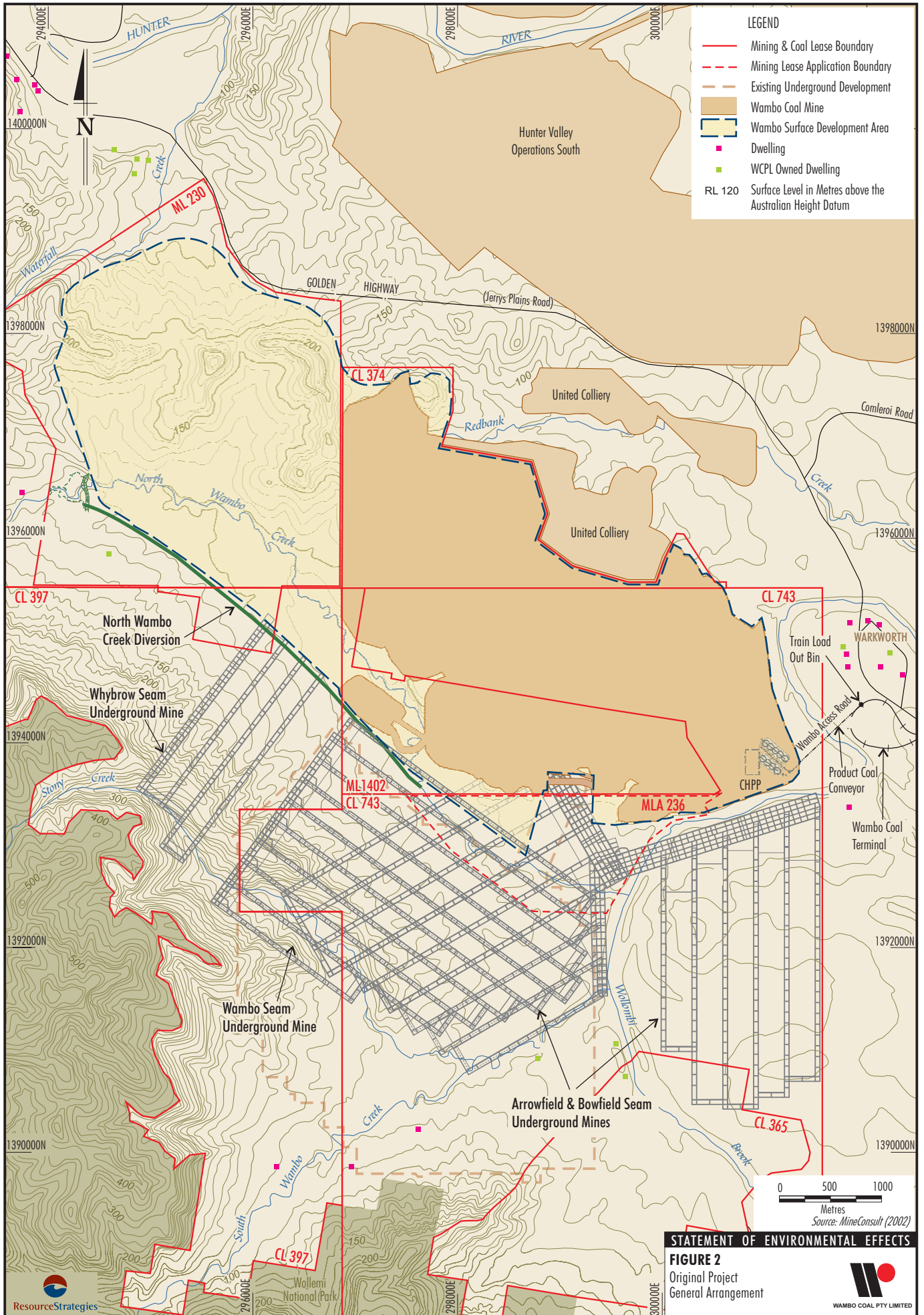
Wambo is owned by Wambo Coal Pty Limited (WCPL). In July 2003, WCPL submitted a Development Application (DA) (DA 305-7-2003-i) for the Wambo Development Project to the Minister for Infrastructure and Planning (the Minister). DA 305-7-2003-i was accompanied by the Wambo Development Project Environmental Impact Statement (WCPL, 2003) (the Project EIS). The Minister approved DA 305-7-2003-i on 4 February 2004. Wambo, incorporating the Wambo Development Project comprises the following components (herein referred to as the "Original Project") (Figure 2):

- continued development of open cut mining operations (including limited auger mining beyond open cut mining limits) within existing WCPL mining and coal leases and into new mining lease application areas;
- continued emplacement of waste rock and coarse rejects within mine waste rock emplacements;
- continued placement of tailings within open cut voids and capping with waste rock and coarse rejects;
- an extension to the existing Wollemi Underground Mine Boxcut (within the limits of the open cut mining area) to provide direct access for the development of the Whybrow Seam Underground Mine;
- extension of drifts from the existing Wollemi Underground Mine to facilitate longwall mining of the Wambo Seam Underground Mine;
- construction of a portal and drift access adjacent to the coal handling and preparation plant (CHPP) to facilitate the development of the Arrowfield and Bowfield Seam Underground Mines;
- upgrade of the existing CHPP to facilitate increased coal production;
- development of a water control structure across North Wambo Creek (herein referred to as the North Wambo Creek Diversion) at the north-western limit of the open cut operation and a channel to allow the passage of flows to the lower reaches of North Wambo Creek around the open cut development;
- de-gazettal and physical closure of Pinegrove Road;
- development of new access roads and internal haul roads;
- relocation of the existing explosives magazine and construction of additional hydrocarbon storage facilities; and
- relocation of the administration area and site offices.

Mining operations at Wambo commenced under DA 305-7-2003-i in November 2005.

A copy of the current consent conditions for Wambo (DA 305-7-2003-i) is provided in Appendix A.





In addition to the above, a separate DA accompanied the Project EIS to facilitate the development of rail and train loading infrastructure at Wambo (the Wambo Coal Terminal). The construction of the Wambo Coal Terminal has been completed and the terminal was officially opened in June 2006. All Wambo product coal is now transported via the Wambo Coal Terminal.

1.1.1 Previous Modifications to DA-305-7-2003-i

An application to modify DA 305-7-2003-i was lodged in January 2005 accompanied by a Statement of Environmental Effects (SEE) entitled *Wambo Seam Underground Mine Statement of Environmental Effects* (WCPL, 2005a) (North Wambo SEE) to facilitate alterations to the North Wambo Underground Mine including:

- the re-orientation of the North Wambo Underground Mine longwall panels; and
- access to the Wambo Seam via the open cut highwall.

The modifications were approved by the Minister on 4 May 2005. The re-orientated North Wambo Underground Mine longwall panels are shown on Figure 3. The North Wambo Underground Mine commenced production in November 2005 and is currently developing the first longwall panel.

In addition, two further minor modifications to the Original Project have been granted under Section 96(1A) of the *Environmental Planning and Assessment Act, 1979* (EP&A Act):

- 10 January 2006 – to facilitate the construction of an open cut workshop extension and surface infrastructure for the North Wambo Underground Mine.
- 19 April 2006 – to facilitate the extraction of remnant coal from the existing Wollemi Underground Mine.

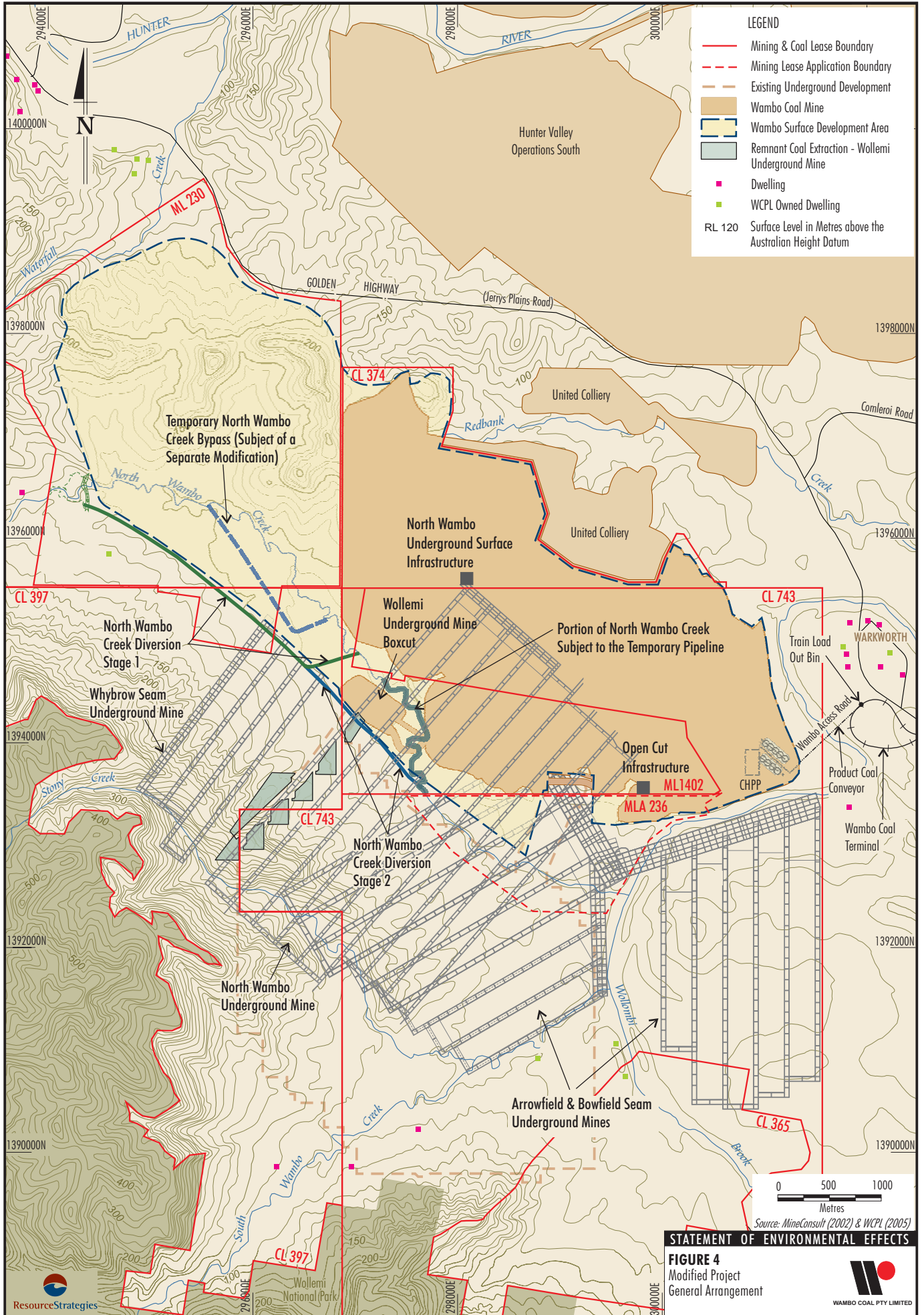
In addition to the above, in 2004 the Department of Planning (DoP) also modified Condition 5, Schedule 3 of DA 305-7-2003-i to read:

This consent shall only commence when the Applicant has surrendered all previous development consents for the Wambo coal mine, excluding DA No. 108/91 issued by Singleton Shire Council, to the satisfaction of the Director-General.

Wambo, incorporating the approved modifications described above, is herein referred to as the "Approved Project". The general arrangement of the Approved Project is shown on Figure 3.

1.1.2 Pending Application to Modify DA-305-7-2003-i

In addition to the above, on 27 July 2006 WCPL submitted an application to modify DA 305-7-2003-i under Section 96(1A) of the EP&A Act. The modification comprised construction of a temporary North Wambo Creek bypass around open cut operations that are scheduled in the next two years. The proposed alignment of the temporary North Wambo Creek bypass is shown on Figure 4. It is understood that the Minister is currently considering this modification.



1.1.3 Overview of the Proposed Modification

The primary component of the proposed modifications is to construct the approved North Wambo Creek Diversion (the Diversion) in two stages. Other modifications that are also assessed in this SEE comprise development of a temporary North Wambo Creek pipeline, and construction of minor gas drainage and dewatering infrastructure for the North Wambo Underground Mine.

Wambo, incorporating these proposed changes, is herein referred to as the “Modified Project”.

An overview of the Modified Project is presented below and a more detailed description is presented in Section 3.

Staged Construction of the North Wambo Creek Diversion

The Diversion was assessed in the Project EIS and was approved as part of DA 305-7-2003-i. The objective of the Diversion is to divert flows in North Wambo Creek around the western limit of the open cut operations.

It is proposed to construct the Diversion in two stages (Figure 4). Each stage of the Diversion would retain all of the engineering and hydrological features described in the Project EIS. Constructing the Diversion in two stages has a number of potential environmental benefits (Section 3.1).

Temporary North Wambo Creek Pipeline Over the North Wambo Underground Mine

The potential for connective cracking between the North Wambo Underground Mine workings and the North Wambo Creek was identified in the Project EIS and the North Wambo Subsidence Management Plan (SMP) (WCPL, 2006a). In accordance with the outcomes of the SMP risk assessment, it is proposed to construct a temporary pipeline to convey low flows in reaches of North Wambo Creek where the depth of cover above the North Wambo Underground Mine is less than 100 metres (m).

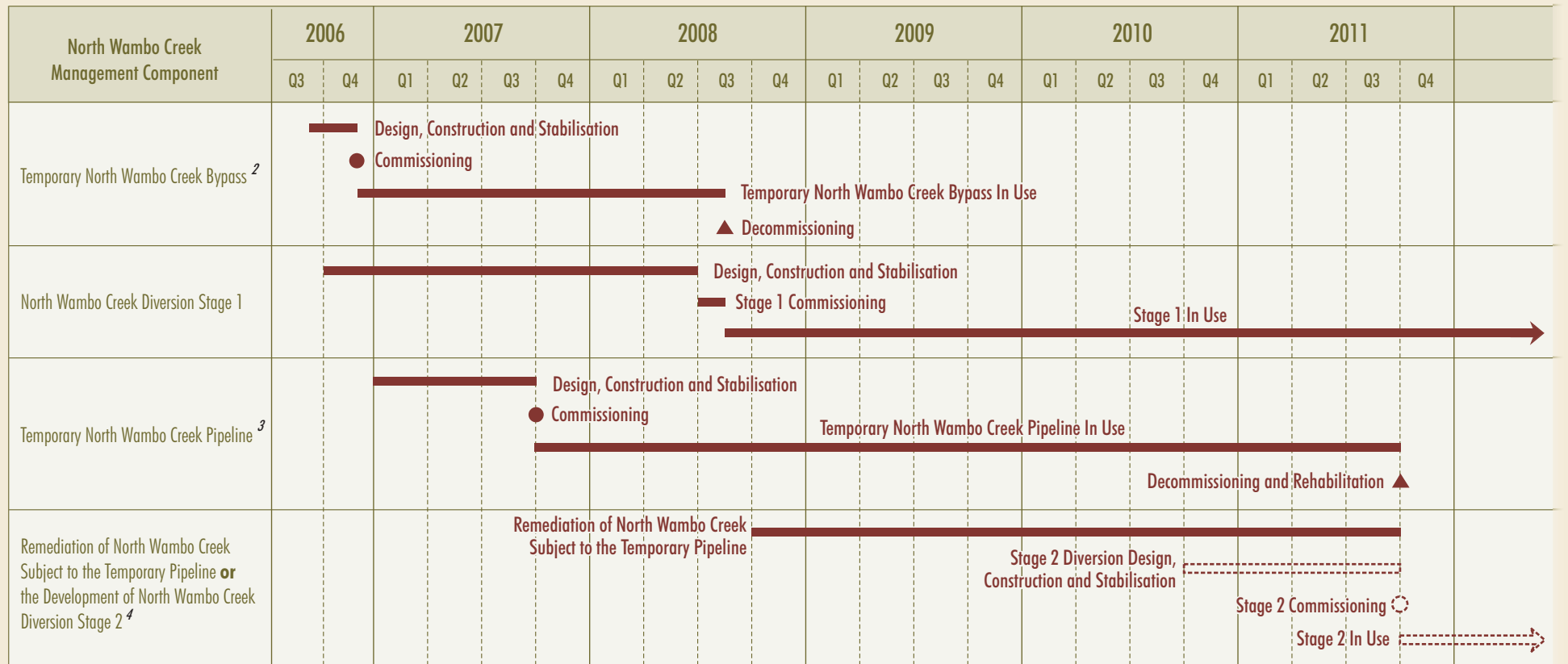
The temporary pipeline would comprise a pipe (or pipes), and inlet and outlet structures and would be located predominantly within the ultimate extent of the approved open cut workings (Figure 4).

Following subsidence associated with the North Wambo Underground Mine, the temporary pipeline would be removed and disturbed areas would be rehabilitated. Prior to the temporary pipeline being removed, either:

- remediation of the section of the North Wambo Creek channel subject to the temporary pipeline would be undertaken in accordance with the Project EIS and flow in the remediated creek channel would be re-established; or
- Stage 2 of the Diversion would be constructed over the subsided landform and North Wambo Creek flows would be permanently diverted to the Diversion.

Figure 5 presents the provisional timing of the temporary North Wambo Creek pipeline, staged construction of the Diversion and the temporary North Wambo Creek bypass for the open cut (which is the subject of a pending consent modification application – refer to Section 1.1.2). It should be noted that the timeline presented in Figure 5 is provisional and the actual timing would be subject to the progression of open cut and underground mining.

Provisional Development Schedule¹ of North Wambo Creek Management Components



- Notes
- ¹ Provisional schedule may change subject to the progress of relevant open-cut and underground mining components.
 - ² The subject of a separate consent modification.
 - ³ Temporary pipeline may be constructed in stages over individual longwall panels. In this event, decommissioning and rehabilitation would also be staged.
 - ⁴ See Section 1.1.3 for details.

North Wambo Underground Mine Gas Drainage and Dewatering Infrastructure

Investigations conducted during the development of first workings of the North Wambo Underground Mine have indicated that the installation of gas drainage wells and ventilation boreholes is required to regulate the level of gas for mine safety. In addition, a limited number of dewatering boreholes and associated pipelines and pumps are required. While these components are minor in nature, they were not specifically described in the Project EIS and have therefore been included in this SEE.

Summary of Proposed Changes

Table 1 provides a summary comparison of the key Project components for the Original, Approved and Modified Projects.

**Table 1
Summary Comparison of the Original, Approved and Modified Projects**

Project Component	Original Project¹	Approved Project²	Modified Project³
Open Cut Mining	<ul style="list-style-type: none"> Open cut mining at a rate of up to 8 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal from the Whybrow, Redbank Creek, Wambo and Whynot Seams. Average stripping ratio of 6.5 bank cubic metres (bcm) waste rock:1 tonne (t) ROM coal. An estimated total open cut reserve of 98 Million tonnes (Mt). 	<ul style="list-style-type: none"> Unchanged. 	<ul style="list-style-type: none"> Unchanged.
Underground Mining	<ul style="list-style-type: none"> Underground mining of up to 7.5 Mtpa of ROM coal from the Whybrow, Wambo, Arrowfield and Bowfield Seams. Underground reserves are estimated at 104 Mt. 	<ul style="list-style-type: none"> Addition of Wollemi remnant coal - no change to the rate of production or seams mined. Minor increase in underground reserves (ie. less than 2%). 	<ul style="list-style-type: none"> As per the Approved Project.
Processing	<ul style="list-style-type: none"> A second module would be commissioned to operate in conjunction with the existing 900 tonne per hour (tph) single-module CHPP to facilitate processing in the order of 1,800 tph. 	<ul style="list-style-type: none"> Unchanged. 	<ul style="list-style-type: none"> Unchanged.
Product Coal	<ul style="list-style-type: none"> Production of up to 11.3 Mtpa of thermal coal predominantly for export. 	<ul style="list-style-type: none"> Unchanged. 	<ul style="list-style-type: none"> Unchanged.
CHPP Rejects	<ul style="list-style-type: none"> Coarse rejects (approximately 27 Mt during the DA period) and tailings (approximately 18 Mt during the DA period) would be incorporated, encapsulated and/or capped within open cut voids in accordance with existing Wambo management practices. 	<ul style="list-style-type: none"> Unchanged. 	<ul style="list-style-type: none"> Unchanged.

Table 1 (Continued)
Summary Comparison of the Original, Approved and Modified Projects

Project Component	Original Project ¹	Approved Project ²	Modified Project ³
Underground Mining Area Footprint	<ul style="list-style-type: none"> As shown on Figure 2. 	<ul style="list-style-type: none"> Alteration to alignment of mining in Wambo Seam. Addition of the Wollemi Underground Mine remnant coal extraction area (less than 1% increase in the total footprint of the underground mining area). 	<ul style="list-style-type: none"> As per the Approved Project.
Infrastructure and Services	<ul style="list-style-type: none"> As described in Section 2.11 of the Project EIS. 	<ul style="list-style-type: none"> Addition of surface infrastructure for the North Wambo Underground Mine and expansion of the existing open cut workshop. 	<ul style="list-style-type: none"> As per the Approved Project with the addition of minor gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure for the North Wambo Underground Mine.
Coal Handling	<ul style="list-style-type: none"> Coal from the North Wambo Underground Mine conveyed to the surface would be reclaimed from the Wollemi ROM stockpile using a front end loader and hauled by trucks to the CHPP ROM stockpile. 	<ul style="list-style-type: none"> Coal from the North Wambo Underground Mine would either be conveyed via a highwall conveyor directly to the CHPP ROM stockpile or conveyed to a ROM stockpile located close to the underground mine entry before being reclaimed using a front end loader and hauled by trucks to the CHPP ROM stockpile. 	<ul style="list-style-type: none"> As per the Approved Project.
North Wambo Creek Diversion	<ul style="list-style-type: none"> The Diversion⁴ would be constructed to allow the passage of flows from North Wambo Creek around the open cut. 	<ul style="list-style-type: none"> Unchanged. 	<ul style="list-style-type: none"> The Diversion would be constructed in two stages. Addition of a temporary North Wambo Creek pipeline. <i>Construction of a temporary bypass of North Wambo Creek within the approved open cut limits⁵.</i>

¹ DA 305-7-2003-i approved February 2004.

² Modifications to DA 305-7-2003-i approved May 2005, January 2006 and April 2006.

³ Proposed modification to the Approved Project.

⁴ Denoted as 'water control system' in the Project EIS.

⁵ The temporary bypass is the subject of a separate consent modification lodged on 27 July 2006. This modification has not yet been determined.

1.2 LEGISLATIVE FRAMEWORK

The Project EIS and accompanying DA (Section 1.1) was assessed under Part 4 of the EP&A Act.

As discussed in Section 1.1, DA 305-7-2003-i has previously been modified under Sections 96(2) and 96(1A) of the EP&A Act.

The EP&A Act provides the statutory context for this modification application. This SEE has been prepared in accordance with Section 96(2) of the EP&A Act which states:

A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:

- (a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), and*
- (b) it has consulted with the relevant Minister, public authority or approval body (within the meaning of Division 5) in respect of a condition imposed as a requirement of a concurrence to the consent or in accordance with the general terms of an approval proposed to be granted by the approval body and that Minister, authority or body has not, within 21 days after being consulted, objected to the modification of that consent, and*
- (c) it has notified the application in accordance with:
 - (i) the regulations, if the regulations so require, or*
 - (ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and**
- (d) it has considered any submissions made concerning the proposed modification within the period prescribed by the regulations or provided by the development control plan, as the case may be.*

This SEE describes the Modified Project and provides justification for the conclusion that it is substantially the same development as the Original Project (ie. the application of Section 96[2] of the EP&A Act is justified).

Singleton Local Environmental Plan 1996

The Project lies wholly within the Singleton Local Government Area (LGA) and is situated on land zoned Rural 1(a) within the *Singleton Local Environmental Plan 1996* (Singleton LEP) under the EP&A Act. In accordance with the Singleton LEP, land use within this zone must comply with the following objectives:

- (a) to protect and conserve agricultural land and to encourage continuing viable and sustainable agricultural land use;*
- (b) to promote the protection and preservation of natural ecological systems and processes;*
- (c) to allow mining where environmental impacts do not exceed acceptable limits and the land is satisfactorily rehabilitated after mining;*

- (d) *to maintain the scenic amenity and landscape quality of the area;*
- (e) *to provide for the proper and co-ordinated use of rivers and water catchment areas;
and*
- (f) *to promote provision of roads that are compatible with the nature and intensity of development and the character of the area.*

The proposed modifications would not significantly alter the Original Project such that it would no longer comply with applicable objectives of the Singleton LEP.

Part 9 of the Singleton LEP addresses the conservation of heritage items of local, regional and State significance, which are listed in Schedule 3 of the Singleton LEP. The proposed modifications would not alter the potential impacts of the Original Project on identified heritage items.

Hunter Regional Environmental Plan 1989

The proposal lies within the jurisdiction of the *Hunter Regional Environmental Plan 1989* (Hunter REP), which was enacted in 1989 with the following goals:

- (a) *to promote the balanced development of the region, the improvement of its urban and rural environments and the orderly and economic development and optimum use of its land and other resources, consistent with conservation of natural and man-made features and so as to meet the needs and aspirations of the community;*
- (b) *to coordinate activities related to development in the region so there is optimum social and economic benefit to the community; and*
- (c) *to continue a regional planning process that will serve as a framework for identifying priorities for further investigations to be carried out by the Department and other agencies.*

In regard to mineral resources and extractive materials the Hunter REP aims to:

- (a) *manage the coal and other mineral resources and extractive materials of the region in a coordinated 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 Hunter REP contains a number of matters of direct relevance to the Modified Project. These matters have been addressed where relevant throughout the SEE.

Hunter Regional Environmental Plan (Heritage) 1989

Clause 5 of the Singleton LEP excludes the Singleton LGA from the *Hunter REP (Heritage) 1989*. All items of local, regional and State significance contained within the *Hunter REP (Heritage) 1989* are listed in Schedule 3 of the Singleton LEP.

State Environmental Planning Policy No. 11 (Traffic Generating Developments)

The Original Project DA was forwarded to the Roads and Traffic Authority (RTA) in accordance with State Environmental Planning Policy (SEPP) 11. No significant alteration to the Original Project traffic movements is anticipated due to the Modified Project (Section 4.9).

State Environmental Planning Policy No. 33 (Hazardous and Offensive Development)

SEPP 33 requires the consent authority, in considering a DA for a potentially hazardous or a potentially offensive industry, to take into account:

- (c) *in the case of development for the purpose of a potentially hazardous industry—a preliminary hazard analysis prepared by or on behalf of the applicant, and*
- (d) *any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application)...*

The Modified Project does not significantly alter the consequences or likelihood of a hazardous event occurring at Wambo as the operational activities on-site would be generally unchanged. Notwithstanding, environmental management plans and monitoring programmes would be reviewed and revised by WCPL to include the Modified Project and manage any associated environmental risks.

State Environmental Planning Policy No. 44 (Koala Habitat Protection)

SEPP 44 requires the consent authority for any DA in certain LGAs (including Singleton) to consider whether land subject to a DA is "*potential Koala habitat*" or "*core Koala habitat*".

An assessment of potential and core Koala habitat was conducted in the Project EIS. This assessment concluded that lands within the vicinity of Wambo do not contain potential or core Koala habitat (Resource Strategies Pty Ltd, 2003).

The provisions of SEPP 44 are therefore not considered to be applicable to the Modified Project.

Other Approvals

In addition to the modified Development Consent which is required to be obtained from the Minister for Planning, the following other approvals may be required for the Modified Project:

- a variation to the Environmental Protection Licence (EPL) (No. 529);
- relevant water licences under the *Water Act, 1912*; and
- a modification of the relevant Mining Operations Plan (MOP).

1.3 DEPARTMENT OF NATURAL RESOURCES GUIDELINES

The Department of Infrastructure, Planning and Natural Resources (DIPNR) (now the Department of Natural Resources [DNR]) released a guideline in April 2005 entitled "*Stream/Aquifer Guidelines Management of Stream/ Aquifer Systems in Coal Mining Developments*" (herein referred to as the DNR Guidelines). The baseline conditions and water management principles for Wambo are outlined in the Project EIS. Notwithstanding, the DNR Guidelines have been reviewed with respect to the staged Diversion and temporary pipeline and the DNR Guideline is referenced in this SEE where relevant.

1.4 CONSULTATION

1.4.1 State and Local Government Agencies

Consultation undertaken with respect to the modifications in this SEE is summarised below:

- WCPL has discussed the modification with the DoP periodically during the development of this SEE.
- A representative of the DNR attended two risk assessments (in August 2005 and April 2006) with respect to subsidence impacts, including the risk assessment that determined the need for the temporary North Wambo Creek pipeline over the North Wambo Underground Mine.
- Representatives of the DPI-MR and the DNR attended an on-site meeting with WCPL on 8 June 2006 to discuss the proposed staged Diversion and temporary North Wambo Creek pipeline.
- WCPL met with representatives of the DPI-MR and the DNR on 16 August 2006 to explain the proposed modifications and the status of the SEE assessments.
- WCPL provided the DPI-MR, DNR, DPI-Fisheries and the DEH with briefing papers in August/September 2006 which described the Modified Project and SEE assessment timing and process. Follow-up discussions with these authorities were also held in August/September 2006.

1.4.2 Community Consultation

WCPL has outlined aspects of the proposed modifications in the July edition of the 'Wambo Wrap' newsletter, which is distributed to households in the Jerrys Plains, Warkworth and Long Point Road areas and other interested community groups. The proposal was also presented and discussed at Wambo Community Consultative Committee (CCC) meeting of 8 August 2006.

1.4.3 Ongoing Consultation

The consultation initiatives presented above will continue throughout the SEE assessment process and beyond. This will be achieved by:

- formal exhibition of the SEE (as required by the *Environmental Planning and Assessment Regulation, 2000*);
- ongoing discussions with key regulatory authorities;
- continuation of community consultation via the CCC and future editions of the 'Wambo Wrap'; and
- discussions with the DNR with respect to the required licences under the *Water Act, 1912* and public notification associated with these licence applications.

1.5 REPORT STRUCTURE

The remainder of this SEE is structured as follows:

- Section 2: Presents an overview of relevant aspects of the Approved Project.
- Section 3: Describes the proposed Modified Project.
- Section 4: Provides an assessment of the potential environmental effects of the Modified Project and applicable management measures.
- Section 5: Presents a conclusion to this SEE.

Appendices A and B also provide supporting information as follows:

- Appendix A: Wambo Coal Mine – Development Consent (DA 305-7-2003-i).
- Appendix B: Hydrological Assessment of Staged Diversion and Temporary Pipeline - North Wambo Creek.

2 OVERVIEW OF THE APPROVED PROJECT

The following description of Approved Project is based on the Project EIS, North Wambo SEE and current operational practices as described in the *Open Cut MOP* (WCPL, 2005b), the *Underground MOP* (WCPL, 2005c) and the *2005-2006 Annual Environmental Management Report* (AEMR) (WCPL, 2006b).

Wambo is located in the Hunter Coalfield, a subdivision of the Sydney Basin. The Hunter Coalfield covers an area of approximately 2,100 square kilometres (km²) and contains coal measures of bituminous rank and Permian age. The Whybrow, Redbank Creek, Wambo and Whynot Seams are mined using open cut methods, while the Whybrow, Wambo, Arrowfield and Bowfield Seams will be mined using underground mining methods.

2.1 MINING METHODS

2.1.1 Open Cut Operations

The general sequence of open cut mining operations at Wambo is as follows (WCPL, 2005b):

- Vegetation clearing and soil stripping. Stripped soil is used directly in progressive rehabilitation or placed in temporary stockpiles.
- Excavation of weathered overburden and haulage to mine waste rock emplacements.
- Blasting of the harder and more competent overburden and interburden materials, excavation and haulage to mine waste rock emplacements.
- Selective mining of coal and haulage to the ROM stockpile.
- Progressive rehabilitation of mine waste emplacements.

2.1.2 Underground Mining Operations

Underground mining will be undertaken in the following mines over the life of the Approved Project:

- North Wambo Underground Mine;
- Whybrow Seam Underground Mine;
- Arrowfield and Bowfield Seam Underground Mines; and
- remnant coal extraction from the existing Wollemi Underground Mine.

WCPL are currently developing the first workings of the North Wambo Underground Mine. Longwall mining is scheduled to begin in early 2007. The mine will be mined using conventional longwall mining methods and panel widths of 250 m. A summary overview of the North Wambo Underground Mine is provided below as it is of relevance to the proposed modifications:

- Eight longwall panels will be developed in the North Wambo Underground Mine, with the panels oriented south-west to north-east (Figure 3).
- Longwall panels 1–4 will be developed off main headings driven from the existing Bates North highwall.
- Panels 5-8 will be developed by punch mining directly off the Homestead Pit open cut highwall.

- The longwall panels are approximately 3.8 to 4 km in length and extend to the southern side of Stony Creek (Figure 3).
- The Wambo Seam varies from 1.8 m to 2.3 m in depth and the full seam section will be extracted during mining.

2.2 COAL RECLAIM AND PREPARATION

The approved CHPP comprises two operational modules. Each CHPP module will operate up to 24 hours per day, seven days per week with a design capacity of approximately 900 tonnes per hour (tph) of ROM feed (WCPL, 2005c). Figure 6 presents a conceptual schematic of the CHPP modules as approved.

2.3 COAL TRANSPORT

The Wambo Coal Terminal comprising coal reclaim and rail load-out facilities for train loading of all product coal was officially opened in June 2006. All Wambo product coal is now transported via rail. Product coal is loaded onto typical Hunter Valley nominal 8,600 t trains for transport to market. The number of trains loaded per week is based on mine production and relevant rail and port schedules.

2.4 WATER MANAGEMENT

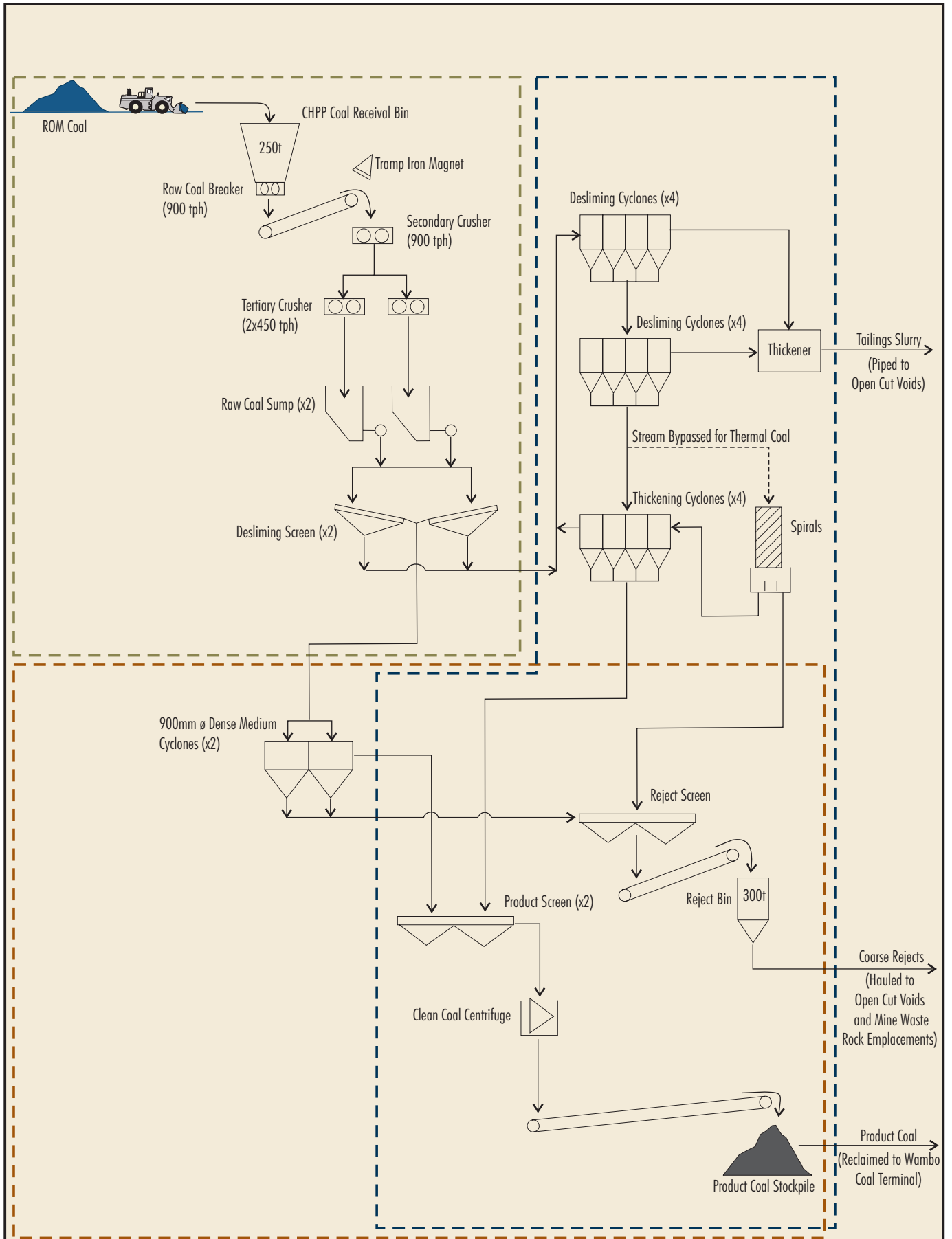
The water management strategy for Wambo is based on the containment and re-use of mine water and the control of runoff from disturbed areas (WCPL, 2005c).

Historically, Wambo has been able to balance water supply and demand within the mine site through the input of water from external sources (e.g. licensed extractions) and licensed discharges (WCPL, 2005a).

Surface water management at Wambo is based on the following principles (WCPL, 2005c):

- mine-generated water is consumed in the CHPP and for dust suppression;
- discharge of water in accordance with the requirements of the Hunter River Salinity Trading Scheme;
- stored water is circulated via a network of pumps between relevant site dams;
- clean water (runoff from undisturbed areas) and dirty water (runoff from disturbed areas) are separated where practicable; and
- diversion banks and dams are designed to cater for storm events.

Further details on the site water management system are provided in the Open Cut MOP and the Site Water Management Plan (SWMP).



LEGEND

- Coal Reclaim, Crushing and Screening
- Coarse Coal Circuit
- Fine Coal Circuit

Source: WCPL (2002)

STATEMENT OF ENVIRONMENTAL EFFECTS

FIGURE 6
Coal Handling and Preparation Plant Module



WAMBO COAL PTY LIMITED

2.5 MINE WASTE ROCK MANAGEMENT

As described in the Project EIS, the open cut operation will produce approximately 640 Million bank cubic metres (Mbcm) of waste rock during the life of the Approved Project. Only a limited amount of waste rock will be produced by the North Wambo Underground Mine (WCPL, 2005b).

Overburden removal is carried out mostly by excavators and haul trucks with the waste material hauled either around the ends of the operating pits to be disposed of in the spoil, or to one of several out-of-pit dumps.

2.6 INFRASTRUCTURE AND SERVICES

Major items of infrastructure and services at Wambo include:

- administration offices;
- bathhouses;
- workshops;
- access roads;
- electricity supply;
- potable water supply;
- sewage treatment and waste disposal; and
- telecommunications.

2.7 REHABILITATION

The rehabilitation objectives at Wambo include:

- the creation of safe, stable, adequately drained post-mining landforms that are consistent with the local surrounding landscape;
- establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park;
- preservation of existing beneficial use of water resources; and
- development of a sustainable post-mining land use plan towards the end of the Project life.

2.8 ENVIRONMENTAL MONITORING AND MANAGEMENT

Environmental management at Wambo encompasses a range of management plans and monitoring programmes overseen by statutory planning provisions. Approved management plans/monitoring programmes include:

- Flora and Fauna Management Plan (FFMP).
- Air Quality Monitoring Programme (AQMP).
- Groundwater Monitoring Programme (GWMP).
- Surface Water Monitoring Programme.

- Noise Monitoring Programme.
- Erosion and Sediment Control Plan (ESCP).
- Landowner Notification Procedure.
- Surface and Groundwater Response Plan.
- Surface and Subsurface Investigation Programme.
- Environmental Management Strategy (EMS).
- Blast Management Plan (Skinner).
- Blast Monitoring Programme.
- Environmental Monitoring Programme.

2.8.1 ENVIRONMENTAL MONITORING

Wambo maintains an extensive monitoring programme whereby data is collected, analysed and maintained for reporting, future examination and assessment. A summary of the programme is provided below.

Meteorology

Wambo's meteorological station is located adjacent to the administration building (Figure 7). This station records lapse rate, rainfall, sigma theta at 10 m, temperature (2 m and 10 m), solar radiation at 10 m, wind speed and direction at 10 m and evaporation (inferred) (WCPL, 2006c).

Surface Water and Groundwater

Surface water monitoring includes sampling of streams and on-site water storage structures (Figure 7) and includes both monthly and/or event based monitoring. Stream sampling locations are situated on Wollombi Brook, North Wambo Creek, Waterfall Creek, South Wambo Creek and Stony Creek (Figure 7) (WCPL, 2006c). Gauging stations are situated on South Wambo Creek (V1 and V2), Stony Creek (V7 and V8) and Wollombi Brook (V10 and V11) (Figure 7) (WCPL, 2006c).

Surface water and groundwater samples are analysed for a suite of physical and chemical parameters for comparison with the relevant trigger levels outlined in the SWMP and GWMP, respectively.

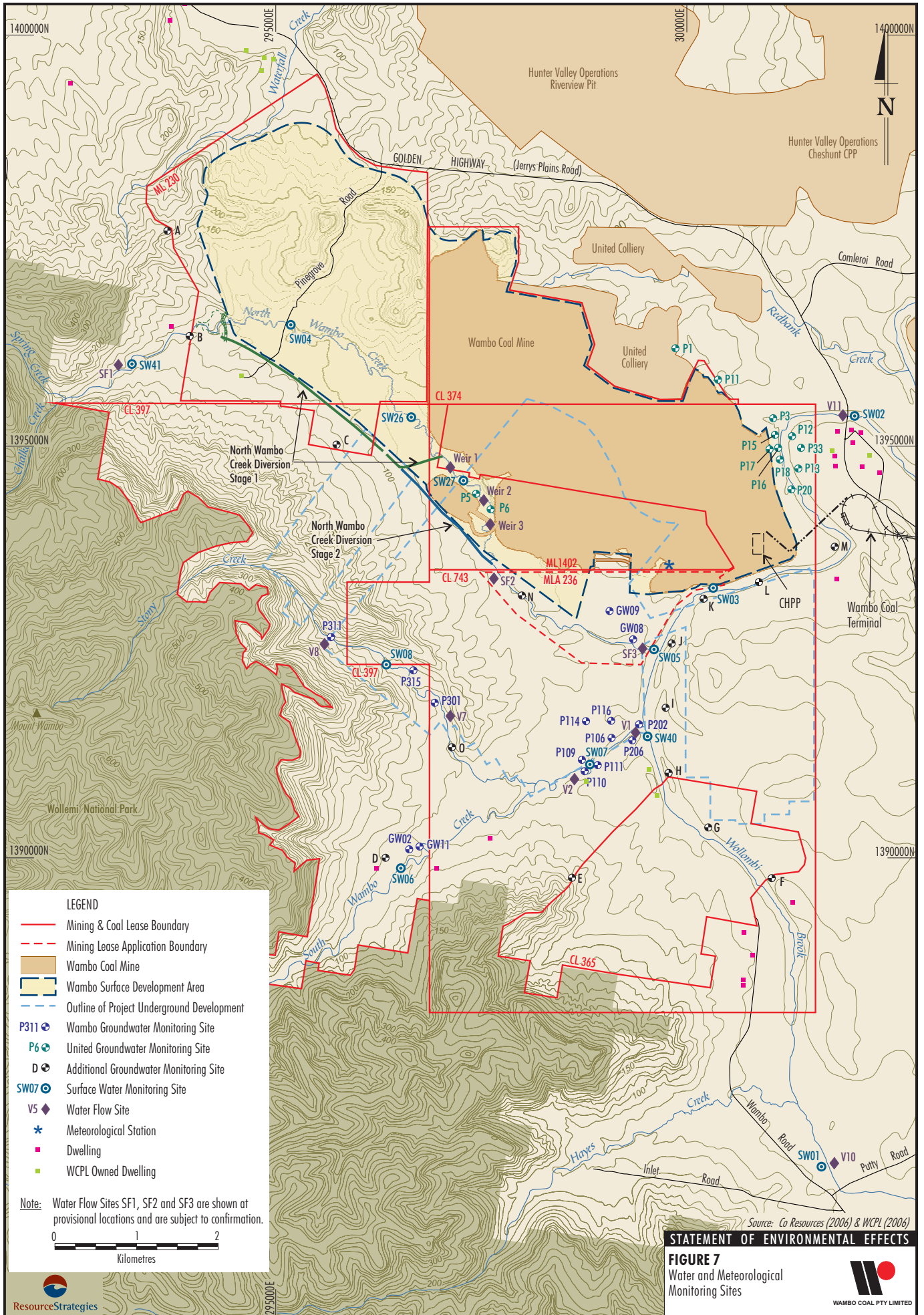
Groundwater levels and quality are monitored every two months at a number of sites both within and surrounding Wambo (Figure 7) (WCPL, 2006c).

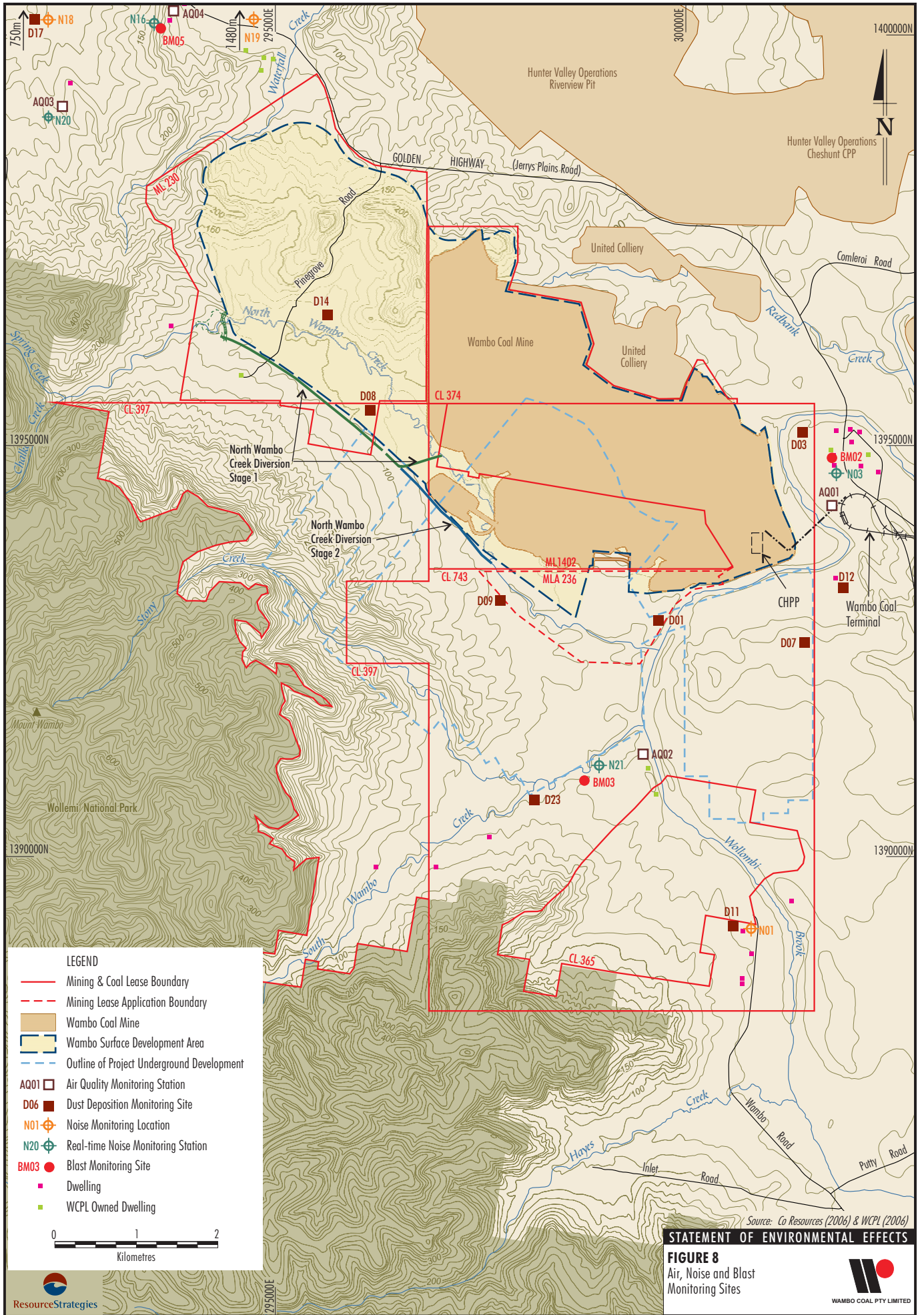
Noise

Real-time noise monitoring is conducted at four sites including the Kelly property (N03), Muller property (N16), Thelander property (N20) and WCPL-owned property (N21) (Figure 8) (WCPL, 2006c). In addition, quarterly attended and unattended noise monitoring is conducted at three sites including the Lambkin dwelling (N01), Carter dwelling (N18) and Moses dwelling (N19) (Figure 8) (WCPL, 2006c).

Blasting

Airblast overpressure and ground vibration is monitored for each blasting event. Monitoring is conducted at four locations including the Kelly property (BM02), Harris Property (BM03), Skinner Property (BM04) and Muller property (BM05) (Figure 8) (WCPL, 2006c).





Air Quality

Wambo maintains a network of 15 dust gauges, four high volume samplers and four real-time Tapered Element Oscillating Microbalances (TEOMs) analysers (Figure 8) (WCPL, 2006c).

2.9 COMPLAINTS RECORD

Wambo maintains a 24 hour, 7 days per week phone line which is directed to the Environmental Officer. The procedure for receiving, handling, responding and recording complaints is detailed in the EMS in accordance with Condition 1, Schedule 6 of DA 305-7-2003-i.

A total of 32 complaints were received from the community during the 2005/2006 AEMR reporting period (WCPL, 2006b). The major issue of concern was dust generation from blasting. As a result of these complaints, weather criteria for blasting have been developed whereby blasting is not undertaken under certain weather conditions.

3 DESCRIPTION OF THE PROPOSED MODIFICATION

3.1 STAGED CONSTRUCTION OF THE NORTH WAMBO CREEK DIVERSION

The objective of the approved Diversion is to divert flows in North Wambo Creek around the western limit of the open cut operations.

It is proposed to construct the Diversion in two stages (Figure 4):

- Stage 1 – Initially the upstream portion of the Diversion would be constructed generally along the alignment shown in the Project EIS and would connect to the existing North Wambo Creek channel upstream of the Wollemi Underground Mine Boxcut.
- Stage 2 – This stage would comprise an extension of the Stage 1 Diversion in a south-easterly direction to connect to the existing North Wambo Creek channel downstream of the Wollemi Underground Mine Boxcut.

Depending on open cut mine economics, Stage 2 of the Diversion may not be constructed as open cut mining may be less extensive than described in the Project EIS.

Each stage of the Diversion would retain all of the engineering and hydrological features described in the Project EIS. A description of the modified Diversion, including consideration of hydrological implications was assessed by Gilbert & Associates Pty Ltd and is provided in Appendix B.

The staging of the construction of the Diversion would potentially provide the following benefits:

- Only those reaches of the existing North Wambo Creek which would be impacted by open cut mining would be diverted, thereby retaining as much of the existing creek line as practicable.
- The staged approach would allow construction, hydrological and performance data collected during the development and operation of Stage 1 (and any improvements identified) to be incorporated into the design for Stage 2.
- If Stage 2 is constructed, it would be constructed after mine subsidence associated with the North Wambo Underground Mine. This would reduce the need for post-subsidence remediation work on the Diversion.
- The construction period for Stage 1 of the Diversion would be significantly shorter than it would be for the complete (Original Project) Diversion. This would potentially provide more time for stabilisation of the Diversion prior to commissioning. Stabilisation/vegetation establishment is a key requirement of the DNR Guidelines.
- Staging of the Diversion would also mean that construction activity would be split into two shorter campaigns which may provide an opportunity to schedule the works to coincide with dryer periods.

3.2 TEMPORARY NORTH WAMBO CREEK PIPELINE

The potential for connective cracking between the North Wambo Underground Mine workings and the North Wambo Creek was identified in the Project EIS and the North Wambo Underground Mine SMP (WCPL, 2006a). The potential for connective cracking was assessed in the SMP risk assessment (SP Solutions, 2006) and mitigation measures were identified in order to reduce the level of risk to meet acceptable criteria. In accordance with the outcomes of the SMP risk assessment, it is proposed to construct a temporary pipeline to convey low flows around sections of North Wambo Creek with a depth of cover less than 100 m above the North Wambo Underground Mine (Figure 9).

The temporary pipeline would comprise a pipe (or pipes), and inlet and outlet structures which include block embankments at the upstream and downstream ends of the pipeline. A description of the temporary North Wambo Creek pipeline is provided in Appendix B.

The inlet structure would be located upstream of longwall 1 of the North Wambo Underground Mine and would include a low block embankment structure which would be built across the channel. The embankment would be designed to allow the stable passage of flows to the existing North Wambo Creek channel during high flow events. This would be achieved by rock armouring relevant sections of the block embankment structure. A polyethylene pipeline would extend from the inlet to re-enter North Wambo Creek downstream of the longwall panel being mined at any given time (ie. the pipeline would be stage constructed). The pipeline would be installed in a 'snaked' plan-form so that excess pipeline length would be available to accommodate surface movement associated with subsidence.

Flow from North Wambo Creek would enter the pipeline via a concrete inlet pipe, incorporating a trash screen for removal of debris. Depending on the final design of the pipeline, portions of the pipeline may be buried in a backfilled trench in order to maintain a downhill gradient and minimise the pipeline length.

The pipeline would re-enter the existing creek via an outfall stilling well. The stilling well would consist of a concrete 'manhole' structure located below the invert level of the existing creek. A small block embankment structure would be located upstream of the stilling well to prevent flow propagating upstream. The outlet structure would be removed and re-installed as necessary during the staged construction of the temporary pipeline.

In the event that flow in North Wambo Creek exceeds the design capacity of the block embankment, flow would pass over the block embankment and flow down the existing creek channel overlying the longwall panels.

The temporary pipeline would be generally located within the ultimate extent of the approved open cut workings (Figure 9).

3.3 INSTALLATION OF GAS DRAINAGE WELLS AND DEWATERING INFRASTRUCTURE

Gas measurements conducted during the development of first workings of the North Wambo Underground Mine have indicated that the installation of gas drainage wells and a limited number of ventilation boreholes is required to regulate the level of gas in the mine. Also, investigations in relation to mine water inflows undertaken since the North Wambo SEE indicate that a limited number of dewatering boreholes are required to facilitate appropriate dewatering of the North Wambo Underground Mine.

These measures are generally minor in nature and comprise disturbance associated with the installation of gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure above the longwall panels of the North Wambo Underground Mine.

The gas drainage wells would be installed at approximately 200 m intervals along the longwall panels, generally in the centre of the panel and may be interconnected by a pipeline to facilitate appropriate gas management.

Disturbance associated with the gas drainage wells ventilation boreholes and dewatering boreholes would be limited to an area approximately 20 by 20 m for each well/borehole. In addition, linear disturbance would be necessary for access tracks, gas pipelines, water pipelines and other ancillary infrastructure. This would be minimised where practicable by using existing access tracks.

Gas drainage wells would be decommissioned and rehabilitated as longwall mining progresses. It is anticipated that only two gas drainage wells would generally be operating at any one time, with decommissioned gas wells undergoing rehabilitation and new gas wells under construction.

With regards to gas management, investigations are being undertaken by WCPL as to the feasibility of a flaring facility for the North Wambo Underground Mine. WCPL is also investigating the feasibility of using United Colliery's flaring facility.

Some of the gas wells, ventilation boreholes, dewatering boreholes and associated infrastructure would be located within the Remnant Woodland Enhancement Programme (RWEPP) areas B and C. Therefore, WCPL would also apply to modify its approval under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) (Commonwealth) (approval number EPBC 2003/1138) to facilitate the construction of the proposed infrastructure within the RWEPP areas B and C.

4 ENVIRONMENTAL REVIEW

The existing environment of the Original Project area and surrounds is comprehensively described in the Project EIS (WCPL, 2003). Where relevant to the proposed modification, details of the existing environment and previous environmental assessments from the Project EIS are reproduced.

The following sub-sections present an assessment of the environmental effects of the Modified Project.

4.1 LAND RESOURCES

4.1.1 Climate

Weather data is collected at the on-site meteorological station as discussed in Section 2.8.1. Presented below is a summary of weather data collected by WCPL and the Bureau of Meteorology at nearby sites.

Regional temperatures are warmest from November through March and coolest from May through September (WCPL, 2003). Average daily maximum temperatures peak in January (31.7°C from the long-term record at Jerrys Plains), while average daily minimum temperatures are lowest in July (3.7°C at Jerrys Plains) (WCPL, 2003). For the 2005/2006 AEMR reporting period (1 July 2005 to 30 June 2006) the highest temperature at Wambo was 44.8°C (recorded in February 2006) whilst the lowest was -2.7°C (recorded in June 2006) (WCPL, 2006b).

Average morning (9 am) relative humidity recorded at Wambo was lowest in January and October (54%). The highest recorded average morning (9 am) relative humidity was in June (80%). Average afternoon (3 pm) monthly relative humidity ranged from 41% to 54% for Jerry Plains, from 40% to 56% for Singleton Army Base and from 36% to 54% for Wambo (WCPL, 2003).

Wind roses for the Wambo meteorological station indicate that relatively strong winds from the west/north-west are dominant during winter and spring, while winds from the south-east are more common during summer and autumn (WCPL, 2003). Moderate south-easterly winds are common during the evening and night-time throughout spring, summer and autumn (*ibid.*).

The long term average annual rainfall for Jerrys Plains and Singleton Army Base is approximately 640 millimetres (mm) and 723 mm respectively (WCPL, 2003). For the 2005/2006 AEMR reporting period, Wambo received 456 mm of rainfall, with a maximum of 93.8 mm falling in the month of January 2006 (WCPL, 2006b).

The long term average annual evaporation recorded at Scone is 1590.6 mm, with monthly evaporation highest in December (225.4 mm) and January (218.7 mm) and lowest in June (48.2 mm) and July (56.5 mm) (WCPL, 2003). For the 2005/2006 reporting period described in the AEMR, total evaporation at Wambo was 2,490 mm, with maximum evaporation occurring during December 2005 (343 mm) (WCPL, 2006b).

4.1.2 Landforms

Landforms of the Upper Hunter region are characterised by gently sloping flood plains associated with the Hunter River and the undulating foothills, ridges and escarpments of the Mount Royal Range and Great Dividing Range. Local elevations range from approximately 60 m Australian Height Datum (AHD) at Wollombi Brook to approximately 650 m AHD at Mount Wambo within the Wollemi National Park to the west.

4.1.3 Landuse

Land use in the vicinity of the Modified Project is characterised by a combination of coal mining operations, agricultural land uses and rural residential development at Warkworth. WCPL controlled lands that are not subject to mining operations are utilised for the agistment of stock (primarily cattle).

4.1.4 Soils

Major soil types identified in the Project EIS include alluvial soils along major drainage lines, siliceous sands to the east of Wollombi Brook, yellow podzolics and yellow solodic intergrades adjacent to the alluvials on lower slopes and undulating plains, soloths on moderately elevated slopes and lithosols along the eastern boundary of the Wollemi National Park.

4.1.5 Visual Aspects

The local visual landscape is dominated by the rugged escarpments of the Wollemi National Park and the forested landforms that rise behind the escarpments to above 600 m AHD, peaking at Mount Wambo (approximately 650 m AHD). At lower elevations to the south of Jerrys Plains and north of Bulga, rocky, forested spurs protrude from the Wollemi National Park.

The peaks and ridges of the Wollemi National Park are visible from the majority of locations in the vicinity of Wambo, except where obscured at close range by local topography or vegetation. Other features of the local visual landscape include:

- remnant vegetation and isolated landforms;
- riparian vegetation and flood plain features of the Hunter River and Wollombi Brook;
- local watercourses, including Waterfall, North Wambo, Stony and South Wambo Creeks;
- coal mining operations including Wambo, various Hunter Valley Operations' open cut mines (Coal & Allied), Warkworth Coal Mine and United Colliery;
- the Wambo Coal Terminal and associated coal handling infrastructure;
- power supply infrastructure associated with the Redbank power station;
- agricultural land, including cropping, dairy and beef production and small-scale viticulture and olive groves; and
- residential areas including Jerrys Plains, Bulga and Warkworth.

4.1.6 Environmental Review

The proposed modifications associated with the staged Diversion and temporary pipeline are not visually prominent and are generally within the ultimate extent of the approved surface disturbance area of Wambo.

Gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure associated with the North Wambo Underground Mine may be installed on elevated ridgelines to the south-west of the mine. However, this infrastructure is minor in nature and is unlikely to be visible from any sensitive receiver locations. Where practicable, methane flaring (if undertaken) would be located in topographic locations that minimise potential public viewpoints. The gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure would be temporary features and associated surface disturbance would be rehabilitated after the infrastructure is decommissioned.

No significant alteration to the approved impacts on land resources that were assessed for the Project EIS are anticipated.

4.2 WATER RESOURCES

4.2.1 Surface Water

Background

Wambo is situated adjacent to Wollombi Brook, south-west of its confluence with the Hunter River (Figure 2). Wollombi Brook drains an area of approximately 1,950 km² and joins the Hunter River some 5 km north-east of Wambo. The Wollombi Brook sub-catchment is bound by the Myall Range to the south-east, Doyles Range to the west, the Hunter Range to the south-west and Broken Back Range to the north-east (Hunter Catchment Management Trust [HCMT], 2002).

The majority of lands within WCPL mining tenements drain via Wambo, Stony, North Wambo and Redbank Creeks to Wollombi Brook, while Waterfall Creek drains directly to the Hunter River (Figure 2).

A surface water assessment was undertaken for the Original Project by Gilbert and Associates (2003) (Appendix E of the Project EIS). A detailed description of existing water quality in streams and catchments in the vicinity of Wambo is provided in Section 3.4.1 of the Project EIS.

Appendix B includes a summary description of the hydrology of North Wambo Creek, including estimated flood flows.

Environmental Review

An assessment of the potential surface water impacts of the staged Diversion and North Wambo Creek temporary pipeline has been conducted by Gilbert and Associates (2006) (Appendix B).

The Gilbert and Associates assessment concluded (Appendix B):

“The construction period for the staged diversion (Stage 1) would be significantly shorter than it would be for the larger approved diversion potentially providing more time for stabilisation of the permanent diversion prior to commissioning.

Staging of the diversion would also mean that construction activity would be split into potentially two shorter campaigns which provide greater opportunity to schedule the works to coincide with expected dryer periods. If Stage 2 of the staged diversion is to be constructed, the design of this stage would be refined after consideration of key construction, hydrological and performance monitoring data from Stage 1 of the staged diversion.

In the event that Stage 2 of the staged diversion is constructed, the staged approach would allow this part of the staged diversion to be constructed after subsidence associated with the North Wambo Underground Mine. This would allow subsidence associated with the North Wambo Underground Mine to be incorporated into the design of Stage 2 and would reduce the need for post-subsidence remediation work.

The temporary North Wambo Creek pipeline would divert low flows around North Wambo Underground Mine LWs 1 – 4. In the event that connective cracking occurs, the temporary pipeline would potentially reduce the risk of inflows from North Wambo Creek to the North Wambo Underground Mine.

Exceedance of the design capacity of the temporary pipeline would result in overtopping of the block embankments and flow in the bypassed reaches of North Wambo Creek. Therefore there is the risk of sediment generation from the block embankments or erosion due to flow in subsided and yet-to-be rehabilitated portions of the creek. To mitigate this risk, measures to reduce the risk of excessive sedimentation (such as rip-rap and use of a geotextile) have been included in the design of the temporary pipeline and it is also recommended that construction activities be undertaken in accordance with an approved ESCP for potential erosion impacts.

...

In consideration of the differences in potential impacts between the approved diversion and the proposed modifications, it is concluded that type and nature of potential impacts would be substantially the same. However, the staged diversion would result in reduced risk of adverse impacts occurring due to the greater flexibility provided. Therefore, the staged diversion and the addition of the temporary pipeline are considered to be of minimal environmental impact in comparison to the approved diversion.”

Mitigation Measures

Section 4.6 of the Project EIS outlines mitigation measures that would be applied at Wambo to minimise potential impact on surface water resources. These measures would be applied to the Modified Project where applicable.

Prior to the commencement of construction of the Diversion or the temporary North Wambo Creek pipeline, WCPL would obtain appropriate licenses under the *Water Act, 1912* from the DNR.

Measures of particular relevance to this modification are described below.

Erosion and Sedimentation

Construction activities associated with the Modified Project would be undertaken in accordance with an approved ESCP. The approved ESCP applies the following general principles:

- *“Separation of runoff from disturbed and undisturbed areas where practicable.*
- *Construction of sediment dams or utilisation of existing mine water storages to contain runoff up to a specified design criterion.*
- *Construction of surface drains to facilitate the efficient transport of surface runoff. Drains will be designed using trapezoidal or parabolic cross-sections.*
- *Progressive rehabilitation/stabilisation of mine infrastructure areas.”*

The design of the Modified Project water control structures would incorporate the following features to minimise potential erosion impacts (Appendix B):

Staged Diversion:

- The capacity of the Diversion and the upstream block embankment would be designed to minimise change to existing North Wambo Creek high and low flow regimes.
- The banks of the primary Diversion channel would be extensively planted with endemic riparian vegetation.
- The Diversion channel would be constructed at least 12 months prior to commissioning.

Temporary North Wambo Creek Pipeline:

- Rock armoring of areas susceptible to scour and erosion including the upstream weir and the downstream stilling well outlet.
- Rockfill mattress protection of the downstream side of the upstream weir to reduce erosion during flow events in excess of pipeline capacity which result in overtopping of the weir.

Subsidence associated with the North Wambo Underground Mine in North Wambo Creek would result in areas of ponding and the potential for surface erosion along, and adjacent to, the creek alignment as the creek attempts to re-establish its original gradient (WCPL, 2003). This is an approved impact of the Original Project and would be managed in accordance with Section 4.2.3 of the Project EIS.

Connective Cracking

A monitoring programme would be undertaken to facilitate the detection of connective cracking between the North Wambo Underground Mine and North Wambo Creek. The monitoring programme would include:

- Piezometric monitoring of the alluvial aquifer in the vicinity of the North Wambo Underground Mine to facilitate the detection of any accelerated drainage of the alluvial aquifer and any lowering of the groundwater table.
- Surface water flow monitoring upstream and downstream of the North Wambo Underground Mine to facilitate detection of loss of surface water flow in the section of North Wambo Creek above the underground mine.
- Monitoring of cracks using either isotropic measurements or helium. This would facilitate determining the location of cracks that propagate from the North Wambo Underground Mine to the surface.
- Periodic visual inspections of North Wambo Creek and immediate surrounds.

In addition and in accordance with the approved Surface and Subsurface Investigation Programme, WCPL will install an extensometer to measure the maximum height of continuous subsurface cracking above longwall 1 of the North Wambo Underground Mine. This will facilitate a more accurate understanding of subsurface fracturing behaviour.

In the event that monitoring detects connective cracking between the North Wambo Underground Mine and North Wambo Creek, a low permeability layer (eg. geomembrane) would be installed in the creek where the connective cracking has been identified. The low permeability layer would be installed by excavating the creek alluvium to a depth of up to 1.5 m, installing the low permeability layer and then backfilling the excavation.

In the event that the installation of the low permeability layer does not sufficiently reduce connective cracking water losses, WCPL would consider the following options (in general accordance with the DNR Guidelines):

- Relinquishment of existing water extraction rights equivalent in volume to the loss of water in the North Wambo Creek system to compensate for the water loss. Any relinquishment of water extraction rights would be undertaken in consultation with the DNR.
- Construction of Stage 2 of the staged Diversion around areas of connective cracking to maintain flows downstream in North Wambo Creek. Construction of Stage 2 would draw upon the experience gained from the construction of the Stage 1 Diversion.

The above measures would be documented in a revision of the Surface and Groundwater Response Plan.

4.2.2 Groundwater

Background

Appendix F of the Project EIS presents an assessment of the potential cumulative impacts of the Original Project and surrounding mining operations (i.e. United Colliery and Warkworth Coal Mine) on groundwater resources.

The hydrogeological regime of the Wambo area comprises two main systems (Appendix F of the Project EIS):

- *“a Quaternary alluvial aquifer system of channel fill deposits associated with Wollombi Brook, North Wambo Creek, (South) Wambo Creek and Stony Creek; and*
- *underlying Permian strata of hydrogeologically “tight” and hence very low yielding to essentially dry sandstone and lesser siltstone and low to moderately permeable coal seams which are the prime water bearing strata within the Permian sequence.”*

As a component of the groundwater assessment for the Original Project, a numerical groundwater flow model was developed in order to provide a prediction of the rate of groundwater inflow to the Wambo open cut and underground operations and the potential extent of drawdown within the alluvial aquifers and depressurisation of the Permian strata that could occur in the vicinity of the mining operations.

In regard to the Original Project, Appendix O of the Project EIS stated:

“Connection between the underground mine workings and the [North Wambo Creek] alluvials is not expected although there is some potential for connection in areas where geological structures exist. This would require monitoring if such structures are noted and remediation is necessary as discussed in Section O6.”

The review of the subsidence assessment for North Wambo SEE undertaken by G.E Holt and Associates concluded that:

“The potential for connection between alluvial aquifers associated with the creeks remain unchanged when compared to that assessed in the Wambo Development Project Subsidence Assessment (Holt, 2003).”

In regard to the Original Project, Section 4.7.1 of the Project EIS stated:

“Although connectivity between the underground workings and Stony and (South) Wambo Creeks is considered to be unlikely (Appendix O), careful monitoring of alluvial groundwater levels via a network of piezometers and stream flows along Wambo and Stony Creeks would be conducted. Should connectivity of the creek(s) to the workings be detected, a mitigation option would be to grout and seal any cracks in the creek bed similar to the remediation undertaken of cracking above the existing underground workings at the Wambo Coal Mine.”

In addition, Section 4.2.3 of the EIS included the following remedial measure:

“Stream flow loss – remediation includes bedrock grouting of subsidence cracks and installation of a clay liner.”

Environmental Review

Alluvial Aquifers

The staged Diversion would incorporate block embankments at the inlet and outlet structures. Appendix B describes these embankments as follows:

“To limit the potential loss of alluvial baseflow from the upper reaches of North Wambo Creek it is proposed to cut-off shallow alluvium in the active creek by constructing a low permeability compacted earthfill trench/cut-off key beneath both the upstream and downstream block embankments.”

In relation to the potential for flows from the North Wambo Creek alluvium to the North Wambo Underground Mine via connective cracking, the following monitoring and mitigation measures are proposed:

- Installation of the temporary North Wambo Creek pipeline – incorporating block embankments at its inlet and outlets.
- Detection of connective cracking during and after longwall mining using piezometers, isotropic and/or helium techniques.
- Post-subsidence remediation of areas of connective cracking using methodology such as that described in the Project EIS (or construction of Stage 2 of the Diversion).

The above measures are generally consistent with the requirements of the DNR Guidelines. The implementation of the above measures has the potential to reduce inflows associated with connective cracking from North Wambo Creek alluvium to the North Wambo Underground Mine.

Permian Aquifers

The installation of dewatering boreholes for the North Wambo Underground Mine would assist with dewatering of water from the Wambo Seam Permian aquifer. Section 4.7.2 of the Project EIS assessed the dewatering of all mined coal seam aquifers. Relevant extracts of Section 4.7.2 are reproduced below:

“The available data indicates that substantial dewatering of the coal seams in the Wambo Coal Mine area has already taken place and that the Project would result in further dewatering of the Permian aquifers and lowering of groundwater levels, particularly in the Permian strata around the Project underground workings.

Numerical modelling of the aquifer drawdown in the overburden of the Warkworth Coal Mine pits by Mackie Environmental Research (2002) indicates a radius of the cone of depression of approximately 3 km (Appendix F). A similar impact may be expected around the existing Wambo Coal Mine and adjoining United Colliery open pits.

The assessment undertaken for the Project has shown that the potential impacts of the mining on water quality would be limited to the coal seams and Permian strata (Appendix F). Due to the poor quality of the water, it is considered that the resource is of limited benefit and as a result, any loss through mining activities would not be detrimental to the area.

Loss of aquifer pressures in the Permian strata is not predicted to impact any existing licensed water supply bores within the coal measures. Water supply bores in the vicinity of the Project are located within the shallow alluvium aquifer system.

An assessment of groundwater recovery following cessation of mining indicates that it would take up to approximately 200 years for water levels in the Permian strata from the Wambo Seam and above to fully recover ...”

Given that the impacts of dewatering associated with the North Wambo Underground Mine have been assessed for the Original Project, no additional impacts on Permian aquifers have been identified for the Modified Project.

Mitigation Measures

Sections 4.2 and 4.7 of the Project EIS outline mitigation measures that would be applied at Wambo to minimise potential impact on groundwater resources. These measures would be applied to the Modified Project where applicable.

4.3 FLORA AND TERRESTRIAL FAUNA

Flora

Vegetation in the Hunter Valley has been significantly altered in floristics and structure since the arrival of Europeans in the early 1800's, primarily due to the clearing of vegetation for agriculture, mining, forestry and settlement (Peake, 2000; DMR, 1999). Nevertheless, a diverse array of vegetation types occur in the Upper Hunter region including dry rainforest, semi-evergreen vine thicket, riverine gallery forests, flood plain woodlands, upland ironbark and acacia forest, spotted gum forest and extensive box and ironbark woodlands (HCMT, 2002). Remnant vegetation occurring on the valley floor is generally more degraded and fragmented than that occurring on the slopes and foothills (DMR, 1999).

The condition of native vegetation in the vicinity of Wambo varies, with the most disturbed areas generally occurring along watercourses and on flat and undulating areas which have been cleared for grazing. Remaining areas of remnant vegetation have been semi-cleared, subjected to historical or current stock grazing and contain open areas with regeneration of various ages.

A flora survey and assessment was conducted by Orchid Research in spring and summer 2002 for the Original Project. Areas of remnant vegetation were systematically surveyed using quadrats and spot sampling sites to compile a comprehensive species list and to detect threatened species which may have been present. The results of the mapping are shown on Figure 10.

Remnant vegetation is dominated by eucalypt forests and woodlands, however thin strips of River She-oak (*Casuarina cunninghamiana*) occur along North Wambo Creek, South Wambo Creek, Stony Creek and Wollombi Brook and sand dune heathy woodlands are also present.

A number of tree species including Narrow-leaved Ironbark (*Eucalyptus crebra*), Grey Box (*E. moluccana*) and Bulloak (*Allocasuarina luehmannii*) are widespread and common and associate within many other species. Other dominant tree species include Spotted Gum (*Corymbia maculata*), Grey Gum (*E. punctata*), Blakely's Red Gum (*E. blakelyi*), Rough-barked Apple (*Angophora floribunda*) and Drooping She-oak (*Allocasuarina verticillata*).

Endangered Ecological Communities

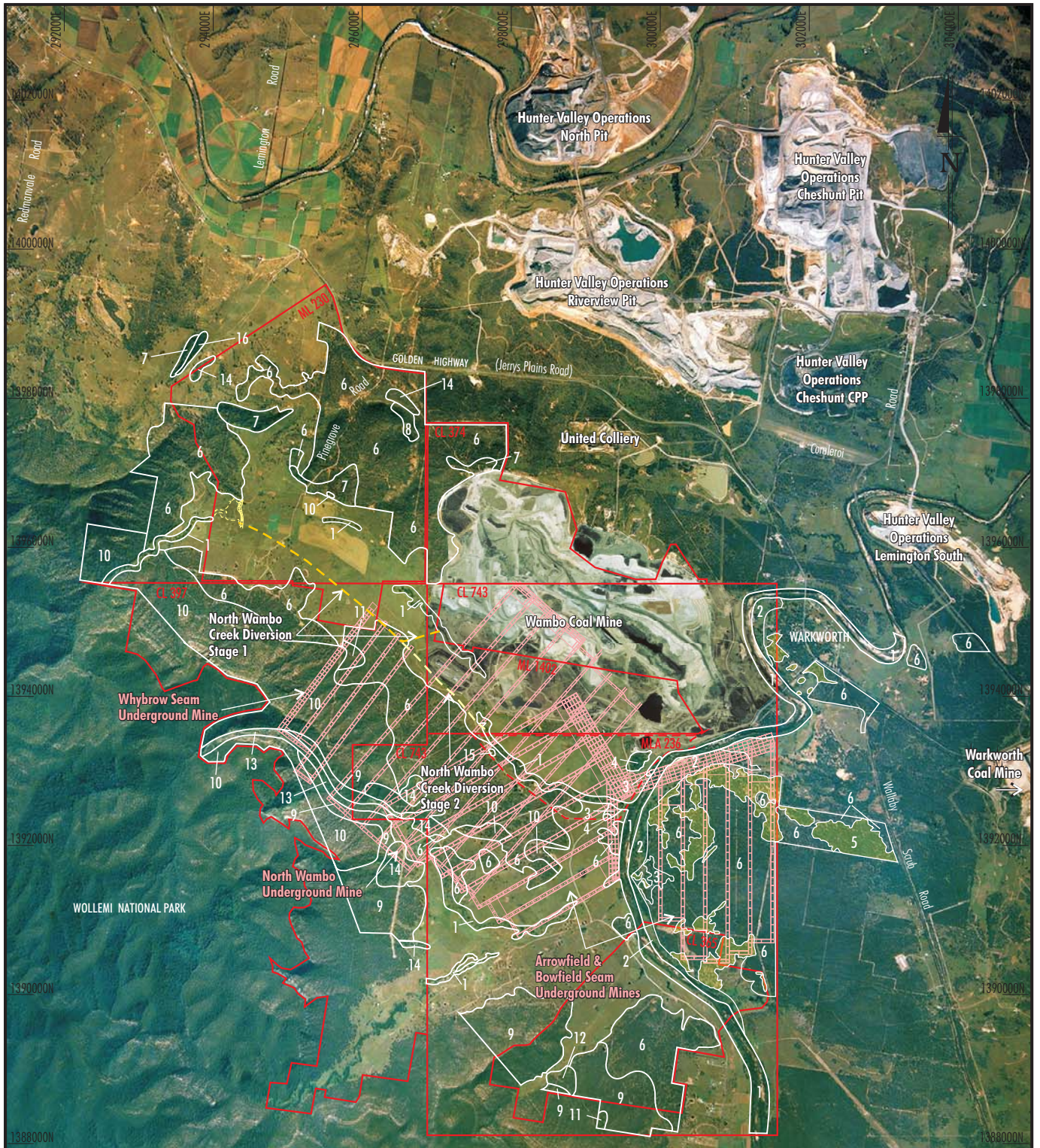
Two endangered ecological communities have been identified in the vicinity of Wambo, namely the Warkworth Sands Woodland endangered ecological community (EEC) (listed in the *Threatened Species Conservation Act 1995* [TSC Act]) and the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodlands EEC (listed in the TSC Act).

Eight Part Tests of Significance

In accordance with the provisions of Section 5A of the EP&A Act, Eight Part Tests of Significance have been prepared for 17 threatened flora species and three EECs considered possible occurrences in the vicinity of Wambo (Appendix HE of the Project EIS). Based on the information presented in the Eight Part Tests, it was determined that Wambo is unlikely to place any threatened flora species, populations, ecological communities, or their habitats at risk of extinction.

Terrestrial Fauna

Avifauna, mammals, reptiles and amphibians were surveyed in September and October 2002 as part of the Project EIS terrestrial fauna assessment. Bat fauna were surveyed separately in September 2002 as part of the bat fauna assessment. A number of reference sources containing the results of regional fauna surveys and database records (e.g. National Parks and Wildlife Service [NPWS] Atlas of NSW Wildlife, Birds Australia, Australian Museum and Hunter Bird Observers Club) were also reviewed and, where appropriate, included in these assessments.



VEGETATION COMMUNITIES	
Riverine Communities (Alluvial Soils)	
1. <i>Casuarina cunninghamiana</i> / <i>Angophora floribunda</i>	6. <i>E. crebra</i> / <i>E. moluccana</i> / <i>Allocasuarina luehmannii</i> / <i>M. decora</i>
2. <i>Eucalyptus camaldulensis</i>	7. <i>A. floribunda</i> / <i>E. crebra</i> / <i>E. moluccana</i> / <i>A. luehmannii</i>
3. <i>E. melliodora</i> / <i>E. blakelyi</i> / <i>A. floribunda</i>	8. <i>E. moluccana</i> / <i>E. crebra</i> / <i>Allocasuarina verticillata</i>
Colluvial Soil Communities	
4. <i>E. tereticomis</i> / <i>Melaleuca decora</i>	9. <i>Corymbia maculata</i> / <i>E. crebra</i> / <i>E. moluccana</i> / <i>A. luehmannii</i> / <i>M. decora</i>
Aeolian Soil Communities (Warkworth Sands Woodland)	
5. <i>Banksia integrifolia</i> / <i>A. floribunda</i> / <i>E. blakelyi</i>	10. <i>E. dawsonii</i> / <i>E. crebra</i> / <i>A. luehmannii</i> / <i>M. decora</i>
	11. <i>E. punctata</i> / <i>E. crebra</i> / <i>A. luehmannii</i> / <i>M. decora</i>
	12. <i>E. blakelyi</i> / <i>A. floribunda</i> / <i>E. crebra</i>
	13. <i>E. acmenoides</i> / <i>A. floribunda</i>
	14. <i>Geijera salicifolia</i> / <i>Notelaea microcarpa</i>
	15. <i>Acacia pendula</i> ¹
	16. Vine Thicket (Dry Rainforest)
	¹ This community was previously mapped <i>Acacia aneura</i>

LEGEND
 — Mining & Coal Lease Boundary
 - - - Mining Lease Application Boundary

Source: Orchid Research (2003)
STATEMENT OF ENVIRONMENTAL EFFECTS
FIGURE 10
 Vegetation Communities of Remnants
 in the Vicinity of Wambo

The number of terrestrial fauna species identified during the surveys for the Project EIS is provided per fauna type in Table 2.

Table 2
Identified Terrestrial Fauna Species

Fauna Type	Number of Species Identified
Amphibians	10
Reptiles	15
Birds	117
Mammals	23
Total	165

After: WCPL (2003)

The majority of amphibians recorded by the surveys were associated with water bodies, however, several species not closely associated within open water were also recorded, including Sudell's Frog (*Neobatrachus sudelli*), Smooth Toadlet (*Uperoleia laevigata*) and several *Limnodynastes* species. Four species of tree frogs were recorded by the surveys, namely, the Eastern Dwarf Tree Frog (*Litoria fallax*), Broad-palmed Frog (*Litoria latopalmata*), Rocket Frog (*Litoria nasuta*) and Peron's Tree Frog (*Litoria peronii*).

The Eastern Snake-necked Turtle (*Chelodina longicollis*), Lace Monitor (*Varanus varius*), Bearded Dragon (*Pogona barbata*) and Robust Ctenotus (*Ctenotus robustus*) were the most common reptile species recorded during the surveys.

The fauna surveys recorded a relatively large number of woodland birds and birds associated with water bodies. The surveys also recorded a high diversity of woodland bird species including a number of woodland birds observed to have a declining population status in NSW.

Twenty-three native mammals were recorded by the surveys including the Short-beaked Echidna (*Tachyglossus aculeatus*), Yellow-footed Antechinus (*Antechinus flavipes*), Common Wombat (*Vombatus cuculla*), Squirrel Glider (*Petaurus norfolcensis*), Common Brushtail Possum (*Trichosurus vulpecula*), four macropods (Kangaroos and Wallabies) and 14 bat species. The Eastern Grey Kangaroo (*Macropus giganteus*) and Red-necked Wallaby (*Macropus rufogriseus*) were recorded in high numbers. The highest number of bat calls was recorded at water bodies, however the majority of bat fauna utilised the wide variety of habitats available.

Eleven introduced species were recorded by the surveys for the Original Project EIS, including the House Sparrow (*Passer domesticus*), Common Starling (*Sturnus vulgaris*), Common Mynah (*Acridotheres tristis*), House Mouse (*Mus musculus*), Black Rat (*Rattus rattus*), Cat (*Felis catus*), Dog (*Canis familiaris*), Red Fox (*Vulpes vulpes*), Brown Hare (*Lepus capensis*), European Rabbit (*Oryctolagus cuniculus*) and Cow (*Bos taurus*).

Eight Part Tests of Significance

Thirteen threatened fauna species were recorded in the vicinity of Wambo, including eight birds and five mammals. In accordance with the provisions of Section 5A of the EP&A Act, Eight Part Tests of Significance were completed (refer to Appendix HE of the Project EIS) for 41 threatened fauna species considered possible occurrences within the Wambo area and/or surrounds. Based on the information presented in the Eight Part Tests, it was determined that Wambo is unlikely to significantly affect any threatened fauna species to the extent of undermining the viability of a local population of that species.

Remnant Woodland Enhancement Programme

A RWEPP has been developed to help conserve regional biodiversity, whilst enhancing the habitat available to flora and fauna. The RWEPP has been prepared in accordance with Consent Condition 47, Schedule 4 of DA 305-7-2003-i and the conditions of the approval under the EPBC Act. The RWEPP is documented in the FFMP.

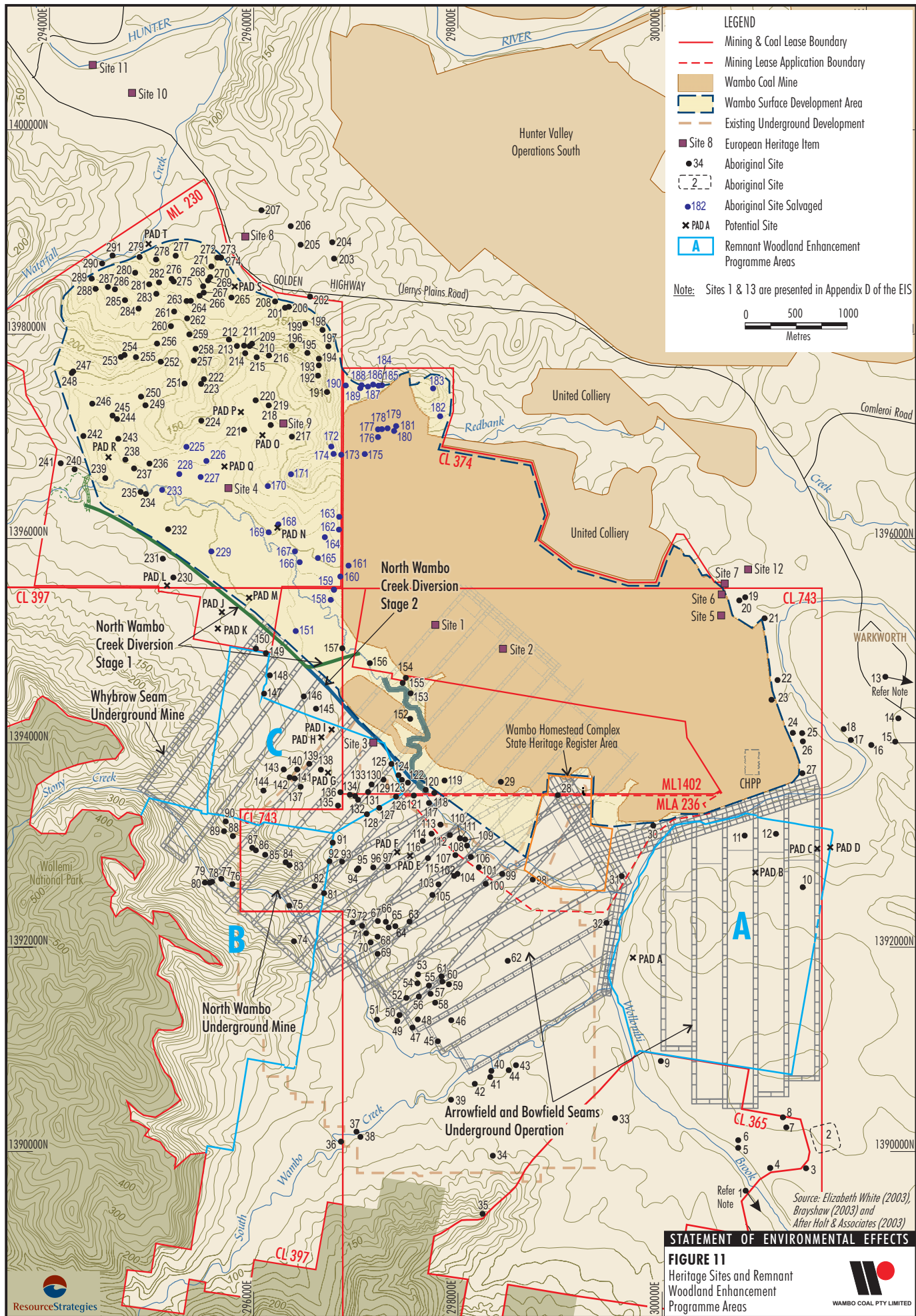
In accordance with the EPBC approval, the RWEPP provides a strategy that gives protection in perpetuity for RWEPP Area A and long-term protection of RWEPP Areas B and C. The three RWEPP areas are shown on Figure 11.

A description of the flora values of RWEPP Areas A, B, and C is presented in Table 3.

Table 3
Flora Values of the Remnant Woodland Enhancement Areas

Remnant Woodland Enhancement Area	Flora Values
Area A	<p>The flora values of Area A include the occurrence of:</p> <ul style="list-style-type: none"> The Warkworth Sands Woodland EEC (listed in the TSC Act). As noted earlier, this community is considered to be the most threatened vegetation community occurring within the region due to its restricted distribution and absence within any conservation reserve. As indicated by Peake <i>et. al.</i> (2002), no areas of Warkworth Sands Woodland currently occur within a conservation reserve. While there has been patchy clearing and regeneration within this remnant, overall the community is in good condition and is considered to be capable of recovery close to its original condition if grazing is limited to minimise damage to the natural regeneration of native species. White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodlands (Box-Gum Woodland) EEC. This community is listed in both the TSC Act and EPBC Act. This particular stand of Box-Gum Woodland is considered to be in close to pristine condition. Regionally significant populations of the River Red Gum (<i>Eucalyptus camaldulensis</i>) within the flood plain of Wollombi Brook. Vegetation community 6 (<i>E. crebra</i>/<i>E. moluccana</i>/<i>A. luehmannii</i>/<i>M. decora</i>), the community that would primarily be disturbed by the open cut mining operations. The Rare or Threatened Australian Plants (ROTAP) species, <i>Grevillea montana</i>.
Area B	<p>The flora values of Area B include the occurrence of:</p> <ul style="list-style-type: none"> The same dominant overstorey species that would be removed by the open cut operations (such as <i>E. crebra</i>, <i>A. luehmannii</i>, <i>M. decora</i>, <i>A. floribunda</i>, <i>G. salicifolia</i> and <i>N. microcarpa</i>). A variety of vegetation communities, specifically vegetation communities 6, 9, 10, 3 and 14, thereby increasing Wambo's contribution to regional biodiversity.
Area C	<p>The flora values of Area C include the occurrence of:</p> <ul style="list-style-type: none"> Vegetation community 6 (<i>E. crebra</i>/<i>E. moluccana</i>/<i>A. luehmannii</i>/<i>M. decora</i>), the community that would primarily be disturbed by the open cut operations. Vegetation communities 10 and 11. Only relatively small patches of vegetation community 11 (<i>E. punctata</i>/<i>E. crebra</i>/<i>A. luehmannii</i>/<i>M. decora</i>) occur in the vicinity of Wambo. Conservation and enhancement of this patch would further contribute to regional biodiversity.

Source: Greg Richards and Associates (2003); Mount King Ecological Surveys (2003); Orchid Research (2003)



LEGEND

- Mining & Coal Lease Boundary
- - - Mining Lease Application Boundary
- Wambo Coal Mine
- Wambo Surface Development Area
- Existing Underground Development
- Site 8 European Heritage Item
- 34 Aboriginal Site
- 2 Aboriginal Site
- 182 Aboriginal Site Salvaged
- ✕ PAD A Potential Site
- A Remnant Woodland Enhancement Programme Areas

Note: Sites 1 & 13 are presented in Appendix D of the EIS

0 500 1000
Metres

STATEMENT OF ENVIRONMENTAL EFFECTS

FIGURE 11
Heritage Sites and Remnant Woodland Enhancement Programme Areas

Source: Elizabeth White (2003), Brayshaw (2003) and After Holt & Associates (2003)

WAMBO COAL PTY LIMITED

Environmental Review

The Modified Project would potentially involve additional areas of disturbance from the Original Project associated with:

- a small portion of North Wambo Creek (eg. riparian vegetation) due to construction of the temporary pipeline (the majority of disturbance would be located within the approved open cut limits); and
- installation of gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure above the North Wambo Underground Mine longwall panels.

With respect to potential impacts associated with the staged construction of the Diversion, any additional disturbance associated with the staged construction of the Diversion compared to the Original Project would be expected to be minimal. In fact, the staged approach would result in only those reaches of the existing North Wambo Creek which would be impacted by open cut mining being diverted, thereby retaining as much of the existing creek channel as practicable (Section 3.1).

Disturbance associated with the installation of gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure may include clearing of an approximate 20 m by 20 m pad for drilling and well construction, construction of gas and water pipelines between drainage wells/boreholes and construction of access tracks as necessary.

Clearance would also be necessary for bushfire management in accordance with the Wambo Bushfire Management Plan. All clearance associated with the gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure would be rehabilitated following decommissioning.

Vegetation clearance activities would be undertaken in accordance with the Vegetation Clearance Protocol (VCP), which is a component of the FFMP. The VCP includes the following elements:

- delineation of disturbance areas;
- pre-clearance surveys;
- fauna management strategies;
- vegetation clearance;
- seed collection;
- salvage and re-use of materials; and
- weed management strategies.

Rehabilitation would be undertaken in accordance with the FFMP and would include the use of endemic plant species which are characteristic of the vegetation communities to be disturbed. These minor areas of vegetation clearance would not impact on identified endangered ecological communities.

The Original Project required clearance of 473 hectares (ha) of remnant vegetation. Given the implementation of the above mitigation measures and in consideration of the relatively minor extent of additional vegetation clearance required for the Modified Project, no significant additional impacts on terrestrial flora and fauna are expected.

EPBC Approval

The Modified Project would include the construction of gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure within the RWEP areas B and C. Disturbance to vegetation in these areas would be short-term; and revegetation would occur following decommissioning of the temporary infrastructure. WCPL has commenced consultation with the Department of Environment and Heritage (Commonwealth) regarding any requirement to amend its EPBC Act approval to include these activities.

4.4 AQUATIC ECOSYSTEMS

Aquatic macroinvertebrate, fish and water quality sampling was conducted for the Project EIS. The ten sampling sites displayed considerable variation in terms of stream structure (e.g. pool/run sequence or isolated pools), stream flow and the condition of the riparian zone. A summary of the stream reach characteristics for each site is presented in Appendix HD of the Project EIS. Section 4.10 of the Project EIS stated the following:

“North Wambo, Wambo and Stony Creeks are intermittent streams which cease to flow in extended dry periods. North Wambo, Wambo and Stony Creeks have been highly disturbed by historic and present day grazing activities. In some locations on Wambo and Stony Creeks, earthworks have been conducted to re-contour the stream channel and banks to remediate subsidence effects from past underground mining activities.

*The riparian vegetation is generally sparse and discontinuous. Where riparian vegetation does occur, it exists as a thin strip of *Casuarina cunninghamiana* and *Angophora floribunda*. The adjacent land use consists of pasture for cattle grazing. Grasses and weeds often cover the stream banks and bed in areas which are dry.*

At the time of Project aquatic surveys, North Wambo Creek was characterised by a flowing pool-riffle or pool-run sequence near the confluence with Wollombi Brook, a series of isolated ponds in the middle reaches and a dry channel in the upper reaches. (South) Wambo Creek was predominantly dry at the time of the survey with some isolated small pools, and Stony Creek was completely dry.

The SIGNAL A biotic index was utilised, with a range of other biological indices to assess the ecological condition of the sites sampled. Calculation of the Signal A biotic index (Chessman, 1995) indicated the water quality of these streams is “possibly mildly polluted” to “probably moderately polluted”, an assessment supported by the historical land use and stream characteristics.

North Wambo and (South) Wambo Creeks are considered to represent minimal fish habitat. Two native and one introduced fish species were recorded from North Wambo Creek, and three native and one introduced species recorded from (South) Wambo Creek.

*The results indicate a relatively species-poor fish fauna assemblage. The most widespread and numerically dominant species was the Mosquito Fish (*Gambusia holbrooki*). The majority of native fish species were only recorded at sites where the introduced Mosquito Fish was absent.*

North Wambo and (South) Wambo Creeks have catchment characteristics, water quality and stream riparian, bank and channel characteristics which are considered unlikely to support a species-rich fish assemblage.”

Environmental Review

As discussed above, North Wambo Creek is significantly disturbed and significant impacts on aquatic ecosystems for the Original Project were deemed to be unlikely.

It is considered that potential impacts on aquatic ecosystems resulting from the staged Diversion would be the same as or less than those for the Original Project as the staging of the Diversion may result in only Stage 1 of the Diversion being constructed. In addition, staging of the construction of the Diversion facilitates other potential benefits as discussed in Section 3.1.

The installation of the temporary North Wambo Creek pipeline would result in some short-term reduction in aquatic habitat quality in the existing creek between the upstream and downstream ends of the temporary pipe. However, the pipeline, in conjunction with the other proposed ameliorative measures, facilitates the maintenance of low flows across the associated longwall mining area which would potentially benefit downstream aquatic ecosystems.

4.5 NOISE

A noise assessment was presented in the Project EIS in accordance with the NSW *Industrial Noise Policy* (INP) (EPA, 2000).

Potential noise related impacts of the Modified Project would be associated with the staged construction of the Diversion, the temporary North Wambo Creek pipeline and gas drainage wells and pipelines. Construction works would generally be undertaken during daytime hours (7.00 am to 6.00 pm) up to seven days per week.

Given the minor nature of the construction works associated with the Modified Project in comparison to the construction of the approved Diversion and the scale of open cut mining operations at Wambo, the potential noise impacts of the Modified Project when compared to the potential noise impacts identified in the Project EIS would remain largely unchanged.

4.6 AIR QUALITY

The Project EIS air quality impact assessment considered the air emissions likely to be generated by the Original Project and the likely impact of these emissions in combination with existing and proposed future emissions of relevant surrounding mining operations (i.e. Warkworth Coal Mine, Hunter Valley Operations and United Colliery).

Potential air quality related impacts of the Modified Project would be associated with the staged construction of the Diversion, the temporary North Wambo Creek pipeline and gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure. The AQMP outlines a range of controls to reduce dust emissions from the Original Project, the following of which are relevant to the Modified Project:

- disturbing only the minimum area necessary for mining operations and ancillary infrastructure;
- minimising the area of land disturbed at any one time;
- watering active roads and traffic areas using water carts to minimise the generation of dust;
- minimising and clearly defining the number of active roads;
- rehabilitation of roads once they are no longer required;

- revegetating topsoil stockpiles which are not planned to be used for over six months;
- lowering dust aprons during drilling; and
- equipping drill rigs with dust suppression equipment which would be operated whenever the potential for high levels of dust generation is identified.

Given the minor nature of the construction required for the Modified Project and the range of air quality controls that would be implemented, the potential air quality impacts of the Modified Project when compared to the potential air quality impacts identified in the Project EIS would remain substantially unchanged.

4.6.1 Greenhouse Gases

The Project EIS included an assessment of greenhouse gas emissions in Appendix B. This assessment included consideration of methane emissions from the North Wambo Underground Mine (Wambo Seam Underground Mine).

The Modified Project includes additional gas and ventilation infrastructure to regulate the level of gas for mine safety. These measures are not expected to alter the potential greenhouse emissions of the North Wambo Underground Mine. WCPL is investigating the feasibility of flaring the captured gas (Section 3.3). This is consistent with the requirements of Consent Condition 87, Schedule 4 of DA 305-7-2003-i.

4.7 ABORIGINAL HERITAGE

The Aboriginal heritage assessment undertaken for the Project EIS was based on the results of a search of the NPWS Aboriginal Sites Register and the results of surveys conducted by an archaeological team and representatives of the Lower Wonnarua Tribal Council, Upper Hunter Wonnarua Council and Ungooroo Aboriginal Corporation in November and December 2002. Results of the NPWS search and surveys were supplemented by a geomorphological study.

A total of 292 sites (Figure 11) were identified and comprised:

- a carved tree/ceremonial site;
- grinding groove sites;
- possible grinding groove sites;
- probable scarred tree;
- contact sites with flaked glass objects;
- possible contact sites with scatters of historic material together with stone objects; and
- isolated objects and object scatters (open sites).

Environmental Review

Section 4.13 of the Project EIS presents a description of the potential impacts relating to infrastructure areas (including the Diversion), as follows:

“Infrastructure Areas

As part of the Project detailed design phase the final alignment of the rail spur, Wallaby Scrub Road intersection and water control structure would be determined. Prior to construction, pre-clearance surveys would be conducted to identify Aboriginal objects located within the footprint of these works. Consent to destroy would be sought under section 90 of the NPW Act for Aboriginal objects unable to be avoided by these Project components.”

The above extract from the Project EIS would apply to the Modified Project. The final locations of the Diversion, the temporary North Wambo Creek pipeline, gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure would have regard for the location of Aboriginal objects and would avoid Aboriginal objects where practicable.

Mitigation Measures

WCPL has obtained a permit and consent under Sections 87 and 90 (permit and consent number 2222) of the *National Parks and Wildlife Act 1974* for Wambo for an area encompassing the footprint of the Modified Project. Salvage of Aboriginal objects within the surface disturbance areas would be undertaken in accordance with the approved Salvage Programme and the permit and consent. The Salvage Programme incorporates the following elements:

- collection of surface artefacts;
- recovery of archaeological material from salvage excavations;
- basic recording of recovered artefactual material;
- analysis of selected salvaged artefactual material from sub-surface excavations;
- an excavation program designed to test for the presence of deep archaeological deposits;
- storage of selected artefacts in a Keeping Place; and
- returning collected artefacts to the landscape following completion of rehabilitation works.

Prior to construction of the Modified Project, a pre-clearance survey would be undertaken in accordance with Section 4.13 of the Project EIS and the approved Salvage Programme.

4.8 NON-ABORIGINAL HERITAGE

The Wambo Homestead Complex (WHC) is located on the western side of Wollombi Brook to the south of the existing Wambo Coal Mine (Figure 11). The WHC comprises eight distinct buildings and the remnants of barns with many fences to mounting yards and paddocks still in existence. The WHC is listed on the State Heritage Register of NSW.

In addition to the WHC the heritage assessment undertaken for the Project EIS identified 12 items during the surveys of lands in the vicinity of the Original Project (Figure 11). Table 4 below provides a summary of these items.

**Table 4
Items of Non-Aboriginal Heritage**

Site Number	Site Name	Description	Significance
Site 3	Abandoned Homestead A	Located adjacent to Stony Creek within the underground mining footprint. The site consists of the remains of a cottage, four outbuildings and a pit mine. A number of moveable items are located at the site. The remains are ruins and therefore in very poor physical condition.	Minor Local Significance
Site 4	"Whynot" Homestead	Located to the south-west of the open cut footprint. The site is a federation period small farm site consisting of a weatherboard cottage and outbuildings. Overall the buildings are in sound condition.	Limited Local Significance
Site 5	Abandoned Homestead B	Located adjacent to Wollombi Brook in the vicinity of the Wambo rail loop. Homestead B consists of an abandoned cottage and shed. The physical condition of the buildings is poor.	Local Significance
Site 6	Piggery and Butcher's Hut	Located within the footprint of the Wambo rail loop. The Piggery and Butcher's Hut are dilapidated and beginning to fall apart.	Minor Local Significance
Site 8	"Montrose" Homestead	Located 400 m north-west of the open cut mine footprint. It consists of a brick and weatherboard homestead and a number of outbuildings including an old wool shed. The buildings are in good condition.	Slightly Significant
Site 10	Roman Catholic Cemetery	Old Roman Catholic Cemetery is located at Jerrys Plains.	Local Significance
Site 11	Old Anglican Cemetery	Old Anglican Cemetery is located at Jerrys Plains.	Regional Significance
Site 12	St. Philips Anglican Church and Cemetery	St. Philips Anglican Church and Cemetery are located at Warkworth. The buildings and cemetery are in good condition.	Regional Significance

Source: WCPL (2003)

Environmental Review

No items of Non-Aboriginal heritage (including the WHC) would be impacted by the Diversion or the temporary North Wambo Creek pipeline. One item overlies the North Wambo Underground Mine and is described in Section 4.14.2 of the Project EIS as follows:

"Underground Mining Operations Areas

One heritage item was recorded within the underground mining operations area. Site 3 (Figure 3-9) is an abandoned homestead building. Impacts from subsidence are likely to exacerbate the dilapidated condition of the building."

The location of the gas wells, dewatering bores and pipelines would be located such as to avoid any impact on Site 3. Hence, none of the items of Non-Aboriginal heritage identified in the Project EIS would be impacted by the Modified Project.

4.9 ROAD TRANSPORT

The Modified Project is not expected to result in any significant alteration of the traffic impacts of the Original Project. Therefore, traffic impacts from the Modified Project are expected to be substantially the same as for the Original Project.

4.10 SOCIO-ECONOMICS

The construction activities associated with the Modified Project would not significantly alter capital expenditure or employment in comparison to the Original Project. Therefore, the Modified Project would not result in a significant change (increase or decrease) to the socio-economic impacts of the Original Project.

4.11 HAZARD AND RISK

The Project EIS included a preliminary hazard analysis (PHA) to assess the potential hazards and risks associated with the Original Project. The PHA comprised a qualitative assessment of risks to the public, property and the environment associated with the development and operations of Wambo (Appendix K of the Project EIS). The PHA was conducted in accordance with the general principles of risk evaluation and assessment provided in the DoP guidelines for *Multi-Level Risk Assessment* (DUAP, 1999).

Potential risks with respect to construction were addressed in the PHA as part of "General Operations".

The PHA concluded (as extracted from Section 4.16.1 of the Project EIS):

"... no incremental risks posing significant off-site impacts have been identified."

It is considered that the Modified Project would not change the existing potential risk areas identified in the PHA conducted for the Original Project. However, environmental management plans and monitoring programmes would be reviewed and revised by WCPL to include the Modified Project and manage any associated environmental risks.

5 CONCLUSION

This SEE provides a description of proposed modifications to the Wambo Development Consent. The Modified Project would include:

- the staged construction of the Diversion;
- construction of a temporary North Wambo Creek pipeline; and
- the installation of gas drainage wells, ventilation boreholes, dewatering boreholes and associated infrastructure to facilitate the regulation of gas levels and dewatering of the North Wambo Underground Mine.

Environmental reviews that have been conducted to evaluate the proposed modifications have concluded that any potential additional environmental impacts of the proposed modifications are minor in nature. Based on this and a comparative analysis of the key Project elements (ie. the Project as modified compared to that originally approved) it is considered that the Project as modified is substantially the same as the Project originally approved by the Minister under DA 305-7-2003-i in February 2004.

6 REFERENCES

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Wambo Coal Pty Limited (WCPL) (2005c) *Underground Mining Operations Plan*.

Wambo Coal Pty Limited (WCPL) (2006a) *North Wambo Subsidence Management Plan*.

Wambo Coal Pty Limited (WCPL) (2006b) *Annual Environmental Management Report July 2005 to June 2006*.

Wambo Coal Pty Limited (WCPL) (2006c) *Environmental Monitoring Program*.

APPENDIX A

WAMBO COAL MINE – DEVELOPMENT CONSENT
(DA 305-7-2003-i)

Development Consent

Section 80 of the *Environmental Planning & Assessment Act 1979*

I, the Minister Assisting the Minister for Infrastructure and Planning (Planning Administration), approve the Development Application referred to in schedule 1, subject to the conditions in schedules 3 to 6.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the on-going environmental management of the development.

SIGNED

Diane Beamer MP
**Minister Assisting the
Minister for Infrastructure and Planning
(Planning Administration)**

Sydney

4 February 2004

File No: S02/02197

Blue type represents 2004 modification

Red type represents May 2005 modification

Green represents January 2006 modification

Pink represents April 2006 Modification

SCHEDULE 1

Development Application:	DA 305-7-2003;
Applicant	Wambo Coal Pty Limited;
Consent Authority:	Minister for Infrastructure and Planning;
Land:	See Appendix 1;
Proposed Development:	<p>The development of open cut and underground mining operations at the Wambo coal mine, which includes:</p> <ul style="list-style-type: none">• continued development of open cut and underground mining operations within existing Wambo Coal Pty Limited (WCPL) mining and coal leases and into new mining lease application area;• selective auger mining of the Whybrow, Redbank Creek, Wambo and Whynot seams up to 200 m beyond the open cut limits within WCPL owned land;• continued placement of waste rock and coarse rejects within mine waste rock emplacements;• continued placement of tailings within open cut voids and capping with waste rock and coarse rejects;• an extension to the existing Wollemi Underground Mine Box Cut (within the limits of the development open cut mining area) to provide direct access for three underground longwall panels in the Whybrow Seam;• longwall mining of the Wambo Seam via the open cut highwall;

- construction of a portal and drift access to facilitate longwall mining of the Arrowfield and Bowfield Seams;
- an upgrade of the existing Coal Handling and Preparation Plant (CHPP) to facilitate increased coal production;
- development of a water control structure across North Wambo Creek at the north-western limit of the open cut operation, and a channel to allow the passage of flows to the lower reaches of North Wambo Creek around the open cut development;
- degazettal and physical closure of Pinegrove Road;
- development of new access roads and internal haul roads;
- relocation of the existing explosives magazine and construction of additional hydrocarbon storage facilities;
- relocation of the administration area and site offices;
- extraction of up to 14.7 million tonnes of run-of-mine (ROM) coal a year;
- operation of the mine 24 hours a day, 7 days a week;
- continued haulage of coal by road from Wambo Coal Mine to Mt Thorley Coal Loader prior to the commissioning of the Wambo "Rail and Train Loading Infrastructure" (which is the subject of a separate development application: DA 177-8-2004); and
- haulage of coal by the Wambo "Rail and Train Loading Infrastructure".

State Significant Development:

The proposal is classified as State significant development, under section 76A(7) of the *Environmental Planning & Assessment Act 1979*, because it involves coal-mining related development that requires a new mining lease under section 63 of the *Mining Act 1992*.

Integrated Development:

The proposal is classified as integrated development, under section 91 of the *Environmental Planning & Assessment Act 1979*, because it requires additional approvals under the:

- *Protection of the Environment Operations Act 1997*;
- *National Parks & Wildlife Act 1974*;
- *Water Act 1912*;
- *Fisheries Management Act 1994*;
- *Heritage Act 1977*;
- *Roads Act 1993*; and
- *Mine Subsidence Compensation Act 1961*.

Designated Development:

The proposal is classified as designated development, under section 77A of the *Environmental Planning & Assessment Act 1979*, because it is for a coal mine that would "produce or process more than 500 tonnes of coal a day", and consequently meets the criteria for designated development in schedule 3 of the *Environmental Planning & Assessment Regulation 2000*.

BCA Classification:

Class 5:	Office upgrade
Class 9b:	Bathhouse
Class 10a:	Car park
	Heavy vehicle wash station
	Gas drainage bores
	De-watering bores
Class 10b:	Coal conveyor

Note:

- 1) To find out when this consent becomes effective, see section 83 of the *Environmental Planning & Assessment Act 1979 (EP&A Act)*;
- 2) To find out when this consent is liable to lapse, see section 95 of the *EP&A Act*; and
- 3) To find out about appeal rights, see section 97 of the *EP&A Act*.

SCHEDULE 2 DEFINITIONS

AEMR	Annual Environmental Management Report
Applicant	Wambo Coal Pty Limited
BCA	Building Code of Australia
Bore	Any bore or well or excavation or other work connected or proposed to be connected with sources of sub-surface water, and used or proposed to be used or capable of being used to obtain supplies of such water whether the water flows naturally at all times or has to be raised whether wholly or at times by pumping or other artificial means
CCC	Community Consultative Committee
Council	Singleton Shire Council
DA	Development Application
Day	Day is defined as the period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays
DEC	Department of Environment and Conservation
Department	Department of Infrastructure, Planning and Natural Resources
Director-General	Director-General of Department of Infrastructure, Planning and Natural Resources, or delegate
DPI	Department of Primary Industries
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
Evening	Evening is defined as the period from 6pm to 10pm
First Workings	Underground workings which establish access to the coal resource area
GTA	General Term of Approval
Land	Land means the whole of a lot in a current plan registered at the Land Titles Office at the date of this consent
Minister	Minister for Infrastructure and Planning, or delegate
MOP	Mining Operations Plan
MSB	Mine Subsidence Board
Night	Night is defined as the period from 10pm to 7am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays
Offset Strategy	The revegetation and enhancement program described in the EIS for the Wambo Development Project, dated July 2003
PCA	Principal Certifying Authority appointed under Section 109E of the Act
Privately-owned land	Land excluding land owned by a mining company, where: <ul style="list-style-type: none"> • A private agreement does not exist between the Applicant and the land owner; and • There are no land acquisition provisions requiring the Applicant to purchase the land upon request from the land owner.
ROM Coal	Run-of-mine coal
RTA	Roads and Traffic Authority
Southern Area	See Figure HA-5 in Appendix HA of Volume 4 of the EIS for the Wambo Development Project
Site	Land to which the DA applies
Vacant land	Vacant land is defined as the whole of the lot in a current plan registered at the Land Titles Office that does not have a dwelling situated on the lot and is permitted to have a dwelling on that lot at the date of this consent.

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**SCHEDULE 3
ADMINISTRATIVE CONDITIONS**

Obligation to Minimise Harm to the Environment

1. The Applicant shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

Terms of Approval

2. The Applicant shall carry out the development generally in accordance with the:
 - (a) DA 305-7-2003;
 - (b) EIS titled *Wambo Development Project*, volumes 1-5, dated July 2003, and prepared by Resource Strategies Pty. Ltd.;
 - (c) letter from Holmes Air Sciences to the Department, dated 3 September 2003, and titled *Wambo Development Project - Response Air Quality Assessment*;
 - (d) letter from Wambo Coal Pty. Ltd. to the Department, dated 24 October 2003, and titled *Wambo Development Project – Development Application Amendment (DA 305-7-2003-i)*;
 - (e) Statement of Environmental Effects titled *Wambo Development project – Wambo Seam Underground Mine Modification*, dated January 2005, and prepared by Wambo Coal Pty Ltd;
 - (f) document titled *Wambo Development Project – Modification of DA 305-7-2003-I*, dated 24 October 2005;
 - (g) document titled *Wambo Development Project – Modification of DA 305-7-2003-I*; dated 23 January 2006; and
 - (h) conditions of this consent.
3. If there is any inconsistency between the above, either the conditions of this consent or the most recent document shall prevail to the extent of any inconsistency.
4. The Applicant shall comply with any reasonable requirement/s of the Director-General arising from the Department's assessment of:
 - (a) any reports, plans or correspondence that are submitted in accordance with this consent; and
 - (b) the implementation of any actions or measures contained in these reports, plans or correspondence.

Deferred Commencement

5. This consent shall only commence when the Applicant has surrendered all previous development consents for the Wambo coal mine, excluding DA No. 108/91 issued by Singleton Shire Council, to the satisfaction of the Director-General.

Limits on Approval

6. This consent lapses 21 years after the date it commences.
7. The Applicant shall not extract more than 14.7 million tonnes of ROM coal a year from the development.

Management Plans/Monitoring Programs

- 7A The Applicant may prepare and submit for approval all the management plans and monitoring programs required by this consent on a progressive basis. Where such management plans and monitoring programs are required before carrying out any development, or stage of development, they may be prepared and submitted for approval in relation to either discrete components of the development or for a specified time period.

Structural Adequacy

8. The Applicant shall ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.

Notes:

- Under Part 4A of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works.
- Part 8 of the EP&A Regulation sets out the requirements for the certification of development.

- *The development is located in the Patrick Plains Mine Subsidence District. Under section 15 of the Mine Subsidence Compensation Act 1961, the Applicant is required to obtain the Mine Subsidence Board's approval before constructing or relocating any improvements on the site.*

Demolition

9. The Applicant shall ensure that all demolition work is carried out in accordance with *AS 2601-2001: The Demolition of Structures*, or its latest version.

Operation of Plant and Equipment

10. The Applicant shall ensure that all plant and equipment used at the site, or to transport coal off-site, are:
 - (a) maintained in a proper and efficient condition; and
 - (b) operated in a proper and efficient manner.

Section 94 Contribution

11. Before carrying out any development, or as agreed otherwise by Council, the Applicant shall pay Council \$60,000 in accordance with Council's Section 94 Contribution Plan.

Community Enhancement Contribution

12. Before carrying out any development, or as agreed otherwise by Council, the Applicant shall pay Council \$15,000 for the enhancement of community infrastructure or services in the Warkworth/Jerrys Plains area.

**SCHEDULE 4
SPECIFIC ENVIRONMENTAL CONDITIONS**

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the landowner of the land listed in Table 1, the Applicant shall acquire the land in accordance with the procedures in conditions 9-11 of schedule 5:

2 – Lambkin	23A & B - Kannar
13C - Skinner	31A,B,C & D - Fisher
19A & B – Kelly	51 – Hawkes
22 – Henderson	56 - Haynes

Table 1: Land subject to acquisition upon request

Note: For more information on the numbering and identification of properties used in this consent, see Attachment 1 of the EIS for the Wambo Development Project.

AIR QUALITY

Impact Assessment Criteria

2. The Applicant shall ensure that the air pollution generated by the development does not exceed the criteria listed in Tables 2, 3, and 4 at any privately-owned land.

Pollutant	Averaging period	Criterion
Total suspended particulate (TSP) matter	Annual	90 µg/m ³
Particulate matter < 10 µm (PM ₁₀)	Annual	30 µg/m ³

Table 2: Long term impact assessment criteria for particulate matter

Pollutant	Averaging period	Criterion
Particulate matter < 10 µm (PM ₁₀)	24 hour	50 µg/m ³

Table 3: Short term impact assessment criterion for particulate matter

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m ² /month	4 g/m ² /month

Table 4: Long term impact assessment criteria for deposited dust

Note: Deposited dust is assessed as insoluble solids as defined by Standards Australia, 1991, AS 3580.10.1-1991: Methods for Sampling and Analysis of Ambient Air - Determination of Particulates - Deposited Matter - Gravimetric Method.

Land Acquisition Criteria

3. If the air pollution generated by the development exceeds the criteria in Tables 5, 6, and 7 at any privately-owned land, the Applicant shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 9-11 of schedule 5.

Pollutant	Averaging period	Criterion
Total suspended particulate (TSP) matter	Annual	90 µg/m ³
Particulate matter < 10 µm (PM ₁₀)	Annual	30 µg/m ³

Table 5: Long term land acquisition criteria for particulate matter

Pollutant	Averaging period	Criterion	Percentile ¹	Basis
Particulate matter < 10 µm (PM ₁₀)	24 hour	150 µg/m ³	99 ²	Total ³
Particulate matter < 10 µm (PM ₁₀)	24 hour	50 µg/m ³	98.6	Increment ⁴

Table 6: Short term land acquisition criteria for particulate matter

¹Based on the number of block 24 hour averages in an annual period.

²Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with the DEC.

³Background PM₁₀ concentrations due to all other sources plus the incremental increase in PM₁₀ concentrations due to the mine alone.

⁴Incremental increase in PM₁₀ concentrations due to the mine alone.

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m ² /month	4 g/m ² /month

Table 7: Long term land acquisition criteria for deposited dust

Note: Deposited dust is assessed as insoluble solids as defined by Standards Australia, 1991, AS 3580.10.1-1991: Methods for Sampling and Analysis of Ambient Air - Determination of Particulates - Deposited Matter - Gravimetric Method.

¹Monitoring

4. The Applicant shall establish air quality monitoring stations at a minimum of 4 locations around the site, including the residences on properties 40 (Muller) and 125 (Barry) whilst privately-owned, to monitor (by sampling and obtaining results by analysis) the concentration of each pollutant in Table 8 to the satisfaction of DEC and the Director-General, using the specified averaging period, frequency, and sampling method:

Pollutant	Units of Measure	Averaging Period	Frequency	Sampling method ¹
PM ₁₀	µg/m ³	24 hour, annual	Continuous	AS3580.9.8 – 2001 ²
TSP	µg/m ³	24 hour, annual	1 day in 6	AM-15
Dust Deposition	g/m ² /month	Month, annual	Continuous	AM-19
Siting	-	-	-	AM-1

Table 8: Air quality monitoring

¹ NSW EPA, 2001, Approved Methods for the Sampling and Analysis of Air Pollutants in NSW.

¹ Incorporates DEC GTA

²Standards Australia, 2001, AS3580.9.8-2002, Method for Sampling and Analysis of Ambient Air - Determination of Suspended Particulate Matter - PM₁₀ Continuous Direct Mass Method using a Tapered Element Oscillating Microbalance Analyser, or any other method that is approved by the DEC and the Director-General.

5. Before carrying out any development, the Applicant shall prepare an Air Quality Monitoring Program, in consultation with DEC, and to the satisfaction of the Director-General.

²NOISE

Noise Impact Assessment Criteria

6. The Applicant shall ensure that the noise generated by the development does not exceed the noise impact assessment criteria presented in Table 9.

Day <i>L_{Aeq}(15 minute)</i>	Evening/Night <i>L_{Aeq}(15 minute)</i>	Night <i>L_{A1}(1 minute)</i>	Land Number
35	41	50	94 – Curlewis
35	40	50	3 – Birrell
			4B – Circosta
			15B - McGowen/Caslick
			16 – Cooper
			23C – Kannar
			25 – Fenwick
			28A & B – Garland
			33 -Thelander/O'Neill
			39 – Northcote
			40 – Muller
254A – Algie			
35	39	50	5 – Strachan
			6 - Merrick
			7 - Maizey
			37 - Lawry
35	38	50	48 - Ponder
			1 - Brosi
			17 - Carter
			18 - Denney
			38 - Williams
			49 - Oliver
			63 - Abrocuff
75 - Barnes			
35	37	50	91 - Bailey
			27 - Birralea
			43 - Carmody
			137 - Woodruff
35	36	50	163 - Rodger/Williams
			246 - Bailey
			13B - Skinner
35	35	50	178 - Smith
			188 - Fuller
			262A, B & C - Moses
35	35	50	All other residential or sensitive receptors, excluding the receptors listed in condition 1 above

Table 9: Noise impact assessment criteria dB(A)

Notes:

- a) Noise from the development is to be measured at the most affected point or within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary, to determine compliance with the *L_{Aeq}(15 minute)* noise limits in the above table. Where it can be demonstrated that direct measurement of noise from the development is impractical, the DEC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.

² Incorporates DEC GTAs

- b) Noise from the development is to be measured at 1 metre from the dwelling façade to determine compliance with the $L_{A1(1 \text{ minute})}$ noise limits in the above table.
- c) The noise emission limits identified in the above table apply under meteorological conditions of:
- Wind speeds of up to 3 m/s at 10 metres above ground level; or
 - Temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.

Land Acquisition Criteria

7. If the noise generated by the development exceeds the criteria in Table 10, the Applicant shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 9-11 of schedule 5.

Day/Evening/Night <i>L_{Aeq}(15 minute)</i>	Property
43	94 - Curlewis 23C – Kannar 254A - Algie
40	All other residential or sensitive receptor, excluding the receptors listed in condition 1 above

Table 10: Land acquisition criteria dB(A)

Note: Noise generated by the development is to be measured in accordance with the notes presented below Table 9 above.

Monitoring

8. The Applicant shall conduct real-time monitoring of the noise generated by the development at a minimum of four properties to the south and north-west of the site, in general accordance with the *NSW Industrial Noise Policy* and *AS1055-1997: Acoustics – Description and Measurement of Environmental*.
9. Before carrying out any development, the Applicant shall prepare a Noise Monitoring Program to the satisfaction of the Director-General, which includes a noise monitoring protocol for evaluating compliance with the criteria in Tables 9 & 10.

³METEOROLOGICAL MONITORING

10. The Applicant shall establish a permanent meteorological station at a location approved by the DEC, and to the satisfaction of the Director-General, to monitor the parameters specified in Table 11, using the specified units of measure, averaging period, frequency, and sampling method in the table.

Parameter	Units of measure	Averaging period	Frequency	Sampling method¹
Lapse rate	^o C/100m	1 hour	Continuous	Note ²
Rainfall	mm/hr	1 hour	Continuous	AM-4
Sigma Theta @ 10 m	°	1 hour	Continuous	AM-2
Siting	-	-	-	AM-1
Temperature @ 10 m	K	1 hour	Continuous	AM-4
Temperature @ 2 m	K	1 hour	Continuous	AM-4
Total Solar Radiation @ 10m	W/m ²	1 hour	Continuous	AM-4
Wind Direction @ 10 m	°	1 hour	Continuous	AM-2
Wind Speed @ 10 m	m/s	1 hour	Continuous	AM-2

Table 11: Meteorological monitoring

¹ NSW EPA, 2001, *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW*.

² The Applicant shall calculate lapse rate from measurements made at 2m and 10m.

³ Incorporates DEC GTA

⁴BLASTING & VIBRATION

Airblast Overpressure Limits

11. The Applicant shall ensure that the airblast overpressure level from blasting at the development does not exceed the criteria in Table 12 at any residence on privately-owned land with the exception of property 13C (Skinner) (see condition 20 below).

Airblast overpressure level (dB(Lin Peak))	Allowable exceedance
115	5% of the total number of blasts over a period of 12 months
120	0%

Table 12: Airblast overpressure impact assessment criteria

Ground Vibration Impact Assessment Criteria

12. The Applicant shall ensure that the ground vibration level from blasting at the development does not exceed the criteria in Table 13 at any residence on privately-owned land with the exception of property 13C (Skinner) (see condition 20 below).

Peak particle velocity (mm/s)	Allowable exceedance
5	5% of the total number of blasts over a period of 12 months
10	0%

Table 13: Ground vibration impact assessment criteria

Blasting Hours

13. The Applicant shall only carry out blasting at the development between 9 am and 5 pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays or any other time without the written approval of DEC.

Public Notice

14. During the life of the development, the Applicant shall:
- operate a Blasting Hotline, or alternate system agreed to by the Director-General, to enable the public to get up-to-date information on blasting operations at the development; and
 - notify the occupants of any land within 2 km of the site about this hotline or system on an annual basis.

Property Inspection

15. Before carrying out any blasting, the Applicant shall advise all landowners within 2 km of the site that they are entitled to a property inspection.
16. If the Applicant receives a written request for a property inspection from any landowner within 2 km of the site, the Applicant shall:
- within 14 days of receiving the request, commission a suitably qualified person, whose appointment has been approved by the Director-General, to inspect the condition of any building or structure on the land, and recommend measures to mitigate any potential blasting impacts; and
 - give the landowner a copy of this property inspection report within 14 days of receiving the report.

⁴ Incorporates DEC GTA

Cumulative Impacts

17. The Applicant shall undertake all reasonable steps to co-ordinate blasting at the development with the blasting at surrounding mines – such as Bulga, Mount Thorley, Warkworth, and Hunter Valley Operations – to minimise the cumulative impacts of blasting in the region.

Monitoring

18. The Applicant shall monitor the airblast overpressure and ground vibration impacts of the development at a minimum of four locations around the site, using the specified units of measure, frequency, sampling method, and location in Table 14.

Parameter	Units of Measure	Frequency	Sampling Method	Measurement Location
Airblast overpressure	dB(Lin Peak)	During every blast	AS2187.2-1993 ¹	Not less than 3.5 m from a building or structure
Peak particle velocity	mm/s	During every blast	AS2187.2-1993	Not more than 30 m from a building or structure

Table 14: Airblast overpressure and ground vibration monitoring

¹Standards Australia, 1993, AS2187.2-1993: Explosives - Storage, Transport and Use - Use of Explosives.

19. Before carrying out any development, the Applicant shall prepare a detailed Blast Monitoring Program for the development, in consultation with DEC, and to the satisfaction of the Director-General.

Blast Management

20. Before carrying out any development, the Applicant shall prepare a Blast Management Plan for property 13C (Skinner) in consultation with the landowner, and to the satisfaction of the Director-General. This plan must include measures to minimise, mitigate, and if necessary remediate the blasting impacts on the property. The Applicant shall implement this plan whilst the property is privately-owned.

Property Investigations

21. If any landowner within a 2 km radius of the site claims that his/her property has been damaged as a result of blasting at the development, the Applicant shall:
- (a) within 14 days of receiving this claim in writing, commission a suitably qualified person whose appointment has been approved by the Director-General to investigate the claim; and
 - (b) give the landowner a copy of the property investigation report within 14 days of receiving the report.

If this independent investigation confirms the landowner’s claim, and both parties agree with these findings, then the Applicant shall repair the damages to the satisfaction of the Director-General.

If the Applicant or landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Director-General for resolution.

If the matter cannot be resolved within 21 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process (See Appendix 2).

SUBSIDENCE

Note: This development will be regulated under the new approval process for managing the impacts of coal mining subsidence under the Mining Act 1992.

Subsidence Management Plan

22. Before carrying out any underground mining operations that will potentially lead to subsidence of the land surface, the Applicant shall prepare a Subsidence Management Plan for those operations in accordance with the DPI documents:
- New Approval Process for Management of Coal Mining Subsidence - Policy; and
 - Guideline for Applications for Subsidence Management Approvals
- to the satisfaction of the Director-General of DPI.

REJECTS EMPLACEMENT STRATEGY

- 22A. Within 6 months of this consent commencing, the Applicant shall prepare a Life of Mine Rejects Emplacement Strategy for the development, to the satisfaction of the Director-General of DPI.

⁵SURFACE & GROUND WATER

Note: The Applicant is required to obtain licences for the development under the Water Act 1912 and the Protection of the Environment Operations Act 1997.

Pollution of Waters

23. Except as may be expressly provided by a DEC licence, the Applicant shall comply with section 120 of the *Protection of the Environment Operations Act 1997* during the carrying out of the development.

Discharge Limits

24. Except as may be expressly provided by a DEC licence or the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*, the Applicant shall:
- not discharge more than 250 ML/day from the licenced discharge point/s at the development;
 - ensure that the discharges from any licenced discharge point comply with the limits in Table 15:

Pollutant	Units of measure	100 percentile concentration limit
pH	pH	$6.5 \leq \text{pH} \leq 9$
Non-filterable residue	mg/litre	$\text{NFR} \leq 120$

Table 15: Discharge Limits

Note: This condition does not authorise the pollution of waters by any other pollutants.

Site Water Balance

25. ⁶Each year, the Applicant shall:
- review the site water balance for the development against the predictions in the EIS;
 - re-calculate the site water balance for the development; and
 - report the results of this review in the AEMR.

North Wambo Creek Diversion

26. The Applicant shall design, construct, maintain, and rehabilitate the North Wambo Creek Diversion in consultation with DPI and NSW Fisheries, and to the satisfaction of the Director-General.
27. Within one month of completing the construction of the North Wambo Creek Diversion, the Applicant shall submit an as-executed report, certified by a practising registered engineer, to the Director-General.
28. ⁷Prior to destroying the original creek line, the Applicant shall demonstrate that the North Wambo Creek Diversion is operating successfully from a hydrological and biological point of view to the satisfaction of NSW Fisheries and the Director-General.

Monitoring

29. The Applicant shall:
- measure:
 - the volume of water discharged from the site;
 - water use on the site;
 - dam and water structure storage levels,
 - water transfers across the site; and

⁵ Incorporates DEC GTA

⁶ These calculations must exclude the clean water system, including any sediment control structures, and any dams in the mine lease area which fall under the Maximum Harvestable Right Dam Capacity; include any dams that are licensable under Section 205 of the Water Act 1912, and water harvested from any non-harvestable rights dam on the mine lease area; address balances of inflows, licenced water extractions, and transfers of water from the site to other sites; include an accounting system for water budgets; and include a salt budget.

⁷ Incorporates NSW Fisheries conditions.

- water transfers between the site and surrounding mines;
- (b) monitor the quality of the surface water:
 - discharged from the licenced discharge point/s at the development; and
 - upstream and downstream of the development;
- (c) monitor flows in the Wollombi Brook; and North Wambo, South Wambo, and Stony Creeks;
- (d) monitor the volume and quality of water inflows from each separate source to the underground and open cut workings; and
- (e) monitor regional ground water levels and quality in the alluvial and overburden aquifers during the development and at least 10 years after mining; and
- (f) periodically assess groundwater pressure response in the coal measures; to the satisfaction of DEC and the Director-General.

Site Water Management Plan

30. Before carrying out any development, the Applicant shall prepare a Site Water Management Plan for the development in consultation with DEC and NSW Fisheries, and to the satisfaction of the Director-General. This plan must include:
- (a) the predicted site water balance;
 - (b) the North Wambo Creek Diversion Plan;
 - (c) an Erosion and Sediment Control Plan;
 - (d) a Surface Water Monitoring Program;
 - (e) a Ground Water Monitoring Program;
 - (f) a Surface and Ground Water Response Plan; and
 - (g) a strategy for the decommissioning water management structures on the site.
31. The North Wambo Creek Diversion Plan shall include:
- (a) the detailed design and specifications of the creek diversion, including the flow control bund, cut off wall, and channel;
 - (b) a revegetation program for the channel using a range of suitable native riparian and floodplain species;
 - (c) the detailed design of the system that would return intercepted ground water to the alluvial aquifer downstream of the open cut;
 - (d) a construction program for the creek diversion, describing how the work would be staged, and progressively integrated with the mining operations and the mine waste emplacement drainage system;
 - (e) water quality, ecological and geomorphic performance criteria for the creek diversion;
 - (f) a program to monitor water quality, ecological, and geomorphic integrity of the creek diversion; and
 - (g) a program to inspect and maintain the creek diversion and revegetation works during the development.
32. The Erosion and Sediment Control Plan shall:
- (a) be consistent with the requirements of the Department of Housing's *Managing Urban Stormwater: Soils and Construction* manual;
 - (b) identify activities that could cause soil erosion and generate sediment;
 - (c) describe the location, function, and capacity of erosion and sediment control structures; and
 - (d) describe measures to minimise soil erosion and the potential for the migration of sediments to downstream waters.
33. ⁸The Surface Water Monitoring Program shall include:
- (a) detailed baseline data on surface water flows and quality in the Wollombi Brook, and North Wambo, South Wambo, and Stony Creeks;
 - (b) surface water impact assessment criteria;
 - (c) a program to monitor surface water flows and quality in the Wollombi Brook; and North Wambo, South Wambo, and Stony Creeks;
 - (d) a program to monitor bank and bed stability in North Wambo, South Wambo, and Stony Creeks;
 - (e) a program to monitor the quantity and quality of the vegetation in the riparian zones adjacent to North Wambo, South Wambo, and Stony Creeks; and
 - (f) a program to monitor the effectiveness of the Erosion and Sediment Control Plan.
34. The Ground Water Monitoring Program shall include:
- (a) detailed baseline data on ground water levels and quality, based on statistical analysis, to benchmark the pre-mining natural variation in groundwater levels and quality;
 - (b) ground water impact assessment criteria;
 - (c) a program to monitor the volume and quality of ground water seeping into the open cut and

⁸ Incorporates DEC GTA

- (d) underground mining workings; and
a program to monitor regional ground water levels and quality in the alluvial and overburden aquifers.

By the end of April 2006, the Applicant shall update its Groundwater Monitoring Program, to the satisfaction of the Director-General.

35. The Surface and Ground Water Response Plan shall include:
- (a) measures to mitigate any adverse impacts on existing water supply bores or wells;
 - (b) measures to mitigate the loss of surface water flows in the surface water streams or channel on the site;
 - (c) measures to remediate any connective cracking between the underground mine workings and the surface water streams, channel or alluvials;
 - (d) measures to mitigate the long term direct hydraulic connection between the backfilled open cut and the North Wambo Creek alluvium if the potential for an downstream adverse impact is detected;
 - (e) measures to address the decrease in throughflow rates caused by the development within the Wollombi Brook alluvium downstream of the open cut;
 - (f) measures to address any reduction in the stability or ecological quality of the North Wambo Creek Diversion below the established performance criteria; and
 - (g) the procedures that would be followed if any unforeseen impacts are detected during the development.

Surface & Sub-surface Investigation Program

36. Prior to the commencement of underground mining, the Applicant shall develop and implement a surface and subsurface investigation program to assess the likely fracturing of geological strata and hydraulic property changes above each longwall panel, to the satisfaction of the Director-General. This program shall:
- (a) provide an interpreted comparison of the results from all longwall panels against pre-mining baseline geological conditions, in order to assess the level of variability of fracture and changes in hydraulic properties between panels.;
 - (b) assess the impact on groundwater resources and surface expression resulting from underground mining at varying depths; and
 - (c) be repeated for each coal seam as it is mined.

Independent Audit

37. Prior to seeking approval from the DPI for each set of longwall panels (excluding the first set of longwall panels), unless the Director-General directs otherwise, the Applicant shall commission a suitably qualified person, whose appointment has been approved by the Director-General, to conduct an independent audit of the subsidence, surface water, and ground water impacts of the development. This audit shall:
- (a) review the monitoring data for the development;
 - (b) identify any trends in the monitoring data;
 - (c) examine the subsidence, surface water, and ground water impacts of the development;
 - (d) compare these impacts against the relevant impact assessment criteria and predictions in the EIS; and, if necessary;
 - (e) recommend measures to reduce, mitigate, or remediate these impacts.
38. If the independent audit determines that the subsidence, surface water, and/or ground water impacts resulting from the underground mining operations are greater than those predicted in the EIS, the Applicant shall:
- (a) assess the significance of these impacts;
 - (b) investigate measures to minimise these impacts, including modifying subsequent mine plans; and
 - (c) describe what measures would be implemented to reduce, minimise, mitigate or remediate these impacts in the future;
- to the satisfaction of the Director-General.

Final Void Strategy

39. At the end of Year 7 of the development, or as directed otherwise by the Director-General, the Applicant shall prepare a Final Void Management Plan for the development, in consultation with the DPI, the Director-General and Council, and to the satisfaction of the Director-General. This Plan must:
- (a) investigate options for the future use of the final void;
 - (b) re-assess the potential groundwater impacts of the development; and
 - (c) describe what actions and measures would be implemented to:

- minimise any potential adverse impacts associated with the final void; and
- manage, and monitor the potential impacts of, the final void over time.

FAUNA & FLORA

Offset Strategy

40. Within the limits of current technology and best practice flora and fauna management, as determined by the Director-General in consultation with the Hunter Coalfield Flora & Fauna Advisory Committee, the Applicant shall implement:
- the offset strategy summarised in Table 16; and
 - any subsequent revisions to the offset strategy, prepared in consultation with the Hunter Coalfield Flora & Fauna Advisory Committee, and approved in writing by the Director-General; to the satisfaction of the Director-General.

Note:

The Director-General shall form the Hunter Coalfield Flora & Fauna Advisory Committee to:

- provide on-going advice on the Flora and Fauna Management Plan; and
- monitor and review the performance of the implementation of the Remnant Woodland Enhancement Program.

Area	Size
Remnant Woodland Enhancement Area A	424 ha
Remnant Woodland Enhancement Area B	454 ha
Remnant Woodland Enhancement Area C	202 ha
Open Cut Woodland Revegetation	1,570ha
Other Areas (e.g. Community 15 and the Southern Area)	Where practicable

Table 16: Broad Targets for Offset Strategy

Deed of Agreement

41. Within 6 months of the commencement of this consent, the Applicant shall enter into a Deed of Agreement with the Minister. In this agreement, the Applicant shall agree to:
- conserve and manage the land in the offset strategy in accordance with the Remnant Woodland Enhancement Program (see Condition 47) in the Flora & Fauna Management Plan (see Condition 44),
 - apply to rezone the land in Remnant Woodland Enhancement Area A for the purpose of:
 - protecting the land for conservation; and
 - excluding open cut mining;
 - conserve and manage the land in Remnant Woodland Enhancement Area A in accordance with any Aboriginal cultural heritage conservation agreement (see Condition 51);
 - exclude open cut mining in Remnant Woodland Enhancement Areas B and C, unless, in the opinion of the Minister, the Applicant has demonstrated that there is a clear justification for this on social, economic, and/or environmental grounds. To assist the Minister in his decision-making, the Applicant shall:
 - establish the coal reserve in Remnant Woodland Enhancement Area Areas B and C;
 - investigate the options for mining this reserve;
 - assess the implications of any open cut coal mining proposal on the offset strategy and broad conservation outcomes; and
 - assess the environmental, economic and social aspects of any open cut mining proposal in the area; and
 - apply to rezone Remnant Woodland Enhancement Areas B and C, in whole or in part, excluding any lands approved for open-cut mining by the Minister.

Hunter Coalfield Flora & Fauna Advisory Committee Contribution

42. The Applicant shall contribute a reasonable amount, up to \$20,000, each year towards the operation of the Hunter Coalfield Flora & Fauna Advisory Committee.

Strategic Study Contribution

43. If, during the development, the Department commissions a strategic study into the regional vegetation corridor stretching from the Wollemi National park to the Barrington Tops National Park, then the Applicant shall contribute a reasonable amount, up to \$20,000, towards the completion of this study.

Flora & Fauna Management Plan

44. Before carrying out any development, the Applicant shall prepare a Flora and Fauna Management Plan for the development, in consultation with the Hunter Coalfield Flora and Fauna Advisory Committee, and to the satisfaction of the Director-General. This plan must include:
- (a) a Vegetation Clearance Protocol;
 - (b) a Threatened Species Management Protocol;
 - (c) a Remnant Woodland Enhancement Program;
 - (d) a Flora and Fauna Monitoring Program;
 - (e) strategies to manage any subsidence impacts in the Remnant Woodland Enhancement Areas; and
 - (f) a description of who would be responsible for monitoring, reviewing, and implementing the plan.
45. The Vegetation Clearance Protocol shall include:
- (a) the delineation of areas of remnant vegetation to be cleared;
 - (b) progressive clearing;
 - (c) pre-clearance surveys;
 - (d) identification of fauna management strategies;
 - (e) collection of seed from the local area;
 - (f) salvage and reuse of material from the site; and
 - (g) control of weeds during clearing activities.
46. The key components of the Threatened Species Management Protocol shall include:
- (a) observations/surveys for threatened species (facilitated by the vegetation clearance surveys and Flora and Fauna Monitoring Program);
 - (b) consultation with regulatory authorities; and
 - (c) threatened species management strategies and reporting.
47. The Remnant Woodland Enhancement Program shall include:
- (a) a habitat assessment of Remnant Woodland Enhancement Areas A, B and C to obtain additional information on existing habitat resources and characteristics of each area;
 - (b) investigation of other areas to be included in the Program, including the *Acacia anuera* Community (Community 15) and the Southern Area;
 - (c) appropriate enhancement strategies to be implemented based on the habitat assessment including:
 - the fencing of remnants to exclude livestock;
 - control measures to minimise the occurrence of weeds;
 - control measures to minimise the occurrence of feral pests;
 - limiting vehicular traffic;
 - selective planting of native vegetation; and
 - the provision of roosting/nesting resources for fauna.
48. The Flora and Fauna Monitoring Program shall include:
- (a) a program to monitor revegetation of disturbance areas including:
 - visual monitoring to determine the need for maintenance and/or contingency measures; and
 - monitoring of the quality of rehabilitation using Ecosystem Function Analysis (or a similar systems based approach) through the assessment of landscape function, vegetation dynamics and habitat complexity; and
 - (b) a program to monitor the effectiveness of offset strategy in accordance with the description in Table 17.

Monitoring Component	Monitoring Description
<i>Flora</i>	<i>A number of permanent flora survey quadrats (of varying sizes to survey tree, shrubs and ground cover) should be established in woodland enhancement areas to obtain quantitative data on plant species diversity and abundance.</i>
<i>Habitat Complexity</i>	<i>Habitat complexity should be monitored using a number of permanent transects established within woodland enhancement areas. Habitat complexity parameters such as canopy cover, shrub cover, ground vegetation cover, the amount of litter, fallen logs and rocks should be surveyed.</i>

<i>Terrestrial Fauna</i>	<i>Terrestrial fauna surveys should be conducted to monitor the usage of enhancement areas by vertebrate fauna. Monitoring may include fauna species diversity and abundance or, alternatively, the use of indicator species to measure the effectiveness of enhancement measures.</i>
<i>Aquatic Fauna</i>	<i>Freshwater macro-invertebrate monitoring, including an assessment of SIGNAL A values and water quality (e.g. temperature, pH, and salinity).</i>
<i>Specific Enhancement Initiatives</i>	<i>Monitoring of specific enhancement initiatives (e.g. the provision of nesting/roosting boxes, weed control or feral animal control).</i>

Table 17: Flora & Fauna Monitoring Program

Annual Review

49. The Applicant shall:
- (a) review the performance of the Flora and Fauna Management Plan annually, in consultation with the Hunter Coalfield Flora & Fauna Advisory Committee; and
 - (b) revise the document as necessary to take into account any recommendations from the annual review.

Independent Audit

50. Within 5 years of the date of this consent, and every 5 years thereafter, unless the Director-General directs otherwise, the Applicant shall commission, and pay the full cost of, an Independent Audit of the offset strategy. This audit must:
- (a) be conducted by a suitably qualified, experienced, and independent person whose appointment has been endorsed by the Director-General;
 - (b) assess the performance of the offset strategy;
 - (c) review the adequacy of the Flora & Fauna Management Plan; and, if necessary,
 - (d) recommend actions or measures to improve the performance of the offset strategy, and the adequacy of the Flora & Fauna Management Plan.

⁹ ABORIGINAL CULTURAL HERITAGE

Note: The Applicant is required to obtain consent from DEC under the National Parks Wildlife Act 1974 to destroy Aboriginal sites and objects on the site.

Conservation Agreement

51. Within 12 months of the commencement of this consent, the Applicant shall develop a conservation agreement (as part of the Deed of Agreement with the Minister referred to in condition 41 above) for the management of Aboriginal cultural heritage in Remnant Woodland Enhancement Area A in consultation with the Aboriginal Communities and DEC.

Salvage

52. Before making application for section 90 consents under *the National Parks & Wildlife Act 1974*, the Applicant shall develop a targeted, strategic salvage program for the development in consultation with DEC and the Aboriginal communities.
53. Before the commencement of salvage operations, the Applicant shall ensure that a keeping place is established to house objects recovered from the salvage program.
54. The Applicant shall house the objects recovered during the salvage program in the keeping place established for the purpose.

⁹ Incorporates DEC GTAs

Further Investigations

55. The Applicant shall:
- (a) investigate the cultural significance of the corridors A – Southern and B – Middle (see map in appendix 3) in consultation with the Aboriginal Communities;
 - (b) examine the possible pathways between Remnant Woodland Enhancement Area A (which includes the camp ground associated with the bora) and Wollemi National Park to the east; and
 - (c) investigate the feasibility of reserving from future mining operations, those areas identified as being of cultural significance to the Aboriginal Communities in consultation with DEC.

Trust Fund Contribution

56. Before carrying out the development, or as agreed otherwise by the Director-General, the Applicant shall contribute \$50,000 to the Hunter Aboriginal Cultural Heritage Trust Fund for further investigations into Aboriginal cultural heritage, as defined by the Trust Deed.

¹⁰WAMBO HOMESTEAD COMPLEX

Section 60 Approval

57. An application under section 60 of the Heritage Act must be submitted to and approved by the Heritage Council prior to the commencement of any development on land within the State Heritage Register listing boundary for the Wambo Homestead Complex. In this regard a mine management plan shall be required to accompany the application which demonstrates that the proposed underground mining shall not have adverse heritage impacts on the WHC due to land subsidence.

Conservation Measures

58. Within 12 months of the commencement of this consent, the Applicant shall prepare a conservation management plan for the Wambo Homestead Complex in accordance with Heritage Office guidelines for the consideration of the Heritage Council of NSW.
59. The conservation policies and an interpretation strategy contained in the conservation management plan are to be implemented in accordance with a timetable to be contained in the a conservation management plan.
60. A suitably qualified and experienced consultant is to be engaged by the applicant to record an oral history of the Wambo Homestead Complex having regard to the strong associations of members of the local community with the site.
61. In circumstances where safe access to the Wambo Homestead Complex is able to be provided, opportunities are to be offered to the local community to visit the site during and after its conservation.
62. Prior to the commencement of mining operations, and then at yearly intervals prior to the approved structural engineer's inspections, a photographic record is to be prepared of all elevations of all structures within the Wambo Homestead Complex. The photographs are to be of archival quality in accordance with the Heritage Office guidelines, *How to Prepare Archival Records of Heritage Items 1994*, and *Guidelines for Photographic Recording of Heritage Items, 1994*. The photographic record is to be lodged with the NSW Heritage Office, the Department and the Council.

Blasting

63. Ground vibration and air blast levels are to be monitored and recorded at a blast monitoring station to be established within the Wambo Homestead Complex for each blast within 2 km of the Wambo Homestead Complex.
64. A suitably qualified and experienced structural engineer, with expertise in vibration and blast monitoring is to be appointed to examine all monitoring records from the Wambo Homestead Complex blast monitoring station. The appointment of the structural engineer is to be approved in writing by the Director of the NSW Heritage Office.
65. Ground vibration and air blast levels experienced at the Wambo Homestead Complex blast monitoring station are not to exceed the structural damage assessment criteria prescribed by *Australian Standard AS 2187.2-1993 "Explosives – Storage Transport and Use" for Sensitive and Heritage Structures* to prevent damage to the heritage items.

¹⁰ Incorporates NSW Heritage Council GTA

66. The approved structural engineer is to report to the Applicant on the monitoring results each month for blasting within 2 km of the Wambo Homestead Complex and 6 monthly for the remainder of the open cut mining operation and make recommendations to ensure the conservation and prevention of damage to the significant heritage structures. Copies of these reports are to be forwarded to the NSW Heritage Office.
67. The approved structural engineer is to inspect the Wambo Homestead Complex structures annually and as soon as practical, but no later than 3 days after blasting monitoring which exceeds the structural damage assessment criteria prescribed by AS 2187.2-1993. During the period between blasting monitoring being recorded which exceeds the criteria in AS 2187.2-1993 and the engineer's inspection, ground vibration from blasting is to be limited to a level which will prevent further blasting damage. The structural engineer is to advise the applicant and the NSW Heritage Office of any action required to repair the damage.
68. The approved structural engineer is to make an assessment of whether blasting within 2km of the Wambo Homestead Complex is to cease or be managed in order to stabilise or repair the damage, and so advise the applicant and the Director of the NSW Heritage Office. If blasting has been required to cease, it is not to resume until the damage has been stabilised or repaired, and the written approval for resumption has been issued by the Director of the NSW Heritage Office.

Rehabilitation

69. Following the cessation of the use of the coal haulage road which traverses the Wambo Homestead Complex property, the land is to be returned to its former condition (pre1999) and the half palisade fence on the southern alignment of the mounting yard, which was removed, is to be reinstated as required by the approval of the Heritage Council for the construction of the road on 12 February 1999.

Movable Heritage Items

70. The Applicant shall liaise with the Power House Museum and Museums and Galleries Foundation regarding the significance of movable heritage which shall be displaced by the proposed open cut mining and suitable repositories for the conservation and storage of any significant items.

TRAFFIC & TRANSPORT

New Access Intersection

Note: The Applicant requires RTA approval under the Roads Act 1993 for the new intersection.

71. ¹¹The Applicant shall design and construct the proposed new access intersection with the Golden Highway to the satisfaction of the RTA.

¹²**Road Closure**

Note: The Applicant requires Council approval under the Roads Act 1993 prior to closing Pinegrove Road.

72. Prior to closing Pinegrove Road, the Applicant shall prepare and implement a Road Closure Management Plan in consultation with the affected landowners, and to the satisfaction of Council. This plan must describe the alternate access arrangements for any affected landowners.

Parking

73. The Applicant shall provide sufficient parking on-site for all mine-related traffic to the satisfaction of the Director-General.

Coal Haulage

74. The Applicant shall not transport more than 3 million tonnes of product coal a year from the site until a rail coal loader is commissioned in the vicinity of the site.

Note: The Applicant has submitted a separate development application to the Minister for the Wambo "Rail and Train Loading Infrastructure" (DA 306-7-2003).

75. The Applicant shall cease all coal haulage on public roads as soon as a rail coal loader is commissioned in the vicinity of the site, except in an emergency, and as agreed by the Director-General in consultation with Council.

¹¹ Incorporates RTA GTA

¹² Incorporates Council GTA

76. If no rail loader is commissioned in the vicinity of the site within 2 years of the commencement of this consent, the Applicant shall submit a report to the Director-General outlining the alternatives to road haulage, and describing the proposed arrangements for transporting coal from the site.
77. The Applicant shall ensure that all loaded coal haulage vehicles entering or leaving the site are covered.
78. The Applicant shall pay Council 0.5 cents for each tonne of product coal hauled along Council roads to the Mount Thorley Coal Loader, in accordance with Council's Section 94 Contribution Plan.

Note: This contribution is subject to indexation by the Implicit Price Deflator, as published by the Australian Bureau of Statistics.

Monitoring

79. The Applicant shall:
 - (a) keep records of the
 - amount of coal transported from the site each year; and
 - number of coal haulage truck movements generated each day by the development; and
 - (b) include these records in the AEMR.

Traffic Management Plan

80. The Applicant shall prepare and implement a Traffic Management Plan in consultation with Council, and to the satisfaction of the RTA for the proposed blasting activities that require the temporary periodic closure of the Golden Highway. This plan shall ensure that adequate warning is given to road users prior to blasting, and that follow up inspections are made to ensure that public roads are safe and clear of debris.

VISUAL IMPACT

Visual Amenity

81. The Applicant shall implement measures to mitigate visual impacts including:
 - (a) design and construction of development infrastructure in a manner that minimises visual contrasts; and
 - (b) progressive rehabilitation of mine waste rock emplacements (particularly outer batters), including partial rehabilitation of temporarily inactive areas.
82. The Applicant shall investigate and where feasible implement the following measures at locations assessed in the EIS as having a high potential visual impact:
 - (a) implement landscaping works in consultation with affected rural residents (see Condition 83); and/or
 - (b) place and maintain visual screens between development infrastructure and the viewing location.
83. If a landowner of any dwelling assessed in the EIS as having a high potential visual impact requests the Applicant in writing to investigate ways to minimise the visual impact of the development on his/her dwelling, the Applicant shall:
 - (a) within 14 days of receiving this request, commission a suitably qualified person whose appointment has been approved by the Director-General, to investigate ways to minimise the visual impacts of the development on the landowner's dwelling; and
 - (b) give the landowner a copy of the visual impact mitigation report within 14 days of receiving this report.

If both parties agree on the measures that should be implemented to minimise the visual impact of the development, then the Applicant shall implement these measures to the satisfaction of the Director-General.

If the Applicant and the landowner disagree on the measures that should be implemented to minimise the visual impact of the development, then either party may refer the matter to the Director-General for resolution.

If the matter cannot be resolved within 21 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process (see Appendix 2).

Overburden Dumps

84. The Applicant shall construct the overburden emplacements generally in accordance with the EIS, and to the satisfaction of **DPI**.

Lighting Emissions

85. The Applicant shall take all practicable measures to mitigate off-site lighting impacts from the development.
86. All external lighting associated with the development shall comply with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting*.

GREENHOUSE GAS

87. Before carrying out any underground mining operations, the Applicant shall identify and assess options for reducing the greenhouse gas emissions of the development to the satisfaction of the Director-General.

WASTE MINIMISATION

88. The Applicant shall minimise the amount of waste generated by the development to the satisfaction of the Director-General.

HAZARDS MANAGEMENT

Spontaneous Combustion

89. The Applicant shall:
- take the necessary measures to prevent, as far as is practical, spontaneous combustion on the site; and
 - manage any spontaneous combustion on-site to the satisfaction of **DPI**.

Dangerous Goods

90. The Applicant shall ensure that the storage, handling, and transport of:
- dangerous goods is done in accordance with the relevant *Australian Standards*, particularly *AS1940* and *AS1596*, and the *Dangerous Goods Code*; and
 - explosives are managed in accordance with the requirements of **DPI**.
91. Before carrying out any development, the Applicant shall update the Safety Management System covering all operations on the site, including the safe storage of ammonium nitrate, to the satisfaction of the Director-General.

BUSHFIRE MANAGEMENT

92. The Applicant shall:
- ensure that the development is suitably equipped to respond to any fires on-site; and
 - assist the Rural Fire Service and emergency services as much as possible if there is a fire on-site during the development.
93. Before carrying out any development, the Applicant shall prepare a Bushfire Management Plan for the site, to the satisfaction of Council and the Rural Fire Service.

REHABILITATION

94. The Applicant shall:
- rehabilitate all mining areas in accordance with the requirements of any mining lease granted by the Minister for Mineral Resources, having regard to the *Synoptic Plan – Integrated Landscapes for Mine Site Rehabilitation*; and
 - ensure that the progressive rehabilitation is carried out to the satisfaction of the **DPI**.

MINE EXIT STRATEGY

95. The Applicant shall work with the Council to investigate the minimisation of adverse socio-economic effects of a significant reduction in local employment levels and closure of the development at the end of its life.

**SCHEDULE 5
ADDITIONAL PROCEDURES FOR AIR QUALITY & NOISE MANAGEMENT**

Notify Landowners

1. If the air dispersion and/or noise model predictions in the documents listed in condition 2 of schedule 3 identify that the air pollution and/or noise generated by the development are likely to be greater than the air quality and/or noise impact assessment criteria in conditions 1 and 6 of schedule 4, then the Applicant shall notify the relevant landowners and/or existing or future tenants (including tenants of mine-owned properties) accordingly before it carries out any development.
2. If the results of the air quality and/or noise monitoring required in schedule 4 identify that the air pollution and/or noise generated by the development are greater than the air quality and/or noise impact assessment criteria in schedule 4, then the Applicant shall notify the relevant landowners and/or existing or future tenants (including tenants of mine-owned properties) at the end of each quarter.
3. Before carrying out any development, the Applicant shall develop a procedure in consultation with DEC and NSW Health and approved by the Director-General, for notifying landowners and tenants referred to in condition 1. This procedure must ensure that:
 - (a) all existing and future tenants are advised in writing about:
 - air quality impacts likely to occur at the residence during the operational life of the mine; and
 - likely health and amenity impacts associated with exposure to particulate matter;
 - (b) the written advice in (a) is based on current air quality monitoring data, dispersion modelling results, research and literature; and
 - (c) there is an ongoing process for providing current air quality monitoring data, dispersion modelling results, research and literature to the tenants.

Independent Review

4. If a landowner considers the development to be exceeding the air quality and/or noise impact assessment criteria listed in schedule 4 at his/her dwelling, or at any proposed dwelling on his/her vacant land, then he/she may ask the Applicant for an independent review of the air pollution and/or noise impacts of the development on his/her dwelling, or proposed dwelling.

If the Director-General is satisfied that an independent review is warranted, the Applicant shall:

- (a) consult with the landowner to determine his/her concerns; and
- (b) commission a suitably qualified person – whose appointment has been approved by the Director-General – to conduct air quality and/or noise monitoring at the relevant dwelling to determine whether the development is complying with the relevant impact assessment criteria, and identify the source(s) and scale of any air quality and/or noise impact at the dwelling, and the development's contribution to this impact.

Within 14 days of receiving the results of this independent review, the Applicant shall give a copy of these results to the Director-General and landowner.

5. If the independent review (referred to in condition 4) determines that the development is complying with the relevant impact assessment criteria listed in schedule 4 at the dwelling, then the Applicant may discontinue the independent review with the approval of the Director-General.
6. If the independent review (referred to in condition 4) determines that the development is not complying with the relevant impact assessment criteria listed in schedule 4 at the dwelling, and that the development is primarily responsible for this non-compliance, then the Applicant shall:
 - (a) take all practicable measures, in consultation with the landowner, to ensure that the development complies with the relevant impact assessment criteria; and conduct further air quality and/or noise monitoring at the dwelling to determine whether these measures ensure compliance; or
 - (b) secure a written agreement with the landowner to allow exceedances of the air quality and/or noise impact assessment criteria listed in schedule 4.

If the additional monitoring referred to above subsequently determines that the development is complying with the relevant impact assessment criteria listed in schedule 4 at the dwelling, then the Applicant may discontinue the independent review with the approval of the Director-General.

If the measures referred to in (a) do not ensure compliance with the air quality and/or noise land acquisition criteria listed in schedule 4 at the dwelling, and the Applicant cannot secure a written agreement with the landowner to allow exceedances of the air quality and/or noise impact assessment criteria listed in schedule 4, then the Applicant shall, upon receiving a written request from the landowner, acquire all or part of the landowner's land in accordance with the procedures in conditions 9-11 below.

7. If the independent review determines that the development is not complying with the air quality and/or noise impact assessment criteria listed in schedule 4 at the dwelling, but that several mines are responsible for this non-compliance, then the Applicant shall, with the agreement of the landowner and other mine(s) prepare and implement a Cumulative Air Quality and/or Noise Impact Management Plan for the land to the satisfaction of the Director-General. This plan must provide the joint approach to be adopted by the Applicant and other mine(s) to manage cumulative air quality and/or noise impacts at the landowner's dwelling, and the acquisition of any land.

If the Applicant is unable to finalise an agreement with the landowner and/or other mine(s), and/or prepare a Cumulative Air Quality and Noise Impact Management Plan, then the Applicant or landowner may refer the matter to the Director-General for resolution.

If the matter cannot be resolved within 21 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process.

If, following the Independent Dispute Resolution Process, the Director-General decides that the Applicant shall acquire all or part of the landowner's land, then the Applicant shall acquire this land in accordance with the procedures in conditions 9-11 below.

8. If the landowner disputes the results of the independent review (referred to in condition 4), either the Applicant or the landowner may refer the matter to the Director-General for resolution.

If the matter cannot be resolved within 21 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process.

Land Acquisition

9. Within 6 months of receiving a written request from the landowner, the Applicant shall pay the landowner:
- (a) the current market value of the landowner's interest in the land at the date of this written request, as if the land was unaffected by the development the subject of the DA, having regard to the:
 - existing and permissible use of the land, in accordance with the applicable planning instruments at the date of the written request; and
 - presence of improvements on the land and/or any approved building or structure which has been physically commenced at the date of the landowner's written request, and is due to be completed subsequent to that date;
 - (b) the reasonable costs associated with:
 - relocating within the Singleton local government area, or to any other local government area determined by the Director-General;
 - obtaining legal advice and expert advice for determining the acquisition price of the land, and the terms upon which it is required; and
 - (c) reasonable compensation for any disturbance caused by the land acquisition process.

However, if within 6 months of receiving this written request, the Applicant and landowner cannot agree on the acquisition price of the land, and/or the terms upon which the land is to be acquired, then either party may refer the matter to the Director-General for resolution.

Upon receiving such a request, the Director-General shall request the President of the Australian Institute of Valuers and Land Economists to appoint a qualified independent valuer or Fellow of the Institute, to consider submissions from both parties, and determine a fair and reasonable acquisition price for the land, and/or terms upon which the land is to be acquired.

If either party disputes the independent valuer's determination, then the independent valuer must refer the matter back to the Director-General.

Upon receiving such a referral, the Director-General shall appoint a panel to determine a fair and reasonable acquisition price for the land, and/or the terms upon which the land is to be acquired, comprising the:

- (i) appointed independent valuer,
- (ii) Director-General or nominee, and
- (iii) President of the Law Society of NSW or nominee.

Within 14 days of receiving the panel's determination, the Applicant shall make a written offer to purchase the land at a price not less than the panel's determination.

If the landowner refuses to accept this offer within 6 months of the date of the Applicant's offer, the Applicant's obligations to acquire the land shall cease, unless otherwise agreed by the Director-General.

- 10. The Applicant shall bear the costs of any valuation or survey assessment requested by the independent valuer, panel, or the Director-General and the costs of determination referred to in Condition 9.
- 11. If the Applicant and landowner agree that only part of the land should be acquired, then the Applicant shall pay all reasonable costs associated with obtaining Council approval for any plan of subdivision, and registration of the plan at the Office of the Registrar-General.

SCHEDULE 6
ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING & REPORTING

ENVIRONMENTAL MANAGEMENT STRATEGY

1. Before carrying out any development, the Applicant shall prepare and implement an Environmental Management Strategy for the development to the satisfaction of the Director-General. This strategy must:
 - (a) provide the strategic context for environmental management of the development;
 - (b) identify the statutory requirements that apply to the development;
 - (c) describe in general how the environmental performance of the development would be monitored and managed during the development;
 - (d) describe the procedures that would be implemented to:
 - keep the local community and relevant agencies informed about the operation and environmental performance of the development;
 - receive, handle, respond to, and record complaints;
 - resolve any disputes that may arise during the course of the development;
 - respond to any non-compliance;
 - manage cumulative impacts; and
 - respond to emergencies; and
 - (e) describe the role, responsibility, authority, and accountability of all the key personnel involved in environmental management of the development.
2. Within 14 days of the Director-General's approval, the Applicant shall:
 - (a) send copies of the approved strategy to the relevant agencies, Council, and the CCC; and
 - (b) ensure the approved strategy is publicly available during the development.

ENVIRONMENTAL MONITORING PROGRAM

3. Before carrying out any development, the Applicant shall prepare an Environmental Monitoring Program for the development in consultation with the relevant agencies, and to the satisfaction of the Director-General. This program must consolidate the various monitoring requirements in schedule 4 of this consent into a single document.
4. The Applicant shall regularly review, and if necessary update, this program in consultation with the Director-General.

ANNUAL REPORTING

5. The Applicant shall submit an AEMR to the Director-General and the relevant agencies. This report must:
 - (a) identify the standards and performance measures that apply to the development;
 - (b) include a summary of the complaints received during the past year, and compare this to the complaints received in the previous 5 years;
 - (c) include a summary of the monitoring results on the development during the past year,
 - (d) include an analysis of these monitoring results against the relevant:
 - impact assessment criteria;
 - monitoring results from previous years; and
 - predictions in the EIS;
 - (e) identify any trends in the monitoring over the life of the development;
 - (f) identify any non-compliance during the previous year; and
 - (g) describe what actions were, or are being, taken to ensure compliance.

INDEPENDENT ENVIRONMENTAL AUDIT

6. At the end of Year 1 of the development, and every 5 years thereafter, unless the Director-General directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
 - (a) be conducted by a suitably qualified, experienced, and independent person whose appointment has been endorsed by the Director-General;
 - (b) be consistent with *ISO 19011:2002 – Guidelines for Quality and/or Environmental Systems Auditing*, or updated versions of these guideline;
 - (c) assess the environmental performance of the development, and its effects on the surrounding environment;
 - (d) assess whether the development is complying with the relevant standards, performance measures, and statutory requirements;
 - (e) review the adequacy of the Applicant's Environmental Management Strategy and Environmental Monitoring Program; and, if necessary,

- (f) recommend measures or actions to improve the environmental performance of the development, and/or the environmental management and monitoring systems.
7. Within 3 months of commissioning this audit, the Applicant shall submit a copy of the audit report to the Director-General, with a response to any of the recommendations contained in the audit report.

COMMUNITY CONSULTATIVE COMMITTEE

8. Before carrying out any development, the Applicant shall establish a new Community Consultative Committee to oversee the environmental performance of the development. This committee shall:
- (a) be comprised of:
 - 2 representatives from the Applicant, including the person responsible for environmental management at the mine;
 - 1 representative from Council; and
 - at least 3 representatives from the local community, whose appointment has been approved by the Director-General in consultation with the Council;
 - (b) be chaired by the representative from Council or by a third party as approved by the Director-General;
 - (c) meet at least twice a year; and
 - (d) review and provide advice on the environmental performance of the development, including any construction or environmental management plans, monitoring results, audit reports, or complaints.
9. The Applicant shall, at its own expense:
- (a) ensure that 2 of its representatives attend the Committee's meetings;
 - (b) provide the Committee with regular information on the environmental performance and management of the development;
 - (c) provide meeting facilities for the Committee;
 - (d) arrange site inspections for the Committee, if necessary;
 - (e) take minutes of the Committee's meetings;
 - (f) make these minutes available to the public for inspection within 14 days of the Committee meeting, or as agreed to by the Committee;
 - (g) respond to any advice or recommendations the Committee may have in relation to the environmental management or performance of the development;
 - (h) forward a copy of the minutes of each Committee meeting, and any responses to the Committee's recommendations to the Director-General within a month of the Committee meeting.

**APPENDIX 1
SCHEDULE OF LAND**

Freehold Land

DESCRIPTION	
Lot 79 DP753792	Lot 181 DP823775
Lot 57 DP753817	Lot 177 DP823775
Lot 160 DP753817	Lot 118 DP753792
Lot 18 DP753817	Lot 95 DP753792
Lot 71 DP753817	Lot 2 DP709722
Lot 161 DP753817	Por 131 DP753792
Lot 49 DP753792	Lot 2 DP616303
Lot 50 DP753792	Lot 1 DP720705
Lot 51 DP753792	Lot 2 DP720705
Lot 52 DP753792	Lot 3 DP720705
Lot 58 DP753792	Lot 4 DP720705
Lot 66 DP753792	Lot 45 DP753792
Lot 67 DP753792	Lot 46 DP753792
Lot 62 DP753792	Lot 4 DP542226
Lot 63 DP753792	Lot 5 DP542226
Lot 64 DP753792	Lot 1 DP241316
Lot C DP33149	Lot 7 DP3030
Lot 22 DP753817	Lot 23 DP3030
Lot A DP33149	Lot 92 DP755267
Lot 79 DP753821	Lot 109 DP753792
Lot 19 DP3030	Lot 110 DP753792
Lot 129 DP755267	Lot 111 DP753792
Lot 22 DP755267	Lot 112 DP753792
Lot 1 DP616303	Lot 103 DP753792
Lot 100 DP753792	Lot 104 DP753792
Lot 101 DP753792	Lot 82 DP548749
Lot 38 DP753792	Lot 83 DP548749
Lot 39 DP753792	Lot 1 DP110084
Lot 60 DP753792	Lot 2 DP110084
Lot 61 DP753792	Lot B DP33149
Lot 1 DP709722	Lot 113 DP753817
Lot 55 DP753792	Lot 2 DP617852

Crown Land Descriptions

Crown lands have been identified and numbered on the attached plan (PD003). Council controlled roads have been identified using geographical names where possible. Council and Crown roads and sections of Wollombi Brook with no real property identifier have their location described relative to adjoining lots.

Crown Land

1. Lot 170 DP 823775
2. Lot 208 DP 753817

Travelling Stock and Camping Reserve No. 5294

3. Lot 175 DP 823775

Council Roads

4. Wambo Mine Road
5. Road within Lot 1 DP 616303

6. Pine Grove Road
7. Road bounded by Lots 7,19 & 23 DP 3030, Lots 22 & 129 DP755267, Lot 83 DP548749 and Lot 1 DP 110084

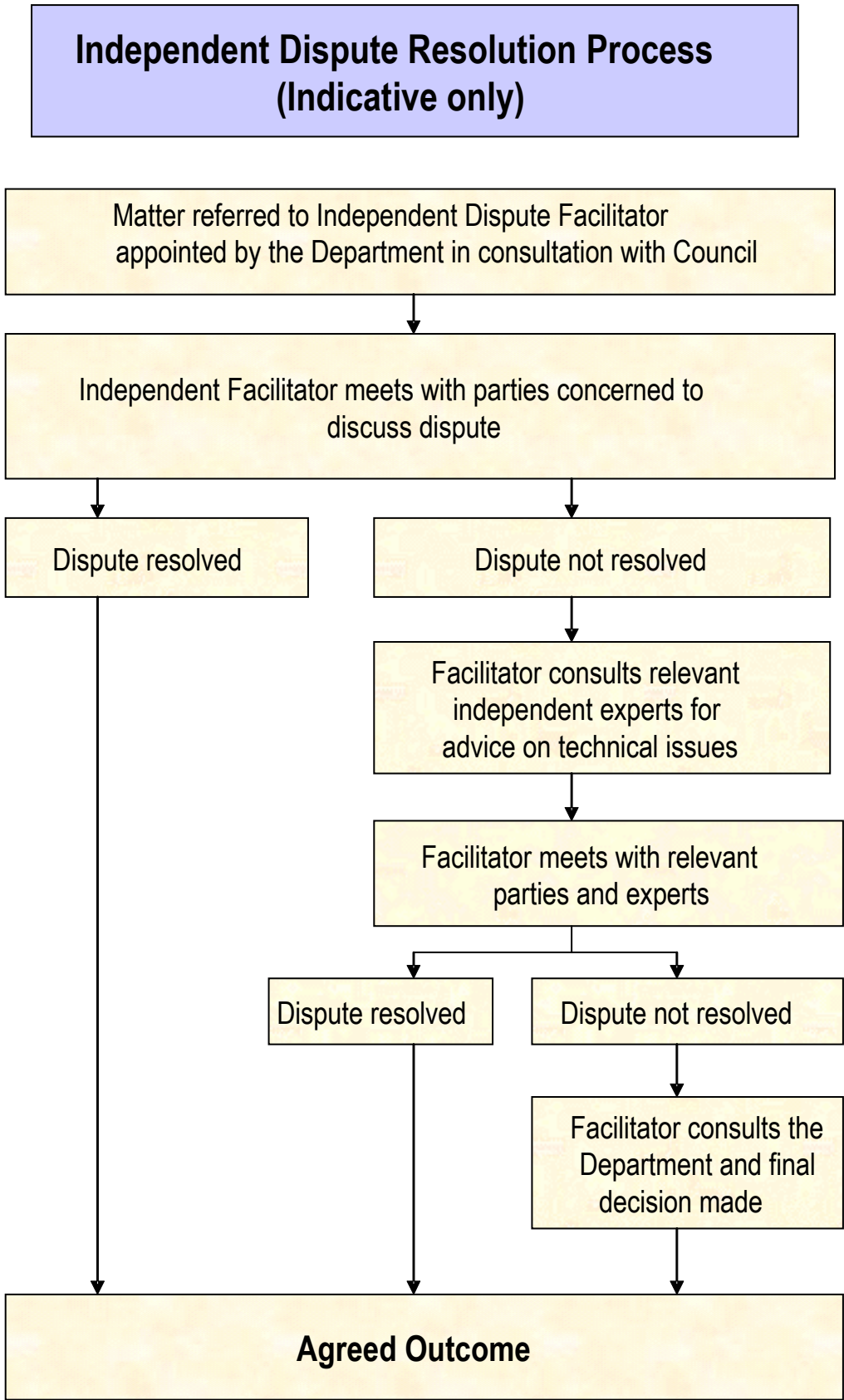
Crown Roads

8. Bounded by Lots 92 & 129 DP 755267
9. Bounded by Lots 4 & 5 DP 542226, Lots 2 &3 DP720705 and Lot 2 DP 616303
10. Bounded by Lots 38, 55, 61, 100, 101, 149 DP 753792, Lot 2 DP617852 and Lot 1 DP 616303
11. Within Lot 2 DP617852
12. Bounded by Lots 175, 177, 181 DP 823775
13. Bounded by Lot 177 DP 823775, 60, 62-64, 95, 118 DP 753792, Lot 2 DP617852
14. Bounded by Lots 170, 177 DP 823775, 49-51, 58, 118 DP 753792
15. Bounded by Lots 170 DP 823775, 49, 50, 52, 79 DP 753792, 18, 160, 161 DP753817
16. Bounded by Lots A & B DP 33149, 22, 66, 67, 71 DP 753817
17. Adjoining to the East and North Lot 79 DP753821

Wollombi Brook

18. Bounded by Lots 22 DP 755267, Lot 83 DP 548749, Lot 1 DP 110084, Lot 1 DP 241316, Lot 7 DP 3030

APPENDIX 2
INDEPENDENT DISPUTE RESOLUTION PROCESS



APPENDIX 3
MAP FOR ABORIGINAL CULTURAL HERITAGE INVESTIGATIONS
(See Condition 55)

APPENDIX B

HYDROLOGICAL ASSESSMENT OF STAGED DIVERSION AND
TEMPORARY PIPELINE – NORTH WAMBO CREEK

REPORT

Wambo Coal Mine

Hydrological Assessment of Staged Diversion and Temporary Pipeline - North Wambo Creek

Prepared for: Wambo Coal Pty Limited

Sep-06
Appendix B-e.doc

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EXECUTIVE SUMMARY

Diversion of North Wambo Creek is required to enable open cut mining of coal resources underlying the creek. The North Wambo Creek Diversion (herein referred to as 'the approved diversion') is described in detail in the Wambo Development Project Environmental Impact Statement¹ (EIS) and was approved as part of the Wambo Development Project development consent (DA 305-7-2003-i). Wambo Coal Pty Limited (WCPL) is seeking to amend the development consent to facilitate a more flexible staged approach to construction of the diversion (herein referred to as the staged diversion), and a temporary pipeline to convey flows in portions of North Wambo Creek above the North Wambo Underground Mine in areas of low depth of cover.

The approved diversion (denoted as the North Wambo Creek Water Control System in the EIS) comprises an open channel to convey flows in North Wambo Creek around the approved open cut mine workings.

The alignment of the approved diversion is offset and approximately parallel to the south-western limit of the ultimate extent of the open cut. The inlet of the approved diversion includes a water control block embankment and header pondage was across North Wambo Creek at a relatively confined section of the creek (Figure 1). During flow events, the pondage structure would have overflowed into the top of the approved diversion channel via a broad, shallow by-wash spillway. The approved diversion was to re-enter North Wambo Creek downstream of the Wollemi Boxcut (Figure 1).

The staged diversion is ultimately expected to comprise two stages depending on final mine planning. The two stages comprise:

1. Initially, the upstream portion of the staged diversion would be constructed rejoining North Wambo Creek north of the Wollemi Underground Mine Boxcut.

Depending on open cut mine planning, a further stage may be constructed comprising:

2. An extension to the permanent diversion to enable open cut mining of the remainder of the North Wambo Creek alignment within the approved open cut development area (extending south to the North Wambo Underground Mine longwall [LW] 4).

In addition, the risk assessment carried out for the North Wambo Subsidence Management Plan (SMP) indicated that additional controls are necessary to minimise the risk of inflows of North Wambo Creek to the North Wambo Underground Mine via connective cracking. In accordance with the outcomes of the SMP risk assessment, a temporary pipeline is proposed to facilitate the conveyance of flow in a section of North Wambo Creek above the North Wambo Underground Mine with a depth of cover less than 100 metres (m).

¹ Wambo Coal Pty Limited, 'Wambo Development Project - Environmental Impact Statement', July 2003.

Following subsidence associated with the North Wambo Underground Mine, the temporary pipeline would be removed and disturbed areas would be rehabilitated. Following mine subsidence, the remediation of the North Wambo Creek channel would be undertaken in accordance with Section 4.2.3 of the EIS, or Stage 2 of the Diversion would be constructed.

A temporary bypass of North Wambo Creek for open cut operations scheduled in the next two years is also proposed by WCPL. This temporary bypass is the subject of a separate consent modification application and a separate hydrological report².

The approach used to design the staged diversion is based on replicating hydraulic and geomorphologic conditions of the existing creek by adopting a similar form and profile. The following specific criteria would be used to design the staged diversion based on these observations:

- The main channel flow length of the staged diversion would be similar to the relevant section of the existing creek.
- The hydraulic conditions in the staged diversion (such as mean velocity, average bed shear stresses and stream power) for the full range of expected flows would be similar to equivalent areas in the existing creek.
- The form and profile of the staged diversion would be consistent with the existing creek where it traverses areas with similar terrain and geology.
- Whilst it is considered that the existing creek is degraded and potentially actively readjusting to past changes in land use, it is proposed to replicate and partially restore pre-disturbance riparian and in stream vegetation to provide long-term stability to the staged diversion.
- Depending on the timing and progress toward establishment of self sustaining stable vegetation, temporary artificial stabilisation measures would be used to ensure short-term stability. These might include use of rip rap or artificial “biodegradable” revetments.
- To limit the potential loss of alluvial baseflow from the upper reaches of North Wambo Creek it is proposed to cut-off shallow alluvium in the active creek by constructing a low permeability compacted earthfill trench/cut-off key beneath both the upstream and downstream block embankments.

The construction period for Stage 1 of the diversion would be significantly shorter than it would be for the larger approved diversion potentially providing more time for stabilisation of the permanent diversion prior to commissioning. As discussed above, a temporary bypass of North Wambo Creek for open cut operations scheduled in the next two years is also proposed.

² Gilbert & Associates Pty Ltd ‘North Wambo Creek Temporary Bypass’. Letter to Jeff Hanlon (WCPL). Report JO207-7-rg7e.doc. July 2006.

Staging of the diversion would also mean that construction activity would be split into shorter campaigns which would potentially provide an opportunity to schedule the works to coincide with expected dryer periods. If Stage 2 (Figure 2) of the staged diversion is to be constructed, the design of this stage would be refined after consideration of key construction, hydrological and performance monitoring data from Stage 1 of the staged diversion.

In the event that Stage 2 of the staged diversion is constructed, the staged approach would allow this part of the staged diversion to be constructed after subsidence associated with the North Wambo Underground Mine. This would allow subsidence associated with the North Wambo Underground Mine to be incorporated into the design of Stage 2 and would reduce the need for post-subsidence remediation work.

The temporary North Wambo Creek pipeline would divert low flows around sections of North Wambo Creek above the North Wambo Underground Mine with a depth of cover of less than 100 m. In the event that connective cracking occurs, the temporary pipeline would potentially reduce the risk of inflows from North Wambo Creek to the North Wambo Underground Mine.

The temporary North Wambo Creek pipeline inlet would include a block embankment to divert flows into the pipeline. Exceedance of the design capacity of the temporary North Wambo Creek pipeline would result in overtopping of the block embankments and flow in the bypassed reaches of North Wambo Creek. Therefore, there is the risk of sediment generation from the block embankments or erosion due to flow in subsided and yet-to-be rehabilitated portions of the creek. To mitigate this risk, it is recommended that construction activities be undertaken in accordance with an approved Erosion and Sediment Control Plan (ESCP).

In consideration of the differences in potential impacts between the approved diversion and the proposed modifications, it is concluded that type and nature of potential impacts would be substantially the same. However, the staged diversion would result in reduced risk of adverse impacts occurring due to the greater flexibility provided. The temporary pipeline would potentially reduce the risk of inflows from North Wambo Creek to the North Wambo Underground Mine via connective cracking. Therefore, the staged diversion and the addition of the temporary pipeline are considered to be of minimal environmental impact in comparison to the approved diversion.

The following recommendations have been made in regard to the proposed modifications to the management of North Wambo Creek:

- Preparation and submission of a formal North Wambo Creek Diversion Plan which would be produced/updated in accordance with the proposed staged construction schedule.
- The construction works should be undertaken under the guidance and control of WCPL management and should conform to their environmental management system. Construction works for each stage should be scheduled such that the main channel component of the works would be completed prior to construction of the inlet and outlet works. Temporary creek protection works should be installed to provide uninterrupted and undisturbed conveyance of normal low flows in the creek during the period that the inlet and outlet works are constructed (eg. using temporary pipelines and pumps).

- All works should be carried out in accordance with an approved ESCP. Relevant sections of the ESCP should be incorporated into the staged diversion works contract.
- Prior to commencement of construction works, two streamflow gauging stations should be established on North Wambo Creek. One should be established at a suitable site upstream of the staged diversion inlet and the other downstream of the ultimate limits of the staged diversion. These stations should be maintained during the active mine life. Data collected prior to the construction of Stage 1 would be used as a baseline for comparison with streamflow following diversion construction in order to quantify any changes to the flow regime. Data would also aid in the detection of loss of surface water flow to the North Wambo Underground Mine.
- Electrical conductivity and turbidity monitoring should be undertaken at both gauging stations prior to the commencement of the staged diversion and through all active construction periods until the final staged diversion works have been completed and stabilised. Data collection prior to the construction of Stage 1 would be used as a baseline for comparison with data following diversion construction.
- Groundwater levels in the alluvium should be monitored via three piezometer transects: upstream, downstream and in a midsection along the staged diversion route. The transects should extend across the alluvial plain and be established prior to commencement of the first stage of the works (where there is considered to be no possibility of damage to the piezometer during construction). Alluvial groundwater levels in individual piezometers should be monitored monthly until completion of the staged diversion works construction.

1.0 INTRODUCTION

Diversion of North Wambo Creek is required to enable open cut mining of coal resources underlying the creek. The North Wambo Creek Diversion (herein referred to as 'the approved diversion') is described in detail in the Wambo Development Project Environmental Impact Statement (EIS) and was approved as part of the Wambo Development Project development consent (DA 305-7-2003-i) (Figure 1).

Wambo Coal Pty Limited (WCPL) is seeking to amend the approved diversion to allow a more flexible, staged diversion scheme (herein referred to as 'the staged diversion'). In addition, WCPL proposes to construct a temporary pipeline to facilitate the conveyance of flow in a section of North Wambo Creek above the North Wambo Underground Mine where the depth of cover is less than 100 metres (m) (Figure 2). The physical limits of the staged diversion and temporary pipeline are generally within the limits of the approved surface development area.

This report outlines the design concepts of the staged diversion and the temporary North Wambo Creek pipeline. The report also contains an assessment of the hydrological and hydraulic performance of the staged diversion and the temporary pipeline in comparison with the approved diversion, including potential hydrological and water quality impacts and recommendations for construction and post construction control and monitoring.

2.0 HYDROLOGY AND WATER QUALITY OF NORTH WAMBO CREEK

Comprehensive surface water studies were undertaken for the Wambo Development Project EIS³. To augment these studies, further hydrological work has been undertaken with respect to the design of the North Wambo Creek Diversion. This section provides a summary of the hydrology and water quality characteristics of North Wambo Creek based on these studies.

2.1 Hydrological Characteristics

The catchment of North Wambo Creek extends from the Wollemi National Park escarpment west and north of the mine area to its confluence with Wollombi Brook south and east of the mine area. The North Wambo Creek catchment has a total area of some 48.5 square kilometres (km²), some 26.5 km² of which is upstream of the start of the approved diversion (Figure 1).

WCPL has constructed a series of low flow monitoring weirs on North Wambo Creek to assess potential surface flow losses associated with past mine subsidence. Whilst providing information on low flow (baseflow), these devices were not intended to provide any information on larger flow rainfall-runoff response in the catchment, of direct relevance to design of the staged diversion.

³ 'Wambo Development Project Surface Water Assessment'. Gilbert & Associates Pty Limited, June, 2003.

Gauging stations have been established by the Department of Natural Resources (formerly Department of Land and Water Conservation) on Doyles Creek and Apple Tree Creek – located west of the North Wambo Creek catchment. These catchments are similar in area and topography to the North Wambo Creek catchment, and are expected to exhibit similar hydrological behaviour. A daily catchment water balance model (AWBM) of North Wambo Creek was set up using parameters taken from a similar model which had been calibrated against observed data at Doyles Creek. The North Wambo Creek model was then run using a long sequence of simulated daily rainfall data to produce a corresponding simulated sequence of daily streamflow which reflects the expected flow regime of North Wambo Creek.

The simulated flow duration curve derived for North Wambo Creek is shown in Figure 3.

The form and shape of the flow duration curve indicates that North Wambo Creek is ephemeral and has a relatively low yield as a proportion of average rainfall. Anecdotal evidence provided by WCPL personnel indicates that the creek has rarely flowed over the past 3 to 5 years.

2.2 Estimated Flood Flows

The magnitude of flood flows in North Wambo Creek has also been estimated using a runoff routing model (RORB) which has been calibrated to specific floods recorded at the Doyles Creek gauging station. RORB is an accepted flood prediction model recommended by the Institution of Engineers Australia⁴ for estimation of flood hydrographs. It differs from the AWBM in that it operates on a much smaller time step (typically between 10 and 60 minute increments depending on the size of catchment and the duration of the rainfall event being simulated). RORB is used to simulate flood hydrographs for specific short rainfall events, rather than an extended sequence of daily averaged flows that the AWBM generates. In the context of this study the RORB model was used to assess the peak discharges in North Wambo Creek at the inlet and outlet ends of the approved diversion that correspond to a range of statistically relevant rainfall events.

Predicted peak flood discharges obtained from the RORB modelling for the staged diversion inlet are summarised in Table 1 below.

Table 1
Predicted Peak Flood Discharges – North Wambo Creek at the
Approved Diversion Inlet – from RORB Modelling

Average Recurrence Interval (ARI) – Years	1 in 2	1 in 20	1 in 100
Peak Discharge (cubic metres per second [m ³ /s])	37.5	61.1	90.9

⁴ 'Australian Rainfall and Runoff – A Guide to Flood Estimation'. The Institution of Engineers Australia, Barton, ACT, 1987.

3.0 DESCRIPTION OF APPROVED DIVERSION

The approved diversion (denoted as the North Wambo Creek Water Control System in the EIS), comprises two block embankments and an open channel to convey flows in North Wambo Creek around the open cut workings. The following discussion has been reproduced from the Appendix E of the EIS⁵.

“The project would require the construction of a water control system to facilitate the passage of North Wambo Creek flows around the southern limit of the open cut mine and its associated waste emplacement areas, which will extend across the present creek channel alignment. These works would constitute a licensable work under the Water Act, 1912.

It is expected that it would be necessary to construct the water control system (comprising the water control structure and channel) prior to year 6 of the project. The channel would be aligned along the southern limit of the main open cut, to minimise the length of channel and therefore area of disturbance necessary to the creek upstream of the mine (refer Figure E-10 [of the EIS]). A water control structure would be constructed across North Wambo Creek at the upstream end of the channel. This structure would provide regulation of inflows to the channel. During flow events the structure would fill and overflow the pondage via a broad, shallow by-wash spillway. The spillway would convey flows into the top of the channel via a transition channel.

The channel would be designed to convey flood flows up to the 1 in 10 year peak discharge within a primary channel formed in cut. Larger flows would be allowed to flood out over the adjacent land surface (secondary overflow zone). A permanent bund would be constructed to act as a flood levee between the channel and the open cut/overburden emplacement to reduce the risk of floodwater entering the mine area. The actual design flow capacity of the primary channel and the bund would be determined as part of detailed design studies using a risk analysis approach and would be documented in the Mining Operations Plan and Site Water Management Plan (to be developed in consultation with the relevant authorities). The banks of the primary channel would be extensively planted with endemic riparian vegetation. The secondary overflow zone would be planted with riparian vegetation to resist erosion during high flow events. The channel would be constructed at least 12 months prior to being commissioned to enable the critical vegetation elements time to establish. Figure E-14 illustrates the concepts (reproduced in this report as Figure 4).

Where the channel is constructed over a subsidence area, the channel would be formed so as to provide a relatively even bed slope, with any irregularities in the surface grade as a result of previous subsidence being incorporated into the channel design. The detailed design and form of the channel would be such that it accommodates the effects of subsidence and would be documented in a revision of the Site Water Management Plan in consultation with the relevant authorities. The following principles and approach to detailed design would be adopted:

- *Consideration would be given to the development of pools and riffle zones within the channel alignment to provide for aquatic habitat.*

⁵ 'Wambo Development Project Surface Water Assessment'. Gilbert & Associates Pty Limited, June, 2003.

-
- *The channel form would incorporate a series of narrower, steeper riffle reaches in stretches corresponding to pillar areas where subsidence is less than in other areas. The channel would widen along the sections of greatest subsidence where bed slopes would be lower.*
 - *The channel geometry would be selected such that channel velocities and boundary shear stresses developed under design flood flow conditions would not exceed critical values for long term stability. These limiting velocities and boundary shear values would be determined through an assessment of the post subsided creek geometry and associated geomorphological stability.*
 - *Should, contrary to current predictions, significant surface cracking occur with propagation of highly transmissive zones linking the surface with the underground seams along the diversion zone, the channel would be lined (locally) to control vertical leakage.”*

All concepts contemplated in the approved diversion would be incorporated into the design of each stage of the staged diversion. The design of the staged diversion would be detailed in the North Wambo Creek Diversion Plan required by Schedule 4, Consent Condition 31 of the Wambo consent (DA 305-7-2003-i).

4.0 DESCRIPTION OF PROPOSED STAGED DIVERSION

As previously noted, the full details of the staged diversion would be presented in the North Wambo Creek Diversion Plan. The following section summarises the main features of the proposed staged diversion and describes the approach that would be taken to final design.

The staged diversion is ultimately expected to comprise two stages depending on final mine planning. The two stages comprise:

1. Initially, the upstream portion of the staged diversion would be constructed rejoining North Wambo Creek north of the Wollemi Underground Mine Boxcut.

Depending on open cut mine planning, a further stage may be constructed comprising:

2. An extension to the permanent diversion to enable open cut mining of the remainder of the North Wambo Creek alignment within the approved open cut development area (extending south to the North Wambo Mine longwall [LW] 4 and around the temporary pipeline).

In addition, a temporary pipeline is proposed to facilitate the conveyance of flow in sections of North Wambo Creek above the North Wambo Underground Mine with a depth of cover less than 100 m (refer to Section 5.2) (Figure 5).

A temporary bypass of North Wambo Creek for open cut operations scheduled in the next two years is also proposed (Figure 2). This temporary bypass is the subject of a separate consent modification application and a separate hydrological report⁶.

Indicative alignments and inlet and outlet locations for the staged diversion and temporary pipeline are illustrated on Figures 2 and 5. Design details of the temporary pipeline are provided in Section 5.3 of this report. Design of the staged diversion would be detailed in the North Wambo Creek Diversion Plan in accordance with Development Consent Condition 31, Schedule 4 of DA 305-7-2003-i.

The approach used to design the staged diversion (Stages 1 and 2) was based on replicating as far as possible the hydraulic and geomorphological conditions of North Wambo Creek by adopting a similar form and profile. A visual reconnaissance of the creek was undertaken by Gilbert and Associates in April 2006. It is apparent from these observations that the existing creek has a variable form and profile over the reach that would potentially be diverted. The following specific observations can be made:

- In the upstream reaches, the creek is predominantly a low-capacity, shallow swale-like channel that meanders across a relatively wide alluvial plain which includes alluvial terraces, flood levee deposits and frequent multiple (secondary and tertiary) banks.
- In the middle reaches, the creek form becomes more incised and more frequently confined between high primary banks with limited fringing floodplain areas, although it occasionally reverts to a shallow swale-like form with fringing flood plains where it crosses flatter terrain.

⁶ Gilbert & Associates Pty Ltd 'North Wambo Creek Temporary Bypass'. Letter to Jeff Hanlon (WCPL). Report JO207-7-rg7e.doc. July 2006.

- In areas where the creek traverses the foot-slope of the Wollemi escarpment, it has cut down through the residual and colluvial soils (to rock in places). The following additional observations were made in these areas:
 - The banks in these areas are often very steep and show signs of active erosion. Extensive head-ward erosion is also evident in side tributaries in these areas.
 - It is suspected that past clearing and grazing in the catchment are major contributing factors to the observed instability of the creek in these areas.

The staged diversion alignment would traverse a variety of terrain types with a significant proportion comprising the foot-slope areas upslope of the creek alignment. The invert levels in the staged diversion would be similar to the corresponding creek levels and the staged diversion would, by necessity, be more deeply incised than the existing creek. In areas where the staged diversion would be close to the existing creek alignment (i.e. near the diversion inlet and outlet), topographical and geological conditions would be similar to the existing creek. The form and profile of the staged diversion would be designed to replicate the condition of the existing creek with due allowance for differences in terrain and geological conditions. The staged diversion is not expected to encounter geological/terrain conditions that are significantly different to any that exist along the existing creek alignment.

The following specific criteria would be used in the design of the staged diversion based on these observations:

- The main channel flow length of the staged diversion would be similar to the relevant reach of the existing creek.
- The hydraulic conditions in the staged diversion (such as mean velocity, average bed shear stresses and stream power) for the full range of expected flows would be similar to equivalent reaches of the existing creek.
- The form and profile of the staged diversion would be consistent with the existing creek where it traverses areas with similar terrain and geology.
- Whilst it is considered that the existing creek is degraded and potentially actively readjusting to past changes in land use, it is proposed to replicate and partially restore pre-disturbance riparian and in-stream vegetation to provide long term stability to the staged diversion.
- Depending on timing and progress toward establishment of self sustaining stable vegetation, temporary artificial stabilisation measures would be used to improve short term stability. These might include use of rip rap or artificial "biodegradable" revetments.
- To minimise potential loss of alluvial baseflow from the upper reaches of North Wambo Creek it is proposed to cut-off shallow alluvium in the active creek by constructing a low permeability compacted earthfill trench/cut-off key beneath both the upstream and downstream block embankments.

5.0 PROPOSED MANAGEMENT OF UNDERGROUND MINING IMPACTS

5.1 Background

Upon completion of mining of LW1-4, a subsided surface profile will form, as detailed by G.E Holt and Associates Pty Ltd in the EIS⁷. WCPL (2003) reports the following potential subsidence impacts for North Wambo Creek:

“The maximum predicted subsidence of North Wambo Creek would be up to 4.23 m in areas where the Wambo, Arrowfield and Bowfield Seams overlap (Figure 4-2 [of the EIS]). This would be expected to result in areas of ponding and the potential for surface erosion along, and adjacent to, the creek alignment as the creek attempts to re-establish its original gradient (i.e. by eroding high points and accreting sediment in the low points in the new bed profile).

An elongated on-stream pond would be expected to form in the lower reaches of North Wambo Creek. Smaller on-stream ponds would also potentially form further upstream as a result of subsidence (Appendix E [of the EIS]). On-stream ponds would likely become depositional zones for sediment carried in flows in North Wambo Creek. The shallower off-stream depressions would likely become wetlands over time with periodic connection to North Wambo Creek as has been observed in existing subsidence areas (Appendix E [of the EIS]).

Some additional areas of the North Wambo Creek catchment would likely be inundated during floods either from its own catchment or backwater flooding from Wollombi Brook due to subsidence (Appendix O [of the EIS]).

With mining of the Wambo Seam, cracking in the alluvials along North Wambo Creek would potentially occur along the sides of the panels, and in curvilinear fashion across the panels. Cracking in the underlying rocks may result in short-term drainage of groundwater out of the alluvials. These cracks would however be expected to in-fill quickly with sediment or close (Appendix O [of the EIS]). The minimum depth of cover between North Wambo Creek and the Wambo Seam longwall panels is not expected to cause connection from the surface to the underground workings (Appendix O [of the EIS]). Cracking is not expected to cause connection from the alluvials to the underground workings although there is some potential for connection in areas where geological structures exist (Appendix O [of the EIS]).

Due to the depth of cover, mining of the Arrowfield and Bowfield Seams is not likely to cause surface cracking or sub-surface strata disruption that would result in stream capture (Appendix O [of the EIS]).”

Section 4.2.3 of the EIS describes remedial measures which may be undertaken for streams subject to subsidence, as follows:

- *“Bank erosion and instability – remediation includes the removal of trees and debris to limit diversion of flow onto the banks, removal of wombat burrows, battering back, armouring and stabilisation of subsidence-affected banks and installation of creek crossings for vehicles and stock.*

⁷ Wambo Coal Pty Limited, ‘Wambo Development Project - Environmental Impact Statement’, July 2003.

- *Bed erosion – remediation includes the installation of bed control structures in the form of low rock weirs to manage headward channel erosion, widening and rehabilitation of incised channels, filling, ripping and revegetation of surface cracks, and installation of contour banks upslope of surface cracks in the stream bed.*
- *Stream flow loss – remediation includes bedrock grouting of subsidence cracks and installation of a clay liner.*
- *Revegetation – remediation includes establishment of grasses, shrub and trees within the riparian zone (i.e. creek banks and alluvial terraces) and fencing of riverine vegetation to promote regrowth....”*

If Stage 2 of the staged diversion is constructed, then rehabilitation of the diverted portions of North Wambo Creek would be obviated, with the staged diversion re-entering the creek over LW4.

5.2 Control of Flow Loss Due to Connective Cracking

Options for the control of flow loss in North Wambo Creek due to potential connective cracking were the subject of two risk assessments carried out with respect to the North Wambo Underground Mine Subsidence Management Plan (SMP). The risk assessments were undertaken in August 2005 and April 2006. Participants in the risk assessments included representatives of WCPL, the Department of Natural Resources (DNR), Strata Engineering (Australia) Pty Ltd (August 2005 only), G.E. Holt and Associates Pty Ltd (April 2006 only), Gilbert & Associates Pty Ltd and Resource Strategies Pty Ltd.

In accordance with the outcomes of the SMP risk assessment, WCPL has proposed to install the temporary pipeline prior to LW mining under North Wambo Creek in areas with a depth of cover of less than 100 m (refer to Section 5.3 for the details of the pipeline).

During LW mining, a monitoring programme would be undertaken to facilitate the detection of connective cracking events. The monitoring programme would include:

- Piezometric monitoring of the alluvial aquifer in the vicinity of LW mining to facilitate detection of accelerated drainage of the alluvial aquifer towards cracks and a lowering of the groundwater table.
- Surface water flow monitoring upstream and downstream of the North Wambo Underground Mine to facilitate detection of loss of surface water flow.
- Monitoring of cracks using either isotropic measurements or helium. This would facilitate locating cracks that propagate from the underground mine to the surface.

In the event that monitoring detects connective cracking between the North Wambo Underground Mine and North Wambo Creek, a geomembrane⁸ (or similar low permeability layer) would be installed in the creek where permanent connective cracking is identified. The geomembrane would be installed by excavating the creek alluvium to a depth of up to 1.5 m, installing the geomembrane and then backfilling the excavation with alluvium.

⁸ A geosynthetic clay liner is envisaged for this purpose, comprising twin geotextile layers encapsulating a layer of sodium bentonite.

If monitoring indicates that connective cracking persists following initial liner installation, additional sections of the creek where connective cracking has been identified would be lined with a geomembrane. In the event that excessive loss of flow in North Wambo Creek continues, WCPL would consider the following options:

- Relinquishment of existing water extraction rights equivalent in volume to the loss of water in the North Wambo Creek system to compensate for the water loss. Any relinquishment of water extraction rights would be undertaken in consultation with the DNR.
- Construction of Stage 2 of the staged diversion around areas of connective cracking to maintain flows in downstream North Wambo Creek. Construction of Stage 2 would draw upon the experience gained with the construction of the Stage 1 diversion and the temporary pipeline.

Section 5.4 describes the rehabilitation of the existing creek and temporary pipeline.

5.3 Design Features of Temporary Pipeline

Introduction

A temporary pipeline is proposed to facilitate the conveyance of flow in sections of North Wambo Creek above the North Wambo Underground Mine where the depth of cover is less than 100 m (Figure 5). It is recognised that it is not feasible to provide capacity to divert all possible flows in North Wambo Creek via the temporary pipeline and that in the event of a creek flow event in excess of design capacity, flow would pass over the block embankment and into the creek channel overlying the North Wambo Underground Mine LW panels.

Components

The temporary pipeline would comprise a pipe (or pipes), block embankments at the upstream and downstream ends of the pipeline and inlet and outlet structures. Flows would be transferred either under gravity or would be pumped down the pipeline. The conceptual design features of these components are outlined below and shown in Figure 6.

Inlet

The upstream end of the temporary North Wambo Creek pipeline (just upstream of LW1) is located in a well defined (incised) portion of the creek. The creek channel in this area is approximately 2-2.5 m deep and about 20-30 m wide (top of bank to top of bank). The temporary pipeline inlet would include a low, overtoppable, earthfill/rockfill block embankment structure (incorporating a spillway) which would be built across the channel. The embankment would have a central 30 m wide overflow section, 0.7 m lower than the crest on the abutments, to allow controlled overflow of flows greater than the peak flow design capacity of the temporary pipeline. In the event of flow in excess of design, flow would pass over the block embankment and into the existing creek channel overlying the North Wambo Underground Mine LW panels.

The block embankment design comprises a central compacted earthfill zone with rockfill on both the upstream and downstream shoulders of the embankment. The downstream batter would be constructed at a flatter gradient and would include rock armouring comprising large size rockfill and/or rockfill mattresses with geofabric underlay to protect against the effects of overtopping flows (Figure 6).

The proposed inlet to the pipeline channel comprises a precast concrete inlet pipe laid horizontally from the creek upstream of the block embankment to a precast concrete manhole, founded on a reinforced concrete base. The manhole would house the upturned inlet of the pipeline (Figure 6) which would be approximately at the same level as the adjacent creek invert. The pipeline exiting through the side wall of the manhole would be laid with a continuous downhill gradient so that the inlet would be self draining down to the level of the upturned pipe and adjacent creek invert, which would minimise the potential loss of flows via seepage and evaporation.

Pipeline

The temporary pipeline would be laid from the inlet manhole upstream of LW1 to re-enter North Wambo Creek downstream of the LW panel being mined at any given time (i.e. it would be stage-constructed). The first stage would be constructed over LW1, the second stage over LW1-2, and so on. Stage construction would simply involve laying the new section of pipeline, connecting the upstream end to the existing pipeline upstream of the existing outlet and either relocating or reconstructing the outlet at the downstream end of the new length of pipeline. Polyethylene (PE) pipe material would be used. Decisions on the design size (diameter) of the pipeline and whether the system would operate under gravity alone or whether a pump would be used to pressurise the pipeline would be made by WCPL.

The expected risk of exceedance of the pipeline capacity has been investigated for a range of pipe sizes for both gravity and pumped systems. Pipe diameters from 355 to 630 millimetres (mm) size for the gravity system option gave estimated average annual exceedance probabilities of 28 to 9 days respectively. Pumped systems employing pipe sizes of between 400 and 500 mm gave estimated annual exceedance probabilities of between 13 and 9 days respectively.

Section 6.0 discusses potential impacts of exceedance of pipeline capacity.

In interpreting this information, it should be noted that the assessment is based on analysis of simulated daily flow data and that the analysis is therefore too coarse to assess the actual duration of overflows in hourly terms. Clearly some overflow events would last for a relatively short period of time (of the order of an hour or a few hours), while others might last several days.

A gravity pipeline would need to be laid within an excavated and partially backfilled trench, to maintain a downhill gradient and minimise the pipeline length. Predicted subsidence along the pipeline alignment would result in the formation of a sagged profile and potential for localised extension (tensile) stresses to form particularly in areas of surface cracking. It is proposed that the pipeline be laid in a "snaked" plan-form so that predicted extensions could be taken up without excess tensile stresses forming along the pipe.

Outlet

The temporary pipeline outlet would be located downstream of the LW panel being mined at any given time. The outlet would comprise a stilling well energy dissipater, constructed from a precast concrete manhole as shown on Figure 6. The pipeline would enter through the side wall of the manhole, which would be installed below the creek bed, with the top of the manhole just above the adjacent creek invert level. Rockfill armouring would be placed around the manhole to protect against scour. A small earthfill/rockfill block embankment structure would be located in the creek channel just upstream of the outlet stilling well to prevent backflow into the reach of creek overlying the LW panel being mined.

Reconnaissance of each of the four re-entry points and downstream reaches indicates that the creek has a well defined channel and stable bed and banks at each of these locations (Plates 1 and 2 below). Excavation into rock may be required at some outlet locations.



Plate 1 North Wambo Creek near proposed LW1 temporary pipeline outlet – looking upstream



Plate 2 North Wambo Creek near proposed LW1- 4 temporary pipeline outlet – looking upstream

5.4 Creek Stability Rehabilitation

Creek stabilisation measures (in general accordance with Section 4.2.3 of the EIS) to be undertaken following subsidence associated with the North Wambo Underground Mine would include the following:

- removal of the upstream and downstream block embankments, inlet and outlet structures associated with the temporary North Wambo Creek pipeline;
- backfilling of the pipeline trench and establishment of vegetation along the filled trench (where necessary);
- removal of fallen trees and debris to limit diversion of flow onto the banks;
- removal of wombat burrows;
- battering back, armouring and stabilisation of subsidence-affected banks;
- installation of bed control structures in the form of low rock weirs to manage headward channel erosion;
- filling, ripping and revegetation of surface cracks;
- installation of contour banks upslope of surface cracks in the stream bed;
- establishment of grasses, shrubs and trees within the riparian zone (i.e. creek banks and alluvial terraces); and
- fencing of creek vegetation areas to promote regrowth.

As previously noted, if Stage 2 of the staged diversion is constructed, then rehabilitation of the diverted portions of North Wambo Creek would be obviated, with the staged diversion re-entering the creek over LW4.

6.0 ASSESSMENT OF POTENTIAL SURFACE WATER IMPACTS

The following section provides an assessment of the potential impacts associated with the staged diversion and temporary pipeline compared to those identified and assessed for the approved diversion. The potential surface water impacts associated with the construction and operation of the approved diversion adapted from Section 4 of the EIS are summarised in Table 2 below.

The same issues identified in Table 2 and requirements for mitigation arise in the staged diversion and temporary pipeline. There are however a number of subtle differences which are summarised below.

The construction period for the staged diversion (Stage 1) would be significantly shorter than it would be for the larger approved diversion potentially providing more time for stabilisation of the permanent diversion prior to commissioning.

Staging of the diversion would also mean that construction activity would be split into potentially two shorter campaigns which provide greater opportunity to schedule the works to coincide with expected dryer periods. If Stage 2 of the staged diversion is to be constructed, the design of this stage would be refined after consideration of key construction, hydrological and performance monitoring data from Stage 1 of the staged diversion.

In the event that Stage 2 of the staged diversion is constructed, the staged approach would allow this part of the staged diversion to be constructed after subsidence associated with the North Wambo Underground Mine. This would allow subsidence associated with the North Wambo Underground Mine to be incorporated into the design of Stage 2 and would reduce the need for post-subsidence remediation work.

The temporary North Wambo Creek pipeline would divert low flows around North Wambo Underground Mine LWs 1 – 4. In the event that connective cracking occurs, the temporary pipeline would potentially reduce the risk of inflows from North Wambo Creek to the North Wambo Underground Mine.

Exceedance of the design capacity of the temporary pipeline would result in overtopping of the block embankments and flow in the bypassed reaches of North Wambo Creek. Therefore there is the risk of sediment generation from the block embankments or erosion due to flow in subsided and yet-to-be rehabilitated portions of the creek. To mitigate this risk, measures to reduce the risk of excessive sedimentation (such as rip-rap and use of a geotextile) have been included in the design of the temporary pipeline and it is also recommended that construction activities be undertaken in accordance with an approved Erosion and Sediment Control Plan (ESCP) for potential erosion impacts.

Post-subsidence rehabilitation measures for North Wambo Creek in the vicinity of the North Wambo Underground Mine are outlined in Section 5.4.

In consideration of the differences in potential impacts between the approved diversion and the proposed modifications, it is concluded that type and nature of potential impacts would be substantially the same. However, the staged diversion would result in reduced risk of adverse impacts occurring due to the greater flexibility provided. Therefore, the staged diversion and the addition of the temporary pipeline are considered to be of minimal environmental impact in comparison to the approved diversion.

Table 2
Potential Surface Water Impacts Associated with the Approved Diversion of North Wambo Creek

Activity or Component	Potential Impact Scenario	Nature of Impact	Mitigation
Construction	Drainage of sediment laden runoff to downstream surface waters prior to stabilisation.	Degradation of water quality downstream by elevated turbidity and bed smothering.	Adoption of an approved ESCP covering the construction activities.
Post construction effects	Alteration of flow regime and degradation/loss of native riparian vegetation along the existing creek.	Reduction in high flow variability and possible reduced low flows associated with upstream alluvial areas. Increased instability and reduced habitat values in the existing creek associated with poorer riparian vegetation.	Diversion capacity and upstream block embankment to minimise change to high and low flow regimes. The banks of the primary channel would be extensively planted with endemic riparian vegetation. The channel would be constructed at least 12 months prior to commissioning.

After: WCPL (2003)⁹

⁹ Wambo Coal Pty Limited, 'Wambo Development Project - Environmental Impact Statement', July 2003.

7.0 RECOMMENDED CONSTRUCTION AND OPERATION MONITORING AND CONTROLS

The following recommendations have been made in regard to the proposed modifications to the management of North Wambo Creek:

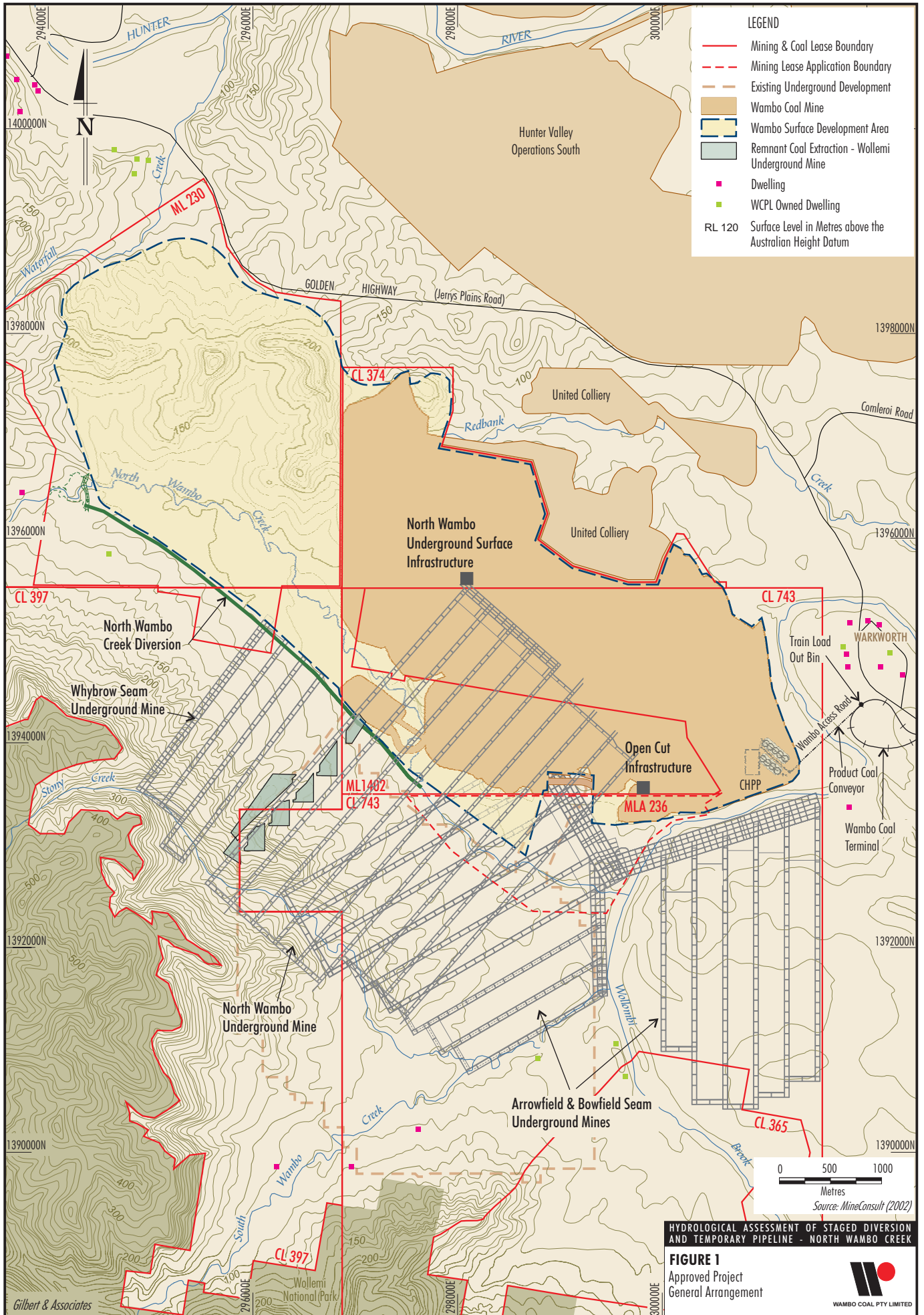
- Preparation and submission of a formal North Wambo Creek Diversion Plan which would be produced/updated in accordance with the proposed staged construction schedule.
- The construction works should be undertaken under the guidance and control of WCPL management and should conform to their environmental management system. Construction works for each stage should be scheduled such that the main channel component of the works would be completed prior to construction of the inlet and outlet works. Temporary creek protection works should be installed to provide uninterrupted and undisturbed conveyance of normal low flows in the creek during the period that the inlet and outlet works are constructed (eg. using temporary pipelines and pumps).
- All works should be carried out in accordance with an approved ESCP. Relevant sections of the ESCP should be incorporated into the staged diversion works contract.
- Prior to commencement of construction works, two gauging stations should be established on North Wambo Creek. One should be established at a suitable site upstream of the permanent diversion inlet and the other downstream of the ultimate limits of the permanent diversion. These stations should be maintained during the active mine life. Data collected prior to the construction of Stage 1 would be used as a baseline for comparison with streamflow following diversion construction in order to quantify any changes to the flow regime. Data would also allow detection of loss of surface water flow to the North Wambo Underground Mine.
- Electrical conductivity and turbidity monitoring should be conducted at both gauging stations prior to the commencement of the staged diversion and through all active construction periods until the final diversion works have been completed and the diversion works are stabilised. Data collection prior to the construction of Stage 1 would be used as a baseline for comparison with data following diversion construction.
- Groundwater levels in the alluvium should be monitored via three piezometer transects: upstream, downstream and in a midsection along the permanent diversion route. The transects should extend across the alluvial plain and be established prior to commencement of the first stage of the works (where there is considered to be no possibility of damage to the piezometer during construction). Alluvial groundwater levels in individual piezometers should be monitored monthly until completion of the diversion works construction.
- During operation of the temporary pipeline, the inlet and outlet structures should be inspected following flow events to check for debris clogging and saltation.

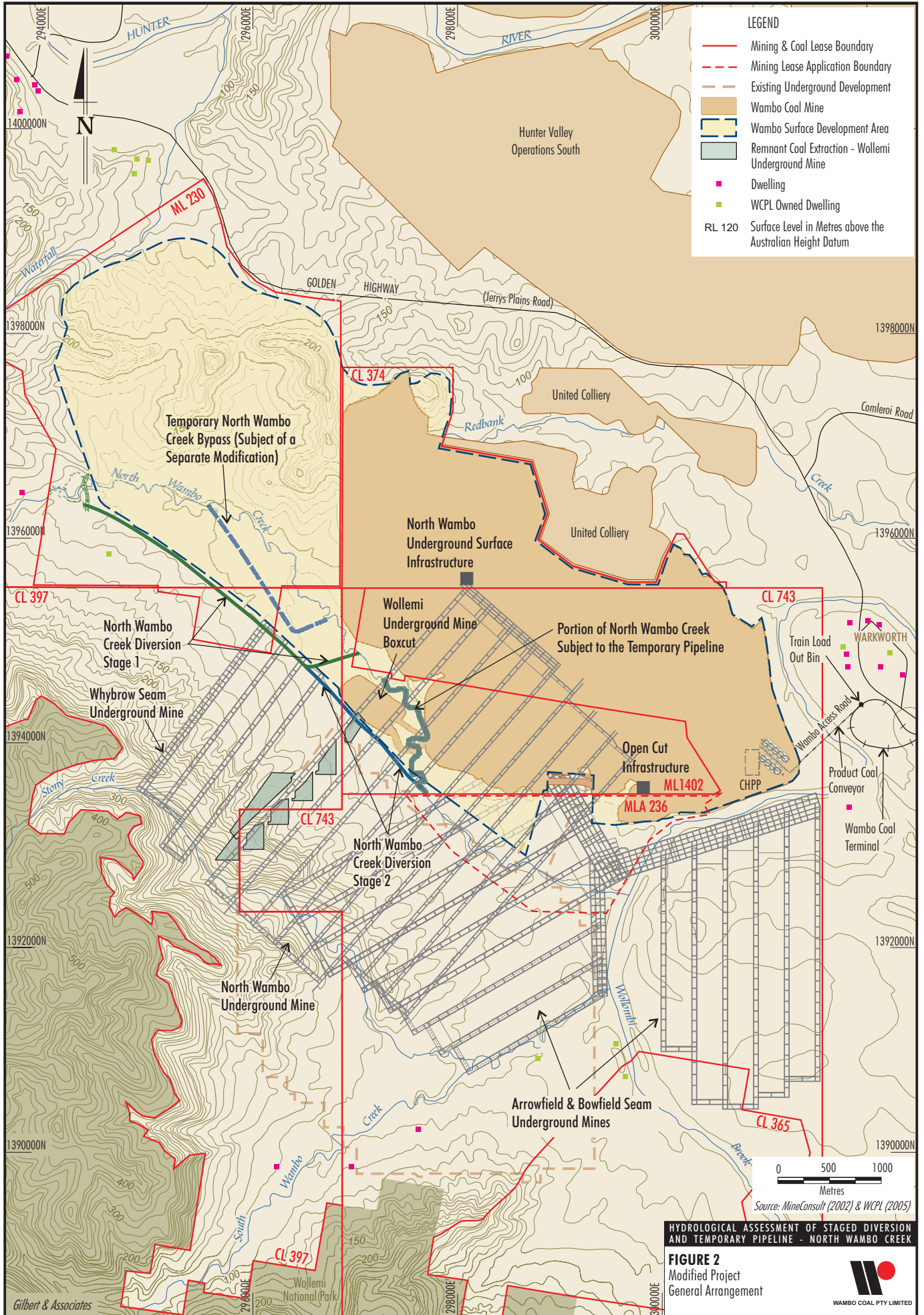
8.0 CONCLUSION

Staged construction of the approved diversion would potentially afford the following benefits:

- Only those sections of the existing creek which would be impacted by open cut mining would be diverted, thereby retaining as much of the existing creek line as possible.
- The staged approach would allow construction, hydrological and performance data collected for Stage 1 and any improvements identified to be incorporated into the design for Stage 2.
- The staged approach would allow the south-eastern portion of the staged diversion to be constructed after subsidence associated with the North Wambo Underground Mine. This would reduce the need for post-subsidence remediation work on the staged diversion.
- The construction period for Stage 1 of the diversion would be significantly shorter than it would be for the approved diversion, potentially providing more time for stabilising Stage 1 of the diversion prior to commissioning.
- Staging of the diversion would also mean that construction activity would be split into two shorter campaigns which provide greater opportunity to schedule the works to coincide with expected dryer periods.
- The temporary pipeline would potentially reduce the risk of inflows from North Wambo Creek to the North Wambo Underground Mine via connective cracking.

FIGURES

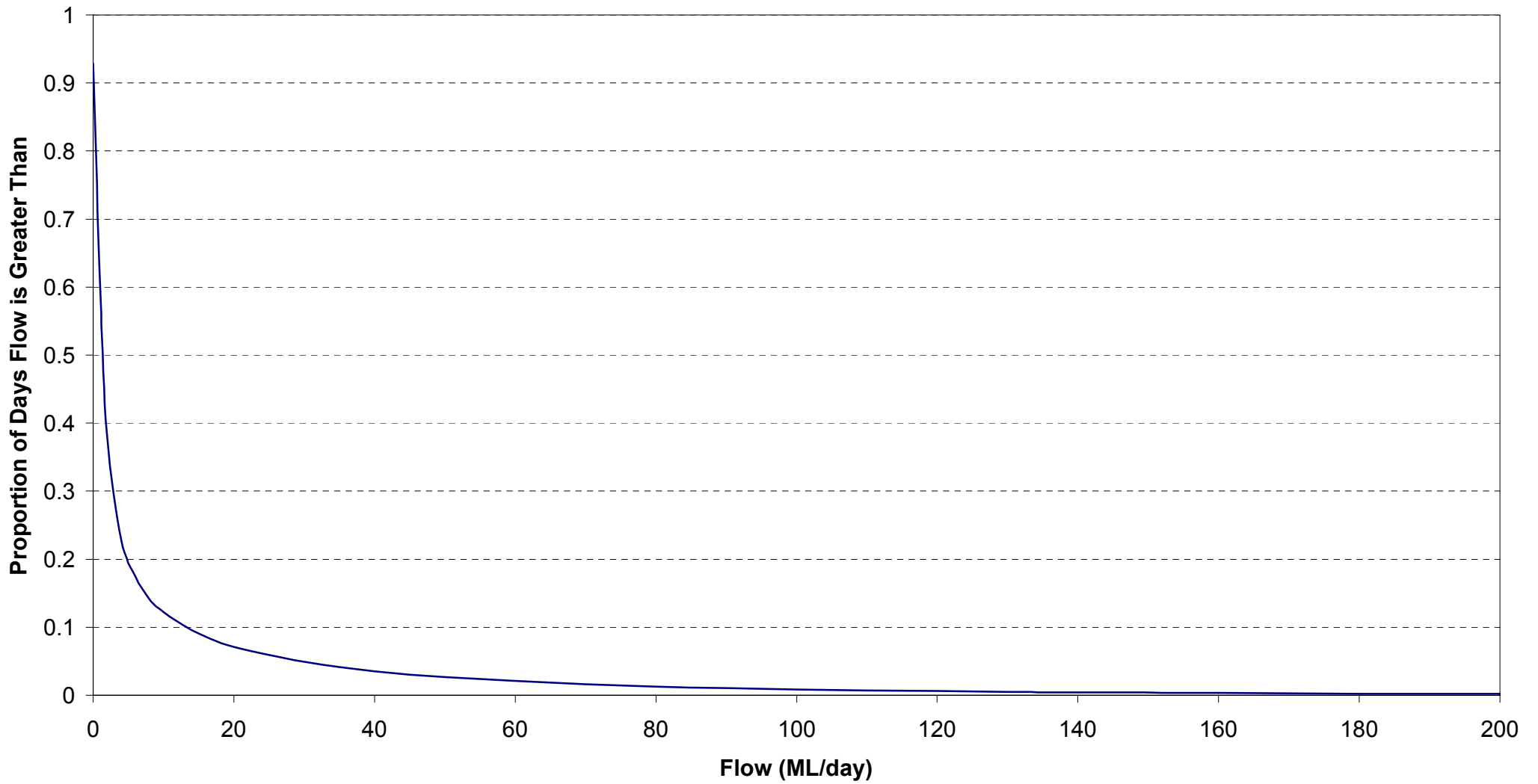




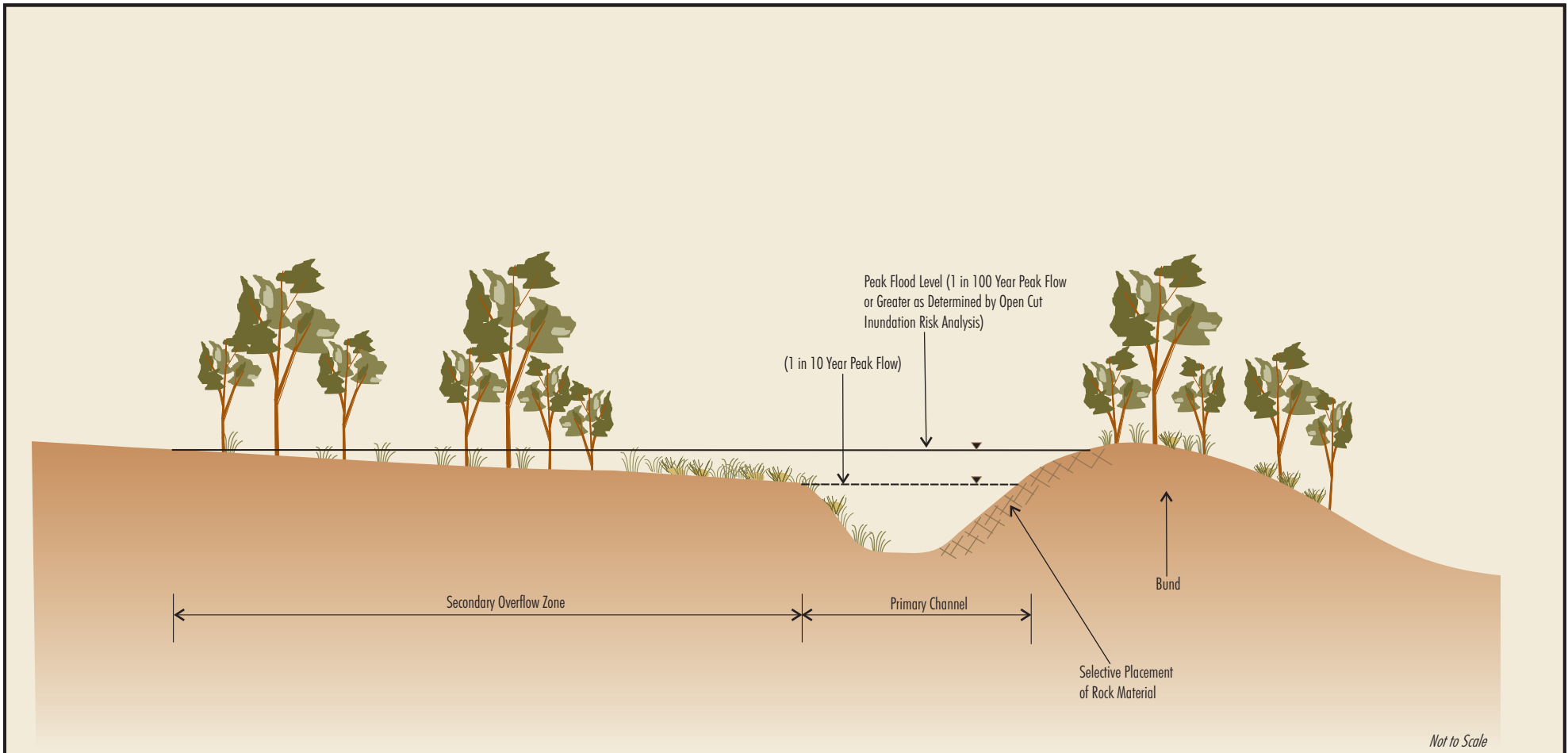
HYDROLOGICAL ASSESSMENT OF STAGED DIVERSION AND TEMPORARY PIPELINE - NORTH WAMBO CREEK

FIGURE 2
Modified Project
General Arrangement





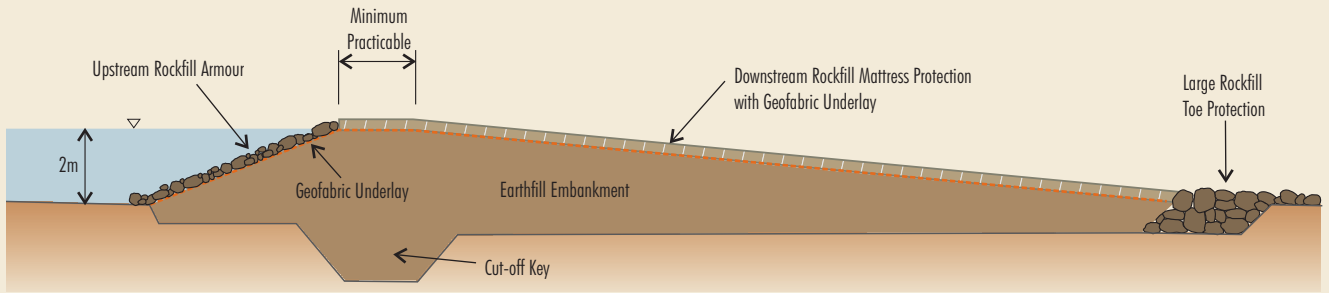
Date	Revision	Description	Drawn:	Checked:	<i>Gilbert and Associates Pty Ltd</i>	WAMBO COAL PTY LIMITED		
4/08/2006		...G&A\Jobs\2002\J0207 Wambo\Task 9\Reports\Wambo Underground Diversion\Figures\Figu	LMG	TSM		Simulated Flow Duration Curve North Wambo Creek		
					Hydrological Assessment of Staged Diversion and Temporary Pipeline - North Wambo Creek	Project:	Drawing:	Figure:
						J0207-9		3



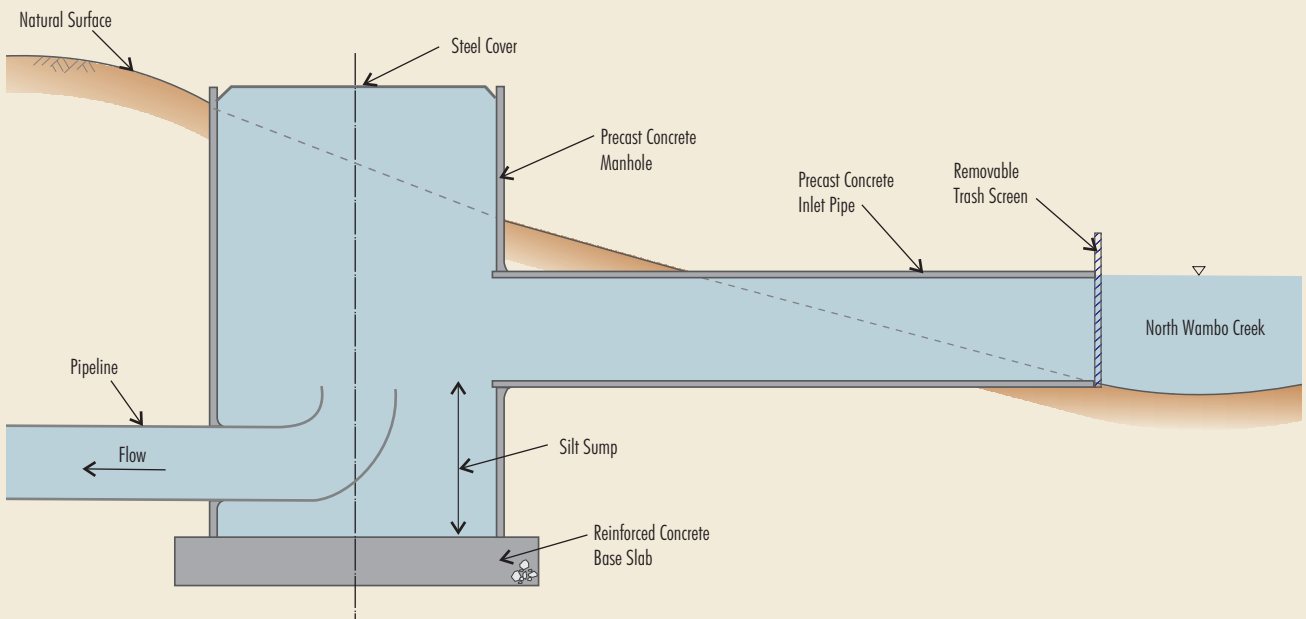
HYDROLOGICAL ASSESSMENT OF STAGED DIVERSION AND TEMPORARY PIPELINE - NORTH WAMBO CREEK

FIGURE 4
 Conceptual Permanent Diversion Channel Typical Section

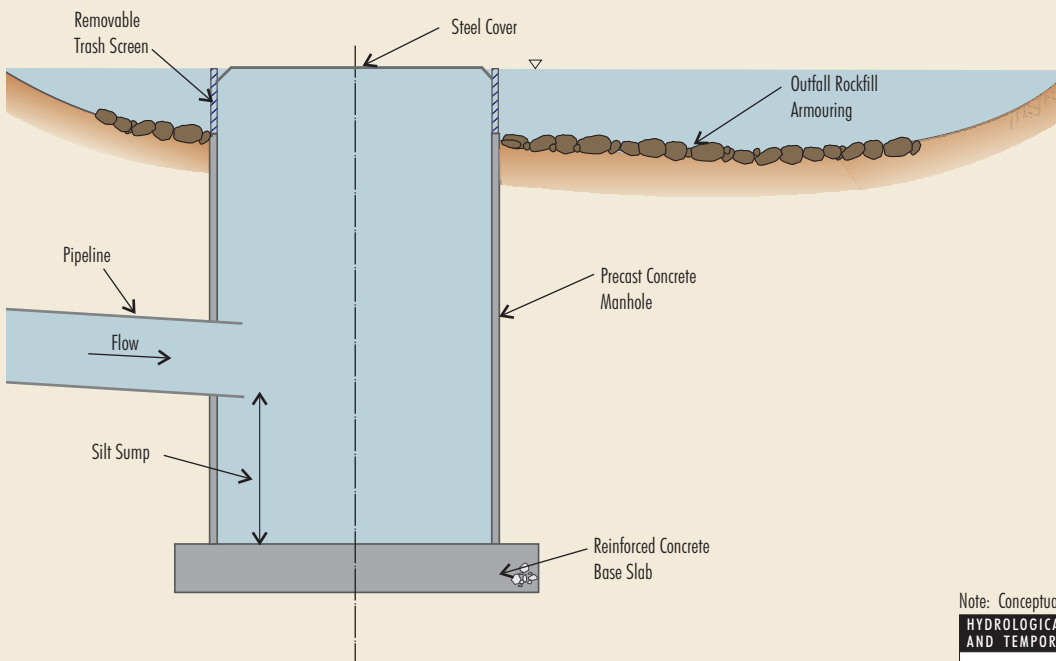




TYPICAL CROSS SECTION UPSTREAM WEIR



TYPICAL CROSS SECTION UPSTREAM INLET



TYPICAL CROSS SECTION OUTFALL STILLING WELL

Note: Conceptual structures are indicative only and not to scale.
 HYDROLOGICAL ASSESSMENT OF STAGED DIVERSION
 AND TEMPORARY PIPELINE - NORTH WAMBO CREEK

FIGURE 6
 Conceptual Sections and Details
 of Temporary Pipeline Inlet
 and Outlet Structures

