APPENDIX I

Visual Impact Assessment

COALPAC Consolidation Project

Visual impact assessment

December 2011

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Glossary

Areas of Primary Visual Concern	Areas that have potential views to the Project based on a consideration of topography alone as a screening element
Visual Sensitivity	The degree to which a change to the landscape will be perceived in an adverse way
Visual Effect	A measure of the visual interaction between the Project and the landscape setting within which it is located
Primary View Zone	This zone is the central most critical part of a view that is seen with the greatest clarity. It is that part of a view that is within an horizontal arc of 30^0 either side of the centre line of a view and a vertical arc of 30^0 above the horizontal
Field of View	This area includes the total view, consisting of the primary view zones above and the secondary or peripheral view zones around the primary view zone, out to about 70^0 either side of the central view line in both vertical and horizontal plain
Visual Impact	A measure of a joint consideration of both visual sensitivity and visual effect that considered together determine the visual impact of a development
Contrast	The degree to which a development component differs visually from its landscape setting
Integration	The degree to which a development component can be blended into the existing landscape without necessarily being screened from view
Screen	The degree to which a development element is unseen due to intervening landscape elements such as topography or vegetation
VCU	Visual Character Unit. Areas of landscape that have similar topographic, vegetation and land use features that create areas of similar visual character

1. INTRODUCTION

1.1 Background

Coalpac Pty Ltd (Coalpac) seeks a Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EPandA Act) to consolidate the operations and management of the Cullen Valley Mine and Invincible Colliery sites under a single, contemporary planning approval to allow coal mining operations within its current mining tenements to continue for a further period of 21 years (the Project). The Project Application Boundary (Project Boundary) is shown on Figure 1.1.

Coalpac was established in 1989 and has successfully owned and operated coal mines in the Lithgow district for over 20 years. Coalpac has operated Invincible Colliery using various mining methods since that time, including underground continuous miner, open cut excavator and truck, and highwall mining operations.

In February 2008, Coalpac purchased the Cullen Valley Mine and with Invincible Colliery, has operated the two mines in unison since that time. It is the intention to utilise these mines as a base from which to grow Coalpac's operations in the Western Coalfields of NSW.

1.2 The Project

Project Approval is sought for the following Project:

- Consolidation and expansion of the existing Cullen Valley Mine and Invincible Colliery;
    - Consolidation and extension of the existing Cullen Valley Mine and Invincible Colliery operations to produce up to a total of 3.5 Mtpa product coal, including:

The continuation of mining operations at Cullen Valley Mine (the area west of the Castlereagh Highway) via both open cut and highwall mining methods to access an additional resource of approximately 40 Mt ROM; and

The continuation of mining operations at Invincible Colliery including an extension north into the East Tyldesley area via open cut and highwall mining methods to access an additional resource of approximately 60 Mt ROM;

- Continuation of coal supply to the local Mount Piper Power Station (MPPS) via a dedicated coal conveyor over the Castlereagh Highway (to be constructed), and (emergency supply to) Wallerawang Power Station, with flexibility for supply to additional domestic destinations and Port Kembla for export;
- Upgrades to existing administration, transport and other infrastructure;
- Construction and operation of additional Offices at Cullen Valley Mine;
- Construction and use of the previously approved Coal De-shaling preparation Plant (CDP) at Cullen Valley Mine;
- Construction and use of a bridge over the Castlereagh Highway to link operations east and west of the highway and the development of required access roads to the East Tyldesley area;
- Construction and operation of a bridge and haul road across the Wallerawang - Gwabegar Railway line to permit access to mine the previously approved Hillcroft resource;
- The extraction of the Marangaroo Sandstone horizon from immediately below the Lithgow Coal Seam in the northern coal mining area of Cullen Valley Mine. This material will to be trucked for crushing on site prior to sale into the Sydney (and surrounds) industrial sand market;
- Construction of a rail siding (or rail loop) and associated infrastructure to permit transport of product coal and sand products;

- Integration of the water management of both sites into a single system; and Integration of the management of mine rehabilitation and conceptual final landform outcomes for Cullen Valley Mine and Invincible Colliery.

1.3 Description of Project Area and Surrounds

As shown on Figure 1.1, the existing Cullen Valley Mine and Invincible Colliery operations are located adjacent to the Castlereagh Highway, approximately 25 km north-west of Lithgow, NSW. Cullen Valley Mine is located to the west of the highway and Invincible Colliery to the east of the highway. Both operations are located on lands surrounding the township of Cullen Bullen, with Invincible Colliery and Cullen Valley Mine located approximately 1 km to the south-east and north-west, respectively. All of Coalpac's mining activities occur within the Lithgow City Council Local Government Area (LGA).

The Project is located on undulating to steep forested lands within and adjacent to Ben Bullen State Forest and is adjoined by rural grazing lands on gentle to moderately sloping terrain.

1.4 Visual Assessment Objectives

This technical report is a visual assessment of the potential impacts of the Project on the existing landscape and visual values of the area, including those from existing land uses. The report identifies the visual character of the existing landscape as well as that which is predicted to occur as a result of the Project. The visual impact of the Project, including both short term and long term impacts, has been assessed and visual impact mitigation strategies developed as required.

This report also considers cumulative visual impacts in the locality of the Project. This will include a consideration of light effects.

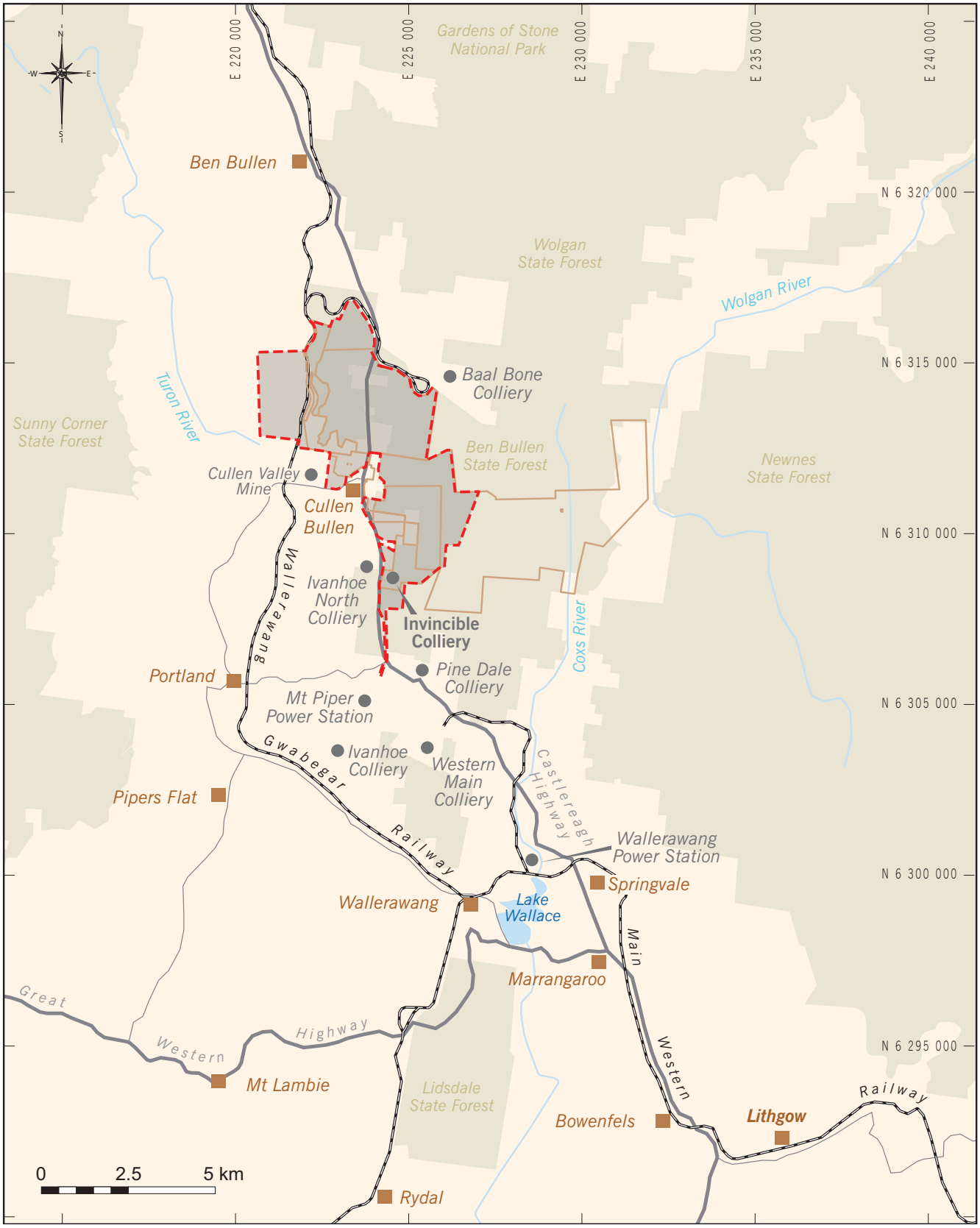


Figure 1.1 | Regional Locality

2. ASSESSMENT METHODOLOGY

2.1 Introduction

The methodology to determine the level of visual impact of the Project involves three stages. The consideration of the existing visual environment includes a review of existing landscape settings, and how they are seen from various viewing locations. In this way, the visual character of the landscape (as well as visual sensitivity of the various viewing locations) can be determined.

Secondly, the visual effect of the Project is assessed by considering the visual characteristics of the Project in the context of the landscape within which it is seen.

A combined consideration of both visual sensitivity and visual effect identifies Project impacts and directs if any mitigation strategies are required. The overall method of visual assessment of the existing landscape and the Project in the context of the landscape is outlined in Figure 2.1.

2.2 Evaluation of the Existing Visual Environment

The evaluation of the existing visual environment consists of the assessment of both the landscape and viewing locations within it that may be impacted by the Project. It also includes consideration of the statutory framework within which any development must be considered.

2.2.1 Landscape Setting

The landscape setting of the Project is defined in terms of topography, vegetation, hydrology and land use features. These elements define the existing visual character of the landscape that the Project is located within interacts with. Within any landscape there are areas of similar visual features are defined as a Visual Character Units (VCU). Characterising the landscape in terms of these units assists in understanding the visual character of the landscape as a whole.

The scenic amenity of the various VCUs in the landscape are defined as either distinctive, common or minimal.

Distinctive landscapes are of regional significance and have unique landscape values in terms of topography, vegetation, geology, hydrology and or various cultural or heritage features. In addition, these areas would have a high visual integrity with no detracting features. These landscapes will have unique form, shape, line and / or colour, geological, vegetation or hydrological features.

Common landscapes are areas that have visual integrity but are not uncommon or unique. These landscapes will have pleasing pattern, shape, line and or colour (e.g. rural areas).

Minimal landscapes can have a high integrity but often lack visual interest. These landscapes will be common but also lack visual variety of form, shape, line or colour. Landscapes such as Lake Eyre have little visual variety, with the exception of scale and ephemeral effects, but these values make it unique and distinctive. Disturbed landscapes lack visual integrity with intrinsic values of form, shape, line colour and texture significantly compromised (e.g. overburden areas and mining areas).

Disturbed landscapes are those that have been modified and would require some form of management to reinstate scenic amenity and restore integrity to surrounding landscapes.

The scenic amenity of each VCU was considered in the methodology for this assessment as outlined in Section 3.

2.2.2 Viewing Locations

The viewing locations are those areas where people are likely to obtain a view of the Project. These viewing locations have different significance based on numerous factors, collectively evaluated through land use and viewing distance to the Project.

2.2.3 Statutory Framework

This impact assessment has been prepared in accordance with Part 3A of the EPandA Act. This Act and the Director-

General Requiems (DGRs) issued by Department of Planning for the Project, require that environmental impacts including visual impacts be assessed and mitigated where required.

2.2.4 The Project

The Project is evaluated to define the visual elements that are most significant from a visual perspective in the context of the existing environment. The key Project elements from a visual context are defined as being major or minor and are considered in terms of how they contrast with the main element of the existing environment.

2.3 Analysis of the Project and its Setting

The analysis of the interaction between the existing visual environment and the Project provides the basis for determining impacts and developing mitigation strategies. The impact levels of the Project are determined by the definition of the visual effects of the Project and visual sensitivity at specific viewing locations.

2.3.1 Visual Effect

Visual effect is a measure of the level of visual contrast and integration of the Project with the existing landscape.

The degree to which the visual characteristics and elements of the Project contrast with the existing landscape will determine the level of visual effect. A new mine site will have a higher visual effect due to strong contrast. Extension of operations in an existing mine will have a lesser visual effect. The successful completion of rehabilitation would be likely to have a low visual effect due to limited contrast with the existing landscape.

In a similar way, a development is said to be integrated with the existing landscape based on issues of scale, position in the landscape and contrast with the surrounding environment. High visual integration is achieved if a development is dominated by the existing landscape, is of small scale and or of limited contrast.

The magnitude of the visual effect for a development, outlined in Figure 2.2, is determined by a balanced analysis of the following factors.

2.3.2 Contrast and Integration

The level of contrast and integration of the Project with its surrounding landscape determine visual effect. Project elements as expressed through the visual expression elements (i.e. form, shape, pattern, line and colour with minor consideration in relation to texture) contrast to varying degrees with the surrounding landscape and will also create some level of integration with it.

2.3.3 The Proportion of a View that includes Project Areas

For any given level of contrast and integration, a lower proportion of the view that is occupied by the Project elements, will result in a lower level of visual effect. This is determined by defining the proportion of the total field of view that is occupied by the Project. This in turn is most appropriately determined by defining what percentage of the Primary View Zone (PVZ) it occupies, see Figure 2.3. The PVZ is that area that is occupied by an arc created by sight lines from the eye radiating out vertically and horizontally at angles of 30^0 around a centre view line from a nominated viewing location.

The PVZ is the most critical and central part of a view. It is not representative of the total view, but is the most important part.

Measuring the percentage of the PVZ occupied by a development will provide a more conservative measure than the consideration of the development in the context of the whole view zone, which would include both primary and secondary view areas (representing a view arc of 120^0 instead of a view arc of 60^0 represented by the PVZ only).

Generally, a high visual effect will result if a visible element of the Project has a high visual contrast and low integration to the surrounding landscape.

A low or very low visual effect will occur if there is minimal contrast between the visible area of the Project and the existing landscape setting and or the area occupied by the Project represent only small parts of a total view.

2.3.4 Visual Sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different land use areas in the vicinity of a project.

In this regard, residential, tourist and / or recreation areas generally have a higher visual sensitivity than other land use areas including industrial, agricultural or transport corridors. This is because land uses, such as residential, use the scenic amenity values of the surrounding landscape and may be used as part of a leisure experience and often over extended viewing periods. Figure 2.4 indicates the levels of visual sensitivity associated with the Project.

However, the visual sensitivity of individual residences may range from high to low, depending on the following additional factors:

- Screening effects of any intervening topography, buildings or vegetation. Residences with well screened views of the Project will have a lower visual sensitivity than those with more open views;
- Viewing distance from the residence to visible areas of the Project. The longer the viewing distances, the lower the visual sensitivity; and
- General orientation of residences to landscape areas affected by the Project. Residences with strong visual orientation towards the Project, i.e. those with areas such as living rooms and/or verandas orientated towards it, will have a higher visual sensitivity than those not orientated towards the Project, and which do not make use of the views toward the Project.

For any area to be given a sensitivity rank, it must have visibility to the Project. This visibility was determined based on field assessment, evaluation and computer assessment of topographic and vegetation data.

2.3.5 Visual Impact

The visual impact of the Project has been determined by considering both visual effect and visual sensitivity, which when considered together determine impact levels. The way in which the visual parameters of visual sensitivity and visual effect are cross referenced and resultant impacts is illustrated in Figure 2.5.

2.4 Development of Treatments

Visual impact mitigation strategies are recommended for both on site and off site as required, ensuring that either visual effects and or visibility/visual sensitivity factors are decreased in appropriate time frames to achieve impact mitigation. General strategies to reduce visual impacts which may be recommended are outlined below.

2.4.1 Reduce Visual Effects

Rehabilitation of disturbed areas associated with the Project to decrease the visual contrast created by mining operations to the existing landscape. Rehabilitation strategies that emulate patterns, shapes, line and colour of the existing landscape can reduce the contrast between the Project and the existing landscape, reducing visual effect.

2.4.2 Reduce Visual Sensitivity

Reducing visual sensitivity is achieved by carrying out treatments to minimise visibility to the Project. Due to the scale of open cut coal mine components, such as the Overburden Emplacement Areas (OEA), screening would best be completed at or close to the point of viewing. Such screening treatments can also be used to redirect views to areas not affected by mining activities as well as generally enhancing the landscape at the viewing point.

2.4.3 New Visual Setting

On completion of mining operations and following rehabilitation, a new local landscape will be created. This new landscape would reflect post mining landforms and landuse.

2.5 Implementation of Study Method

The methodology set out above was implemented through a combination of different evaluation processes and analyses. These are outlined below and included:

- Evaluation of plans, maps, aerial photography and reports;
- Field assessment; and
- Computer analysis.

Evaluation of plans and reports

Initial evaluation of the Project was based on the description contained in the Preliminary Environmental Assessment (PEA) prepared for the project by Hansen Bailey. As the Project was refined as a result of environmental impact studies, other reports by various sub-consultants provided other data that was of some relevance to visual impact assessment.

Topographic mapping and aerial photography provided the basis for the establishment of landscape and visual character, and along with field work in the areas within and surrounding the Project Boundary assisted in establishing VCUs for the Project.

Project plans, such as those for the conceptual mine plans, rehabilitation and final landform were used to assist in defining visual effects and where they will occur through the life of the Project.

Aerial photography, along with computer analysis assisted in evaluating the visibility and sensitive receptor location and extent.

Field assessment

Field evaluation involved visitation to locations within the PVZ. This included the assessment of the Project from the Castlereagh Highway; Red Springs Road (to the north, west and south of the Project), Portland Cullen Bullen Road and Back Cullen Bullen Road as well as the towns of Cullen Bullen and Portland.

Views toward the Project Boundary from the Gardens of Stone National Park to the north and Ben Bullen and Wolgan State Forests to the east were also evaluated from areas accessible by track as well as from some elevated rock edges, rock shelves and areas under escarpment tops. More significant heritage areas such as the Cullen Bullen General Cemetery and Aboriginal rock shelters were also assessed.

Such an assessment was made to give an indication of likely visibility conditions of the Project from each area (e.g. foreground screening, vegetation, open views, etc), the experience of different VCUs and how these are seen together to consider cumulative effects.

Computer analysis

Three forms of computer analysis were completed. These included establishing zones of visual influence, photomontage development and cross section analysis.

The zones of visual influence map was based purely on an assessment of topography and the 3D model of the mine for the key years assessed in the Project mine plans. They illustrate all areas that could have potential views (foreground vegetation and view orientation permitting), over a 20 year period, of even a small area of disturbance for even a short period of time during the life of the Project. In itself, this analysis provides a basis for interpreting potential 'seen' areas for the Project, it is not a 'seen area' map of itself as it does not give consideration to the screening effect of foreground vegetation or built elements. These features can significantly affect the areas from which the Project may be seen. The potential for such features to influence seen areas were determined via aerial photographs and in the field assessment and enable a more detailed analysis of the likely Project viewsheds and impacts (see Section 4 to Section 6).

Photomontage are images that bring a computer model of the terrain and the Project together to illustrate what the Project may look like from a given location at various points in time. Four montages were done to illustrate likely visual effects as seen from the north, east, west of the Project Boundary and from a central view location at the Cullen Bullen General Cemetery.

Cross section analysis illustrates the Project in relation to terrain at a specific location and is another tool for illustrating views and for identifying areas that may be screened from view by intervening topography.

Combined Analysis

In completing this assessment, no one analysis technique stood by itself. Rather it was a joint consideration of all the analysis techniques summarised above that was used to outline viewsheds, sensitive receptors, visual sensitivity and visual effect.

General trip lines along roads and forest access tracks have also been mapped which were visited in the field component of the visual assessment of the Project and where some of the photography that was completed during field assessment.

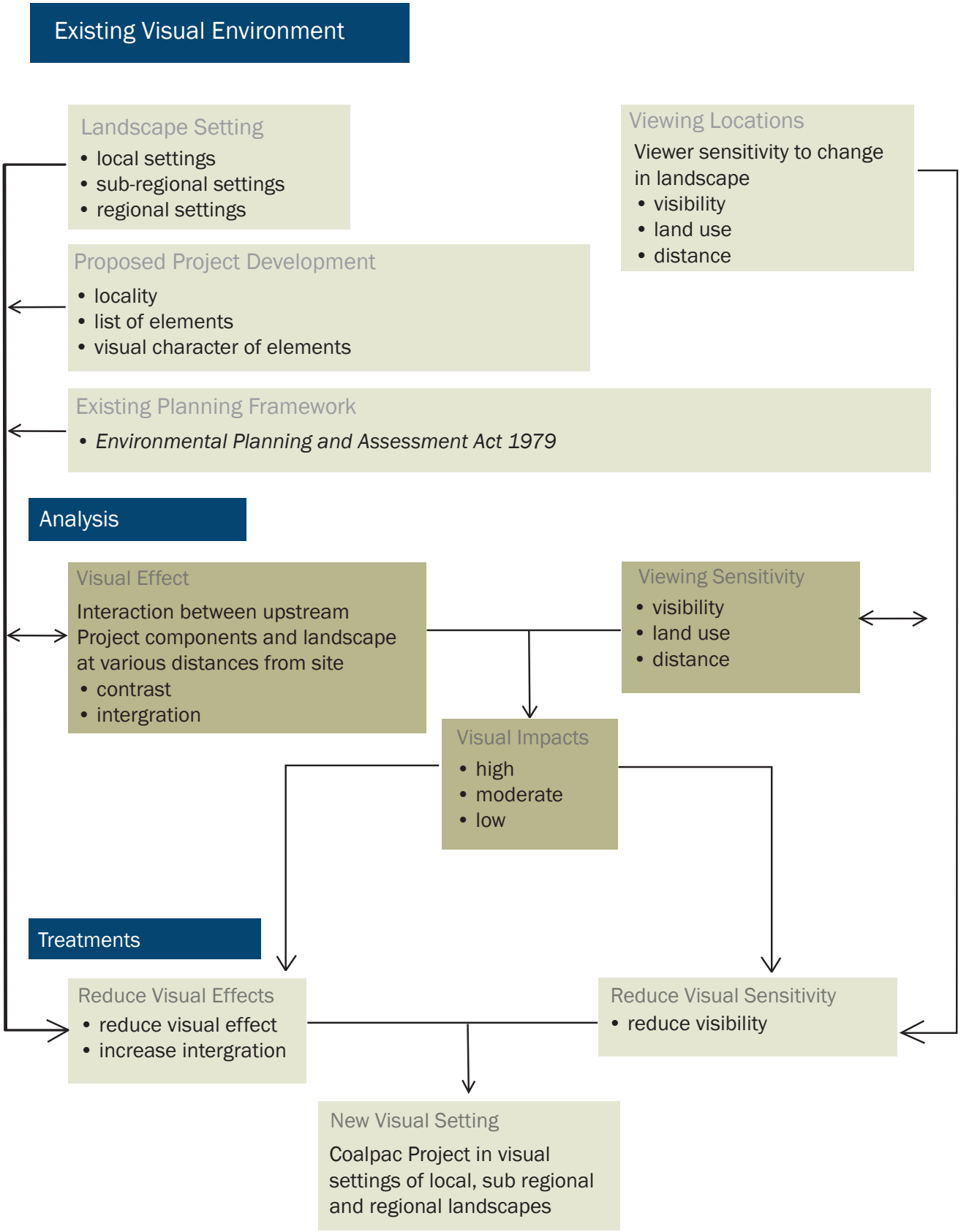


Figure 2.1 | Visual Assessment Methodology

Visual Properties			Visual Effect		
Contrast Levels with elements in primary view zone	Visual Integration with elements in primary view zone		High Visual Effect	Moderate Visual Effect	Low Visual Effect
High Project elements do not borrow, form, shape, line, color or texture or scale from existing features of the visual setting and contrast levels are high with existing landscape	Low The Project lacks integration with visual setting because of scale totally dominating the ability of site or surrounding features, vegetation and or topographic features to integrate the development	CATEGORY 1	Visible element occupies more than 2.5% of the primary view shed	Visible element occupies between 1 - 2.5% of the primary view shed	Visible element occupies less than 1% of the primary view shed
Moderate Project elements borrow from some features of the visual setting in terms of form, shape, line pattern and or color and scale, reducing visual contrast with existing setting	Moderate The Project has some degree of visual integration with setting from other features, vegetation and / or topography achieving some level of integration	CATEGORY 2	Visible element occupies more than 20% of the primary view shed, generally when in a foreground location	Visible element occupies between 20-10% of the primary view shed	Visible element occupies less than 10% of the primary view shed
Low Project elements borrow extensively from features in visual setting in terms of form, shape, line, pattern color and scale minimizing contrast with the existing setting	High Visual integration is high due to other features, vegetation and or topography achieving dominance and screening or filtering	CATEGORY 3	Visible element occupies more than 40% of the primary view shed	Visible element occupies 40-30% of the primary view shed	Visible element occupies less than 30% of the primary view shed

Figure 2.2 | Visual Effect Levels

Area of Primary View Zone at various distances from project area

Distance from project area	Area of Primary View Zone
1 km	0.52 km²
2 km	2.09 km²
3 km	4.71 km²
4 km	8.38 km²
5 km	13.07 km²
6 km	18.85 km²
7 km	25.65 km²
8 km	33.51 km²
9 km	42.41 km²
10 km	52.36 km²
11 km	63.35 km²
12 km	75.40 km²
13 km	88.49 km²
14 km	102.62 km²
15 km	117.81 km²

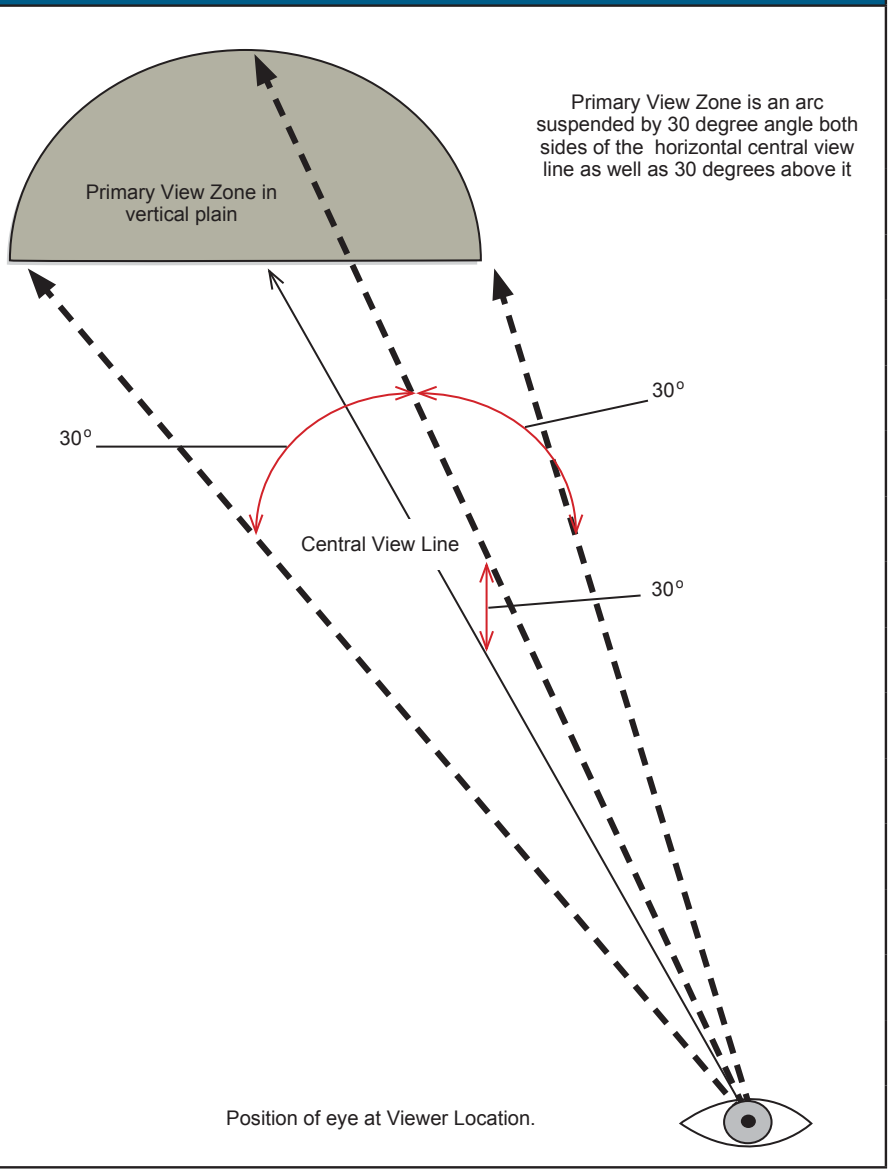


Figure 2.3 | Area of Primary View Zone at various distances from the Project

Land Use	Visual Sensitivity Levels			
	Nearest visible project elements less than 2.5 km+ away	Nearest visible project elements between 2.5 - 7.5 km away	Nearest visible project elements between 7.5 - 12.5 km away	Nearest visible project elements more than 12.5 km away
Rural houses, villages, towns & cities	High Sensitivity	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Tourist destination of visually sensitive land	High Sensitivity	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Designated tourist roads, main roads and highways, e.g. Castlereagh Highway	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Low Sensitivity
Other roads e.g. Portland Cullen Bullen Road	Moderate Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity
Minor local roads in rural area, Back Cullen Bullen Road	Moderate Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity
Broad acre rural lands and state forest lands	Low Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity

Figure 2.4 | Visual Sensitivity

Visual Effect	Visual Sensitivity		
	High	Moderate	Low
High	High visual Impact	High/Moderate Visual Impact	Moderate/Low Visual Impact
Moderate	High /Moderate Visual Impact	Moderate Visual Impact	Moderate/Low Visual Impact
Low	Moderate/Low visual Impact	Moderate/Low Visual Impact	Low Visual Impact

Visual Impact is dependant on the interaction between visual effect and sensitivity.

Figure 2.5 | Visual Impact

3. ASSESSMENT METHODOLOGY

3.1 Introduction

This section of the report establishes the visual character of the Project and the surrounding landscapes that make up its visual settings. The existing visual settings of the Project are created by a range of different landscapes, which vary as a result of topography, vegetation cover and land use types. Based on visual differences created by these landscape elements, six Visual Character Units (VCU) were identified.

These VCUs were analysed in terms of their visual character within the PVZ of the Project.

3.2 Regional Context

In a regional context the Project is located at the outer and western edge of the Ben Bullen State Forest, a key feature of which is the sandstone formations that create the distinctive pagodas and escarpments. These sandstone formations differ in form, shape and line from the more massive sandstone formations of the Blue Mountains.

These formations are easily recognisable from aerial photography and occur within Newnes State Forest, Ben Bullen State Forest, Wolgan State Forest and the Gardens of Stone and Wollemi National Parks. These areas are distinctive landscapes that are unique to the region and for the greater part, have high visual integrity. At their western extent, it is only the edges of this formation that have reduced integrity due to the existence of current mining operations, including Cullen Valley Mine, Invincible Colliery and Baal Bone Colliery.

To the west of these sandstone formations and forested areas, the landscape is generally dominated by the rolling topography of cleared rural lands and in the more distant west forested lands. This landscape, while having moderate to high visual integrity in the context of rural landscapes is relatively common in terms of visual amenity. values. These landscapes are highly modified and support such land uses as the Castlereagh Highway and Wallerawang – Gwabegar Rail Line, which run on a north to south alignment within the Project Boundary.

The only areas in the region with minimal landscape and visual values are the existing mining and industrial areas.

The proposed Project will be a consolidation and extension of existing Coalpac mining operations and will not affect visual catchments outside of those that already have some views to mining operations within them. In this way the Project does not affect the visual integrity of the distinctive regional features, including the pagoda landscapes to the east in the Ben Bullen State Forest. The Project will to varying degrees affect the visual setting around the existing mine areas. However, although such areas are currently affected, the ongoing visual effects of the Project mining operations in these catchments will be of a larger scale than current operations.

The Primary Visual Catchment (PVC) which is defined below in Section 3.3 is located on the western edge of the distinctive pagoda sandstone formations within the Ben Bullen State Forest. This is the area that contains most critical views. The Project Boundary lies between these formations and the rolling rural hills to the west.

3.3 Primary Visual Catchment

The Primary Visual Catchment (PVC) includes the most significant parts of the total visual catchment from which the Project Area potentially could be seen. It covers an area of approximately 130 km^2. At a regional scale, the Visual Catchment is defined by the forested sandstone ridges and escarpments of Ben Bullen State Forest to the east. To the north, the visual catchment is defined by similar ridges within Garden of Stone National Park and Wolgan State Forest. There is more gentle terrain in the adjoining rural lands to the west of the Project area. This terrain within Sunny Corner State Forest and cleared rural lands define the western boundary of the PVC, while to the south it encloses the township of Portland and generally follows topographic spurs within the vicinity of Boulder Road.

The PVC represents the area within which the majority of critical views of the Project are located. It is the critical part of the Visual Catchment. The PVC does not enclose all view points, but a consideration of those within the PVC will achieve proper visual assessment of the Project. The PVC is illustrated in Figure 3.1.

The PVC is dominated by the rugged sandstone topography to the east of the Project, with more gentle rural lands to the west. The PVC also contains the village of Cullen Bullen and the larger township of Portland.

3.4 The Project Site

The site enclosed by the Project Boundary consists of two existing components, Cullen Valley Mine, generally to the west of the Castlereagh Highway and the Invincible Colliery to the east. Coal mining from both underground and open cut operations has been ongoing in these locations for many years, with all phases of open cut mining from stripping of vegetation to rehabilitation as well as mining infrastructure being visible from surrounding viewing locations.

The landscape within the Project Boundary generally consists of steep forested slopes of the Ben Bullen State Forest dominated by open forest on sandstone ridges and escarpments. The elevation of the site is generally between 900 – 1,000 m above sea level (ASL).

3.5 Visual Character of the Landscape

The visual character of the regional and local landscape in the vicinity of the Project is created by the mosaic of topographic form, vegetation and land cover, with the dominant landscape element in the region being the sandstone ridges and escarpments that often create visual features within the region. The landscape features of the locality combine in various ways to create areas of relative visual uniformity that can be defined as VCU. The VCUs combine in various vistas that are obtained from viewing locations such as residences and roadways.

Figure 3.1 illustrates the VCUs within the PVC for the Project and includes:

- Forested Slopes and Ridges VCU;
- Rural Lands VCU;
- Woodland Hills VCU;
- Villages VCU;
- Cullen Bullen Cemetery; and
- Mining Areas VCU.
- Each is discussed further below.

3.6 Forested Slopes and Ridges VCU

The Forested Slopes and Ridges VCU are for the greater part contained within Ben Bullen State Forest and Wolgan State Forest to the east and north east. The Garden of Stone National Park is located over 2 km to the north and part of the Project Boundary is located within the Gardens of Stone 2 proposal area. The Sunny Corner State Forest is located to the west of the cleared rural lands (see Section 3.6) immediately adjacent to the Project Boundary. Both of these forested areas differ significantly in visual character based on their geology. The Forested Slopes and Ridges VCU dominate the eastern part of the PVC.

Ben Bullen State Forest consists of moderate to steep lower and middle slopes, with upper slopes and ridge often consisting of sandstone pagodas and escarpments with elevations rising from 900 m to over 1,000 m ASL. All areas are generally dominated by open sclerophyll forest communities. Sandstone escarpments are a feature of this forest area, as shown on Figure 3.2.

Further to the east and north east of the PVC, the landscapes are dominated by the pagoda landscapes of the sandstone plateaus within Ben Bullen State Forest, Wolgan State Forest, the Gardens of Stone National Park and Gardens of Stone 2 proposal.

Sunny Corner State Forest consists of more moderate sloping land rising from 800 m to 900 m ASL and lacks the overtopping sandstone geological features. It represents a minor part of the PVC located 2.5 km west of the Project Boundary. *The significance of this VCU is that it creates the limits to the PVC to the east and west and is often the visual backdrop and horizon to Project mining areas. The pagoda landscapes to the east of the Project, including those in the Ben Bullen/Wolgan State Forests and the Garden of Stone National Park are a distinctive landscape feature with high scenic amenity values. The landscapes to the west of the Project Boundary within Sunny Corner State Forest are more common, lacking the drama and uniqueness of the pagoda landscapes in the greater Lithgow Region.*

The western and southern edges of the pagoda landscapes are the only part of the vast area of State Forests and other reserves in the region that is visually compromised by existing views to Baal Bone Colliery and Invincible Colliery from western escarpment edges.

3.7 Rural Lands VCU

The Rural Lands VCU dominates the western part of the PVC. Slopes are gentle with moderate slopes occurring in some hilly areas. The VCU has elevations between 800 m and 900 m ASL. The terrain is undulating with scattered tree cover occurring mainly in small residual stands of open woodland but with some individual trees scattered in open woodland as shown on Figure 3.3.

The rural lands support a number of rural residences on varied size holdings. These residences and other farm buildings, along with surrounding landscapes, create minor visual features in this rural locality.

The cleared lands together with the wooded hills create the rural component of the landscape within the PVC. The areas collectively have a pleasing visual character, however it is not an uncommon landscape setting in the regional or local setting.

The significance of this VCU, in addition to its visual character, is the open views it allows to more distant locations, including mining areas. Many viewing locations occur within this unit, so that it creates a foreground to view from many other locations.

3.8 Wooded Hills VCU

There are a limited number of hills within the rural lands that have retained their open forest land cover. This is likely to be due to slope and general unsuitability for grazing landuse. These hills have moderate to steep slopes and have elevations from 900 m to 1000 m ASL.

These hills are isolated and surrounded by open grassland on lower slopes. There is visual contrast between the undulating open grassland and the steeper forested hills that the grassland encloses as shown on Figure 3.4. These hills have common landscape values.

The wooded hills by virtue of contrast and prominence are minor visual features of the rural landscape in this locality.

3.9 Villages VCU

The village of Cullen Bullen and the larger village of Portland occur within the PVC and make up the two components of this VCU.

The village of Cullen Bullen is located on the Castlereagh Highway and is enclosed to the north and east by the forested slopes of Ben Bullen State Forest. The village occurs on gentle slopes on a re-entrant that occurs between the steep forested ridges of the state forest to the east and west of the highway as shown on Figure 3.5.

The residences within Cullen Bullen are on larger lots, creating an open feeling in the village. Tree cover is scattered and garden landscapes make limited use of tree cover, maintaining the openness of the village. The Castlereagh Highway runs north south through the middle of the village and a small village centre is located on a side road parallel to the highway.

The larger village of Portland is located in the south western corner of the PVC, approximately 5 km from the Project Boundary at its closest point. The town is built around but generally to the south of the old Portland Cement Works and covers an area of approximately 4 km^2. The cement works and its setting would constitute a landscape/visual setting

with heritage value and in that context would be a distinctive cultural landscape.

Portland is located on undulating hills and is enclosed for the greater part on the east, south and north by forested hills, but with more open views to the north and north east as shown on Figure 3.6.

The significance of this VCU is that it contains a concentration of potentially sensitive residential receptors. The potential visibility of mine areas from these locations is therefore significant.

3.10 Cullen Bullen Cemetery VCU

The Cullen Bullen Cemetery is located on the Castlereagh Highway, approximately 1.5 km north of Cullen Bullen. It is on the eastern side of the highway and occurs on a gentle slope. The Cemetery is surrounded by forested lands that are within the Project Boundary.

The Cemetery has a formal layout and is generally open and devoid of tree cover. There are open views to surrounding areas within the Project Boundary as shown on Figure 3.7. This landscape setting has local heritage significance.

This VCU depends to a large extent on the visual setting of forested lands within the Project Boundary and as an active cultural heritage site, represents a sensitive receptor location.

3.11 Mining Areas VCU

There are existing coal mining operations within the southern, central and eastern part of the PVZ. They include the approved Cullen Valley Mine, Invincible Colliery, Ivanhoe North Mine and Baal Bone Colliery. The scale of the mines in the existing landscape is strong enough to create a VCU based on the visual character as shown on Figure 3.8.

The VCU contains: active mining overburden emplacement areas and mine infrastructure facilities, including coal handling infrastructure, truck loading facilities and haul roads. Existing visual treatments include earth bunding and tree screening to screen mining areas.

The mine and infrastructure areas contrast with the surrounding forest and agricultural landscapes. The mine and infrastructure areas contrast with the surrounding forest and agricultural landscapes. These areas have minimal landscape value and when viewed compromise the integrity of rural and forest landscapes and require restoration to restore landscape values.

The mine and infrastructure areas create strong contrast with the existing forest landscapes within which they occur. However they do create a visual context for the mining operation proposed for the Project in some visual settings.

3.12 Summary

The various VCUs within the PVC create a range of visual settings and views. The open rural lands that adjoin many viewing locations allow for long distant views, while also creating the foreground and middle ground in many views. On the other hand forested ridges such as those around Cullen Bullen block long distant views.

The sandstone capped ridges and escarpments within Ben Bullen State Forest as well as the adjoining Wolgan State Forest and Gardens of Stone National Park are a regional landscape feature with distinctive landscape values.

While the rural land often creates a foreground to views, the forested slopes and ridges create the backgrounds and horizons to views. These views while attractive are common to rural settings and lack the distinctive quality of the sandstone escarpments and plateaus.

Open cut coal mines and general coal mining supporting infrastructure are a visible part of the landscapes in this locality as a result of the existing activities of Coalpac and other approved operations. These areas have disturbed landscape values and require restoration to elevate values.

All the VCUs interact to create various landscape settings as seen from a range of viewpoints. They create the total view as well as screening or providing view corridors to the Project Boundary and potential operations within it.

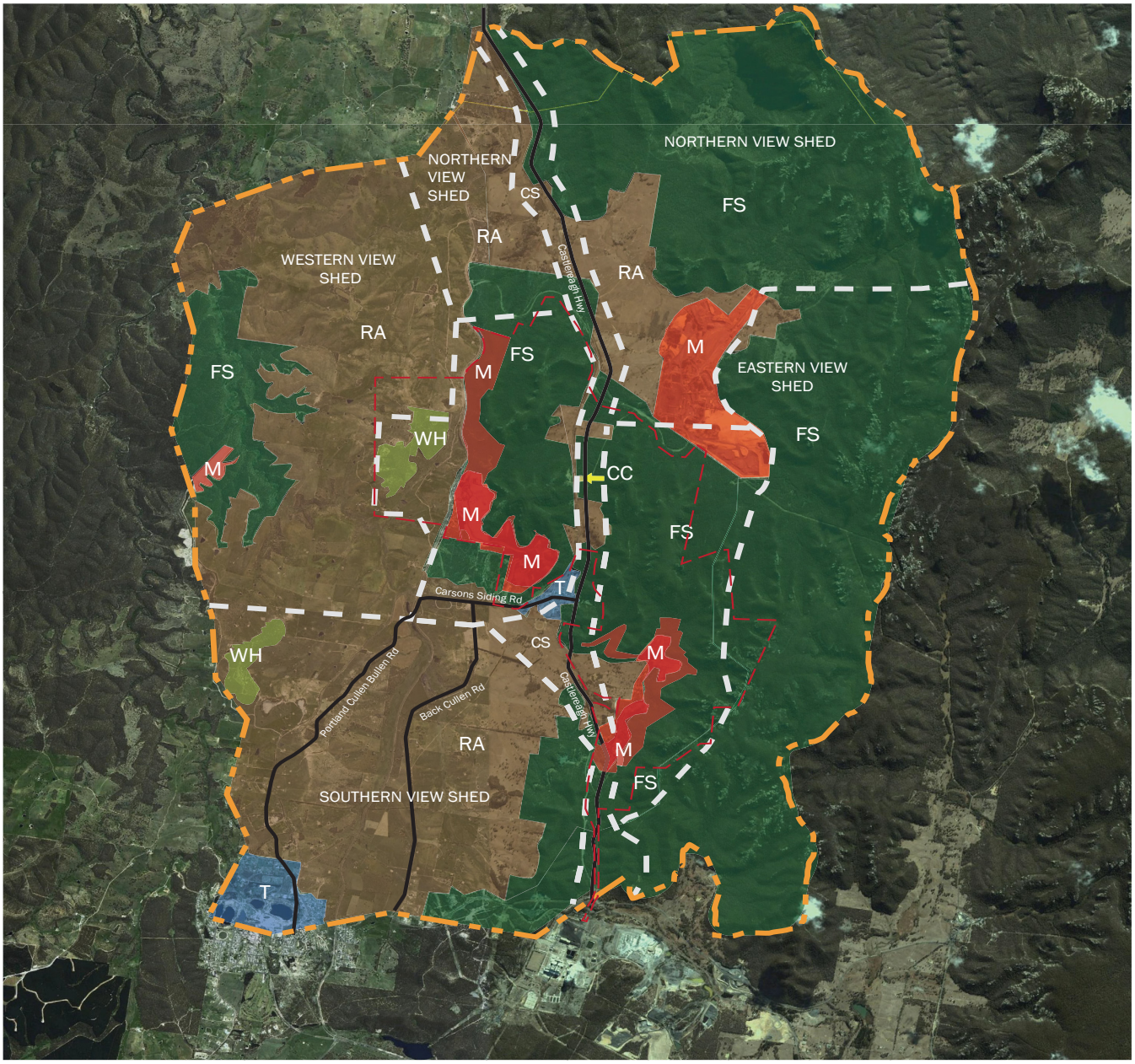


Figure 3.1 | Primary Visual Catchment and Visual Character Units

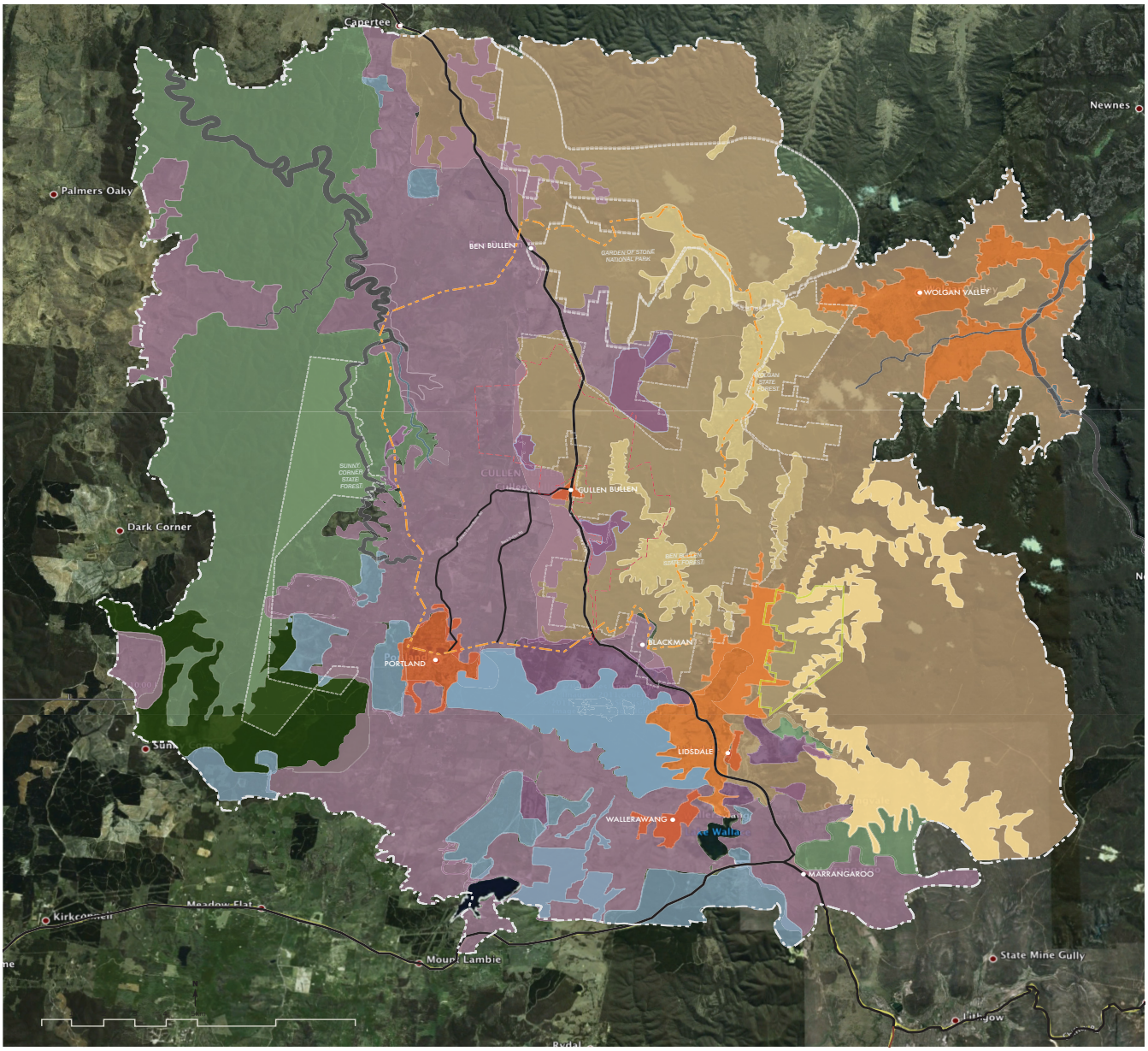


Figure 3.1a | Overall Visual Catchment and Regional Landuse Units

Figure 3.2 | Forested Slopes and Ridges VCU
The forested ridges and slopes create strong contrast to more open rual lands. They are often the background and create viusal boundaries to most views.

Figure 3.3 | Rural Lands VCU
Rural lands are dominated by open grassland with scattered trees on gentle to moderately undulating terrain. These areas are often the foreground of many views within the PVC.

Figure 3.4 | Wooded Hills
The wooded hills are similar to the forested slopes and ridges in visual character but are isolated, small scale and surrounded by rural grasslands. This makes them minor viusal features in the landscape.

Figure 3.5 | Towns and Villages VCU
Cullen Bullen is located between a series of forested ridges that enclose it to the north, east and west restricting view to mine areas. It retains open vistas to the south over rual lands.

Figure 3.6 | Towns and Villages VCU
Portland is located in the south west of the PVC. It is enclosed to the south, south east and west, but has view to the north and north east. Some of these views will include views to existing mine areas and hills that will include proposed mine areas.

Figure 3.7 | Cullen Bullen Cemetery
The Cullen Bullen Cemetery is a small feature landscape within the forested slopes and ridges VCU. Its openness and cultural elements make it significant.

Figure 3.8 | Mining Areas
Existing mine areas of Cullen Valley, Invincible Colliery and Baal Bone are visible elements within the PVC.

4. THE PROJECT AND VISUAL EFFECT

This section of the report evaluates the various components of the Project and defines their visual effects in terms of how these elements contrast with the existing landscapes. Mining for the Project will occur in a number of locations that can generally be defined as being areas within: the Cullen Valley Mine (including the Hillcroft resource); East Tyldesley Open Cut; and Invincible Open Cut. These three mining areas are illustrated on Figure 4.1.

4.1 Project Components

From a visual perspective, the Project elements outlined in Section 1.2 of this report can be divided into major and minor elements. Major elements have the potential for significant visual effect in relation to external views. Minor elements, although not necessarily insignificant in horizontal scale, have a less significant visual effect due to lack of vertical scale and visual projection outside of the Project Boundary. Alternatively, minor mine components can include extensions of existing facilities such as office buildings or coal processing infrastructure.

Visual elements similar to the proposed major and minor components already occur within the existing environment will occur due to the established Cullen Valley Mine, Invincible Colliery, Ivanhoe North Mine and Baal Bone Colliery within the PVC. This will lessen the visual effects of some new mining components that occur within close visual proximity to existing mine elements.

The visual effects of major mine components will vary through the progression of mining across the Project life, and more specifically, within each of the Cullen Valley Mine, East Tyldesley and Invincible Colliery mining areas.

4.1.1 Major Project Components

Major mine development components are shown in Figure 4.1 – 4.6 and include:

- Consolidation and extension of the existing Cullen Valley Mine and Invincible Colliery operations to produce up to a total of 3.5 Mtpa product coal, including:
    - The continuation of mining operations at Cullen Valley Mine (the area west of the Castlereagh Highway) via both open cut and highwall mining methods to access an additional resource of approximately 40 Mt ROM; and
    - The continuation of mining operations at Invincible Colliery including an extension north into the East Tyldesley area via open cut and highwall mining methods to access an additional resource of approximately 60 Mt ROM;
- Construction of the East Tyldesley Coal Preparation Plant (ETCPP); and
- The extraction of the Marangaroo Sandstone horizon from immediately below the Lithgow Coal Seam in the northern coal mining area of Cullen Valley Mine.

4.1.2 Minor Project Components

Minor mine development components include:

- Upgrades to existing administration, transport and other infrastructure;
- Construction of a rail siding with loading infrastructure;
- Construction of a conveyor overpass at the Castlereagh Highway;
- Construction of a bridge over the Castlereagh Highway to link operations east and west of the highway and the development of required access roads to the East Tyldesley and Hillcroft areas; and
- Construction of a bridge and haul road across the Wallerawang - Gwabegar Railway line to permit access to mine the previously approved Hillcroft resource.

4.2 Open Cut Mining Areas

4.2.1 Physical Character

Following stripping, topsoil and mulched vegetation material is stockpiled for reapplication on rehabilitated areas post-mining.

Overburden removal then takes place, predominately by conventional truck and excavator operations working within the open cut. Overburden is transported to available OEAs immediately behind mining. Coal and in some cases sand will be mined and transported to various Coal Handling Plants (CHPs) at Cullen Valley Mine, Invincible Colliery and East Tyldesley during different stages of the mining operations. Sand mining will be in existing mine void areas and would be at a lower elevation than overburden and coal mining in the same area, minimising visibility to receptors.

Highwall mining will occur largely within the mine void and would not be visible to external view as it is largely below natural ground level or located in areas shielded by bunds or OEAs.

4.2.2 Visual Effect

Open cut mining areas for the Project consist of two significant components. These include the 'highwall' (active mining area) and the 'low wall' which forms part of the OEA. Generally, the 'highwall' is located below natural ground level and therefore only the higher elevations of this component are visible. Visual effects of the open cut 'highwall' will likely occur, however, in many situations within the Project mining areas of Cullen Valley Mine, East Tyldesley and Invincible Colliery, where the steep slopes of existing topography and the lower elevation of the edge of the pit that is closest to viewing locations will allow for views into the mine pit area.

The low wall, generally being part of the open cut OEA, will become visible once it is formed back above natural ground level as mining progresses.

The visual effect of the open cut mining areas is created by the colour of the raw earth, exposed rock and (to varying extents) coal seams contrasting with the surrounding landscape. The open mining face also creates strong form, shape and line characteristics that differ from the existing landscape. These effects can be greatly decreased over distance however caused by atmospheric conditions such as cloud cover, backlight and heat haze.

Open cut areas create a high visual effect (Visual Effect Level 1 on Figure 2.2 and Figure 4.7. This effect cannot be reduced until the final landform is created and progressively rehabilitated following mining activities in each area.

4.3 Highwall Mining Areas

Another component of the Project that is not discussed further below is the extraction of coal by highwall mining methods. Due to the location and nature highwall mining operations, these activities will not result in any visual effects or impacts in addition to those that occur due to open cut mining.

For the Project, highwall mining operations will therefore result in positive visual effects where this method is applied instead of open cut mining. By conducting highwall mining instead of open cut operations for key areas within the Project Boundary that are topographically exposed and visually sensitive, overall visual impacts are significantly reduced as no surface disturbance will occur.

4.4 Overburden Emplacement Areas

4.4.1 Physical Character

Overburden will generally be removed by ripping and excavating with harder overburden being initially fractured by controlled blasting. Overburden will be trucked to OEAs and will immediately follow mining operations filling mine voids. These areas will generally consist of a series of terraces with moderate to steep sloping edges defining the terraces and the outer edge of the OEAs, generally consistent with the pre-mining landform.

4.4.2 Visual Effect

The OEAs for the Project will create strong contrasting form in the landscape and will initially have a strong colour contrast. This contrast and high visual effect (Visual Effect Level 1, Figure 2.2 and Figure 4.6) will be reduced during

rehabilitation as initial grass cover establishes, lowering visual effects to moderate (Visual Effect Level 2, Figure 2.2 and Figure 4.7). Following the establishment of tree cover, the visual effect will be reduced (Visual Effect Level 3, Figure 2.2, Figure 4.7 and 4.8).

Some high visual effect levels may be experienced for a number of years due to visual exposure to a pre-rehabilitated condition of the OEA. These effects can be minimised by the continued use of progressive rehabilitation and by optimising rehabilitation timetables for each exposed area.

4.5 Infrastructure Elements

4.5.1 Physical Character

Existing mine infrastructure, including Invincible CHP are located within the infrastructure Project Boundary at Cullen Valley Mine and Invincible Colliery. These elements will be retained.

In addition, the ETCPP will be constructed by around Project Year 2. The ETCPP will include a 100,000 tonne ROM coal stockpile and an 80,000 tonne product coal stockpile, coal crusher and washery as well as offices and water management infrastructure conceptually shown on Figure 4.2, Insert 1 and 2.

All the infrastructure elements have a distinct industrial character. They are large in scale with some elements such as the proposed ETCPP being up to over 30 m in height. These large scale infrastructure components, coupled with the minor additional elements, create an industrial setting.

The lighting effects of the infrastructure area may be of visual concern although surrounding topography and vegetation should screen these effects. This area will be lit in various work areas to meet applicable health and safety standards. This will require high illumination levels in intense work areas with more general lighting be provided in intermediate areas.

4.5.2 Visual Effect

The major infrastructure elements would create a high visual effect (Level 1) where they are visible due to strong contrasts with the surrounding rural landscapes. The rectilinear form, shape and line of the ETCPP, product bins, coal stockpiles, conveyors, etc will contrast strongly with the natural form shape and line of the topography and vegetation of the locality.

Most of these infrastructure elements to be utilised for the Project were constructed under previous approvals and therefore are part of the existing visual environment, with the exception of the ETCPP which will has the potential for a high visual effect (Level 1), if seen from surrounding viewing locations.

4.6 Rail Siding

4.6.1 Physical Character

The rail siding will be constructed adjacent to the east of the Wallerawang Gwabegar Railway and the existing footprint of Cullen Valley Mine.

4.6.2 Visual Effect

The siding will be at grade and have little vertical projection. While earth embankments are being developed, a moderate visual effect (Level 2 visual effect, Figure 2.2) will be created, but this effect will become low (Level 3 visual effect) when the earth bunds are rehabilitated and grassed.

The coal stockpiles will be low structures approximately 5 m in height and will contrast strongly with the existing environment, creating a Level 1 visual effect where localised views are available behind the bund to be constructed to the east of this facility.

4.7 Roads and Bridges

4.7.1 Physical Character

New internal haul roads will be established to allow transport of ROM coal to the ETCPP for processing and back to the Rail Siding, as well as to haul overburden from the mine pit to OEAs. In addition, a new road will connect Invincible Colliery in the south with the ETCPP and via a highway over pass to Cullen Valley Mine. There will also be an overpass bridge constructed over the Wallerawang – Gwabegar Railway line within the Cullen Valley mining area to access the Hillcroft resource.

The roads will require normal cut and fill configuration and along with the bridges will be established by the end of Year 2. The bridges will allow passage for large dump trucks and other vehicles in the Project fleet.

4.7.2 Visual Effect

The roads will have potential to create linear contrast in the landscape. These have however been designed to be generally screened by surrounding vegetation or strategically placed bunds to minimise visual effect.

The bridges will occur in the context of existing road and rail line infrastructure. In these contexts these components are a part of the normal Castlereagh Highway road infrastructure and the operations of Wallerawang – Gwabegar Railway line and would create a moderate Level 2 visual effect.

4.8 Site Offices

4.8.1 Physical Character and Visual Effect

In Year 2, new offices will be located at the entry to the Cullen Valley Mine adjacent to an existing weather station. Several portable office buildings, a toilet block and a car park will be constructed in addition to the existing building conceptually shown on Figure 4.2.

These elements are of domestic scale and would not be dissimilar to a cluster of farm buildings and would have a low visual effect level 3.

4.9 Water Infrastructure

4.9.1 Physical Character and Visual Effect

The water infrastructure consists of onsite drainage and water retention basins in and around OEA and infrastructure areas. All of these elements are at or below ground level and therefore would have very little visual effect outside of the Project Boundary

4.10 Cullen Valley Mine and Hillcroft

As shown conceptually on Figure 4.2, open cut coal mining would progress north on the eastern side of the Wallerawang – Gwabegar Railway line to the northern extent of the Project Boundary. Following this, mining activities will occur during Year 2 on the western side of the railway line in the Hillcroft area, as shown in Figure 4.3. ROM coal from these areas would be transported to the approved Cullen Valley Mine CDP until Year 2, when all ROM coal from the Cullen Valley Mine will be transported east on a dedicated haul road which traverses across the Castlereagh Highway on an overpass bridge to the new processing facility at the ETCPP.

Coal mining will then continue from the northern extent of Cullen Valley Mine to the east and south, with the noise bund located north-east of the current Cullen Valley Mine area to be constructed from the overburden generated during these operations. At the conclusion of coal mining and sand quarrying operations in these areas, the coal mining operation would then relocate to the southeast to the mining areas located adjacent to the west of the Castlereagh Highway for the remainder of the life of the Project as shown conceptually on Figure 4.4 and 4.5

Sand extraction operations in the Marrangaroo Sandstone below the Lithgow Seam will take place generally in the areas shown in Figure 4.1 at the same time as open cut coal mining activities, with rehabilitation to be undertaken immediately as OEAs progress with mining operations. Sand extraction activities for the Project are anticipated to

conclude following the completion of operations in around Year 14.

The visual effects of mining in the Cullen Valley and Hillcroft mining areas will result from a number of activities. These operations will impact different areas at different times over the life of the Project and are shown on Figure 4.1.

In summary, the initial operations will consist of:

- Progressive rehabilitation of existing mining areas approved for Cullen Valley Mine;
- Mining west of Wallerawang – Gwabegar railway line in the Hillcroft area; and
- Construction of noise mitigation bunds.

Following on from this, there will be:

- A continuation of mining behind the northern screening bund; and
- Mining in the eastern part of Cullen Valley mining areas adjacent to the existing mine site and the Castlereagh Highway.

A summary of the visual effect of these activities is provided below.

4.10.1 Progressive Rehabilitation of Existing Areas

The visual effect of the active mining areas will be high; however this represents the continuation of existing and approved mining. The visual effect of initial rehabilitation activities will decrease to moderate as ground cover establishes. As tree growth continues, this visual effect will further lessen until forest tree cover is achieved in 5 - 10 years, assuming appropriate target densities of tree species are successfully achieved during rehabilitation. At that stage, a low visual effect will be achieved. Progressive rehabilitation of Project mining areas will ensure that the extent of any untreated areas is minimised during the life of the Project.

4.10.2 Visual Effect of Mining West of Railway Line in the Hillcroft Area

These operations occur on a forested hill that is enclosed by rural lands. The visual effect of vegetation stripping, overburden removal and open cut mining will create strong contrast in form, shape, line, colour and texture that will be a major deviation from existing environment that is present in this area.

The visual effect of the mining operation will be high until post mining operations reshape the hill and achieve initial grass covering (from the end of Year 2). Such rehabilitation may achieve a more significant lowering of visual effect to moderate or low, due to the surrounding rural settings. This reduction in visual effect could be achieved in two years following completion of mining in this area.

The further establishment of trees during rehabilitation development will further reduce the visual effects to low to very low over a period of 5-10 years.

4.10.3 Mining and Construction of Noise Mitigation Bund

To achieve acoustic screening for those properties located to the north of the Project Boundary, an earth bund will be constructed at the commencement of mining operations in the east of the existing Cullen Valley Mine. This bund will be constructed and have preliminary rehabilitation works completed by Year 2 of the Project.

Following a brief period of a high visual effect during bund construction and initial rehabilitation activities, a moderate visual effect will occur by the end of Year 2. This will reduce to low to very low once more developed tree cover is re-established on the bund and full colour / texture values of the tree cover is achieved.

4.10.4 Continuation of Mining behind the Noise Mitigation Bund

Consistent with existing operations, the usual range of high, moderate and low visual effects resulting from active mining operations and progressive rehabilitation will be experienced in this area up to approximately Year 17 of the Project. However, such visual effects to potential receptors will be effectively screened behind the noise mitigation bund within this area.

4.10.5 Mining in the Eastern Part of the Cullen Valley Mining Area

The active mining operation in this area will progress generally north to south, creating high visual effects to receptors from approximately Year 8 of the mine life. The visual effect on northern views would reduce to moderate by Year 17 when the active mine face is rehabilitated and subsequently to low as tree cover becomes established. Between year 17 and year 21 southern views will be affected creating a high impact until this mining face is rehabilitated at the end of the 21 year Project mine life.

4.11 East Tyldesley Mining Area

The open cut mining operations in the East Tyldesley Open Cut area will commence in the south western corner of the East Tyldesley Mine Area. This includes the ETCPP infrastructure area, which will be constructed from this time. The overburden from the initial box cut is planned to be placed in an out of pit dump to the west of these areas as a visual and noise impact bund, between the initial open cut development and the Castlereagh Highway. These bunds will be maintained to the east of the Castlereagh Highway adjacent to open cut mining areas and extended as mining progresses in the East Tyldesley area.

From the initial development in the East Tyldesley area to the east of the Castlereagh Highway, mining generally progresses north from the ETCPP to the extent of the Project Boundary around the sandstone escarpment which divides this area. Mining operations will then develop west toward the Castlereagh Highway before progressing southward from approximately Year 15.

Rehabilitation activities in this area will be undertaken progressively behind overburden emplacement operations, progressively filling the open cut pit, consistent with existing Coalpac operations. Overburden is emplaced up to final surface levels and shaped to allow for rehabilitation to be established as soon as practicable following the completion of mining.

The visual effects of mining in the East Tyldesley mining area have the potential to result from a number of activities. These operations will impact different areas at different times over the life of the Project. This depends on the construction activities; elevation and rehabilitation of the proposed roadside bund (see Section 4.9.7)

These operations include:

- Construction and development of the Castlereagh Highway bunds;
- Mining adjacent to the Castlereagh Highway, where some views to mining operations may be available behind the rehabilitated roadside bunds;
- Establishment of the ETCPP (shown conceptually on Figure 4.2), if visible from external viewing locations. Again the roadside bund will reduce the effect of views to this locality; and
- Mining in the north and west of the East Tyldesley area.

4.11.1 Construction and Development of the Castlereagh Highway Bund

As shown on Figure 4.2, a bund of approximately 6 m in height will be developed along the northern extent of the open cut mining areas in the East Tyldesley area and along the western extents that are adjacent to the Castlereagh Highway. These bunds will be constructed in advance of mining operations and rehabilitated progressively to provide for screening of mining and coal haulage activities to receptors in Cullen Bullen and for those road users travelling in either direction on the Castlereagh Highway.

4.11.2 Mining Adjacent to the Castlereagh Highway

Development in this area will commence immediately on approval and includes the construction of the ETCPP. By Year 2 and as shown on Figure 4.3, the active face of mining activities will progress in a northerly direction from the area proposed for the ETCPP infrastructure, following the topography of the area Figure 4.4. Mining in this location will be generally shielded by the surrounding topography and construction of the bund along the Castlereagh Highway.

High visual effects will be experienced in early years when some views of raw overburden and active mine face are open to view over the adjoining tree canopies to the north and over and through the tree canopies to the west. This

effect will reduce somewhat when initial rehabilitation is complete but meaningful reductions of visual effect in this forest visual setting at higher elevations can only be achieved when tree cover is established. The visual effect will continue to decrease as tree cover establishes from 5 years after tree planting or seeding on rehabilitated areas has occurred. The Castlereagh Highway bunds will continue to provide significant screening of activities within this area.

4.11.3 Visual Effect of Mining in the North Eastern Pit

Mining in the north eastern pit commences in Year 7 and by Year 14 it should be well progressed, as shown conceptually on Figure 4.4. Mining commences north from the ETCPP area and progresses to the north towards the Project Boundary, before then following the topography west toward the Castlereagh Highway. In this way, the high visual effect active mine face and OEA areas are potentially exposed to easterly and northerly views, over the adjoining tree cover.

These visual effects of active mining in this area will remain high until rehabilitation occurs. These effects will decrease during the development of rehabilitation areas and more mature trees establish as shown on Figure 4.7 and 4.8.

4.11.4 Visual Effect of Establishment of the ETCPP

The ETCPP will include at least a coal crusher, washery, product and ROM and product coal stockpiles, interlinking conveyors and office buildings. These elements are large scale industrial elements that will contrast strongly with the surrounding environment of the Ben Bullen State Forest. Their location within the existing topography will, however, ensure that they are integrated into the landscape settings and any view of the ETCPP from external viewing locations will be limited. The ETCPP has the potential to create a high visual effect if it is seen. This is due to its scale and industrial character as shown conceptually (Figure 4.2). However, given its location low in a valley it is not likely to be seen from external view locations.

4.12 Invincible Colliery Mining Area

Mining operations in the Invincible Colliery area will generally progress in a northerly direction through the life of the Project in lands located to the east and north of the previously approved mining activities.

The visual effects of mining in the Invincible Colliery mining area will result from a number of activities. These operations will affect different areas at different times in the life of the mine.

These activities include:

- Mining and Rehabilitation of existing areas;
- Mining and rehabilitation to the south and east of the existing infrastructure; and
- Mining of the areas to the north of the existing operations.

4.12.1 Mining and Rehabilitation of Existing Areas

The footslopes of areas to the north of the Invincible Colliery Offices and ICPP are currently being mined under existing approvals (see Figure 4.2). The visual effect of these mining areas is currently high due to their extent and more elevated location. Rehabilitation of these existing areas by Year 2 (conceptually shown in Figure 4.3) will progressively reduce these visual effects from high to moderate as grass and especially tree cover starts to become more established.

4.12.2 Mining and Rehabilitation to the East and South of the Existing Infrastructure

Mining operations in the Invincible Colliery area generally progress northward through the life of the Project, to the east of the areas approved under existing operations as shown conceptually in Figure 4.3. The location of these mining areas in relation to potential receptors results in a high visual impact for exposed areas, which would be reduced following initial rehabilitation. As with the rehabilitation of other mining areas for the Project, these works would be expected to reduce visual effect levels for receptors to moderate and low as rehabilitation develops. In addition, the more northern areas proposed to be mined in this area during Years 14 – 21 are generally more enclosed by intervening topography, limiting the visibility of open cut operations for receptors.

4.13 Photomontage and Cross Sectional Illustration of Visual Effect

The visual effects of the Project were also evaluated by completing a photomontage analysis from three critical viewing locations to the north and south of the Project Boundary, as well within this area for East Tyldesley mining operations. Cross sectional figures were also completed for other key viewing locations. The locations were photomontages were completed are illustrated on Figure 4.9 and include:

- Red Springs Road to the north of the Project;
- Portland - Cullen Bullen Road to the south of the Project ; and
- Cullen Bullen General Cemetery, located adjacent the Castlereagh Highway in the central area of the Project. This land will not be disturbed for the Project.

4.13.1 Red Springs Road

The existing southerly view from Red Springs Road toward the Project is toward the northern part of the existing Cullen Valley Mine.

From this location for the Project, there remains the potential for views into the Cullen Valley Mine open cut mining areas. The view to other Project mining areas beyond is restricted by the intervening vegetated ridge lines, as shown in Figure 4.10 and Figure 4.10a.

Views from Red Springs Road and adjacent houses to the south are currently to the forested slopes and sandstone ridges and escarpments. By the end of Year 2 of the Project, mining and rehabilitation will have been completed on areas within the existing Cullen Valley Mine area. These areas to be disturbed are visible from a number of residences on Red Springs Road an example of which is shown in Figure 4.10b.

By Year 2, the noise bund to screen residences on Red Springs Road is also anticipated to be in place (see Figure 4.10b) and mining would have commenced to the south of this feature. It is anticipated that preliminary rehabilitation of the noise bund will be complete by the end of Year 2.

In the first instance, the active mining areas in the northern extent of the Cullen Valley Mine area would cause a high visual effect, which would reduce to moderate once the OEA is established and rehabilitated (Figure 4.10b). The visual effect of the mining and bund construction to the east of these areas would also create a high visual effect, consistent with current mining operations at Cullen Valley Mine. By Year 2013, the development of grass in rehabilitation areas would have established, decreasing visual effects for receptors on Red Springs Road.

By around Year 2019, tree development would be enhancing the visual mitigation provided by rehabilitation grass cover on the noise bund and within the existing Cullen Valley Mine footprint, Figure 4.12c. Tree growth on the main bund greatly reduces visual contrast, reducing visual effect. There remains some potential for mine areas to be seen over the noise bund as it is currently proposed, however such areas are small, and may be mitigated by additional areas of tree plantings.

By Year 2025, Figure 4.12d, another small mining area to the north-west is visible over the bund. The visual effect would be limited by the scale of views and limited time of exposure before rehabilitation is established. Also, by this time, the trees on the noise bund would be up to 15 years old, adding further screening potential to the mining areas at higher elevations behind the bund (as viewed by receptors on Red Springs Road).

By 2031, all visible mined areas including the noise/visual bund will be well covered with forest cover that has been established by mitigation works. This reduces the visual effect levels to low, Figure 4.10e.

In summary, the visual effect of the Project (as seen from critical receptors in the north on Red Springs Road) will initially be high. Rehabilitation of northern mining area of Cullen Valley Mine by Year 2 of the mining commencing limits the time of that high visual effect. Again the visual effect of mining as seen from Red Springs Road will be high, however this will decrease significantly when the visual bund is completed. This bund will mitigate the visual effects of most mining behind it from year 2 to till year 12 when mining is complete.

However the visual effect of the bund will remain high to moderate without a modification of land form until tree cover reduces the colour contrast of the ground cover of the bund.

4.13.2 Ben Bullen State Forest

The current westerly view from the edge of the sandstone escarpments within the Ben Bullen State Forest provides some views over elements of the existing Coalpac mining operations as well as other parts of the PVC and several VCUs, Figure 4.11. The elevated viewing locations from the western edges of the escarpment also provide views overlooking the Invincible and East Tyldesley mining areas proposed for the Project.

At Year 2 (Figure 4.11b), the rehabilitation of the existing open cut mining areas of Invincible Colliery will have commenced, reducing the visual effect of these areas. From the commencement of the Project, open cut mining will continue within the Invincible mining area with areas of approximately 12 - 24 ha to be mined annually. This will vary depending on topography as the biggest influence on strip ratio.

Previously completed open cut mining areas will be progressively rehabilitated. This approach will ensure that the visual effects of active open cut mining on elevated eastern and northern view areas will generally be less than is currently the case, thereby reducing visual effects over those existing currently due to the operations of Invincible Colliery with approximately 100 ha disturbed in any year.

From elevated locations within the western edges of the Ben Bullen State Forest and Wolgan State Forest active open cut mining for the Project in the south of the Invincible mining area will continue to create high visual effect levels in contrast to the remnant forested slopes (see Figure 4.11b). However the extent of these (12-24 ha) and rehabilitation schedules will minimise the significance of these effects, Figure 4.11 b and c.

Similar views to the East Tyldesley mining areas will be available from elevated locations in the Ben Bullen/Wolgan State Forest over the existing surface facilities of Baal Bone Colliery. Again, the small annual active open cut mining areas and progressive rehabilitation development will minimise visual effects.

4.13.3 Portland - Cullen Bullen Road

The view illustrated in Figure 4.12a is typical of views that are seen from the open rural lands and, to a lesser extent, the north eastern edge of the township of Portland. The view is across open rural lands toward the existing Coalpac mining areas of Cullen Valley Mine that are not screened by intervening topography from southern views.

Active mining for the Project, as seen from the south is completed by Year 2, Figure 4.12b. By this time, mining west of the Wallerawang – Gwabegar railway line and within the current footprint of Cullen Valley mine will be complete and preliminary rehabilitation will have been established in that area. This will quickly reduce the high visual effect of mining to moderate as landform and grass cover is established.

Subsequent to this, tree cover will establish itself, which would further increase integration of the final landform within the existing environment, Figure 4.12c, maintaining a moderate visual effect. This will reduce to low as the colour and texture values of tree plantings emulate those of the surrounding forest, Figures 4.12d and 4.12e

The visual effect of mining operations as seen from this location and from the south in general will be high during the limited time of mining for the Project, but will reduce to moderate as soon as the land form is re-established and grass cover from initial rehabilitation is achieved. The visual effect reduction in this location is faster than those illustrated in Figure 4.10 *due to the landform outcomes and the stronger presence of grassed areas in the surrounding rural landscape of the PVZ from Portland.*

4.13.4 Cullen Bullen General Cemetery

The view illustrated in Figure 4.13 is as seen from the Cullen Bullen Cemetery, taken from the west facing east across the Project. This view is also similar to some views that will be observed from road users on the Castlereagh Highway, albeit such views are generally filtered through a band of roadside vegetation. The primary reason for assessing this view is due to the highly sensitive nature of the Cemetery and its importance to the local community.

Easterly views from the Cemetery and the highway from this area will be over the western parts of the East Tyldesley mining area. Initially it was intended that this area would be mined using open cut methods, however the critical evaluation of this option (as shown on Figure 4.13d) was the basis for changing mining methods in this location. The changes in mining methods for this section of the East Tyldesley area from open cut to the highwall mining method greatly reduce the visual effect and amenity impacts on this location, Figures 4.13 c-d.

Visual effects of open cut mining operations as seen from the Cullen Bullen General Cemetery are generally screened

by the foreground vegetation communities located above the highwall mining areas, which will not be disturbed for the Project. Only a small area of active open cut operations is predicted to be seen to the north east in the later years of Project mining operations in the East Tyldesley area, which will result in high visual effects, Figure 4.13d. *These effects will be reduced, however, following the development of rehabilitation of these areas to include more mature forest canopy values,* Figure 4.13e.

4.13.5 Cross Sections at Cullen Bullen

Cullen Bullen is located between Cullen Valley Mine to the west, Invincible Colliery to the south and East Tyldesley to the north east. In relation to this sensitive area, a photomontage would not illustrate any mining areas. However, a consideration of visibility is possible by use of cross sections in critical viewing directions, Figure 4.13.

In relation to Cullen Valley Mine, the ridge immediately to the west of Cullen Bullen screens views to the existing operations and those proposed for the Project. The ridge immediately to the east restricts views to both East Tyldesley to the north east and Invincible Colliery to the east and south east.

As noted above, there will be views from the Cullen Bullen General Cemetery into some open cut operations within the north-eastern extent of the East Tyldesley mining area. However this visibility is limited to views to some more distant elevated open cut areas that are screened at lower elevations by foreground vegetation surrounding the Cemetery. The visibility and resultant impacts of the open cut mining areas at higher elevations in the East Tyldesley mining area can be further controlled by on site plantings at the Cemetery.

4.14 Visual Effect Summary

The visual effects of the mine elements vary from high to low across the four mining areas and the life of the Project. However, many significant high visual effect areas may not be visible to external view locations. With time, high visual effects can be reduced to low with appropriate mitigation treatments.

4.14.1 Highwall Mining

Highwall mining areas for the Project located in the East Tyldesley area adjacent to the Cullen Bullen General Cemetery were put in place, in preference to open cut mining, to achieve the desired visual impact outcomes. The use of highwall mining for coal extraction mitigates totally the visual effects that would occur due to open cut mining.

4.14.2 Visual Bunds

A number of visual bunds are planned to assist in decreasing the visual effects of mining operations in all mine areas. These bunds in Cullen Valley, East Tyldesley and Invincible mining areas will reduce the visual effect of mining areas and OEAs. The location of these bunds is illustrated on Figures 4.2 - 4.5. Such bunds will be very significant in relation to minimising visual effects from viewing locations on Red Springs Road and the Castlereagh Highway.

4.14.3 Open Cut Mining Areas

Consistent with existing operations, the establishment and excavation of the mine will continue to have a high visual effect throughout the life of Project, being created by the active mine face and that of the exposed OEAs. However, the full extent of the open cut is unlikely to be visible to most external viewing locations. Some views of the upper levels of the active faces of the open cut will be available, particularly for when mining reaches its higher elevations below the sandstone escarpment pagodas. As discussed in Section 4.2, visual effect levels are reduced by the scale of these 'slivers' of mining activity that can be seen from each viewing location, in the context of the entire PVZ.

4.14.4 OEAs

The OEAs in all areas will for short periods of time create a high visual effect. As soon as the outer faces of the OEAs have been rehabilitated this effect is generally quickly reduced as grass cover becomes established.

In this situation, however, many visual settings are forested hills and the initial rehabilitation OEA will consist of grass cover until trees establish. This will result in continued colour and texture contrast with these forested backgrounds of the existing environment. A successful reduction in visual effect from the progressive rehabilitation of OEAs will depend on tree regrowth to significantly reduce visual effects.

4.14.5 Rail Siding

The rail siding will have a low visual effect. The rail siding and associated infrastructure is located within the existing footprint of Cullen Valley Mine, has little vertical projection, and cut and fill embankments will be revegetated to emulate surrounding landscape elements.

4.14.6 Major Infrastructure Elements

The existing ICPP is an industrial feature and will continue to create a high visual effect for receptors on the Castlereagh Highway, along with those elements of the conveyor to MPPS that are visible from the Castlereagh Highway and have been part of this landscape since 1976. The proposed location of the ETCPP is screened mitigating any visual effect it may have on external view locations.

4.14.7 Other Infrastructure Elements

These elements, although numerous and spread over a large site area, lack significant vertical scale and will not have a high visual effect in the context of the surrounding environment.

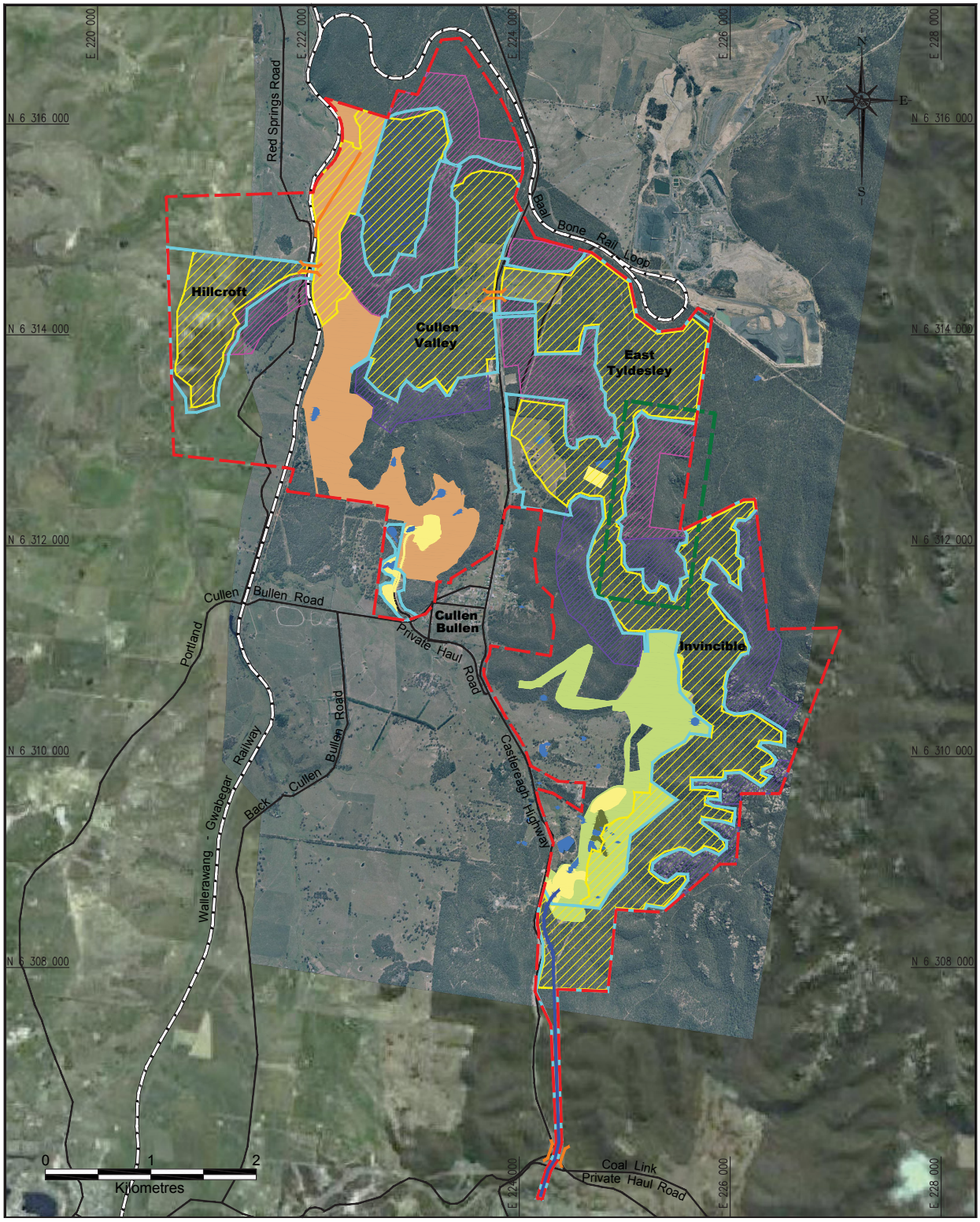
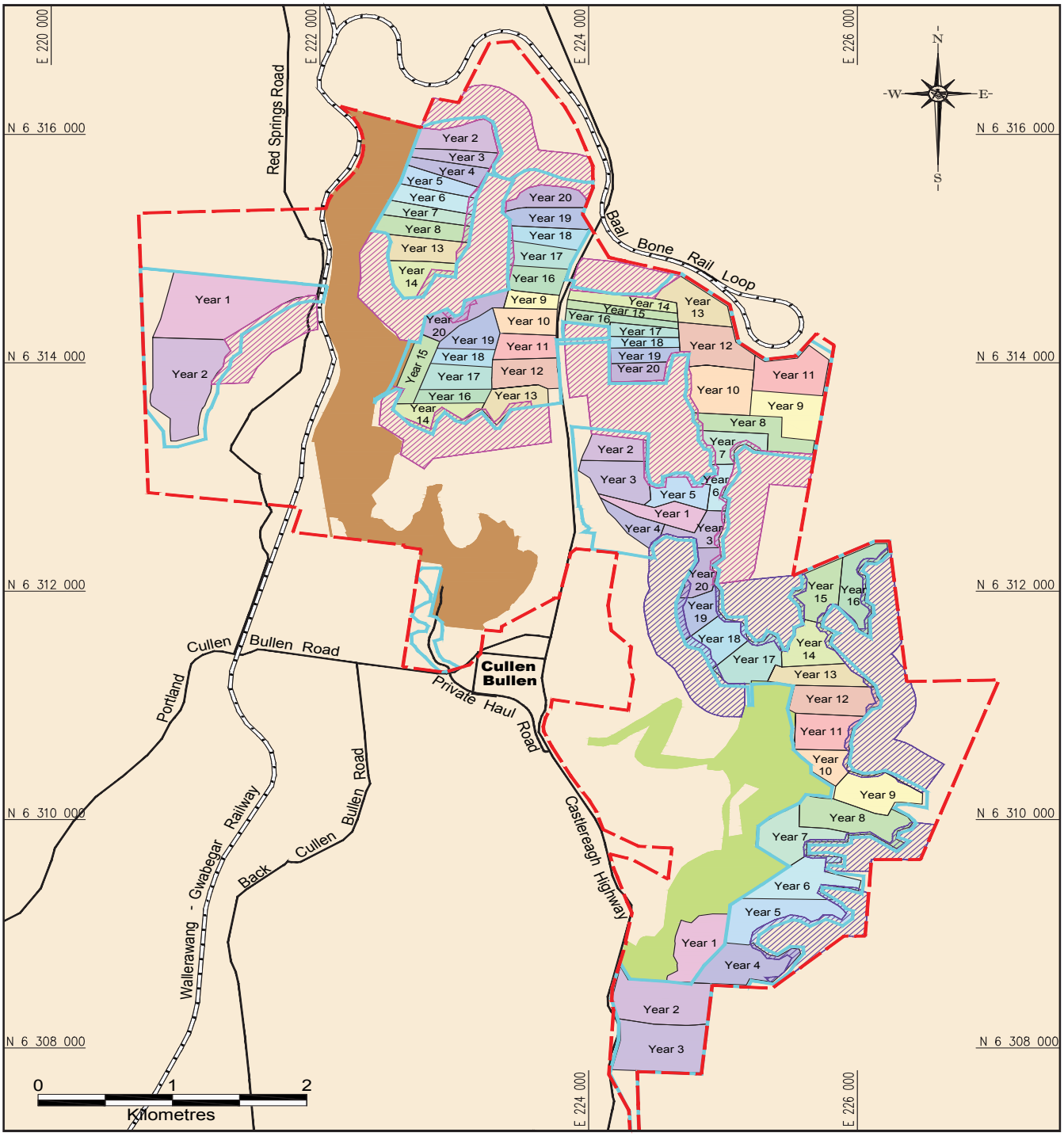


Figure 4.1 | Project Mining Areas



legend

- Project Boundary
- Project Disturbance Boundary
- High Wall Mining All seams
- High Wall Mining All seams Except Lithgow
- Existing Cullen Valley Mine
- Existing Invincible Colliery

Figure 4.1b | Conceptual Open Cut Mining

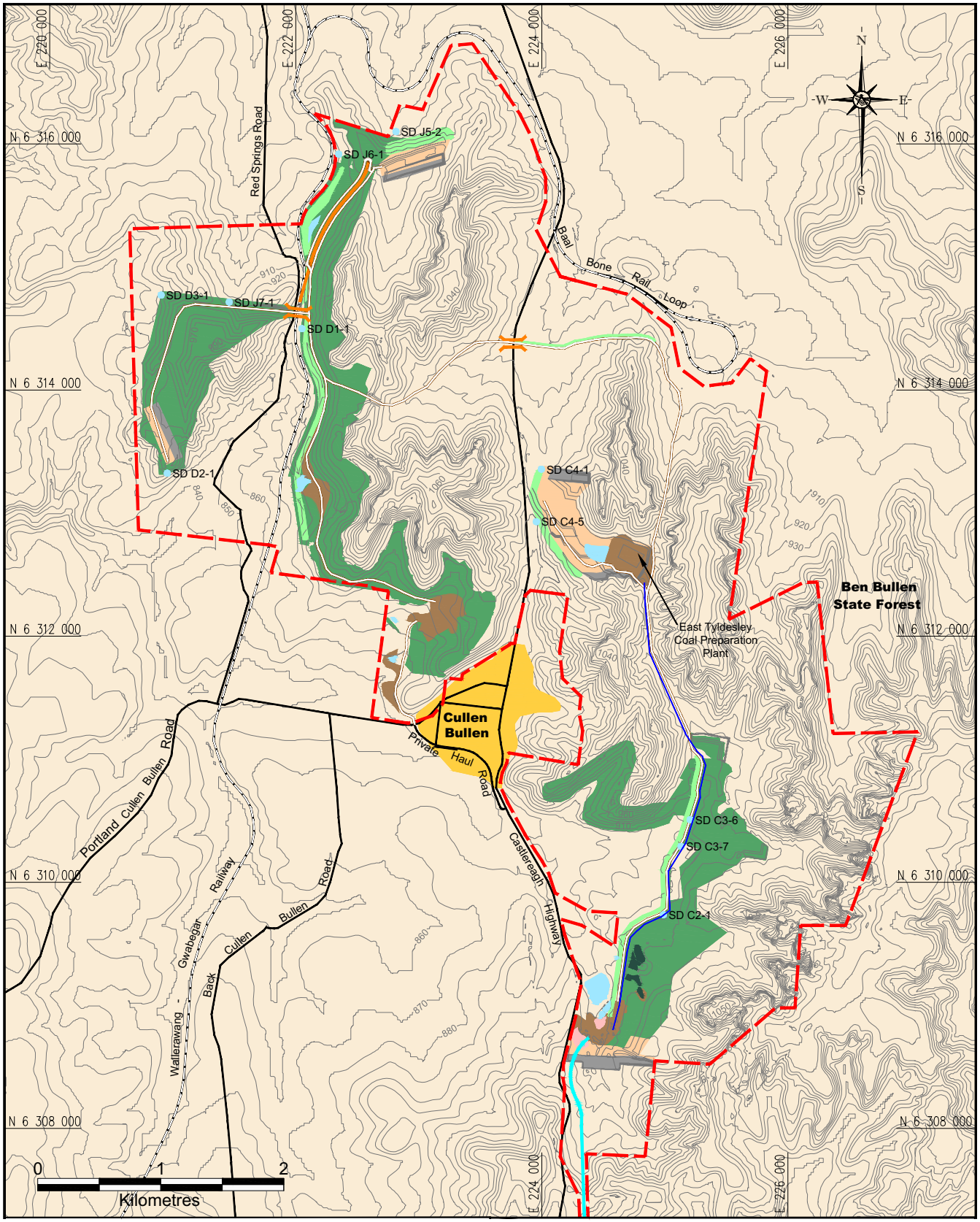


Figure 4.2 | Year 2 Mine Plan

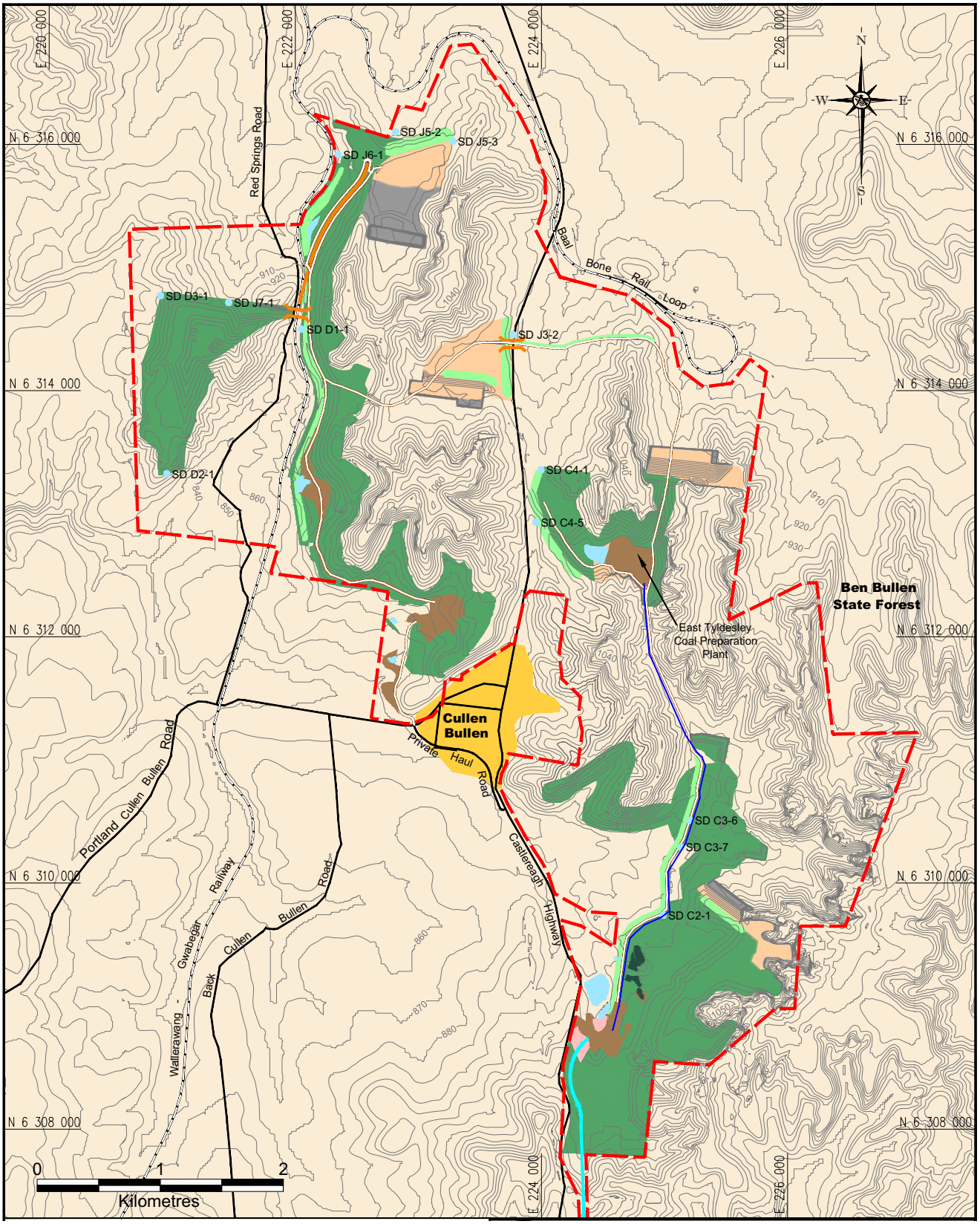


Figure 4.3 | Year 8 Mine Plan

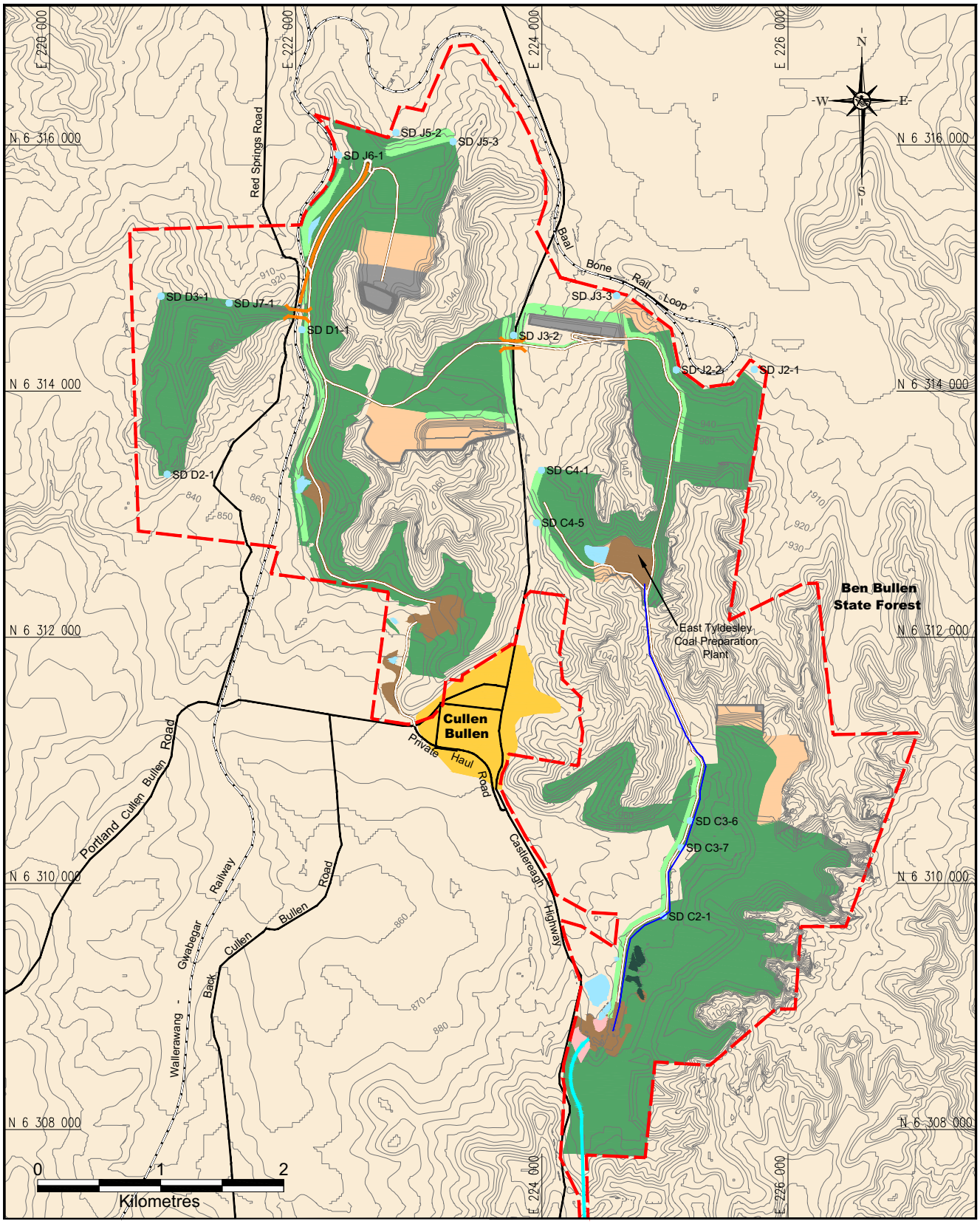


Figure 4.4 | Year 14 Mine Plan

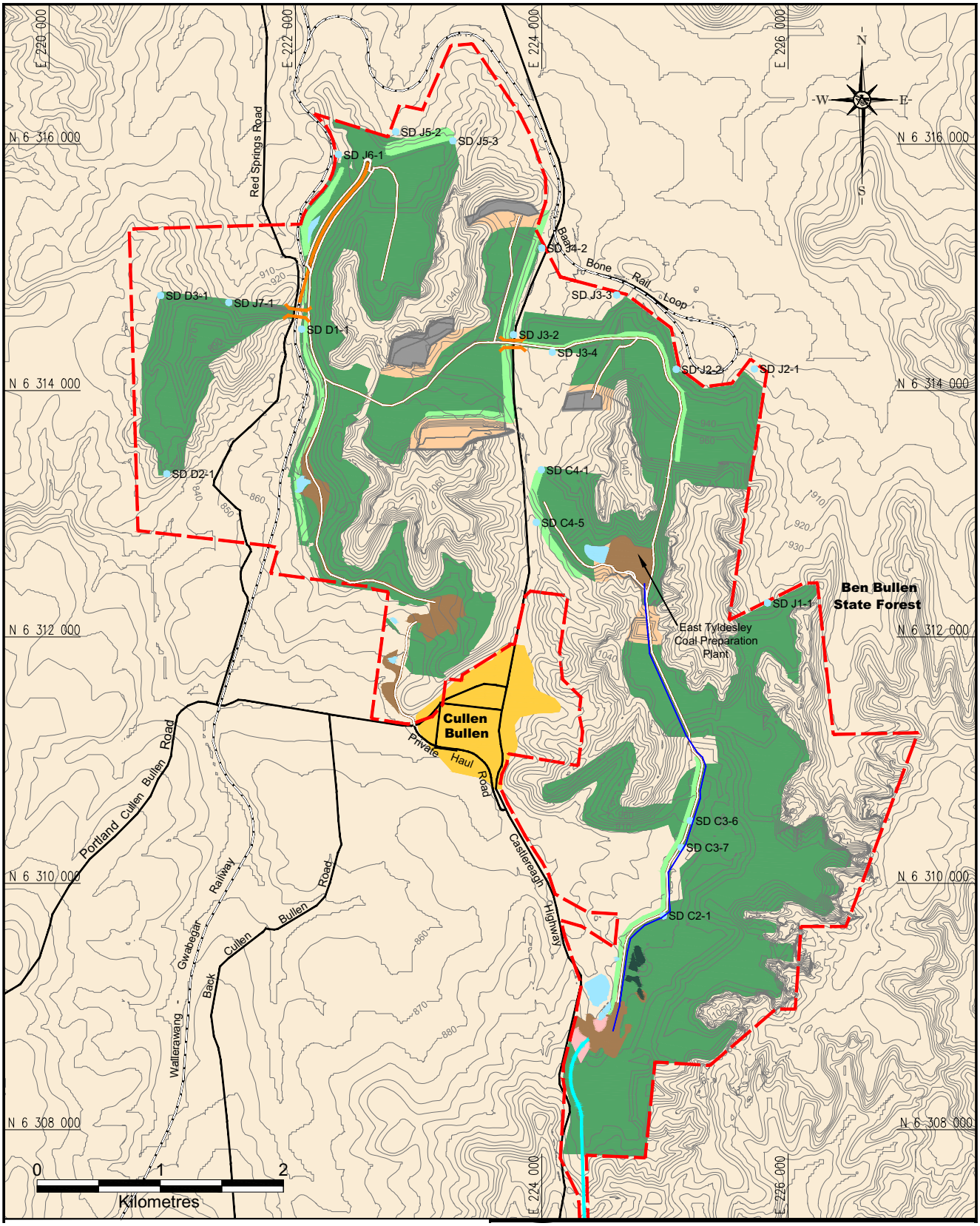


Figure 4.5 | Year 20 Mine Plan

Figure 4.6 | Mine and OEA
Mine and OEA create a high visual effect due to contrast in landform line and colour with existing landscape.

Figure 4.7 | Rehabilitation
Rehabilitation reduces visual effect levels: firstly to moderate when land is reshaped and grass cover is established and then to low when tree cover is established.

Figure 4.8 | Advanced Rehabilitation
Advanced rehabilitation restores forest canopy colour and texture values helping to reduce visual effect.

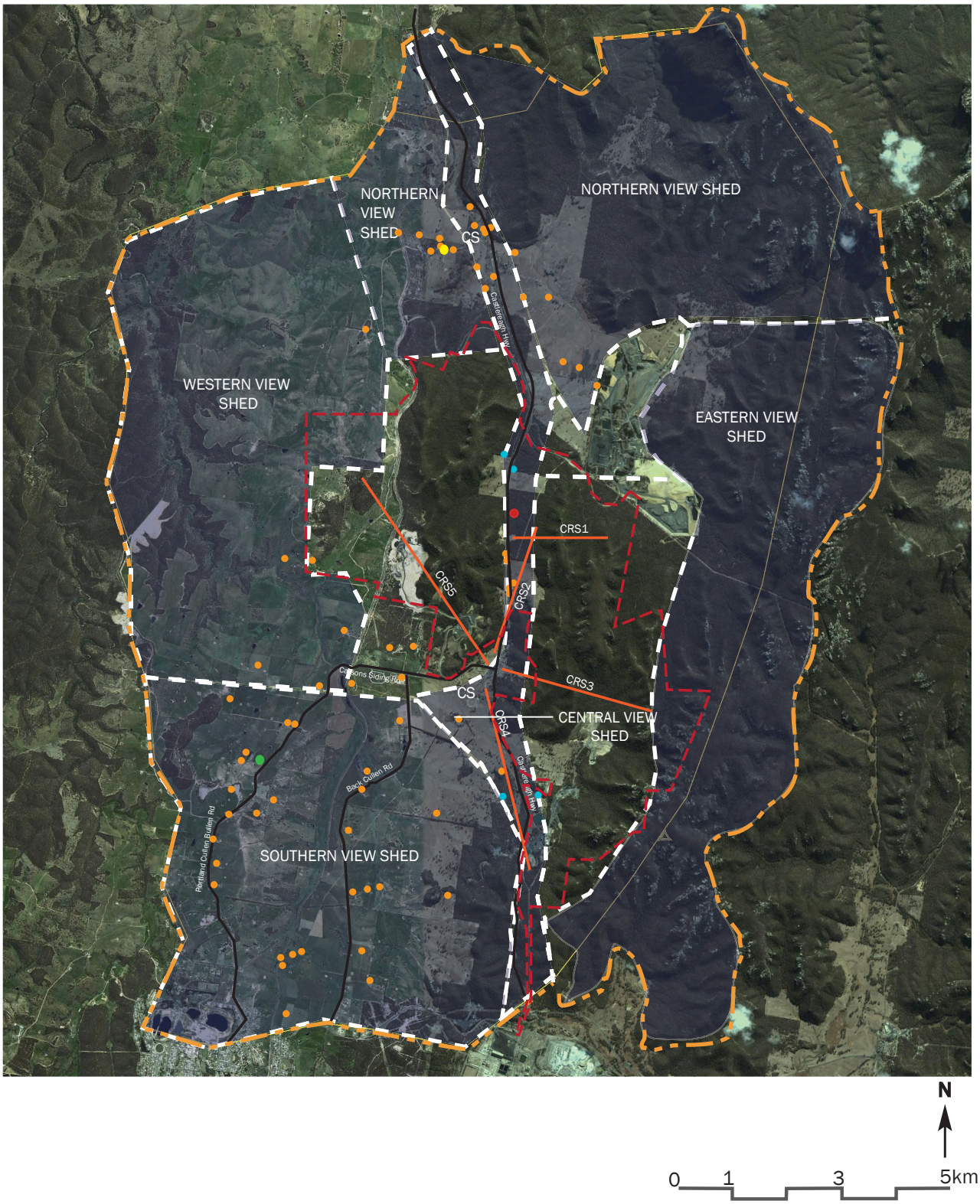


Figure 4.9 | Photomontage and Cross Section Locations

Figure 4.10a | Existing View from Red Springs Road

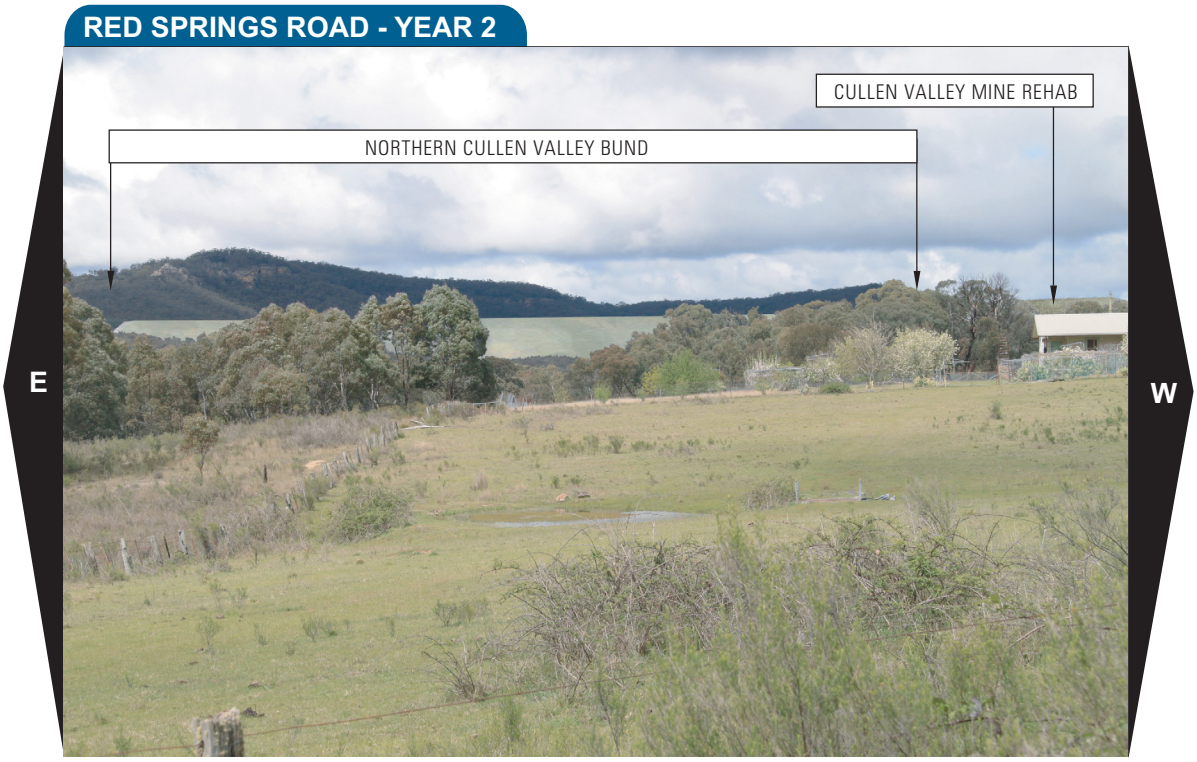


Figure 4.10b | Red Springs Road - Year 2
Showing initial rehabilitation of visual/noise bund

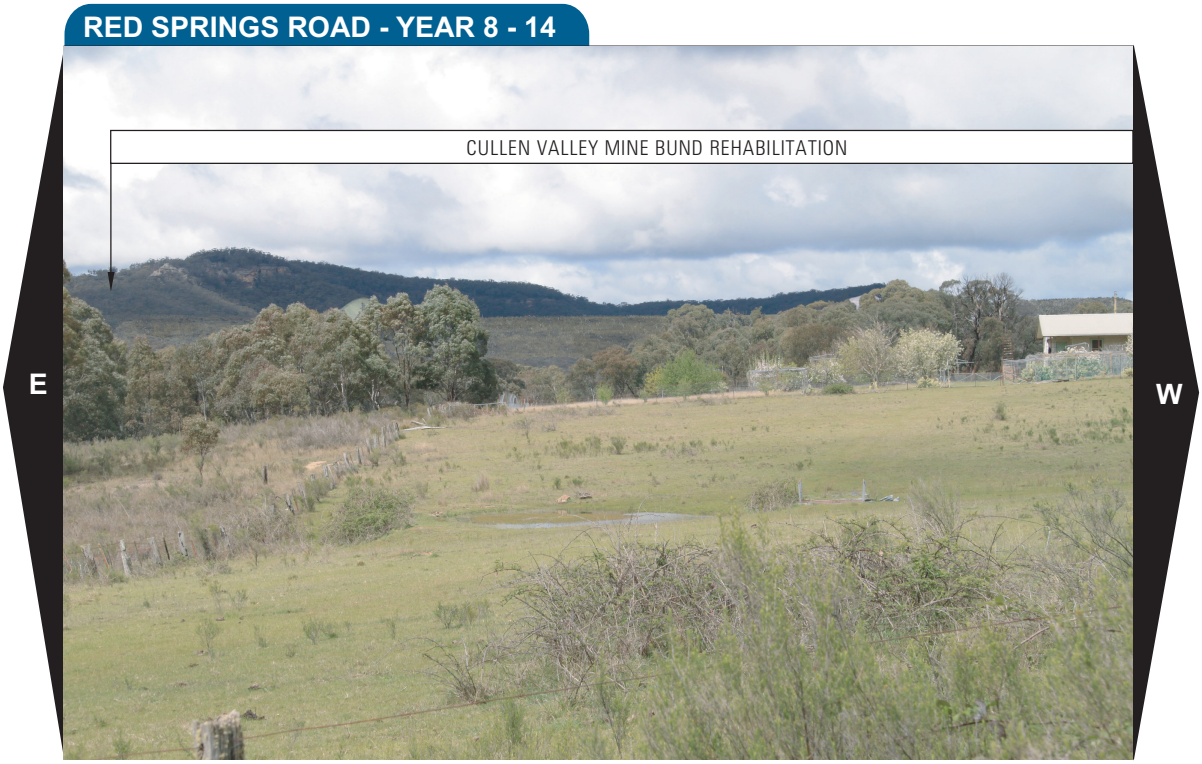


Figure 4.10c | Red Springs Road - Year 8 - 14
Showing early establishment of tree regrowth

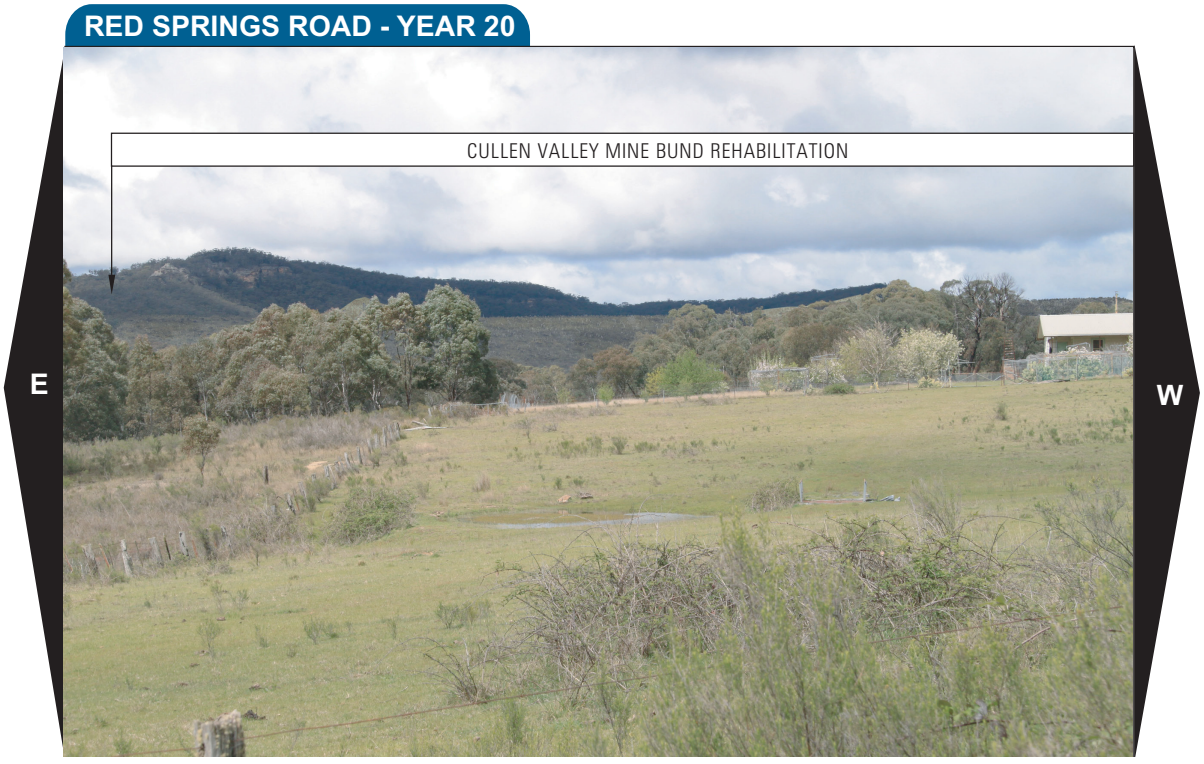


Figure 4.10d | Red Springs Road - Year 20
Showing more advance growth on main bund and smaller disturbed area in various stages of rehabilitation

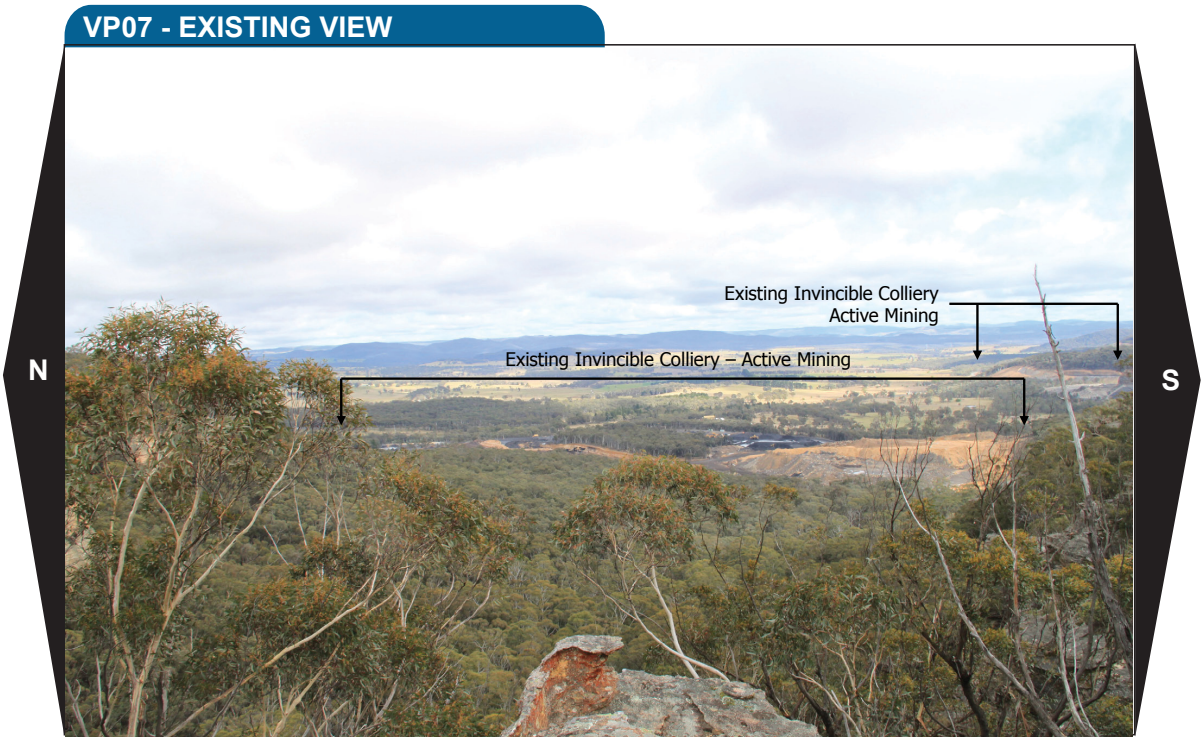


Figure 4.11a | Views of existing active mining areas

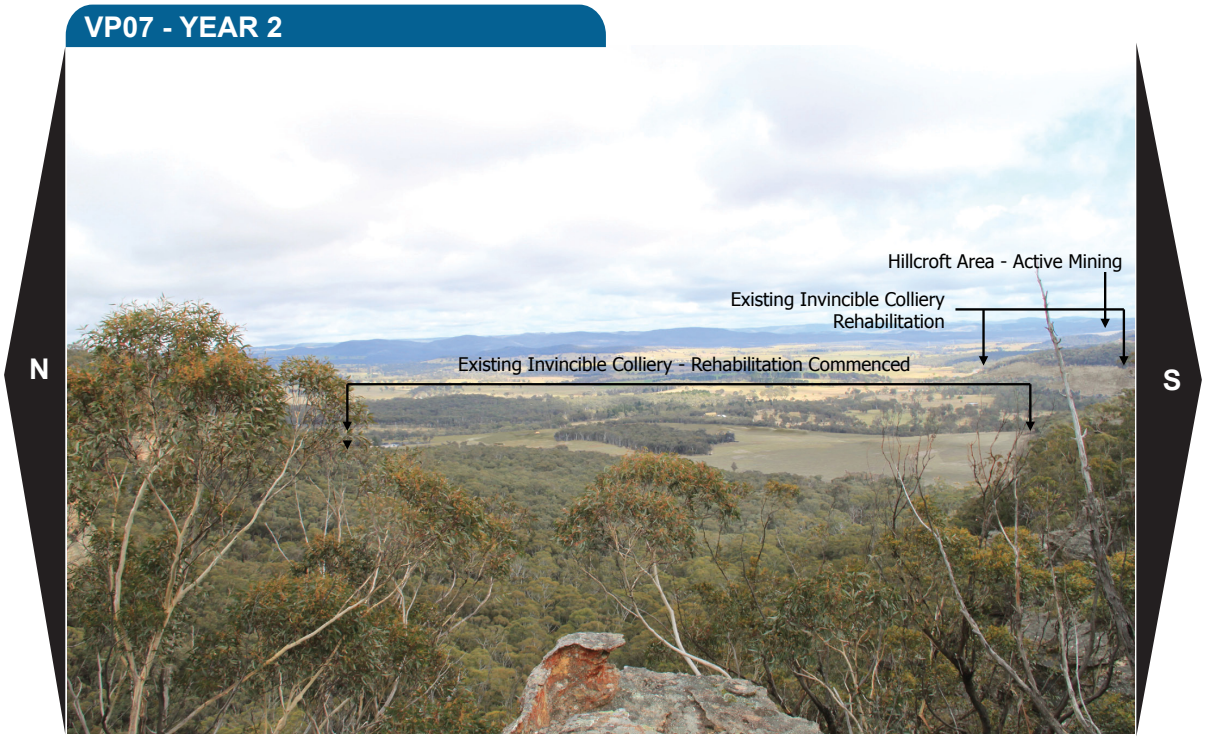


Figure 4.11b | Views of rehabilitation areas

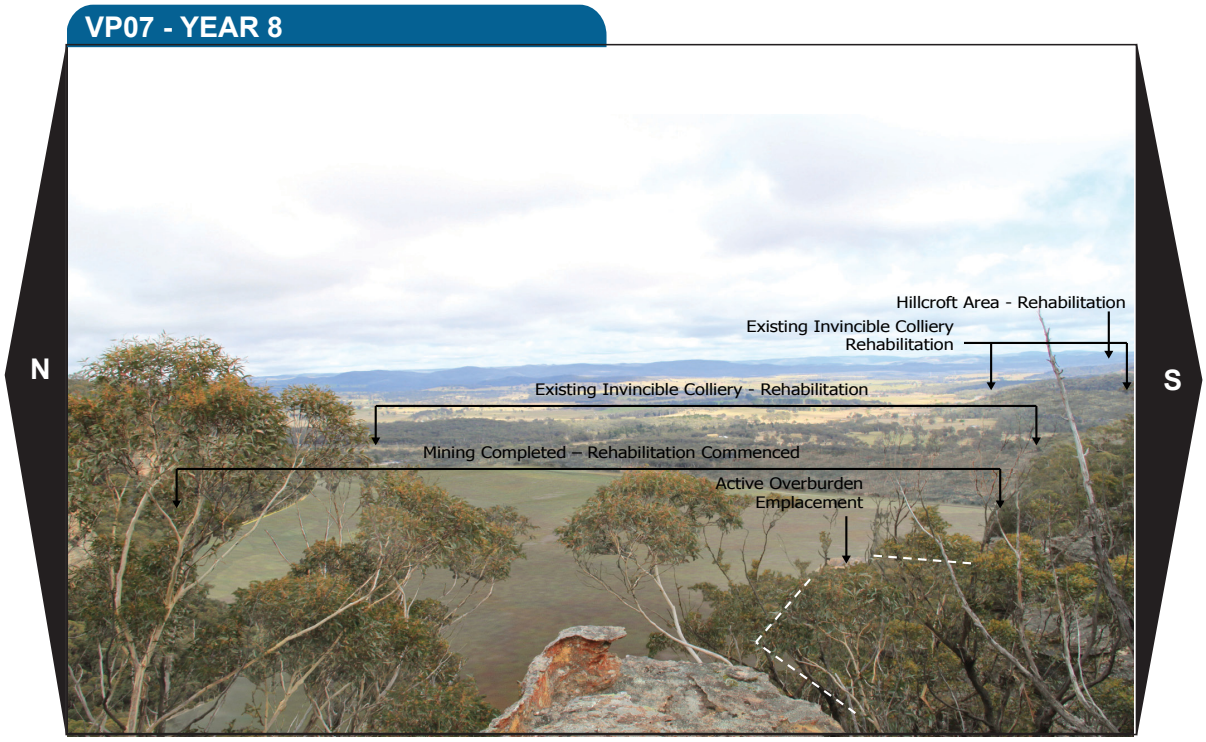


Figure 4.11c | Views of Rehabilitated areas at Year Eight

Figure 4.12a | Existing View from Portland - Cullen Bullen Road

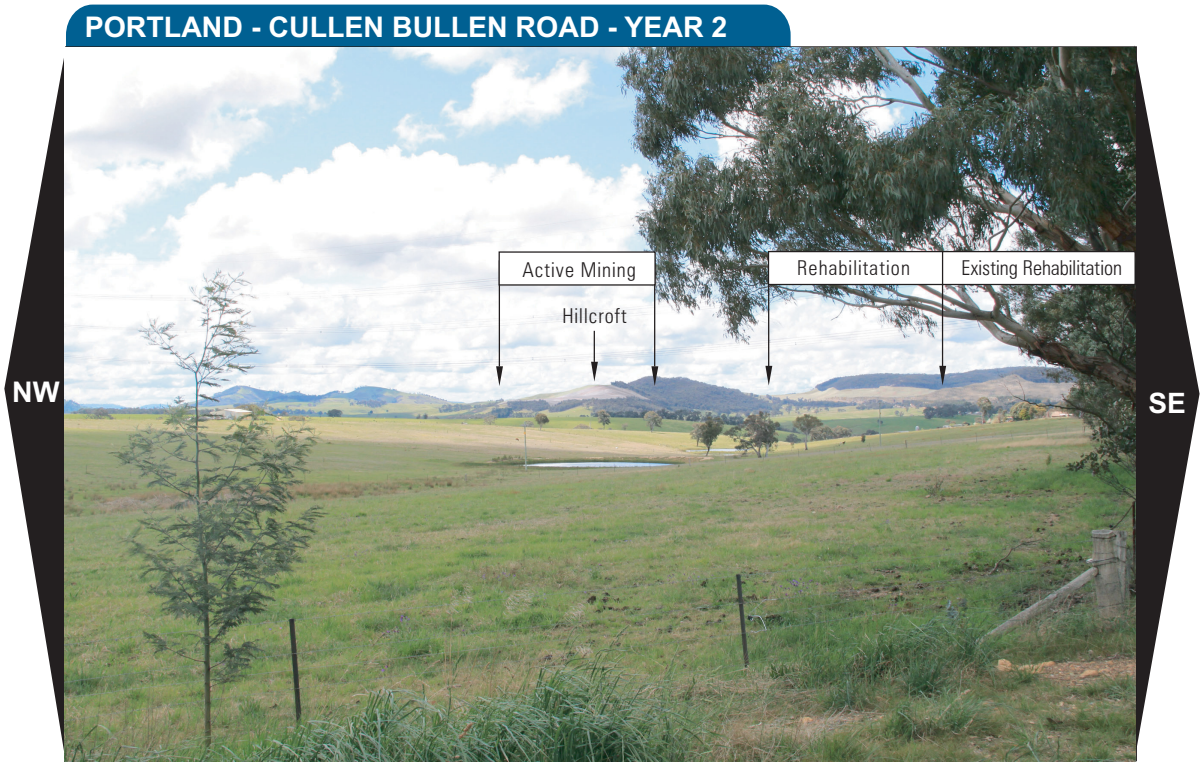


Figure 4.12b | Portland - Cullen Bullen Road Year 2

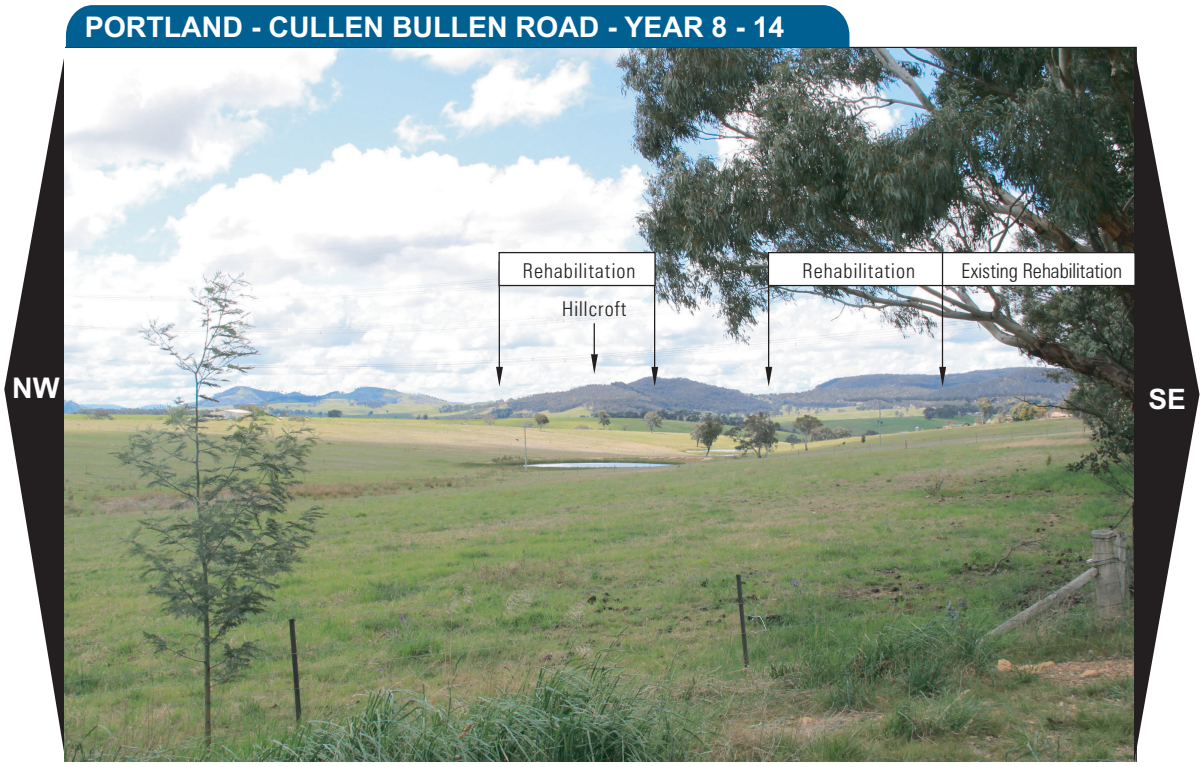


Figure 4.12c | Portland - Cullen Bullen Road Year 8 - 14
Showing initial rehabilitation of mined areas

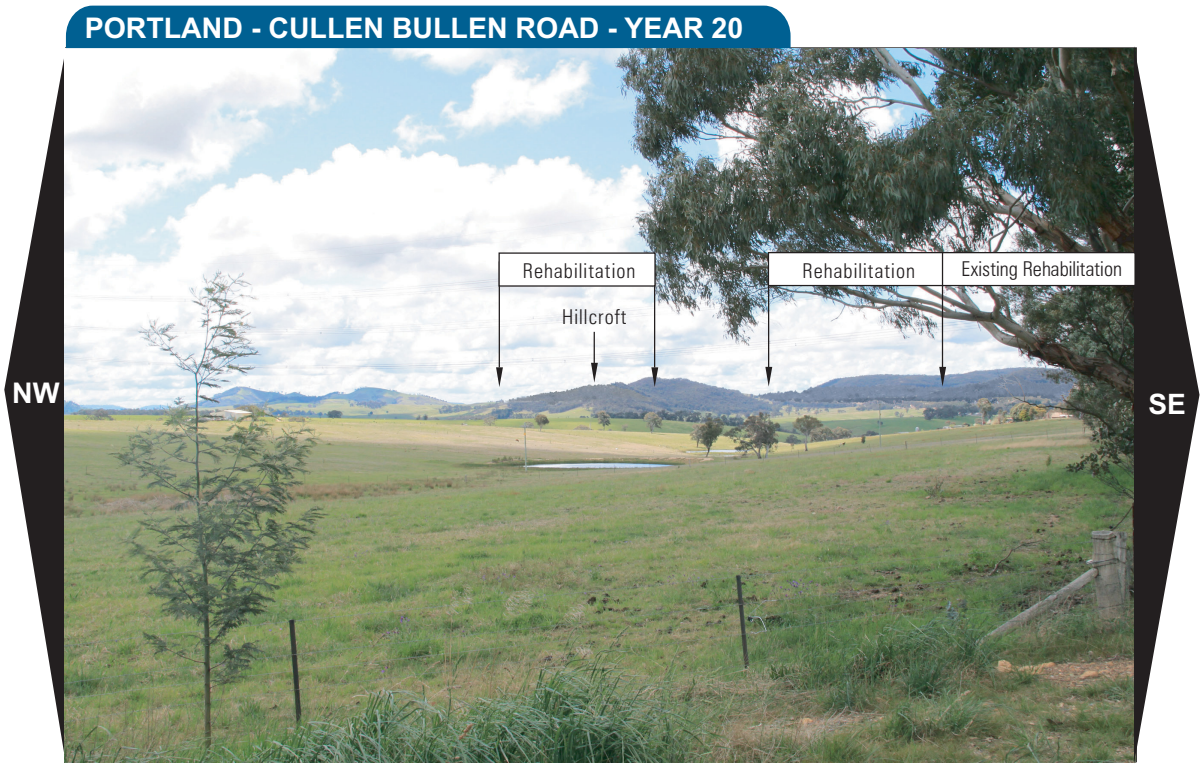


Figure 4.12d | Portland - Cullen Bullen Road Year 20
Showing early establishment of tree re-growth on rehabilitated areas

Figure 4.13a | Existing View of Cullen Bullen Cemetery

Figure 4.13b | Cemetery - Year 14

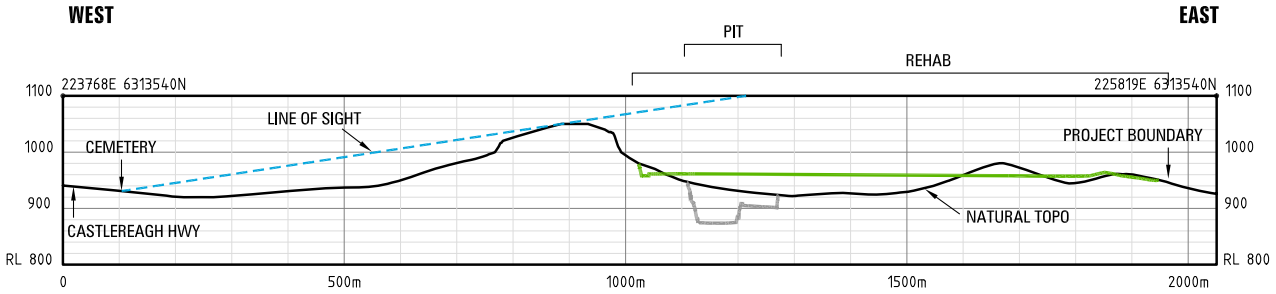
Figure 4.13c | Cullen Bullen Cemetery - Year 20

Figure 4.13d | Cullen Bullen Cemetery - Previous and superseded mine plans

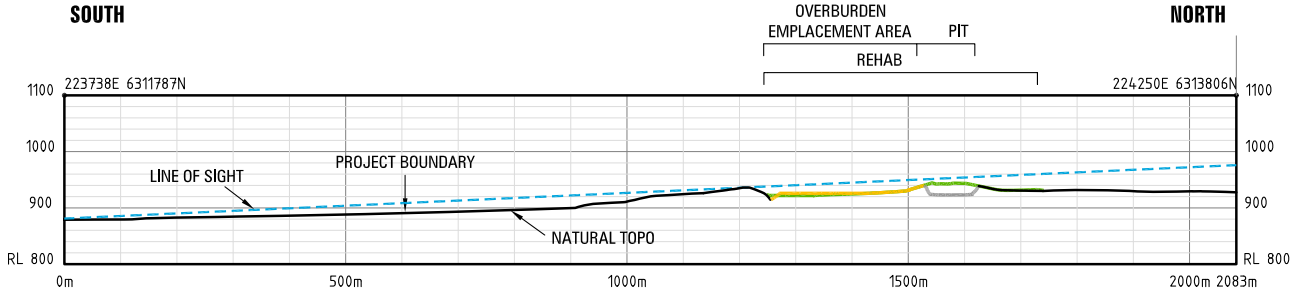
CEMETERY - END OF PROJECT LIFE

Figure 4.13e | Cullen Bullen Cemetery - End of project life

1 CEMETERY SECTION



2 CULLEN BULLEN SECTION 2 - EAST TYLDESLEY



3 CULLEN BULLEN SECTION 3

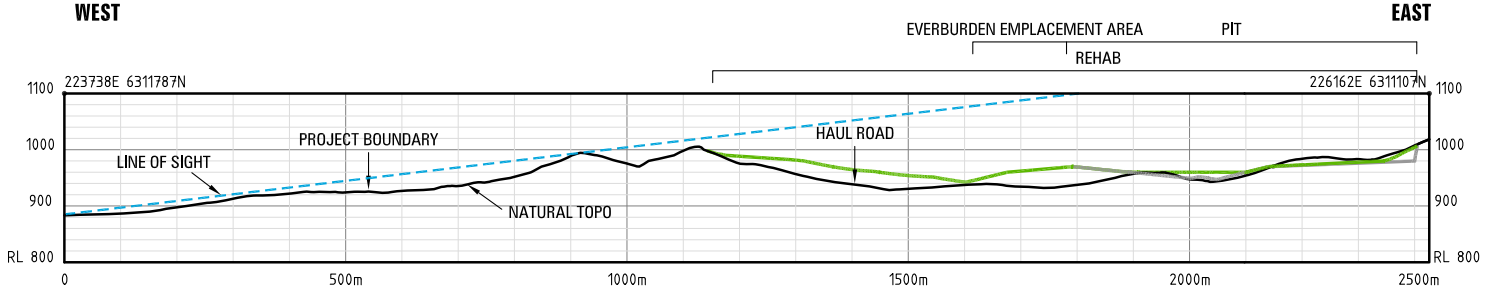
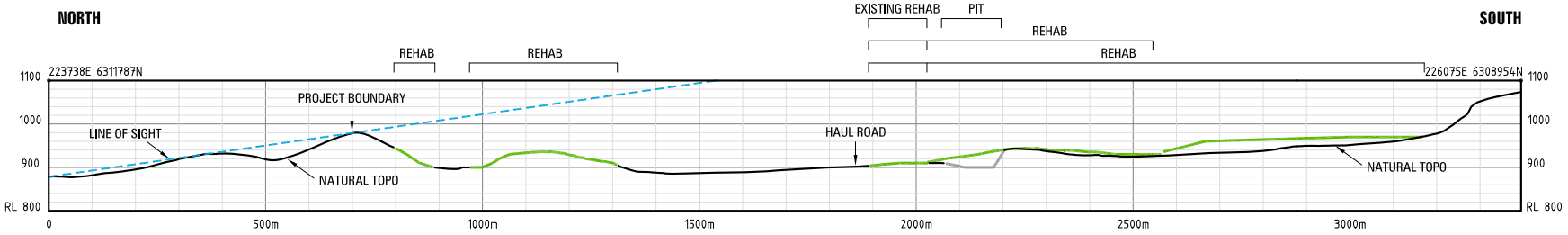
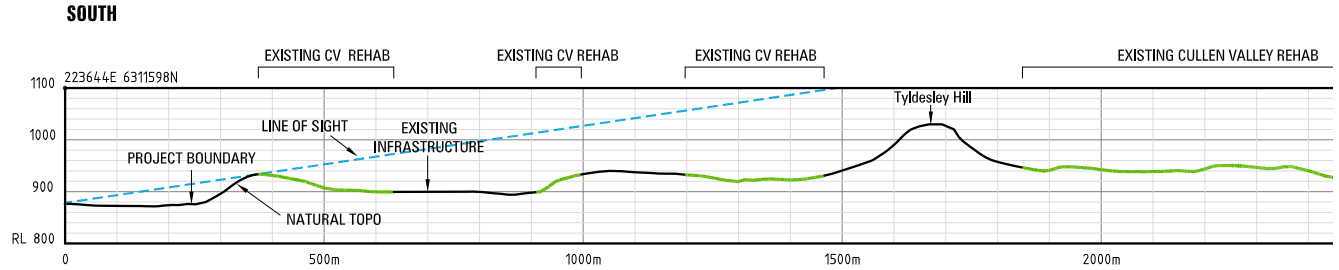


Figure 4.14a | Cross Sections from Cullen Bullen and Cemetery to mine areas

4 CULLEN BULLEN SECTION 4



5 CULLEN BULLEN SECTION 1



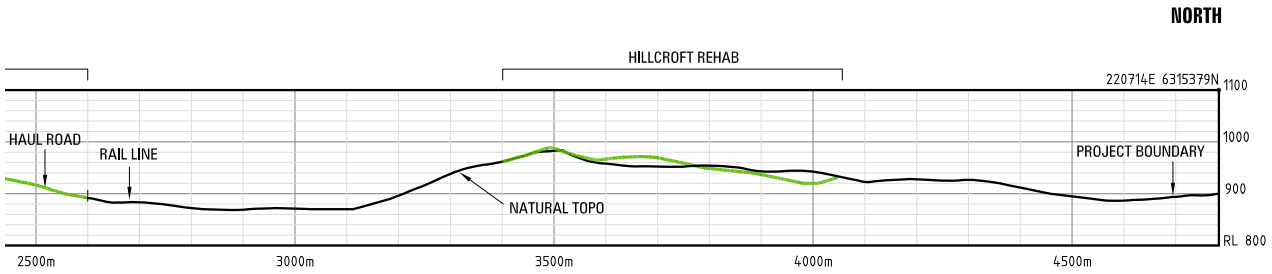


Figure 4.14b | Cross Sections from Cullen Bullen and Cemetery to mine areas

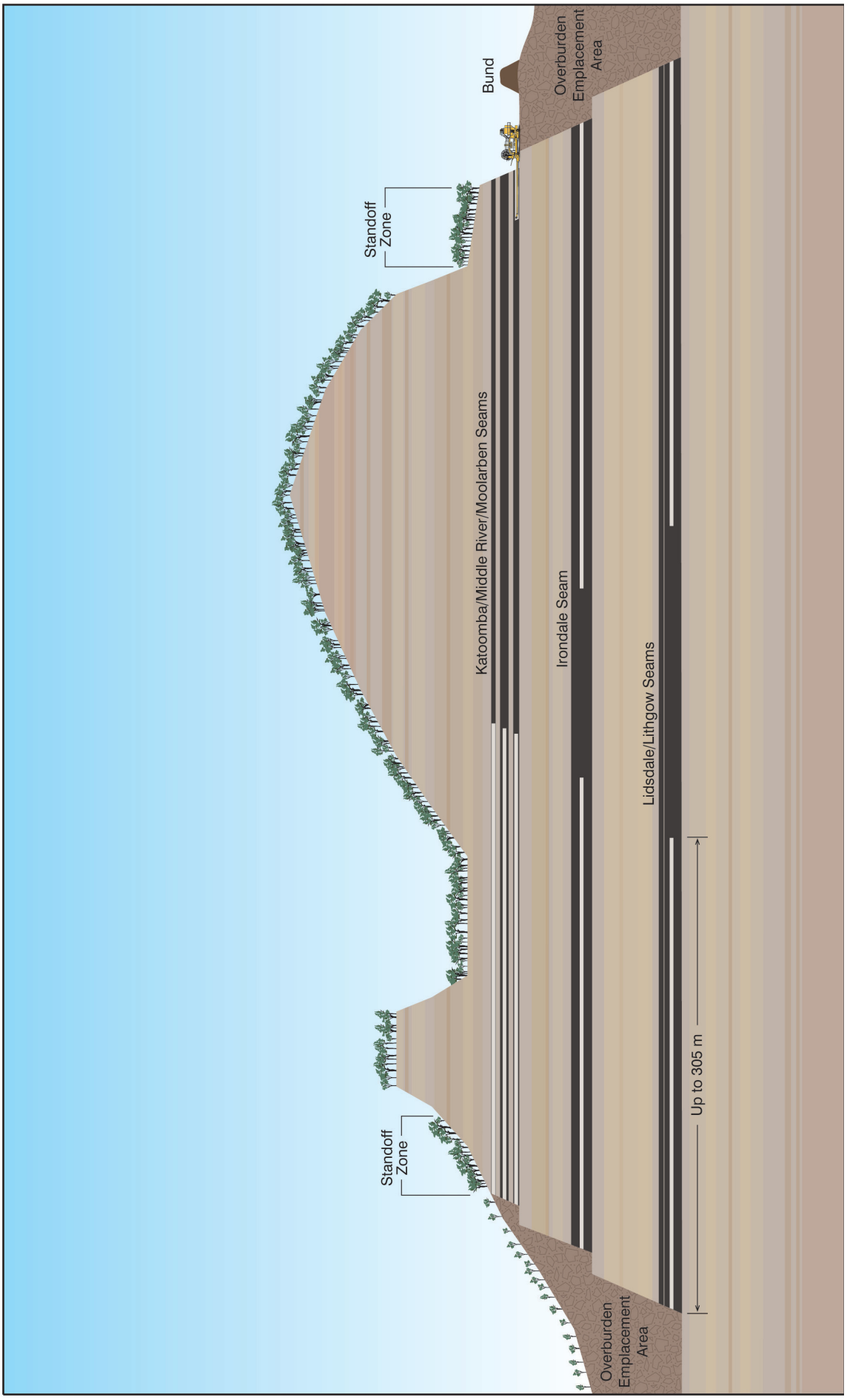


Figure 4.14c I High Wall Cross Section -

5. VISIBILITY AND VISUAL SENSITIVITY

This section of the report evaluates and analyses the visibility of the Project to external view locations such as homesteads and the highway. There has to be visibility to the various mine components for an impact to be incurred at receptor locations.

5.1 Area of Primary Visual Concern within PVC

Field assessment and evaluation of mapping and aerial photography as well as computer analysis was used to define a potential zone of visual influence and assisted in defining the Project PVC (see Figure 5.1 and Figure 5.1a). The PVC contains numerous locations with potential views to the Project and all areas with potential views (based on topography alone) are shown in Figure 5.1a. However, without interpretation of other landscape parameters such as vegetation and visual sensitivity, consideration of topography alone does not give an accurate prediction of visibility of Project elements (Figure 5.1b).

This section of the report evaluates and analyses the visibility of the Project and the sensitivity of viewing locations such as residences, recreation areas and roadways within the region. To assist in an evaluation of this visibility, the PVC has been divided into the Northern, Eastern, Southern, Western and Central sectors. There are view points beyond the PVC from which elements of the Project will be seen; however the most critical are at the closer distances within the PVC.

There has to be visibility to the one or more of the various Project components for a visual sensitivity and a visual impact to be incurred. Areas that do not have a view of the Project will not be visually impacted. These viewpoints (Figure 5.1) are for the most part within the PVC, but it remains possible for some more distant viewpoints to have views of the Project. More distant locations with views to the Project would have lower sensitivity and visibility due to distance, compared to those within the PVC.

Viewing characteristics were determined by field evaluation of the landscape to complement the computer analysis. This was undertaken to better determine potential screening effects as a result of topography, vegetation and other land use features.

5.2 Significant Topographic Features

There are a number of topographic features that greatly assist in limiting the visibility of the Project mining areas, Figure 5.1 and 5.2. These features limit views from the north, east, west and central sectors in different ways.

The ridges and spurs illustrated on Figure 5.1 create distinct view sheds that eliminate many operational areas from views in different directions. All of these ridges and spurs are the sandstone capped ridges and escarpments that will dominate the mine areas that occur below them.

5.3 Significant Vegetation Areas

Tree cover is usually important in providing potential screening to the Project components. It is especially significant when it is close to the viewing locations. For the Project this is most significant in relation to views from the highway as shown in Figure 5.3.

In addition to the screening effect of native woodland and forest (especially that associated with the eucalypts along the creeks and drainage lines), cultural plantings around rural residences also create screening effects. Cultural plantings and residual tree areas in the foreground or near middle ground of views oriented toward the Project can be significant in reducing views to Project areas. In the same way, vegetation around residences or village streets can greatly assist in screening views to the Project Boundary.

5.4 Sensitive Receptors

There are a range of potentially sensitive viewing locations around the Project Boundary. These include Cullen Bullen, Portland, rural residences, roads and recreation areas in the Ben Bullen and Wolgan State Forests and in the southern/western edges of the Gardens of Stone National Park.

5.4.1 Cullen Bullen and Portland

Cullen Bullen and Portland are the only clustering of residences and community facilities within the primary PVC. As shown

in Figure 5.4, some areas within Portland have views to the proposed mining activity areas, but Cullen Bullen is generally well screened by intervening topography surrounding the town.

If views to the Project are available, these locations would have a high sensitivity.

5.4.2 Rural Residences

There are a number of rural residences spread throughout the locality, see Figure 5.5. Most significant are those located in the northern sector adjacent to the Castlereagh Highway and on Red Springs Road as well as in the southern sector.

These locations would have a high sensitivity if views of mining operations are visible.

5.4.3 Roads and Railway

Roads within the PVC are limited. As illustrated in Figure 5.6, the major road in the locality is the Castlereagh Highway, which is the spine of the Central sector. The other road of local significance is the Portland - Cullen Bullen Road.

The only other roads that occur in the PVC are Red Springs Road to the north and west and Back Cullen Bullen Road to the south. The Wallerawang – Gwabegar Railway line runs on a north south alignment through the North, West and Southern sectors and for the greater part, is located to the west of the Project Boundary. There are no passenger services on this Railway line.

Unless the roads have a regular tourist usage, such as the Castlereagh Highway, sensitivity would be moderate to low.

5.4.4 Tourist / Recreation Areas

A tourist attraction in the region is the Gardens of Stone National Park, 5km to the north of the Project Boundary. Mudgee, 100 km to the north of the Project, is a significant regional tourist destination, so that tourists travelling from Sydney travel the Castlereagh Highway through and alongside the Project Boundary.

Ben Bullen, Wolgan and Sunny Corner State Forests, as with all State Forests in NSW, are available for forest recreation, especially forest driving, trail bike riding, hunting and other recreational activities. However, these activities generally would not include recreation that would make use of the landscape amenity of the locality.

The Castlereagh Highway, Figure 5.6, in this locality will have a high sensitivity due to views to mining areas available for receptors travelling in both directions. Visual bunds, and / or retained vegetation or plantings, once established, will screen views from this sensitive location.

5.4.5 Rural Areas

Agricultural activity dominated by grazing is one of the dominant land uses within the PVC, along with forestry and mining. These lands occur in Northern, Western and Southern sectors around the Project Boundary.

All of these areas in the North, West and South sectors will have a low visual sensitivity.

5.5 Northern Sector

The Northern view sector is illustrated in Figure 5.1. This sector is dominated by low sensitivity rural lands. However it does support a number of rural residences on Red Springs Road to the north of the Project Boundary that have will have a high sensitivity, where they are orientated towards the Project. This area is flanked in the north-east by the Gardens of Stone National Park.

5.5.1 Rural Residences

There are a number of rural residences within this sector along the Red Springs Road, the Castlereagh Highway and Reserved Road, Figure 5.7. The residences on the highway and on Red Springs Road have potential views onto the northern part of the proposed Cullen Valley mining areas.

The houses on Reserved Road have potential views onto the northern parts of the East Tyldesley mining area. However as operations are at low elevations, there is a potential for forested areas to the north of the Baal Bone Colliery Rail Loop to screen these operations, but it is more likely that part of the OEAs in the East Tyldesley mining area will

still be seen over the tree canopy in this location.

Each of the northern and eastern bunds that have been incorporated into the mine plans for the East Tyldesley area has been developed to assist in reducing the visibility of Project operations from residences on Red Springs Road, Reserved Road and receivers using the Castlereagh Highway.

Views from these residences will have a high sensitivity as they are closer than 7.5 km to proposed mining operational areas of the Project.

5.5.2 Local Roads

There are views from local roads including Red Springs and a Reserved Road to the east of the highway and north of the Baal Bone Colliery Rail Loop. These roads are minor rural roads but views from them are possible from distances closer than 2.5 km.

The roads are minor rural roads and would have a low sensitivity.

5.5.3 Recreation Areas

The northern sector contains the Gardens of Stone National Park, areas within the Gardens of Stone 2 Proposal and areas of Wolgan State Forest. Both of these areas would support recreational uses, although of a different type and sensitivity. The Wolgan State Forest would also support trail bike riding, four wheel driving and hunting while the National Park would generally be more likely to support bush walking, especially within the significant pagoda and sandstone escarpment areas.

The State Forest areas within the sector do not largely appear to support access roads and trails in locations that would have a visibility to the Project mining areas. There may be views from non-road areas such as west facing rock face and escarpment edges in the Ben Bullen State Forest and exposed areas with a southerly aspect in the Gardens of Stone National Park. Bushwalking use of lands within recreation areas with views of the Project would have a higher sensitivity than any views from road and access trails.

The sensitivity of bushwalkers in areas with views to the Project from recreation areas, especially within the areas of the Gardens of Stone National Park that retain visibility, would be high up to a distance of 7.5 km. This could include views to the northern extent of the East Tyldesley and Cullen Valley mining areas. However there have been views since the early 1980's of the existing mining at Baal Bone Colliery from viewpoints at the Gardens of Stone National Park, Wolgan and Ben Bullen State Forests. At various times between 1980 and 2008 the Baal Bone Colliery open cut operation was a dragline operation and then subsequently an excavator and truck operation. Rehabilitation of the completed open cut area at Baal Bone Colliery is, however, in its final stages. Potential view areas are also available within Wolgan State Forest. But even here, views would be restricted to west facing rock faces and escarpment tops.

Views from these areas towards the Project are generally limited by intervening topography and mature forest vegetation. More open views from some western facing rock and escarpment edges would be available towards the Project and any operations within it across existing mining at Baal Bone Colliery.

Similarly, views from natural heritage sites in the sector associated with the sandstone escarpment and pagoda formations are similarly limited to rocky edges, with elevated views to the south west. Apart from such exposed edges created by these formations, such sites are generally screened by vegetation.

5.6 Eastern Sector

Computer analysis of visibility based on topography alone, illustrated that the main areas to the east that had visibility to proposed mining operations for the Project were immediately adjacent to the existing mining operations at Invincible Colliery and Baal Bone Colliery. In this sector, these areas were largely external to the existing Gardens of Stone National Park and were generally located within the Ben Bullen and Wolgan State Forests.

5.6.1 Ben Bullen State Forest

The eastern sector is dominated by lands within the Ben Bullen State Forest. There are no major receptors close to the Project Boundary so there is no potential for views from sensitive receptors in this sector into proposed mine operational areas, Figure 5.8. Such receptors would generally be further to the north and east where bushwalking is a more prevalent recreational activity. Much of the land currently occupied by the Ben Bullen State Forest in this sector

is within land nominated as a potential State Conservation Area under the Gardens of Stone 2 proposal.

There is however, a NSW Forests management access trail that runs along the elevated ridge line to the east of the Project. There are views over the Project to the Invincible and East Tyldesley mining areas from rocky outcrops on the edge of the escarpment close to this trail, but generally not from the access trail itself. Recreationally this trail is used mainly for four wheel driving and by trail bikes. These activities are not considered to have a high visual sensitivity that would be attributed to activities such as bushwalking.

However, the eastern sector within Ben Bullen State Forest also contains some areas of pagodas and sandstone escarpments that have the potential to be visited by bushwalkers and would have high sensitivity from that user group. Potential views of the Project would be limited to the western cliff tops and rock outcrops and would contain views of existing mining at Baal Bone and Invincible Colliery.

5.6.1 Wolgan State Forest

Wolgan State Forest is located between Ben Bullen State Forest to the south and the Gardens of Stone National Park to the north. The physical character of the forest is similar to these areas as it is dominated by the pagoda sandstone formations.

Similar to Ben Bullen State Forest, there are views to Project areas from western cliff top and rock ledges over Baal Bone Colliery to East Tyldesley mining areas.

5.6.2 Garden of Stone National Park

A small part of the Gardens of Stone National Park located east of the Wolgan River has high terrain in this sector that could potentially have views to the highest elevations of operations on easterly aspect slopes in Invincible Colliery. Such views are generally within forested ridges and not rocky outcrops, suggesting that vegetation would provide screening of these views.

The visual sensitivity of this sector is therefore considered to be very low for land use and restricted viewing potential.

5.7 Southern Sector

This sector is dominated by open rural lands with scattered rural residences and local roads, Figure 5.9, as well as a small section of Portland in the south west corner of the PVC.

5.7.1 Rural Residences

There are some 20 rural residences and two rural residential areas within the vicinity of Portland. For the greater part, these residences are within 7.5 km of the Project and will have a high visual sensitivity.

There will be potential for some residences to obtain views of the Project, especially those that occur on northerly and north easterly slopes. Such views would depend on the orientation of the house and landscape treatments around it and would vary greatly.

5.7.2 Portland

There exist views as well as potential views to new mine areas from the north eastern portion of the town across adjacent rural fields. This location is also closer than 7.5 km from the Project Boundary and would have a high visual sensitivity to additional mining areas proposed for the Project.

5.7.3 Portland – Cullen Bullen Road and Back Cullen Bullen Road

There are views to the proposed operations in the Cullen Valley and Invincible Colliery mining areas from Portland –Cullen Bullen Road and from the Back Cullen Bullen Road. The distances of these views are generally greater than 2.5 km and therefore a low visual sensitivity applies. Only a short distance of the Portland – Cullen Bullen Road is closer to the Project than this and a moderate sensitivity would apply to this section of road as it relates to view of the mining areas in the Cullen Valley mining area located to the west of the Wallerawang – Gwabegar railway line.

5.7.4 Rural Lands

The rural lands themselves would have a low visual sensitivity.

5.8 Western Sector

The Western sector is dominated by rural lands edged by Sunny Corner State Forest. The open rolling hills give open views to the western edge of the existing Cullen Valley Mine and the mining areas proposed for the Project in this area, Figure 5.10. The sector will have open views to operations in those areas.

There are open views from the sector into existing mining at Cullen Valley Mine and also, from the southern extent of this sector it would be possible to get views into existing and proposed mining areas of Invincible Colliery.

The sector contains a limited number of rural residences, part of Red Springs Road and a section of the Wallerawang-Gwabegar Railway line within the broader matrix of rural grazing lands.

5.8.1 Rural Residences

There are two residences that are close to the Cullen Valley Mine west of the Wallerawang - Gwabegar Railway line that will have a high sensitivity.

5.8.2 Red Springs Road

In this sector, this road is a minor public road that passes through private and unfenced grazing land. Within the Western sector, Red Springs Road is mainly used as for limited private access and would therefore have low sensitivity.

5.8.3 Wallerawang - Gwabegar Railway

For the greater part, this is a freight train line and would have a low visual sensitivity.

5.9 Central Sector

The central sector is located between Cullen Valley Mine to the west and East Tyldesley and Invincible Colliery to the east. The Castlereagh Highway is the spine of the sector. Along this spine, there are a number of sensitive receptors in addition to the highway itself and include Cullen Bullen, rural residences along the highway and the Cullen Bullen Cemetery.

Views are generally restricted to short distances enclosed by the vegetated sandstone ridges and escarpments. However, within this context, views are open and occur in the immediate foreground, creating highly sensitive viewing conditions.

5.9.1 Castlereagh Highway

The highway, Figure 5.11, is located on the western boundary of the Invincible Colliery and East Tyldesley mining areas and the eastern boundary of the Cullen Valley mining areas. From this moving viewing location for receptors travelling along the highway, there are views into existing operations at Invincible Colliery. Both the northern and southern journeys will also give views to proposed mining operations for the Project. Areas that will potentially be seen by receptors in this sector include:

- The eastern Cullen Valley Mine areas adjacent to the highway;
- The western East Tyldesley mining areas adjacent to the highway; and
- The Invincible Colliery mining areas, particularly those at higher elevations that will not be fully shielded by topography or intervening vegetation.

Many of these areas will be seen from the roadway immediately adjacent to the Project Boundary. Other areas are more distant, but all are within 2.5 km, creating a high visual sensitivity for the highway in relation to proposed mining operations. Proposed bunding and rehabilitation works are proposed within the existing mine plans to assist in mitigating visual impacts.

5.9.2 Cullen Bullen

Cullen Bullen is visually well screened from existing mining areas by topography and vegetation. Cullen Bullen is

adjoined by steep forested ridges to the east, north-east, north-west and west. These ridges converge into a narrow valley at the northern end of the town. These ridges generally screen Cullen Bullen from views to the west, north-west as well as to the north, north-east and east. Figure 4.14 contains a number of cross sections to illustrate this point. Figure 5.1c and Figure 5.12 illustrates the photographic survey that was completed to complement the topographic computer analysis.

A white line analysis was completed by computer evaluation of photographs taken in Cullen Bullen. This evaluation as illustrated in Figure was based on: GPS data of photo location; the 3D computer model of terrain; the mine plan; and the photo itself which represents a view from the various GPS locations. An unbroken line illustrates that the upper elevation of the mine is below screening hills. An upbroken line illustrates that mine operations would be visible.

The photos and analysis of them were taken from four locations around the town. The white line analysis indicates that Cullen Bullen is and will continue to be screened from potential views of the Project, with the exception of a small area of residences in a 'triangle of land' enclosed by Farley Street to the east, Portland – Cullen Bullen Road to the west and the Cullen Valley Private Haul Road to the south. From properties in this location, there are potential views through a narrow corridor to the south-east past the ridges into the southern end of the proposed Invincible mining area, immediately south and east of the ICPP. Areas to the north and south of this narrow view corridor are cut off by screening ridges and vegetation. An evaluation of houses in this location indicates that they do not have a strong viewing orientation toward the Invincible Colliery mining areas. However, where a strong orientation is present without screening effects, this would create a high sensitivity.

Another narrow view corridor exists along the Castlereagh Highway to the north. This view line, that relates more to the highway than the town, is along the road corridor and is into a sliver of area within the East Tyldesley area. Such a view would have a high sensitivity if views of active mining are available from Cullen Bullen.

5.9.3 Rural Residences

There are a number of rural residences along the Castlereagh Highway, generally located immediately to the north of Cullen Bullen. The residences north of the village that are adjacent to the southern extent of the East Tyldesley mining areas will have open views of the proposed noise bund that will effectively screen the proposed mining operations, due to these residences being lower in elevation that the crest of the noise bund.

South of Cullen Bullen, residences are generally well screened by vegetation and topography. Where vegetation is more set back, views would be available over the vegetation to mining operations.

Residences with open views to mining and OEAs will all have a high sensitivity.

5.9.4 Cullen Bullen Cemetery

The Cullen Bullen Cemetery is located some 1.5 km north of Cullen Bullen off the Castlereagh Highway. The Cemetery is in use and also has a strong historic value and association with the town. The Cemetery is located adjacent to the East Tyldesley mining areas and will have open views to mining operations to the north, east and south, Figure 3.7 and Figure 4.14.

This locality has a high sensitivity.

5.10 Summary

Visibility to Project mining areas is restricted to various areas by the local topography, especially the dominant sandstone ridges and escarpments. These features restrict northern views of the Cullen Valley mining area for many receptors.

Southern areas have more open views to many areas within the Invincible Colliery the western Cullen Valley mining areas and to a lesser extent, the existing OEAs of Cullen Valley Mine. However, these views are more distant middleground and background views.

By far the most visually sensitive sector is the central sector that has open and immediate views to proposed mining operations from residences located adjacent to the Castlereagh Highway and for receptors travelling along it. However bunds that are part of the existing mine plan should assist in mitigating the visual effects and impacts of these operations.

All sectors, with the exception of the Eastern sector, have a number of sensitive receptors that experience a high visual sensitivity. It is more difficult to define this for individual receptors in the South, but to the North, West and Central sectors, there are specific receptors that will have a high sensitivity to the mining operations proposed for the Project.

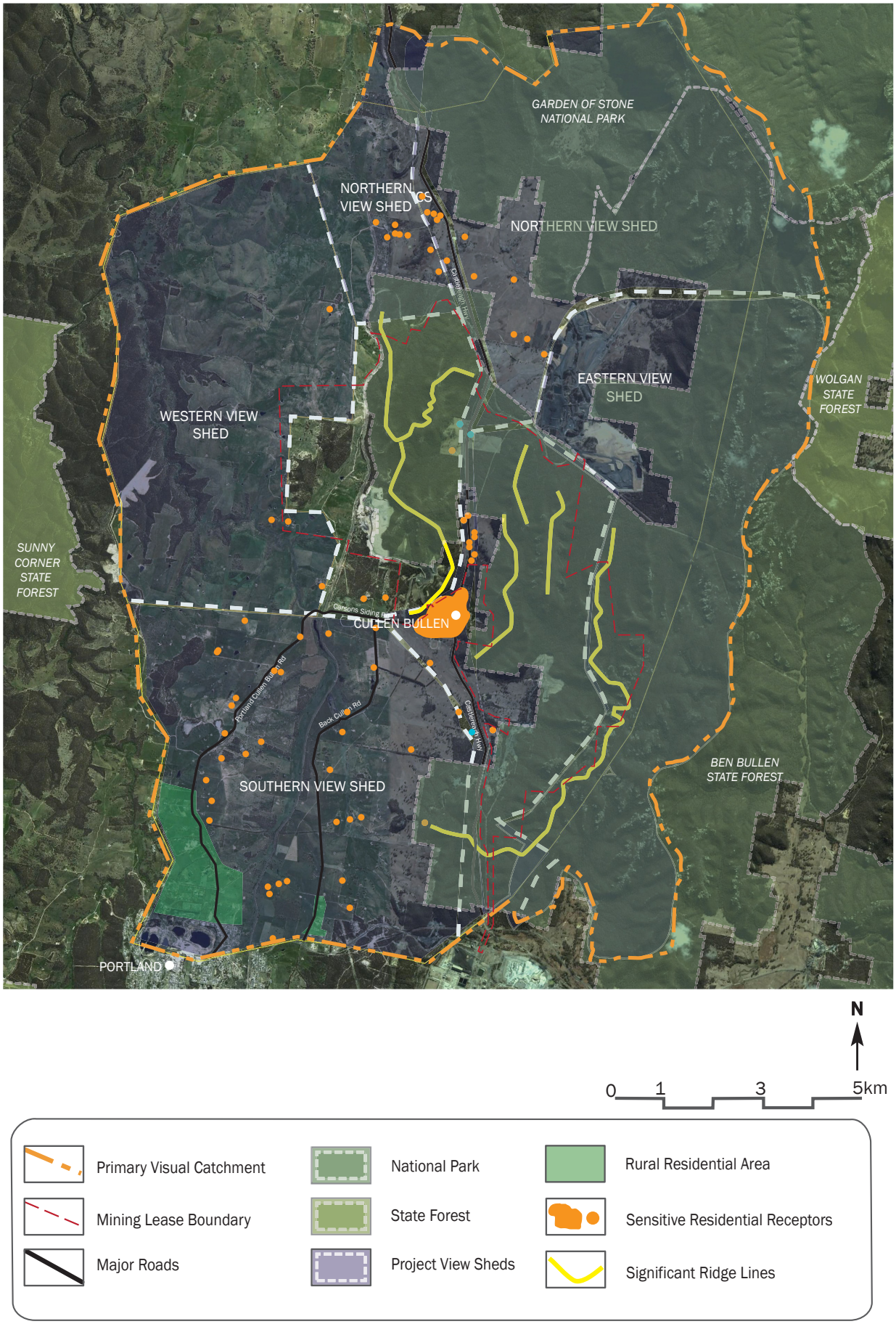


Figure 5.1 I Project View Sheds

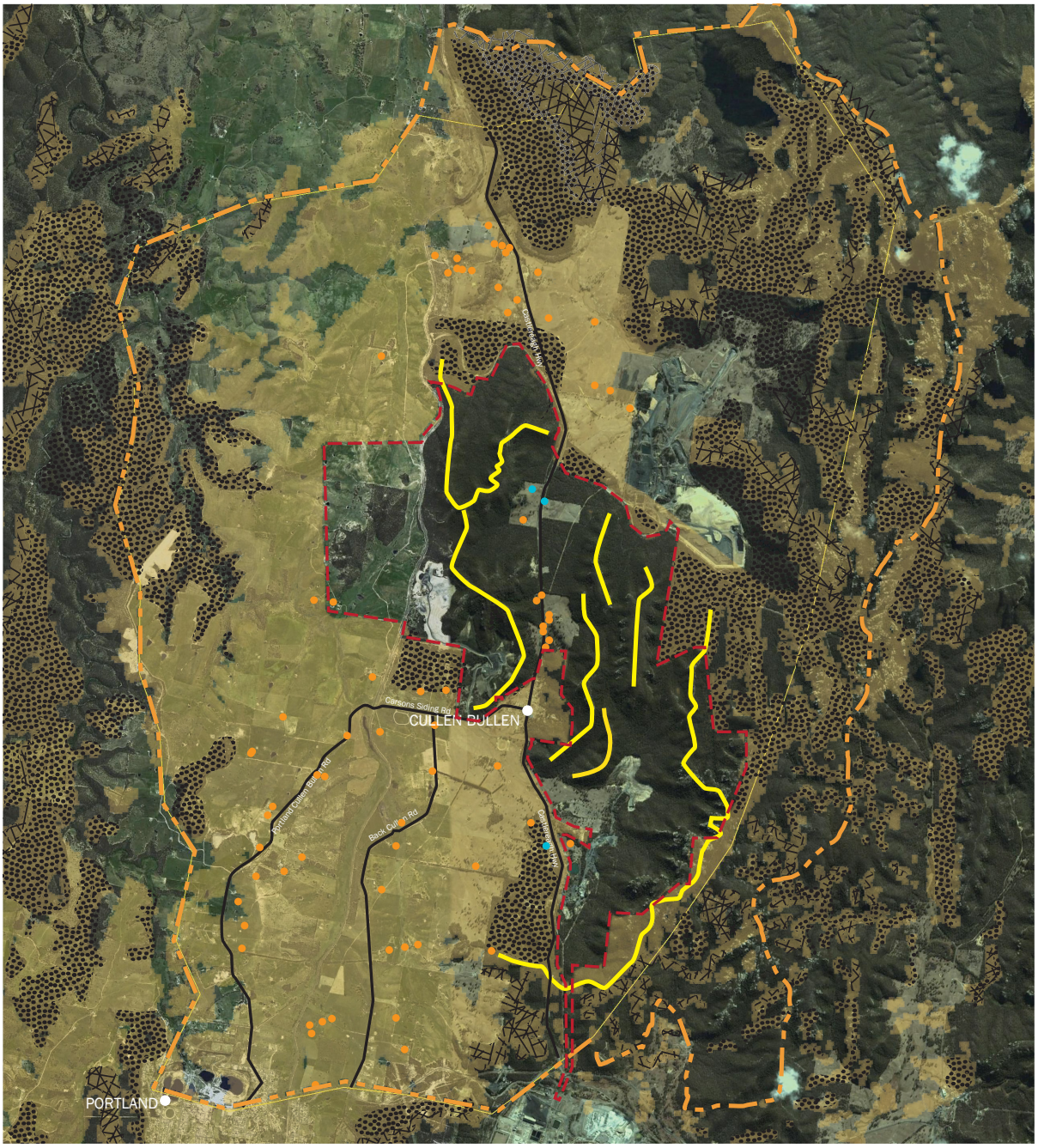


Figure 5.1a I Visibility Analysis

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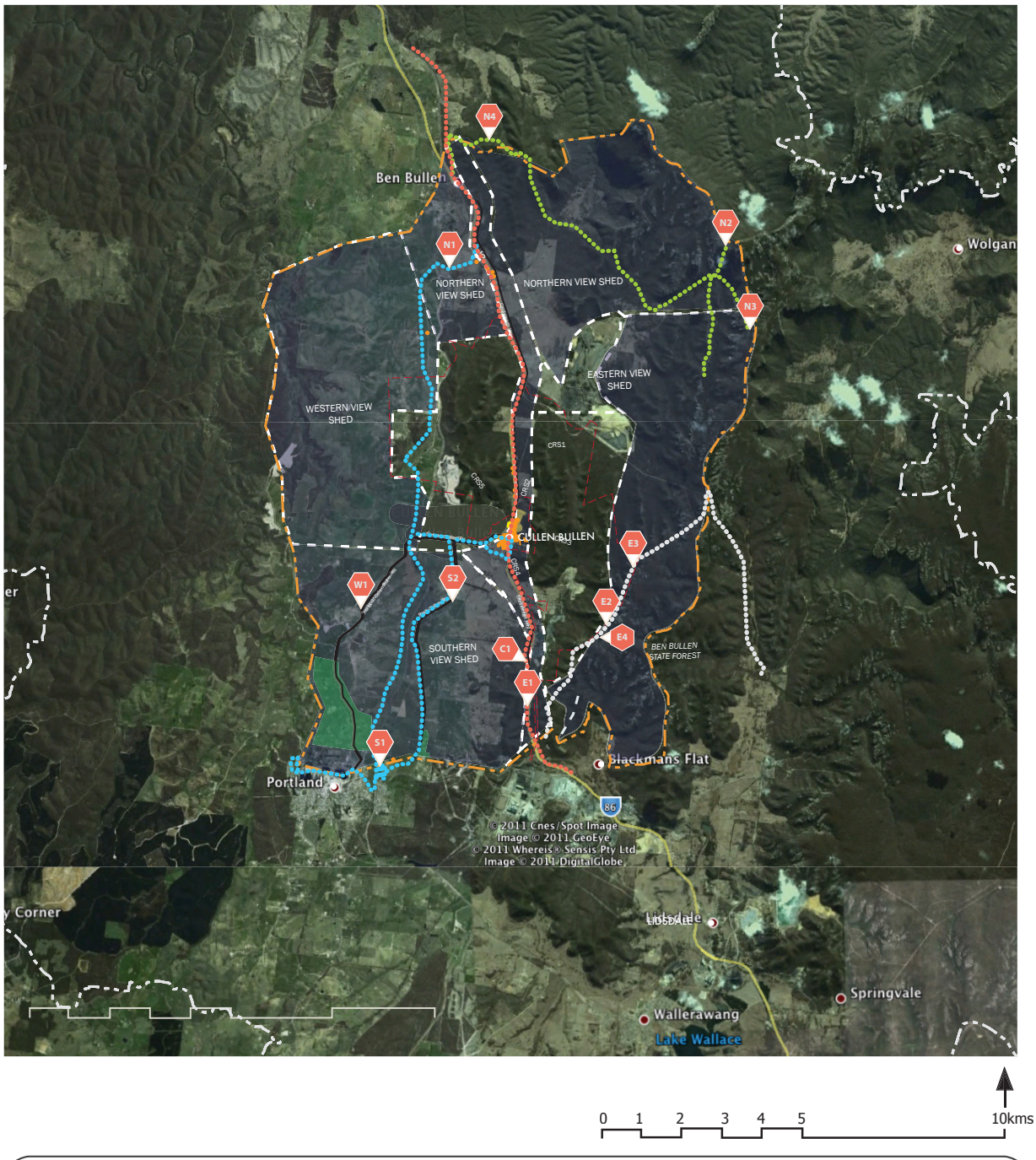

Figure 5.1b | Photo Locations

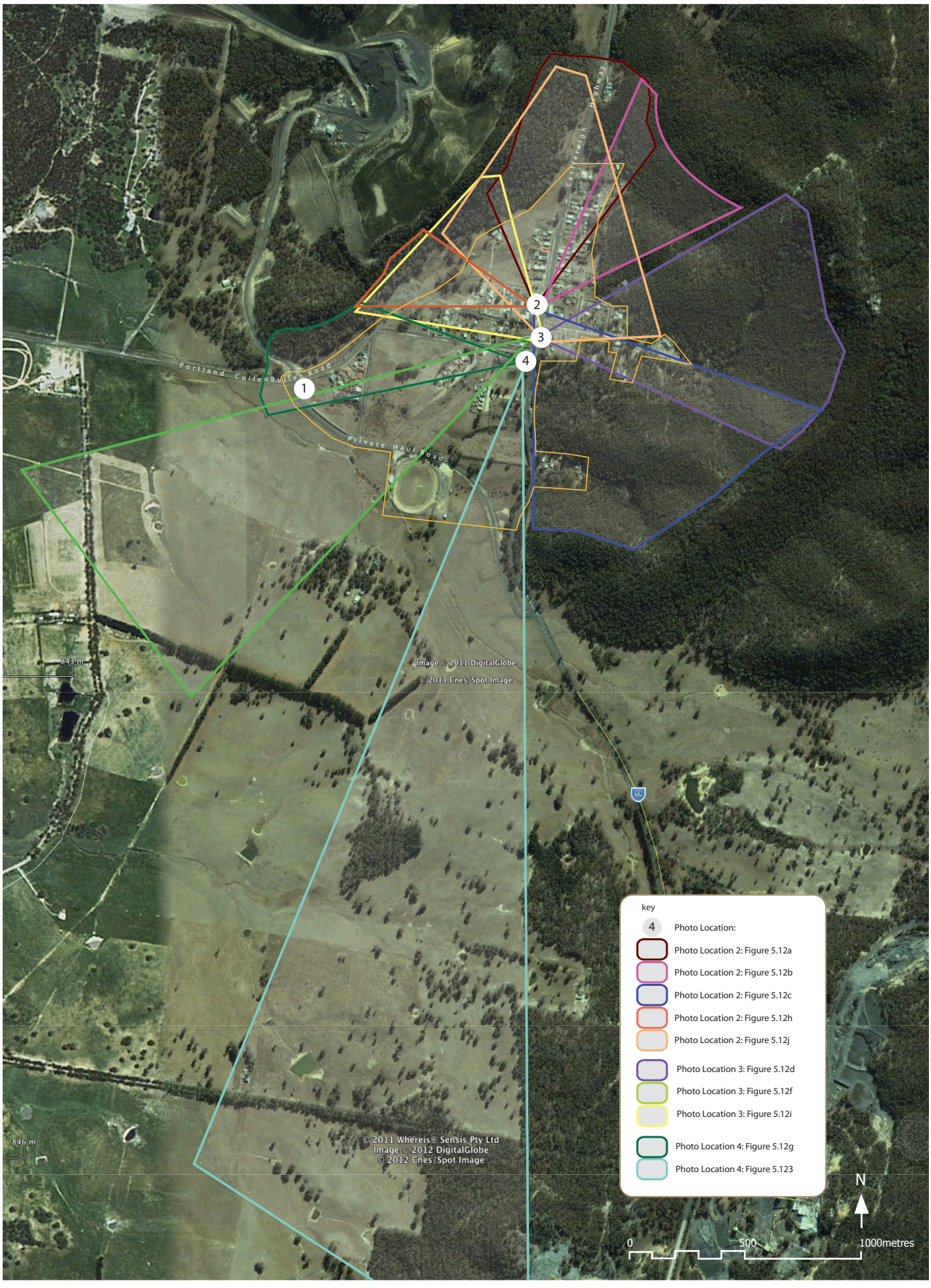

Figure 5.1c | Cullen Bullen Village Photo Locations

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Figure 5.1d | N1: NORTHERN VIEW SHED
Views from Red Springs Road and adjoining areas will be on to northern operational areas within Cullen Bullen till visual bund is constructed in year 2.

Figure 5.1d| N2: NORTHERN VIEW SHED
View south from Baal Bone Gap illustrates the screening effect of forest vegetation when it occurs adjacent to the viewing location with views to Baal Bone and Coalpac screened by tree

Figure 5.1d| N3: NORTHERN VIEW SHED
Views below the cliff line such as this view within Wolgan State Forest are screened from distant views by forest vegetation.

Figure 5.1d | N4: NORTHERN VIEW SHED
Views from within forested areas such as this trackside location within the Gardens of Stone National Park are typical of where views may be obtained from steep elevated locations where the forest cover allows for filtered views to Project areas. Such views would be experienced from similar locations within Wolgan and Ben Bullen State Forests

Figure 5.1e | E1: EASTERN VIEW SHED
Clearings within Ben Bullen State Forest allow for views to surrounding land uses such as the Mount Piper Power Station. Such views often include, rural, other forestry areas, mining and power generation facilities.

Figure 5.1e| E2: EASTERN VIEW SHED
Views form rocky outcrops on the western escarpment of Ben Bullen State Forest overview existing mining and rural areas

Figure 5.1e | E3: EASTERN VIEW SHED
Northern views from Ben Bullen State Forest can include Baal Bone Colliery and mine areas. This would be similar to views from northern areas including some areas within Wolgan State Forest and to a lesser extent the Gardens of Stone National Park.

Figure 5.1e | E4: EASTERN VIEW SHED
View from in front of Aboriginal Rock Shelter illustrating the screening effect of forest adjoining these 'below' cliff top shelters.

Figure 5.1f | S1: SOUTHERN VIEW SHED.
Some operations will be visible from the outer edges of the town of Portland where buildings, street and garden plantings immediately adjacent to a viewing location, do not screen views

Figure 5.1g| W1: WESTERN VIEW SHED |
Views from this view shed are generally onto mining in the Hillcroft area for a period of less than 3 years at the beginning of the Project.

Figure 5.1f | S2: SOUTHERN VIEW SHED |
Views from Back Cullen Bullen Road towards existing operations at Invincible Colliery. Views of the Project will be smaller scale and rehabilitated on an annual basis.

Figure 5.1h | C1: CENTRAL VIEW SHED
There will be periodic views from the highway, although views will not be as critical as this focal view with long exposure times at the end of a long straight elevated section of road

Figure 5.2 I Topographic Features
Topographic features in the form of sandstone ridges restrict views to limited areas defining northern, eastern southern, western and central view zones.

Figure 5.3 I Vegetation limiting views
Vegetation along roadways or around residences can limit long distant views, screening views to mining areas

Figure 5.4 | Portland
There are some potential views from a limited number of residences in the north eastern parts of Portland

Figure 5.5 | Rural Residences
Rural Residences along the highway will have potential views to some parts of the proposed mining operations for limited periods of time

Figure 5.6 | Castlereagh Highway
The Castlereagh Highway is the major road in the locality and there will be potential views from the roadway to some mine areas

Figure 5.7 | The Northern Sector
The Northern Sector has limited view to proposed mine areas.

Figure 5.8 I The Eastern Sector
The Eastern Sector is dominated by state forest and is screened from mining operations by sandstone ridges

Figure 5.9 I The Southern Sector
The Southern Sector has more open views over rual lands towards existing and proposed mining areas

Figure 5.10 I The Western Sector
The Western sector has views to existing and proposed mining operations to the west of Cullen Bullen but contains limited sensitve receptors.

Figure 5.11 I The Castlereagh Highway
Dominates the Central sector and has potential views to existing and proposed mining operations along the highway.

Figure 5.12a I View North from corner Portland - Cullen Bullen Road and Castlereagh Highway. Ridges and forest vegetation just to the north of town screen views to proposed operations to the north of the village

Figure 5.12b I View to the north east from corner Portland - Cullen Bullen Road and Castlereagh Highway. Forested ridges screen views to proposed operations to the north east of the village

Figure 5.12c I View to the east from corner Portland - Cullen Bullen Road and Castlereagh Highway . Forested ridges behind the hotel screen views to proposed operations to the east of the village

Figure 5.12d I View to the east from corner King Street and Castlereagh Highway Views to the east illustrate the forested ridge that will screen any proposed operations to the east of the village

Figure 5.12e I View to the south from corner Watson Ave and Castlereagh Highway . Vegetation at southern end of village screens views to south with possible exception of small elevated section of ridge to the south of Invincible Colliery. No white line analysis to this view as mine not in seen area.

Figure 5.12g I View to the west from corner Watson Ave and Castlereagh Highway . Views to the west from this location take in southern part of ridge that screens views to operational areas within Cullen Bullen Valley Mine. No white line analysis to this view as mine not in seen area.

Figure 5.12f I View to the south west from corner King St. and Castlereagh Highway . Views to the south west are away from proposed mining areas and give open views to rural areas. No white line analysis to this view as mine not in seen area.

Figure 5.12h I View to the north east from corner Portland-Cullen Bullen Road and Castlereagh Highway .View west illustrates the forested ridge that screens operations to the west of the village. No white line analysis to this view as mine not in seen area.

Figure 5.12i I View to the north-west from corner Portland-Cullen Bullen Road and private haul road .
View to north east along Portland-Cullen Bullen Road illustrating screening of ridges on north eastern and eastern side of the Village.

Figure 5.12j I View to the north from corner Portland-Cullen Bullen Road and private haul road.
View to south east illustrating view to southern part of Invincible Colliery mining area. Some operations would be visible from the SW part of the village in the vicinity of Farley Road.

6. VISUAL IMPACT AND MITIGATION

The visual effects of the various elements of the Project were discussed in Section 4 of this report. The visual sensitivity levels of the Project were discussed in Section 5 of this report.

This section considers the visual impact of the Project based on visual effect and sensitivity values and outlines strategies to mitigate those impacts. The impact of the development will vary according to the visual effect, Figure 2.2, of the Project, its visibility, and the visual sensitivity of areas, Figure 2.4, from which it is seen. These two factors are considered together as indicated in Figure 2.5 to determine impact levels. The visual impacts are considered in relation to the various sectors.

Visual impact mitigation will be carried out both on site and off site as needed. On site mitigation generally occurs in three phases. Following completion of mining operations and placement of overburden, final landforms are created as per the proposed mine plan (Figure 4.2 to Figure 4.5). Prior to this, the visual effect of the active mine areas and exposed overburden is high.

Secondly these areas are stabilised with grass cover. The grassing can reduce visual effects to low in rural areas; however in forested areas the visual effect remains moderate due to the contrast with the mature forest and woodland vegetation that is characteristic of the region.

Finally, tree planting is undertaken and this reduces colour and texture contrast over time, resulting in a low visual effect level. These visual effect levels are indicated in Figures 4.10, 4.11, 4.12, 6.1 and 6.2.

Visual mitigation treatments can also be completed as needed at specific points of viewing, such as on the Castlereagh Highway or at residences as required. Foreground treatments of this type, such as mitigation tree plantings, can provide screening, filtering and/or visual integration treatments as well as enhancement of foreground landscape outcomes.

6.1 Northern Sector

The Northern sector is dominated by rural lands with flanking forest areas to the north and north-east within the Gardens of Stone National Park and the Wolgan State Forest. The sector also includes residences located along Red Springs Road and Reserved Road.

6.1.1 Visual Effects

Visual effects will potentially be created in this location by operations in the northern extents of the Cullen Valley Mine and East Tyldesley mining areas. In the Cullen Valley Mine areas, there will be high visual effects on the Northern sector receptors for a 1 - 2 year period from commencement of the Project, after which the northern bund in this area will reduce the high /moderate visual effects to low (see Figure 4.13). Some small mining areas will remain exposed over the top of the bund at some viewing locations from time to time, however these will be less than 2.5% of a PVZ and would only create a moderate to low visual effect (Figure 2.2).

6.1.2 Sensitivity

The residences in the Northern sector have been ascribed a high visual sensitivity as all are within 7.5 km of the Project Boundary. Most residences have open views of surrounding areas, which therefore increases the likelihood of open views to mining areas.

The roads in the locality are minor roads but have been ascribed a moderate visual sensitivity, being located within 2.5 km of the Project Boundary.

On the basis of land use, all rural lands in this sector would have a low sensitivity.

As noted above in Section 5.5, this sector also includes the southern and western extents of lands within the Wolgan State Forest and Gardens of Stone National Park. On the basis of limited recreational landuse, these areas with views to the Project would have a high visual sensitivity. This would particularly be the case where views of the Project are available from any exposed pagoda and escarpment landforms at higher elevations that have inherent natural heritage values and would be more likely to be visited by bushwalkers and where vegetation may not provide such a

degree of screening. However there have been views since the early 1980's of the existing mining at Baal Bone Colliery from viewpoints at the Gardens of Stone National Park, Wolgan and Ben Bullen State Forests. At various times between 1980 and 2008 the Baal Bone Colliery open cut operation was a dragline operation and then subsequently an excavator and truck operation. Rehabilitation of the completed open cut area at Baal Bone Colliery is now in its final stages. The Surface Infrastructure for the underground longwall operation continues to be a dominant feature the landscape in the area.

6.1.3 Visual Impacts

Rural Residences

As stated above, the residences in this sector have a high sensitivity. Operations in the northern Cullen Valley Mine areas will have a high visual effect for a 1 - 2 year period from commencement of the Project, creating a high impact. This impact will be moderated through construction of the bund that will be constructed in this area and when rehabilitation takes place. However, due to the forested setting surrounding these operational areas, rehabilitation activities will require the establishment of more mature tree cover to reduce visual effects and impacts of the bund to low.

Operations in the East Tyldesley mining areas along the northern edge of the Project Boundary will have a high visual effect on northern residential viewing locations for a period of 2 - 10 years during mining in this area. There is potential for high visual impacts to result in relation to these areas, depending on the extent of views over the adjoining forested areas located between viewing locations and Project mining areas and OEAs. High visual effects in these locations will create a high visual impact. This impact will decrease to moderate after initial rehabilitation when grass species are established on the bunds to be developed at the northern extent of these mining areas, but will only become low when tree cover is more established.

Tourism / Recreation Areas

There would potentially be moderate to high visual impacts on some National Parks, State Forests and bushwalking locations. However these impacts are reduced in significance by views to existing mining and the smaller scale of future unrehabilitated mine areas for the Project.

6.2 Eastern Sector

The Eastern sector is dominated by forestry land uses that have low visual sensitivity. There is also limited visibility from this sector to operations within the Project Boundary. For these reasons there is little to no visual impact on the majority of this sector, beyond the western escarpment edge.

6.2.1 Visual Effect

The visual effects of Project operations on the eastern sector are restricted to the Invincible Colliery and East Tyldesley mining areas. The visual effects will be similar to those currently experienced due to views of existing Invincible Colliery open cut operations and open cut and surface facilities of Baal Bone Colliery and will be high until rehabilitation with mature tree cover is achieved. There are some moderating influences in that active mining is already visible from many locations along the sandstone escarpment formation that runs along the eastern extent of this sector. Such locations would experience a moderate visual effect.

6.2.2 Visual Sensitivity

There are limited views from the eastern sector due to topography and vegetation. The exception to this is in those areas where the sandstone escarpment outcrops immediately above the existing Invincible Colliery mine area. There are views over the Project from this escarpment (which runs along much of the eastern sector), however these areas are exposed to existing mine views and are not considered to have a high sensitivity based on low frequency of use and the general landuse type.

This sector also contains Aboriginal heritage sites in the form of rock shelters but these are all below the exposed escarpment ridgeline and those with easterly aspects are screened from views to open cut mining areas by adjoining forested vegetation.

More distant views are limited to the western edges of elevated sandstone outcrops that are free of vegetation cover

in Ben Bullen, Wolgan and Newnes State Forest. However these views will be limited in extent to the more elevated mine areas with easterly aspects. Again, under current land use patterns, these areas are considered to have low sensitivity, being located in State Forest land and not within designated recreational areas.

6.2.3 Visual Impact

The visual impact on the eastern sector is limited by lack of visibility due to forested vegetation and the sandstone escarpment that runs from south to north along its edge. Areas that have high visibility generally have a low sensitivity and would therefore experience moderate to low impacts. Areas with high visibility will experience moderate to low visual effects given existing large scale pre-rehabilitated areas being replaced with smaller scale active mining areas and progressive rehabilitation programs. The initial moderate impact would reduce to low when rehabilitation is achieved.

6.3 Southern Sector

The sector is dominated by low sensitivity rural land uses. However, it contains several sensitive rural residences and, of less significance, several local roads.

6.3.1 Visual Effect

The visual effects of the Project on the Southern sector relate to both Cullen Valley Mine and Invincible Colliery mining areas.

Although visual effects as seen from this sector are Category 1 Visual Effects (Figure 2.2 and 2.3), they are likely to have moderate to low visual effects due to the longer distances to mining areas and the limited portion that these mining areas will be of the PVZ, Figure 2.3.

In relation to the Cullen Valley Mine areas, these visual effects will be limited in time, with a period of two years from mining taking place before rehabilitation being initiated. While the initial stages of rehabilitation do not significantly decrease contrast in forest areas, the rehabilitation of mining areas west of the Wallerawang – Gwabegar railway line can borrow visual character from surrounding rural lands, lessening the visual effect.

The higher visual effects of each operational area at Invincible Colliery will be generally short lived; however there are many such areas within the PVZ that can be seen during the Project life, so that cumulative Category 1 visual effects are experienced for longer periods of time. More significant is the extent of OEAs that will be visible in early stages of rehabilitation. These grassed areas will continue to contrast with the existing forest areas at higher elevations within the Ben Bullen State Forest, creating moderate visual effects.

6.3.2 Sensitivity

There are some 24 residences as well as two clusters of rural residential areas and part of Portland in the Southern sector. The visual sensitivity of residences in this sector would generally be high as all residences are generally within 7.5 km of mine operations. However this would depend on there being visibility and visual orientation from these residences to the Project mining areas.

The visual sensitivity of the Portland – Cullen Bullen Road and the Back Cullen Bullen Road is low. Similarly, the sensitivity of rural lands is low.

6.3.3 Visual Impacts Cullen Valley Mining Areas

The visual impact of mining activities west of the Wallerawang – Gwabegar railway line is potentially high, as seen from some rural residences that may have strong visual orientation to these mining areas, especially those in the northern part of the Southern sector. However, this impact level shall be short lived as initial rehabilitation of the Hillcroft area will be completed within two years of the commencement of mining. This will reduce the visual effect to moderate and low, hence reducing impacts.

Residences with less prominent orientation to the Project mining areas will experience a moderate to low impact in the first instance and this would decrease to low following rehabilitation establishment.

Visual impacts on roads and rural lands in this sector would be low.

6.3.4 Visual Impacts Invincible Colliery Mining Areas

Visual effects will be high in various areas at different times, especially during the first seven years of the Project. However it is considered that if the active mining areas and OEAs that are in the pre-rehabilitation phase and exposed to view can be kept below 2.5% of a PVZ, then visual effect levels can be kept to moderate levels. Visual effects are likely to stay at moderate levels until rehabilitation areas can develop enough to achieve tree cover. Unlike some areas in the Cullen Valley Mine area that have rural landscape settings adjoining them, the Invincible Colliery mine areas are within a forest setting and require a restoration of forest vegetation during rehabilitation to achieve low visual effects. This is due to the higher levels of contrast created against the background from most viewing locations in this sector.

The visual impact would be high for some residences if they are orientated toward the Invincible Colliery mining areas for the Project. This could be the case for houses with easterly aspects on Back Cullen Bullen Road and on Portland – Cullen Bullen Road. Houses that are not orientated to this view would experience lower visual impacts.

The roads and rural lands within the southern sector could experience a low visual impact.

6.4 Western Sector

The Western sector is dominated by rural lands. It has only two rural residences in it and also includes a section of Red Springs Road that has very limited public use in this sector.

6.4.1 Visual Effects

The main visual effect in this sector includes high visual effects of mining operations within the existing footprint of Cullen Valley Mine and in those areas west of the Wallerawang – Gwabegar railway line. In the first two years of the Project, a high visual effect will occur and would continue until rehabilitation develops by approximately Year 8 of the Project. From this time, moderate visual effects will occur, reducing to low when more mature tree rehabilitation is achieved.

6.4.2 Sensitivity

The visual sensitivity of the broad rural landscape in this sector will be low. A low visual sensitivity on the section of Red Springs Road located in the sector is likely due to limited public usage. The sensitivity of the railway line that is mainly used for haulage of freight would be low.

As stated above, there are two rural residences in this sector. However they are in close proximity to the western Cullen Valley Mine areas and approximately 500 m from the Project Boundary. These residences would have a high sensitivity to operations within the Cullen Valley Mine area. The residences will be partially screened from the mining operations by intervening topography but will be exposed as operations develop in Years 1 and 2.

6.4.3 Visual Impact

There will be a high visual impact experienced by residences within the sector for a period of up to two - three years from Project commencement, as operations in close proximity will create high visual effects. These impacts will continue until rehabilitation is established, creating moderate/high impacts. This impact will reduce to moderate/low when tree cover is established in rehabilitation areas and to low when such cover achieves some level of maturity.

A moderate to low visual impact will be experienced on the broader sector within its rural lands and on Red Springs Road. This will decrease to a low impact when rehabilitation is completed.

6.5 Central Sector

The Central sector is dominated by visually sensitive land uses. The Castlereagh Highway creates the spine of the sector and it includes the village of Cullen Bullen. Further to the north adjacent to the highway are a number of residences that adjoin proposed mining areas.

6.5.1 Visual Effect

There will be a high visual effect of operations immediately adjacent to the highway as OEAs are established. This

will also occur in the Invincible Colliery areas that are not shielded by existing vegetation and topography as mining progresses to the north. These high visual effects will persist until rehabilitation with more mature trees is achieved. The extent of pre-rehabilitated OEA visible at any one time needs to be less than 2.5% of the PVZ of sensitive receptors to lower visual effect levels to moderate during this period.

Similarly those Cullen Valley Mine and East Tyldesley mining areas immediately adjacent to the highway will experience high visual effects as OEAs and mitigation bunds are constructed. Within these areas, there will also be high visual effects from active mine faces at higher elevations that are in direct line of sight and in close proximity to the highway.

The visual effects of mining operations adjacent to the Castlereagh Highway in the Cullen Valley and East Tyldesley mining areas will be greatly reduced by the utilisation of highwall mining methods and the establishment of visual bunds adjacent to the highway road reserve generally in the locations as illustrated on Figures 4.13c and Figure 4.13d.

6.5.2 Visual Sensitivity

The whole of the central sector has high sensitivity. In the first instance, this sensitivity is established by the highway.

At certain nodal points, various residences have a high sensitivity due to the close proximity of these residences to proposed mining areas. This occurs for the greater part immediately to the north of Cullen Bullen, but there are also some residences north of Invincible Colliery that may experience high sensitivity as well. The Cullen Bullen Cemetery will also have a high sensitivity.

The village of Cullen Bullen retains a high visual sensitivity but is generally screened from views to Project mining areas by ridges and spurs adjoining the town. There is a narrow view corridor north along the highway to a sliver of the south west corner of the East Tyldesley mining areas; however this view is more related to highway users than other town elements.

6.5.3 Visual Impact

Given the high visual sensitivity of the residences, Castlereagh Highway and the close proximity of mining areas and OEAs, the high visual effects created by these elements will result in high visual impacts being experienced in a number of locations within the Central sector.

Trips both in a northerly and southerly direction along the Castlereagh Highway would experience high visual impacts where views to active mining areas and newly constructed OEAs are available. The residences along the highway are also generally oriented toward Project mining areas. The Cullen Bullen Cemetery will have the potential for open and extensive views over mining in the Cullen Valley and East Tyldesley mining areas, creating high impacts that will be reduced by mitigation treatments.

The township of Cullen Bullen will, for the greater part, not experience a high visual impact due to surrounding topography providing shielding of Project mining areas.

6.6 Impacts of Night Lighting

6.6.1 Introduction

The commencement of night operations proposed for the Project will result in a range of varying visual effects. These will be influenced by the locality of operations on site, the relative level at which the viewing locations are situated and the presence of any off-site barriers such as topographic features and / or screening vegetation.

There are two types of lighting effects that could be experienced from the Project. The first effect is where a light source is directly visible, and will be experienced if there is a direct line of sight between a viewing location and the light source.

The second effect relates to the general night-glow (diffuse light) that results from light of sufficient strength being reflected into the atmosphere. This type of effect will create a strong local focal point and the effect will vary with distance and atmospheric conditions such as fog, low cloud and / or dust particles, which all reflect light.

The primary visual catchment of the Project would have very low ambient night light that would be generated by dispersed homesteads and vehicle travel on local roads. The cumulative effect of these lights would be unperceivable. There will be some ambient light created by mining lighting adjacent the Cullen Bullen Township, however these ef-

fects are considered to be minimal.

6.6.2 Direct Light Effects

Direct light effects are generally restricted to vehicles / train lights and mine void lighting, as other operational light would generally be hooded, directed downwards and/or away from receivers.

Generally, Project truck and vehicle lighting will be screened by topography, vegetation and by established OEA areas. During the initial period of bunds construction, night lighting from mobile equipment could impact residences; however this activity will not be conducted after 6 pm.

The other form of direct lighting effects will be created by train movement along the rail siding. In this situation, the train lights are for the greater part directly in front of the train along the rail track, which will be screened by bunding to the west and south; and add to existing train movements along the line.

There are two sensitive receptors which may potentially be within this zone but both are screened by topography from additional direct lighting effects.

Direct lighting effects will also continue be experienced in and around the ICPP infrastructure, albeit at increased intensity. These effects, however, would only be experienced from the Castlereagh Highway as the ICPP is screened by surrounding ridges. The location proposed for the ETCPP within the existing environment means that any potential for direct lighting impacts would be minimised.

6.6.3 Diffuse Light Effects

In addition to direct lighting effects at the current ICPP and the proposed ETCPP, these facilities will collectively create a glow of light that will be seen in the ambient dark night. This glow will represent the indirect lighting effects of all the lights in these areas, including machinery as well as lights around work areas and infrastructure elements to allow night operations to safely occur.

Generally, this glow will not create a significant visual effect but such effects will be apparent from time to time. This will be especially true for the residences close to the south west corner of mining in the East Tyldesley area.

6.6.4 Night Light Impacts

The main light effects will be from lights associated with truck movement associated with the construction of the Project, however this will not occur after 6 pm. Mobile equipment movement and lighting plant also have a potential to impact sensitive receivers. Elevated locations will negate the screening effect of surrounding vegetation and topography, creating direct light effects.

The diffuse light effects will have less of an impact although they will be noticeable, especially if moisture or particulate matter levels in the local atmosphere are high.

The area most likely to be impacted by direct light are two residences south of the western edge of Cullen Valley Mine and residences along the Castlereagh Highway to the north and south of the East Tyldesley mining areas.

The area most affected by diffuse light will be those residences approximately 1 km to the west of the proposed ETCPP site.

6.7 Cumulative Visual Impact

Visual impacts differ from other impacts when considering and quantifying cumulative effects. Visual impacts of a new mining area within a visual catchment that had no mining in it is greater than a cumulative impact where there is already mining. It is only when mining is very large scale and without rehabilitation that cumulative impacts are significant in a viewshed.

In the context of the Project, there has been no mining within Coalpac leases in the Northern sector, however there has been mining and processing within the Baal Bone Colliery. Sensitive receptors will be exposed to mining areas within the Cullen Valley Mine lease areas until screening bunds are completed in the first two years of the Project.

The proposed mining at Cullen Valley Mine, East Tyldesley and Invincible Colliery are a continuation of mining that has been carried out for a substantial time in existing operations at Cullen Valley Mine, Invincible Colliery, Ivanhoe North Mine and Baal Bone Colliery.

If the mine plans are viewed collectively, the cumulative visual impact could be high at any one time as much of the Ben Bullen State Forest in this locality would be disturbed for the Project. However, at ground level this impact is different, as the mine areas all occur in different visual catchments and the overall area of disturbance in relatively small at any one time across the life of the Project.

The northern most mining areas of Cullen Valley Mine and East Tyldesley impact on the Northern sector.

The Invincible Colliery mining areas proposed for the Project to the east of currently approved areas and operations to the west of the Wallerawang – Gwabegar railway line in the Hillcroft area of Cullen Valley Mine impact on the Southern sector to varying degrees. The Hillcroft area is also the main component of the Project impacting on sensitive receptors in the Western sector.

The Central sector and especially the Castlereagh Highway is affected by most proposed mine areas and experiences the greatest cumulative impact. The initial views of mining within Invincible Colliery are extended north as mining activity is potentially viewed both immediately east and west of the highway within the East Tyldesley and Cullen Valley Mine lease areas.

To a lesser extent, some residences within the Southern sector will experience the cumulative visual effects of mining in the Invincible Colliery mining areas. Here, extensive mining in areas to the east of approved operations may potentially be in open view at some locations as the Project progresses.

There is a cumulative visual impact; however the breakup of the Project Boundary into distinct visual catchments significantly lessens this cumulative visual impact at individual viewing locations. These impacts will be further lessened by successful rehabilitation and re-foresting of OEAs in the various locations where mining is proposed.

6.8 Visual Impact Summary

Visual impacts vary in each sector. The Northern sector experiences visual impacts for a limited time until a bund is built in the north to screen mining as it progresses to the south. Mining in East Tyldesley will generally be screened from sensitive receptors by intervening forest areas and proposed visual bunds.

Visual impacts in the Southern sector relates to both Cullen Valley Mine and Invincible Colliery mining areas. In both cases there is potential for high impacts. However if pre-rehabilitation mining can be kept below 2.5% of a PVZ, then visual effects and impacts can be maintained at a lower level.

The visual impact on the Western sector is limited to two residences to the south of the Cullen Valley Mine. There will be a high visual impact created by this mining area for a period of up to three years as mining in this location reaches its southern extremity.

The highest impact is experienced in the Central Sector. The high sensitivity Castlereagh Highway, residences along it and the Cullen Bullen Cemetery will all be exposed to high visual impacts as mining in Cullen Valley, East Tyldesley and Invincible Colliery occur immediately adjacent to the highway.

There is no visual impact on the Eastern sector.

6.9 Mitigation

Mitigation measures in relation to reducing visual impact relevant to the Project include:

On site treatments to reduce visual effects; and

At viewer location treatments to reduce visual sensitivity.

On site treatments involve rehabilitation of landforms and land cover, while viewer location treatments could involve a range of treatments to screen views, filter views and or re-orientate primary views should this be needed. It should be noted that on site treatments are already being carried out as they relate to OEA establishment and rehabilitation.

Detail landscape plans for on-site and off-site treatments are to be prepared in consultation with a landscape architect.

6.9.1 On Site Treatments to be implemented for the Project include:

- Landform design of outer faces of the OEAs and associated drainage structures;
- The early establishment and rehabilitation of the outer faces of the bunds and OEAs, especially in the eastern Cullen Valley Mine areas and the western mining areas of East Tyldesley and Invincible Colliery. These strategies have been

incorporated into the existing mine plans as illustrated in Figures 4.2-4.5. Key locations where bunds will be developed to reduce visual effects include:

- Immediately west of the Project rail siding, at least 9 m in height above the level of the railway siding track and extending to the north and south of the loading area to form an effective visual planted bund from receptors to the west;
- Along the western side of the Cullen Valley Mine area infrastructure, at least 6 m in height above the main haul road;

Along the western side of the southern half of the haul road from the East Tyldesley CHPP to the Invincible CHPP at a height of 5 m where it may be exposed to views;

Along the eastern and western sides of the Castlereagh Highway to shield views to mining areas;

- On the western side of all OEAs to be established in the south of the Invincible Colliery mining areas where active operations may be visible; and
- Along the northern extent of the OEAs in the East Tyldesley and eastern Cullen Valley Mining areas, at a height of approximately 6 m;

- Retain a tree screen between the Castlereagh Highway and all mine areas, especially where natural screening is lacking. Establish 30 m wide tree screens where practical, particularly for areas where views of the Project are available from sensitive viewing locations;
- Ensure progressive rehabilitation is undertaken to reduce impacts to sensitive receptors;
- Establishment of visual and ecological forest planting patterns to achieve landscape patterns that emulate existing forest colour and texture continuums in the landscape;
- Infrastructure at East Tyldesley to be finished in forest tones (i.e. olive green, grey, etc) to blend with the surrounding forest environment as far as practical;
- Achieve a simple bridge design for highway over pass to maintain visual clarity in the setting of the overpass;
- Establish significant forest plantings to the adjoining approach roads to the bridge providing screening to truck movement and lights and providing visual balance to the bridge overpass. This planting should have a natural edge and not be a linear planting reflecting the road alignment; and
- Where possible and consistent with health and safety requirements, ensure lights are hooded or directed away from sensitive receptors to avoid direct light spillage from the East Tyldesley CPP site.

6.9.2 Off site treatments to be implemented for the Project include:

- Prepare and implement a consolidated Rehabilitation and Landscape Management Plan for the Project. This plan should be prepared to consider specific impact mitigation strategies for sensitive viewing locations, particularly for Cullen Bullen Cemetery;
- Consultation with the Cullen Bullen Cemetery Trust and Lithgow City Council should be undertaken to determine appropriate visual treatments for plantings at the Cullen Bullen Cemetery;
- Complete a site inspection and where required, prepare landscape strategies for receptors that will experience prolonged high levels of visual impact, where requested;
- Implement landscape plantings to achieve visual screening of residences as per prepared and plans agreed with the landholder.

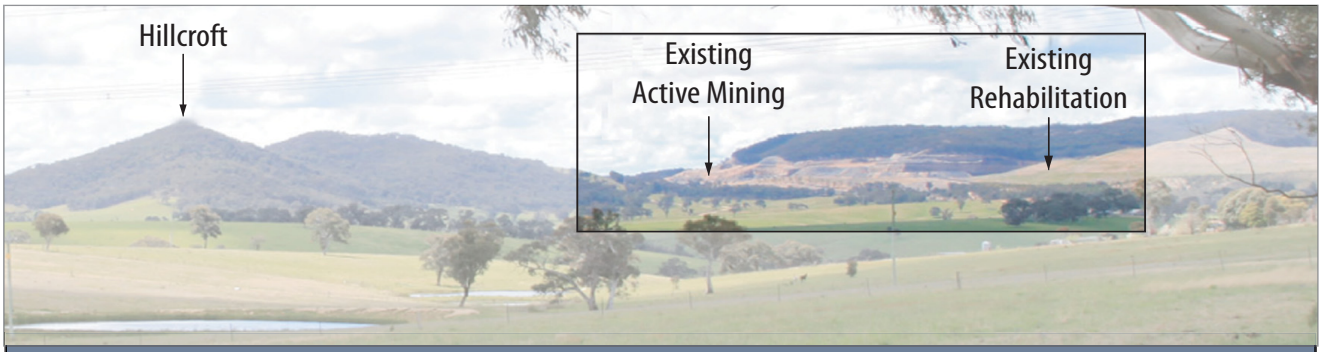

Figure 6.1 (a) I Level of Visual Effect: HIGH
This mine area contrast in colour, texture, shape, form and line with surrounding landscape.

Figure 6.1(b) I Level of Visual Effect: MODERATE
This recently rehabilitated area has achieved form integration but still has colour, texture and shape contrast with surrounding landscape.

Figure 6.1(c) I Level of Visual Effect: LOW
The re-establishment of tree cover recreates continuity with adjoining forested slopes but still has weak colour and texture contrast.

Figure 6.1(d) I Level of Visual Effect: VERY LOW
Successful maturing forest cover on rehabilitated area removes all visual contrast with surrounding forest slopes..

7. CONCLUSION

The visual impacts associated with the Project impact the Northern, Southern, Western and Central sectors of the PVZ. The Eastern sector does not experience any visual impacts, being located in lands occupied by the Ben Bullen State Forest. The other sectors are affected by views to different mining areas within the Cullen Valley Mine, East Tyldesley and Invincible Colliery due to the steep topography.

Key sensitive receptors include the Castlereagh Highway, rural residences with an orientation towards the Project and the Cullen Bullen Cemetery. To a lesser extent, the north east corner of Portland also has some views and would have a high sensitivity. Cullen Bullen itself has a high visual sensitivity but is generally screened from proposed mining areas by adjoining forested ridges.

The visual effect of all Project operations will vary through time and location of operations. All operations will create a high visual effect. This visual effect is generally quickly reduced when rehabilitation is implemented and develops over time. The initial rehabilitation will reduce visual effect significantly if the mine area is within or adjoining open rural areas, as the rehabilitated surface quickly emulates the pattern and colour of adjoining rural grasslands. However if it is within or adjacent to forested areas, tree regrowth has to be established before a substantial reduction in contrast between the rehabilitation area and the mine area is achieved.

The new ETCPP infrastructure also has the potential to have a light impact on some residences in the vicinity of the Castlereagh Highway, if it is visible. These impacts will, however, be mitigated due to the location and elevation at which the ETCPP infrastructure will be developed, as described above.

The most significant visual impacts will occur in the Central sector. This includes the highway and rural residences generally to the north of Cullen Bullen with an orientation towards the Project, as well as the Cullen Bullen Cemetery. These areas would experience high visual effect and impact levels for various periods of time during the life of the Project due to operations in the Cullen Valley Mine, East Tyldesley and Invincible Colliery mining areas.

Visual impacts will be experienced from the western edhes of the PVC in State Forestes and National Parks to the east and north of the Project mining areas. These impacts will result from the high sensitivity of bushwalking areas and high visibility of the exposed western edge escarpments. However visual effects will be moderate to low as mine areas will be small in scale and will be progressively rehabilitated, quickly reducing visual effects to moderate/low.

However these impacts will be mitigated by the use of highwall mining, retention of roadside vegetation, the construction of bunds and the progressive rehabilitation of those bunds OEAs and mined areas. Many of these strategies are part of the existing Coalpac mining operations. The remainder are landscape/visual mitigation strategies as outlined in Section 6 of this report. Measures for the management and mitigation of visual impacts for the Project will be included in a Rehabilitation and Landscape Management Plan, to be developed in consultation with the relevant regulators.

Implementation of these visual mitigation strategies for the Project, both on site and off-site, will reduce visual effect levels and visibility of Project components, reducing visual effect and impacts to low. Progressive rehabilitation of tree cover in rehabilitated lands and bunded areas, especially in existing forest areas, is essential to this outcome.