Section 2

Description of the Project

PREAMBLE

This section describes the proposed Tomingley Gold Project including:

- *the objectives of the Project;*
- *an overview of the Project and the approvals required;*
- *the infrastructure that would be established and/or relocated;*
- *the site preparation that would be undertaken;*
- *the proposed mining and processing operations and management of waste rock and processing residue;*
- *ancillary activities that would be undertaken; and*
- *the proposed re-establishment of native vegetation communities in areas that are currently cleared and rehabilitation of areas that would be disturbed throughout the life of the Project.*

The Project is described in sufficient detail to provide the reader with an overall understanding of the nature and extent of the activities proposed, how the various activities would be undertaken and to enable an assessment of the potential impacts on the surrounding environment. The boundaries of the various components described throughout this section and dimensions information are indicative only.

Details of the safeguards and management measures that the Proponent proposes to implement to minimise or negate the potential impacts on components of the surrounding environment are provided in Section 4 of this document.

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2.1 INTRODUCTION

2.1.1 Project Objectives

The Proponent's objectives in constructing and operating the Tomingley Gold Project would be to:

- safely and economically mine the identified gold reserves;
- operate the Project in a manner that would minimise surface disturbance and impacts on surrounding residents and the local environment;
- implement a level of management control and mitigation measures that ensures compliance with appropriate environmental criteria and reasonable community expectations;
- develop and operate the Project in compliance with all relevant statutory requirements;
- establish a facility that can process the currently identified and any additional mineral resources that may be identified within or in the vicinity of the Mine Site;
- minimise waste and maximise the efficiency of the operation during the life of the Project;
- create a final landform that is suitable for a post-mining land use that would be determined in consultation with the local community and could include a combination of nature conservation, agriculture, tourism or light industry;
- restore and enhance existing remnant native vegetation and re-establish areas of native vegetation over currently cleared sections of the Mine Site;
- provide for the ongoing monitoring of local environmental parameters such as water, noise, air quality and biodiversity;
- continue to maintain an open and honest relationship with the surrounding community;
- work cooperatively with the surrounding community to build socio-economic capacity within communities surrounding the Project Site; and
- achieve the above objectives in a cost-effective manner to ensure security of employment and the continued economic viability of the Proponent.

2.1.2 Project Overview and Mine Site Layout

The Project would include the following components (**Figure 2.1**).

- Establishment of infrastructure required for the Project, including a water supply pipeline, an underpass beneath the Newell Highway, and vegetated amenity bunds.

- Extraction of waste rock and ore material from four open cut areas, namely:
  - Caloma Open Cut (approximately 19ha);
  - Caloma Two Open Cut (indicative design approximately 9ha);
  - Wyoming Three Open Cut (approximately 10ha); and
  - Wyoming One Open Cut (approximately 19ha).
- Extraction of waste rock and ore material from the Wyoming One Underground.
- Construction of three waste rock emplacements covering a combined area of approximately 129ha.
- Construction and use of various haul roads, including an underpass under the Newell Highway, and a run-of-mine (ROM) pad.
- Construction and use of a processing plant and office area, incorporating a crushing and grinding circuit, a standard carbon-in-leach (CIL) processing plant, site offices, workshops, ablutions facilities, stores, car parking, and associated infrastructure.
- Construction and use of a residue storage facility (approximately 49ha).
- Construction and use of an approximately 46km water pipeline, from a licensed bore located approximately 7km to the east of Narromine, to the Mine Site (**Figures 1.3** and **1.4**).
- Construction and use of a transformer and electrical distribution network within the Mine Site (from the 20km of 66kV electricity transmission line from Peak Hill to the Mine Site to be constructed under separate approval) (**Figure 1.5**).
- Relocation of existing items of infrastructure, including a 22kV power line which currently passes over the area of the Caloma and Caloma Two Open Cuts.
- Re-routing (node to node) of a 4.2km section of a Nextgen Network fibre optic cable (telecommunications line).
- Construction and use of ancillary infrastructure, including the Main Site Access Road and intersection with the Tomingley West Road.
- Construction of soil stockpiles (for use in rehabilitation works).
- Construction of the Eastern Surface Water Diversion Structure to divert surface water flows to the east of mining and waste rock emplacement activities. Additional surface water management structures would be constructed within the Project Site to control surface water flows within the Mine Site (**Figure 2.5**).
- Construction and use of dewatering ponds to store water accumulating in and pumped from the open cuts.

Disturbance associated with the mining and associated activities would be progressively rehabilitated to create a geotechnically stable final landform, suitable for a final land use of nature conservation, agriculture, tourism and/or light industry.

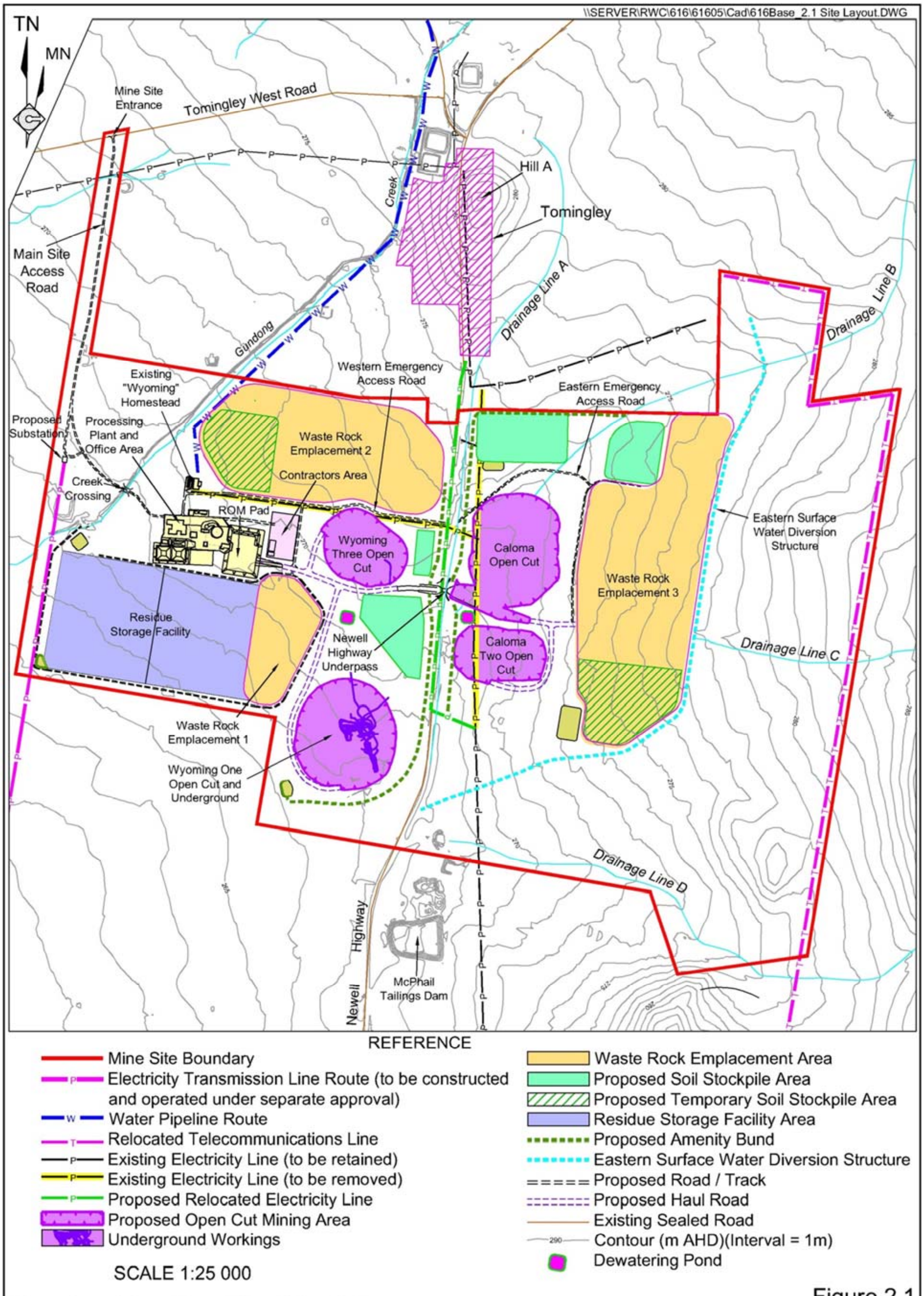


Figure 2.1
MINE SITE LAYOUT

It is noted that the design of the proposed Caloma Two Open Cut is an indicative design only, with additional drilling required to further define the mineralisation. As a result, the indicative design for the Caloma Two Open Cut presented in this document represents the maximum area that would be developed. The development of this maximum impact footprint has been taken into account in all other aspects of the Project, including the required capacity, layout and design of the waste rock emplacements and residue storage facility. Approval is sought for the proposed design, acknowledging that the final design of the open cut would be the same size or smaller than that displayed on **Figure 2.1**.

In addition, throughout the life of the Project, the Proponent proposes to undertake additional exploration drilling to further identify mineralisation. Should further mineable mineralisation be identified, and once sufficient information is available to adequately identify the proposed activities, a subsequent application for approval to extract these resources may be prepared.

2.1.3 Approvals Required

The Project would require project approval from the Minister for Planning and Infrastructure under Part 3A of the *Environmental Planning and Assessment Act 1979*. The application for project approval was made on 23 July 2009 (application number MP 09_0155). In addition, the following licences, leases, permits, agreements and approvals would be required to allow commencement of the Project.

1. An Environment Protection Licence issued by the NSW Office of Environment and Heritage (OEH) under Section 47 of the *Protection of the Environment Operations Act 1997* would be required for the proposed activities.
2. A Mining Lease issued by the Department of Trade and Investment, Regional Services and Infrastructure – Division of Resources and Energy (DTIRIS-DR&E) under the *Mining Act 1992*. The Proponent currently holds Exploration Licences 5675 and 5830 over the relevant sections of the Mine Site and will submit a Mining Lease Application (MLA) coinciding with the majority of the area covered by the Mine Site.
3. A dewatering licence issued by the NSW Office of Water (NOW) under Part 5 of the *Water Act 1912* would be required to account for the removal of groundwater in-flow into each of the proposed open cuts. An exemption to the current groundwater embargo under Order 2 of the *NSW Groundwater Shortage Zone Embargo* was sought on 23 October 2009.
4. A *Water Access Licence* (WAL) and Water Use Approval issued by NOW under Part 5 of the *Water Act 1912* would be required to permit extraction of water from the proposed water supply bores. The Proponent has a Call Option with the owner of "Woodlands" to purchase a 1 000ML share of WAL 20270 to the Lower Macquarie Zone 6 Groundwater Source.
5. One or more licences issued by NOW under Part 5 of the *Water Act 1912* would be required for each of the three existing and any additional proposed groundwater monitoring bores. The Proponent already holds licences for Monitoring Bores 2, 5 and 6.
6. A licence issued by NOW under *Part 8* of the *Water Act 1912* would be required for the construction of bunding to the southeast of Gundong Creek which could affect the nature of local flooding off the Mine Site.

7. A Section 138 Permit, issued by the Narromine Shire Council under the *Roads Act 1993*, would be required for all works (as described by Section 138 of the *Roads Act 1993*) affecting classified roads, namely:
   - Newell Highway (State Highway 17);
   - Mitchell Highway (State Highway 7); and
   - Tomingley-Narromine Road (Main Road 89).
8. A licence agreement between Australian Rail Track Corporation Ltd (ARTC) and the Proponent to construct a horizontal borehole beneath the Main Western Railway Line to carry the proposed water pipeline. The bore would be constructed in accordance with the requirements of Australian Standard AS 4799.
9. An approval from the NSW Dams Safety Committee for the design and construction of a residue storage facility.
10. A Licence issued by Workcover Authority of New South Wales for the storage and use of explosives, cyanide and other reagents within the Mine Site. This licence is typically only granted after the Department of Trade & Investment, Regional Infrastructure and Services – Division of Resources & Energy (DTIRIS-DR&E) approves a Security Plan for the storage and handling of explosives (including explosive precursors).
11. A high voltage Connection Agreement with County Energy which holds an electricity distributor's licence under the *Electricity Supply Act 1995*.
12. Approval from Country Energy to relocate a distribution asset.

It is noted that a *Works Authorisation Deed* was executed by Alkane Resources Ltd and the RTA effective from 12 May 2011. A *Works Authorisation Deed* is the agreement by which all works (as per the definition provided for in Section 138 of the *Roads Act 1993*), including the underpass of the Newell Highway pipeline and transmission line crossings of classified roads and works connecting to classified roads, will be administered by the RTA (including the design, construction, alteration, maintenance and demolition of those works). The terms of the *Work Authorisation Deed* also govern any other works as provided for in Section 138 of the *Roads Act 1993*, not expressly referred to in the *Work Authorisation Deed*, such as the connection of the proposed emergency roads to the Newell Highway.

In the event of any inconsistency between information provided in this *Environmental Assessment* and the executed *Work Authorisation Deed*, the terms of the *Work Authorisation Deed* will prevail.

2.2 SITE ESTABLISHMENT AND SERVICES RELOCATION

2.2.1 Introduction

In order for mining, processing and product transportation to be undertaken on the Mine Site, various infrastructure and other site features would be required to be established. The various site establishment activities described in the following sub-sections are as follows.

- Construction of a water supply line between the Mine Site and a licensed production bore (or bores) located on a private property near Narromine (see Section 2.2.2).

- Construction of a 66kV electricity transmission line and distribution network (see Section 2.2.3)[1].
- Construction of an underpass beneath the Newell Highway (see Section 2.2.4).
- Construction of an access road to the Mine Site and intersection with the public road network (see Section 2.2.5).
- Construction of a range of amenity bunds, surface water diversion and retention structures (see Section 2.2.6).

Site establishment would also include the construction of various infrastructure and facilities associated with processing operations (Section 2.6), processing residue management and storage (Section 2.7), internal movement of vehicles and mobile equipment (Section 2.9), and administrative and maintenance facilities (Section 2.10). The infrastructure and facilities associated with these activities are included in the relevant referenced sub-sections.

Complete site establishment, i.e. complete construction of all Mine Site infrastructure and facilities, is anticipated to take 12 months although it is noted that mining and processing would be undertaken concurrently for a period towards the end of the site establishment phase.

Those public services that would be relocated are as follows.

- A 22kV electricity transmission line (see Section 2.2.7)[2].
- A Nextgen Network fibre optic cable adjacent to the Newell Highway (see Section 2.2.8).

2.2.2 Water Supply Bores and Water Pipeline

2.2.2.1 Water Supply Bores

The Proponent would draw its principal water supply from a licensed production bore (or bores) located on private property, "Woodlands", located approximately 7km to the east of Narromine. A licensed and equipped test bore (close to the production bore) would be used as a back-up supply during maintenance of the production bore.

The owner of "Woodlands" has obtained the appropriate licences required for the construction and operation of the test and production water supply bores. The Proponent has a Call Option with the owner of "Woodlands" to purchase a 1 000ML share of his Water Access Licence to the Lower Macquarie Zone 6 Groundwater Source.

2.2.2.2 Water Supply Pipeline

During the site establishment stage of the Project, the Proponent would construct and operate a water pipeline to the Mine Site from the "Woodlands" bore(s). With the exception of those sections of the route within the "Woodlands" property at the northern end of the pipeline and "Wyoming" property at the southern end of the pipeline, the pipeline route would be entirely within road and railway reserves. On the "Woodlands" property, an easement approximately 750m long and 10m wide (0.85ha) would be created from the Mitchell Highway road reserve along the "Woodlands" access road to the bores (**Figure 2.2**).

[1] Approval for the construction and operation of the 66kV electricity transmission line and distribution network is being sought separately from Essential Energy under Part 5 of the EP&A Act.

[2] Approval for the relocation and operation of the 22kV electricity transmission line is being sought separately from Essential Energy under Part 5 of the EP&A Act.

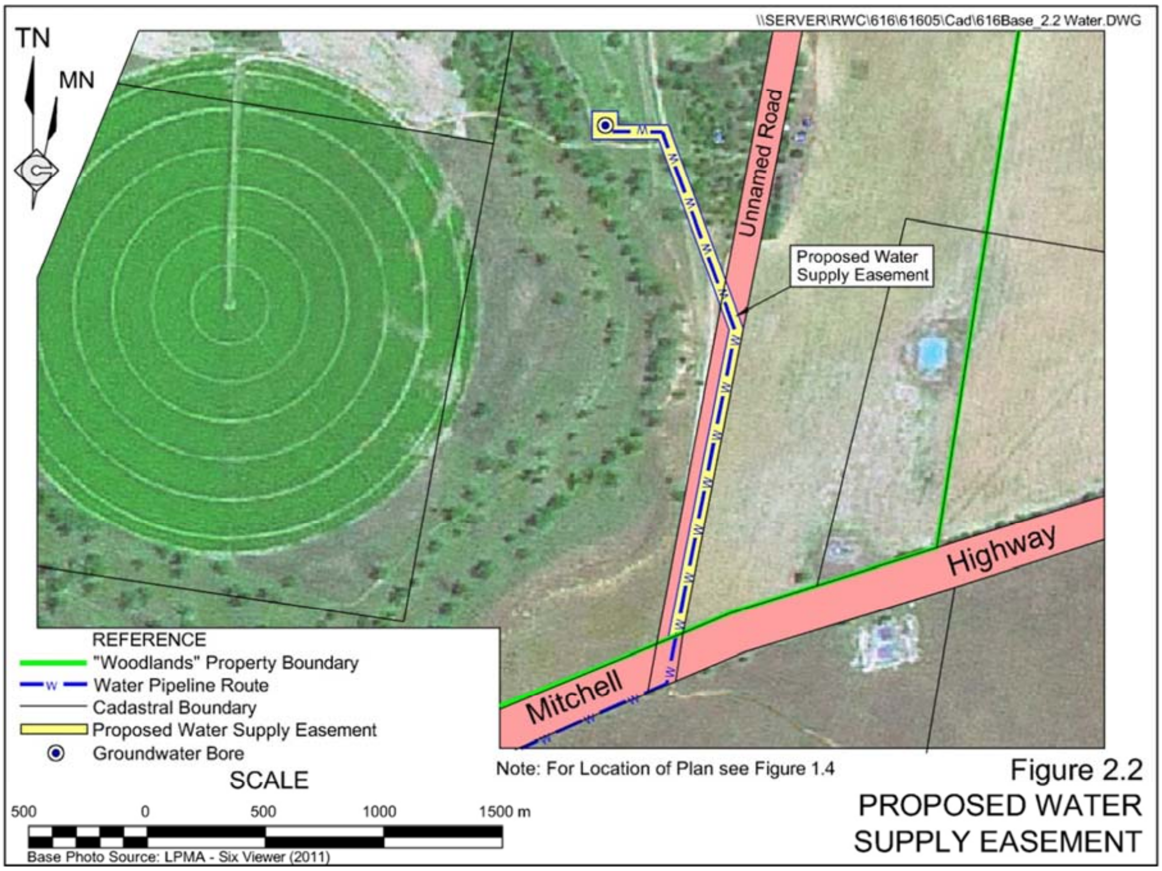


Figure 2.2
PROPOSED WATER SUPPLY EASEMENT

The water pipeline would be constructed of 315mm to 280mm external diameter polyethylene pipe. With the exception of each end of the pipeline and any outlets that may be constructed along the pipeline route, the pipeline would be buried up to 1m below surface. All joins in the pipeline would be butt fusion welded and tests would be undertaken to ensure the integrity of each join before it is buried.

The trench for the pipeline would be excavated using trenchers, mini-excavators and/or backhoes. All equipment would be selected to minimise the disturbance footprint of the trench construction. The trench would be approximately 1.4m deep and 0.6m wide. With the exception of small sections in the vicinity of joins in the pipe, generally no more than 200m of the excavation would be open and unprotected at any one time. In the vicinity of joins in the pipe, small sections of the excavation would remain open to permit pressure testing of all joins in the pipe. While this is occurring, all open sections of the trench would be fenced to prevent any unauthorised or accidental access by persons, livestock or native fauna and appropriately signposted. Once pressure testing is complete, the open sections of the trench would be backfilled and the area of disturbance rehabilitated as soon as practicable. Should other sections of the excavation be required to be left open for any purpose, they would also be fenced and signposted.

The Proponent notes that the proposed water supply pipeline would cross the Mitchell Highway, Main Western Railway Line, sealed and unsealed local roads, several private farm access roads and four identifiable drainage lines. The crossings beneath the highway, local roads, railway and creeks would be constructed using horizontal drilling techniques. This would be undertaken using a drill rig at an appropriate set back from the road, rail line or drainage line to be crossed. The appropriate set back from drainage lines would be 40m with the set back from roads and rail line to be determined in consultation with the relevant authority in each case. The resulting drill hole would be cased to allow later placement of the water supply pipeline. In the case of drainage lines, the drill rig would be setback at least 40m from the top bank of the drainage line. In addition, no significant ground disturbance such as access tracks would be permitted within 20m of the top bank of any drainage line along the alignment of the pipeline.

The Proponent anticipates that it will require less than 1 000ML per year to be drawn from the "Woodlands" bore(s) for operational purposes. Based on the estimated water requirements for the Project (see Section 2.10.3.5), the potential exists for some surplus water to be provided to Tomingley village for stock and domestic use. In addition, following completion of the Project, the pipeline would remain in place and would potentially be available for other classes of development. To accommodate availability of water to future developments, water take-off points may be constructed along the water supply pipeline following completion of the Project and granting of all required approvals and licences.

2.2.3 Electricity Transmission Line, Substation, Transformer and Distribution Network

The Proponent would commission the construction of approximately 20km of 66kV electricity-transmission line from an existing Essential Energy operated substation on the southern edge of Peak Hill to a proposed transformer within the Mine Site (**Figure 2.1**). As noted in Sections 2.1 and 2.2.1, the Electricity Transmission Line, which traverses both freehold land and road reserves, would be constructed under approval to be obtained in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979.* The Proponent has negotiated appropriate arrangements with the majority of landowners, occupiers and relevant public authorities to establish the required electricity easement. The electricity transmission line would be constructed in accordance with Essential Energy's *High Voltage Connection Requirements* (CEPG8079 Issue 2).

The Proponent would construct and operate a 66kV to 11kV substation and transformer within the Project Site (**Figure 2.1**). The substation and transformer would comply with Australian Standard AS 2067 - *Switch Gear Assemblies and Ancillary Equipment for Alternating Voltages above 1kV* and would be enclosed within a 2.5m high security fence and appropriate signage would be installed.

Following construction, ownership, operation and maintenance responsibilities for the proposed electricity transmission line would pass to Essential Energy, under approval obtained under Part 5 of the EP&A Act. Essential Energy may continue to operate the line beyond the life of the Project.

Power would be distributed to the processing plant, offices, workshops and other areas by a combination of overhead and underground power lines.

2.2.4 Newell Highway Underpass

2.2.4.1 Introduction

The Caloma and Caloma Two Open Cuts are located to the east of the Newell Highway which separates these open cuts from the major Project-related infrastructure, particularly the processing plant and site offices, located to the west of the highway. Notably, the Newell Highway is the principal north-south road transportation route through central NSW and is the principal inland route between Melbourne and Brisbane. As a result, it would not be appropriate for mining-related vehicles to cross the highway and interact with traffic using the highway. The Proponent therefore proposes to construct an underpass beneath the Newell Highway to allow light and heavy mining-related vehicles to travel beneath the highway (see **Figure 2.3**).

2.2.4.2 Underpass Design and Construction Parameters

The underpass would be constructed during the site establishment stage of the Project. **Figure 2.4** presents an indicative cross section and long section through the proposed underpass. In summary, an arch structure would be constructed to allow Project-related vehicles to pass beneath the Newell Highway. The highway underpass arch would be designed to meet the requirements of the Austroads "*Guide to Road Design*" (Austroads, 2009) and be based on a concrete arch structure or precast concrete arches to Australian Standards or Roads and Traffic Authority (RTA) standards. The structure would have the following indicative design parameters.

- Maximum clearance above haul road – 9.15m.
- Width at base of arch – 9.8m.
- Haul truck clearance envelope – 10.6m wide x 7.0m high.
- Tunnel length at base – 45m.
- Distance between top of arch and Newell Highway road surface – 1.5m.

Construction of the underpass would require the construction of a temporary diversion of the Newell Highway, excavation and then re-construction of approximately 30m to 50m of the Newell Highway on its current alignment. Additionally, tapered widening of the edge of the highway would be required for approximately 50m each side of the underpass and re-instatement works would be required where the temporary side track connects to the highway (see Section 2.2.4.3). Where the highway crosses the underpass, it would be constructed in accordance with the RTA *Road Design Guide* to the following design parameters.

- Two lanes of approximately 3.5m width.
- A central median of approximately 1.2m width.
- Two sealed shoulders of approximately 2m width.
- Safety barriers to Australian Standard *AS 5100 – Bridge Design*, where appropriate.
- Pavement design to the satisfaction of the RTA.
- Appropriate verges and road side drainage.

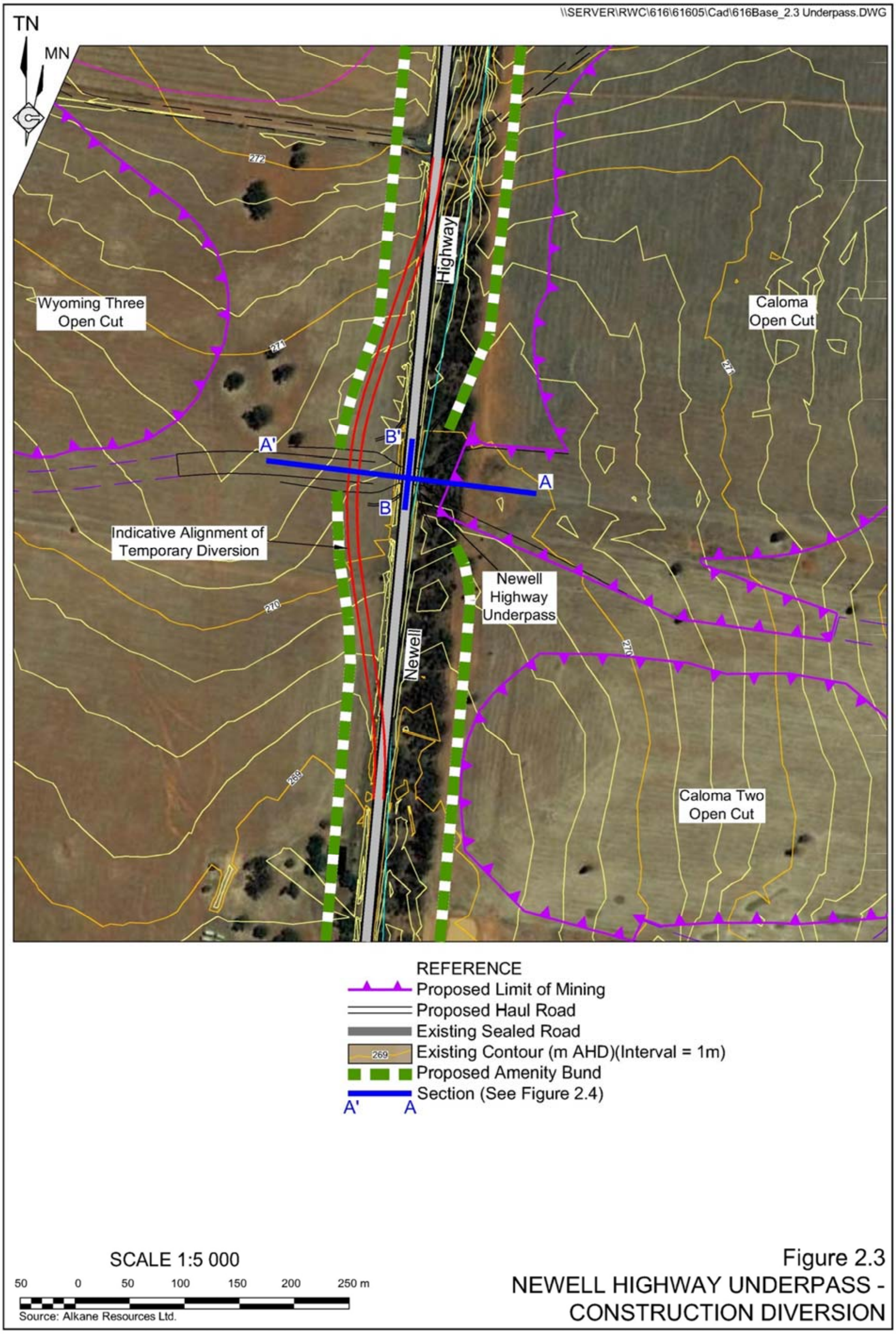


Figure 2.3
NEWELL HIGHWAY UNDERPASS - CONSTRUCTION DIVERSION

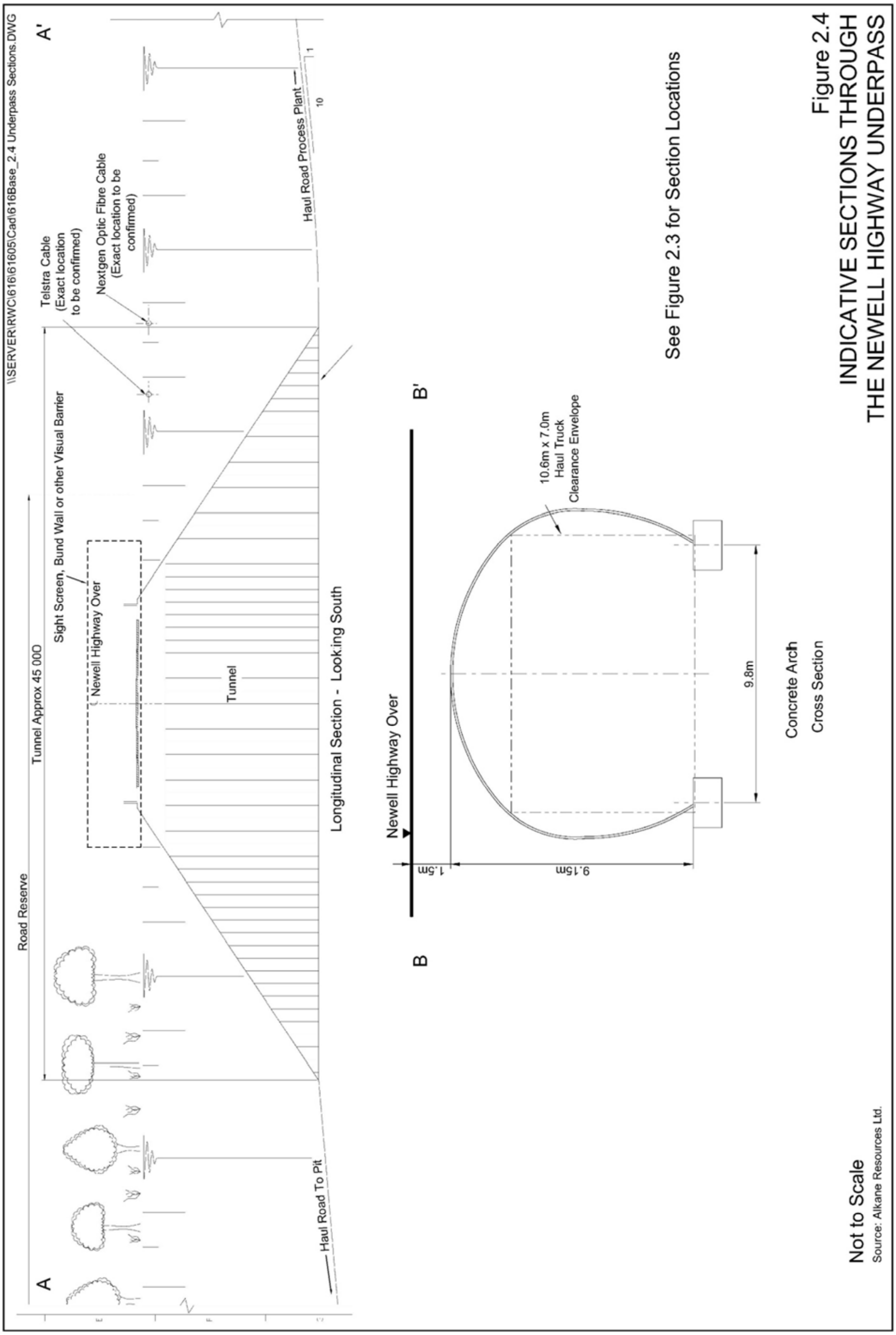


Figure 2.4
INDICATIVE SECTIONS THROUGH THE NEWELL HIGHWAY UNDERPASS

The underpass would be constructed in such a manner that the haulage ramp from the Caloma Open Cut would merge with the eastern end of the underpass such that the grade of the ramp and eastern approach to the underpass would be relatively constant. As a result, vehicles travelling from the Caloma and Caloma Two Open Cuts to the processing plant would not reach the elevation of the natural surface until they have passed through the underpass.

2.2.4.3 Construction of the Underpass

The underpass would be constructed by a suitably qualified and experienced roads construction contractor approved by the RTA. The Proponent anticipates that construction of the underpass would require approximately 14 weeks.

During construction of the underpass, a temporary side track or construction diversion would be provided to divert traffic around the construction site (**Figure 2.3**). The side track would be constructed for two-way traffic in accordance with RTA requirements and the following indicative design parameters.

- Design speed 90km/h for a signposted 80km/h speed zone throughout in accordance with Austroads (2009).
- Minimum 9m width seal and verge with edge line markings.
- Pavement design to RTA approval with minimum 400mm pavement thickness.
- Provision for oversized loads up to 8m wide.

The Proponent would prepare, in consultation with the Roads and Traffic Authority, a *Construction Road Traffic Management Plan* prior to commencing construction of the side track.

Once no longer required, the Proponent would rehabilitate those sections of the footprint of the side track not required for mining-related purposes.

2.2.4.4 Operation of the Underpass

Following completion of construction operations, the speed limit on the Newell Highway would return to 100km/hr.

The Proponent would prepare and implement a *Mine Site Traffic Management Plan* for Project-related traffic within the Mine Site. This would include measures to ensure safe operation of the underpass. These measures would include the following.

- A speed limit of 40km/hr will be enforced.
- A one-way traffic system that would ensure that haul trucks do not pass within the underpass.
- A warning system to alert drivers of haul trucks approaching the underpass with the truck trays elevated.

2.2.5 Main Site Access Road and Intersection

The Proponent would construct a new private road from the Tomingley West Road to the Processing Plant and Office Area (the 'Main Site Access Road') (**Figure 2.1**). The road would be located adjacent to the western boundary of the Mine Site and would require construction of an intersection between the Main Site Access Road and the Tomingley West Road, as well as a crossing over Gundong Creek.

The Main Site Access Road would be an all-weather, unsealed two lane road suitable for use by light and heavy vehicles and be sufficiently wide that two loaded semitrailer trucks can pass safely. The road would be elevated approximately 0.3m above the natural ground surface and appropriate road-side drainage would be constructed in accordance with the requirements of *Managing Urban Stormwater – Soils and Construction – Volume 2C Unsealed Roads* published by the Department of Environment and Climate Change in 2008 (DECC, 2008a).

The intersection with the Tomingley West Road would be constructed to the standard identified in Part 4 of Austroads (2009) for rural property access, with the major movements being left-in and right-out. The intersection would be sealed and an approximately 50m length of the Main Site Access Road adjacent to the intersection would also be sealed. The sealing of the section of the access road closest to the Tomingley West Road would assist in minimising the tracking of mud and fine materials from the Mine Site onto the Tomingley West Road.

The Main Site Access Road would cross Gundong Creek, an ephemeral creek with a catchment of approximately 9.1km^2, at a point 200m west of the Processing Plant and Office Area (**Figure 2.5**). A detailed description of Gundong Creek is provided by Section 4.3.2.2. The crossing has been located to ensure that existing stands of vegetation are retained. The crossing would comprise three, 1.5m wide x 0.9m deep box culverts (in accordance with the recommendations of SEEC, 2011). These culverts would fit within the existing creek bed without the requirement for excessive earthworks of the creek bed and banks, and would have capacity close to the full bank stream flow before overtopping. Inlet and outlet erosion protection to the creek bed and banks would also be incorporated into the design. All disturbed areas would be stabilised and rehabilitated as required to restore the integrity of the riparian corridor. Additionally, the road profile has been designed to facilitate grades suitable for heavy vehicles over the Mine Site bund.

A profile of the proposed Main Site Access Road crossing of Gundong Creek is included in *Appendix 6* of SEEC (2011) identifying the gradients and placement of the culverts in the existing channel. The impact of this profile design on local flooding is considered in Section 4.3.5.3, and indicates that any change in flood height will be almost completely restricted to the Mine Site and would not have a detrimental effect on adjoining landholders. The crossing design would achieve the assessment objectives of the NSW Office of Water '*Guidelines for Controlled Activities*' (see *Appendix 7* of SEEC, 2011).

In the event of a rainfall event in excess of the design criteria of the Main Site Access Road or a flood event that covers the Tomingley West Road, the Main Site Access Road would not be used. An alternative emergency site access road, namely the existing "Wyoming" property access road, would be maintained to allow personnel to access the Mine Site directly from the Newell Highway without the requirement to cross Gundong Creek (**Figure 2.1**).

2.2.6 Amenity Bunds and Surface Water Control Structures

2.2.6.1 Introduction

The Proponent has identified that in order to manage visual amenity of the Mine Site from surrounding vantage points and surface water-related aspects of the surrounding environment, a range of amenity bunds and surface water control structures would be required **(Figure 2.5)**.

The amenity bunds would screen the mining activity from passing traffic on the Newell Highway and residents of Tomingley (see Section 4.8.3). Bunds constructed for the purpose of providing acoustic attenuation of Mine Site activities are discussed separately in Sections 2.5.4 and 4.2.5.

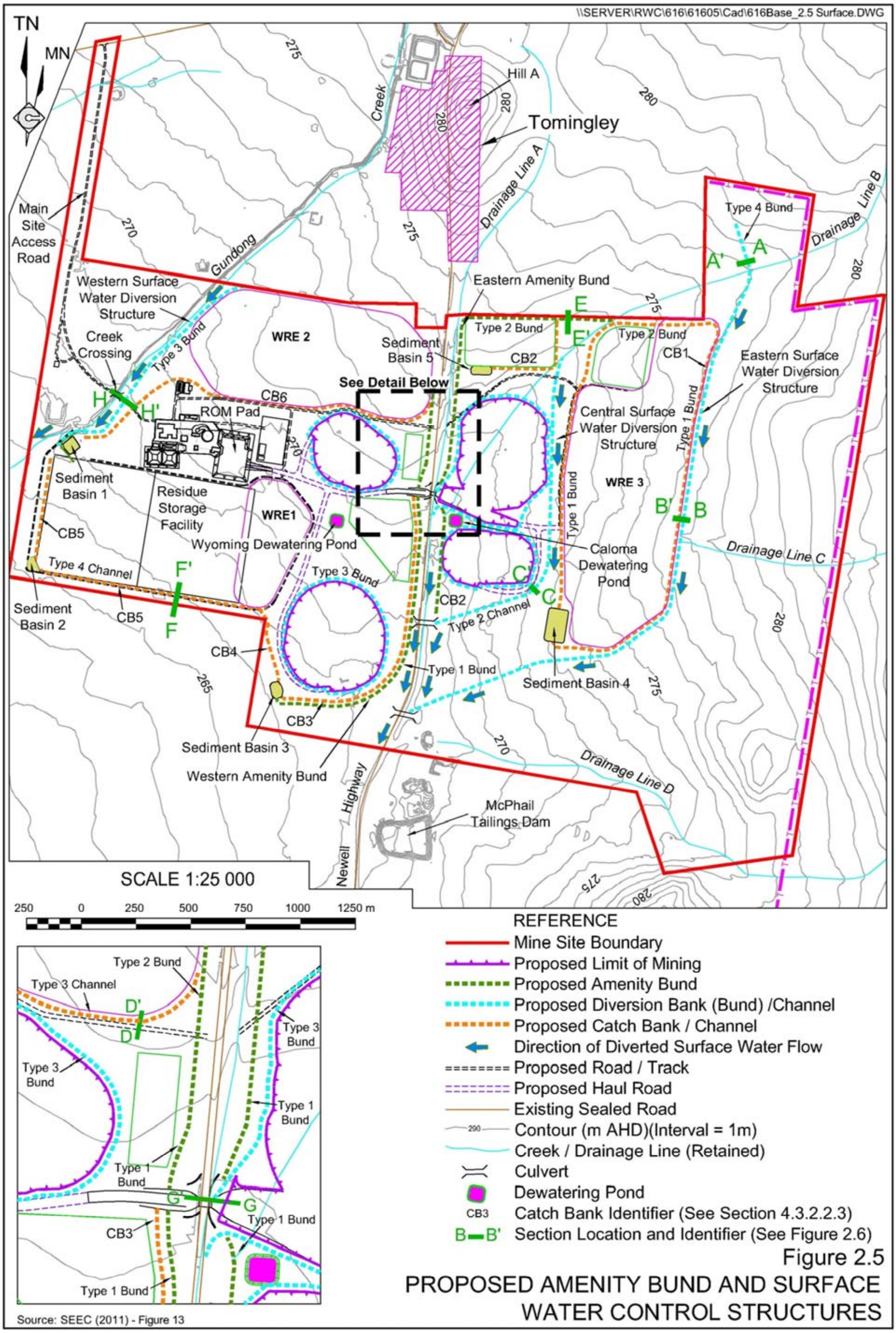


Figure 2.5
PROPOSED AMENITY BUND AND SURFACE WATER CONTROL STRUCTURES

The surface water control structures to be constructed would include the following.

- Diversion banks and channels for diverting surface water from undisturbed sections of the Mine Site away from disturbed sections.
- Catch banks and channels for containing potentially sediment- or salt-laden water within the disturbed sections of the Mine Site.
- Sediment basins for retaining potentially sediment-laden water for a sufficient period until it may be discharged in accordance with the site's Environment Protection Licence.

During construction of the amenity bunds and surface water control structures, soil would initially be removed as described in Section 2.3.3.3. Channels and basins would be excavated with the removed subsoil and waste rock removed used to construct the associated bund. Where no channel is required, or where supplementary material is required, the bunds would be constructed using subsoil and/or waste rock material excavated from the open cuts. Each of the structures would then be shaped, erosion protection works installed (where required), subsoil and topsoil spread and the final landform revegetated. Each of the amenity bunds and surface water control structures would be retained in the final landform and have been designed to be stable in the long term.

The Proponent anticipates that the initial revegetation program for the amenity bunds and surface water control structures would be used as a trial for later, larger-scale revegetation programs within the Mine Site.

Section 2.2.6.2 provides the design and construction details for the surface water control structures identified on **Figure 2.5**. Section 2.2.6.3 provides the design and construction details for the amenity bunds.

2.2.6.2 Surface Water Control Structures

Design and Construction

Figure 2.5 presents the location of each of the proposed surface water control structures. In summary, four classes of bunds (referred to as Types 1, 2, 3 and 4 bunds) and four classes of channels (referred to as Types 1, 2, 3 and 4 channels) have been identified. Cross-sections A-A' to H-H' (identified on **Figure 2.5**) of **Figure 2.6** provide an overview of the design parameters of each of the proposed bunds and channels. These have been designed by Mintrex who state that each has been designed to divert surface waters to an Annual Recurrence Interval rainfall event of 1 in 100 years (Mintrex, 2009).

The following sub-sections provide an overview of the key surface water control structures of the Mine Site.

Eastern Surface Water Diversion Structure

The Eastern Surface Water Diversion Structure would be constructed to divert surface water flows from the northeast, east and southeast of Waste Rock Emplacement 3 to the south of the proposed areas of disturbance. As illustrated on **Figure 2.6**, it would comprise a combination of a Type 1 and Type 4 bund and a Type 1 channel. It is noted that the depth of the Type 1 channel would vary along the length of the channel to a maximum of 3.4m deep. The eastern toe of Waste Rock Emplacement 3 would be constructed in a manner that is consistent with the proposed design of a Type 1 bund.

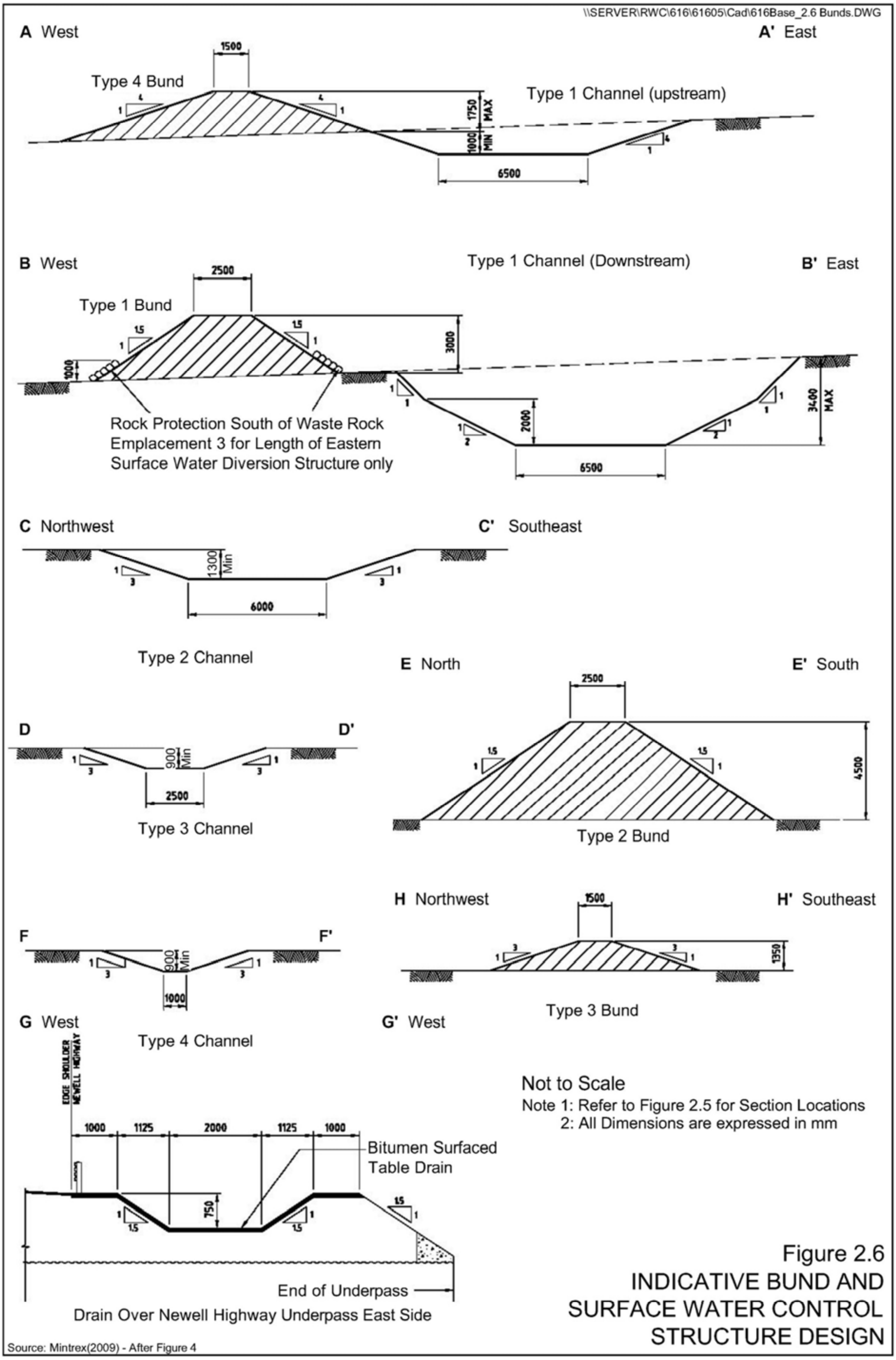


Figure 2.6
INDICATIVE BUND AND SURFACE WATER CONTROL STRUCTURE DESIGN

This structure would provide protection to the open cuts to prevent a sudden in-rush of water and would ensure that clean surface water, namely surface water from undisturbed sections of the Mine Site and surrounding areas is separated from potentially sediment-laden water, namely surface water from disturbed sections of the Mine Site. An assessment of the surface water aspects of the environment is provided in Section 4.3.5.

Other Bunds and Channels

Cross-section C-C' (**Figure 2.6**) provides the design features of a Type 2 channel structure which would be constructed between the Caloma Open Cut and Waste Rock Emplacement 3 to divert surface water away from disturbed sections of the Mine Site (**Figure 2.5**). The Type 2 channel would be approximately 1.3m deep, with a width at the base of approximately 6m and side slopes of approximately 1:3 (V:H).

Cross-section D-D' (**Figure 2.6**) provides the design features of a Type 3 channel which would be constructed to the north of the Emergency Access Road to divert surface water from the northern section of the Mine Site, in particular Waste Rock Emplacement 2, to Sedimentation Basin 1 (SB1) (**Figure 2.5**). The Type 3 channel would be approximately 0.9m deep, with a width at the base of approximately 2.5m and side slopes of approximately 1:3 (V:H).

Cross-section H-H' (**Figure 2.6**) provides the design features of a Type 3 bund which would be constructed in the following locations (**Figure 2.5**).

- Surrounding each of the proposed open cuts, including adjacent to the haul road passing through the Newell Highway Underpass.
- Between the southern end of the Western Amenity Bund and Waste Rock Emplacement 1.
- To the east of Gundong Creek (Western Surface Water Diversion Structure).

The Type 3 bunds would be between approximately 1.3m and 1.4m high, have side slopes of approximately 1:3 (V:H) and a crest width of approximately 1.5m and would divert surface water away from and/or retain potentially sediment-laden water within disturbed sections of the Mine Site. In addition, these bunds would prevent inadvertent vehicular access to the upper crest of the open cuts.

Cross-section F-F' (**Figure 2.6**) provides the design features of a Type 4 channel which would be constructed in the following locations (**Figure 2.5**).

- To the west of Wyoming One Open Cut to divert potentially sediment-laden water to Sediment Basin 3. To the south and west of the RSF to divert potentially sediment-laden water to Sediment Basin 2.
- Down slope of the soil stockpile to the north of Caloma Open Cut to divert potentially sediment-laden water to Sediment Basin 5.

The Type 4 channels would be approximately 0.9m deep, with a width at the base of approximately 1m and side slopes of approximately 1:3 (V:H). These structures would allow surface water in the vicinity of the RSF to be kept separate from surface water from other sections of the Mine Site.

A bitumen surfaced table drain (Cross-section G-G' of **Figure 2.6**) would be constructed on the eastern side of the Newell Highway over the proposed underpass to permit surface water to flow within the road reserve to the south of the underpass (**Figure 2.5**).

Sediment Basins

Five sediment basins would be constructed within the Mine Site as indicated on **Figure 2.5**. The capacity of these basins has been determined by SEEC (2011) who undertook the surface water assessment for the Project (Part 2 of the *Specialist Consultant Studies Compendium*). SEEC (2011) state that the capacity of each basin have been determined in accordance with the requirements of Landcom (2004) and DECC (2008b) for the 5-day, 90th percentile rainfall depth. The calculated basin capacities are as follows.

- Sediment Basin 1 – 19 700m^3.
- Sediment Basin 2 – 2 900m^3.
- Sediment Basin 3 – 7 000m^3.
- Sediment Basin 4 – 14 880m^3.
- Sediment Basin 5 – 1 840m^3.

The sediment basins would be managed in accordance with the recommendations presented in *Section 7.3.1* of SEEC (2010). In summary, these measures would include the following.

- The sediment basins would be generally maintained in an empty state, with in-flowing water preferentially used within the Mine Site, as far as practicable, for operational purposes such as dust suppression and processing operations.
- If required, water would only be discharged from the sediment basins when the concentration of suspended sediment is less than that specified in the Environment Protection Licence.
- A sediment storage zone would be maintained within each basin and accumulated sediment would be removed, as required.
- All sediment basins would be inspected regularly and following any rainfall event exceeding 5mm.

Mine Dewatering Ponds

Two mine dewatering ponds would be constructed as shown on **Figure 2.5**. These ponds would only receive water pumped from the open cut or underground mining operations, as required. Given the saline nature of the groundwater, each dewatering pond would be constructed using clay of low to medium plasticity which, when compacted, has a permeability of less than 1×10^{-9}m/sec (classified as very low permeability). These ponds would not receive surface water flows. The accumulated water within the dams would not be discharged and would be used for mining-related purposes within the Mine Site Amenity Bunds

2.2.6.3 Amenity Bunds

Type 1 and Type 2 bunds (**Figure 2.6**) would be constructed to the east and west of the Newell Highway and to the north of the Caloma Open Cut (**Figure 2.5**). Type 1 bunds (see cross section B-B' of **Figure 2.6**) constructed to a height of 3m would be located to the south of the emergency access road from both the Caloma and Wyoming sides of the Mine Site. Type 2 bunds would be constructed to the north of these emergency access roads to where the bund joins Waste Rock Emplacement 2 (on the western side of the Mine Site) and Waste Rock Emplacement 3 (on the eastern side of the Mine Site). The bunds would be constructed in a manner that would, together with the topsoil stockpiles and Waste Rock Emplacements 2 and 3, limit the visual and noise impacts of the Project on surrounding residents and limit the visibility of the Mine Site for motorists travelling on the Newell Highway.

It is noted that Waste Rock Emplacements 2 and 3 would initially be constructed with a northern face that would act as an amenity bund approximately 15m high. In line with the design provided by **Table 2.5** (Section 2.5.3), the initial amenity bund component of these two waste rock emplacements would have outer slopes of 1:3(V:H). The inner slopes (which would not be visible from vantage points off the Mine Site) would be retained at the angle of repose of the waste rock.

2.2.7 Relocation of Power Lines

As indicated on **Figure 2.1,** a 22kV electricity transmission line is currently located in close proximity to the proposed Caloma and Caloma Two Open Cuts and would be relocated.

In summary, approximately 1.8km of the 22kV line would be constructed from a point on the northern boundary of the Mine Site along the western side of the Newell Highway to a point approximately 550m north of southern Mine Site boundary. The relocated line would, with two exceptions, be located on property that owned by the Proponent. The line would, however, be required to cross the Newell Highway twice. Approximately 1.7km of the existing 22kV line would be removed as indicated on **Figure 2.1**.

In addition, approximately 1.3km of the existing line which supplies the “Wyoming” homestead in the vicinity of the Wyoming Three Open Cut would be removed. This line would not be relocated.

2.2.8 Relocation of Telecommunication Cables

The following telecommunication cables are located within the Mine Site.

- Nextgen Network Pty Limited Fibre Optic Cable - buried inside “Wyoming” property boundary on the western side on the Newell Highway (Route SB2, Section R1:02).
- Telstra copper cable buried within the “Wyoming” property boundary (west of the Newell Highway).
- Disused Telstra copper cable buried in the eastern section of the Newell Highway road reserve.

These cables would be disturbed during construction of the Newell Highway underpass. As a result, the Proponent proposes to relocate an approximately 7.2km section of the Nextgen Network cable as indicated on **Figure 2.7** prior to commencing construction operations for the Newell Highway underpass. The Proponent has consulted with Nextgen Network and has confirmed that the cable would be relocated by an appropriately experienced and licensed contractor and the relocated cables would be installed to the appropriate standard.

The Telstra cable located within the “Wyoming” property boundary would be relocated during the construction of the Newell Highway underpass. The disused Telstra cable would not be relocated. The Proponent has consulted with Telstra Network Integrity (Asset Re-location) in relation to this matter. It is expected that following inspection of the abandoned Tomingley–McPhail buried copper line, written permission to terminate the line north of the proposed underpass will be provided as it is highly unlikely this line would ever need to be re-activated.

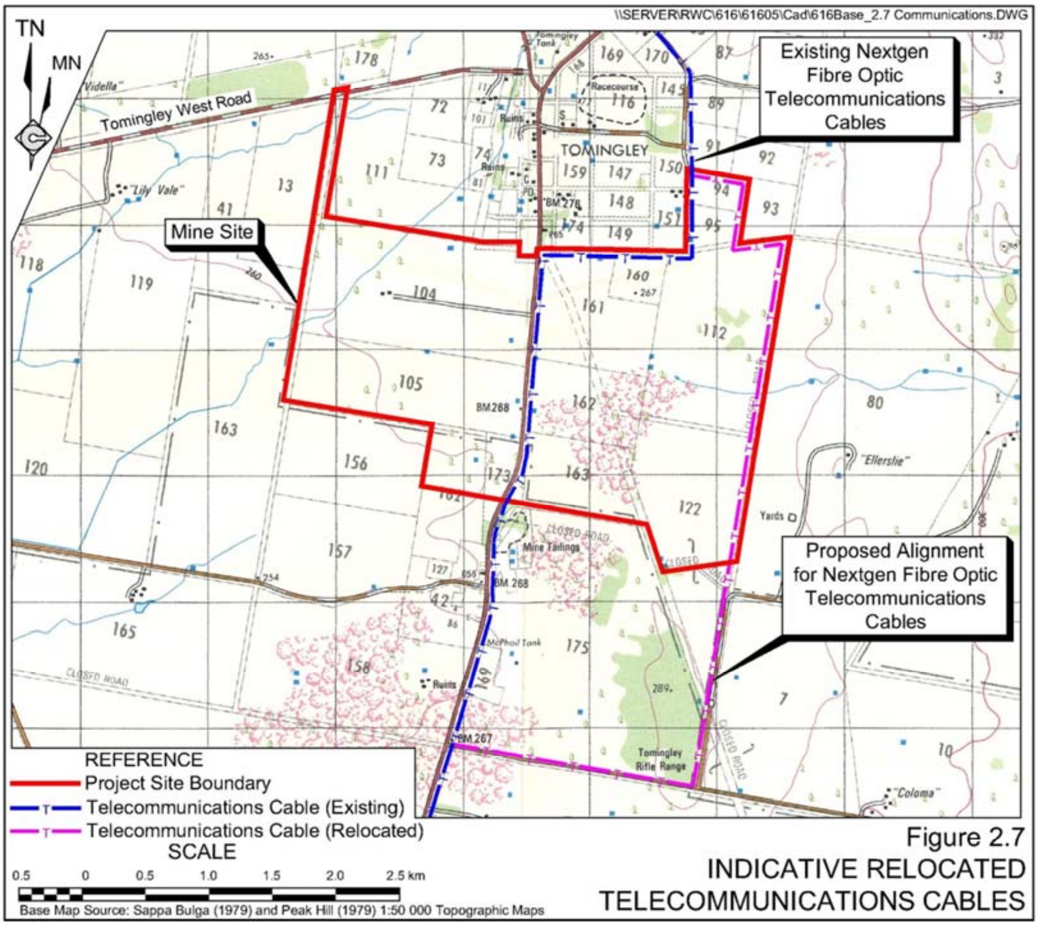


Figure 2.7
INDICATIVE RELOCATED TELECOMMUNICATIONS CABLES

2.3 SITE PREPARATION

2.3.1 Introduction

This section describes the activities that would be undertaken in preparation for mining operations, namely, removal of vegetation and soil stripping and stockpiling operations.

2.3.2 Vegetation Clearing

A large proportion of the Mine Site was cleared of native vegetation between the 1880s and the 1980s. However, of the approximately 156.3ha of remnant vegetation remaining within the Mine Site, approximately 21.6ha would need to be cleared of remnant native vegetation for the Project, comprising:

- approximately 2.7ha of Inland Grey Box – Poplar Box – White Cypress Pine tall woodland scattered across the Mine Site;
- approximately 0.9ha of Fuzzy Box – Inland Grey Box community in the vicinity of the Wyoming One Open Cut; and
- approximately 18.0ha of Belah / Black Oak Western Rosewood, Wilga Woodland community in the vicinity of the Caloma Two Open Cut and Waste Rock Emplacement 3.

It should be noted that the density of mature trees within the Belah/Black Oak Western Rosewood, Wilga Woodland community within the disturbance footprint has been extensively reduced and modified by historic ringbarking activities.

Approximately 0.7ha of planted Mugga Ironbark would also require clearing from within the footprint of Waste Rock Emplacement 2. Approximately 12.9ha of River Red Gum riverine woodland occurring in the vicinity of the Main Site Access Road and Waste Rock Emplacement 2 would remain undisturbed.

During vegetation clearing operations, larger vegetation would be removed using a bulldozer with its blade positioned just above the surface. It is noted that two modified trees with Indigenous heritage significance were identified during the Aboriginal heritage field survey (see Section 4.6.7.5). These trees would be removed and retained in accordance with the procedures identified in Section 4.6.8.

All other tree trunks would be stored for later use in rehabilitation activities. Wherever possible, available seed would be harvested prior to clearing.

Ground cover vegetation would be removed with the topsoil to maximise the retention of the seed bank and nutrients within the soil, as well as to minimise opportunities for erosion and dust lift-off between removal of the larger vegetation and soil stripping.

2.3.3 Soil Stripping

2.3.3.1 Introduction

Soil materials within those sections of the Mine Site that would be disturbed have been assessed by Sustainable Soils Management. A full description of the soils assessment is provided in SSM (2011) (Part 8 of the *Specialist Consultant Studies Compendium*) and summarised in Section 4.12.3. The following sections identify the soil categories identified within and surrounding the Mine Site, the proposed maximum stripping depths, the volumes of soil that would be available for use during rehabilitation and the procedures that would be used during soil stripping and stockpiling operations.

2.3.3.2 Soil Units, Stripping Depths and Inventory

Six soil units have been identified within and surrounding the Mine Site as follows (**Figure 2.8**).

- Red Dermosol – This soil unit is characterised by a red, silty clay loam topsoil over a light clay subsoil.
- Grey Dermosol – This soil unit is characterised by a variety of sandy and silty material in layers up to 30cm, deposited as alluvial material from Gundong Creek.
- Brown Dermosol – This soil unit is similar to the Red Dermosol, however, an electrical geophysical survey indicated that this material had a very low conductivity.
- Sodic Dermosol – This soil unit is characterised by a silty clay loam topsoil over an alkaline, light grey subsoil.
- Sodic Gilgaied Dermosol - This soil unit is characterised by a strongly alkaline, uniform soil profile that has been extensively gilgaied.
- Rudosol – This soil unit is characterised by thin loamy soil with minimal profile development.

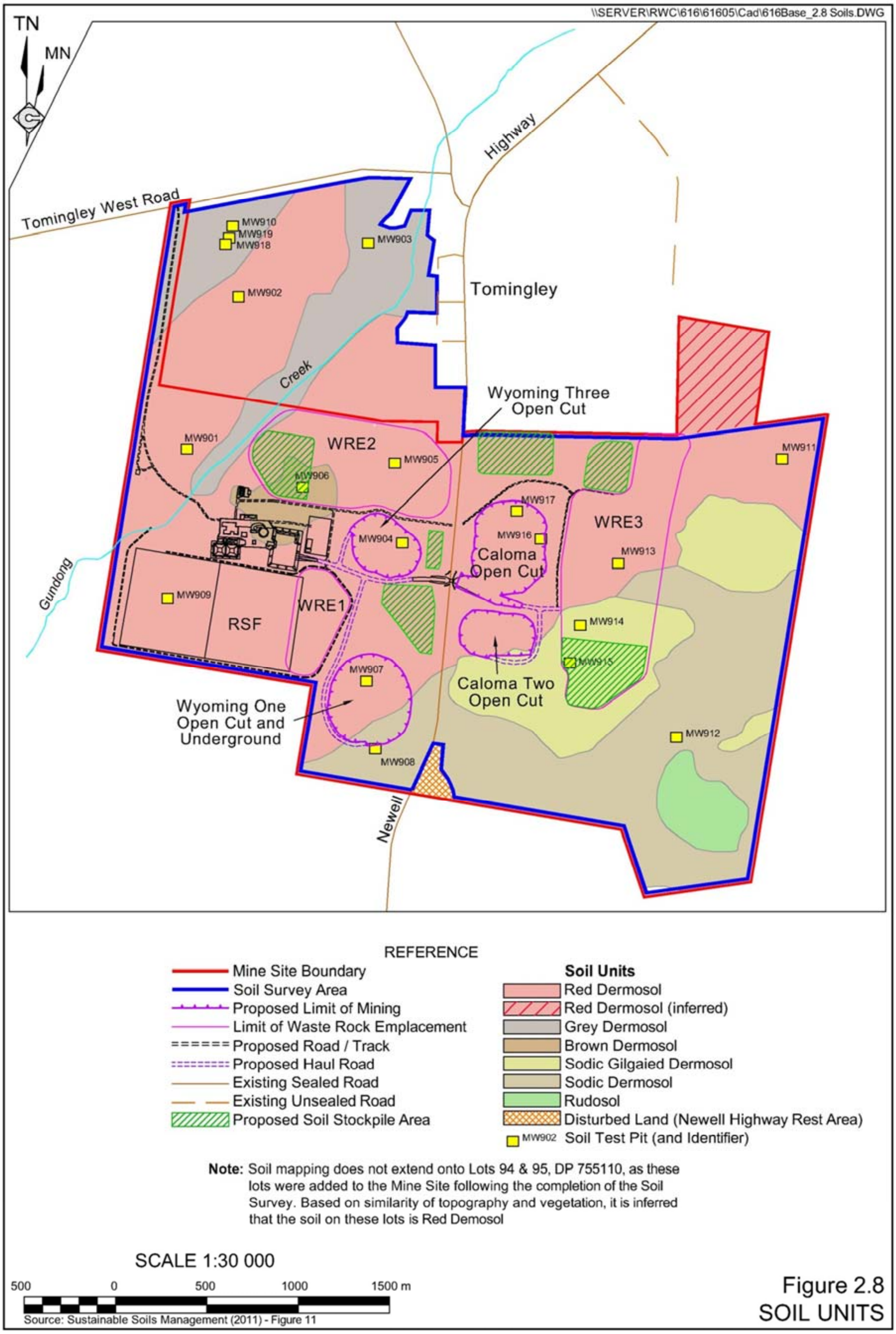


Figure 2.8
SOIL UNITS

It is noted that soil mapping does not extend onto Lots 94 and 95, DP755110 (**Figure 1.2**) as these two lots were added to the Mine Site following the completion of the soil survey. However, based on the similarity of topography and vegetation on the land to the immediate south, it is inferred that this soil is also Red Dermosol (the main soil type which occurs across the Mine Site).

Table 2.1 presents the available stripping depths and approximate volumes of each soil unit that could be stripped and available for rehabilitation operations based on recommendations provided in SSM (2011). It is noted that no rudosol soils would be disturbed through the life of the Project.

Table 2.1
Indicative Soil Inventory

Soil Unit	Area to be disturbed (ha)	Topsoil		Subsoil	
		Proposed Maximum Stripping Depth (cm)	Maximum Available Volume (m^3)	Proposed Maximum Stripping Depth (cm)[1,2]	Maximum Available Volume (m^3)[3]
Red Dermosol	142	30	426 000	20 to 70	639 000
Grey Dermosol	0.4	20	800	-	-
Brown Dermosol	16.0	50	80 000	-	-
Sodic Dermosol	20.0	-	-	-	-
Sodic Gilgaied Dermosol	2.7	-	-	-	-
Total	181.1		506 800		639 000

Note 1: Below Base Of Topsoil.
Note 2: Maximum Stripping Depth Determined By Presence of Mottling.
Note 3: Assumes average depth to mottling is 45cm.
Source: Modified after SSM (2010) – Table 10

It is noted that, with the exception of soil material placed on benches, the footprints of the proposed open cuts would not be rehabilitated. As a result, the volume of soil materials required for rehabilitation purposes would be significantly less than the maximum available volume.

The Proponent estimates that approximately 410 000m^3 of topsoil would be required for rehabilitation operations. As a result, the Proponent proposes to strip topsoil materials to the following approximate depths.

- Roads, buildings, processing plant – up to 30cm.
- Open cuts, waste rock emplacements, RSF, ROM pad and other processing infrastructure footprints – up to 30cm.
- Bunds and surface water diversion structures – 20cm.

The Sodic Dermosol and Sodic Gilgaied Dermosol soils, as identified on **Figure 2.8**, would not be stripped where these are to be overlain by Waste Rock Emplacement 3, internal roads or bunds associated with surface water control structures. Where stripping is required to develop Caloma Two and Wyoming One Open Cuts or the Eastern Surface Water Diversion Structure channel, the stripped soil would be placed within the appropriate waste rock emplacement.

Once the topsoil is stripped from the Red Dermosol soil type, subsoil would be stripped to a depth of 70cm below the natural land surface, or a depth where mottled soil is observed.

2.3.3.3 Soil Stripping Procedures

During soil stripping operations, the following procedures would be implemented.

- Strip soil material to the depths identified in Section 2.3.3.2.
- Strip both topsoil and subsoil within the footprints of the proposed open cuts, waste rock emplacements, RSF, amenity bunds and the eastern surface water diversion structure.
- Strip topsoil only within the footprints of all other areas of disturbance.
- Ensure that soil materials are not stripped when in either excessively dry or wet.
- Grade or push soil into windrows using graders or dozers for later collection by elevating scrapers or loading into trucks by front-end loaders to minimise compaction of soil materials.
- Use soil materials immediately in areas undergoing progressive rehabilitation, where practicable. Where this is not practicable, place soil transported by truck directly into storage or place soil transported by scrapers in thick "lifts" to minimise compaction.

2.3.3.4 Soil Stockpile Management

Figure 2.8 identifies six soil stockpile areas within the Mine Site. These would be located as follows.

- To the southeast of the Wyoming Three Open Cut.
- To the north of the Caloma Open Cut.
- To the northwest of Waste Rock Emplacement 3.
- In the southern section of Waste Rock Emplacement 3 (temporary stockpile).
- In the western section of Waste Rock Emplacement 2 (temporary stockpile).

In addition, soil materials would be effectively stockpiled in the construction of amenity and other bunds within the Mine Site.

The soil stockpiles within the footprints of Waste Rock Emplacements 2 and 3 would be temporary stockpiles and would be utilised during the life of the Project for progressive rehabilitation. The soil stored within the temporary stockpiles would be used preferentially for Mine Site rehabilitation with the remaining soil stockpiles only used once the soil contained within the temporary stockpiles is exhausted. Soil material 'stockpiled' within the amenity bunds would not be used during rehabilitation operations.

The following soil stockpile management procedures would be implemented.

- Minimise, as far as practicable, the operation of machinery on soil stockpiles to minimise compaction.
- Ensure that soil stockpiles have a maximum height of 5m comprising a maximum of 3m of subsoil, overlain by a maximum of 2m of topsoil.
- Leave the surface of the stockpile with an even but roughened surface to assist in erosion control and seed germination and emergence.
- Establish an appropriate vegetative cover on all soil stockpiles to be retained for more than 3 months.

2.4 MINING OPERATIONS

2.4.1 Introduction

Project approval is sought for the extraction of ore and waste rock from within the Caloma and Caloma Two, Wyoming Three and Wyoming One Open Cuts. This section provides an overview of the layout of each of the open cuts, a description of the proposed mining methods, mining rate and sequence and the equipment that would be used during mining operations.

2.4.2 Layout of the Proposed Open Cuts

Figure 2.9 presents an overview of the layout of each of the proposed open cuts.

Caloma Open Cut

The footprint of the Caloma Open Cut would be an irregular ellipse, with a long axis of approximately 580m and a width of approximately 400m. The maximum depth of the open cut would be approximately 180m below the natural land surface. One branch of the access ramp would be constructed in such a manner to enable vehicles using the ramp to enter the Newell Highway underpass from the east without first climbing to the natural surface. The other branch of the access ramp would permit transportation of waste rock from the open cut to Waste Rock Emplacement 3.

Caloma Two Open Cut

If proven viable, the estimated footprint of the Caloma Two Open Cut would be an irregular ellipse, with a long axis of approximately 400m and a width of approximately 250m. The maximum depth of the open cut would be approximately 100m below the natural land surface. Ore and waste rock material would be transported to the surface via a single haul road. Ore material would then be transported via the Caloma Open Cut access ramps to the processing plant.

Wyoming Three Open Cut

The footprint of the Wyoming Three Open Cut would be an irregular, east-west orientated ellipse with a long axis of approximately 420m and a width of approximately 270m. The maximum depth of the open cut would be approximately 100m below the natural land surface.

Wyoming One Open Cut

The footprint of the Wyoming One Open Cut would be an irregular ellipse with a long axis orientated northwest of approximately 475m and a width of approximately 430m. The maximum depth of the open cut would be approximately 180m below the natural land surface.

2.4.3 Open Cut Mining Method

2.4.3.1 Introduction

This sub-section provides a summary of the open cut mining methods that would be employed throughout the life of the Project. These methods would be broadly similar in each of the proposed open cuts and are shown schematically in **Figure 2.10**.

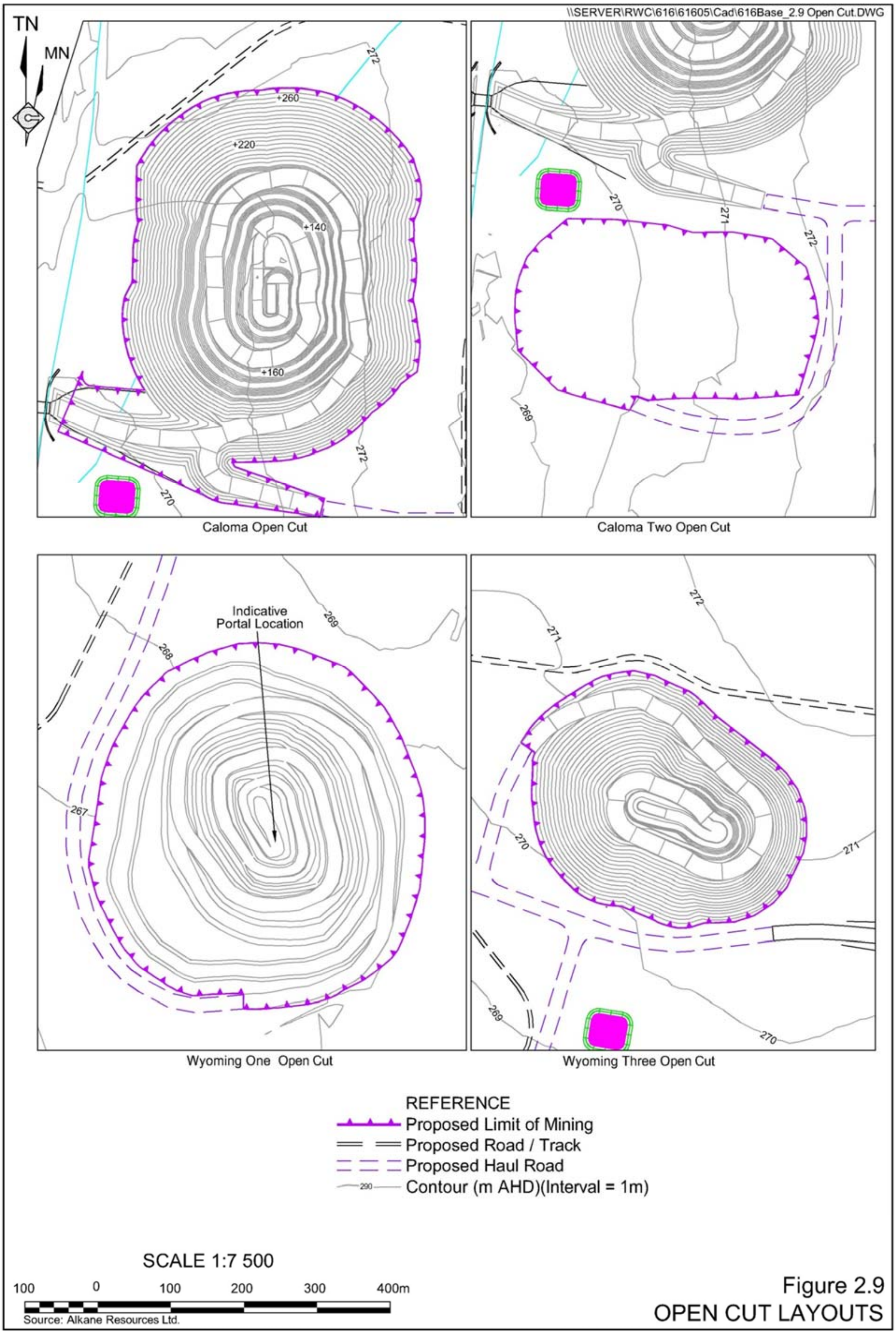


Figure 2.9
OPEN CUT LAYOUTS

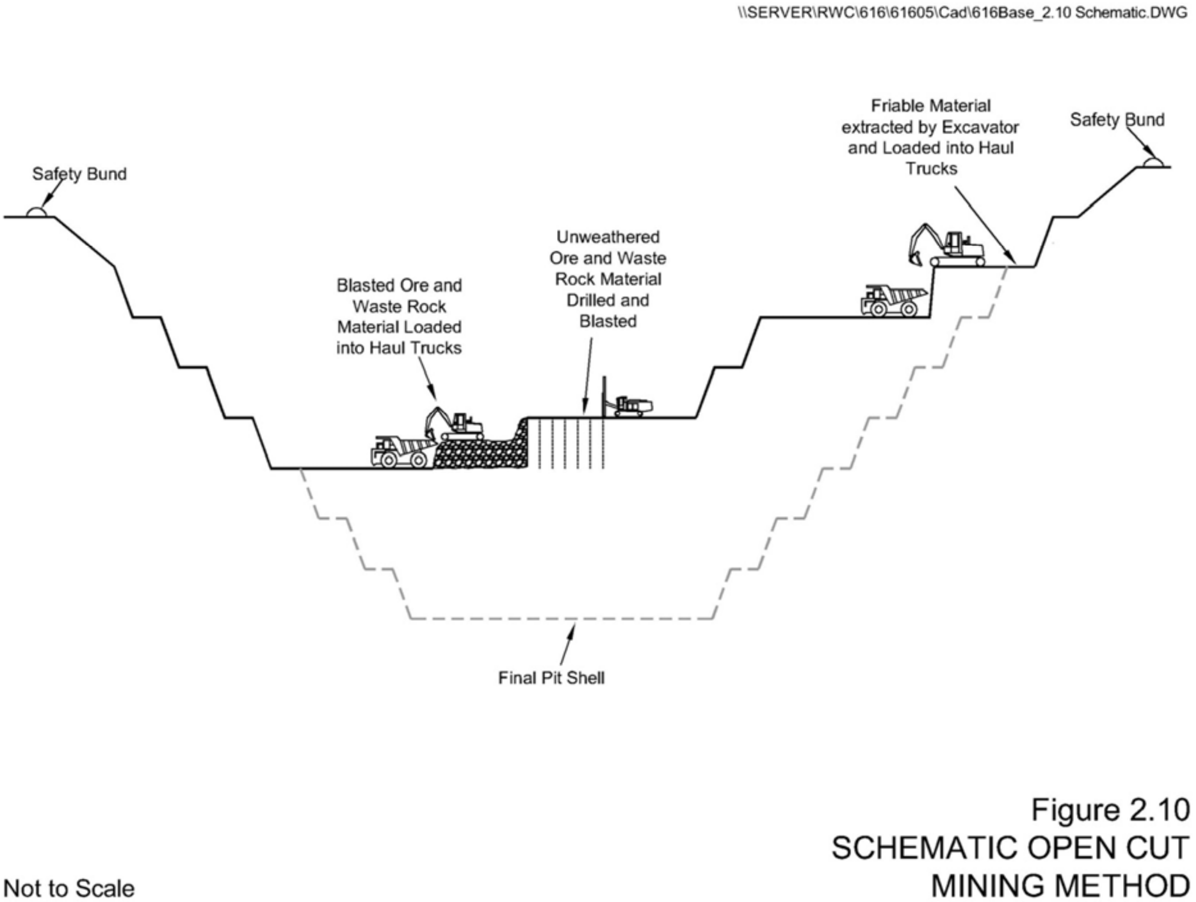


Figure 2.10
SCHEMATIC OPEN CUT MINING METHOD

2.4.3.2 Grade Control Drilling

Grade control drilling would be undertaken in all areas of the open cuts with the exception of the unmineralised overburden. This drilling would be undertaken well ahead of planned mining to more precisely define the boundary between ore, low grade ore and waste rock. Grade control drilling in friable material, namely material that can be freely extracted may be undertaken using an aircore or reverse circulation drill rig. Grade control within non-friable material is anticipated to be undertaken using reverse circulation grade control drilling methods.

All grade control samples would be transported to an off-site laboratory for analysis.

2.4.3.3 Extraction of Friable Material

Following removal of vegetation and soil material as described in Sections 2.3.2 and 2.3.3, mining would commence with the removal of friable material, including both cover material and weathered basement rocks. This material would either be lightly fragmented using drill and blast methods (see Section 2.4.3.4) and extracted using an excavator, or alternatively, ripped and pushed up using a bulldozer. Extracted material would be loaded into haul trucks for transportation to the ROM pad, the low grade stockpile, waste rock emplacement or bund. The Proponent anticipates that friable material will occur from the base of the subsoil to a depth of between 5m and 60m below the surface.

2.4.3.4 Drill and Blast Operations

Drill and blast methods would be used to fragment material that cannot be excavated using a bulldozer or excavator alone. All drill and blast operations would be supervised by a suitably qualified and experienced blasting engineer or shot firer. Blast holes would be drilled using up to three hydraulic drill rigs equipped with dust and noise suppression equipment. **Table 2.2** provides for the indicative blast design parameters to be applied on the Mine Site.

Table 2.2
Indicative Blast Design Parameters

	Friable Material	Unweathered Material
Blasthole Diameter	89mm	
Blasthole Depth	5.5m to 11.0m	
Blasthole Spacing	4m x 4m	3m x 3m
Depth of Stemming	1.9m	
Area of Blast	1 600m^2	900m^2
Size of Blast	8 000m^3	up to 25 000m^3
Bulk Explosive Type	ANFO	
Powder Factor	0.25kg/bcm	0.80kg/bcm
Maximum Instantaneous Charge (MIC)	Up to 68kg (generally 30kg)	
Initiation System	Nonel	
Note: bcm = bank cubic metre		
Source: Alkane Resources Ltd		

The Proponent would ensure that all relevant blasting criteria are achieved at surrounding non Project-related residences and other sensitive receivers. The Proponent would also ensure that flyrock does not pose a threat to motorists using the Newell Highway or to neighbouring properties through appropriate management of blasting operations. This would be achieved through appropriate orientation of blasts away from the highway. Section 4.10.5 and *Part 1* of the *Specialist Consultant Studies Compendium* provide further detail on the management of blasts to limit the generation of fly rock.

Detonators and boosters would be stored within magazines within a designated Magazine Area. This area would be constructed in accordance with Australian Standard *AS2187 – Explosives Storage, Transport and Use*. The Magazine Area would be secured by a 1.8m high security fence topped with barbed wire and a lockable gate. In addition, the Magazine Area would be the subject of regular inspection by security personnel. The Magazine Area would be likely to be transportable structures, which would be constructed, secured, maintained and permitted in accordance with the relevant guidelines.

Blasting would be undertaken between the hours of 9:00am to 5:00pm, Monday to Saturday. No blasting operations would be undertaken on Sundays or Public Holidays[3].

Signs advising employees, contractors and visitors to the Mine Site of the date and time of the next blast would be positioned at the entrance to the Mine Site from the Tomingley West Road and at other appropriate locations within and surrounding the Mine Site. Signage would also be erected adjacent to the Newell Highway, within Tomingley village and in the vicinity of the truck stop immediately south of the Mine Site to identify blasting as an activity which occurs on a daily basis. In addition, the Proponent would consult with surrounding residents to determine the most appropriate method to notify them of blast times and would implement the agreed notification methods.

[3] It is possible that blasting outside of the nominated hours of operation may be required to alleviate a safety hazard, e.g. caused by a mis-fire, or at the request of DTIRIS.

2.4.3.5 Load and Haul Operations

Following completion of each blast, boundaries between ore and waste rock material would, if required, be identified and marked on the ground using paint, tape or similar materials. Fragmented material would then be loaded into haul trucks using a hydraulic excavator and transported to one of the waste rock emplacements, or the ROM pad.

2.4.4 Underground Mining Method

2.4.4.1 Introduction

The Proponent would establish a portal in the lower section of the Wyoming One Open Cut and develop a decline to permit access to those sections of the Wyoming One ore body that cannot be economically extracted using open cut mining methods. Ore material would be removed using a long hole open stoping mining method. This sub-section provides a summary of the proposed underground mining methods.

2.4.4.2 Formation of the Portal and Underground Infrastructure

Once a suitable point for the establishment of the portal has been identified within the Wyoming One Open Cut, the wall above the portal entrance would be stabilised as required using a combination of rock bolts, cable bolts and shotcrete.

Once stabilised, the portal and subsequently the decline would be constructed using methods similar to those described in Section 2.4.4.3. Additional roof and wall support, may be required in the near surface sections of the decline. This may include rock bolts, spiling bars, cable bolts and/or shotcrete.

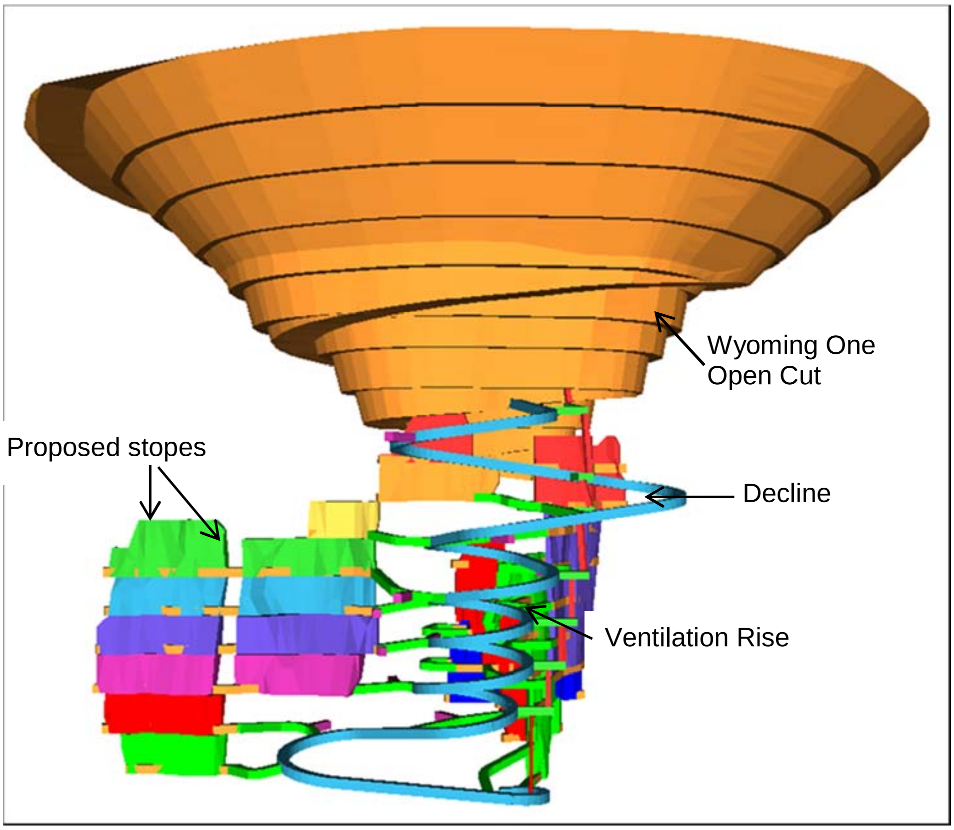
Once the portal is established, infrastructure required for underground mining operations would be installed. This would indicatively include the following.

- Underground power, including a transformer to reduce the voltage of the distributed electricity to 1 000V, suitable for use underground.
- Temporary ventilation, including one or more vent fans located adjacent to the portal.
- Mine water supply to provide water for underground mining operations.
- A tag board and associated surface safety and communication equipment and infrastructure.
- One or more air compressors.

2.4.4.3 Decline and Development Design and Construction

Figure 2.11 presents an overview of the proposed underground development. In summary, the decline would have the following indicative design parameters.

- Height – approximately 5.0m.
- Width – approximately 5.0m.
- Gradient – approximately 1:7 (V:H).
- Maximum depth of development – approximately 360m below surface or 210m below portal level (180m below the base of the Wyoming One Open Cut).



Source: Mintrex

Figure 2.11 Proposed Underground Development

Development headings and ore drives, namely those drives that would permit access to individual mining areas, would have the following indicative design parameters.

- Height – approximately 4.5m.
- Width – approximately 4.5m.

Once the portal has been established and the required infrastructure installed, underground development would commence. Initially, this would require development of the decline using a single heading. However, once decline development reaches the initial ore extraction level, development on multiple headings would be undertaken.

The decline, development headings and ore drives would be developed using drill and blast techniques. A jumbo, or underground drill rig, would drill a pattern of holes, the spacing and length of which would be determined by the mining contractor. Once drilling has been completed, these holes would be loaded with pre-packaged bulk explosives and detonators, and the in situ material fragmented.

Blasting would only be undertaken once the proposed mine has been evacuated, typically at meal breaks or shift changes.

Fragmented material would be extracted using an underground loader or load-haul-dump (LHD) unit. The LHD unit would be used to load underground haul trucks or transport the fragmented material to a loading bay for later reclamation. If required, the LHD unit may be remotely operated.

Once loaded into haul trucks, fragmented waste rock would be transported to the surface and placed either within the lower sections of the Wyoming One Open Cut or Waste Rock Emplacement 1. Once mining operations have progressed sufficiently, waste rock material may be placed within completed stopes to assist with the geotechnical stability of the stopes. The Proponent anticipates that approximately 77 000t of waste rock would be transported to the Wyoming One Open Cut, with a further 50 000t of material placed within Waste Rock Emplacement 1.

Fragmented ore material would be transported to the ROM pad.

2.4.4.4 Ventilation and Emergency Egress

Once the portal is established, suitable ventilation would be required. Initially, this would be provided using a temporary ventilation fan located at the portal which would pump air to the decline face using flexible ventilation ducting. Return air would flow back up the decline. As the decline progresses, the temporary ventilation infrastructure would be advanced to ensure adequate ventilation in all sections of the advancing decline.

Once the decline has been advanced sufficiently, a ventilation access drive would be established and a near vertical ventilation rise or shaft would be constructed. The ventilation rise would have a diameter of approximately 1.8m and would be constructed on a bench within the Wyoming Open Cut.

Construction of the ventilation rise would involve a raise-bore drill rig which would drill an initial pilot hole. The pilot hole would then be progressively widened from the bottom up, with the drill cuttings permitted to fall to the bottom of the hole where they would be collected from the vent drive. As the decline is developed, the ventilation rise network would be progressively extended.

The ventilation rise would have two ventilation fans installed underground. As a result, surface noise emissions associated with the ventilation rise would be negligible. The ventilation system would have an indicative capacity of approximately $100m^3$/second. The decline would be the only air intake for the mine.

In addition, the vent rise would be fitted with appropriate emergency egress infrastructure, including ladderways and platforms. Other mine services such as power and water may also be installed within the vent rise or the access decline.

2.4.4.5 Underground Stoping Operations

Underground mining of ore material would be undertaken using a long hole open stoping mining method. This mining method is particularly well suited to relatively narrow, near vertical ore bodies. **Figure 2.12** presents a schematic overview of this mining method and the following provides a brief description of the method.

During mining operations, a number of development drives would be established at approximately 20m vertical intervals within the ore zone. A series of holes would then be drilled in rings from each drive. These rings would then be sequentially loaded with explosives and the ore material blasted. The fragmented material would then be removed from the stope or open void using a LHD unit, operated remotely, where required. Between stopes, pillars (vertical) and sills (horizontal) of unmined material would be left to provide support and prevent ground collapse. In addition, a crown pillar would remain between to the top of the underground mine and the base of the open cut.

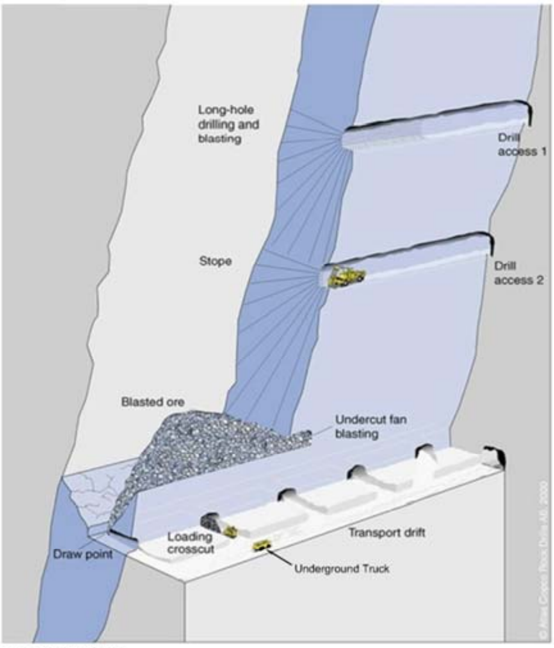


Figure 2.12
SCHEMATIC LONG HOLE
OPEN STOPING MINING METHOD

The Proponent would develop a range of stopes to permit extraction of the ore material. The detailed design of each stope would be determined following completion of additional drilling during development operations to better define the boundary between classes of material. The mine design would be developed to ensure that there would be no surface subsidence within the Project Site.

2.4.4.6 Stope Backfilling Operations

In order to ensure stability of sections of the proposed underground mine once mining operations have been completed in those sections, mined-out stopes may be backfilled using waste rock material sourced preferentially from concurrent underground development. Additional waste rock material would be transported from surface, as required.

This material would be transported to a drive in the vicinity of the top of the stope using an underground haul truck. The material would be stockpiled in the drive and then pushed or tipped into the stope using a LHD unit. During such operations, the loader may, where required, be operated remotely.

Where required, the strength of the material used during backfilling operations may be increased through the use of cement mixed with the waste rock. In addition, where required to ensure stope stability, waste rock material may be concurrently placed into one end of a stope while mining is progressing at the other end.

2.4.5 Mining Rate and Sequence

Table 2.3 presents the proposed mining rate for the life of the Project (which accounts for the production of approximately 500 000t of ore and 500 000t of waste rock from Caloma Two Open Cut). In addition, **Figure 2.13** presents an indicative outline of the mining sequence.

Table 2.3
Indicative Mining Rate

Year	Ore (t)	Waste Rock (t)		Total (t)
		Open Cut	Underground	
1	169 058	1 795 701	0	1 964 759
2	1 502 037	17 638 772	0	19 140 809
3	1 206 742	13 509 385	0	14 716 127
4	1 391 368	7 812 788	0	9 204 156
5	1 339 849	3 694 680	0	5 034 529
6	291 341	128 115	0	419 456
7	204 491	0	157 434	361 925
8	352 624	0	203 384	556 008
9	105 090	0	100 110	205 200
Total	**6 562 600**	**45 040 369**		**51 602 969**

Note 1: Year 1 includes 1 month pre-strip for construction of facilities
Source: Alkane Resources Ltd

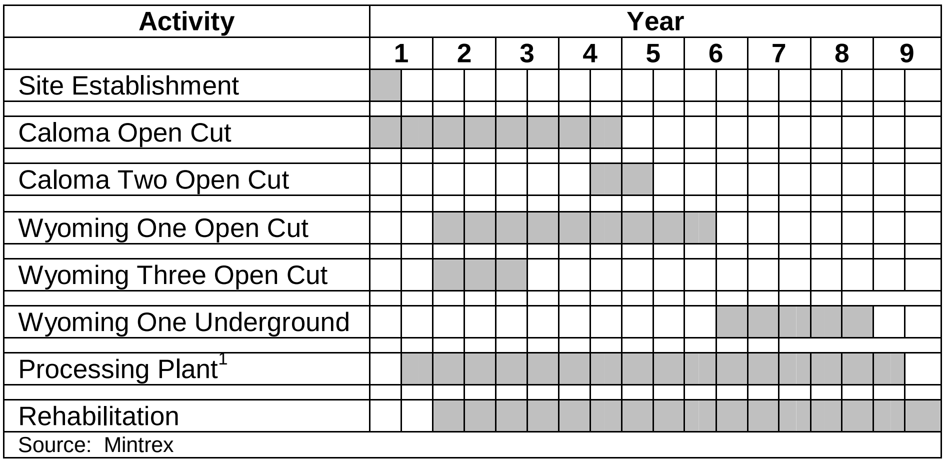


Figure 2.13
INDICATIVE MINING SEQUENCE

2.4.6 Mining Equipment

Table 2.4 presents an overview of the indicative mining fleet that would be used during mining operations within the Mine Site. In addition to the equipment identified in **Table 2.4**, a number of light and other vehicles would be used during mining operations.

2.5 WASTE ROCK MANAGEMENT

2.5.1 Introduction

During mining operations, material that contains insufficient gold to justify immediate processing or stockpiling for later processing, would be either placed within one of three waste rock emplacements, or used to construct amenity bunds and site infrastructure (**Figure 2.1**). This section provides an overview of the characteristics of the waste rock material (Section 2.5.2), as well as the design of the waste rock emplacements (Section 2.5.3) and the procedures that would be implemented during placement operations (Section 2.5.4).

Table 2.4
Indicative Mining Fleet

Equipment No	Indicative Number	Use	Proposed Hours of Operation[1]
Major Equipment – Open Cut Mining			
Excavator (Hitachi EX 1200)	1 to 3	Extraction of ore material and waste rock	24 hours, 7 days per week
Excavator (Hitachi ZN 870)	1		
Truck (Cat 777)	Up to 8	Transportation of ore material and waste rock	
Major Equipment – Underground Mining			
Twin Boom Jumbo Drill (various)	2	Drilling blast holes for the development of drives	24 hours, 7 days per week
Production drills	2	Drilling blast holes for underground stopes	
40t to 50t capacity haul truck	1	Haulage of ore and waste rock within the underground or from underground to surface	
Load Haul Dump Unit	2	Stope bogging and loading to trucks	
Service vehicles	2	Servicing and refuelling of underground mining fleet	
Support Equipment			
Blast Hole Drill Rig (Atlas Copco L6)	1 to 2	Drilling blast holes	24 hours, 7 days per week
Bulldozer (Cat D10)	1 to 3	Stripping soil, shaping of waste rock emplacements, clearing of benches, general site maintenance	
Grader (Cat16M)	1 to 3		
Front-end loader (Cat 998)	1	Management of ROM material, loading of haul trucks	
Service Truck	1	Equipment servicing and refuelling	
Watercart (Cat 769)	1 to 2	Dust suppression	
Explosives Delivery Vehicle	1	Explosives delivery	Daylight hours only
Diesel Generators & Lighting Plants	variable	Pump sump, mobile lighting towers, other power supply as required	Variable

Note 1: Hours of operation of some equipment may be restricted during the life of the Project. See Section 4.2 for further detailed discussion.

Source: Alkane Resources Ltd

2.5.2 Waste Rock Characteristics

Four representative samples of non-oxidised material from drill holes within the Wyoming One and Caloma Open Cut pit shells but outside the ore envelope were analysed for net acid generation potential (NAGP) by the ALS Laboratory Group. Each of the samples returned a negative NAGP, indicating that the waste rock from those open cuts would not generate an acidic leachate once placed within the relevant waste rock emplacements. Waste rock material within Wyoming Three and, if mined, Caloma Two is oxidized material and would not generate acid.

2.5.3 Waste Rock Emplacement Design

Figure 2.14 presents the layout of each of the waste rock emplacements and **Table 2.5** presents the indicative design criteria for each.

Table 2.5
Indicative Waste Rock Emplacement Design Criteria

Design Criteria	Waste Rock Emplacement		
	1	**2**	**3**
Area (ha)	14	39	40
Maximum height (m)	30	40	40
Lift heights (m)	10	10	10
Number of lifts	3	4	4
Berm widths (m)	5	5	5
Final Slope (V:H)	1:3	1:3	1:3
Final Design Volume (million m^3)	1.04	14.30	14.32
Anticipated Volume Required (million m^3)	1.04	12.99	13.00
Source: Alkane Resources Ltd			

The waste rock emplacement layouts and design criteria presented in **Figure 2.14** and **Table 2.5** represent the maximum footprint and height of these structures and accounts for the production of approximately 500 000t (300 000m^3) from Caloma Two Open Cut. Should less waste rock be removed from the open cuts and underground, or proportion used for backfilling underground stopes increased, the height (and possibly area) of these structures could be reduced.

Water management structures, would be constructed during shaping of each emplacement to reduce the risk of erosion both during and following the mine's operational life. In summary, these structures would comprise 5m wide berms at approximately 10m vertical intervals with slopes of approximately 1:200 (V:H) and, where required, engineered high slope sections or 'drop structures' to transfer surface water from the contour banks to the dirty water management system or, following completion of rehabilitation operations, to natural drainage.

2.5.4 Waste Rock Emplacement Procedures

Waste rock material removed from the open cut areas may be divided into two categories, namely:

- friable or weathered material; and
- unweathered material.

Waste rock material would be transported to the appropriate waste rock emplacement using off-road haul trucks. Waste rock material from the Caloma (and Caloma Two), Wyoming Three and Wyoming One Open Cuts would typically be placed within Waste Rock Emplacements 3, 2 and 1 respectively. Minor quantities of waste rock may also be used to construct other infrastructure within the Mine Site, including the amenity bunds, RSF, ROM pad, surface water diversion structures, haul roads, etc.


\\SERVER\RWC\616\61605\Cad\616Base_2.14 Waste Rock.DWG
Waste Rock Emplacement 2
Waste Rock Emplacement 1
Waste Rock Emplacement 3
SB4
+310
+315
REFERENCE
Mine Site Boundary
Proposed Open Cut Mining Area
Waste Rock Emplacement Area
Soil Stockpile
Proposed Temporary Soil Stockpile Area
Residue Storage Facility Area
Proposed Road / Track
Proposed Haul Road
Proposed Amenity Bund (See Figure 2.5)
Proposed Diversion Bank (Bund) / Channel (See Figure 2.5)
Proposed Catch Bank / Channel (See Figure 2.5)
Contour (m AHD)(Interval = 1m)
SCALE 1:10 000
100 0 100 200 300 400 500 m
Source: Alkane Resources Ltd.
TN
MN
Figure 2.14
INDICATIVE WASTE ROCK
EMPLACEMENT LAYOUT

Waste rock produced by underground mining would be primarily used to backfill completed stopes underground. Prior to the commencement of stope backfilling, i.e. during decline and drive development, the waste rock would either be placed within the Wyoming One Open Cut (below the 115m AHD elevation of the underground portal) (77 000t), or temporarily stored at surface near the top of the open cut pit ramp (50 000t). Ultimately, the waste rock placed within and outside of the open cut would be reclaimed and used to backfill the underground stopes. In fact, mine planning has estimated that a further 61 000t of waste rock would be reclaimed from one of the waste rock emplacements to make-up a calculated deficit. Additional ‘in-pit’ placement of waste rock on the Mine Site, i.e. within the completed open cuts has been considered, however, this would potentially sterilise resources that may be available for future development. Section 6.1.6 considers the in-pit placement of waste rock alternative in more detail.

The Proponent may use small quantities of waste rock material as a road base within the Mine Site. There is potential that road base material produced from the waste rock could be marketed for use outside the Mine Site. However, this does not form part of this application, and should a market for this material be identified, a modification to the project approval (should it be granted), or a separate development consent/project approval would be sought.

Figure 2.15 presents an overview of the methods that would be employed during construction of the waste rock emplacement. In summary, waste rock material would initially be ‘paddock dumped,’ within the proposed footprint of each waste rock emplacement. The piles of waste rock material would be pushed flat using a bulldozer prior to construction of the next layer. Subsequent layers would be built by establishing a tip head on the active emplacement face. The emplacements would be constructed in 10m lifts, typically from the outer margins of the emplacement towards the centre, allowing for the final face angle for each lift of 1:3 (V:H). Between each lift, a 5m wide berm with a 1:20 (V:H) or 5% backslope and a 1:200 (V:H) or 0.5% longitudinal grade would be constructed. The waste rock emplacements would be compacted during construction by heavy vehicles travelling across the surface of the emplacement.

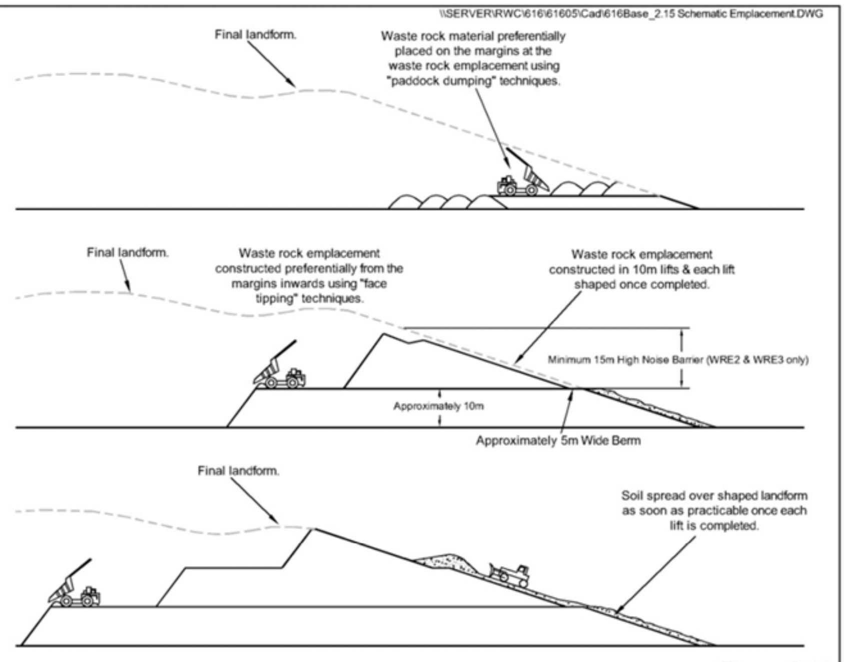


Figure 2.15
INDICATIVE WASTE ROCK EMPLACEMENT CONSTRUCTION

Not to Scale

In general, the northern perimeter of Waste Rock Emplacements 2 and 3 would be constructed to maintain a 15m high acoustic barrier between the village of Tomingley to the north and waste rock placement operations. The progressively more elevated northern acoustic barrier would only be constructed during the daytime, namely between 7:00am and 6:00pm. This would avoid the operation of mobile equipment in the most exposed locations of the Mine Site (to Tomingley) during periods when noise enhancing meteorological conditions may prevail, i.e. inversions. The Proponent would also review operations when winds from the southern quadrants prevail, with equipment potentially relocated during these conditions to minimise the noise levels received at residences within Tomingley. Section 4.2.5 provides more detailed descriptions of the proposed noise management strategy to be implemented by the Proponent.

Waste rock initially placed within Waste Rock Emplacement 1 would be used during rehabilitation operations to cap the RSF. Extraction of that material would be undertaken prior to final shaping and rehabilitation of Waste Rock Emplacement 1.

Following completion of construction of the outer section of each lift, the outer face of the emplacement would be progressively shaped and covered with friable waste rock material. Approximately 50cm of subsoil and 20cm of topsoil would then be spread over the emplacement and the emplacement progressively revegetated. Rehabilitation operations are described more fully in Section 2.14.

2.6 PROCESSING OPERATIONS

2.6.1 Introduction

Ore material would be processed within the on-site processing plant. This section provides a brief description of the layout of the processing plant, together with the ROM stockpiling, crushing and grinding, carbon-in-leach and gold extraction operations. This section also provides an overview of the proposed cyanide management procedures that would be implemented.

2.6.2 Processing Plant and Office Area Layout

Figure 2.16 presents the layout of the Processing Plant and Office Area which comprise the following components.

- ROM Pad.
- Crushing and screening infrastructure including:
  - Primary crushing building;
  - screening building;
  - Surge bin and surge stockpile; and
  - conveyors.
- Processing plant (including grinding circuit, leach circuits and reagent storage areas).
- Raw water, process water and settling dams.
- Potable water processing plant.
- Transformer and electrical switch room.
- Workshops, laboratory and ablutions facilities.
- Administration office[4].

[4] The Administration Office is to utilise the existing "Wyoming" residence and as a result has been separated from the rest of the processing and office infrastructure. For the purpose of this assessment, reference to the Processing Plant and Office Area includes the administration office and car park.

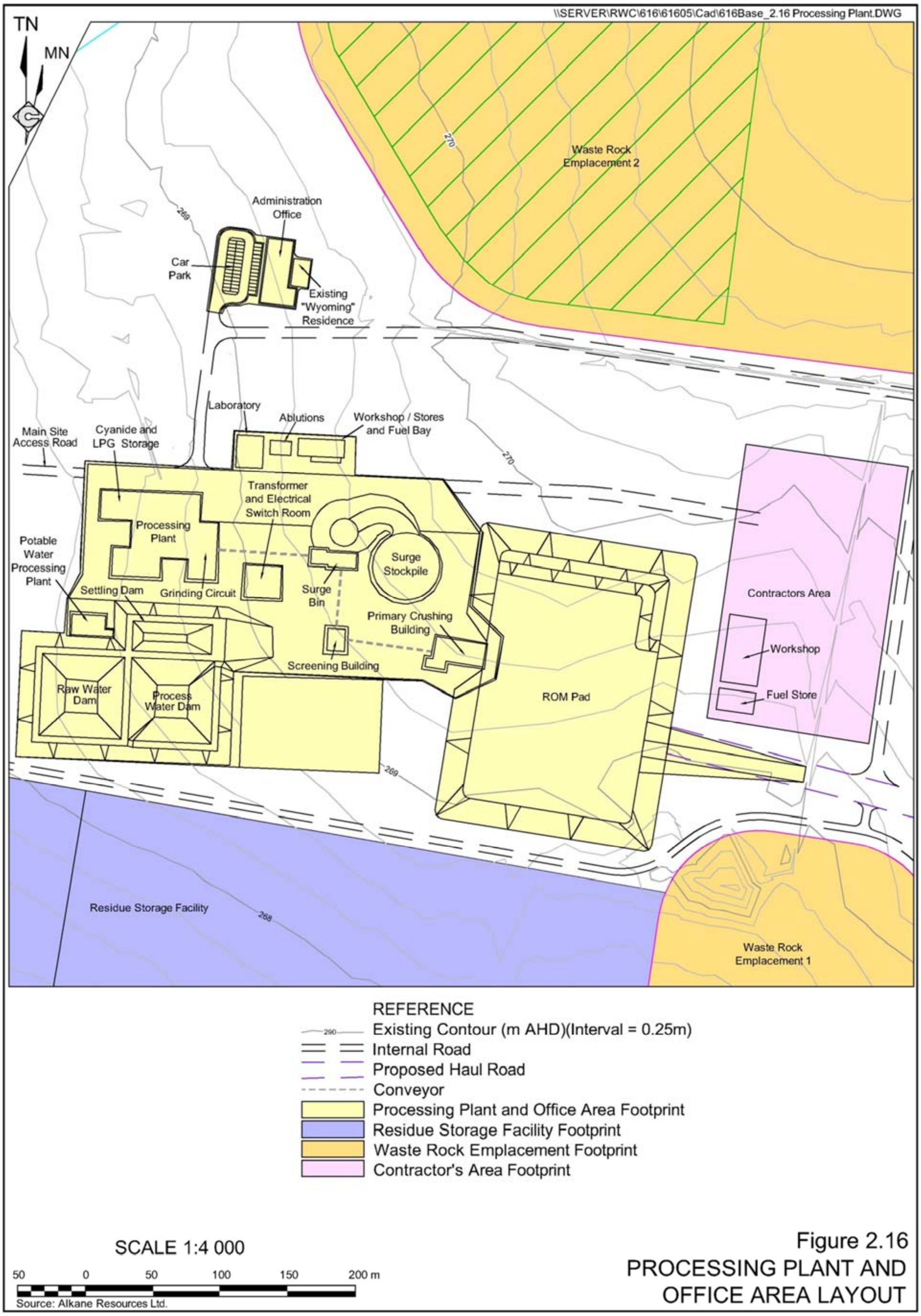


Figure 2.16
PROCESSING PLANT AND OFFICE AREA LAYOUT

2.6.3 Processing Operations

2.6.3.1 Introduction

The following sub-sections provide a description of the process to be followed to recover the gold from the ROM ore material. Section 2.6.3.2 provides a summary of the operations to initially reduce the size of the ore for processing and gold recovery. Section 2.6.3.3 provides a summary of the processing operations that would be undertaken to recover the gold from the crushed and ground ore.

2.6.3.2 ROM Stockpiling, Crushing and Grinding Operations

Ore material would be transported to the ROM pad by haul trucks. This material would be stockpiled within the ROM pad according to ore characteristics. A front-end loader would then be used to blend the material and deliver it to the ROM coarse ore feed bin within the primary crushing building. Occasionally, oversize material would be broken using a hydraulic rock breaker on the ROM pad. When undertaken, the Proponent would ensure that this occurs on the southern side of a stockpile of ore at least 5m high.

From the ROM coarse ore feed bin, material would drop into a primary jaw crusher which would reduce the size of the material to a nominal 80% passing 100mm. It is anticipated that the primary crusher would have a design throughput of 170t per hour. A rock breaker installed adjacent to the crusher (and within the primary crushing building) would break any oversized rocks that lodge in the primary jaw crusher and would otherwise not pass through.

The crushed material would pass to a series of conveyors which would deliver it to a classifying screen within the screening building. This screen would allow material with a diameter smaller than 23mm to pass through the screen. Oversize material would be delivered to a secondary crusher to further reduce the size of the material, which would then be conveyed back to the classifying screen.

Undersize material from the classifying screen would be delivered to a surge bin, which when full, would overflow to a conveyor feeding an on-ground surge pile. This surge pile would provide feed for the processing plant when the crushing circuit is not operational as a result of breakdowns or planned maintenance shutdowns.

Material from the surge bin or surge stockpile would be conveyed to the grinding circuit within the processing plant where a ball mill with a diameter of 5m and a grinding length of 8.2m. The ore would be combined with water and steel balls with the revolving motion able to further reduce the size of the ore. The overflow from the ball mill (crushed ore and water mix) would flow to a trommel, or a rotating screen, where the material would be further classified. Material with a diameter greater than 12mm would be returned to the surge bin. Undersize material would be passed to a series of cyclones to separate the material based on density which will determine to which part of the gravity and leach circuit the material would report (Section 2.6.3.3) for gold recovery.

2.6.3.3 Gravity and Leach Circuit

Cyclone underflow, namely larger or denser material, would flow to a gravity concentrator which would further separate the denser material from less dense material. The densest material would flow to a holding tank for intensive leach processing to extract the gold. The less dense cyclone underflow material would be returned to the ball mill (described in Section 2.6.3.2). Cyclone overflow, namely smaller or less dense material, would flow to the standard CIL process.

Intensive Leach Process

The intensive leach process (otherwise referred to as an InLine Leach Reactor) is an intensive cyanidation process (operated at higher temperature and pressure to a standard carbon-in-leach [CIL] circuit) designed to treat small volume gravity gold concentrates. Although the intensive leach process can be operated as a continuous process, it would be operated as a batch processing plant for the Project. The de-watered concentrate would be injected into a tank where it would be exposed to a high oxygen, high cyanide solution. The cyanide would dissolve the gold into solution. Residence time would be predicted in the laboratory and set by reactor volume and solids feed rate. Barren solids would be removed from the circuit via a de-watering cone and de-watering screen. The pregnant solution would be pumped from the tank to the electrowinning circuit for gold recovery. Barren solution would be recirculated to optimise the use of reagents.

Standard CIL process

The standard cil leach circuit would comprise six tanks with an indicative capacity of approximately 1 000m^3 each to allow ground material to be held in the tanks for approximately 24 hours. The gold would be recovered using cil technology which involves the addition of sodium cyanide, lime and other additives to the slurry of ground material and water in a series of agitated tanks containing activated carbon. In each tank, the additives would be managed to maximise the recovery of gold. The cyanide would dissolve the gold into solution. The dissolved gold would be recovered from the solution through adsorption onto pores of the carbon granules. The gold-loaded carbon would then be collected using a screen within each tank.

The carbon would be introduced into the last tank and advanced through the tanks in the opposite direction to the slurry to the first tank, becoming increasingly “loaded” with gold as it progresses. The gold-loaded carbon would then be transferred to an elution column which would contain a strong solution of caustic and cyanide heated by an LPG gas-fired heater. This step reverses the adsorption process. The gold would be then removed from the solution by electrowinning. Carbon stripped of gold would be returned to the leach circuit for re-use.

The leach circuit would be constructed within a concrete bunded area with sufficient volume to contain 110% of the volume of the largest tank, or approximately 1 080m^3. All surface water flows within the bunded area would be directed to a sump and pumped back into the CIL tanks.

Gold Production

Gold sponge, namely a product from the electrowinning cell, would be smelted on site in a gas-fired furnace to produce gold doré, stored briefly and then collected by a security company for transportation to a gold refinery.

Residue Management

The remaining slurry would then be concentrated and washed using a counter current decant system utilising two 14.6m diameter thickeners. Residue would then be pumped from the last leach tank to the first thickener and, once excess water has been removed for re-use, raw water and decant water would be added to reduce the cyanide concentration in the slurry before it is pumped to the second thickener. Once excess water has again been removed for re-use, the residue would be pumped to the residue storage facility (RSF). Reclaim water would be collected in two decant towers within the RSF and pumped directly to the process water dam.

The document *Priority Existing Chemical Assessment Report No 31 – Sodium Cyanide* published by the Commonwealth Department of Health and Aging in February 2010 identifies that where appropriate management measures are implemented, incidents of fauna mortality are rare where the WAD cyanide concentration is less than 50ppm. Cyanide speciation test work on Tomingley ores indicates that plant cyanide levels may be managed to reduce concentrations of WAD cyanide complexes in the residue stream to less than 50ppm. However, in order to enable a high degree of certainty in relation to management of cyanide levels in material discharged to the RFS, a second, counter current decant thickener has been included in the circuit as described previously.

The Proponent would implement the following to restrict access by fauna to potentially cyanide-contaminated water.

- Construction of animal-proof fences around the RSF and processing plant site.
- Monitoring of the levels of weak acid dissociable (WAD) cyanide in the residue at the residue discharge point, within the RSF and the Process Water Dam and in selected surface and groundwater monitoring locations within and surrounding the Mine Site (monthly to quarterly). The Proponent anticipates that results from the weekly monitoring program would be returned within 72 hours.
- Limitation of the area of free water within the RSF to minimise its attractiveness to water and other birds and other fauna.
- Alternate water storages, i.e. farm dams and sediment basins, would be maintained on the Mine Site to provide alternate watering points for birds.
- Regular inspection of the RSF and other areas of the Mine Site for fauna deaths. Where such deaths are identified, the Proponent would ensure testing to identify the cause of death and, if required, would implement further controls to manage cyanide within the Mine Site. These controls would be developed in conjunction with relevant government agencies.

2.6.4 Reagent Management

The processing plant would primarily use the following reagents and the Proponent would implement the following measures to ensure that environmental risks associated with each reagent is minimised to the greatest extent possible.

- Sodium Cyanide

  Sodium cyanide would be delivered in solid form in 22t capacity isotainers (sealed tanks designed for the transport and management of potentially harmful substances). Water would be circulated through the isotainer to dissolve the sodium cyanide which would then be transferred to one or more liquid storage tank(s) with an indicative capacity of 5 000L. The isotainer would remain in place until all the solid sodium cyanide is consumed, after which, it would be replaced with a new isotainer. The liquid storage tank and isotainer would be contained within concrete bunds with a capacity of 110% of the volume of the liquid storage tank.

Systems would be implemented to ensure that environmental and occupational health and safety risks associated with transportation, handling, storage and use of the sodium cyanide are minimised to the greatest extent possible. These procedures would be embodied in a *Reagent Management Plan* that would be prepared prior to commencement of processing operations. It is anticipated that this plan would be incorporated into the Mining Operations Plan that would be required for the Project and would require the approval of DTIRIS-DR&E, OEH, as well as WorkCover.

- Caustic Soda

  Caustic soda would be delivered to the Mine Site by road in liquid form in road tankers and stored in a $24m^3$ caustic storage tank located in the same bunded containment area as the cyanide dissolving and cyanide storage tanks. Care would be taken to ensure that the liquid is stored appropriately with other compatible chemicals. The *Reagent Management Plan* would identify management measures that would be implemented to ensure the appropriate transportation, handling, storage and use of this material.

- Hydrochloric Acid

  Concentrated hydrochloric acid would be delivered by road in liquid form in 1 000L sealed containers held inside shuttle bins. The containers would be unloaded into a $24m^3$ tank located in a concrete containment bund adjacent to, but separated from, the cyanide plant. Care would be taken to ensure that the liquid is not stored inappropriately with other chemicals. The *Reagent Management Plan* would identify the management measures to ensure the appropriate transportation, handling, storage and use of this material.

- Activated Carbon

  Activated carbon comprising burnt coconut husks would be delivered by road in one tonne bulka-bags. No particular management measure would be required for this material as it is does not pose an environmental or safety risk.

2.7 RESIDUE MANAGEMENT

2.7.1 Introduction

Following completion of processing operations, the residue (in the form of slurry from which the majority of the gold has been removed) would be pumped to the RSF. This section provides an overview of the proposed design of the RSF and the procedures that would be used during residue placement to ensure appropriate densities and compaction are achieved within the RSF.

2.7.2 Residue Storage Facility

2.7.2.1 Introduction

The Proponent engaged the following specialist consultancies to assist with the geotechnical assessment and design of the RSF.

- D.E. Cooper & Associates Pty Ltd prepared the *Tomingley Gold Project Residue Management Design Report* (Cooper and Associates, 2009) which outlines the design, construction methodology, post construction testing and operation of the RSF. Included as an appendix to Cooper and Associates (2009) was a geochemical and waste characterisation report prepared by Graeme Campbell & Associates.
- Mining One undertook a geotechnical assessment of the RSF footprint based on 25 soil test pits excavated to 2.6m depth and the top 15m of cored bore holes within the Wyoming One Open Cut footprint, from where the material for construction of the embankments would be sourced. The resulting report is entitled *Tomingley Gold Project Feasibility Study Factual Geotechnical Report For Residue Storage Facility* (Mining One, 2009).

2.7.2.2 Design of the Residue Storage Facility

The proposed footprint of the RSF is presented on **Figure 2.1** and **Figure 2.17**. Key features of the RSF include the following.

- Area - two cells with a combined area of 42ha.
- Crest elevation – 280.5m AHD.
- Crest width – 6m.
- Slope of outer face – 1:3 (V:H).
- Slope of inner face – 1:1.5(V:H).
- Key trench – up to 2m deep, base 3m wide, side slopes = 2:1 (V:H).
- Maximum elevation of residue – 280.0m AHD.

Figure 2.17 also provides a schematic cross section through one of the residue storage cells.

As indicated on **Figure 2.17**, the eastern embankment of the RSF would be effectively created by Waste Rock Emplacement 1. However, those sections of the eastern embankment to be constructed prior to the construction of Waste Rock Emplacement 1 would provide for the key features identified above as the minimum standard.

The RSF would comprise two cells of approximately 21ha each with a common embankment. Each cell would be equipped with a centrally located decant tower which would enable water released from the residue and incident rainwater to be returned to the processing plant for re-use. The Proponent anticipates that the RSF would be a "prescribed" dam and would be listed in Schedule 1 of the *Dams Safety Act 1978.*

An allowance has been made for a 2m deep key trench adjacent to the outer embankments.

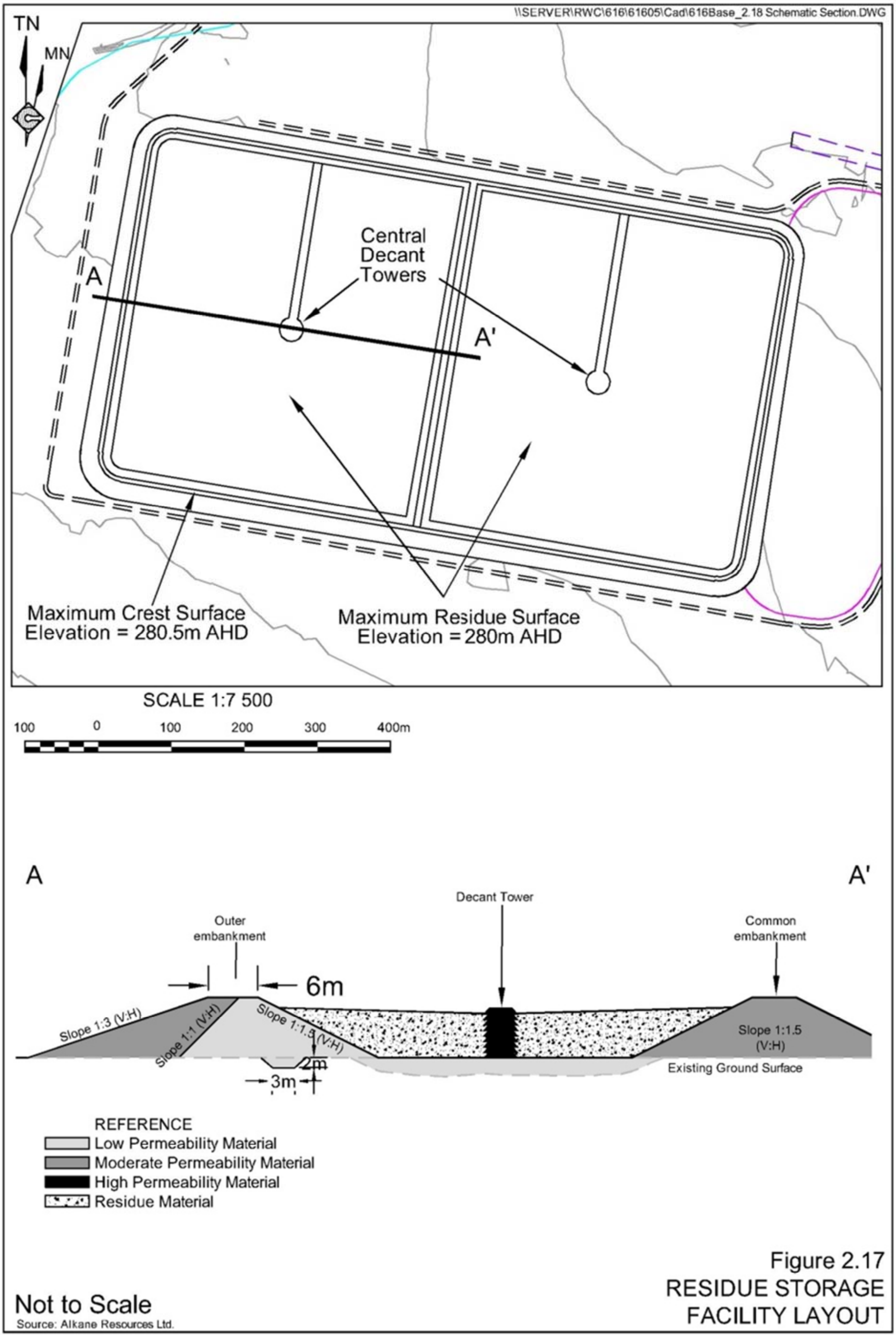


Figure 2.17
RESIDUE STORAGE
FACILITY LAYOUT

2.7.2.3 Geotechnical and Hydrological Assessment

Mining One (2009) stated that the foundations of the proposed embankments comprise stiff clay with some traces of sand. The clay becomes more competent with depth and has a high bearing capacity. The only preparation required before construction of the embankments would be to strip the topsoil and lightly rip, moisture condition and compact the foundation areas.

Material sourced from the upper sections of the Wyoming One or Wyoming Three Open Cuts would be used during construction of the initial sections of the embankments. This material had been classified under the Unified Soil Classification as an inorganic clay to sandy clay of low to medium plasticity which, when compacted, has a permeability of less than 1×10^{-9}m/sec (classified as very low permeability). The material sourced from extraction of the key trench adjacent to the outer embankments would be suitable for use during construction of the embankments of the RSF.

Ultramafics Pty Ltd (2009) undertook a hydrological investigation of the RSF footprint based on falling head test data gathered by The Impax Group. Five boreholes to 25m depth were drilled within the RSF footprint and no water was encountered in any of the holes. The permeability of the strata up to 25m below the surface ranged from 2×10^{-10} m/s to 2×10^{-9} m/s. Cooper and Associates (2009) states that assuming that the amount of water held within and on the surface of the deposited residue is minimised, seepage losses from the storage should be insignificant.

2.7.2.4 Construction of the Residue Storage Facility

Construction Requirements and Schedule

The RSF would be constructed in stages, with the initial stage of the facility providing adequate storage capacity for the first 12 to 15 months of processing operations, i.e. to contain approximately one million tonnes of residue. The embankments would be constructed from selected waste rock material extracted from within the upper sections of the Wyoming One Open Cut. As processing operations continue, the embankments would be progressively raised throughout the life of the Project to maintain adequate freeboard and ensure the facility would contain all residue and associated reclaim water and incident rainfall.

The initial height of the Stage 1 embankments would be approximately 5.5m. The final maximum height would be approximately 15m. The eastern side of the RSF would be buttressed by Waste Rock Emplacement 1 (see **Figure 2.14**).

The floor of the RSF would be compacted to achieve a permeability of $<1 \times 10^{-9}$m/s for depth of at least 900mm. Where this is not achievable, due to the physical characteristics of the in situ material, clay from elsewhere within the RSF footprint (or from the footprint of the Wyoming One or Wyoming Three Open Cuts) would be used to line the RSF floor (at least 900mm in depth). Clay, either from the footprint of the RSF or Wyoming One and Three Open Cuts, would be used to line the internal walls of the RSF. The thickness of this compacted clay liner would be at least 900mm.

A central decant tower would be provided within each cell. This would be constructed of pre-cast pipe sections which would be progressively stacked on top of each other, with rock placed around, as the RSF is progressively raised.

Quality Assurance / Quality Control

As a Prescribed Dam under the NSW *Dams Safety Act 1978*, the RSF would be designed, constructed and operated to meet the requirements of the NSW Dams Safety Committee (DSC). These requirements are extensive and detailed, however, broadly require the RSF to be designed in accordance with current good practice as set out in the various Australian National Committee on Large Dams (ANCOLD) Guidelines.

In regard to construction, the DSC requires:

> "*the dam designers to be integrally involved during construction of tailings dams and to approve any design changes made during construction. This involvement is to be signed-off formally by the Owners representative in a Construction Certificate to be provided to the DSC. Work-as-Executed Drawings and a Construction report are to be provided to the DSC at the same time.*"

Detailed design of the RSF would be completed following the issue of project approval and would include the Technical Specification for RSF construction. The Technical Specification will include a section setting out quality assurance/quality control (QA/QC) requirements in regard to construction material properties and compaction. The contractor responsible for the construction of the RSF would be required to complete a QA/QC Plan to confirm the satisfaction of the Technical Specification requirements. The QA/QC data would be progressively reviewed by the designers during construction, and would be incorporated in the final RSF Construction Report.

QA/QC requirements to be established and applied to earthworks would include the following requirements.

- All fill material would be tested to ensure compaction to the correct moisture content. Samples for moisture content testing shall be taken in accordance with the requirements of AS 1289.1-1991.
- The minimum frequency of testing would be 1 test per 5 000m^2 of each layer of fill.
- Fill material not compliant with the required moisture content limit specifications would be reworked and watered/dried as required.
- Compaction testing of the fill material would be carried out immediately following compaction of homogenous lots.
- Test lots would be determined by the earthworks contractor and approved by the superintendent or construction manager.
- Acceptance of results to specified permeability requirement ($<1x10^{-9}$m/s) required before further placement of fill to be carried out.
- The minimum frequency of testing would be 1 test per 5 000m^2 of each layer of fill. A higher frequency of testing would be implemented if a significant number of test results fail to meet the specification requirements or the material is showing significant variability.

2.7.2.5 Operation of the Residue Storage Facility

Throughout the life of the Project, residue material would be discharged into two cells, with the active discharge cell rotated on a pre-determined basis. The material would be discharged from spigots (discharge points) on a peripheral pipeline. The spigots would be regularly spaced around the perimeter of the each cell and the residue slurry would be discharged from six to eight spigots at any one time. The active spigots would be regularly changed to allow an even build-up of residue solids over the whole area of each cell. The residue would be largely unsaturated except for a very small area around the decant tower in the active cell. Each cell would have the opportunity to dry when the discharge of residue is changed to the adjacent cell. This placement procedure would allow for an appropriate residue density to be established ensuring the ongoing stability of the RSF.

In addition, the management measures identified in Section 2.6.4 would be implemented to limit the potential for fauna to access potentially cyanide-contaminated reclaim water.

2.7.3 Residue Volume

It is anticipated that throughout the life of the Project approximately 3 900 000m^3 of solid residue material would be produced. The proposed RSF has a capacity to store approximately 4 800 000m^3 of material. As a result, the proposed RSF would cater for all residue material produced throughout the life of the Project. It is noted that potential exists for additional ore material to be mined throughout the life of the Project. As a result, the RSF has been designed with surplus capacity to cater for these eventualities.

2.7.4 Residue Characteristics

2.7.4.1 Geological Characteristics

The residue material would be derived from ore material which has been crushed and ground and had the gold removed. The primary ore material is composed of commonly occurring minerals, including quartz, feldspar, ankerite (a carbonate mineral), muscovite mica and traces of pyrite and arsenopyrite and calcite. There are no known naturally-occurring hazardous minerals such as asbestos-related minerals within the ore material. As a result, there would be no such minerals within the residue material.

2.7.4.2 Geotechnical Characteristics

Samples of the residue from friable (oxide) and unweathered (primary) ore have been tested by Graeme Campbell & Associates Pty Ltd through the laboratory of SGS Australia to determine residue settling characteristics, the likely final desiccated density and permeability. In practice, the processing plant would be fed with a combination of weathered and unweathered material, with the ratio changing throughout the life of the Project.

A combined ore feed would result in final residue density of between approximately 0.85t/m^3 and 1.31t/m^3. The desiccated (dry) density of the residue is expected to be approximately 1.56t/m^3 for weathered material and approximately 1.7t/m^3 for unweathered material.

An average in situ density of 1.45t/m^3 has been used when determining the required capacity of the RSF storage.

2.7.4.3 Geochemical Characteristics

The geochemical characteristics of the residue material were assessed by Amdel Mineral Laboratories Pty Ltd to determine the net acid generation potential of the residue material. In summary, when rock material containing naturally-occurring sulphide minerals is exposed to oxygen, the sulphide minerals can oxidise to form a low pH or acidic leachate. That testwork determined the following.

- Oxidised material within the Mine Site is non-acid forming.

- Primary or non-oxidised material within the proposed open cuts and underground mines contains minor concentrations of sulphide material. However, sufficient amounts of acid neutralising minerals e.g. ankerite and calcite are present to ensure that the non-oxidised material would not be acid forming.
- Ore material within the Project Site contains small amounts of naturally occurring arsenopyrite, a mineral composed of iron, arsenic and sulphur. During weathering of the mineralised material, arsenopyrite oxidises to a range of secondary arsenic-bearing minerals. Following processing operations, arsenopyrite and the secondary minerals would be encapsulated within the RSF. Kinetic-testing of representative samples of tailings from the various ores has been completed by Graeme Campbell & Associates Pty Ltd (GCA, 2011) to identify species of secondary minerals that could be formed during oxidation of the primary arsenopyrite and whether the contained arsenic is likely to be able to be mobilised within the RSF.

  The results of GCA (2011) confirm that the tailings samples from the oxide ores contain "pools" of arsenic forms, e.g. Fe/Ca-arsenates of complex and variable composition, however, these should consolidate within the RSF to a tightly-compacted state, and therefore exhibit a very low hydraulic conductivity. Other ore samples from the Caloma resource were characterised by low arsenic solubility during circum-neutral weathering.

2.8 NON-PRODUCTION WASTE MANAGEMENT

Table 2.6 lists the non-production wastes that would be generated throughout the life of the Project and briefly describes how each class of waste would be stored or managed on site and subsequently removed from the Mine Site.

2.9 TRANSPORTATION

2.9.1 Introduction

This section describes the proposed transportation both within and surrounding the Mine Site. The Proponent would prepare a *Transportation Management Plan*, incorporating management measures to minimise the risk of potential safety- and environmental-related impacts associated with transportation prior to commencing mining operations.

2.9.2 Mine Site Transportation

2.9.2.1 Site Access

Construction of the proposed Main Site Access Road and intersection with the Tomingley West Road is described in Section 2.2.5.

All vehicles would normally access the Mine Site via the Tomingley West Road and the Main Site Access Road. However, the Proponent notes that that this route requires vehicles to cross Gundong Creek twice, once on the Tomingley West Road and once within the Mine Site (**Figure 2.1**).

Table 2.6
Non-Production Waste Management

Waste Type	Storage/Management	Removal
General waste (including food scraps)	Covered bins or skips located within lunch rooms, offices, outside workshops and elsewhere as required. Where these bins would be located in open areas, they would be fitted with animal-proof lids.	Collected on a regular basis by a licensed waste contractor and transported to a licensed waste disposal facility.
General Recyclables	Covered bins located within lunch rooms, offices and elsewhere as required. Where these bins are located outside a closed building they would be fitted with animal-proof lids.	Collected on a regular basis by a licensed recycling contractor and transported to an appropriate recycling facility if such a contractor and facility is available in the area.
Waste oils and greases	Placed within bunded tank(s) within the workshop area. Where required, smaller, temporary storage containers may be positioned close to work areas, with the contents of those container transferred to a larger storage tank prior to collection.	Collected on a regular basis by a licensed waste contractor and transported to an appropriately licensed facility for recycling.
Batteries	Used batteries would be placed within a covered and marked used battery storage area until removed from site.	Used batteries would be collected on a regular basis by an appropriate contractor and recycled.
Tyres	Tyres would be placed within a marked used tyre storage area until removed from site or used for another purpose.	Tyres would be re-used on site for construction of retaining walls, erosion protection, traffic control or would be removed from site for re-use elsewhere or recycling. If re-use or recycling is not practicable, then used tyres would be encapsulated within the waste rock emplacements.
Scrap Steel/Metal	Stored in a specified area within the workshop area or elsewhere as required.	Collected on a regular basis by a scrap metal recycler.
Waste water	Waste water from the ablutions facilities and lunchrooms would be treated using an appropriate waste water treatment plant approved by Narromine Shire Council. The unit would be fully containerised and only require an in-ground transfer tank. Treated waste water would be suitable for process water. When required, solids from the treatment facility would be periodically removed during regular servicing operations and transported to a licensed disposal facility.	

It is also noted that at times the Tomingley West Road is covered with water during and immediately following extreme rainfall events. As a result, the Proponent would upgrade and maintain the existing access track to the "Wyoming" homestead, from the Newell Highway, as the Western Emergency Access Road. In addition, the Eastern Emergency Access Road would also be constructed and maintained from the Mine Site on the eastern side of the Newell Highway to the Newell Highway. These access roads would permit direct access to the Newell Highway during periods when access to the Mine Site via the Main Site Access Road or Newell Highway Underpass (for the eastern section of the Mine Site) is unsafe or not available (**Figure 2.1**).

The Proponent would maintain locked security gates at the intersection of the Newell Highway and these emergency access roads and would, where appropriate, ensure that traffic controllers are positioned at the intersection to ensure that safe operation of the intersection during any periods of use.

2.9.2.2 Internal Haul Road Network

A range of internal haul roads and other roads would be constructed during and following site establishment. These would include the following (**Figure 2.1**).

- A haul road from the Caloma Open Cut (and Caloma Two Open Cut), via the Newell Highway underpass, to the ROM pad (Caloma – ROM pad Haul Road).
- Haul roads from the Wyoming One and Wyoming Three Open Cuts to the Caloma – ROM pad Haul Road.
- Haul roads from each of the open cuts to the respective waste rock emplacements.
- A range of temporary haul roads within the proposed open cuts and waste rock emplacements.

The internal haul roads would be designed, constructed and/or maintained in accordance with the document *Managing Urban Storm Water – Volume 2C – Unsealed Roads* published by the then Department of Environment and Climate Change in 2008 (DECC, 2008a). In summary, the haul roads would be constructed to the following parameters.

- The width of the haul roads would be a minimum of three times the width of the largest haul truck. Typically, total haul road width would be approximately 20m wide, for dual access roads.
- A safety bund, a minimum of half the wheel height of the largest vehicle likely to travel the road, would be positioned on the downslope side of all haul roads where they are located adjacent to or traverse steep slopes.
- Haul roads would typically be constructed with a gradient of no more than 1:7 (V:H).
- In order to maintain all weather access, the surfaces would be sheeted with suitable waste rock materials recovered during the mining activities.
- The roads would be routinely maintained and watered to suppress the generation of dust.
- All haul roads would be constructed in a manner that would avoid excessive erosion during rain events. Surface runoff from these haul roads would be contained as part of the overall dirty water management system.

2.9.2.3 Site Access and Light Vehicle Road Network

A range of access tracks would be constructed within the Mine Site. These tracks would include the Eastern and Western Emergency Access Roads (**Figure 2.1**). Other access tracks would permit access to the RSF, waste rock emplacements and other sections of the Mine Site. These access tracks would also be constructed generally in accordance with the document *Managing Urban Storm Water – Volume 2C – Unsealed Roads* (DECC, 2008a) and would be maintained in a manner that would minimise the potential for erosion and sedimentation and dust lift off.

2.9.2.4 Separation of Mine and Non-mine Traffic

Vehicular access to the 'operational' sections of the Mine Site would be restricted through implementation of barricade systems and gates. Access to those sections of the Mine Site would be restricted to approved heavy and light vehicles and approved drivers. Where non-approved vehicles or drivers require access to the Mine Site, they would be escorted.

2.9.3 External Transportation

2.9.3.1 External Road Network

The Proponent anticipates that there would be three principal transportation routes to access the Mine Site as follows (**Figure 1.1**).

- To/from Narromine via Tomingley-Narromine Road and Tomingley West Road.
- To/from Dubbo via Newell Highway, Tomingley-Narromine Road and Tomingley West Road.
- To/from Peak Hill and Parkes via Newell Highway, Tomingley-Narromine Road and Tomingley West Road.

Both the Newell Highway (State Highway 17) and the Tomingley-Narromine Road (Main Road 89) are State roads. Tomingley West Road is a local road maintained by Narromine Shire Council.

2.9.3.2 Proposed Upgrade to the Tomingley West Road

The surrounding road network is described in detail in Section 4.11.2.2 and Part 7 of the *Specialist Consultant Studies Compendium*. In summary, the Tomingley West Road is a two lane, two way road with a central sealed carriageway of between 3.5m to 4.0m wide. The Proponent recognises that this layout would not be adequate as the main access route for the Project and would undertake, in consultation with Narromine Shire Council, to widen the sealed section of the road between the Main Site Access Road and the Tomingley-Narromine Road.

2.9.3.3 Traffic Types and Levels

Traffic types associated with the Project would include the following.

- Light vehicles: including passenger vehicles, light trucks and buses.
- Heavy vehicles: including rigid trucks and semi-trailers delivering consumables, processing reagents and supplies.
- Oversize and overweight vehicles: delivering components of the processing plant and mobile fleet. The Proponent would ensure, where practicable, that all oversize and overweight vehicles would have the appropriate permits and approvals and would be appropriately escorted, when required. It is noted, however, that obtaining of required permits and approvals is typically the responsibility of the road transportation contractor.

Table 2.7 presents the anticipated Project-related traffic levels for each of the principal transportation routes identified in Section 2.9.3.1 during site construction and operation of the Project.

Table 2.7
Anticipated Daily Traffic Movements[1]

Route	Light Vehicles	Heavy Vehicles[2]
Project Construction		
Newell Highway	120	14
Tomingley – Narromine Road[3]	60	6
Tomingley West Road	180	20
Project Operation		
Newell Highway	102	6
Tomingley – Narromine Road[3]	34	2
Tomingley West Road	136	8

Note 1: Two vehicle movements = one return trip
Note 2: Includes over size and overweight vehicles.
Note 3: North of the intersection with the Tomingley West Road
Source: Alkane Resources Ltd

The existing traffic levels on the roads surrounding the Mine Site are presented in Section 4.11.2.3.

2.9.3.4 Alternative Modes of Transportation

Road transportation of the gold doré of the Project is the only feasible method of transportation given the relatively low volume of material produced.

2.10 FACILITIES AND SERVICES

2.10.1 Introduction

The Project would include construction and use of a range of facilities and services. A description of the principal infrastructure that would be established for the Project is provided in Section 2.2. This sub-section provides a description of the other facilities and services that would be required.

2.10.2 Facilities

An Administration Office area, which forms part of the Processing Plant and Office Area, would be constructed during the site establishment phase of the Project. **Figure 2.16** presents an indicative layout of the office area which would comprise the following components.

- The existing "Wyoming" homestead which would be used for exploration or training offices.
- The existing "Wyoming" shearing shed, which has a concrete floor and a raised timber board which would be used for a general site muster area or storage area.
- A series of demountable buildings that would contain the Proponent's site office, ablution facilities, first aid room, security and meeting rooms.
- An unsealed car park with capacity for 42 vehicles.

As noted in Section 2.6.2 as shown on **Figure 2.16**, the Proponent would establish a workshop area within the Processing Plant and Office Area. The workshop area would comprise the following components.

- Workshop building(s), including a concrete sealed floor and vehicle inspection bays. A small bund or drain around the perimeter of the building would contain potentially contaminated runoff and an oil/water separator would be incorporated in the drainage plan.
- A stores facility.
- A hardstand area comprising an unsealed area for storage of excess equipment awaiting use or removal from site, or parking of mobile equipment.
- A fuel bay and refuelling area incorporating a concrete bunded storage area containing fuel tanks, unused oil and grease, waste oil tank and a concrete sealed refuelling area. All potentially contaminated surface water runoff would be directed to an oil/water separator.

A Contractor's Area would be established to the east of the ROM Pad (**Figure 2.16**). This area would indicatively include the following.

- A transportable building for use as the contractor's office and crib room.
- A workshop building, including a two-bay open-front workshop with concrete floor, apron and workshop office, a basic stores facility (containers) plus fenced storage area, fuel and oils storage facilities (self-bunded tanks) and waste oil management facilities.
- An ablutions facility.

2.10.3 Services

2.10.3.1 Electricity Supply

Power for the processing plant and the various buildings within the Mine Site would be provided by a distribution system from the proposed substation described in Section 2.2.3. The distribution network would be partially above ground and partially buried.

Power for mine dewatering pumps and mobile lighting towers would be supplied by diesel generators. Lighting in the vicinity of the processing plant and workshops would be provided by mains-powered lights. All lights would, where practicable, be orientated away from surrounding residences and the Newell Highway.

The Proponent estimates that once the processing plant and remaining Project-related activities are being undertaken at the proposed rate, the annual power consumption within the Mine Site would be approximately 32.16GWhr.

If haul trucks are required to pass beneath any overhead power lines, the power lines would be elevated to a height where the haul trucks can pass safely beneath them.

2.10.3.2 Communications

The site office would be serviced by telephone and data lines. In addition, communications within the Mine Site would be via two-way radio and/or mobile phone.

2.10.3.3 Hydrocarbons

All diesel fuel for the mobile equipment would be stored in above ground tanks with a total indicative capacity of 100 000L. These tanks would be either self-bunded or located within a bunded fuel bay in the vicinity of the workshop within the Contractor's Area (**Figure 2.16**). Bunding, if required, would be sized to meet the OEH containment requirements and *AS 1940:2004 - Safe storage & handling of flammable & combustible liquid*s.

A sealed refuelling area would be located adjacent to the fuel bay with all drainage from both areas directed to an oil/water separator. All haul trucks and graders and some light vehicles would utilise the refuelling area while the excavators, bulldozers and generators would be refuelled at their work site using a mobile fuel tanker.

Any bulk oils, greases and waste oils would also be stored within this bunded fuel bay or alternative appropriately bunded areas.

It is anticipated that the Project would require on average approximately 590 000L of diesel per month. This consumption, however, is expected to vary between approximately 121 000L and approximately 1.8ML per month. Anticipated diesel consumption throughout the life of the Project would be approximately 2.19ML of diesel throughout the life of the Project.

In addition, between approximately 30 000L and 40 000L of LPG would be used per month within the processing plant for heating reagents during processing operations, or approximately 2 200 000L throughout the life of the Project. The LPG would be stored within six 7 500L tanks within the same compound as the cyanide within the Processing Plant and Office Area (**Figure 2.16**).

2.10.3.4 Potable Water

Potable water and water for the ablutions facilities would be sourced from the proposed water pipeline and would be appropriately treated within the Potable Water Processing Plant before being used (**Figure 2.16**).

2.10.3.5 Operational Water

Operational water requirements, namely water for processing operations, dust suppression and workshop wash-down purposes would vary depending on ore production rates (up to 1.53Mtpa) and meteorological conditions. Considering maximum production rates and the Proponent's experience of dust suppression requirements at the nearby Peak Hill Gold Mine, water requirements could be as high as follows.

- Processing: 878ML/yr.
- Dust suppression and wash down: 60ML/year.

Water for processing and wash down purposes would be preferentially sourced from recycled water from each of those facilities. Make-up water would be sourced from the water supply pipeline.

Water for dust suppression purposes would preferentially be sought from the surface water containment structures within the Mine Site, including any in-pit sumps constructed to collect incident rainfall and groundwater inflows, if any. Make-up water would be sourced from the water supply pipeline. Section 4.3.5.5 and Part 2 of the *Specialist Consultant Studies Compendium* present a site water balance for the Mine Site.

2.10.3.6 Sewage and Waste Water

Sewage from ablutions facilities within the Mine Site would be treated through an appropriately licenced waste water treatment system. Solids removal would be serviced by a licensed waste collection and disposal contractor, as required.

2.11 PROJECT LIFE AND HOURS OF OPERATION

2.11.1 Project Life

Based upon the expected total quantity of ore material as identified in Section 1.4.3 and on the proposed mining rate described in Section 2.4.5, the Proponent anticipates that construction operations may take up to 12 months and mining operations would require approximately nine years to complete (see **Table 2.3**). In addition, following completion of mining operations, site decommissioning and rehabilitation operations may take up to 12 months, with further monitoring and limited management to continue after that. As a result, the proposed project life would be approximately ten years.

The Proponent, notes that throughout the life of the Project, the Company plans to explore for possible extensions to known mineralisation or additional mineralisation within or surrounding the Mine Site. Further ore reserves indicated by this program may extend the life of the mining operation. Separate applications for approval to extract that material would be made at that time.

2.11.2 Hours of Operation and Workforce Rosters

Table 2.8 presents the proposed hours of operation for each of the relevant components of the Project.

Table 2.8
Proposed Hours of Operation

Activity	Proposed Days of Operation	Proposed Hours of Operation
Vegetation clearing and topsoil stripping	7 days per week, during each campaign	Daylight hours
Construction operations	7 days per week for a period of approximately 6 to 12 months	24 hours per day
Open cut mining operations	7 days per week	24 hours per day
Underground mining operations	7 days per week	24 hours per day
Blasting operations	Monday to Saturday	9:00am to 5:00pm[1]
Maintenance operations	7 days per week	24 hours per day
Processing operations	7 days per week	24 hours per day
Rehabilitation operations	7 days per week	7:00am to 10.00pm
Note 1: Unless required for misfire re-blast, emergency or safety reasons.		
Source: Alkane Resources Ltd		

All mining and processing operations would be undertaken on a continuous roster, seven days per week. It is noted that in order to satisfy intrusiveness noise criteria under the NSW Industrial Noise Policy (INP) (Environment Protection Agency, 1999), restrictions on the number and location of equipment operating between the hours of 10:00pm to 7:00am would be implemented. The relevant noise criteria and proposed operational restrictions are discussed in Section 4.2.

It is envisaged that all operational personnel would be resident locally (Parkes, Peak Hill, Tomingley, Dubbo) and the bulk of the workforce would be sourced locally. To this end, it is envisaged that senior and middle management would operate on a five or six day week. All other personnel would operate on a twelve hours rotational shift basis and 2:1 weekly roster.

2.12 EMPLOYMENT AND ECONOMIC CONTRIBUTIONS

The Proponent estimates that the Project would make the following employment and economic contributions to the surrounding communities.

- Approximately 100 full-time equivalent positions during the construction phase of the Project.
- Approximately 85 to 90 full-time equivalent positions during the operational phase which would be divided approximately equally be between employees of the Proponent and the mining contractor. A peak work force of up to 125 to 130 people would be required in the initial open cut mining phase, i.e. during Year 2.

In addition, **Table 2.9** presents the economic contribution of the Project to the local and regional, NSW and Federal economies.

Table 2.9
Economic Contribution Attributable to the Tomingley Gold Project

	Annual	Life of the Project
Local and Regional Economy		
Wages and salaries (employees and contractors)	$13,142,000	$95,280,000
Local services and suppliers (deliveries, local earthmoving, maintenance, etc.)	$15,442,000	$111,951,000
Council rates and community contribution	$35,000	$254,000
State and Federal Economy		
State and National services and suppliers (mining contractor less contractor wages, national suppliers, etc.)	$18,513,000	$134,220,000
NSW government royalty	$1,849,000	$13,405,000
Total	**$48,981,000**	**$355,110,000**
Source: Alkane Resources Ltd		

2.13 SAFETY AND SECURITY

2.13.1 Public and Employee Safety

The Proponent recognises that the proximity of the Mine Site to the Newell Highway and Tomingley would necessitate the implementation of procedures and controls to protect the safety of the public.

Measures would be implemented to ensure the safety of visitors, contractors and employees, as well as ensuring the security of facilities and equipment from unauthorised access. It is the Proponent's policy that each person employed on, or visiting the Mine Site would be provided with a safe and healthy working environment. In order to achieve this, the Proponent would implement a recruitment, induction and training program to:

- ensure compliance with statutory regulations and maintain constant awareness of new and changing regulations;

- eliminate or control safety and health hazards in the working environment in order to achieve the highest possible standards for occupational safety in the mining industry;
- ensure the suitability of prospective employees through a structured recruitment procedure;
- provide relevant occupational health and safety information and training to all personnel;
- develop and constantly review safe working practices and job training;
- conduct regular safety meetings and provide an open forum for input from all employees;
- provide effective emergency arrangements for all employees, visitors and general public protection;
- maintain good morale and safety awareness through regular employee assessment and counselling; and
- ensure all contractors adopt and maintain Proponent's policy objectives and safety standards at all times.

Central to all aspects of site public and employee safety would be the following.

- The adoption of a pro-active approach to employee and public safety.
- Strict compliance at all times with the requirements of the following.
  - *Mine Health and Safety Act 2004.*
  - *Mine Health and Safety Regulation 2007.*
  - *General Rule 2000.*
  - *Occupational Health and Safety Act 2000.*
  - *Occupational Health and Safety Regulation 2001.*
  - *Occupational Health and Safety (Dangerous Goods) Act 2003.*
  - *Explosives Act 2003.*
  - *Explosives Regulation 2005.*
  - *Dams Safety Act 1978.*
  - All other relevant legislation and Australian Standards.
- An *Occupational Health and Safety Policy* to cover all component activities at the mine.

Specifically, the following safety and security measures would be implemented.

- A Mine Safety Management Plan, including a Contractor Safety Management Plan, would be prepared in accordance with the requirements of the *Mine Health and Safety Act 2004*.

- A fence would be erected around the perimeter of the active sections of the Mine Site, including adjacent to the Newell Highway. The form of the fencing would be determined in consultation with DTIRIS-DR&E and would be identified in the *Mining Operations Plan*.
- A safety bund (Type 3 bund – see Section 2.2.6.3) approximately 1.3m to 1.4m high would be constructed around the perimeter of each of the proposed open cuts. This bund would remain in place following completion of mining-related activities. A service track to allow vehicular access around the perimeter of the open cuts would be constructed between the safety bund and the security fence.
- The Main Site Access Road would be the only regular vehicular access point to the operational sections of the Mine Site. All visitors would be required to report to the site office. Security/warning signs would be positioned at strategic locations around or within the Mine Site indicating the presence of earthmoving and mining equipment, deep excavations and steep slopes. The positioning of signs would depend on the location of the mining activities at any one time.
- Signs identifying blasting procedures and times would also be installed adjacent to the Main Site Access Road, adjacent to the Newell Highway and in the vicinity of the truck stop immediately south of the Mine Site.
- Employee and contractor inductions would include safe working practices and regular follow-up safety meetings and reviews.
- Toolbox meetings would be held regularly and would include a review of safety-related matters.
- Regular drug and alcohol testing would be undertaken in accordance with the Proponent's *Drug and Alcohol Policy*.
- Where internal haul roads are adjacent to steep slopes, windrows along the down slope margins of those haul roads would be constructed to a minimum of half the wheel height of the largest item of mobile equipment on site.
- Appropriate controls with respect to the storage and use of explosives would be identified in an *Explosives Storage and Management Plan* which would be prepared prior to commencement of blasting operations.
- The blasting engineer or shotfirer would use appropriate blasting procedures to contain all fly rock within the design blast envelope and minimise the generation of excessive ground and air vibrations (see Section 2.4.3.4).
- Appropriate controls with respect to the storage and use of processing reagents would be identified in a *Reagent Management Plan* which would be prepared prior to commencement of processing operations.
- Lighting plants and vehicle headlights would be directed such that the vision of motorists travelling on the Newell Highway is not adversely impacted by the Project.

- All earthmoving equipment would be fitted with appropriate safety equipment in accordance with the *Guideline for Mobile and Transportable Equipment for Use in Mines* (MDG 15) published by the DTIRIS-DR&E.

2.13.2 Explosive Storage

Explosive storage would be undertaken in accordance with an *Explosives Storage and Management Plan.* In summary, detonators and boosters would be stored within magazines within the Magazine Area located adjacent to Waste Rock Emplacement 1[5]. This area would be secured by a 1.8m high security fence topped with barbed wire and a lockable gate. In addition, the Magazine Area would be the subject of regular inspection by security personnel working for or contracted to the Proponent. The magazines would be likely to be transportable structures which would be constructed, secured, maintained and permitted in accordance with the relevant guidelines. Bulk explosives would be transported to the Mine Site on the day of the blast.

2.14 SITE DECOMMISSIONING AND REHABILITATION

2.14.1 Introduction

The Proponent would adopt a progressive approach to the rehabilitation of disturbed areas within the Mine Site to ensure that, where practicable, areas where mining or waste rock placement are completed are quickly shaped and vegetated to provide a stable landform. The progressive formation of the post-mining landform and the establishment of a vegetative cover would also minimise the potential Project-related visual amenity and air quality impacts at surrounding residences.

Rehabilitation activities and biodiversity enhancement plantings (offset plantings) would also occur on some areas of the Project Site that would not be disturbed by Mine Site activities or infrastructure. These plantings would be progressive and form part of the final landform.

The following sub-sections describe the Proponent's proposed approach to site decommissioning and rehabilitation and:

- outline the rehabilitation objectives of the Proponent with respect to the rehabilitation of the Mine Site (Section 2.14.2);
- provide an overview of the strategic management of rehabilitation, which includes the categorisation of rehabilitation domains, establishment of a rehabilitation hierarchy, and establishment of completion criteria, performance indicators and monitoring programs (Section 2.14.3);
- describe the proposed final land use and landform (Sections 2.14.4 and 2.14.5);
- describe the procedures to be applied to each component of the mine, water management structures and other areas of disturbance associated with the mining and processing operations (Section 2.14.6);
- describe the proposed rehabilitation maintenance procedures, post-mining management and noxious weed management (Sections 2.14.7 and 2.14.8); and
- describe the proposed Project Biodiversity Offset Strategy (Section 2.14.9).

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[5] For security reasons, the exact location of the explosives magazine has not been provided on report figures.

It is noted that the Proponent proposes to undertake ameliorative plantings in some sections of the Mine Site that have been previously cleared for agricultural purposes. Refinements to the proposed rehabilitation presented in the following sub-sections would be provided in the *Mining Operations Plan* (MOP) to be prepared for the Project following project approval and then, if required, would be undertaken on the basis of operational experience gained by the Proponent, or by others at similar operations. These refinements would be reported in the relevant *Annual Environmental Management Report* (AEMR) and/or any amended MOP(s) produced by the Proponent throughout the life of the Project. It is noted that the Proponent operated the Peak Hill Gold Mine, located approximately 15km to the south-southeast of the Mine Site since between 1996 and 2002. Most of that site has now been fully rehabilitated and a large proportion of a Security Deposit has been released by DTIRIS-DR&E. The mined landscape at Peak Hill is currently operated as a tourist mine and was a finalist in the 2003 NSW Tourism Awards. **Plates 2.1** to **2.4** present views of the completed rehabilitation within the Peak Hill Gold Mine Site.

2.14.2 Rehabilitation Objectives

The Proponent's rehabilitation objectives are divided into three specific categories, namely:

- landform establishment;
- growth media development; and
- ecosystem development (final land use).

The specific objectives associated with each category are as follows.

Landform Establishment

- To stabilise all disturbed areas and minimise erosion and dust generation.
- To reduce the visual impact upon surrounding residents by early establishment of vegetation in areas where mining-related operations have been completed, i.e. on the external face of the amenity bunds and progressive rehabilitation of the waste rock emplacements as described above.
- To blend the created landforms with the surrounding topography.
- To provide a low maintenance, geotechnically stable and safe, non-polluting landform which blends with surrounding landforms and provides land suitable for the final land use of nature conservation, agriculture, tourism or light industry.

Growth Media Development

- To achieve a soil profile capable of sustaining the specified final land use.
- To establish native vegetation with the species diversity commensurate to each relevant ecological community.

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Plate 2.1: Rehabilitated slopes of Peak Hill Gold Mine Waste Rock Emplacement
(Ref: PHGM_WRE batter rehab_20110330)

Plate 2.2: Rehabilitated slopes of Peak Hill Gold Mine Waste Rock Emplacement viewed from distance
(Ref: PHGM_WRE_batter rehab)

Plate 2.3: Vegetation regrowth within the Peak Hill Gold Mine Open Cut
(Ref: BobbyBurn_Rehab_20101205)

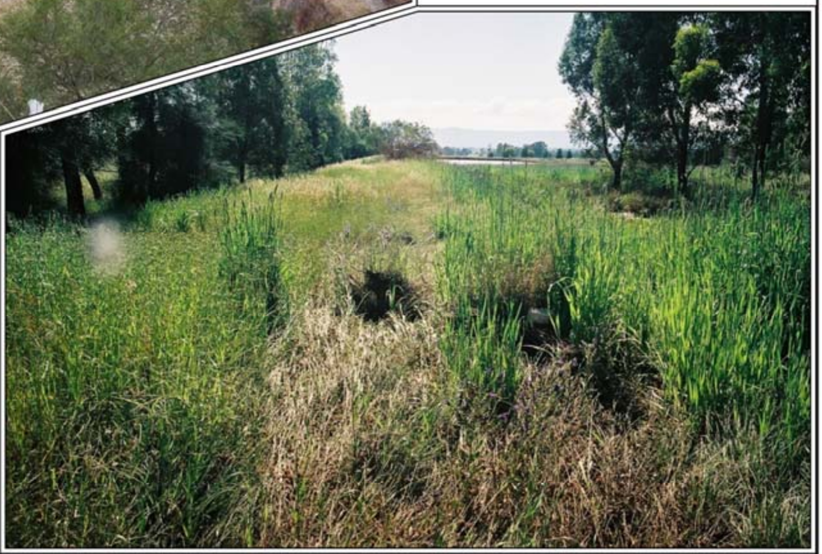

Plate 2.4: Rehabilitated Table Drain at Peak Hill Gold Mine
(Ref: Table drain to NE sedpond Nov 05)

Ecosystem Development (Final Land Use)

- To re-instate woodland ecological communities commensurate with the remnant woodland vegetation disturbed by Project activities.
- To protect and enhance those sections of the Mine Site with remaining vegetation, focusing particularly on that vegetation that may be classified as endangered ecological communities under State or Commonwealth legislation.
- To establish an area of ameliorative plantings in some sections of the Mine Site that are not required for mining-related operations to provide habitat and generally improve the biodiversity value of the Mine Site.
- To retain areas on the Mine Site amenable to future agricultural or industrial activities.

2.14.3 Strategic Rehabilitation Management

2.14.3.1 Rehabilitation Domains

Rehabilitation domains refer to areas of related disturbance based on processes and use prior to rehabilitation and for which decommissioning and rehabilitation activities would be similar. A description of each domain is given below.

Domain 1 – Infrastructure Areas (D1)

This domain would include the Processing Plant and Office Area, the Contractors Area, ROM Pad, explosives magazine, the Main Site Access Road and any other miscellaneous buildings or roads.

Domain 2 – Amenity Bunds and Surface Water Management Structures (D2)

This domain includes all clean and dirty water dams, diversion drains, amenity bunds and associated infrastructure.

Domain 3 – Waste Rock Emplacement Areas (D3)

This domain would include all waste rock emplacement areas and soil stockpile locations.

Domain 4 – Residue Storage Facility (D4)

This domain includes the Residue Storage Facility and associated infrastructure.

Domain 5 – Final Void Area (D5)

The final void area would include the post-mining void and any associated access.

The rehabilitation objectives described in Section 2.14.2 relate to all rehabilitation domains.

2.14.3.2 Rehabilitation Hierarchy

The rehabilitation hierarchy for the Project follows a modified rehabilitation hierarchy based on DTIRIS-DR&E's model but is aligned to the rehabilitation objectives in Section 2.14.2. A summary of each phase of the rehabilitation hierarchy is as follows.

Decommissioning

Specific details of decommissioning completion criteria would be covered in a *Mine Closure Plan* to be prepared closer to completion of mining activities. In general, however, the decommissioning phase of the rehabilitation hierarchy involves the cessation of usage of infrastructure, as well as its demolition, removal and any remediation of the land that may be required. Specific decommissioning activities that relate to completion criteria at this stage in the rehabilitation hierarchy are outlined in Section 2.14.6.2.

Landform Establishment

The landform establishment phase involves the earthworks required to cover and/or profile all or part of each domain to create a landform suitable for the proposed final land use and which blends with the adjacent topography. This stage would also include the construction of any drainage structures needed for the area. Specific procedures relating to landform establishment that relate to completion criteria at this stage of the rehabilitation hierarchy are outlined in Section 2.14.6.

Growth Media Development

The growth media development phase of the rehabilitation hierarchy involves the replacement of soil over disturbed areas and preparation of the soil for revegetation including fertiliser or ameliorant application and ripping or scarifying the soil. It is also covers (similar to DTIRIS-DR&E Ecosystem Establishment phase) the revegetation of the rehabilitated landform and biodiversity offset areas with native species commensurate with the targeted final land use. Specific procedures relating to growth media development are outlined in Section 2.14.6.

Ecosystem Development (Final Land Use)

The ecosystem development (final land use phase) of the rehabilitation hierarchy occurs once monitoring shows that there is adequate vegetation over the area. An area may be in this stage for a long period of time, depending on what the final land use outcome is. During this stage, the area would continue to be monitored and would not reach its nominated sustainable end land use until monitoring determines that the completion criteria summarised in **Table 2.10** have been met.

2.14.3.3 Strategic Rehabilitation Completion Criteria, Associated Performance Indicators and Monitoring Strategy

The strategic rehabilitation completion criteria, associated performance indicators and monitoring strategy for the Project are summarised in **Table 2.10**. While the rehabilitation criteria are based on the DTIRIS-DR&E model, it has been modified to align with the rehabilitation objectives outlined in Section 2.15.2 and the rehabilitation hierarchy discussed in Section 2.15.3.2. The rehabilitation criteria aim to achieve the following.

- The ongoing refinement of completion criteria and monitoring programs that would facilitate lease relinquishment following mine closure.
- Alignment with rehabilitation and biodiversity offset area objectives.
- The facilitation of continuous improvement in restoration management practices of the rehabilitation and biodiversity offset areas.

Table 2.10
Strategic Rehabilitation Completion Criteria, Associated Performance Indicators and Monitoring Strategy

Page 1 of 2

Rehabilitation Objective	Completion Criteria	Performance Indicator	Monitoring Strategy
Landform Establishment	The landform morphology fits in with the surrounding landscape.	Slopes are at or less than 18° for waste rock emplacements and RSF. Final slopes of open cut (void) walls are stable.	*Annual Environmental Management Report (AEMR)* includes up to date survey of final landforms.
	The rehabilitated area does not represent an erosion hazard.	Erosion does not exceed 0.3m (gully) deep.	Quarterly visual inspection by Mine Manager, Environmental Officer or other nominated (and appropriately trained) personnel.
Growth Media Development – Woodland Ecological Community	Appropriate native plant species richness is present for the restored ecological community.	To be determined.	Vegetation monitoring (EFA score) by ecologist to determine native plant species richness (prior to lease relinquishment).
	Appropriate density/structure of native overstorey species is present.	To be determined.	Vegetation monitoring (EFA score) by ecologist to determine over storey structure (prior to lease relinquishment).
	Appropriate density/structure of native mid storey species is present.	To be determined.	Vegetation monitoring (EFA score) by ecologist to determine mid storey structure (prior to lease relinquishment).
	Appropriate native groundcover is present.	To be determined.	Vegetation monitoring (EFA score) by ecologist to determine native plant species richness (prior to lease relinquishment).
Growth Media Development – Agricultural Land	Areas retained for future agricultural or industrial activities.	Nominated areas of the Mine Site maintained free of woodland vegetation and weed species.	Annual monitoring for weed species to be reported in *AEMR*.
Ecosystem Development (Final Land Use)	The area and its sustainability is consistent with the intended land use.	Establish areas of rehabilitation consistent approval conditions. Land use classifications to include: • Rehabilitation of Woodland Ecological Communities. • Agricultural land. • Biodiversity Offset Area.	*AEMR* to quantify areas. *Biodiversity Offset Management Plan* to be audited every 3 years.

Note: EFA Score = Ecological Function Analysis Score.

Table 2.10 (Cont'd)
Strategic Rehabilitation Completion Criteria, Associated Performance Indicators and Monitoring Strategy

Page 2 of 2

Rehabilitation Objective	Completion Criteria	Performance Indicator	Monitoring Strategy
Ecosystem Development (Final Land Use) (Cont'd)	There are no potential hazards inconsistent with the intended land use.	The site is free of safety or environmental hazards including: • holes, tunnels or unstable areas; • mining infrastructure or debris; or • hazardous materials.	Quarterly visual inspection Environmental Officer or other nominated (and appropriately trained) personnel.
	The soil pH is representative of the intended land use.	pH levels are within the range generally acceptable for plant growth (5.0 to 8.5) until data from analogue sites is available.	Annual soil analyses by Environmental Officer or other nominated (and appropriately trained) personnel.
	Exotic weeds or vegetation is not competing or impacting on the intended land use.	Noxious weeds are not present within rehabilitation or biodiversity offset areas until data from analogue sites is available.	Annual visual inspection by Environmental Officer or other nominated (and appropriately trained) personnel.
	Feral pests are not impacting on the intended land use.	Feral pests are not present within rehabilitation or biodiversity offset areas until data from analogue sites is available.	Annual visual inspection by Environmental Officer or other nominated (and appropriately trained) personnel.

Note: EFA Score = Ecological Function Analysis Score.

Specific rehabilitation criteria and a monitoring program would be outlined in a relevant management plan to be submitted and approved after project approval. The rehabilitation criteria would be continually refined through monitoring and revised through a relevant updated management plan to be approved by DP&I and DTIRIS-DR&E.

The rehabilitation monitoring strategy for the Project would generally be in accordance with the monitoring program implemented successfully at the Peak Hill Gold Mine. The objective of the monitoring program would be to evaluate the restoration progress of the mine rehabilitation towards fulfilling ecological community land use objectives and closure criteria. The purpose of monitoring activities would be to ensure the sustainable re-colonisation and ongoing management of native flora and fauna, and to guide continual improvement of rehabilitation practises.

2.14.4 Final Landform

Figure 2.18 presents the final landform. In summary, the final landform would include the following components.

- Three shaped and covered waste rock emplacements with undulating upper surfaces, outer faces with maximum slopes of approximately 18º (1V:3H) and appropriately located and designed surface water control structures to minimise the risk of erosion and sedimentation.

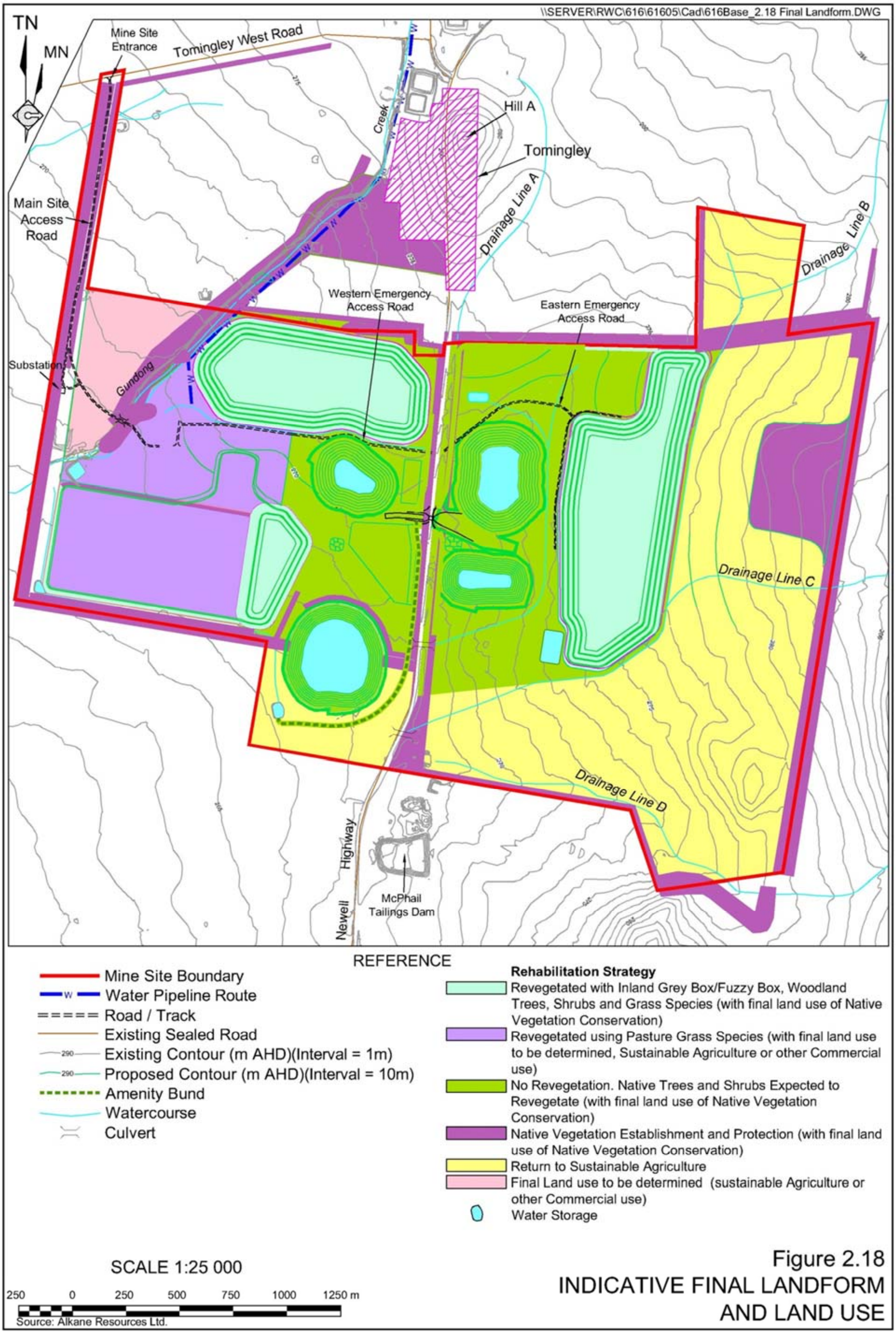

Figure 2.18
INDICATIVE FINAL LANDFORM AND LAND USE

- The final landform of Waste Rock Emplacement 1 would merge with a shaped and covered RSF. The final RSF landform would be free-draining, i.e. shed water, with the upper surface capped to create a slightly convex surface. The final walls of the RSF would be constructed at approximately 18º with appropriate surface water management structures constructed to shed water.
- Four appropriately bunded, fenced and signed open cuts.
- The vegetated amenity bunds and surface water infrastructure, including sediment basins would be retained.
- The 66kV substation would be retained.
- The water supply pipeline would be retained.
- The fate of the underpass beneath the Newell Highway would be determined in accordance with the Work Authorisation Deed executed by the Proponent and the RTA. It would be the preference for the underpass to be retained so as to make the Mine Site more amenable to future light industrial land uses, however, it is acknowledged that decommissioning and demolition of this structure may be required.

Final land uses would be determined in consultation with the community and the relevant government agencies, e.g. Department of Primary Industries, DTIRIS, DP&I, OEH and the RTA, prior to decommissioning of the Project. It is likely, however, that sections of the Mine Site would be revegetated throughout the life of the Project. As a result, the final land uses within the Mine Site would include sections that may be used for nature conservation, agriculture, tourism, light industry or some other land use identified by the community as an appropriate land use for the site.

2.14.5 Final Land Use

In proposing a final land use for the Mine Site, the Proponent has considered the current land use on the "Wyoming" and surrounding properties, the infrastructure that would be developed on the Mine Site and the proximity of the Mine Site to other industry.

Land uses considered included:

- a return to agriculture;
- the development of other industry;
- the development as a tourist site; and/or
- the conservation of biodiversity.

A return to agriculture on the Mine Site would have practical application as the Project has been designed to have minimal impact on local surface water, with additional water storing infrastructure retained which would be of value to grazing. This land use would also ensure that the Mine Site retains an economic value post-completion of the Project. It is noted that certain elements of the Project may not be compatible with agricultural activities, e.g. the rehabilitated RSF and open cut voids. This notwithstanding, such features would have limited value to any potential future land use and would be managed in such a way as to ensure no hazard is created.

The Project would also provide for infrastructure on the Mine Site potentially suited to other industry, e.g. available electricity supply and sub-station, roads and hard stand surfaces, buildings, power generating infrastructure and water delivery and storage infrastructure. However, as the future use of the site by other industry could be constrained by the distance from the Mine Site to larger regional centres such as Dubbo or Parkes, the site may be unsuitable to those industries requiring regular transport to and from the site.

The development of the Mine Site, or a portion of the Mine Site, for tourism has also been considered. The nearby Peak Hill Gold Mine has been developed as a tourist site, with look-outs and interpretive signs erected to provide the visitor with an understanding of the history of the site, environmental management undertaken, and cultural and ecological aspects protected. Given the close proximity of the Mine Site to Peak Hill Gold Mine, it is feasible that it could be incorporated into a mining 'tourist trail'. However, the similarity of the likely final landform on the Mine Site to that at Peak Hill Gold Mine reduces the potential uniqueness of the site as a tourist destination and thereby the viability of such a land use.

The development of land for conservation is also considered a practical final land use, as once established this would require minimal ongoing management (which could be undertaken in conjunction with concurrent agricultural activities) and would be positively affected by the significant distance to larger regional centres of Dubbo and Parkes (reducing the potential for encroachment by other development).

On the basis of the above, it has been proposed that the Mine Site be returned to an agricultural land use with sections excised for re-establishment and conservation of woodland vegetation. The Proponent is currently investigating alternative land use to agriculture and should this prove feasible will incorporate this into a Mine Closure Plan (and separate development application if relevant to the land use proposed). Section 2.15.8 provides further detail on the Proponent's proposed development and management of an area of the Mine Site to be devoted to conservation.

2.14.6 Rehabilitation Methods and Procedures

2.14.6.1 Introduction

Following receipt of project approval, and as a component of a Mining operations plan for the Mine Site, the Proponent would prepare a detailed rehabilitation plan for the Project. This would provide the agreed final landform and land uses (including any land excised for biodiversity offsetting purposes), detailed progressive rehabilitation schedule and specific revegetation species mix to be used as part of direct seeding and ameliorative planting over the Mine Site. The following sub-sections provide a summary of the methods that the Proponent would adopt for each of the identified rehabilitation domains to meet the objectives described in Section 2.14.6.2, and achieve the conceptual final landform described in Section 2.15.4 and the principal land uses described in Section 2.15.5 (see **Figure 2.18**).

2.14.6.2 Decommissioning Activities

Decommissioning activities would be undertaken upon cessation of mining and processing activities. The following structures and facilities would be decommissioned and removed prior to final rehabilitation of the Mine Site.

- The Processing Plant and Office Area.
- Various fuel storage, workshops, offices and ablutions structures.
- Roads not to be maintained in the final landform.

Items of infrastructure that would not be decommissioned and remain available for future land use are likely to include the following.

- Water supply pipeline.
- 66kV substation, electricity transmission line, transformer and power lines.
- Site buildings, including the office and workshops.
- Main Site Access Road from Tomingley West Road and the western emergency access road.

Processing Plant and Office Area (Domain D1)

Prior to the cessation of mining and processing activities, the Proponent would attempt to identify a buyer for the processing plant (in its entirety or in part). Should the Proponent successfully negotiate the sale, the various buildings and processing infrastructure would be deconstructed.

Should relocation or sale not eventuate, the structure would be separated into smaller sections with parts on-sold as scrap metal and any useable elements transported to a storage facility off site.

Miscellaneous Buildings and Structures (Domain D1)

The majority of buildings and structures erected/constructed on the Project Site would be demountable and therefore would simply be dismantled, washed down with high powered water sprays and transported off site.

Hydrocarbon storage facilities (for diesel, LPG and oils) would be pumped out. A thorough assessment of the soil directly below and surrounding the storage facilities and refuelling area(s) would be conducted to ensure any contaminated soil would be identified. Any contaminated soil classified as "*Restricted Solid Waste*" (under NSW Waste Classification Guidelines, DECCW 2009) would be excavated for treatment on site within a specific bioremediation area or disposed of at an appropriately licensed facility. The fuel storage facility would be on-sold or re-used at another site.

All concrete footings and foundations of buildings or structures to be dismantled or demolished would be broken up and removed or covered and all areas to be rehabilitated would be re-profiled to mimic pre-mining levels.

Roads (Domain D1)

The Proponent intends to remove the majority of Mine Site roads (some roads may be retained to provide ongoing access to the Project Site lands). The Mine Site roads to be removed would be decommissioned (and rehabilitated) as follows.

i) The roads would be closed, with a lockable gate constructed or maintained to prevent access.

ii) The compacted surface would be ripped, removed by truck and disposed of within one of the waste rock emplacements.

iii) All compacted sub-base and base-course material would be ripped, excavated and disposed of within one of the waste rock emplacements or recycled, if appropriate.

The roads would be rehabilitated through further ripping, the respreading of topsoil and reseeding with pasture species or native tree and shrub species depending on the land use designated for that section of the road.

2.14.6.3 Infrastructure Areas (Domain D1)

Once infrastructure decommissioning has been completed, the remaining infrastructure would be rehabilitated as follows.

- Any internal haul roads and other access tracks, with the exception of those specifically noted in Section 2.15.6.2, would be ripped, covered with previously stockpiled topsoil and seeded with locally occurring tree, shrub or grass species (dependent on the intended final land use). Section 2.15.6.8 provides details as to the indicative revegetation activities to be completed over this and other rehabilitation domains of the Mine Site.
- Remaining hardstand areas would be scraped to remove and material not appropriate for rehabilitation, ripped, and covered with previously stockpiled topsoil. Revegetation would be undertaken as described generally in Section 2.15.6.8.
- Appropriate drainage controls would be installed.

2.14.6.4 Amenity Bunds and Surface Water Management Structures (Domain D2)

Section 2.2.6 identifies the amenity bunds and surface water management structures that would be constructed during the site establishment phase of the Project. These structures would be retained in the final landform with rehabilitation limited to the removal of any accumulated silt or sediment, minor profiling activities as required and revegetation using the indicative methods and species list described in Section 2.15.6.8.

In summary, the amenity bunds would be progressively rehabilitated using shrub and grass species that would be representative of the Inland Grey Box and Fuzzy Box Woodland Endangered Ecological Communities. Trees would only be planted at the toe of bunds as they have the potential to reduce the vegetation cover on the batters through competition for moisture. The surface water drainage structures would be revegetated with a mixture of introduced and native grass species (annual and perennial).

2.14.6.5 Waste Rock Emplacements (Domain D3)

Completed sections of the waste rock emplacements would be progressively shaped as soon as practicable after they are no longer required for mining-related purposes. Remaining sections of the waste rock emplacements would be shaped following completion of mining operations.

During shaping operations, contour banks would be constructed on the rehabilitated landform. These structures would direct water at non-erosive velocities from the emplacement to the natural landform or to high-slope, drop-down structures such as flumes. These drop-down structures would be constructed on the slopes of the final landform to direct the surface water flows collected by the contour banks initially to the dirty water management system and then, following completion of rehabilitation operations, to natural drainage lines. Detailed plans showing surface water structures would be provided in the Mining Operations Plan prepared for the Project.

Soil would be placed on the shaped landform in accordance with the following procedures.

- Where required, weathered overburden material would be placed on the surface of the area to be rehabilitated to prevent large rocks from protruding from the final landform and provide a growth medium/water retention material during revegetation.
- Soil material would be placed on the shaped landform. The thickness this material would be determined by the area to be rehabilitated and the volume of soil material available for rehabilitation operations.
- The surface of the shaped landform would be left even but roughened. This would assist in maintaining soil stability, maximising seed retention and germination and minimising erosion.
- If required, artificial covers such as bitumen impregnated straw or mulches would be used to stabilise the soils on the shaped landform.
- The shaped landform would be revegetated with an appropriate species mix to be determined by an appropriately qualified and experienced rehabilitation consultant. **Table 2.11** presents an indicative species list that would be used during rehabilitation operations.

Table 2.11
Indicative Rehabilitation Native Species List

Scientific Name	Common Name	Scientific Name	Common Name
Eucalyptus microcarpa	Inland Grey Box	*Acacia pendula*	Myall
Eucalyptus conica	Fuzzy Box	*Acacia deanii*	Dean's Wattle
Eucalyptus populnea	Bimble Box	*Acacia decora*	Western Golden Wattle
Eucalyptus camaldulensis	River Red Gum	*Acacia hakeoides*	Hakea Wattle
Allocasuarina leumanii	Buloke	*Acacia implexa*	Lightwood
Callitris glaucophylla	White Cypress Pine	*Acacia salicina*	Cooba
Pittosporum phillyroides	Butterbush	*Dodonea viscosa*	Hopbush
Brachychiton populneus	Currajong	*Daviesia genistifolia*	Broom Bitter-pea
Hakea tephrosperma	Needlewood	*Enchylaena tomentosa*	Ruby Saltbush
Hardenbergia violacea	False Sarsparilla	*Rhagodia nutans*	Climbing Saltbush
Austrostipa scabra	Rough Speargrass	*Themeda australis*	Kangaroo Grass
Austrodanthonia sp.	Wallaby Grass	*Chloris sp.*	Umbrella Grass
Bothriochloa macra	Redgrass	*Microlaena stipoides*	Weeping Grass
Cymbopogon refractus	Barbed-Wire Grass	*Paspalidium jubifllorum*	Warrego Summer Grass
Source: Landscape Strategies Australia (2009)			

The soil stockpile areas from which the soil would be stored and then sourced for rehabilitation would be ripped, covered with a layer of topsoil and revegetated in accordance with the general strategies described in Section 2.15.6.8.

The Proponent would undertake a program of collecting seed from native vegetation within and surrounding the Mine Site for use during rehabilitation and enhancement operations. In addition, the Proponent would also undertake revegetation trials to determine the most appropriate mechanism and species mix for rehabilitation within the Mine Site. Details of the trials would be included in the AEMR.

2.14.6.6 Open Cut Areas (Domain D4)

Prior to the commencement of mining operations within each open cut, a 1.3m to 1.4m high safety bund (Type 3 bund – see Section 2.2.6.2) would be constructed around each open cut area. Following completion of mining operations, the haul ramps would be blocked using large rocks or bunds to prevent vehicular access to the open cuts. No planned revegetation of the open cuts would be undertaken, though it is likely vegetation could re-establish on the benches of the open cuts through natural revegetation (as has occurred at the Peak Hill Gold Mine located approximately 15km to the south-southwest of the Mine Site [**Plate 2.3**]).

The final depth of the open cuts would be below the local groundwater table and therefore, groundwater would seep into and accumulate within the retained voids. Initially, the water quality within the final voids would be similar to that of the local groundwater, however, as a consequence of local evaporation exceeding rainfall, the salinity of the water within the void would gradually increase. Section 4.4.4.3 provides a brief discussion as to possible fuinal salinity concentration.

The water held within the final voids would be isolated from the surface water drainage system of the final landform as the final water level would remain well below the lowest point of the surrounding final landform, i.e. the rim of the open cut. Access to the voids would be prevented through the construction of the safety bund noted above, which would be allowed to revegete naturally. The potential for impact on downstream waters would therefore be minimal.

The salinity concentration of the water accumulating in the void would be sampled and analysed for a period to be established in a Water Management Plan for the Project to establicsh the actual quality of the accumulating water. Management of the final voids, and the water to be stored within these is discussed further in Section 4.4.4.3.

2.14.6.7 Residue Storage Facility (Domain D5)

The RSF would, following completion of processing-related operations, be allowed to dry out and settle. During that period, surface water and groundwater monitoring as identified in Section 4.4.8 would continue. Once the RSF has settled sufficiently and water quality is confirmed as acceptable, the RSF would be capped with a layer of impermeable clay to form a free draining landform, i.e. water shedding. Further layers of subsoil and topsoil would be placed over the clay, with appropriate drainage installed to direct surface flows to designated drop-down structures.

The external batters of the RSF would also be covered with a layer of subsoil followed by topsoil, and then revegetated with a combination of the native grass and shrub species nominated in Section 2.15.6.8.

2.14.6.8 Indicative Mine Site Revegetation Strategy

Revegetation of the Mine Site would be undertaken as either;

- revegetation of the rehabilitated final landform; or
- ameliorative planting of native species as a component of a Biodiversity Offset Strategy.

This sub-section focuses on the revegetation of the rehabilitated final landform. Section 2.14.8 provides the Proponent's proposed Biodiversity Offset Strategy which includes ameliorative planting of native species.

Over the major areas of disturbance, i.e. on the batters of the waste rock emplacements and RSF, and various amenity bunds, a mixture of native and introduced species of grasses and legumes would be used for rapid stabilisation of batters. The Proponent has 14 years of experience with rehabilitation techniques at the Peak Hill Gold Mine to guide techniques. Once stabilisation of the final landform is confirmed, these areas would be seeded with a native species mix containing species representative of the Inland Grey Box Woodland and Fuzzy Box Woodland Endangered Ecological Communities as well as other locally occurring species.

Table 2.11 presents an indicative list of species that would be used during ameliorative and rehabilitation planting programs. The indicative species list includes both tree, shrub and grass species and would be refined with experience and the actual species used would be presented in the AEMRs that would be prepared for the Project.

It is recognised that the exact grass, shrub or tree species to be used in Mine Site rehabilitation may vary over the five domains dependent on final landform and function, e.g. vegetation to be used in the rehabilitation of a drainage line will vary to that used on the upper surface of a waste rock emplacement. As noted in Section 2.15.6.1, more specific detail on the exact species mix to be used, and the planting techniques to be implemented, would be provided as the Rehabilitation Management plan component of a Mining Operations Plan to be prepared following receipt of project approval.

2.14.7 Rehabilitation Management and Monitoring

The Proponent's commitment to effective rehabilitation would involve an ongoing monitoring and maintenance program following completion of mining-related operations. Areas being progressively rehabilitated would be regularly inspected, including during AEMR meetings. During these inspections the following would be noted.

- Evidence of any erosion or sedimentation from areas with establishing vegetation cover.
- Success of initial cover crop or grass cover establishment.
- Success of tree and shrub plantings.
- Natural regeneration of native species.
- Adequacy of drainage controls.
- General stability of the rehabilitated areas.

Post-mining rehabilitation remediation and enhancement activities would include but not be limited to the following.

- Where rehabilitation success appears limited, maintenance activities would be initiated. These may include re-seeding and where necessary, re-topsoiling and/or the application of specialised treatments.
- If drainage controls are found to be inadequate for their intended purpose, or compromised by wildlife or native vegetation, these would be replaced.

- Temporary fences would be installed to exclude native fauna, if grazing appears to be excessive.
- In the event areas of excessive erosion and sedimentation are identified, remedial works such as importation of additional fill, subsoil or topsoil material, or redesigning of water management structures would be undertaken.
- Appropriate noxious weed control or eradication methods and programs would be undertaken in consultation with the Department of Primary Industries – NSW Agriculture (DPI-Ag) and / or the local Noxious Weeds Inspector.

No time limit has been placed on post-mining rehabilitation monitoring and maintenance. Rather, maintenance would continue until such time as the objectives outlined in Section 2.14.2 are achieved to the satisfaction of the relevant government agencies.

2.14.8 Offset Strategies

2.14.8.1 Summary of Impacts

The development of the Project as proposed would require the clearing of approximately 21.6ha of remnant vegetation including:

- approximately 2.7ha of Inland Grey Box – Poplar Box – White Cypress Pine tall woodland (considered a component of the NSW Inland Grey Box Woodland EEC and referred to hereafter as the Inland Grey Box EEC);
- approximately 0.9ha of Fuzzy Box – Inland Grey Box community (considered a component of a Fuzzy Box on Alluvials EEC and referred to hereafter as the Fuzzy Box EEC); and
- approximately 18.0ha of Belah / Black Oak Western Rosewood, Wilga Woodland community[6].

2.14.8.2 Biodiversity Offset Requirements

In December 2010, the then Department of Environment, Climate Change and Water (DECCW) issued an interim policy on assessing and offsetting biodiversity impacts of Part 3A developments (DECCW, 2010[7]). This policy seeks to provide a consistent and transparent approach to impact assessment and offsetting for projects assessed under Part 3A of the EP&A Act. This policy also provides the basis for aligning NSW and Commonwealth assessment and offsetting processes by providing an assessment pathway that is likely to satisfy both NSW and Commonwealth requirements.

Under this policy, the Proponent is required to:

- describe, quantify and categorise the biodiversity values and impacts of a proposal;

[6] The density of mature trees within the Belah/Black Oak Western Rosewood, Wilga Woodland community within the disturbance footprint has been extensively reduced and modified by historic ringbarking activities

[7] It is noted that the nominated expiry date for the interim policy, June 2011, has passed. No formal policy position from the OEH has been subsequently provided.

- identify, for benchmarking purposes, the offsetting that would be required to meet the improve or maintain standard; and
- provide the information for calculating offsets under this policy.

The interim policy of OEH relies on the use of the Biobanking Assessment Methodology (BBAM) for the purpose of quantifying and categorising the biodiversity values and impacts of Part 3A proposals. The nominated offset strategy is then considered against benchmark requirements for the level of disturbance proposed (generated by BBAM) to determine whether it meets one of the following biodiversity outcomes.

- Improve or maintain. The benchmark offsets nominated by BBAM are achieved.
- No net loss. With the exception that 'red flag' areas, e.g. EECs or threatened flora, are not protected, the benchmark offsets nominated by BBAM are achieved
- Mitigated net loss. The nominated offset does achieve the benchmark nominated by BBAM, however, a lesser quantum is justified on the basis of other factors.

The OEH interim policy acknowledges that it may not be feasible or appropriate to apply the BBAM in all cases. In such cases, the OEH interim policy states that "*offsets are to be negotiated on a case by case basis and in accordance with DECCW's offsetting principles*". The referenced "DECCW offsetting principles" are those provided in the *Principles for the use of Biodiversity Offsets in NSW* presented as Appendix II of the *Guidelines for Biodiversity Certification of Environmental Planning Instruments – Working Draft* published by the then Department of Environment and Climate Change (DECC, 2008c). DECC (2008e) requires that, in order to adequately compensate for the disturbance, the offset must:

1. address impacts remaining after mitigation or prevention measures have been undertaken;
2. meet all regulatory requirements;
3. never reward ongoing poor performance;
4. complement other government programs such as national parks and reserves;
5. be underpinned by sound ecological principles;
6. aim to result in a net improvement in biodiversity over time;
7. be enduring, i.e. they must offset the impact of the development for the period that the impact occurs;
8. be agreed upon prior to the impact occurring;
9. be quantifiable, i.e. the impacts and benefits must be reliably estimated;
10. be targeted, i.e. they must offset the impacts on a "like for like or better" basis;
11. be located appropriately, i.e. they must offset the impact in the same region;
12. be supplementary, i.e. beyond existing requirements and not already funded by another scheme; and
13. be enforceable, i.e. through development consent conditions, licence conditions, covenants or a contract.

Also considered are the guiding principles of the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC) which require that the offset should meet the following principles (DEWHA, 2007).

1. Environmental offsets should be targeted to the matter protected by the EPBC Act that is being impacted.
2. A flexible approach should be taken to the design and use of environmental offsets to achieve long-term and certain conservation outcomes which are cost effective for proponents.
3. Environmental offsets should deliver a real conservation outcome.
4. Environmental offsets should be developed as a package of actions - which may include both direct and indirect offsets.
5. Environmental offsets should, as a minimum, be commensurate with the magnitude of the impacts of the development and ideally deliver outcomes that are ‘like for like’.
6. Environmental offsets should be located within the same general area as the development activity.
7. Environmental offsets should be delivered in a timely manner and be long lasting.
8. Environmental offsets should be enforceable, monitored and audited.

2.14.8.3 The Proposed Biodiversity Offset Strategy

The proposed biodiversity offset strategy for the Project (“TGP BOS”) has been developed in collaboration with OzArk Environment and Heritage Management (“OzArk”), ecological consultants to the Proponent. The development of the TGP BOS considered the scale of the impacts proposed, the NSW and Commonwealth requirements for biodiversity offsets, as well as local factors such as land use both current and future.

Based on these principal considerations, the focus of the TGP BOS is the protection, enhancement and long-term conservation of the existing remnant native vegetation on the Mine Site and surrounding lands. Particular focus has been given to enhancing and conserving those remnants of Inland Grey Box EEC and Fuzzy Box EEC occurring on and immediately surrounding the Mine Site. **Figure 2.19** illustrates the critical features of the proposed TGP BOS which can be summarised as follows.

- Approximately 21.1ha of remnant Inland Grey Box EEC in Moderate to Good Condition (as defined by BBAM) would be protected and conserved. Remnant vegetation is predominantly thin strips of vegetation along road reserves and isolated patches along drainage lines within farmed paddocks (remnant patch width does not exceed 30m).

  The TGP BOS proposes to protect these remnant areas from degradation that could result from competing land uses, e.g. grazing. Where remnant vegetation is present and in Low Condition (as defined by BBAM), the extant remnants will be enhanced by supplementary seeding and/or planting. The TGP BOS also provides for the extension of these remnant areas of Inland Grey Box EEC as follows.

- The remnant that is aligned along the Main Site Access Road and along the western and southern boundary of the Mine Site would be extended (on to the Mine Site) by 20m (resultant width of the patch would be no narrower than 50m). The extended remnant area would be surveyed, marked and fenced as required. Initially, natural remediation and revegetation would be encouraged, however, supplementary seeding and tree planting would be undertaken, as required.
- Within this same 20m extension (onto the Mine Site), survey, fencing and supplementary revegetation would also be implemented where strips of Inland Grey Box EEC occur on the western section of the Mine Site. As noted above, the width of the remnant would not be smaller than 50m.
- Habitat corridors would be created through the extension of the existing native vegetation remnants around Wyoming One Open Cut and along the southern boundary on the western section of the Mine Site. These 20m strips would be surveyed, protected from competing land use (by fencing if necessary) and enhanced by supplementary seeding and/or tree planting, as required.
- Planting of vegetation indicative of the Inland Grey Box EEC would be undertaken on land bounded to the north and east by Tomingley village, to the west by Gundong Creek and to the south by an existing strip of Fuzzy Box EEC vegetation. As noted earlier, where Low Condition remnants are located adjacent to a Moderate to Good remnant the aim of habitat restoration is to achieve widths no less than 50m.

In total 21.5ha of Inland Grey Box EEC remnant extension and enhancement is proposed by the TGP BOS. In total 42.6ha of Inland Grey Box EEC including all structural layers would be protected within the Mine Site. Notably, under existing (pre-mining conditions) at least 24.7ha of this vegetation lacks substantive grassy or shrub layers.

- Approximately 5.1ha of remnant Fuzzy Box EEC in Moderate to Good condition would be protected and conserved as described above for the Inland Grey Box EEC remnants (this includes remnants contained within the Newell Highway easement but excludes the small southern-most remnant which occurs on land not under the control of the Proponent). The TGP BOS also provides for the extension of these remnant areas of Fuzzy Box EEC as follows.
  - The remnants aligned along the Newell Highway, around the boundary of the western section of the Mine Site and onto the eastern section of the Mine Site in the vicinity of Wyoming One Open Cut would be extended by 20m (remnant width would be in the order of 60m). The extended remnant area would be surveyed, protected and enhanced as described for the Inland Grey Box EEC remnants.
  - An additional 20m wide strip of Fuzzy Box EEC would be established on the eastern and southern boundaries of Lots 94 and 95, DP755110, extending to the east and then north (achieving remnant width of no narrower than 50m). This would be surveyed, protected and enhanced as described for the Inland Grey Box EEC remnants.

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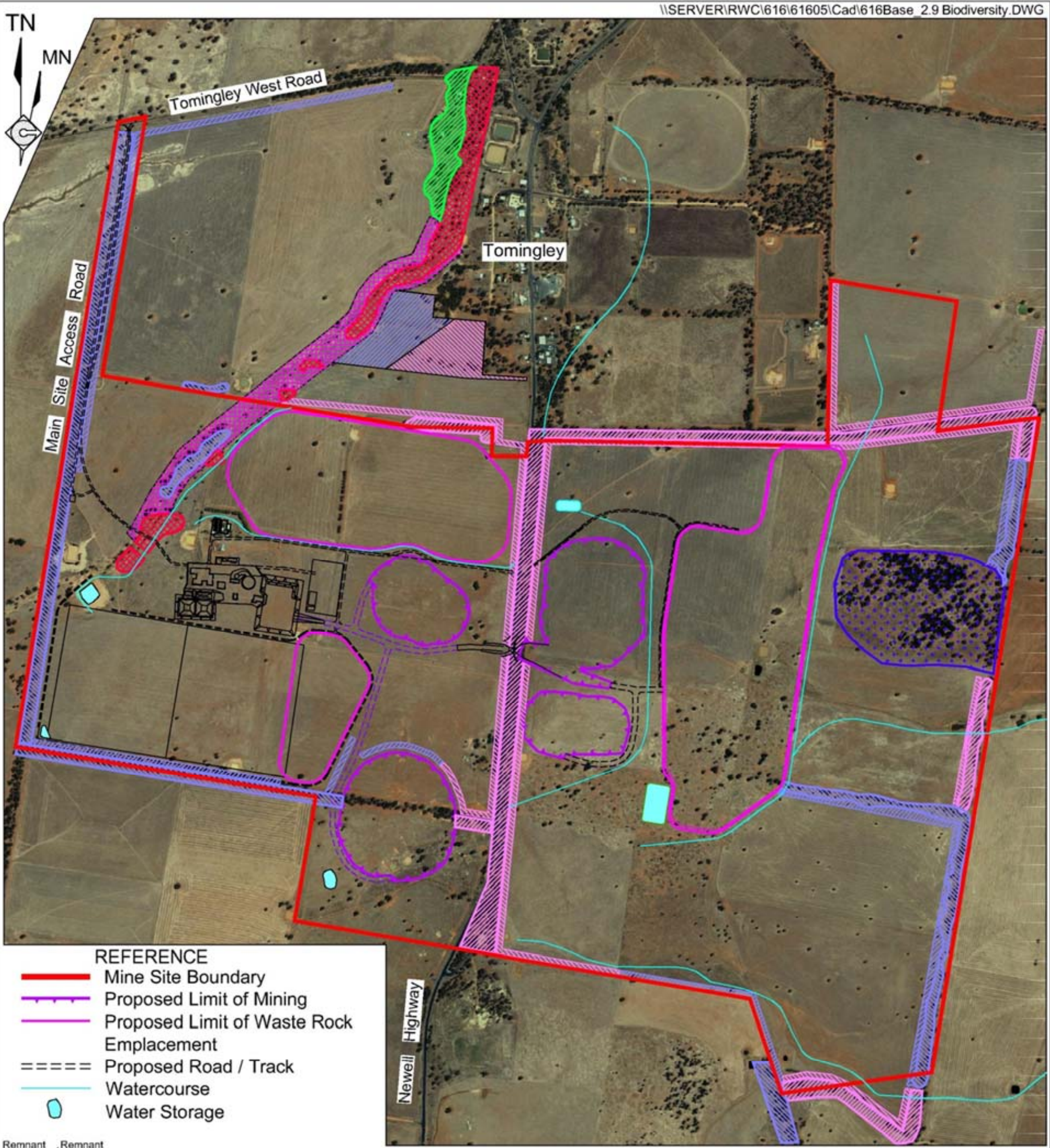

Remnant to be Conserved / Remnant Extension Zones

Community 1 - Inland Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams (Benson 76)

Community 2 - River Red Gum riverine woodland forest (Benson 78)

Community 3 - Fuzzy Box - Inland Grey Box on alluvial brown loam soils (Benson 201)

Community 4 - Poplar Box - Belah woodland on clay alluvial plains (Benson 56)

Community 5 - Belah / Black Oak Western Rosewood, Wilga Woodland (Benson 57)

Community 6 - Mugga Ironbark (Planted)

	Community					
	1	2	3	4	5	6
Area to be Disturbed (ha)	2.7	0	0.9	0	18.0	0.7
Remnant to be Conserved (ha)	21.1	13.1	5.1	4.9	34.3	0
Remnant Extension (Protection & Ameliorative Planting) (ha)	21.5	13.5	26.0	0	0	0

Note: Areas of referenced vegetation on land not owned or under agreement with the Proponent do not form part of the Biodiversity Offset Strategy

SCALE 1:25 000

250 0 250 500 750 1000 1250 m

Source: OzArk (2011) - Figure 13

Figure 2.19
BIODIVERSITY OFFSET STRATEGY

  - Planting of vegetation indicative of the Fuzzy Box EEC would also be undertaken on land bounded to the north and east by Tomingley village, to the west by Gundong Creek and to the south by an existing strip of Fuzzy Box EEC vegetation (achieving remnant width of no narrower than 50m).

  In total 26.0ha of Fuzzy Box EEC remnant extension and enhancement is proposed by the TGP BOS. In total, 31.1ha of Fuzzy Box EEC including all structural layers would be protected within the Mine Site. Notably, under existing (pre-mining conditions) at least 6.0ha of this vegetation lacks substantive grassy or shrub layers.

- Approximately 13.1ha of River Red Gum riverine woodland forest, occurring along Gundong Creek, would be protected and conserved as described above for the Inland Grey Box and Fuzzy Box EEC remnants. The TGP also provides for the extension of this remnant area as follows.

  - A 50m wide area would be protected either side of the creek channel. This would be surveyed, marked (and fenced as necessary) and protected from competing land uses.
  - Initially, natural remediation and revegetation would be encouraged, however, supplementary seeding and tree planting would be undertaken as required.

  In total 13.5ha of River Red Gum riverine woodland forest remnant extension and enhancement is proposed by the TGP BOS. In total, 26.6ha of Fuzzy Box EEC including all structural layers would be protected within the Mine Site.

- Approximately 4.9ha of Poplar Box – Belah woodland on clay alluvial plains and 25.5ha of Belah / Black Oak Western Rosewood Wilga woodland would be conserved on and immediately surrounding the Mine Site.

- 17.2ha of Belah/Black Oak – Western Rosewood – Wilga woodland of central NSW (Benson 57) in Moderate to Good Condition and 17.2ha of Benson 57 in Low Condition would be protected and enhanced by natural recovery.

- The sediment basins and drainage lines established for the Project would be retained and revegetated incorporating native vegetation such as rushes, sedges, grasses and trees common to watercourses and storage areas.

- The proposed final land uses of the Mine Site (see **Figure 2.18**) are also an important component of the TGP BOS, with significant areas identified as '*Native Vegetation Establishment and Protection*'. Remaining areas are identified as being returned to '*Sustainable Agriculture*'.

Table 2.12 provides a summary of the vegetation to be disturbed, conserved and extended/enhanced on and surrounding the Mine Site.

Assessment of the suitability of the proposed TGP BOS is considered by OzArk (2011a) with a summary of this assessment included in Section 4.5.7.4.

Table 2.12
Proposed Tomingley Gold Project Biodiversity Offset Strategy

	Community[1]					
	1	2	3	4	5	6
Area to be Disturbed	2.7	0	0.9	0	18.0	0.7
Remnant Conservation and Enhancement	21.1	13.1	5.1	4.9	17.2	0
Remnant Extension (and Enhancement)	21.5	13.5	26.0	0	17.2	0
Total Offset (Remnant Conservation + Enhancement)	42.6	26.6	31.1	4.9	34.4	0

Note 1:
- Community 1: Inland Grey Box EEC.
- Community 2: River Red Gum riverine woodland forest.
- Community 3: Fuzzy Box EEC.
- Community 4: Poplar Box – Belah woodland on clay alluvial plains.
- Community 5: Belah / Black Oak Western Rosewood, Wilga Woodland community.
- Community 6: Mugga Ironbark (planted).

Source: Modified after OzArk (2011a) – Table 19

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