



Visual Assessment



Appendix 15



VISUAL & LIGHTING IMPACT ASSESSMENT ANVIL HILL PROJECT

Prepared for
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AND
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1.1 The Project

The Anvil Hill Project (The Project) is located approximately 20 km west of Muswellbrook and 10 km north of Denman in the area surrounding Anvil Hill. The project seeks to extract coal in four pits with associated overburden emplacement over a period of 21 years. The project incorporates a coal preparation plant, stockpiles, rail loop infrastructure and tailings dam.

1.2 Objectives

The objectives of this Visual Impact Assessment report are:

- To analyse the visual character of the regional and local landscape with reference to the Study Area.
- To assess the visual impact of the proposed mine and associated facilities and to consider ameliorative measures.

1.3 Methodology

This visual impact assessment has been divided into five sections:

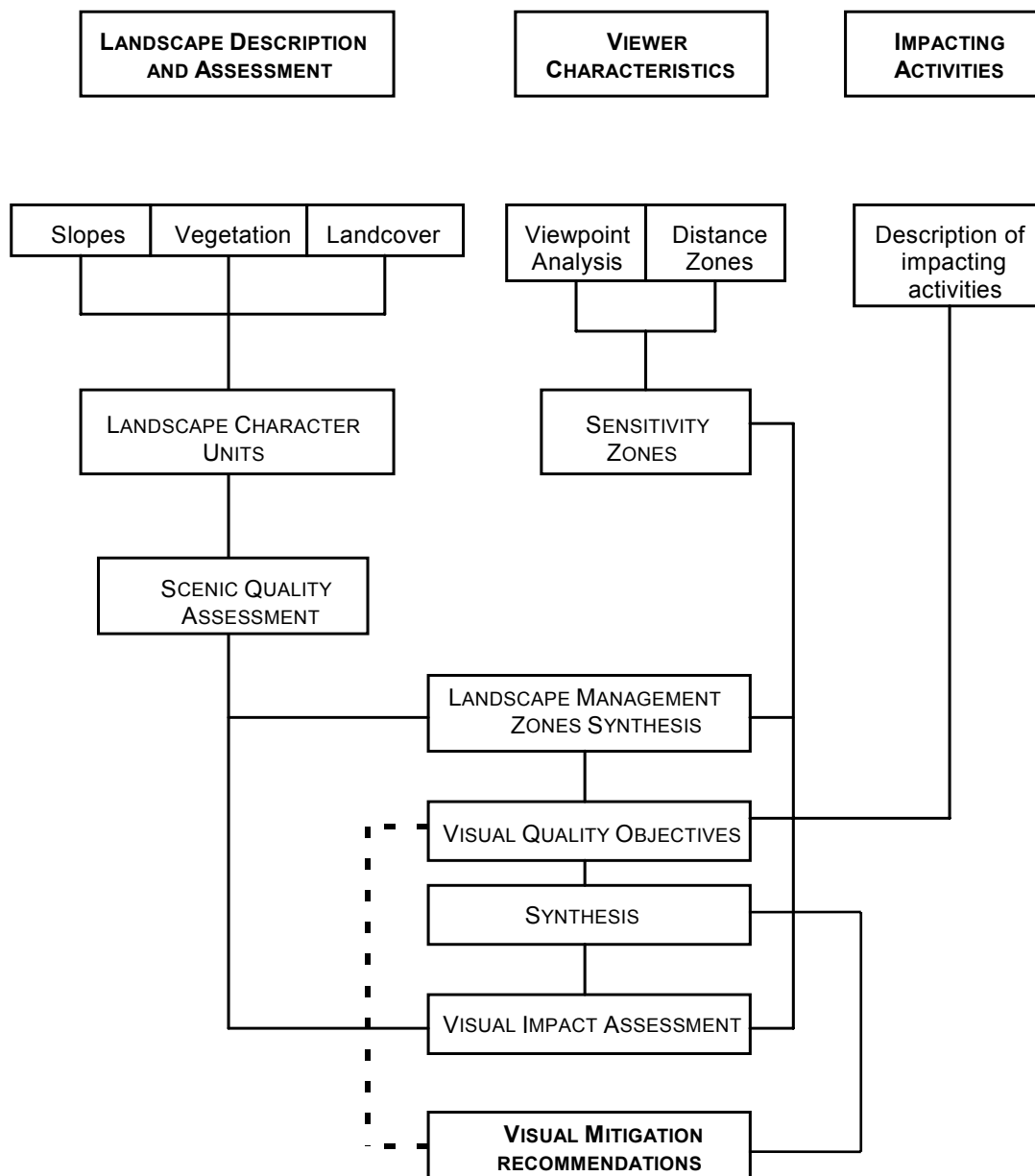
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The methodology outlined in Figure 1.1 is based on the model developed by the Forest Commission of Victoria and the landscape assessment techniques of the U.S. Department of Agriculture, and has been adapted for the purpose of this project. The method of assessment of visual impact has been the subject of professional discussion and analysis since the early 1970s. Much of the work on visual impact has been carried out by the Forest Service of the U.S. Department of Agriculture (U.S.D.A Forest Service). The U.S.D.A. Forest Service has issued the following documents amongst others to describe an appropriate method of impact assessment:

- "Forest Landscape Description and Inventories A basis for Land Planning and Design" U.S.D.A. Forest Service Research Paper PSW-49 R. Burton Litton Jr.
- National Forest Landscape Management Handbook U.S.D.A Forest Service No. 434 February 1973;
- U.S.D.A Forest Service, Agricultural Handbook No. 462, "National Forest Landscape Management" Volume 2 Chapter1 The Visual Management system - April 1974;
- "National Forest Landscape Management" Volume 2 Chapter 2 Utilities, U.S.D.A Forest Service - July 1975;
- U.S.D.A Forest Service "National Forest Landscape Management" Recreation Volume 2 Chapter 8, Forest Service Agricultural Handbook No. 666 - December, 1987;

The scenic assessment method used by the U.S.D.A Forest Service is a systematic approach to visual assessment using quantitative measures. It assesses the influence of landform, vegetation, water and other landscape factors on scenic quality with refinement applied for the sensitivity levels of the viewers from various selected viewpoints. Early attempts to assess visual impact contained a very high level of subjectivity. The search for a quantitative assessment of visual impact seeks a higher level of objectivity in determining visual impact of any particular project or development. The U.S. Forest Service system has become a benchmark for the quantitative measurement and assessment of the visual impact. The Forest Commission of Victoria has also developed a programme of scenic management policies and guidelines. As an initial basis for assessment the Commission has adapted descriptive criteria used by the U.S.D.A. Forest Service. This approach is described in the article entitled "Scenic Perceptions of Australian Landscapes" by Dennis Williamson in Landscape Australia published April, 1979.

Figure 1.1
Methodology



2.1 The Existing Environment

2.1.1 Regional Landscape Character

The regional landscape character is consistent with the landscape character of the western edge of the Hunter Valley from Cessnock through to Murrurundi. The character varies generally from east to west.

To the east lies the predominantly rural countryside and the undulating areas of the Hunter Valley. To the west are the various elements of the Great Dividing Range, rugged sandstone ranges covered with remnant natural vegetation. These areas are situated away from the main urban and transport corridors of the Hunter Valley. The landscape character of the region is predominantly rural. Rivers such as the Hunter and Goulburn rise in the west in the tributary creeks and streams amongst the Great Dividing Range then gradually flow east, gathering volume to then flow southeast to the coast.

As a result the topography generally is steep and rugged on the western edge and the visual catchment of the region is bounded to the west by rocky escarpments and dense vegetation on mountainous terrain. As the viewer moves east, the terrain moves into foothills. The foothills are often steep and highly undulating. Most areas have been substantially cleared for rural development.

The predominant rural activity is grazing but in many areas vineyards have become a significant visual element of these undulating areas. Both of these activities have different visual properties. The unirrigated grazing areas are consistent in colour and are covered in a mosaic of fencing patterns, often following the subdivision lines of the properties or the local topographical features of the countryside. On the other hand the vineyards have a more structured visual quality. The colour and texture of the vineyard areas varies strongly with the seasons of the year. The vineyards are not consistent elements. Vineyards rely heavily on soil type, aspect and drainage. The result is a blend of low impact rural activity, dotted within the grazing lands, often on hillsides that are steep and difficult to graze. To the viewer this creates an interesting range of visual elements.

A third visual element within the regional character is coal mining. Often screened from main travel routes or hidden from view in remote locations, the region is home to a large number of coalmines and their associated infrastructure. Commencing near Maitland and west of Lake Macquarie and extending north to Muswellbrook the western edge of the Hunter Valley is dotted with numerous coalmining projects. The open cut areas (OCAs) are not always identifiable in the various stages of cut and rehabilitation. Many of the infrastructural elements including load out facilities and coal preparation plants are visible within the region.

The coal industry was formerly concentrated in the lower Hunter Valley Areas. In the last 50 years it has moved north gradually identifying resources and opening mines along the western edge of the Hunter Valley following the underlying geological deposits. Mines have become larger and infrastructure generally is clustered close to the rail transport corridor. In recent times, approval of mines at

Bengalla and Mount Arthur North have resulted in open cuts and infrastructure to the north closer to the Upper Hunter Valley area.

To the east the landscape becomes softer and less heavily dissected by waterways. The Hunter Valley dominates the topography and the surrounding land is predominantly flood plain and low foothills. These areas are less diverse in natural visual quality and more heavily modified by human intrusion at a local scale. The towns and urban infrastructure are more dense in the eastern areas of the valley, concentrated around the rivers and following the historical transport corridors. This area has a variety of agricultural uses. Agricultural infrastructure of low to moderate scale is a strong element in the landscape character.

2.1.2 Local Landscape Character

The landscape character of the area immediately around the proposed Anvil Hill Coal Project is closely linked to the underlying geological formations and the existing topography. The underlying formations are predominantly sedimentary with high levels of faulting. These original sedimentary deposits have been significantly transformed by movement over time. To the west of the Project site they have been folded and driven up to form the massive ranges and to the east, the variety of the topography has been created by lifting, folding and cutting of the underlying sedimentary material. The steep sided hills have created fast flowing streams and rivers that have cut deeply into the underlying material.

The visual character of the area is dominated by the rugged ranges to the west and occasional high rocky outcroppings that appear randomly within the foothill areas.

The landscape of the local area is not of a significantly distinctive nature. The area is highly undulating and has a number of steep outcropped areas. Small creeks such as Big Flat Creek and Anvil Creek flow generally east to west to meet Wybong Creek which flows south to meet the Goulburn River north of Myambat. To the south, the Denman Range creates a visual barrier with highly elevated rocky ground up to RL 440. To the south and southeast the area opens and falls down to the flood plain of the Hunter River at around RL 110. To the north the adjacent elevated ridges are heavily forested to levels around RL 330.

These constraints would normally provide the appearance of a valley enclosed on 3 sides. In this case however the enclosure is more detailed and localised by an additional ridgeline running along Roxburgh Road and a series of elevated rocky plateaus throughout the area. Rocky outcrops such as Denman Knob, Limb of Addy Hill, and Anvil Hill run as a group sweeping from north-west to south – south east throughout the visual catchment. The result is a series of dissected rocky outcrops with a strong local directional character provided by the stream or drainage systems. The directions however vary across the area.

The vegetation fits the pattern established throughout the region for areas of grazing land and more mountainous surrounds. Here as elsewhere, the vegetation is predominantly woodland on the ridges and steeper hills. The valleys and low sloping hills have been cleared for grazing. This results in the contrast of green pasture lands to the darker existing surrounding native vegetation. In dryer weather the pasture areas brown off and create a series of contrasting colours with the darker green vegetation.

The landscape has several strong cultural modifications. First, the Muswellbrook to Ulan railway that runs relatively consistently along the line of the western edge of the Hunter River flood plain, turns west toward Denman, following and reinforcing the directional quality of the Hunter River landscape on a north / south axis.

Second, east of Roxburgh Road are the workings of the Bengalla Coal Project. This project has an open cut mine visible from parts of Muswellbrook. In addition it is visible along a number of local roads including Wybong and Denman Roads. The mine is an open cut of large scale, approximately 2 km long and planned to move east to west over a 20 year period. The Roxburgh Road ridge creates a visual barrier between the Bengalla mine and areas to the west.

2.2 The Study Area

For the purposes of this visual assessment, the Study Area is defined as the total visual catchment of the Anvil Hill Project. It is bounded to the north by the Wybong Ridge Area; to the South by the Denman Range and the Hunter River Valley; to the east by the ridges along Roxburgh Road; and to the west by the Ranges adjacent to Reedy Creek (see **Figure 01**).

2.3 Landscape Description And Visual Character of the Study Area

The Study Area can be broken into broad homogenous landscape units of slope, vegetation type and landscape cover. The landscape units are described below in terms of their visual components of form, line, colour, texture and cultural modifications. Cultural modifications are assessed to ascertain the degree of change that has occurred to the predominant character of the area. See **Figures 03 and 04** for vegetation and slope analysis of the Study Area.

2.3.1 Ridgeline And Upper Wooded Slopes

This landscape unit forms a visually prominent backdrop to the northern, western and eastern boundaries of the Study Area. Slopes range from 20 to 40% and the unit has a maximum height of approximately RL 443 at "Denman North" and is approximately 240 metres higher than the maximum elevation of the proposed mine.

- | | |
|-------------------|--|
| Form: | The steep slopes, rock outcrops and high elevation form the dominant visual element in this landscape unit. The prominence of the ridgeline and upper slopes is accentuated by its contrast to more gentle slopes and alluvial plains. |
| Line: | Line is also an important visual element for this unit as the ridgeline forms the silhouette against the skyline. |
| Colour & Texture: | The dense vegetation particularly on and adjacent to the ridgelines results in a strong dark ragged edge silhouette and provides a contrast in colour and texture to the surrounding cleared areas. There is also a colour and textural contrast at the horizon line |
| Cultural | The natural character is dominant in both areas and existing cultural elements appear to be insignificant. |

2.3.2 Undulating Foothills (Vegetated And Cleared)

Undulating foothills form a constant landscape unit of the study area. Consequently this unit contributes significantly to the overall character of the study area. This unit comprises slopes in the range of 10 to 20%.

Form: Form is also the dominant visual element of this landscape unit, although it is less distinctive than the steeper ranges and alluvial plain. With a significant diversity in shape, orientation and dissection, these undulating foothills provide a source of interest to the viewer as foreground elements and contribute to a higher visual absorption capacity.

Line: The undulations of the foothills also make line an important visual element in this unit, however due to the random nature of the line elements the overall form of the foothills visually dominates this landscape unit.

Colour & Texture: Vegetation contributes significantly to the colour and texture perceived in this unit. The extensive areas of remnant woodland around the Limb of Addy Hill and Anvil Hill provide a contrast to cleared pasture lands that are predominantly to the south and east.

Cultural Modifications: Few cultural modifications exist and most are limited to some rural residential properties and some obvious fencing. The most significant element is the 500 kV power lines that cross the area. These power lines have a strong lineal influence when viewed from some locations. To the north Wybong and Ridglands Roads cross the foothills landscape unit bringing bridges and road infrastructure. Some other local roads also exist within the unit.

2.4.3 Alluvial Floodplain Areas (slopes less than 10%)

The main body of this unit is located around the rail line within the Hunter River flood plain in the southeast of the Study Area. Several smaller creeks also have alluvial areas of reduced size.

Form: The form is relatively unimposing and due to the horizontal line of the landform, any vertical elements situated on this landform gain some visual prominence in the landscape due to contrast with this flat form.

Line: The horizontal plane of the landform makes line a strong visual element in this landscape unit. Line is also emphasised by the course of the Hunter River tributaries, tree lines, fencing and the rail line.

Colour & Texture: Colour is a distinctive visual element in this landscape unit. The contrasting dark trees to light green grasses creates clear distinctions of vegetation. These contrasts create visual variety of the flood plain.

Cultural Modifications: Agricultural land, exotic plantings and fencing add favourably to the visual variety of this landscape unit. Rural residential development is more concentrated in this area and is consistent particularly along the roadsides. The rail line and roads are generally straight and prominent from some viewing locations.

2.4.4 Water Bodies

The main water body within the Study area is the Hunter River meandering through the south east corner of the study area. The small creeks and tributaries which drain into the Goulburn River fall to the west.

Line: The meandering courses of some creeks result in line being a moderate visual element in this landscape unit. These linear elements are accentuated by vegetation, especially trees, along the water course and adjacent to dams.

Form, Colour & Texture Water by virtue of its liquidity forms a significant contrast to the surrounding land mass in terms of form, colour and texture and creates the dominant element in the landscape. The scale is small and not a dominant form in the landscape.

Cultural Modifications: The shape of the dams in some cases creates elements that are obviously man made and not well blended with the surrounding topography.

2.4.5 Other Cultural Elements

Small residences are widely scattered with strong influences from vertical farm infrastructure. The Muswellbrook to Ulan rail line and the 500 kV power line are the most significant cultural elements. Local roads are secondary elements in the landscape.

2.5 Existing Nightscape

The assessment of the existing nightscape was made from local travel routes and various locations around the Study Area. The assessor considered background light levels, brightness, glare compared to background and colour when the source is viewed from varying distances. The basic assumption of the nightscape assessment is that the night lighting impacts of the Anvil Hill Project should be assessed in relation to the overall character of this section of the Hunter Valley. The nightscape character of the Study Area is perceived as being highly rural in character with a small number of scattered residences and with small concentrations of light in more densely populated areas.

In order to understand the impact of the Open Cut Area (OCA) and the coal preparation plant an assessment of the Dartbrook Coal Preparation Area and the Bengalla Open Cut was made at night. Table 2.1 provides an assessment of the existing night lighting environment in the Study Area and a comparison to the existing effects of the similar Open Cut and Coal Handling Areas.

It is assumed that the night lighting environment in the preparation plant area at the Anvil Hill Project will be similar to that of other mining operations in the Hunter Valley. Impacts from the Open Cut Areas will be more spread out, dynamic and diverse than the Bengalla Open Cut Area due to the proposed truck and shovel nature of the extraction method, and four pits operating throughout the majority of the project life. Overburden emplacement operations will also run concurrently at night in several areas. The night lighting assessment in Section 5 assumes that the OCAs and Infrastructure Areas will be working 24 hours per day.

Table 2.1
Visual Impact of Lighting in Existing Nightscape:

ASSESSMENT OF EXISTING STUDY AREA					
Nightscape Unit	Foreground 0-400/800m	Close Middleground 400m/800m - 2/3km	Distant Middleground 2/3km - 5/8km	Background 5/8km - infinity	Overall Rating
Upper ridges	Nil	Nil	Nil	Nil	Nil
Foothills with residences along local roads	Low	Low	Nil	Nil	Nil/ Low
Wybong	Low/ Moderate	Low	Low	Low	Low/ Moderate
ASSESSMENT OF FACILITIES SIMILAR TO THOSE PROPOSED					
Dartbrook Mine Coal Handling & Preparation Plant lighting	High	High/ Moderate	Moderate	Low	Moderate/ High
Dartbrook surface Mine facilities and office areas	High	Moderate	Low/ Moderate	Low	Moderate
Bengalla Open Cut Assessment	High	High/Moderate	Moderate	Low	Moderate

See individual assessments under viewpoint impacts in **section 5.7** for assessment from each selected location.

3.1 Assessment Criteria

The basic premise of visual quality assessment is that all landscapes have some value, but those with the highest diversity have the greatest potential for high scenic quality.

Scenic quality is the combination of elements used to identify the importance of the proposed development to potential viewers.

The assessment of scenic quality is performed by assessing the landscape character units in scenic quality classes eg. high, moderate, low. These classes are based on the diversity of form, line, colour and texture, prominence of landform, prominence of vegetation and geology, and water forms.

3.2 Scenic Quality Assessment

Based on the description of the landscape units in Chapter 2, the scenic quality assessment of the Study Area is summarised in Tables 3.1 and 3.2.

The scenic resource values are based on Williamson's (1979) findings for landscape dimension scenic quality relationships that are based on earlier research studies.

Those studies identify that scenic quality increases as:

- Topographic ruggedness and relative relief increase
- Presence of water forms, water edge, and water areas increase
- Patterns of grasslands and forest become more diverse
- Natural and agricultural landscapes increase and man-made landscapes decrease
- Land use compatibility increases and land use edge diversity decreases

Source: Williamson, Dennis. *Scenic perceptions of Australian Landscapes*, LANDSCAPE AUSTRALIA, 1979 vol. 2

Refer Figure 05 for scenic quality assessment.

Table 3.1

Scenic Quality Assessment:

Landscape Rating Unit	SCENIC QUALITY CRITERIA Proportional Prominence of				Scenic Quality Classes
	Diversity of Landscape Elements	Landform	Vegetation	Water	Result
Ridgeline & upper wooded slopes	Moderate	High	High	-	MODERATE/HIGH
Undulating foothills and elevated outcroppings	Moderate	Moderate /High	Moderate		MODERATE
Alluvial Flood Plains of Hunter River	Moderate	Moderate	Low	Low	LOW/MODERATE
Impact of Cultural modifications	Low	Low	Low	-	LOW

3.3 Viewer Characteristics

Viewer characteristics of the landscape are specific to the Project and are determined by individual viewing points, distance to the object and sensitivity of the viewer. Visibility of the landscape elements and visual prominence is determined by the individual viewing points selected within the Study Area. Note that the impact can change with only slight modification to the viewing points. Locations have been selected from which the major views of the various open cut areas, and the emplacement areas will be prominent. The locations are considered representative of a general location or group of locations. They are grouped according to relative distance.

3.4 Viewpoints

The selection of viewpoints is specific to the Project and is determined by the angle and elevation of the view and distance to the object. Distance definitions have been determined from those listed in **Table 3.2**. These distance zones are used throughout to identify how far elements are from viewpoints or frequently travelled viewing corridors. Generally viewpoints are limited to public roads and accessible public areas.

Table 3.2
Distance Definition for Landscape Assessment

	Foreground	Close Middleground	Distant Middleground	Background
Distance	0-400/800m	400/800m-2/3km	2/3km - 5/8km	5/8km- infinity
Viewing capacity	Detailed	detail and general	general	general - no detail
Object viewed	rock outcrop	hill or small valley	entire ridge	ridge system
Visual characteristics	species of individual plants	textures (palms and hardwoods)	course textures (grass to tree cover)	patterns (light and dark)

Source: Forest Commission, Victoria, 1981 - Visual Absorption Capability in the Blue Range Study Area. Adapted by O'Hanlon Design Pty. Ltd. 2006 to suit the Anvil Hill Study Area and subsequent studies.

THE VIEWPOINTS: (Refer to **Figure 02** for locations)

- VP 1 - Roxburgh Road approximately 1500m from Wybong Road intersection: RL 265
- VP 2 - Mangoola Road approximately 3000m north of Roxburgh Road: RL 150
- VP 3 - Corner of Mangoola Road and Roxburgh Road: RL 180
- VP 4 - Mangoola Road: 1200m north of Bells Lane: RL 180
- VP 5 - Denman Road: RL 140
- VP 6 - Wybong Road 1900m north of the Reedy Creek Road Junction: RL 165-170
- VP 7 - End of Anvil ROW adjacent to Bellevue: RL 180 (This is a private road)
- VP 8 - Wybong Road 1200m north of Wybong Bridge: RL 145

- VP 9 - Wybong Road 1100m south of Wybong Post Office Road: RL 145
- VP 10 - Wybong Post Office Road: RL 200
- VP 11 - Ridgeland Road adjacent to bridge: RL 180
- VP 12 - Golden Highway 1500m east of the Rosemount road intersection: RL 175

3.5 Sensitivity Levels

Sensitivity levels are a measure of people's concern for the scenic quality of an existing environment. They are based upon the scenic quality of the landscape unit, distance, zone and type of travel routes or location of viewpoints, and the number and type of potential viewers.

Major roads and primary use areas carry a higher number of viewers than secondary roads and use areas. Generally, tourists and residents have a higher concern for visual quality than commuters. Residents have a high concern for the scenic quality of their visual catchment if it is threatened by perceived detrimental changes. Residents are generally more concerned with Foreground and Middleground impacts. Commuters are generally more concerned with Foreground elements.

Very little research has been carried out in Australia to determine the public sensitivity to visual impacts generally or to the visual impact of coal mines specifically. Most assessments are based on overseas research and anecdotal evidence. We have assessed public sensitivity levels against the criteria shown in **Table 3.3** and our estimate of viewer numbers, and our assessment of level of concern generally demonstrated in similar communities.

Table 3.3
Sensitivity Levels - General Criteria

Use/viewer numbers	Sensitivity Level		
	1	2	3
Primary Travel Routes, resorts, historical sites, urban residential Areas, National Parks, or primary recreation areas and passenger railways	At least 25% of users have MAJOR concern for scenic qualities of the area	Less than 25% of users have MAJOR concern for scenic qualities of the area	
Secondary Travel Routes, Rural Residential Areas and Water Bodies	At least 75% of users have MAJOR concern for scenic qualities of the area	At least 50% and not more than 75 % of users have MAJOR concern for scenic qualities of the area	Less than 50 % of users have MAJOR concern for scenic qualities of the area
Rural roads and outlying areas		At least 75% of views have MAJOR concern for scenic qualities of the area	Less than 75% of users have MAJOR concern for scenic qualities of the area

In the above **Table 3.3** primary travel routes are considered to be highways, freeways and motorways carrying high volumes of traffic or routes designated as scenic highways.

Source: **Table 3.3** is based on tables and percentages quoted in U.S.D.A Forest Service, Agricultural Handbook No. 462, "National Forest Landscape Management" Volume 2 Chapter 1 The Visual Management system - April 1974 and, as suggested therein, modified by O'Hanlon Design Pty. Ltd. (2006) to suit the visual study of the Anvil Hill Project.

Table 3.4
Sensitivity Levels - Travel Routes & Urban Areas

Use/viewer numbers	Sensitivity Level		
	1	2	3
Primary Travel Routes	Golden Highway (VP12)		
Secondary Travel Routes		Roxburgh Road (VP1), Mangoola Road (VP2, VP3, VP4), Denman Road (VP5), Wybong Road (VP6, VP8, VP9), Wybong Post Office Road (VP10), Ridgeland Road (VP11)	
Rural roads and outlying areas			Anvil R.O.W. (VP7)

3.6 Landscape Management Zones

The assessment of the degree of visual impact of the proposed open cut areas and the related facilities is based on the perceived severity of the developments within the landscape from selected viewpoints, the number of viewers expected to experience the changes and the capacity of the landscape to absorb the proposed changes.

In order to determine the absorption capacity of the landscape the areas affected have been divided into Landscape Management Zones (LMZ). These Landscape Management Zones are an indication of the perceived ability of the area to absorb visual change.

In the following **Table 3.5** the Scenic Quality Class determined in **Table 3.1** is matrixed against the distance definitions in **Table 3.2** combined with the sensitivity rating determined using **Table 3.3** to indicate the level of potential concern for the visual resource of the area. This level of concern is viewpoint specific and is used to determine the potential capacity to absorb the proposed changes without significant levels of impact when viewed from a specific viewpoint.

Table 3.5
Landscape Management Zones

LANDSCAPE MANAGEMENT ZONES								
		Sensitivity Level / Distance Zone						
		1 Fg	1 Mg	1 Bg	2 Fg	2 Mg	2Bg	3
Scenic Quality Class	High	A	A	A	A	B	B	B
	Moderate	A	A	B	B	B	C	C
	Low/Mod	B	B	C	C	C	C	C

In the table above Fg, Mg and Bg stand for Foreground, Middleground and Background respectively.

LMZ as noted in the above table are described as follows:

ZONE A - High concern for visual resources

In this zone the ability to absorb change without significant effect is low. If possible, mitigation methods should be used to significantly reduce the impact of any change. This zone is primarily along residential access roads, along the ridgelines and the upper wooded slopes and includes views of local features such as Anvil Hill and the Limb of Addy Hill.

ZONE B - Moderate concern for visual resource

In this management zone the ability to absorb the change is moderate. Therefore greater levels of modification are possible before the new elements become intrusive. This zone comprises the bulk of the Project Area visible from secondary roads and rural residences.

ZONE C- Low concern for visual resource

In this zone the ability to absorb the proposed change is high, due to the lower number of viewers and/or their locations and the overlaying topography. This zone is comprised largely of the immediate foothills behind the ridgelines away from the secondary roads.

Rating: **The Project Area falls across all Landscape Management Zones depending on the viewer location.**

Section 4

Relevant Aspects of the Proposed Development

4.0 General

This section describes the various elements of the Project and the items that will affect visual quality. The proposed method and timing of mine and overburden emplacement operations are described by the conceptual 'Progression of Mining' plans 1-5 prepared by Umwelt (see the main body of the EA and **Appendices 1 to 5**). The development of the Anvil Hill Project includes a number of distinct elements each of which have varying impacts related to the location of the viewer and year of progress.

4.1 Infrastructure and Tailings Dam

4.1.1 Mine Infrastructure Area

The basic infrastructure, Tailings Dam, Coal Preparation Plant and Rail Loop are works that will be completed within the first year of the project construction. These facilities are static and will remain for the duration of the project.

Most of the facilities and the Coal Preparation Plant (CPP) are located adjacent to the 500 kV power line in the south east of the disturbance area. The base level of these facilities will be in the order of RL 180 to 185. The largest of the facilities will be the Product Stacker/Reclaimer and the CPP. The Stacker is a mobile unit of limited visual impact. The Stacker however works over the Product Stockpile at a height of around 28 metres. This indicates a likely coal stockpile height in the order of 20-25 metres with a variable length up to 600 metres depending on demand and availability of transport. This coal stockpile is a significant element in size and colour.

The CPP is a large rectangular building of approximately 29 metres in height located adjacent to the northwest end of the Coal Stockpile. These buildings and base heights indicate an overall development height allowing for design development of between RL 210 and RL 215. In addition a Surge Bin will be located on site with a height of approximately 34 metres. The top of the Bin will be located at approximately RL 215.

Smaller buildings such as offices and the bathhouse have a height up to 10 metres

4.1.2 Tailings Dam

The tailings dam is located 1.5 km north of the main infrastructure area and is a relatively large structure. The main dam wall is approximately 400 metres long at the ridge. The base is located at RL 165 and the ridge at approximately RL 180. The Dam wall will face south toward the Rail Loop and the surface area of the Tailings Dam will be approximately 400 x 500 metres with graduated arms tailing up into the original gullies.

4.1.3 Rail Loop

The Rail Loop and Loading Bins are proposed on a spur from the main Muswellbrook to Ulan line. The line extension will commence adjacent to Mangoola Road at RL 120 and run west then north for approximately 2.8 km terminating in a loop at approximately RL 133. On the Loop will be located a rail load out bin fed by overland conveyors from the coal product stockpiles. The height of the rail load out bin is approximately 27 metres, giving a level at the top of the bin of approximately RL 165

(assuming the bottom of the bin is 5 metres above the track). Given the gradients adjacent to the load out bin and the Rail Loop some cutting and embankments will be required in the rail loop area.

The elevated conveyors and the adjacent access/service road run in a predominantly straight line from the CPP to the rail loop. These will necessitate some vegetation removal and clearing in a straight line approximately 25 metres wide.

4.2 Mining Operations

4.2.1 OCA Design Development

The OCA has changed shape and sequence during the development of the mine plan. Some changes have occurred in response to the initial visual assessments of the project. Initially the OCA was planned to run close and parallel to Wybong Road adjacent to Big Flat Creek, south of the Angle Vale Homestead. This would have exposed large areas of the Main Pit to view for the middle ten to twelve years of the project. Screening would have been difficult due to the relative viewer levels. In response to this issue and other environmental factors the mine plan has been adjusted to set back approximately 250 to 350 metres from Wybong Road leaving a screen of existing vegetation intact.

4.2.2 Mine Sequencing

The main construction sequence of the OCA and overburden emplacement areas are outlined on the conceptual mine plans.

The plan is broken into 4 pits with plans showing mine progress at Year 2, 5, 10, 15 and 20. At various times throughout the project all 4 pits will be operating simultaneously.

The Mine will be an Open Cut Mine operated by dump trucks and hydraulic excavators. The 4 pits will be mined concurrently to allow for quality control of the product for the life of the mine.

This approach allows for progressive rehabilitation and attempts to reduce the visual impacts in each area. The operation of 4 separate pits does not increase the area potentially visually exposed over the life of the mine but is likely to spread the impacts over a wider catchment. Some reduction and containment of individual impacts will be achieved in specific directions at particular times due to the fragmented nature of the OCA operation.

4.3 Individual Open Cut Pit Areas

4.3.1 Main Pit

The Main Pit is located in an area of dense natural vegetation. Workings in the Main Pit commence at the start of the project and are located in an area of existing tree cover. The initial cut runs from northwest to southeast parallel to the 500 kV power line. Initially the Pit is worked at both ends with an out-of-pit overburden emplacement area (OEA) centrally located between the pits, towards the northwestern end of the Pit. Around Year 2 this out-of-pit OEA will be approximately 700 metres long at right angles to Wybong Road at a distance of approximately 400 metres with a height of around 40 metres above the existing ground level. The area of open cut adjacent to Wybong Road will be visible as an approximately 500 metre

long slot at right angles to Wybong Road and approximately 250 metres distant. The workings of the southeast end of the Pit will be screened by the OEA. At this stage the OEA will be initially shaped but unrehabilitated.

With time the two ends of the Pit meet west of the OEA. At around Year 5 the OEA will become an extended ridge running northwest to southeast parallel to the 500kV power line. The slope of the OEA face will be steepest adjacent to Wybong Road with an elevation up to RL 210. The north corner of the rehabilitated face of the OEA will be a prominent element when viewed travelling west along Wybong Road. The southwest face of the OEA will be unrehabilitated. The northeast face of the OEA will have been rehabilitated facing the power lines and together with the rehabilitated southwest face of the Northern Pit OEA it forms a deep rectangular shaped valley facing Wybong Road approximately 150 metres wide at the base with side slopes of approximately 40 metres in height at a batter of approximately 1:7. The sloping faces of these OEA's flank the power line. This creates a strong and uncharacteristic landform around the 500 kV line that remains on completion of the project.

Mining progresses southwest from Years 5 to 15 passing on both sides of Anvil Hill, leaving Anvil Hill standing as a core element around which the OEA forms a new landscape. The levels of the new landscape are significantly higher than the original levels adjacent to Wybong Road. In the northern corner of the OEA finished heights will exceed existing levels by up to 40 metres. A new plateau is formed between Anvil Hill and the power lines with heights around RL 200. The northwest face of the OEA lengthens over time running parallel to Wybong Road at a distance of approximately 600 metres from the road. Continued working of the southwest face will present an un-rehabilitated surface between 1.5 and 2.5 km long, for the bulk of the 20 year mine life. Around Year 15 the Open Cut Pit moves south of the rocky knoll known as Wallaby Rocks west of Anvil Creek and becomes screened from views from the northwest.

From Year 15 to Year 20 the Pit continues to move southwest. The OEA and rehabilitation follows parallel to the Main Pit leaving a new valley in place of the original Anvil Creek. The valley floor elevation is generally 20 to 30 metres higher than the original creek floor with a new plateau area south of Anvil Hill at RL 165. Anvil Hill and the rocky ground will remain as elements within the landscape with reduced prominence due to the raised levels of the new plateaus adjacent and between the outcropping.

Rehabilitation will be scheduled to commence as soon as possible after mining disturbance, to minimise the disturbed area at any point in time. The proposed final land use will include self sustaining indigenous vegetation communities, consisting of native and naturalised tree, shrub and grass species. Replacement of the existing density of vegetation could take up to 30 years if correctly implemented.

4.3.2 Northern Pit

The Northern Pit is located in an area of more intermittent vegetation. Excavation of the Northern Pit commences just north of the 500 kV power line and the out-of-pit OEA for the Northern Pit is established in the northwest corner of the Pit. By Year 2 the OEA has grown to a height of approximately 40 metres (RL 200) with a width of 400 metres. At that time mining takes place in the south corner of the Pit cutting into existing topography ranging from RL 160 to RL 220. The cut areas will be partially screened by the OEA.

By Year 5 the OEA has grown to mirror the work adjacent in the Main Pit creating the narrow valley through which the 500 kV power lines run. The rehabilitation predominantly faces into the valley in which the power line is located. The working face of the OCA is moving uphill to the northeast with the OEA following behind. The overburden emplacement will reach a finished height of RL 210 and similarly to the Main Pit begins to plateau at levels up to 40 metres above the original ground. The original gullies and creek lines are mined and filled with a new landform. The new landform has steeper slopes adjacent to Wybong Road, than the existing landforms.

Between Years 10 and 15 the OCA of the Northern Pit reduces in length to 750 metres and it moves more quickly across the landscape. By Year 15 the Northern Pit is completed, the OEA is formed and rehabilitated. Rehabilitation will initially appear as grassland until vegetation growth has sufficient time to thicken into semi dense woodland. The levels on the southeast side of the rehabilitated OEA appear to match the existing levels and tie back to the existing landforms.

4.3.3 Southern Pit

The Southern Pit commences at project inception with a small pit approximately 900 metres east of Anvil Hill on the southern side of the Main Haul road. The overburden is moved by truck to create an emplacement 1000m southwest of the site facilities. The base level of the South Pit OEA is at approximately RL 180. At this time two smaller pits are opened north and south of the OEA with cuts at levels around RL 170 and RL 210 respectively. The latter pit sits on the south edge of the ridge running east from the Limb of Addy Hill.

In Year 5 the twin pits are both moving southwest with working faces exposed northwest but significantly screened by the OEA which continues to grow behind and to the east of the working face.

At Year 10 the two pits have moved further southwest and combined into a single working pit southwest of the OEA. The northern face of the OEA has reached a plateau at about RL 220 and the northern face has been rehabilitated. The southeastern face of the OEA is exposed as an ongoing emplacement area.

Moving through Year 15 the Pit continues its southwest progress followed by the OEA, which reaches a summit at approximately RL 230. Rehabilitation is completed on the northern and eastern faces of the OEA.

Between Year 10 and 15 the Mine Haul road between the Southern and Main Pits remains at natural ground level whilst high mounds grow on either side of the Haul road. This narrow opening continues to grow up to Year 20 and remains after the completion of the project. At Year 20 the Open Cut is completed and an unrehabilitated face awaits completion of the mine and final landform.

4.3.4 Tailings Pit

The progress of the Tailings Pit is closely linked to the Tailings Dam. The Dam is constructed in the initial stages of the project. The main Tailings Pit however is not utilised for tailings disposal until after Year 5. The Pit is on the southern side of the haul road to the Northern Pit moving from south to north. The Pit varies in depth throughout the mine life and generally is below natural adjacent ground level by approximately 40 metres. The Tailings Pit is screened by the Northern Pit Haul road and

the natural landforms to the north. The Tailings Pit is rehabilitated from south to north to meet the adjacent existing ground levels.

4.4 Design Considerations

The underlying philosophy of the visual mitigation strategy is to create the conditions for minimising impact during the mining activity. The identification of existing vegetation capable of providing a fully-grown screen is considered a significant tool. As noted in Section 4.2.2 redesign of the mine plan has allowed retention of the existing vegetation along Wybong Road. Very little other existing vegetation is suitably located to provide substantial screening for the operations.

Revegetation is proposed to reflect the existing density and character of the adjacent landscape. Trees will be planted in the majority of the Proposed Disturbance Area and strategically planted along ridgelines and reconstituted creek lines. The revegetation strategy has been designed to complement the future use of the mine area as self-sustaining woodland after mine completion. In addition, strategic ridgelines have been identified (see Figure 03) which currently these have little or reduced tree cover. Some of these ridges are also proposed to be allowed to revegetate as part of the offsets strategy for the Project which will provide extra screening. Section 5.5 includes a discussion of potential visual mitigation measures for the Project.

4.5 Night Lighting Considerations

The proposed night lighting will be primarily concentrated on the Open Cut Areas, the CPP and access roads. Lighting is anticipated to be locally concentrated within the pit at reduced heights due to the truck and shovel nature of the operations. Truck movements at night with associated headlights and warning lights are likely to be significant impacts as the light source may be flashing or moving.

With 4 pits operating simultaneously the potential for significant vehicle movement impacts is increased. This simultaneous operation will also create a potentially larger area of lighting in the landscape and increase potential sky glow. The glow in the sky on overcast nights, commonly referred to as sky glow, is a significant element in the night environment at several other mines in the Hunter Valley.

Based on inspections of other mines the lighting elements that are likely to cause impacts are listed below:

- Direct views of High Pressure Sodium (HPS) floodlights on electric drills
- Direct views of HPS safety lighting in the infrastructure areas.
- Views of lights moving on the working faces.
- Direct views of HPS and Metal Halide (MH) floodlights on skid mounted lighting plant.
- Direct views of headlights on vehicles as they move up sloping mine roads, along level mine roads, and as they turn bends.
- Direct views of lighting adjacent to, or part of conveyors and loading \ surge bins.

These issues are addressed in the mitigation measures section and the main thrust of lighting controls will be shielding floodlights required for safe work practices.

5.1 General

The assessment of the degree of visual impact of the proposed open cut areas and the OEA areas is based on the perceived severity of the works and facilities within the landscape from selected viewpoints and the number of viewers expected to experience the visual changes.

The complexity of the mining emplacement and rehabilitation process and the location of the emplacement areas and associated infrastructure require these to be individually assessed throughout the mine life.

Factors included in the assessment are as follows:

- (a) Selection of viewpoints, which offer prominent views from the north, south, east and west of the Study Area. These viewpoints do not represent all possible views attainable from each direction; the visual impact would vary according to the stage of operation, viewing position and specific site conditions.
- (b) Consideration of the various landscape components in relation to the visual impact.

5.2 Open Cut Area (OCA)

The open cut areas are the most complex of the mine elements to assess due to their dynamic nature and the simultaneous operation of the 4 pits. This is reflected in the impact ratings for each viewpoint that may decrease or increase over time due to the directional shift of the open cut area and/or the proposed emplacement and topographical changes, which will allow or impede views to each of the pit areas.

Table 5.1
Description of Landscape Components for Open Cut Area

LANDSCAPE COMPONENTS	GENERAL DESCRIPTION OF IMPACT WHERE VISIBLE
Form	Major changes to topography - extensive excavation and at varying times.
Line	The edge of the worked surfaces would provide strongly contrasting elements to the surrounding landform.
Colour	Exposure of coal seams, associated geological strata and spoil emplacement, would provide a severe contrast to adjacent pastoral grasslands and vegetated areas.
Scale Contrast	The extent of the open cuts are a significant element and has a significant contrast in scale to other landscape features during construction of each pit.
Spatial Dominance	The open cuts would be perceived as a prominent spatial element of the local landscape particularly when viewed from elevated locations and from foreground locations. The size, scale and colour of the overburden emplacements will vary with time in the landscape. These will combine to create a form, which will be spatially dominant to its surroundings.

5.3 Overburden Emplacement Areas (OEA)

The overburden Emplacement Areas will be visible as close middleground elements from significant sections along Wybong Road. The impact of the work will be increased by the enclosed location and the proposal to build the emplacement wall either side of the 500kV power lines.

The overburden emplacement works themselves would become significant permanent elements in the landscape.

Table 5.2
Description of Landscape Components for the Overburden Emplacement Areas

LANDSCAPE COMPONENTS	GENERAL DESCRIPTION OF IMPACT WHERE VISIBLE
Form	The form attempts to match adjacent topography to some degree however some features are likely to be obviously man made. The valleys are filled and the landform becomes more enclosed. The removal of large areas of vegetation throughout the mining area will significantly change the visual character of the Study Area.
Line	Potentially the most significant visual element. The relatively sharp edges of the sides of the 500kV power line corridor will contrast with the surrounding landscape. These edges will be accentuated by shadow effects in the morning and afternoon when viewed from the north.
Colour	Proposed progressive rehabilitation measures will reduce potential impacts. The upper bench faces will be rehabilitated progressively creating a colour contrast. This will combine with shadow effects on the lower faces to create a significant impact. These colour contrasts will endure for most of the life of the mine from selected viewing angles.
Scale Contrast	The scale will be compatible with other adjacent topographical elements however the faces are likely to be less modelled and more machine made.
Spatial Dominance	The placement of large volumes of materials will appear to fill the valley facing Wybong Road and dominate the visual field.

5.4 Assessment of Visual Impacts

For this project we have ranked the visual impact ratings in decreasing order of severity on a scale as follows: Severe, High, Moderate, Low and Nil. For a tabulated assessment of the impacts with an impact rating see **Table 5.4** at the end of this section. For location of each viewpoint refer to figure showing viewpoints (**Figure 02**).

Transects have also been prepared for some selected viewpoints where it is considered that they may add to the reviewers understanding of the impacts. Where the mine elements are relatively static, such as the infrastructure and rail loop areas, transects have been selected at times that we consider are representative of views over the mine life. Where the open cuts create dynamic impacts, transects have been prepared for various years to assist understanding of the changing nature of the impacts.

Extreme care should be exercised when considering the transects. Each transect represents a view along one section line only, and does not provide a representation of the view with the naked eye nor an indication of the complete impact from that point at that time.

For a dynamic element such as an open cut a very large number of transects may be required to be taken at a large range of different angles to completely describe the impacts over time. A transect may provide little evidence of impact at a point in time when the OCA has not reached the line of the transect, but several degrees change in the angle of the transect could significantly change the impacts. For this reason the written description and the tabulated impacts are the precedent tools. They provide the most comprehensive assessment incorporating our assessments the dynamic impacts and distance relationships.

The following assessment of the impacts at each viewpoint has been divided into the static and dynamic elements titled "Infrastructure Areas" and "Open Cut Areas".

5.4.1 VP 1 Roxburgh Road

Infrastructure Areas

From the northern end of Roxburgh Road views of the Infrastructure Areas will be limited and oblique to the general outlook. The tailings dam will not be visible. The rail loop and load out bins will not be visible. Views of the coal preparation plant, coal stockpiles and stacker facilities will be possible at a distance of 7 to 8 km but due to the distance from the viewer and the size of the infrastructure, these elements will be visible as relatively small objects when the light and atmospheric conditions are suitable.

Open Cut Areas

The nearest edge of the Northern Pit is approximately 7.5 km from VP1 making all visible works within the OCA areas background elements and relatively limited in size within the view catchment. Viewers at VP1 are at approximately RL 265 which places them at a superior elevation to all the mine works. The Southern Pit is partially screened from view at its south end by the small ridge 1 km southwest of VP1 (see Figure 02) The initial strip and cut of the Southern Pit will be visible as a background element approximately 9 km from VP1. The works will then move out of sight below ground level until approximately Year 5 when mining progresses south of Anvil Creek and commences moving up the northeast face of the Limb of Addy. At this time the OEA will not have obtained sufficient height to screen the OCA and the working face will become exposed. The growth of the OEA will gradually hide the actual pit, however the progress of the cut and strip up the northeast face of the Limb of Addy matches the growth of OEA. This means that the cut edge will continue to be visible as a narrow slot until Year 20 at a distance of 9-10 km from the viewer.

The final landform on the south edge may leave a near vertical face, in a narrow gorge. If suitably finished this could complement some other rocky edges and outcroppings in the local area, e.g. the west edge of the Limb of Addy. The bulk of the OEA of the Southern Pit will be visible during construction. The northern edge of the Northern Pit will be visible north of Brays Hill (see Figure 03 for location).

Views onto the initial strip and cut at the north end of the Main Pit and Northern Pit will be possible for approximately 3 to 4 years. Construction of the Main Pit OEA north end will be visible between Years 1 and 4 and later between Years 7 and 13 south of Anvil

Hill. Views of the construction of the OEA face of the Northern Pit in an unrehabilitated form will be possible north of Brays Hill until around Year 15 when rehabilitation of the Northern OEA is completed. Around Year 10 clearing of vegetation and excavation of the Tailings pit will create an exposed cut edge, limited views of the power lines and haul roads around the pit junction area.

These views range in distance from 10 km to 7 km as background elements. This distance significantly reduces the impacts. The impact will be greatest in the morning and middle of the day with sun highlighting the difference in colour of the OEA to the background of the ranges beyond. In the afternoon and early evening, glare from the west toward VP1 will reduce the visibility of these elements.

5.4.2 VP 2, 3, 4. Along Mangoola Road

Views of the infrastructure elements will not be possible from the section of Mangoola Road north of "Saxonvale" due to the distances and intervening topography. South of "Saxonvale" and through the sharp corners of Mangoola Road, views of the rail loop area and load out bins will be possible. The views will be close middleground viewed from slightly superior to level elevations at a distance of 2 to 2.5 km. Impacts will increase further south along Mangoola Road as the viewing locations increase in height up to RL 180 at the Roxburgh Road junction. Moving further south views east to the Rail loop area infrastructure become closer middleground elements as Mangoola Road approaches Bells Lane and further south the rail loop infrastructure will be visible at similar elevations when travelling north at distances varying between 2.5 and 6 km.

Transect 06 demonstrates the significance of the superior height of the viewer to the rail loop area and the potential for the infrastructure area to be viewed as a horizon element from this viewpoint.

Views of the construction of the tailings dam and the final face of the wall will be possible from Mangoola Road between VP2 and VP4 at distances varying from 1.8 km to 4 km. Impacts will vary depending on vegetation cover and shape of the tailings dam wall.

Viewers along Mangoola Road from the Sandy Creek Crossing south to VP4 will experience views of the mine infrastructure from inferior viewing levels. The tops of the stackercoal stockpiles and washery will be visible as close middleground elements at varying degrees depending on viewer elevation at distances between 2 and 3 km.

Views up and along the vegetation cut for the overland conveyor and access road will be possible. The vegetation removal and conveyor will create a formal line across the landscape when viewed from positions between VP3 and VP4.

VP2 Open Cut Area

Given the elevation of VP2 at approximately RL 150, the intervening topography and vegetation, views of the OCAs and construction of each OEA will not be possible except for the most elevated point of the Southern Pit OEA. This possible view will be dependent on the location and density of the vegetation removed from the knoll 500m east of the south end of the product stockpile. This knoll is partially cut by the link road from the Tailings Dam to the Infrastructure Area.

VP3 Open Cut Area

From VP3 some views of the prestripping and initial box cut for the Southern Pit will be visible in the first 2 years of mine life. After that the Pit will be shielded by the construction of the Southern Pit OEA.

The OEA for the Southern Pit will be visible as an un-rehabilitated working surface until Year 10. From Year 10 to Year 15 rehabilitation will increase and from approximately Year 16 or 17 only a rehabilitated surface will be visible. During Year 7 to 12 some limited views of the construction of the southeast edges will be possible at distances of approximately 5 km and 4.5 km respectively. Transect 8 illustrates the relative positions at around Year 15 with the Southern Pit rehabilitation area shielding the on going open cut mining and overburden emplacement when viewed from locations adjacent to VP3.

The initial strip and cut for the Tailings Pits will also be slightly visible around Year 5. However once the initial work for each pit is completed and the pits move below natural ground level only intermittent stripping and cutting for each new benching will not be visible. The distances to pits varies from 4.5 km to 7 km. These works will therefore be distant middleground views for a short period only. Transect 6 demonstrates that these impacts will be minimal.

VP4 Open Cut Area

Views of the OCA will not be possible from VP 4 or adjacent locations on Mangoola Road due to the screening effect of the existing ridge running between the southern corner of the Southern Pit and the southeast corner of the Production Stockpile (see Figure 03).

Views of the construction of the Southern Pit OEA are possible for a limited time. The south edge of the OEA has a proposed ridge at RL 240 east of the Limb of Addy. Construction and rehabilitation of this ridge will be visible between Years 10 and 15 as a distant middleground element approximately 3.5 km from VP4. The finished scale and size of this element will blend successfully into the landscape.

5.4.3 VP 5 Denman Road

Transect 5 demonstrates the relative distance and elevation between viewers at or adjacent to VP5 and the rail loop and infrastructure areas.

Infrastructure Areas

Viewers along Denman Road will experience similar views of the infrastructural elements as those along Mangoola Road. Viewers are elevated slightly higher between RL 125 and RL 145. The elements are in the distant middleground varying between 4 km for the rail loop out to beyond 5 km for the coal handling and preparation areas and between 5 km and 6 km distant to the face of the Tailings Dam.

One of the most prominent viewing locations adjacent to the "Piercefield" property has views directly up and along the vegetation removed for the overland conveyor and road. This will create greater viewing opportunities of the coal handling and preparation plant including the south end of the coal stockpiles and the stacker/reclaimer.

Open Cut Area

VP5 is located on Denman Road in a similar direction from the mine site to VP4 but with a viewer level of approximately RL 145 and at a greater distance. Views of the OCA will not be possible but views of the south end of the Southern Pit OEA will be similar to VP4 at a distance of approximately 5.5 km. Impacts will be limited to between Year 10 and 15.

5.4.4 VP 6 Wybong Road

Transect 07 shows the relative height and location of the viewer to Anvil Hill and the Main Pit OEA from this location.

Infrastructure Areas

From this viewing location at approximately RL 164 to 170 on Wybong Road the infrastructure area is primarily screened by the northern arm of the Limb of Addy Hill. This intervening topography with vegetation has an overall height of approximately RL 190 to RL 195 at a distance of 3 km from the viewer. The coal stockpile and coal handling plant is a further 3.5 km to the west. Very limited views of the top of the CHPP may be possible particularly in the late afternoon with sun shining onto the west side of the viewable elements. Colour will be significant if the elements vary from the surrounding vegetation and background.

In a very isolated, short section of the Wybong Road, adjacent to VP6, the top of the infrastructure will break the skyline and form part of the horizon. Line will be a determinant of visibility in the morning as a hard-edged silhouette. Colour and line will be more prominent in the afternoon. The localised extent of this intrusion reduces the degree of impact. The Rail Loop and Tailings Dam are not visible due to their lower elevations.

Open Cut Area

Views of the OCA pits from VP6 are not directly possible due to the location and elevation of VP6. Some prestripping and initial cut operations of the Tailings Pit west of the ROM pad may be possible in the very early years of the mine life. The upper edge of the cut on the west face of Anvil Hill will be visible for a short period prior to rehabilitation.

Similarly views of the OEAs will be restricted to a short period. The Main Pit OEA will be visible as an unrehabilitated face on the southern edge of Anvil Hill for a few years between Years 10 to 15.

5.4.5 VP 7 Anvil R.O.W, Adjacent to Bellevue Homestead

Transect 07 shows the relative height and location of the viewer to Anvil Hill and the Main Pit OEA from this location.

Anvil ROW was accessible for assessment purposes and provides one of the best locations for viewing the open cut from the west, but it should be noted that the Anvil ROW is **not** a public road and access to this location will not be open to the public during the mining process.

Infrastructure Areas

From Anvil Row south of "Bellevue" views east over the Open Cut Area and the infrastructure are possible to viewers at RL 180. The view is across the heavily wooded areas following the line of Anvil Creek. The base level of the infrastructure is at RL 180 and therefore the coal stockpile and CPP area will be visible as a distant middleground element at a distance of 3-4 km. The infrastructure will break the horizon line and be silhouetted in the early morning to approximately half its visible height. In the afternoon, the structural edge and final selection of the colour of the infrastructure will affect the degree of visibility. Views of the tailings dam will be screened by intervening topography and vegetation. Views of the rail loop area are not possible due to its lower elevation.

Open Cut Area

Views from VP7 to the OCA are screened during the early and mid years of the mine life by the heavy existing vegetation cover between VP7 and all the OCAs. Anvil Hill and its associated ridges also screen the Main Pit and Northern Pit at these times. Around Years 12-15 it will be possible to see some minor workings along the north edge of the Southern Pit at a distance of 1.5 km.

At approximately the same time and distance the Main Pit workings will become visible from VP 7 as the pit surrounds Anvil Hill and commences moving southeast downhill into Anvil Creek at inferior levels to viewers at VP7. The Main Pit then continues to move toward the viewer to VP7. At that time VP7 is looking into the Main Pit.

Whilst the pit workings are not visible the OEAs for all pits will be visible from VP7 for the full life of the mine. In the initial years of mine life the northern edge of the Main Pit OEA and Northern Pit OEA will be visible as they grow beyond RL 180. From Year 5 the unrehabilitated face of the Main Pit OEA will increase in height to RL 210 and commence moving southeast toward the viewer covering the 3.5 km distance in approximately 15 years. The length of the OEA varies with time between 1.2 km and 2.4 km.

Also around Year 5 the Southern Pit OEA grows to around RL 200 and commences moving southeast at a similar speed to the Main Pit OEA showing an unrehabilitated face to VP7 throughout the mine life. This remains a close middleground element until completion.

5.4.6 VP 8 Wybong Road

Transect set 01 demonstrates the dynamic nature of the OCA relative to this viewpoint. Extreme care should be exercised when considering the transects in set 01. Each transect represents a view along one section line only, and does not provide a representation of the view with the naked eye nor an indication of the complete impact from that point at that time. A small change in angle of these transects would significantly change the size and time locations of the Main Pit and its OEM as it moves toward then past the viewpoint relatively quickly.

Infrastructure Areas

Viewers along Wybong Road north of Wybong Creek Bridge are generally at levels around RL 145. In the zone between Wybong Creek Bridge and "Angle Vale" homestead views of the coal stockpiles and CPP are screened by Anvil Hill and the adjacent outcrops.

Views of the tailings dam and rail loop are also screened by intervening topography. The line of the 500 kV power line creates a permanent visual element screening these views.

Open Cut Area

The initial cuts for both the Main Pit and Northern Pit and the creation of both associated OEAs will be visible from VP 8. Around Year 3 the Main Pit OEA will obscure all work on the Northern Pit and its associated OEA.

The Main Pit and the Main Pit OEA will move southeast toward VP 8 and pass at around Year 15. Most of the works will have significant screening from the remnant vegetation in the set back to Wybong Road. The construction of the upper levels of the OEA is likely to be prominent. The cut face of Anvil Hill will be visible at this stage for several years between Years 10 and 15. The shape of the western tip of the OEA will be the most significant long-term element.

5.4.7 VP 9 Wybong Road 1.1 km south of Wybong Post Office Road

Transect 4 taken at around Year 5 indicates the position of the Main pit relative to VP9. The main pit and OEM are relatively close to Wybong Road at this stage of the works.

Infrastructure Areas

No views of the coal stockpiles and the CPP are possible from Wybong Road adjacent to "Angle Vale". The intervening topography adjacent to Wybong Road and between the Northern Pit and Tailings Pit screens these elements throughout the life of the mine.

Open Cut Area

Viewers along Wybong Road will be provided with some screening from the existing vegetation in the set back adjacent to the road. This vegetation will screen most of the workings of the Main pit and Northern pit OCA. Impact will occur in the foreground due to the creation of the OEA for both pits. The growth of the emplacement and the rehabilitation works will be obvious at a distance varying from 500 to 700 metres. Growth of the Main pit OEA will follow the road west from inception until Year 15. The Northern Pit OEA will evolve in a similar manner to the east until approximately Year 12. Both OEA's will create a new horizon line and close down the open appearance of the valley due to their proximity to Wybong Road. Anvil Hill will not be visible from Wybong Road north of VP 9 from around Year 10. The existing character will change to be dominated by the OEA's rather than the original natural features.

5.4.8 VP 10 Wybong Post Office Road

Transect set 02 demonstrates the dynamic nature of the OCA relative to this viewpoint. Care should be exercised when considering the transects in set 02. Each transect represents a view along one section line only, and does not provide a representation of the view with the naked eye nor an indication of the complete impact from that point at that time.

Infrastructure Areas

At the high point of Wybong Post Office Road a section of road will have intermittent views, partially screened by vegetation over the coal stockpiles and infrastructure area. This section of the road is approximately 2 km long at a distance of approximately 6 km.

These views will only become possible when the existing spur ridge northeast of Anvil Hill is removed for mining around Year 5. The proposed OEA reaches only RL 200 and will not provide a long term screen to this view.

The coal stockpiles and infrastructure will be viewed from the north as distant middleground elements on the horizon of the ridge approximately 6.2 km distant. The CPP and coal stockpiles will be most visible during the middle of the day and into the afternoon when sunlight falls on the northwestern surface of the elements.

No views of the Tailings Dam and Rail Loop Area are possible.

Open Cut Area

The most significant impact on VP10 will be the progression of the Main Pit Open Cut. The Cut and OEA will be visible from the initial cut and its northwest/southeast axis aligns it with the views from VP10. Around Years 6-9 views down into the pit along its total 2.3 km length will be possible. The pit and OEA will be a close middleground element. As the pit moves southeast the slot will close and recede. Some views of the cut edges of Anvil Hill will be visible around Year 10.

The size, colour and line of the pit will make this a dominant element in the landscape. On completion the OEA of the Main pit will create a new ridgeline and face at approximately 2 km distant. The rehabilitation treatment of this emplacement will affect the long-term visual quality from all viewpoints north and northwest.

5.4.9 VP 11 Ridgeland Road

Transect 03 shows the relative height and location of the Main pit OEM and the Northern Pit OEA from this location.

Infrastructure Areas

When viewing from Ridgeland Road at RL 180 or lower the haul road section between the Northern Pit and the Tailings Pit at around RL 220 screens the CPP and the coal stockpile. The tailings dam and rail loop area are also not visible.

Open Cut Area

The OCA excavation and rehabilitation works will be visible from VP 11 and adjacent locations until around Year 15 of the project. In the very early years of the mine the initial cut of the main pit and northern pit will be highly visible as middleground elements 2.5 to 3.5 km distant. The working areas will each exceed 2.2 km in length and as the viewer is at RL 180 the initial works will be at inferior levels. As time passes, the construction of each OEA will be highly visible. The North Pit moves closer followed by the OEA, which is approximately 1.5 km distant between Years 10 and 15.

The main pit OEA moves further away with superior levels at RL 210 to 220. Views of the cut edge of Anvil Hill will be visible around Years 8 to 10 followed by the construction of the OEA. Views of the Southern pit and the Tailings pit will be screened by the 500kV power line easement and the tailings pit haul road respectively.

5.4.10 VP 12 Golden Highway

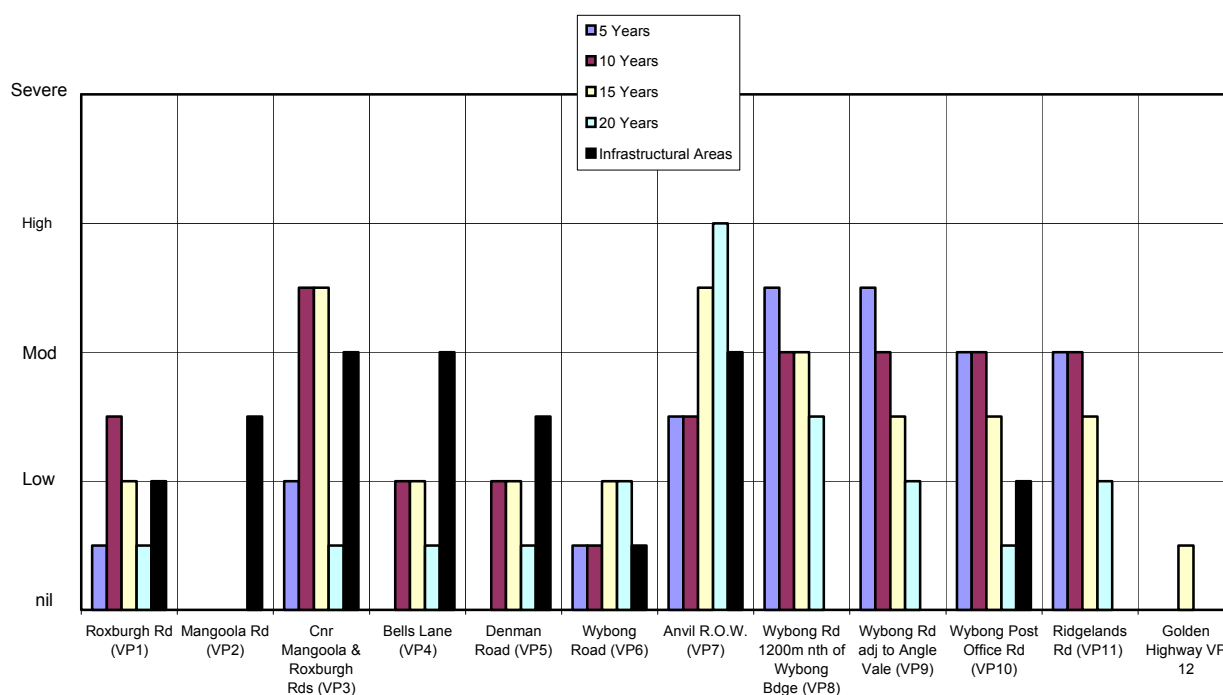
Infrastructure Areas

When viewing from the Golden Highway views of the CPP, the coal stockpile, the tailings dam and rail loop area are not possible.

Open Cut Area

Views of the Open Cut Area are not possible from the Golden Highway.

Table 5.4 Visual Impacts at selected years of the Project life



5.5 Mitigation Measures

The following measures if implemented will reduce the overall visual impacts of the pits, the overburden emplacement areas and the Infrastructural elements from various viewpoints:

- Planting of a vegetative screen along the lower sections of Mangoola Road from Roxburgh Road to the new Rail Loop intersection.
- Curving of the wall of the Tailings Dam north to create a more natural shaped face to Mangoola Road and Denman Road, allowing different vegetation and shadow effects.
- Planting of a vegetative screen along the ridge between Limb of Addy Hill and Bellevue Homestead.
- Design the face of the Main Pit and Northern Pit OEAs to reduce straight edges and curve faces to create greater relief. Vary ridge heights when viewed from Wybong Road. The shape of the western tip of the OEA will be the most significant long-term element and needs careful moulding into existing topography.

- Design the corner of both OEAs at the 500 kV line to shape each corner differently and vary the line of the base of each OEA that runs south parallel to the 500 kV line to reduce visual convergence when viewed from Wybong Road.
- Vary ridge height along the edge of both OEAs adjacent to the 500 kV line. Raise ridge heights at middle or rear edges.
- Relocate the link road from the CPP to the Tailings Dam slightly west to avoid the knoll 500 metres east of the product stockpile. This will ensure existing vegetation on the knoll shields views of the CPP and stockpile from viewers at VP2.
- Select colour of building roof and walls to differentiate elements and reduce visual mass.
- Create a variety of roof and wall edges on the CPP by use of line and colour to reduce long sharp edges in silhouette.
- Recreation of the spur on the northeast edge of Anvil Hill at RL 220 as part of the OEA to assist screening of the CPP from Years 10 to 20 when viewed from the north around VP 10.
- Create a landscape rehabilitation program including woodland revegetation if land use is suitable.

5.6 Night Lighting Impacts

The night lighting impacts for the Anvil Hill Coal Project fall into two parts

- Direct lighting effects
- Sky glow

5.6.1 Direct Lighting Effects

The potential direct lighting impacts from the various pits of the OCA would be visible from a range of viewing points.

Viewpoints and surrounding areas that will be impacted by direct lighting effect at various parts of the life of the Open Cut Areas are at or adjacent to:

- | | |
|-------|--|
| VP 1 | Roxburgh Road approximately 1.5 km from the Wybong Road intersection |
| VP 3 | Corner of Mangoola Road and Roxburgh Road |
| VP 6 | Wybong Road 1.9 km north of the Reedy Creek Road Junction |
| VP 7 | End of Anvil R.O.W. adjacent to Bellevue |
| VP 8 | Wybong Road 1.2 km north of Wybong Bridge |
| VP 9 | Wybong Road adjacent to Angle Vale |
| VP 10 | Wybong Post Office Road |
| VP 11 | Ridgelands Road adjacent to bridge |

Generally areas that can view the works of the Open Cut pits and OEA will be affected by direct lighting at various stages of the work.

The direct lighting impacts of the infrastructure and rail loop areas will be visible from:

- | | |
|------|--|
| VP 2 | Mangoola Road south of Saxonvale |
| VP 3 | Corner of Mangoola Road and Roxburgh Road |
| VP 4 | Mangoola Road 800 metres north of Bells Lane |
| VP 5 | Denman Road |

The impact will vary in intensity depending on positions and working level within the OCA.

A continuing effect will be created by the lighting of the infrastructure and coal handling areas.

5.6.2 Sky Glow

The sky glow component of the night lighting impact is highest when there is a solid low cloud cover. At that time light reflects off the clouds creating the sky glow effect.

Shielding lighting with hoods and louvers would significantly reduce sky glow. Further the use of low brightness lights in the infrastructure area with horizontal floodlight bodies and sharp cut off angles can also reduce stray light.

Because of the location of the mine and the dark background levels of luminance it will be impossible to completely reduce the sky glow impacts. On a cloudy night the valley and sky will glow with a soft reflected light.

5.7 Assessment of Nightlighting Impacts

Nightlighting impacts for the OCA and OEMs will vary with time and atmospheric conditions. We have assessed the impacts at the highest anticipated levels for each viewpoint. Nightlighting impacts for the infrastructure areas are assumed to be constant. **Table 5.7**, at the end of this section, provides a graphic representation of the anticipated impacts without mitigation.

5.7.1 VP 1 Roxburgh Road

The Rail Loop is not visible from VP1 and will contribute only sky glow to the night lighting cast by the mine activities. The CHPP and stockpile areas are visible at a distance of 8.2 km. The impact increases during the night due to the darkness of the background ranges. As a result the CPP and workshop areas will be clearly visible.

Work on the visible elements of the Southern, Northern and Main Pit OCAs and OEAs will also be visible for the durations and locations noted in the OCA analysis above. Whilst reduced by distance, these impacts will be visible due to the relative darkness and lack of other direct lighting on the ranges to the west beyond the mine site.

5.7.2 VP 2 Mangoola Road

From VP2 night lighting will generally be restricted to sky glow from the mine area and separately from the Rail Loop Area due to the different locations of each element.

Approximately 900 metres south of VP2 on Mangoola Road some views of the Rail Loop are possible and direct lighting from the Rail Loop will be visible at a distance of approximately 2 km. These views are with the viewer at a superior elevation allowing the shielding of fittings to be most effective.

5.7.3 VP 3 Cnr Mangoola & Roxburgh Roads

From VP3, night lighting will be most significant from the Rail Loop Area and the Infrastructure Area. The Rail Loop is approximately 45 metres lower than VP3 at a distance of approximately 1.8 km. The lights of the Infrastructure Area and the CHPP will be visible throughout the life of the mine. As VP3 is at an inferior level to the infrastructure lighting more light spill from these fittings is likely and the shielding of the fittings for light spill will be

less effective than those at the Rail Loop. This effect will be reduced by the increased distance to the CHPP and other infrastructure of around 3.5 km.

Direct lighting effects on VP3 from the construction of pits and each OEA will be restricted to times and durations similar to the daytime effects. The likely movement of lights mounted on vehicles and flashing creates significant active lighting impacts against the dark background. Sky glow from all pits and construction of the OEAs will be possible throughout mine life and dependent on the weather conditions.

5.7.4 VP 4 Adjacent to Bells Lane

Lighting effects from the OCA areas will be limited to sky glow at a distance not less than 3.5 km. The construction of the Southern Pit OEA will create some direct lighting impacts between Years 10 and 15.

The Rail Loop, CPP and other infrastructure will create some direct lighting impacts at various distances between 2 km and 5 km from a range of viewing locations adjacent to VP4 along Mangoola Road. Screening will be less effective due to the inferior level of viewers at VP4.

5.7.5 VP 5 Denman Road

Impacts are similar in location, duration and number to VP4. The slightly higher viewer elevation at VP5 will allow more views into the infrastructure and Coal Handling Area with a resultant increase in light spill. The rail load out bin and facilities will be at a slightly inferior level to VP5 creating views down and into the rail loop area. This will allow shielding of the light fittings to be very effective from this viewing location. These impacts will be further offset by the *increased distance* of these objects from the viewer when compared to VP4.

5.7.6 VP 6 Wybong Road

Night lighting effects will be limited to sky glow for viewers at VP6 except for night work on the Main Pit OEA visible south of Anvil Hill for a few years between Years 10 to 15. This effect is limited to a narrow viewing corridor on Wybong Road around RL 170.

5.7.7 VP 7 Adjacent to Bellevue

The lighting effects follow the movement of the pits and OEAs. When the pits are not visible the lighting effects will be sky glow only. However toward the end of the mine life the Main Pit lighting will be highly visible. Lighting effects from the OEAs will potentially be significant depending on the operational methods and timing of work on each OEA. In general however it can be anticipated that night work on the OEAs will be visible from VP7 throughout the bulk of the 21 year mine life.

5.7.8 VP 8 Wybong Road

Night lighting effects follow the movement of the Main pit OCA and OEA. The overall effect will be moderate until after Year 15, focused on the OEA and sky glow from the main pit as foreground to close middleground elements with potential for some direct lighting impacts on the working face of the OEM.

5.7.9 VP 9 Wybong Road 1100m south of Wybong Post Office Road

It is likely that night lighting effects will be obvious through the roadside vegetation and sky glow from the OCA will be significant as a foreground and close middleground element for the life of the Main Pit. Effects will vary but overall impacts are likely to be moderate to high.

5.7.10 VP 10 Wybong Post Office Road.

Night lighting effects will be constant over a wide horizon from inception to completion of the mine. The dynamic effects of lighting of the main pit and OEA will be supplemented by works on the north pit OEA and lighting at the CHPP and coal stockpiles. The overall effect will be moderate rising to high at peak times around Years 5-10.

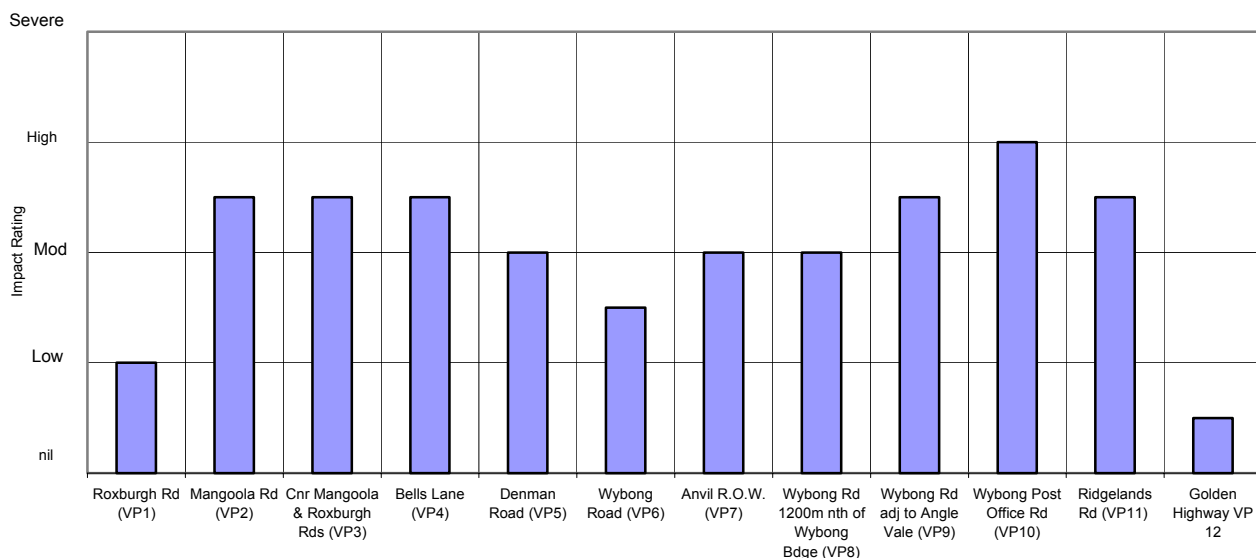
5.7.11 VP 11 Ridglands Road

The night lighting effects will vary throughout the mine life following the movements of the OCA and the OEA. Initially impacts will be moderate and rising as the Northern Pit OEA reaches completion around Years 12-15.

5.7.12 VP 12 Golden Highway

Night lighting effects will be limited to skyglow. This may appear on a limited number of nights both northwest and southeast of the Limb of Addy Hill when cloud cover is heavy and works are proceeding on the adjacent areas of the pits or OEMs.

Table 5.7 Nightlighting Impacts



5.8 Mitigation Measures (Night Lighting)

The measures that could be taken by Centennial to mitigate adverse night lighting impacts are as follows:

- Within the Infrastructure Areas use approximately 15 metre high light columns and low brightness floodlights with the floodlight body horizontal and the floodlight reflector designed to provide sharp cut-off and restrict stray light.
- Clad the whole of the north, east and south sides of the workshop and CHPP and eliminate translucent panels from the roof, the north, south and eastern sides of the building if they are visible from rural residential areas to the north, south and east.
- Use wall mounted lights with horizontal bodies and low brightness design to light areas around the workshop and CPP to 50 lux and adjacent portions of the hard stand area to 10 lux.
- Shield all floodlights in the Open Cut Area to the maximum extent practicable.
- Face workshop doors south, south west to reduce light spill.
- Where safe to do so, trucks on access roads would make use of portable visual edge markers to increase drivers' visibility of road edges when driving with dipped headlamps.
- Work programmes could be arranged so that work can be carried out on surfaces of the OCA and OEM visible from outside the lease area only during daytime hours as defined by the EPA or only at lower levels of the emplacement at night.
- Restriction of work to daylight hours or only at lower levels at night on the overburden emplacement areas would significantly reduce potential direct lighting effects from random elements such as truck headlights and flashing beacons moving on the OEAs and haul roads at night. This would maintain the night time ambience for rural residential properties north, east and south of the OEAs.

5.9 Individual Residences

The potential visual impacts for individual residences throughout the Study Area vary relative to their location, elevation and distance to the proposed mine and associated infrastructure. Given the dynamic nature of the mining operation, an assessment similar to those given for each selected viewpoint is not possible within the scope of this report. The impacts at residences can be ascertained by reference to the viewpoint that most closely resembles the location, elevation and distance to the proposed mine and associated infrastructure.

However, one group of residences and another particular residence have impacts that are likely to vary significantly from those possible on adjacent public roads and open spaces and from the view points discussed.

5.9.1 Residences west of VP8 between Wybong Road and Wybong Post Office Road

This group of residences varies from the impacts noted at VP8 due to superior viewing elevations but at slightly greater distances from the mining areas. These different characteristics result in differing impacts throughout the life of the mine. Due to their

elevation, these residences will view across the vegetation screen along Wybong Road and onto the working area of the Northern and Main Pits. The workings of the Northern Pit and its OEA will be visible for a relatively short period at the commencement of the mine life until the Northern OEA is fully formed and rehabilitated. The Main Pit will however be located between the Main Pit OEA and the residences. As a result these residences will view the progress of the Main Pit to the west and the progress of the Main Pit OEA as an unrehabilitated face throughout the life of the mine.

Night lighting impacts will be similarly more extensive. Residences located more to the south will be less affected than those to the north due to the partial screening effect of the northern end of Wallaby Rocks. Some increases in impact will be partially ameliorated by the increased distance to the OCA and OEM. The resultant impacts will be similar to VP8 in the first five years of the mine life. The progress of the mine toward the residences and the associated gradual diminution of distance to the workings will maintain the impacts in the Moderate to High range for the life of the mine, increasing toward the end of the mine life.

Views of the CPP, workshop, administration and coal stockpile areas will also be possible from the northern most residences close to Wybong Post Office Road.

Night lighting impacts will be similarly more extensive. Night lighting effects will increase into the Moderate to High range for all residences east of Yarraman Road for the life of the mine.

5.9.2 "The Knob" Lot 11 Merriwa Rd, (The Golden Highway)

The visual impacts on this property vary significantly from those possible on the adjacent portion of the Golden Highway, represented by VP12. On the road west of Denman Knob views of the mine are not possible. This residence however is on the eastern side of Denman Knob facing north east at an elevation of approximately RL 240. In this location the workings of the Main Pit, Northern Pit and the bulk of the Southern Pit are not visible as they are screened by the Limb of Addy and the adjacent outcroppings running northwest and east. The south eastern edge of the Southern Pit and the Southern OEA will however be visible at a distance of approximately 4.5 km commencing around year 5. As the viewing location is superior to the screening ridge by 20 to 25 metres, limited views into the pit and views of the unrehabilitated face of the OEA will be possible from Year 5 until at least Year 15. Given the distance from the viewer to the mine elements impacts will vary from low to moderate depending on the amount of unrehabilitated surface visible at any time.

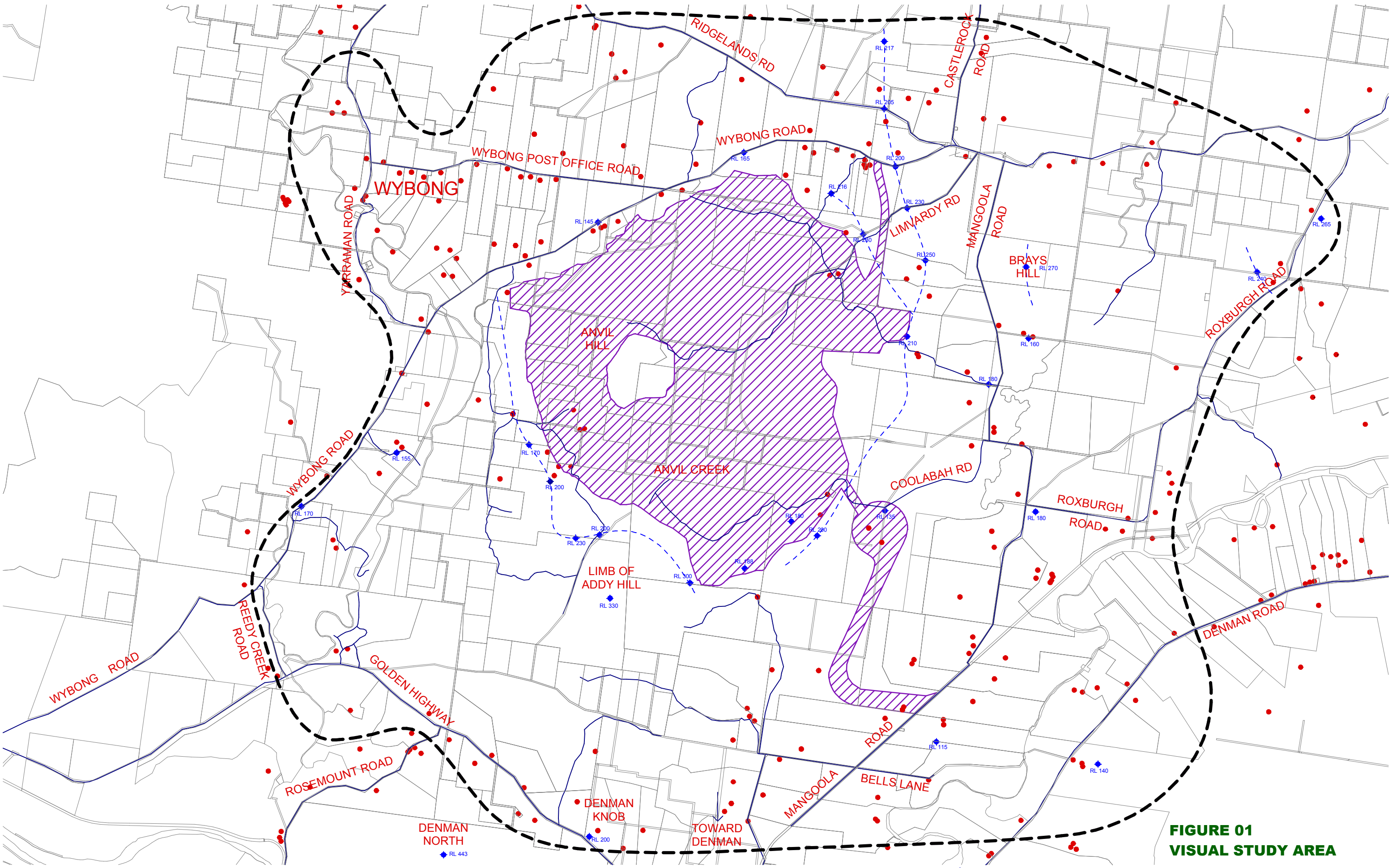
In addition views of the coal stockpiles and infrastructure elements will be visible at a distance of approximately 6.5 km until approximately Year 12 or 13, when the southern edge of the OEA is rehabilitated at its upper level of approximately RL 240 creating a screen to the elements further to the east. These impacts will be Low reducing to Nil.

Night lighting will have similar impact levels varying from low to moderate depending on mine sequence, the orientation of the buildings, location of plant and access roads at any point in time. Sky glow from the Main Pit area will potentially be of moderate impact in the last 10 to 15 years of mine life depending on density of cloud cover.

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 - Williamson, Dennis. *Scenic perceptions of Australian Landscapes*, LANDSCAPE AUSTRALIA, 1979 vol. 2
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-

FIGURES



**FIGURE 01
VISUAL STUDY AREA**



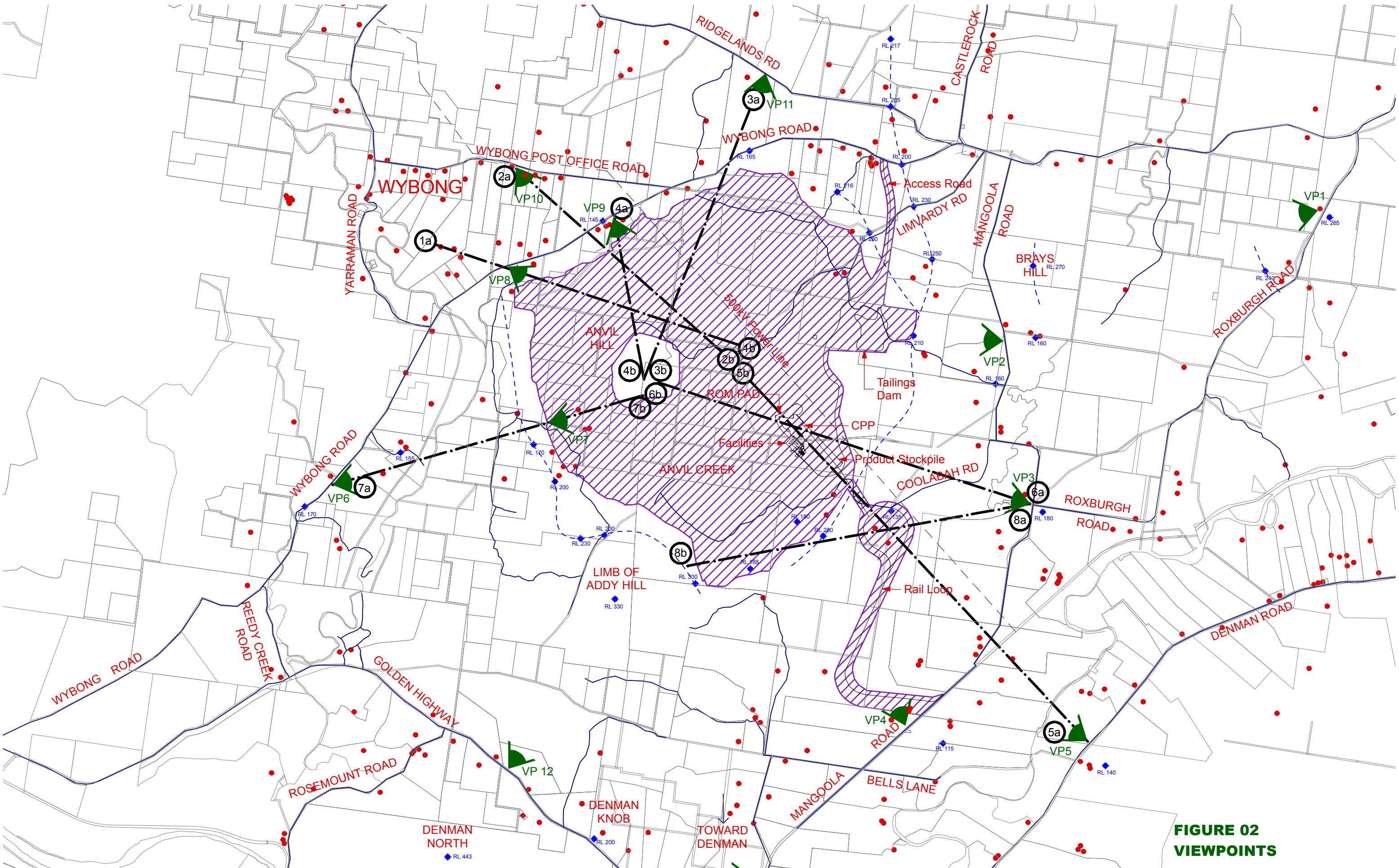
Scale 1:50,000 (km)

LEGEND

- Visual Study Area
- Mine Disturbance Area
- Ridge Lines
- RL's
- Residences



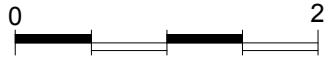
NORTH



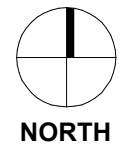
**FIGURE 02
VIEWPOINTS**

LEGEND

- VP View Point Locations
- Mine Disturbance Area
- Ridge Lines
- RL's
- Residences
- Sections



Scale 1:50,000 (km)



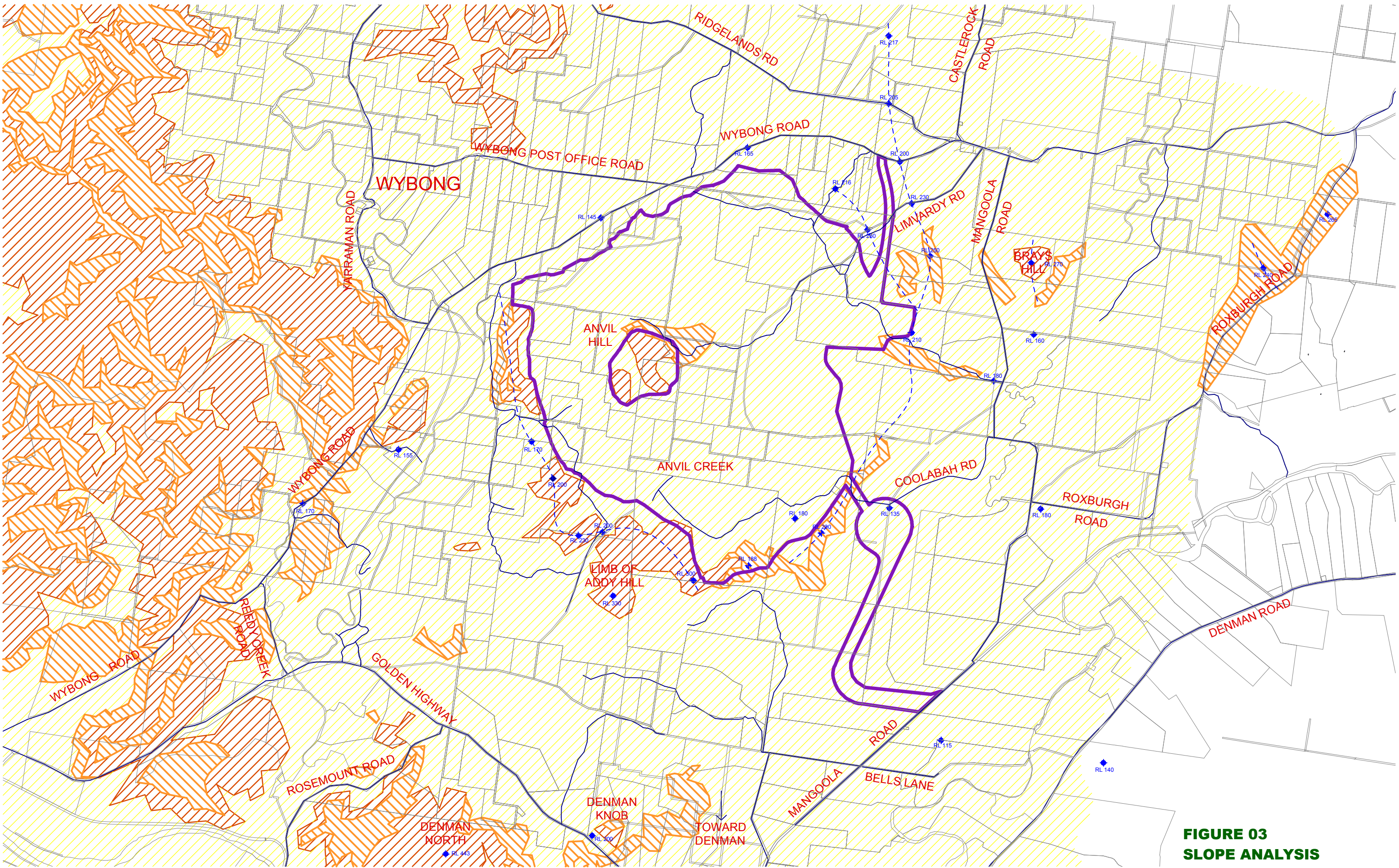
NORTH



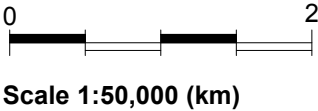
O'HANLON DESIGN Pty Limited
LANDSCAPE ARCHITECTS

Anvil Hill Coal Mine
Visual Impact Assessment

REF	DATE	REVISION	ISSUE
735-02	JUN 06	FINAL	F



**FIGURE 03
SLOPE ANALYSIS**



LEGEND

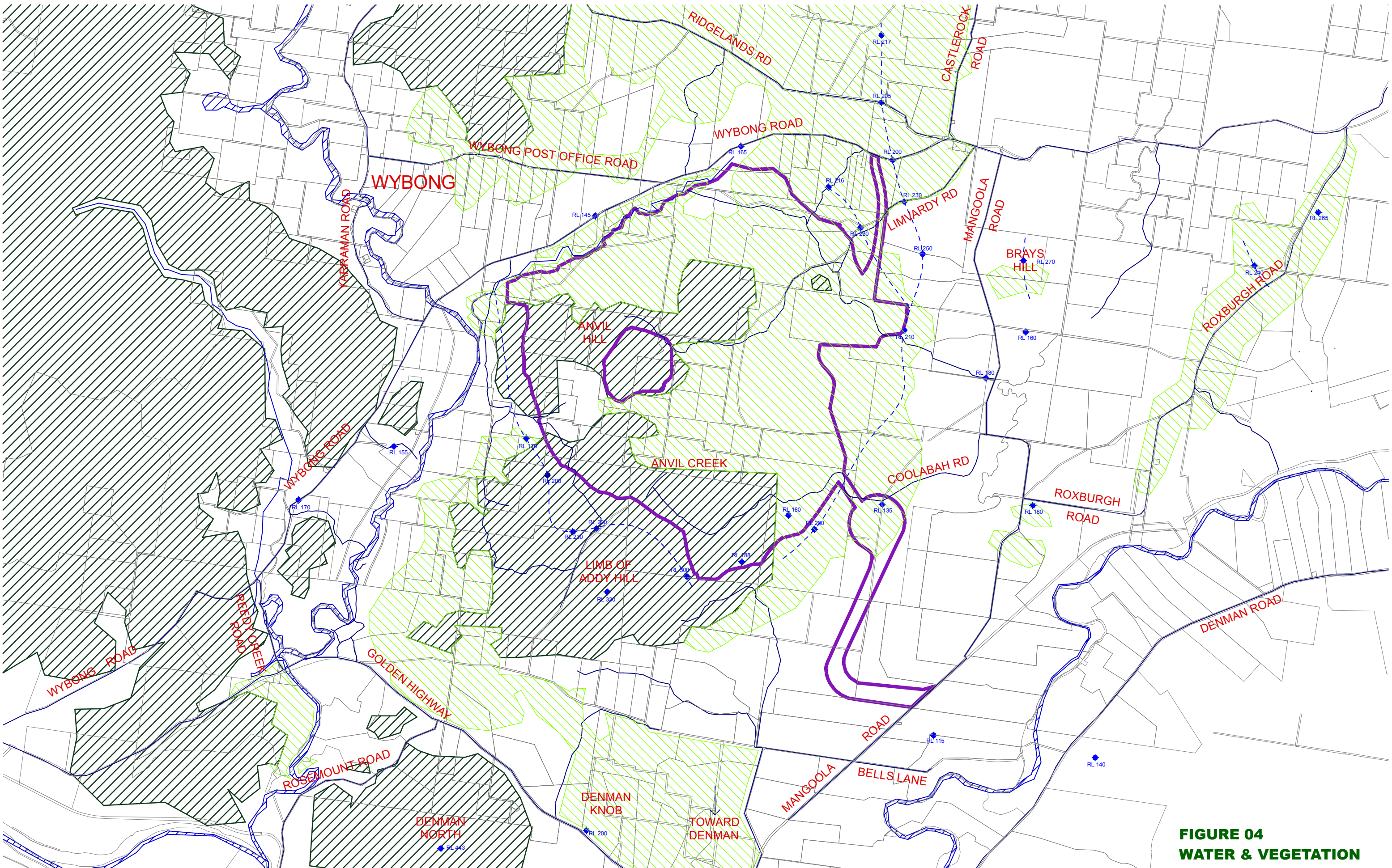
- 0% - 10% Slope
- 10% - 30% Slope
- 30% > Slope
- Ridge Lines
- RL's
- Mine Disturbance Area



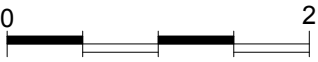
O'HANLON DESIGN Pty Limited
LANDSCAPE ARCHITECTS

Anvil Hill Coal Mine
Visual Impact Assessment

REF	DATE	REVISION	ISSUE
735-03	JUN 06	FINAL	F



**FIGURE 04
WATER & VEGETATION**



Scale 1:50,000 (km)

LEGEND

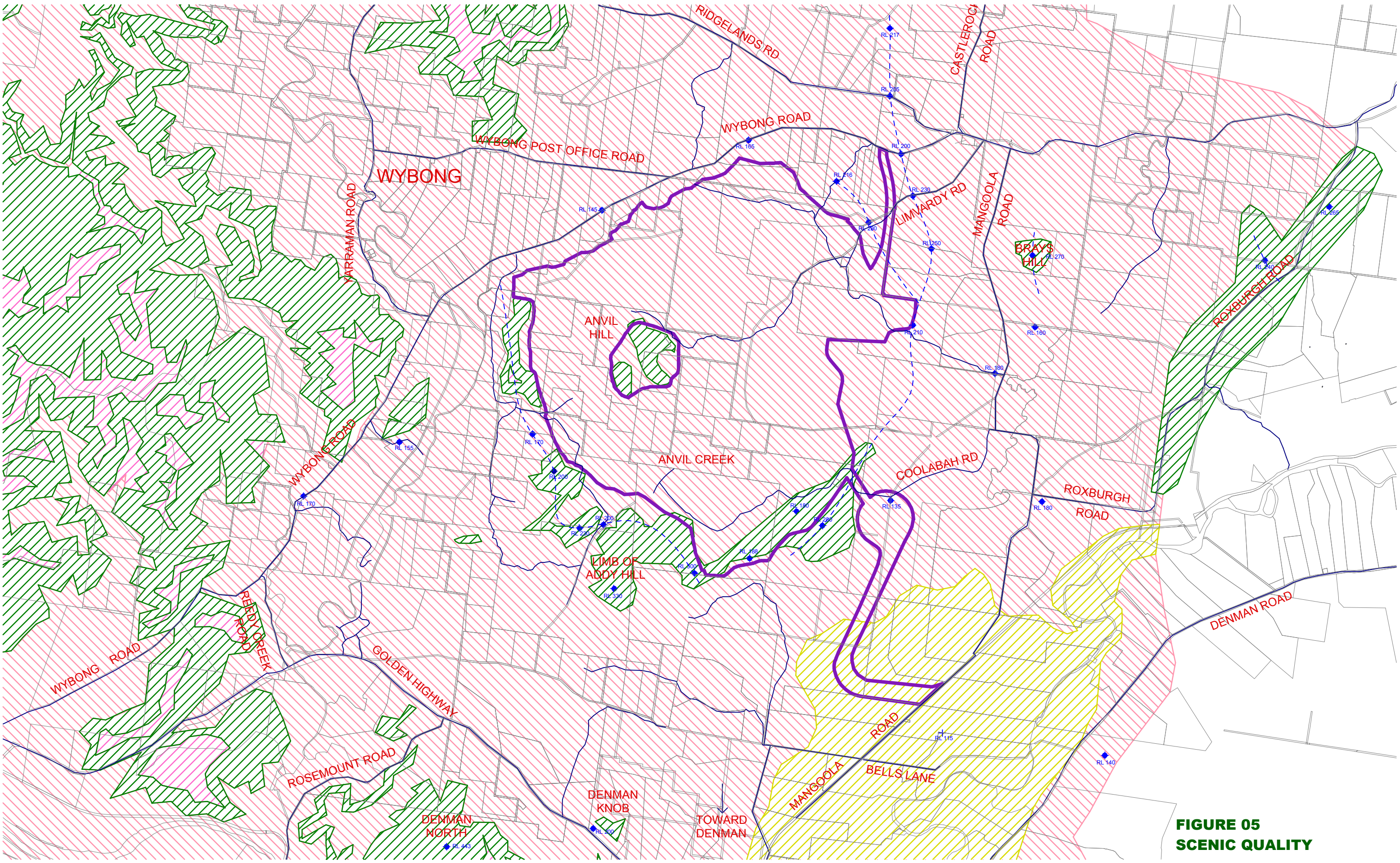
- Dense Natural Vegetation
- Scattered Natural Vegetation
- Permanent Water Bodies
- Ridge Lines
- RL's
- Mine Disturbance Area

REF	DATE	REVISION	ISSUE
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735-04 JUN 06 FINAL F



NORTH



**FIGURE 05
SCENIC QUALITY**

LEGEND

- Low / Moderate Scenic Quality
- Moderate Scenic Quality
- Moderate / High Scenic Quality
- Ridge Lines
- RL's
- Mine Disturbance Area

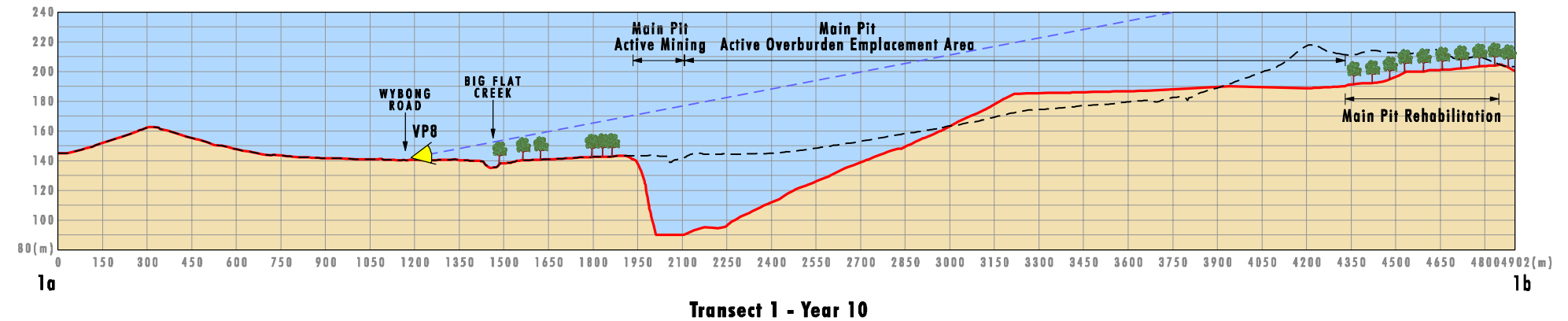
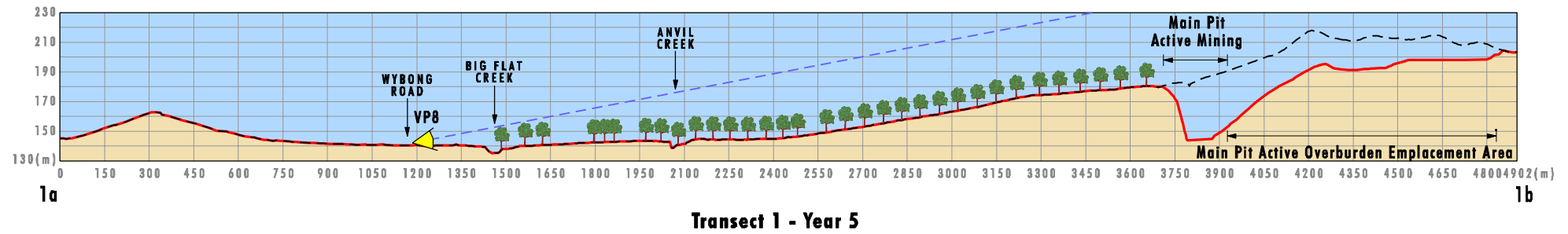
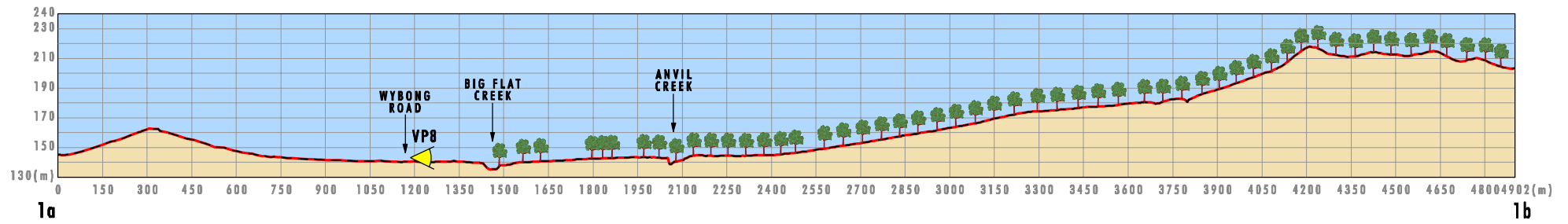


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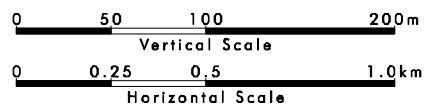
TRANSECTS



Legend

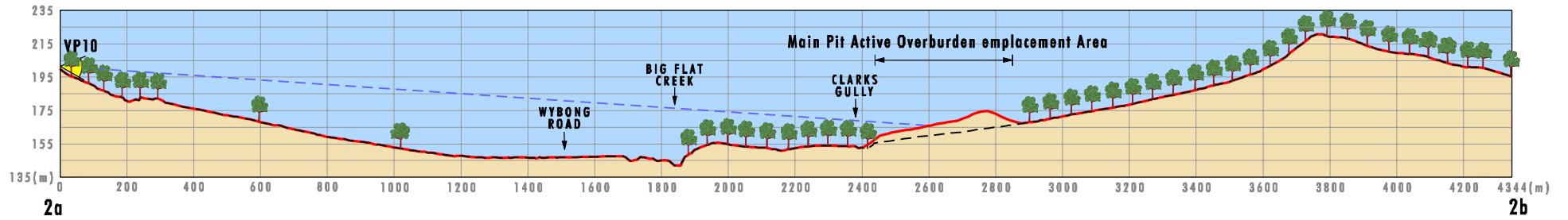
- Existing Surface
- Post-Mining Surface
- Line of Sight
- ▲ Viewpoint
- Tree

Vertical Exaggeration 1:5

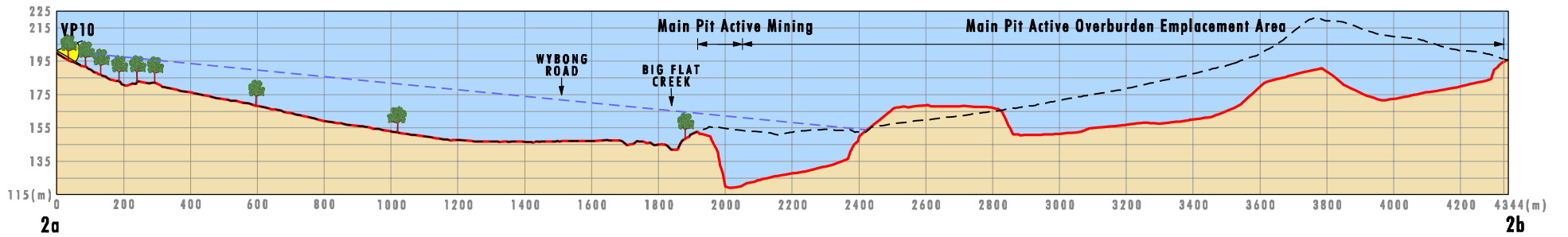


TRANSECT 1a-1b

VP 8 - Year 2, Year 5, and Year 10



Transect 2 - Year 2



Transect 2 - Year 5

Legend

- Existing Surface
- Post-Mining Surface
- Line of Sight
- ▲ Viewpoint
- Tree

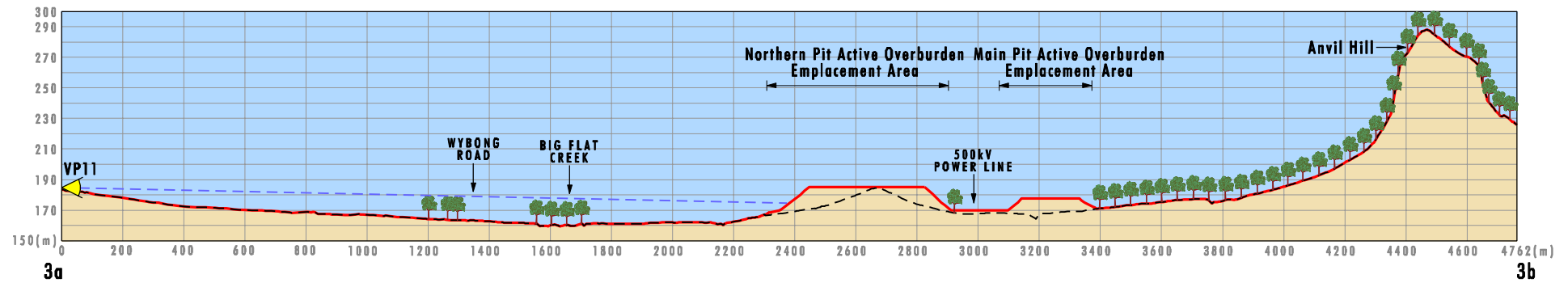
Vertical Exaggeration 1:5

0 40 80 160m
Vertical Scale

0 200 400 800m
Horizontal Scale

TRANSECT 2a-2b

VP 10 - Year 2 and Year 5

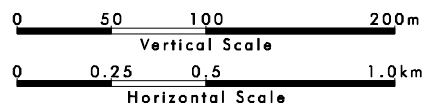


Transect 3 - Year 2

Legend

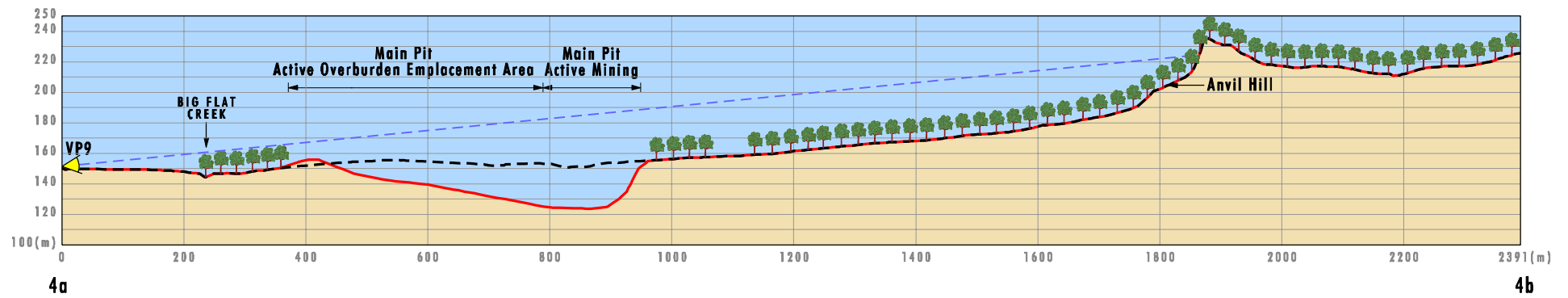
- Existing Surface
- Post-Mining Surface
- Line of Sight
- ▲ Viewpoint
- Tree

Vertical Exaggeration 1:5



TRANSECT 3a-3b

VP 11 - Year 2



Transect 4 - Year 5

Legend

- Existing Surface
- Post-Mining Surface
- Line of Sight
- Viewpoint
- Tree

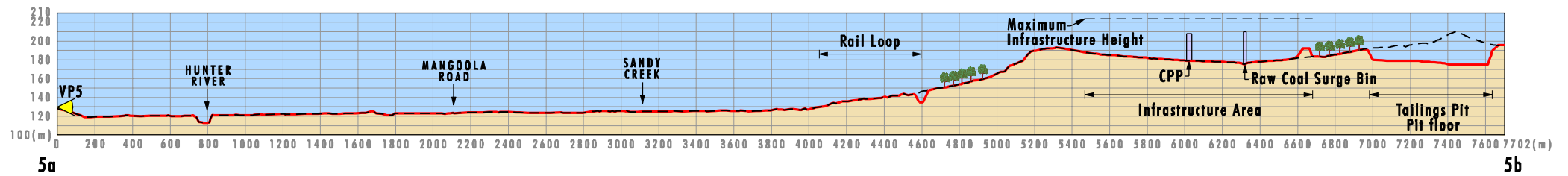
Vertical Exaggeration 1:2.5

0 40 80 160m
Vertical Scale

0 100 200 400m
Horizontal Scale

TRANSECT 4a-4b

VP 9 - Year 5



Transect 5 - Year 10

Note: Infrastructure elements are diagrammatic and locational only due to the vertical exaggeration distortion

Legend

- Existing Surface
- Post-Mining Surface
- ▲ Viewpoint
- 🌳 Tree

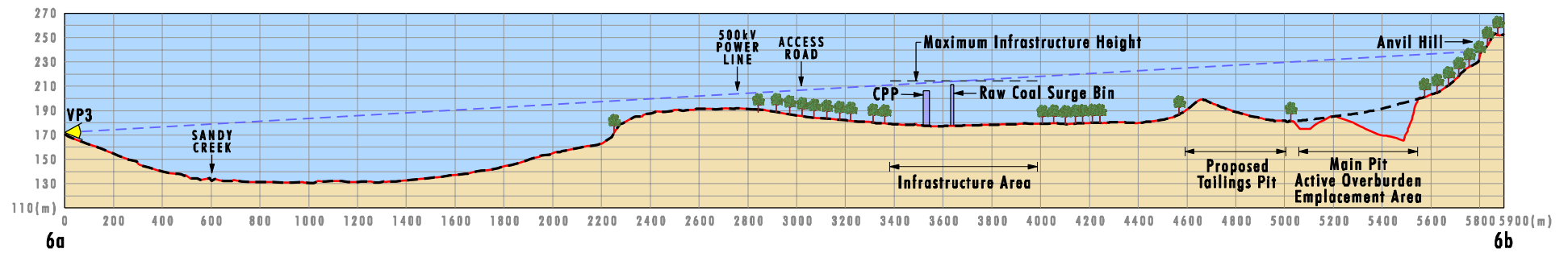
Vertical Exaggeration 1:5

0 100 200 300m
Vertical Scale

0 0.5 1.0 1.5km
Horizontal Scale

TRANSECT 5a-5b

VP 5 - Year 10



Transect 6 - Year 10

Note: Infrastructure elements are diagrammatic and locational only due to the vertical exaggeration distortion

Legend

- Existing Surface
- Post-Mining Surface
- Line of Sight
- ▲ Viewpoint
- Tree

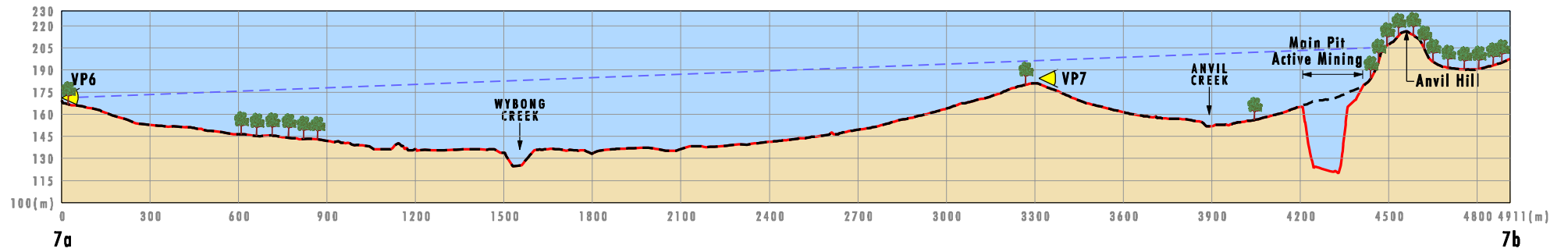
Vertical Exaggeration 1:5

0 50 100 200m
Vertical Scale

0 0.25 0.5 1km
Horizontal Scale

TRANSECT 6a-6b

VP 3 - Year 10



Transect 7 - Year 15

Legend

- Existing Surface
- Post-Mining Surface
- Line of Sight
- Viewpoint
- Tree

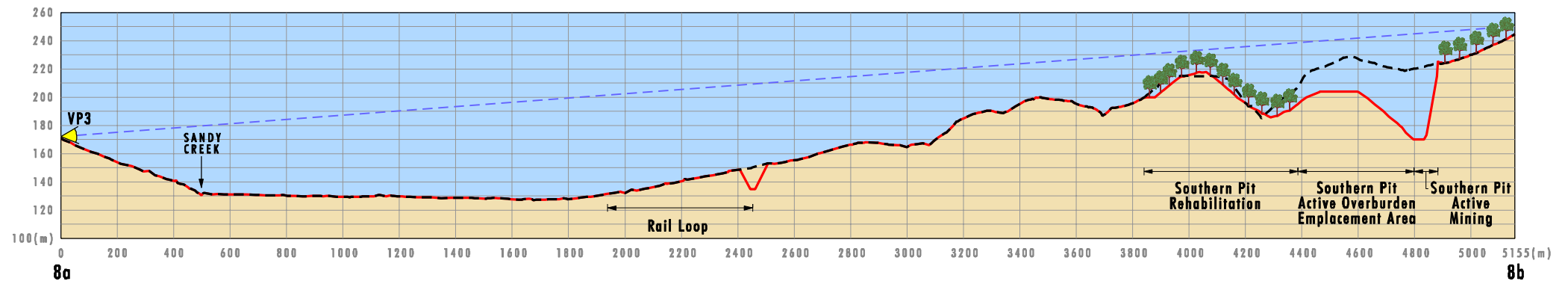
Vertical Exaggeration 1:5

0 50 100 200m
Vertical Scale

0 0.25 0.5 1.0km
Horizontal Scale

TRANSECT 7a-7b

VP 6 and VP7 - Year 15



Transect 8 - Year 15

Legend

- Existing Surface
- Post-Mining Surface
- Line of Sight
- Viewpoint
- Tree

Vertical Exaggeration 1:5

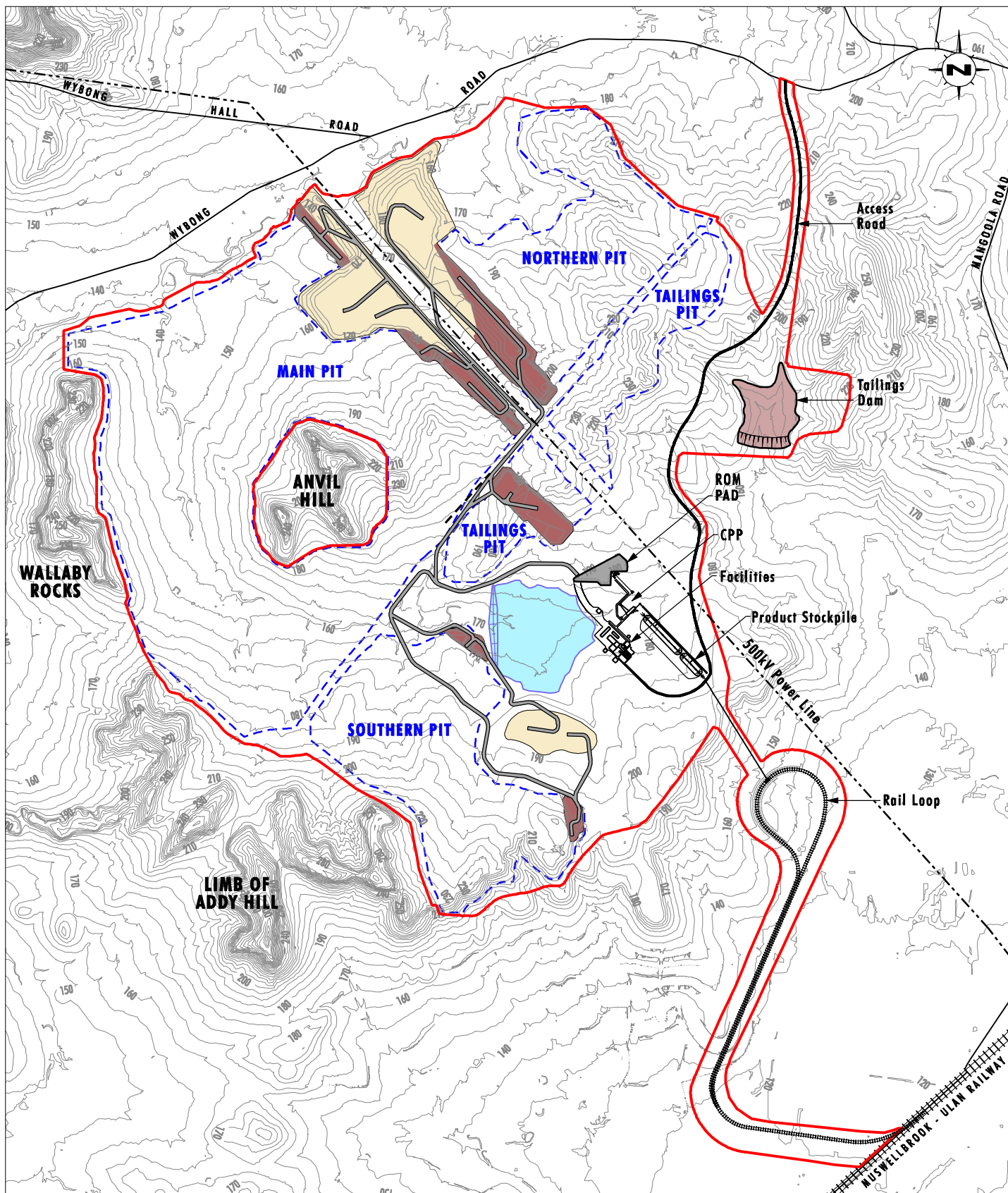
0 50 100 200m
Vertical Scale

0 0.25 0.5 1km
Horizontal Scale

TRANSECT 8a-8b

VP3 - Year 15

APPENDICES



Source: Mine Consult (2005)
Base Map: Dept. of Lands (2003), Geospectrum (2004)

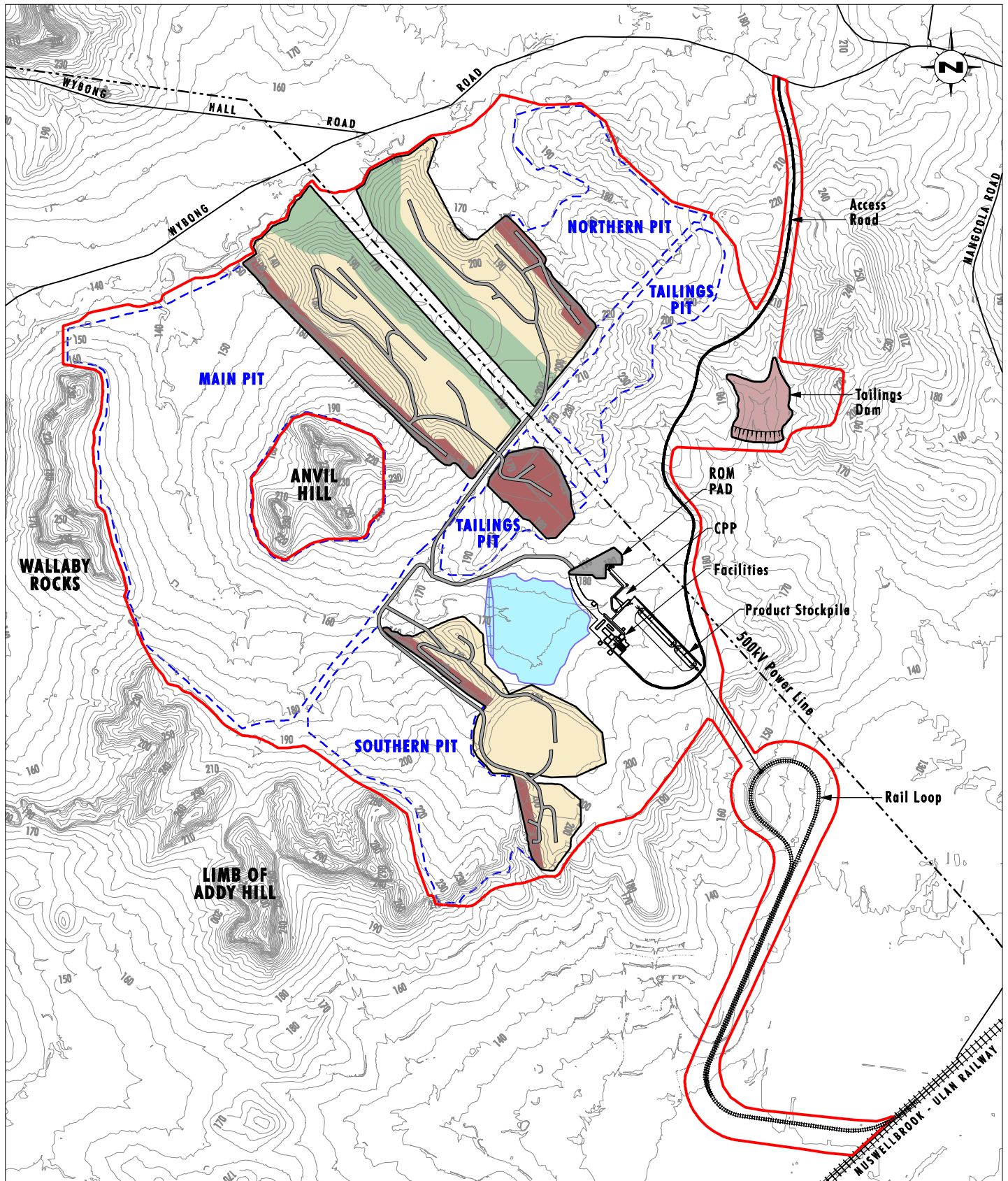
0 0.5 1.0 2km

Legend

- Proposed Disturbance Area
- - - Proposed Mining Area
- Haul Road
- Active Pit
- Active Overburden Emplacement
- Active Tailings
- Main Dam

APPENDIX 1

Conceptual Progression of Mining Year 2



Source: Mine Consult (2005)
Base Map: Dept. of Lands (2003), Geospectrum (2004)

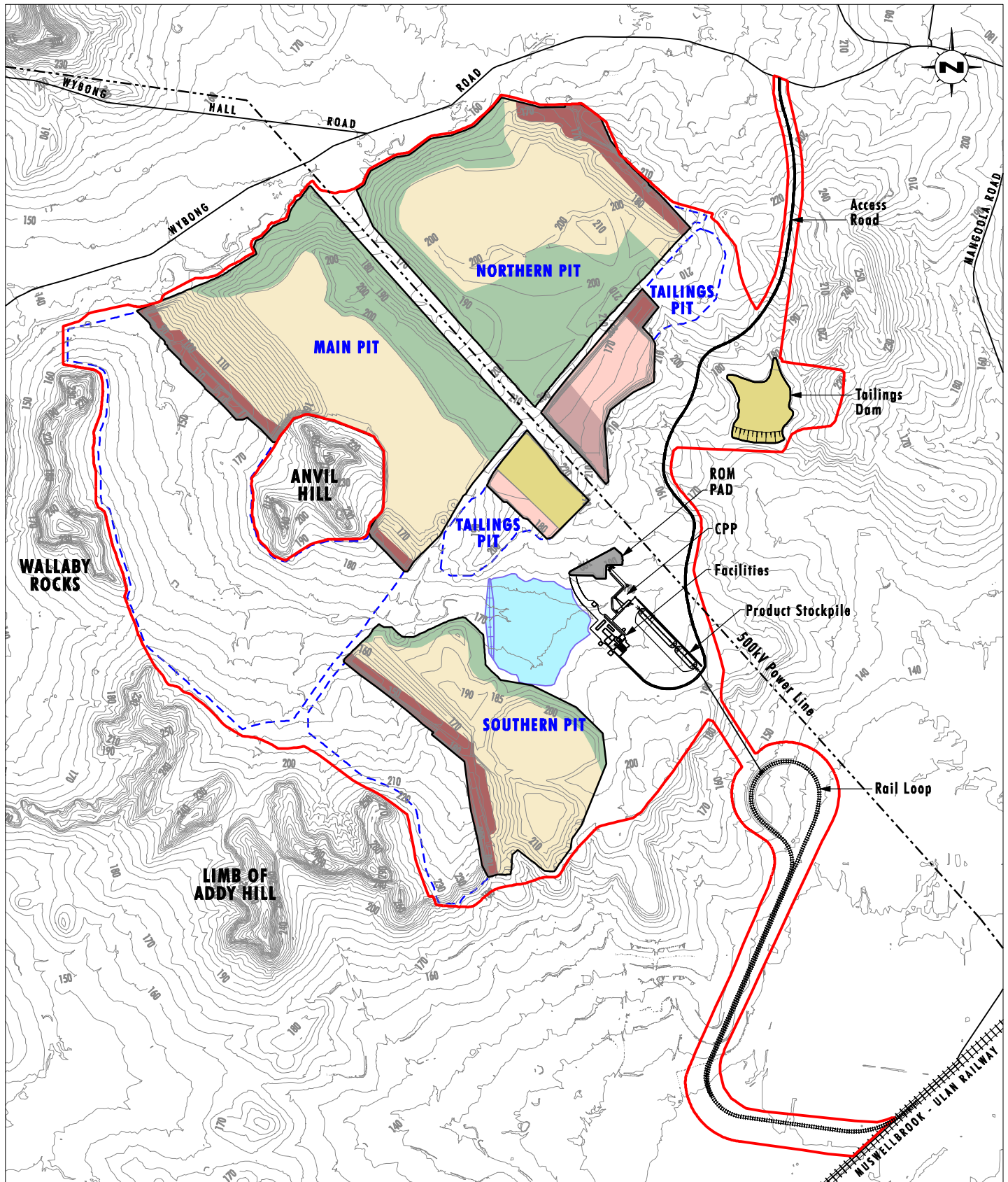
0 0.5 1.0 2km

Legend

- Proposed Disturbance Area
- - - Proposed Mining Area
- Haul Road
- Active Pit
- Active Overburden Emplacement
- Active Tailings
- Rehabilitation
- Main Dam

APPENDIX 2

Conceptual Progression of Mining Year 5



Source: Mine Consult (2005)
Base Map: Dept. of Lands (2003), Geospectrum (2004)

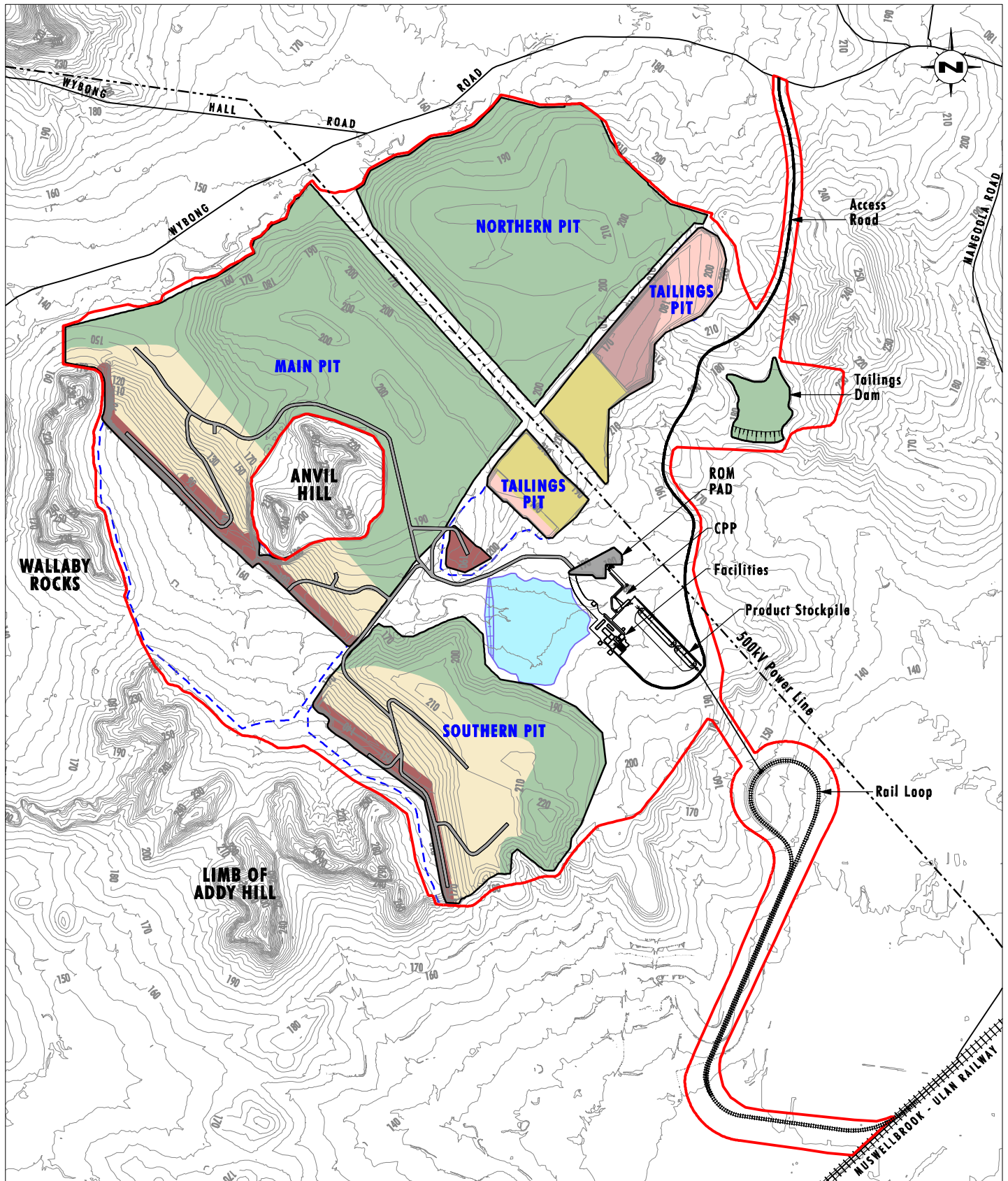
0 0.5 1.0 2km

Legend

- | | |
|---|---|
| — Proposed Disturbance Area | — Rehabilitation |
| — Proposed Mining Area | — Main Dam |
| — Haul Road | |
| — Active Pit | |
| — Active Overburden Emplacement | |
| — Active Tailings | |
| — Inactive Tailings | |
| — Pit Floor | |

APPENDIX 3

Conceptual Progression of Mining Year 10



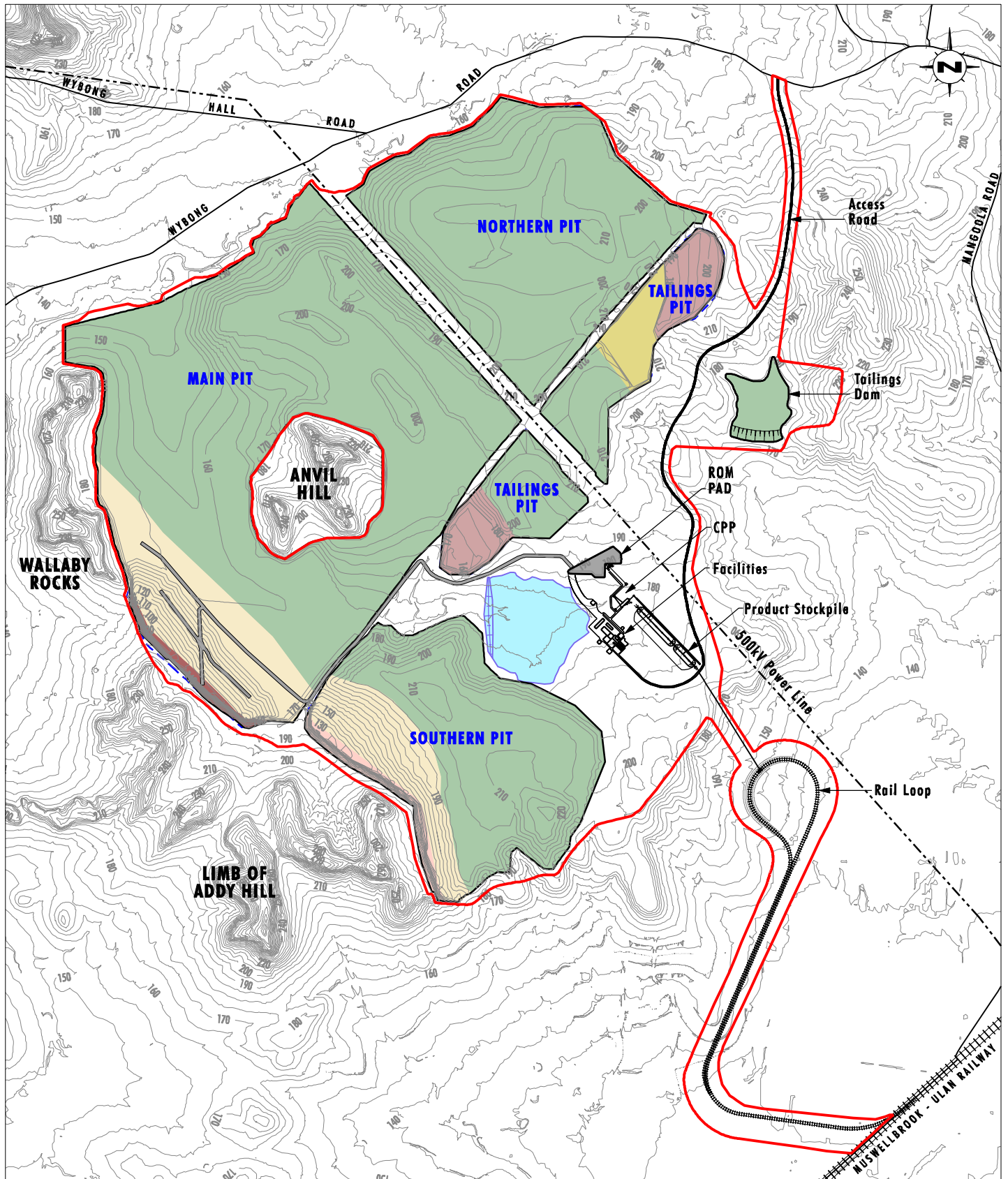
Source: Mine Consult (2005)
Base Map: Dept. of Lands (2003), Geospectrum (2004)

Legend

- | | |
|--|---|
| Proposed Disturbance Area | Rehabilitation |
| Proposed Mining Area | Main Dam |
| Haul Road | |
| Active Pit | |
| Active Overburden Emplacement | |
| Active Tailings | |
| Inactive Tailings | |
| Pit Floor | |

APPENDIX 4

Conceptual Progression of Mining Year 15



Source: Mine Consult (2005)
Base Map: Dept. of Lands (2003), Geospectrum (2004)

0 0.5 1.0 2km

Legend

- | | |
|--|---|
| Proposed Disturbance Area | Rehabilitation |
| Proposed Mining Area | Main Dam |
| Haul Road | |
| Active Pit | |
| Active Overburden Emplacement | |
| Active Tailings | |
| Inactive Tailings | |
| Pit Floor | |

APPENDIX 5

Conceptual Progression of Mining Year 20