

# MOOLARBEN COAL PROJECT

*Stage 2*

## *A P P E N D I X 14*

### *Visual and Lighting Impact Assessment*



**STAGE 2  
MOOLARBEN COAL  
PROJECT**



**VISUAL & LIGHTING  
IMPACT ASSESSMENT**

*Prepared for*  
**MOOLARBEN COAL MINES PTY LTD**

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**1.1 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; and
- To assess the visual impact of the Stage 2 Moolarben Coal Project: Stage 2(MCP) and the proposed ameliorative measures.

**1.2 Methodology**

This visual impact assessment has been divided into five sections:

- 1 Introduction
- 2 Landscape Assessment
- 3 Scenic Quality Assessment
- 4 Relevant Aspects of the Proposed Development
- 5 Visual Impact Assessment

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 (USDA), 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 1970's. Much of the work on visual impact has been carried out by the United States Department of Agriculture (USDA) Forest Service. The USDA Forest Service has issued the following documents amongst others to describe an appropriate method of impact assessment:

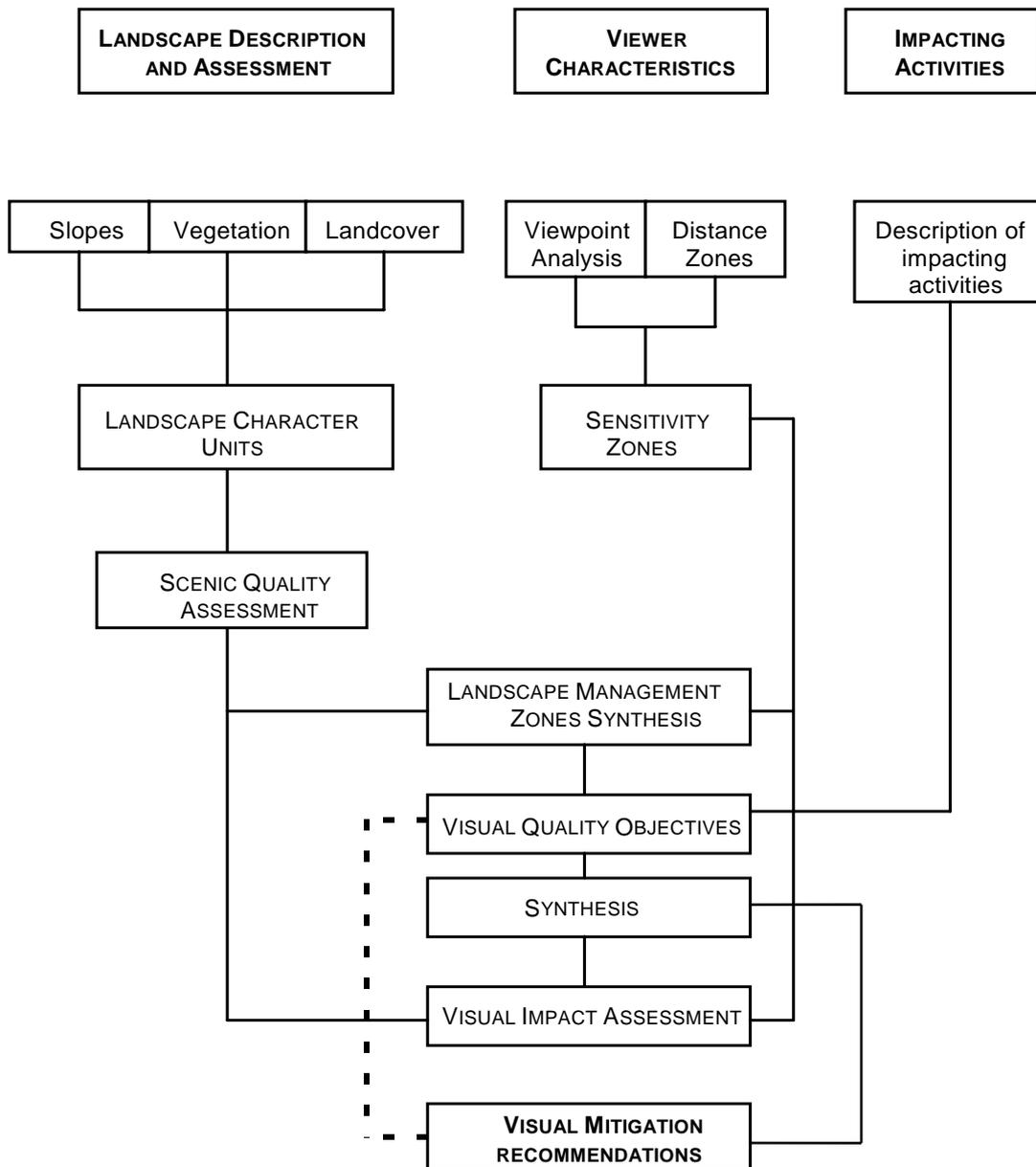
- "Forest Landscape Description and Inventories. A basis for Land Planning and Design" USDA Forest Service Research Paper PSW-49 R. Burton Litton Jr;
- National Forest Landscape Management Handbook No. 434 February 1973;
- USDA Forest Service, Agricultural Handbook No. 462, "National Forest Landscape Management" Volume 2 Chapter 1 The Visual Management system - April 1974;
- "National Forest Landscape Management" Volume 2 Chapter 2 Utilities, USDA Forest Service - July 1975; and
- USDA 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 USDA Forest Services 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 qualitative assessment of visual impact seeks a higher level of objectivity in determining visual impact of any particular project or development. The USDA Forest Service system has become a benchmark for the qualitative measurement and assessment of the visual impact.

The Forest Commission of Victoria (The Commission) 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 USDA 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**  
**Visual Impact Assessment Methodology**



## 2.1 The Project

Stage 2 of the MCP is located approximately 40 km north of Mudgee and approx 5.6 km east of the village of Ulan. The Open Cut Area (O/C 4) is located in the Murragamba Valley and is on its north east boundary adjacent to the Ulan-Wollar Road. Stage 2 of the project seeks to extract coal from two underground mines and one open cut mine, with associated overburden emplacement over a period of 27 years. Stage 2 of the project seeks to use the coal handling plant, stockpiles, rail loop infrastructure approved in Stage 1 and add to the underground access points and ventilation shafts. The project has a north-south footprint of approx 7km and an overall width of approx 5km.

The underground mines are referred to as Underground 1 (U/G1) and Underground 2 (U/G2). U/G1 is located beneath the sandstone ridge that divides the Stage 1 and Stage 2 Open cut areas. U/G2 is located beneath the sandstone ridge at the north end of Munghorn Gap Nature Reserve.

The Stage 2 open cut mine is described as Open Cut No. 4 (O/C4), and covers an area of approx 1270 ha. O/C4 is located in Murragamba Valley and limited to the north by the Ulan-Wollar Road. The extraction sequences of both U/G1, and U/G2 in combination with O/C4 will be coordinated with the proposed extraction of Stage 1. O/C4 will be a 24 hour 7 days a week operation.

## 2.2 The Existing Environment

### 2.2.1 *Regional Landscape Character*

The regional landscape character in the area surrounding Gulgong and Mudgee varies considerably from the landscape of the Hunter Valley to the east. The area around Mudgee is dominated by the Great Dividing Range which passes approximately 18km north of Mudgee in a north westerly direction then turns to resume its progress north. As the Great Dividing Range transverses the area it sets the physical pattern for the visual quality. The uplift of the main ridge system is supplemented by extensive uplift and ridge formation predominantly to the east of the main ridge.

The individual ridges are high particularly along the main range with elevations between 600 and 750 Australian Height Datum (AHD) . Ridges to the east peak at 450 to 500 AHD. The area is heavily dissected by streams that form the headwaters to several river systems. To the north the headwaters of the Goulburn River form around Ulan running east. Also in the north the headwaters of the Talbragar River form to flow west. Further to the west, beyond the study area, and adjacent to Gulgong, the confluence of several smaller creek systems forms the Wialdra Creek system flowing west. To the southeast, Wollar Creek forms and flows north to ultimately also join the Goulburn River. Within the study area the catchments of several unnamed creeks add to the flow of Murragamba Creek which feeds into Wilpinjong Creek in the north east corner of the study area.

As the area is dominated by the ridges of the Great Dividing Range and associated uplifts the landscape is heavily dissected into a series of enclosed valleys surrounded by high escarpments and steep slopes. The valleys are often fed and shaped by deeply cut intermittent water courses. As a result of the nature of the terrain, vegetation on the ridges and slopes is often dense with few cultural modifications. The tops of the ranges and steep escarpments are heavily covered in native vegetation, predominantly dry sclerophyll forest.

The region includes several areas of National Park, State Forest and Nature Reserve. The largest of these are the Munghorn Gap Nature Reserve (MGN Reserve) and the Goulburn River National Park. These areas are predominantly located on the top of the ridges. Access beyond the camping areas in these parks and reserves is generally by 4 wheel drive along fire trails and much of the area is accessible only on foot.

To the west of the region the topography is less undulating although it is still elevated. The townships of Mudgee, Gulgong, Dunedoo and Tallawong are situated to the west of the Great

Dividing Range on the junction of the ranges with the fertile western plains. These areas have been heavily cultivated and are more intensely populated. They therefore have a higher degree of cultural modification.

Major cultural modifications in the region include:

- The existing Ulan Coal Mine north of Ulan;
- The approved Moolarben Stage 1 project;
- The major town centres Mudgee, Gulgong, Tallawong and Dunedoo;
- A number of rail lines (active and disused);
- High voltage power lines and attachments including the Wollar to Wellington 330kv line;
- The diversion of the Goulburn River at Ulan;
- The Wilpinjong Coal mine to the east of the MCP;
- A range of road infrastructure; and
- Smaller villages including Ulan and Wollar.

### 2.2.2 Local Landscape Character

The landscape character of the local area is similarly heavily influenced by the topography and underlying geology. As with the regional character the local landscape character differs from east to west. In the east beyond the Great Dividing Range the topography is rugged with many steep sided enclosed valleys. To the west the topography is more gently undulating with a higher proportion of cultural modification. Vegetation density generally matches topography. Remnant dry sclerophyll forest is dense along the ridges and the land is heavily cultivated in the valleys.

The local area is bounded by several key geographical features. To the east the locality is bounded by the ridges of the MGN Reserve. To the north and east the ridges of the Goulburn River National Park form a natural visual boundary. To the west, Dexter Mountain and the main ridges of the Great Dividing Range form the boundary. To the south the area is strongly undulating and visually enclosed between the Great Dividing Range and the MGN Reserve. The local public accessible viewing areas are predominantly at inferior viewing levels along the Ulan-Wollar Road.

## 2.3 The Study Area

The study area can be loosely defined as the visual catchment east and north of MGN Reserve to the Goulburn River National Park adjacent to Wilpinjong Creek. See **Drawing 801-01-A** attached.

Within this area the predominant features are Murragamba Creek and Wilpinjong Creek. The deep cuts of Murragamba Creek have created the steep sides and rocky outcrops of the valley that rise up to the surrounding heavily vegetated ridges of the MGN Reserve.

To the east the study area extends along the valley of Wilpinjong Creek and into the area covered by the Wilpinjong Coal Mine.

Visually the study area landscape has a strong sense of enclosure. The relatively narrow steep sides, vegetated slopes create strong lines and an elongated depth to the study area along the valley floor. Stands of vegetation on the creek lines at higher levels of the valley provide significant visual relief and emphasis the lineal nature of the landscape.

The unique location of the local landscape, situated at the commencement of the inland plain, on and within the Great Dividing Range creates a unique blend of vegetation and landforms.

The area has a high density of *Callitris* sp. interspersed with *Eucalypt* sp. This is particularly noticeable in the Murragamba Valley where stands of *Callitris* border the creek areas and are complimented by lone or small groups of eucalypts. These creek line plantings add significantly to the visual diversity of the valley when viewing from inferior foreground locations.

In addition strands of *Callitris* sp. run up the valley sides and are visible in some locations as silhouetted specimens on the ridge tops. This feature creates a relatively unique, open appearance to the ridge top. The verticality of the *Callitris* sp. on the ridges is an interesting visual contrast to the more common softer, rounded *Eucalyptus* sp. silhouettes.

## 2.4 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 **Drawing 801- 02-A and 04-A** for vegetation and slope analysis of the study area.

### 2.4.1 Ridgeline And Upper Wooded Slopes

This landscape unit forms a visually prominent backdrop to the southern and western boundaries of the study area. Slopes range from 20 to 40 % and the unit has a maximum height of an approximately relative level (RL) 745 at the Munghorn.

**Form:** The steep slopes, rock outcrops and high elevation form the dominant visual element in this landscape unit, to the south and west a series of escarpments are visible that enclose the study area leaving it open and with a softer appearance to the north. The prominence of the ridgeline and upper slopes is accentuated by its contrast to more gentle slopes and the alluvial valleys.

**Line:** Line is a critical visual element for this unit, when viewed from within the study area as the ridgelines form the silhouettes against the skyline with interesting variety as noted in 2.3 above. The vegetation adjacent to Murragamba Creek also forms a strong linear element reducing valley width.

**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 and occasionally areas of escarpment. There is also a strong colour and textural contrast at the horizon line

**Cultural** The natural character is highly dominant. The existing cultural changes and elements are insignificant in this unit.

### 2.4.2 Undulating Ridgelines (Vegetated And Cleared)

Undulating ridgelines are a minor unit of the study area. Consequently this unit contributes significantly less to the overall character of the study area. This unit is comprised of slopes in the range of 10 to 20%. They are predominantly to the north of the study area.

**Form:** The form of undulating ridge lines is almost imperceptible in the area. Some modest slopes and undulations occur at the sides of the valleys but generally they are lost in the transition of the ridgelines.

**Line:** The line of undulations is not significant in the Study area.

**Colour & Texture:** The lack of form and line makes the colour and texture of this unit difficult to discern from the surrounding elements.

**Cultural Changes:** There are no significant cultural modifications associated with this unit.

#### 2.4.3 Valleys and Floodplain Areas (slopes less than 10%)

The valleys and creek plain areas are the other significant unit in the study area. The main body of this unit is located throughout the centre of the study area. They include the catchments of Murragamba, Wilpinjong and several other un-named creeks.

Form:	The form is relatively unimposing and due to the horizontal line of the landform, any vertical elements situated on this landform gain 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.
Colour & Texture:	Colour is a distinctive visual element in this landscaped unit. The contrasting dark trees of the surrounding ridges and creek lines with light green grasses create clear distinctions of vegetation. Significant parts of the unit along the creek lines have interspersed vegetation cover. These contrasts create visual variety in the valley.
Cultural Changes:	The appearance of the creeks has been altered by clearing of the banks and in some locations significant soil erosion. They form a strong element in the remaining landscape where vegetation remains in its original form..

#### 2.4.4 Water Bodies

The main water body within the study area is the Wilpinjong Creek meandering through the northeast corner of the study area. The small creeks and tributaries of the Murragamba Creek are also significant items, however many only flow intermittently and are not easily visible from public locations.

Line:	The meandering courses of the creeks and their small size result in line being a moderate level visual element in this landscape unit. These linear elements are accentuated by vegetation, especially the verticality of the <i>Callitris</i> sp., along the water course.
Form, Colour & Texture	The form, colour and texture of the creeks themselves are relatively insignificant to the viewer in these units. Along Murragamba Road the creek and tributaries are observable at several crossings that would be significant in periods of high flow.
Cultural Changes:	The only significant cultural modifications are the small four dams that are dotted throughout the study area. These follow the creek lines and would be an interesting repetitive element when flows have been sufficient to fill the dams. During drought conditions they have negligible scenic value.

The water bodies themselves are therefore of little significance however the associated line and colour of the vegetation adds greatly to the visual amenity.

#### 2.4.5 Other Cultural Elements

The other major cultural elements adjacent or proposed within the study area are:

- Ulan Mine Infrastructure  
The elements of the Ulan Mine include coal stockpiles, coal handling preparation plant (CHPP), rail loop and associated infrastructure. These elements are highly visible from the Ulan-Cassilis Road and form a large discordant element in the landscape;

- MCP-Stage One Mine Infrastructure;  
The open cut areas of Stage 1 of MCP and the associated infrastructure north of the study area;
- Gulgong to Sandy Hollow Railway;
- Ulan – Wollar road;
- Town centres and villages;
- The Wilpinjong Coal Mine to the east of the MCP; and
- To the north the Wollar to Wellington 330 kV transmission line.

## 2.5 Existing Nightscape

The assessment of the existing nightscape was made from local travel routes and various locations around the study area. Background light levels, brightness and glare were 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 MCP should be assessed in relation to the overall character of this section of the Study Area. The nightscape character of the study area is perceived as being highly rural in character, with scattered residences and with very small concentrations of light at individual homesteads. The lighting of the existing Ulan and Wilpinjong mine infrastructure and working areas stand out as discordant elements in the existing nightscape.

**Table 2.1**  
**Visual Impact of Lighting in Existing Nightscape**

<b>ASSESSMENT OF EXISTING STUDY AREA</b>					
<b>Nightscape Unit</b>	<b>Foreground &lt;400/800m</b>	<b>Close Middleground 400m/800m - 2/3km</b>	<b>Distant Middleground 2/3km - 5/8km</b>	<b>Background 5/8km - infinity</b>	<b>Overall Rating</b>
<b>Upper ridges</b>	Nil	Nil	Nil	Nil	Nil
<b>Foothills with subdivision residences along local roads</b>	Low	Low	Low	Nil	Low
<b>Mine Infrastructure and working areas</b>	High	High	Moderate	Moderate	High/Moderate

O/C 4 will operate 24 hours/7 days per week. O/C 4 is however a dynamic element dependant on extraction rates. The shape and nature of the topography around O/C 4 will result in highly variable impacts. For much of the early parts of the extraction works the working areas and faces will be totally shielded from viewers outside the mine lease area.

The works in the two north south valleys will be shielded by the intervening ridges. This will result in minimal direct lighting impacts. Once extraction commences at the north end of O/C 4 the vegetation between the Ulan-Wollar Road and the work areas will again screen the direct lighting impacts. Toward the end of the extraction sequence, when the Ulan-Wollar Road is diverted, the works at night will become highly visible. This stage is likely to be relatively short in the life of the project but is highly dependant on the extraction rates and sequences.

The overall impact of the night lighting will be low for most of the O/C4 extraction sequence however the impact will be high for the works adjacent to the Ulan-Wollar Road. The relatively short term nature of that impact is not significant to the impacts of the open cut section of the project.

The infrastructure areas on the north and south sides of the realigned Wollar Road will be more spread out and in parts closer to viewers than approved in Stage 1. The repositioning of the conveyors adjacent to Wollar Road will be a very strong visual element when lit at night. The overall effect will be that viewers will drive through a highly visible industrial landscape for several kilometres.

### 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.

The impact of cultural modifications can often detract from the scenic value if the modifications are discordant with the surroundings.

### 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 **Table 3.1**

**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	-	<b>HIGH</b>
Undulating foothills and elevated outcroppings	High	Moderate	Moderate	-	<b>MODERATE/HIGH</b>
Valleys & flood plains	Moderate	Moderate	Moderate	Low	<b>MODERATE</b>
Water bodies and Associated vegetation	High	Moderate	High	Low	<b>MODERATE/HIGH</b>
Impact of cultural modifications	Low	Low	Moderate	-	<b>LOW</b>

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; and
- Land use compatibility increases and land use edge diversity decreases
- 

Refer **Drawing 801-06-A** for the scenic quality assessment of the study area.

### 3.3 Viewer Characteristics

Viewer characteristics of the landscape are specific to the MCP and are determined by individual viewing points, distance to the object and sensitivity of the viewer.

Visibility of individual landscape elements and visual prominence of items in the landscape 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 MCP 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 group viewpoints or frequently travelled viewing corridors allowing more clarity in assessment.

**Table 3.2**  
**Distance Definitions 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. Definitions have been adapted by O'Hanlon Design Pty. Ltd. (1997) to suit the Kayuga Coal and subsequent studies.

#### **THE VIEWPOINTS** (Refer **Drawing 801-03-A** for locations)

The selected viewpoints for the project area of Stage 2 are:

- VP 1** - Ulan to Cassilis Road 1km north of rail bridge 430 AHD
- VP 2** - Ulan to Cassilis Road at the rail bridge 430 AHD
- VP 3** - Ulan to Cassilis Road adjacent to Ulan stockpiles 425 AHD.
- VP 4** - Ulan to Wollar Road adjacent to infrastructure 430 AHD
- VP 5** - Carr's Gap Road at the "Murragamba" 537 AHD
- VP 6** - Murragamba Valley east side 485 AHD
- VP 7** - Ulan to Wollar Road 250M north of Planters Creek 390 AHD
- VP 8** - Ulan to Wollar Road adjacent to borrow pits 415 AHD

### 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 valid 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 U.S.D.A. research and anecdotal evidence.

We have assessed public sensitivity level 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, Urban Residential Areas	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 Individual Property Areas		At least 75% of users MAJOR concern for scenic qualities of the area	Less than 75% of users have MAJOR concern for scenic qualities of the area

Traffic data provided for the Sinclair Knight Mertz Study (June 2008) indicates that the Ulan-Wollar Road will have very high proportion of mine traffic from Wilpinjong Mine and the future development of the MCP. The only other significant traffic noted is the daily school bus service. It is assumed that mine generated traffic has a low concern for impacts on visual quality created by the mines themselves.

The Ulan –Wollar Road has very few residences and most of those will be removed in due course as part of the Wilpinjong and MCP developments.

Given the locations and our assessment of the type of viewers, we have concluded that the sensitivity of each viewpoint is set out in **Table 3.4** below.

**Table 3.4**  
**Sensitivity Levels - Travel Routes & Urban Areas**

Level 1	VP1, VP2, VP3
Level 2	VP5, VP6
Level 3	VP4, VP7, VP8

### 3.6 Landscape Management Zones

The assessment of the degree of visual impact of the proposed O/C 4 and the addition of new infrastructure facilities on the Ulan – Wollar Road 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 LMZ as shown in **Table 3.5** below are derived from the information provided in tables 3.1 and 3.2 and the rankings are an indication of the perceived ability of the area to absorb visual change.

**Table 3.5 Landscape Management Zones**

Adapted for the project by O'Hanlon Design Pty Ltd 2006 (Moolarben Coal Project - Stage 1)

KEY TO THE LANDSCAPE MANAGEMENT ZONES								
		<i>Sensitivity Level Distance Zones (from table 3.2)</i>						
		<i>1 Fg</i>	<i>1 Mg</i>	<i>1 Bg</i>	<i>2 Fg</i>	<i>2 Mg</i>	<i>2Bg</i>	<i>3</i>
<b>Scenic Quality Classes</b> <i>(See Table 3.1)</i>	<b>High</b>	A	A	A	A	B	B	B
	<b>Moderate</b>	A	A	B	B	B	C	C
	<b>Low/Mod</b>	B	B	C	B	C	C	C

Landscape Management Zones (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 the ridgelines and the upper wooded slopes and includes local features such as the main ridge of the Great Dividing Range, the Goulburn River National Park and the MGNR. Also of concern are the slopes and foothills visible from the Ulan-Cassilis Road.

#### **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 MCP area visible from secondary roads and rural residences, including the area of O/C 4.

#### **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 valley areas between the ridgelines away from the secondary roads. The compilation and distribution of landscape management zones is shown on figure 04.

**Rating:** **O/C4 of Stage 2 of the MCP is relatively isolated and the bulk of the works are remote from viewers. This places it in Zones B and C and therefore of low to moderate concern for visual resources. The infrastructure area of Stage 2 of the MCP is located on a secondary road but visible from a level 1 travel route as a middle ground element. This places it in Zone A - an area of high concern for visual resources.**

Refer to **Drawing 801-05-A** for details of Landscape Management Zones when viewed from the public roads within the study area.

## **Section 4** **Relevant Aspects Of The Proposed Development**

### **4.0 General**

This section describes the various visible elements of the Stage 2 MCP the items that will affect visual quality and visibility. The proposed method and timing of mine and spoil emplacement are co-dependant on Stage 1. Therefore the exact timing of work in any specific area of O/C 4 cannot be exactly determined.

Whilst Stage 2 has significant underground and open cut areas the use of the existing and approved infrastructure significantly limits the degree of change in the visual environment created by Stage 2.

### **4.1 Infrastructure Areas**

#### **4.1.1 Surface Facilities Upgrade**

All coal is proposed to be handled by the Surface Facilities originally approved in Stage 1 of the MCP. Some modifications have been made to the design and location of the surface facilities. The Stage 2 workshop, office, bath-house and stores are proposed to be located south of the realigned Ulan-Wollar Road.

It is proposed to relocate the Raw Coal Stockpile south of the relocated Ulan-Wollar Road. This stockpile is proposed to be approx. 470m in length at its maximum capacity with a base at AHD 190 and a height of approximately 25m. The raw coal stockpile runs east west parallel to the Ulan-Wollar Road. Between the Ulan-Wollar Road and the raw coal stockpile a mobile stacker/reclaimer will operate feeding coal onto a reclaim conveyor. The reclaim conveyor is approx. 500m in length adjacent to the Ulan-Wollar Road and feeds the Raw Coal Reclaim Transfer Station (RCRTS) immediately adjacent to Ulan-Wollar Road. The surge bin is approx. 30m high located with a base level of approximately AHD 445. The original surge bin, raw coal stockpile and conveyors were located east of the Ulan-Cassilis Road and north of Wollar Road in Stage 1.

Also to be relocated in Stage 2 are the ROM dump stations and rejects bin. These will now be located approx. 150m south of the realigned Wollar Road and fed by the U/G ROM conveyor from the ROM stockpile proposed to be relocated to the north end of O/C 1. Similar to the Stage 1 facilities layout the stockpile and the Coal Preparation Plant (CPP) remain on the north side of Wollar Road between the Ulan-Cassilis Road and the rail loop.

The net effect of these changes on the visual environment is a significant reduction in intensity of development adjacent to the Ulan-Cassilis Road and a significant increase in infrastructure located directly south and adjacent to the new Ulan-Wollar Road diversion. This will spread the visual intrusion into a longer strip on both sides of Ulan-Wollar Road over a distance of approximately 2500m. At 60 km/hour this is a travel duration of approx. two and a half minutes along Ulan-Wollar Road.

The relocation of facilities south of the Ulan-Wollar Road will result in removal of significant stands of vegetation south of the Ulan-Wollar Road. The proposed layout and proximity to the Ulan-Wollar Road leaves no space for landscape screening between the road and infrastructure.

Also of significance is the new level of the U/G ROM Stockpile. As noted previously this is proposed to be relocated into the north end of O/C 1. The stockpile was assessed in Stage 1 as a conical stockpile close to Ulan-Cassilis Road. The relocation will move it further from the Ulan-Cassilis Road and reduce the base level by approx 40m thereby reducing visibility significantly.

#### 4.1.2 Underground Mining

Stage 2 will incorporate both U/G1 and U/G2. Generally these mines have limited visual impact, except for the infrastructure already described in Section 4.1.1

The access to U/G1 will be by the previously approved high wall access in O/C1. Access to U/G2 will be by either a high wall entry at the north-west side of O/C4 or via an underground link from the access at U/G1. All entries are at lower levels than the surrounding viewing locations. Some gas vent infrastructure may be required to service U/G2 but locations have yet to be determined.

#### 4.1.3 Rail Loop

The rail loop and loading bins are located off the Gulgong - Sandy Hollow Railway Line all as previously approved in Stage 1.

### 4.2 Mining Operations

#### 4.2.1 Open Cut No.4 (O/C4)

O/C4 commences excavation at the south end of the Murragamba Valley. The initial works require pre-stripping and placement at O/P1. The mining sequence moves the Open Cut Area initially to the west to fill the end of the adjacent valley. Once the valley is filled, the Open Cut Area moves north. As O/C4 will remove most of Murragamba Creek, part of the early works is the relocation of sections of the Creek to the east side of the valley. A small section of remnant creek will remain in the centre of the valley and the mine will move west of that section.

As the project reaches the mid point of development, the O/C works in Murragamba Valley reach their most northern extent adjacent to the intersection of Murragamba Creek and the Wollar Road. From that point the Open Cut swings south/east following Ulan-Wollar Road, working in a strip approximately 400-600m wide until it reaches the eastern boundary of the lease.

Views into O/C4 will be prominent from locations along the Ulan-Wollar Road although the road is generally lower than the edge of the pit so elevated views are restricted to the hill at VP8 adjacent to the borrow pits.

#### 4.2.2 Out of Pit Emplacements

Two emplacement areas are proposed. The first is at the south end of Murragamba Creek; Out of Pit Emplacement 1. The second is located in the south west end of Murragamba Valley in the vicinity of an area of disused mine pits; Out of Pit Emplacement 2.

The locations of both pits place them at the most remote ends of Murragamba Valley and significantly reduce their potential for visual impact. Both emplacements however remove stands of natural vegetation. In this respect the 'nibbling effect' on the edges of the Munghorn Gap Nature Reserve is visually significant.

Out of Pit Emplacement 2 will rectify the visual intrusions left behind by previous small scale mining pits within its footprint. The upper levels of both Out of Pit Emplacement 1 and Out of Pit Emplacement 2 will reach or exceed the 520m contour specified in the Mid Western Region Interim Local Environmental Plan.

A section of Out of Pit Emplacement 2 lies above the 520 AHD. This is necessary as the existing disused pits are at levels that exceed 520 AHD contour with some as high as 540 AHD. Given the location, topography and desire to ameliorate the disused pits the visual

intrusion above 520 AHD created by Out of Pit Emplacement 2 can be mitigated with a replanting strategy. In this area re-vegetation strategies should attempt to carefully replicate existing topography and vegetation to allow a long term rehabilitation of the areas above 520 AHD.

### **4.3 Road Realignment**

The MCP Stage 1 sought and gained approval for realignment of the Ulan-Wollar Road adjacent to the intersection with the Ulan-Cassilis Road. As part of Stage 2 it is proposed to realign a section of Ulan-Wollar Road starting 3km east of the Ulan-Cassilis intersection and for approx 3km in length.

The realignment of Wollar Road would require new road works and the loss of most roadside tree planting. It is proposed to provide a 1-2m high band adjacent of the road to prevent vehicle ingress into the adjacent areas of O/C4. This band could provide some visual screening to the road side section of O/C4.

### **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. Where possible the existing vegetation should be protected during construction.

Re-vegetation should reflect the existing density and character of the adjacent landscape. It would be appropriate for re-vegetation to be designed using aerial photo mapping to allow replication of location and density on completion. The re-vegetation strategy needs to compliment the future use of the mine area after mine completion.

### **4.5 Night Lighting Considerations**

The proposed night lighting will be primarily concentrated on the Stage 2 infrastructure area, O/C 4 working area, and access roads. Lighting is anticipated to be locally concentrated within the pits at reduced heights due to the truck and shovel nature of the operations. Truck movement at night with associated headlight and warning lights are likely to be significant impacts as the light source may be flashing or moving.

The glow in the sky on overcast nights, commonly referred to as sky glow, is a significant element in the night environment at other mines such as Ulan, and Bengalla.

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 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; and
- Direct views of lighting adjacent to, or part of conveyors and loading / surge bins.

The type of lighting described above is typical for open cut mines. Due to the nature of open cut mining there is limited scope to reduce the dynamic impacts of moving lights from vehicles.

### 5.1 General

The assessment of the degree of visual impact of the proposed open cut areas, the infrastructure and emplacements 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 sequential nature of the mining emplacement, 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.

Visual impact ratings are ranked in decreasing order of severity on a scale between 8 and 0 as follows: Severe, High, Moderate, Low and Nil.

### 5.2 Open Cut Area (O/C4)

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

In order to assess the impact of the open cut areas we have assessed the impact in relation to the key parameters used in **Section 2.4** to assess the visual characteristics of the Study Area. The assessment of the visual landscape components is shown below in **Table 5.2**.

**Table 5.2**  
**Description of Landscape Components for Open Cut Area 4**

LANDSCAPE COMPONENTS	GENERAL DESCRIPTION OF IMPACT
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 during construction. The rehabilitated surfaces will show varying colour until the new vegetation reaches semi maturity.
Scale Contrast	The extent of the open cuts is a significant element and has a significant contrast in scale to other landscape features during construction of the pit.
Spatial Dominance	The open cut would be perceived as a prominent spatial element of the local landscape particularly when viewed from elevated locations or from foreground locations. As the Murragamba Valley is narrow and enclosed the spatial dominance in the visual catchment will be high. The size, scale and colour of the overburden emplacements will vary with time in the landscape. The result is a form, which will be spatially dominant to its surroundings.

### 5.3 Out of Pit Emplacement Areas

The overburden emplacement works themselves will become significant permanent elements in the landscape. Similarly the analysis of the visual impact of both in the pit and out of pit emplacement areas is shown below in **Table 5.3** and assessed against the same visual landscape components.

**Table 5.3**  
**Description of Landscape Components for the Out of Pit Emplacement Areas**

LANDSCAPE COMPONENTS	GENERAL DESCRIPTION OF IMPACT
Form	The forms are often lineal and smooth faced. This is a contrast in form to the surrounding edge of the ridgelines and upper wooded slopes. The existing edges are heavily dissected and ragged. This produces a variety of shadow and lighting effects that contrast with those of the smooth faced emplacements.
Line	Potentially a significant visual element.
Colour	Proposed progressive rehabilitation measures will reduce potential impacts.
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 elements are dominant when read at a distance.

## 5.4 Assessment of Visual Impacts

### 5.4.1 VP 1 Ulan to Cassilis Road - 1km north of rail bridge 430 AHD

Viewers at VP1 who are travelling south on the Cassilis Road travel over a small ridge at approx 430-435 AHD. From this vantage point the approved Stage 1 infrastructure will be visible as foreground elements at distances of between 400 and 800m. The Stage 2 infrastructure will be visible at distances of approximately 2200m to 2500m. The Stage 2 infrastructure is largely masked by the approved Stage 1 structures. Viewers would find it difficult to identify the various elements of each stage. The new infrastructure will add to the mosaic of built forms.

The Raw Coal Reclaim Transfer Station will be clearly visible and, in conjunction with the associated conveyors, creates an element strongly discordant with the landscape. Views of O/C4 are not possible from VP1. The impacts of O/C1 from Stage 1 remain as originally approved.

### 5.4.2 VP 2 Ulan to Cassilis Road - at rail bridge 430 AHD

Viewers on the rail overpass have oblique views to the east, northeast and southeast. Viewers travelling north will have an unrestricted view of the Stage 1 product stockpile at a distance of 300-400m, and oblique views east toward the main infrastructure areas with conveyors and bins at approx. 1000m distant. The offices, bathhouse, workshop complex for Stage 2 are approx. 2000m to the east. Some potential exists to maintain some of the planting on the south side of Ulan-Wollar Road around the rejects bin and ROM dump stations. If retained this vegetation would significantly screen the proposed ROM dump area and the Stage 2 workshop complex.

As at VP1 The Raw Coal Reclaim Transfer Station will be clearly visible. Views of O/C4 are not possible from VP2.

### 5.4.3 VP 3 Ulan to Cassilis Road - adjacent to Ulan Stockpiles 425 AHD

Viewers travelling east along Ulan-Cassilis Road adjacent to the Ulan stockpiles will have views of the Moolarben product stockpiles at distances beyond 3km for the duration of the mine life. Filtered views of the Stage 2 ROM dumps, rejects bins and raw coal stockpiles as middleground elements will be possible at distances varying from 3km to 4km. The duration

of the view will be 1 to 1.5 minutes depending on the speed of the vehicle. The objects will gradually increase in visibility as the viewer nears the rail overpass. Views of O/C4 are not possible from VP3.

#### **5.4.4 VP 4 Wollar Road - adjacent to infrastructure 430 AHD**

As part of the assessment of visual impact for Stage 1 the views along Wollar Road of the rail loop, the infrastructure, coal stockpile and conveyor system were assessed as high to very high for the duration of the project.

The relocation of infrastructural elements will marginally increase this impact in intensity and significantly increase the duration of the intensity. The office workshop/bathhouse complex will be visible south of the realigned Wollar Road at a distance less than 100m.

Slightly further west the raw product stockpile, the associated stacker reclaimer and the conveyors run parallel to the road for a distance of approx. 400m. These elements are within 100m of the road. The heights, bulk, colour, line and proximity of these elements in the close foreground creates very high visual impacts in an area previously assessed as natural in Stage 1. The Raw Coal Reclaim Transfer Station adjacent to the ROM dump area is approx. 30m high and immediately adjacent to the road.

The proximity and proposed vegetation clearing suggests that no vegetative screening is proposed between the road and these elements. The elements will appear as highly dominant and will break the horizon line in a number of locations. Due to the type and low number of probable viewers along the Wollar Road the area is one of low concern for visual resources, however some forms of amelioration would be beneficial given the very high level of impact.

As viewers adjacent to VP4, travel to the east around the bend in Wollar Road to follow the rail line, views into O/C4 will be possible. During the early years of working in O/C4 the open cut area will be 4-5 km distant and predominantly screened by intervening vegetation. As O/C reaches its most northern limit of excavation, views into the open cut will become possible at distances in the order of 1500 to 2000m. These impacts will be low rising to moderate/high toward the end of the project.

#### **5.4.5 VP 5 Carr's Gap Road at "Murragamba" 437 AHD**

Carr's Gap Road is a local access road defined in the valley by gates and an unformed track edge. As the road nears the saddle of Carr's Gap the access becomes ill defined with no formed track or edges obvious. The gate system and usage indicates that it is only used by landowners to short cut from the Mudgee-Ulan Road into the Murragamba valley system. Viewers at the saddle of the Gap are located at 535-540 AHD.

Views to the north east of the infrastructure and coal stockpiles are not possible from this location. Views of O/P1 and O/P2 are also screened by the intervening topography and vegetation.

Extraction and emplacement in O/C4 commences approx. 5500m to the south-east at the head of Murragamba Valley. In the very early stages it is unlikely the work in O/C4 will have any visual impacts at Carr's Gap. Loss of vegetation, the open cut itself and gradual mine rehabilitation will all be visible moving toward the viewer over time. Some amelioration of the impacts will be provided by the remnant strands of vegetation surrounding Murragamba Creek in the centre of the valley. The reconstruction of the northern end of Murragamba Creek will be highly visible from the superior viewing elevation at Carr's Gap.

Just prior to the mid point of extraction the O/C4 works will pass within 300m of viewers at Carr's Gap. At this stage the impacts will be very high and the very high impacts will continue for several years as O/C4 turns and moves east. The work area of O/ will progress

further east to culminate approximately 6000m distant, adjacent to the Wollar Road near Planters Creek. The visual impacts will remain high until the end of the mine life as landform reconstruction and re-vegetation will continue in the foreground and middleground views after the time has passed.

One of the possible entry portals to U/G2 is located within 1km of Carr's Gap. If the portal from U/G4 is used then the portal drift, access roads and some infrastructure will remain as elements in the foreground at a distance of approx. 600-800m.

#### **5.4.6 VP 6 Murragamba Valley - east side 485 AHD**

VP6 is located within the Murragamba Valley and is typical of the impacts within the valley generally. From within the Murragamba Valley the proposed changes to the main infrastructure areas have no visual impacts.

During the initial stages of excavation of O/C4 the works at O/P1 and O/P2 will be approximately 1500-2000m distant. Both emplacements will result in significant vegetation removal and associated visual impacts. O/P2 will be the more significant impact as the vegetation removal, extent of emplacement and the relative levels are significantly higher than O/P1. From VP6, O/P2 will be a significant visual impact until the emplacement area re-vegetation becomes established as a thick canopy similar in colour and texture to the ridges of the MGN Reserve that surround the emplacement.

O/C4 moves from south to north in the valley passing within 100m of VP6. The potential timing varies due to extraction rates but it is likely to pass within the first 10 years. The resultant visual impacts will be significant until full rehabilitation is completed. Some amelioration of impacts within the valley is possible if the vegetation surrounding Murragamba Creek can remain.

This does not ameliorate views in the immediate foreground such as VP6. Retention of the creek vegetation would provide some screening and visual reduction of the mass of O/C4 when viewed from the surrounding plateau edges of MGN Reserve.

#### **5.4.7 VP 7 Wollar Road - 250m north of Planters Creek 390 AHD**

Views on the Ulan-Wollar Road adjacent to VP7 will approach the mining operations area from the south east. No views of the main infrastructure areas are possible from the Ulan-Wollar Road adjacent to VP7.

Views of O/C4 will become possible around Year 8-10 of the project. Depending on the extraction rates at some time after Year 10 the two southern excavation arms of O/C4 will exit their respective valleys and join in the Central Pit Area of O/C4. At that time the working area of O/C4 will be approximately 2000m east of VP7.

During the final years of extraction O/C4 will move east toward VP7. Viewers at VP7 are at approximately 390AHD, with the edge of the pit at approximately 410AHD it is not possible to view into the open cut area. Views of the emplacement forming behind the open cut will be possible with the un-rehabilitated face advancing toward VP7. The resultant impacts will increase from low initially rising to high as O/C4 moves east. On completion of the extraction the upper edges of the final void will be visible from along the road at VP7. Views into the final void will not be possible.

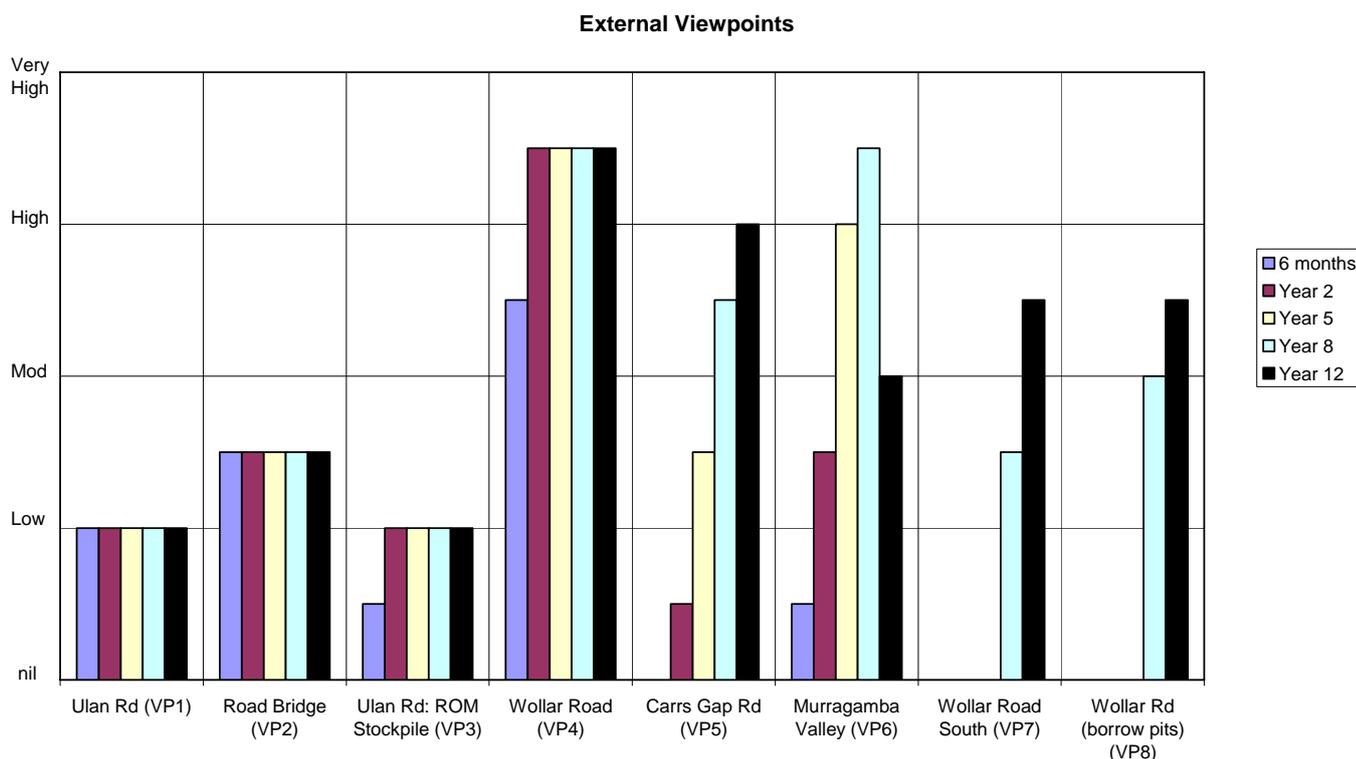
#### **5.4.8 VP 8 Wollar Road - adjacent to borrow pits 415 AHD**

As noted in the "Proposed Development" section of this report it is proposed to relocate the Ulan-Wollar Road to the east adjacent to VP8 for approx. 3km in length. Relocation to the east will reduce the potential viewing levels to around 390AHD. The progression of the impacts and sequence of extraction will be similar to those described for VP7.

For viewers at VP 8 some elements of the workshop and CHPP may be visible at distances of 5000-8000m if vegetation clearing creates a clear line of sight. The impacts of O/C4 would range from moderate around Year 8-10 rising to high at completion of the extraction. The proposed road safety bund to Ulan-Wollar Road would provide significant screening of the emplacement areas following behind O/C4. This amelioration would be enhanced by low shrub planting on the top and edges of the road safety band. The duration of exposure to users of Ulan-Wollar Road to the works at O/C4 will be in the order of 3 minutes.

**Figure 5.4**  
**Degree of visual impact of O/C4 and the Stage 2 mine infrastructure**

To assist with an understanding of the nature of the visual impacts, the impacts assessed above for each viewpoint have been ranked on a scale nil, low, moderate to high in **Figure 5.4** below. The impacts are adjusted to demonstrate the changing nature of the impacts due to time, movement of O/C4.



#### 5.4.9 Affected Residences

A number of residential buildings are located within the Murragamba Valley area. One of these is owned by Ulan Coal Mine and many are unoccupied including the original Murragamba homestead. For the purpose of this report these buildings were considered to be subject of removal and visual impacts were not assessed.

Two residential buildings in Murragamba Valley are intermittently occupied. These are residences 27 (Helms) and 44 (Power). Both of these properties will be subject to visual impacts. Residence 27 is located on the east side of the valley at approx. 485 AHD. This property will be affected by impacts similar to those described for VP6.

Residence 44 is located at the south end of Murragamba Valley 300-400 m south of the out of pit emplacement 1. This residence is located at approx. 530 AHD. At this level residence 44 will have uninterrupted views of the initial cut for O/C4 and the installation of out of pit emplacement 1. The visual impacts would be very high to extreme for at least 5 years and then gradually reduce as O/C4 moves north and out of the valley.

## 5.5 National Parks and Nature Reserves

### 5.5.1 Goulburn River National Park

The western edge of the Goulburn River National Park is situated approximately 3km east of the infrastructure area of the Moolarben Coal Project. The western edge of the National Park is roughly defined by the course of Wilpinjong Creek. The key visitor facilities and access areas are located approximately 17km to the east off Mogo Road and Spring Gully Road.

The Lees Pinch lookout and Mount Dougan provide extensive views over the park to the east and south only. Views are not possible toward the Moolarben area to the west. The proposed mine infrastructure and facilities will not be visible from any of the main lookouts, picnic areas or camping grounds within the Goulburn River National Park.

The 2006 Draft Plan of Management for Goulburn River/Munghorn Cap Nature Reserve does not indicate any public facilities development in any area overlooking the MCP.

### 5.5.2 Munghorn Gap Nature Reserve

The Munghorn Gap Nature Reserve is located to the south, west and southwest of O/C4. Following closure of access roads within Murrumbidgee Valley entry to and through the park will be via the Mudgee-Wollar Road.

The main visitor facilities are at the Moolarben Picnic Area located approximately 5km south of the south edge of O/C4. No views of the open cut area or infrastructure are possible from this location or from the Gulgong-Wollar Road. The main walking trail in the park is the Castle Rock Trail. The Castle Rock Trail lookout area is approximately 4km south of the boundary of O/C4 and views into the OCA are not possible.

Parts of the Munghorn Gap Nature Reserve are located east-northeast of O/C4 at a distance of 200-300m. These areas are at approximately AHD600. From the edge of the escarpment, extensive views of O/C4 would be possible. The current mapping shows no 4 wheel drive access into the area and the topographical map indicates the terrain is rugged. Viewer numbers along the escarpment are likely to be very low. Closure of access roads from the Murrumbidgee Valley will reduce visitor numbers to the north side of the Nature Reserve.

## 5.6 Mitigation Measures

The following measures if implemented will reduce the overall impacts of the open cut mining areas, the overburden emplacement works and the infrastructural elements from various viewpoints as shown above:

- Implement a revegetation strategy for each rehabilitation area to mirror the existing vegetation removed from the areas to be rehabilitated;
- Retain existing vegetation around the new infrastructure areas and on the road fringes of O/C 4 where possible; and
- Consider planting and bunding along the edge of the Ulan-Wollar Road where it abuts O/C 4.

## 5.7 Night Lighting Impacts

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

- Direct lighting effects; and
- Sky glow

### 5.7.1 Direct Lighting Effects

The potential direct lighting impacts from the pit of the O/C 4 and pre-stripping would be visible from a range of viewing points.

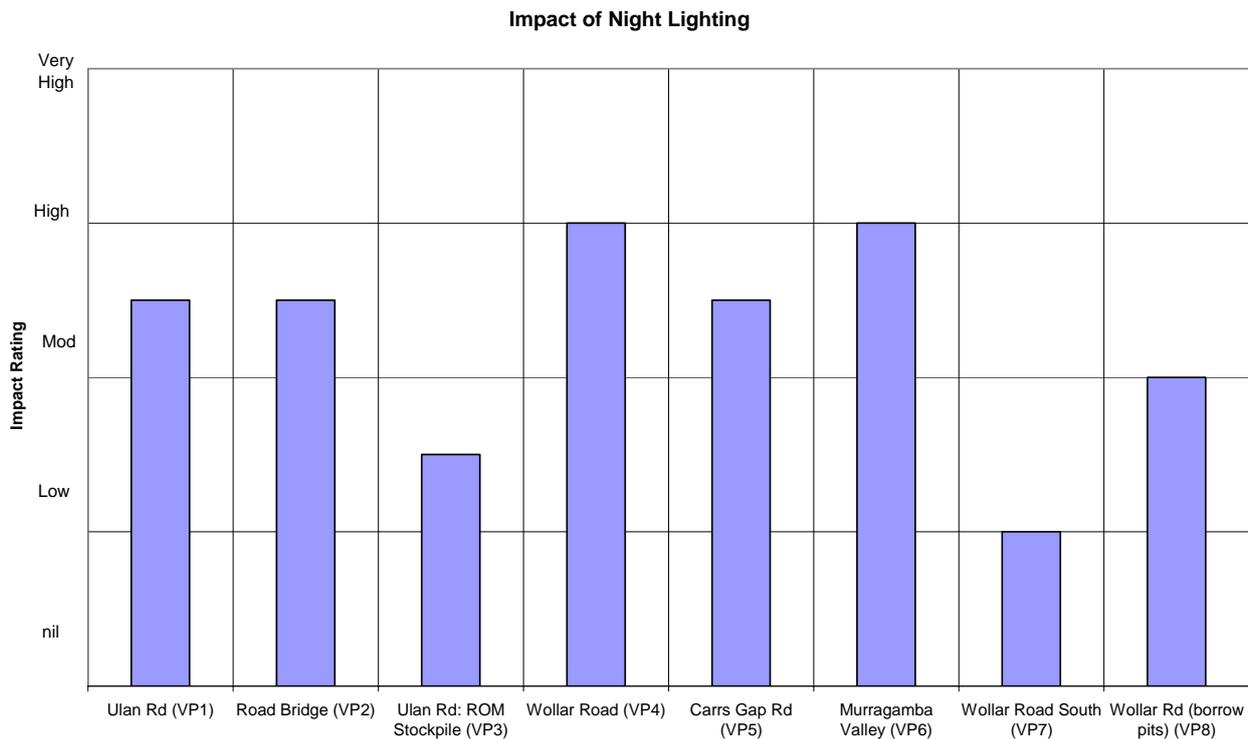
Viewpoints and surrounding areas that will be impacted by direct lighting effect at various parts of the life of the open cut areas are assessed in **Figure 5.7** below. Generally the impacts will reduce with distance from the viewer.

The impacts will vary greatly with time depending on the working sequences and emplacement locations. Impacts are likely to be progressive across the landscape following the working areas.

Most impacts will be intermittent in duration. For example, emplacement may occur in an area for 1-2 months each night depending on weather conditions and then move on to another adjacent location. The degree of impact will vary depending on screening, elevation and distance from each potential viewer.

Generally areas that can view the works of O/C4 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 the Ulan-Wollar Road, along Ulan-Cassilis Road, Ulan Village, and adjacent residences. The likely effects of these impacts are shown by viewpoints 1-4 in **Figure 5.7** below. The impact will vary in intensity depending on positions and working level within the O/C4. A continuing effect will be created by the lighting of the infrastructure and coal handling areas.

**Figure 5.7**  
**Night Lighting Impacts**



### 5.7.2 Sky Glow

The sky glow component of the night lighting impact is most severe 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 louvres 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 sky above the infrastructure area and working areas of O/C4 will glow with a soft reflected light. An analysis of the visual impact of the Infrastructure areas, open cut and the out of pit emplacement areas is shown below.

The lighting impacts from Stage 2 are relatively minimal. They do however extend and spread the overall lighting changes over a wider area and therefore increases the cumulative effect of the MCP lighting on the rural landscape. Added to the Wilpinjong and Ulan lighting the potential sky glow effects extend for many kilometres. Thus for a number of years the night environment will be significantly altered by the cumulative effects of all the various coal mining works.

## **5.8 Mitigation Measures (Night Lighting)**

The measures that could be taken by Moolarben Coal Mines Pty Ltd 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;
- Use wall mounted lights with horizontal bodies and low brightness design to light areas around the workshop and CHPP 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 toward the adjacent hillside 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; and
- Lighting should be screened to viewers where possible but lighting must always be selected to meet safe working practices.

## **5.9 Summary**

A review of the visual impacts of the project reveals that viewpoints around the main infrastructure area are significantly impacted throughout the life of the mine. Selected viewpoints will be affected by the works in O/C4 and the main infrastructure area to varying degrees. A large proportion of the impact identified in this report related to the location of the main infrastructure was assessed and previously approved as part of Underground No. 4 in 1985 and the MCP Stage 1 works. Our report provides some recommendations to ameliorate these impacts. These impacts are however not viewed in isolation as they are adjacent to the existing Ulan Coal Mine, the previously approved works for MCP Stage 1 and are assessed within that context.

A key point of difference to other proposed coal mining operations assessed by our company in the Hunter Valley area is the shorter proposed mine working period of the open cuts of approximately 10 -11 years. This of course depends on weather, market factors and extraction sequences but the shorter proposed mine life assists in limiting the duration of impacts of the open cut and emplacement areas. This should assist in reducing overall viewer sensitivity to the extraction works.

## ***References***

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- “Forest Landscape Description and Inventories A basis for Land Planning and Design” USDA Forest Service Research Paper PSW-49 R. Burton Litton Jr;
- National Forest Landscape Management Handbook No. 434 February 1973;
- Forest Service U.S. Department of Agriculture, 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, Forest Service U.S. Department of Agriculture - July 1975; and
- U.S. Department of Agriculture “National Forest Landscape Management” Recreation Volume 2 Chapter 8, Forest Service Agricultural Handbook No. 666 - December, 1987;
- Williamson, Dennis. Scenic perceptions of Australian Landscapes, Landscape Australia, 1979 vol. 2
- Forest Commission, Victoria, 1981 - Visual Absorption Capability in the Blue Range Study Area.

## ***Assessment Documents***

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The attached assessment is based on the following documents provided by Moolarben Coal Mines Pty Ltd.

1. 'Moolarben Coal Project - Preliminary Environmental Assessment' April 2008
  2. 'Moolarben Coal Mines Pty Ltd - Dwg. N<sup>o</sup>. 02947-E  
Stage 2 - General Arrangement (Figure 3) 30.4.08
  3. 'Moolarben Coal Mines Pty Ltd - Dwg. N<sup>o</sup>. 02883-D  
Coal Handling Layout (Figure 4) 02.04.08
  4. White Mining Limited Dwg. N<sup>o</sup>.03102-7 inclusive  
Open Cut Mine Plan Year 1-8 27.05.08
  5. Moolarben Coal Project Dwg. N<sup>o</sup>. -  
Helms and Power Properties 1:7500 06.06.08
  6. SKM Pty Ltd Dwg N<sup>o</sup>s NR60-M-0200 to 0210  
Coal Handling Plant Amend. B 23.04.08
  7. Mid Western Regional Interim Local Environmental Plan 2008  
Clause 71. Part 6. 15.02.08
-



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**Moolarben Coal Project  
Visual Study - Stage 2**

**LEGEND**

-  Licence Area
-  Study Area
-  Existing Railway Line
-  Proposed Rail Loop
-  Proposed O/C 4 - Affection Area

DRAWING TITLE

**Study Area**

DRAWING NUMBER

**801-01-A**

DRAWN: AOH

DATE: JUNE 2008



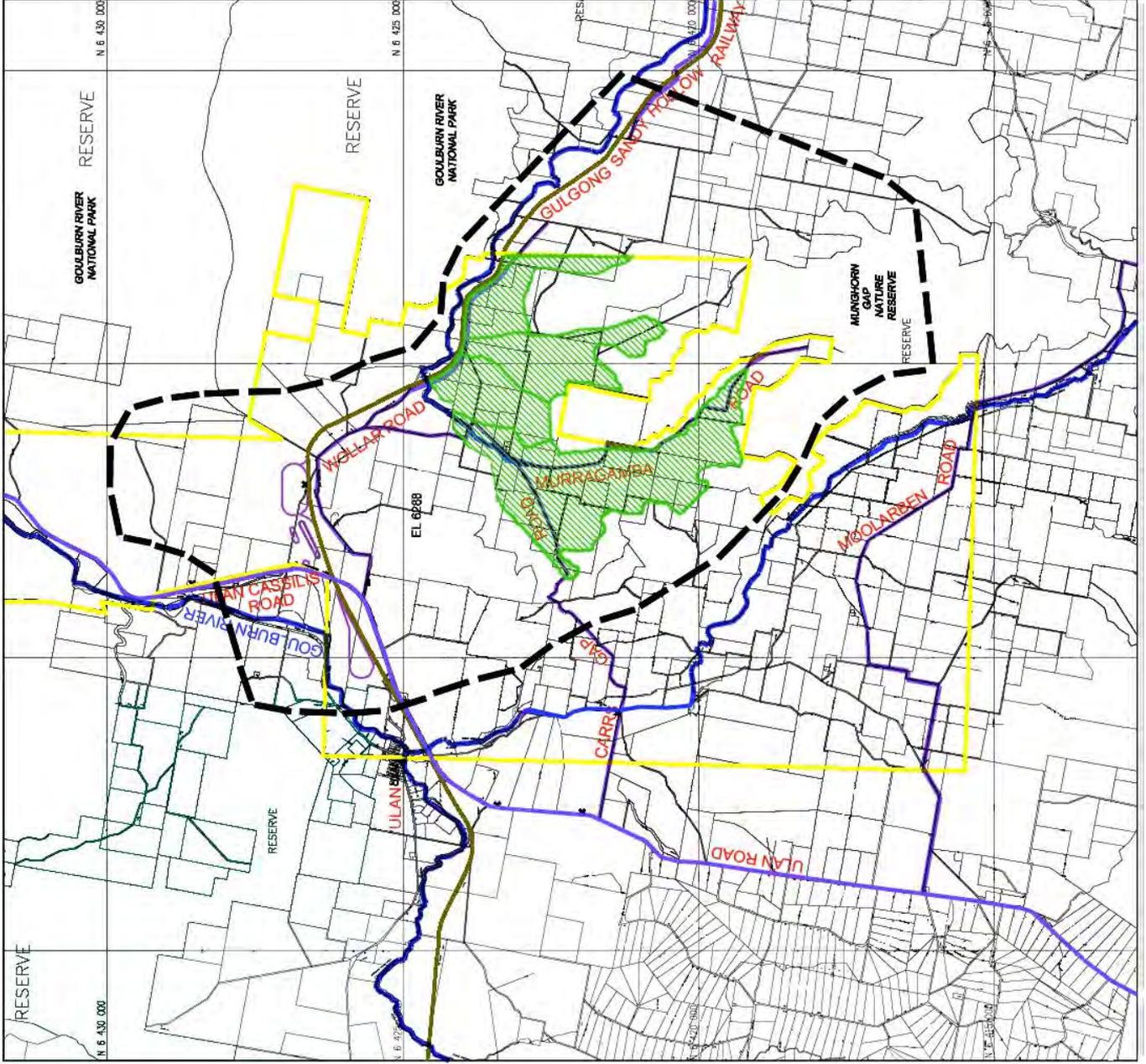
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**Moolarben Coal Project  
Visual Study - Stage 2**

**LEGEND**

-  Licence Area
-  Natural Vegetation
-  Water Bodies

DRAWING TITLE

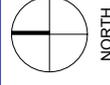
**Water/ Vegetation**

DRAWING NUMBER

**801-02-A**

DRAWN: AOH

DATE: JUNE 2008

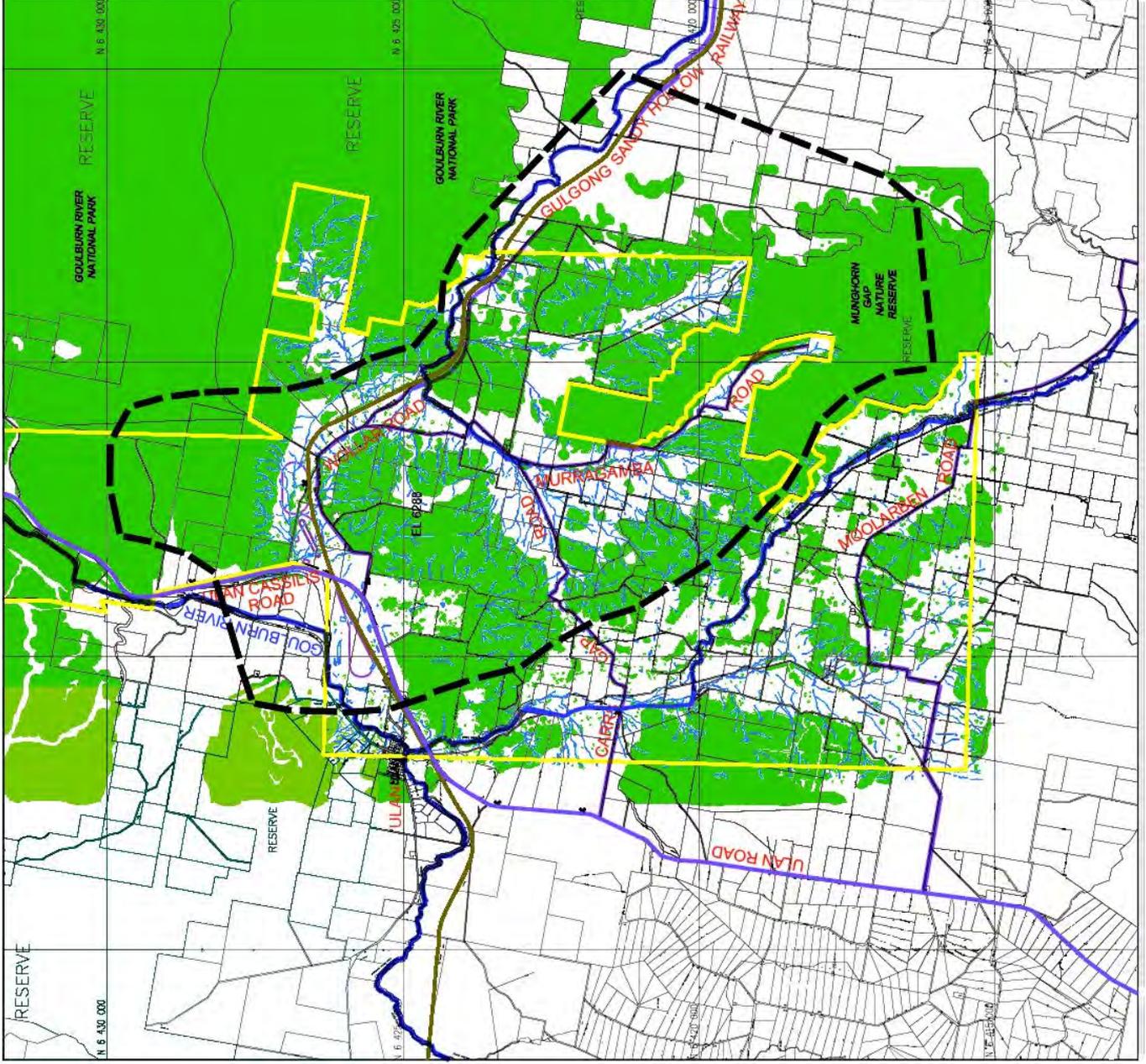


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**Moolarben Coal Project  
Visual Study - Stage 2**

**LEGEND**

-  Licence Area
-  View Point Locations
-  Railway
-  Roads
-  Rivers

DRAWING TITLE

**View Points**

DRAWING NUMBER

**801-03-A**

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DATE: JUNE 2008



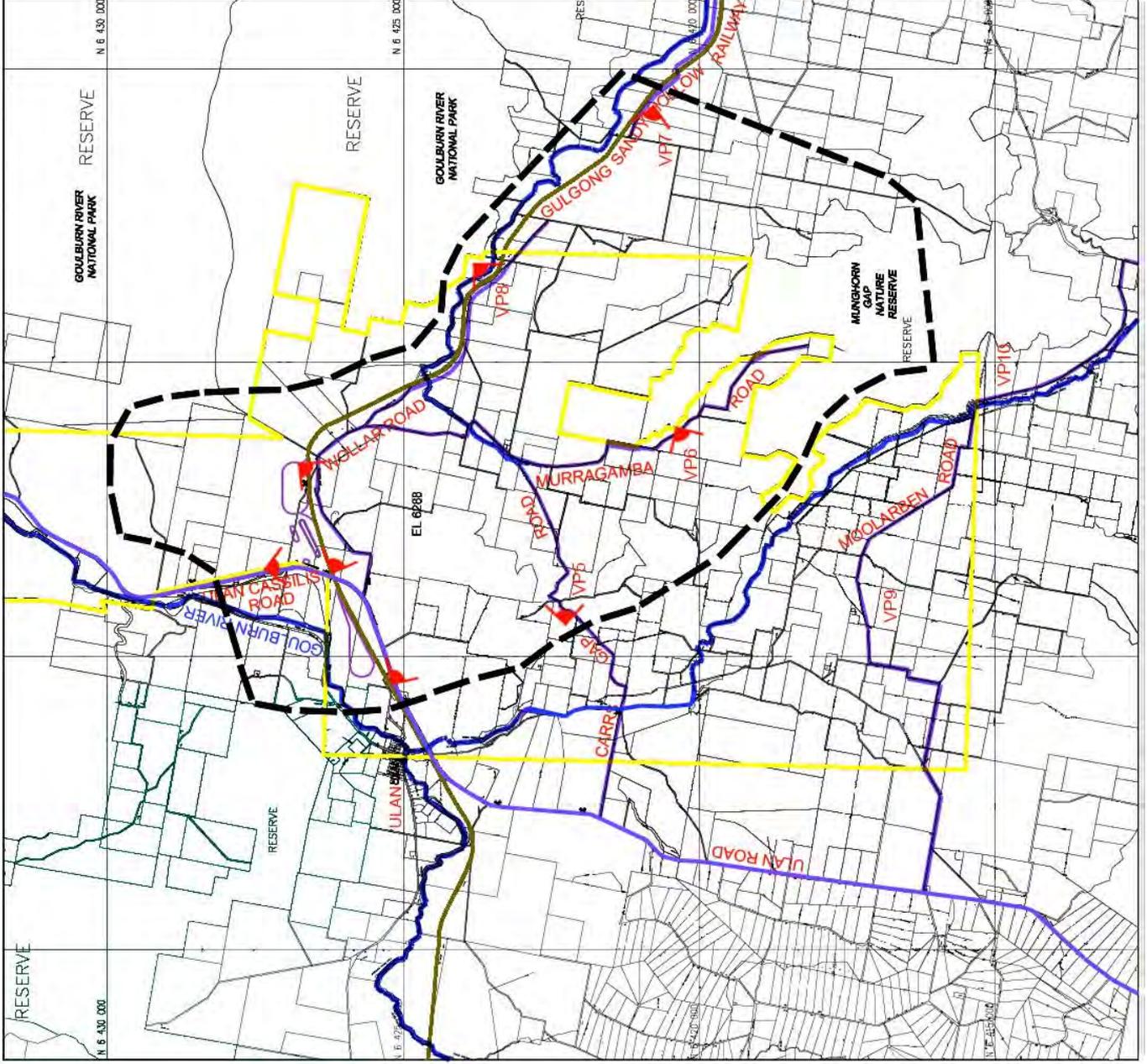
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**Moolarben Coal Project  
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**LEGEND**

-  Study Area
-  0% - 10% Slope
-  10% - 30% Slope
-  30% - 50% Slope

DRAWING TITLE

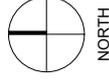
**Slope Analysis**

DRAWING NUMBER

**801-04-A**

DRAWN: AOH

DATE: JUNE 2008



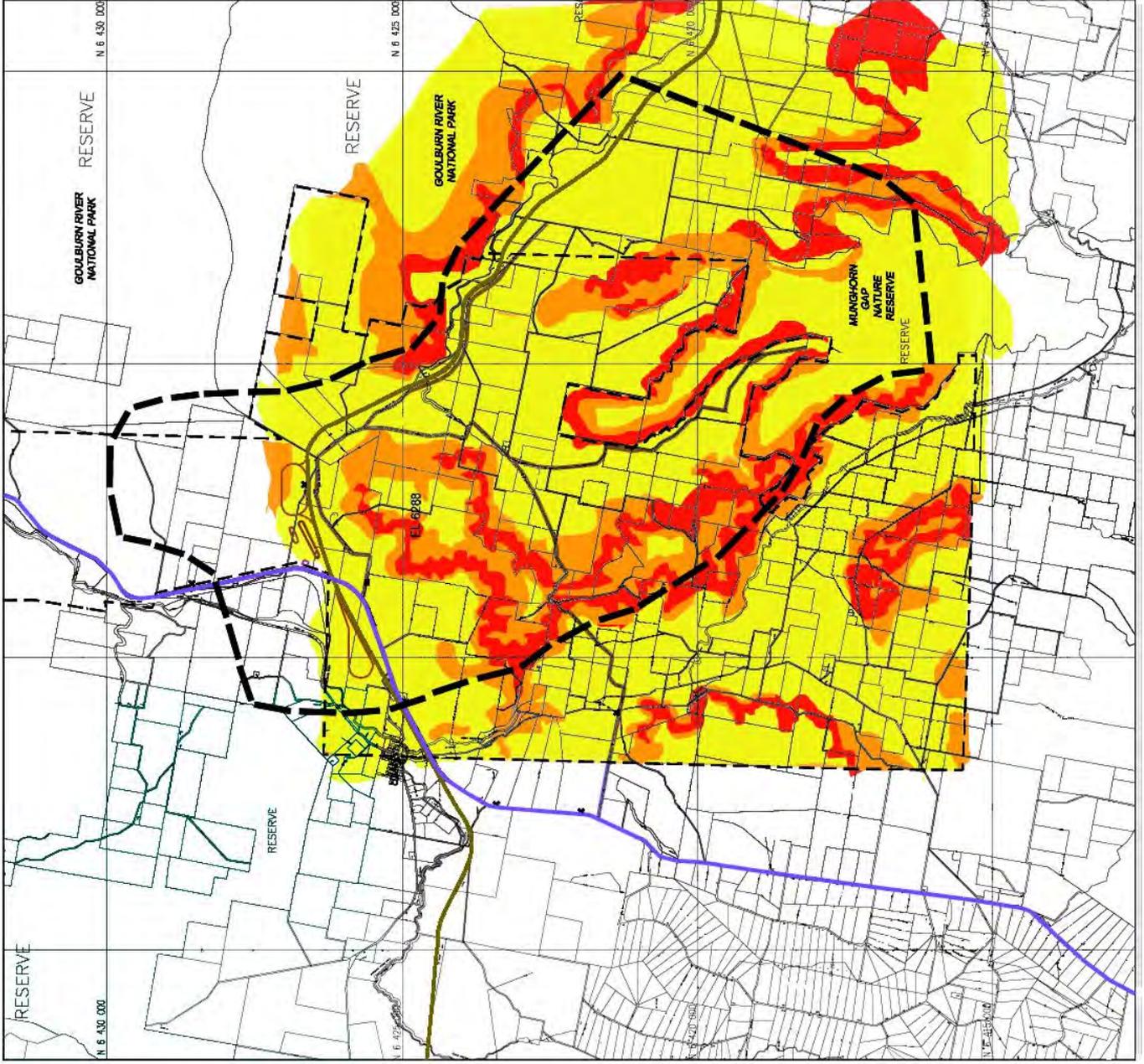
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**Moolarben Coal Project  
Visual Study - Stage 2**

**LEGEND**

-  Study Area
-  Licence Area
-  Existing Railway Line
-  Proposed Rail Loop
-  Zone of High Scenic Quality
-  Zone of Moderate Scenic Quality

DRAWING TITLE

**Landscape  
Management Zones**

DRAWING NUMBER

**801-05-A**

DRAWN: AOH

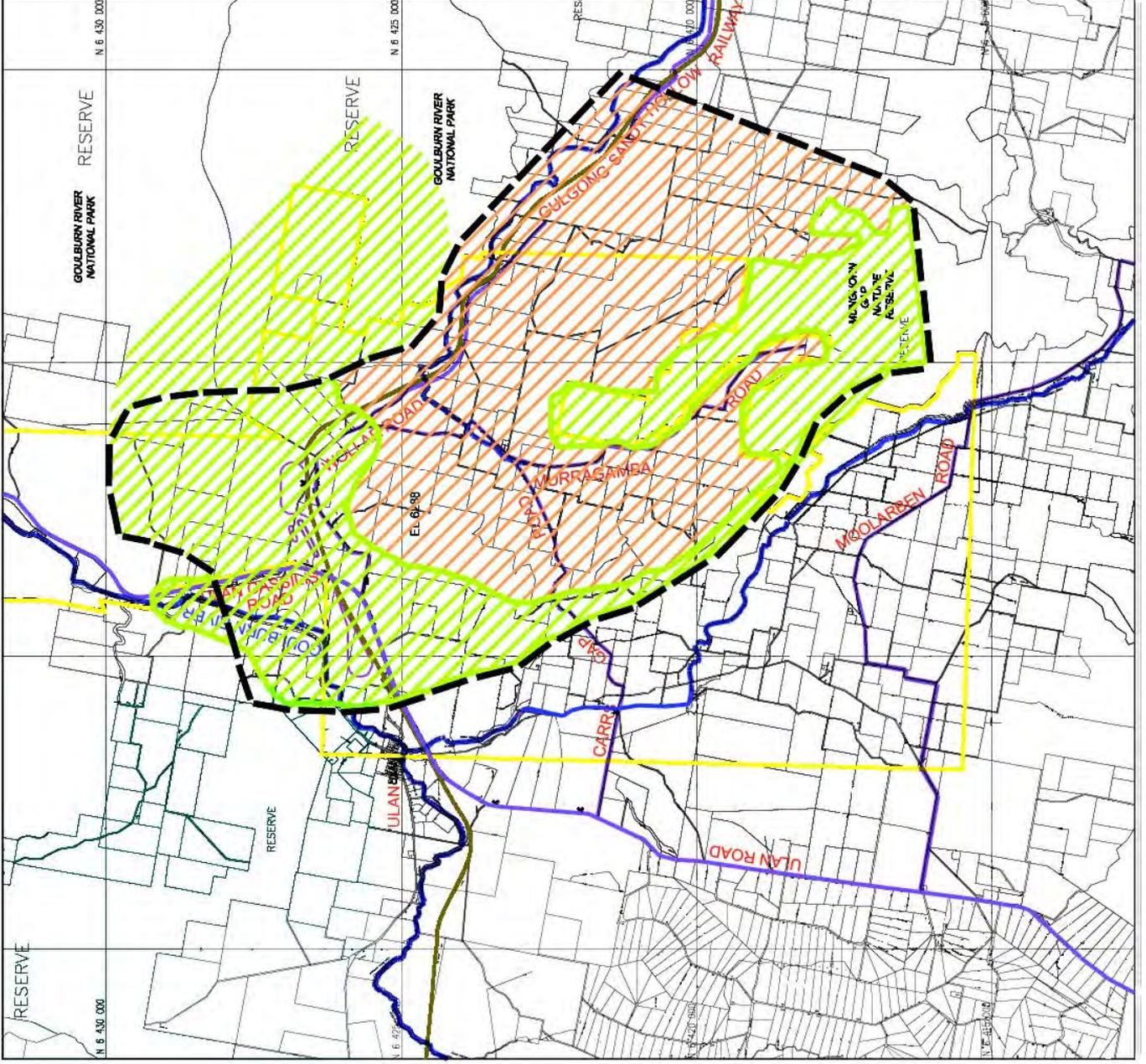
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**Moolarben Coal Project  
Visual Study - Stage 2**

**LEGEND**

-  Study Area
-  Licence Area
-  Existing Railway Line
-  Proposed Rail Loop
-  Zone of High Concern
-  Zone of Med Concern
-  Zone of Low Concern

DRAWING TITLE

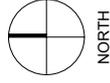
**Scenic Quality  
Assessment**

DRAWING NUMBER

**801-06-A**

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