



MAXWELL PROJECT

APPENDIX N

Landscape and Visual Impact Assessment



Maxwell Project

Landscape and Visual Impact Assessment

Prepared for MALABAR COAL



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Maxwell Project

Landscape and Visual Impact Assessment

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GLOSSARY and ACRONYMS

BSAL	Biophysical Strategic Agricultural Land (BSAL) as defined in the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP).
CCC	Community Consultation Committee
CIC	Critical Industry Cluster.
Contrast	The degree to which a development component differs visually from its landscape setting.
Field of View	This area includes the total view, consisting of the primary view zones above and the secondary or peripheral view zones around the primary view zone, out to about 70° either side of the central view line in both vertical and horizontal plane.
Integration	The degree to which a development component can be blended into the existing landscape without necessarily being screened from view.
LCA	Muswellbrook-Jerrys Plains Landscape Conservation Area
PVC	Primary view catchment: Areas that have potential views to the Project based on a consideration of topography alone as a screening element.
PVZ	Primary view zone. This zone is the central and most critical part of a view and is seen with the greatest clarity. It is that part of a view that is within a horizontal arc of 30° either side of the centre line of a view and a vertical arc of 30° above the horizontal.
Screen	Intervening landscape elements such as topography or vegetation that limit the ability to see development components to a degree.
SIA	Social Impact Assessment
Sky glow	Changes to night sky viewing conditions due to a general luminous glow, i.e. sky glow, caused by the scattering of light in the atmosphere.
SRLUP	Strategic Regional Land Use Plan
VCU	Visual character unit: Areas of Landscape with similar topographic, vegetation and land use features that create areas of similar visual character.
VP	View point
VSA	Visual study areas
Visual Effect	A measure of the visual interaction between the Project and the landscape setting within which it is located.
Visual Sensitivity	The degree to which a change to the landscape would be perceived in an adverse way.
Visual Impact	A measure of a joint consideration of both visual sensitivity and visual effect that considered together determine the visual impact of a development.
ZVI	Zone of visual influence.

1. INTRODUCTION

1.1 Background

Maxwell Ventures (Management) Pty Ltd, a wholly owned subsidiary of Malabar Coal Limited (Malabar), is seeking consent to develop an underground coal mining operation, referred to as the Maxwell Project (the Project).

The Project is located in the Upper Hunter Valley of New South Wales (NSW), east-southeast of Denman and south-southwest of Muswellbrook (Figure 1.1).

Underground mining is proposed within Exploration Licence (EL) 5460, which was acquired by Malabar in February 2018. Malabar also acquired existing infrastructure within Coal Lease (CL) 229, Mining Lease (ML) 1531 and CL 395, known as the “Maxwell Infrastructure”. The Project would include the use of the substantial existing Maxwell Infrastructure, along with the development of some new infrastructure.

This assessment forms part of an Environmental Impact Statement (EIS) which has been prepared to accompany a Development Application for the Project in accordance with Part 4 of the NSW Environmental Planning and Assessment Act, 1979 (EP&A Act).

1.2 Project Description

The Project would involve an underground mining operation that would produce high quality coals over a period of approximately 26 years.

At least 75% of coal produced by the Project would be capable of being used in the making of steel (coking coals). The balance would be export thermal coals suitable for the new generation High Efficiency, Low Emissions power generators.

The Project would involve extraction of run-of-mine (ROM) coal, from four seams within the Wittingham Coal Measures using the following underground mining methods:

- underground bord and pillar mining with partial pillar extraction in the Whynot Seam; and
- underground longwall extraction in the Woodlands Hill Seam, Arrowfield Seam and Bowfield Seam.

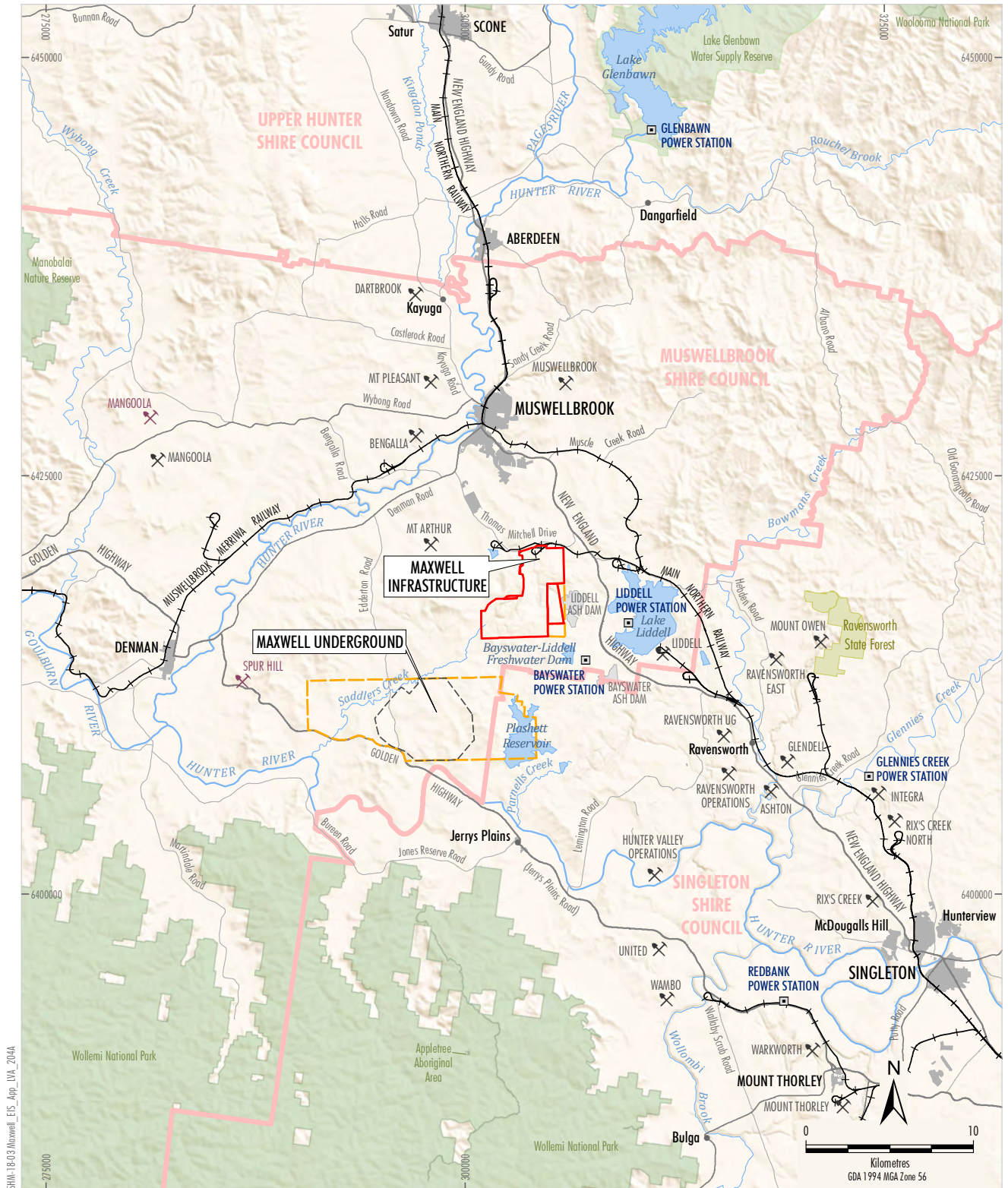
The substantial existing Maxwell Infrastructure would be used for handling, processing and transportation of coal for the life of the Project. The Maxwell Infrastructure includes an existing coal handling and preparation plant (CHPP), train load-out facilities and other infrastructure and services (including water management infrastructure, administration buildings, workshops and services).

A mine entry area would be developed for the Project in a natural valley in the north of EL 5460 to support underground mining and coal handling activities and provide for personnel and materials access.

ROM coal brought to the surface at the mine entry area would be transported to the Maxwell Infrastructure area. Early ROM coal would be transported via internal roads during the construction and commissioning of a covered overland conveyor system which would transport the ROM coal to the Maxwell Infrastructure area once it is completed.

The Project area comprises the following main domains:

- The proposed area of underground mining operations within EL 5460 (Maxwell Underground).
- A mine entry area and associated facilities that support the underground mining activities and provide for personnel and materials access to the underground mine.
- Maxwell Infrastructure – the area within existing mining leases comprising the substantial existing infrastructure (including the CHPP) and previously mined areas.



SHW-18-03 Maxwell_EIS_App_LVA_2044



- LEGEND**
- Mining Operation
 - Proposed Mining Operation
 - Railway
 - Local Government Boundary
 - State Forest
 - National Parks and Wildlife Service Estate
 - Maxwell Project Exploration Licence Boundary
 - Maxwell Project Mining and Coal Lease Boundary
 - Indicative Extent of Underground Development

Source: © NSW Department of Planning and Environment (2019);
NSW Department of Finance, Services and Innovation (2019);
Office of Environment and Heritage NSW (2019)

Figure 1.1 | Maxwell Project Regional Location

- The transport and services corridor between the mine entry area and Maxwell Infrastructure – this would comprise a site access road, a covered overland conveyor, power supply and other ancillary infrastructure and services.
- A potential realignment of Edderton Road.

A detailed description of the Project is provided in the main document of the EIS.

1.3 Landscape and Visual Assessment Objectives

This technical report is an assessment of the potential impacts of the Project on the existing landscape and visual amenity values of the area.

The report identifies the visual character of the existing landscape.

The potential visual impact of the Project, including both short-term and long-term impacts, is assessed and visual impact mitigation strategies are proposed.

The report also considers cumulative visual impacts in the locality, as well as night lighting effects and dynamic landscape impacts.

1.4 Previous Visual Impact Assessments

Previous development applications for an open cut operation within EL 5460 (the Drayton South Coal Project) were lodged by Anglo American plc (Anglo American) in 2012 and 2015, and included landscape and visual impact assessments.

The 2012 application proposed an open cut mine with significant visual bunds constructed using mine overburden. These bunds were located adjacent the Golden Highway and the southern and south-eastern extent of mine operations. The aim was to provide visual (and other) mitigation from the impacts of the mine, providing a buffer to the township of Jerrys Plains along with the adjacent sensitive residences and horse studs.

Anglo American's 2012 application was refused by the NSW Planning Assessment Commission (PAC) in October 2014. The reasons for refusal were that *'the project did not provide sufficient buffers to protect Coolmore and Darley horse studs from the impacts of mining'* with a potential *'risk of losing Coolmore and Darley and the potential demise of the equine industry in the area with flow-on impacts on the viticulture tourism industries... and the Project is not in the public interest'* (NSW PAC, 2014).

In 2015 Anglo American lodged a second application and EIS for an open cut mine coal of reduced scale. This application was refused by the NSW PAC in 2017 on the grounds of potential impacts on existing land uses, unacceptable negative economic and social impacts in the locality, incompatibility with *'the particular nature, operations and requirements of the existing land uses'*, and potential impacts on the Equine Critical Industry Cluster (CIC) (NSW PAC, 2017).

Malabar is committed to investigating development of the resource in EL 5460 solely as an underground mine. Malabar volunteered a condition of EL 5460 that authorises prospecting for the purposes of the assessment and potential future extraction of an underground resource only.

This current Landscape and Visual Impact Assessment has considered the previously identified key issues in terms of landscape and visual impacts.

1.5 Malabar Commitments

There are numerous visual mitigation measures incorporated into the design of the Project. These include:

- locating the mine underground;
- utilising existing infrastructure at the Maxwell Infrastructure;

- positioning the mine entry area in a natural depression, which encloses most operational components within natural topography;
- ongoing rehabilitation at the Maxwell Infrastructure;
- use of compatible tones for building and cladding colours (such colours would include tonal variations of existing colours in the surrounding landscape); and
- landscaping at the mine entry area to create tonal variations when viewed from the air.

2. ASSESSMENT METHODOLOGY

The level of visual impact of a development is determined based on:

- the appearance of the existing landscape (existing landscape settings); and
- changes to this landscape as a result of a development from various viewing locations.

In this way, the visual character of the landscape and the visual sensitivity of the various viewing locations are considered.

The visual effect of a development is determined by considering the visual characteristics of the development in the context of the landscape in which it is seen.

A combined consideration of both visual sensitivity and visual effect determines the visual impacts, and the degree of impact guides the level of mitigation required. The overall method of visual assessment of the existing landscape and the development in the context of the landscape is outlined in Figure 2.1.

2.1 Evaluation of the Existing Visual Environment

The evaluation of the existing visual environment involves assessing the appearance of the existing landscape from key viewing locations.

2.1.1 Landscape Setting

The landscape setting can be defined in terms of topographical, vegetation, hydrological and land use features. These elements define the existing visual character of the landscape adjacent to the development. Within any landscape there are areas of similar visual features that are defined as a Visual Character Unit (VCU). Defining the landscape in terms of these units assists in understanding the visual character of the landscape as a whole.

2.1.2 Viewing Locations

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

2.2 Applicable Policy and Legislation

2.2.1 Planning Secretary's Environmental Assessment Requirements

The EIS for the development must comply with the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, which require the potential environmental effects of a proposal to be properly assessed and considered in the decision-making process.

In preparing this landscape and visual assessment, the revised Secretary's Environmental Assessment Requirements (SEARs) issued for the Project (SSD 18_9526) on 17 January 2019 have been addressed.

In particular, the EIS must include:

- an assessment of the likely impacts of the development on the environment, focusing on the key issues identified below, including:
 - a description of the existing environment likely to be affected by the development, using sufficient baseline/background data;
 - an assessment of the likely impacts for all stages of the development, including any cumulative impacts, taking into consideration any relevant laws, legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice;

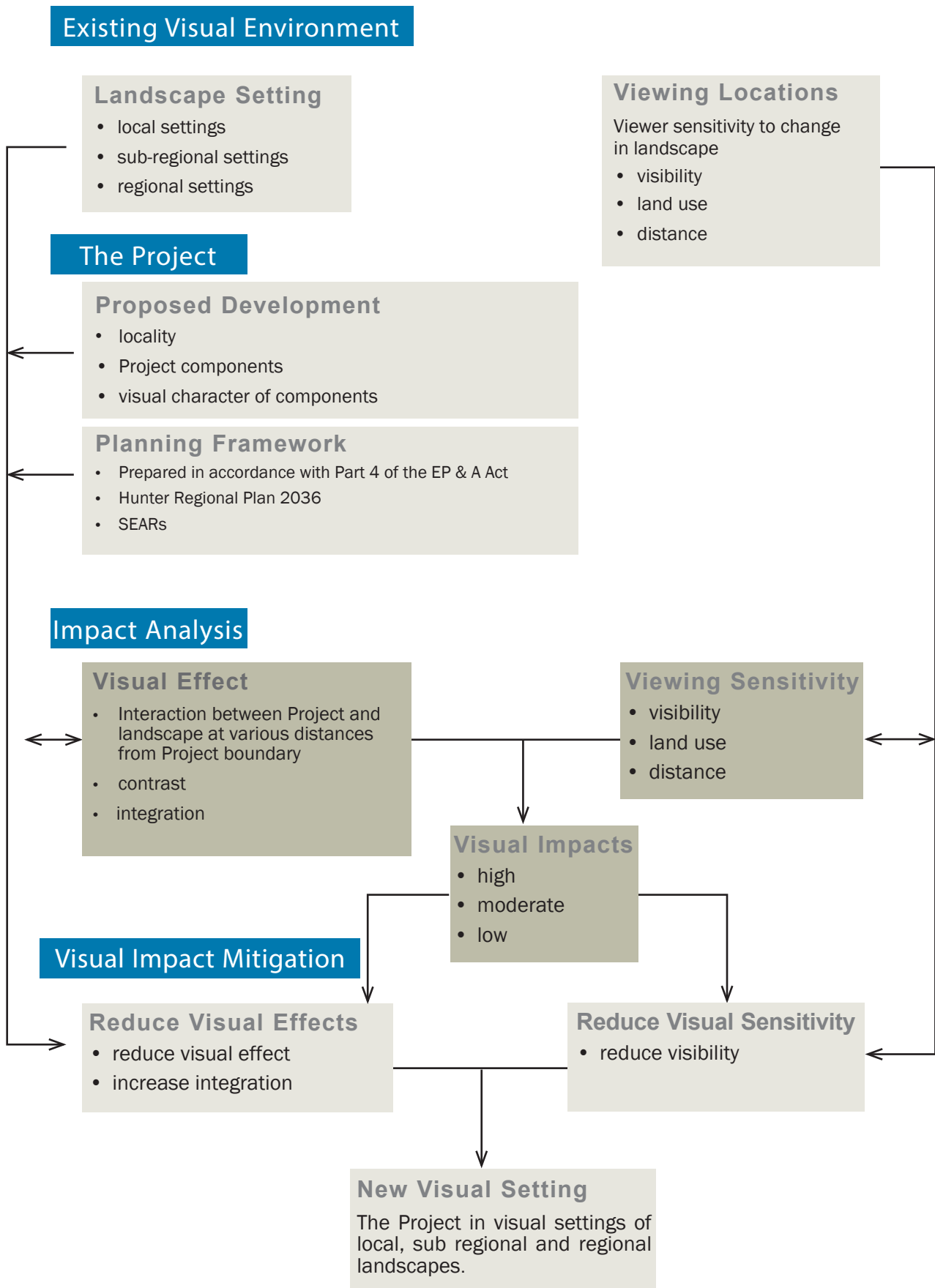


Figure 2.1 | Visual Assessment Methodology

- a description of the measures that would be implemented to avoid, minimise, mitigate and/or offset the likely impacts of the development, and an assessment of:
 - whether these measures are consistent with industry best practice, and represent the full range of reasonable and feasible mitigation measures that could be implemented;
 - the likely effectiveness of these measures; and
 - whether contingency measures would be necessary to manage any residual risks;
 - a description of the measures that would be implemented to monitor and report on the environmental performance of the development; and
- a detailed assessment of the likely visual impacts (including lighting) of the development (before, during and post-mining) on private landowners in the vicinity of the development and key vantage points in the public domain.

2.2.2 **Gateway Certificate Requirements**

A *Conditional Gateway Certificate* (NSW Mining and Petroleum Gateway Panel, 2018a) and an accompanying report from the Mining and Petroleum Gateway Panel were issued to Malabar in December 2018 (NSW Mining and Petroleum Gateway Panel, 2018b).

Clause 17H(4) of Part 4AA of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (the Mining SEPP) provides the relevant criteria for the Gateway Panel's determination and recommendations. Within the relevant criteria are clauses that relate to the CICs and the visual landscape, specifically 17H(4)(b)(v):

- b) *in relation to critical industry cluster land that the proposed development will not have a significant impact on the relevant critical industry based on a consideration of the following:*

...

- (v) *the loss of scenic and landscape values.*

The Gateway Panel Report notes there are no viticulture or equine CICs or enterprises within EL 5460 (NSW Mining & Petroleum Gateway Panel, 2018b). However, it was noted that significant equine and viticulture enterprise are adjacent to EL5460 along its south-west boundary.

The outcome in the *Conditional Gateway Certificate* is that there are no specific requirements relevant to the potential for loss of scenic and landscape values, however this assessment has included consideration of the potential impacts of the Project to the equine and viticulture enterprises.

2.2.3 **Regional Plans**

Hunter Regional Plan 2036 (NSW Government, 2016)

This regional plan provides an overarching framework to guide subsequent and more detailed land use plans, development proposals and infrastructure funding decisions. It identifies a series of priority actions for each council to coincide with medium-term and long-term population growth and economic change. These include:

- Conduct an assessment of land use compatibility.
- Undertake a land use assessment of the viticulture CICs to align planning controls to achieve a balance between scenic amenity and ongoing growth in tourism.
- Support diversification of the energy and agricultural sectors.
- Protect the equine CICs and allow for expansion of the industry.

Consideration has also been given to the Upper Hunter Strategic Regional Land Use Plan (NSW Government, 2012). However, it is understood that the Hunter Regional Plan 2036 superseded the Upper Hunter Strategic Regional Land Use Plan.

2.2.4 ***Hunter Regional Environmental Plan (1989) (Heritage)***

The Hunter Regional Environmental Plan (1989) (Heritage) was a non-statutory register of heritage items, which was repealed on 5 August 2016. However, items listed in this plan have been considered for completeness. The general aims and objectives of this plan were:

- a) to conserve the environmental heritage (including the historic, scientific, cultural, social, archaeological, architectural, natural and aesthetic heritage) of the Hunter Region,
- b) to promote the appreciation and understanding of the Hunter Region's distinctive variety of cultural heritage items and areas including significant buildings, structures, works, relics, towns, precincts and landscapes, and
- c) to encourage the conservation of the Region's historic townscapes which contain one or more buildings or places of heritage significance or which have a character and appearance that is desirable to conserve.

2.3 **Analysis of a Development and its Setting**

The interaction between the existing visual environment and a development is analysed to provide the basis for determining impacts and potential mitigation strategies. By defining the visual effect of the development and testing the visual sensitivity from key viewing locations the overall visual impact can be determined.

2.3.1 ***Visual Effect***

Visual effect is a measure of the level of visual contrast and integration of a development with the existing landscape and the proportion of the view that is occupied by the development (Table 2.1).

Contrast and Integration

The form, pattern and colour of the development components will contrast to varying degrees with the surrounding landscape, and the comparative scale of the development will define a level of integration with the environment.

The degree to which the visual characteristics of a development contrast with the existing landscape determines the level of visual effect. A greenfield site (i.e. new development) would generally have a higher visual effect due to strong contrast with the existing environment, in comparison to an extension of an existing mine. In a similar way, high visual integration is achieved when a development is of a small scale compared to the surrounding landscape. A successfully rehabilitated development would integrate with the existing landscape through use of similar visual characteristics (forms, patterns, lines, colours and textures) that minimise the contrast with the surroundings and mitigate the visual impact of the development.

The proportion of a view that includes development areas

For any given level of contrast and integration the lower the proportion of the view that is occupied by the development the lower the level of visual effect. This is determined by defining the proportion of the total field of view occupied by the development, or more appropriately determined by defining what percentage of the Primary View Zone (PVZ) it occupies, see Figure 2.2.

The PVZ is the most critical and central part of a view. It is not the total view, but the most important part. It is that area that is occupied by an arc created by sight lines from the eye radiating out vertically and horizontally at angles of 30° around a centre view line.

Table 2.1 | Visual Effect Levels

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

Area of Primary View Zone at various distances from project area

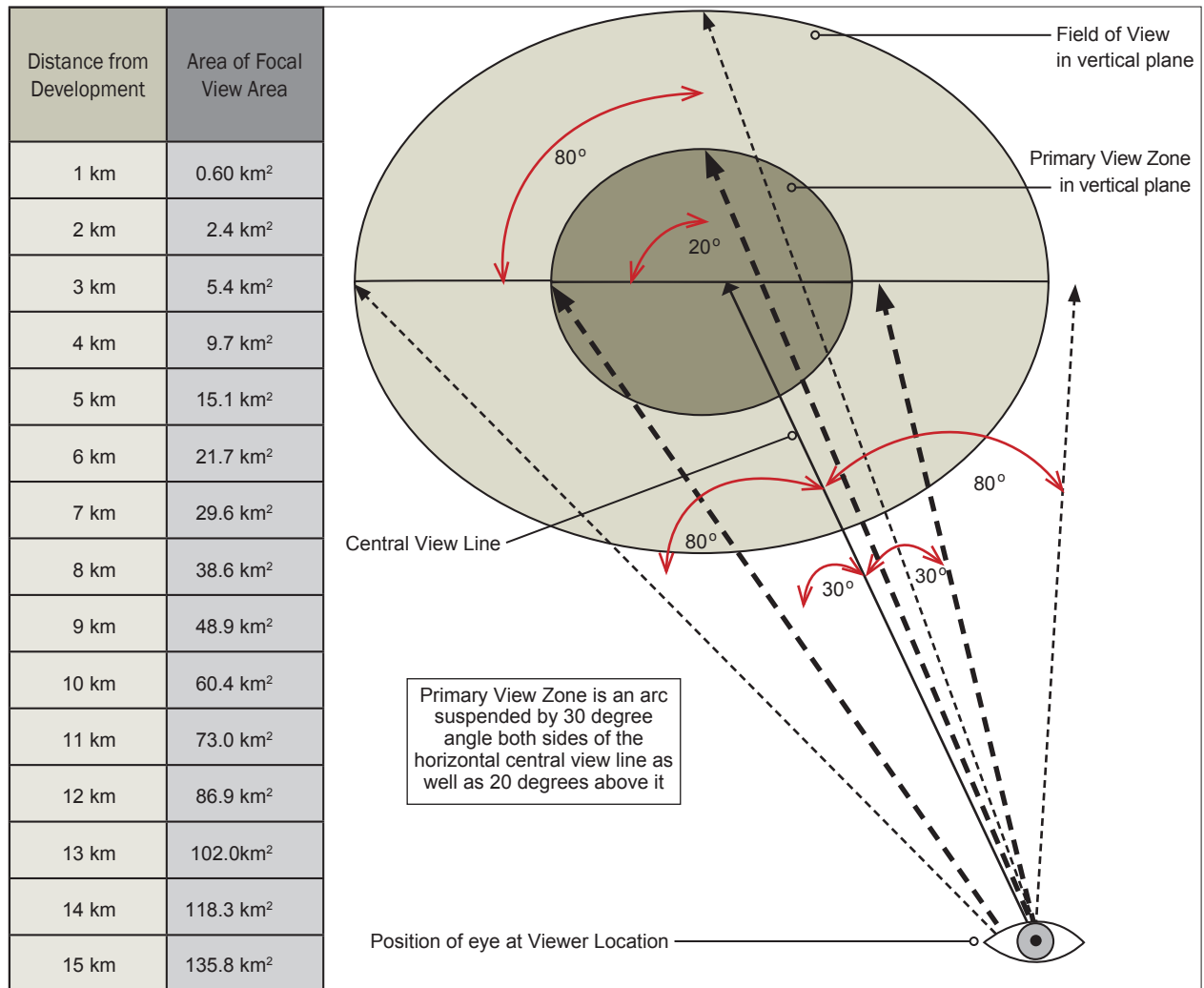


Figure 2.2 | Area of Primary View Zone (PVZ) at various distances from the Project.
The PVZ being the most critical and central part of any view.

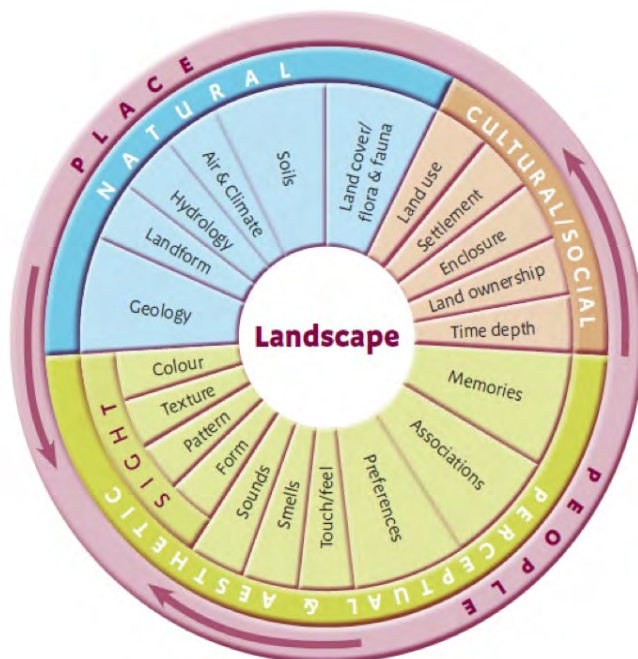


Figure 2.3 | Landscape Characteristics
Source: Natural England (2014)

Measuring the percentage of the PVZ occupied by a development will provide a more critical measure than a measure of the development in the context of the whole view zone which would include both primary and secondary view areas, representing a view arc of 120° – 150°, instead of a view arc of 60° represented by the PVZ only.

Generally, a low or very low visual effect level will occur if there is minimal contrast between the visible area of the development and the existing landscape setting and/or the area occupied by the development are only small parts of a total view.

Conversely, a high visual effect level will result if a visible area of the development has a high visual contrast and low integration to the surrounding landscape.

The consideration of the level of visual effect and the percentage of the PVZ that the development occupies, as well as the visual sensitivity will determine the overall impact. For example, a development that is determined as Level 1 when considering level of contrast and integration but occupies 1% or less of the primary view has a low visual effect.

2.3.2 **Visual Sensitivity**

Visual sensitivity is a measure of how critical a change to the existing landscape may be when viewed by different land use areas and other stakeholders from varying distances.

In this regard, residential, tourist and / or recreation areas generally have a higher visual sensitivity than other land use areas, including industrial, agricultural or transport corridors. This is because land uses, such as residential, use the scenic amenity values of the surrounding landscape, often over extended viewing periods. Table 2.2 indicates the levels of visual sensitivity associated with the development.

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

- Screening effects of any intervening topography, buildings or vegetation. Receptors with well screened views of the development would have a lower visual sensitivity than those with open views.
- Viewing distance from the receptors, to visible areas of the development. The longer the viewing distances, the lower the visual sensitivity.
- General orientation of receptors to landscape areas affected by the development. Receptors with strong visual orientation towards the development would have a higher visual sensitivity than those not orientated towards the development.

2.3.3 **Visual Impact**

The level of visual impact of a project is determined by combined consideration of the visual effect and the visual sensitivity. This combined consideration is illustrated in Table 2.3.

2.3.4 **Cumulative Impacts**

An appropriate radius of analysis is required to include all relevant existing developments that the development would potentially interact with on a visual level. The cumulative impacts should also consider potential future actions that could affect the landscape and account for future generations of viewers.

Cumulative visual impacts are the combined impacts of the development with other past, present, or likely future developments that would have potential visual interactions.

Cumulative visual impacts can occur:

- Where multiple facilities are seen within the same view without the viewer turning his/her head (the facilities may be juxtaposed so that one is seen “through” the other;
- Where multiple facilities can be seen successively if the viewer turns his/her head; or

Table 2.2 | Visual Sensitivity

Land Use	Visual Sensitivity Levels			
	Nearest visible mine area less than 2.5kms away	Nearest visible mine area between 2.5kms - 7.5kms	Nearest visible mine area between 7.5kms - 12.5kms away	Nearest visible area more than 12.5km away
Urban and rural houses	High Sensitivity	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Designated areas of high cultural and landscape values e.g. Muswellbrook - Jerrys Plains Landscape Conservation Area	High Sensitivity	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Destinations of visually high sensitive land uses eg. horse studs, vineyards and recreation areas	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Low Sensitivity
Designated tourist roads eg New England Highway, Golden Highways and Edderton Road,	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Low Sensitivity
Commercial Facilities	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Low Sensitivity
Other main roads eg Thomas Mitchell Drive	Moderate Sensitivity	Low Sensitivity	Low Sensitivity	Very Low Sensitivity
Minor local roads in rural zone eg Bureen Rd.	Moderate/Low Sensitivity	Low Sensitivity	Very Low Sensitivity	Very Low Sensitivity
Broad acre rural lands	Low Sensitivity	Low Sensitivity	Very Low Sensitivity	Very Low Sensitivity

Table 2.3 | Visual Impact

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

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

- Where multiple facilities are viewed in succession as the viewer moves through the landscape (e.g., driving on highways, hiking trails, or boating on rivers). In this case, multiple facilities can impact the viewing experience for moving viewers even if the facilities are not visible from a single common viewpoint.

Cumulative visual impacts are particularly important where large scale changes occur to the landscape over long distances, which increases the chances that multiple projects are in view at the same time or in succession for moving viewers. As the Project is an underground mine with limited surface infrastructure, it would not involve large-scale changes to the landscape (with exception to the ongoing rehabilitation at the Maxwell Infrastructure). This landscape and visual impact assessment has included consideration of potential cumulative impacts and dynamic landscape impact assessment.

2.4 Visual Impact Mitigation

Visual impact mitigation strategies address on-site and off-site viewers, visual effects and sensitivity factors over time.

2.4.1 Reduce Visual Effects

The Project has been designed to reduce the potential for visual effects, in consideration of key criticisms of previous development applications, by:

- locating the mine underground;
- utilising existing infrastructure at the Maxwell Infrastructure;
- positioning the mine entry area in a natural depression, which encloses most operational components within natural topography;
- the use of compatible tones for building and cladding colours (such colours would include tonal variations of existing colours in the surrounding landscape); and
- landscaping at the mine entry area to create tonal variations when viewed from the air.

Furthermore, the rehabilitation of overburden emplacement areas at the Maxwell Infrastructure would decrease the visual contrast to the broader landscape. The rehabilitation strategies that emulate patterns, shapes, lines and colours of the existing landscape would reduce the contrast between the overburden emplacement areas at the Maxwell Infrastructure and the broader landscape, reducing visual effect levels.

2.4.2 Reduce Visual Sensitivity

Reducing visual sensitivity is achieved by carrying out treatments to minimise visibility to the Project. Such screening treatments can be used to enhance the landscape view and reframe views towards areas not affected by mining activities.

2.5 Dynamic Landscape Assessment

Landscape has been defined as ‘...an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors’ (Kaymaz, 2012).

Human factors are expressed through a wide range of rural and urban land uses. In the Hunter Region this includes, farming, horse studs, vineyards and mining. Other manifestations include towns and villages as well as roads of various scales and character and other infrastructure such as power lines and power generation facilities.

Landscape assessment seeks to identify and describe variation in the character of the landscape, with reference to elements and features both natural and cultural, as understood by human perception (Figure 2.3). It differs from visual assessment in that it considers all sensory perception of the landscape.

Dynamic landscape assessment refers to the collective evaluation of these values at a regional and subregional level in addition to local area assessment. It reflects people’s perceptions as they move through the landscape. A dynamic landscape assessment for the Project is presented in Section 8.

3. EXISTING ENVIRONMENT

3.1 Introduction

This section establishes the visual character of the existing environment. The existing environment surrounding the Project comprises a range of different landscapes, which vary as a result of topography, vegetation cover and land use types.

3.2 Visual Study Area

The Primary Visual Catchment (PVC) is the visual study area. The PVC covers an area of approximately 360 square kilometres (km²) and is defined by:

- Wollemi National Park escarpment to the south;
- ridges, spurs and foothills to the west;
- existing mining areas and overburden emplacement areas of Mt Arthur Mine and the Maxwell Infrastructure, and the low ridges to the north of Thomas Mitchell Drive; and
- to the east, the low north-south ridgeline and associated ridges east of the Maxwell Underground.

The extent of the PVC is shown on Figure 3.1.

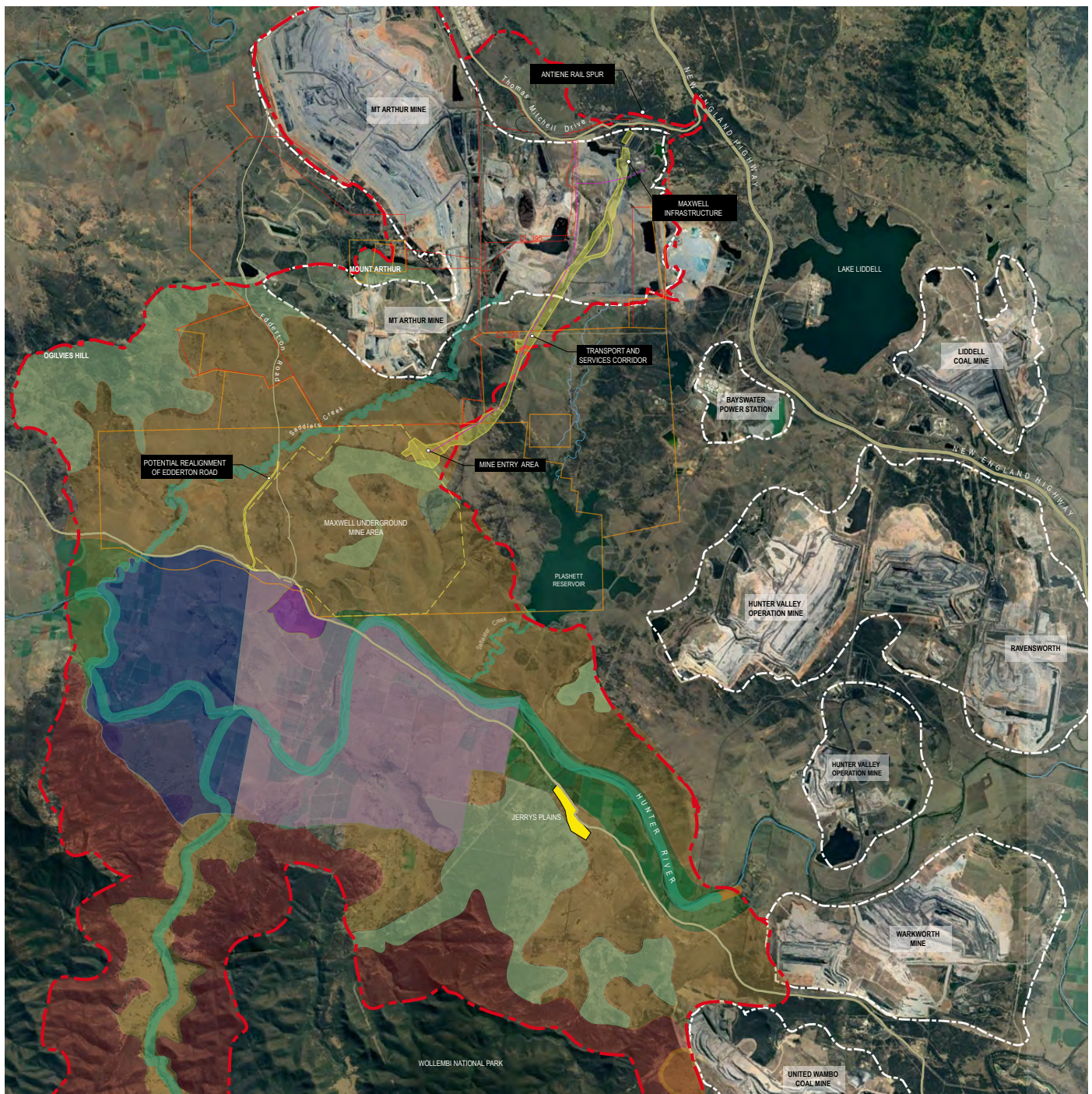
Key landscape features within the PVC include:

- Wollemi National Park is a regionally significant landscape at the southern edge of the PVC. Its steep heavily wooded escarpment and plateau contrast significantly with the predominantly cleared lowland within the PVC to the north. The steep folded topography and isolated knolls and ridges of this elevated conservation area creates a landscape of high visual amenity.
- Ridgelines and prominent rocky hills form the western and north-western perimeter of the PVC.
- Mount Arthur is the highest landform in the north of the PVC. Notably there is no public access to the telecommunications facilities at its peak.
- The Hunter River is a major river in NSW flowing east through the PVC and provides the water resources and rich flood plain soils that differentiate the area from surrounding hills and grazing lands. The towns along the river locally include Muswellbrook, Denman, Jerrys Plains and Singleton. The Golden Highway runs west to east within the PVC.
- Existing open cut mining areas, overburden emplacement areas and coal handling and preparation infrastructure.
- Saddlers Creek, located north of the Maxwell Underground, flows north-east to south-west through gently rolling grazing land and flows into the Hunter River. Saltwater Creek lies to the east and flows from north to south and into Plashett Reservoir. The riparian vegetation bands that mark Saddlers Creek and Saltwater Creek are distinctive landscape features contrasting with the gently rolling grasslands and wooded hills that characterise the PVC.

3.3 Project Area and Surrounds

The topography that overlies the Maxwell Underground has general elevations ranging from 150 metres (m) in the vicinity of Saddlers Creek to 277 m. Dry open sclerophyll forest dominates on gentle to moderate slopes, with open grazing land on the lower slopes.

The existing Maxwell Infrastructure lies within a region of significant disturbance due to previous open cut mining activity. Adjacent surrounding elevations are generally above 220 m with the existing overburden emplacement areas rising to over 260 m.



key

	Mining lease boundary		Coolmore Stud VCU		Slopes and Hills VCU
	Exploration licence boundary		Godolphin Woodlands Stud VCU		Forested Hills VCU
	Primary visual catchment		Vineyard VCU		Southern Escarpment VCU
	Main Roads		Village VCU		Creeklines VCU
	Existing mines and infrastructure uses VCU		Hunter River Flood plain VCU		

Figure 3.1 | Visual Study Area and Associated Visual Catchment Units
 The visual settings of the Project sites are created by a range of landscapes with different topography, vegetation, and land use features. Considered together, these create a number of distinctive visual character units (VCU). Any view may include a number of VCUs.

The facilities at the Maxwell Infrastructure are located on an elevated flat (elevation approximately 250 m), including administration and workshop buildings, the CHPP and train load out facilities, overburden emplacement areas and coal stockpiles. The Maxwell Infrastructure is accessed via the site access road off Thomas Mitchell Drive. Vegetation buffers separate the Maxwell Infrastructure from Thomas Mitchell Drive.

A mine entry area and associated facilities would be developed for the Project to support the underground mining activities and provide for personnel and materials access to the underground mine. Surface infrastructure would include coal surge stockpiles, coal handling facilities, administration and workshop buildings and other supporting infrastructure. The mine entry area has been strategically positioned within a natural valley to limit views of the surface infrastructure.

The mine entry area and Maxwell Infrastructure would be connected by a transport and services corridor, which would include a road, a covered overland conveyor and other linear infrastructure components within the corridor. These components would be developed within gently undulating hills and would cross the elevated north-south ridge to the east of the mine entry area.

The potential Edderton Road realignment crosses undulating grassland and scattered trees to the south of Saddlers Creek.

3.4 Visual Character Units

The visual character of the landscape in the vicinity of the Project is defined by the mosaic of topographic form, vegetation patterns, and the riparian network of Saddlers Creek, Saltwater Creek and the Hunter River system. These landscape features combine in various ways to create distinct areas of visual uniformity defined as VCUs. The VCUs combine in various vistas from viewing locations such as residences and roadways.

The VCUs within the PVC include:

- Coolmore Stud VCU;
- Godolphin Woodlands Stud VCU;
- Vineyard VCU;
- Jerrys Plains village VCU;
- Hunter River flood plain VCU;
- Forested hills VCU;
- Slopes and foothills VCU;
- Creek lines VCU;
- Southern escarpment VCU; and
- Existing mining, power generation and industrial VCU.

Each of these VCUs is discussed in the subsections below.

3.4.1 *Horse Studs*

The dominant land use to the south and south-west of the Project is thoroughbred horse breeding with associated rural residential functions.

The Project is in the vicinity of two internationally-owned, high-profile thoroughbred horse studs – Coolmore Stud and Godolphin Woodlands Stud. Coolmore Stud is located south of the Project (refer Figure 3.1). Godolphin Woodlands Stud is located to the west of the Coolmore Stud and south-west of the Project.

Coolmore Stud VCU

The Coolmore Stud presents lush green irrigated grazing land on river flats with distinctive timber post and rail fences and yards. This creates a rural landscape with high visual appeal, particularly when viewed from the Golden Highway. This river flat landscape is contrasted by gentle enclosing hills with dryland grass and scattered tree cover on the northern edge of Appletree Creek (refer Figure 3.2). Mature exotic tree plantings define property perimeters, entrances and internal roads. Trees also delineate numerous horse paddocks, reinforcing the rectilinear pattern of the manicured landscape and differentiating it from the Hunter River flood plain VCU areas. They also contrast with the more random pattern of the native remnant trees on the surrounding rolling hills.

There are a number of residential and administration facilities associated with the Coolmore Stud. Buildings include the heritage sites, Strowan Homestead and Arrowfield Cottage and other residences, with mature trees providing shade for residents.

Internal roads at the Coolmore Stud give access to a number of lookouts.

The Coolmore Stud creates a distinctive landscape setting. The Coolmore Stud contributes to the overall visual amenity of the Muswellbrook-Jerrys Plains Landscape Conservation Area.

With the exception of a small area of river flats, the Coolmore Stud and residences are to the south of the Golden Highway.

Godolphin Woodlands Stud VCU

The Godolphin Woodlands Stud presents as lush, highly maintained green grazing land. Under its previous name ('Woodlands') it was included in the Hunter Regional Environmental Plan 1989 (Heritage) Schedule 2 – *Items of regional environmental heritage* (now repealed). The distinctive entrance is announced with post and rail fencing, creating an attractive rural landscape from the Golden Highway.

This stud is characterised by varied topography with significant ridgelines within the property perimeter. Internal roads provide access to rocky outcrops and higher vantage points overlooking the surrounding landscapes (refer Figure 3.3).

The lush character of the undulating irrigated grazing land contrasts with surrounding dryland grass associated with the Slopes and foothills VCU.

There are mature tree plantings along the Golden Highway frontage and along several internal roads. Numerous horse paddocks are defined by established trees reinforcing the identity of the Godolphin Woodlands Stud. The pattern of the paddock vegetation contrasts with the more random remnant trees on the surrounding rolling hills. Scattered remnant trees also cover Trig Hill and its associated ridgeline.

An extensive rural complex including yards, staff cottages and administration infrastructure is located south of the Hunter River. A manager's residence is located further north at a higher elevation, closer to the northern entrance to the Godolphin Woodlands Stud.

Godolphin Woodlands Stud creates distinctive landscape settings that add to the visual quality of the region and locality. Godolphin Woodlands Stud is a high profile stud that contributes to the overall visual amenity of the Muswellbrook-Jerrys Plains Landscape Conservation Area.

'Randwick Park Hill' has an elevation of 255 m, and provides the highest elevation on the property, serving as a lookout for visitors.

The Godolphin Woodlands Stud and associated residences are located predominantly on the southern side of the Golden Highway.

3.4.2 Vineyards VCU

Hollydene Estate Wines (previously Arrowfield), a popular tourist attraction, is a commercial vineyard that operates a boutique winery and restaurant. The estate is covered by tiered rows of vines delineating the contours of the local topography. These vineyards create a textured patchwork appearance interspersed with mature remnant vegetation, surrounded by the landscapes of the horse studs.



Figure 3.2 | Coolmore Stud VCU

The horse studs and residences within the visual study area are limited mostly to the southern side of Golden Highway with several rural properties and houses adjacent the highway.



Godolphin Woodlands Stud grazing paddocks as seen from the Golden Highway.



Views north towards Mount Arthur and east from Godolphin Woodlands Stud - Bowman's Hill.

Figure 3.3 | Godolphin Woodlands Stud VCU
Godolphin Woodlands Stud has several higher vantage points with views of high visual appeal.

The winery cellar door, 'Vines' restaurant, outdoor decks and gardens, administration and function facilities are located on a north-easterly facing slope with views of the vineyards, the Golden Highway, Wollemi Escarpment and the Hunter Valley landscape in the middle distance. Established gardens surround the buildings and scattered trees cover a portion of the undeveloped area of the estate.

Hollydene Estate Wines contains a distinctive landscape setting that adds to the visual quality of the region and locality (refer Figure 3.4). It is a popular tourist destination and commercial operation that is part of the Hunter Valley food and wine trail.

3.4.3 ***Jerrys Plains Village VCU***

The historic village of Jerrys Plains is located in the south-eastern corner of the PVC. The village is set within the Slopes and foothills VCU, immediately adjacent to the Hunter River flood plain. The Golden Highway is the main street of the village and feeds a grid of local streets that front large lots carrying residential buildings and scattered trees.

The small village includes a tavern, service station, school and several historic buildings: the old school, police station, church and post office which date from the 1870s.

The village is a visual feature of the region and, for the greater part, retains its village integrity. It represents an area of high sensitivity (refer Figure 3.5).

3.4.4 ***Hunter River flood plain VCU;***

This VCU is relatively flat with irrigated grass and cropping, affording long views from the Golden Highway across the flood plain to the surrounding hills and ranges (refer Figure 3.1).

There are a number of scattered rural residences within this VCU, with some additional properties located within the Godolphin Woodlands Stud and the Coolmore Stud properties.

The significance of the VCU is the rectilinear character of the verdant green improved pastures and cropland which creates high visual amenity contrasting with surrounding drier grasslands, wooded slopes and rugged escarpment (refer Figure 3.6).

The wide valley views and verdant cropping areas are included in the Muswellbrook-Jerrys Plains Landscape Conservation Area, discussed further in Section 5.3.

Croplands create strong patterns, shapes, lines and colours in the landscape of this VCU. From key vantage points, views open to more distant landscapes over adjoining riparian vegetation and forested hills.

3.4.5 ***Forested hills VCU***

This VCU consists of forested hills and open woodlands, the former are situated mainly around the perimeter of the PVC with the latter scattered throughout the PVC. Some of these hills lie close to the Golden Highway. The topography in the area of the Maxwell Underground rises gently from the surrounding slopes and foothills to elevations in the vicinity of 150 m to 240 m.

Generally, the view from the hills is unobstructed, with the tree cover sitting below the ridgeline. Significantly the contrasting colour and texture of the open forest on the hillsides against the surrounding paler grasslands accentuates their visibility as a landscape element (refer Figure 3.7).

The forested slopes adjacent to the Golden Highway boundary near the thoroughbred horse studs create a visual boundary to viewsheds to the north. The forested hills include gentle to moderate slopes with limited topographic relief that limits visibility to many external view locations.

3.4.6 ***Slopes and foothills VCU***

The slopes and foothills occur between the cropping lands and forested hills, and/or surrounding ranges. Gentle to moderate slopes are predominantly cleared and maintained as grazing land with a scattered covering of remnant trees (refer Figure 3.8). This unit is the most common in views of the rural landscapes, including views towards the Project.



Figure 3.4 | Vineyards VCU

This VCU is limited to a small area adjacent the Golden Highway and is surrounded by Coolmore and Godolphin Woodlands Studs. It is a commercial enterprise and tourist destination.



Figure 3.5 | Jerry's Plains Village VCU
Towns and villages create focal points in the landscape as well as local settings with built elements contributing to the foreground of a view.



Figure 3.6 | Hunter River flood plain VCU
Cropping lands dominate this VCU creating a strong open large scale and small scale rectilinear pattern of great visual diversity. The VCU is generally backdropped by the Slopes and hills VCU that adds visual interest to the views of the valley.



Figure 3.7 | Forested hills VCU
Forested hills include gentle to moderate slopes with topographic features that could create visual screens to the Project.



Figure 3.8 | Slopes and hills VCU
The undulating country within the VCU is generally cleared with scattered tree cover.

3.4.7 **Creek lines VCU**

This VCU comprises the two main creeks within the PVC;

- Saddlers Creek.
- Saltwater Creek.

Downstream of the Plashett Reservoir, Saltwater Creek appears to have been realigned into a man made channel. The remnant River She-Oaks (*Casuarina cunninghamiana*) are the most significant visual features of Saddlers Creek and Saltwater Creek. The River She Oak woodlands define the creeks and water ways in the landscape and often act as visual barriers to more distant views.

This VCU provides a visual backdrop to many of the adjoining paddocks, fields and croplands and is evident in the foreground of many local views, providing some screening and filtering of the views beyond (refer Figure 3.9).

3.4.8 **Southern escarpment VCU**

The southern and south-western edge of the PVC are defined by an escarpment consisting of sheer cliff faces, plateaus, ridges and rocky knolls that mark the northern extent of the Wollemi National Park. The escarpment rises from 540 m to 600 m above the flood plain. The steep slopes support open eucalypt and cypress forests.

The visual significance of the escarpment is that it creates a dramatic background to views from a wide range of view locations and provides a visual barrier to distant views. It is a major visual feature of the PVC (refer Figure 3.10).

3.4.9 **Existing mining, power generation and industrial VCU**

There are existing open cut coal mines and power stations in close proximity to the Project. Some lie partially within the visual study area. They include the Mt Arthur Mine (BHP), Hunter Valley Operations (an open cut mining complex jointly owned by Yancoal Australia Ltd and Glencore Coal Pty Ltd [a subsidiary of Glencore plc]) and Liddell and Bayswater Power Stations (AGL Energy Limited [AGL]). The visual character and scale of the existing Maxwell Infrastructure, the adjacent Mt Arthur Mine and the Liddell and Bayswater Power Stations are strong enough to create a VCU (refer Figure 3.11).

The VCU contains mining areas, overburden emplacement areas and mine infrastructure facilities. It also contains significant infrastructure associated with Liddell and Bayswater Power Stations including cooling towers, emissions stacks and a large river pumping station. The mine and industrial areas create a large-scale industrial landscape that contrasts with the surrounding forested hills and the agricultural landscapes of the foot slopes and flood plains.

The visual effect of rehabilitated overburden emplacement areas is similar to the existing landscape, while pre-rehabilitated overburden emplacement areas contrast strongly with the surrounding landscape.

3.5 **Summary**

The various VCUs within the PVC create a diverse range of visual settings and views. The visual prominence of the horse studs is reinforced by the verdant character of the landscape that demarcates these properties. The forested hills create a strong contrast to the pale gentle slopes of the grazing land while providing some visual screening of the Project components. In this regard, the forested hills within the Project area are a significant asset.

The southern escarpment associated with Wollemi National Park creates a strong visual feature to the south and defines the PVC in that location.

The mine entry area is situated within a gently undulating landscape of depressions and ridgelines that restrict views into the area. Surrounding topographic features and riparian vegetation along various creek lines also limit clear views to the Project.

The VCUs interact visually to provide a range of landscape settings when viewed from the various viewpoints. Collectively these VCUs frame the view, at times revealing, then screening, view corridors to the Project.



Figure 3.9 | Creek lines VCU

This VCU defines the lower lying drainage catchment within the surrounding undulating grazing lands. River She Oak woodlands define the creeks and water ways in the landscape, often providing visual barriers to more distant views.



Figure 3.10 | Southern escarpment VCU
The Southern Escarpment VCU dominates the southern horizon and creates spectacular backdrops to local landscape settings within the visual study area.



The main large scale visual elements of mines are the overburden emplacement areas (OEAs). The visual effect of rehabilitated OEAs is similar to the existing landscape while pre-rehabilitated OEAs maintains a strong contrast.



Regional infrastructure such as power stations are highly visible elements in the landscape. The visual effect of these type of facilities contrast strongly with surrounding rural character.

Figure 3.11 | Existing mining, power generation and industrial uses VCU

4. THE PROJECT

This section evaluates the various components of the Project and defines their visual effects in terms of how these components contrast with the existing landscapes.

4.1 Project Components

From a visual perspective, the major components of the Project are as follows:

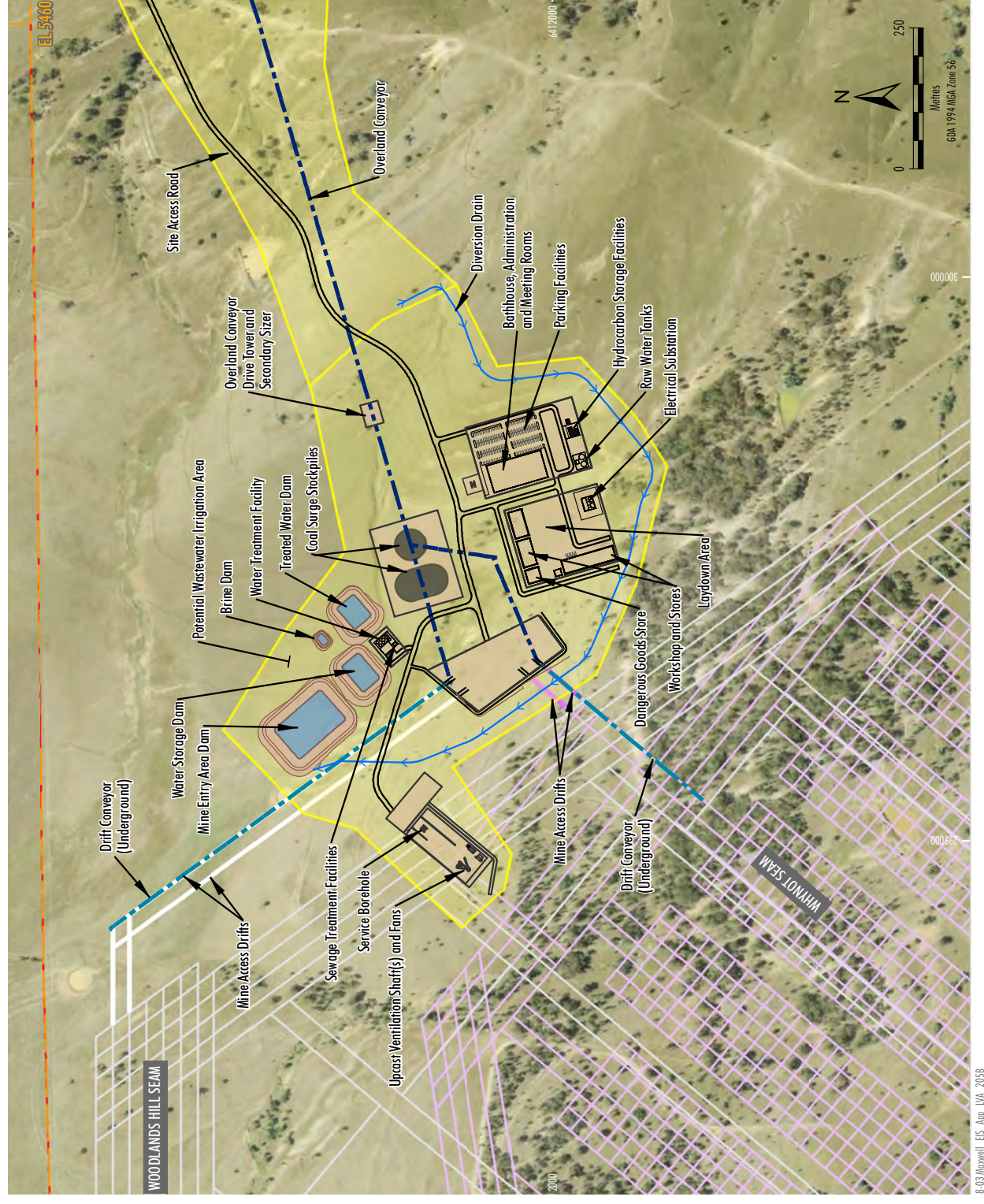
- the proposed area of underground mining operations within EL 5460 (Maxwell Underground);
- the underground mine entry area;
- the existing Maxwell Infrastructure and associated upgrades;
- the existing overburden and tailings emplacement areas within CL 229, ML 1531 and CL 395;
- the power supply infrastructure;
- the transport and services corridor; and
- the potential realignment of Edderton Road.

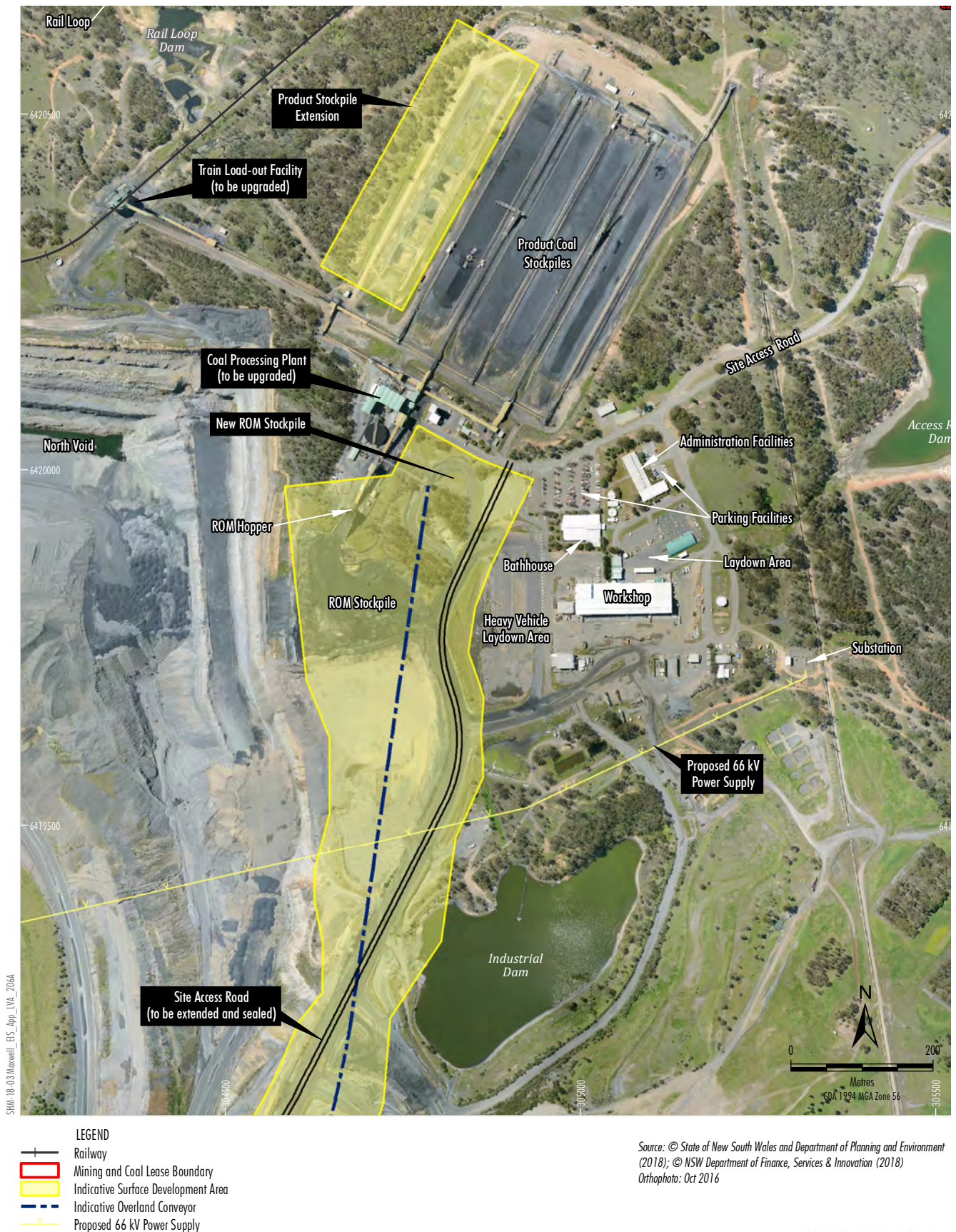
Figure 4.1 illustrates the proposed general arrangement of these Project components.



SPM-18-03 Maxwell_ES_Appl_VLA_203C

Figure 4.1 | Maxwell Project general layout





Source: © NSW Department of Planning and Environment (2018);

Figure 4.3 | Maxwell Infrastructure Area proposed layout

4.2 Mine Entry Area

<i>Visual Components</i>	- Construction and development of coal surge stockpiles and coal handling facilities. - Construction of temporary and permanent vehicle access. Earthworks including removal and stockpiling of material for later reuse and temporary erosion and sediment control. - Infrastructure associated with underground works and operations as follows: - buildings, services and facilities, fuel storage, bathhouse, laydown and parking. - mine ventilation and gas management structures. - sumps, pumps, pipelines and water storage structures associated with water management. - Lay down and assembly areas and installation of mining equipment and parking for heavy machinery (such as front-end loaders) delivery, assembly, and installation of mining equipment.	
<i>Physical Character</i>	The mine entry area includes a range of structures and work areas on a small scale. Collectively the arrangement of these components takes on an industrial character. Approximate heights of the key infrastructure above the existing ground level are as follows: - The top of the raw coal stockpiles and associated infrastructure - approximately 25 m. - The top of the overland conveyor tower - approximately 10 m. - Other infrastructure and buildings - 5 to 10 m. The infrastructure at the mine entry area has been purposely located in a valley and designed so that it would not be visible from the Godolphin Woodlands Stud or the Coolmore Stud. Earthworks would modify the surface topography to provide for establishment of the required infrastructure. Generally, structures would be painted in neutral colours borrowed from the surrounding landscape, except where safety requirements dictate otherwise. At night, lighting from work areas, mobile equipment and head lamps would potentially affect the ambient darkness that characterises the surrounding rural landscape. Lighting would be designed to minimise “spill”, which may include the use of shielded fittings, minimisation of upward spill light through aiming of lights or the use of energy efficient lighting (such as LED [Light Emitting Diode] lighting).	
<i>Visual Effect</i>	During construction	Operation
	Level 1 visual effect: During the initial years of the Project clearing and earthworks would create areas of colour and texture that contrast with the surrounding landscapes. These works would generally be situated below the surrounding ridgelines, which would provide screening.	Level 3 visual effect: After year 2, the Project has achieved a good level of integration due predominantly to the screening provided by surrounding ridge lines. If visible, the collection of industrial buildings would establish a texture of rectilinear forms and geometric shapes in contrast with surrounding landscape setting. Potential night-lighting effects are discussed in Section 7.3.

4.3 Maxwell Underground

<i>Visual Components</i>	The underground mining works would be below the surface and consequently do not present visual components. This contrasts with an open cut mining operation where mining activities (e.g. pit excavation and overburden emplacements) typically represent the most significant visual effects.	
<i>Physical Character</i>	As above- refer to Section 4.9 - Subsidence due to underground mining.	
<i>Visual Effect</i>	During construction	Operation
	No visual effects	No visual effects

4.4 Existing Maxwell Infrastructure

<i>Visual Components</i>	Minor upgrades to existing Maxwell Infrastructure.	
<i>Physical Character</i>	Existing approved infrastructure and facilities with minor physical changes to existing infrastructure and modified layout and expanded footprint for various components as follows: - development of a new product coal stockpile and associated infrastructure, adjacent to the existing product stockpiles (approximately 30 m high, 340 m long and 50 m wide); - decommissioning of the ROM truck hopper (high point within the Maxwell Infrastructure) and development of a new ROM coal stockpile (approximately 25 m high, 155 m long and 140 m wide) and associated infrastructure (i.e. conveyor that is approximately 25 m high at the highest point) sited adjacent the CHPP; and - upgrade of the train load-out bins, use of existing bins with changes to feed and loading hardware.	
<i>Visual Effect</i>	During construction	Operation
	Level 3 visual effect: Well integrated with existing setting of Maxwell Infrastructure. Limited contrast or change to existing visual setting.	Level 3 visual effect: Well integrated with existing setting of Maxwell Infrastructure. Limited contrast or change to existing visual setting.

4.5 Existing Overburden and Tailings Emplacement Areas

<i>Visual Components</i>	The existing overburden and tailings emplacement areas within CL 229, ML 1531 and CL 395 would be rehabilitated as part of the Project. Works would include: - reshaping of the landform; - spreading of inert capping and topsoil; and - seeding and revegetation. Stabilisation works within the existing voids would also be undertaken as part of the rehabilitation and mine closure activities. However, these activities would be below ground level and out of the line of sight.	
<i>Physical Character</i>	Earthworks and rehabilitation would be undertaken during the day.	
<i>Visual effect</i>	During construction	Operation
	Not applicable - existing landform.	Level 3 visual effect: The rehabilitation activities on the existing overburden emplacement areas would progressively decrease the visual contrast with the surrounding setting, enhancing the visual integration with the local landscape over time. The final modified landforms would resemble local topography and vegetation communities (e.g. grassed hills).

4.6 Power Supply Infrastructure

<i>Visual Components</i>	The visual components for this component of the Project are as follows: - substation and protective fencing; - vertical poles; - horizontal cables between poles; - existing road, transport and services corridor and access tracks; and - earth moving equipment and elevated work platforms during construction.
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Physical Character	The power supply infrastructure to the mine entry area would be comprised of standard 66 kilovolt (kV) powerlines. The powerline would be located predominately within the transport and services corridor (with the exception of approximately 3.5 kilometres (km) within CL 229). The hardwood timber or concrete power poles would range in height from approximately 10 to 20 m. The timber poles would be treated with preservative, which weathers to a dull green. The poles would be spaced at a maximum of 120 m and would be designed to carry the powerlines without cross bars.	
Visual effect	During construction	Operation
	Level 2 visual effect: During years 1 and 2 of the Project, construction equipment, trucks and elevated work platforms would be on site. Earth moving plant and equipment would also be utilised in the construction of the transport and services corridor (refer Section 4.7). The pole components create vertical contrast with the backdrop of undulating hills. This contrast would soften over time as the poles weather and blend with the neutral tones of the landscape. Scattered woodland would break the regular pattern of the poles and help integrate these vertical components with the surroundings.	Level 3 visual effect: Powerlines are a common visual component in the broader local landscape. The region has several high voltage power lines that cross the landscape. These existing powerlines can be seen from the Golden Highway and New England Highway. The powerlines for the Project would be smaller in scale, with moderate integration due to construction materials. The vertical poles would provide the most significant contrast with the existing rural setting. The greatest visual effect from power poles and wires is when viewed against the skyline, where their outline becomes clearly delineated. Against a landscape background they have only a low-level contrast and are a common feature of rural settings (refer Figure 4.4).

4.7 Transport and Services Corridor

Visual Components	The main visual components of the transport and services corridor include: <i>The site access road from Thomas Mitchell Drive and existing Maxwell Infrastructure area to the Maxwell Underground.</i> <i>Use of the new road from the mine entry area to the existing CHPP for transportation of coal using road-registerable trucks during the early years of the Project.</i> <i>Covered, overland conveyor system to transport coal from the mine entry area to the Maxwell Infrastructure (refer Figure 4.4).</i> <i>Operational traffic use of the transport and services corridor.</i>
Physical Character	The transport and services corridor would require some vegetation clearing and earthworks to establish the site access road and other associated infrastructure. The site access road heading north-east crosses the ridgeline towards the Maxwell Infrastructure. The covered overland conveyor is a long linear covered structure that would be painted muted colours to blend with existing surroundings (similar to existing infrastructure at the Maxwell Infrastructure). The covered overland conveyor is industrial in character and of similar character to conveyors currently established between the Mt Arthur Mine and the Liddell and Bayswater Power Stations. The covered overland conveyor would have a low profile, so visibility would depend on view position.

<i>Visual effect</i>	During construction	Operation
	Level 1 visual effect: During years 1 and 2 of the Project, clearing and earthworks would create areas of contrasting colour and texture against the surrounding landscapes. Cuttings through elevated areas would create exposed banks and some cutting faces that would integrate into the landscape as they weather and soften with vegetation cover. Most of the corridor is contained visually by the undulating topography, with vegetation providing some visual screening.	Level 3 visual effect: After the sealing of the site access road, the transport and services corridor would have a similar appearance to a rural road. The number of vehicles utilising the site access road would decrease following commissioning of the covered overland conveyor. The corridor would also contain the power supply infrastructure (refer to Section 4.6).

4.8 Potential Edderton Road Realignment

<i>Visual Components</i>	Potential subsidence impacts on Edderton Road would be managed through either road maintenance or the potential realignment of the road around the underground mining area. The potential realignment and new intersection would be to the west of the underground mine area passing through the Malabar-owned “Bowfield” property. Construction would require some vegetation clearance, excavation and earth moving, grading and resurfacing of new road sections. Maintenance of the existing Edderton Road alignment would result in increased road work activities, with related visual effect. The potential realignment of Edderton Road would result in relocation of traffic signage on the Golden Highway and decommissioning of the original Edderton Road alignment.	
<i>Physical Character</i>	The realigned Edderton Road would be a two-lane bitumen surfaced rural road (approximately 7 m wide carriage way with 2 m shoulders) with a new intersection at the Golden Highway and associated signage. The realigned road would be similar in character to the existing alignment.	
<i>Visual effect</i>	During construction	Operation
	Level 2 visual effect: Vegetation clearing and earthworks would create areas of contrasting colour and texture in disturbed areas. Views from the Golden Highway would potentially be affected. In the short-term, views of construction activity would be evident from the Golden Highway creating moderate levels of contrast against the existing visual setting. General topography would remain similar to the existing terrain along Edderton Road.	Level 3 visual effect: Views to the north of the Golden Highway through existing clearings would be altered however these views would be similar to other views along this road. The potential realignment would pass through undulating grazing land which is similar to the setting for the existing Edderton Road

4.9 Subsidence due to Longwall Mining

<i>Visual Components</i>	Potential subsidence impacts on natural and built features may alter the micro-topography, physical textures, vegetation patterns, colours and surface detail in different areas. This includes changes to natural and built features as described in the Subsidence Assessment. Proposed monitoring and mitigation measures should limit the visual effects on sensitive receptors.	
<i>Physical Character</i>	Subsidence may be demonstrated via surface cracking, heaving, buckling, humping and stepping at the surface. • Maximum vertical subsidence of 5600 millimetres (mm). • Maximum tilt of 50 millimetres per metre (mm/m) (or 5%).	
<i>Visual effect</i>	During construction	Operation
	Level 3 visual effect: There may be progressive deformation and subsidence of existing surfaces within Malabar owned grazing lands. This may result in some areas of erosion and decrease in vegetation patterns. Some fence lines and small rural structures may show variation of horizontal alignment.	Level 3 visual effect: There may be ongoing changes to micro topography, vegetation patterns and densities over time across the subsidence area. The levels of contrast with existing landscapes would be low. These may further reduce following remediation works if these are determined to be required during monitoring.

4.10 Visual Effect Summary

The visual effects of the various components of the Project are typically moderate during construction, reducing to low during operations. The undulating topography and the fact that the mining would be underground mitigates against the potential high-level visual effects. In many instances the visual components of the Project are obscured from view and would not be visible from most external view locations.



Existing CHPP, workshops and coal loading equipment at Maxwell Infrastructure facility.



Existing overland conveyor at Maxwell Infrastructure facility uses muted colours borrowed from surrounding vegetation thereby reducing its contrast and visual effects.



Existing Antiene Rail Spur



Existing coal processing and loading equipment.

Figure 4.4 | *Maxwell Infrastructure existing project components*



Examples of similar scale and profile power lines as the proposed transmission line in similar rural contexts.

Figure 4.5 | Power supply infrastructure

5. VISIBILITY AND VISUAL SENSITIVITY

This section of the report evaluates the visibility of the various components of the Project from locations surrounding the Project boundaries. The degree of visibility is subject to the effects of topography and vegetation. The degree of visibility would be diminished where the topographic features or vegetation are close to the viewer.

The visual sensitivity of the various neighbours to the Project relates to their existing land use. Tourism facilities, thoroughbred horse studs and private residences would have a high land use sensitivity as discussed in Section 5.3. Conversely, areas including rural lands and back country could have a lower land use sensitivity. Local conditions and current perceptions regarding the visual amenity provided by a landscape also require consideration. Section 5.3.1 describes current land use practices or previously determined listing of valued landscape conservation areas.

Field assessment, evaluation of mapping and aerial photography and digital analysis define the PVC shown on Figure 5.1. The most critical locations with potential views to the Project sites are contained within the PVC.

Importantly, areas that do not have a view of the Project would not be directly impacted.

5.1 Significant Topographic Features

There are a number of topographic features that limit the visibility of the mine entry area.

Views to the north and north-west of the mine entry area are screened by the hills and low ranges associated with Mount Arthur. To the east, the low ridgeline that runs north-south to the east of the Maxwell Underground limits views from east of the ridgeline.

To the south and south-west of the mine entry area lie a series of low ridges and spurs adjacent to the Golden Highway and the Hunter River (Figure 5.2) that define local viewsheds dependent upon viewing elevation. Consequently, views to the Project from the Golden Highway are limited to locations at the western and eastern extremities of the PVC or elevated locations.

Further to the south, the Wollemi National Park escarpment and associated wilderness areas limit views. The only potential exception being views from the extreme northern end of the Wollemi National Park plateau. There are no accessible designated lookout points on any marked trail that would enable walkers to obtain distant views of the Project.

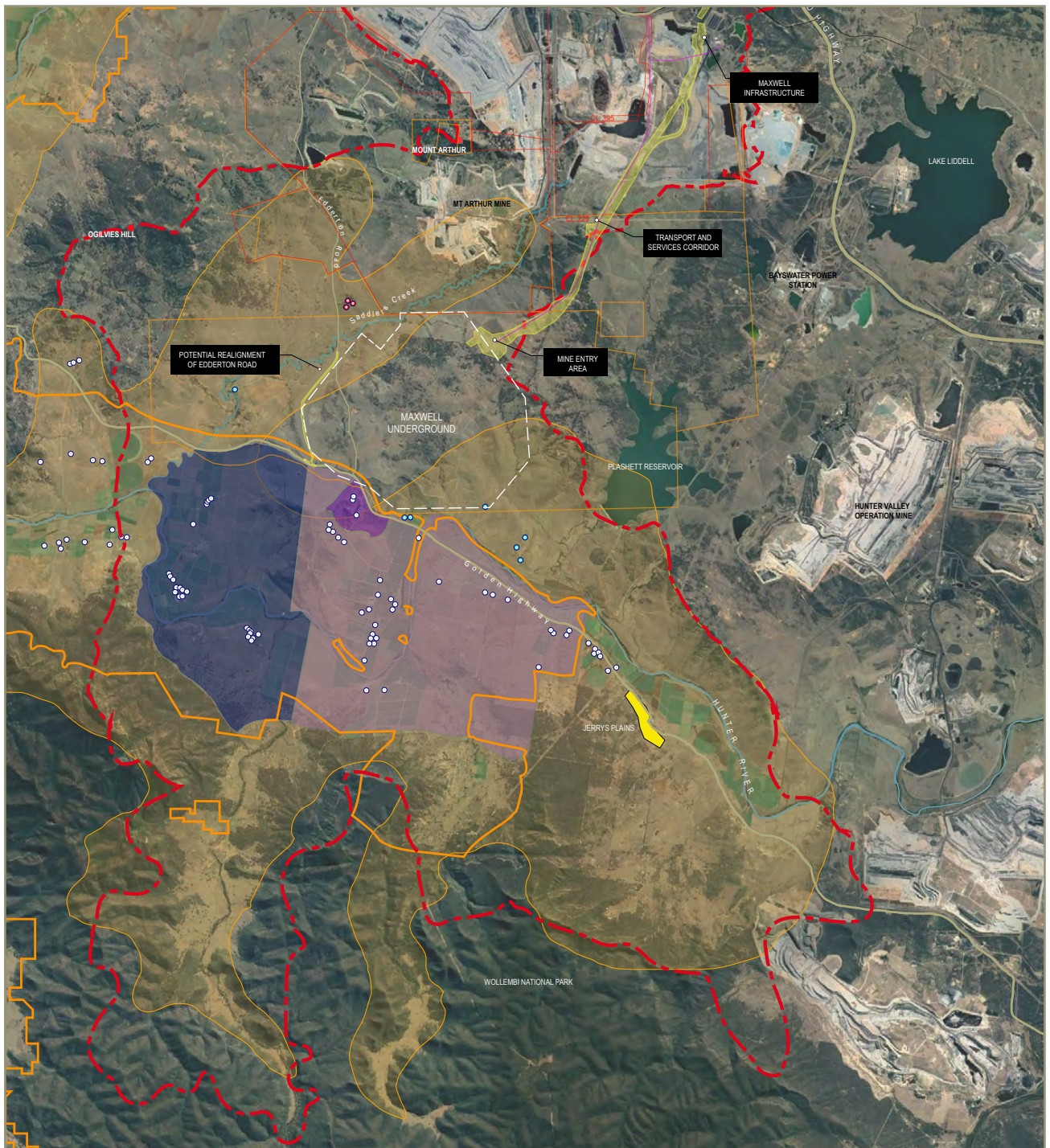
To the west, there are extensive rural land holdings with limited sensitive receptors. A high ridge to the north-west, dividing the Hunter River and Saddlers Creek catchments, limits views into the mine entry area. Views are also limited by the numerous low ridges on both sides of the Golden Highway.

The Maxwell Infrastructure is in an elevated location adjacent to Mt Arthur Mine, between the New England Highway and Thomas Mitchell Drive.

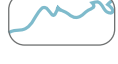
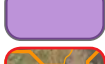
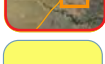
5.2 Significant Vegetation Areas

Tree cover is important in providing potential screening of the Project components at the Maxwell Infrastructure and mine entry area. It is especially significant when it is close to the viewing locations as shown in Figure 5.3.

Plantings and remnant trees in rural residential areas limit views to the Project, particularly when the vegetation is close to the viewer. Native woodland and the vegetation along the creeks and drainage lines can also provide effective screening (refer Figure 5.4).



key

- | | | | |
|---|---------------------------|---|--|
|  | Primary visual catchment |  | Muswellbrook - Jerrys Plains Landscape Conservation Area |
|  | Maxwell Underground |  | Godolphin Woodlands Stud |
|  | Main roads |  | Coolmore Stud |
|  | Rivers and creeks |  | Hollydene Estate |
|  | Malabar owned receptor |  | Equine and Viticulture Critical Industry Cluster |
|  | Other mine owner receptor |  | Jerrys Plains |
|  | Privately owned receptor | | |



0 1 2 3 4 5 10kms

Figure 5.1 | Sensitive Receptors

5.3 Visibility and Visual Sensitivity

5.3.1 **Muswellbrook – Jerrys Plains Landscape Conservation Area**

The National Trust of Australia registered the Muswellbrook-Jerrys Plains Landscape Conservation Area in 1985, citing its reasons for registration as:

“Aesthetic: The lush cultivated alluvial flats of the Central Hunter and lower Goulburn Rivers present a magnificent view, with wide valley floor of majestic scale bounded by low hills to the east and west and the rugged escarpment of the Wollemi National Park to the south.”

The listing of a place on the Register of the National Trust of Australia has no legislative effect and gives rise to no statutory obligations.

The National Trust recommendations were for protection of the high scenic and cultural qualities of the Muswellbrook-Jerrys Plains Landscape Conservation Area (refer Figure 5.5) via appropriate planning protection and the restriction of open cut mining within the alluvial river flats.

Key potentially sensitive viewing locations around the Project within the Muswellbrook Jerrys Plains Landscape Conservation Area are considered in this assessment, including Jerrys Plains village, rural residences, roads, the Godolphin Woodlands Stud and the Coolmore Stud, Hollydene Estate Wines and elevated lookouts.

5.3.2 **Equine Industry – Coolmore Stud and Godolphin Woodlands Stud**

Both the Coolmore Stud and the Godolphin Woodlands Stud contain a number of sensitive receptor locations. The cultural landscapes created within the horse breeding properties are testament to the value placed on the visual amenity by the owners. These landscapes reinforce the cultural and economic profile of the properties and underpin the presentation of the businesses to visitors and employees. Consequently, there are a number of sensitive receptors located in the equine industry area.

The operations and activities associated with thoroughbred horse breeding are considered highly sensitive to mine operations as referred to in the NSW PAC (2017) due to the ‘particular nature of, operations and requirements’ of them as existing land uses and potential impacts on the sustainability of the Equine CIC. Refer to Figure 5.1 for the extent of the equine and viticulture cluster.

Coolmore Stud

The Coolmore Stud is located to the south of the Project. It contains a number of landscape areas that have different view characteristics. The elevated parts of the estate have views to more distant locations beyond the immediate Hunter Valley landscapes. Mining and infrastructure activity to the north-east can be seen from elevated positions within the Coolmore Stud property and are an integral part of the existing landscape.

Most of the Coolmore Stud property is located on the alluvial flats associated with the Hunter River and Appletree Creek (refer Figure 5.6). With the exception of a narrow strip of river flats between the Hunter River and the Golden Highway, the majority of the property is to the south of the Golden Highway. Rolling hills with higher elevation adjoin these river flats.

Most of the intensive stud use areas and the most sensitive receptors are on the low flat lands. This includes the Coolmore Stud office and reception building, many stud facilities and paddocks. Many of the residences occupied by managers’ and workers’ families are located on the adjoining undulating hills. These residences include the Strowan Homestead.

The stud manager’s house on Oak Range Road and the workers’ accommodation buildings adjacent to Bureen Road are located on higher ground. There are roads that cross this higher terrain, specifically the road to the south of Strowan Homestead. There are also some storage areas and a property quarry in this area of the property.



Figure 5.2 | Golden Highway from Coolmore Stud - view to northwest

Topographic features in foreground or near middleground of sensitive receptors are effective in screening views to Project areas.



Figure 5.3 | Vegetation along Edderton Road

Vegetation in the foreground such as a roadside is effective in screening views.



Edderton Homestead. Vegetation around the residence filters views to the mine entry area.



Low ridgeline between Project and Golden Highway provides screening of views to operational areas.

Figure 5.4 | Foreground elements screen views
Trees, vegetation and topography can screen distant views.

The elevated rolling hills also provide vantage points such as Batty Hill and high points on Strowan Road. The highest locations on the property are associated with the Randwick Park Hill ridge system on the western end of the Coolmore Stud property. This ridge for the greater part supports lower sensitivity activities such as the property quarry, however it is used on some occasions for viewing over the property to the east.

Most of the sensitive locations are located within approximately 6 km to 7.5 km of the mine entry area. However, being located on the river flats, these locations have no views of the Project (refer Figure 5.1). Some locations on the slopes of hills, including some residences and horse stud show areas have limited views beyond the immediate ridgelines north of the Golden Highway. On occasions, Coolmore Australia take commercial visitors to elevated ridge viewpoints.

Coolmore Stud is classed as having high land use sensitivity. Due to the distance from the nearest visible Project components, elevated locations on the property that have minor views of the transport and services corridor would have moderate visual sensitivity.

Coolmore Australia has a private airstrip located parallel to the Golden Highway, approximately 4.4 km north-west of Jerrys Plains. Visitors and residents of the Coolmore Stud may arrive by plane thereby receiving aerial views of the entire Hunter Valley landscape on approach and departure. Visitors may also arrive by helicopter. The mine entry area would be one of several mining operations that are part of the broad mosaic of regional landscapes that can be viewed from a plane or helicopter. The percentage of the broader viewed landscape that the mine entry area would occupy would be relative to the distance from the airstrip. On final approach or take off, the mine entry area would be apparent, as would other mining and power station operations in the vicinity (e.g. Mt Arthur Mine, Hunter Valley Operations, Bayswater Power Station and Liddell Power Station and existing Maxwell Infrastructure).

Aerial views afforded to commercial and tourism visitors are considered further in Section 8.

Godolphin Woodlands Stud

Lower elevations on the Godolphin Woodlands Stud property are screened from views of the Project either by intervening topography within the estate or by ridges to the north of the Golden Highway. These lower areas contain the more sensitive receptors, including the administration centre, entrance gate, entrance road, residences, staff quarters and paddocks (refer Figure 5.6).

The ridgeline associated with Randwick Park Hill screens many of the Godolphin Woodlands Stud property views to the north. On higher elevations along the eastern boundary and other high points, including the converging ridgelines and lookout areas, minor views to the transport and services corridor are possible.

The land use sensitivity at the Godolphin Woodlands Stud would be classed as high. Due to the distance from the nearest visible Project components, elevated locations on the property are considered to have moderate visual sensitivity.

Aerial views afforded to commercial and tourism visitors are considered further in Section 8.

5.3.3 Jerrys Plains Village

This village and houses close to the Golden Highway are the only clustering of residences and community facilities within the PVC (refer Figure 5.7).

The land use sensitivity in the Jerrys Plains village would be classed as high. The village of Jerrys Plains is located approximately 10 km to the south-east of the mine entry area. Intervening topography, vegetation and buildings within Jerrys Plains would screen all views from this location. Consequently, visual sensitivity to the Project is considered very low.

5.3.4 Rural Residences

Edderton Homestead

Edderton Homestead is located approximately 3.3 km west of the mine entry area. Edderton Homestead is owned by BHP but is residentially leased (refer Figure 5.8).



Figure 5.5 | Muswellbrook - Jerrys Plains Landscape Conservation Area - sensitive receptor



Godolphin Woodlands Stud



Coolmore Stud paddocks

Figure 5.6 | *Equine Industry - sensitive receptor*



Figure 5.7 | Jerrys Plains Village - sensitive receptors
Buildings and tree cover within streets and gardens often screen views beyond the town edge.

The land use sensitivity at the Edderton Homestead would be classed as high. The residence is positioned on an elevated knoll with views to the mine entry area. There are also views from parts of the property across low-lying areas of Saddlers Creek towards the mine entry area. However, the vegetation around the residence and trees in adjoining fields filter some of these views. Consequently, for Edderton Homestead visual sensitivity is considered high.

Bowfield Homestead

Bowfield Homestead is approximately 6.6 km from the mine entry area, on a property owned by Malabar and leased. Local topographic features, existing vegetation and tree planting around the residence would reduce the visibility to the Project. The land use sensitivity at the Bowfield Homestead would be classed as high. Bowfield Homestead would have views limited by the intervening topography and is considered to have moderate visual sensitivity.

Bobbagullion Residence

The residence 'Bobbagullion' is adjacent to the Mt Arthur Mine (BHP), west of Edderton Road and is approximately 7.8 km from the mine entry area. The land use sensitivity at the Bobbagullion residence would be classed as high. Local topography would screen views from this residence; therefore it would have very low visual sensitivity.

5.3.5 Hollydene Estate Wines

Hollydene Estate Wines and 'Vines' Restaurant are situated 10 km west of Jerrys Plains on the Golden Highway. It opened in February 2011 and is a popular destination on the Hunter Valley food and wine trail and is well promoted by local and regional tourism (refer Figure 5.9).

The property supports a cellar door, restaurant and reception centre and a number of residences. The facilities and outdoor recreation areas are positioned on the north-east facing slopes looking towards the Golden Highway; the adjacent ridgeline limit views to the north. There are distant views to the east, which are not oriented towards the Project.

The land use sensitivity at the Hollydene Estate Wines would be classed as high. Views to the Project would be screened by intervening topography features. Accordingly, Hollydene Estate Wines would have very low visual sensitivity.

5.3.6 Roads/Highways

The major roads in the locality include the New England Highway and the Golden Highway, located to the east and south of the Project, respectively (refer Figure 5.10). Other roads within the locality include:

- Thomas Mitchell Drive;
- Edderton Road; and
- Bureen Road.

New England Highway

The New England Highway is the main inland road route linking Sydney to Brisbane, connecting Singleton and Muswellbrook and providing access to tourist routes (Golden Highway) and the Hunter Valley winery trail. The highway provides a vital link for the Hunter Valley coal mines, power stations, vineyards and the regional towns along its route.

This is the main road route between Sydney, the Hunter Valley and destinations to the north. It is also a key tourist route in and around the region.

The land use sensitivity for the New England Highway would be classed as moderate. There would be no views of the Project from the New England Highway. Accordingly, the relevant section of the New England Highway would have very low visual sensitivity.



Edderton Homestead



Rural residence on Golden Highway

Figure 5.8 | Rural residences - sensitive receptors
Rural residences are sensitive receptors with visibility often depending on foreground gardens and view orientation.



Hollydene Estate Wines and cellar door and Vines restaurant is a popular local tourist destination.



Lake Liddell Recreation Area to the east of the Project area.

Figure 5.9 | Tourist and Recreation Areas - sensitive receptors

Golden Highway

The Golden Highway, also known as Jerrys Plains Road, is a State road that provides a road link between the New England Highway at Minimbah and Newell Highway at Dubbo. The Golden Highway is a tourist route, and a thoroughfare for goods and services travelling between the coast and Central Western NSW.

In the vicinity of the Project, a power transmission line runs parallel to the highway with pylons and wires viewed above the ridgeline and low woodland vegetation on the north side of the Golden Highway. This vegetation filters views beyond the road corridor to surrounding rural lands and mining operations.

One section of the Golden Highway crosses an elevated spur, affording views of the potential Edderton Road realignment. Other views to the mine entry area would be limited by intervening vegetation and low ridgelines to the north of the Golden Highway. In most sections of the Golden Highway, there are ridges and hills that lie between the highway and the Project, obstructing most of the direct views to the mine entry area.

The highway travels through undulating terrain of generally open pastoral land. The views afforded to the Wollemi National Park have very high visual amenity and contribute to the area's landscape and scenic values.

The land use sensitivity for the Golden Highway would be classed as high. The Golden Highway has predominantly very low visual sensitivity due to an absence of views to any operational areas. It has high visual sensitivity in sections with views to the potential Edderton Road realignment construction works and moderate to low visual sensitivity to views to the mine entry area and the transport and services corridor based on distance.

Thomas Mitchell Drive

Thomas Mitchell Drive is a connector road corridor between Denman Road and the New England Highway. It services a local industrial area and coal mines including Mt Arthur Mine and Maxwell Infrastructure. The land use sensitivity for Thomas Mitchell Drive would be classed as moderate sensitivity. At its nearest point, Thomas Mitchell Drive is approximately 500 m from the existing Maxwell Infrastructure. Thomas Mitchell Drive would have no views of the mine entry area or transport and services corridor and is therefore considered to have very low visual sensitivity.

Edderton Road

Edderton Road is a local rural road linking Denman Road to the Golden Highway and is signposted with distance markers to local winery destinations to the south, so is considered part of the regional tourism experience. Edderton Road also serves as a thoroughfare between the horse studs around Jerrys Plains and other horse studs and equine services near Aberdeen and Scone to the north.

There are local views to the mine entry area from a section of Edderton Road, the view location being 3.8 km west of the nearest Project infrastructure overlooking a low-lying area of Saddlers Creek.

The potential realignment (refer Figure 5.1) would increase the distance of those views. The existing road alignment transverses Saddlers Creek approximately 5 km from the mine entry area. Rolling topography and creek line vegetation would screen some of the views from this road.

As a tourist route, the land use sensitivity for Edderton Road would be classed as moderate. Edderton Road would have a moderate to low visual sensitivity along its length depending on the viewing distance to the Project.

Bureen Road

Bureen Road is a local road south of the Hunter River. The land use sensitivity for Bureen Road would be classed as low. The visibility from this road to the Project is generally limited by the hills and ridges adjacent to the Golden Highway. Project components would not be visible from Bureen Road.



Views from Golden Highway looking east towards Project area.



Views northeast from Bureen Road.



Views from Edderton Road looking north-east.



New England Highway adjacent Bayswater Power Station. Vegetation screens views to locations outside the road corridor.

Figure 5.10| Roads - sensitive receptors
Roads have varying status and sensitivity reflecting the type of use of the road. Visibility depends on roadside vegetation and surrounding topography.

5.3.7 *Other Potentially Sensitive Receptors*

Lake Liddell Recreation Area

The Lake Liddell Recreation Area is located 15 km south of Muswellbrook to the east of the New England Highway and approximately 6.5 km from the Maxwell Infrastructure. The lake and recreation area were developed in association with the Liddell Power Station, which is part of the visual context of this facility (refer Figure 5.9).

The Lake Liddell Recreation Area is a simple recreation area offering camping, fishing, water sports, swimming and bird-watching.

The land use sensitivity at the Lake Liddell Recreation Area would be classed as high. Both Liddell and Bayswater Power Stations can be seen from this location. However, due to very low visibility of Project components the recreation area has a low visual sensitivity to the Project.

Heritage sites

A number of heritage sites (e.g. homesteads) were identified in the broader surrounds of the Project in the Historic Heritage Assessment (Extent Heritage, 2019). These include, the Edderton Homestead, Bowfield Homestead, Arrowfield Cottage, Randwick Homestead, Woodlands Homestead, Plashett Homestead, Strowan Homestead and the old stockyard. The sensitivity of the Edderton Homestead and Bowfield Homestead have been discussed in Section 5.3.4.

The other remaining heritage sites would have high land use sensitivity, however due to intervening topography there would be no views of the Project from Arrowfield Cottage, Randwick Homestead, Woodlands Homestead, Plashett Homestead, Strowan Homestead and the old stockyard.

Commercial/Industrial precinct

A large commercial/industrial precinct is located on Thomas Mitchell Drive, approximately 4 km from the Maxwell Infrastructure area. Mt Arthur Mine lies directly across from Thomas Mitchell Drive from this precinct, with existing views significantly altered due to mining.

The land use sensitivity at the Commercial/Industrial Precinct would be classed as low. Within 7.5 km from the Maxwell Infrastructure, the commercial facilities have a low visual sensitivity dependent on available views to the new components. Furthermore, existing roadside vegetation limits views of the Maxwell Infrastructure (refer Section 6).

Plashett Reservoir

Plashett Reservoir is located to the east of the Project. There is no public access to Plashett Reservoir, consequently, Plashett Reservoir is considered to have very low sensitivity.

Mount Arthur

Mount Arthur's distinctive single peak and communications tower are prominent on the northern skyline of the PVC. Several existing open cut mining operations are adjacent to the peak. From the vantage point of the communication tower there would be views towards the mine entry area, approximately 4.4 km to the south. However, the peak of Mount Arthur is not publicly accessible, and is considered to have very low visual sensitivity.

5.4 **Summary**

Table 5.1 attributes a level of visual sensitivity to each of the receptors identified in Section 5. This table is intended to provide a general reference for visual sensitivity, taking into account overall land use sensitivity and actual visibility of components which moderate those broader assessments sensitivity attributes. More view specific locations are addressed in Section 6 to explore the visual effect of the Project in more detail.

Table 5.1 **Visual sensitivity summary**

Receptor	Land Use Sensitivity	Components	Distance	Visibility	Visual Sensitivity
Coolmore Stud	High	Potential Edderton Road realignment	<2.5 km	Moderate	Moderate
		Mine entry area	6.0 km	Not visible	Moderate
		Transport and services corridor	7.5 km	Low	Moderate
Godolphin Woodlands Stud	High	Potential Edderton Road realignment	<2.5 km	Moderate	Moderate
		Mine entry area	6.0 km	Not visible	Moderate
		Transport and services corridor	7.7 km	Low	Moderate
Jerrys Plains Village	High	Project not visible	10 km	Not visible	Very Low
Edderton Homestead	High	Potential Edderton Road realignment	<2.5 km	High	High
		Mine entry area	3.3 km	High	High
		Transport and services corridor	4.0 km	High	High
Bowfield Homestead	High	Potential Edderton Road realignment	< 2.5 km	Moderate	Moderate
		Mine entry area	6.2 km	Moderate	Moderate
Bobbagullion Residence	High	Project not visible	7.8 km	Not visible	Very Low
Hollydene Estate Wines	High	Project not visible	4.7 km	Not visible	Very Low
New England Highway	Moderate	Project not visible	23 km	Not visible	Very Low
Golden Highway	High	Mine entry area	4.5 km	Low	Moderate
		Transport and services	5.2 km	Low	Low
		Potential Edderton Road realignment	< 2.5 km	High	High
Thomas Mitchell Drive	Moderate	Maxwell Infrastructure	<2.5 km	Very Low	Very Low
Edderton Road	Moderate	Mine entry area	3.3 km	Moderate	Moderate to Low
		Transport and services corridor	4.3 km	Moderate	Moderate
Bureen Road	Low	Project not visible	>10 km	Not visible	Very Low
Lake Liddell Recreation Area	High	Maxwell Infrastructure	5.5 km	Very Low	Low
Heritage Sites	High	No views to mine entry area or transport and services corridor	>3.3 km	Not visible	Low
Commercial/Industrial Precinct	Low	Maxwell Infrastructure	4.0 km	Low	Low
Plashett Reservoir	Low	No views to Project components	3.0 km	Very Low	Very Low
Mount Arthur	Moderate	No views due to no public access	4.0 km	Very Low	Very Low

6. VISUAL EFFECT

6.1 General

The potential sensitive viewing locations (receptors) around the Project have been defined in Section 5.

This section defines the visual effect of various project components from external view locations around the site. The visual effects of the Project have been assessed from a number of representative viewing locations (i.e. viewpoints) in terms of visual contrast with the existing surrounding landscape elements and the extent of any primary view that is occupied by Project components. These viewpoints were analysed through various techniques, including photomontages.

6.2 View selection rationale

The representative viewing locations used in this assessment are shown in Figure 6.1.

The photomontage locations were selected to illustrate a range of typical views and potential worst-case scenarios as seen from these locations. Each location was logged with GPS coordinates and views photographed to establish the base for the photomontages.

Viewpoints were selected to capture a broad selection of potentially impacted views. For example, VP9 was selected due to its elevated position along the Golden Highway, which could have potential views of the mine entry area or the potential Edderton Road realignment.

Potentially sensitive locations with views of the Maxwell Infrastructure on Thomas Mitchell Drive and the New England Highway were selected for consideration. Locations were also selected from recreation sites where activities at the Maxwell Infrastructure would potentially be in view, such as the Lake Liddell Recreation Area.

Typically, there are no views to the Maxwell Infrastructure from closer locations due to intervening local topography and / or screening vegetation.

The level of visual impact on receptors is discussed in Section 7, based on the consideration of receptor sensitivity (Section 5) and visual effect (Section 6).

The visual effects of the Project were evaluated by analysing photomontages using consistent criteria. Twelve locations were selected and illustrated on Figure 6.1.

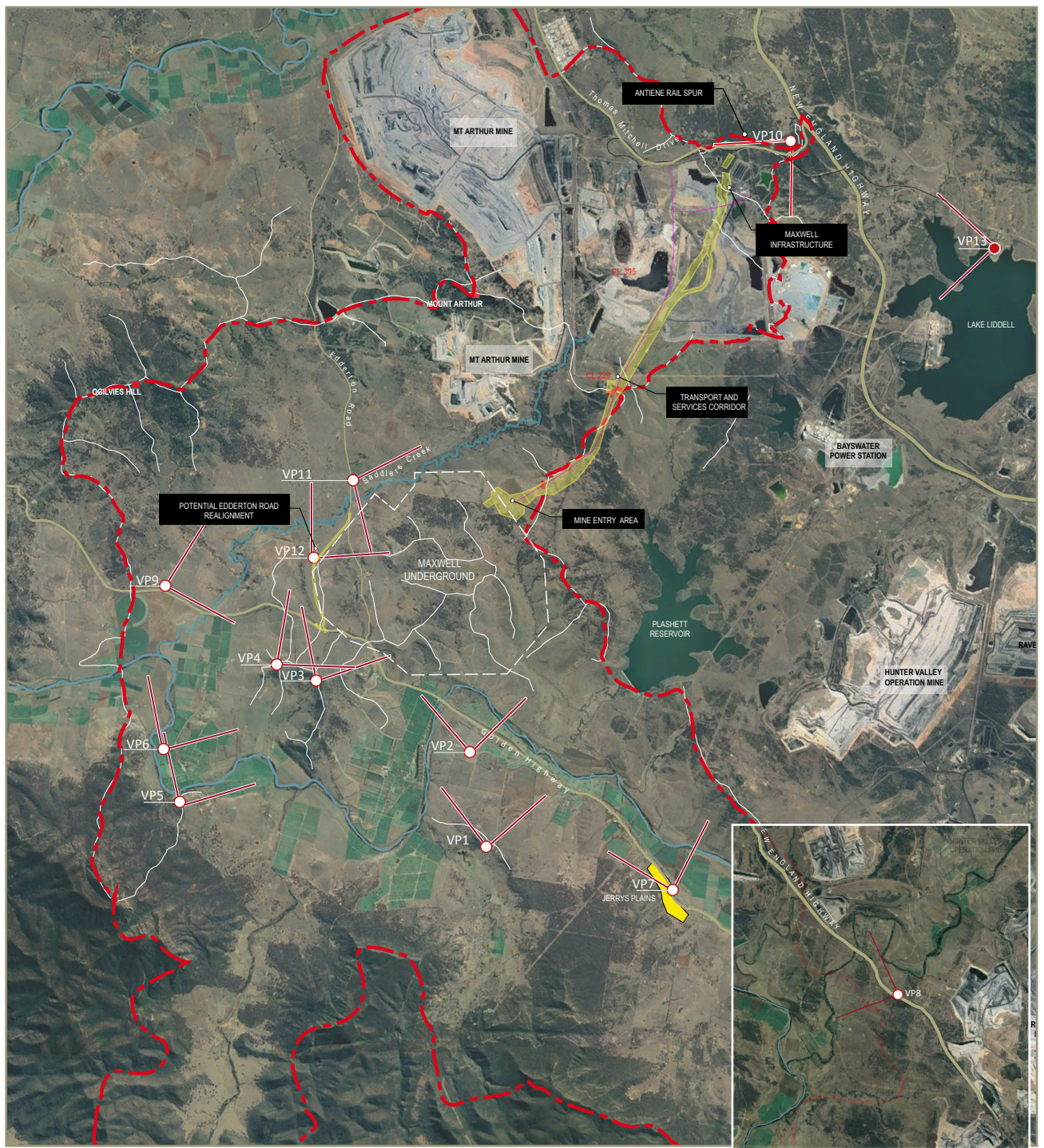
6.3 Analysis of Visual Effect

6.3.1 VP1 – Coolmore Stud– Oak Range Road

Oak Range Road is the main internal road at the Coolmore Stud, providing visitors with elevated views over the property. Due to intervening topography to the north of the Golden Highway, there are no views of Project components from VP1 (Figure 6.2).

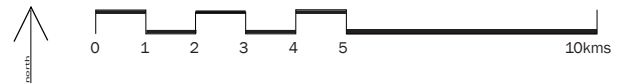
VP1 Visual effect

Distance from nearest potentially visible Project component	8.1 km
Area of PVZ occupied by the Project	0%
Visual effect: No views to the Project	No visual effect



key

- Primary visual catchment
- Maxwell Underground mine area
- Roads
- Rivers and creeks
- Ridges
- Jerrys Plains



Photomontage locations and view angles

Figure 6.1 | Photomontage and other assessed receptor view locations

6.3.2 **VP2 – Coolmore Stud – Horse Paddock**

While the horse paddock provides broad views over the property, it sits at a lower elevation than the rise on Oak Range Road resulting in a similar but lower perspective of the Coolmore Stud. As with VP 2, the intervening topography to the north of the Golden Highway prevents any views of the Project components (Figure 6.3).

VP 2 Visual effect

Distance from nearest potentially visible Project component	6.0 km
Area of PVZ occupied by the Project	0%
Visual effect: No views to the Project	No visual effect

6.3.3 **VP3 – Coolmore Stud – Highest Vantage Point**

VP3 is the highest vantage point at the Coolmore Stud providing visitors with expansive views, extending beyond the local ridge lines to include views to Mt Arthur Mine to the north (Figure 6.4). VP 3 is the highest vantage point at the Coolmore Stud providing visitors expansive views, extending beyond the local ridgelines to include views to Mt Arthur Mine to the north (Figure 6.4).

A small section of the transport and services corridor and covered overland conveyor would be visible as they cross ridge lines north-east of the mine entry area (Figure 6.4). From this vantage point, these components of the Project would be between 6.8 km and 7.5 km from the viewer. Other project components at the mine entry area (infrastructure, workshops and coal stockpiles) would be screened by the intervening ridge lines (Figure 6.4).

VP3 - Visual effect

Distance from mine entry area	6.8 km
Distance from transport and services corridor	7.5 km
Distance from potential Edderton Road realignment	1.3 km
Area of PVZ occupied by: - the mine entry area - the transport and services corridor - the potential Edderton Road realignment	0% <1% <2%
Visual effect: - during construction - during operations	Level 2 – Low Level 3 – Low

6.3.4 **VP4 – Godolphin Woodlands Stud - highest vantage point**

VP4 is the highest vantage point at the Godolphin Woodlands Stud adjacent to the local triangulation survey marker. Locally, it has been known as Randwick Park Hill. Like Coolmore, visitors to Godolphin are taken to this outlook to experience the expansive views which extend beyond the local ridgelines to include views to Mt Arthur Mine to the north (Figure 6.5).

A section of the transport and services corridor and covered overland conveyor are visible as they cross ridgelines north-east of the mine entry area (Figure 6.5). From this vantage point, these components of the Project are between 6.8 km and 7.7 km from the viewer. Other Project components at the mine entry area (infrastructure, workshops and coal stockpiles) are screened by the intervening ridgelines (Figure 6.5).

VP4 – Visual Effect

Distance from mine entry area	6.8 km
Distance from transport and services corridor	7.7 km
Distance from potential Edderton Road realignment	1.3 km
Area of PVZ occupied by the Project: - the mine entry area - the transport and services corridor - the potential Edderton Road realignment	0% <1% <2%
Visual effect: - during construction - during operations	Level 2 – Low Level 3 – Low

6.3.5 VP5 – Godolphin Woodlands Stud - Lookout

The view from Godolphin Woodlands Stud Lookout is to the north-east towards the Project (Figure 6.1). The view is from an elevated location with the ridge line associated with VP4 lying between the lookout and the Project. Visitors are taken to this location to get an overview of Godolphin Woodland's operational areas, historic homestead and southern pastures. Consequently, this is a location of high sensitivity.

There are no views to the mine entry area, the transport and services corridor or Maxwell Infrastructure (Figure 6.6).

VP5 - Visual effect

Distance from mine entry area	10.3 km
Distance from potential Edderton Road realignment	5.3 km
Area of PVZ occupied by the Project	0%
Visual effect: No views to the Project	No visual effect

6.3.6 VP6 - Godolphin Woodlands Stud – Manager's House

This view from the Godolphin Woodlands Stud manager's house is orientated in a north-easterly direction within the Godolphin Woodlands Stud VCU. A small knoll rises just to the north of this location, screening views of the Project (Figure 6.7).

There are no views to the mine entry area, Maxwell Infrastructure or potential Edderton Road realignment from this location.

VP6 - Visual effect

Distance from mine entry area	10.3 km
Distance from potential Edderton Road realignment	5.3 km
Area of PVZ occupied by the Project	0%
Visual effect: No views to the Project	No visual effect

6.3.7 VP7 – Jerrys Plains near Golden Highway

Due to intervening topography to the north of the river and the Golden Highway, there are no views to the mine entry area, Maxwell Infrastructure or the potential Edderton Road realignment (Figure 6.8). Consequently, there are no visual effects for existing views from this location.

VP7 – Visual effect

Distance from nearest potentially visible Project component	10.0 km
Area of PVZ occupied by the Project	0%
Visual effect: No views to the Project	No visual effect

6.3.8 VP8 - New England Highway

This view location illustrates distant views towards Maxwell Infrastructure from an open elevated section of the New England Highway. Views from this location have been assessed via viewshed analysis and detailed cross sections (Figure 6.9). Topography and vegetation between the New England Highway area and the Maxwell Infrastructure would screen views (Figure 6.10).

VP 8 – Visual effect

Distance from nearest potentially visible Project component	23 km
Area of PVZ occupied by the Project	0%
Visual effect: No views to the Project	No visual effect

6.3.9 VP9 – Golden Highway - Elevated Vantage Point

The Golden Highway passes over an elevated spur to the north of the Godolphin Woodlands Stud. The view is across the Slopes and foothills VCU with Saddlers Creek in the middle distance, while a low ridge beyond the creek screens views to the potential Edderton Road realignment.

Due to intervening topography between the Golden Highway and Project components, there are no views to the mine entry area or Maxwell Infrastructure (Figure 6.11).

VP9 – Visual effect

Distance from nearest potentially visible Project component (i.e. mine entry area)	8.5 km
Area of PVZ occupied by the Project	0%
Visual effect: No views to the Project	No visual effect

6.3.10 VP10 - Thomas Mitchell Drive

This view, taken near the entrance to the Maxwell Infrastructure facilities off Thomas Mitchell Drive (approximately 2 km from the nearest operational areas), illustrates how the local topography and vegetation enclose the view (Figure 6.12).

VP10 – Visual effect

Distance from nearest potentially visible Project component	1.5 km
Area of PVZ occupied by the Project	0%
Visual effect: No views to the Project	No visual effect

6.3.11 VP 11 – Edderton Road

The view from this location to the west of the Project includes broad acre rural lands with patches of open woodland (refer Figure 6.13). At a distance of approximately 3.8 km from the nearest Project component, there are limited views of the following components:

- administration, bathhouse, stores and workshop facilities;

- coal stockpile;
- covered overland conveyor;
- transport and services corridor; and
- transmission line.

The photomontage for VP11 shows limited views of both the transport and services corridor and covered overland conveyor. These components are visible above the intervening topography as they cross the ridge line to the east and north-east of the mine entry area.

There are limited views of the coal surge stockpile and adjacent administration, workshops and stores buildings. The stacks and steam from Bayswater Power Station and a high voltage power pylon can be seen in the background of this existing view.

VP 11 Visual effect

Distance from nearest potentially visible Project component	3.8 km
Area of PVZ occupied by the Project	2.6%
Visual effect:	
• during construction • during operations	Level 2 - Low
	Level 3 - Low

6.3.12 **VP12 – Potential Edderton Road realignment**

Viewshed analysis from this elevated location on the potential realignment of Edderton Road indicates glimpses to the transport and services corridor similar to that viewed from VP11 Edderton Road. These limited views of Project components are at a distance >7.5 km from the view location. These components may be visible above the intervening topography as they cross a ridge line to the north-east of the mine entry area (refer Figure 5.14).

Similar to VP11, VP12 would also include the views of existing Bayswater Power Station and high voltage powerlines.

VP 12 – Visual effect

Distance from nearest potentially visible Project component	8.0 km
Area of PVZ occupied by the Project	<1%
Visual effect:	
• during construction • during operations	Level 2 - Low
	Level 3 - Low

VP 13 - Lake Liddell Recreation area

Views from this location have been assessed via viewshed analysis and detailed cross sections. Topography and vegetation between the Lake Liddell Recreation Area and the Maxwell Infrastructure would screen views (Figure 6.15).

VP 13 – Visual effect

Approximate distance from nearest Project component	6.6 km
Area of PVZ occupied by the Project	0%
Visual effect: No views to the Project	No visual effect

View Point 1 - Coolmore Stud - Oak Range Road | E 150° 51'54.2" / S 32° 28'27.2"

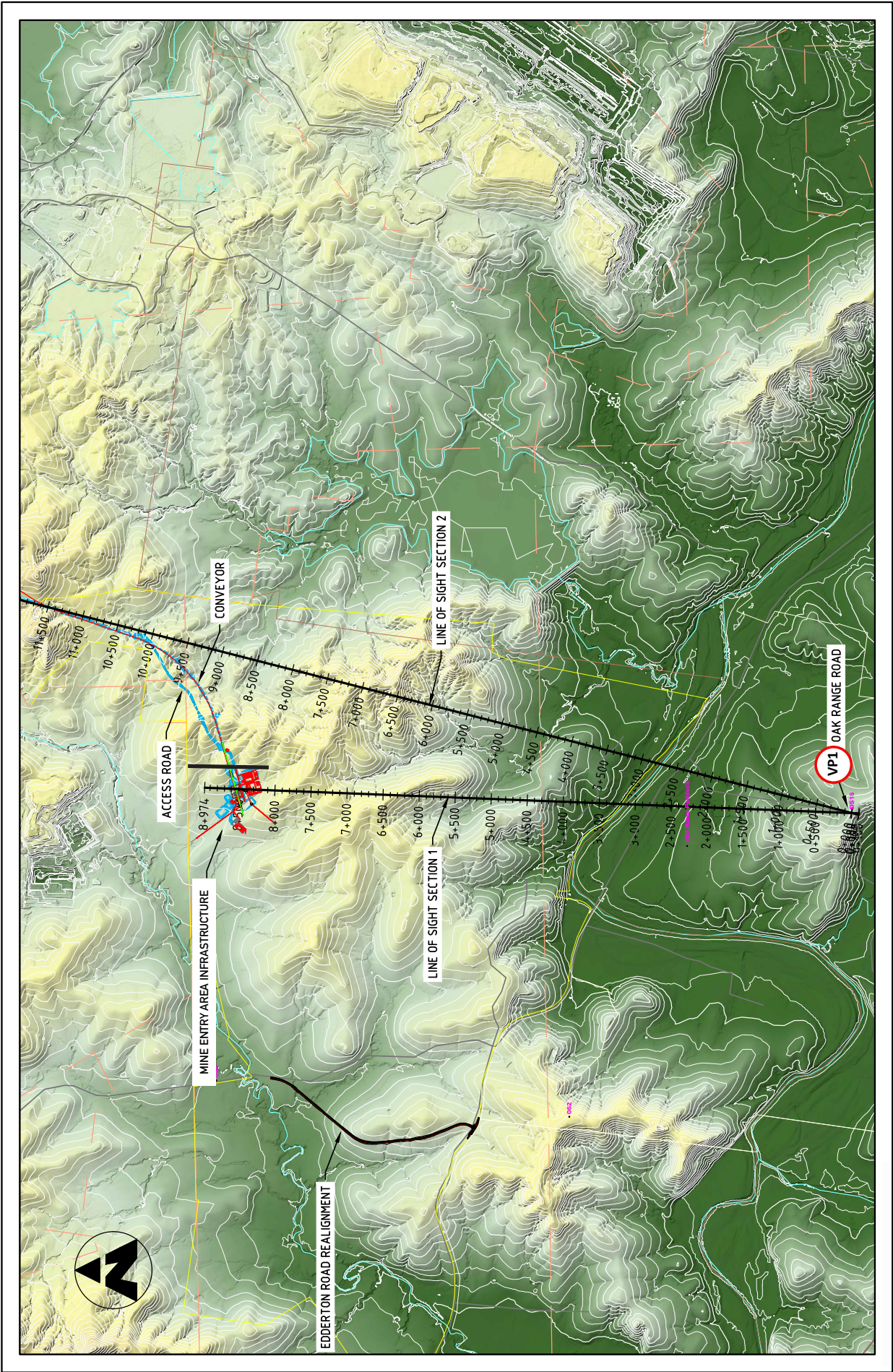
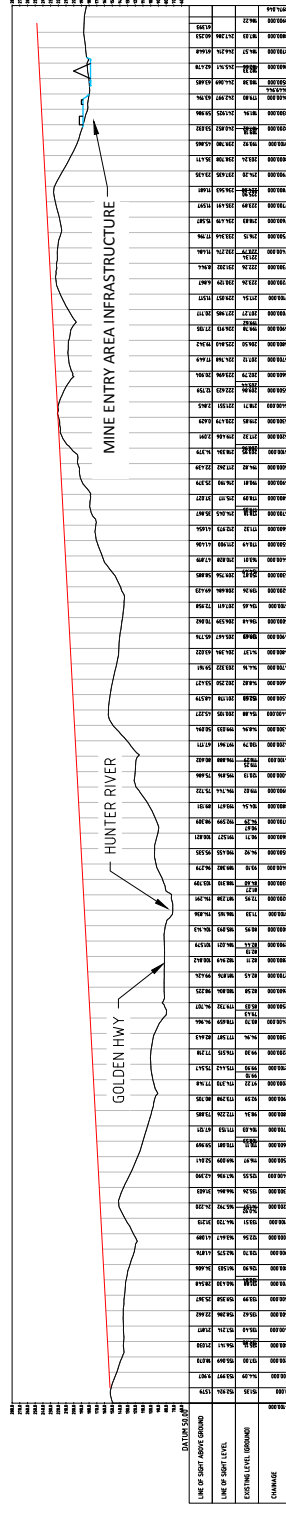
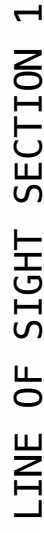


Figure 6.2a | VP1 - Coolmore Stud - Oak Range Road to Mine Entry Area

View Point 1 - Coolmore Stud - Oak Range Road | E 150° 51'54.2" / S 32° 28'27.2"



LINE OF SIGHT SECTION 2

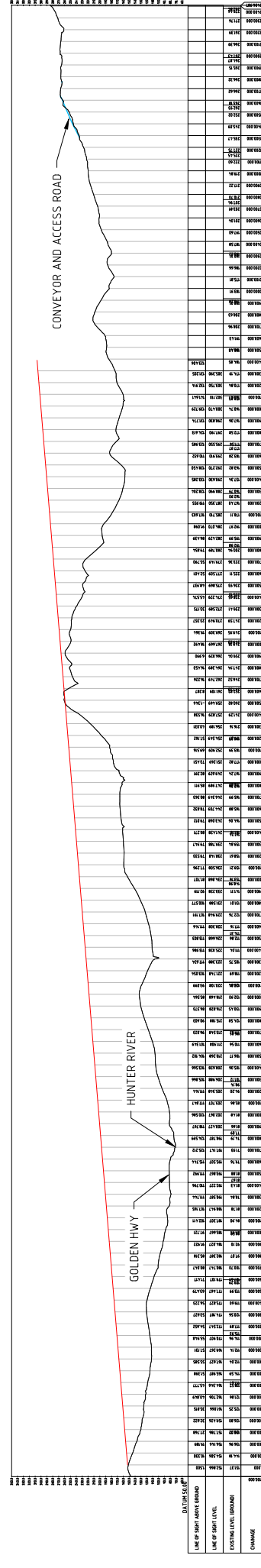


Figure 6.2b | Line of sight sections - VP1 - Coolmore Stud - Oak Range Road to Mine Entry Area

VP1: Coolmore Stud - Oak Range Road - 72 mm lens length



Existing view



Existing view with frame of Project components all screened by intervening topography.

Figure 6.2c | Photomontage VP1 - Coolmore Stud - Oak Range Road to Mine Entry Area

View Point 2 - Coolmore Stud - Horse Paddock | E 150° 51'30.7" / S 32° 27'54.5"

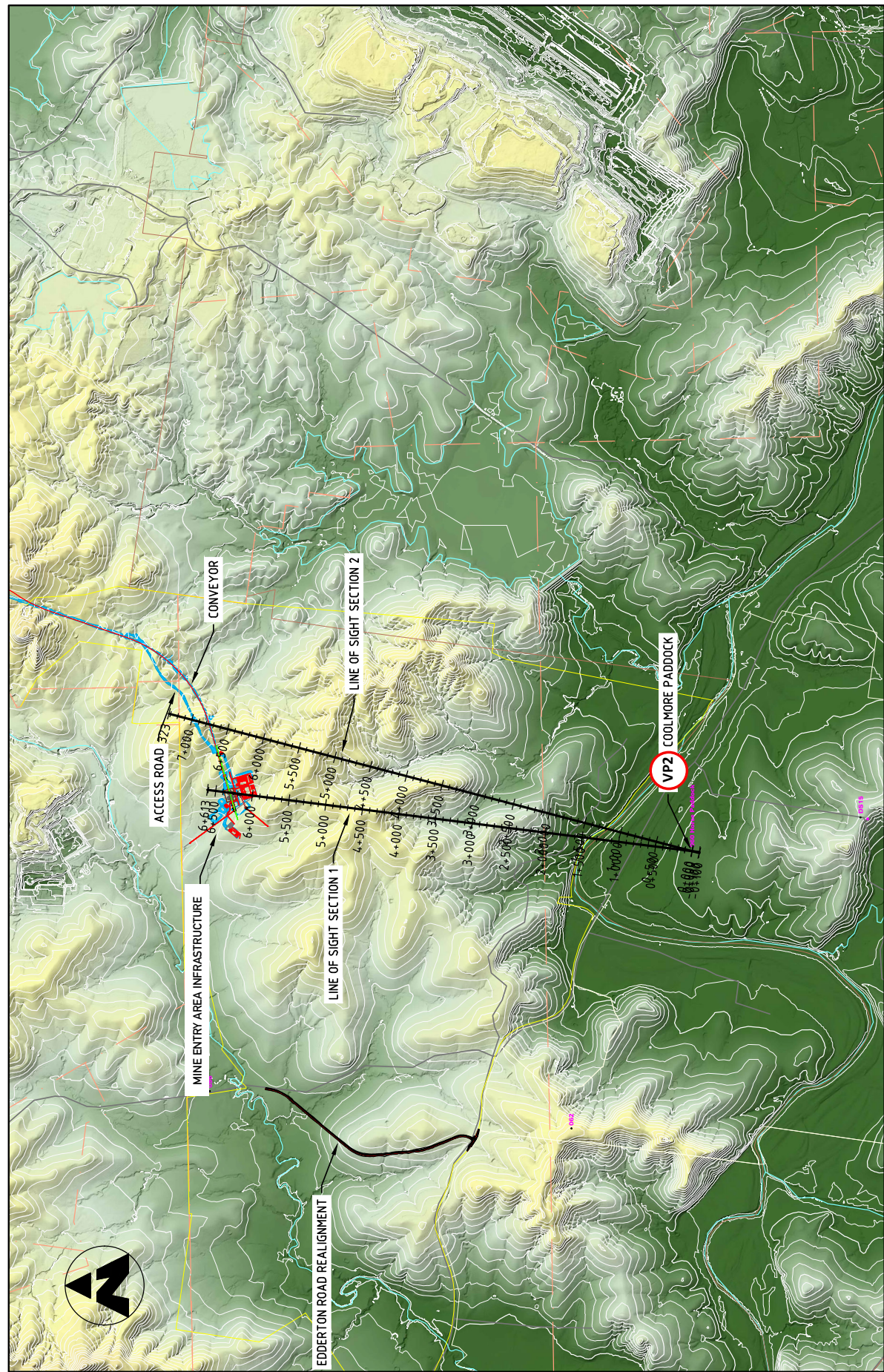
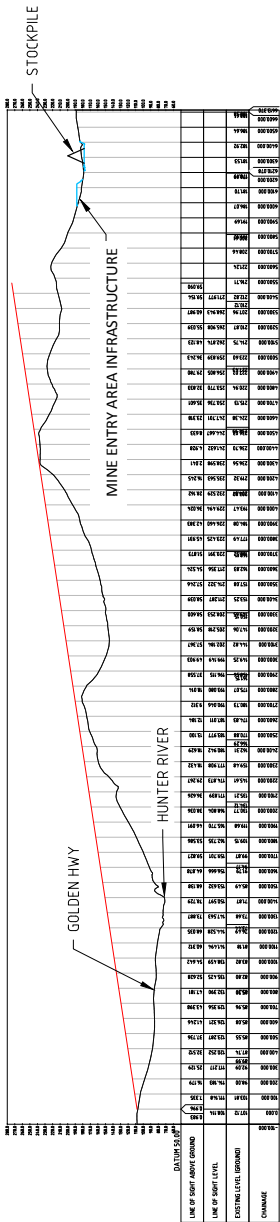


Figure 6.3a | VP2 - Coolmore Stud - Horse Paddock to Mine Entry Area

View Point 2 - Coolmore Stud - Horse Paddock | E 150° 51'30.7" / S 32° 27'54.5"

LINE OF SIGHT SECTION 1



VP2: Coolmore Stud - Horse Paddock - 72mm lens length



Existing view within Coolmore Stud looking north towards to Maxwell Underground Mine Entry Area which is beyond the ridge shown in this photograph.



Existing view with frame of Project components all screened by intervening topography north of the Golden Highway.

Figure 6.3c | Photomontage VP2 - Coolmore Stud - Horse Paddock to Mine Entry Area

View Point 3 - Coolmore Stud | E 150° 52' 32.5" / S 32° 24' 45.2"

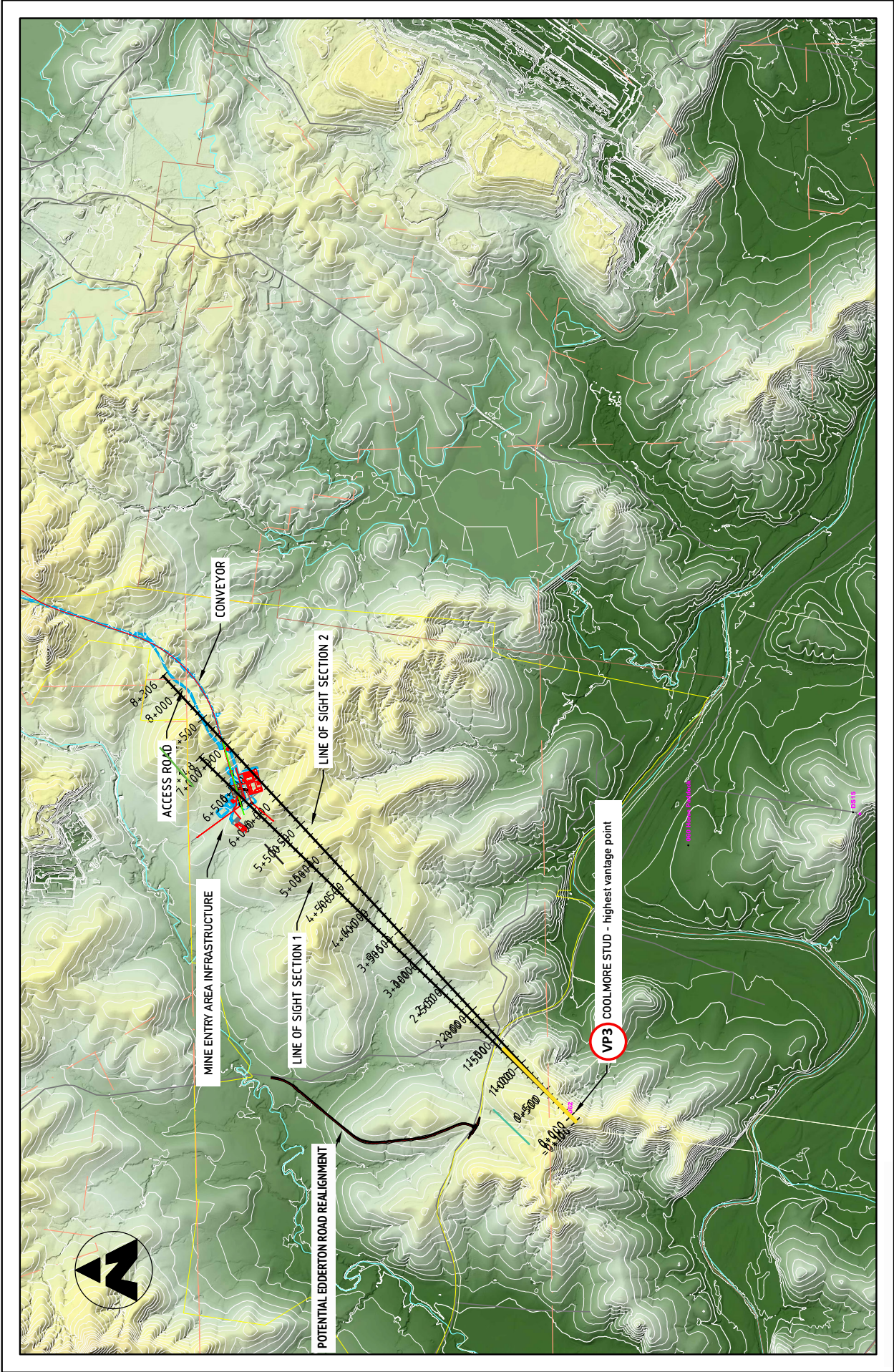
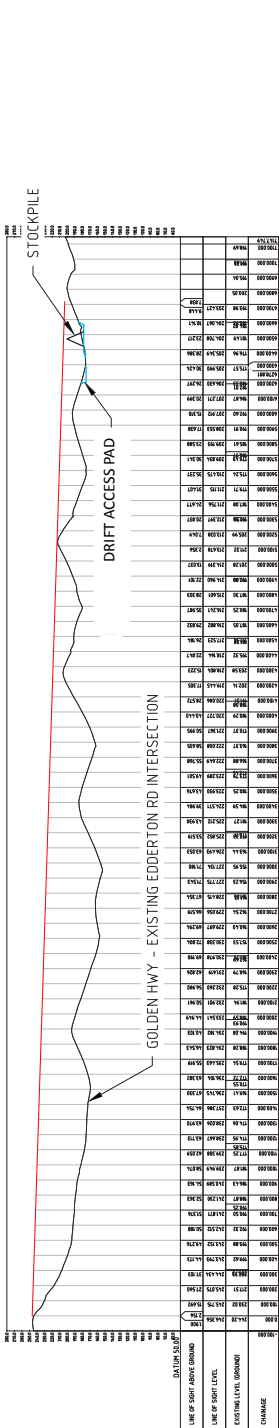


Figure 6.4a | VP3 - Coolmore Stud - highest vantage point - view to Mine Entry Area

View Point 3 - Coolmore Stud | E 150° 52'32.5" / S 32° 24'45.2"

LINE OF SIGHT SECTION 1



LINE OF SIGHT SECTION 2

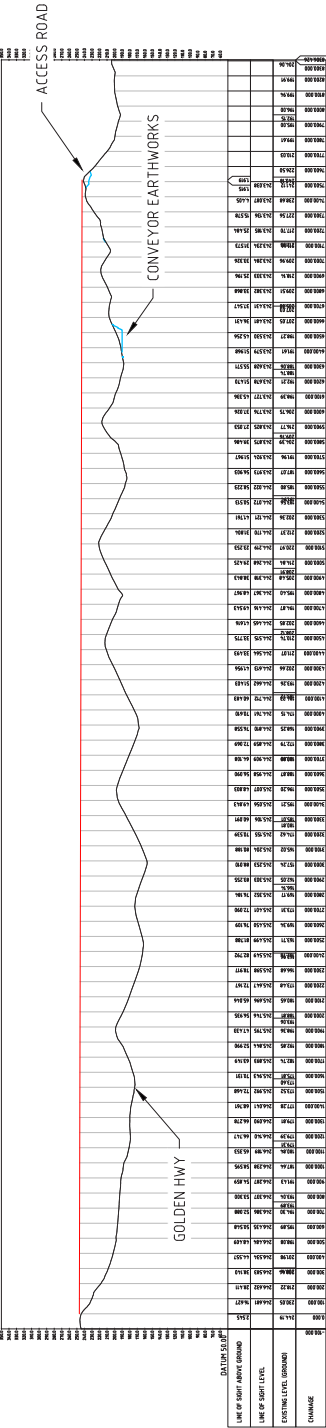


Figure 6.4d window

Mount Arthur

Figure 6.4c window



Existing view panorama with photomontage window identifying the portion of the view occupied by the Project.

Figure 6.4b | Line of Sight Sections - VP3 - Coolmore Stud - highest vantage point - view to Mine Entry Area

VP3: Coolmore Stud - 72mm lens length

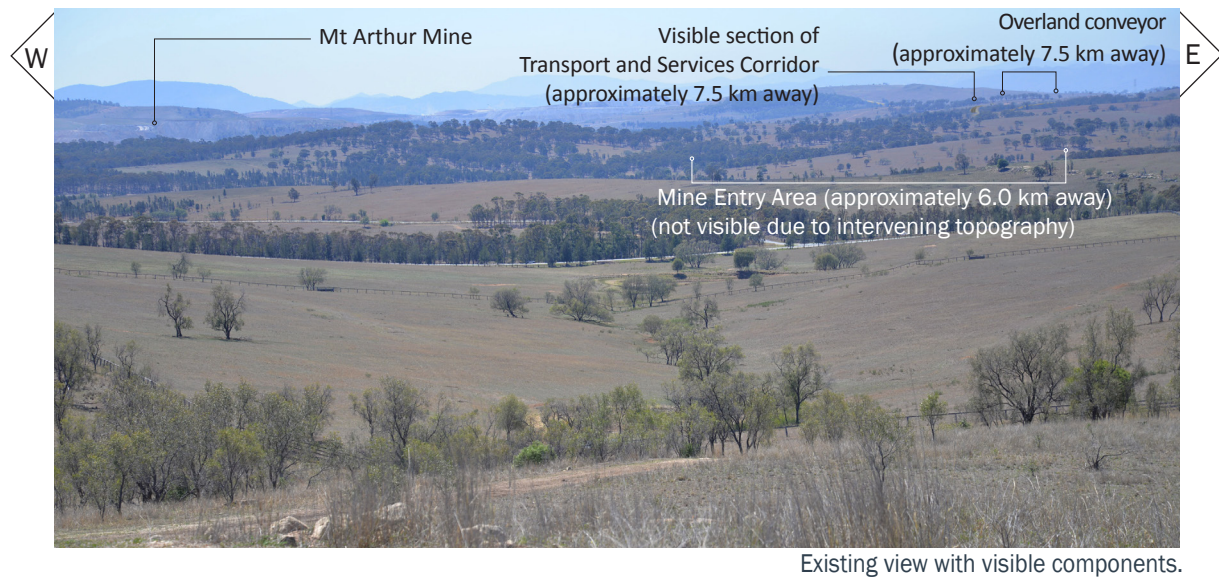
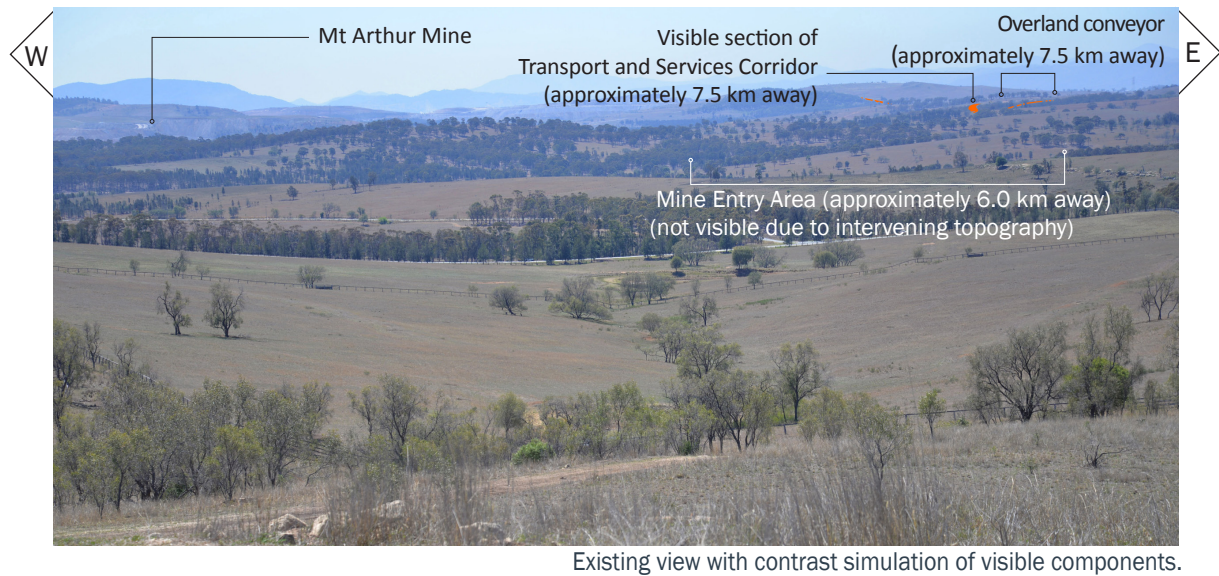


Figure 6.4c | Photomontage VP3 - Coolmore Stud - view towards Mine Entry Area

VP3: Coolmore Stud - view towards potential Edderton Road realignment

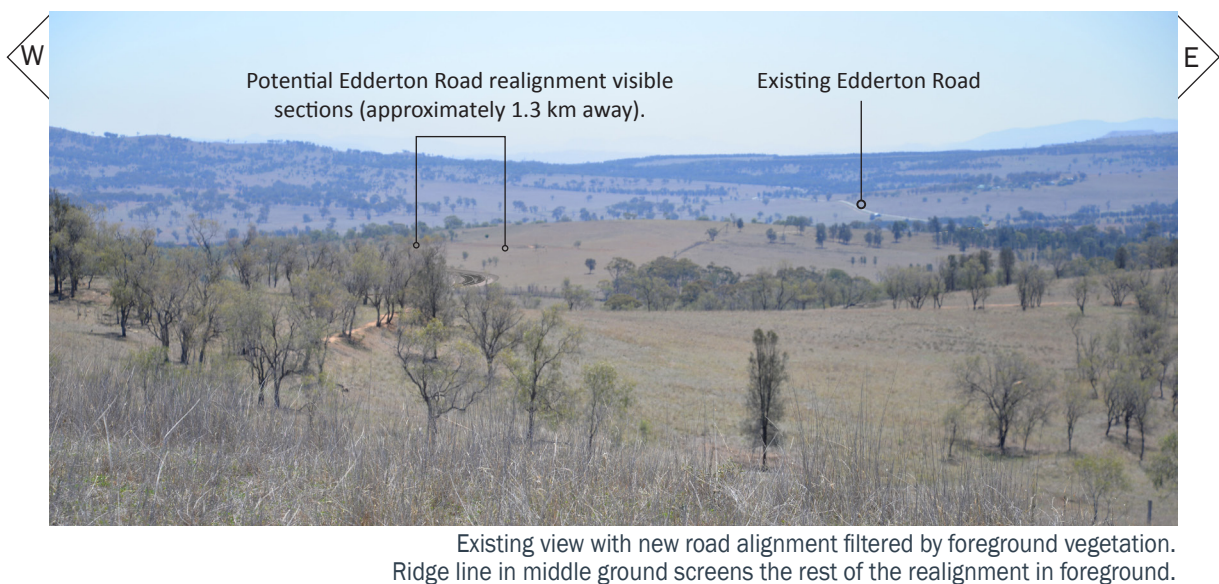
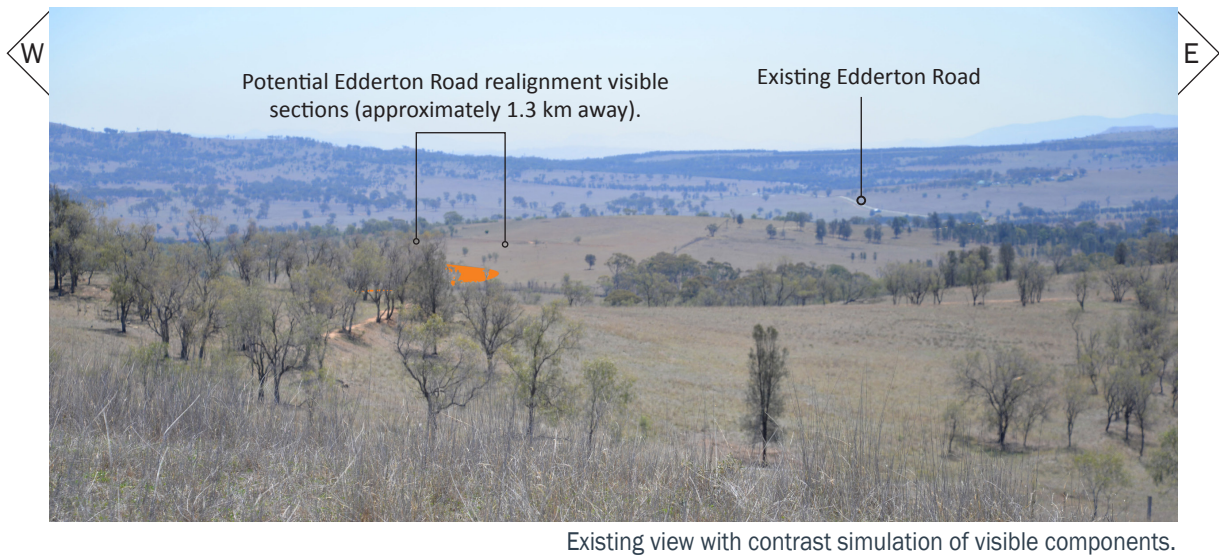
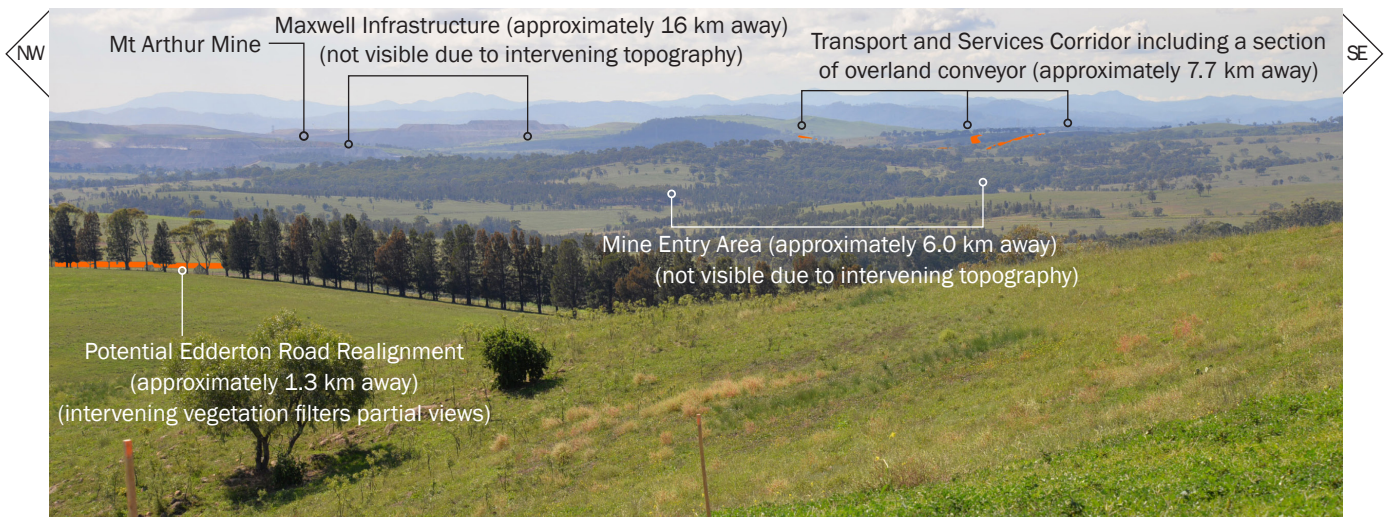


Figure 6.4d | Photomontage VP3 - Coolmore Stud - view towards potential Edderton Road realignment

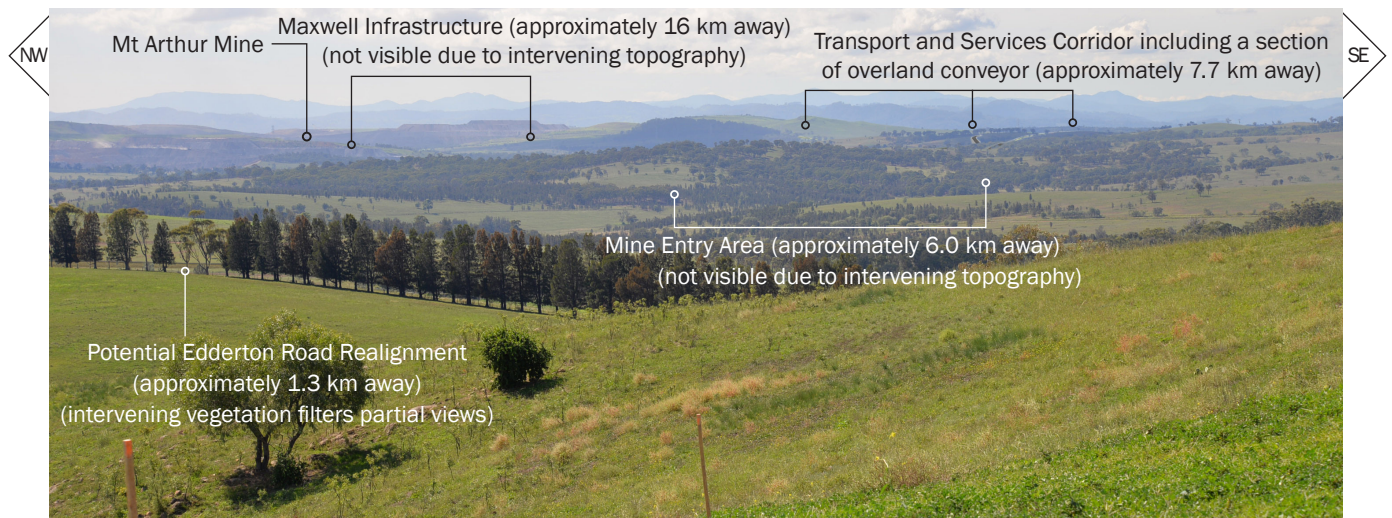
VP4: Godolphin Woodlands Stud - Converging Ridgelines | E 150°47'16.82" / S 32°27'28.24"



Existing view.



Existing view with contrast simulation of visible components.



Existing view with Project components.

Figure 6.5 | Photomontage VP4 - Godolphin Woodlands Stud - Converging Ridgelines to Mine Entry Area

VP5: Godolphin Woodlands Stud - Lookout | E 150°46'58.55" / S 32°28'30.78"



Figure 6.6 | Photomontage VP5 - Godolphin Woodlands Stud - Lookout to Mine Entry Area

VP6: Godolphin Woodlands Stud - Manager's House | E 150°46'51.98" / S 32°27'45.99"

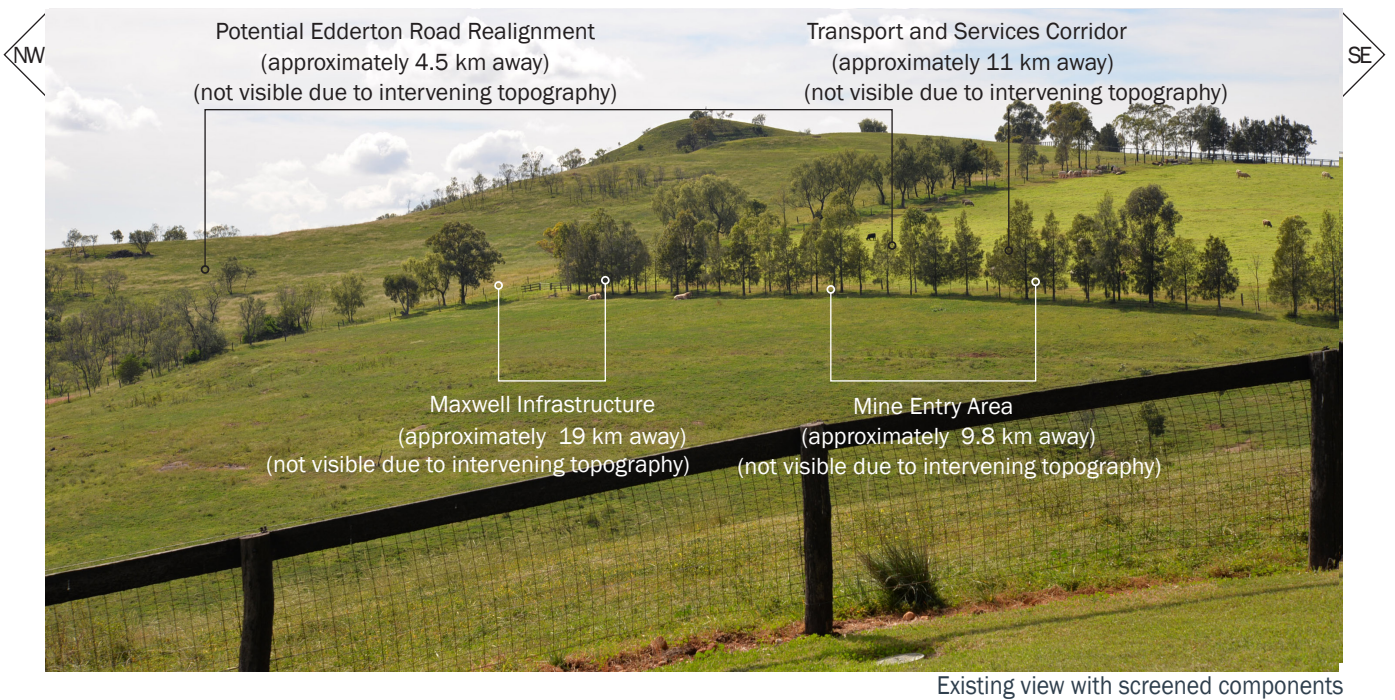
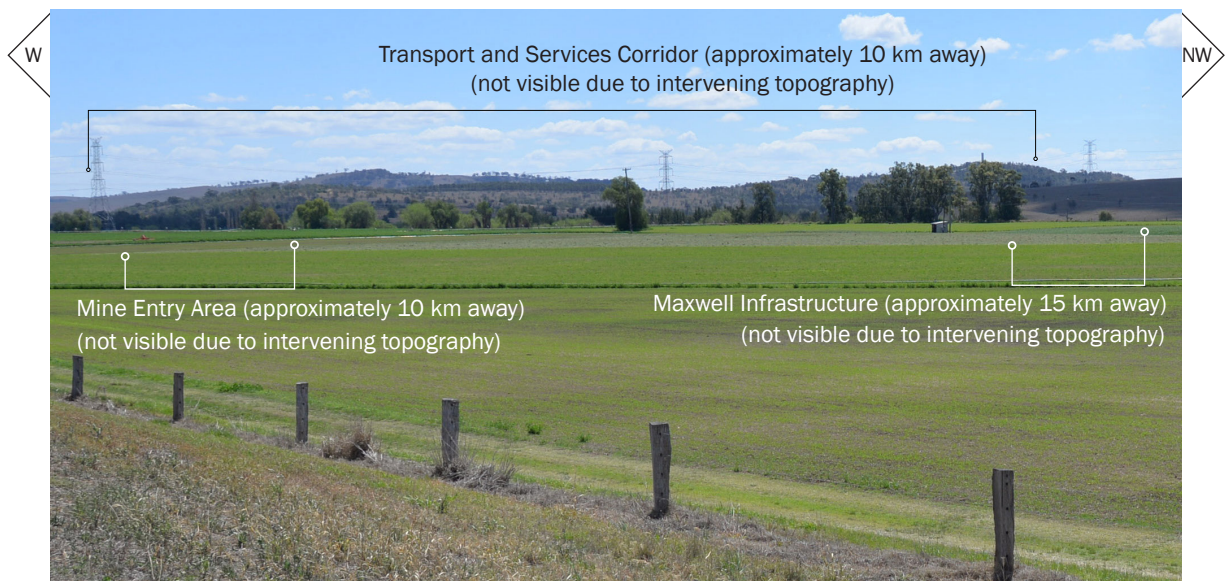


Figure 6.7 | VP6 - Godolphin Woodlands Stud - Manager's House to Mine Entry Area

VP7: Jerrys Plains near Golden Highway - E 150° 54'17.99" / S 32° 29'30.52"



Existing view looking north-west towards to Mine Entry Area.

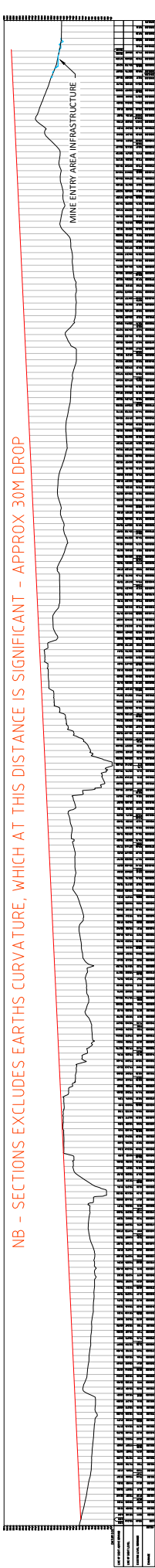


Existing view with Project components all screened by intervening topography north of the Golden Highway.

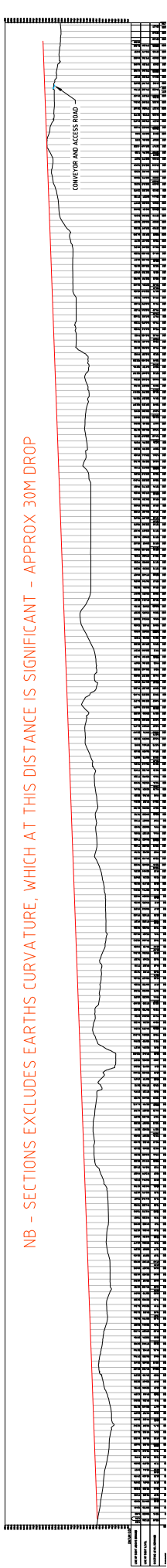
Figure 6.8 | Photomontage VP7 - Jerrys Plain near Golden Highway to Mine Entry Area

View Point 8 - New England Highway | E 151° 05'47.9/ S 32° 29'9.5"

LINE OF SIGHT SECTION 1

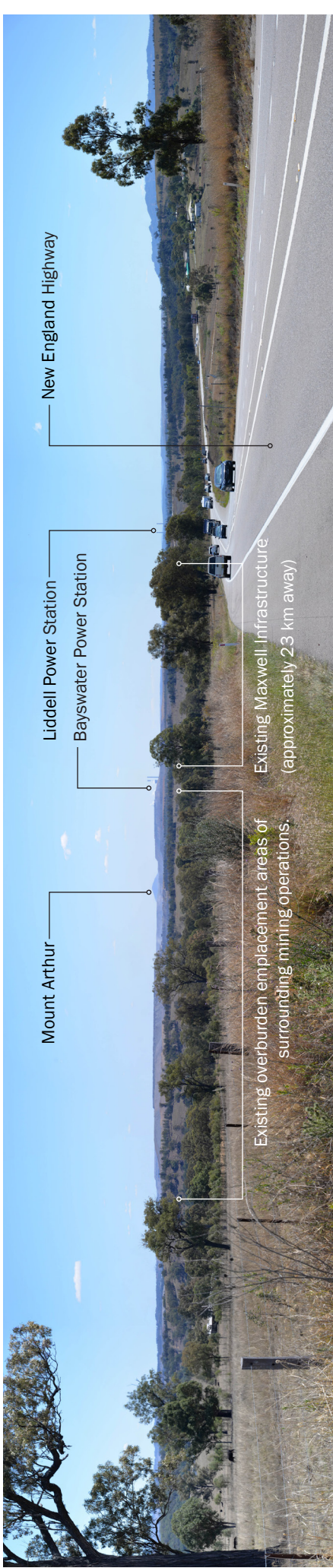


LINE OF SIGHT SECTION 2



Line of sight sections illustrate how topography will screen views to Maxwell Infrastructure from this location approximately 23 km to the south-east.

Figure 6.9 | Line of Site Sections - VP8 - New England Highway



Views to the north-west towards the Maxwell Infrastructure. VP12 is the closest location with open and elevated view towards the Project from the New England Highway. Existing mining operations are visible in the middle view.

Figure 6.10 | Photomontage VP8 - New England Highway

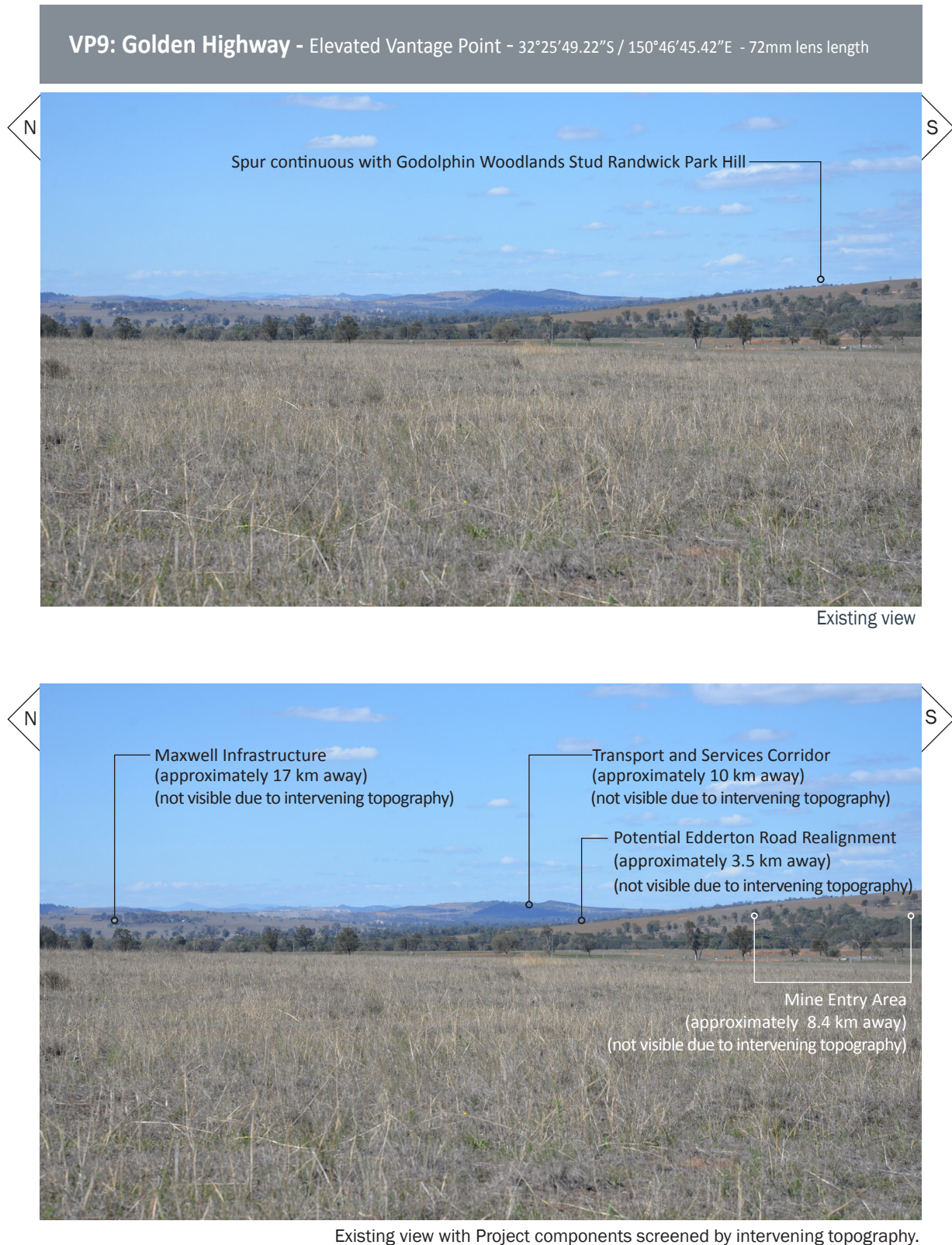


Figure 6.11 | Photomontage VP9 - Golden Highway - elevated vantage point to Mine Entry Area and Potential Edderton Road Realignment

VP10: Thomas Mitchell Drive - E 150° 56'31.72/ S 32° 19'57.46" - 72mm lens length



Existing view



Existing view with Project components screened by intervening vegetation.

Figure 6.12 | Photomontage VP10 - Thomas Mitchell Drive adjacent Maxwell Infrastructure area

View Point 11 - Edderton Road | E 150° 49'31.4" / S 32° 24'20.5"

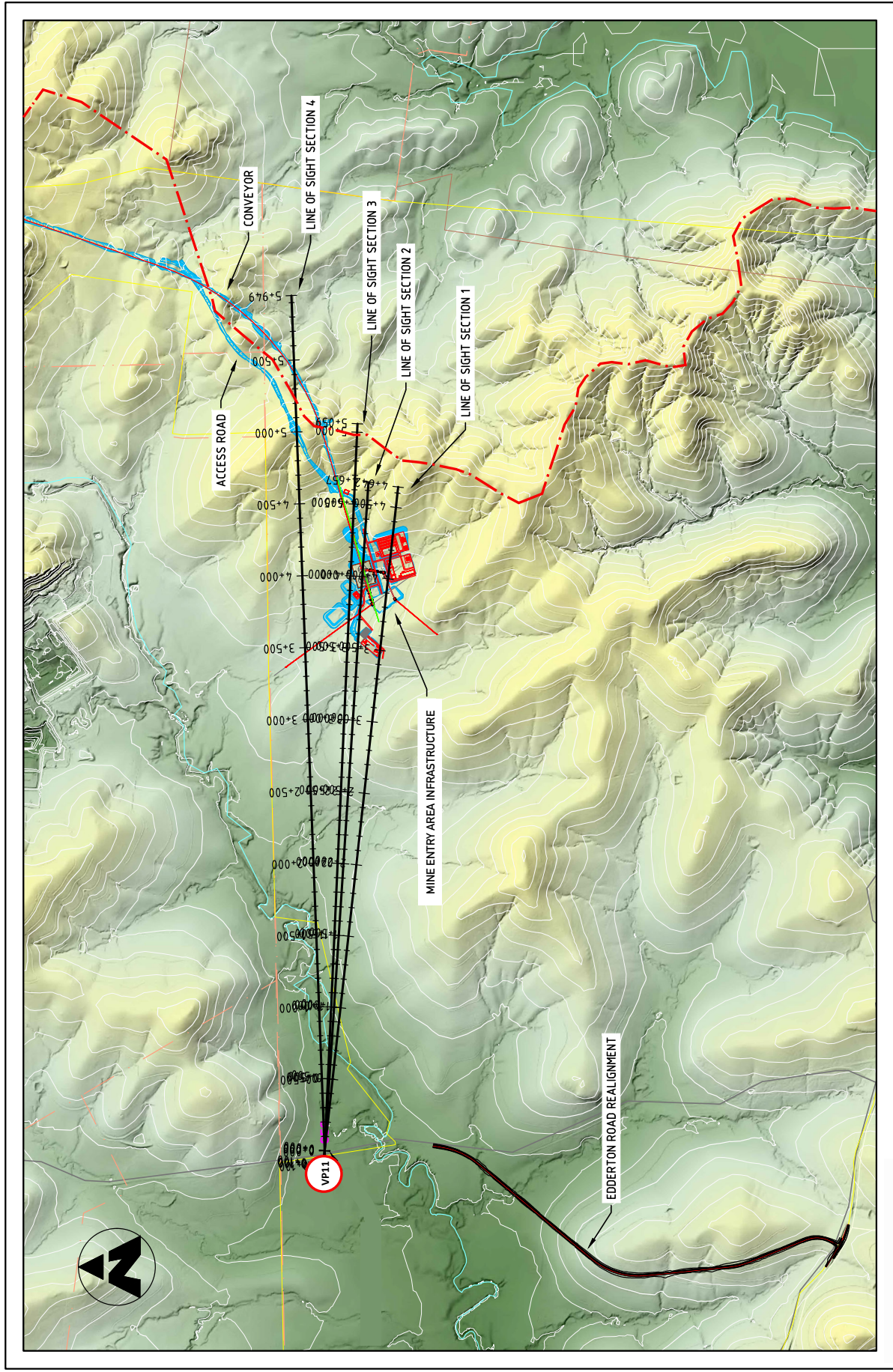
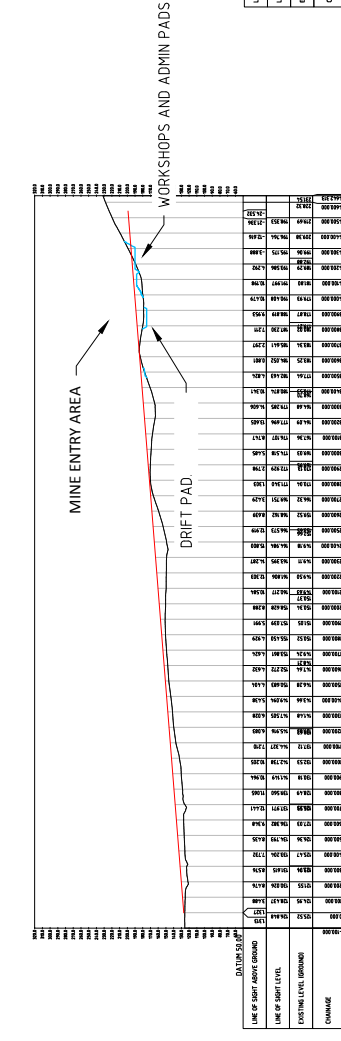


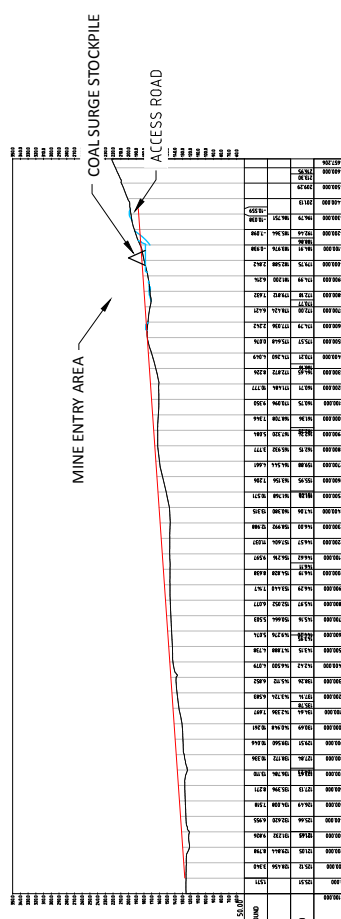
Figure 6.13a | VP11 - Edderton Road to Mine Entry Area

View Point 11 - Edderton Road | E 150° 49' 31.4" / S 32° 24' 20.5"

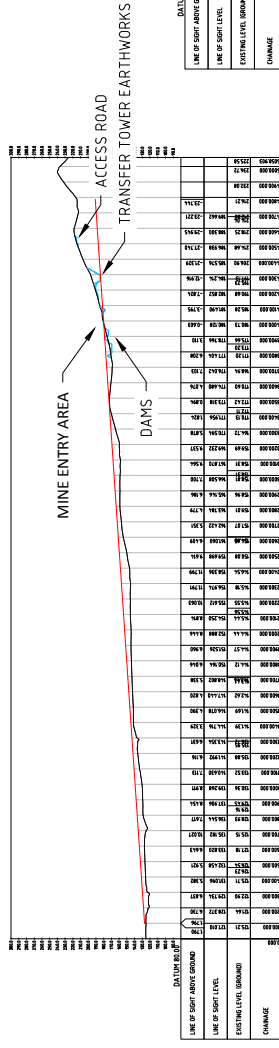
LINE OF SIGHT SECTION 1



LINE OF SIGHT SECTION 2



LINE OF SIGHT SECTION 3



LINE OF SIGHT SECTION 4

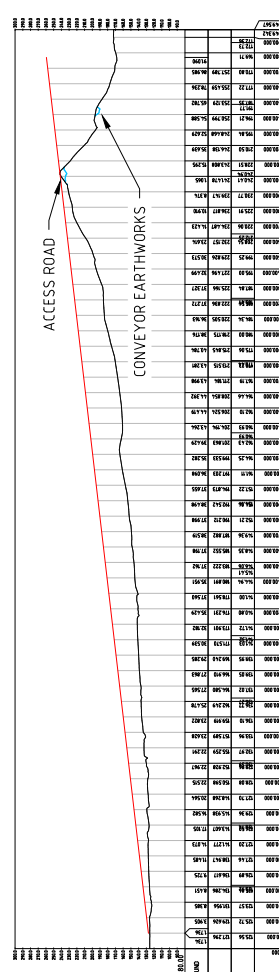
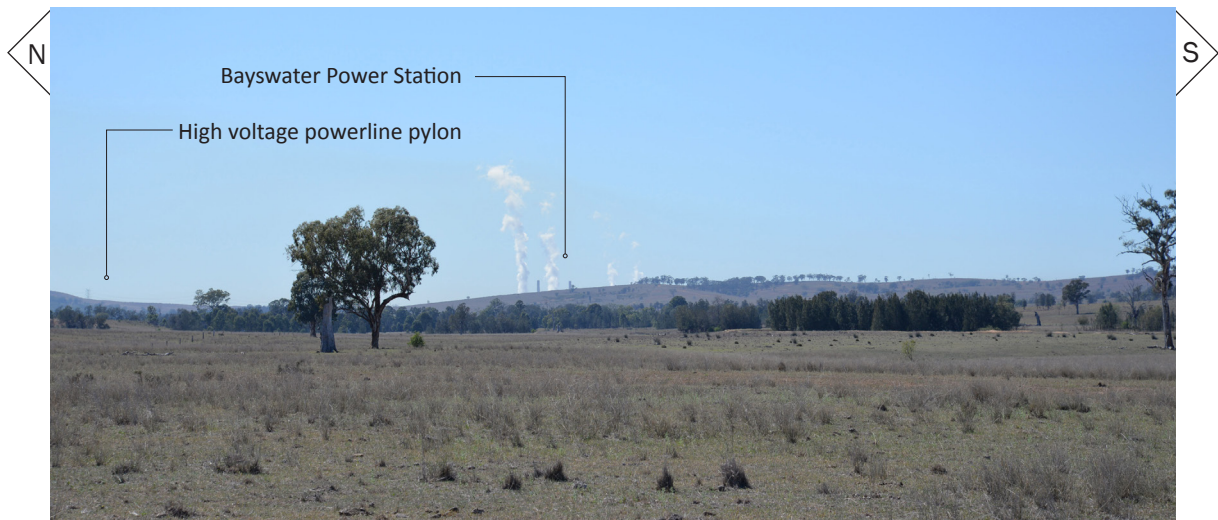
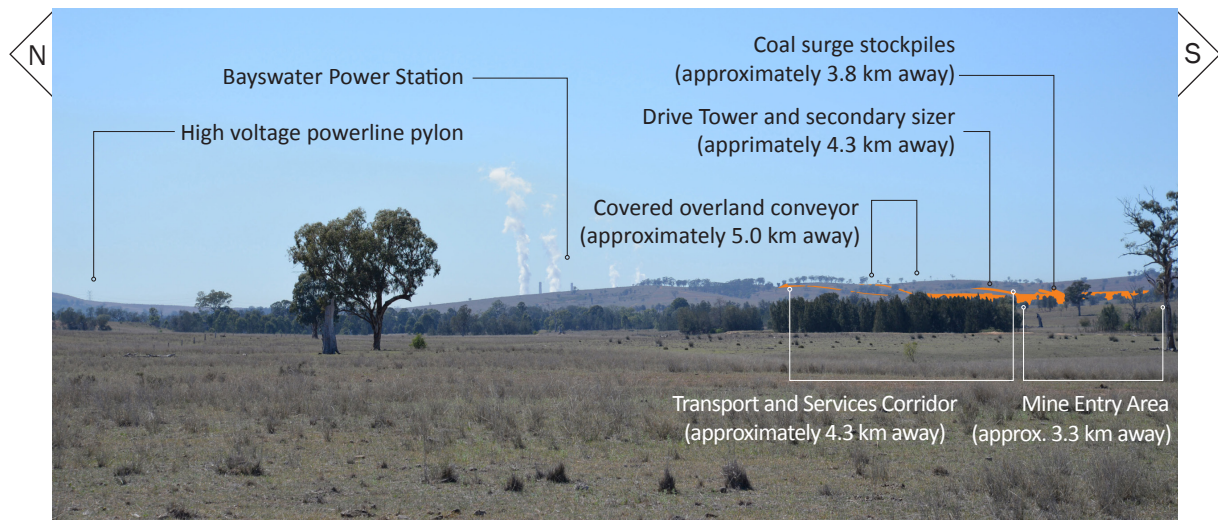


Figure 6.13b | Line of Sight Sections - VP11 - Edderton Road to Mine Entry Area

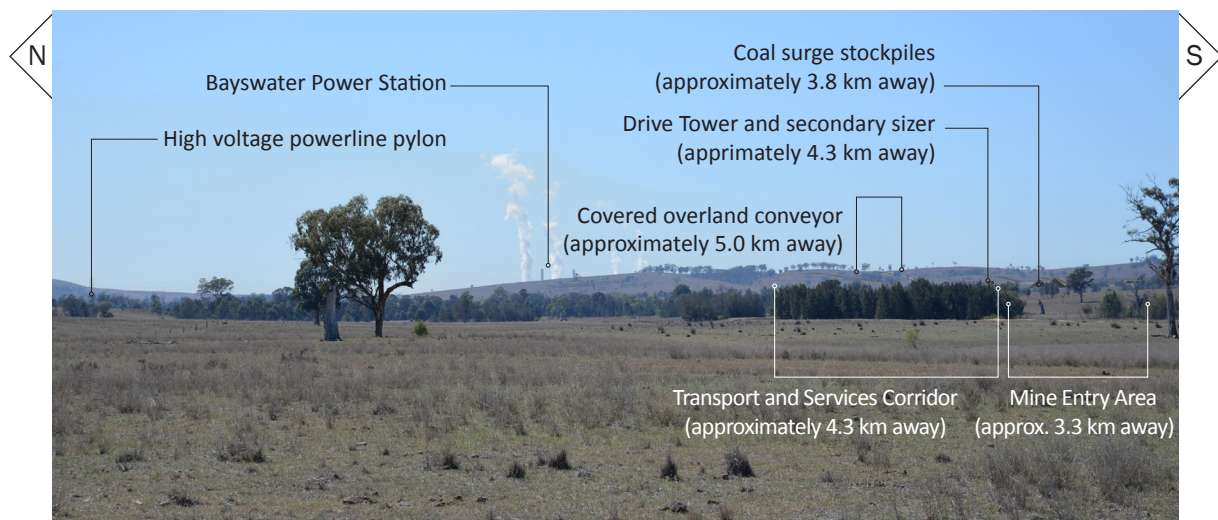
VP11: Edderton Road - 72mm lens length



Existing view



Existing view with contrast simulation of visible components



Existing view with visible Project components.

Figure 6.13c | Photomontage VP11 - Edderton Road to Mine Entry Area

VP12: Potential Edderton Road Realignment- 72mm lens length

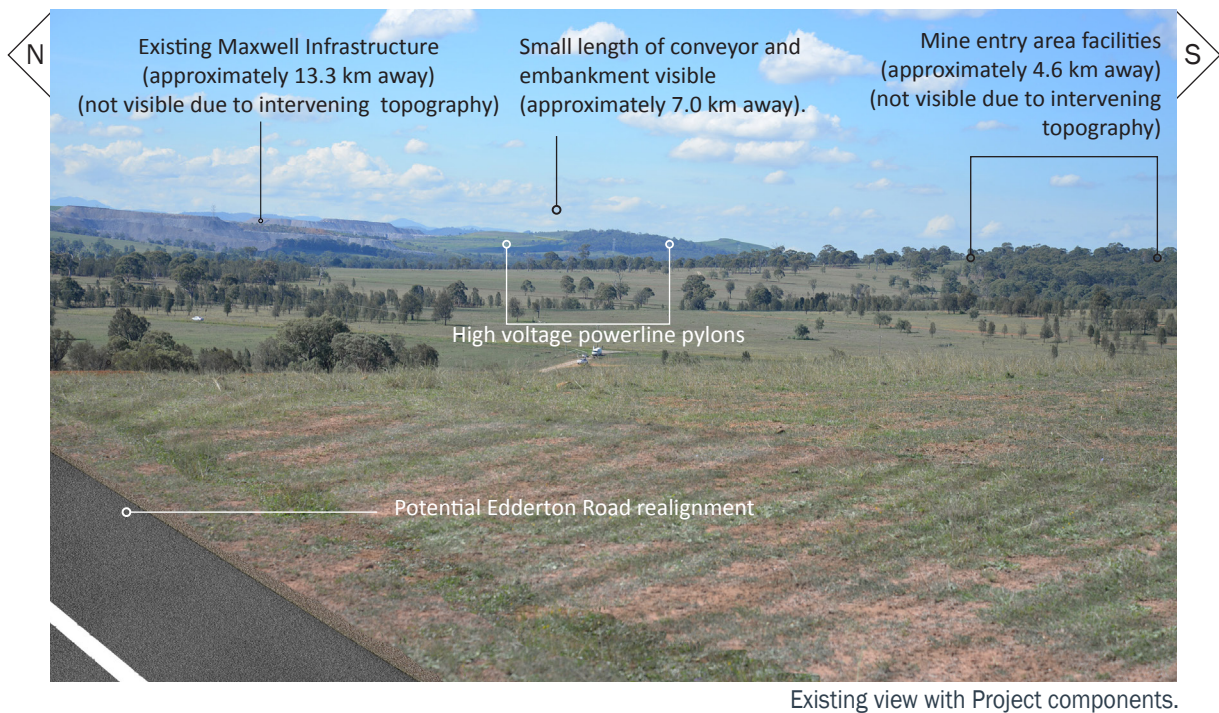


Figure 6.14 | Photomontage VP12 - Potential Edderton Road Realignment to Mine Entry Area

View Point 13 - Lake Liddell Recreation Area | E 150° 56'31.72/ S 32° 19'57.46"

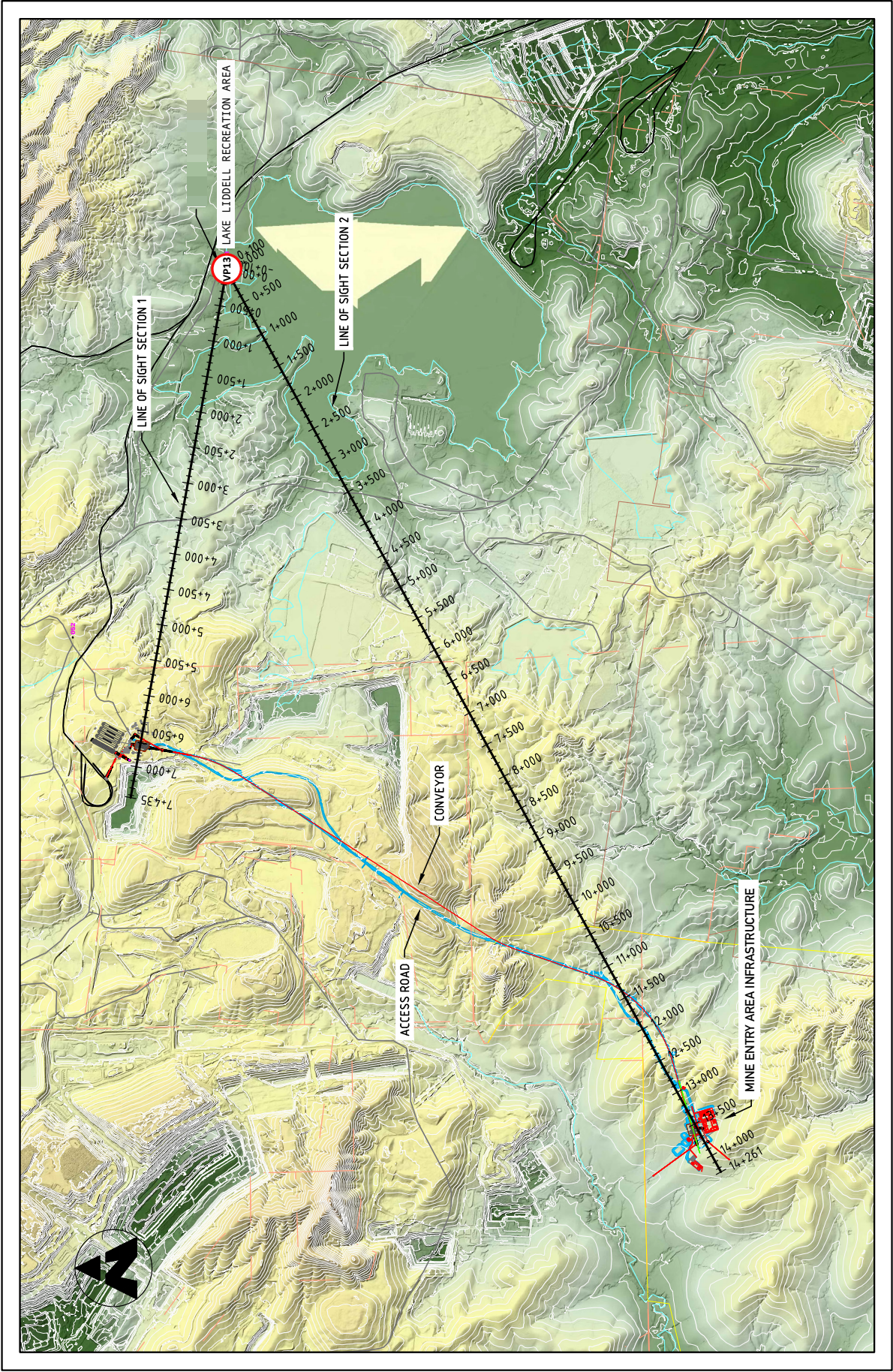
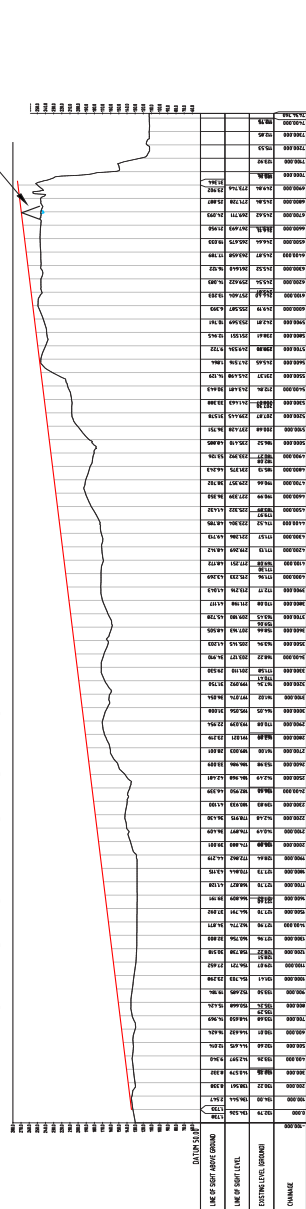


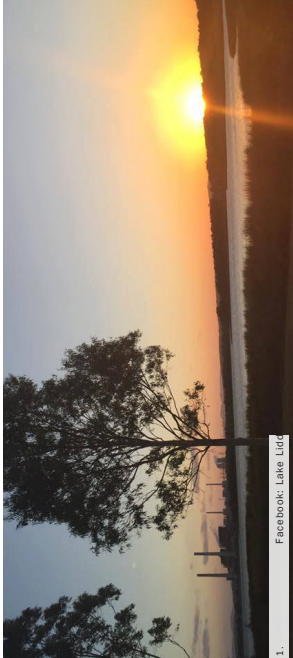
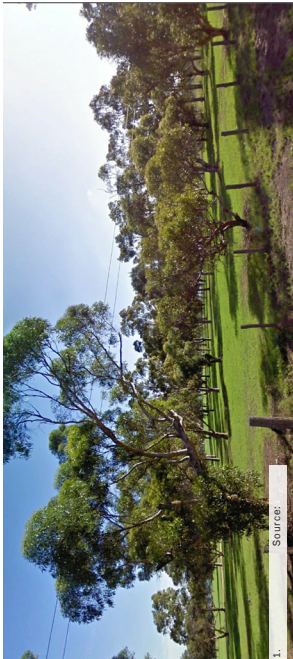
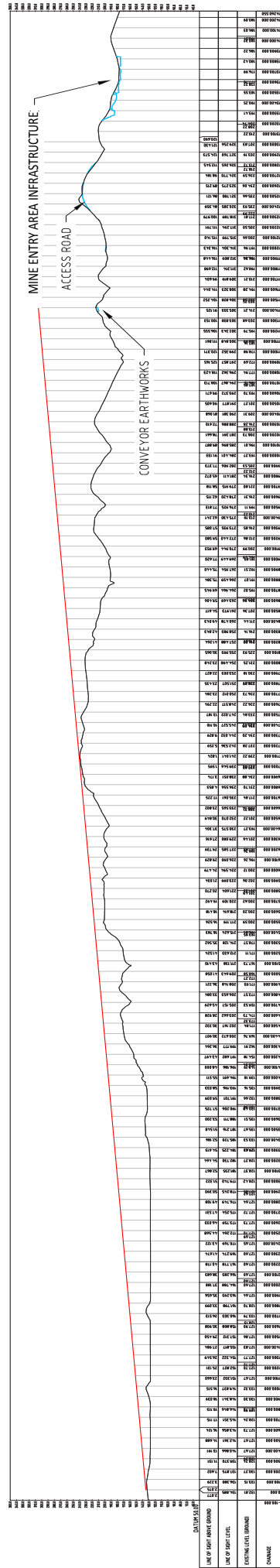
Figure 6.15a | VP13 - Lake Liddell Recreation Area

View Point 13 - Lake Liddell Recreation Area | E 150° 56'31.72/ S 32° 19'57.46"

LINE OF SIGHT SECTION 1



LINE OF SIGHT SECTION 2



Views around the recreation area camping area illustrates mature foreground vegetation that will filter views to the west. The existing views also include large scale infrastructure.

Figure 6.15b | Line of Sight Section - VP13 - Lake Liddell Recreation Area

6.4 Viewpoint Visual Effect Summary

Table 6.1 Visual effects summary

View location	Nearest Visible Project component	Visual Contrast	Visual Integration	Proportion of the View Occupied by the Project	Visual Effect
VP 1	Coolmore Stud – Oak Range Road to mine entry area	Moderate	Moderate	0%	No views
VP 2	Coolmore Stud – Horse paddock to mine entry area	Moderate	Moderate	0%	No views
VP 3	Coolmore Stud – Highest vantage point - to mine entry area - to transport and services corridor - to potential Edderton Road realignment	Moderate	Moderate	0% <1% <2%	No views Level 3 low Level 3 low
VP 4	Godolphin Woodlands Stud – converging ridge lines - to mine entry area - to transport and services corridor - to potential Edderton Road realignment	Moderate	Moderate	0% <1% <2%	No views Level 3 low Level 3 low
VP 5	Godolphin Woodlands Stud – Lookout - to mine entry area - to transport and services corridor - to potential Edderton Road realignment	Moderate	Moderate	0% 0% 0%	No views No views No views
VP 6	Godolphin Woodlands Stud – Manager's house to mine entry area	Moderate	Moderate	0%	No views
VP 7	Jerrys Plains near Golden Highway to mine entry area	Moderate	Moderate	0%	No views
VP 8	New England Highway to Maxwell Infrastructure	Low	High	0%	No views
VP 9	Golden Highway – Elevated vantage point: - to potential Edderton Road realignment - to mine entry area	Moderate	Moderate	0% 0%	No views No views
VP 10	Thomas Mitchell Drive to Maxwell Infrastructure	Low	High	0%	No views
VP 11	Edderton Road to mine entry area	Moderate	Moderate	2.6%	Level 3 Low
VP 12	Potential Edderton Road realignment to mine entry area	Moderate	Moderate	< 1%	Level 3 Low
VP 13	Liddell Recreation Area to Maxwell Infrastructure	Low	High	0%	No views

7. VISUAL IMPACT

7.1 General

This section considers the visual impact of the Project based on visual effect and sensitivity values and outlines strategies to mitigate those impacts where required. The visual effect of the Project and the visual sensitivity of areas from which it is seen are considered together as per the methodology in Table 2.3 to determine impact levels prior to any mitigation treatments.

Visual impact mitigation would be carried out both on and off site as needed.

Foreground treatments at specific viewpoints, such as mitigation tree plantings can provide filtering, screening and/or visual integration treatments as well as enhancement of foreground landscapes.

7.2 Visual Impacts

7.2.1 *Muswellbrook-Jerrys Plains Landscape Conservation Area*

The visual sensitivity of the Muswellbrook-Jerrys Plains Landscape Conservation Area ranges from areas of low sensitivity broadacre rural grazing and agriculture to areas of high sensitivity including the equine and viticulture areas, Jerrys Plains, and the Golden Highway (refer to Figure 5.6).

From viewshed analysis, the Muswellbrook-Jerrys Plains Landscape Conservation Area lies predominantly below the ridgelines that surround the mine entry area. Topographic features on rural land screen most of the Muswellbrook-Jerrys Plains Landscape Conservation Area from views to the mine entry area (refer Edderton Road below and VP11- Edderton Road - Section 6).

Visual impacts from relevant receivers within the Muswellbrook-Jerrys Plains Landscape Conservation Area are considered in the following sub-sections.

7.2.2 *Coolmore Stud*

There would be no views of the Project from the majority of viewpoints on the Coolmore Stud property. Elevated locations at Coolmore Stud that have potential for limited views of the transport and services corridor have moderate visual sensitivity (due to the distances to these features) and would experience low visual effect. Views of the transport and services corridor would occupy less than 1% of the view from this location which significantly reduces discernible components. Accordingly, visual impacts would be low.

7.2.3 *Godolphin Woodlands Stud*

There would be no views of the Project from the majority of viewpoints on the Godolphin Woodlands Stud property. Elevated locations on the Godolphin Woodlands Stud property that have potential for views to the Project have moderate visual sensitivity due to the distance to the nearest visible Project components. The visual effect of the transport and services corridor at these distances would be low. Views of the transport and services corridor would occupy less than 1% of the view from this location, which significantly reduces discernible components. Accordingly, visual impacts would be low.

7.2.4 *Jerrys Plains Village*

Views to the Project from Jerrys Plains would be screened by intervening topographic features.

Accordingly, there are no visual impacts from this location.

7.2.5 *Edderton Homestead*

Edderton Homestead is a residence owned by BHP with views of the Project. It is approximately 3.3 km from the mine entry area. The elevated position of the property and residences gives it broader, but limited views to the mine entry area and infrastructure within the transport and services corridor.

The existing views to the east from some areas of the property include the Bayswater Power Station and some high voltage transmission line pylons along the horizon ridgeline.

Visual sensitivity of the Edderton Homestead to the Project at this distance would be high. The visual effect on the Edderton Homestead would be similar to the adjacent viewpoint, VP11, but with a slightly higher elevation; it was assigned a low visual effect. Accordingly, visual impacts at the Edderton Homestead would be moderate. Proposed mitigation for Edderton Homestead is discussed in Section 9.3.

7.2.6 ***Other Rural Residences***

Bowfield Homestead, owned by Malabar, is located west of the mine entry area and could potentially have views of the Project. The mine entry area and the potential Edderton Road realignment are approximately 6.3 km and approximately 1.8 km to the east, respectively. Visual sensitivity to the Project at the Bowfield Homestead is moderate. Viewshed analysis shows that intervening topographic features screen other Project components at the mine entry area. Woodland vegetation between the Project and the Bowfield Homestead also limits views (Figure 5.16). Due to the intervening vegetation the visual impacts to Bowfield Homestead are low.

Other rural residences in the vicinity of the Project would be screened by intervening topography features. Accordingly, there are no visual impacts to these locations.

7.2.7 ***Hollydene Estate Wines***

Views to the Project from Hollydene Estate Wines would be screened by intervening topography features. Accordingly, there are no visual impacts from this location.

7.2.8 ***New England Highway***

Views to the Project from the New England Highway would be screened by intervening topography features. Accordingly, there are no visual impacts from this location.

7.2.9 ***Golden Highway***

Views to the Project from the Golden Highway would be screened by intervening topographic features and/or roadside vegetation. The positioning of the mine entry area in a small depression behind local ridges limits views from all locations along the Golden Highway. At its nearest point, the Golden Highway is approximately 4.5 km from the mine entry area.

Photomontage views from an elevated position (refer Section 6 - VP 9 – Golden Highway west) illustrate that views would not be available.

Visual impacts from the realignment of Edderton Road would occur due to construction and changes to road signage and traffic management along the Golden Highway. These localised impacts would be adjacent to the existing and new intersections; and would be limited to the duration of the construction.

Moderate visual impacts would occur until rehabilitation of disturbed areas and removal of all traffic management and construction equipment. Once grassing and vegetation patterns are re-established, visual impacts would be reduced to low.

7.2.10 ***Thomas Mitchell Drive***

At its nearest point, Thomas Mitchell Drive is approximately 500 metres from the existing Maxwell Infrastructure and has moderate visual sensitivity to any views of the Project.

Field studies and terrain modelling confirm there are no views to the Project from this road corridor. Significant woodland vegetation and local topography screen the views to the west into Project areas. Accordingly, there are no visual impacts on Thomas Mitchell Drive.

7.2.11 ***Edderton Road***

Locations along Edderton Road would have views to the mine entry area, and infrastructure within the transport and services corridor, overland conveyor from a low-lying section near Saddlers Creek. These views have been described and illustrated in Section 6 – VP11 – Edderton Road.

Visual effect during construction and operations would be low. Accordingly, visual impacts to Edderton Road are considered low.

7.2.12 ***Bureen Road***

Views to the Project from Bureen Road would be screened by intervening topographic features, roadside features and roadside vegetation. Accordingly, there are no visual impacts on Bureen Road.

7.2.13 ***Rural Land, Roads and Tracks***

View shed analysis shows there would be views from some isolated elevated positions, but viewer numbers would be very low as the land is primarily owned by Malabar, BHP or AGL. In this context, visual impacts to rural land, roads and tracks are considered low.

7.2.14 ***Lake Liddell Recreation Area***

Views to the Project from the Lake Liddell Recreation Area would be screened by intervening topographic features and vegetation. Accordingly, there are no visual impacts from this location.

7.2.15 ***Heritage sites***

There would be no views from Arrowfield Cottage, Randwick Homestead, Woodlands Homestead, Plashett Homestead, Strowan Homestead and the old stockyard. Accordingly, there are no visual impacts on these heritage sites.

Visual impacts at the Edderton Homestead and Bowfield Homestead are discussed in Sections 7.2.6 and 7.2.7, respectively.

Further assessment of these heritage sites is included as part of the Historic Heritage Assessment (Extent Heritage, 2019).

7.2.16 ***Commercial/Industrial Precinct***

Views to the Project from the commercial and industrial precinct would be screened by intervening local topography features and vegetation. Accordingly, there are no visual impacts from this location.

7.2.17 ***Plashett Reservoir***

Plashett Dam has no views to the Project. Accordingly, there are no visual impacts from this location.

7.2.18 ***Mount Arthur***

Mount Arthur is not publicly accessible. Accordingly, there are no visual impacts from this location.

7.3 **Impact of Night Lighting**

There are two types of lighting effects that could be generated by the Project, direct light effects and diffuse light effects. Direct light effects result from when the light source is directly visible and would be experienced if there is a direct line of sight between the light source and the viewpoint.

Diffuse light effects relate to the general night-glow that results from light of sufficient strength being reflected into the atmosphere. Diffuse light effect would create a local focal point that would vary with distance and atmospheric conditions such as fog, low clouds and/or dust particles which all reflect light.

Both of these light effects are observed in the existing environment surrounding the Project and are discussed in more detail below.

Australian/New Zealand Standard (AS/NZS) 4282:2019 Control of the obtrusive effects of outdoor lighting outlines the potential influence of night-lighting impacts on the surrounding environment, in particular Section 2.3 states:

The obtrusive effects of the lighting system may be significantly influenced by the following factors:

- a) *The use of the area abutting or in close proximity to the proposed development.*
- b) *The topography of the area surrounding the lighting installation. Residential developments at a lower level than that of the lighting installation are more likely to be subjected to a direct view of the luminaires.*
- c) *Physical features, such as adjacent buildings, trees and spectator stands, that may be effective in restricting light spill beyond the boundaries of the development.*
- d) *The existing ambient lighting characteristics relative to the proposed lighting.*
- e) *The location of the proposed development relative to—*
 - (i) *areas of special significance, e.g. areas having cultural, environmental, historical or scientific importance;*
 - (ii) *harbours, airports, waterways, roads or railway systems where spill light from the proposed development may interfere with the visibility of signalling systems; or*
 - (iii) *community and scientific optical observatories where spill light from the proposed development may interfere with astronomical observations.*

The visual effect of night-lighting would be influenced by the location of operations, the elevation of the viewpoint and the presence of any barriers such as topographic features and/or vegetation.

Changes in night-lighting would primarily occur at the mine entry area and along the transport and services corridor. Night-lighting at the Maxwell Infrastructure would not be materially different to that previously experienced.

Sensitive receptors are generally towards the south of the mine entry area (i.e. Hollydene Estate Wines and Coolmore and Godolphin Woodlands Studs). The closest residences to the west of the mine entry area are owned by BHP and Malabar (i.e. Edderton Homestead and Bowfield Homestead). There are no sensitive receptors further north of the Edderton Homestead (towards Mt Arthur Mine) or to the east of the mine entry area, as the receptors would be separated from the Project by existing mining operations and power stations.

The screening of light, especially to the south, would be afforded by the ridge lines and vegetation to the north of the Golden Highway.

7.3.1 ***Direct Light Effects and Impacts***

The majority of the lighting associated with mining projects is typically associated with CHPP infrastructure, workshops and train load-out facilities.

For the Project, the CHPP and train load-out facilities are both located at the existing Maxwell Infrastructure and not at the mine entry area. At the mine entry area, there would be limited above-ground infrastructure reducing the potential for the Project to cause direct light effects. Lighting associated with the infrastructure at the mine entry area would be either hooded or underground, which further restricts the ability to produce potential direct light effects.

Direct lighting effects may occur during the construction of the potential Edderton Road realignment or potential subsidence-related maintenance of Edderton Road. These activities could be observed by sensitive receptors to the south of the potential Edderton Road realignment, however the direct lighting impacts would be isolated and temporary in nature and would be consistent with the road works that would occur along Edderton Road and the Golden Highway.

During the operational phase of the Project, the potential for direct light effects would be generally limited to vehicles moving along the transport and services corridor and within the mine entry area. However, due to the location of the mine entry area and transport and services corridor, the majority of direct lighting from vehicle and mobile equipment would be screened to sensitive receptors by local topography and existing vegetation.

Screened, intermittent and isolated direct lighting from vehicles along the transport and services corridor and within the mine entry area would contribute a minor cumulative impact to overall lighting in the context of the surrounding mining operations and power stations.

Direct lighting has the potential to result in a higher impact, in comparison to diffuse lighting, however it would be limited to the north and west of the Project during the operations. In the south, direct light effects would be limited to intermittent lights associated with the construction of the potential Edderton Road realignment (the majority of this work would be in daylight hours with some potential for night work at the intersections) or subsidence-related maintenance of Edderton Road. These impacts would be isolated and temporary in nature and would not likely be significant.

7.3.2 *Diffuse Light Effects and Impacts*

A number of mining operations, power stations, residences and agricultural activities in the vicinity of the Project already contribute to diffuse light effects into the night sky (sky glow). The influence of lighting associated with surrounding mining operations and power stations would reduce the potential visual sensitivity of diffuse light emanating from the mine entry area, transport and services corridor and additional facilities at Maxwell Infrastructure.

The diffuse lighting effects would have lower but broader effects due to the prevalence of atmospheric moisture or background particulate matter such as dust. This would create a halo of light above the source of operational lighting.

Existing diffuse light levels at the proposed location of the mine entry area and transport and services corridor range between 0.25×10^{-9} watts per square centimetre (W/cm^2) to $1 \times 10^{-9} \text{ W}/\text{cm}^2$ (Figure 7.1). Immediately adjacent to the mine entry area and transport and services corridor, the existing levels of diffuse light range from $0.4 \times 10^{-9} \text{ W}/\text{cm}^2$ to $4 \times 10^{-9} \text{ W}/\text{cm}^2$ due to the surrounding open cut mining operations and power stations¹.

During construction and operation, the increase in diffuse light effects associated with the majority of the transport and services corridor is anticipated to be negligible compared to the existing diffuse light effects. A slight increase in diffuse light effects is expected to occur during construction and operation of the mine entry area, as the existing levels of diffuse lighting are low. However, the diffuse light effects would be limited to above the mine entry area and immediate surrounds, with significant separation distance so as to not visually impact on sensitive receptors to the south of the Golden Highway. Other sensitive receptors (i.e. Edderton Homestead and Bowfield Homestead) are also not expected to experience significant visual impacts as a result of diffuse light.

During subsidence maintenance activities on Edderton Road, diffuse light effects may become apparent from time to time, however, it is not expected to significantly impact on sensitive receptors.

The visual impacts of diffuse lighting associated with the mine entry area and transport and services corridor would be minimal compared to existing diffuse lighting as a result of the surrounding mining operations and power stations.

¹ Falchi, Fabio; Cinzano, Pierantonio; Duriscoe, Dan; Kyba, Christopher C. M.; Elvidge, Christopher D.; Baugh, Kimberly; Portnov, Boris; Rybnikova, Nataliya A.; Furgoni, Riccardo (2016) *The New World Atlas of Artificial Night Sky Brightness*.

There is potential for diffuse light from the Project to be observed from elevated locations, such as from the highest vantage points at the Coolmore and Godolphin Woodlands Studs. However, the contribution of diffuse light effects from the mine entry area and transport and services corridor would be indistinguishable from the surrounding mining operations and power stations and access to these areas at night is expected to be limited.

Mitigation measures that were incorporated into the design of the Project are discussed in Section 9.2. Through the design of the Project, the visual impact of night-lighting on sensitive receptors would not be significant.

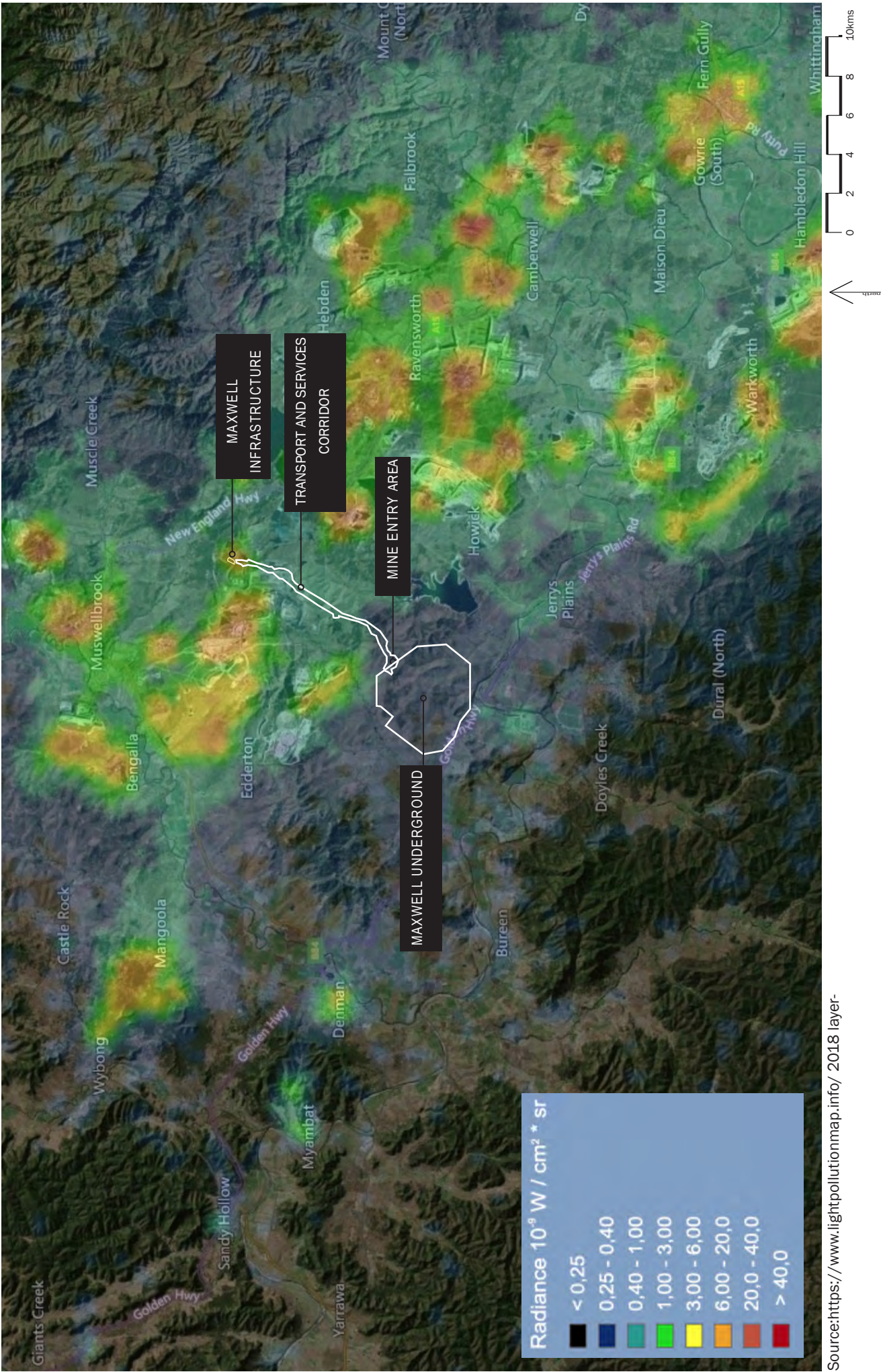
7.4 Cumulative Impacts

As the Project is for an underground mine, the potential visual impacts would be primarily due to the development and operation of the mine entry area and transport and services corridor. To consider the cumulative impact of the Project, it is necessary to consider the visual effect in the context of the existing environment.

The existing mining and power generation operations in the vicinity of the Maxwell Underground (i.e. Mt Arthur Mine, existing Maxwell Infrastructure, Hunter Valley Operation, Bayswater Power Station and Liddell Power Station) would remain visually dominant, in comparison to the surface infrastructure required for the mine entry area and transport and services corridor.

Furthermore, a number of the existing open cut mines are within or in the vicinity of the Muswellbrook-Jerrys Plains Landscape Conservation Area, including the Mt Arthur Mine to the north and the Hunter Valley Operations to the south east. The topography of the region in the vicinity of the Muswellbrook-Jerrys Plains Landscape Conservation Area and equine and viticulture enterprises provides mitigation against a cumulative visual impact from most viewing locations, through the fragmentation of the visual catchments.

Being an underground mine, the Project impacts on a limited number of sensitive receptors and at a significantly smaller scale. The mine entry area and transport and services corridor were designed to minimise the potential visual impacts. As the visual impacts of these components are considered low, there would be minimal increase in cumulative visual impacts from the Project.



Source: <https://www.lightpollutionmap.info/> 2018 layer-

Figure 7.1 | Light pollution map - Hunter Valley region

7.5 Viewpoint Visual Impact Summary

Table 7.1 | Visual Impact Summary - Long Term

Receptor	Land Use Sensitivity	Visual Sensitivity	Visual Effect	Visual Impact
Coolmore Stud	High	Moderate	Low	No impact to majority of the property. Low at highest vantage point.
Godolphin Woodlands Stud	High	Moderate	Low	No impact to majority of the property. Low at highest vantage point
Jerrys Plains Village	High	Very Low (No visibility)	No Views	No Impact
Edderton Homestead	High	High	Low	Moderate
Other Rural Residences	High	Moderate to Low	Low	Low
Hollydene Estate Wines	High	Very Low (No visibility)	No Views	No Impact
New England Highway	Moderate	Very Low (No visibility)	Very Low	No Impact
Golden Highway	High	High to Low	Low	Moderate (during construction of potential Edderton Road Realignment) Low (during operation)
Thomas Mitchell Drive	Moderate	Very Low (No visibility)	No Views	No Impact
Edderton Road	Moderate	Moderate	Low	Low
Bureen Road	Low	Very Low (No visibility)	No Views	No Impact
Lake Liddell Recreation Area	High	Moderate	No Views	No Impact
Heritage Sites	High	Low	No views	No impact
Commercial/Industrial Precinct	Low	Low	No Views	No Impact
Plashett Reservoir	Low	Very Low (No visibility)	No Views	No Impact
Mount Arthur	Moderate	Very Low (No visibility)	No Views	No Impact

8. DYNAMIC LANDSCAPE ASSESSMENTS OF IMPACTS

The natural and cultural/social elements of the landscape and the potential impacts of the Project on these elements are assessed in detail by other relevant technical experts, including:

- Mine Subsidence Engineering Consultants Pty Ltd (MSEC) (subsidence predictions and impact assessment);
- HydroSimulations (groundwater assessment and numerical groundwater modelling);
- WRM Water & Environment Pty Ltd (surface water assessment and site water balance);
- Fluvial Systems Pty Ltd (geomorphology assessment);
- Hunter Eco (biodiversity development assessment);
- Eco Logical Australia (aquatic ecology and stygofauna assessment);
- AECOM Australia Pty Ltd (Aboriginal cultural heritage assessment);
- Extent Heritage Pty Ltd (historic heritage assessment);
- Wilkinson Murray Pty Ltd (noise impact assessment);
- Todoroski Air Sciences Pty Ltd (TAS) (air quality and greenhouse gas assessment);
- The Transport Planning Partnership (road transport assessment);
- Elliott Whiteing Pty Ltd (social impact assessment);
- Deloitte Access Economics (economic assessment);
- 2rog Consulting Pty Ltd (2rog) (agricultural impact statement); and
- Environmental Risk Sciences (EnRiskS) (human health risk assessment).

Accordingly, this dynamic landscape assessment focuses on the perceptual and aesthetic characteristics of a landscape, including visual, sound, smell, touch/feel, preferences, associations and memories. The latter elements of preferences, associations and memories are influenced by the receptors' existing understanding of the landscape (e.g. through exposure to media describing the landscape prior to arrival). Whilst dynamic landscape assessment considers each of these inputs to a receptor's perception of the landscape, it is accepted that sight is the most dominant sensory input (Porteous, 1996; Kaymaz, 2012).

Table 8.1 outlines potential impact mechanisms considered as part of this assessment.

Table 8.1 | Dynamic Landscape Assessment of Impacts

Landscape Characteristics	Potential Impact Mechanisms
Sight	• Direct visual impacts (assessed separately in Sections 5,6 and 7). • Visual impacts from night lighting (assessed separately in Section 7.3). • Visual impacts whilst travelling through sub-region and region (e.g. views from the public road network or views from planes/ helicopters). • Indirect visual impacts (e.g. additional mine-related vehicles on roads, mine staff wearing high visibility clothing in public places or visible dust and road entry signs to sites).
Sounds	• Noise/ vibration from construction, operation, road and or rail activities.
Smells	• Odour generated by the Project (e.g. from spontaneous combustion events).
Touch/feel	• Not applicable given public access to the Project site would be restricted, with minor exception potentially from dust events.

Landscape Characteristics	Potential Impact Mechanisms
Preferences, associates and memories	• Viewing media related to the Project (including news articles, company statements and Google Earth). • Mapping and aerial photography. • Existing reports • Engaging with Malabar representatives. • Memories of historical land uses and / or projects.

Individual perception varies between individuals and can therefore be difficult to assess. The NSW Department of Planning and Environment's (2017) Social Impact Assessment Guideline for State Significant Development state the following with respect to assessing perceptions of adverse impacts:

When considering perceptions of adverse impacts on amenity, an evaluation must be made of the reasonableness of those perceptions. This evaluation involves 'the identification of evidence that can be objectively assessed to ascertain whether it supports a factual finding of an adverse effect on amenity...': Telstra Corporation Ltd v Hornsby Shire Council [2006] NSWLEC 133.

Accordingly, the assessment of perceptions in this dynamic landscape assessment draws, in part, on the assessment of potential adverse effects on amenity undertaken by other technical experts, where relevant (as listed above).

8.1 Sensitive Receptors

Receptors considered particularly sensitive to potential dynamic impacts of the Project on the local landscape are:

- Jerrys Plains village;
- Coolmore and Godolphin Woodlands Studs;
- Hollydene Estate Wines; and
- rural residences.

Jerrys Plains

The small village of Jerrys Plains has a strong rural character and is regarded as a point of interest for tourists. The community values and cultural identity of Jerrys Plains residents are based in the rural history of the local area, the picturesque landscapes, the country town feel and a quiet but busy rural way of life (Elliott Whiteing, 2019). This country town character is considered sensitive to potential dynamic landscape impacts associated with mining.

The town of Denman would have a similar sensitivity, but is located outside of the extent of the PVC (Primary Visual Catchment) and therefore is unlikely to be subject to dynamic landscape impacts from the Project, other than through knowledge based impacts.

Horse Studs

The Coolmore and Godolphin Woodlands Studs create an attractive rural landscape with high visual appeal that they consider fundamental to the success of their operations. The Godolphin Woodlands and Coolmore Studs include a number of higher vantage points overlooking the surrounding landscapes and Coolmore Stud includes an airstrip for clients to arrive by plane. The Godolphin Woodlands and Coolmore Studs are considered sensitive to potential dynamic landscape impacts.

Hollydene Estate Wines

Hollydene Estate Wines (previously Arrowfield) is a commercial vineyard and popular tourist attraction that operates a boutique winery and restaurant. Hollydene Estate Wines contains a distinctive landscape setting that adds to the visual quality of the region and locality. It is considered sensitive to potential dynamic landscape impacts.

Rural Residences

There are a number of scattered rural residences within the PVC. Landholders and families near the Project area enjoy a rural way of life which includes (Elliott Whiteing, 2019):

- grazing, equine breeding, viticulture and mining as central to local employment and to family and community wellbeing; and
- social and recreational activities based around outdoor activities, environmental appreciation, regular community events and celebration of rural heritage.

Rural residences are considered sensitive to potential dynamic landscape impacts given the aesthetic of the landscape is considered central to the rural way of life.

8.2 Potential Dynamic Landscape Impacts

Dynamic visual assessment takes into account human perceptions of the landscape (beyond sight) through sound (blasting and traffic), smell and touch (dust).

The natural and cultural/social elements of the landscape are assessed by other relevant technical experts. Accordingly, this dynamic landscape assessment is focused on three components:

- ephemeral effects;
- other visual effect experiences at regional and subregional scale;
- educational inputs.

8.3 Ephemeral Environmental Effects

These are due to non-visual environmental elements such as noise, dust and smell which may be experienced by receptors (viewers) within the PVC. These ephemeral effects can be positive experiences (e.g. sound of a water fall), or negative (e.g. smell of rubbish, sound of machinery). In this way, ephemeral effects of the Project, when significant, can lessen the experience of the landscape.

8.3.1 Sounds

As discussed above, Malabar has reduced the amount of surface infrastructure required at the mine entry area by using the existing Maxwell Infrastructure, which is located further away from sensitive receptors in the south (including the Coolmore and Godolphin Woodlands Studs and Jerrys Plains).

Wilkinson Murray (2019) has modelled potential noise impacts associated with the Project and found:

- Noise contributions from the Project to privately-owned sensitive receptors to the south would be indistinguishable from background noise in the existing environment during the daytime, evening and night time.
- With the implementation of appropriate mitigation measures, negligible or no exceedance of the Project noise trigger levels are predicted at all but four privately owned receivers to the north of the Maxwell Infrastructure. All four of these receivers are characterised as having “marginal” exceedances of Project noise trigger levels and would be afforded rights to mitigation upon request.
- Compliance with the relevant road traffic noise criteria is expected at all receivers surrounding the Project.

- Along the Antiene Rail Spur, the Project would comply with the relevant noise criteria at all surrounding noise sensitive receivers before and after closure of the Mt Arthur Mine. This is part of existing infrastructure with no increase resulting from the Project.

Concerns regarding the potential for blasting to impact on the safety of employee's (noise startling a horse while being handled) and customers' perceptions of the Godolphin Woodlands and Coolmore Studs was raised throughout the assessment and determination of the Drayton South Coal Project. As an underground mining operation, surface blasting would not occur as part of operational activities. Malabar would seek to eliminate or minimise the need for blasting during construction activities, with material preferentially removed through the use of dozers and excavators only. Blasting of material may be required during construction activities associated with the mine entry area and transport and services corridor. Construction blasting is relatively minor in scale in comparison to open cut mining blasts.

A review of overpressure and ground vibration levels associated with potential construction blasting indicates that these would comply with the relevant limits at a distance of 1.5 km. The closest privately-owned receiver to potential blasting activities is 4.7 km away, therefore overpressure and ground vibration levels associated with blasting activities from the Project are predicted to comply with the relevant criteria at all privately-owned receivers.

In consideration of mechanisms described above for sounds, it is expected that noise generated by the Project would not impact on the perception of the landscape.

Any incidence of negative perception of sound at sensitive receptors may evoke temporary memories of adverse landscape impacts. In the context of the Project, the modified mining operations, distances from receptors and intervening topography, this adverse impact is considered minimal and not significant.

8.3.2 *Smells*

Malabar has strategically located the mine entry area and ventilation infrastructure away from sensitive receptors to the south of the Maxwell Underground, which reduces the likelihood of odour impacts off-site. Events that could potentially cause releases of odour (i.e. spontaneous combustion) would be managed and monitored during operations, however it is not expected that spontaneous combustion would occur at the Project due to the low sulphur content of the targeted coal seams.

Spontaneous combustion at the Maxwell Infrastructure would be managed during the Project through monitoring and the rehabilitation of the landform, which would reduce the potential for future spontaneous combustion events. Given the design of the Project and the nature of the targeted coal seams, it is expected that the potential odour generated from the Project would not impact on the perception of the landscape.

In an unlikely occurrence of odour impacts off-site, there may be a temporary adverse landscape impact of short duration based on an educated understanding of the Project.

8.4 **Visual Effects of Proposal Outside Seen Area.**

In addition to dynamic perceptions created by sound and smell, the effects on a viewers' perceptions, gained accumulatively from moving away from a particular location can affect dynamic impacts. Such views (memories) would become part of the visual diary of the Project as seen from anywhere around it, generally within the PVC.

Such viewing then forms part of that viewer's perceptions of the Project at local, sub-regional and regional levels.

Dynamic landscape assessment considers these perceptions from both outside the PVC and within it in areas that do not have views of the Project.

The existing visual landscape settings inform perceptions of current mining affected landscapes and possible changes to those settings. Those settings include:

- local setting (Muswellbrook – Jerrys Plains Landscape Conservation Area, horse studs and Golden Highway);
- sub-regional setting (PVC); and
- regional setting (Upper Hunter Valley).

The visual impact assessment report identifies that the visual impacts are limited to the visual effects created by minor views of upper portions of the infrastructure area and to parts of the transport and services corridor as seen from the most elevated locations on the critical horse stud precinct.

However, views of the Project from around the PVC more broadly, may contribute to the perceptions of the Project at those sensitive receptors (horse studs) in locations with no views. This would include passenger views from the air to Coolmore and Godolphin Woodlands Studs and from road travel along the Golden Highway, New England Highway, Edderton Road and Denman Road.

8.4.1 ***Sub-regional Landscape***

In both the sub-regional and regional contexts, the Project's visible components are considered to be insignificant in terms of extent of visibility and the visual context which includes extensive existing mining landscapes.

This is apparent from the presence of, and views into, existing mine areas in the sub regional context. From Denman Road, there are views into Mount Pleasant Operation, Bengalla Mine and Mt Arthur Mine open cut and infrastructure areas. Views from Edderton Road would include views of the existing Mt Arthur Mine and Maxwell Infrastructure area. From the Golden Highway east of the PVC there are views into Wambo Coal Mine and Hunter Valley Operations (Figures 8.1 and 8.2).

This sub-regional and regional landscape includes many additional areas of quarries, open cut mining, partially rehabilitated mine areas, infrastructure areas and associated administration areas, all of landscape character consistent with the Existing Mining, Power Generation and Industrial VCU as identified in the visual and landscape assessment.

With the exception of the underground components, the Project would be an extension of the Existing Mining, Power Generation and Industrial VCU. However, this extension to visual effect of the broader sub-regional and regional Existing Mining, Power Generation and Industrial VCU is very low.

As defined in this landscape and visual assessment, various operations have different levels of visual effect, (e.g. underground mining having no visual effect, infrastructure areas and conveyors having a level 1 visual effect and roads potentially having a level 1 or 2 visual effect). The additional visual effect of these areas for the Project, when considered with all other existing mining areas within the sub-regional and regional visual catchment, are not significant.

As seen from a journey along Denman Road and Edderton Road, the small part of the coal surge stockpiles (seen from 4 km) and transport and services corridor and conveyor (seen from 4.5 to 5 km) are visible from a 600 m stretch of Edderton Road. This limited view is seen in the larger context of existing 'seen' mining at the Mount Pleasant Operation, Bengalla Mine and Mt Arthur Mine on the same journey.

The total visible disturbance from the Project would not be significant, and even less so when considering the small proportion of the infrastructure area, transport and services corridor and covered overland conveyor that are visible.



Figure 8.1 | Sub-regional views of Existing Mining Operations - Golden Highway
Views include signs for mine site entry and open cut pits.



Figure 8.2 | Sub-regional Views of Existing Mining Operations - Golden Highway
Mine infrastructure, signs of mine blasting, coal trucks and open cut pits are part of the existing environment informing people's perceptions of visual landscape.

Travels at this sub-regional scale would result in minor views of the Project on this journey and would be limited by effective landscape mitigation treatments.

8.4.2 **Regional Landscape**

On a regional scale, the Project is experienced by arriving from the east via Singleton, from the south via Broke and Bulga or from the north via Scone and Muswellbrook. These road journeys expand the current experience of regional open cut coal mines with Mount Pleasant Operation, Bengalla Mine, Mt Arthur Mine, Greater Ravensworth Area Operations, Hunter Valley Operations, United Wambo, Mt Thorley and Warkworth Complex all visible in varied degrees from the New England Highway, Golden Highway, Denman Road and Putty Road.

This broader experience of existing mining areas reduces the significance of the small areas of visible disturbance of the Project on a regional scale (Figures 8.3 and 8.4).

Staff and fly-in guests and clients of the Godolphin Woodlands and Coolmore Studs would have 'bird's eye' views of the broader region including existing large-scale open cut mines that surround the Golden Highway to the north, east and south-west.

There would be views of the mine entry area, transport and services corridor, and Maxwell Infrastructure from the air. The visual effects would vary depending on elevation before and after take-off; increasing as viewing angles afford the aerial views then decreasing as planes or helicopters move away from the runway. These visual effects would be seen in the context of the broader mined landscape around the Project boundary.

Aerial views (including via Google Earth) illustrate this where all mine areas in the Hunter Valley are experienced over the 65 km from Broke to Muswellbrook and across the 30 km wide valley (see Figure 8.5). The areas of mine-related disturbance in this regional view are significant. The addition of the small proportion of disturbed area from the Project to this overall view containing existing open cut mines is considered insignificant.

8.5 **High Visibility Clothing**

Engagement with the local community for the Social Impact Assessment (Elliott Whiteing, 2019) indicated a presence of strong rural community values and a desire to protect local environmental qualities. This is particularly evident in the villages of Denman and Jerrys Plains.

The NSW PAC has previously recognised the potential for mining to affect the tourism atmosphere of small towns and local sentiment against turning into 'high vis' mining towns (referencing the high visibility safety clothing required to be worn in operational areas of most mine sites).

Given that most of the employees would work in the underground, these individuals due to the nature of their work environment, would likely change out of 'high vis' prior to leaving the mine site. Malabar would discourage other workers from wearing high visibility clothing when travelling to public places in quiet rural areas such as Jerrys Plains and Denman. While similar policy for Muswellbrook and Singleton is not considered warranted given the existing strong influence of mining in these towns, the type of work associated with the Project would limit any exacerbation. With these policies in place, the Project is not anticipated to cause a dynamic landscape impact due to an increased presence of people in high visibility clothing in otherwise quiet rural areas.

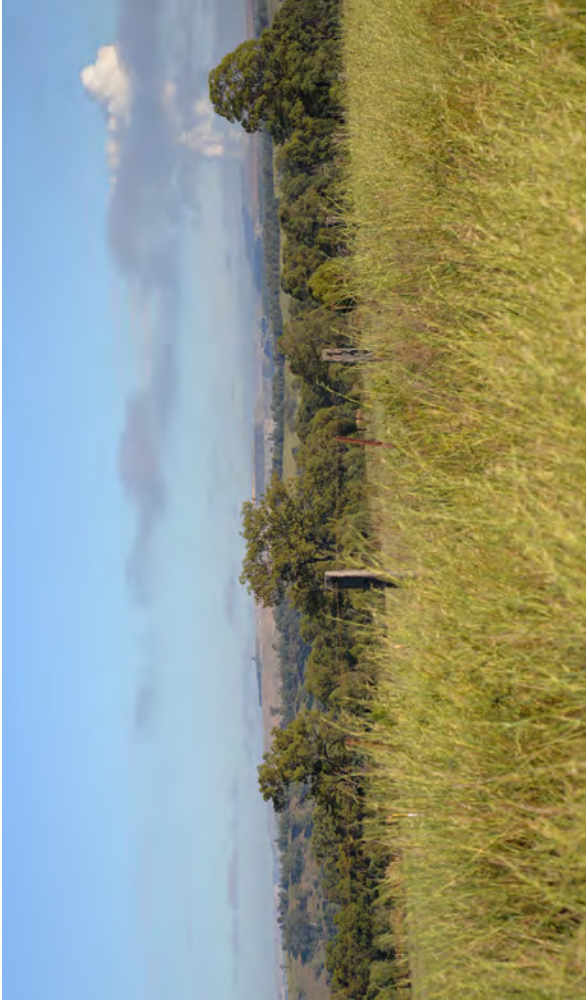


Figure 8.3 | Sub-regional Views of Existing Mining Operations - New England Highway
Mine infrastructure and open cut pits are part of the existing environment informing people's perceptions of visual landscape.



Views into Mt Arthur Mine from northern end of Edderton Road.



Figure 8.4 | Sub-regional Views of Existing Mining Operations - Edderton Road and Denman Road
Mine infrastructure , Bengalla Mine and Mt Arthut Mine open cut pits are part of the existing environment informing people's perceptions of visual landscape.



LEGEND
Railway

Source: © NSW Department of Finance, Services & Innovation (2019)
Orthophoto Mosaic: 2018, 2016, 2011

Figure 8.5 | Aerial views of existing mine related disturbance in the Hunter Valley and simulation of Project infrastructure (during operation)

8.6 Knowledge Based Perception

Perceptions on the basis of knowledge gained by reading, hearing and or seeing reports on previous, existing and proposed activities having an effect on personal perceptions. This perception input goes beyond any consideration of visual perception as it is based on all inputs that create a knowledge base of a landscape setting and the projects within it.

Such knowledge gained through public information would create an overarching awareness of this Project, including the underground mining component, the infrastructure area, and the entry road.

8.6.1 *Memories of Historical Land Uses and/or Projects*

In November 2012 Anglo American lodged its first development application, including an EIS, to develop the coal reserve within EL 5460 as an open cut mine (the Drayton South Coal Project), however the application was refused by the PAC (as delegate of the Minister for Planning) in October 2014.

A second development application and EIS for an open cut mining operation was lodged by Anglo American in May 2015. The second development application for the Drayton South Coal Project attempted to address the PAC recommendations through changes to the open cut mine design. The key change to the Drayton South Coal Project, included positioning the open cut mine completely behind the second ridgeline, thus removing the Redbank and Houston mining areas, to increase the buffer between the open cut mine and the Godolphin Woodlands and Coolmore horse studs (Anglo American Coal Pty Ltd, 2015).

The second development application for open cut mining was refused by the PAC (as delegate of the Minister for Planning) in February 2017 for reasons including potential air quality and blast noise impacts on existing land uses, unacceptable negative economic and social impacts in the locality, incompatibility with 'the particular nature, operations and requirements of existing land uses', and potential impacts on the sustainability of the Equine CIC (NSW PAC, 2017).

Engagement undertaken for the Social Impact Assessment identified potential legacy issues (community concerns and conflicts) associated with opposition to the Drayton South Coal Project.

When announcing its intention to acquire EL 5460 in May 2017, Malabar committed to investigating development of the resource in EL 5460 solely as an underground mine to address concerns raised regarding the Drayton South Coal Project. Since that time, Malabar's commitment to an underground mining operation has been reaffirmed through:

- Voluntary acceptance of conditions that prevent any open cut development that were imposed on EL 5460 as part of the renewal process in December 2017.
- A public submission in December 2017 in support of changes to the Mining SEPP that prohibit a development application for open cut mining in EL 5460.
- Consistent communication of Malabar's intentions through interactions with stakeholders.
- Malabar's significant investment in technical and environmental studies into the development of the site solely as an underground mining operation.
- Malabar's recent addition to the team of a highly experience underground mine manager to take responsibility for the delivery of the Project.

As a proposed underground mine, the Project would have inherently low potential to generate adverse impacts to the amenity of the Godolphin Woodlands and Coolmore Studs and other sensitive receptors. The commitment to underground mining substantially addresses the concerns raised by the PAC for the Drayton South Coal Project.

Accordingly, legacy issues associated with the Drayton South Coal Project are not anticipated to affect receptors' perceptions of the Project or the way it affects the landscape.

8.6.2 *Perceptions of Subsidence Landscape Impacts*

Consistent with broader general knowledge of regional adverse subsidence landscape impacts related to underground mining, perceptions of this potential have some adverse dynamic impacts.

Subsidence potential within and around the study area is identified and assessed in the technical report for subsidence predictions and impact assessment (MSEC, 2019). The report identifies that the potential subsidence impacts on both natural and built features are away from key sensitive receptors.

The physical or visual effects of these potential changes are described in Section 4.9. Local knowledge and experience of the described physical effects of subsidence described as “longwall mining can result in surface cracking, heaving, buckling, humping and stepping at the surface” (MSEC, 2019) could contribute to the broader perceptions about the Project.

Social impact management strategies are expected to reduce the potential for stress and anxiety in relation to such issues; however, concerns may persist for some community members. Regular engagement would help monitor relationships and potential risks to wellbeing (Elliot Whiteing, 2019).

8.6.3 *Viewing Media Related to the Project*

Throughout assessment of the Drayton South Coal Project, the Godolphin Woodlands and Coolmore Studs raised concerns regarding the potential for reputational impacts should evidence of open cut mining activities become apparent to their clients, including via media and the internet.

As discussed earlier, the Project is proposed to be an underground mine and would therefore have inherently low potential to generate adverse impacts to the amenity of the Godolphin Woodlands and Coolmore Studs and other sensitive receptors. Malabar is committed to publicising the environmental and amenity benefits of underground mining within EL 5460.

To mitigate the potential for media to negatively affect perception of the Project and its effect on the landscape, Malabar would continue to:

- actively report the beneficial outcomes of the Project in company statements and via the company website;
- use appropriate media platforms to disseminate current Project information that reinforces the relative benefits of underground mining and the beneficial outcomes of the Project; and
- offer to release joint media with horse studs or other sensitive receptors regarding the potential for co-existence between underground mining and other local industries (including equine, viticulture and agriculture).

As discussed earlier, aerial views of the Project (e.g. via Google Earth) would be negligible when viewed in the context of the existing landscape.

In consideration of the above, it is considered unlikely that the Project would result in horse stud clients forming a negative perception of potential mining impacts of the Project to horse stud operations.

8.7 *Stakeholder Engagement*

Memories, associations and preferences of a project are obtained via stakeholder engagement (Natural England, 2014). A SIA has been prepared for the Project in accordance with the NSW Department of Planning and Environment's (2017) Social Impact Assessment Guideline for State Significant Development

(Elliott Whiteing, 2019). Consultation for the SIA included:

- interviews with Muswellbrook Shire and Singleton Council representatives;
- consultation with neighbouring landholders and community members;

- SIA workshop with community and government agencies;
- correspondence with neighbouring equine operations;
- interviews with representatives of Hollydene Estate Wines, Jerrys Plains Public School, Muswellbrook Public School, Muswellbrook South Public School, Muswellbrook Hospital, Singleton Hospital, NSW Rural Fire Service Hunter Valley Operations and Dalswinton Rural Fire Brigade, and NSW Farmers Association's local representative; and
- consultation with Indigenous community representatives, with input also sought via the Project's Registered Aboriginal Parties.

The SIA summarises and assesses the concerns and issues raised by stakeholders throughout the engagement process.

Malabar has emphasised the importance of positive community engagement since announcing its intention to acquire EL 5460. Opportunities for community feedback in relation to the EIS have been provided through:

- Information sessions held at both Jerrys Plains and at the Maxwell Infrastructure.
- Regular correspondence with both the Coolmore and Godolphin Woodlands Studs, including meetings and site visits.
- Distribution of newsletters to the community surrounding the Project.
- Community surveys.
- Ongoing facilitation of the Maxwell Infrastructure, Spur Hill and Antiene Rail Spur Community Consultative Committees (CCCs).

Malabar is committed to contributing to the local community. Over the last five years, Malabar has provided donations, sponsorship or support to a number of community organisations in the region. Malabar has continued to show a strong focus on engagement with the community. As Malabar has an existing foundation within the broader region it is not expected that perceptions of Malabar would negatively impact on the perceptions of the Project or how it would affect the landscape.

8.8 Dynamic Landscape Impact

Individual perception varies between individuals and can therefore be difficult to assess. In this context it appears appropriate to consider the NSW Department of Planning and Environment's (2017) Social Impact Assessment Guideline for State Significant Development, which states the following with respect to assessing perceptions of adverse impacts:

When considering perceptions of adverse impacts on amenity, an evaluation must be made of the reasonableness of those perceptions. This evaluation involves 'the identification of evidence that can be objectively assessed to ascertain whether it supports a factual finding of an adverse effect on amenity...': Telstra Corporation Ltd v Hornsby Shire Council [2006] NSWLEC 133.

Accordingly, it is considered that the limited scale of impact of the Proposal on the landscape and the mitigation of those impacts in the context of existing land use patterns at the regional, subregional and local scales would create low dynamic landscape impact; there are those who have an existing adverse perception of mining activity no matter how low the impacts or how informative the educational inputs. This impact is not necessarily tied to one's experience of the actual landscape and can create an adverse perception in those that have not even experienced the area.

However, in the context of "...considering perceptions of adverse impacts on amenity, an evaluation must be made of the reasonableness of those perceptions", it is considered that the dynamic landscape impact is low based on intensity and extent of visual and other perceptual experiences of the Project in the context of existing mining in the locality, sub region and region.

9. MITIGATION

There are numerous visual mitigation measures incorporated into the design of the Project.

These include:

- locating the mine underground;
- utilising existing infrastructure at the Maxwell Infrastructure;
- positioning the mine entry area in a natural depression which encloses most operational components within natural topography;
- ongoing rehabilitation at the Maxwell Infrastructure;
- use of compatible tones for building and cladding colours (such colours would include tonal variations of existing colours in the surrounding landscape); and
- landscaping at the mine entry area to create tonal variations when viewed from the air.

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

- On-site treatments to reduce visual effects of the Project components by reducing visibility for sensitive receptors and reducing the level of contrast.
- Off-site treatments at viewer locations to reduce visual sensitivity.

On-site treatments involve rehabilitation of landforms and land cover, while off-site treatments could involve a range of treatments to screen views, filter views and/or reorientate primary views, should this be necessary. It should be noted that on-site treatments are already incorporated in the design and operating plans for the Project as they relate to placement of the mine entry area and rehabilitation.

Malabar would conduct ongoing consultation with stakeholders surrounding the site over the life of the Project to identify any issues in relation to visual impacts on surrounding sensitive viewing locations. Following further consultation with the stakeholders, additional measures may be implemented to increase visual mitigation at specific sensitive viewer locations.

9.1 On-site Treatments

The following on-site treatments are recommended to be implemented for the Project:

- Establishment of visual mitigation tree screening along ridge line contours west of the mine entry area. This comprises four rows of planting (at 2 m centres) of native canopy tree species and 2 metre tall shrub species to provide a screening understory (Figure 9.1). Malabar has implemented this mitigation planting and would undertake further screen planting to achieve visual screening as required.
- Within the transport and services corridor, all earthwork batters should be rehabilitated.
- Where possible, design of transmission line poles should consider placement of poles in locations of high visual absorption.
- Revegetation of disturbed areas should be undertaken as soon as practicable after the completion of construction.
- Where feasible, rehabilitation should be undertaken to emulate existing landscape patterns, colours and texture continuums.
- Compatible tones should be used for the covered overland conveyor building and cladding colours. Such colours should include tonal variations of existing colours in the surrounding landscape. Contrasting and discordant colours that stand out in the landscape should be avoided.

The mitigation measures listed above would reduce the visual effect of Project components by reducing the level of contrast with the surroundings. The revegetation of disturbed areas would also increase screening of views of Project components.

It is recommended that planting of screening vegetation is undertaken adjacent to the mine entry area, on the west slope of the bounding ridgeline. The potential visual effect of the mine entry area to the section of Edderton Road, where the Project is visible (approximately 600 m), would be significantly reduced (Figure 9.1).

The tree screen should be planted as early as possible to allow for establishment and growth parallel to the approvals process. Visual sensitivity is moderate and visual impacts are low. Planting is, in this context, not essential, however, it is an opportunity for further reduction of visual effects and resulting reduced visual impacts in the landscape.

9.2 Night-Lighting

Sky glow is an area-wide problem that is less amenable to control. Because sky glow is caused both by reflected light and direct light from the installations, restricting design illuminances to the minimum necessary for the application will provide additional mitigation.

All external lighting associated with the Project would comply with AS/NZS 4282:2019 – Control of the Obtrusive Effects of Outdoor Lighting, including the minimisation of light spill through the following:

- Adequate aiming of lights (including consideration of mounting heights).
- Use of shielded fittings, where available and safe to do so.
- Use of anti-reflective paint to light spill surfaces (where the designer has a choice of surfaces, it is desirable that a surface with the lowest practical reflectance be selected, compatible with the function of the area).
- Upward spill light would be minimised and lighting would generally be directed either downwards, or away from the south and Edderton Road.
- Night-lighting would be restricted to the minimum required for operational and safety requirements so as to avoid over-lighting.
- Energy efficient lighting would be used for any new fixed lighting installed, where available and safe to do so.
- Where floodlights are required, asymmetric beams would be used.
- Fixed lights would not be directed towards reflective surfaces.
- Lighting would use warm white colours for fixed lighting, where available and if compliant with industrial lighting standards.

9.3 Off-site Treatments

Edderton Homestead qualifies for the consideration of off-site treatment due to the moderate visual impacts. If requested by the landowner (i.e. BHP) and/or tenant, landscaping works along the eastern and southern boundary fence line of Edderton Homestead are recommended to supplement existing vegetation and further screen views of the Project (Figure 9.2). Implementation of the visual mitigation measures should be subject to consultation and agreement with the landowner and/or tenant.

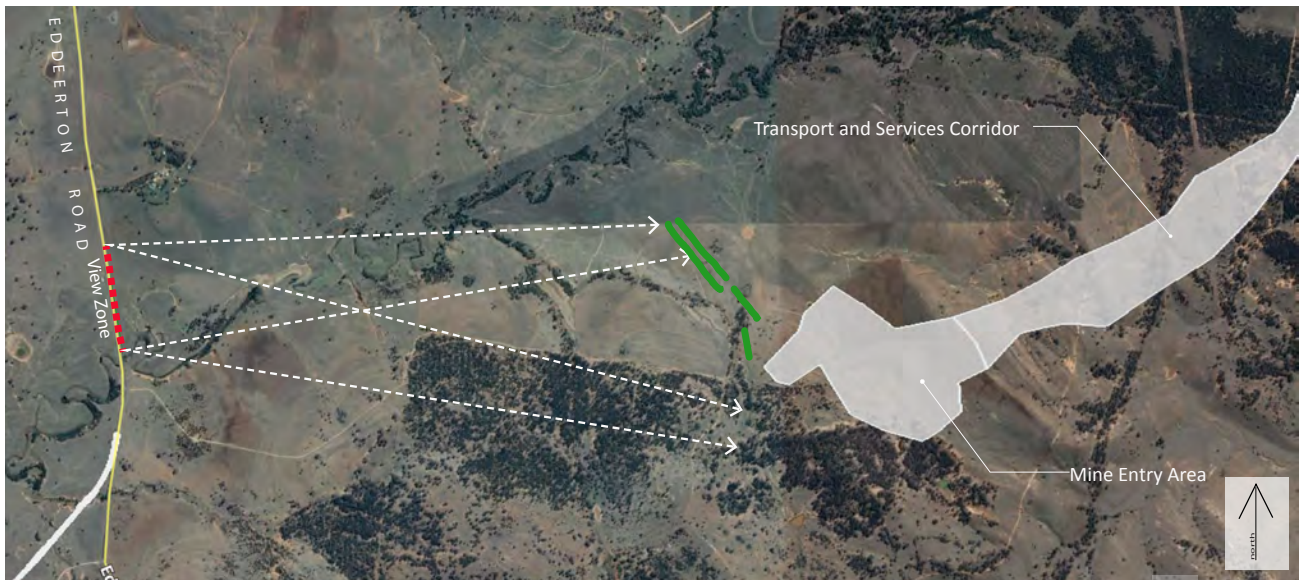


Figure 9.1 | On-site Mitigation - Mine Entry Area

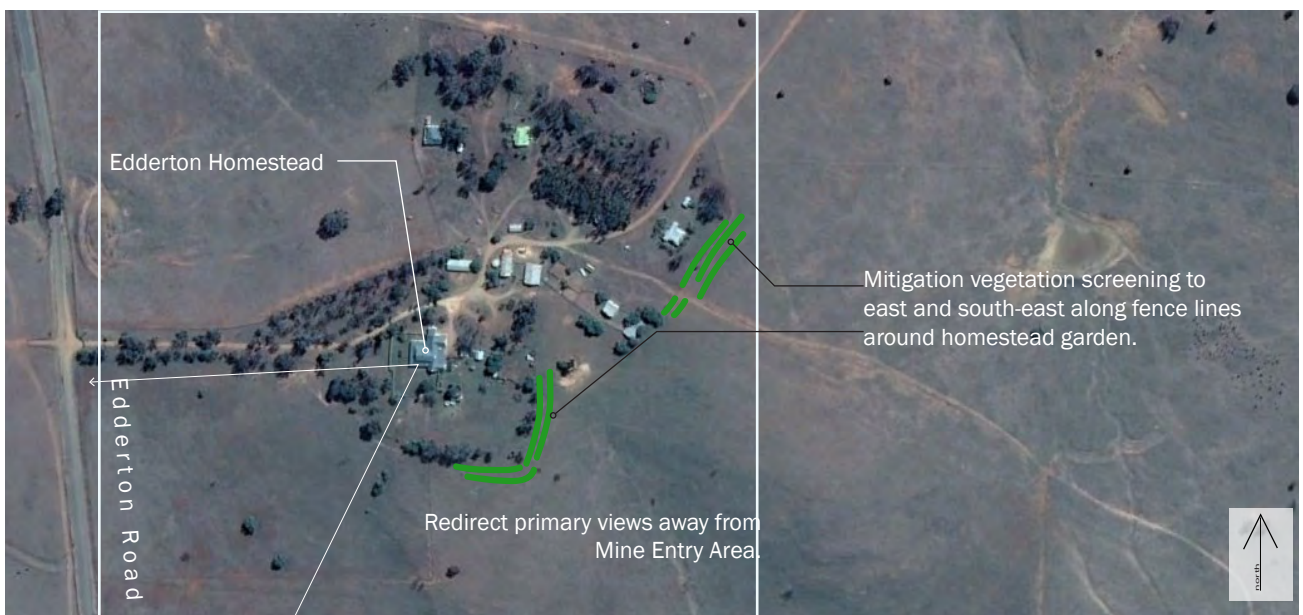


Figure 9.2 | Off-site Mitigation - Edderton Homestead

10. CONCLUSION

The Project comprises the following main domains with the potential to alter existing views and visual amenity values within the surrounding areas.

- The proposed area of underground mining operations within EL 5460 (Maxwell Underground).
- A mine entry area and associated facilities that support the underground mining activities and provide for personnel and materials access to the underground mine.
- Maxwell Infrastructure – the area within existing mining leases comprising the substantial existing infrastructure and previous mining areas.
- The transport and services corridor between the mine entry area and Maxwell Infrastructure – this would comprise a site access road, a covered, overland conveyor, power supply and other ancillary infrastructure and services.
- A potential realignment of Edderton Road.

Following visual assessment according to the VPA methodology as described in Section 2.0, the following conclusions summarise the outcomes of this study.

10.1 Maxwell Underground

The Project would inherently low visual impacts because the mining operation would be underground.

10.2 Mine Entry Area and Transport and Services Corridor

Mine entry area has been located in a natural valley within undulating topography that limits most views into the operational area from surrounding sensitive receptors.

Local topography would screen most views from the north, east and south reducing potential for visual impacts.

Impacted views to the mine entry area and transport and services corridor are limited to the following locations in the west and distant south:

- Edderton Homestead on Edderton Road
- A short section of Edderton Road west of the mine entry area, where low-lying areas along Saddlers Creek allow views to the coal stockpiles, some coal loading facilities and infrastructure, and the more elevated sections of the transport and services corridor and covered overland conveyor as they cross the adjacent ridge to the east. These impacts would be experienced briefly along a 600 m stretch of Edderton Road, typically from a moving vehicle.
- Elevated locations on Coolmore Stud and Godolphin Woodlands Stud properties, where there are distant views to the more elevated sections of the infrastructure within the transport and services corridor as they cross the adjacent ridge and PVC boundary to the east. The mine entry area would not be visible from anywhere on the horse stud properties, including the elevated locations.
- Views from the air (i.e. arriving and departing the Coolmore Stud by plane or helicopter and arriving and departing the Godolphin Woodlands Stud by helicopter).

Night lighting from the mine entry area and transport and services corridor would contribute to the existing sky glow in this region. It would have localised effects in an area with few sensitive receptors. Distance would reduce the visual impacts from more distant sensitive view locations in the south as it becomes part of the greater sky glow prevalent in this area.

10.3 Maxwell Infrastructure

The visual impacts associated with additions to the Maxwell Infrastructure area are anticipated to be minimal. All changes occur within the existing site boundary. There would be minimal to no impacts associated with additional components within this existing area.

The Project boundaries are screened by topography to the north, east, south and west. Vegetation and Mt Arthur Mine also screen views to any new components from Thomas Mitchell Drive.

10.4 Potential Edderton Road realignment

The moderate visual impacts associated with realignment works would be localised, and would be limited to the construction phase of the potential Edderton Road realignment. These impacts would be reduced to low following rehabilitation of disturbed areas. As vegetation becomes established, impacts would be further reduced to become insignificant.

11. REFERENCES

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