

## Appendix C5

## Visual Assessment



# ***VISUAL AND LIGHTING IMPACT ASSESSMENT***

## ***MANGOOLA COAL PROJECT***

### ***MODIFICATIONS TO THE MINE PLAN AND INFRASTRUCTURE***

***Prepared for***

***XSTRATA MANGOOLA PTY  
LIMITED***

***June 2010***

***REF: 853-Z-07***

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# ***Table of Contents***

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## **Section 1 Introduction**

- 1.1 The Project
- 1.2 Objectives
- 1.3 Methodology
- 1.4 Referenced Documents

## **Section 2 Relevant Aspects of the Proposed Development**

- 2.1 Relevant Aspects of the Proposed Development
- 2.2 Mine Sequence
- 2.3 The Tailings Dam
- 2.4 The Rail Loop
- 2.5 Mining Operations
- 2.6 Night Lighting Consideration

## **Section 3 Visual Impact Assessment**

- 3.1 Visual Impact Assessment
- 3.2 VP1 Roxburgh Road
- 3.3 VP2, VP3, V4 along Mangoola Road
- 3.4. VP5 Denman Road
- 3.5. VP6 Wybong Road
- 3.6 VP7 Anvil Hill ROW
- 3.7 VP8 Wybong Road
- 3.8 VP9 Wybong Road
- 3.9 VP10 Wybong Hall Road
- 3.10 VP11 Ridgeland Road
- 3.11 VP12 Golden Highway
- 3.12 Mitigation Measures
- 3.13 Night Light Impacts
- 3.14 Assessment of Night Light Impacts
- 3.15 Individual Residences
  - 3.15.1 Residences west of VP8 between Wybong Road and Wybong Hall Road
  - 3.15.2 "The Knob" Lot 11 Merriwa Road (The Golden Highway)

## **List of Figures & Appendices**

---

### Figures:

1. Figure 1 Location of Wallaby Rocks
2. Figure 2 Mine Plan Year 2
3. Figure 3 Mine Plan Year 5
4. Figure 4 Mine Plan Year 10
5. Figure 5 Mine Plan Year 15
6. Figure 6 Conceptual Final Landform
7. Figure 7 "Visual Assessment Locations", extract from 'Visual and Lighting Impact Assessment Anvil Hill Project' O'Hanlon Design Pty Ltd June 2006 ref: 735-Z-12

### ***Appendix A:***

#### Transects Location Diagram

|           |                                           |
|-----------|-------------------------------------------|
| Transects | 1a-1b (VP8 – Year 2, Year 5, and Year 10) |
|           | 2a-2b (VP10 – Year 2, and Year 5)         |
|           | 3a-3b (VP11 – Year 2)                     |
|           | 4a-4b (VP9 – Year 5)                      |
|           | 5a-5b (VP5 – Year 10)                     |
|           | 6a-6b (VP3 – Year 10)                     |
|           | 7a-7b (VP6 and VP7 – Year 15)             |

### **1.1 The Project**

The Mangoola Coal Project is located approximately 20km west of Muswellbrook and 10km north of Denman, New South Wales. The project was approved in June 2007 to extract coal in four pits with associated overburden emplacement over a period of 21 years. The project approval incorporates a coal preparation plant, stockpiles, rail loop infrastructure and tailings dam. It is proposed to modify the original approval to accommodate changes to the mine plan, infrastructure area and to relocate the 500kV electricity transmission line which bisects the site. **Figure 1** shows an aerial photo of the approved project disturbance area and surrounds, including areas where it is proposed to extend the approved project disturbance boundary, and the extent of the natural topographic feature in the area known as Wallaby Rocks.

This report assesses the visual impacts from the proposed mine modifications, and should be read in conjunction with the inter-related project involving the relocation of the 500kV electricity transmission line which currently bisects the site.

### **1.2 Objectives**

The objectives of this Visual and Lighting Impact Assessment report are:

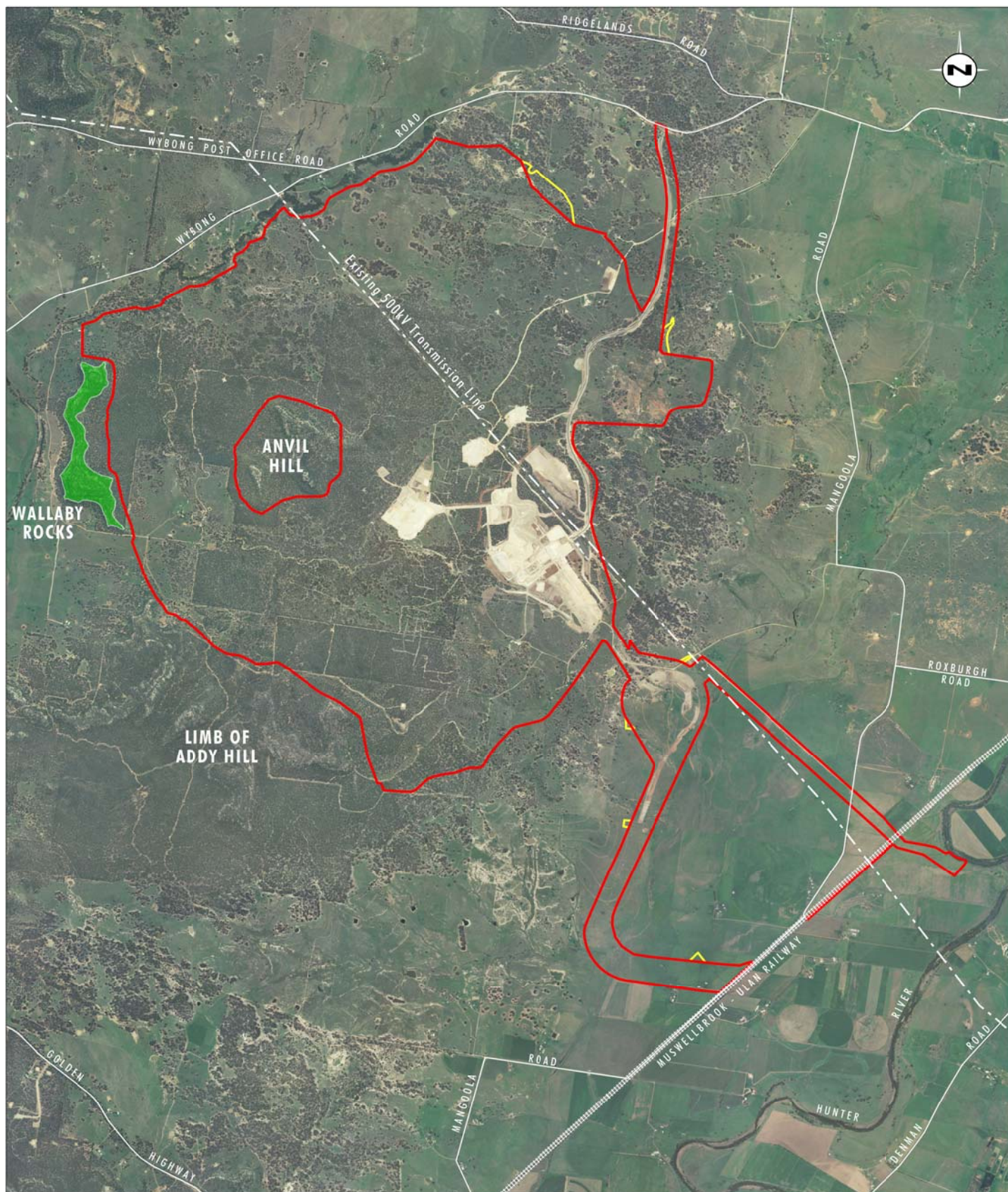
- To assess the visual impact of the proposed modifications to the mine plan, infrastructure, and final topography and to consider associated ameliorative measures.

### **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

Reference is made in this report to the viewpoints used in our original "Visual and Lighting Impact Assessment- Anvil Hill Project "(O'Hanlon Design 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 selected to highlight the locations from which the impacts will be most prominent. Viewpoints are limited to public roads and accessible public areas as these relate to the highest number of users. The selected viewpoints are also the most logical positions for assessment of the change in impacts of the proposed mine plan modifications. The same viewpoints are also used for the inter-related 500kV electricity transmission line relocation.



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
- Approximate extent of Wallaby Rocks
- Modified Project Disturbance Boundary

FIGURE 1

Location of Wallaby Rocks

## 1.4 Referenced Documents

The following documents are referenced in the report or were considered in forming the assessments provided. Transects are attached in Appendix A. The transects are a 2 dimensional representation and do not reflect all conditions from a particular viewpoint. The transects could vary significantly if relocated to an adjacent location. For this reason the text associated with each viewpoint forms the basis of the assessment. The transects provide a visual reference of distance and scale that may provide for some readers a framework within which to interpret the text of the assessment.

- 'Visual and Lighting Impact Assessment Anvil Hill Project'  
O'Hanlon Design Pty Ltd, June 2006 ref: 735-Z-12
- Umwelt (Australia) Pty Limited: file WD\_VI / 2497\_Working27.dgn  
Figure 7 – "Mangoola Land Ownership and Residences"
- 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 modifications to the approved project, as modified (Project Approval 06\_0014) and rehabilitation strategy that would result in different impacts to the original visual assessment for the approved project. The proposed relocation of the 500kV electricity transmission line that currently bisects the site will allow changes to the mining sequence and the emplacement of landforms. Since the original assessment for the approved project, an earlier modification approved in June 2009 (PA 06\_0014 MOD2) has changed the intended management of tailings. The previously approved tailings dam is now a raw water dam and an in-pit strategy for management of tailings has been adopted. Changes are now proposed to the speed and extent of extraction, the area of pit open for working, the extent of un-rehabilitated dump areas exposed and the heights of final landforms.

The proposed modification contains a number of elements, some of which will have an impact on the visual amenity of the area. These elements are:

- Changes to mine plan sequence and staging (see Section 2.2 and 2.5 below);
- Associated changes to ancillary activities
  - o Establishment of a temporary ROM pad and a minor extension to the approved ROM pad (see Section 2.7 below);
  - o Changes to site water management (see Section 2.3 below)
- Minor extensions to the approved project disturbance boundary for mining
  - o Inundation area for a raw water dam of approximately 1.7 hectares (see Section ;
  - o Rail loop drainage design with a total area of approximately 1.6 hectares (see Section 2.4 below);
  - o Minor extension to approved project disturbance boundary for the purposes of mining (approximately 8.4 hectares);
- Construction of a noise wall near the rail loop (see Section 2.4 below).

Changes to mine plan sequence, staging and construction of a noise wall near the rail loop could potentially affect the visual impacts identified in the approved project.

## **2.2 MINE SEQUENCE**

The proposed relocation of the 500kV electricity transmission line will create an opportunity to mine the site in a different sequence to the mine plan originally designed. The modified mine plan has been produced to demonstrate the staging at Year 2, Year 5, Year 10, and Year 15. These years are considered representative of mining throughout the life of the mine. This is a result of a faster extraction process, with faster ramping up to maximum approved production levels.

The current project approval has the mine designed into four distinct pits, the Northern Pit, the Main Pit, the Tailings Pit and the Southern Pit. These four pits operated independently. In the modified mine plans the Northern Pit, the Tailings Pit and the Main Pit are combined. We have referred to this new larger pit as the Main Mangoola Pit. The Southern

Pit operates separately until about Year 8 when it joins the Main Mangoola Pit to form the southern edge of the pit as it moves west.

The proposed mine sequence is documented on **Figures 2, 3, 4, 5 and 6** of the Mine Plans for Years 2, 5, 10, 15 and the conceptual final landform.

## **2.3 TAILINGS MANAGEMENT**

The position and size of the tailings dam has been substantially altered, and in-pit management of tailings is now proposed. The original project approval allowed for one tailings dam on the eastern side of the Mine Area relatively close to Mangoola Road. However, this dam was approved to be developed as a raw water dam in a modification to the project approval granted in June 2009. The current proposed modification proposed to increase the inundation extent of the raw water dam to full supply level (approximately 187m AHD), but does not propose to alter the height of the dam wall from that already approved. The current proposal for management of tailings involves the creation of a series of four tailings dams that are active for different periods of the mine life.

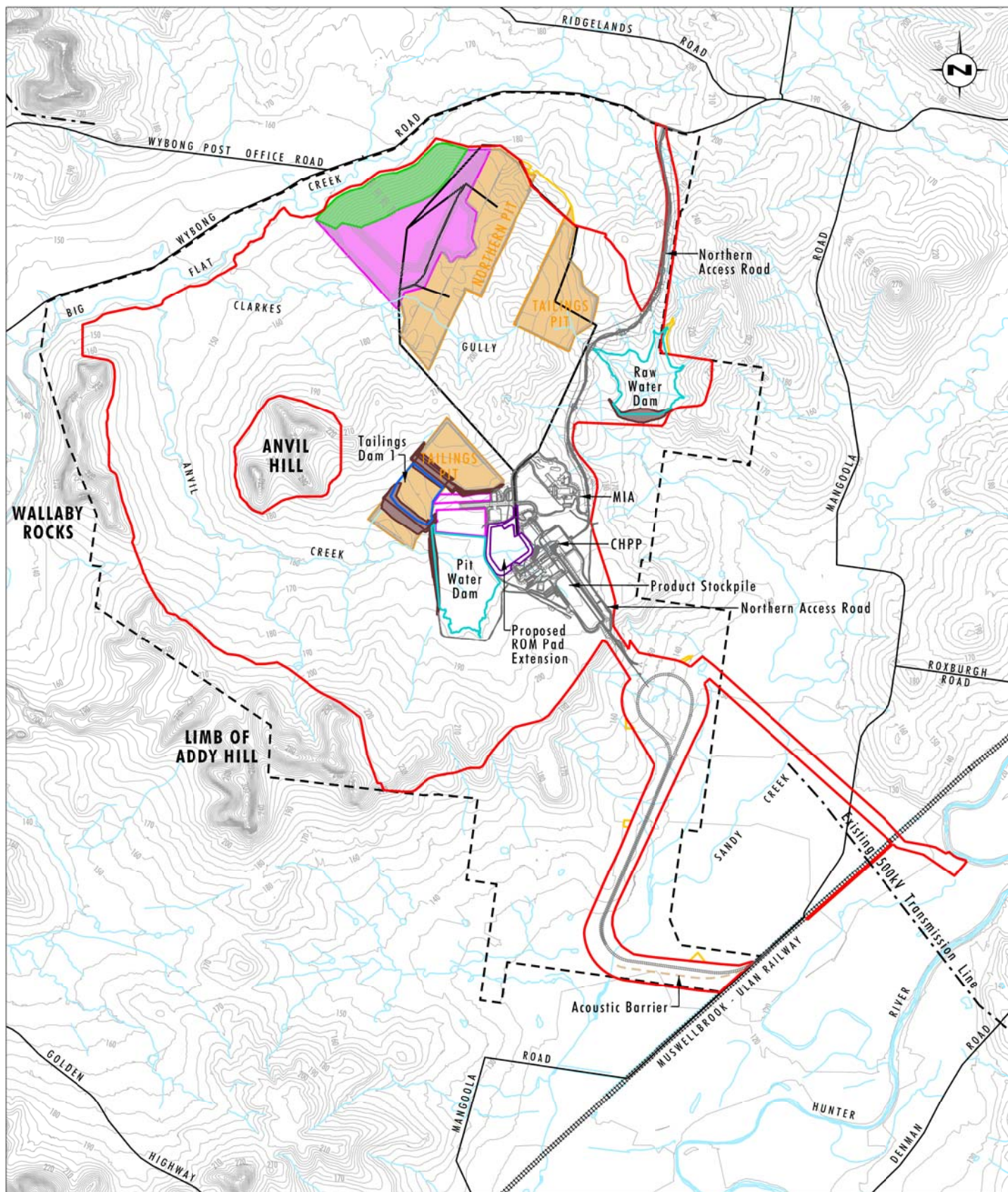
Tailings Dam No.1 is relatively small and adjacent to the Southern Pit. This dam is operational for the early stages of the Project only. Tailings Dams 2 and 3 also appear only in the Mine Plan up to Year 5. At around that time the mine plan creates an opportunity to join both Tailings Dam 2 and 3 to create Tailings Dam 4, a much larger capacity dam to the west of the Main Infrastructure Area and the Coal Handling and Preparation Plant. This Tailings Dam sits in an excavated area within the approved project disturbance area and south-east of the Main Mangoola Pit.

In addition to the raw water dam, a new pit water dam will be located west of the ROM pad, as approved in June 2009. These already approved dams are generally not visible from areas beyond the approved project disturbance boundary as they are located at levels below the rehabilitated edges and are somewhat shielded by the topography near the approved project disturbance boundary. The small extension to the inundation area of the raw water dam will only result in a minor increase in scale of the dam, and this increase will relate to the expansion of the surface area of the water in the horizontal plane. It is currently approved with a capacity of 4ML, equating to a height of the dam wall being 22 metres. The proposed modifications will result in a minor extension to the inundation area from the dam, but no change to the height of the dam wall.

## **2.4 THE RAIL LOOP**

The Rail Loop sits within the same corridor as the original Rail Loop and the only changes proposed relate to the construction of a noise wall to a height of approximately four metres in the southern section of the rail loop and some minor extensions to the approved project disturbance area for the purposes of drainage works. The infrastructure and levels of the Rail Loop are not identified as varying from the project approval.

The modified mine plans do not seek to change the size, level or location for the rail loop, the load out bin, or associated facilities.



Source: Xstrata Mangoola  
Base Map: Dept. of Lands (2003), ortho-rectified by Plateau Images  
Note: Contour Interval 5m

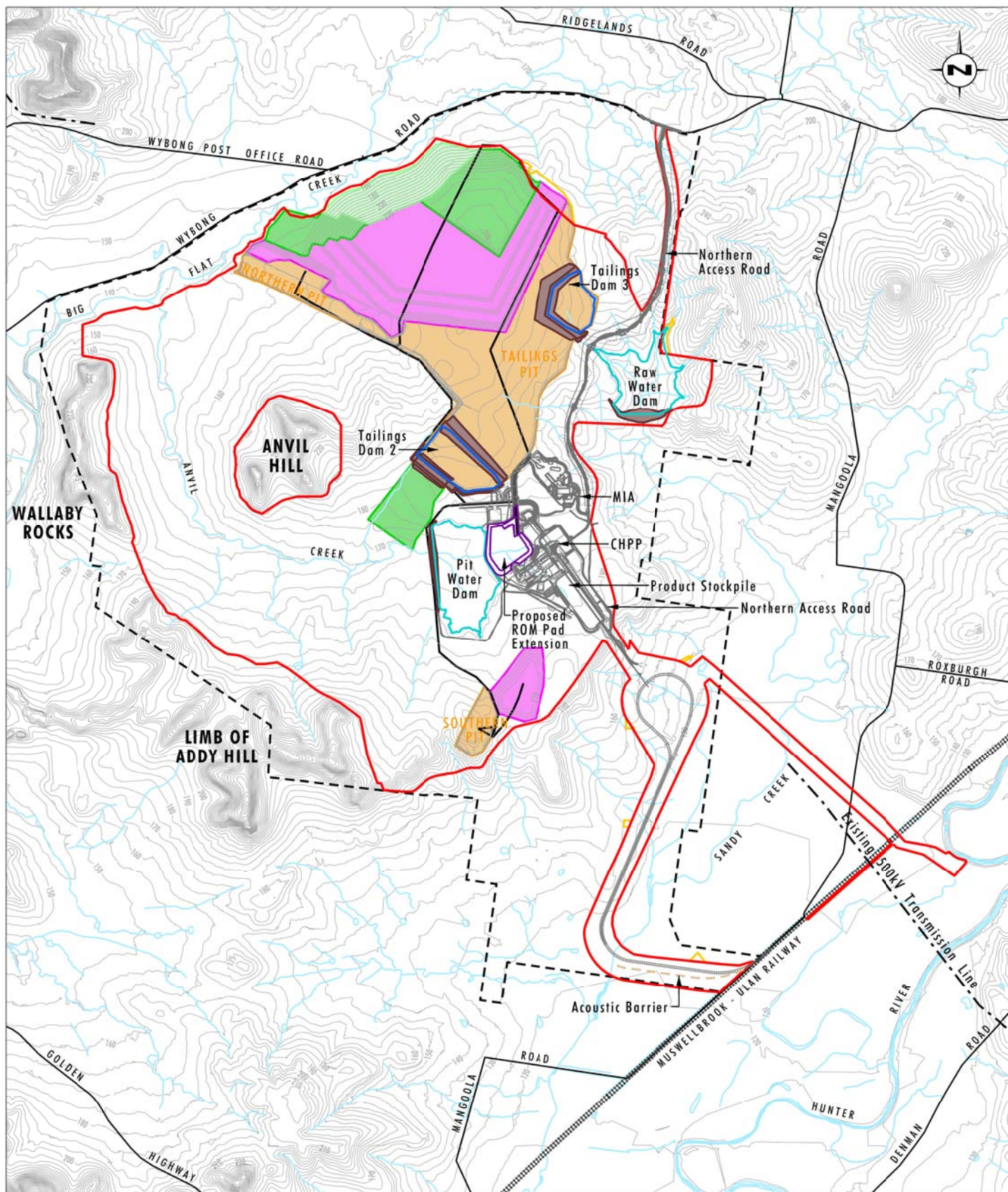
0 1.0 2.0 2.5 km  
1:50 000

### Legend

- |                                                                                                                               |                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <span style="border: 2px solid red; padding: 2px;"> </span> Approved Project Disturbance Boundary                             | <span style="background-color: pink; border: 1px solid black; padding: 2px;"> </span> Active Overburden Emplacement |
| <span style="border: 1px dashed black; padding: 2px;"> </span> Mining Lease 1626 Boundary                                     | <span style="background-color: orange; border: 1px solid black; padding: 2px;"> </span> Active Pit                  |
| <span style="background-color: yellow; border: 1px solid black; padding: 2px;"> </span> Modified Project Disturbance Boundary | <span style="background-color: green; border: 1px solid black; padding: 2px;"> </span> Rehabilitation - in progress |
| <span style="background-color: pink; border: 1px solid black; padding: 2px;"> </span> Temporary ROM Coal Pad                  | <span style="border: 1px solid black; padding: 2px;"> </span> Haul Road                                             |
| <span style="background-color: purple; border: 1px solid black; padding: 2px;"> </span> Proposed ROM Pad Extension            |                                                                                                                     |

**FIGURE 2**

**Proposed Year 2  
Mine Plan**



Source: Xstrata Mangoola  
Base Map: Dept. of Lands (2003), ortho-rectified by Plateau Images  
Note: Contour Interval 5m

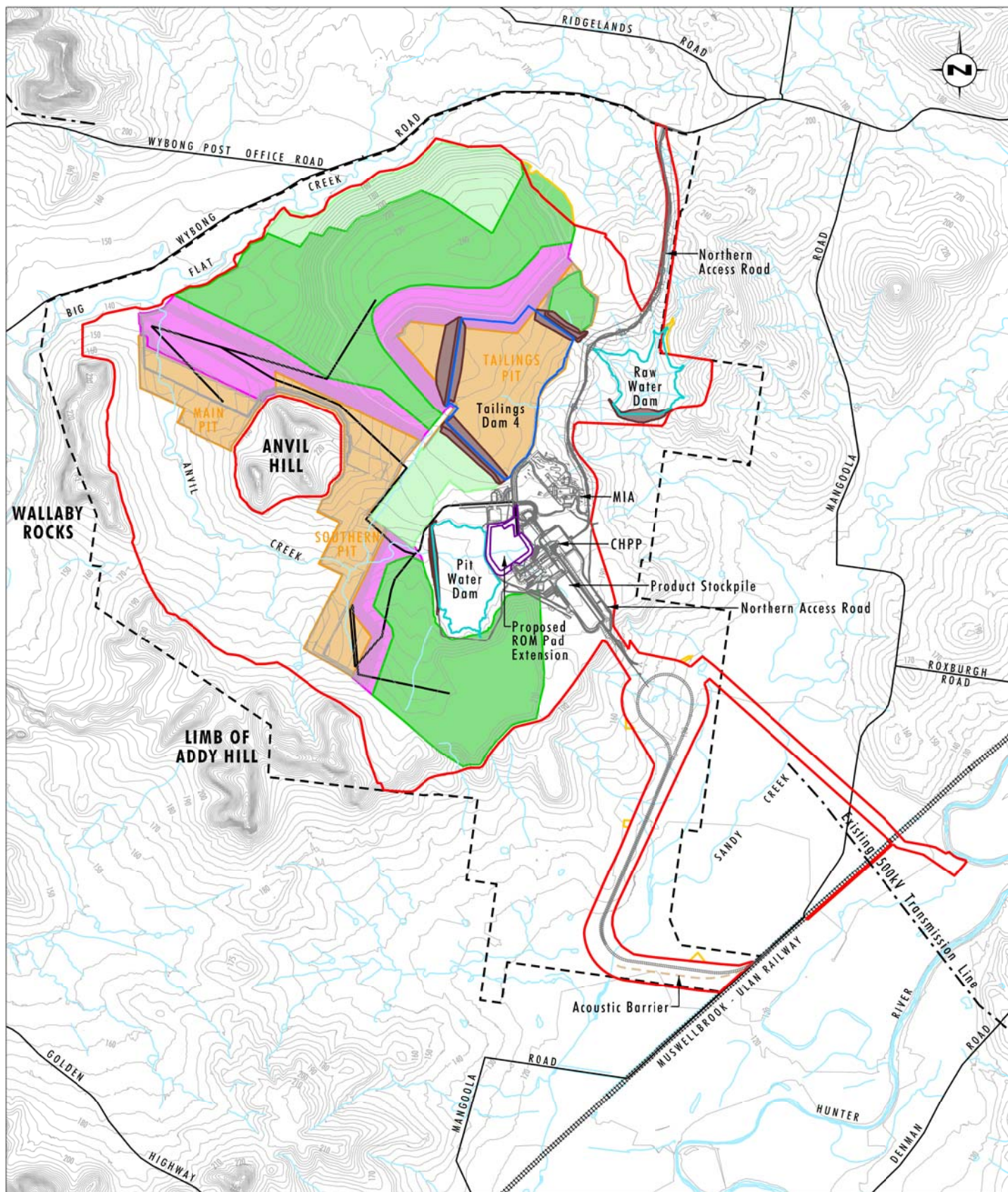
0 1.0 2.0 2.5 km  
1:50 000

### Legend

- |                                                                                                                               |                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <span style="border: 2px solid red; padding: 2px;"> </span> Approved Project Disturbance Boundary                             | <span style="background-color: orange; border: 1px solid black; padding: 2px;"> </span> Active Pit                     |
| <span style="border: 2px dashed black; padding: 2px;"> </span> Mining Lease 1626 Boundary                                     | <span style="background-color: green; border: 1px solid black; padding: 2px;"> </span> Rehabilitation - in progress    |
| <span style="background-color: yellow; border: 1px solid black; padding: 2px;"> </span> Modified Project Disturbance Boundary | <span style="background-color: lightgreen; border: 1px solid black; padding: 2px;"> </span> Rehabilitation - completed |
| <span style="border: 2px solid purple; padding: 2px;"> </span> Proposed ROM Pad Extension                                     | <span style="border-bottom: 2px solid black; display: inline-block; width: 20px;"> </span> Haul Road                   |
| <span style="background-color: magenta; border: 1px solid black; padding: 2px;"> </span> Active Overburden Emplacement        |                                                                                                                        |

FIGURE 3

Proposed Year 5  
Mine Plan



Source: Xstrata Mangoola  
Base Map: Dept. of Lands (2003), ortho-rectified by Plateau Images  
Note: Contour Interval 5m

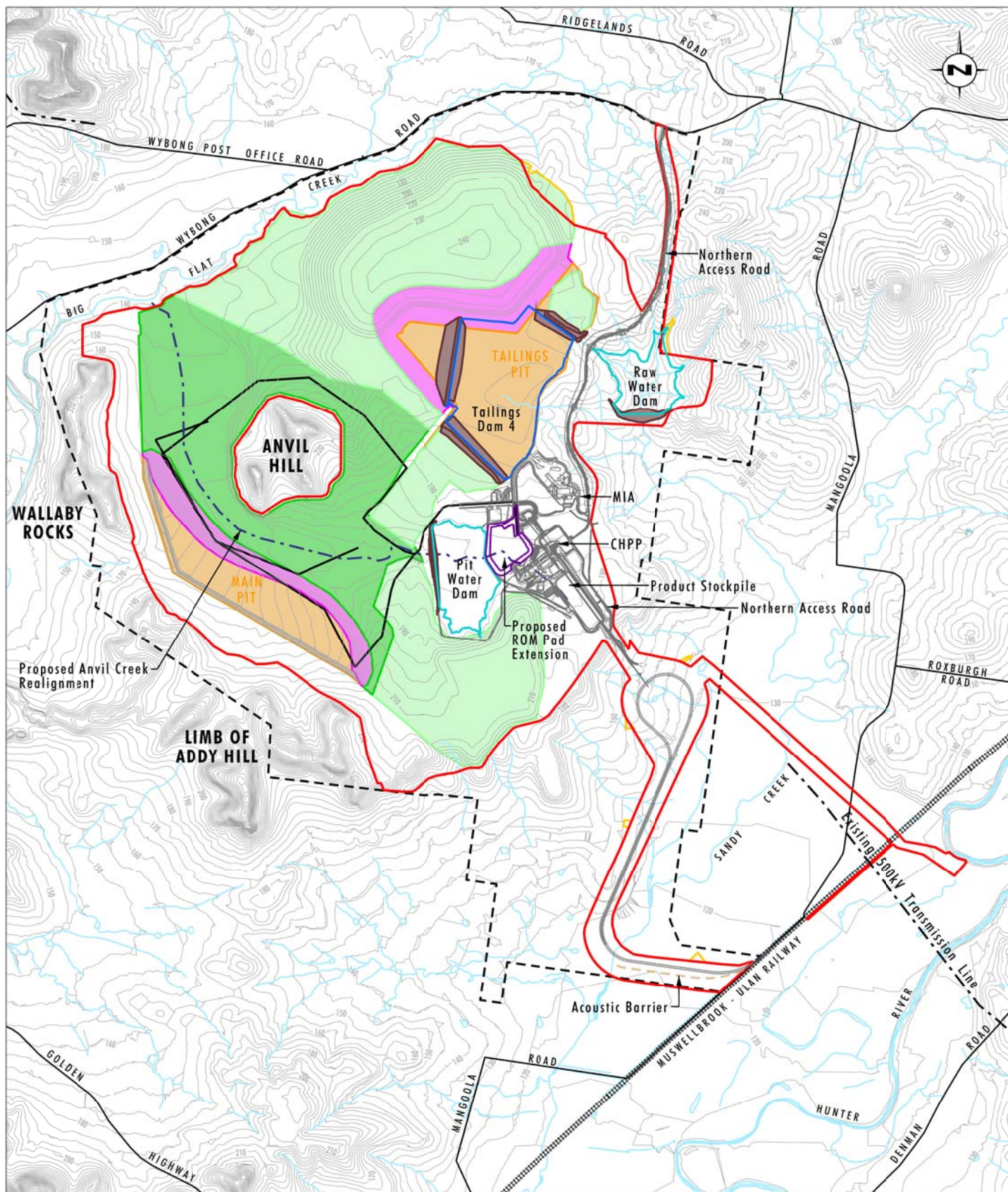
0 1.0 2.0 2.5 km  
1:50 000

### Legend

- |                                                                                                                               |                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <span style="border: 2px solid red; padding: 2px;"> </span> Approved Project Disturbance Boundary                             | <span style="background-color: orange; border: 1px solid black; padding: 2px;"> </span> Active Pit                     |
| <span style="border: 2px dashed black; padding: 2px;"> </span> Mining Lease 1626 Boundary                                     | <span style="background-color: green; border: 1px solid black; padding: 2px;"> </span> Rehabilitation - in progress    |
| <span style="background-color: yellow; border: 1px solid black; padding: 2px;"> </span> Modified Project Disturbance Boundary | <span style="background-color: lightgreen; border: 1px solid black; padding: 2px;"> </span> Rehabilitation - completed |
| <span style="border: 2px solid purple; padding: 2px;"> </span> Proposed ROM Pad Extension                                     | <span style="border: 1px solid black; padding: 2px;"> </span> Haul Road                                                |
| <span style="background-color: magenta; border: 1px solid black; padding: 2px;"> </span> Active Overburden Emplacement        |                                                                                                                        |

FIGURE 4

Proposed Year 10  
Mine Plan



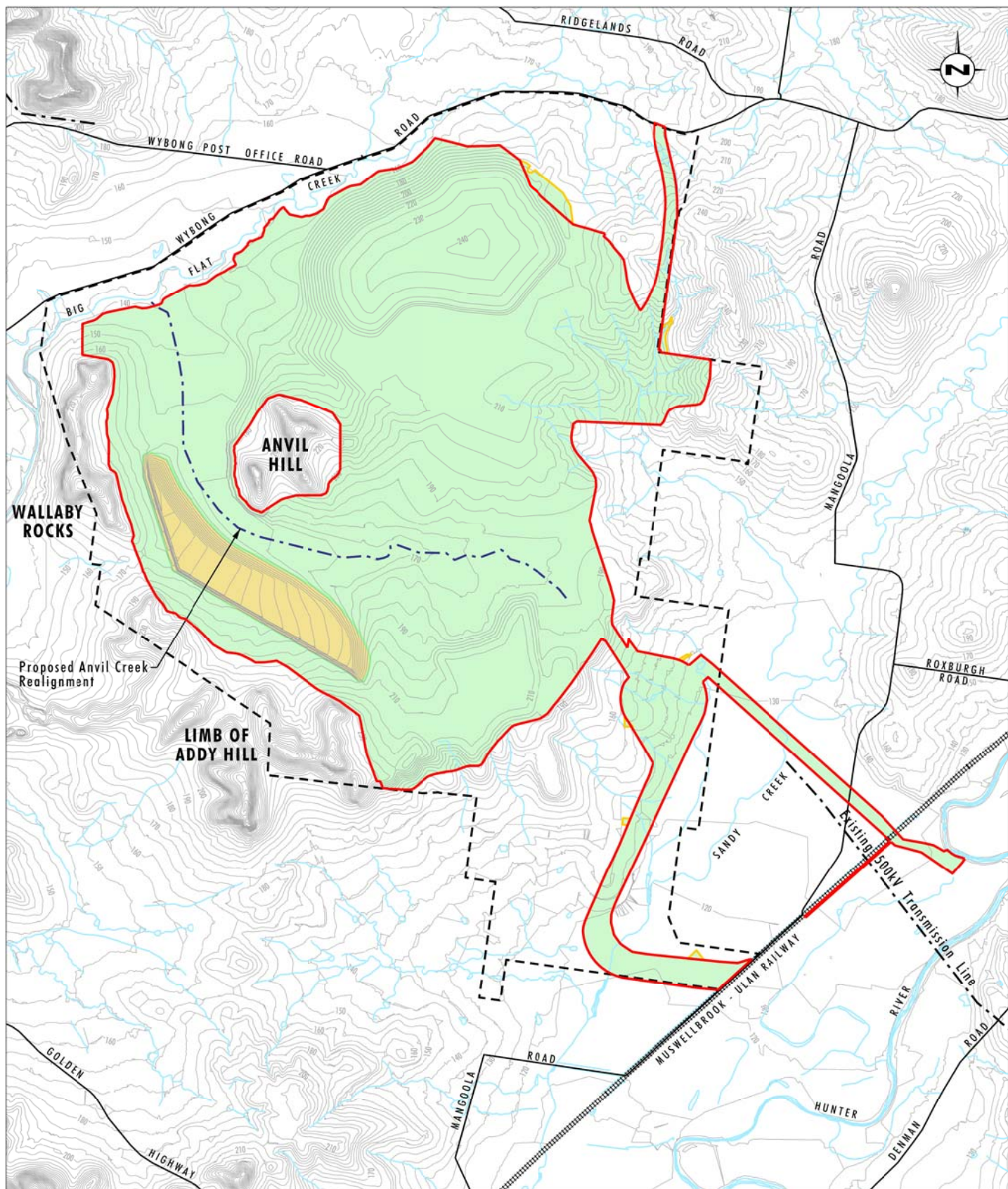
Source: Xstrata Mangoola  
Base Map: Dept. of Lands (2003), ortho-rectified by Plateau Images  
Note: Contour Interval 5m

#### Legend

- |                                                                                                                               |                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <span style="border: 2px solid red; padding: 2px;"> </span> Approved Project Disturbance Boundary                             | <span style="background-color: orange; border: 1px solid black; padding: 2px;"> </span> Active Pit                     |
| <span style="border: 2px dashed black; padding: 2px;"> </span> Mining Lease 1626 Boundary                                     | <span style="background-color: green; border: 1px solid black; padding: 2px;"> </span> Rehabilitation - in progress    |
| <span style="background-color: yellow; border: 1px solid black; padding: 2px;"> </span> Modified Project Disturbance Boundary | <span style="background-color: lightgreen; border: 1px solid black; padding: 2px;"> </span> Rehabilitation - completed |
| <span style="border: 2px solid purple; padding: 2px;"> </span> Proposed ROM Pad Extension                                     | <span style="border: 1px solid black; padding: 2px;"> </span> Haul Road                                                |
| <span style="background-color: magenta; border: 1px solid black; padding: 2px;"> </span> Active Overburden Emplacement        |                                                                                                                        |

FIGURE 5

Proposed Year 15  
Mine Plan



Source: Xstrata Mangoola  
Base Map: Dept. of Lands (2003), ortho-rectified by Plateau Images  
Note: Contour Interval 5m

0 1.0 2.0 2.5 km  
1:50 000

#### Legend

- Approved Project Disturbance Boundary
- Mining Lease 1626 Boundary
- Modified Project Disturbance Boundary
- Rehabilitation - completed
- Final Void

**FIGURE 6**

**Conceptual Final Landform**

## 2.5 MINING OPERATIONS

The mining operation commences in a 1500m long open cut facing Wybong Road opposite the junction of Wybong Road and Wybong Post Office Road. This allows the Open Cut Area (OCA) to move south-east away from Wybong Road with the initial emplacement and rehabilitation facing Wybong Road. This initial emplacement creates a visual screen of the OCA from Wybong Road. The modified mine plans results in the direction of the OCA being at a 90° angle to the proposed cuts in the Northern and Main Pit extractions in the Project Approval. The modified mine plan at Year 5 proposes that a much greater extent of the total OCA will be working in Year 5 than previously proposed. By Year 5 the OCA will have extended to create 2 dumping edges; one facing south-west and a second facing south-east towards Tailings Dam No.3. By Year 5 the cut and dumping edge facing south-west will have turned to run at 90° to Wybong Road and will have crossed the location of the existing 500kV electricity transmission line.

The rehabilitated landforms in this area and the northern end of the pit will be significantly different from the approved project. The approved deep rectangular valley that was proposed to flank the original 500kV electricity transmission line will not be constructed. The rehabilitated form will be a bank at a ratio of approximately 1:8 ratio, with a relatively even face to Wybong Road. The changes to the mine plan also result in significantly higher landforms than previously assessed in the northern end of the pit. The approved Project has a maximum rehabilitated height of around RL210 whereas the proposed Project has a proposed final rehabilitated height of RL 240. This is not significantly out of context with the surrounding topography, as many locations around Anvil Hill, such as The Limb of Addy and Wallaby Rocks exceed this height. The most significant difference to the surrounding topography is the unbroken line and volume of the new emplacement combined with the steep sided appearance over a distance of approximately 2400m. The extra height of the embankment will emphasis the volume and scale of the element.

The split pit in Year 2 means that the south-east arm of the Northern Pit commences mining in a north-west direction. The two pits meet between Years 2 and 5 to form one larger pit. From Year 5 through to Year 10 the Main Mangoola Pit moves in a similar direction and speed to the original Main Anvil Hill Pit. This varies from the mining direction of the Northern Pit in the Approved Project. Within this timeframe Tailings Dam No. 2 and No.3 join to form Tailings Dam No.4. By Year 10 the Southern Pit has joined the south-east edge of the main working face and the bulk of the rehabilitation on both the northern and southern emplacements will be underway.

The final rehabilitated level in the area of the Southern Pit will be approximately RL230. As in the Approved Project the rehabilitated edge facing south-east will be approximately 15 to 20m above the edge of the existing plateau. The mine plan at Year 10 proposes that the south-western corner of the Southern Pit will not reach the approved project disturbance boundary. This will result in less cut of the landform east of the Limb of Addy. This reduction in the removal of the edge of the plateau will reduce excavation time in the Southern Pit and result in an earlier rehabilitation for the landscape on the edge of the plateau.

At around Year 10 the OCA will be centred around the base of Anvil Hill as was proposed in the currently approved project. From Year 10 to Year 15 the Main Mangoola OCA will move south-west similar to the original direction of the Anvil Hill Main Pit. Mining will be on a reduced length of cut face of about 2700m as the Southern Pit will be completed and rehabilitated. During this period Anvil Creek will be mined and reconstructed in a similar layout to the original project. These works appear to be carried out in a shorter time frame than originally proposed. Given the similarity of the direction, depth and length of the OCA at this stage to the original project, it is likely that the final landform adjacent to and between Wallaby Rocks and the Limb of Addy will be similar to the original scheme.

One significant difference will be the position of the relocated electricity transmission line. The proposed location of that line will result in the final mine disturbance for excavation being approximately 60-80m to the east of Wallaby Rocks and the Limb of Addy. This results in a greater area of vegetation and original topography remaining as a buffer to the OCA. This will potentially allow for a smoother transition of the final void to the original topography, all subject to the final design of the mine plan.

## **2.6 NIGHT LIGHTING CONSIDERATIONS**

Similar to the Approved Project the proposed night lighting will be primarily concentrated on the Open Cut Areas, the Coal Preparation Plant (CPP) and the access roads. Lighting is anticipated to be locally concentrated within the pit at reduced heights due to the truck and shovel nature of the operations. Truck movements at night with associated headlights and warning lights will remain the most significant impacts.

The combination of the Northern, Main and Tailings Pit will result in a more compact working face at most times compared to the Approved Project. This should result in slightly reduced lighting impacts. In addition, the reduced operational time of the OCA should result in lighting and sky glow impacts over a shorter mine life. The proposed direction of the initial cut will result in the OCA being located behind the initial emplacement relative to Wybong Road for the first 3 or 4 years of mine life. The result will be reduced direct lighting effects on Wybong Road during the early years of the project.

As outlined in the Anvil Hill assessment the lighting elements that are likely to cause impacts are listed below:

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

The main thrust of lighting controls will continue to be shielding of floodlights required for safe work practices.

## **2.7 ROM Coal Pad**

As part of the modifications it is proposed to establish a temporary ROM (Run of Mine) Pad to the west of the Coal Preparation Plant (CPP) and a minor extension to the approved ROM Pad is also proposed. This temporary ROM pad will remain in place for approximately the first two years of mining, after which time all run-of-mine material will be stored at the approved long-term ROM pad location adjacent to the CPP.

The base level of the temporary ROM Pad is between 180 and 197 metres RL, with a height of approximately 10 metres above the base level. The area of the two temporary ROM pads is approximately 15 hectares.

### **3.1 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 modifications in the mine plan and infrastructure are assessed from the original viewpoints as those public viewpoints were again the most suitable and generally have the highest impacts. For assessment locations refer **Figure 7** "Visual Assessment Locations", which are the same locations as those used in the 'Visual and Lighting Impact Assessment Anvil Hill Project', O'Hanlon Design Pty. Ltd., June 2006 ref: 735-Z-12.

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

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

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

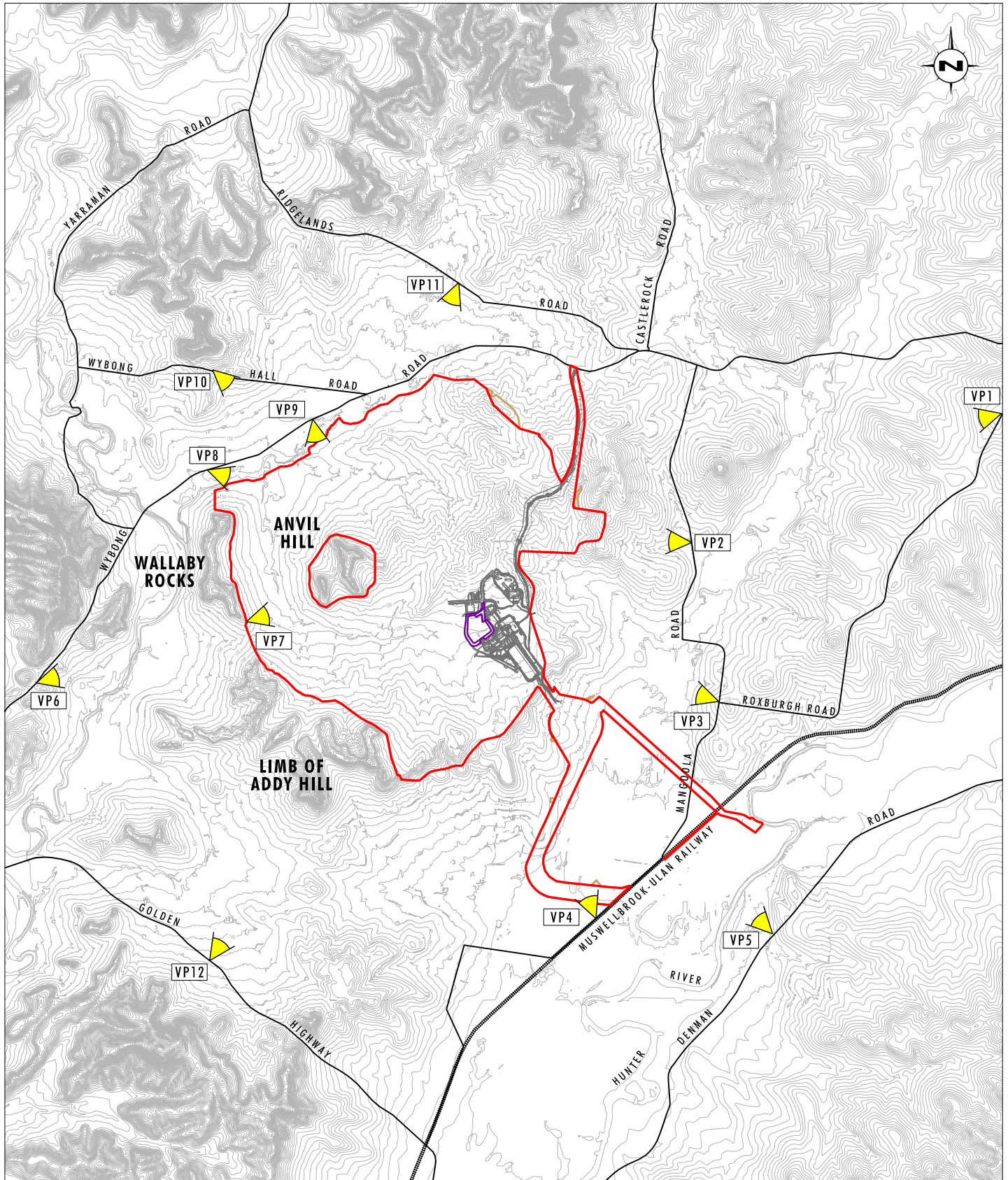
Sensitivity levels are affected by the duration of the exposure to a view. Static viewers are often most sensitive to foreground and close middle ground elements. Viewers in vehicles and trains are often travelling sufficiently quickly for foreground elements to be blurred or missed, whereas the distance and duration of exposure to middle ground elements allows time for recognition and assessment of the elements.

#### **Rail Loop and Tailings Management Areas**

The proposed modifications relating to changed water management will not create a visual impact as they relate to handling and management of water at or close to the ground surface.

#### **Transects**

A series of transects are attached as Appendix A. These provide a single location 2 dimensional snapshot at a selected time during the development. It is important to note that the scale of the transects are exaggerated to improve readability. The transects are



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
- Modified Project Disturbance Boundary
- Proposed ROM Pad Extension
- ▲ Viewpoint
- VP6 Viewpoint Number

**FIGURE 7**

**Visual Assessment Locations**

only provided to assist with understanding of the field of view and related topography from a particular viewpoint, they do not form the basis of the assessment.

### **3.2 VP1 Roxburgh Road (1500m from the Wybong Road Intersection: RL265)**

#### **Infrastructure Areas**

From the northern end of Roxburgh Road at a distance of 7-8 km the changes to infrastructure elements will not be significant. The rearrangement of elements and small changes in footprint do not change the original assessment. The temporary ROM pad will not be perceptible from this view point.

#### **Open Cut Areas (OCA)**

As the Mangoola Project OCA has an almost identical footprint to the original footprint, the visual impacts will remain very similar to the original assessment. The change in initial stripping of the mine and emplacement in the first 5 years of the project will slightly reduce the width of the open cut visible from VP1 up until Year 5. The footprint area open from Year 5 for mining and rehabilitation will be significantly greater than in the approved project. From the elevated viewer levels are VP1 (RL265) a greater area of cleared and disturbed space will be visible. These elements are however viewed at a distance of 7-8 km as background elements and the impacts are greatly reduced by distance from the viewer.

Visual impacts created by the Southern Pit will be slightly reduced compared to the original assessment. The reduction in OCA adjacent to the Limb of Addy and the shortened working time in the Southern Pit before rehabilitation will slightly reduce those impacts on VP1.

### **3.3 VP2, VP3, VP4 Along Mangoola Road (3000m north of Roxburgh Road: RL150)**

#### **Infrastructure Elements**

Generally the impacts of the modified mine plan will be consistent with the original mine plan impacts. The location of the Tailings Dams within the pits, and the increased inundation area of the raw water dam and the general infrastructure elements such as temporary ROM pad and ancillary changes have not changed in a manner that varies the visual impact.

The approved relocation of the Main Infrastructure Area will have impacts on VP2, VP3 and VP4, and a visual screen has been planted in accordance with the project approval to ameliorate visual impacts from VP3 and VP4. These impacts have been documented in a separate visual impact assessment 'Changes to the Main Infrastructure Area', O'Hanlon Design Pty Ltd 821-Z-04B, September '09.

#### **Open Cut Areas**

For viewers at or adjacent to VP2 at RL150 the ridge to the west (RL220) screens the work in the OCA and the impacts remain insignificant.

For viewers at or adjacent to VP3, the impacts due to changes to the OCA will increase. The increased height of the main emplacement and rehabilitation areas will be visible to the north-west at a distance of approximately 4500 to 5000m. The changes in direction of the strip and cut to run south-east will expose the working face for a greater length of time. The mine plan indicates that the working face, 2000m wide, will be un-rehabilitated for at least 15 years, facing VP3. Views into the Main Mangoola Pit around Anvil Hill will be

possible until around Year 12 and this combined with the view of the un-rehabilitated surface of the south-east cutting will present an un-rehabilitated strip in excess of 4000m in length for a period of 3 to 4 years around year 7.

The work in the Southern Pit is proposed to be significantly faster and further from the Limb of Addy. This will reduce the impacts originally assessed for the Southern Pit. The visual impacts appear to be limited to a 2-3 year period around Year 7 until the east facing emplacement is rehabilitated. Interpolation of the mine plan between Year 5 and 10 indicates that there will be a 2 - 3 year period when the Main Mangoola Pit and Southern Pit are both showing an un-rehabilitated edge to VP3 with a combined length exceeding 5000m at distances between 3000 and 5000m from the viewer at VP3.

The reduced height of the southern out of pit emplacement facing Mangoola Road at RL220 is approximate 20m lower than previously assessed. Earthworks for this emplacement east of the Limb of Addy will commence around Year 4 and rehabilitation will commence around Year 6 or 7. The proposed time frame of approximately 3 years between stripping and rehabilitation will reduce the impacts originally assessed from VP3, VP4, VP5 and surrounding residences and viewing locations.

Views of the Main Mangoola Open Cut Area will not be possible from VP4 or adjacent locations on Mangoola Road.

### **3.4 VP5 Denman Road (300m from Piercefield Property: RL145)**

#### **Infrastructure Areas**

From VP5 and surrounding viewer locations the changes to the infrastructure areas will be difficult to distinguish from the Approved Project. The face of the raw water dam remains the same. The stockpiles, coal handling plant and conveyors are similarly located to the original project. The establishment of the temporary ROM pad does not change the visual impact assessment.

#### **Open Cut Area**

As noted previously the reduction in height of the proposed southern emplacement and the accelerated rehabilitation will reduce the visual impacts of the OCA works at VP5 and surrounding locations created by the Southern Open Cut and emplacement.

The increase in height of the Main Mangoola emplacement will result in potential visibility of the top edge of the emplacement when viewed from Denman Road adjacent to VP5. The un-rehabilitated top edge of the emplacement will become potentially visible at elevations above RL235 from Year 2 to Year 10. Some screening of the emplacement works will be provided by the vegetation remaining along the edge of the plateau east of the Main Infrastructure Area and east of the Northern Access Road. The density and height of the remnant screening will determine the potential for views of the emplacement. Around Year 10 the face will be finished and rehabilitated creating a new relatively horizontal edge as a background element approximately 8000m to the north of the viewer at VP5.

### **3.5 VP6 Wybong Road (1900m north of Reedy Creek Road: RL165-170)**

#### **Infrastructure Areas**

Changes to the infrastructure elements will not affect the visual impacts previously assessed for the Approved Project.

### **Open Cut Area**

As the pre-stripping and Open Cut operations are similar around Anvil Hill in both the Anvil Hill and Mangoola Projects, the visual impacts of the OCA works when viewed from VP6 and surrounding locations will not vary. As noted in the Anvil Hill visual impact report planting along saddle 180 to the south of Wallaby Rocks would further reduce those impacts. The area of known as Wallaby Rocks is shown in **Figure 1**.

### **3.6 VP7 Anvil Hill ROW (right of way; adjacent to Bellevue: RL180)**

All properties along Anvil Hill ROW except one which is currently vacant have been acquired by Mangoola Coal and the road, which was very low use, has now been closed to public access. The views of both the infrastructure and OCA proposed in the amended project will be similar to those assessed in the Anvil Hill visual report. The reduction in extraction time for the Southern Pit and the area around Anvil Hill would slightly reduce impacts as previously assessed. The relocation of the Tailings Dam and greater areas stripped in the early years of the project would slightly increase impacts in those years. Given that the road is now inaccessible to the public the changes in visual impacts are not significant.

### **3.7 VP8 Wybong Road (1200m north of Wybong Bridge: RL145)**

#### **Infrastructure Areas**

As noted in the previous Report for the Approved Project, views of the infrastructure areas were not possible from VP8 due to the intervening topography created by the south west ridge of the Main Pit haul road and the south-east ridge that was required to maintain the 500kV easement. The removal of the haul road and 500kV ridge will create opportunities for some potentially limited views of infrastructure elements when the OCA is open at right angles to the viewer around VP8 and VP9. Viewers are at lower levels of approximately RL145 looking south east to middle distance infrastructural elements at distances exceeding 4km. Potential increases in impact are low. The density of remnant screening along Wybong Road will also determine visibility. Vegetation is sparse adjacent to VP8 therefore the potential for limited views of the top of some infrastructure elements will increase around VP8.

#### **Open Cut Area**

Visual impacts of the OCA for viewers adjacent to VP8 will increase slightly due to the change in direction of the initial stripping and removal of the existing 500kV electricity transmission line easement. Previously the 500kV easement required two embankments to be created and revegetated either side of the easement as a setback from the line to minimise impacts of blasting. The northern embankment previously created a screen to later works east of the embankment. Removal of the embankment will potentially expose greater areas to viewers at VP8. The degree of extra exposure will be determined by the speed and area of pre-stripping between the viewers at VP8 and the emplacement works. The increased emplacement height will also increase impacts to viewers at VP8. The overall impact will increase from moderate to moderate/high between years 5 and 15. This change is charted in **Table 3.1**

It is however important to note that the "Mitigation Measures" recommended in Section 5.5 of the Original Visual Impact Assessment dated June 2006, included softening and re-landscaping of the corners of the rehabilitated areas adjacent to the 500Kv transmission line to reduce the long term legacy of the highly engineered appearance of the final landform. This element was considered as the most undesirable visual element of the project. The benefit of the modifications to the mine plan addresses this issue and provides a lower visual impact landscape beyond the life of the mine. The resultant long term visual impact at VP8 should be considered to be lower than the Approved project and can be assessed as "low" This should be balanced with the increased impacts that occur

due to the relocation of the 500kV transmission line closer to Wallaby Rocks. That impact is outlined and assessed in the 'Visual Impact Assessment of the 500kV Transmission Line' prepared by O'Hanlon Design Pty Ltd, June 2010 ref: 839-Z-01C.

### **3.8 VP9 Wybong Road (1000m south of Wybong Hall Road: RL145)**

#### **Infrastructure Areas**

No views of the CPP and coal stockpiles are possible from Wybong Road adjacent to VP9.

#### **Open Cut Area**

Similar to the assessment of the Approved Project the Mangoola Main Pit will move west past VP9. The highest elevations of the main emplacement exceed the original design by around 20 metres but do not extend as far west. The result will be a slight decrease in the visual impacts as the bulk and dominance of the emplacement will be reduced when looking south from VP9.

The most significant changes are the impacts along Wybong Road to remove the 500kV easement and the change to overall height of the emplacement. To accommodate the original 500kV Line the emplacement was split either side of the easement. This created an unnatural strongly engineered valley landscape visible from Wybong Road. Removal of the line and easement has allowed the Mangoola Project to create a more natural landscape facing Wybong Road. Careful detailing could now create a landform that is blended into the topography without hard engineered lines and edges.

The changes to the overall height of the main emplacement in the north east area will increase the dominance and scale of the emplacement when viewed from Wybong Road around VP9. The balance of improvements and changes to height result in no overall change to the associated visual impacts.

### **3.9 VP10 Wybong Hall Road (200m south of existing transmission line: RL200)**

#### **Infrastructure Areas**

At the highest point of Wybong Post Office Road intermittent views are still likely of the infrastructure elements and temporary ROM stockpiles. The proposed saddle east of Anvil Hill to the main Mangoola emplacement has a height of RL220. This is approximately 20m higher than the Anvil Hill proposal. This will result in a more significant screen of the Infrastructure Areas from this view point. Some views of the Infrastructure Area will remain during extraction and construction of the saddle. On completion and following rehabilitation it is unlikely that views of the infrastructure will remain.

#### **Open Cut Area**

From VP10 the views of the main OCA will be similar to those previously assessed. The rehabilitation will occur over a slightly shorter time frame thereby slightly reducing the impacts. The 20 metre increase in height of the emplacement will create a new horizon line to the south-east which will have a slightly more prominent edge until completion of the rehabilitation.

### **3.10 VP11 Ridgeland Road (200m east of the Creek Bridge: RL180)**

#### **Infrastructure Areas**

From Ridgeland Road long-term views of the Infrastructure Areas were not possible in the Anvil Hill Assessment. Some short-term views during the early years of the mine will now be possible as the original east-west haul road has been removed from the project.

## Open Cut Areas

At VP11 changes to the mine plan will vary the impacts and the exposure of the OCA areas significantly.

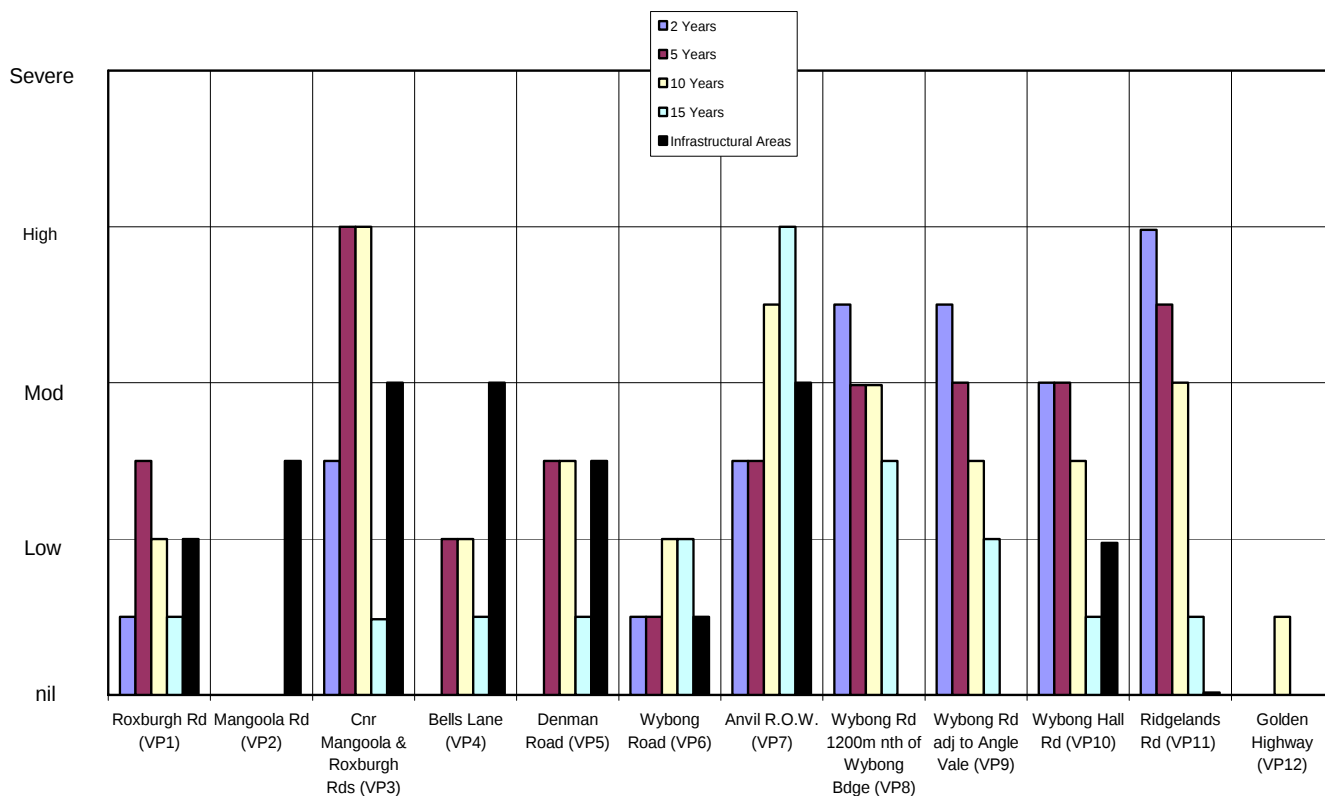
The change in direction of the initial cut in the north-east corner of the OCA will create an emplacement that screens the working face to the south from viewers at VP11. This occurs early in the mine life at around Year 4 and will reduce impacts significantly. The increase in height of the emplacement will however correspondingly increase the long term visual impacts due to the final bulk and scale of the emplacement. Changes to the infrastructure area will not significantly vary the previously assessed impacts at VP11.

Extraction of the south-east arms of the Main Mangoola Pit will be significantly more prominent than previously assessed as the pit will move at 90° to the viewer for a period of approximately 2 years around year 4. The final emplacement will also be more prominent due to the increase in bench height to RL240. The short and long-term views of Anvil Hill will not be possible due to the extra height of the main emplacement at RL240. The heightened main emplacement will screen the later years of mine extraction to viewers adjacent to VP11.

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

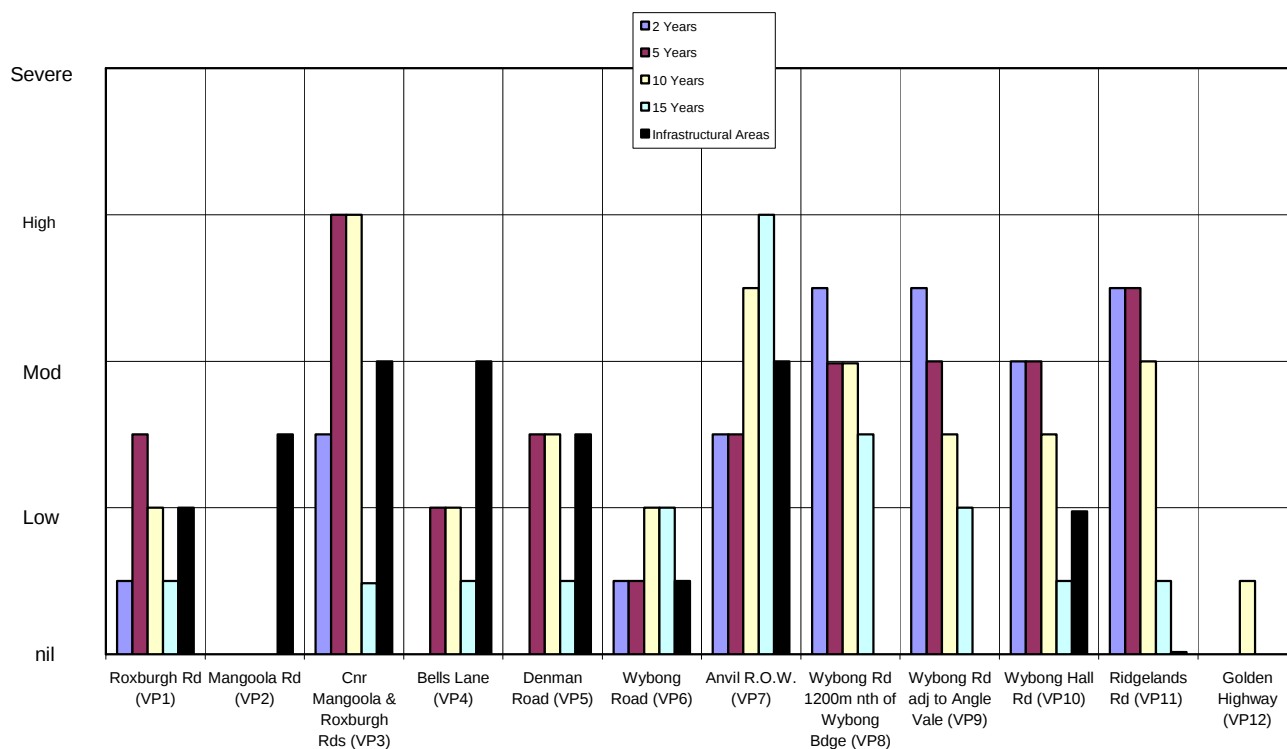
Views of the Infrastructure Areas, coal stockpiles and Rail Loop are not possible and impacts are unchanged to viewers at VP12. Views into the OCA are not possible. A very low impact remains due to possible visibility of the western edge of the southern pit prior to rehabilitation.

**Table 3.1 Revised Visual Impacts at selected years of the Project life**



**Table 3.2 Approved Project Visual Impacts at selected years of the Project life: June 2006**

An extract from report 735-Z-12 June 2006 is reproduced below. As can be seen by comparison of the tables above the significant differences between the Approved project and the revised impacts are at VP3, P8, Vp10 and Vp11.



### 3.12 Mitigation Measures

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

- Planting of a vegetative screen along the lower sections of Mangoola Road from Roxburgh Road to the new Rail Loop intersection (approximately from VP2 to VP3). This visual screen now forms part of the project approval and is due for completion by July 2010.
- Curving of the wall of the Raw Water Dam to create a more natural shaped face to Mangoola Road and Denman Road, allowing different vegetation and shadow effects.
- Planting of a vegetative screen along the ridge between Limb of Addy Hill and Bellevue Homestead.
- Recreation of the spur on the northeast edge of Anvil Hill at RL220 as part of the OEA to assist screening of the CPP from Years 10 to 20 when viewed from the north around VP 10

- Maintain as much remnant vegetation as possible along the south-east edge of the plateau facing VP3, 4 and 5.

### **3.13 Night Lighting Impacts**

The night lighting impacts fall into two parts

- Direct lighting effects
- Sky glow

#### **Direct Lighting Effects**

Similarly to the Approved Project the potential direct lighting impacts from the two pits of the OCA would be visible from a range of viewing points.

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

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

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

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

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

As previously noted the impact will vary in intensity depending on positions and working level within the OCA.

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

#### **Sky Glow**

As previously assessed the sky glow component of the night lighting impact is highest when there is a solid low cloud cover. At that time light reflects off the clouds creating the sky glow effect. Shielding lighting with hoods and louvers would significantly reduce sky glow. Further the use of low brightness lights in the infrastructure area with horizontal floodlight bodies and sharp cut off angles can also reduce stray light.

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

### **3.14 Assessment of Night Lighting Impacts**

Night lighting impacts for the OCA and OEMs will vary with time and atmospheric conditions. We have assessed the impacts at the highest anticipated levels for each viewpoint. Night lighting impacts for the infrastructure areas are assumed to be constant. Whilst the OCA configuration and direction of movement has changed in the Mangoola Project, we anticipate that the slight increases will occur at some selected viewpoints due to the larger areas exposed to view. It is reasonable to expect however that the number of machines and trucks working on an area at any time would not increase significantly. Therefore the increase in impact is due to a greater number of evenings when they could be visible.

#### **VP1 Roxburgh Road**

The accelerated pre-stripping and greater extent of working area will marginally increase the impacts when viewed from VP1 but the distance from the viewers to the light source slightly mitigates the impacts. The extended area pre-stripped by Year 5 should allow work to continue at night in areas that have lower lighting impacts.

#### **VP2 Mangoola Road**

No significant change to night lighting would be noticeable for viewers at VP2.

#### **VP3 Corner Mangoola & Roxburgh Roads**

Similar to VP1, the accelerated pre-stripping area and greater extent of the working area will slightly increase the impacts of night lighting for viewers at VP3. The degree of impact will be determined by the exact location of lighting in the OCA on a given evening.

#### **VP4 Adjacent to Bells Lane**

No significant change to night lighting would be noticeable for viewers at VP4.

#### **VP5 Denman Road**

The changes in height of the Main Mangoola emplacement creates a likelihood that lighting and vehicle movement impacts will now be visible along the top edge of the emplacement from Year 2 to Year 10 at a distance varying between 8000m and 10,000m. Due to the dark background the lights of the vehicles and work on the top edge of the emplacement will be highlighted in the night time for viewers from VP5.

#### **VP6 Wybong Road**

No significant change to night lighting would be noticeable for viewers at VP6.

#### **VP7 Adjacent to Bellevue**

As noted previously the Anvil Hill ROW properties have been purchased by Mangoola Coal or are vacant and the ROW is now closed.

#### **VP8 Wybong Road**

For viewers at VP8 the removal of the 500kV electricity transmission line easement and the embankments that were previously designed to accommodate the easement and roads will increase the visibility of the OCA when viewed from VP8. Potentially the night

lighting effects will be increased but limiting work on the highest levels to day light hours would ameliorate any significant increase.

#### **VP9 Wybong Road 1100m south of Wybong Hall Road**

Similar to VP8, some increases in lighting impacts could occur for viewers at VP9. Any impacts could be ameliorated by limiting work at high levels to daylight hours.

#### **VP10 Wybong Hall Road**

The impacts previously assessed for viewers at VP10 will be slightly increased from those originally assessed for the Approved Project. The removal of the east-west haul road will open a greater area of the OCA to viewers. The increase is relatively low as the extra area potentially viewed is predominantly at distances exceeding 2000m.

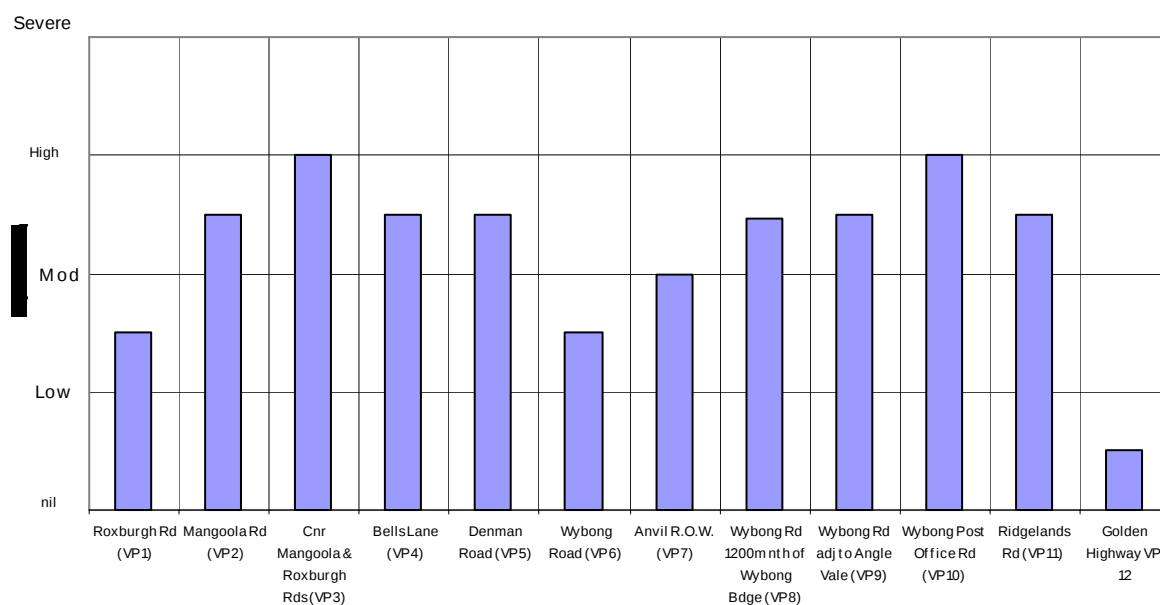
#### **VP11 Ridgeland Road**

Similar to VP10 increases in lighting impacts will occur. Again as the distance exceeds 3000m from the viewer the increases are only low.

#### **VP12 Golden Highway**

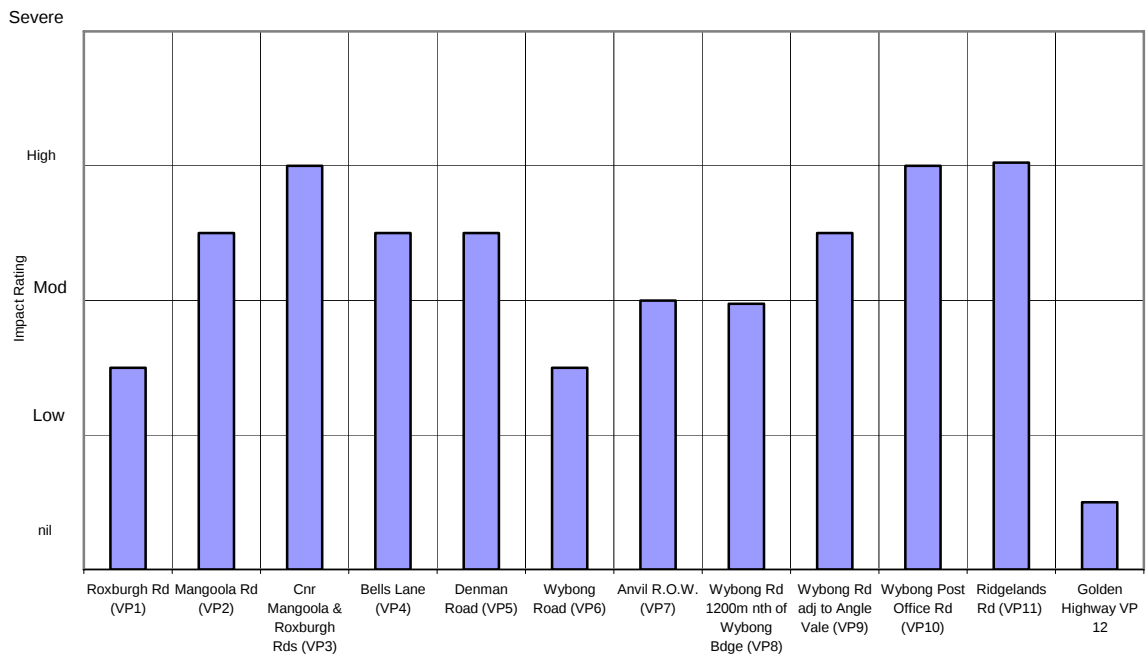
No significant change to night lighting would be noticeable for viewers at VP12.

**Table 3.2 Revised Night Lighting Impacts**



**Table 3.3 Approved Project Night Lighting Impacts at selected years of the Project life: June 2006**

An extract from report 735-Z-12 June 2006 is reproduced on the following page. As can be seen by comparison of the tables above the only significant difference between the Approved project and the revised impacts are at VP8.



### 3.15 Individual Residences

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

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

#### 3.15.1 Residences west of VP8 between Wybong Road and Wybong Hall Road

As noted in the previous report these residences are significantly more affected than viewers at VP8 due to their superior viewing levels but at slightly greater distances from the mining areas.

Changes to the mine plan and increases in emplacement heights will as previously noted increase impacts at VP8 and a corresponding increase in impacts will occur for the residences west of VP8 at superior viewing levels. The main change will be the removal of the 500kV easement and the original east-west haul road. The removal of these elements opens a greater area of the OCA to viewers over a shorter mine life. The extended area and Tailings Dam 4 will be partially screened by Anvil Hill but from these elevated viewing locations the impacts will increase into the moderate-high range. Night lighting impacts will be similarly increased and are likely to be high on a larger number of evenings due to the extended areas visible.

#### 3.15.2 “The Knob” Lot 11 Merriwa Rd, (The Golden Highway)

As previously noted residents at Lot 11 Merriwa Road will have significantly differing impacts to those assessed at VP12. At the request of the owners, and due to its unique position on the east face of “The Knob”, this residence was assessed and not considered to be correctly represented by the public viewing points in the adjacent areas. The residence was assessed only from the external verandah and I understand that the main

The Mangoola Pit will remain screened by the Limb of Addy and the adjacent outcrops running north-west. Views of the southern pit remain possible. The reduced extent of the southern pit, reduced overall height and shorter construction period will reduce visual impacts on the residence at Lot 11. The impact appears to commence around Year 5 and will now cease around Year 8 - an overall reduction of approximately 7 years. The impacts of the infrastructure areas will remain similar to those previously assessed. However the lower final height of the rehabilitated southern emplacement at RL220 will allow some views of the top of the workshop and CHP for the duration of the mine life. The result will be an overall reduction of the impact to low. Night lighting impacts will be similarly reduced.

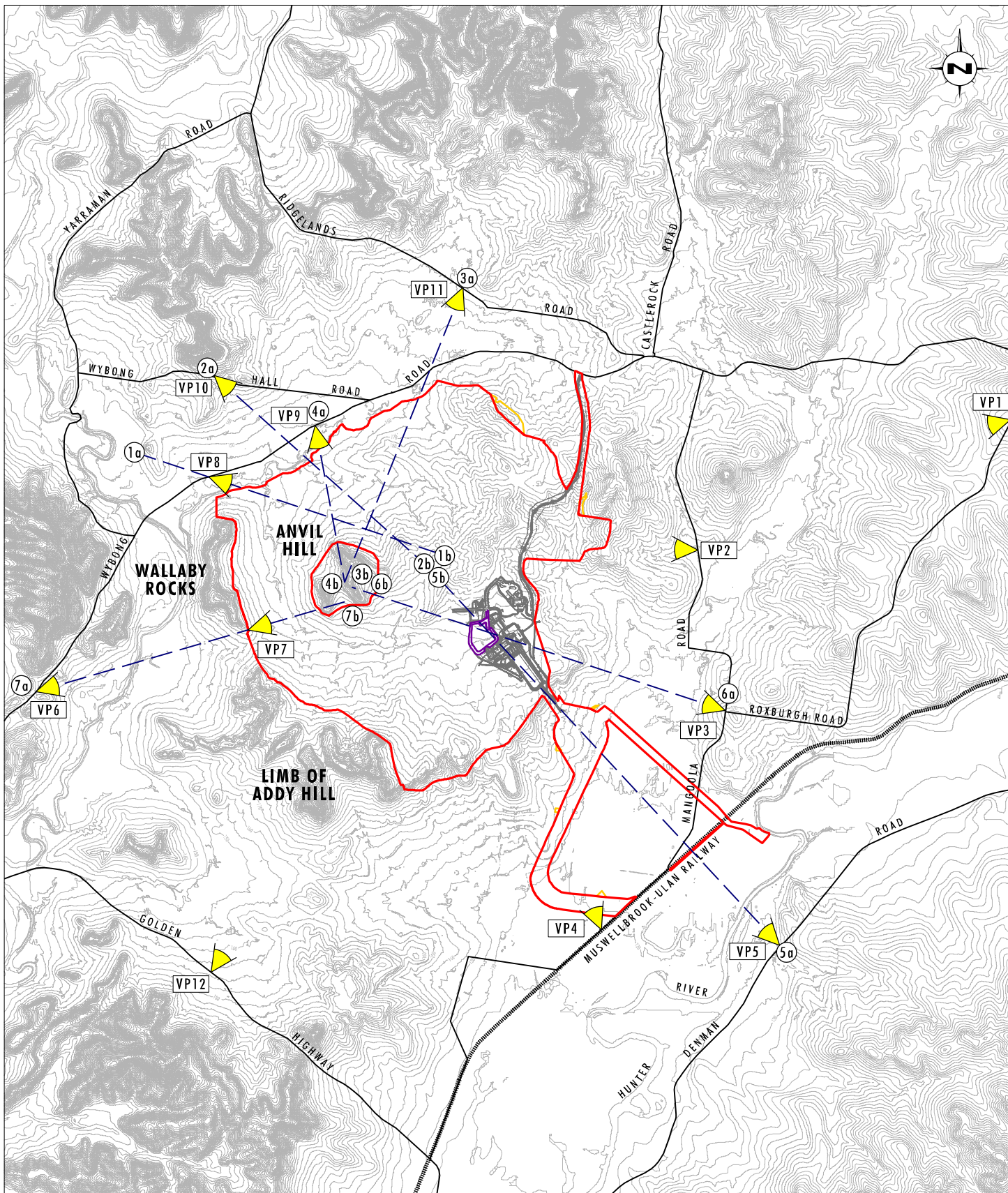
## **Conclusion**

Our review of the proposed modifications to the approved project has revealed that the assessed visual impacts are not significantly changed by the modifications. Some significant reductions and increases in impact occur at viewpoints along Wybong and Ridgeland. At those locations the change height and change in direction of the movement of the open cut will result in some increases in impacts from Years 5 to 15.

It is however important to note that the long term inter-generational visual impacts of the final landform along Wybong Road will be significantly reduced following the relocation of the 500Kv transmission line and the subsequent modifications to the shape of the final embankment adjacent to Wybong Road.

Edward O'Hanlon RAIA  
Director  
O'Hanlon Design Pty Ltd

## **APPENDIX A**



Source: O'Hanlon Design (2006)

Base Map: Dept. of Lands (2003)

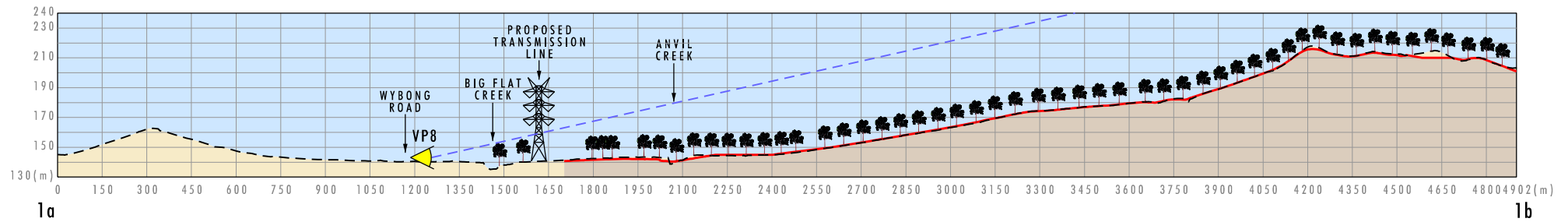
Note: For section details, refer to Figures 5.28

0 1 2 4 km  
1:80 000

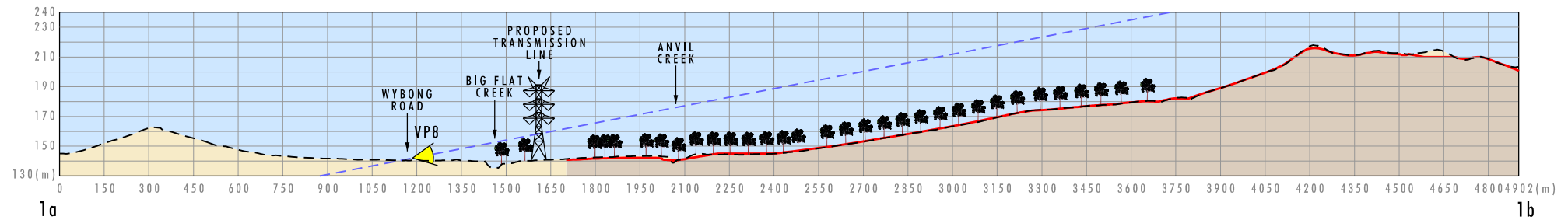
### Legend

- Approved Project Disturbance Boundary
- Modified Project Disturbance Boundary
- Proposed ROM Pad Extension
- ▲ Viewpoint
- Transect Location
- 2b Transect Number
- VP6 Viewpoint Number

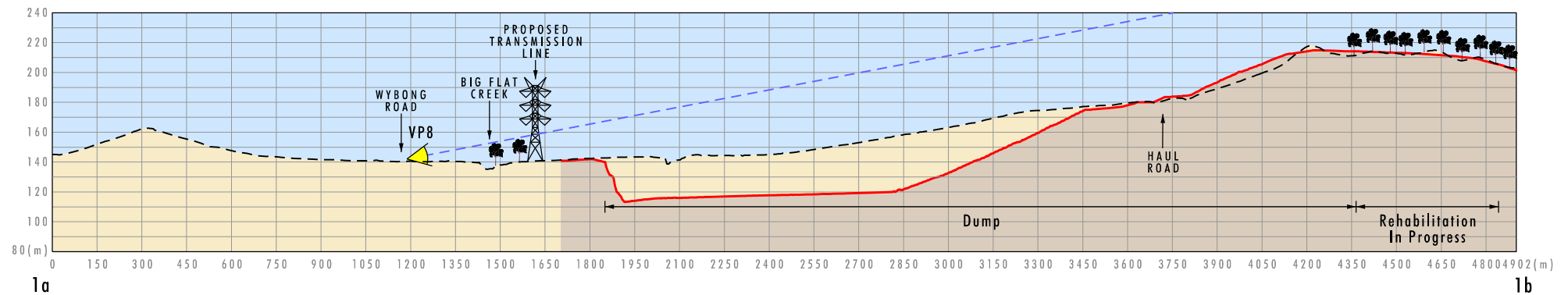
**Transects Location Diagram**



**Transect 1 - Year 2**



**Transect 1 - Year 5**



**Transect 1 - Year 10**

**Legend**

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

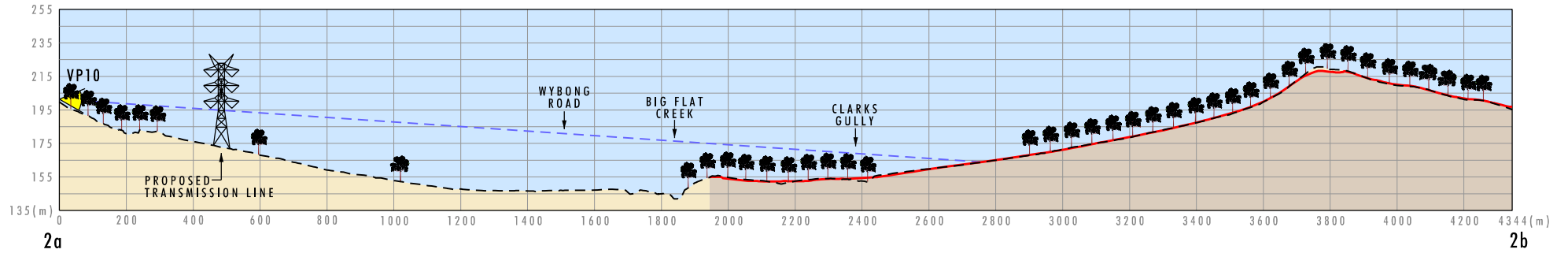
Vertical Exaggeration 1:5

0 50 100 200m  
Vertical Scale

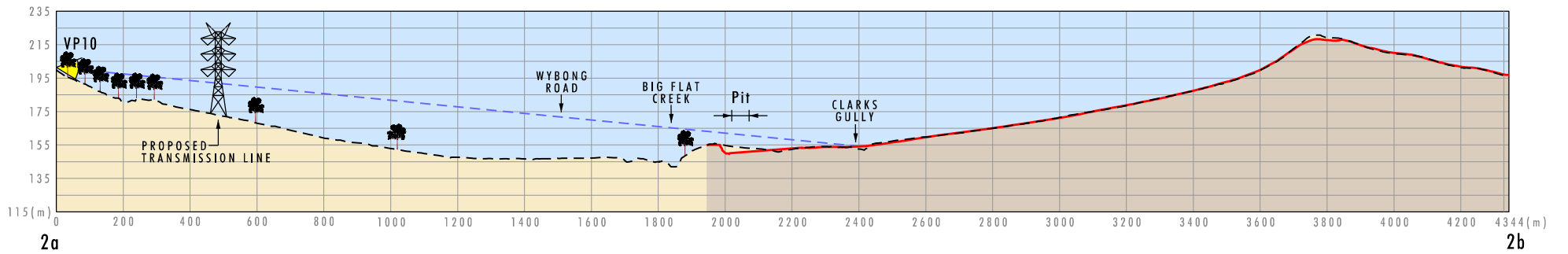
0 0.25 0.5 1.0km  
Horizontal Scale

TRANSECT 1a-1b

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



Transect 2 - Year 2



Transect 2 - Year 5

### Legend

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

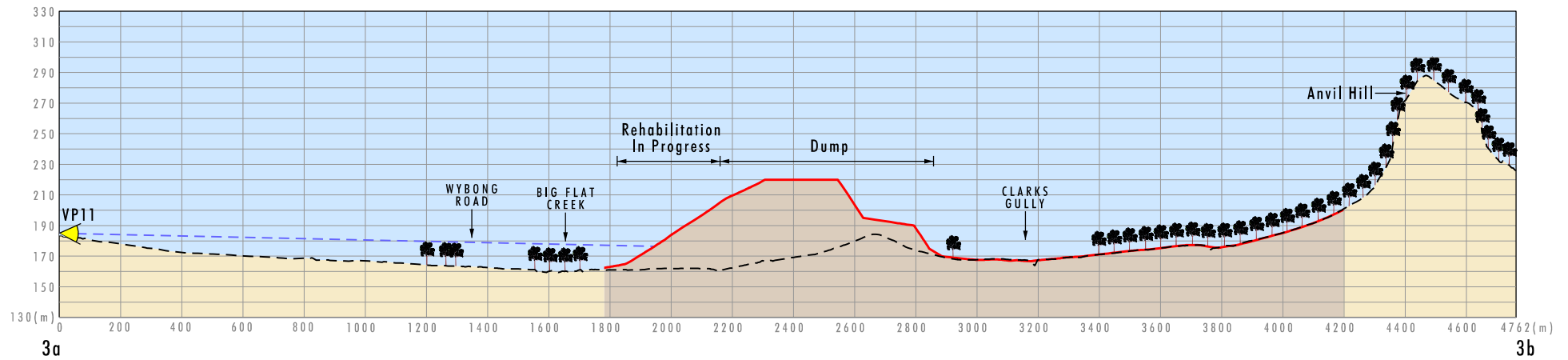
Vertical Exaggeration 1:5

0 40 80 160m  
Vertical Scale

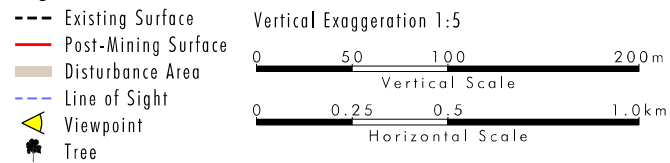
0 200 400 800m  
Horizontal Scale

TRANSECT 2a-2b

VP 10 - Year 2 and Year 5

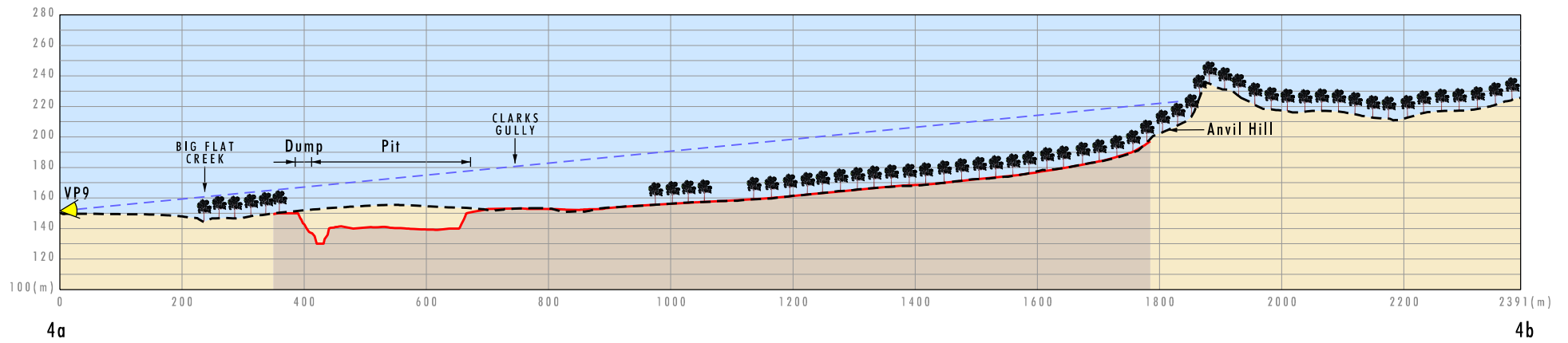


### Legend



TRANSECT 3a-3b

VP 11 - Year 2



Transect 4 - Year 5

### Legend

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

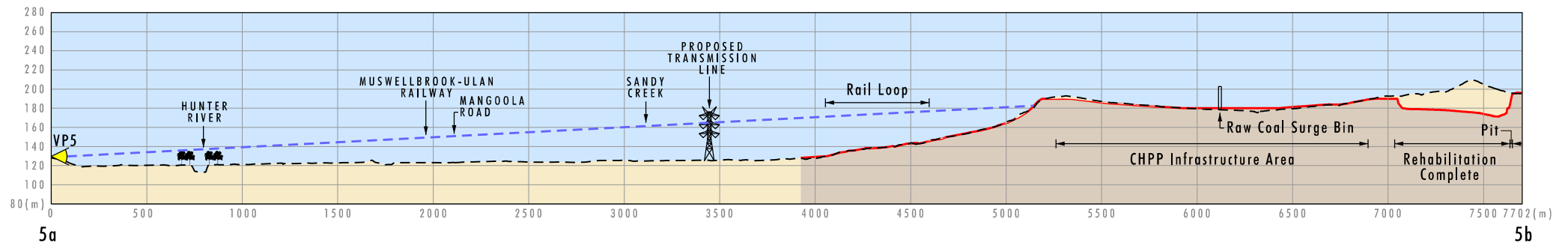
Vertical Exaggeration 1:2.5

0 40 80 160m  
Vertical Scale

0 100 200 400m  
Horizontal Scale

TRANSECT 4a-4b

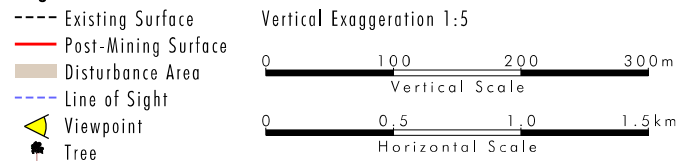
VP 9 - Year 5



Transect 5 - Year 10

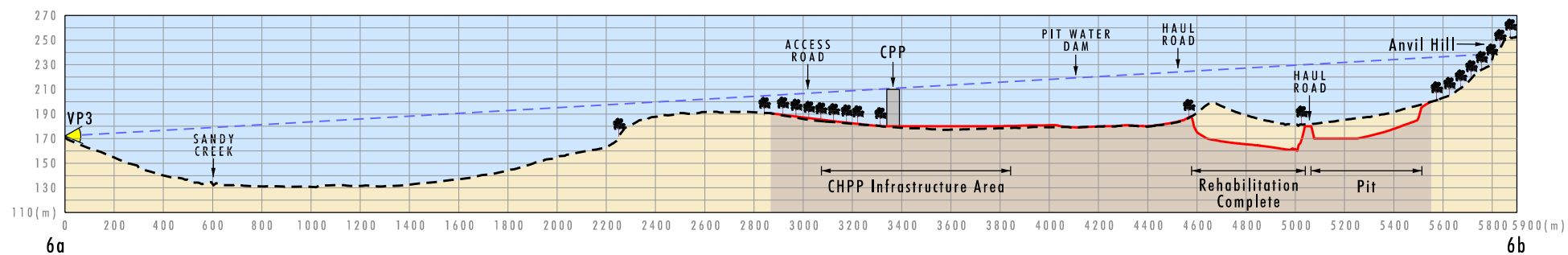
**Note:** Infrastructure elements are diagrammatic and locational only due to the vertical exaggeration distortion

### Legend



TRANSECT 5a-5b

VP 5 - Year 10



Transect 6 - Year 10

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

### Legend

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

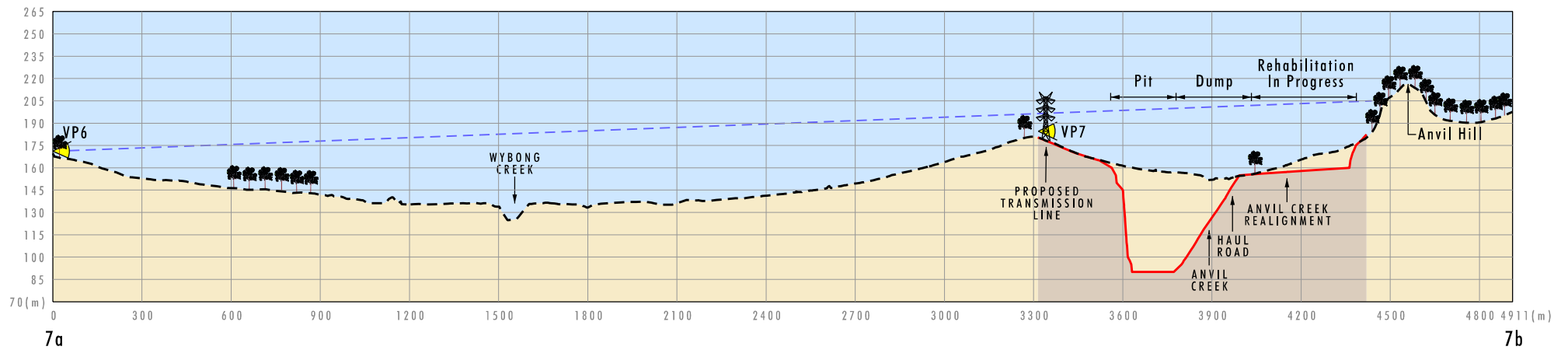
Vertical Exaggeration 1:5

0 50 100 200m  
Vertical Scale

0 0.25 0.5 1km  
Horizontal Scale

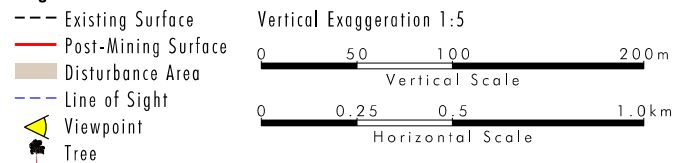
TRANSECT 6a-6b

VP 3 - Year 10



Transect 7 - Year 15

### Legend



TRANSECT 7a-7b

VP 6 and VP7 - Year 15



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