

Appendix B3

Visual Assessment



VISUAL IMPACT ASSESSMENT

MANGOOLA COAL PROJECT

RELOCATION OF THE 500 kV ELECTRICITY TRANSMISSION LINE

Prepared for

***XSTRATA MANGOOLA PTY
LIMITED and TRANSGRID***

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REF: 839-Z-01C

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1.1 The Project

The Mangoola Coal Project (The Project) is located approximately 20km west of Muswellbrook and 10km north of Denman, New South Wales. The project formerly approved as the Anvil Hill Coal Project sought to extract coal in four pits with associated overburden emplacement over a period of 21 years. The project incorporates a coal preparation plant, stockpiles, rail loop infrastructure and tailings dam. The original mine plan was designed to accommodate a 500kV electricity transmission line which bisects the site. It is now proposed to relocate this electricity transmission line to the south and west, inside the approved project disturbance boundary, to facilitate improved efficiency of the mine.

Land ownership in the surround areas is shown in **Figure 1**.

1.2 Objectives

The objectives of this Visual Impact Assessment report are:

- To assess the visual impact of the relocation of the 500kV electricity transmission line.

The visual impacts of the related changes to the mine plan have been assessed in a separate report.

1.3 Methodology

This visual impact assessment has been divided into three sections:

- 1 Introduction
- 2 Relevant Aspects Of The Proposed Development
- 3 Visual Impact Assessment

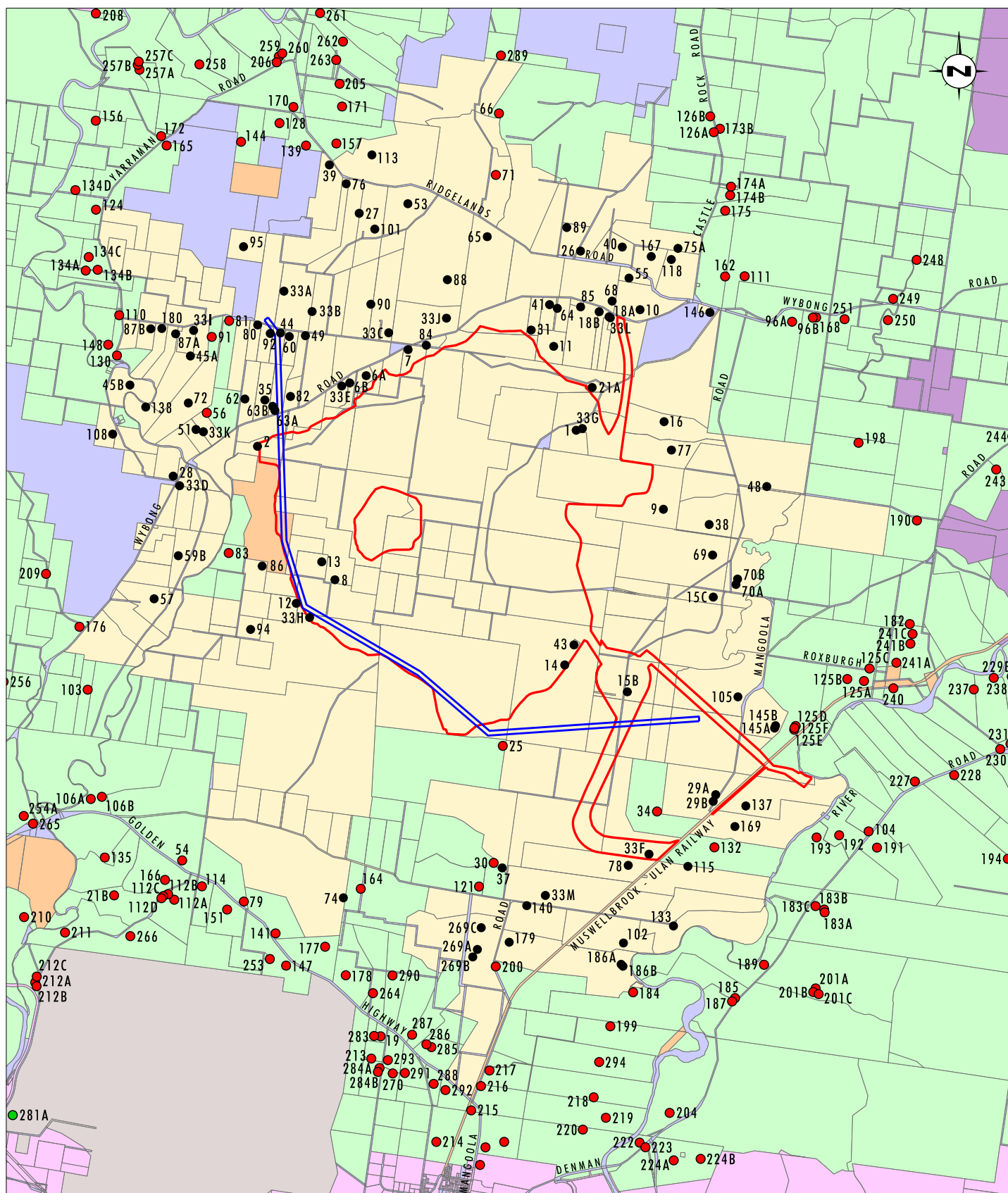
The purpose of the assessment was to determine the potential visual impacts of the relocation of the 500kV electricity transmission line. On the 4th August 2009 a site inspection was carried out in conjunction with Greg Newton, Mangoola Coal's Environment and Community Officer.

Reference is made in this report to the viewpoints used in our original "Visual and Lighting Impact Assessment- Anvil Hill Project" ref. 735-Z-12 June 2006. The viewpoints are noted in that report as being selected as representative of the range of possible locations and to highlight the locations from which the impacts are likely to be most prominent. Viewpoints are limited to public roads and accessible public areas as these relate to the greatest numbers of potential users. The selected viewpoints also were the most logical positions for assessment of the impacts of the proposed relocation of the 500kV transmission line (The Line). The viewpoints are shown on Figure 2 "Visual Assessment Locations".

1.4 Referenced Documents

The following documents are referenced in the report or were considered in forming the assessments provided.

- 'Visual and Lighting Impact Assessment Anvil Hill Project'
O'Hanlon Design Pty Ltd, June 2006 ref: 735-Z-12



Source: Dept. of Lands (2003)

0 1 2 4 km
1:80 000

Legend

- Approved Project Disturbance Boundary
- Proposed 500kV Transmission Line Easement
- Cadastral Boundary
- Private Residence
- Mine Owned Residence
- Commonwealth Residence

Land Ownership Status:

- Xstrata Mangoola Pty Limited
- Crown Land
- The State of NSW
- Private
- Commonwealth of Australia
- Other Mine Owned
- Unknown

File Name (A4): Subbies/Visual/ETL_V1/2497_262.dgn

FIGURE 1
Land Ownership

- Figure 1 – Land Ownership, Umwelt (Australia) Pty Limited: file SUB/Visual/ETL_V1/2497_262.dgn
- Figure 2 – Proposed 500kV Electricity Transmission Line Route, Umwelt (Australia) Pty Limited: file SUB/Visual/ETL_V1/2497_264.dgn
- Umwelt (Australia) Pty Limited: file R12-V1 / 2497_201.dgn
Figure 3.7 – “Proposed Year 2 Mine Plan”
- Umwelt (Australia) Pty Limited: file R12-VI / 2497_191.dgn
Figure 3.11 – “Proposed Year 10 Mine Plan”
- Central Mapping Authority of NSW
1:25000 Topographical Map “Sandy Hollow” 9033-111-N
First Edition. Reprinted 1983.
- Google Earth Image ‘Image 2009 Digital Globe’
2009 Map Data Sciences Pty Ltd PSMA

2.1 RELEVANT ASPECTS OF THE PROPOSED DEVELOPMENT

This section describes the proposed relocation of the 500kV electricity transmission line (The Line). The relocation will occur within the first five years of the overall Mangoola Coal project to allow changes to the mine plan and recovery of the additional resource made possible by The Line relocation. The changes are mapped on **Figure 2**. "Proposed 500kV Electricity Transmission Line Route".

2.2 RELOCATED 500KV ELECTRICITY TRANSMISSION LINE

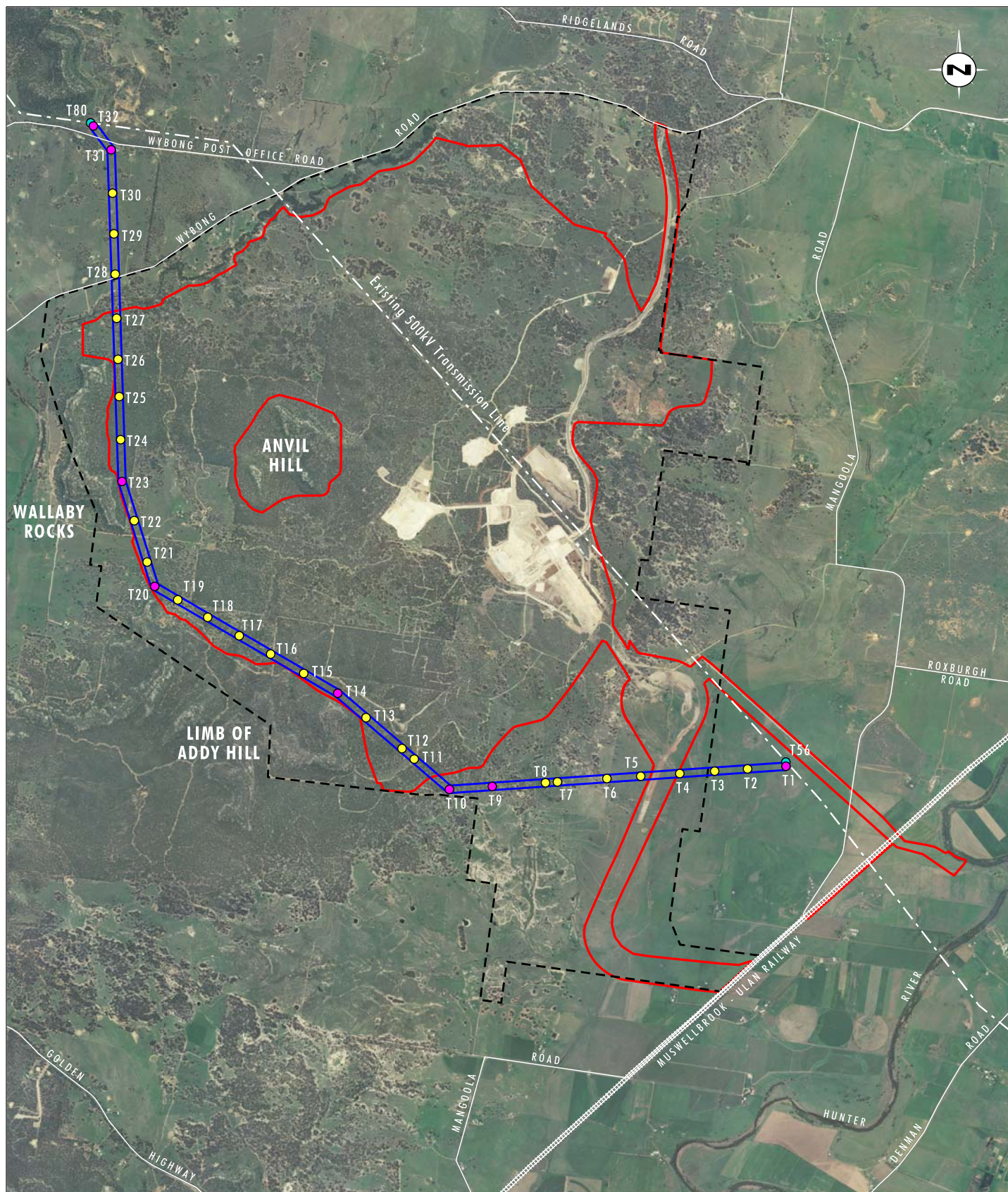
The Line consists of a series of 32 new towers (numbered T1 – T32, **Figure 2**) with interconnecting transmission lines, or conductors. The relocation commences at existing tower T56 on the existing 500kV transmission line south-east of the approved project disturbance area and rejoins the existing 500kV transmission line at T80 north-west of the approved project disturbance area.

The initial direction of the proposed route of The Line is west from ET56, across relatively flat, cleared topography at levels between RL120 and RL140 for approximately 1500m, during which distance The Line crosses the incoming Mangoola Coal rail loop. When The Line reaches T6 it commences a rise to T7 and T8. Between T7 and T8 The Line bridges a small spur with a level in the order of RL185 (Spur 185). From T6 The Line moves into more heavily vegetated topography.

The Line continues west for approximately 800 metres to T10 with underlying topography levels rising to around RL 170 to 180. At T10 The Line changes direction to travel north-west and crosses into the approved project disturbance area. Travelling north-west, The Line rises steeply toward T11 passing through relatively dense vegetation on the south east edge of the Limb of Addy Plateau. Between T11 and T12 The Line bridges a high level knoll with a maximum RL around RL220 (Knoll 220). From T12 The Line continues to rise through thick timber toward T13, crossing a spur running north from the Limb of Addy Plateau with a level in the order of RL270. (Spur 270). From T13 to T20 the Line continues to travel north-west across intermittently cleared and lightly tree covered pasture land where the underlying topography falls from RL270 to RL170.

At T20 The Line changes direction to travel north. Initially it crosses the saddle south of Wallaby Rocks at the underlying topography level of approximately RL175 (Saddle 175). Maintaining a base level of approximately RL185 The Line skirts the eastern side of Wallaby Rocks for 1500 metres from T22 to T26 through relatively heavily timbered vegetation. From T26 to T28 the underlying topography drops from RL185 down to RL140 at the crossing of Big Flat Creek north of T27, where The Line leaves the approved project disturbance area.

At T28 The Line crosses Wybong Road heading north towards Wybong Post Office Road. From T28 to T31, adjacent to Wybong Post Office Road, The Line rises across lightly timbered land with underlying levels that increase from RL150 to RL190. From T31 The Line crosses Wybong Post Office Road, travels slightly north-west across heavily timbered slopes and rises up a south facing slope toward the Wybong to meet the existing 500kV electricity transmission line at T32/ ET80. At this point the underlying level is around RL210. The existing transmission line then travels west at levels around RL 215 skirting the southern slope of "The Wybong".



Source: Dept. of Lands (2003), ortho-rectified by Plateau Images

0 1.0 2.0 2.5 km
1:50 000

Legend

- ▬ Approved Project Disturbance Boundary
- - - Mining Lease 1626 Boundary
- ▬ Proposed 500kV Transmission Line Easement
- Existing 500kV Tower
- Proposed 500kV Suspension Tower Location
- Proposed 500kV Tension Tower Location

FIGURE 2

**Proposed 500kV Electricity
Transmission Line Route**

2.3 VISIBILITY AND TOWER CONFIGURATION

The transmission lines are supported on a series of towers. The towers are between approximately 46 to 66 metres high, with an average height of 56 metres, and constructed of galvanised steel members. The towers can be painted to blend with the surrounding landscape elements if required.

The visibility of the towers depends on viewer location, distance and background features from each potential viewing location. Where towers can be viewed as foreground elements at distances less than 800m, the towers can be visually intrusive in the landscape (refer P1, P2 and P3 below).



P1- Distance to tower less than 100m immediately adjacent to the road

The towers can dominate the landscape due to their relative height. The opportunity to view towers as close foreground elements usually occurs where the electricity transmission lines cross the road (refer P1 and P3). The towers are strong rectilinear elements that often breach the horizon line. The attached transmission wires or conductors create strong linear directional elements.

When viewed as middle ground elements the towers visibility is highly dependant on topography. If the towers are several kilometres from the viewer with strong background landscape beyond, visibility is reduced (see P4, P5). If however the towers are elevated

above the viewer or the towers are located on a ridge forming a silhouette on the skyline the visibility is increased (refer P6, P7).



P2 – Viewing distance to tower 200m



P3 – Existing transmission lines cross Mangoola Road



P4 – Towers almost invisible within the background

The colour of the tower and the background can be important for visibility within the close middle ground range up to 3km (refer P 1-7). Some camouflaging is possible where towers have a consistent background from the viewer location. At middleground distances the towers can be partially camouflaged by painting with colours complimentary to the background within the viewer's catchment. If however the lines or towers form a silhouette the original galvanised colour is often the best match to the sky colour.



P5 – galvanised colour almost invisible

At background distances beyond 3km the transmission lines are barely visible (refer P6, P7). The towers are of less significance and, depending on background and atmospheric conditions, generally cease to be visible around a distance of approximately 3000 – 4000 metres from the viewer (refer P8).



P6 – towers partially visible against background



P7 – towers slightly visible on ridge



P8 – towers barely visible

Vegetation clearing within the easement associated with the electricity transmission lines is an associated potential visual impact. Where the easement crosses cleared or cultivated areas, heavy vegetation has already been completely removed and localised vegetation removal for the easement is not required.

However where the easement passes through moderate to heavily timbered areas the visual impact of lines and towers is increased by the removal of vegetation in straight lines along the easement. As foreground and middle ground elements, when the view is in direction of travel of the easement, the vegetation removal creates unnatural straight lines that focus the viewer attention on the elements within the easement. The variation in vegetation texture and colour between the easement and heavily timbered surroundings often highlights the shape of the easement.



P9 – Disturbed area

At background viewing distances the conductors and towers may be almost imperceptible. However the variations in colour and texture of the easement create strong lineal visual impacts that can be identified by viewers at distances up to and beyond 10,000 metres depending on the relative viewpoint.

3.0 VISUAL IMPACT ASSESSMENT

The visual impact of the proposed changes can be referenced to the base data and descriptions of the landscape components provided in Section 5 'Visual Impact Assessment' of the original report dated June 2006 Ref: 735-Z-12. The impacts of the proposed 500kV electricity transmission line route (The Line) are assessed from the original locations as those public viewpoints were again the most suitable and generally those viewpoints have the highest impacts. For assessment locations refer **Figure 3** "Visual assessment Locations", extract from 'Visual and Lighting Impact Assessment Anvil Hill Project', O'Hanlon Design Pty. Ltd., June 2006 ref: 735-Z-12.

Once constructed, The Line is a static element and therefore the impacts will remain constant for the life of the infrastructure.

3.1 VP1 Roxburgh Road (1500m from the Wybong Road Intersection: RL265)

Viewers along the northern section of Roxburgh Road are at elevations around RL200. From these locations The Line and associated towers will be at a distance of approx. 10,000m. The elements are unlikely to be observable with the naked eye. As The Line travels parallel to the viewer The Line and associated clearing paths will be unlikely to be visible as the backdrops of ranges to the west will prevent silhouetting.

3.2 VP2 Mangoola Road (3000m north of Roxburgh Road: RL150)

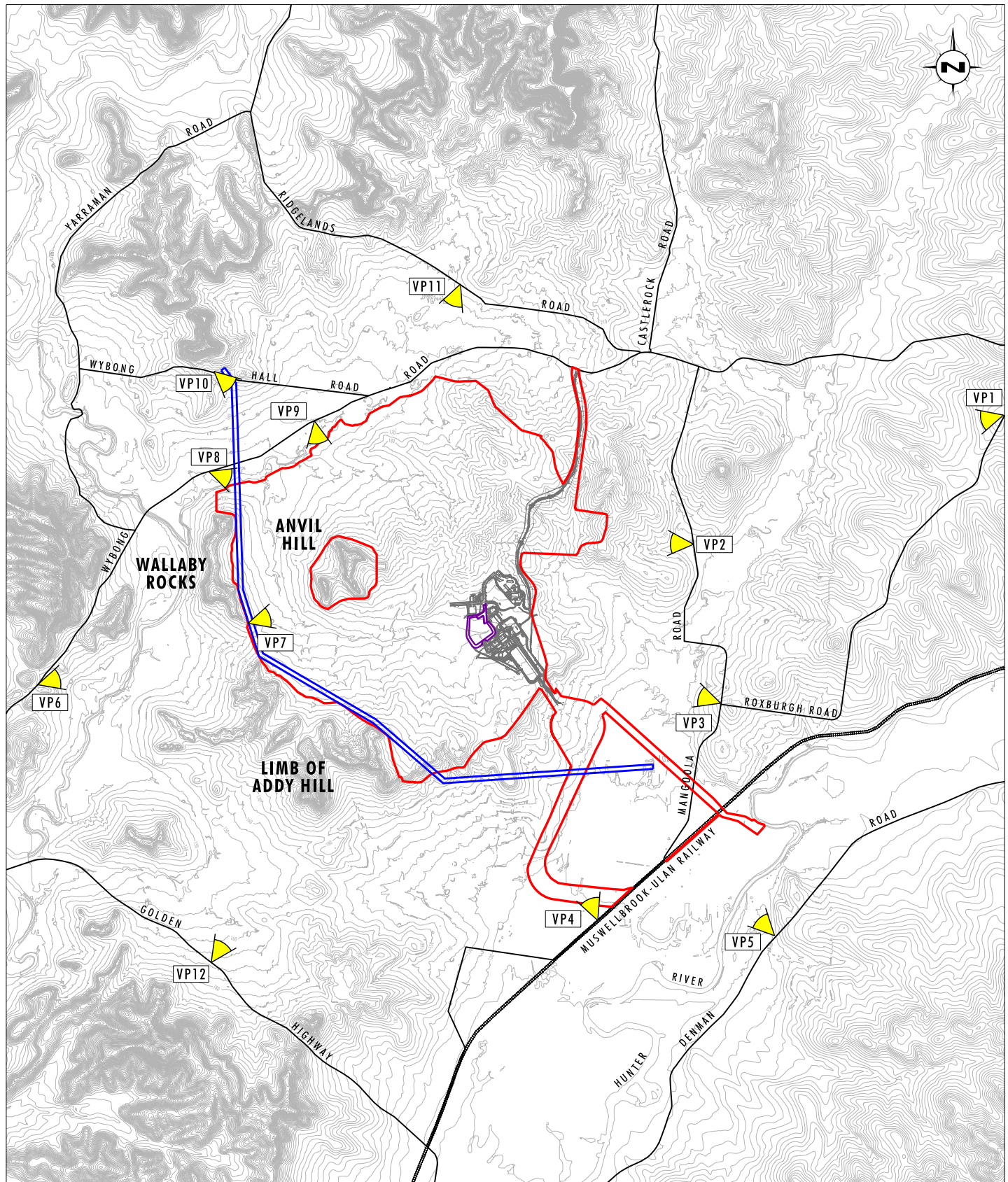
The existing 500kV Line is visible from Mangoola Road near Milang Gully in a small area to the south at a distance of 3000m. The relocated Line is unlikely to be visible from VP2 due to the screening of intervening topography and the low level of the viewpoint.

3.3 VP3 Roxburgh Road (Corner of Mangoola Road and Roxburgh Road: RL180)

From VP3 the existing 500kV Line is visible to the west at distances of approximate 1500m. The tops of the towers are most highly visible as silhouetted elements against the skyline. The proposed relocation of the Line generally doubles the distance of The Line from the viewer. The Line will also be less visible as the towers are located at lower underlying levels concealed by the edge of the south facing plateau. The orientation prevents direct viewing along the transmission easement.

3.4 VP4 Mangoola Road (1200m north of Bells Lane: RL180)

On Mangoola Road around VP4 viewers will have varying views of the 500kV Line. The intersection of the old and new line is adjacent to Mangoola Road and will be as prominent as ET56 is currently. The relocated Line will be visible north of Mangoola Road from T1 to T10. Around T8 and T9 the easement will cut through a heavily timbered area over Spur 190. At this point the tops of the towers will be at approximately RL245. This will make the upper sections of the tower visible as a silhouette to viewers along Mangoola Road at a distance of approximately 2500m. Viewers on Mangoola Road just south of VP3 will have a snapshot view north-west looking along the direction of travel of the easement



Source: O'Hanlon Design (2006)
Base Map: Dept. of Lands (2003), ortho-rectified by Plateau Images

0 1 2 4 km
1:80 000

Legend

- Approved Project Disturbance Boundary
- Proposed 500kV Transmission Line Easement
- Proposed ROM Pad Extension
- ▲ Viewpoint
- VP6 Viewpoint Number

FIGURE 3

Visual Assessment Locations

from T10 to T13 at a distance of approx. 3000m. The silhouette of the tops of the towers will be visible against the sky for a short distance.

3.5 VP5 on Denman Road (300m from Piercefield Property: RL145)

The existing 500kV Line runs very close to VP5 on Denman Road. The impacts here are high but localised. This impact will be unchanged. The existing towers and the easement visible north-west of ET56 will disappear in the early years of the mine. On the new Line towers T1 to T18 will be visible as middle ground elements at distances varying between 3000m and 5000m. The tops of T7 and T8 will be visible from VP5 as silhouettes against the background topography adjacent to Spur 190. Similarly the tops of T11 and T12 will be just visible against the background beyond Wybong Road at distances of approximately 6000m.

3.6 VP6 Wybong Road (1900m north of Reedy Creek Road: RL165-170)

From VP6 very localised views of The Line will be possible over the saddle (Saddle 180) south of Wallaby Rocks. T21 will also be visible as a single element at a distance of 3000m with a backdrop of Anvil Hill.

3.7 VP7 Anvil Hill ROW (adjacent to Bellevue: RL180)

Since the original assessment in 2006 the properties along the Anvil Hill ROW (right of way) have been purchased by Mangoola Coal, or are vacant. As such, the ROW has been closed. Public access is no longer available. Hence, no assessment has been undertaken at this location.

3.8 VP8 Wybong Road (1200m north of Wybong Bridge: RL145)

Viewers at VP8 will be located immediately adjacent to T28 on the north side of Wybong Road. The visual impact will be very high, equivalent to the existing tower that is being removed 1500m east on Wybong Road (refer P1). The tower will be dominant in the landscape and visible for approximately 1000m north on Wybong Road.

Viewers to the west and south on Wybong Road will have views of the tower until 1500m south of the Yarraman Road intersection. Viewers on Yarraman Road will have views for approximately 1000m north of the Wybong Road – Yarraman Road intersection at distances of approximately 2000m from the tower. This proposed location of the Wybong Road crossing between T27 and T28 has greater visual impacts than the existing location as it is visible from a greater diversity of road and residential locations around the Yarraman - Wybong Road junction. In addition The Line in this location stands in contrast to the natural forms of Wallaby Rocks.

Wallaby Rocks is a unique rock formation of a similar nature to Anvil Hill. The report methodology used in the original visual report ('Visual and Lighting Impact Assessment Anvil Hill Project' O'Hanlon Design Pty Ltd, June 2006 ref: 735-Z-12) Identified in Section 3.2 "Scenic Quality Assessment" that scenic quality increases as ruggedness and diversity increases. It is therefore reasonable to assume that the local scenic quality in the vicinity of Wallaby Rocks is high to very high.

Foreground viewers approaching the proposed transmission lines on Wybong road will view transmission towers T27 and T28 at distances of approximately 300m and 50m respectively with wallaby Rocks as an adjoining foreground element. Combined with the sensitivity of viewers on the travel route these

factors would combine to place the impact in an area of highest concern for the protection of visual resources.

The resultant ability of the landscape to absorb the change without significant impact is very low. The result will be high to very high impacts around towers T27 and T28, similar to the impacts noted in photographs P2 and P3 on page 8 previous. The only mitigating factor is that viewers will be almost exclusively in vehicles travelling at 60km or greater with a limited exposure time to the highest impacts, where Wallaby Rocks and the transmission towers are combined foreground elements, for around 45 seconds. The relative scale and location of the towers prevents screening or mitigation using colour. The potential to mitigate the impact is therefore negligible.

3.9 VP9 Wybong Road (1000m south of Wybong Hall Road: RL145)

Viewers at VP9 were adjacent to the original road crossing tower on Wybong Road. As part of construction of the relocation of the 500kV electricity transmission line this tower will become redundant and will be removed. This will reduce the impacts around this location.

In addition, the original mine plan for the Anvil Hill Project created a rehabilitated artificial valley for the carriage of the transmission lines within the easement. The 'Anvil Hill Visual Impact Assessment 2006' – O'Hanlon Design, suggested that the visual impact created by that engineered landform was high. The removal of the easement provides opportunities to soften the landform shape for rehabilitation and to remove the steep engineered form of the artificial valley. This is proposed in the revised Mine Plan.

Views of T29, T30 and T31 will be possible when travelling west at distances in excess of 1500m. The impacts of the towers will be relatively low.

3.10 VP10 Wybong Post Office Road (2000m east of Yarraman Road: RL200)

Impacts at VP10 on Wybong Post Office Road will be similar to those experienced at VP8 on Wybong Road. T31 is immediately adjacent to the road and will be a significant visual element due to the proximity to the viewer and the height of the tower. Painting the lower sections of the tower green would slightly reduce the impacts. However, the proximity and height of the tower create localised high impacts.

3.11 VP11 Ridgeland Road (200m east of the Creek Bridge: RL180)

Views of the Line are unlikely to be possible from VP11 due to the intervening topography, and vegetation. The viewing distance of approximately 4000m would also significantly reduce any impacts.

3.12 VP12 Golden Highway (1500m east of Rosemount Road: RL175)

Viewers along the Golden Highway adjacent to VP12 are unlikely to have views of the proposed Line due to the intervening topography and thick vegetation along the spur running north from Denman Knob.

3.13 Offset Areas

The proposed Line passes through several offset areas

- T 3 - T 6 Sustainable Agriculture Offset Areas

- T 6 - T11 Habitat Enhancement Offset Area
- T27 - T28 Conservation Offset Area

The location of these offset areas is shown in **Figure 4**.

The visual impacts of the passage of The Line through these areas are of no greater significance than the impacts at the adjacent viewpoints to each area. The visual impact of the easement clearing through the Conservation Offset Area will be evident only when the area becomes heavily vegetated and the difference between the Conservation Area and the easement vegetation becomes apparent. Impact will then be similar to VP8.

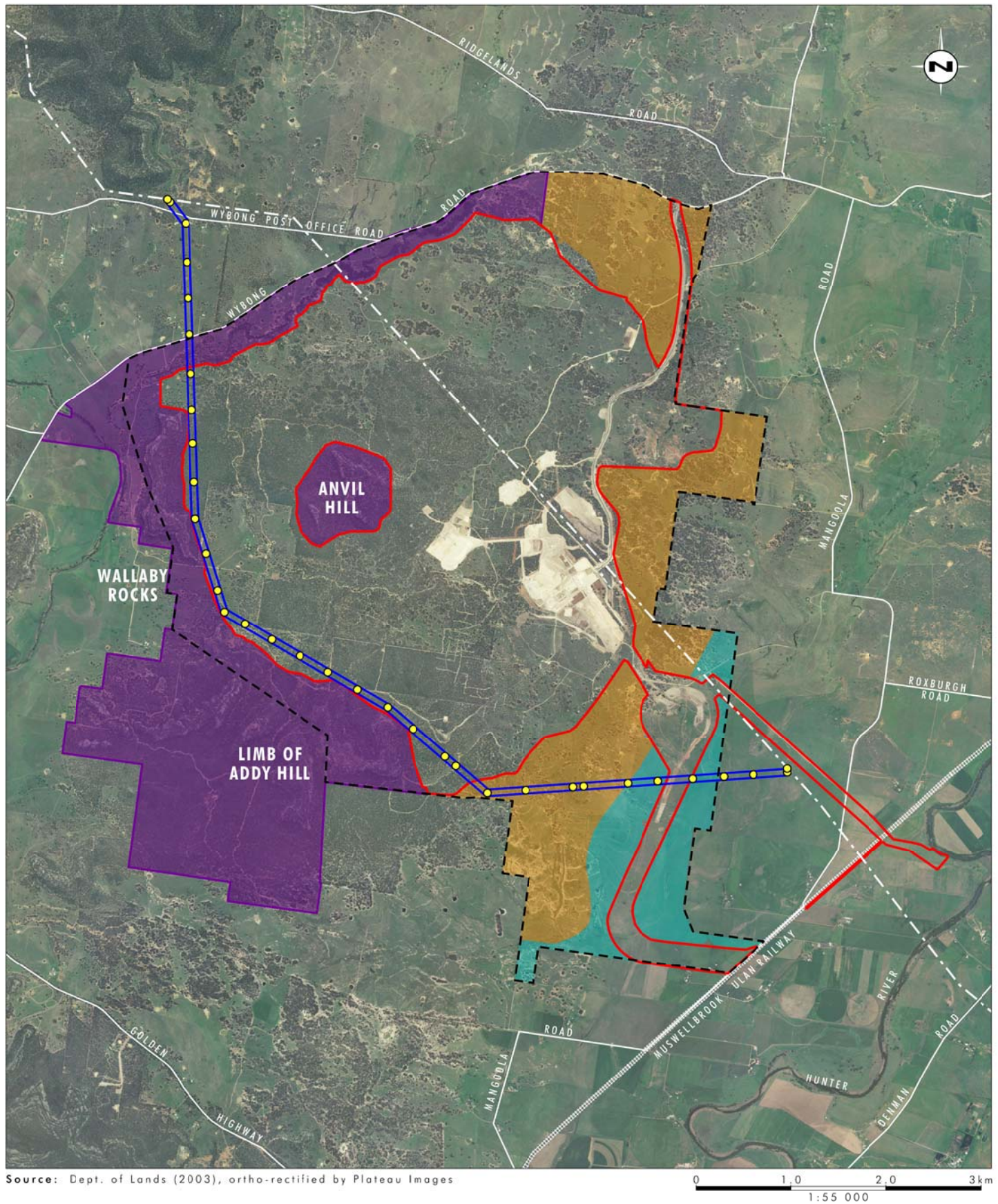
3.14 Individual Residences

A number of individual residences will be impacted to a different degree to the impacts at the selected viewpoints by the relocation of this section of the 500kV electricity transmission line. A summary of the impacts on those residences not currently owned by Mangoola Coal is shown in **Table 1** below. Residences beyond those noted or adjacent to existing viewpoints will not vary to a significantly higher degree than those identified.

Table 1: Individual Residences Visual Impact

Assessments for individual residences may vary from the assessments provided at the selected viewpoints. For residences in private ownership as noted in **Figure 1** "Land Ownership" the following specific impacts have been assessed.

Residence Number	Impact	Approximate Distance	Comment
81 and 91	Views of top 10-15m of towers may be possible looking east at a distance of 600m depending on density of vegetation adjacent to the residence, but this is unlikely	500 to 600m	Acquisition rights already in place for 91
56	T29 + T28 visible to east	1000m	Acquisition rights already in place
110	Very limited views east south east	2500m	
148	Possible middleground views	2500 – 3000m	
130	Unlikely to be visible due to low viewer levels at RL140		
25	Highly visible. Residence 25 is adjacent to tower T10	100m	Acquisition rights already in place



Legend

- Approved Project Disturbance Boundary
- - - Mining Lease 1626 Boundary
- Proposed 500kV Transmission Line Easement
- Habitat Enhancement Offset Area
- Sustainable Agriculture Offset Area
- Conservation Offset Area
- Proposed 500kV Tower Location

File Name (A4): Subbies/Visual/ETL_V1/2497_265.dgn

FIGURE 4

Proposed 500kV
Electricity Transmission
Line Route and Offset Areas

Residence Number	Impact	Approximate Distance	Comment
121, 30, 200 and residences south of Mangoola Road	Similar to or less than impacts at VP4. Views from T2 and T13.	Varies from 1500m to 4500m	Acquisition rights already in place for 30 and 121,.
164	Limited views east depending on vegetation density. Possible view of a silhouette of the Line on Knoll 230	3000m	
178	Elevated views from RL220-230 to east from T6 to T13. Knoll 230 (T11, T12) will be in silhouette.	Varies from 4000m-5000m	
54, 112a, 112b, 112c, 112d, 114, 166	Possible distant views of Knoll 230 (T11, T12) in silhouette depending on residence elevation aspect and vegetation	Varies around 5000m	

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