2. The Proposal

This section describes the proposed Wallarah 2 Coal Project in sufficient detail to allow for thorough assessment of the potential impacts of the development.

2.1 Project Overview

The W2CP will involve the extraction of up to 5 million tonnes per annum of export quality thermal coal by underground longwall mining methods. The surface facilities will be located on appropriate land for industrial development located away from the rural valleys and main current and future residential areas. The environmental focus in the project design has resulted in eliminating the need for a coal washing plant because coal quality is suitable for both the export and local thermal markets without the need for additional processing. Accordingly, no coal washery waste materials will be produced and project water usage will be highly reduced.

All coal produced will be railed off site, either to Newcastle for export or to a domestic power station. The coal resource is suitable for use in electricity generation.

The key elements of the project are:

- An underground longwall mine;
- A coal handling plant providing crushing and screening and storage facilities;
- Rail loop and loading infrastructure;
- An underground drift entry;
- Ventilation shafts;
- Administration offices and bathhouse; and
- Gas and water management facilities.

Most of these surface facilities except the ventilation shafts and main administration office and bathhouse will be located on company owned land between the Motorway Link Road and the F3 Freeway known as the Tooheys Road site. The main ventilation shafts will be on company owned land located adjacent to the Buttonderry Land Waste Management Facility. In future, a second downcast shaft site (air intake only) will be located within the Wyong State Forest away from residential areas.

Gas released from the strata into the underground mine workings is a normal by-product of coal mining and is routinely managed so as to provide safe and well ventilated underground working areas. Gas will be extracted from the mine via in-seam boreholes and brought to the surface facilities by an underground pipeline and used either on site to generate power or transferred into the general gas supply reticulation system.

2.2 Resource Description

The W2CP proposed underground mining area, shown on Figure 2.1, covers a subset of the coal resources that exist within the Exploration Licence area and which have been subject to detailed mine planning and resource evaluation. The proposed mining area is located wholly within the declared Wyong Mine Subsidence

District and the Hue Hue Mine Subsidence District which together extend west of the F3 Freeway in the northern part of the Wyong Shire.

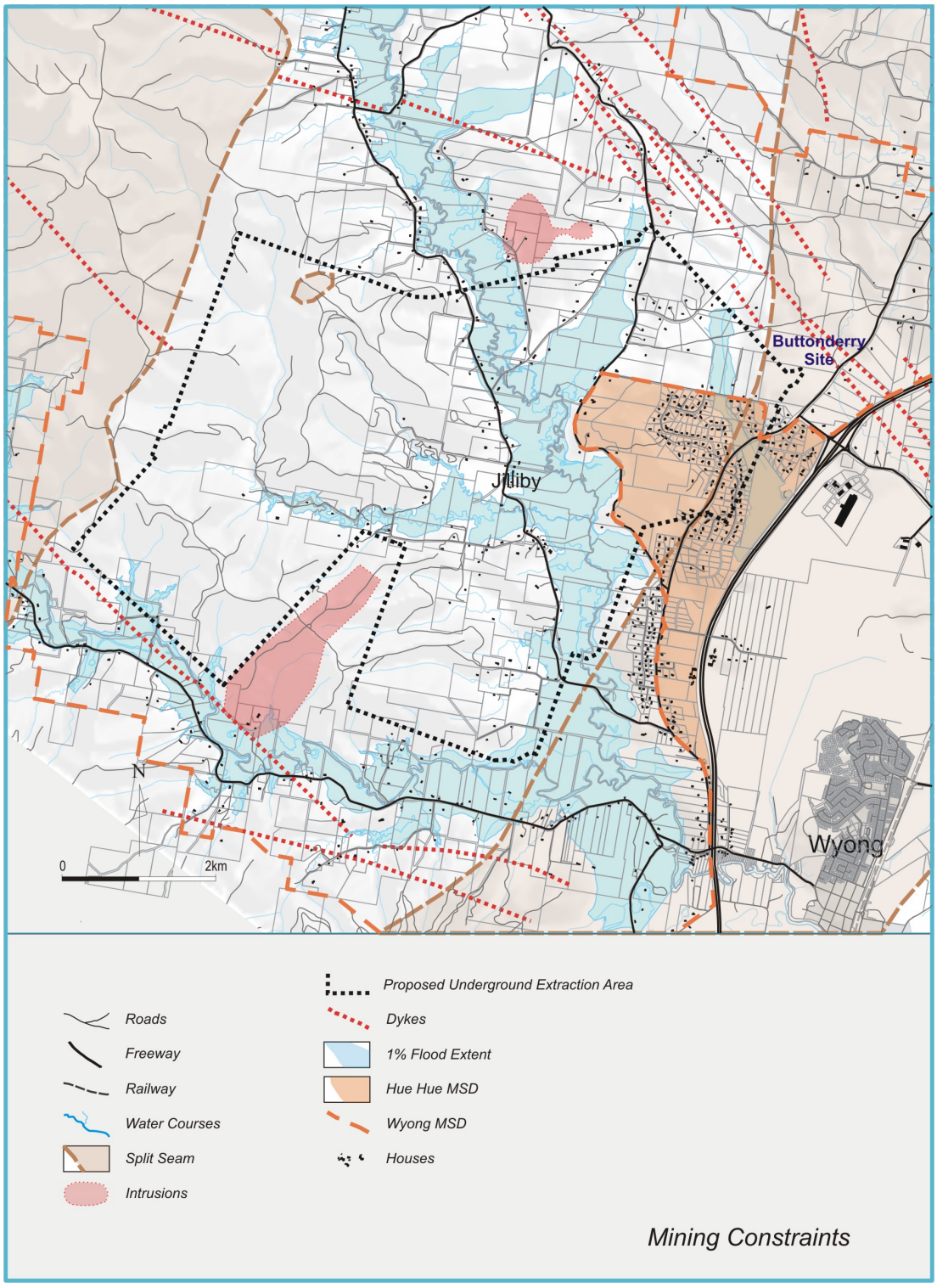

Figure 2.1 Constraints to the Mining Area

The planning of the proposed mining area has been responsive to many geological, environmental and social constraints. The proposed mining target area is delineated to the north by a large north-west oriented dyke zone (a vertically orientated geological zone of igneous rock) which passes through the northern half

of the original government tender area. This dyke zone was detected by airborne and ground based geophysical surveys, and consists of several widely spaced but significantly thick dykes.

Beyond the southern boundary of the W2CP target mining area is a combination of features including the Wyong River and a separate dyke system (which was also detected by airborne and ground based magnetic surveys). Additional coal resources lie south of this dyke system, however there is only a short distance between the dyke zone and the southern boundary of the exploration licence area. This reduces the economic viability of mining within this confined southern area and resulted in this zone being deleted from the mining target area.

The eastern boundary of the proposed mining area is where the coal seam splits into thinner units, however development roadways could still be driven in the coal seam within this area. The Western Split line forms the western boundary. Within the W2CP mining area the Wallarah and Great Northern Coal Seams are fully coalesced, resulting in seam thickness ranging from 3.2 m to 6.8 m. Depth of overburden cover above the coal seam over most of the proposed mining area ranges from approximately 350 m to 550 m, increasing to a maximum of 690 m below some heavily timbered, steep sided hills separating the Yarramalong and Dooralong Valleys.

In terms of extraction thickness, a working section of 4.5 m potentially can be maintained over virtually the entire W2CP extraction area. Along and beyond the north-western margin of the mining area, the seam thickness reduces to 4 m. Working section raw ash increases from 12.5% (ad: air dry basis) in the north-east to greater than 20% towards the Western Split, as shown on Figure 2.2. Specific Energy of raw coal generally ranges from a calorific value of 8,100 to 8,200 kcal/kg (daf: dry ash free basis) but decreases to 8,000 kcal/kg in areas of increased ash. Sulphur content of the coal is consistently low, at about 0.35% (ad).

Major features of the coal compared to other coals from the Newcastle and Hunter coalfields are the low moisture, low sulphur and low nitrogen contents. The coal quality characteristics provide environmental as well as energy benefits when used as a thermal coal product.

2.3 Mining Constraints

A number of constraints and design factors which have been identified are taken into account in the proposed mine plan. These include:

- The need to safeguard water supply catchment functions and infrastructure;
- The criteria of the Hue Hue Mine Subsidence District;
- Floodplains of both Dooralong and Yarramalong Valleys;
- Wyong River and its floodplain;
- Geological constraints including identified igneous intrusions, faults and coal quality; and
- Protection of public infrastructure such as roads, railways, power lines etc.

Other issues which have had a bearing on the mine plan include the location of the pit top and ventilation shaft facilities. As a result, these facilities will be located as far as reasonably practicable away from residences but have the benefit of good access to the freeway and main rail line.

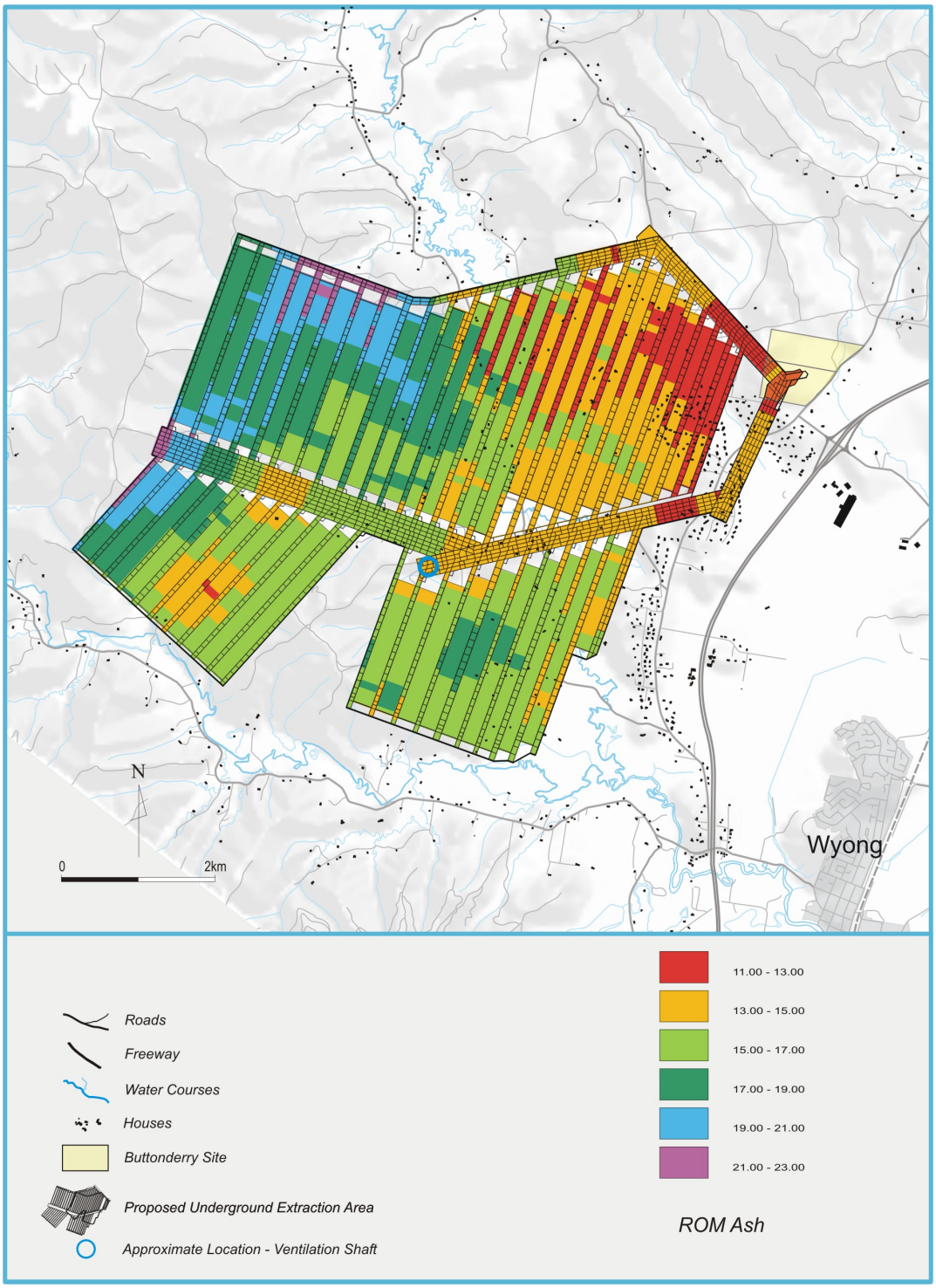

Figure 2.2 Run of Mine Ash Content in the Mining Area

Figure 2.3 shows significant igneous features identified by an aeromagnetic survey undertaken as part of the exploration activities.

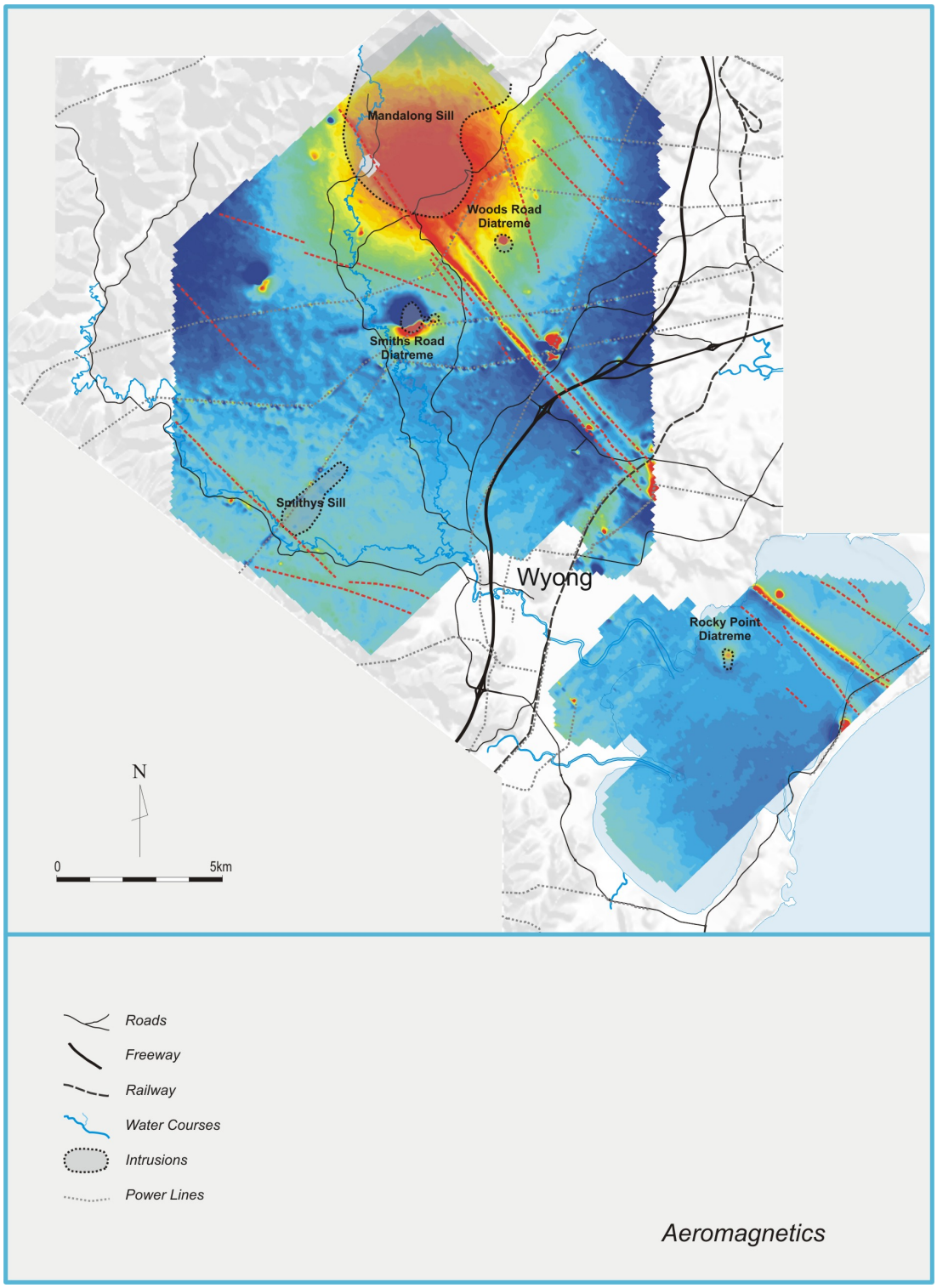

Figure 2.3 Aeromagnetic Geological Mapping

2.4 Selected Mining Method

Due to the size of the resource, the significant depth of cover and the corresponding high cost of surface to underground access that is needed to meet environmental planning requirements, a high production mining method is required. Analysis of the various options has concluded that longwall mining provides the best option in terms

of workforce safety, financial viability, production capacity, environmental considerations and resource recovery.

Longwall mining is a term given to a particular type of underground coal extraction. All underground mines use mechanised coal extraction equipment and often in combination with hydraulic roof supports in order to safely remove the coal. In the case of longwall mining, blocks of coal are delineated by developing a series of parallel roadways, or tunnels, within the coal seam. Once developed, a longwall mining system is installed which progressively extracts the longwall coal block. The roof is supported by a series of hydraulic supports which advance with the shearer in order to protect both the workers at the face and the extraction equipment.

The coal is removed from the mine by a conveyor system which runs along the operating face of the coal block being extracted, then down one side of the block to the main roadways leading out of the mine. The roadways are also used for equipment and personnel access and to draw fresh air into the mine to ventilate the workings.

2.5 Proposed Mine Layout and Extraction Sequence

Numerous variations on the mine plan for the W2CP have been considered throughout the planning process. These have occurred primarily as a result of environmental studies which indicated whether modification to the mine design has been required to reduce environmental impacts to an acceptable level.

The mining target area and proposed mine layout is shown in Figure 2.4 while the proposed longwall panel extraction sequence is shown on Figure 2.5. Evaluation of alternative layouts indicates that the proposed mine plan is the preferred layout, although some minor adjustment to panel orientation and geometry may be made as a result of ongoing environmental and engineering studies. The mine layout incorporates a variety of longwall panel widths in order to optimise economic reserve recovery taking into account environmental and subsidence constraints such as:

- The use of 120 m and 150 m wide longwall blocks below the north-eastern portion of the Hue Hue Mine Subsidence District;
- 150 m, 170 m or 200 m wide longwall blocks depending on depth of cover (the distance from the coal seam to the surface) below the 1-in-100 year flood zone; and
- Predominantly 250 m wide elsewhere.

As shown in Figure 2.5, it is proposed that underground coal extraction will commence in the north-eastern corner of the W2CP mining area, adjacent to the pit bottom facilities. To meet the project's subsidence management goals the initial longwall panels will be relatively narrow. To commence longwall extraction as early as possible, the first eleven longwall panels will be extracted from a set of northern main headings (MNW1), which run parallel and adjacent to the major dyke zone. A five roadway configuration will be used for these permanent main headings. A protection barrier of 120 m will be applied to separate the workings from the dyke zone. The main headings will terminate just east of the volcanic geological feature known as the Smiths Road Diatreme.

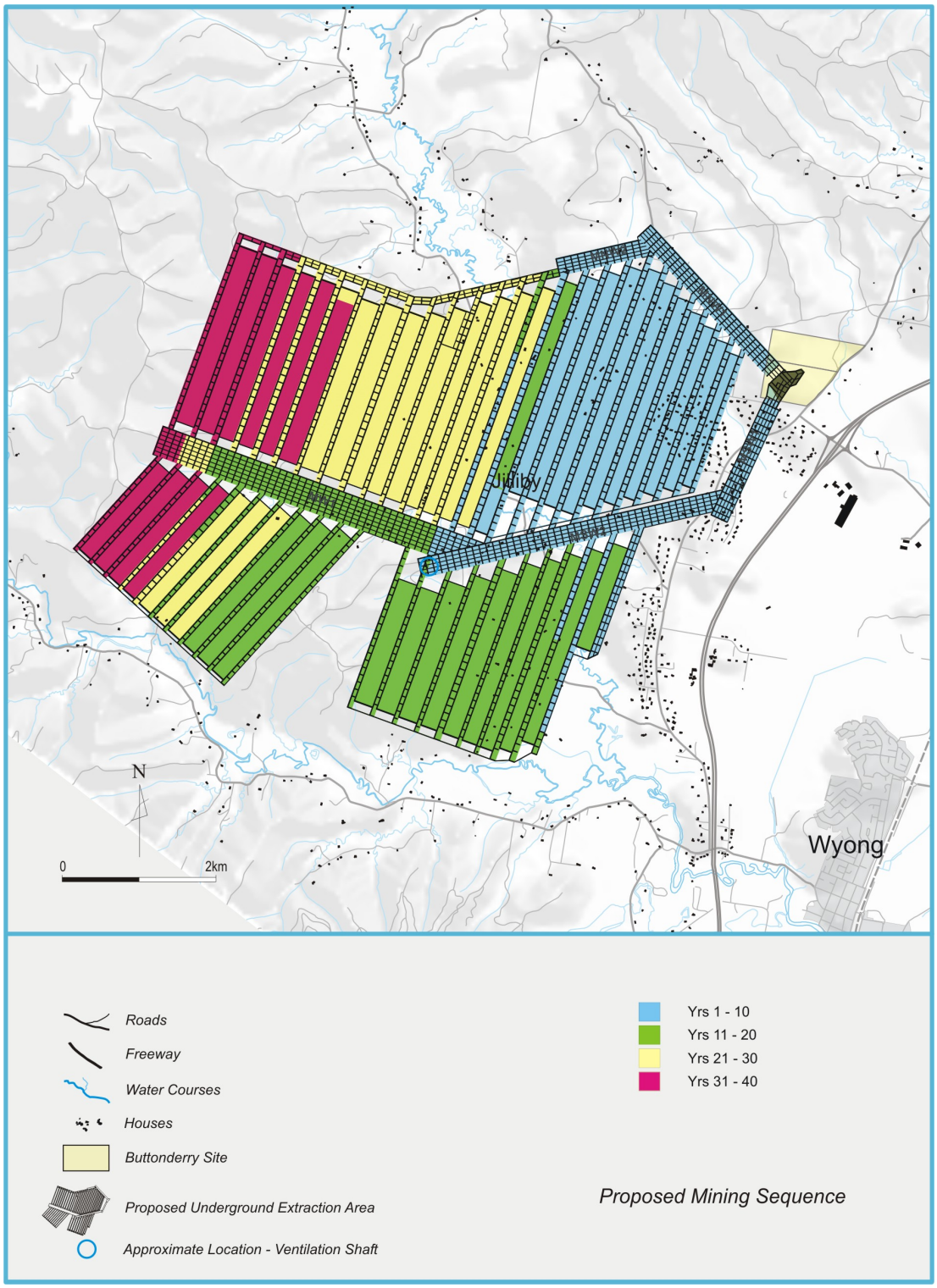

Figure 2.4 Proposed Mining Sequence – 10 Year Blocks

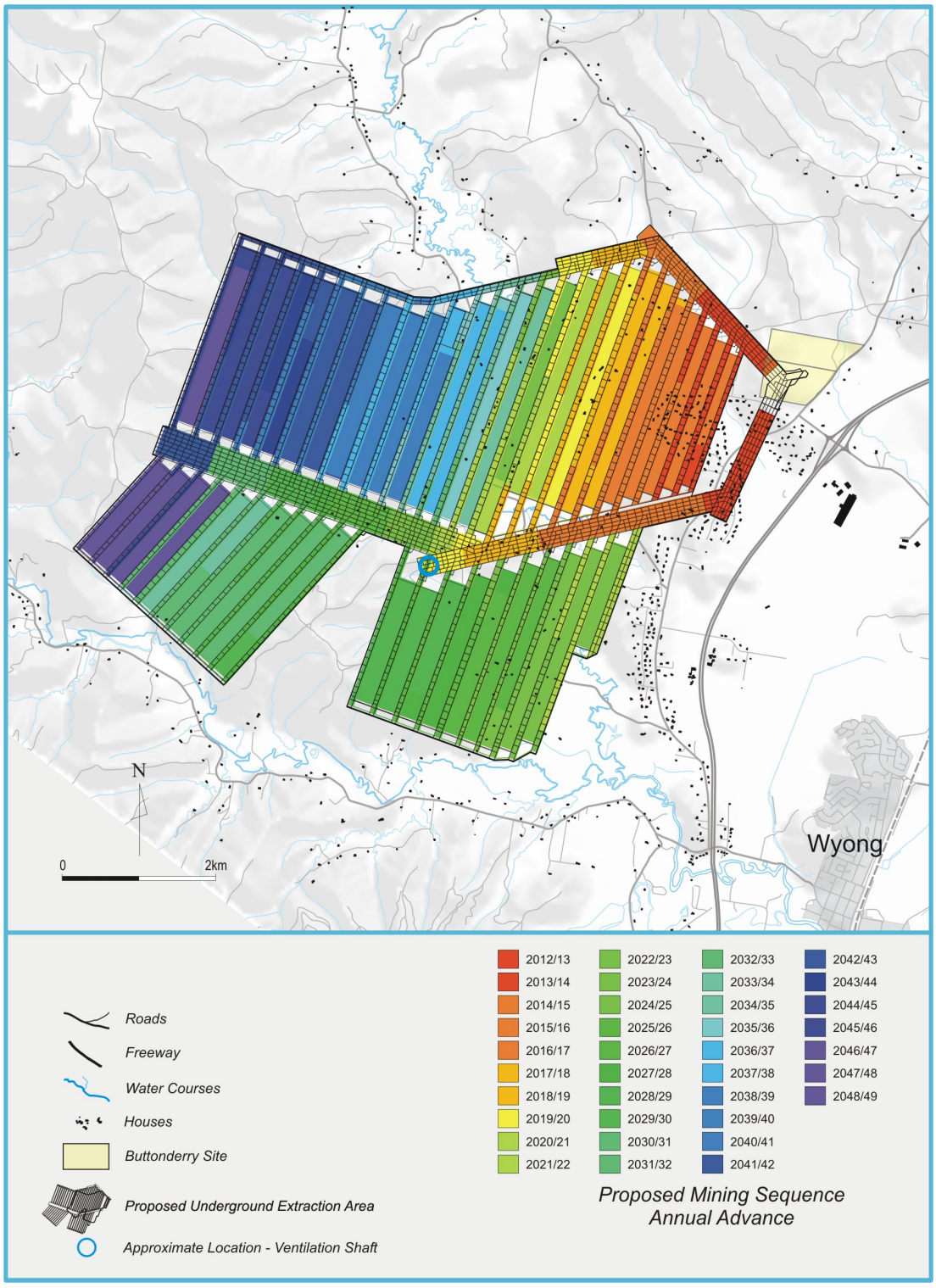

Figure 2.5 Proposed Mining Sequence – Annual Advance

It is proposed that while these first eleven longwall panels in the northeast sector are being developed and extracted, an additional development unit will drive the initial southern main headings. These southern main headings will consist of four headings (MSW1) in a south-south-west direction (east of and parallel to the first longwall panel), then five headings (MSW2) in a west-south-west direction that cross deep under the valley to below the Wyong State Forest. In contrast to the longwall panels, the main headings will not be extracted by longwall mining but

instead will be mined using continuous miner equipment. These headings will be permanent tunnels for access and services throughout the mine life and, unlike the longwall panel extraction areas, will not result in subsidence.

The western extremity of the MSW2 main headings is the selected location for an additional downcast ventilation shaft. This shaft will be required prior to longwall extraction from the southern mains.

Following extraction in the north-east area of the initial eleven longwall panels from the northern main headings, it is proposed that extraction of the southern panels will commence in the south-east area. This sequence provides the following advantages:

- Better quality coal will be extracted first, improving project economics; and
- Better mining conditions are anticipated in areas of thicker seam development.

The south-eastern group of longwall panels will be reduced in length to avoid mining beneath Wyong River and a large number of flood affected properties within the Kidmans Lane area. Continuity of the southern longwall panels will be interrupted to the west by a large horizontal igneous intrusion known as Smithys Sill (as shown in Figure 2.1). This effectively separates the southern longwall panels into two discrete blocks. Extraction of the southern panels will continue until LWS16 and will then involve extension of the southern main headings with eight headings (MW1) driven to the western edge of the W2CP mining area. Again, the panels in the southwest area are designed to avoid the Wyong River system and any existing or future water supply scheme infrastructure.

Mining of the south-eastern panels will continue until the relative deterioration in coal quality in the south-west corner of the W2CP mining area will result in extraction moving back to the north-western panels (LWN11 to LWN25). As this north-western set of panels is to be extracted from the southern main headings, it is proposed that longwall retreat will be down dip (progressing southwards as opposed to panels LWN1 to LWN11 in the north-east which will be mined from the northern main headings and which will see the longwall retreating northwards up dip). Thus, it is proposed that only these north-western panels out of the entire W2CP will be mined in a southerly direction. All other longwall panels will be mined from south to north.

With an extraction height range of 3.5 m to 4.5 m, recoverable reserves in the mine plan are calculated to be 151 Mt (ROM). The overall longwall to development tonnage ratio will be 11.0 : 1. Figure 2.6 shows depth of cover for the mining area and Figure 2.7 shows the extraction height (the thickness of the extraction coal seam section to be mined).

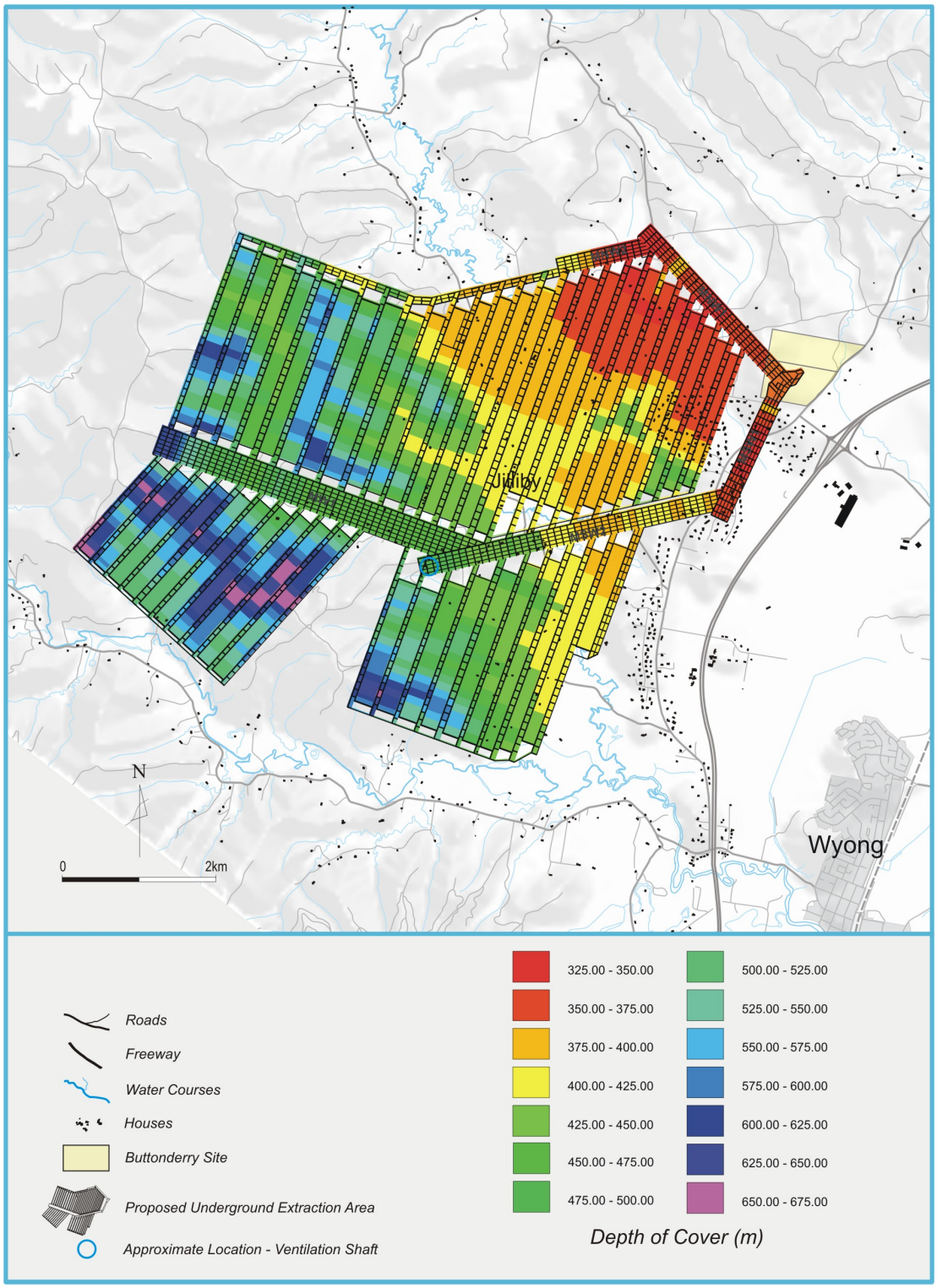

Figure 2.6 Depth of Coal Seam to Surface

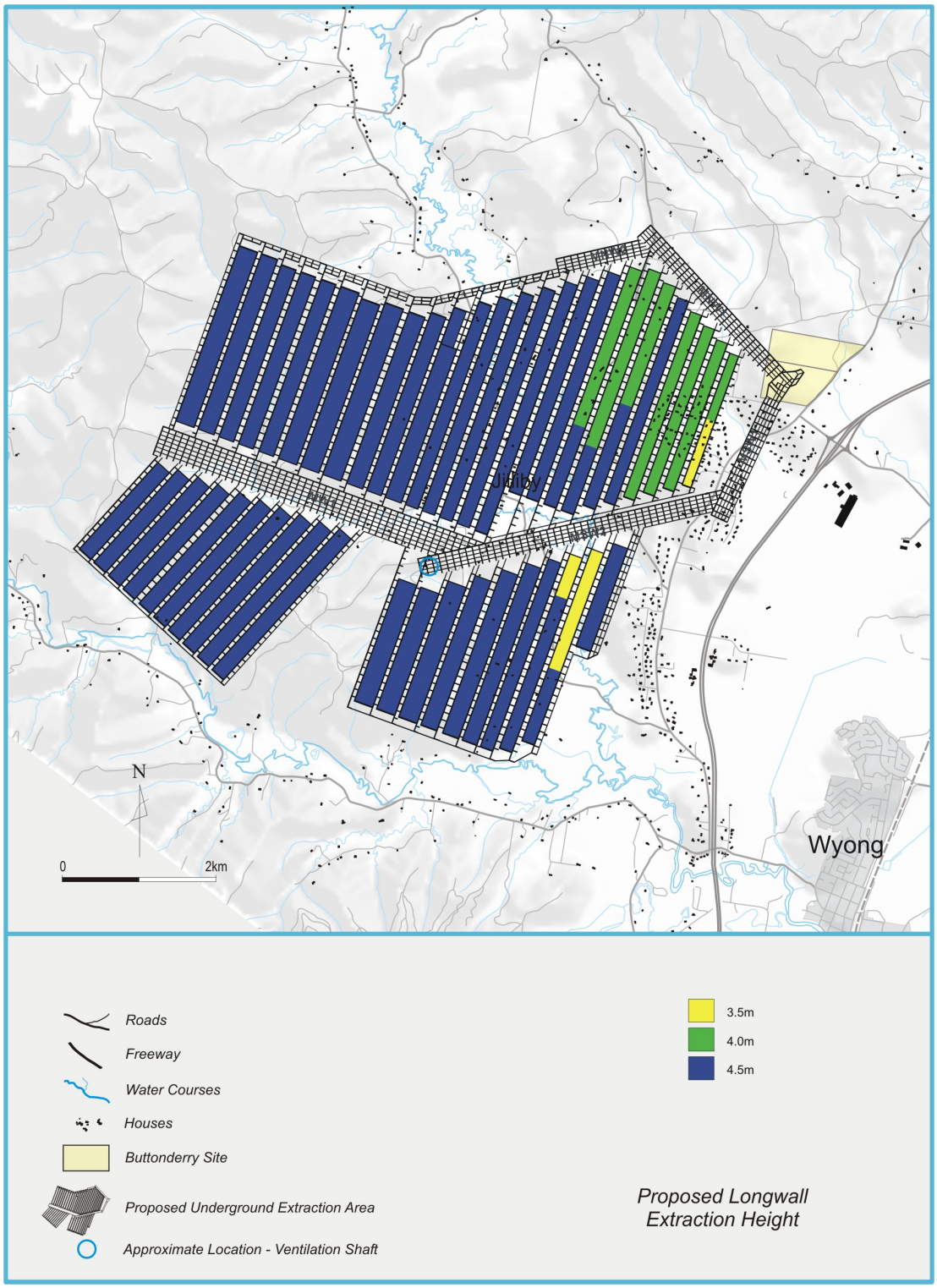

Figure 2.7 Proposed Longwall Extraction Height

2.5.1 Mine Ventilation

There are two ventilation shafts proposed at the Buttonderry site:

- Downcast ventilation shaft – approximately 8 m diameter, approximately 350 m deep; and

- Upcast ventilation shaft – approximately 6 m diameter, 350 m deep.

Following the completion of the upcast shaft the exhaust fan will be installed. A winder car motor room and staging area would be constructed around the downcast ventilation shaft. The mine ventilation fan house will accommodate vent fans, outlet silencers and air flow control dampers. The fans will be housed within an acoustic building to reduce noise emissions to design levels.

A second (western) shaft site will be required by Mining Year 10 to be located in the Wyong State Forest. This future western shaft facility will house a downcast shaft only (that is, air intake into the mine) and its likely approximate location is shown in Figure 2.7.

2.5.2 Mine Plan Variations to Address Constraints

There have been numerous permutations of the mine plan to address the geological and environmental constraints. These variations are summarised below but are further explored in the assessment of impacts for each identified risk issue.

Variations to Protect Houses

Longwall panel width and extraction height were reduced in the Hue Hue Mine Subsidence District in order to ensure that specific tilt and strain requirements for subsidence are complied with. Panel width has been reduced to between 125 m and 155 m while extraction height has been reduced to between 3.5 m and 4.0 m. This ensures that the predicted levels of less than 4 mm/mm tilt and 3 mm/m strain not only conform to the requirements of the Hue Hue Mine Subsidence District (maximum ground tilt of 4 mm/m and maximum ground strain of 3 mm/m) but also fall within the design criteria of houses constructed to the subsidence standards specified by the Mine Subsidence Board (MSB).

The MSB is a service organisation operating for the community in coal mining areas of New South Wales, and is responsible for administering the Mine Subsidence Compensation Act. If any damage is caused by the extraction of coal then it will be fully corrected at no cost to the landowner by the MSB.

Variations to Protect Waterways

The mine plan has been amended to ensure the protection of surface water flow and to continue the existing range of subsurface contributions to water flow in the long term. These amendments required assessment and management of the risks to the long term integrity of the near surface aquifer. The main amendments included:

- Reducing panel widths to between 150 m and 200 m, depending on depth of cover, for the duration of mining beneath the Jilliby Jilliby Creek floodplain;

- Layout of the mine plan and mining sequence to ensure that, as the mining progresses westwards, the crossing beneath the Dooralong Valley floodplain occurs in the most expeditious and responsible manner;

- Terminating longwall panels short of the Wyong River;

- Sequencing panel extraction to minimise effects on flows such as pooling; and

- Relocation and re-orientation of the main headings beneath the alignment of the Little Jilliby Jilliby Creek valley in order to maintain flow gradient while avoiding risk of channel breakout during major flood events.

These interactive design amendments were made to address identified environmental risks, and then remodelled to verify that the resultant mine plan achieved the required risk reduction. This process in some cases took several iterations where subsidence prediction models were re-run in order to confirm the results. A high level of confidence can therefore be given to the impact assessment.

Variations for Flood Regimes

Several amendments were made to the panel layout and location of the main headings to reduce the effects of low level flood events on the functions of Jilliby Jilliby Creek and Little Jilliby Jilliby Creek. The amendments were designed to minimise the risk of channel scour and break-out during smaller flood events.

For large flood events up to the 1% AEP event (sometimes referred to as the 1 in 100 year event or 100 year ARI flood), the overall mine design measures to reduce the impacts on shallow alluvials have in turn reduced the impacts of major flood events. That is, the reduction of panel width and extraction height also reduced the level of vertical movement on the floodplain, thereby reducing the overall flood impacts.

2.6 Operation

2.6.1 Production

The anticipated coal production schedule will be as follows. Mining Years denote mining years following completion of construction.

Mining Year 1: 300,000 tonnes. Production will be limited to development coal extracted to extend the workings from pit bottom (where the inclined drift tunnel enters the coal seam 350 m beneath the Buttonderry site) out towards the first longwall block.

Mining Year 2: 700,000 tonnes. Production will be limited to the development of main headings and the first longwall block. Production will be increased from Year 1 by additional continuous miner units being established.

Mining Year 3: 3.3 million tonnes. Production will ramp up with the installation and extraction of the first longwall block.

Mining Year 4: 3.8 million tonnes. Longwall production will be underway but reduced extraction height of narrow panels beneath the Hue Hue area will limit full production capacity.

Mining Year 5 onwards: 4.5 to 5 million tonnes. Once past the Hue Hue rural residential area, production will progressively increase to 4.5 million tonnes per annum. Peak annual production will be 5 million tonnes and will generally occur when panel width increases beyond the western side of the Jilliby Jilliby Creek floodplain.

2.6.2 Duration of Mining

Project Approval is sought for the entire proposed mine area, as shown on Figure 2.1, with approval being sought for an initial duration of 28 years. Since the projected life of the mine is in the order 42 years, a further planning approval will be required for mining years 29 to 42. Because the current project application covers the entire proposed mine plan area, environmental assessment studies and impact predictions encompass the entire mine area.

2.6.3 Hours of Operation

It is proposed that the project will operate 24 hours per day 7 days per week. Shut downs may occur from time to time to allow for major equipment upgrades, repairs and maintenance.

2.6.4 Employment

It is anticipated that the project will involve 300 direct jobs, around 70% of which will be targeted to be recruited from the Central Coast and immediately adjacent region. The vast majority of these employees will work from the Buttonderry site while only about 20 workers over three shifts will have their work base at the Tooheys Road site.

In addition, a substantial annual allowance is proposed to be made for specific initiatives such as encouraging local flow-on employment by maximising local spending by the project and to assist youth employment and training opportunities.

Total revenue to Government is estimated to be in the order of $1 billion over the project life and substantial indirect economic and employment benefits will arise from ongoing expenditure on services, maintenance, plant and equipment and flow-on employment effects. Over 1,000 new jobs are expected to be supported in the local and regional economy stemming from the direct and indirect flow-on effects of the operation of the new project.

Apart from the direct employment for the mine itself (300 jobs), there will be ongoing flow-on jobs just in the Central Coast area for 426 people at full production operations and a further 336 jobs in the Hunter-Newcastle region.

Given that as much as $600 million of the $700 million project development cost potentially could be spent in the region, around $1 billion in economic stimulus is expected for the Central Coast economy during construction. The Central Coast Research Foundation has confirmed that the construction phase of the project will result in over 1,800 local direct and flow-on jobs in the first year with over 5,000 total jobs (expressed as “job-years”) over the three year construction period.

2.6.5 Transport

All product coal will be routinely transported from the site by rail. At peak production, it is anticipated that between five to six trains will be loaded every 24 hours.

Approximately 280 employees will arrive at the Buttonderry site over an anticipated three shifts during a 24 hour period. This site includes the main office, bathhouse and employee access to and from the underground mine.

Mine supplies and stores will be delivered to both the Tooheys Road site and the Buttonderry site, with larger items typically being delivered to Tooheys Road.

Approximately two trucks per day are expected to deliver materials and fuel supplies to Tooheys Road site. As required, most supplies and equipment will then be transported to the underground mine via the drift tunnel at Tooheys Road. There will be around three truck deliveries per week delivering fuel, oil and stores to the Buttonderry site.

Approximately 20 employees will work at the Tooheys Road site over three shifts in a 24-hour period. This site's operations will require limited truck deliveries for fuel, stores and other supplies (typically about two per day) and will generate approximately one truck load of stone waste material from the mine or coal handling system. This inert fill material will be available for landscaping or bunding construction on site but is mainly expected to be transported to a nearby approved facility.

2.6.6 Site Security

The two main surface sites will be manned 24 hours per day, 7 days per week. Additional security will be provided during periods of lower surface manning, particularly during evenings and weekends.

Security fences will be constructed around the Buttonderry and Tooheys Road sites as well as the Western Shaft site. The Western Shaft site will not be manned and simply represents an air intake with low potential security risk. The site will however be fenced and made secure.

2.7 Geology

The Wyong area is located within the north-eastern margin of the Sydney Basin and in the southern part of the Newcastle Coalfield (see Figure 2.8). In this region any economic coal resources are contained within the upper part of the Permian Newcastle Coal Measures. These strata outcrop to the far north and north-east of the region and dip gently to the south-west beneath the WACJV exploration area at grades of 1 in 30 to 1 in 50.

The Newcastle Coal Measures are overlain by the Triassic Narrabeen Group (refer Figure 2.9) which outcrops across the WACJV exploration area. The lowermost strata of the Narrabeen Group comprise the Dooralong Shale which consists of between 50 and 70 m of shales and laminites. This sequence coarsens upwards to contain beds of pebbly sandstone.

The overlying Munmorah Conglomerate is generally 70 to 80 m thick and consists of coarse and pebbly sandstones with occasional green-grey shales. Neither of these sequences outcrop in the proposed target mining area. Outcropping in the north-east of the area is the Tuggerah Formation, a 200 m thick sequence of sandstones with minor siltstones and rare conglomerates.

The Patonga Claystone, which consists of 80 to 110 m of interbedded grey-green and red-brown claystones and minor fine-grained sandstones, commonly outcrops in the lower, more undulating areas through (and immediately beneath) the Yarramalong and Dooralong Valleys. The uppermost strata of the Narrabeen Group in the area belong to the Terrigal Formation and consist of sandstones and minor siltstones. This sequence occurs through the more elevated zones of the south-western half of the project area, which is typically covered by State forests.

Figure 2.8 Regional Geological Setting of the Wallarah 2 Coal Project

Unconsolidated Quaternary silts and sands occur as fill along the Yarramalong and Dooralong Valleys and beneath Tuggerah Lake. Thicknesses of up to 50 m have been recorded.

Two broad synclines, which are recognised regionally, traverse the area. The Macquarie Syncline traverses the western edge of Tuggerah Lake in a north-easterly direction. The Yarramalong Syncline traverses the extreme western edge of the project area in a similar orientation. Regional geology and the major structural features are shown for the WACJV exploration areas in Figure 2.10.

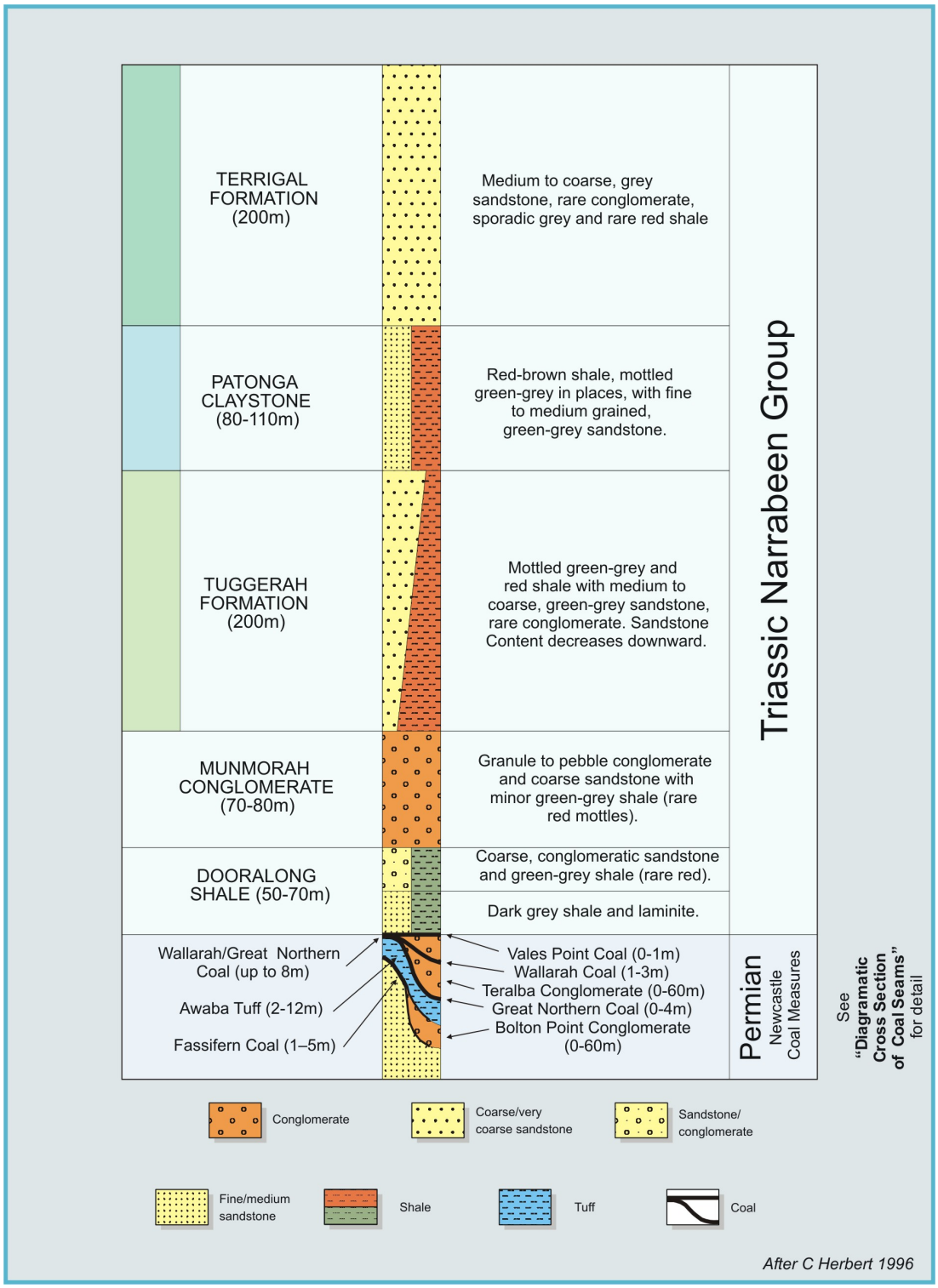

Figure 2.9 Generalised Stratigraphic Column

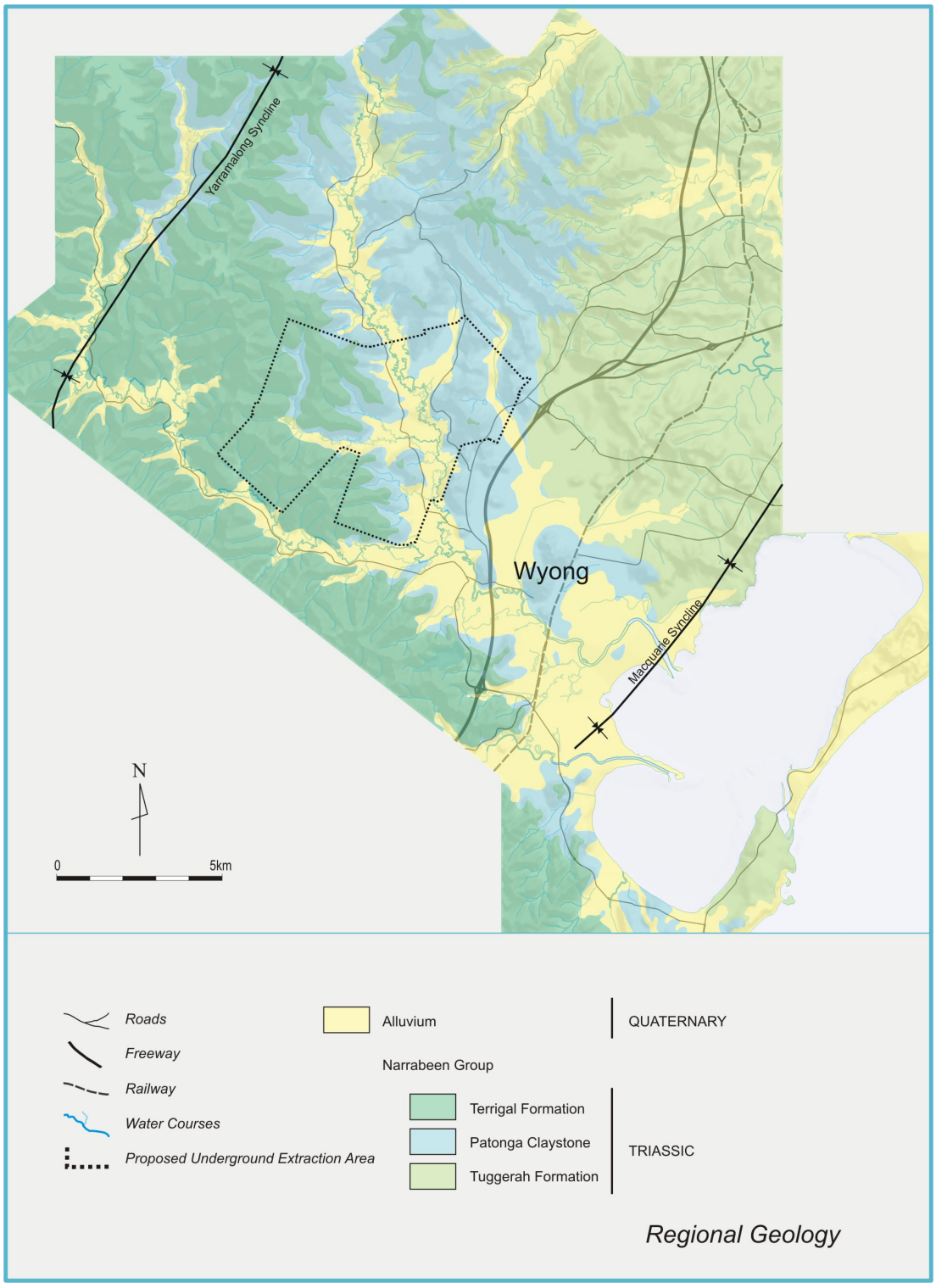

Figure 2.10 Regional Surface Geology

2.7.1 History of Coal Exploration in the Wyong Region

The presence of coal in the subsurface of the Wyong area has been recognised for more than 100 years. In the north-east of the area the full sequence of coal resource utilisation has already occurred comprising coal discovery, exploration, mining and, in some instances, reserve exhaustion, final pit closure and new land use succession (such as on the Wallarah Peninsula). These existing and former

mining activities in the north-east extend southward to the boundary of the Tuggerah Lake area (which abuts the Exploration Licence EL4912, being the eastern area held by WACJV) and Mandalong in the north-west (which abuts Authorisation 405 and EL4911, being WACJV's western exploration licences).

The mining and exploration titles held by WACJV and numerous other mining companies are shown in Figure 2.11, along with the location of all key exploration boreholes undertaken in the Wyong region.

The Department of Mines drilled the earliest boreholes in the Wyong area in 1882. These boreholes confirmed the presence of coal at depth. No further drilling activities are recorded until 1957 when Australian Oil & Gas Corporation completed three boreholes.

In all, twelve separate geological exploration programs were undertaken in the Wyong region during the period from commencement in 1882 up until 1987. Until about 1980, exploration objectives varied from determination of regional structure for coal, oil and gas, to regional coal resource assessment of the more southerly part of the Newcastle Coalfield. Subsequently, in the early to mid-1980s, more detailed drilling was undertaken to determine potential resources of energy coal for planned power stations.

Finally, in 1994, the NSW Government released two Coal Tender Areas in the Wyong area. It was awarded to the Wyong Areas Coal Joint Venture (WACJV) in 1995 and intensive field exploration commenced in June 1996, continuing until 2002. After that time the project focus was upon mine planning based upon the geological knowledge and comprehensive environmental assessments. Results from 96 pre-existing boreholes formed part of an information package supplied to all companies who tendered for the right to explore the Wyong Coal Development Areas in 1994. A total of 352 HQ boreholes plus a further five large diameter holes, have been drilled by the WACJV.

The potential for this area to produce coal from underground mining activities was certainly recognised from the time of commencement of regional exploration by Elcom (the Electricity Commission of NSW) in about 1960. Mining in the north of the Wyong LGA and nearby locations commenced shortly afterwards to provide feed to local thermal power stations.

During the period 1960 to 1968, Elcom drilled 20 boreholes in the general Wyong area. These boreholes were designed to examine the continuation of energy coal resources in the Wallarah, Great Northern and Fassifern Seams that were being mined to supply coal to the nearby Vales Point and Munmorah Power Stations, both located within the Wyong LGA.

Between 1973 and 1982 several drilling programmes were conducted by the Department of Mineral Resources and the Joint Coal Board to explore the coal resources of the entire Newcastle Coal Measures. Seventeen boreholes were drilled for a total of 10,159 m.

Because of the potential energy coal reserves contained within the Wallarah and Great Northern Seams in the immediate Wyong area, Elcom carried out a large drilling programme of 46 boreholes (24,533 m) between 1981 and 1986 with the view of developing a major minemouth power station complex near the Tuggerah Lake area. During this same period, the New South Wales Department of Mineral Resources conducted several small programmes aimed at resource evaluation and

to assist in resolving land use conflict issues. The Australian Gas Light Company also drilled another borehole in the area to examine potential for oil and gas reservoirs.

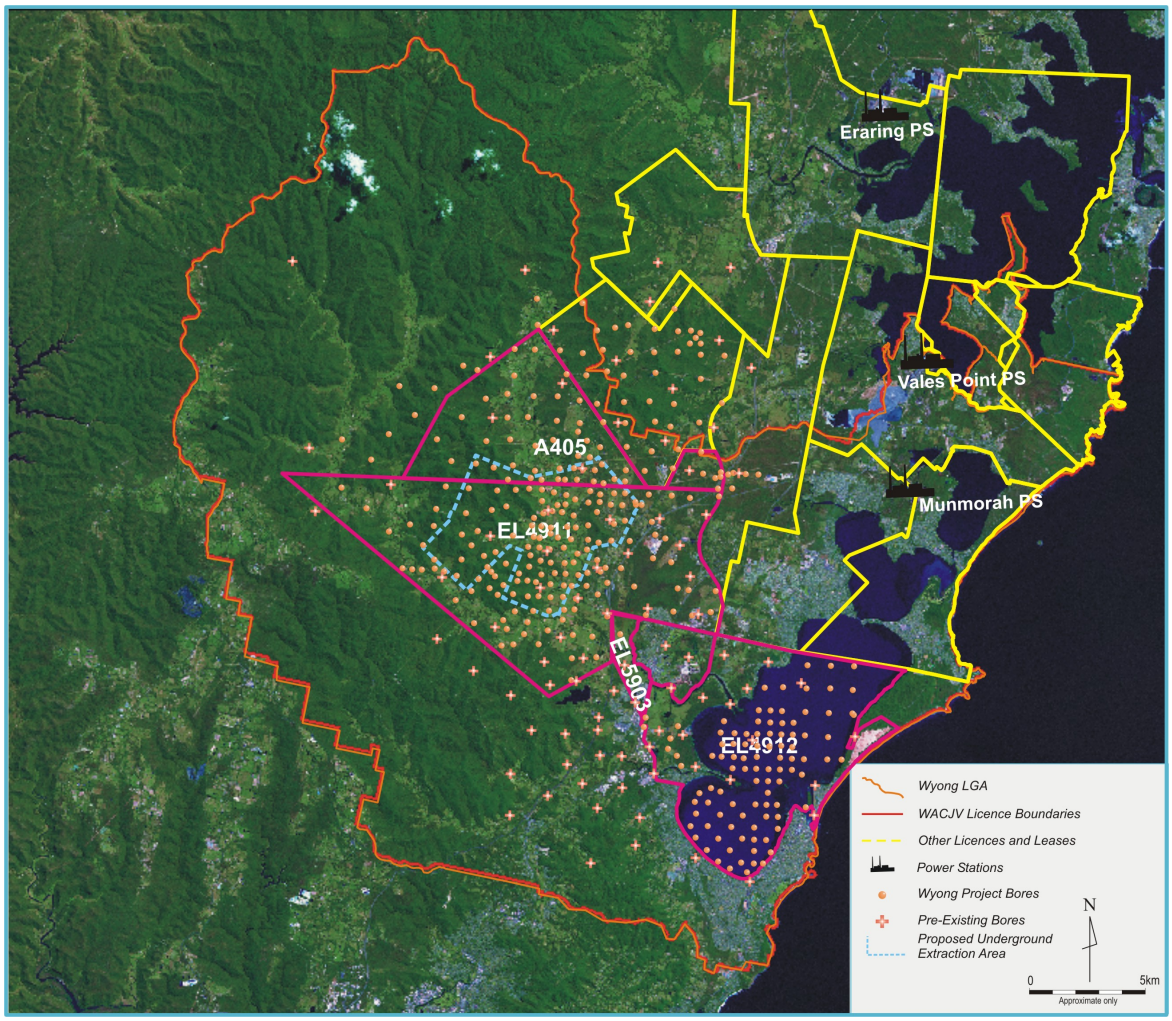

Figure 2.11 Wyong Regional Borehole Exploration - location of all bores within and adjacent to the WACJV exploration area titles.

Table 2.1 lists the programs described above and details the boreholes and metres drilled. A few holes scattered to the south and west, adjacent to or beyond the boundary of the Wyong LGA, are not included (for instance DM Murrays Run, NW Oil & Minerals Longley DDH1). With the emergence of interest in the assessment of coal resources for coal seam methane potential, Sydney Gas undertook exploration in the Wyong area. Three holes were drilled and testing undertaken of gas flows. This data was provided to Department of Industry and Investment.

Table 2.1 Details of Exploration Drilling in the Wyong Area

			Boreholes located within				Metres Drilled		
Drilling Program	**Bore hole Names**	**Year**	**Western Area**	**Eastern Area**	**Outside Project**	**Total Bore holes**	**Slim Core (m)**	**Non-Core (m)**	**Total (m)**
Alisons - Wallarah - Dept. of Mines	ALWA 01	1882			1	1	246.30	-	246.30
Alisons - Wyong - Dept. of Mines	ALWAY01	1882			1	1	250.14	24.50	274.64
Australian Oil & Gas - Morisset	AOGM2	1957	1			1	213.1	10.67	223.77
Elcom - Vales Point	EVP11-12	1960-1961		1	1	2	645.41	-	645.41
Elcom - Ourimbah Creek	EOC1-5	1962		4	1	5	2770.51	53.22	2823.73
Elcom - Wyong	EWY1-10	1964-1966		3	7	10	4643.33	194.99	4838.32
Elcom - Tuggerah	ET1-3	1967-1968		3		3	994.66	71.81	1066.47
Dept. of Mineral Resources - Dooralong/Jilliby	DMD1/ DMJ1	1973	1		1	2	1397.19	36.88	1434.07
Joint Drilling Programme - Mandalong	JDPM1-11	1975	5		5	10	3983.97	2041.47	6025.44
Dept. of Mineral Resources - Mandalong	DMM1-3	1981			3	3	1483.13	58.20	1541.33
Dept. of Mineral Resources – Olney	DMO1	1981	1			1	444.49	12.91	457.40
Dept. of Mineral Resources - Stowe	DMST1	1982			1	1	683.32	18.89	702.21
Dept. of Mineral Resources - Wyong Land Use	DMW1-5	1981-1982	4		1	5	2486.75	40.06	2526.81
Australian Gas Light	AGL3	1982			1	1	166.01	240.00	406.01
Elcom – Tuggerah /Dooralong	ETD01-47	1981-1986	19	8	19	46	14255.57	10278.30	24533.87
Dept. of Mineral Resources - Mandalong	DMM5/6	1987	2			2	214.30	374.00	588.30
Dept. of Mineral Resources - Wyong Land Use	DMW6/8	1987	1		1	2	374.40	370.00	744.40
WACJV EL4912 A405 & EL4911	Grid No.	1996–2003	253	98	1	352	68138.3	89773.7	157912
Sydney Gas		2002-2005				3			
TOTAL			287	117	44	451	103838	103598	206990

The only seams of significant economic potential within the general Wyong area are the uppermost seams of the Newcastle Coal Measures, namely Vales Point (VPT) Wallarah (WAL) and Great Northern (GTN) Seams in various combinations (combined seam WGN). The underlying Fassifern Seam (FAS) has little to no potential, generally being too thin because of splitting in all but limited areas. All other lower seams generally occur at depths and thicknesses that render them uneconomic at the present time.

The general trends of seam configuration, their structure and depth, and the other physical and chemical characteristics of the coal seams, can generally be projected some distance beyond the WACJV exploration areas towards the south and west. However, the virtually complete lack of boreholes in those unexplored areas makes this increasingly uncertain as distance from data points increases.

In the Wyong area, the Wallarah (WAL) and Great Northern (GTN) Seams coalesce to form a single seam, Wallarah – Great Northern Seam (WGN). In a limited area the Vales Point (VPT) Seam also merges with the combined seam to produce a maximum coal thickness of approximately 8.7 m. The seams are subject to splitting and coalescence through the development of conglomerate filled fluvial channels. Figure 2.12 (note variable vertical exaggeration) shows a diagrammatic east-west section through the deposit and clearly defines the zones of seam development and the conglomerate channels.

2.7.2 General Geological Structure: WACJV Exploration Areas

Extensive geological investigations carried out by the WACJV are not described in detail for the purposes of this study. However, the extensive knowledge gained since the exploration work began by WACJV in 1995 has enabled accurate understanding of all aspects of geological and groundwater conditions which have been provided to subsidence, groundwater and flooding/geomorphology assessments for the EA report.

The WACJV exploration areas have been subdivided into a number of zones, as illustrated in Figure 2.12**.**

The coal seams dip gently from the north-east to the south-west beneath the exploration areas at general gradients of 1 in 30 to 1 in 50. Localised areas of steepening or flattening occur, in particular around the edges of sedimentary wedges. Depth of cover to the uppermost coal seam within the project areas ranges from 200 m in the extreme north-east of the exploration licence areas to 680 m in the south-west (see Figure 2.13).

Maximum seam thickness of the WGN is developed in the Western and Eastern Thick Zones. In the southern half of the Western Thick Zone, the WGN ranges from 4 to 6.5 m thick. To the north the seam thins to 3.5 m. In the Eastern Thick Zone the seam is generally 6 to 7.5 m thick but reaches a maximum of 8.7 m when the overlying VPT Seam merges. In the Central Channel Zone, the WAL Seam is generally less than 3 m thick but reaches 3.5 m thick along the western boundary while the GTN Seam is completely removed. In the Western Split Zone, the WAL Seam thins to 2 m and in places totally deteriorates. The GTN Seam reaches 2.5 m thick in the south-west. In the Eastern Split Zone, the Wallarah Seam maintains a thickness of over 3 m along the split line but quickly thins and deteriorates to the east. The GTN Seam deteriorates and thins from the split line.

Figure 2.14 provides illustrative detail of the WGN coal seam's ply and composite intervals.

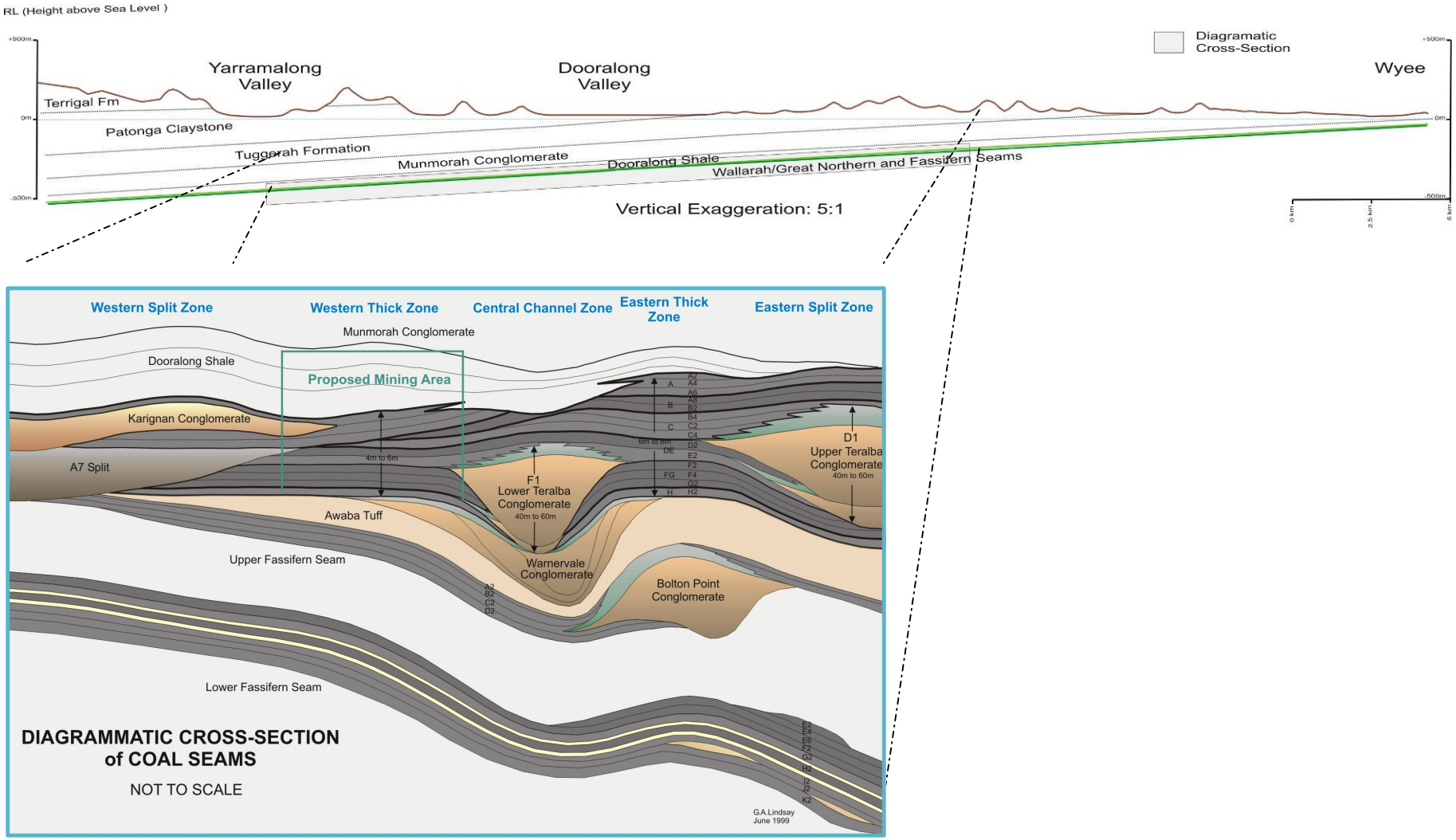

Figure 2.12 Diagrammatic E-W Section of Geology, with focus on deep coal seam layers

Note vertical exaggeration

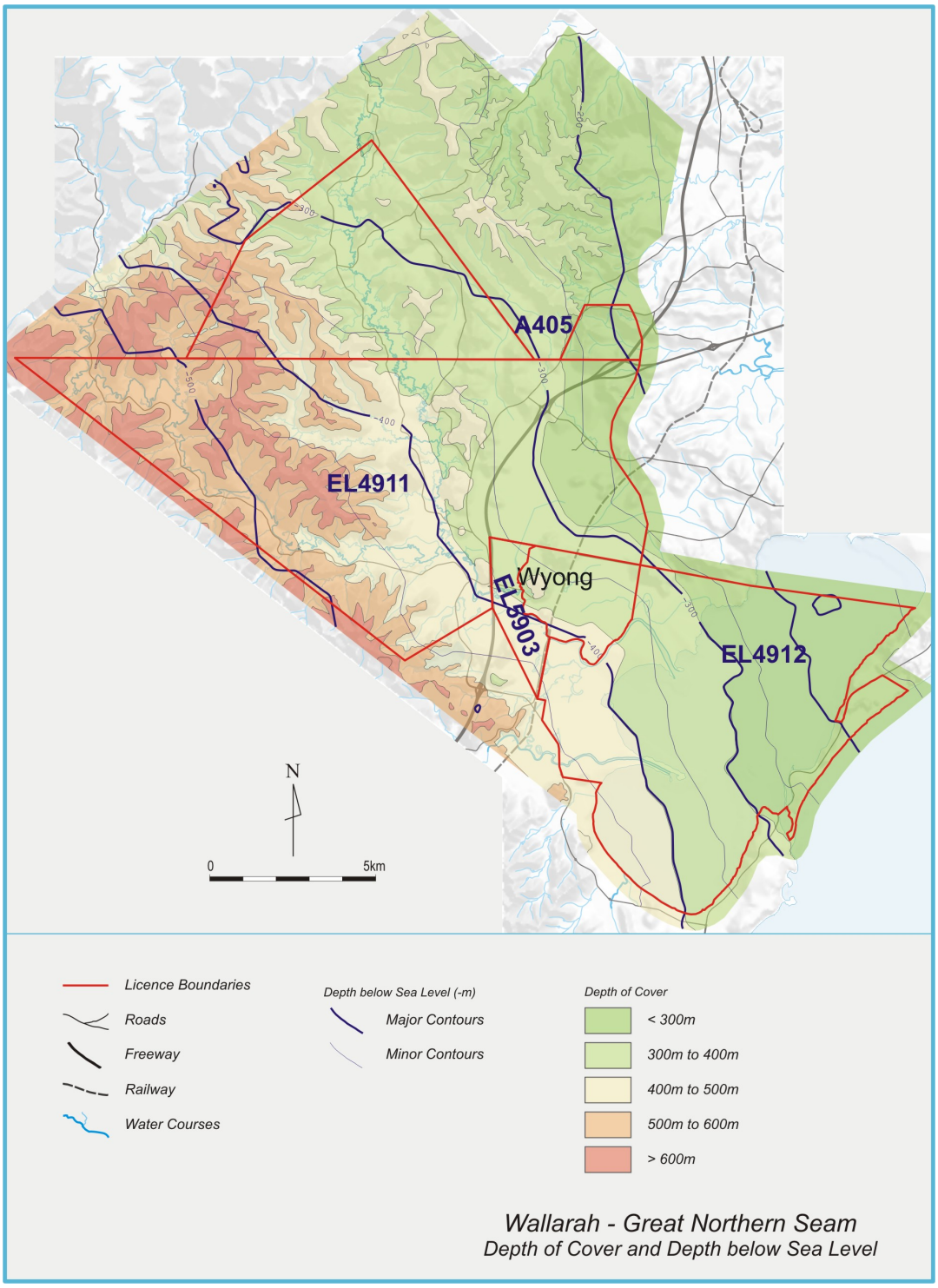

Figure 2.13 Depth to the Target WGN Coal Seams in the WACJV Exploration Areas

A major north-south trending conglomerate filled channel approximately 5 km wide extends along the eastern side of the western area, sub-parallel to the regional synclines. This structure effectively separates the two areas because of the significant loss of coal from the stratigraphic sequence in this vicinity.

Borehole spacing allows resources in the eastern half of the Western Primary Target Area to be classified as *Measured*. Resources in the Western Split Zone can

be classified as *Inferred*. All other resources within the WACJV can be classified as Indicated.

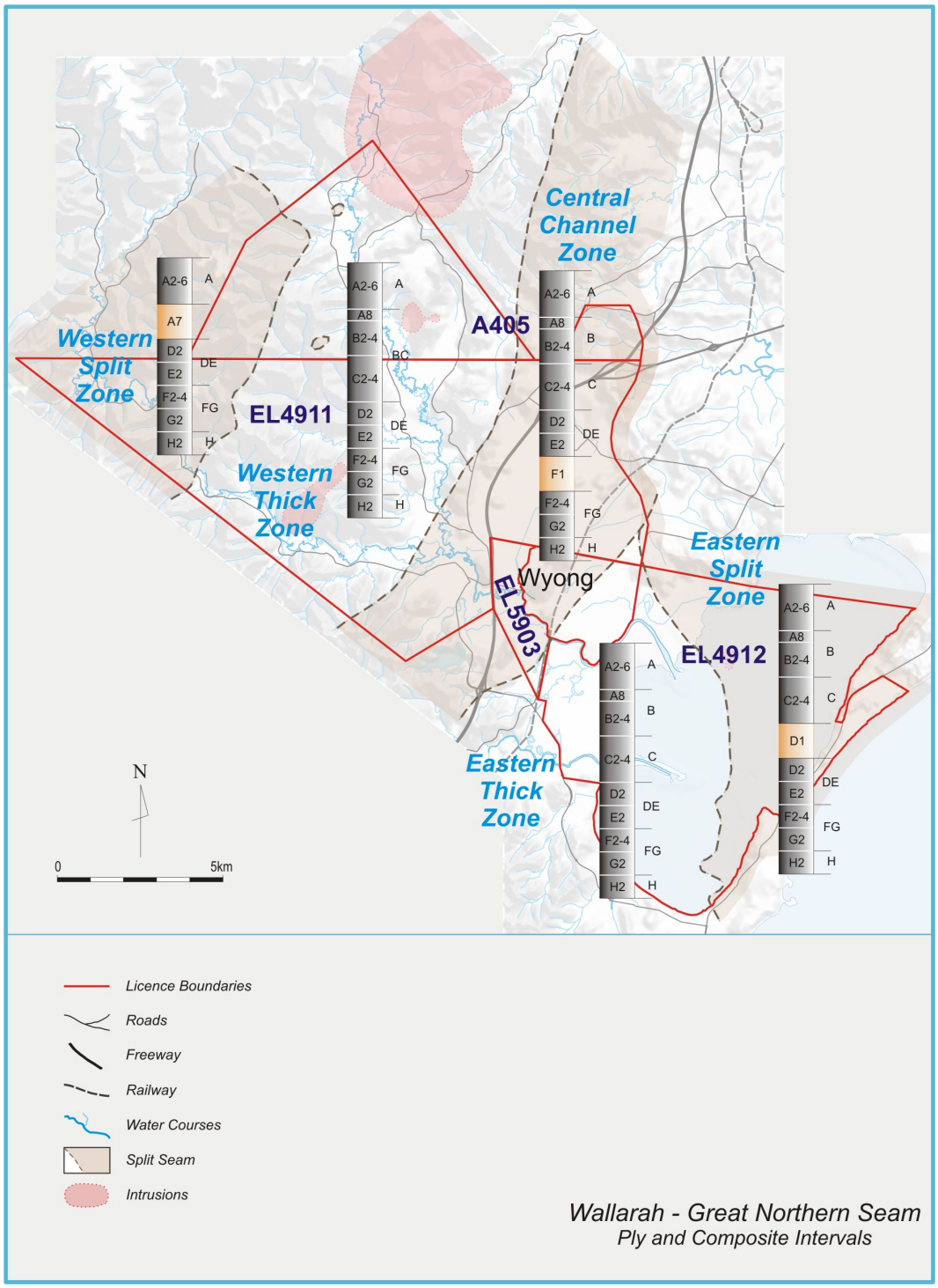

Figure 2.14 Wallarah-Great Northern Seam (WGN) Ply Combinations and Seam Zones

For resource purposes, the area has been subdivided into blocks which are bordered by significant geological structures and geographic and cultural features, as shown Figure 2.15. Table 2.2 summarises the coal resource in the WACJV exploration areas.

Table 2.2 Resource Summary of WACJV Exploration Areas, June 2006

	Tonnage	Raw Ash	Raw Moisture	Raw Specific Energy	Raw Sulphur	Raw VM
		(% ad)	(% ad)	(kcal/kg daf)	(% ad)	(% ad)
Western Lease						
Measured	212,251,347	15.8	1.8	8,085	0.34	27.80
Indicated	468,198,416	18.7	2.0	8,087	0.34	26.90
Inferred	27,416,580	15.8	2.0	8,142	0.31	25.27
Subtotal	707,866,343	17.7	1.9	8,089	0.34	27.11
Eastern Lease						
Measured	232,958,946	14.6	1.8	8,177	0.32	28.68
Indicated	268,978,831	18.5	1.9	8,103	0.32	27.44
Inferred	0					
Subtotal:	501,937,777	16.7	1.9	8,137	0.32	28.01
Grand Total:	***1,209,804,120***	***17.3***	***1.9***	***8,109***	***0.33***	***27.48***

A number of sills, dykes and diatremes have been identified by magnetic surveys and drilling. These features are included in Figure 2.3.

Smithys Sill in the south of the Western Area replaces the WGN Seam but the FAS Seam appears unaffected.

The dominant orientation of identified dykes is north-west, with a secondary orientation west-north-west. This is consistent with dykes reported in existing mines to the north-east. Preliminary interpretations from high resolution ground magnetics indicate that some dykes could be up to 20 m thick. Higher than normal gas contents have been noticed in some boreholes drilled immediately adjacent to dykes. A 900 m wide zone containing multiple dykes traverses the project area and extends from the Mandalong Sill in the north-west to the northern part of Tuggerah Lake, as depicted in the previous Figure 2.3.

2.7.3 Data Acquired by the WACJV Exploration Program

The WACJV exploration project has conducted extensive geological and environmental data gathering programs. Data acquired includes topographic and cadastral survey information, drilling and geological survey techniques, geotechnical, groundwater, coal quality assessment and coal seam gas assessment.

Before drilling commenced the project area was covered by an aeromagnetic survey (refer Figure 2.3). High resolution ground magnetic surveys were then undertaken across anomalous areas particularly where access to properties had been obtained for drilling (see Figure 2.15). A comprehensive set of 2D and 3D seismic surveys was carried out which included areas of the Dooralong Valley floodplains and

Tuggerah Lake. The WACJV drilled 352 boreholes in its exploration areas, involving over 100 private landowners with whom good relations were established and maintained.

Exploration drilling across the WACJV exploration area ranged from the first stage comprising fully cored HQ boreholes drilled on a 2 km square grid through various stages up to the last stage to support mine planning where drilling on a 500 m grid was undertaken over the area of maximum potential. All boreholes were geophysically logged. Geophysical probes run in boreholes included gamma, density, sonic, neutron, induction and dip meter. Televiewer (acoustic scanner) and temperature probes were run in selected boreholes.

A comprehensive, staged geotechnical appraisal was undertaken to provide the required background mine planning information for the assessment of:

- In situ stress and permeability;
- Floor heave and trafficability assessment;
- Roof stability, primary and secondary support design;
- Periodic weighting, wind blast and caving assessment;
- Subsidence;
- Mine pillar sizes required for development and extraction operations;
- Fracturing and caving assessment;
- Subsidence induced deformation and fracturing, including strata fracture separation from, and relationship to, surface aquifers; and
- Potential shaft site issues.

Additional interpretations of acoustic scanner and dipmeter records were undertaken to analyse the orientation of jointing and faulting. The W H Bryan Mining Geology Research Centre at the University of Queensland has undertaken an exhaustive structure modelling project using the probabilistic approach developed in their Australian Coal Association Research Program (ACARP) Project C7025.

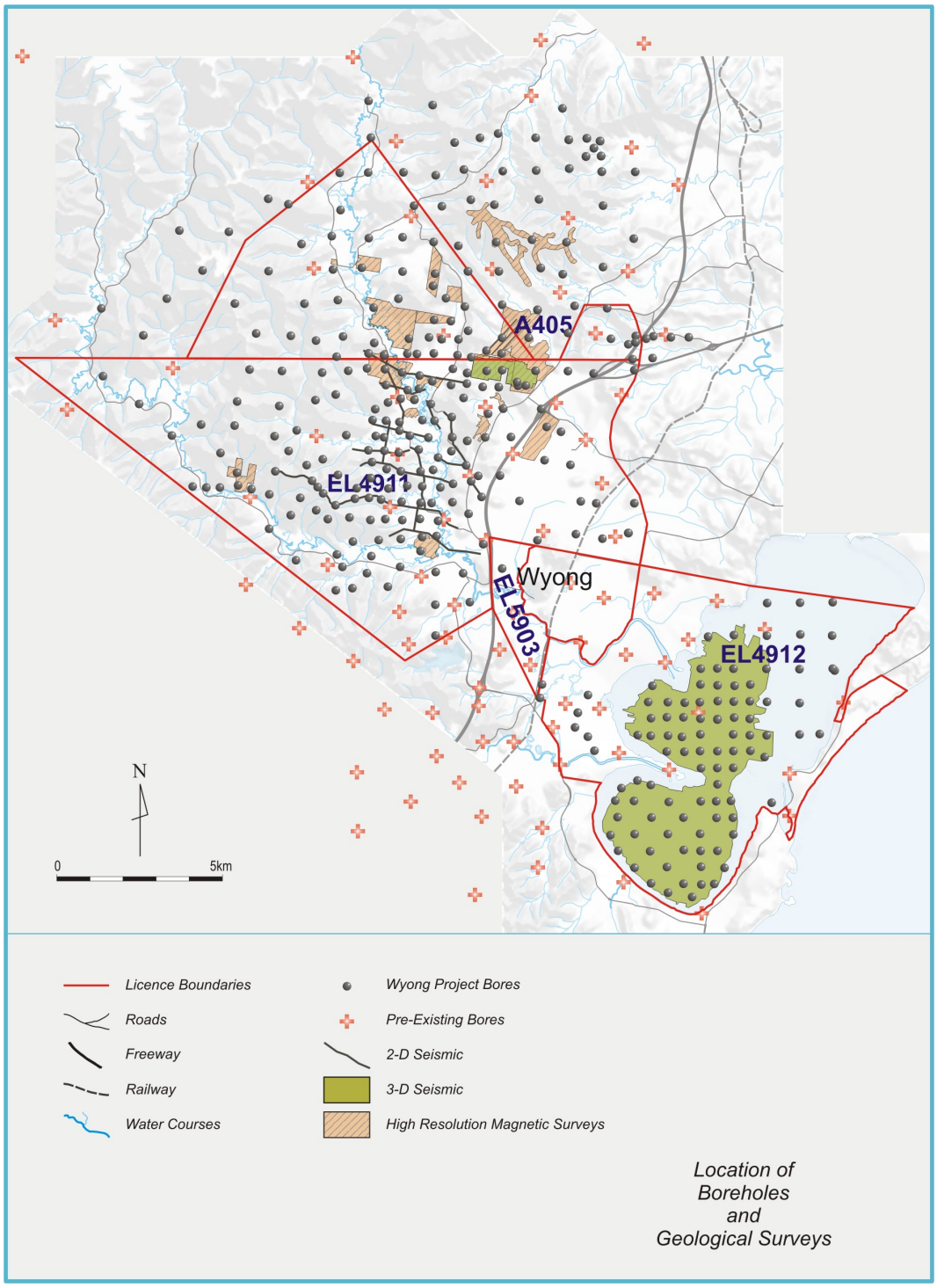

Figure 2.15 Data Acquisition by WACJV Exploration Activity and Others

2.7.4 Seismic Surveys

An in-seam seismic survey was conducted early in the exploration programme to test the effectiveness of installing in-seam geophones. Installations were discontinued because of poor and inconclusive results.

A trial reflection seismic survey along three 1.5 km lines was completed to assess the effectiveness of three different sources. Mini SOSIE gave good resolution with

minimal environmental disturbance. The potential pit bottom area in the proposed mining area resource and initial longwall development area (approximately 2 km x 1 km) were then covered by a 3-D mini SOSIE seismic survey.

A total of 30 km of 2-D mini-SOSIE traverses was completed to form an approximate 1 km grid over the eastern half of the proposed mining target area.

2.7.5 Coal Quality

The target area has been well explored with cored bore holes that have been extensively tested. Thus coal quality can be predicted and modelled with a high degree of confidence. A number of large diameter cores were also drilled to provide detailed sizing and quality information.

The W2CP coal will be an attractive coal to overseas and domestic power station operators and will have the following features:

- Low moisture;
- High energy;
- Low sulphur;
- Medium to high volatile matter;
- Low nitrogen; and
- Benign ash chemistry.

Major advantages of the W2CP coal compared to other coals from the Newcastle and Hunter coalfields are the low moisture, low sulphur and low nitrogen contents.

2.8 Surface Facilities and Infrastructure

The general location of the surface facilities has been chosen following a series of land use planning considerations that encompassed economic, environmental and social factors including advice from local Council. Figure 2.16 gives an indication of the key features near to the Tooheys Road and Buttonderry surface facilities sites which include quarries, waste disposal tip, industrial land, sewage treatment works, freeway, Main Northern Rail line and high voltage transmission lines.

Figure 2.16 Land Uses Surrounding the Surface Facilities Sites

2.8.1 Tooheys Road Site

It is proposed that the Tooheys Road site will provide the main coal processing and handling facilities, coal stockpiling and train loading. The layout of the facilities area, shown on Figure 2.17, is governed by the drift portal entry, boundary constraints to the west and south, and the most suitable location for the access road entry and sedimentation dam.

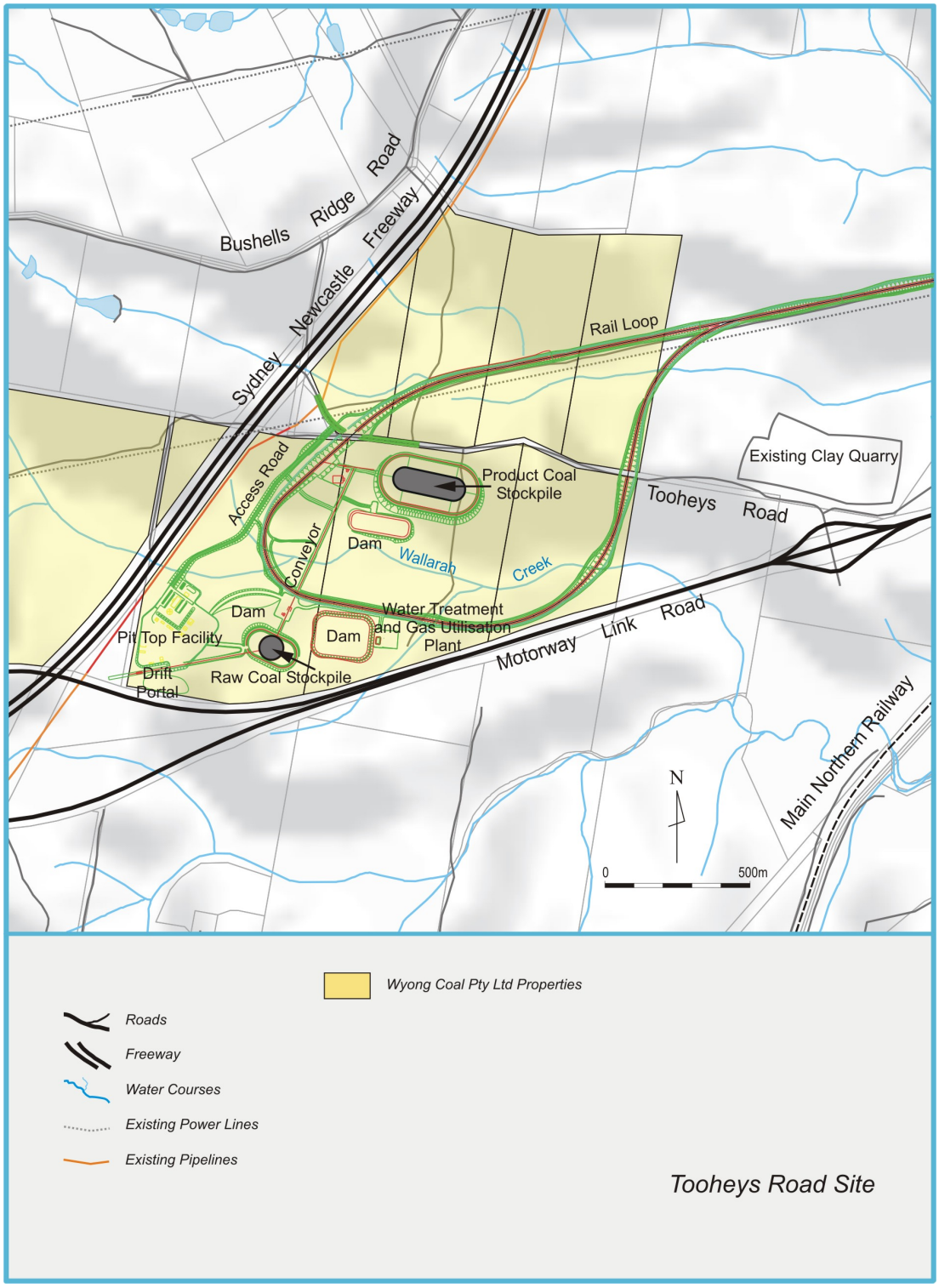

Figure 2.17 Layout of the Tooheys Road Surface Facilities Site

Specifically, the Tooheys Road site will contain:

- Rail spur and loop with coal loader and two rail overbridges along Tooheys Road;
- Office facility, inclusive of minor administration offices, bathrooms, training facilities;
- Coal stockpiles and material handling facilities;
- Site access roads including at least partial relocation of Tooheys Road;
- Mine access drift and portal;
- Gas extraction and treatment plant;
- Car parking facilities;
- Surface workshop, secure store;
- Bulk dry goods store;
- Open yard storage;
- Air compressor installation;
- Vehicle wash down bay, incorporating water treatment plant;
- Fuel, oil and flammable goods storage area;
- Fire fighting water storage tanks and surface fire station;
- Incoming electric power lines, switchyard and transformers;
- Water management and sewage treatment facilities;
- Environmental monitoring station;
- Mine operations pretreatment water storage dam and surface runoff settling ponds; and
- Mine water treatment plant.

The facilities for handling the run of mine (ROM) coal consist of:

- A 4,000 t/h receival system;
- A 50,000 t raw coal surge stockpile;
- A 2,000 t/h raw coal reclaim, crushing and stacking system;
- A 2,000 t/h overhead tripper to stack crushed coal on the 250,000 t product stockpile. Additional emergency stockpile capacity will be achieved using dozer pushout;
- A tunnel reclaim system under the product stockpile using coal valves;
- A 4,500 t/h train loading system including a loading bin of approximately 250 tonnes capacity. Train loading will initially be operated at 3,000 t/h; and
- A balloon loop coming off the main railway line that will be able to hold three of the anticipated 3,400 t trains.

The administration building has been designed as a single storey structure. The building will accommodate a total of 40 personnel although it is anticipated that only 20 staff will be required in an average 24 hour period. The building will comprise a reception area, male and female and disabled amenities, kitchen / meal room, first aid room, conference room, two general meeting rooms, private and open plan office area, goods (consumables) store room and general storage room.

The structure of the administration building will be steel framed, with a brick veneer and a colourbond or equivalent roof, founded on a reinforced concrete ground slab. Internal walls will be plasterboard with a suspended tile ceiling minimum 2,700 mm above floor level. External walls and ceiling space will have thermal and acoustic insulation.

The workshop will be steel framed with 3.6 m colourbond walls, a metal deck roof and a skillion roof extension along one side of the building. The workshop will

feature drive-through bays with roller doors. The workshop floor area will be bunded and drained to a dirty water sump and oily water separator system.

The air compressor house will consist of a concrete ground slab, block wall construction, metal deck roof, all acoustically insulated. An oil containment and separation system will be provided for the compressors.

All storage buildings (flammable goods, bulk dry goods, etc) will consist of a pre-fabricated, steel frame, metal clad structure founded on a concrete slab.

The above details of the proposed development at Tooheys Road are indicative and will be subject to refinement during detail design.

2.8.2 Buttonderry Site

The Buttonderry site at Hue Hue Road is located immediately south of the Council's Buttonderry Waste Management Facility (refer Figure 2.18). It will be the main site for employees for the mine. The Buttonderry surface facility site layout is shown on Figure 2.19 and will consist of:

- ❒ Ventilation and employee / materials access shafts and fan;
- ❒ Main office facility for 40 staff, inclusive of administration offices and training rooms;
- ❒ Bathroom and showers for 140 people, nominally 120 men and 20 women**;**
- ❒ Car parking facilities for 150 cars;
- ❒ Small fuel, oil and hazardous materials storage areas;
- ❒ Fire fighting water storage tanks;
- ❒ Water management and sewage treatment facilities;
- ❒ Emergency services helicopter landing area;
- ❒ Air compressor installation;
- ❒ Environmental monitoring station;
- ❒ Ballast borehole; and
- ❒ Electrical switchyard, hardstand and pollution control facilities.

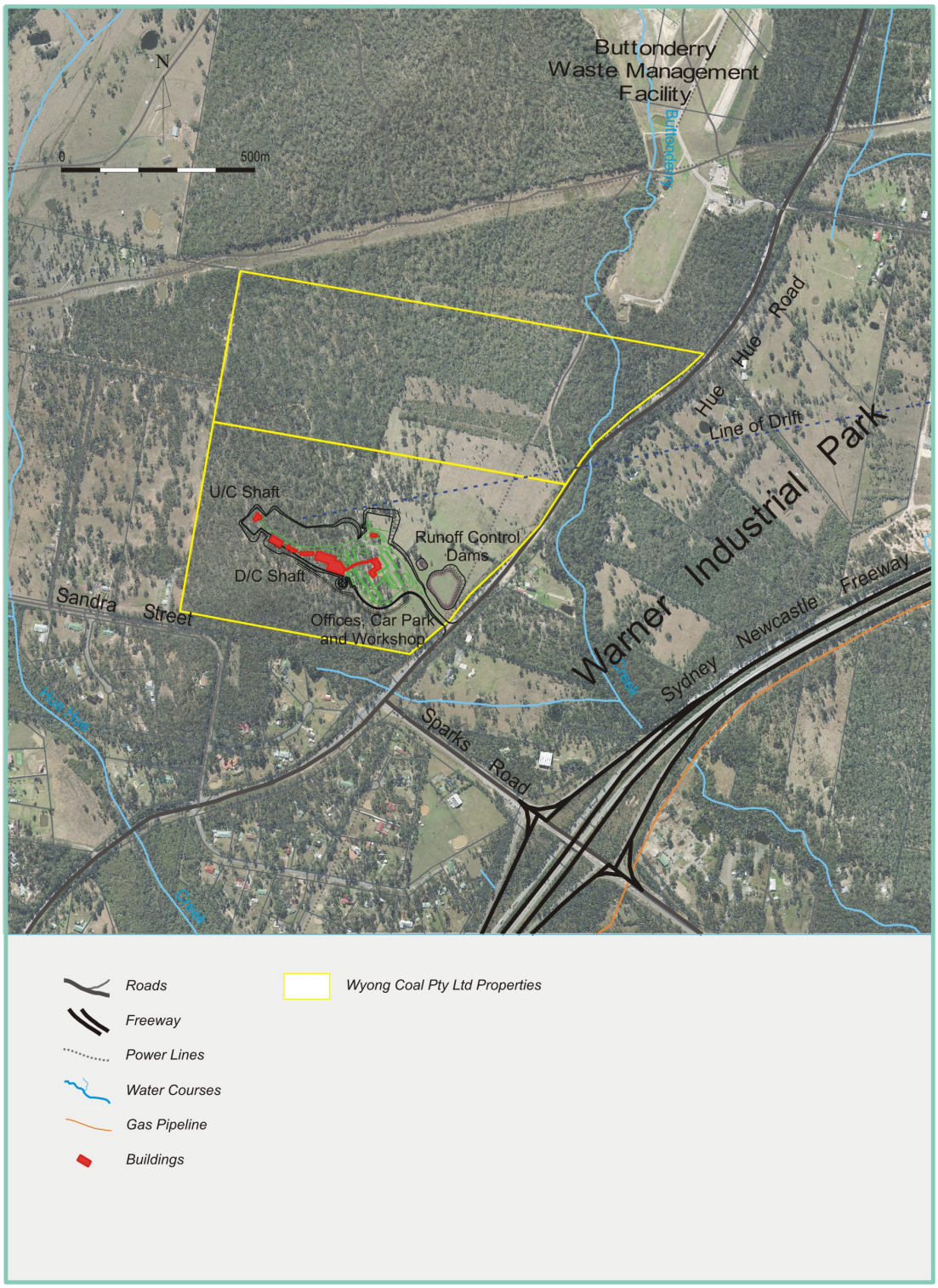

Figure 2.18 Local Setting of the Buttonderry Surface Facility Site

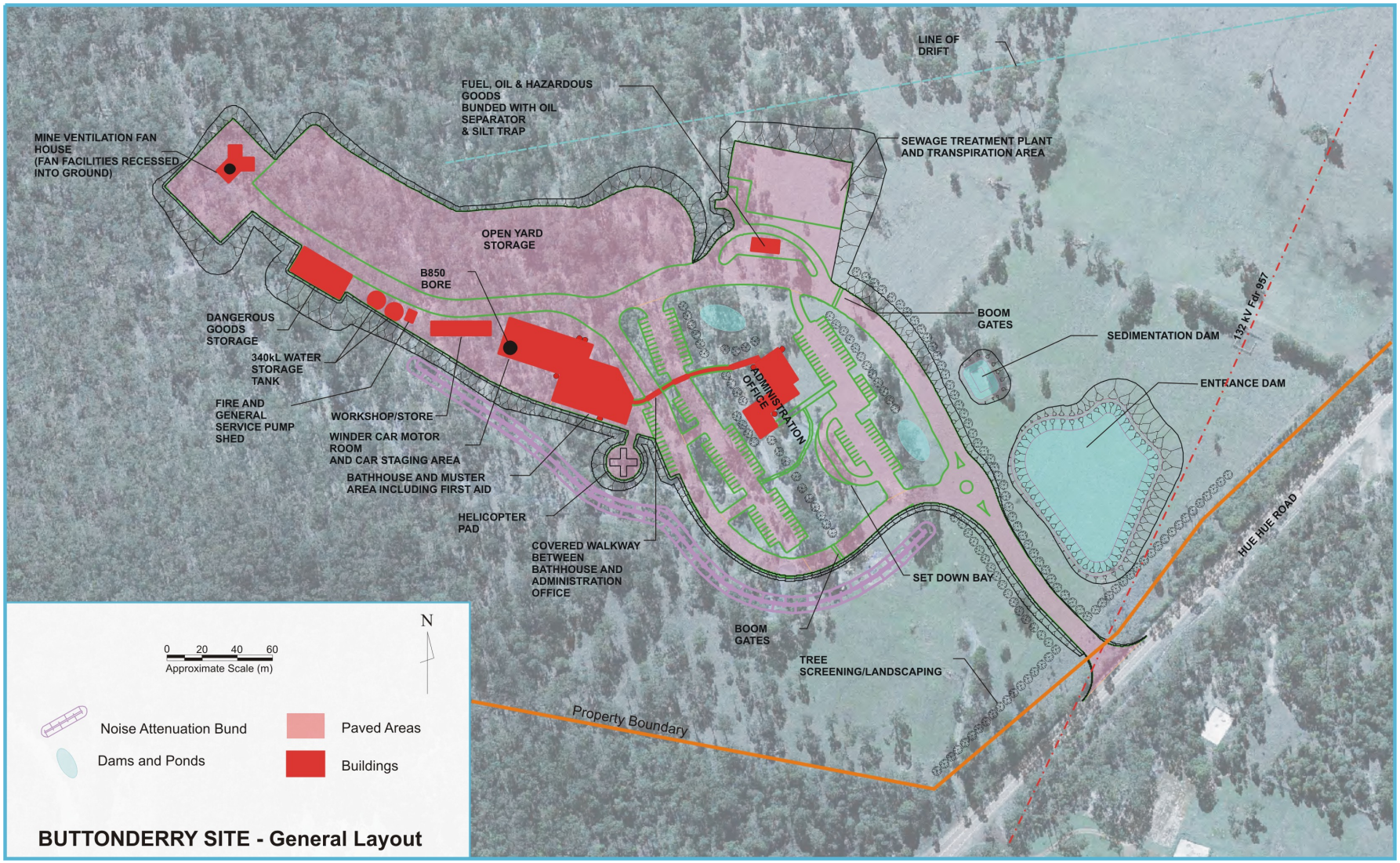

Figure 2.19 General Layout of Buttonderry Surface Facilities Site

The Buttonderry site will be accessed from Hue Hue Road via a sealed internal road. The internal road will have 3.5 m lane widths and 2 m shoulders. The width of the seal will be 9 m. Tree screening and landscaping is proposed either side of the road up to the main administration building and adjoining car park.

The Buttonderry administration building has been designed as a single storey structure with an approximate overall plan dimension of 70 m x 20 m. The building will accommodate a total of up to 40 personnel and include a reception area, male, female and disabled amenities, kitchen/meal room, conference/boardroom, meeting/training rooms, enclosed offices and open plan office area (with workstations), store rooms, and computing and office equipment rooms.

The structure will be steel framed with a brick veneer and a colourbond or equivalent roof, founded on a reinforced concrete ground slab. External walls and ceiling space will have thermal and acoustic insulation.

The bathhouse/muster area will be a single storey building with an approximate plan area of 45 m x 27 m and will comprise clean and dirty change rooms with provision for 300 clean and 300 dirty lockers, separate female clean and dirty change rooms and both male and female toilet facilities. Separate male and female shower facilities for a total of 140 employees at any one time will be provided to cater for expected shift change. Other facilities will include open plan muster area, lamp room, store room, communications room, meeting room, and first aid station

A covered pedestrian way will link the bathhouse to the winder car staging area. The structure will be founded on a suspended concrete floor (with access to plumbing, drainage, air conditioning ducts etc.) and consist of a steel frame with an external pre-finished cladding system. Beneath the colourbond or equivalent roof the external walls and roof space will contain thermal insulation.

The winder car motor room and lift staging area will be housed in an approximately 20 m x 20 m building which will accommodate the winder car motor room, a skillion rooved drive-through vehicle access bay beside the lift car landing area.

The covered bay will serve as a staging area for employees and materials at the lift car landing level. The building will be a standard industrial steel-framed structure with colourbond or similar metal cladding. It will feature a steel-framed floor to lift car motor room at level 1 with store areas at ground level below. Fixed monorail lifting beams to the motor room and staging area (for load/unload materials and equipment) will be installed. Concrete slab floors will be installed at ground level to the staging area and at the ground level of store areas.

The fuel, oil and hazardous goods building will be a steel framed structure with colourbond or equivalent cladding and a metal deck roof. The facility will provide for a 20,000 L above ground storage tank for diesel fuel, appropriately bunded, and a single light vehicle diesel fuel dispensing bowser. The floor area and driveway slab will be bunded and will be drained to a dirty water collection sump. A pump will enable transfer from this sump to the workshop oily water treatment system. A fire and smoke alarm system and foam flooding fire suppression system will be installed.

To provide for on-site storage if required, an explosives magazine will be constructed in accordance with relevant standards. Within an area approximately 30 m x 18 m in size, its construction will likely consist of a 2.5 m high earth bunded

enclosure, with 3m wide light vehicle drive-through road, concrete slab on ground (elevated and drained, 4 m x 2 m) within a bunded enclosure. A 2.4 m high chain wire fence with 3 strand barbed wire top will be installed at the perimeter of the bunded enclosure and lockable vehicle access gates (in - out) will be provided.

The mine ventilation fan house will consist of a 6 m x 6 m shaft cap, with Y branch connected structures each 10 m x 4 m, to accommodate axial flow vent fans, outlet silencers and air flow control dampers. The fans will be housed within an acoustic building to reduce noise emissions.

The cavity block wall structure will be founded on a concrete ground slab. The air tight metal deck roof will include an overpressure relief structure in the design. All entry doors open out via air lock chambers. Acoustic insulation will be installed to the internal walls and roof for noise control.

The above details of the proposed development at Buttonderry are indicative and will be subject to refinement during detail design.

2.8.3 Western Shaft Site

A second (western) shaft site will be required by Mining Year 10 to be located in the Wyong State Forest as shown approximately on Figure 2.20**.**

This future western shaft facility will house a downcast shaft only (that is, air intake into the mine). Only limited facilities will be required at this site, however the site will also serve as a secondary emergency access and egress point. The downcast ventilation shaft is expected to be up to 6 m in diameter and sunk to about 490 m in depth. Electricity supply to the site will be upgraded as necessary or independent diesel power generation supplied.

Three different configurations of the shaft site were considered and assessed to determine the most appropriate design that will have the least impact on the surrounding environment and the community. The design selected represents the most sympathetic alternative.

In order to comply with occupational health and safety legislation, the shaft will be required to be completed as soon as the underground workings are in the vicinity. Therefore construction of the shaft will commence prior to Mining Year 10. To achieve this, the shaft will be blind bored, that is, dug from the surface rather than raise bored where the cuttings fall into the mine workings. Blind boring will involve a weighted full-face bore-head of hemispherical profile, used to drill the shaft from the surface downwards. The head will be equipped with rolling disc-type cutters. The system will operate with a closed loop drilling fluid circulation system. The drilling process will be fully mechanised so that no personnel are required to access the shaft or underground mining operations in the vicinity.

Figure 2.20 Location of Secondary (Western) Shaft in State Forest

This method of shaft construction has been successfully employed in similar projects such as the Springvale Mine, near Lithgow. All excavated soil and rock material (known as spoil) is brought to the surface and the majority of it will be stockpiled and trucked off site in order to reduce the area to be disturbed and manage impacts at this location. Some material will be used for fill in earthworks around the site, however there will be a surplus in the order of 15,000 m^3 requiring off site disposal. The material represents Virgin Excavated Natural Material (VENM) and can be available for use as clean fill for local earthworks or safely disposed of or

productively used as a clean cover or fill material at any licensed landfill or approved quarry.

2.8.4 Stockpiles

Coal stockpiles will only be located at the Tooheys Road site. A small 50,000 t raw coal surge stockpile will be located at the end of the main drift conveyor. This stockpile pad provides additional temporary storage if required.

The main product coal stockpile will have a capacity of 250,000 t product. The coal will be delivered by a 2,000 t/h overhead tripper conveyor which can progressively move to allow consistent stockpile shape and reclaim capacity. Additional emergency stockpile capacity will be achieved using dozer pushout beyond the tripper in the area of the formed coal stockpile pad.

Coal will be reclaimed via three feeders beneath the stockpile located in an underground tunnel. The tunnel reclaim system under the product stockpile will feed a 4,500 t/h train loading system including a loading bin of approximately 250 tonnes.

All coal stockpiles will be equipped with automated wind-activated watering systems for dust control. The sprays will cover the entire stockpile and will be activated when wind speed exceeds a designated trigger level or as required by the Environment Protection Licence.

2.8.5 Rail and Loading Facilities

A rail spur will be constructed from the main railway into the Tooheys Road site. As shown on Figure 2.21, the spur will extend alongside and parallel to the existing 330 kV transmission line easement before entering the site as a balloon loop, passing beneath the coal loader before exiting the site. Trains will operate in a clockwise fashion in order to load in a slight uphill configuration so as to provide continuous tension in the wagons and thus reduce train and wagon noise. The rail siding will have a design speed of 50 kph on the spur and 30 kph on the loop. Earthwork batters of 2:1 (V:H) in fill and 1.5:1 (V:H) in cut have been designed to ensure bank stability.

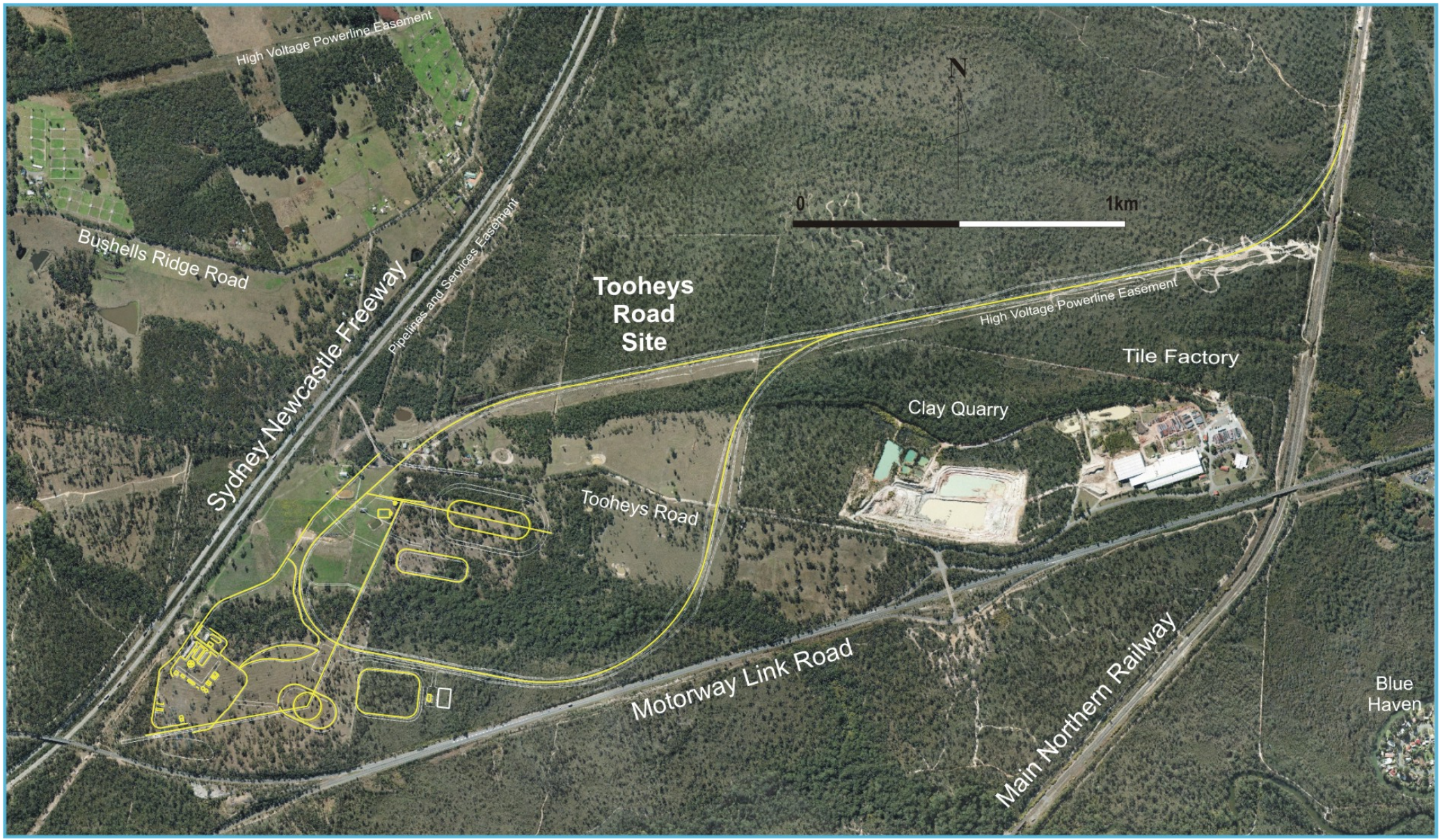

Figure 2.21 Tooheys Road Surface Facilities

Total track length will be approximately 6 km with the tightest radii on the balloon loop being 200 m. The gradient will be 1 in 100 compensated for curvature. The siding will meet Class 1 specifications allowing for 25 tonne axle loads in keeping with the main line specification.

The rail spur, balloon loop and coal loading system has been designed to cater for trains up to 1,325 m long with a maximum train capacity of 5,200 tonnes in keeping with State Rail Authority expectations regarding the future capacity of the main rail line. As longer trains are brought into the network, the number of train movements will decrease accordingly.

A 4 m wide vehicle access track at existing ground level on one side of the proposed rail alignment will be constructed for maintenance and inspections. The vehicle track will include a number of access points constructed up or down to the designed track level which will be accessible by inspection vehicles throughout the length of the proposed rail facility.

The Tooheys Road site is suitably located within an industrial land zone which has also been identified as a future employment zone. The provision of a rail line within this area has been identified by Wyong Shire Council as providing potential benefits to the future industrial area. Council requested that the future use of this line by other industries be considered. Although no commitment can be made at this stage, W2CP will welcome discussions with other potential industries and, if possible, access to the rail line will be provided.

2.8.6 Rail Transport

The rail link between Wyong and Newcastle (Figure 2.22) forms part of the Main Northern Rail Line between Sydney and the Queensland border. The NSW rail system is separated into three networks; the Sydney Metropolitan Network which is owned and managed by Rail Corporation NSW (RailCorp); leased network owned by the NSW State owned Rail Infrastructure Corporation (RIC) but leased and managed by Australian Rail Track Corporation (ARTC) and the Country Regional Network which is owned by RIC and managed by ARTC.

The rail line from the site to the Port of Newcastle is managed by RailCorp to Newcastle (Broadmeadow) and then ARTC for the section into the Port. The main line to Newcastle is mainly used for passenger and freight trains with minor coal train movements from Teralba and Newstan to the Port of Newcastle and domestic coal from the Hunter Valley to Eraring and Vales Point Power Stations. Teralba and Newstan export about 2.2 Mtpa, while Vales Point and Eraring receive about 2 Mtpa of domestic coal by rail.

The Wyong and Newcastle rail link has two tracks consisting of a mix of 53 and 60 kilogram rail, timber rail sleepers, three short passing loops, maximum gradients of 1:40, and maximum axle loads are 25 tonnes. RailCorp rates the condition of the rail link as fair to good and there is an ongoing program of upgrading works.

The rail distance from Wyong to the Port of Newcastle is approximately 70 km, while the distance from the Tooheys Road site is about 60 km (Figure 2.22). Vales Point is about 8 km from Tooheys Road, while Eraring is about 20 km.

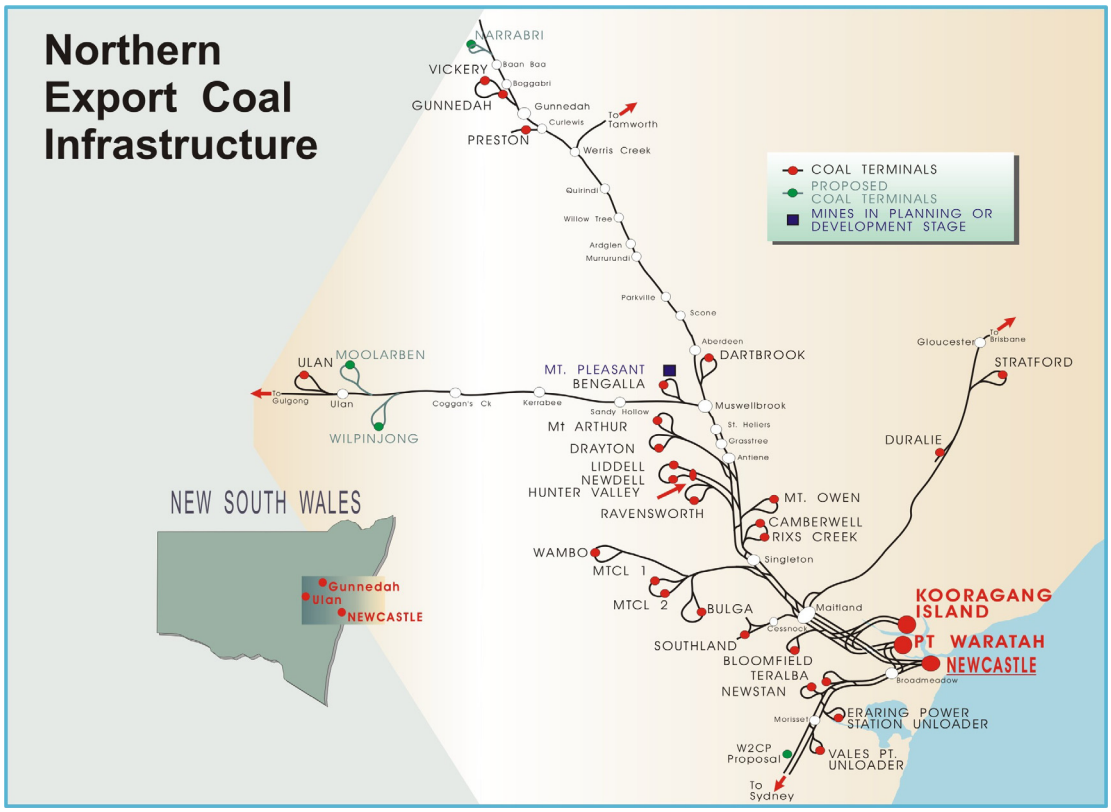

Figure 2.22 Northern Export Coal Infrastructure

Due to the nature of the rail link there is a restriction on the size of export coal trains that can operate between Tooheys Road and Newcastle. Unit trains would be restricted to 3,400 tonnes, require four 3,000 horse power, class 80 locomotives and wagons would be restricted to 100 tonnes gross (25 tonne axle load). Thus rail wagons would need to be either 100 tonne gross, carrying 75 tonnes of coal or a standard 120 tonne gross wagon could only be filled with 75 tonnes of coal rather than 95 tonnes. At peak production, this equates to an average of 5 to 6 trains per 24 hour period.

RailCorp indicates that the existing Wyong-Newcastle rail link has sufficient capacity and available train paths to transport up to 13 Mtpa of Wyong coal based on 320 days per year operation, 3,400 tonne trains at 80% utilisation (Table 2.3, Table 2.4, and Table 2.5).

Table 2.3 Newcastle Port to Wyong Rail System Features

Corridor length	61.8 kilometres (101.1 km to 162.9 km)
Number of tracks	2
Crossing loops	3 for coal trains
Maximum axle load	25 tonnes
Maximum train length	1,500 metres
Rail type	53/60 kilograms
Sleeper type	Timber
Number of tunnels	1
Maximum gradient in loaded direction	1:40 at Fassifern
Signalling system	Double Line Automatic

Table 2.4 Newcastle Port to Wyong Operating Parameters

Direction		Coal	Non Coal Freight	Passenger
Down	Paths available	17	20	55
	Running time	60 minutes	60 minutes	55 minutes
	Maximum speed	80 kph	115 kph	115 kph
Up	Paths available	17	20	55
	Running time	70 minutes	60 minutes	55 minutes
	Maximum speed	80 kph	115 kph	115 kph

Table 2.5 Newcastle Port to Wyong Corridor Capacity

	1999/2000	2004/2005	2009/2010
Corridor Coal Tonnes	3.3 Mt	8.0 Mt	11.0 Mt
Time tabled paths	17	17	17
Practical capacity	17	17	17
Peak demand	11	12	16

Although the majority of coal will be delivered to Newcastle for export, domestic sales are expected from time to time in the first 10 years of mining and progressively increasing past year 20 of extraction. Domestic coal trains delivering coal to Vales Point and Eraring Power Stations would also be restricted in size to 3,200 tonnes and four locomotives due to the track condition and the restricted size of the balloon loop and unloading facilities at each power station.

The final arrangements would be determined prior to the delivery of any domestic coal. Signalling changes may be required and will be determined in consultation with RIC.

2.8.7 Waste Products

Given the quality of the coal resource and the close attention paid to mine planning, the W2CP is targeting a policy of zero coal rejects. This is made possible by the proposal to minimally process the raw coal and thus a major coal washery is not proposed as part of the project. By avoiding the need to have a washery, the production of coarse (stony rejects) or fine (silty tailings) waste materials will not be produced. This in turn will remove the need for coal reject disposal facilities such as tailings dams or reject emplacements as well as significantly reducing the project's water consumption.

However, a small amount of rock that is separated from the run-of-mine (ROM) coal supply prior to the coal handling plant (CHP) will need to be appropriately managed. This inert material (VENM) will be available for landscaping or bunding construction on site but is mainly expected to be transported to a nearby approved facility.

This rock will be predominantly slabby rock pieces excavated during coal mining but which will be crushed and separated during the coal handling process and collected in a dedicated storage bin. Trucks will transport the stone to the Buttonderry Waste Management facility or similar approved facility on an "as needs" basis. Typically, this will involve around one truck load per day.

Clean excavated waste rock will also be created during the construction of the drift and shafts. This amounts to approximately 156,000 m^3 for the Tooheys Road site

and approximately 20,000 m^3 for the Buttonderry site. These figures assume a 25% swell factor for the recompacted material. It is intended to use this material for the creation of perimeter bunding and landscaping features on the two sites. For the Buttonderry site in particular, there will then be no requirement to import fill material to fill the shafts at the completion of mining, as the material could be reclaimed from the bunding.

Cut and fill requirements of the railway construction will be subject to detailed design but will likely to be balanced.

Brine

The underground mine will generate groundwater at a rate ranging from less than 0.1 ML/day at commencement of panel extraction, to a predicted maximum sustained rate of about 2.5 ML/day. It is expected that this groundwater will range in salinity from 1,800 mg/L to over 9,000 mg/L, and will be used for raw water supply to the mine including surface dust suppression. The remainder will be treated to reduce the salinity levels so it is suitable for re-use in the underground mining equipment, or offsite discharge. This water will be treated with a Reverse Osmosis (RO) Plant, as discussed in Section 2.12.3.

The RO plant will be capable of around 80% recovery, that is, 80% of the water will be considered non-saline and suitable for re-use, and the remaining 20% will be brine. Therefore there will be initially 0.02 ML/day per day of brine with a maximum of 0.5 ML/day of brine. The brine will be initially regarded as a waste product and will be pumped back into the underground workings within extracted sections behind the longwall. However, following the initial years of the project it is proposed to investigate the potential for further processing and possible commercial recovery of the dissolved salts or other beneficial uses.

The volume of brine to be pumped back into the mined workings is a small portion of the volume of treated water to be pumped back underground for use in mine equipment. The brine will be separated from the working area and allowed to seep through the goaf where there is sufficient void space and surface area to contain the material. The return water will be a mixture of new infiltration water and treated water used by the mining equipment. The salinity content of the return water is expected to remain within the range of groundwater inflow or less.

2.8.8 Roads and Access

The Buttonderry site will be accessed directly off Hue Hue Road. Employees will generally travel along the F3 Freeway taking the Sparks Road exit before turning right into Hue Hue Road and then making a left turn into the Buttonderry site. A left turn bay and right turn lane will be provided at the site intersection.

The internal Buttonderry site access road will have 3.5 m lane widths and 2 m wide shoulders. The width of the seal will be 9 m. Tree screening and landscaping is proposed either side of the road up to the main administration building and adjoining car park.

At the Tooheys Road site, the existing unsealed Tooheys Road will be slightly realigned but upgraded as the primary access to this site. Tooheys Road joins the Motorway Link Road via an overpass.

Tooheys Road will be upgraded to a sealed road with a statutory speed limit of 60 km/h. The road will be designed for 70 km/hr with 3.5 m lane widths and 2 m shoulders. The sealed width will be at least 8 m.

Rail overbridges will be required where the road crosses the rail loop at two locations. Horizontal realignment of the road will be required at the western end to allow the mine access road to be constructed with safe intersection distances. The realignment will involve the construction of a 175 m radius curve to satisfy standards for a design speed of 70 km/h.

The majority of the proposed road realignment will be in cut. Vertical realignment of the road will be required to provide adequate clearance for trains where the road crosses the rail loop at the eastern end.

The internal access road into the Tooheys Road site has been designed to provide safe sight distances at the intersection with Tooheys Road, avoid as much as possible remnant vegetation areas along Wallarah Creek and allow access to the facilities area with minimal interference with coal handling or water management infrastructure. The road has been kept to the east of the telecommunications cable, Hunter water supply pipeline and other services in the existing easement which runs parallel to the F3 freeway (refer to Figure 2.16). It has been designed as a sealed road with a speed of 60 km/h, 3.5 m lane width with 2 m wide shoulders. The sealed width will be at least 8 m wide.

The proposed route of the internal access road will be mainly on grade however it will rise up across Wallarah Creek to enable efficient sizing of culverts through the creek and to intersect the facilities area at a level grade.

Once completed, the new Tooheys Road may then be available for public use, however the road will need to be temporarily closed during the construction period.

2.8.9 Fuels and Chemicals

Diesel and oil storage facilities will be provided at both the Buttonderry and Tooheys Road sites. Each site will house a bunded above ground tank with the capacity of the bund being a minimum of 120 % of the contained fuel. Each site will be expected to contain 20,000 litres of diesel storage and these facilities will be designed, constructed and operated in accordance with the DECC's *Storing and Handling Liquids: Environmental Protection.*

2.8.10 Power

High voltage electricity is available at the Buttonderry site which will also be utilised for the Tooheys Road site. Other services such as telecommunications will be brought onto the site as required. These services will provide an excellent basis for future industrial development within the surrounding employment precinct.

A 132 kV/11 kV switchyard substation will supply power to the mine access, surface facilities and underground works at the Buttonderry site. The 132 kV supply will be provided by Energy Australia from its 132 kV feeder 957, near Hue Hue Road, with a loop feeder through the switchyard substation. This loop feeder will be approximately 400 m in length (one way).

As part of the project, power supply for the coal handling plant surface infrastructure at Tooheys Road will be provided via a separate 11 kV feeder to be run from the Buttonderry switchyard substation. The new feeder line to be installed by W2CP will be a combination of overhead transmission line and underground cable and will utilise existing service easements including roads (such as Hue Hue Road corridor)

and power lines as well as, to the extent practicable, land owned by the WACJV (refer Figure 1.4).

2.8.11 Monitoring, Exploration and Ancillary Activities

The project will require ongoing activities to support the mining operation. The following activities will be required from time to time within the underground mining area and surface facilities sites and will be conducted on company owned land, Wyong State Forest, Jilliby State Conservation Area and, with agreement, privately owned land:

- ❒ Exploration involving surface to seam drilling, seismic surveys and remote sensing;
- ❒ Piezometer installation and ongoing collection of data;
- ❒ Collection of noise, dust and water samples;
- ❒ Collection of atmospheric data;
- ❒ Construction and maintenance of access tracks;
- ❒ Erosion and sedimentation controls;
- ❒ Subsidence monitoring including installation of survey pegs and control points;
- ❒ Survey controls including lease pegging and mapping;
- ❒ Inspections and recording of surface features and land improvements;
- ❒ Weed removal and riparian planting;
- ❒ Feral animal controls; and
- ❒ Security patrols and fencing.

Any land disturbed by activities associated with the mining operation will be rehabilitated and reinstated.

2.9 Coal Processing

The coal will undergo minimal processing. There will be no traditional coal preparation plant or washery. The coal will be sized by a crusher and screened in a facility known as a coal handling plant (CHP). Depending on the presence of minor faulting with the seam or other geological conditions that may be encountered, there may be the need for deshaling to remove non-coal material. Deshaling involves dry screening to remove harder non-coal material rather than a wet process.

The processing will not produce tailings and no tailings dams will be required. Some waste rock may be produced which will be trucked off site for disposal and a licensed facility. Approximately one truck load per day is envisaged.

2.10 Products and Markets

W2CP coal will be sold to both export and domestic markets. In the first 10 years of mining it is anticipated that the majority of coal will be sold on the export market.

2.11 Gas Extraction and Utilisation

Work on the gas content and extraction has been undertaken by GeoGAS Pty Limited since 1997. A total of 105 gas content samples were used in the assessment and included all coal seams within the proposed mining area.

The work has confirmed that the gas content is generally restricted to the coal seam and consists of greater than 95% methane at an in-seam content ranging from 6.0 to 8.9 m^3/t. To assist mine planning and ventilation studies, the gas content relationship was used to develop a three dimensional gas content model. This model extended from 30 m above the coal seam known as the potential working section (includes all overlying coal) to 70 m below the potential working section.

Calculations for this model utilised all existing quality and structural information, using model estimates where possible and default values for deeper unnamed and un-modelled seams. The final model takes into account coal left in the roof and floor above and below the working section.

Mine planning and scheduling have taken account of gas drainage methods that propose both pre-mining and post-mining operations. Pre-mining gas drainage will include drilling of boreholes underground within the coal seam ahead of mining and post-mining gas drainage will involve the capture of gas from sealed mining areas via underground pipelines.

Collected gas will be brought to the surface at the Tooheys Road site for processing as shown on Figure 2.23. In the initial years of operation it is unlikely that sufficient quantities of gas will be produced to allow commercialisation of the resource. The collected gas will be flared during this time. Flaring will occur as early as practicable during this interim period and will provide a major greenhouse emissions reduction.

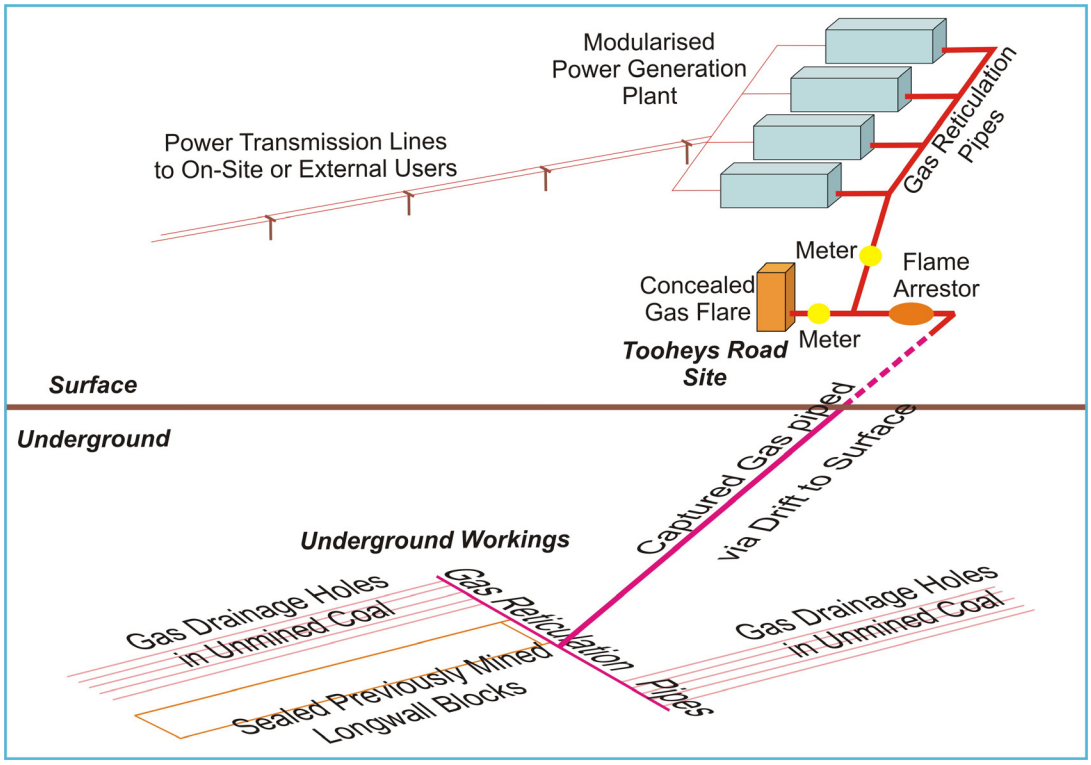

Figure 2.23 General Gas Drainage and Management Arrangements

As the underground extraction area expands, commercial opportunities will be available for gas management and utilisation. One possible option is to pipe the gas directly to a local gas-fired power station which is to be fed by a dedicated pipeline located in close proximity to the Tooheys Road site.

Other options under consideration include supply to local gas distribution, fuel supply to a nearby coal-fired power station for use as an alternative or adjunct fuel, and the potential to install small-scale on-site electricity generation. The nearby Buttonderry waste disposal facility owned by Wyong Shire Council is proposing to try to significantly reduce its greenhouse emissions by implementing landfill gas management measures. W2CP has liaised with Council in relation to the general relationship of the respective gas management intentions. W2CP will continue to evaluate the viability of co-ordinated gas management and usage opportunities with Council and other stakeholders.

2.12 Water Management and Water Pollution Control

Water management entails a number of separate though interrelated components. These are:

- Water produced from the underground workings;
- Water demand for underground operations, coal processing, dust suppression and potable usage;
- Water treatment, particularly water from the coal seam;
- Pollution controls and drainage to ensure that stormwater runoff is contained and treated prior to release or reuse; and
- Overall site water balance and determination of periods of deficit and excess.

These aspects are discussed in the following sections. However, the final design and operation of the water management system will be influenced by, among other things, the availability of the mine to be serviced from and integrated with the regional potable water supply system and the regional sewerage system.

2.12.1 Water Produced from the Mine

Water which may be encountered by underground workings will be pumped from the mine for treatment. The water produced from the mine will be derived primarily from the coal seam as well as recycled water returned underground for supplying water needs for the underground mining process. Water ingress into the workings has been modelled based on the groundwater modelling of both inseam water and water above the seam. Water ingress is predicted to be less than 0.1 ML/day at commencement of panel extraction, with an increase to a predicted maximum sustained rate of approximately 2.5 ML/day as the mine progresses. This seepage range may be enhanced from time to time by potential dewatering of any unidentified fracture related storage at depth. This may lead to short term increases of around 0.5 ML/day, which should dissipate over a period of months.

Studies have demonstrated that surface water from streamflows and perched alluvial aquifers will have only a negligible likelihood of entering the mine workings. Similarly negligible will be the risk of mining causing any significant flow impacts due to effects of subsidence. This issue is further discussed in Section 7.5.1 and has been acknowledged in the expert panel report from the *Strategic Inquiry into Impacts of Potential Underground Coal Mining in the Wyong Local Government Area* released in December 2008. The type of geological sequence present in the area allows full coal extraction under water bodies such as the ocean or lake with negligible or nil water contributions from surface water systems and without the risk of inundation of the mine workings.

The collected water from the mine, which will include water already recycled, will require treatment prior to further onsite reuse, discharge, or being directed offsite for

most reuse options. The proposed treatment system at this stage will probably involve a reverse osmosis process capable of producing potable water for reuse on site with the potential for providing other beneficial uses such as supply to the Gosford Wyong Water Supply Scheme or, with less treatment, as non-potable contribution for industrial uses. However, the final water management and treatment options will depend on further negotiation with water stakeholders up to the actual design stage. Further discussion of the water treatment plant is provided in Section 2.13.3.

Of the entire W2CP operations and facilities, the underground mine operations are expected to use 1 ML/day. In the early years of the mine, based on average climatic conditions, there will be a water deficit but a surplus will occur in later years.

Water collected from the underground mine will be transported by a system of sumps and pipelines to storages. To pump water from the base of the drift to the Tooheys Road surface facilities, the system will have a total static head of around 350 m.

2.12.2 Mine Operations Waste Water Dam – Tooheys Road Site

Water from the mine will be directed to the mine operations dam which has been sized to accommodate up to two months supply and storage requirements for the overall mine operations, i.e. 120 ML. The water supply for dust suppression of the raw coal stockpile will be supplied from the runoff-fed portal dam and, if required, via the main mine waste water dam (mine operations dam). The product coal stockpile, contained within the controlled drainage area inside the rail loop, will be serviced by a smaller dam (stockpile dam) which will be supplied by local runoff and the mine operations dam.

Water for fire fighting will be supplied from the mine operations dam. A pipeline from the dam to the base of the drift will be installed. A pump with a backup diesel generator will be provided at the dam.

2.12.3 Tooheys Road Reverse Osmosis Plant

The groundwater encountered by the mine workings will range in salinity from 1,800 to 9,000 mg/L total dissolved solids, and will be treated at a desalination plant utilising the technique of reverse osmosis. A reverse osmosis (RO) plant will be capable of removing the high levels of total dissolved solids (TDS). The process involves the passing of the flow through a membrane under high pressure which will produce a brine that will be much higher in salt concentration than the feed water and a filtrate (treated water for re-use) which will be much lower in salt concentration.

The RO plant will be supplied as a containerised unit (packed in a standard shipping container). For the ultimate volume predicted to be produced by the mine it is possible that up to three units in total each capable of processing 1 ML/day will eventually be required.

The filtrate produced from the RO plant will be used first to satisfy the mine's operational water demand. The remainder of the treated water will be surplus water that could be available to supply other industries, directed to the Gosford Wyong Water Supply Scheme or released for environmental flows within surrounding creeks.

The initial mine water make of approximately 0.1 ML/day will result in very small treatment throughput in the RO plant. Consequently, initial brine quantities will be produced from a little as 0.02 ML/day. It is proposed that this brine water will be returned to the previously extracted the underground workings, referred to as goaf.

The brine water returned underground will represent a minor proportion (less than 20%) of the water pumped from the mine daily as part of normal water mine water management arrangements. That is, there remains a continued net export of water from the mine rather than any build-up of water in the mine. As all of the salinity in the brine material is sourced from the underground saline groundwaters intercepted during mining, there will be an approximate steady state salinity load maintained in the regional hardrock groundwaters.

Subject to further evaluation of gas management options, it will be possible to generate electricity using the gas from the mine to power the RO Plant (estimated at 56 kW per unit). Water from the mine operations dam will be pumped to a disc screen and then through a micro filtration membrane before going through the RO process to allow for the efficient operation of the plant.

2.12.4 Tooheys Road Site Water Pollution Control System

The surface water pollution control system for the Tooheys Road site has been designed to cater for the 1 in 100 year, 72 hour storm event, and is shown on Figure 2.24. Contained water will be used preferentially on site for dust suppression and other raw water uses.

The Tooheys Road site comprises cleared and partially cleared rural land and, like the F3 Freeway, Motorway Link Road and clay quarry, it is situated within the catchment of the Wallarah Creek. The main creek channel passes through the southern extent of the site, and a tributary of the main channel flows through the north of the site, a part of which is identified as a wetland. An additional unnamed creek is present in the north-eastern extremity of the site, in the vicinity of the proposed rail spur to the Main North Line.

The administration buildings and facilities, raw and product coal stockpiles, mine access roads and the southern section of the rail loop lie within the controlled drainage area of the site that are located within the catchment of Wallarah Creek. The 1% AEP (100 year ARI) flood extent of this channel has been determined as part of project investigations. All site facilities including finished surface levels for the rail loop and access roads are located above the 1% AEP (100 year ARI) flood level of the Wallarah Creek. All sedimentation dams and sediment traps will be inspected, maintained as required (such as collected sediment being frequently cleaned out) to ensure ongoing functional operation.

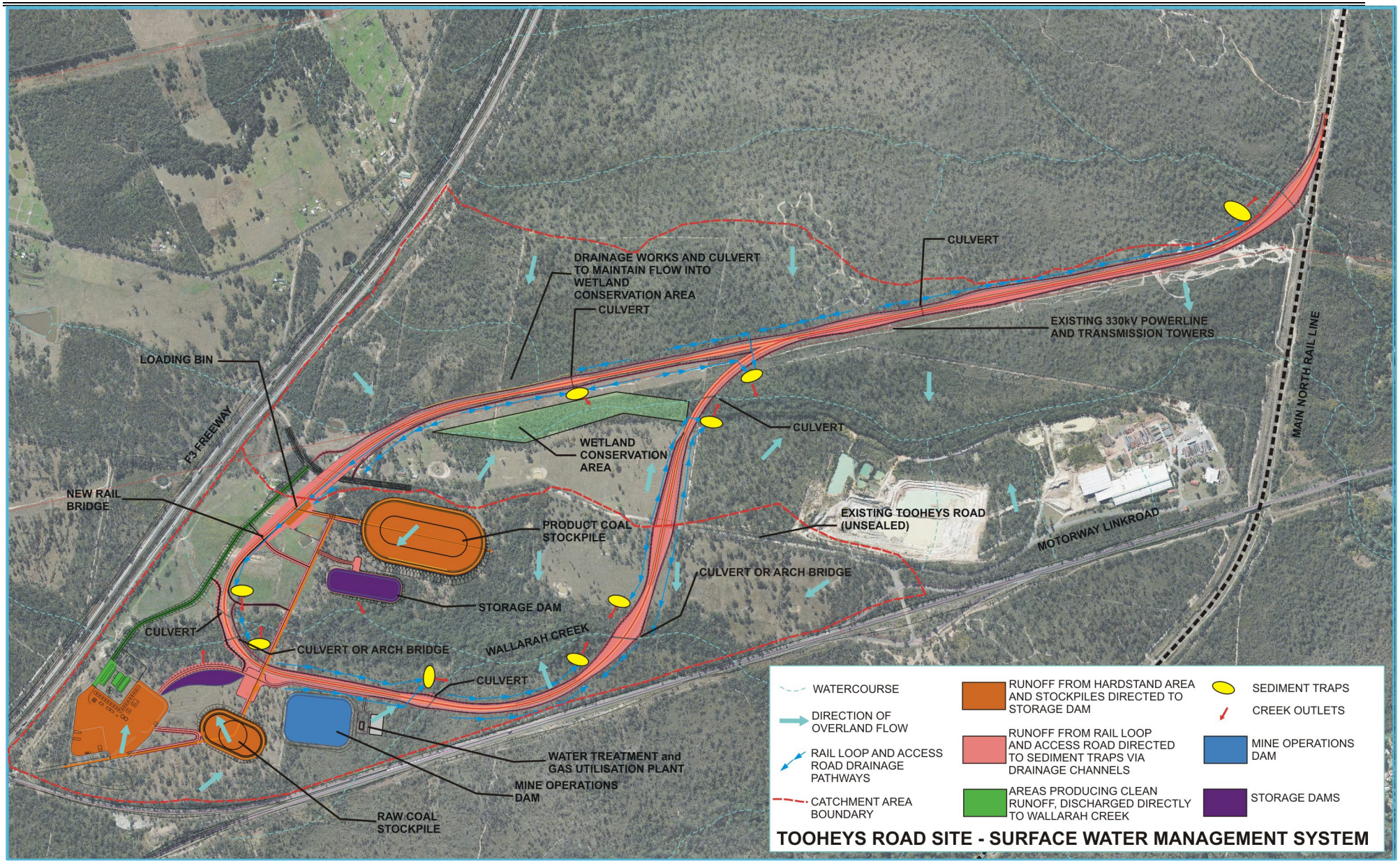

Figure 2.24 Tooheys Road Site Surface Water Management System

Administration Buildings and Facilities Area

The administration buildings and facilities area are situated in the south-western corner of the site, immediately to the south of Wallarah Creek and just north-east of the F3 Freeway intersection with the Motorway Link Road. The facilities comprise an unsealed all weather hardstand area, workshops, fuel store, and administration buildings and associated car parking.

Surface water runoff from the unsealed hardstand area will drain to channels located along its easterly edge. Sediment laden runoff from this area will flow to a sedimentation dam (named the portal dam) immediately to the east of the administration area. This portal dam will also receive runoff from the raw coal stockpile to its south, and local unsealed access tracks linking the facilities area hardstand and raw coal stockpile. The dam will be designed to store runoff from a 1 in 100 year, 72 hour storm event without overtopping. Clean settled water from the dam will be used for onsite purposes or, if suitable, discharged into Wallarah Creek to the north subject to licence conditions.

Runoff from the car parking area is considered clean and free of large sediment loads and will be discharged directly to Wallarah Creek via channel drains and sediment traps. Runoff from the vehicle wash bay will be captured at source and recycled within a water treatment system for reuse within the vehicle wash. Roof water runoff from the administration and bathhouse buildings shall be collected in storage tanks for reuse within the buildings or other parts of the operation.

Rail Loop

The proposed rail loop crosses Wallarah Creek (twice) and two other minor creek channels at a total of eight separate locations in the site area. Six of the crossings occur where the rail line is elevated on an embankment. These crossings will be bridged or culverted. Structures will be sized to convey the 1% AEP (100 year ARI) flow in order to maintain the existing hydraulic regime within the relevant creek channel.

Two crossings of the northern tributary occur where the rail line is in cut. This tributary drains to the wetland area within the rail loop. It is proposed to maintain the existing runoff into the wetland to minimise any impact on the wetland community. This will be achieved through diversion of the northern tributary along the northern side of the rail loop. The diversion channel will be sized to convey the 1% AEP (100 year ARI) flow from its drained catchment, with bunding to provide protection against overtopping into the rail cut. Where the rail line is elevated onto a fill embankment, the channelled flow will be conveyed in a culvert which will be routed beneath the rail line to the wetland.

The north-eastern section of the rail line traverses the south facing side of a ridge which naturally drains to the Spring Creek. In doing so the rail line bisects a series of natural minor drainage lines. To maintain the existing runoff regime, cross drainage culverts will be required to convey the 1% AEP (100 year ARI) runoff from the drained catchments.

The rail corridor will be drained by a network of channels which will follow the longitudinal profile of the rail line. Runoff collected from the rail corridor will potentially contain sediment and will be discharged to sedimentation dams to remove sediment load.

Runoff from the 4 m wide unsealed access track adjacent to the rail line may potentially contain a high sediment load. Channels to the access track will collect runoff and route this to sedimentation dams for the removal of sediment load.

A series of sedimentation dams will be located around the rail loop to receive runoff from the rail corridor and access tracks. It is envisaged that up to ten separate dams will be required. These will be of varying size dependant on the drained area. All of the dams will be located above the 1% AEP (100 year ARI) flood level within Wallarah Creek. Outlets for clean water discharge into the creek will include energy dissipation features and will be situated above the 100 year flood level to prevent surcharging.

To prevent runoff from upslope catchments draining onto the rail corridor, catch drains will be positioned at the top of cut batters. These will collect runoff and divert it towards the creek or existing channel network. Embankment runoff will be collected in toe drains and conveyed to the sedimentation dams.

Coal Loading Facility Drainage

Drainage of the coal loading facility will be achieved using a pit and pipe system. Potentially sediment-laden coal contact water collected in this area will be drained to a dirty water dam for sedimentation treatment (Stockpile Dam). Large sediment particles will be removed upstream of the dam via a sump, with the smaller coal particles allowed to settle out of the water in the dam prior to only the clean water being discharged into the creek or collected for water reuse opportunities. The Stockpile Dam will be situated above the 1% AEP (100 year ARI) flood level of Wallarah Creek.

Coal Stockpiles

Runoff from the raw and product coal stockpiles will be drained to the perimeter of the stockpile pads and discharged to pollution control dams via a pit and pipe network where coal particles will be permitted to settle out.

Runoff from the raw coal stockpile will be directed to the Portal Dam to the north. Clean water from this dam will be discharged to Wallarah Creek, if suitable after settlement and subject to licence conditions, or recycled for reuse on site.

Runoff from the product coal stockpile will be directed to a dedicated storage dam to its southwest (Stockpile Dam). The dam will be designed to store runoff from a 1 in 100 year, 72 hour storm event without overtopping. Clean settled water from this dam will be recycled for dust suppression of the product coal stockpile. To maintain water levels within this dam during periods of low rainfall, this dam will be supplemented by water from the mine operations dam.

Access Roads

Tooheys Road will be sealed as part of the project and drained by a pit and pipe network. Both the existing and realigned road follows the ridgeline separating the Wallarah Creek and northern tributary catchments. Runoff from the sealed road is considered free of high sediment load and will be discharged to both watercourses according to the profile of the road.

The site access road off Tooheys Road will also be of sealed construction and drained by a network of channel drains in the road verge. The route is mainly at grade following the existing topography and draining to Wallarah Creek immediately

north of the pit top facilities. Runoff will be considered free of high sediment load and will be available to be discharged directly to the creek.

The access road crosses Wallarah Creek at two locations. These crossings shall be culverted and designed to convey the 1% AEP (100 year ARI) flow in order to maintain the existing hydraulic regime within the creek.

A series of unsealed roads provide vehicular access between the facilities at the site. Runoff from these roads could potentially contain relatively high sediment loads. This runoff will be collected by dirty water drains and directed into the sedimentation dams collecting the rail corridor runoff.

2.12.5 Buttonderry Site Water Pollution Control System

The surface water pollution control system at the Buttonderry site has been designed to cater for the 1 in 100 year, 72 hour storm event and is shown on Figure 2.25. Contained water will be preferentially re-used on site for operational purposes.

The Buttonderry site is located on the northern face of a partially wooded ridge, to the west of the Hue Hue Road. The existing site naturally drains locally towards the north-eastern corner of the land where the runoff from this catchment drains to Buttonderry Creek to the east of the site. The creek flows towards the south and continues beneath the F3 Freeway to the southeast of the site.

The proposed facilities site layout generally follows the natural contour of the site but will involve cut and fill earthworks. Surface water management measures will be implemented to control the quantity of surface water runoff discharged from the site, to control the discharge of sediment laden runoff from the site, and to manage potential spillages within the fuel store.

Surface water runoff from the unsealed storage hardstand, mine ventilation fan hardstand, and the site access road could be potentially high in sediment load and will be drained to a sedimentation dam where the sediment will be permitted to settle out prior to storage and reuse on site or discharge to the downstream catchment. Drainage of these areas will be achieved by overland flow into drainage channels located along the periphery of the hardstands and road. Channels will be grass lined and designed to convey the peak flow without overtopping.

Catch drains positioned at the top of cut batters will divert clean water from above the site. A sedimentation dam will be located at the lowest point on the site, to the southeast of the main site facilities (Entrance Dam). All runoff draining to the dam will first be routed through a silt trap to remove larger transported particles. Outflow from the dam will be discharged to the natural catchment in a controlled manner, maintaining the existing catchment runoff regime.

Runoff from the fuel store will be drained to the sedimentation dam via a pit and pipe network. Capture of pollutants arising from potential spills within the bunded compound will be achieved using an oil separator while a silt trap will capture any larger sediment loads from being conveyed to the drainage system.

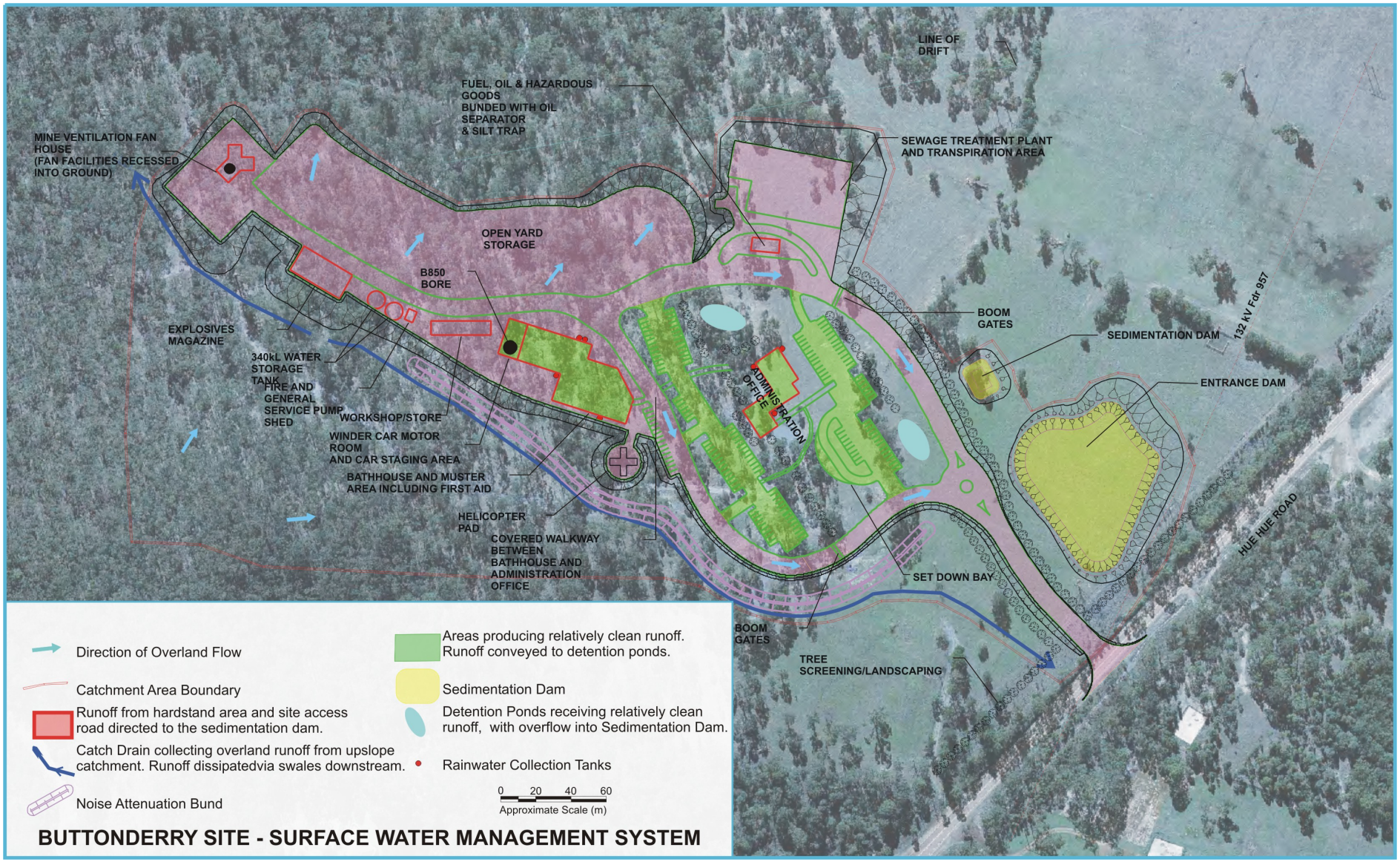

Figure 2.25 Buttonderry Site Surface Water Management System

Surface water runoff from the car parking areas will be considered to be free of large sediment loads. Runoff from these areas will be drained by channels or pit and pipe systems to detention ponds situated around the car park. The ponds will provide attenuation of surface water runoff from the car park areas, while forming a permanent landscaping feature. High level overflows to the Entrance Dam will be provided to prevent overtopping of the ponds during peak storm events.

Roof water runoff from the administration and bathhouse buildings will be collected in storage tanks for re-use within the buildings or elsewhere within the operations.

2.12.6 Sewage Treatment Plant

Assuming that the mine surface facilities areas at least initially will not be serviced by the Council reticulated sewerage system, appropriately sized tertiary sewage treatment systems are proposed to be constructed for both Buttonderry and Tooheys Road sites. Construction and operation of the sewage treatment system will be in accordance with the *National Water Quality Management Strategy: Guidelines for Sewerage Systems – Effluent Management (ARMCANZ/ANZECC); National Water Quality Management Strategy: Guidelines for Sewerage Systems – Use of Reclaimed Water (ARMCANZ/ANZECC);* and *Environmental Guidelines: Use of Effluent by Irrigation (DECC)*.

The tertiary sewage treatment plant will produce effluent suitable for non human contact reuse. The system will include wet wells, duplex grinder pumps and associated reticulation, below ground treatment modules, pump station and discharge to a transpiration pond.

Typical discharge quality for tertiary sewage treatment plants are listed below. These criteria will be included in the design specification for the proposed plants at both the Tooheys Road and Buttonderry sites:

- ❒ Biochemical Oxygen Demand - 10 mg/L
- ❒ Suspended solids - 15 mg/L
- ❒ Total nitrogen - 5 mg/L
- ❒ Total phosphorus - <0.5 mg/L
- ❒ Faecal Coliform - <10 cfu/100mL
- ❒ Ammonia - <1 mg/L
- ❒ PH - 6.5 to 8.5

Sewage and waste water from each of the infrastructure facilities and buildings at Buttonderry and Tooheys Road sites will be connected to their respective sewage treatment systems. The Buttonderry site system will be based on a load of 210 mine operations employees and 40 office staff per day. A consumption of 150 L/day per mine worker and 30 L/day for office staff has been estimated. The Tooheys Road site system will be based on a load of 50 mine pit top operations personnel per day and a consumption of 100 L/day per worker has been estimated.

The systems will comprise the following elements:

- ❒ 10,000 L balance tank (each site);
- ❒ 20,000 L (Tooheys Road site) and 40,000 L (Buttonderry site) primary chamber;
- ❒ 20,000 L (Tooheys Road) and 40,000 L (Buttonderry) extended aeration chamber;
- ❒ 20,000 L (Tooheys Road) and 40,000 L (Buttonderry) clarification chamber; and
- ❒ 2,500 L (Tooheys Road) and 5,000 L (Buttonderry) disinfection chamber.

Treated effluent will be discharged to a transpiration pond at each site and could be used for irrigation to sustain landscaping works around the site.

2.12.7 Water Balance

A water balance assessment including salinity issues has been prepared by Parsons Brinckerhoff Australia Pty Limited (PB), and is included as **Appendix E**. The aim of the water balance assessment was to determine what impact the W2CP will have as a water consumer, in terms of the volume used or produced, and the quality of any water generated for disposal.

On Site Water Supply - Buttonderry

The following description is based on the site not being connected to reticulated town water supply system or the sewer. However, project planning and liaison with stakeholders and authorities is continuing and there is potential for the site to be linked to the town water supply and sewer at the outset or at an early stage in the project.

In order to ensure that sufficient water is available for use during the construction phase of the Buttonderry surface facilities, the construction of the 10 ML Entrance Road Dam and local area site stormwater drainage system will be a high priority. The purpose will be to create a water storage facility on site capable of retaining sufficient water to supply the needs for construction and eventually, mining production operations.

Once established, the Buttonderry site will accommodate approximately 250 persons including management, administration, production and maintenance staff. When the Entrance Road Dam is filled to its normal operating capacity, the site is expected to be self-sufficient in regard to supply of water for both potable and industrial use. The period of self sufficiency is expected to be “on-going” during normal climatic conditions, however, this may not be the case during a drought period exceeding approximately two months.

Water self sufficiency will be achieved by harvesting clean storm water from the site for storage in the Entrance Road Dam, or directly collected from the roofs of buildings into Potable Water Storage Tanks. The Buttonderry site will not process or handle coal material and is therefore considered clean and stormwater collected will be rated as a clean raw water source.

An on site water treatment plant will draw water from the dam and provide potable quality water for domestic consumption during drier periods when roof storm water harvesting is insufficient to meet demand. During a drought period exceeding two months, it is expected that potable quality water will have to be imported.

Sewage and site generated waste water will be treated by an on site Sewage Treatment Plant, with clarified effluent being directed to a local transpiration area or landscape irrigation. Alternatively, it may be disinfected and sterilised and recycled into the Entrance Road Dam.

Site water supply for fire fighting and general industrial use will be pumped directly from the Entrance Road Dam to dedicated water storage tanks located elsewhere on site. Pump stations located adjacent to the tanks will supply water to all areas of the site via a piped reticulation system.

Assessment of the site water balance requirements as shown in Table 2.6 and, Figure 2.26 indicates the site can be made water self-sufficient during a normal climatic "average" year. This will require harvesting storm water run-off from approximately 40 Ha of the site during the initial construction phase. The harvest area could be reduced to approximately 30 Ha after the commencement of mining operations.

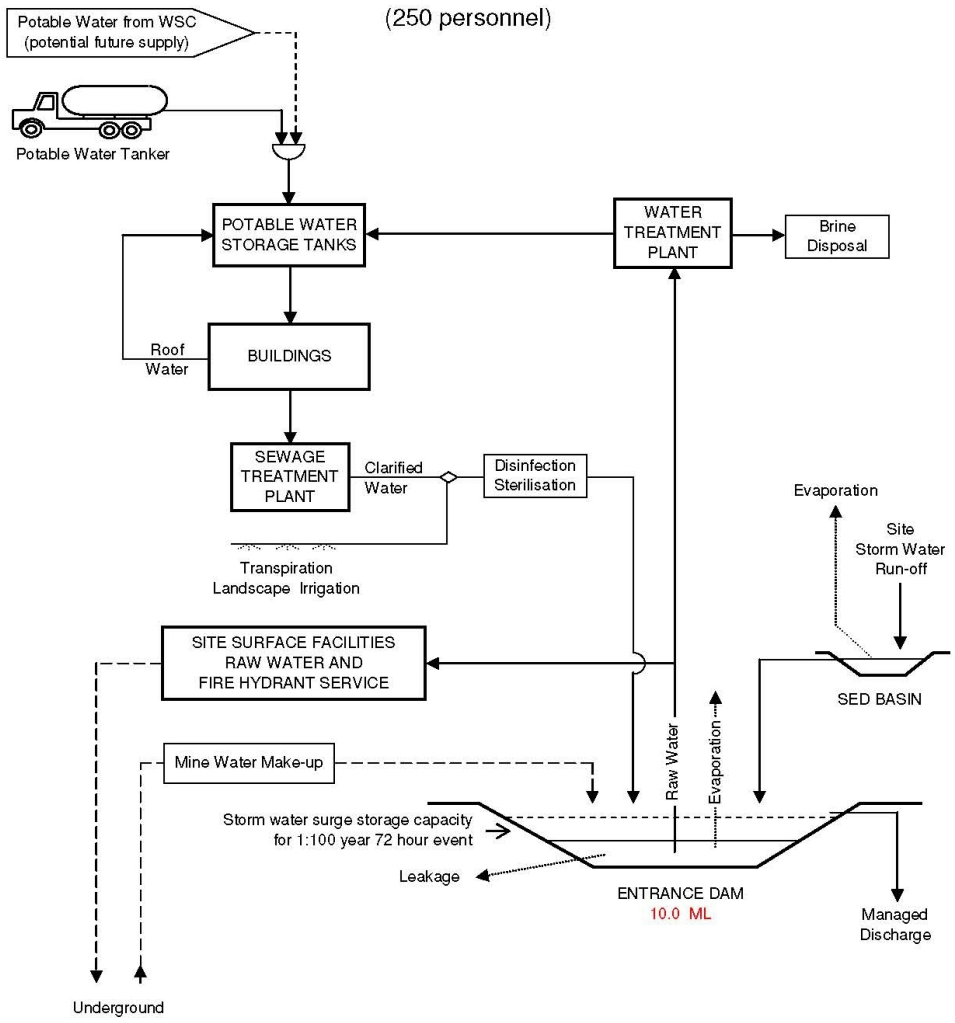

Figure 2.26 Buttonderry Site Water Management Flow Sheet

On Site Water Supply – Tooheys Road

The following description is based on the site not being connected to reticulated town water supply system or the sewer. However, project planning and liaison with stakeholders and authorities is continuing and there is potential for the site to be linked to the town water supply and sewer at the outset or at an early stage in the project.

The Tooheys Road site will accommodate the main coal handling facilities. For this reason, the catchment areas that contain coal sediment sources are considered "contaminated" and all runoff must be contained and treated on site (refer Figure 2.27). For this purpose, three dams will be constructed – 120 ML Operations Dam, 3 ML Stockpile Dam, and a 3 ML Portal Dam. The construction of these dams and the storm water drainage system will be a high priority during the initial development phase. The purpose will be to create water storage facilities on the site capable of

retaining all dirty water runoff. The runoff water will also provide sufficient water to supply needs for the construction phase and eventually, mining production operations.

When the Mine Operations Dam is filled to its normal operating capacity, the site is expected to be self-sufficient in regard to supply of water for both potable and industrial use. The period of self sufficiency is expected to be "on-going" during normal climatic conditions, however, this may not be the case during a drought period exceeding approximately two months.

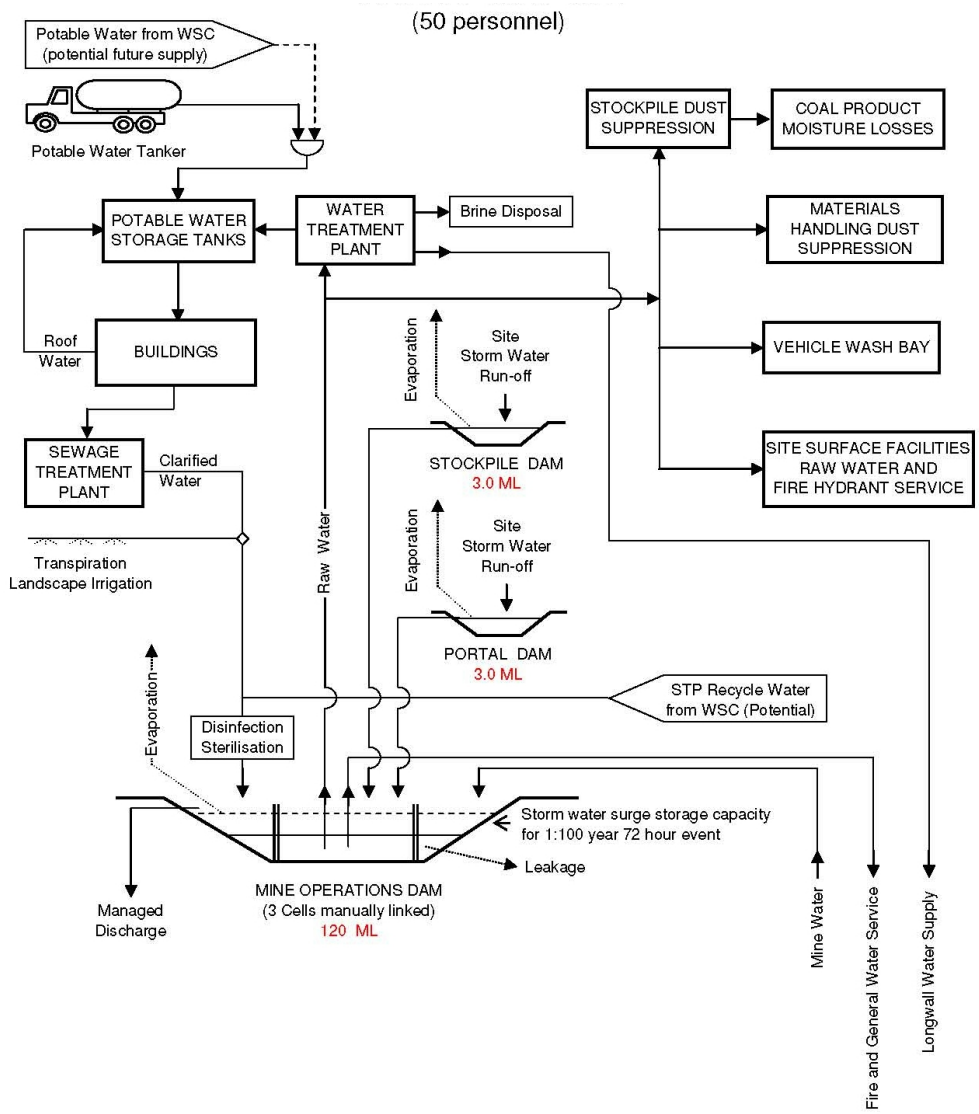

Figure 2.27 Tooheys Road Water Management Flow Sheet

Water self-sufficiency will be achieved by capturing the dirty storm water run off from the site and directing it to the Mine Operations Dam, as well as collecting clean water from the roofs of buildings and directing this into the Potable Water Storage Tanks.

The Stockpile Dam and Portal Dam will serve as transient dirty water storage basins that will collect dirty water from specific areas. Each of these smaller dams will normally be kept empty. As water is collected in the smaller dams, pumps in each dam will transfer the water to the main Mine Operations Dam. The Mine Operations

Dam will provide an 80 ML surge storage capacity required to hold surplus water from a 1:100 year, 72 hour, rolling storm event. The dam will have a total storage capacity of 120 ML, hence has a maximum working volume of approximately 40 ML. This stored volume is expected to be sufficient for up to two months operation during a drought period.

Once established, the Tooheys Road site will accommodate up to approximately 50 persons including production and maintenance staff. An onsite sewage treatment plant will process all domestic waste water, with clarified effluent being directed to a local transpiration area or landscape irrigation or alternatively, via a disinfection and sterilisation unit for recycling into the Mine Operations Dam. An onsite water treatment plant will draw water from the Mine Operations Dam and provide potable quality water for both domestic consumption and underground longwall operating requirements.

Site water supply for fire fighting and general industrial use will be pumped directly from the Mine Operations Dam to dedicated water storage tanks located elsewhere on site. Pump stations located adjacent to the tanks will supply water to all surface and underground areas of the site via a piped reticulation system.

Water supply for surface level stockpile dust suppression, and materials handling systems dust suppression, will be pumped directly from the dam. Offsite discharge of water from the Mine Operations Dam into the adjacent local watercourse will be stringently managed. Control measures will include monitoring of the water quality stored in the dam. If the quality falls below acceptable standards for discharge, the on site water treatment plant will recirculate water from the dam to remove excess contaminants and ensure water quality is raised to meet environmental standards that are acceptable for discharge.

Depending on water level, and water quality in the dam, an offsite discharge pump station will transfer up to 80 ML of surplus “surge stormwater” into the local watercourse. This operation will be done in strict compliance with the project’s Environmental Protection Licence.

Assessment of the site water balance requirements indicates the site will be in water deficit during the first production year (refer Table 2.7). The deficit is attributable to water requirements for operation of the longwall. This deficit will progressively reduce over the next five production years as mine seepage water make (supply) from underground increases as mining progresses. To make up the initial deficit, a combination of separately imported potable water and sewage treatment plant recycled water will be sourced from external suppliers.

Table 2.6 W2CP Buttonderry Site Water Balance (ML/yr)

	Construction Phase		Production Year 1		Production Year 5		Production Year 10		Production Year 20+	
	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply
Potable	13.69		13.69		13.69		13.69		13.69	
Process	30.00		18.85		18.85		18.85		18.85	
Rainfall		40.12		34.26		34.26		34.26		34.26
Losses	7.35		7.35		7.35		7.35		7.35	
Mine Water		0.00		0.00		N/A		N/A		N/A
Recycled		11.63		11.63		11.63		11.63		11.63
Other										
Subtotal	51.03	51.75	39.88	45.90	39.88	45.90	39.88	45.90	39.88	45.90
TOTAL	*0.00*	0.72	*0.00*	6.01	*0.00*	6.01	*0.00*	6.01	*0.00*	6.01

Note: Losses in the table above represent combined losses from brine disposal, plus dam evaporation and leakage losses.
Total Demand numbers in *italics* represents a deficit in the water balance.
Total Supply numbers represent a potential surplus in the water balance.

Table 2.7 W2CP Tooheys Road Site Water Balance (ML/yr)

	Construction Phase		Production Year 1		Production Year 5		Production Year 10		Production Year 20+	
	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply
Potable	9.00		314.44		314.44		314.44		314.44	
Process	30.00		83.80							
Rainfall		161.65		161.65		161.65		161.65		161.65
Losses	65.20		65.20		65.20		65.20		65.20	
Mine Water		0.00		36.50		219.00		328.50		474.50
Recycled		0.00		2.19		2.19		2.19		2.19
Other										
Subtotal	104.20	161.65	463.44	200.34	379.64	382.84	379.64	492.34	379.64	638.34
TOTAL	*0.00*	57.45	*263.10*	0.00	*0.00*	3.20	*0.00*	112.70	*0.00*	258.70

Note: Losses in the table above represent combined losses from brine disposal, plus dam evaporation and leakage losses.
Total Demand numbers in *italics* represents a deficit in the water balance.
Total Supply numbers represent a potential surplus in the water balance.

2.12.8 Water Quality

Buttonderry will produce environmentally clean storm water runoff, as no coal product will be handled on this site and oil containment facilities will be provided. The Entrance Road Dam will harvest a portion of the storm water runoff from the site, and store up to 10 ML. This volume is expected to be sufficient reserve to meet local site demand for periods up to two months normal operation.

Water quality in the dam will be constantly monitored (in accordance with the DECC's Guidelines *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW*) and treated as required by the onsite water treatment plant (WTP) to ensure the water is an acceptable standard for reuse as industrial process water and also meets DECCW/EPA standards for offsite discharge.

The Entrance Road Dam will discharge off-site on those occasions when the Dam is already full, and a normal rainstorm event occurs. Hence there is a need to constantly monitor and maintain the water quality to DECCW/EPA standards. The concentrated liquor or brine arising from the water treatment plant will be the "removal" point for saline material and other contaminants extracted from the site water reservoir.

A portion of the Tooheys Road site will produce saline "coal contact" storm water run-off which will be retained on site. The Mine Operations Dam will have a total storage capacity of 120 ML, with an operating storage volume of 40 ML, and a surge storage volume of 80 ML. There will be no uncontrolled offsite discharge of water from the Tooheys Road site during periods of normal operations and climatic conditions (rainfall) up to a 1:100 year, 72 hour rolling rainstorm event. The 1:100 year rain storm event is expected to generate a surge volume of 80 ML which can be retained by the dam.

Water quality in the dam will be constantly monitored and treated as required by the onsite water treatment plant to ensure the water is an acceptable standard for reuse as industrial process water and also meets DECCW/EPA standards for offsite discharge. Pumps will control the discharge of up to 80 ML of surplus water after a rainstorm event. Controlled discharge will only occur when water quality meets DECCW/EPA standards.

2.13 Construction

A construction program has been developed covering the three separate construction sites, namely, Tooheys Road site, Buttondery site and (later) the Western Shaft site.

2.13.1 Tooheys Road

Construction elements for the Tooheys Road site can be split into the following groups:

- ❒ Decline tunnel (Drift);
- ❒ Civil infrastructure;
- ❒ Rail loop and spur (up to 12 months duration);
- ❒ Administration buildings and facilities; and
- ❒ Mine operations dam and water treatment reverse osmosis plant.

The works associated with these are described in detail in the following sections. Following detailed design activity which could refine details in the following description, construction is anticipated to commence in early 2011, depending on project approvals timeframe. Prior to these works commencing, early works contracts will be nearing completion or completed. These will include, but not be limited to, the upgrade of the existing power supply and high voltage power to the site, and finalising water supply arrangements to and from the site.

2.13.2 Decline

The decline (or drift) will be a 3,570 m long inclined mine access tunnel with a width of 6.5 m and a height of 6 m with a shallow curved roof. It will lead from the surface mine infrastructure area in the south-west corner of the Tooheys Road site down to the mine seam at a depth of over 350 m below ground at the Buttonderry Site. The gradient of the decline will be 1 in 10 and the horizontal alignment is straight.

The cross section geometry was established from consideration of the following factors:

- Clearance envelope for mine operational vehicles;
- Drift internal structures – walkways, ventilation, etc;
- Excavation tolerance and deformation allowance; and
- Drift supports – shotcrete, rockbolts, steel ribs.

The profile will have a flat invert, vertical sidewalls and a curved roof, giving a cross sectional area of approximately 40 m^2.

Construction of the decline could be expected to start in 2011 and will be carried out in two main stages:

- Stage 1a: excavation and support of the portal box cut;
- Stage 1b: construction of portal structure; and
- Stage 2: decline tunnel (drift) construction including intermediate 3 m ventilation shaft and road slab.

The total construction period is estimated at 80 weeks, with each stage sequential. Stage 1a is estimated at 6 weeks, Stage 1b is estimated at 4 weeks, followed by Stage 2 at 70 weeks.

For Stage 2, it is assumed that the roadheader will clear approximately 2,500 m^3/week, assuming a 6 day week with 3 x 8 hour shifts. This will equate to a drift construction rate of approximately 60 m/week and a total duration of 60 weeks. The concreting of the drift invert road slab will take an estimated 10 weeks, and this will not start until the end of drift construction.

The backfilling as part of Stage 1b may be undertaken in parallel with the start of Stage 2 and a period of 3 weeks is estimated for this.

The majority of surface disturbance will occur during the construction of Stage 1a as this is the area involving the larger surface excavations. This will involve the use of earthmoving equipment, drilling equipment, cranes and a variety of support plant.

Stage 1b will involve the placement of precast concrete arches and some backfill over the top of the arches. Once the decline construction commences in Stage 2, the work will be predominantly underground and temporary construction impacts

such as noise and dust generated by the decline works will be mostly restricted to the underground work site.

The establishment of the portal will require an excavation approximately 25 m deep at the deepest point in order to commence tunnelling in rock at a point where there is at least 5 m of rock above the tunnel. The 25 m is derived from the assumption that the depth from the surface to structurally competent rock at this point is 15m, plus 5 m rock cover, plus 5 m tunnel height.

The excavation will have a minimum width of 10 m at the base and a length of approximately 200 m (gradient of 1 in 8 to reach a depth of 25 m). Side slopes in rock will be typically 3V:1H and supported by a combination of rockbolts and steel fibre reinforced shotcrete. Side slopes in the soils overlying the rock will be flatter, possibly 1:3 (V:H). Support should not be required, however a horizontal berm of width up to 3 m at the interface between soil and rock will allow for runoff drainage from the soil slope to be channelled and suitably managed within the site water management system. Similarly, a perimeter drainage channel around the top of the soil cut will intercept surface runoff flows and help prevent slope erosion.

A reinforced concrete invert will be cast over the entire base area which would act as the permanent base slab. Surplus material from the excavation will be used as fill for the raw coal stockpile pad.

The drift is likely to be constructed using a road header. The construction sequence will be for the roadheader to cut one round, full face excavation between 2 m to 3 m in length. The excavated material will be loaded into haul trucks and removed to the surface. Suitable fill material will be used for rail, road and stockpile pad embankments. The exposed rock surface on the tunnel sidewalls and roof will be supported with the designated support system and this could range from almost no support to a system comprising a combination of rockbolts, shotcrete and steel arch ribs.

The 6.5 m width will not be sufficient for passing of trucks and other equipment. Therefore, passing bays will be constructed at intervals along the drift to enable equipment to pass each other and provide space for electrical/drainage installations that will be needed to service the drift during construction. These bays will entail excavating a niche using the roadheader and treating the widened excavation as any other part of the drift, with support as necessary. All support installed will remain as permanent works. The drift invert will be constructed using concrete transported to site from a nearby batching plant.

The major plant and equipment likely to be used is outlined below in Table 2.8.

The roadheader, drilling machines and shotcrete robot used underground will normally be electrically powered. The only diesel engine equipment will be the haul trucks and concrete transit mixers. The haul trucks will drive into the drift and use the passing bays spaced intermittently to turn around and reverse into position just behind the roadheader. After loading they will drive forwards out of the drift. Concrete transit mixers will move in and out of the drift in a similar fashion.

Table 2.8 Likely Plant and Equipment for Decline Construction

Construction activities	Major plant and equipment
Stage 1a – Portal box cut	30-45 tonne excavator (with hydraulic hammer attachment for rock breaking) D8 dozer, with ripper attachment shotcrete robot rockbolting machine flat bed truck mobile crane haul trucks hand power tools
Stage 1b – Portal structure	30-45 tonne excavator (with hydraulic hammer attachment for rock breaking) concrete transit mixer concrete pump flat bed truck mobile cranes haul trucks hand power tools
Stage 2 – Decline construction	roadheader (approx. 300 kW power rating) shotcrete robot rockbolting machine (may be fitted to roadheader) haul trucks concrete transit mixer pumps

2.13.3 Intermediate Small Diameter Ventilation Shaft

An intermediate small diameter temporary ventilation shaft may be required at a point approximately mid-way between the portal and the Buttonderry site. This would be blind-drilled at approximately 3 m in diameter and located on land already owned by the WACJV. The material excavated would be stored on the construction site and used for rehabilitation after the main decline construction is completed. The volume of material to be generated is estimated at around 1,500 m^3.

2.13.4 Tooheys Road Infrastructure

The remaining Tooheys Road site construction works relate to the coal handling infrastructure and buildings. Construction of the civil works will include:

- Raw coal stockpile pad, reclaim tunnel and associated pollution control dam;
- Product coal stockpile pad, reclaim tunnel and associated pollution control dam; and
- Internal access roads, sedimentation ponds and culverts, and other drainage controls.

Once site access has been established off Tooheys Road, bulk earthworks for the proposed stockpile pads and internal access roads will commence soon after and would be coordinated with the rail loop earthworks. It is envisaged that the plant used for the drift portal excavation will move onto the raw coal stockpile pad and storage yard, while a second fleet worked on the product stockpile pad and reclaim tunnel. At the same time a third fleet will commence works on the rail loop and

access roads. Haul routes will be established and the following environmental controls implemented:

- Silt fencing will be installed along embankment bases and hay bale and/or sand socks at site entrances;
- Vehicle wash bays and/or rumble strips will be provided at all vehicle access points to and from construction works site;
- Drains along the top of cuts will be constructed to minimise water entry into cut areas. Erosion will be prevented at source rather than relying on sediment capture at discharge;
- Energy dissipaters or other scour prevention measures, downstream of culverts or other structures, will be provided as required to minimise erosion;
- Natural design features including existing vegetation, local plant seed, existing terrain and materials found in the area will be utilised in accordance the Soil and Erosion Control Plan, which will be developed prior to construction commencing;
- Separation of clean and dirty runoff would be achieved by the use of diversion drains on the upslope perimeter of the site; and
- Discharges will be controlled to prevent erosion, scour or localised flooding.

Stockpile pad structures will be located on stable surfaces and away from potentially sensitive areas, particularly areas of concentrated water flows with erosion control measures implemented as appropriate. Existing drainage lines will be protected by using appropriate measures such as sedimentation barriers, timber windrows, and grassed areas or by directing site drainage water to a sediment control structure.

Appropriate measures will be installed such as silt fencing or litter screens near inlets to prevent the blockage of pipes. Designed stormwater drainage pipes will be installed as soon as possible to control stream and gully erosion. Clean water that may run onto disturbed areas of the site will where possible be diverted to minimise the quantity of water that may require treatment prior to disposal or release. Erosion and sedimentation controls will be regularly inspected and monitored, in particular after rainfall, to ensure performance to the design criteria and that the control systems are maintained to design specifications.

The plant and equipment that are likely to be used are outlined below in Table 2.9.

Table 2.9 Likely Plant and Equipment for Tooheys Road Site Construction

Construction activities	Plant and equipment
Earthworks and roadworks	30-45 tonne excavator, rock breaker, D6-D10 dozers, tippers, 15 tonne bogie trucks, grader, 10 tonne vibratory roller, 815-825 compactor, skidsteer loader, asphalt pavers, water cart.
Culverts & reclaim tunnel	Excavator, concrete transit mixer, concrete pump, flat bed truck, mobile crane, vibratory roller, hand power tools.

2.13.5 Rail Loop and Spur

The proposed alignment will have the following principal features:

- Crossover from the up main north to the down main north at approximate chainage 113.100 km;
- Catch point on the spur line to protect the main north;
- 1,700 m single track spur line that will follow the northern edge of a cleared easement for a 330kV overhead power line;
- 4,300 m balloon loop will operate in a clockwise direction to enable two train lengths to be accommodated before the loader and a single train length to be located after;
- Coal loading bin will be located on the western side of the balloon loop in cutting;
- Two rail underbridges will be built beneath Tooheys Road; and
- Four culverts will be built to accommodate creek crossings.

Construction of the rail loop and spur will be carried out in three main phases:

- Phase A: Preparatory phase to isolate the construction zone from the operating RailCorp rail tracks, and to relocate or protect existing services and utilities;
- Phase B: The phase of major civil construction when the earthworks, culverts and bridges will be constructed; and
- Phase C: Final phase of track construction and installation of signalling and communications facilities. This phase will include installation of connections to the existing RailCorp tracks, testing and commissioning.

The entire construction program is expected to take up to twelve months with overlap between the construction phases. Phase A is expected to take approximately two months to complete (subject to possessions), Phase B approximately nine months, and Phase C approximately three months.

RailCorp's signalling, power and communication cables and other electrical and signalling equipment within the vicinity of the spur connection will need to be relocated where required to the boundary of the railway corridor as the first major item of work for the project. Typically, relocation of the cable troughing will be carried out to a new trough location next to the boundary of the rail corridor. The existing services that are buried and run along the corridor will be either protected with a reinforced concrete cover strip or relocated to the boundary of the railway corridor, subject to RailCorp agreement. The rail loop will cross beneath the 330 kV overhead power lines and work will be required at these locations to ensure sufficient clearance is achieved to the lines and associated support towers.

For safety and feasibility reasons, the construction zone for the spur connection must be isolated from the RailCorp system for all but very limited sections of the route. The isolation will be achieved using different separation methods, depending on available corridor width for construction activity.

The construction sequencing will be designed to ensure that access to the site does not cross the RailCorp tracks. The earthworks will also be configured so that work required on the RailCorp side of the barrier is limited. The resulting work site will be narrow, with limited access points. The main civil works will comprise the following main activities:

- Earthworks;
- Drainage structures; and
- Bridges.

The typical formation for the loop and spur will require areas of cut and fill. An existing drainage pathway at the north-west corner of the rail loop will be diverted for approximately 400 m to accommodate the rail cutting in that location. The rail formation will consist of a select material meeting design specification and a capping layer. The select material will be sourced from modified onsite material and imported additives such as ballast, concrete or stable products.

The rail loop will cross beneath Tooheys Road at two separate locations. The bridge type is expected to be either a pre-cast arch structure or pre-cast plank superstructure founded on contiguous piles. Tooheys Road will be realigned at the western end to accommodate the new bridge and the intersection with the proposed mine access road. The plant and equipment that is likely to be used is outlined below in Table 2.10.

Table 2.10 Likely Plant and Equipment for Corridor Construction

Construction activities	Plant and equipment
Earthworks	30-45 tonne excavator, rock breaker, D6-D10 dozers, tippers, grader, 15 tonne bogie trucks, 815-825 compactor, 10 tonne vibratory roller, water cart
Bridges and culverts	Excavator, hydraulic hammer attachment to excavator tippers, piling rig, concrete transit mixer, concrete pump, flat bed truck, mobile crane, asphalt pavers, vibratory roller, skidsteer loader, hand power tools
Trackwork	Track laying machine (on track), tamping machine (on track), ballast regulator (on track), rail grinding machine (on track), hi-rail excavator with sleeper grabs, tippers, loader.

2.13.6 Buttonderry Site

Construction elements for the Buttonderry Road site can be split into the following groups:

- Shaft construction;
- Pit top facilities and associated infrastructure;
- Upgrade of the existing power supply and HV power to the site and other services to the site; and

- Construction of power cabling and telecommunications to link Buttonderry site and Tooheys Road site.

A period of four weeks has been built into the schedule to account for site set up, mobilisation and training prior to construction activities commencing. The overall duration for the construction works at the Buttonderry site is anticipated to be approximately two years.

There are two ventilation shafts proposed at the Buttonderry site and a ballast hole. Plant and equipment for the shaft construction are shown in Table 2.11. The sizes of these shafts are described below (note dimensions and depths are subject to detailed design):

- Downcast ventilation shaft – 8 m diameter, approximately 350 m deep;
- Upcast ventilation shaft – 6 m diameter, 350 m deep; and
- Ballast hole – 0.9 m diameter, 350 m deep.

The upcast ventilation shaft and the ballast hole are likely to be constructed using the blind bore method. The downcast ventilation shaft may be too large for conventional blind bore methods and may need to be built using other common methods.

Following the completion of the upcast shaft the exhaust fan will be installed. A winder car motor room and staging area will be constructed around the downcast ventilation shaft.

Table 2.11 Likely Plant and Equipment for Buttonderry Shaft Construction

Construction activities	Plant and equipment
Site preparation	30-45 tonne excavator, D6-D10 dozers, tippers, 15 tonne bogie trucks, 10 tonne vibratory roller, skidsteer loader, water cart.
Drilling and lining	Drill rig, excavator, concrete transit mixer, concrete pump, generator, flat bed truck, mobile crane, vibratory roller, forklift, air compressor, water pump, hand power tools.

The main construction items for the Buttonderry site pit top facilities include:

- Administration offices, training rooms and bathhouse;
- Access road, car park and new intersection with Hue Hue Road;
- Upcast ventilation shaft and mine fan;
- Downcast ventilation shaft and man winder;
- Industrial buildings and amenities;
- Sewerage treatment facilities; and
- Surface runoff settling ponds.

Major civil construction works will include site clearance, earthworks, drainage, sedimentation ponds and access road off Hue Hue Road. Following the completion of these works, building works will commence on the office facilities, workshop and

amenities. During the construction phase of the project it is anticipated water for drinking and amenities will be trucked on to the site before connecting the site to the town water supply. Plant and equipment for the pit top facilities are shown in Table 2.12.

Table 2.12 Likely Plant and Equipment for Buttonderry Surface Facilities Construction

Construction activities	Plant and equipment
Earthworks and roadworks	30-45 tonne excavator, D6-D10 dozers, tippers, 15 tonne bogie trucks, 815-825 compactors, 10 tonne vibratory roller, skidsteer loader, asphalt pavers, water cart.
Buildings and amenities	Excavator, concrete transit mixer, concrete pump, flat bed truck, mobile crane, vibratory roller, forklift, air compressor, generator, hand power tools.

2.13.7 Western Shaft

The western shaft will be 5 m in diameter and 485 m deep. It will act as the air intake for the western section of the mine and will serve as a secondary means of emergency egress for underground personnel. The site may also include a number of small diameter boreholes required to conduct essential services to the underground mining operations. These services may include compressed air, communications, electrical power, concrete, ballast, and a dewatering main.

The shaft will not be required for the first 10 years of mine life. Construction will be carried out in the following stages:

- Stage 1: Partial upgrade of Brothers Forest Road;
- Stage 2: Construction of 5 m diameter 485 m deep concrete lined ventilation shaft; and
- Stage 3: Installation of car winder and erection of associated buildings.

The total construction period is estimated at 60 weeks and will involve cut and fill quantities as outlined in Table 2.13. Partial upgrade of Brothers Forest Road will be required. Prior to work commencing on the shaft, the existing access track will be widened and resurfaced to accommodate fully loaded semi trailer trucks and two-wheel drive vehicles. Temporary and permanent services will be laid adjacent to the road as works progress. It is likely that a polyethylene water pipeline will be required to service the site during construction.

Table 2.13 Cut and Fill Quantities for Western Shaft Site Construction

Element	Cut* (m^3)	Fill* (m^3)
Access road upgrade and shaft site	5,019	9,811
Downcast shaft	10,475	0
TOTAL	15,495	9,811

* Cut and fill quantities subject to detailed design but it is anticipated that 5,700 m^3 of material will be required to be trucked from the site.

It is likely the shaft will be constructed using the blind bore method. The lining to the shaft has not been determined but similar shafts of this nature require a steel composite lining.

Sedimentation ponds will be formed to retain water for the closed loop drilling fluid circulating system involved in the blind boring process. The ponds will be located on the portion of the site downslope from the surface of the shaft. Access to the sedimentation ponds will be provided for a track mounted excavator to periodically remove the rock cuttings deposited by the drilling operations.

Rainwater runoff from the site will be directed into runoff catchment ponds using trenches, silt fences and diversion bunds to limit velocity in the drainage path. Diversion bunds and shallow trenches will be installed upslope of the site to deflect rainwater runoff around the disturbed area to minimise the possibility of contaminating the local streams and waterways with sediment from the construction site. Topsoil stockpiles will be protected with silt fencing or other appropriate methods to be detailed in the Soil and Erosion Control Plan.

The shaft will be excavated using blind bore rotary drilling methods. The bore size will be increased in the upper region of the shaft to accommodate an intermediate casing that will provide additional support to the final lining. Once in place the void between the bore and the casing will be grouted and drilling will continue to the bottom.

If a composite steel lining is required, it is likely the steel sections will be transported in segments due to their size, welded together and then concreted on site before installation. Environmental protection measures will be applied to ensure the concreting operation does not present any risk to the local watercourse.

Casings will be welded together and lowered into the borehole and founded on a concrete plug. Water in the borehole would provide buoyancy and reduce the overall lifting weight for the rig. When positioned, the void between the borehole and the units will be grouted. Water will then be pumped out of the shaft and the concrete plug drilled through to complete the shaft. On completion of the shaft the housing structure for the car winder will be constructed and the site fenced with a 2 m high security fence. Likely plant and equipment to be used is provided in Table 2.14.

Table 2.14 Likely Plant and Equipment for Construction of the Shaft

Construction activities	Plant and equipment
Earthworks and roadworks	30-45 tonne excavator, D6-D8 dozers, tippers, 15 tonne bogie trucks, 815-825 compactor, 10 tonne vibratory roller, skidsteer loader, asphalt pavers, water cart.
Drilling and lining	Drill rig, excavator, concrete transit mixer, concrete pump, generator, flat bed truck, mobile crane, baling bucket, vibratory roller, forklift, air compressor, water pump, hand power tools.
Buildings and amenities	Excavator, concrete transit mixer, concrete pump, flat bed truck, mobile crane, vibratory roller, forklift, hand power tools

Construction traffic will access the work area off Little Jilliby Road. It will be preferable for Brothers Forest Road to be closed while it is upgraded and the ventilation shaft is constructed. This issue will be discussed and negotiated with the relevant authorities and stakeholders.

2.13.8 General Vegetation Clearing

Vegetation clearing at all construction sites will be kept to the minimum required. Vegetation that is required to be cleared will be initially windrowed and then mulched. Mulched vegetation will be used in the landscaping works or provided to local nurseries.

Specific management recommendations for the collection of seed and individual plants have been already implemented and will continue to be undertaken prior to vegetation clearing. Onsite seed collection has commenced in the main surface sites areas and seed germination has commenced so as to enable seedlings to be available for immediate use in ecological and landscape control works during construction. Further seed collection will be undertaken following application for collection of seed from particular species.

2.13.9 Topsoil Management

Direct disturbance to soils in relation to the construction and operation of the W2CP will only occur at the surface facilities sites, namely the Buttonderry site, Tooheys Road site, and the Western Shaft site. Soil resources at each of these sites are described in Section 15.4, while erosion control strategies to be employed to protect and conserve these resources are provided in the following section.

Topsoil will need to be stockpiled during construction. Topsoil stockpiles will be no higher than 2 m with side slope of 3:1 (H:V). The length will vary according to volume. These dimensions will reduce the incidence of anaerobic decomposition of organic matter and subsequent loss of viable seeds.

In some cases, freshly stripped topsoil will be laid directly onto shaped excavated or fill material and spread in the single action. This will avoid decomposition of the topsoil over time as well as degradation caused by material rehandling.

Soils range from low to extreme erosion hazard, moderate to poor fertility, generally acid and sometimes sodic. Specific erosion controls will be required during construction in order to avoid sediment loss.

2.13.10 Erosion and Sediment Controls

The assessment of necessary erosion and sedimentation controls is provided in Section 15.4 and summarised below. All erosion and sediment controls will be installed in accordance with the *Managing Urban Stormwater: Soils and Construction* (Landcom):

- Drainage Channels – to be constructed with either a parabolic or trapezoidal cross section rather than a V-shape which can easily be eroded. Channels to be constructed with an adjacent earth bank constructed from the material excavated from the channel;

- Contour Banks – to be constructed around each fill area described in the previous sections. These banks will be constructed *in situ* with no greater than a 1 percent fall to allow stable passage of water. Depending on the overall

length and profile of the slope, a contour bank will be constructed every 10 m of vertical height;

- Absorption Banks – these are the same as a contour bank but are constructed along the contour and then tapered up at each end. Runoff from the batter will be therefore contained within the bank with no discharge at either end. These will be used in selected areas to retain as much water as possible within the bank to assist with rehabilitation;

- Sediment Basins – will be located as described in the previous sections, predominantly within the dirty water system. These are in addition to the main pollution control structures. The primary purpose of these basins will be to contain sediment from normal rainfall events as well as reduce flow velocity during high rainfall events;

- Energy Dissipaters – will be constructed in the form of rock rubble and will be located where necessary within the proposed drainage system. These will provide additional erosion protection during high flow conditions; and

- Sediment Fences – will be used extensively and erected prior to earthworks proceeding at any of the surface facility sites. The purpose of the fence will be to filter runoff from disturbed areas, trapping the sediment and allowing filtered water to pass through. The reason for using a filter fabric instead of a straw bale filter in most applications will be the ease of removing trapped material to be returned to the topsoil stockpile.

2.13.11 Landscaping

Site landscaping forms part of the construction program and has been developed in line with the proposed bunding safeguards for noise and visual mitigation and pollution controls such as dams and water storages. Elements of the plan include:

- Appropriate selection of external building colours to blend into the natural surrounding vegetation and land use;

- Vegetation screening between the Tooheys Road site and the F3 Freeway and along Hue Hue Road;

- Planting of native vegetation along noise control bunding to enhance visual screening effects; and

- Landscaping around buildings and carparks to break up the built elements while keeping functional external work areas.

2.13.12 Construction Buildings and Facilities

The construction program will involve the erection of temporary buildings, light and heavy vehicle parking areas, access roads, equipment storage compounds, lockable shedding, diesel generators, security facilities and services. These facilities will be located at both the Tooheys Road and Buttonderry sites and will generally be within the ultimate development footprint. Any disturbance outside the ultimate development footprint will be rehabilitated on completion of the construction program.

2.14 Rehabilitation

Rehabilitation will occur in three generic phases, however elements may overlap or occur concurrently and progressively as required:

- Construction – by establishing the infrastructure sites disturbance of the surface will occur. It will be essential that all surfaces are made stable and non-polluting during and after construction is complete. Rehabilitation at this stage will be restricted to surface landscaping following construction. Once all stages are fully constructed, the total area of land disturbance is expected to be static for the life of the project.

- Ongoing Operations – during the term of mining operation situations may occur where rehabilitation is required. These may be as a result of additional drilling within the mining area or management of existing water management structures such as dams. The rehabilitation activities that are associated with the ongoing operation of the mine are usually "housekeeping" issues that are undertaken as required, with the purpose of maintaining stable and non-polluting sites.

- End of Mine – this is the largest element of rehabilitation and involves the close down of the mine. Once coal mining has ceased, the pit top facilities will require rehabilitation works in accordance with the conditions of the mining lease, and consistent with the principles in *Strategic Framework for Mine Closure (ANZMEC / MCA)*; *Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia);* and *Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)*.

The following sections focus on the end of mine rehabilitation, however the guiding principles apply to all stages of rehabilitation, with the exception that rehabilitation activities related to construction and the ongoing operations must facilitate the safe and effective mining of coal and coal handling. Rehabilitation of subsidence related impacts in the mining area are discussed in Section 2.14.10.

2.14.1 Statutory Requirements

The statutory requirements for rehabilitation work in relation to surface disturbance within Coal Leases in NSW are principally governed by environmental provisions of the Mining Act 1992 which is administered by the NSW Department of Industry and Investment (I&I NSW).

The general rehabilitation requirements for the site are listed below:

- Provision of pollution control systems to protect water ways and surrounding ecosystems;

- Progressive rehabilitation of disturbed areas to a safe and stable land form compatible with the surrounding land fabric;

- Provision of suitable waste management systems;

- Prevention of soil erosion;

- Control of noxious weeds and vermin;

- ❒ The lodgement of security deposits to ensure compliance with conditions and regular review of these amounts in line with environment liability; and

- ❒ Upon decommissioning of the site, removal of plant and infrastructure and making the site safe.

Irrespective of the proposed final land use (see below), in terms of overall rehabilitation objectives, the Department of Industry and Investment require the site to be effectively managed until final landform is created and vegetation cover is self sustaining. The final landform must allow long term stability with no future liability from coal mining activities.

2.14.2 Final Land Use Options

The determination of a final land use relates only to the areas of surface impacts. The land use of the mining area is governed by the private land owners, and will not be altered or changed by the W2CP (refer to Section 15.2.7 for a discussion on land use impacts).

To decide a final land use for the surface facility sites the following must be taken into consideration:

- ❒ current industry standards;
- ❒ land zonings;
- ❒ strategic planning for the region by Council and State Government;
- ❒ the value and market for a particular land use type; and
- ❒ the ongoing operations of the land owner at the time (in this case the landowner is the WACJV).

The life of the W2CP is anticipated to be 42 years, based on current resource estimates. It is likely that at the end of the 42 year life of the mine the factors listed above will be different to their current status. It is therefore important that the final land use proposed remains flexible to enable these issues to continue to be relevant at the end of the mine life.

Below are potential land use options for the W2CP surface facilities areas that have been considered in the current context of factors listed above.

Potential Agricultural Final Land Use
The Buttonderry and Tooheys Road sites have a long agricultural history and are currently managed as cattle grazing properties. Given the current land use of these sites, if they were to remain undeveloped for the W2CP, their immediate potential would remain as agriculture, in keeping with the neighbouring properties and existing surrounding environment. There is justification to return them to agricultural properties on completion of the W2CP, which would be commensurate with the principle of returning them to the same or better condition.

The Western Shaft Site currently supports native vegetation, and is continuous with vegetation in the region. The option of rehabilitating this site to agricultural land is not appropriate and the site will be returned to a vegetation community compatible with the surrounding Wyong State Forest.

Potential Industrial Final Land Use
The Tooheys Road site is currently zoned as industrial land. This area has been earmarked as future employment lands by the Department of Planning. Currently the provision of services such as roads, water, power and telecommunications to

this location is low, therefore industrial activity has been slow to develop. The development of this site for the W2CP will include the provision of these and other services. It is therefore anticipated that other industrial users will be attracted to the area. The Buttonderry site is adjacent to the area identified as potential employment generating lands.

The future use of the Tooheys Road site for industrial purposes following the cessation of mining is logical, given that the area has been identified for industrial use, and it will contain valuable elements (eg rail spur, hardstand areas, services etc) for such activities.

At this stage it is not proposed that the final land use of the Buttonderry site will be industrial, however if planning strategies and zoning changes in the future, it would be considered for such purposes. Being located directly opposite to the Wyong Employment Zone and expected to be fully serviced at the end of the mine life, the future use of the Buttonderry site for commercial or industrial purposes is highly likely.

Industrial use of the Shaft Site is not considered appropriate given its location surrounded by State Forest, and its existing site condition.

Potential Housing Final Land Use
There is an ever increasing demand for land releases to accommodate the growing population in and around Sydney. While the current land use zoning would not permit subdivision for housing purposes, at the cessation of mining the Buttonderry site may become suitable for such purposes. It is unlikely that the Tooheys Road site would be appropriate, since it will more than likely be surrounded by industrial development.

Conservation Final Land Use
Based on current expectations of key stakeholders and the existing land uses, it is proposed that the Western Shaft surface facilities will be rehabilitated to a native forest ecosystems, similar to pre clearing vegetation systems. Rehabilitation of the Buttonderry site with native vegetation will further enhance the conservation initiatives established in the Ecological Offset Areas.

However, if an alternative final land use (eg employment or industrial lands, housing, agriculture etc) is identified in future regional planning strategies proposed by the government, other final land uses may be considered. If this is the case, the rehabilitation strategy presented in this EA would be different, and would be developed in consultation with key stakeholders.

2.14.3 Rehabilitation Objectives

The primary objective of the rehabilitation program is to produce final stable landforms at each of the three W2CP infrastructure sites, consistent with surrounding topographic features and suitable for the proposed future land use.

Tooheys Road
The Tooheys Road site will be rehabilitated to create a stable and non-polluting landform that is suitable for ongoing use as an industrial site.

Buttonderry Site
The Buttonderry site will be rehabilitated to create a stable, non-polluting landform with self-sustaining vegetation to improve conservation values of the area.

Western Shaft
The Western Shaft site will be rehabilitated to create a stable, non-polluting landform with self-sustaining vegetation to improve conservation values of the area.

2.14.4 Rehabilitation Plan

To facilitate the orderly and strategic rehabilitation at the end of the mine, the surface facility sites have been divided into areas or domains, as shown on Figure 2.28 and Figure 2.29. The domains have been assigned based on similar rehabilitation techniques required. The remediation required for each area is described below, however they are not necessary listed in the order in which they will be rehabilitated. The order of rehabilitation for the various areas will depend upon:

- task difficulty;
- sequence logic;
- resource availability; and
- seasonal considerations.

Tooheys Road
It is proposed that on completion of mining, the Tooheys Road site will be rehabilitated to a condition that is suitable for ongoing use as an industrial site. In order to achieve this, the following rehabilitation activities will be undertaken:

- sealing of the drift portal entry (Domain 6);
- removal of all carbonaceous material (Domain 4);
- removal of the water treatment plant if a future industrial user has not identified it as an asset (Domain 7);
- removal of conveyors and other coal handling equipment (Domain 5); and
- removal of the gas management facility if it is not identified as an asset by a future industrial user (Domain 8).

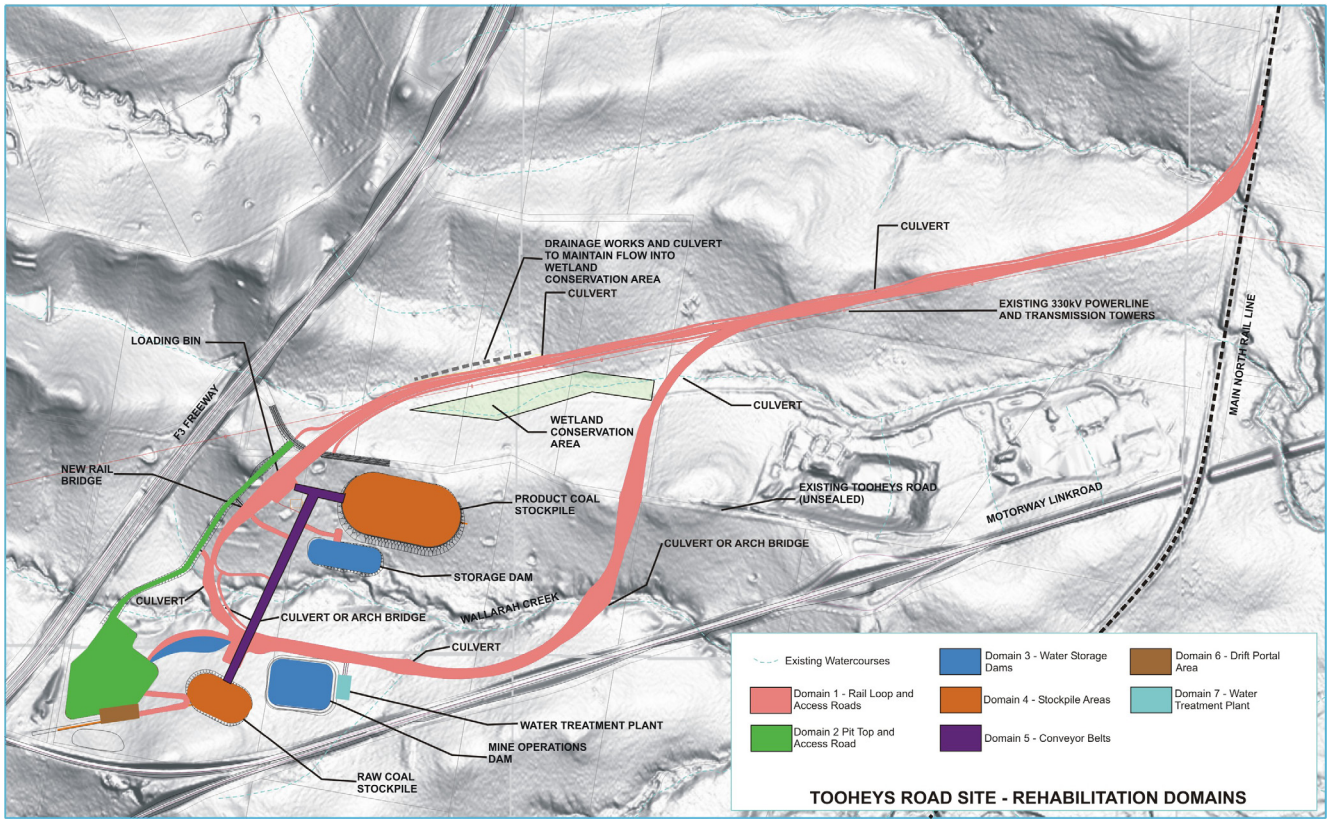

Figure 2.28 Tooheys Road Site – Rehabilitation Domains

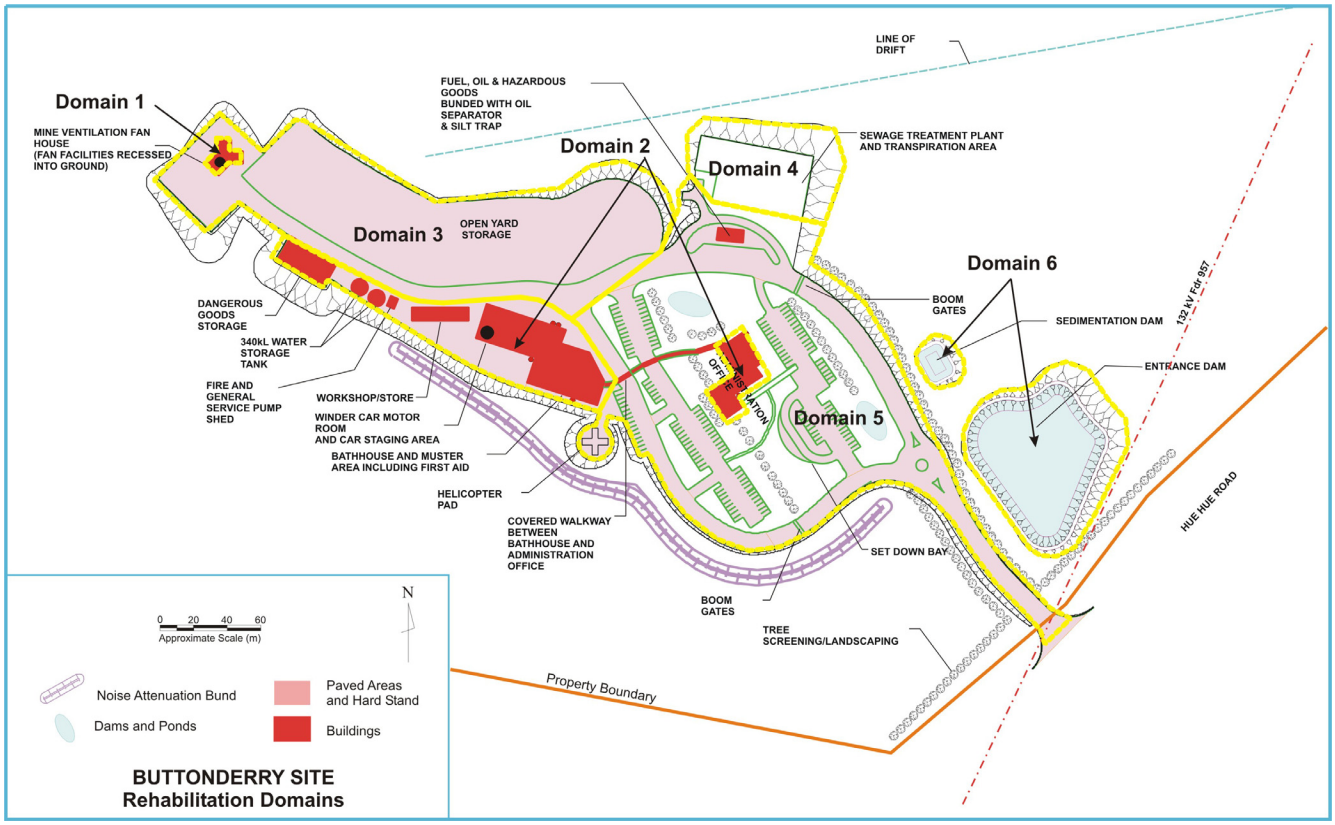

Figure 2.29 Buttonderry Site – Rehabilitation Domains

The following elements will remain as valuable assets for the future industrial use of the site:

- rail line and loading facilities (Domain 1);
- entrance road and carpark (Domain 2);
- offices, bathhouse, workshop and storage buildings (Domain 2);
- fuel storage facilities and bunding (Domain 2);
- fire fighting water storage tanks and the surface fire station (Domain 2);
- sewerage treatment system (Domain 2);
- utilities such as power lines, switchyard and transformers, phone etc (Domain 2);
- hardstand areas (Domain 2);
- Stockpile bases (Domain 4) and
- pollution control water management structures (Domain 3).

Details on the process, methodology and schedule of activities to carry out these rehabilitation activities will be further developed in consultation with key stakeholders and detailed in the Rehabilitation and Environmental Management Plan (which will replace the Mining Operations Plan in 2010) to be prepared after planning approval is granted.

Domain 1
Domain 1 includes the rail loop and access tracks. These elements will be retained for future industrial use. No rehabilitation other than general maintenance is proposed for this Domain.

Domain 2
The area indicated on Figure 2.28 as Domain 2 includes infrastructure such as the office buildings, entrance road and carpark, that would be useful for the future ongoing use of the site for industrial purposes. Other than general maintenance requirements, no specific rehabilitation of this Domain is proposed.

Domain 3
Domain 3 includes all of the pollution control structures such as drains, sediment dams etc that would be required for the future industrial use of the site. No rehabilitation of these areas is proposed other than general maintenance requirements to ensure they continue to operate efficiently.

Domain 4
The two stockpile areas have been included as Domain 4. These will require removal of all carbonaceous material, however the level pad base will remain. Once they are cleaned of coal, they will be available for future use as part of the ongoing industrial land use of the site.

Domain 5
Domain 5 includes the conveyor system. This will not be of use for future industrial purposes and will therefore be dismantled and removed from site. The area beneath the conveyors will be cleaned of all coal material, and revegetation with grasses will be undertaken to ensure ongoing surface stability.

Domain 6
The portal drift will not be required for ongoing industrial purposes, and will be sealed in accordance with the *Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams, DRAFT"* (DPI).

Domain 7
It is unlikely that the Water Treatment Plant will be required for ongoing industrial uses. This will therefore be decommissioned and removed from site. The area will be graded to a stable slope consistent with the surrounding landform and revegetated with grass species to ensure surface stability.

Domain 8
The gas management facilities will not be required for future industrial uses. This infrastructure will be decommissioned and removed from site.

Buttonderry
It is currently proposed that on completion of mining, the Buttonderry site will be rehabilitated and revegetated to provide additional conservation areas to further enhance the ecological offsets for the project. In order to achieve this, the following rehabilitation activities will be undertaken:

- Ventilation, employee / materials access shafts and ballast borehole will be filled and sealed in accordance with the *Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams, DRAFT"* (DPI) (Domain 1);

- All buildings and equipment / infrastructure to be removed (Domain 2);

- All hardstand areas to removed (Domains 5);

- Contaminated hardstand areas eg inside bunded fuel storages to be removed from site and disposed of in an appropriate waste disposal facility (Domain 3); and

- Sewerage treatment facilities disabled and removed (Domain 4).

Following these activities, the final landform can be shaped to final contours and revegetated. The only elements to remain will be the pollution control structures (Domain 6). These will be essential to maintain offsite water quality until a stable ground cover can be achieved. Once self-sustaining vegetation has been created, the pollution control structures will provide a water source for wildlife.

Domain 1
This area contains the mine ventilation shaft. The infrastructure will be removed from site, and the shaft filled in accordance with the *Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams, DRAFT"* (DPI). Minor earthworks to shape the site to a gentle slope consistent with the surrounding topography will be carried out before it is topdressed and sown with native forest species. The material used to fill the shaft will include some of the original excavated material from the shaft construction which was used to form the landscape bunding around the shaft site.

Domain 2
Domain 2 consists of the buildings and workshop. These will be dismantled and removed from site. The hardstand beneath will be removed, and if it is considered appropriate, may be used as the initial fill layer for the shaft. The area will be shaped to provide a gentle landform consistent with the surrounding contours, topdressed and sown with native forest species.

Domain 3
A Stage 1 and 2 contamination assessment will be undertaken around the storage yard. Remediation will be carried out as required, the area shaped, topdressed, and revegetated with native forest species.

Domain 4
The sewerage treatment plant will be removed from site. Soil tests will be carried out to confirm the suitability of vegetation to be grown, and any modification required. This area will be sown to forest species.

Domain 5
This area includes the entrance road and tracks. The hardstands will be removed, and if suitable, may be used to fill the shaft. The surface will be shaped consistent with the surrounding landform, topdressed, and sown with forest species.

Domain 6
Domain 6 includes the water management structures. It is important that these elements remain in place until all rehabilitation is complete, and the success criteria of a stable self sustaining native ecosystem has been achieved. Until this is met, routine maintenance of these structures will be carried out. Once rehabilitation is complete, they will remain to serve as a water source for native fauna.

Western Shaft
It is proposed that on completion of mining, the Western Shaft site will be rehabilitated and revegetated to provide additional conservation areas continuous with the existing surrounding vegetation of Wyong State Forest. In order to achieve this, the following rehabilitation activities will be undertaken:

- The shaft will be filled and sealed; and
- Surface infrastructure (concrete collar, fencing etc) will be removed.

Following these activities, the final landform can be shaped to final contours and revegetated. While no pollution control system has been proposed for this site (post construction), erosion and sedimentation control structures (eg sediment fences) will be employed throughout the rehabilitation process. These will be maintained until a stable and self sustaining vegetation cover has been established. After this time, it is anticipated that no evidence of mining related activities will remain at this site.

2.14.5 Erosion and Sediment Control

Erosion and sediment controls have been detailed in Section 2.13.10. They will be essential downslope of all ground disturbances, including earthworks and reshaping of landforms associated with the final rehabilitation of surface facility areas. Erosion and sediment controls will be maintained until such time as soils are considered stable and a self sustaining vegetative cover has been established. In addition to the existing pollution control systems, additional sediment fences etc will be employed throughout the rehabilitation process.

2.14.6 Revegetation

Revegetation will be required to stabilise slopes and land surfaces following the construction phase, and on completion of shaping for the final rehabilitation of the sites. The preferred season for most sowing applications is autumn, however, winter to early spring sowings can occur depending on completion of surface preparation. This is particularly relevant given that most of the sowing will be using

native tree and grass species which are more resilient in soil environments and generally require significant time to germinate. It is not uncommon for native tree seed to take at least two dormant seasons before germination occurs and significant growth can take at least three years.

The revegetation program will aim to recreate the pre-existing vegetation type, in terms of both floristic diversity and structure. Several methods are available, however the preferred method is direct seeding with native species. This method has proved successful at other mine sites, despite the severe drought conditions prevailing. Efforts will be made to source the seeds from the local region to conserve the genetic integrity of the existing vegetation.

The Buttonderry site currently contains a mix of cleared agricultural land, and native vegetation, as shown on Figure 13.3. Final rehabilitation of the site will aim to recreate these vegetation communities, consistent with the soil type and aspect of the final landform.

The Western Shaft site currently contains Coastal Ranges Moist Layered Forest (refer to Section 13.1.4 for a description). The final rehabilitation of the Shaft site will aim to recreate this vegetation type.

2.14.7 Completion Criteria

Ultimately, the work will be considered successful if the objectives of the rehabilitation plan for each site have been achieved. Detailed completion criteria for each stage of the rehabilitation program will be developed and refined through the Rehabilitation and Environmental Management Plan (which will replace the Mining Operations Plan in 2010), which will be developed in consultation with key stakeholders after planning approval and a mining lease have been granted.

The principles of Landscape Function Analysis (LFA) will be implemented to provide a predictive understanding of how well the rehabilitation landscapes are working. LFA is essentially a monitoring procedure, using simple indicators, to assess how well an ecosystem works as a biogeochemical system. It is intended for repeated measurements to present the data as a time series (trajectory). The normal monitoring of revegetation performance includes:

- Floristic analysis including species composition;
- Structure including height and distribution; and
- Health and vigour of the plants.

These parameters are sufficient to determine ongoing maintenance requirements such as sowing specific species, additional fertiliser or soil conditioning treatments. However with the addition of LFA methods, the function of the landscape system can also be assessed and tracked.

Ultimately, the decision on whether or not the revegetation works have succeeded rests with DII, however it is anticipated that some expert advice will be sought at the time of lease relinquishment.

Tooheys Road
To meet the rehabilitation objective of producing an industrial land use for the Tooheys Road site, the following points will be considered. If these elements are achieved, the rehabilitation will be deemed complete:

- ❒ All surfaces are stable with risk of erosion as low as possible;
- ❒ Surface water management systems are capable of preventing off-site pollution;
- ❒ The site is safe and secure and does not pose a threat to future users or the general public;
- ❒ The site is compatible with the surrounding visual catchment; and
- ❒ Ongoing maintenance requirements such as weed management and feral animal control are as low as possible.

It is anticipated that these completion criteria will be met quickly, since the environmental management of the site during operations should also meet these criteria.

Buttonderry and Western Shaft
To meet the rehabilitation objectives of the Buttonderry and Western Shaft sites, the most effective measures of performance will relate to the revegetation works. These will be deemed successful if native vegetation communities are established that achieve the following:

- ❒ Diversity and structure to be compatible with the surrounding forest ecosystem;
- ❒ Reduce watershed flow velocities that would have the potential to create erosion in the long term;
- ❒ Promote native flora and fauna conservation; and
- ❒ Provides improved visual amenity to the area.

Recording and assessing the species diversity of the rehabilitated areas will take into account normal succession processes that native vegetation communities naturally go through. It is therefore expected that an initial dominance of coloniser species such as acacias will gradually be replaced by canopy and other understorey and groundcover species. Rehabilitation in terms of establishing a vegetation community consistent with the surrounding native vegetation cannot ultimately be determined in the short term, but could be determined with a high level of confidence within three years of initial germination.

The key success criteria will be the occurrence of canopy trees which display healthy growth and which have successfully seeded twice. At this time it could be assumed with some confidence that the vegetation community is self sustaining. Current Landscape Function Analysis methods will be employed to determine effective indicators for satisfying the success criteria.

2.14.8 Monitoring and Research

Surface Facility Sites
Photo and monitoring points will be established for rehabilitation areas, so that site managers can keep accurate records of plant growth and site recovery, as well as track the progress of rehabilitation works. Regular monitoring will also allow the early detection of rilling or erosion of the sites and facilitate timely and cost effective retreatment.

The monitoring locations will be selected to provide a good indication of each of the rehabilitation areas described in this document, and at least one point will be

established in each domain, identified by its survey coordinates, and will consist of a 5 m x 5 m quadrat for vegetation monitoring purposes. In areas that contain steep slopes, a monitoring location will be selected on each of the successive lifts / benches. Monitoring indicators will include current Landscape Function Analysis methods and include soil fertility, moisture, structure, slope, erosion, species structure, health and composition.

Mining Area

Monitoring of the mining area forms a normal part of any underground mining operation and will be detailed in any future Extraction Plans. The monitoring work will be designed to current DII standards and include detect of any cracking or erosion or changes in risk levels. Based on the assessment of soil types that could potentially display subsidence related impacts in certain locations, areas have been identified that will be regularly inspected to detect any locations where rehabilitation works may be required, for example any signs of cracking, new erosion channels, or slumping of land. In addition, if a request is made by a landowner who suspects that surface impacts have occurred on their property, inspections will be made to verify the impact and any rehabilitation works that may be required.

Further details of the monitoring proposed above the area of coal extraction are provided in Section 6.8.

2.14.9 Post-closure Maintenance

Responsible management of the site does not assume that once seeds have been sown and tube stock planted the site is stable and rehabilitation complete. Ongoing monitoring of the success of final landform development and revegetation will be undertaken to ensure the success of such activities, or identify areas where further works are required.

It is anticipated that biannual inspections of the rehabilitation areas will be undertaken, or following severe rainfall events where the potential for erosion is significantly increased.

Follow up work expected to be required includes ongoing weed and feral animal control, repair of any erosion, replacement of dead vegetation (a strike rate of around 70% is considered acceptable in line with current industry standards), and possible additional application of fertiliser if required. It is expected this followup work will continue by the leaseholder for a number of years after the completion of the final rehabilitation works.

The results of ongoing Landscape Function Analysis monitoring will be provided to DII until such time as lease relinquishment is granted by the Minister for Minerals and Energy.

2.14.10 Rehabilitation of the Mining Area

Rehabilitation activities to be undertaken in the mining area will be limited to works required to repair any subsidence related damage as described in Section 6.7.

2.15 Rail Line Subdivision

This application also covers the necessary subdivision to accommodate the rail spur and a section of the loop leading from Main Northern Railway to the Tooheys Road

site. The purpose of the subdivision will be to allow a long term lease to be established from the Darkinjung LALC and Crown Lands.