BOWDENS SILVER

AMENDMENT REPORT

State Significant Development No. 5765

July 2021

Prepared by: **R.W. CORKERY & CO. PTY. LIMITED**

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BOWDENS SILVER

ABN: 37 009 250 051

Amendment Report

for the

Bowdens Silver Project

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1. INTRODUCTION

1.1 SCOPE AND BACKGROUND

Bowdens Silver Pty Limited ("Bowdens Silver" or "the Applicant") proposes to amend Development Application SSD 5765 (SSD 5765) for the Bowdens Silver Project ("the Project") to incorporate the proposed re-alignment of the 500kV power transmission line that traverses the Mine Site for the Project. It is proposed that planning approval for the re-alignment would form a component of SSD 5765, with Bowdens Silver to separately progress the technical aspects of the network modification directly with TransGrid including the standard modification process requirements described in the TransGrid Network Modification Process advice[1]. It is proposed that the re-alignment of the 500kV transmission line would occur during Year 3 of the Project, following which time access to components of the main open cut pit for the Project would necessitate removal of the existing infrastructure.

An *Environmental Impact Statement* (EIS) (RWC, 2020) was prepared for the Project and publicly exhibited from Tuesday 2 June 2020 until Monday 27 July 2020. A comprehensive response to the matters raised in submissions responding to the EIS is presented in the *Submissions Report* for the Project (RWC, 2021) that has been provided to DPIE.

A request for the agreement of the Independent Planning Commission (or their delegate) ("IPC" or "the Consent Authority") to an amendment to the Project in accordance with Clause 55(1) of the *Environmental Planning and Assessment Regulation 2000* was submitted on 19 May 2021 through the Major Projects Planning Portal. Confirmation of agreement to the amendment was provided on 26 May 2021[2].

This *Amendment Report* presents only the proposed amendment to incorporate the proposed re-alignment of the 500kV transmission line. All other matters relating to the environmental, social and economic outcomes of the Project are presented in the EIS and *Submissions Report*. An updated Project Description for the Project is presented in **Appendix 1** and an updated summary of all proposed environmental management and mitigation measures is presented in **Appendix 2**. It is noted that as the re-alignment of the 500kV transmission line was comprehensively assessed within the EIS, these two documents are effectively unchanged.

1.2 PROJECT OVERVIEW

Bowdens Silver proposes to develop and operate an open cut silver mine approximately 26km east of Mudgee within the Mid-Western Regional Local Government Area (LGA) of New South Wales (see **Figure 1.1**). The proposed mine and its associated infrastructure (the "Project") would be located approximately 2km to 3km northeast of Lue. The Project is comprised of three main components (also presented on **Figure 1.1**).

- The "Mine Site" that includes the lands and infrastructure required for open cut mining and processing of ore, and the production of silver/lead and zinc concentrates including associated management of water resources, waste rock and tailings materials.

[1] See the TransGrid Website - https://www.transgrid.com.au/what-we-do/our-network/Network%20Modifications/Pages/default.aspx for more information.
[2] Both the letter request and agreement response are available from the NSW Major Project Planning Portal page for the Project https://www.planningportal.nsw.gov.au/major-projects/project/9641

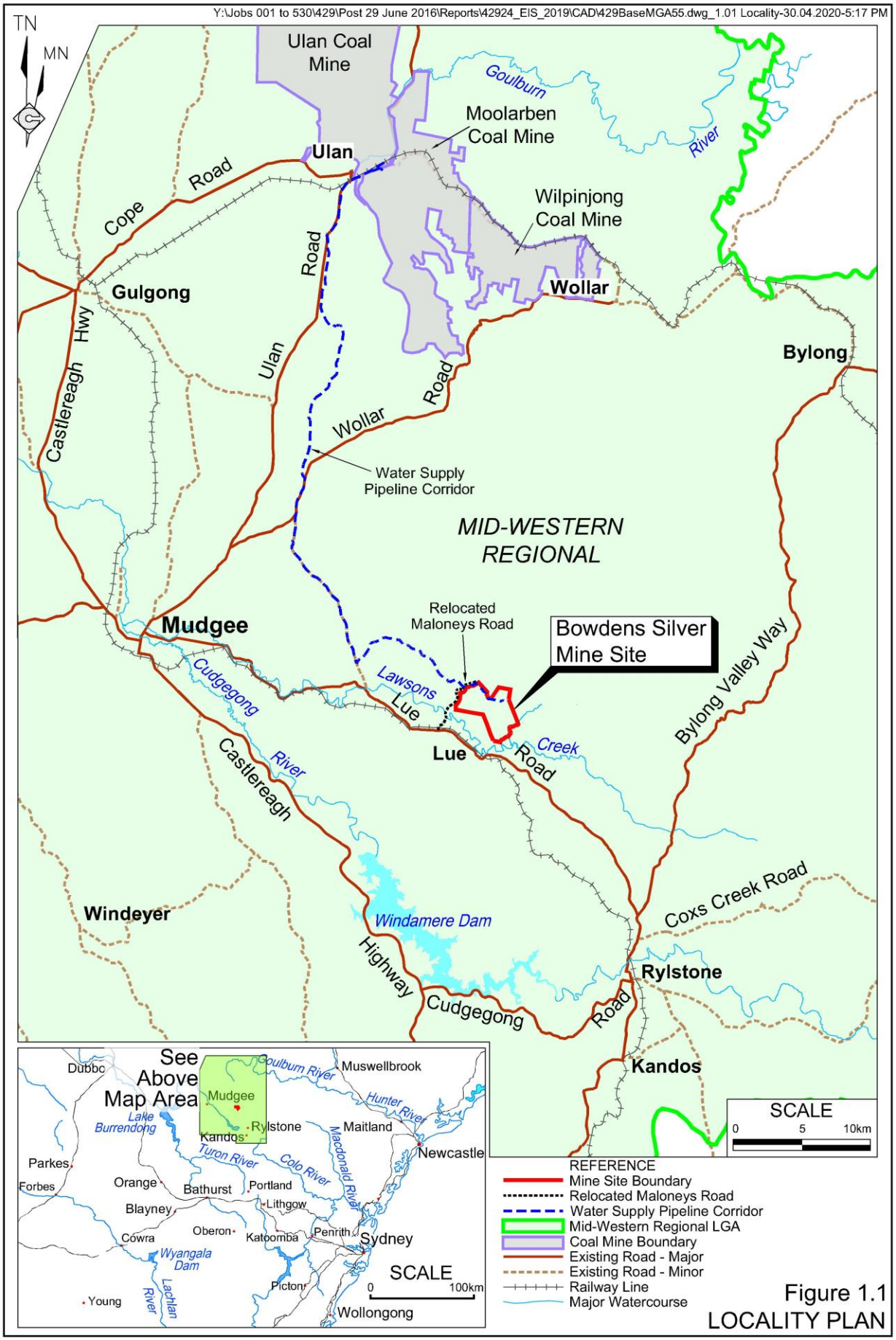


Figure 1.1
LOCALITY PLAN

- The "relocated Maloneys Road" (a public road) which would provide access to the Mine Site from Lue Road west of Lue and comprise a relocated section of Maloneys Road, a new railway bridge overpass and a new road crossing of Lawsons Creek.
- A "water supply pipeline corridor" extending approximately 58.5km from the Mine Site to the Ulan Coalfield to supply the Project with make-up water required for processing and dust suppression.

The power supply for the Mine Site would be sourced via the existing 66kV powerlines in the vicinity of Breakfast Creek (infrastructure owned by Endeavour Energy would be upgraded for this purpose). An additional section of powerline and associated easement would be established between Breakfast Creek and the Mine Site for this purpose. Approval for the construction and use of the additional powerline would be subject to a separate application under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and submitted to Endeavour Energy for assessment and determination.

A comprehensive description of the Project was provided in the EIS and was the subject of technical assessment that was presented in the EIS. This document was publicly exhibited in June and July 2020. A total of 1 909 submissions were received including 16 from Government agencies, 70 from organisations and 1 839 from individuals. While the response from public organisations and individuals was overwhelmingly in favour of the Project (1504 or 79% of these submissions were supportive), 387 submissions opposed the Project. As a result, the Project will be assessed by DPIE and a recommendation provided with formal referral to the Independent Planning Commission (IPC) for determination.

1.3 BACKGROUND TO THE AMENDMENT

The Mine Site is traversed by the existing No. 5A3 Bayswater to Mt Piper and 5A5 Wollar – Mt Piper 500kV transmission line. **Figure 1.2** presents the existing alignment of the transmission line and the proposed re-aligned location.

At the time when the EIS for the Project was finalised, it was proposed that the re-alignment of the TransGrid 500kV transmission line that crosses the proposed Mine Site would be the subject of a separate development application. It was intended that the application would rely upon the assessment presented in the EIS to justify the application and therefore the environmental impacts of the re-alignment were comprehensively assessed as a component of the Mine Site and the outcomes presented in the EIS for the entire Project. In its submission on the application (provided as **Appendix 3**), TransGrid requested that the proposed re-alignment be included in the current development application for the Project and consequently the Project must be amended.

This report presents the proposed re-alignment of the 500kV transmission line and the assessed environmental impacts as a component of the Project. However, as this component has been thoroughly assessed previously no additional environmental impacts (compared to those presented in the EIS) have been identified.

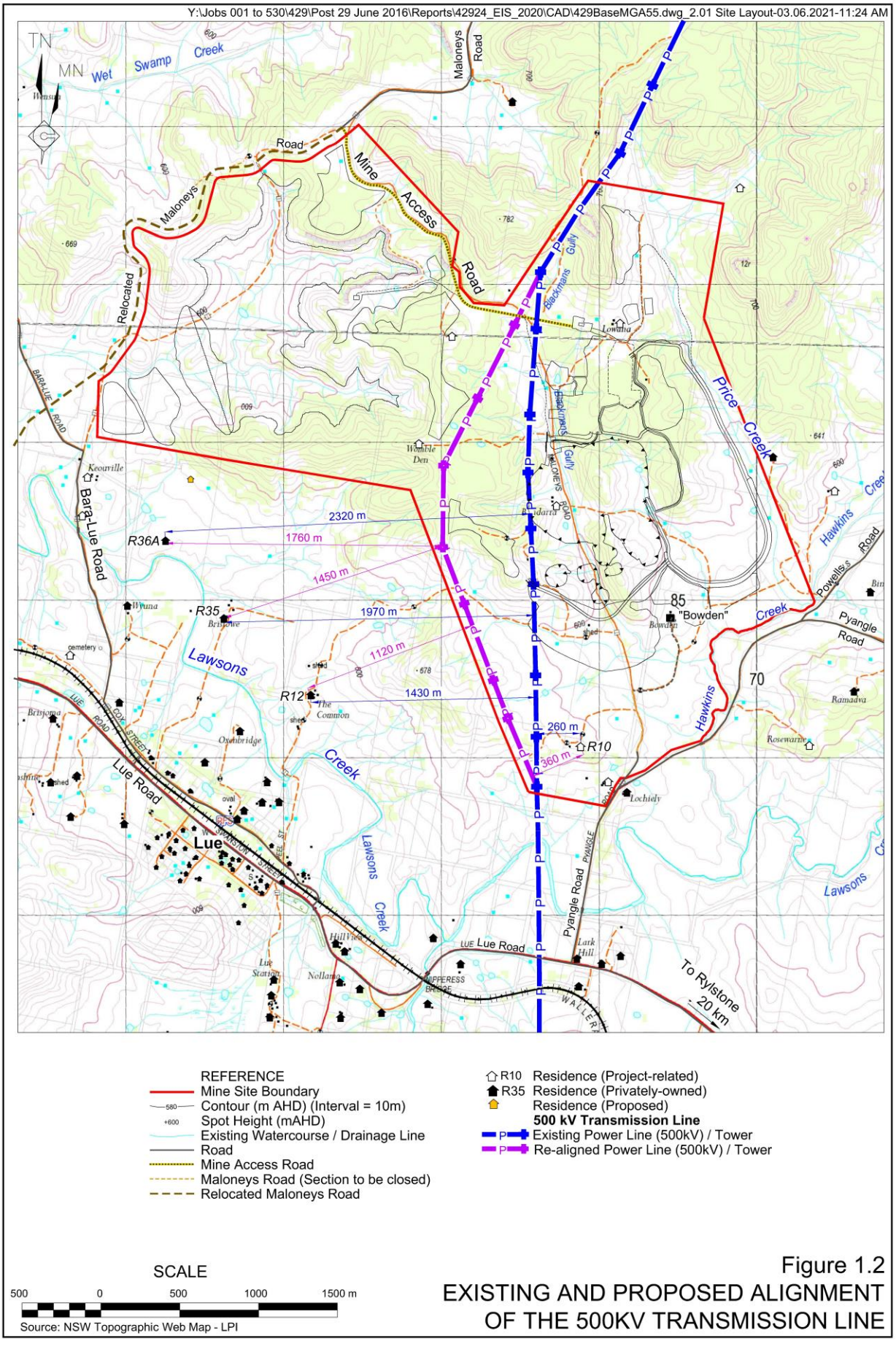


Figure 1.2
EXISTING AND PROPOSED ALIGNMENT OF THE 500KV TRANSMISSION LINE

2. DESCRIPTION OF THE AMENDMENT

This subsection presents a description of the proposed re- alignment of approximately 3.5km of the 500kV transmission line that traverses the western side of the proposed main open cut pit. It is noted that a description of the proposed re-alignment was presented in Section 2.11.3.2 of the EIS and is largely consistent with that description. The complete (and updated) description of the entire Project is provided in **Appendix 1**.

2.1 RE-ALIGNMENT OF 500KV TRANSMISSION LINE

The Mine Site is traversed by the existing No. 5A3 Bayswater to Mt Piper and 5A5 Wollar – Mt Piper 500kV transmission line. The quad bundle conductor double circuit 500kV transmission line would be re-aligned to allow the open cut mining operation to proceed towards the western boundary of the main open cut pit. **Figure 1.2** displays an indicative alignment of the existing 500kV transmission line and the proposed re-aligned section of the line.

The exact location of the re-aligned section of the line would be determined by TransGrid following the completion of three stages of investigation.

Stage 1: A desktop investigation incorporating a review of the available environmental information (principally from the EIS and supporting assessments), a review of the indicative route and development of a concept design route and transmission line profiles (to ensure sufficient ground clearance exists) and the development of a construction program, including the ability to minimise power outages when the new section of the transmission line is commissioned.

Stage 2: A scoping study including on-site investigations such as geotechnical studies.

Stage 3: A detailed design stage for all of the work involved in the construction, connection of the new transmission line and dismantling of the existing transmission line.

Whilst detailed staged investigations would not commence until the commencement of the Project, TransGrid has advised Bowdens Silver that "*there is no engineering reason for the line realignment to be unfeasible and that network outages, constructability and design can all be managed*". A Modification Processes Agreement would be entered into with TransGrid to facilitate Stages 1 to 3 and a Relocation Agreement would be required for the procurement and construction activities. It is estimated that the re-aligned transmission line would be constructed during Year 3 of operations. Overall, it is estimated the construction and dismantling of the line would take approximately 6 to 10 months.

The proposed re-aligned transmission line would be approximately 3km in length comprising 10 to 14 new steel towers, each approximately 45m to 60m high, i.e. comparable to the existing towers. Excluding the section of the existing Maloneys Road that traverses the proposed re-aligned easement, the re-aligned section of line would be located wholly within the Mine Site on land owned by Bowdens Silver. The easement for the re-aligned section of the transmission line would be 70m wide although based on experience of advisors on the process, it is realistic to assume that only 40m to 50m of clearing would be necessary for the construction of the re-aligned section. This anticipated width of clearing is consistent with the extent of clearing for the existing 500kV transmission line.

2.2 CONSTRUCTION AND DISMANTLING ACTIVITIES

Precise plans for the re-alignment works and removal of the redundant towers would be determined in consultation with the contractor commissioned to undertake the works. However, it may be expected that the following activities occur over the 6 to 10 months campaign.

- Vegetation clearing to create the clearing for the re-aligned transmission line and mulching of cleared materials.
- Minor earthworks to establish access tracks and for foundation works.
- Delivery of materials.
- Erection of towers and stringing of power lines.
- Dismantling of existing towers and other infrastructure.
- Removal of dismantled towers and other redundant infrastructure.
- Movements of construction personnel and delivery of materials using the public road network.

2.3 EQUIPMENT

The re-alignment works and removal of the redundant towers would take up to approximately 6 to 10 months to complete and would involve the use of the equipment listed in **Table 1**, as required.

Table 2.1
500kV Transmission Line Re-alignment Equipment Fleet

Type	No.	Model	Function
500kV PTL Re-alignment (Year 3)			
Bulldozer	1	D9R	Vegetation clearing, track construction
Excavator	2	325 FL	Vegetation clearing, preparation of tower footings, loading haul trucks
Mulching Unit	1	272 D2	Mulching vegetation
Articulated Heavy Vehicle	5	Semi-trailer	Delivery (and removal) of tower components
Articulated Haul Truck	2	38t	Transportation of excess excavated material
Crane	2	Up to 250t all-terrain	Erection and dismantling towers and stringing power lines
Franna Cranes	2	Up to 25 tonne	Foundations, erection and dismantling towers and stringing power lines
Elevated Work Platform	3	70m 8X8 truck units	Stringing power lines
Soilmac Drill Rigs	2	SR 30-60 size	Foundation works
Pozitrack	2		Access and foundation works
4WD & Light Vehicles	15	Various	Personnel/delivery of tools
Source: Zinfra Pty Ltd			

2.4 TRAFFIC GENERATION AND ACCESS

Road traffic generation and access was described in details in Section 2.9 of the EIS and was assessed in Section 4.12 of the EIS and the *Traffic and Transport Assessment* prepared by The Transport Planning Partnership Pty Ltd (TTPP, 2020).

Road traffic generated during the dismantling and construction of the transmission line would include six laden heavy vehicles (12 movements) and 15 light vehicles (30 movements) per day.

All traffic generated for the dismantling and construction activities would enter the Mine Site via the proposed Mine Access Road.

All related heavy vehicles and the bulk of the 15 of the light vehicles are anticipated to travel to and from the Mine Site via Lue Road (west of the relocated Maloneys Road) and the relocated Maloneys Road. An estimated three light vehicles would originate from the east and travel through Lue and the relocated Maloneys Road.

2.5 OPERATING HOURS

The proposed operating hours for the construction and dismantling of the 500kV transmission line were described in Section 2.3.3 and Table 2.3 of the EIS. The operating hours would be:

- 7:00am to 8:00pm[3] Monday to Friday; and
- 8:00am to 6:00pm[4] on Saturdays.

Comments from the NSW Environment Protection Authority regarding the proposed operating hours for construction activities are addressed in Section 5.18.5 of the *Submissions Report*.

2.6 EMPLOYMENT

During the 6 to 8 month period when the 500kV transmission line would be re-aligned (prior to Year 4), approximately 30 personnel would be employed by the contractor undertaking the construction and dismantling of the transmission line.

Bowdens Silver proposes that all construction personnel engaged from outside the surrounding communities would rely upon temporary accommodation in the Mudgee / Rylstone / Kandos area.

2.7 WASTE MANAGEMENT

While it would be Bowdens Silver's preference that suitable materials recovered during the demolition of the existing 500kV transmission line towers and wires would be reused, this would be at the discretion of TransGrid. It is possible that unusable materials would be disposed of at the Mudgee Waste Management Facility.

[3] Daylight hours only
[4] Daylight hours only

2.8 REHABILITATION

Following the construction of the new section of the transmission line, the easement would be partially rehabilitated utilising some of the previously cleared material which would be respread over the easement, where this would not impact the long-term access along the easement.

It is not envisaged that any canopy plantings would occur as the height restriction for vegetation within the easement would be limited, therefore, the rehabilitation objective would be to establish a suitable groundcover utilising species from the seedbank contained within the previously cleared vegetation stockpiles. This would be subject to final inspection of the site by TransGrid at completion, who may request additional ground cover removal in the interest of maintenance.

2.9 MAINTENANCE

Maintenance activities and frequency would be the responsibility of TransGrid as the network operator.

2.10 ALTERNATIVES CONSIDERED

It was not possible to relocate the main open cut pit in a manner that would avoid the need to re-align the 500kV transmission line. The Mineral Resource has been identified through exploration drilling activities and its western boundary is understood with a high degree of confidence. While avoiding the re-alignment would provide a significant cost saving to Bowdens Silver, it would sterilise resources and entail foregoing of the substantial economic benefits of this section of the main open cut pit including royalties payable to the State of NSW. It is likely that the viability of the Project under this alternative would be questionable.

During design and planning for the Project, consideration was given to developing the main open cut pit and retaining most of the relevant infrastructure. This alternative was rejected as it would require detailed and refined blasting activities, structural assessment and monitoring and the risk of interruption to power transmission (and the associated financial penalties) would be too great. In addition, alternative options for the proposed re-alignment were considered that directed the transmission line to the east of the mining infrastructure. However, following consideration of the land on which the towers would be located, environmental impacts and the proposed length and cost of construction, the existing alignment was selected.

3. STRATEGIC CONTEXT

The strategic context for the Project is not changed with the proposed amendment. This is largely due to the fact that proposed re-alignment of the 500kV transmission line was a component of the Project as described in the EIS and the amendment is largely administrative as it amends only the process for seeking development consent for the works. Where previously it was proposed that the approval for the re-alignment would be sought under Part 5 of the EP&A Act and managed with TransGrid directly, this component of the Project is now proposed to become part of SSD 5765, with development consent for this and other components of the Project to be determined by the IPC.

The strategic context for the Project is described in the EIS, however in summary the strategic importance of the Project is demonstrated by the following aspects of the Project.

- The uses of silver, zinc and lead are described in detail in Section 1.5 of the EIS. In particular, the use of silver in the manufacture of solar panels and emerging technologies including the electric vehicle industry supports the future demand for this metal.
- The current demand for the products of the Project is strong which is demonstrated in commodity prices. At the time the EIS was prepared, a long-term silver price of US$20 per ounce was assumed for assessment but this is now closer to $US26 per ounce, a significant change.
- Historical and more recent exploration drilling activities have enabled Bowdens Silver to develop a comprehensive understanding of the targeted Mineral Resource and the local and regional geological setting. A detailed description of the geological setting and resources being targeted is described in Section 2.2 of the EIS. A JORC compliant ore reserves statement supports the viability of the Project.
- Exploration drilling within the Bowdens Silver held exploration tenements in the vicinity of the proposed Mine Site supports future expansion of metalliferous mining activities in this region.
- The Project would provide for the diversification of mining opportunities in the Mid-Western Regional Local Government Area. The largest local industry in the region is currently coal mining with recent focus on the industry from scientific, political and community groups supporting the benefits of a diverse mining industry and the opportunity to maintain economic resilience and sustainability.
- The economic benefits and costs of the Project are discussed in detail in Section 4.18 of the EIS and in the Economic Assessment (Gillespie Economics, 2020). The economic benefits, both directly (through the payment of wages, royalties and taxes) and indirectly via the benefits of employment and local services, are significant. The Project is estimated to deliver net social benefits for the NSW community of between $44M and $146M. Globally, the economic benefits are estimated at between $78M and $181M and nationally between $89M and $192M. The economic benefits of the Project have been supported by three peer reviews of the assessment.

- Feedback from consultation with the local communities of Lue, Rylstone and Kandos as well as within Mudgee is described in Section 3.2.2 and 4.20.4 of the EIS and in detail in the Social Impact Assessment for the Project. Bowdens Silver has received strong indications of the need for environmentally and socially sound projects to support the regional economy.

Finally, the overwhelming support demonstrated in submissions on the EIS supports the strategic context for the Project. 1 504 submissions or 79% of all submissions received provided support for the Project. A similar level of support exists within the Mid-Western Regional LGA with 682 submissions or 74% of all submissions from this area supporting the Project.

In terms of the strategic context for the re-alignment of the 500kV transmission line, the western limit of the main open cut pit would be constrained until the transmission line is moved. Therefore, it is considered essential to the successful development of the main open cut pit and access to the identified Mineral Resource. While alternatives were considered that proposed refined development of the main open cut pit in order to avoid re-alignment and impacts to existing towers, these were rejected as it would risk interrupting power supplies throughout NSW.

4. STATUTORY CONTEXT

4.1 INTRODUCTION

The proposed amendment does not change the statutory context for the Project as described in detail in Section 3.2.3 of the EIS. While there have been changes to legislation and planning policies and strategies since the exhibition of the EIS (and the provision of SEARs for the Project), these do not relate to the proposed amendment and therefore are not triggered by this *Amendment Report*.

A brief summary of the statutory context for the Project and the proposed amendment is presented in the following subsections.

4.2 COMMONWEALTH LEGISLATION

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act covers 'matters of national environmental significance' (MNES). Potentially relevant MNES to the Project include:

- listed threatened species and ecological communities;
- listed migratory species protected under international agreements; and
- National heritage places.

Under the EPBC Act, if a project has the potential to have a significant impact on MNES, it is required to be referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for assessment as to whether it represents a 'controlled action' and therefore requires approval from the Commonwealth Minister for the Environment.

The Project, including the impacts associated with the re-alignment of the 500kV transmission line, has been referred to the DAWE and has been determined to be a controlled action. Therefore, approval from the Commonwealth Minister for the Environment will be required for the Project to proceed.

4.3 NSW STATE LEGISLATION AND PLANNING POLICIES

Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for the assessment and determination of development applications in NSW and is administered by the DPIE. The Project has been submitted for approval under Part 4, Division 4.7 of the EP&A Act as a State Significant Development (SSD). As a result of the proposed amendment, the proposed re-alignment of the 500kV transmission line must now be considered by the consent authority (in this case the IPC) in evaluating the merits of the overall Project (including the re-alignment of the 500kV transmission line) in determining the application.

Section 4.41 of the EP&A Act identifies that, if development consent is granted for a SSD, the following potentially relevant authorisations are not required.

- A permit under section 201, 205 or 219 of the *Fisheries Management Act 1994*;
- An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*;

- An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*;
- A bushfire safety authority under section 100B of the *Rural Fires Act 1997*;
- A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*.

Environmental Planning and Assessment Regulation 2000

Clause 55 of the *Environmental Planning and Assessment Regulation 2000* specifies the procedures for amending a development application and specifically provides for the following.

1. That a development application may be amended or varied by the Applicant at any time before it is determined, but only with the agreement of the consent authority.
2. The application to amend the development application for the Project must include sufficient information to demonstrate the nature of the changed development.
3. The amendment must be lodged via the NSW Planning Portal.

Bowdens Silver has consulted with DPIE and TransGrid regarding an amendment to the Bowdens Silver Project to incorporate the proposed re-alignment of the existing 500kV transmission line, owned and maintained by TransGrid. The environmental impacts associated with the re-alignment of the existing 500kV transmission line have been presented in this *Amendment Report* that has been submitted via the NSW Major Projects Planning Portal.

It is noted that the inclusion of the proposed re-alignment of the existing 500kV transmission line in the application does not change the land on which the Project would be developed or the outcomes of assessment, as this component (being the powerline) was comprehensively assessed in the EIS.

State Environmental Planning Policy (Infrastructure) 2007

The Infrastructure SEPP was introduced to facilitate the delivery of infrastructure across NSW by improving regulatory certainty and efficiency. The relevant aims of the Infrastructure SEPP are to provide a consistent planning regime under the EP&A Act that:

- provides greater flexibility in the location of infrastructure and services by identifying a broad range of zones where types of infrastructure are permitted;
- allows for the efficient development, redevelopment or disposal of government owned land by permitting additional uses on State land and allowing adjacent land uses to be undertaken on State land (except conservation lands) if the uses are compatible with surrounding land uses;
- outlines assessment categories and matters to be considered for different types of infrastructure developments; and
- identifies works of minimal environmental impact as exempt or complying development to improve turnaround times for maintenance and minor upgrades.

Clause 41 of the Infrastructure SEPP states that development for the purpose of an electricity power or distribution network may be carried out by or on behalf of a public authority without consent on any land.

Clause 45 of the Infrastructure SEPP identifies that where development would be carried out within or immediately adjacent to an easement for electricity purposes, immediately adjacent to an electricity substation or within 5m of an exposed overhead power transmission line the consent authority must give written notice to the electricity supply authority, inviting comments about potential safety risks and take into consideration any response received. Comments received by TransGrid to date on the Project have been reproduced in **Appendix 3**.

Electricity Supply Act 1995

The objects of the *Electricity Supply Act 1995* (ES Act) are noted in Section 3 of the ES Act and are as follows.

a) To promote the efficient and environmentally responsible production and use of electricity and to deliver a safe and reliable supply of electricity.

b) To confer on network operators such powers as are necessary to enable them to construct, operate, repair and maintain their electricity works.

c) To promote and encourage the safety of persons and property in relation to the generation, power, distribution and use of electricity.

d) To ensure that any significant disruption to the supply of electricity in an emergency is managed effectively.

By virtue of Section 45 of the ES Act, the nominated electricity works may be erected and maintained on public roads and reserves. Furthermore, Section 45 exempts the network operator from requiring an approval under the *Local Government Act 1993*, except in relation to buildings. The preceding notwithstanding, prior to undertaking the proposed electricity works, notice of the proposed works must be given to the affected local council and at least 40 days provided for the council to make submissions to the network operator in relation to the proposed works.

4.3.1 Protection of the Environment Operations Act 1997

The aims of the *Protection of the Environment Act 1997* (POEO Act) are to protect, restore and enhance the quality of the environment in NSW and reduce the risks to human health and degradation of the environment through the prevention of pollution and elimination of harmful wastes. Under the provisions of the POEO Act environment protection licences are required for "scheduled activities" and "scheduled development work", or for non-scheduled activities which would result in the pollution of water.

The proposed re-alignment of the 500kV transmission line would not be a "scheduled activity" or "scheduled development work" (as described in in Schedule 1 of the POEO Act). However, the Project would require an environment protection licence, but it is not expected that it would contain conditions specifically relating to the proposed decommissioning and construction works.

4.3.2 Biodiversity Conservation Act 2016

The purpose of the *Biodiversity Conservation Act 2016* (BC Act) is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

As the Project is State Significant Development, the NSW Biodiversity Offset Scheme must be applied. A Biodiversity Assessment Report (BAR) has been prepared by EnviroKey (2021) (see Appendix 4 of the *Submissions Report*) and includes assessment of vegetation clearing associated with the creation of a new easement for the 500kV transmission line. Therefore, additional assessment of biodiversity-related risks is not required.

4.3.3 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) aims to manage and conserve nature, objects, places and features that have ecological and/or cultural value. The NP&W Act is administered by the Biodiversity and Conservation Division (BCD).

An Aboriginal Heritage Impact Permit (AHIP) is generally required for consent to destroy, deface or damage Aboriginal object or Aboriginal place. However, as the Project is State Significant Development, an AHIP is not required for the destruction of Aboriginal sites, objects or places.

4.3.4 Heritage Act 1977

The *Heritage Act 1977* aims to promote and protect the State's heritage by preventing harm to buildings, relics or places that are on the State Heritage Register.

Under the *Heritage Act 1977*, approval is required to carry out development on land on which an item listed on the State Heritage Register is located or that is subject to an interim heritage order.

No items listed on the State Heritage Register are located within the Mine Site and the three historic heritage items identified in the EIS that would be removed for the development of the Project are not in the vicinity of the proposed 500kV transmission line. Therefore, the provisions of the *Heritage Act 1977* are not considered further.

4.3.5 Water Management Act 2000

An objective of the *Water Management Act 2000* (WM Act) is the sustainable and integrated management of the State's water for the benefit of both present and future generations. The WM Act provides clear arrangements for controlling land-based activities that affect the quality and quantity of the State's water resources. It relevantly provides for three types of approval, namely:

- water use approval (Section 89) – which authorises the use of water at a particular location for a particular purpose;
- water management work approval (Section 90) – which authorises the construction and use of a specified water supply at a specified location; and
- controlled activity approval (Section 91(2)) – which authorises activities on or under waterfront land, i.e. within 40m of waterfront land.

The Proposal would not involve works that require approval under the WM Act and therefore this legislation is not considered further.

4.4 LOCAL PLANNING MATTERS

The Mine Site is located within the Mid-Western Regional LGA and therefore development must consider the provisions of the *Mid-Western Regional Local Environmental Plan 2012* (Mid-Western Regional LEP). The permissibility of the proposed re-alignment of the 500kV transmission line is determined under Clause 41 of the Infrastructure SEPP (that is, development may be carried out by or on behalf of a public authority without consent on any land).

The Mine Site comprises land mapped as vulnerable (Clause 6.4) and biodiversity sensitive (Clause 6.5) within the Mid-Western Regional LEP 2012.

The objectives of Clause 6.4 of the Mid-Western Regional LEP are:

a) to maintain the hydrological functions of key groundwater systems,

b) to protect vulnerable groundwater resources from depletion and contamination as a result of development.

The Project would not adversely impact upon these objectives and any potential impacts on groundwater systems and groundwater users have been comprehensively considered in the groundwater assessment (see Appendix 3 of the *Submission Report*).

The objective of Clause 6.5 of the Mid-Western Regional LEP is to maintain terrestrial biodiversity by:

a) protecting native fauna and flora, and

b) protecting the ecological processes necessary for their continued existence, and

c) encouraging the conservation and recovery of native fauna and flora and their habitats.

The proposed impacts of the Project on terrestrial biodiversity are assessed in the Biodiversity Assessment Report for the Project prepared by EnviroKey and updated following the review of the Government, organisation and public submissions on the Project (see Appendix 4 of the *Submissions Report*). This includes the vegetation clearing associated with the establishment of a new easement for the 500kV transmission line. It is noted that potential impacts to biodiversity have been avoided or minimised to the greatest extent practicable through the design of the Project with residual impacts to be offset as part of the Project's Biodiversity Offset Strategy.

5. ENGAGEMENT

TransGrid is the operator and manager of the main high voltage electricity transmission network throughout NSW. TransGrid is operated by NSW Electricity Networks under a 99 year lease agreement with the NSW State Government.

As the operator and manager of the 500kV transmission line that traverses the Mine Site, TransGrid was consulted with respect to the progressive development of the main open cut pit and proposed future re-alignment of the 500kV transmission line to the west of the main open cut pit in about Year 3 of the Project. Correspondence supplied by TransGrid on 23 August 2017 stated that TransGrid had identified *"no engineering reason for the line relocation to be unfeasible"* and that *"outages, constructability and design can all be managed"*.

Should the Project be granted development consent, Bowdens Silver would enter into a Modification Processes Agreement with TransGrid to facilitate the investigations required for the re-alignment of the 500kV transmission line. This process was confirmed with TransGrid in email correspondence dated 19 January 2021.

No specific engagement with the general public has been undertaken during preparation of this document. The re-alignment of the 500kV transmission line has always been a component of the Project and it has been discussed in all relevant specialist consultant reports and the EIS (RWC, 2020). The re-alignment was also discussed in consultation for the Project undertaken for the Social Impact Assessment. Given it was also raised in a number of submissions on the Project, it is considered that the community are aware of the intention to re-align this infrastructure and the environmental impacts associated with the process. Finally, it is noted that the proposed re-aligned transmission line is presented in an Interactive 3D Model of the Mine Site prepared by Truescape Ltd[5].

[5] Available from the Bowdens Silver website https://bowdenssilver.com.au/

6. ASSESSMENT OF IMPACTS

6.1 INTRODUCTION

The proposed re-alignment of the 500kV transmission line that traverses the Mine Site was incorporated within the technical assessments undertaken and presented with the EIS for the Project. Although an alternative planning pathway for the re-alignment works was elected at the time the EIS was completed, it would be difficult to isolate the works and their impacts from the broader Project. This amendment to the Project to incorporate the re-alignment works is largely concerned with the approval pathway as the environmental impacts of construction of the re-aligned infrastructure and dismantling the existing transmission line has been assessed and are well understood. Regardless, a summary of the assessment of environmental impacts associated with the re-alignment works is presented in this subsection with reference to the location in the EIS or *Submissions Report* where matters have been described in detail. Additional environmental assessment, specific to the re-alignment works has been presented regarding the visual impacts of the works and potential risks from electric and magnetic fields.

Matters for assessment have been presented in the expected order they would occur or be experienced, that is, commencing with surface disturbance and construction of the re-aligned transmission line and then operation of the transmission line.

6.2 BIODIVERSITY

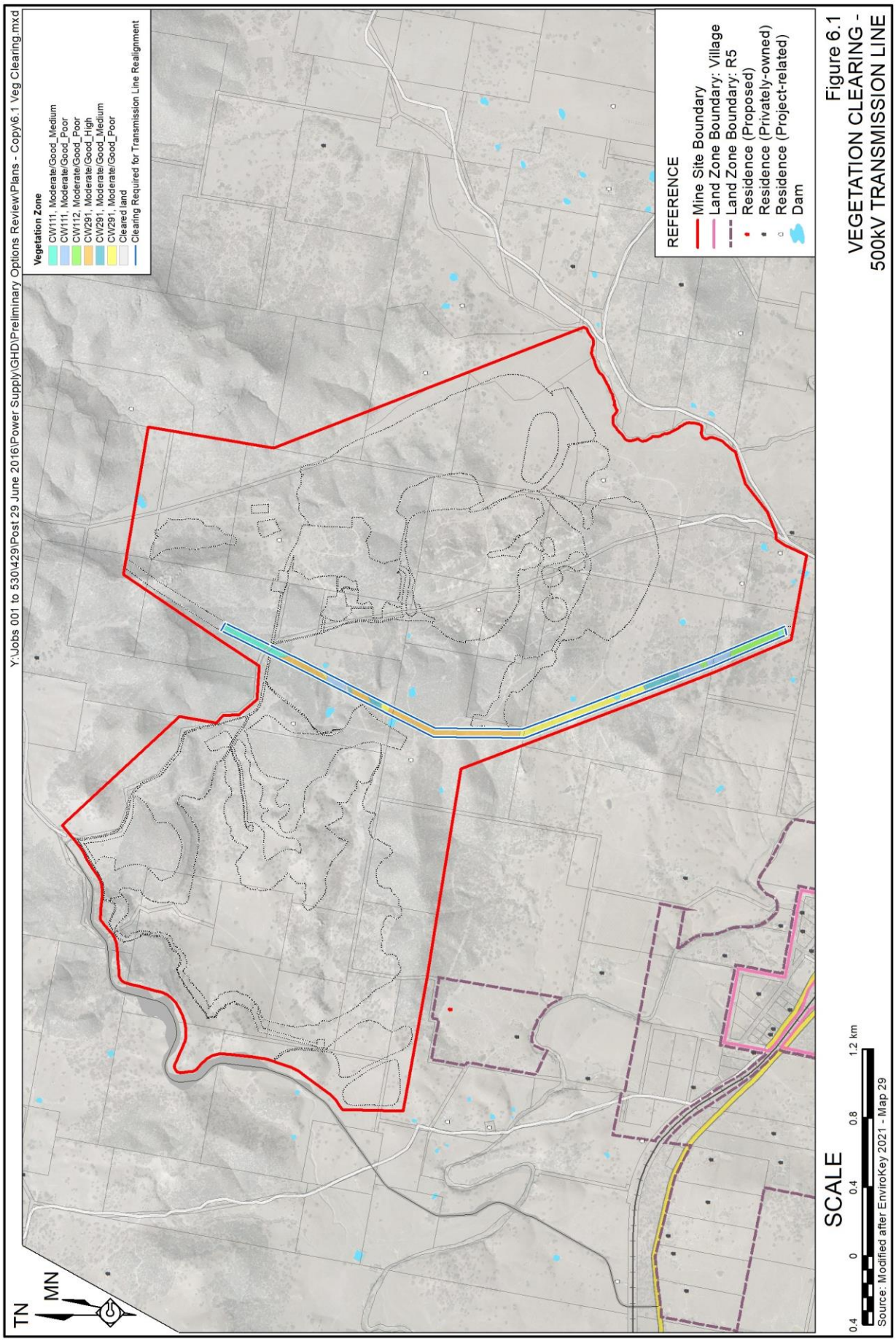
6.2.1 Existing Environment

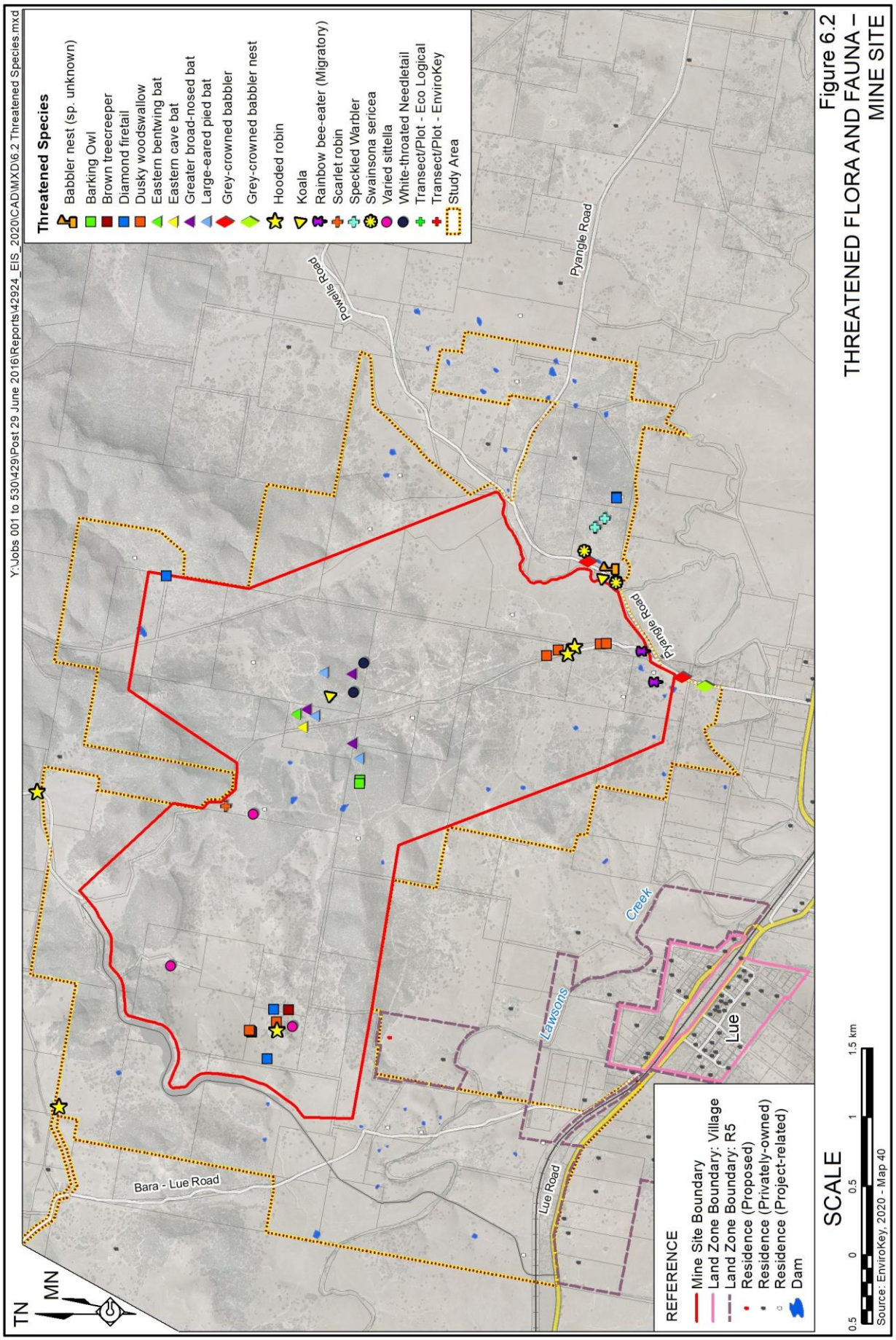
Comprehensive field surveys were undertaken along the entire corridor for the proposed transmission line re-alignment. Mapping of the identified vegetation communities and individual flora and fauna is presented in Section 4.10.4.2 of the EIS. Within the transmission line corridor, three plant community types (PCTs) / Biometric Vegetation Types (CWs) were identified as presented in **Figure 6.1**, namely:

- PCT 277 / CW112- Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion;
- PCT 281 / CW 111 - Rough-barked Apple – Red Gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion; and
- PCT 323 / CW 291 - Red Stringybark – Inland Scribbly Gum open forest on steep hills in the Mudgee – northern section of the NSW South Western Slopes Bioregion.

Both PCT 277 and PCT 281 meet the definition for the Threatened Ecological Community, Box Gum Woodland.

No threatened flora and fauna or listed migratory species were identified in vegetation within the proposed easement for the 500kV transmission line, despite comprehensive surveys. The outcomes of field surveys for flora and fauna for the Project are presented in **Figure 6.2**.


Y:\Jobs 001 to 530\429\Post 29 June 2016\Power Supply\GHD\Preliminary Options Review\Plans - Copy\6.1 Veg Clearing.mxd
Vegetation Zone
CW111, Moderate/Good_Medium
CW111, Moderate/Good_Poor
CW112, Moderate/Good_Poor
CW291, Moderate/Good_High
CW291, Moderate/Good_Medium
CW291, Moderate/Good_Poor
Cleared land
Clearing Required for Transmission Line Realignment
REFERENCE
Mine Site Boundary
Land Zone Boundary: Village
Land Zone Boundary: R5
Residence (Proposed)
Residence (Privately-owned)
Residence (Project-related)
Dam
Figure 6.1
VEGETATION CLEARING - 500kV TRANSMISSION LINE
TN
MN
SCALE
0.4 0 0.4 0.8 1.2 km
Source: Modified after EnviroKey 2021 - Map 29


Y:\Jobs 001 to 530\429\Post 29 June 2016\Reports\42924_EIS_2020\CAD\MXD\6.2 Threatened Species.mxd
Threatened Species
Babbler nest (sp. unknown)
Barking Owl
Brown treecreeper
Diamond firetail
Dusky woodswallow
Eastern bentwing bat
Eastern cave bat
Greater broad-nosed bat
Large-eared pied bat
Grey-crowned babbler
Grey-crowned babbler nest
Hooded robin
Koala
Rainbow bee-eater (Migratory)
Scarlet robin
Speckled Warbler
Swainsona sericea
Varied sittella
White-throated Needletail
Transect/Plot - Eco Logical
Transect/Plot - EnviroKey
Study Area
Powells Road
Pyangle Road
Pyangle Road
Creek
Lawsons
Lue
Lue Road
Bara - Lue Road
TN
MN
REFERENCE
Mine Site Boundary
Land Zone Boundary: Village
Land Zone Boundary: R5
Residence (Proposed)
Residence (Privately-owned)
Residence (Project-related)
Dam
SCALE
0.5
0
0.5
1
1.5 km
Source: EnviroKey, 2020 - Map 40
Figure 6.2
THREATENED FLORA AND FAUNA – MINE SITE

6.2.2 Mitigation and Management Measures

The mitigation and management measures that would be adopted during the re-alignment of the transmission line would be the same as those proposed for the mining operations and outlined in Section 4.10.5 of the EIS. It is noted that the Biodiversity Assessment Report for the Mine Site includes the disturbance of the vegetation within the re-alignment corridor as part of the biodiversity offset calculations. As such, disturbances associated with transmission line re-alignment would be offset as part of the Project's Biodiversity Offset Strategy.

6.2.3 Assessment of Impacts

The impacts associated with the disturbance within the transmission line re-alignment corridor were assessed as part of the overall impacts associated with the Project and presented within the EIS and updated Biodiversity Assessment Report (EnviroKey, 2021). In summary, the re-alignment would result a total of 12.46ha of disturbance (see **Figure 6.1**), broken down as follows.

- PCT 277 / CW112- Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
  - Moderate / Good_poor condition: 2.07ha.
- PCT 281 / CW 111 - Rough-barked Apple – Red Gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion.
  - Moderate / Good_medium condition: 2.35ha
  - Moderate / Good_poor condition: 2.10ha.
- PCT 323 / CW 291 - Red Stringybark – Inland Scribbly Gum open forest on steep hills in the Mudgee – northern section of the NSW South Western Slopes Bioregion.
  - Moderate / Good_high condition: 2.50ha
  - Moderate / Good_medium condition: 1.44ha
  - Moderate / Good_poor condition: 2.00ha.

Whilst the Project would result in residual impacts to native flora and fauna, it is not expected to result in significant impacts upon migratory or threatened species, assuming the implementation of the range of on-site mitigation measures and the proposed Biodiversity Offset Strategy.

6.3 ABORIGINAL CULTURAL HERITAGE

6.3.1 Existing Environment

The potential impacts to items or places of Aboriginal cultural heritage significance were assessed by Landskape Natural and Cultural Heritage Management and presented in an Aboriginal and Historic Heritage Assessment (Landskape, 2020). The assessment included a comprehensive analysis of:

- the landscape and ethno-historical context of the Mine Site;
- previous Aboriginal cultural assessment in the Mine Site or locality;

- the potential for artefacts or evidence of past habitation in the form of a predictive model; and
- consultation outcomes with Aboriginal stakeholders for the Project.

A total of five field survey events were undertaken by Dr Matt Cupper of Landskape, with the assistance of the Aboriginal community representatives over a total period of 17 days between 2011 and 2019.

Figure 6.3 presents the outcomes of field survey and background assessment with the proposed easement for the 500kV transmission line highlighted.

A single Aboriginal rock shelter site has historically been recorded within the proposed easement for the 500kV transmission line on Bingam Ridge, based on the Aboriginal Heritage Information Management System (AHIMS) records. However, the shelter was not able to be relocated in field survey. The following description of the site is provided in Section 5.5.1.1 of Landskape (2020) (page 13-59)

> *There is a shelter with human hand stencil art (AHIMS site number 36-6-0004) recorded as being present on Bingman Ridge which overlooks Lawsons Creek in the southwestern section of the Mine Site in the vicinity of the proposed re-aligned 500kV power transmission line.*
>
> *The shelter is a literature reference from 1899 and was recorded as occurring "half way between Mudgee and Rylstone". The site coordinates are listed as "guessed very general location" on the AHIMS register and could not be re-identified during this or previous assessments (Appleton, 1996; Maynard, 1998).*

No other sites of Aboriginal cultural heritage significance were identified by Landskape (2020) within the proposed easement for the re-aligned 500kV transmission line.

6.3.2 Mitigation and Management Measures

Management and mitigation measures that would be applied for all surface disturbance within the easement for the 500kV transmission line would be consistent with those presented in Section 4.14.9 of the EIS and Section 8 of Landskape (2020).

- Collating all proposed proactive and reactive management strategies relating to Aboriginal cultural heritage in a Heritage Management Plan (HMP) for the Project that would be prepared in consultation with the registered Aboriginal parties.
- Developing a strategy for salvage and storage of sites identified within the Mine Site in conjunction with the Aboriginal community. This process would include an educational program for Aboriginal youth regarding the processes for identification, documentation and storage of artefacts.
- Bowdens Silver would provide training to all on-site personnel regarding the Heritage Management Plan strategies relevant to their employment tasks.
- An unexpected finds protocol would be establishing in the Heritage Management Plan to guide personnel in the event that artefacts are uncovered.
- Bowdens Silver is committed to involving the local Aboriginal community as an integral participant in the management of Aboriginal cultural heritage values in the Mine Site.

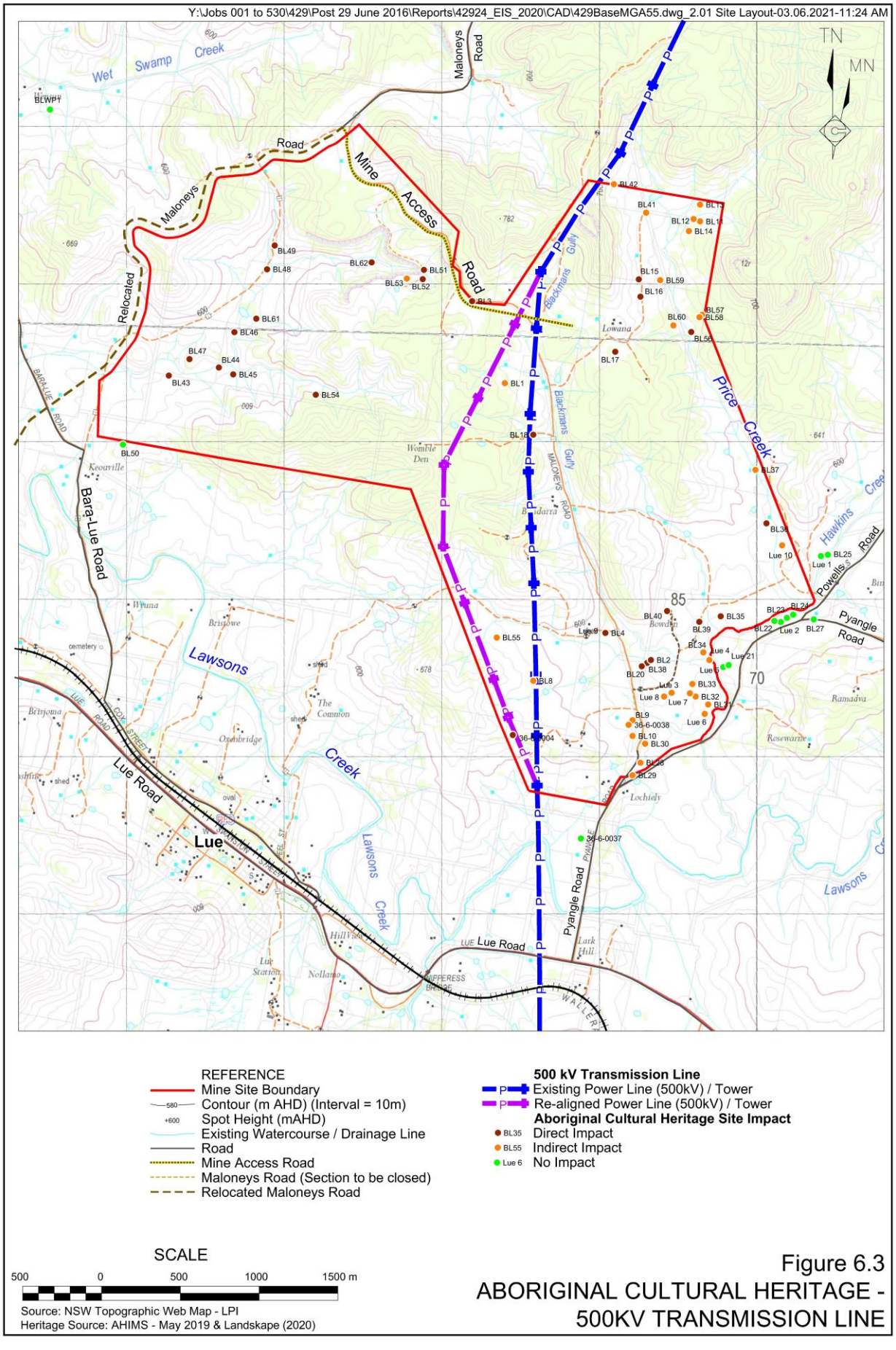


Figure 6.3
ABORIGINAL CULTURAL HERITAGE - 500KV TRANSMISSION LINE

6.3.3 Assessment of Impacts

As the re-alignment works for the 500kV transmission line would not directly impact any identified sites of Aboriginal cultural heritage significance, the impacts associated with these works would be negligible.

6.4 NOISE

6.4.1 Existing Environment

The existing noise environment has been described extensively in Section 4.2.2 of the EIS. In summary, noise which is currently audible at residences in the vicinity of the Mine Site is variously attributable to a range of local sources including:

- traffic on Lue Road and local roads;
- domestic and rural noise from lawn mowers, tractors, etc.;
- rural fauna noise such as stock, insects and birds;
- rural natural noise such as wind in the trees;
- occasional light aircraft; and
- The Louee Enduro and Motocross Complex[6].

Unattended background noise monitoring was undertaken at 12 locations with measured rating background noise levels (RBLs) L_{A90} ranging from between 25dB(A) to 31dB(A).

6.4.2 Mitigation and Management Measures

The mitigation and management measures that would be adopted during the re-alignment of the transmission line are largely an extension of those proposed for the mining operations. In particular, management measures relevant to the re-alignment of the transmission line would be included as part of an approved Construction Noise Management Plan (CNMP). These measures would be supported by the use of continuous real-time noise monitors to enable real-time management.

6.4.3 Assessment of Impacts

Section 8 of the Noise and Vibration Assessment (SLR, 2020) provides the detailed result of the noise modelling for the activities associated with the re-alignment works. This assessment was refined as presented in Section 5.18.5 of the Submissions Report. A summary of the outcomes of that assessment is presented in **Table 6.1**. In summary, negligible exceedances (1dB(A) to 2dB(A)) of the construction noise criteria are predicted at 13 privately-owned residences, marginal to moderate exceedances [3dB(A) to 5dB(A)] at three privately-owned residences, and significant exceedances (>5dB(A)] at two privately-owned residences.

[6] Whilst not a constant noise source, activities at the Louee Enduro and Motocross Complex occur mainly on weekends and during school holiday periods. From the results of community consultation, it is understood that the noise from the complex is periodically audible in Lue and a number of rural and rural residential residences within approximately 5km of the complex.

Table 6.1
Construction Noise Impact Assessment Summary – 500kV Transmission Line

Total Year 3 Operational plus PTL Re-alignment Works	Characterisation of Transmission Line Re-alignment Noise Impacts		
	Negligible[2]	Marginal to Moderate[3]	Significant[4]
Privately-owned Residences[1]			
Rural Residences	R21; R25; R37; R40; R45A; R46, R82; R86; R87	R35; R36A;	R4; R7
Lue Residences	L3; L4; L50	-	-
Lue Places of Interest	-	-	-
Project-related Receivers[1]			
Rural	R1L; R1N; R27	R1B; R1H; R1K; R39; R47	R1A; R1J; R1P; R1Q, R10
Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).			
Note 2: Predicted negligible noise exceedance 1-2dB(A) above the daytime intrusive PNTL of 40dB(A).			
Note 3: Predicted marginal to moderate noise exceedance 3-5dB(A) above the daytime intrusive PNTL of 40dB(A).			
Note 4: Predicted significant noise exceedance >5dB(A) above the daytime intrusive PNTL of 40dB(A).			
Source: Modified after Table 5.9 of the Submission Report (RWC, 2021) and Table 47 in SLR (2020)			

Given the linear nature of the construction and dismantling works, the modelled noise impacts from this activity at any one residence would be limited to an approximately 1 to 2 month period and would be intermittent during that period. As such, these exceedances would be managed in accordance with EPA's Interim Construction Noise Guideline. It is also noted that all private landowners predicted to experience marginal to moderate exceedances or significant exceedances of noise assessment criteria during construction of the 500kV transmission line have been consulted regarding entering negotiated agreements with Bowdens Silver relating to predicted operational noise impacts in accordance with the NSW *Voluntary Land Acquisition and Mitigation Policy 2018* (VLAMP), noting that the predicted exceedances resulting from construction of the 500kV transmission line do not trigger this policy.

6.5 AIR QUALITY

6.5.1 Existing Environment

The existing air quality environment has been described extensively in Section 4.4.2.2 of the EIS. In summary, the existing ambient air quality environment in the vicinity of the Mine Site / 500kV transmission line is mostly influenced by:

- wind-generated dust from exposed areas;
- fugitive dust emissions from agricultural activities, particularly during dry conditions;
- dust entrainment due to vehicle movements along unsealed and, to a lesser extent, sealed roads;
- seasonal emissions from household wood heaters;
- episodic emissions from vegetation fires; and
- long-range transport of fine particles into the region.

6.5.2 Mitigation and Management Measures

The mitigation and management measures that would be adopted during the re-alignment of the transmission line are largely an extension of those proposed for the mining operations. In particular, the key measure relevant to the re-alignment is the adoption of a proactive air quality management system using a combination of the following.

- Meteorological forecasts - to predict when the risk of dust emissions may be high (due to adverse weather) in specific directions around the Mine Site / transmission line re-alignment works and allow procedures and preparatory measures to be implemented.
- Visual monitoring - to provide an effective mechanism for proactive control of dust at source, before it leaves the Mine Site.
- Real-time meteorological and air quality monitoring – to provide alerts for appropriate personnel when short-term dust levels increase, to allow management of the location and intensity of activities or increased controls.

Pending the nature of the works, response measures could include watering of access tracks or temporary cessation of vegetation clearing.

6.5.3 Assessment of Impacts

Given the limited nature of works associated with the re-alignment of the transmission line in comparison with the scale of activities for the mining operations, the contribution of emissions from the re-alignment would be negligible and short-term in nature.

6.6 TRAFFIC AND TRANSPORT

6.6.1 Existing Environment

The existing traffic environment in the vicinity of the Mine Site is detailed in Section 3 of TTPP (2020) and Section 4.12.2 of the EIS and describes:

- the existing road network;
- historic traffic volumes;
- existing and projected traffic volumes;
- roadway capacity and efficiency;
- the local public transport network and school bus services;
- local pedestrian facilities; and
- a review of road safety based on audit outcomes.

Section 2.4 of this document describes road traffic predicted to be generated during the construction and dismantling of the transmission line. These operations would involve up to six laden heavy vehicles (12 movements) and 15 light vehicles (30 movements) per day. All traffic generated for the construction and dismantling activities would enter the Mine Site via the proposed Mine Access Road.

6.6.2 Mitigation and Management Measures

The principal measure to mitigate potential transport impacts from the Project is the proposed relocation of Maloneys Road to the west of the Mine Site. This would remove the need for many heavy vehicles generated by the Project to pass through Lue, including those related to the proposed re-alignment works.

Bowdens Silver is committed to a number of transport-related mitigation and management measures for the Project (including the proposed re-alignment works) that are described in detail in Section 6 of TTPP (2020) and Section 4.12.4 of the EIS. In summary, the measures relevant to the construction and dismantling of the transmission line include the following.

- Preparation and implementation of a Traffic Management Plan including a Driver's Code of Conduct.
- Careful planning of operational shift times to avoid heavy peak periods of personnel use of the local road network.
- All oversize or overmass loads would be transported with the relevant permits obtained in accordance with *Additional Access Conditions for oversize and overmass heavy vehicles and loads* (RMS, 2017), and any other licences and escorts as required by the regulatory authorities.

6.6.3 Assessment of Impacts

The traffic generated by re-alignment works for the 500kV transmission line would generate a relative minor number of heavy vehicles and light vehicles over a short construction period. Given the substantial commitment to relocate Maloneys Road and the remaining commitments relating to transport management, it is considered that the traffic travelling to and from the Mine Site would be accommodated on the surrounding road network with virtually no adverse impacts to road users, the condition of the road network and the amenity of the residents of Lue.

6.7 VISUAL AMENITY

6.7.1 Existing Environment

A comprehensive description of the visual setting of the Mine Site is described in Section 4.9.1 of the EIS and Section 5 of the Visibility Assessment for the Project that was undertaken by Richard Lamb and Associates (RLA, 2020). The location of lattice towers is also discussed in Section 5.29.2 of the Submissions Report.

The existing 500kV transmission line is a prominent feature of the visual setting in the vicinity of the Mine Site, predominantly by the lattice towers up to 50m high. In some places, the cleared easement is visible across the Mine Site although this has substantially revegetated with groundcover in places.

6.7.2 Mitigation and Management Measures

Mitigation of visual impacts associated with the re-aligned 500kV transmission line would occur through locating the lattice towers to provide sufficient topographic elevation while taking into consideration the views of the towers from local vantage points and local road network. This process would occur during design of the re-alignment in conjunction with TransGrid.

6.7.3 Assessment of Impacts

As discussed in Section 5.29.2 of the Submissions Report, review of the Project 3D model on Bowdens Silver's website for the existing transmission line and proposed transmission line (**Figure 6.4**) displays that four of the relocated 500kV powerline towers (P4 to P7) would be topographically higher (to varying extents) and closer to Lue than the existing towers. As a consequence, the upper sections of the towers would be visible. Two towers (E2 and E7) would no longer be visible as they would be dismantled.

The re-alignment of the 500kV transmission line would be visible during the construction period, i.e. in about Year 3 of operations, principally due to the presence of the new towers and existing towers co-existing for a short period. The alignment of the proposed re-aligned transmission line in the visual catchment of the proposed mine is largely in country with similar visual and physical characteristics to the existing line and the new line. The re-aligned transmission line would be located on elevated topography similar to the existing alignment and would be likely to be compatible with the appearance of the existing line and not cause any significant change to view compositions.

Therefore, it is concluded that a low level of impact would be experienced by motorists travelling along Lue Road and occupants of at least six residences from the re-alignment of the 500kV transmission line (two of which are Project-related, having entered into agreements with Bowdens Silver).

The 500kV transmission line is a substantial item of infrastructure in the landscape east of Lue and its slight re-alignment and construction of new towers would not change the overall character of the transmission line when viewed from Lue and surrounds.

6.8 HUMAN HEALTH (ELECTRIC AND MAGNETIC FIELDS)

6.8.1 Background and Guidelines

Electric and magnetic fields (EMF) are part of the natural environment and are present in the Earth's core and the atmosphere. EMF is also produced wherever electricity or electrical equipment is in use. Power lines, electrical wiring, household appliances and electrical equipment all produce EMF. EMF decrease rapidly with distance from the source. Generally, the smaller the object or closer the conductors producing the field, the more rapidly the field would decrease with distance from the source.

The EMF strength at ground level beneath the re-aligned transmission line would be dependent on a range of factors, including the height of the wires above the ground and their geometric arrangement as supported by the transmission towers.

In order to protect human health, the Australian Radiation Protection and Nuclear Safety Agency have adopted *Guidelines for Limiting Exposure to Electromagnetic Fields* prepared by the International Commission on Non-Ionizing Radiation Protection. The latest guideline, published in 2020 (ICNIRP, 2020), specify quantitative EMF levels for personal exposure with adherence to these levels "*intended to protect people from all substantiated harmful effects of radiofrequency EMF exposure*".

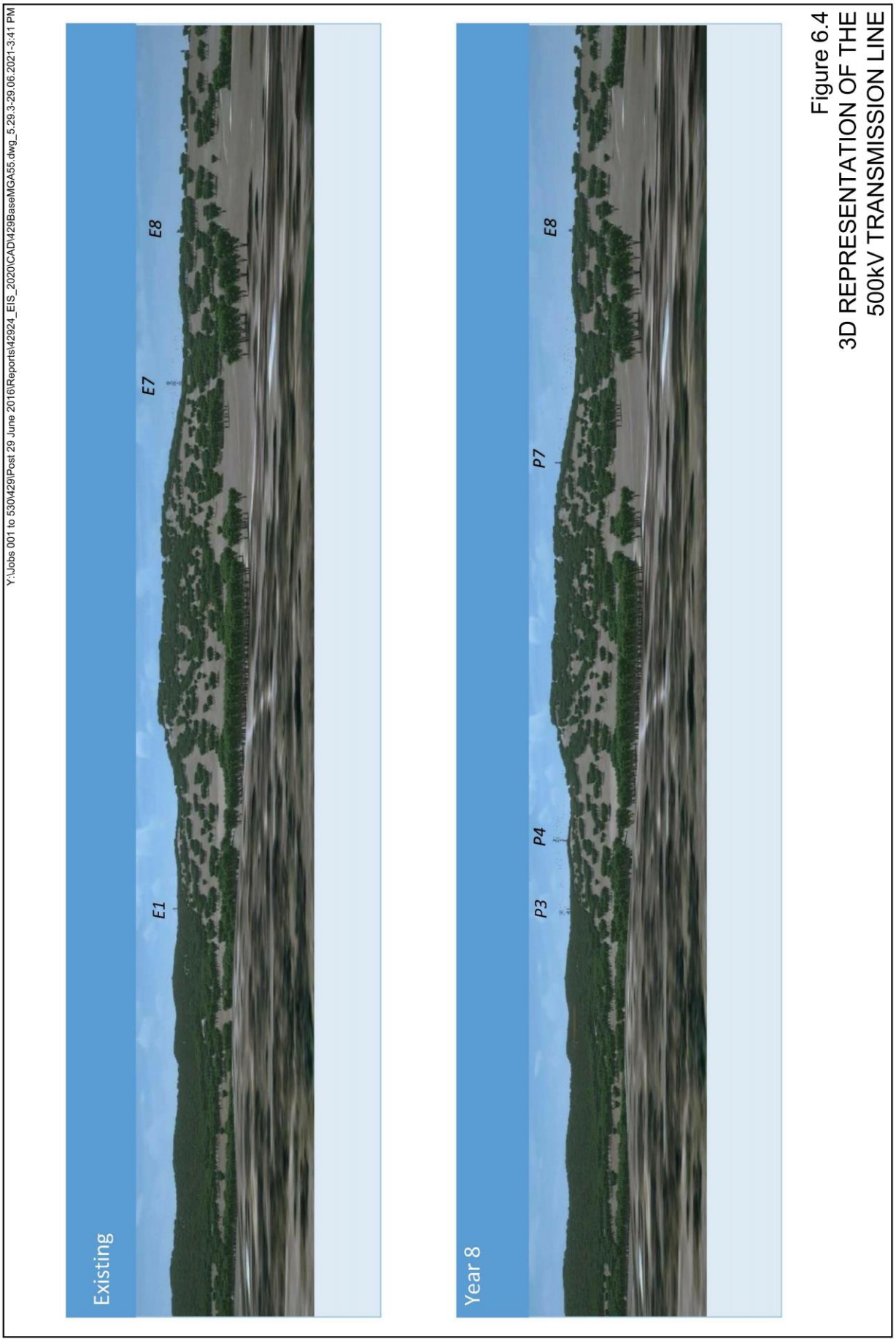


Figure 6.4
3D REPRESENTATION OF THE
500kV TRANSMISSION LINE

6.8.2 Assessment of Impacts

It is noted that the re-alignment would move the transmission line marginally closer to some residences but also further away from others. However, given that the proposed re-aligned transmission line would be constructed in accordance with the *Guidelines for Limiting Exposure to Electromagnetic Fields* (ICNIRP, 2020), it is expected that there would be no change to potential human health risks.

6.9 OTHER CONSIDERATIONS

Bush fire

The risks and proposed management of bush fire within the Mine Site (including the 500kV transmission line) were described in Section 4.16.3 of the EIS that noted that the Project would satisfy the objectives of *Planning for Bush Fire Protection (RFS) (2006)* and *Planning for Bush Fire Protection, Addendum: Appendix 3* (RFS, 2010). It was concluded that the proposed management approach would minimise the risk of a bush fire hazard ignited from within the Mine Site while effectively limiting the spread and damage from any bush fire ignited outside the Mine Site. A detailed summary of the proposed management and mitigation measures to limit bush fire risks is presented in Section 4.16.3.5 of the EIS.

These controls would be extended to the activities associated with re-alignment of the 500kV transmission line.

Soils and Erosion and Sediment Control

A detailed discussion of the soils and land capability of the land within the Mine Site is presented in Section 4.16 of the EIS. Planning for activities associated with the re-alignment works would include the preparation of a construction management plans that includes:

- the preference to minimise the area of disturbance for lattice tower construction, where possible;
- the storage and use in rehabilitation of stripped topsoils; and
- the short term erosion and sediment controls that would be implemented to manage sedimentation and erosion risks. These are likely to include standard measures such as sediment fencing and temporary bunding and drainage, as necessary.

As discussed in Section 5.24.12 of the Submissions Report in relation to earthworks for the relocation of Maloneys Road, no substantial earthworks would commence until all required erosion and sediment controls, constructed in accordance with relevant design guidance (e.g. Managing Urban Stormwater: Soils and Construction, Volume 1, 4th eds. (Landcom, 2004)) are in place.

Historic Heritage

Section 4.15 of the EIS describes the outcomes of assessment undertaken by Landskape Natural and Cultural Heritage Management and presented in an Aboriginal and Historic Heritage Assessment (Landskape, 2020). In summary, the Project would result in the removal of three historical heritage sites comprising hut ruins and two shallow pits. Items from the hut ruins would be salvaged and archived at a place yet to be determined.

The preparation of a Heritage Management Plan would ensure that any unidentified historical cultural heritage sites and values would be protected in accordance with the requirements of the NSW Government and the expectations of the wider community.

There were no sites of historic heritage value identified along the route of the proposed re-aligned 500kV transmission line.

7. EVALUATION OF MERITS

A comprehensive evaluation of the Project is provided in Section 6 of the EIS and Section 7 of the *Submission Report*. Section 6.1 of the EIS discusses the principles of ecologically sustainable development but also considers the following in evaluating the Project.

- The design and planning approach taken by Bowdens Silver.
- The commitments made by Bowdens Silver associated with the Project.
- The relevant planning considerations for the Project, including the objects of the *Environmental Planning and Assessment Act 1979*; and
- Achievement of the objectives of the Project.

Both Section 6 of the EIS and Section 7 of the *Submissions Report* justify approval of the Project based on the biophysical, social and economic outcomes assessment.

As the environmental, social and economic impacts of the re-alignment of the transmission line were included in technical assessment of the Project, the outcomes of assessment are unchanged as a result of the proposed amendment to the Project. Additional consideration of risks associated with electric and magnetic fields concludes that these risks would be managed with TransGrid in accordance with its guidance for design and construction of transmission lines of this size.

The amendment to the Project to include the re-alignment of the 500kV transmission line within SSD 5765 does not alter the merits of the Project as described in the EIS and *Submissions Report*. It remains the conclusion of Bowdens Silver that the Project would be in the public interest as it would provide an acceptable balance of environmental and social outcomes, whilst generating substantial benefits for the local, regional and State economies.

8. REFERENCES

EnviroKey Pty Ltd (2021) – *Updated Biodiversity Assessment Report*, presented as Appendix 4 of the *Submissions Report.* Prepared on behalf of Bowdens Silver Pty Limited.

Gillespie Economics (2020) – *Economic Assessment*, Part 15 of the *Specialist Consultant Studies Compendium*. Prepared on behalf of Bowdens Silver Pty Limited

International Commission on Non-Ionizing Radiation Protection (ICNIRP) (2020) - *Guidelines for Limiting Exposure to Electromagnetic Fields*. Health Phys 118(5):483-524 and available from https://www.arpansa.gov.au/understanding-radiation/what-is-radiation/non-ionising-radiation/low-frequency-electric-magnetic-fields.

Landcom (2004) – *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th eds.*

Landskape Natural and Cultural Heritage Management (2020) – *Aboriginal and Historic Heritage Assessment*, Part 13 of the *Specialist Consultant Studies Compendium*. Prepared on behalf of Bowdens Silver Pty Limited

Richard Lamb & Associates Consulting (RLA) (2020) – *Visibility Assessment*, Part 8a of the *Specialist Consultant Studies Compendium*. Prepared on behalf of Bowdens Silver Pty Limited

Roads and Maritime Services (2017) – *Additional Access Conditions: Oversize and overmass heavy vehicles and loads*. November 2017.

Roads and Maritime Services (RMS) (2017) – *Additional Access Conditions for Oversize and Overmass Heavy Vehicles and Loads*

Rural Fire Service (2010) – *Planning for Bush Fire Protection, Addendum: Appendix 3.*

R.W. Corkery & Co. Pty Limited (RWC) (2020) – *Environmental Impact Statement* (EIS). Prepared on behalf of Bowdens Silver Pty Limited.

R.W. Corkery & Co. Pty Limited (RWC) (2021) – *Submissions Report.* Prepared on behalf of Bowdens Silver Pty Limited.

SLR Consulting Australia Pty Ltd (2020) – *Noise and Vibration Assessment*, Part 1 of the *Specialist Consultant Studies Compendium*. Prepared on behalf of Bowdens Silver Pty Limited

The Transport Planning Partnership Pty Ltd (TTPP) (2020) – *Traffic and Transportation Assessment*, Part 11 of the *Specialist Consultant Studies Compendium*. Prepared on behalf of Bowdens Silver Pty Limited

Appendices

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Appendix 1

Updated Description of the Project

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Section 2

Updated Description of the Project

PREAMBLE

This section describes Bowdens Silver's plans for the proposed site establishment / construction, operation and rehabilitation of the Bowdens Silver Project ("the Project"). Bowdens Silver's objectives for the Project and a brief scenario of the operation as well as a description of the geological setting and the resource to be mined. The proposed site establishment and construction activities, mining operations and processing activities are outlined together with the management of the waste rock and tailings generated. This section also describes the proposed hours of operation, infrastructure and services, site security, waste management, transportation of mineral concentrates and rehabilitation activities. Emphasis is placed in this section upon describing the proposed components of the Project.

The proposed relocation of Maloneys Road and the construction and operation of the proposed water supply pipeline is also described in this section.

The Project is described in sufficient detail to provide the reader with an overall understanding of the nature and extent of activities proposed and to enable an assessment of the potential impacts on the surrounding environment. A range of information outlining how each of the Project components would be undertaken is provided in Appendix 5 of the EIS entitled "Documentation Supporting the Project Description".

Details of the safeguards and mitigation measures that Bowdens Silver would implement to protect and manage noise, air quality, visibility, surface water, groundwater, Aboriginal heritage, flora, fauna, soils and other components of the local environment are detailed in Section 4 of the EIS.

This Updated Description of the Project has been prepared following the public exhibition of the Environmental Impact Statement for the Project from 2 June 2020 to 27 July 2020. A Submissions Report that addresses the matters raised in Government agency, organisation and public submissions received during and after this time has been prepared. In addition, an Amendment Report has been prepared that proposes inclusion of the re-alignment of a 500kV transmission line that currently traverses the Mine Site within the Project. This Updated Description of the Project incorporates the proposed amendment to the Project as well as refines those matters relating to project design and operation that were updated as a result of Bowdens Silver's review of submissions.

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2.1 INTRODUCTION

2.1.1 Objectives

The principal objectives of the Bowdens Silver Project are to:

i) maximise the recovery of the silver, zinc and lead minerals from the defined ore reserves within the proposed open cut pits;

ii) undertake all activities in an environmentally and socially responsible manner to demonstrate compliance with relevant criteria and satisfy reasonable community expectations;

iii) ensure the health of its workforce and the surrounding community is not adversely affected;

iv) preserve the existing character of Lue;

v) maintain a positive relationship with the surrounding agricultural industry and maximise productivity on land retained for agricultural production;

vi) provide a stimulus for the Mudgee, Rylstone, Kandos and district economies; and

vii) achieve the above objectives in a cost-effective manner to ensure the Bowdens Silver Project is economically viable.

2.1.2 Overview of the Project

The seven principal components within the Mine Site are:

i) a main open cut pit and two satellite open cut pits, collectively covering approximately 52ha;

ii) a processing plant and related infrastructure covering approximately 22ha;

iii) a waste rock emplacement (WRE) covering approximately 77ha;

iv) a low grade ore stockpile covering approximately 14ha (9ha above WRE)[1];

v) an oxide ore stockpile covering approximately 8ha;

vi) a tailings storage facility (TSF) covering approximately 117ha; and

vii) the southern barrier to provide visual and acoustic protection to properties south of the Mine Site covering approximately 32ha.

The above components would be supported by a range of on-site and off-site infrastructure. The on-site infrastructure comprises haul roads, water management structures, power/water reticulation, workshops, stores, compounds and offices/amenities. The off-site infrastructure comprises a relocated section of Maloneys Road (including a new railway bridge crossing and new crossing of Lawsons Creek), a 66kV power transmission line and a water supply pipeline for the delivery of water to the Mine Site. **Figure 2.1** displays the indicative locations of the principal mine components.

[1] The low grade ore stockpile would be constructed adjacent to but largely upon the northern sections of the WRE.

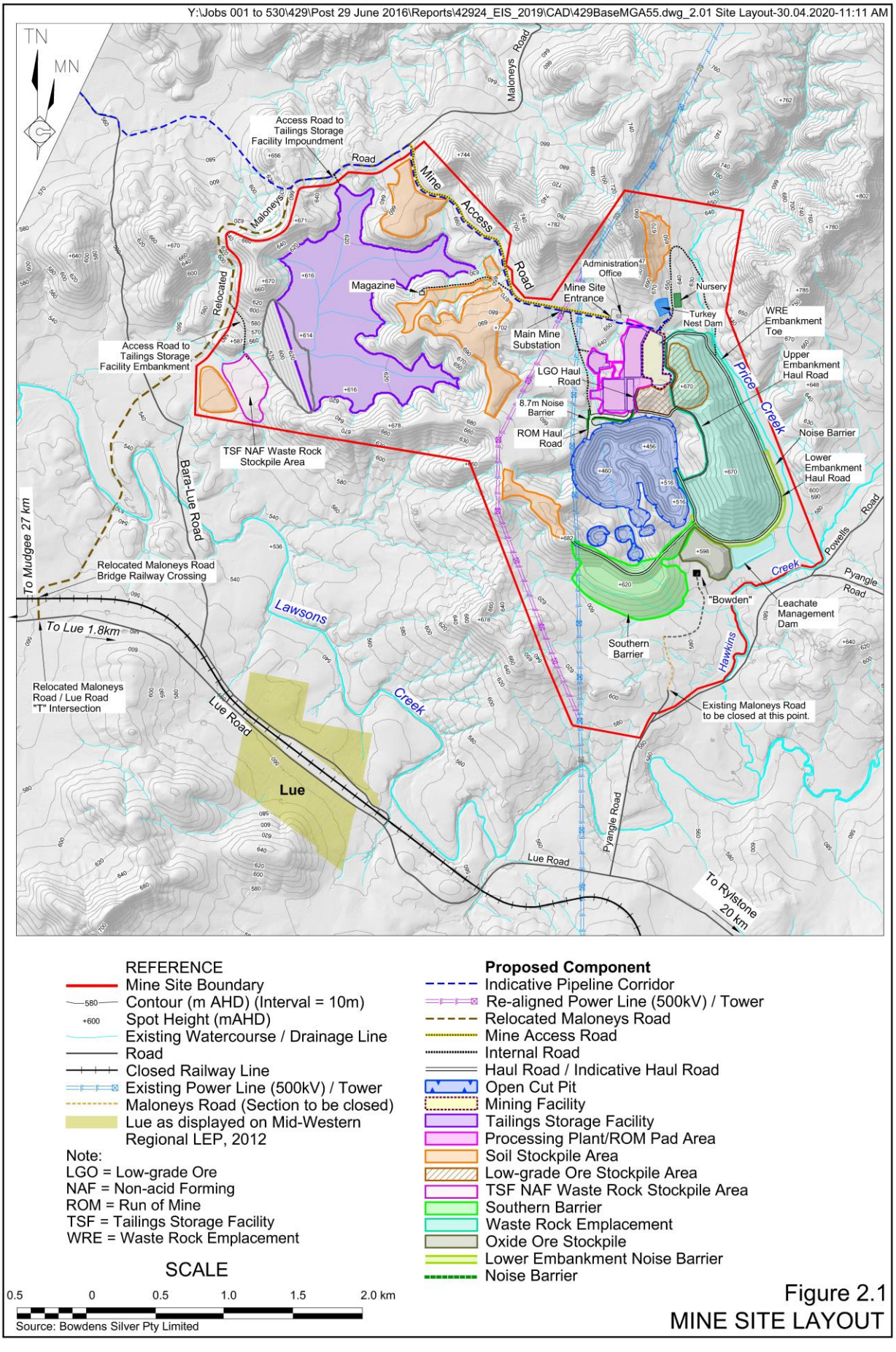


Figure 2.1
MINE SITE LAYOUT

The Project would incorporate conventional open cut pits (one main and two smaller, satellite pits), from which overburden/waste rock is removed from above and around the silver-zinc-lead ore and either used for on-site construction activities or placed in the out-of-pit WRE or the southern barrier. The mined ore would be transported by haul trucks to the on-site processing plant where it would be crushed, milled and processed to liberate the silver, zinc and lead minerals. These minerals would be collected by conventional froth flotation to produce two concentrates that would be dewatered and transported off site by truck. The residual materials from processing (tailings) would be pumped in the form of a slurry to a TSF located to the west of the main open cut pit.

The Project would require a site establishment and construction period of approximately 18 months during which the processing plant and all related infrastructure and the initial embankment of the TSF would be constructed. Once operational, Bowdens Silver anticipates the mine would produce concentrates for approximately 15 years. In total, it is proposed the mine life would be approximately 16.5 years, i.e. from the commencement of the site establishment and construction stage to the completion of concentrate production. It is envisaged rehabilitation activities would be completed over a period of approximately 7 years, i.e. from Year 16 to Year 23. **Figure 2.2** displays the duration of each of the main components throughout the mine life and Project life.

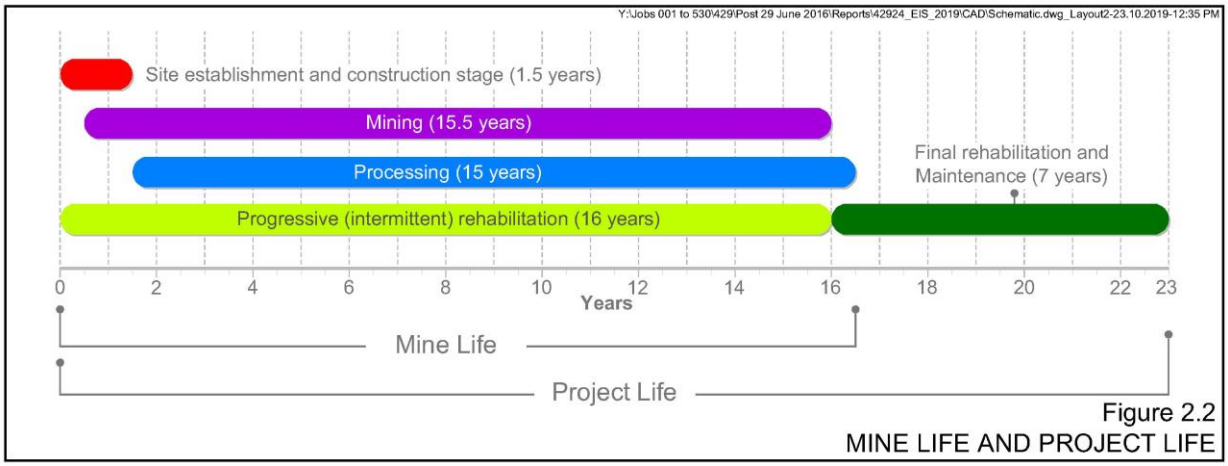


Figure 2.2
MINE LIFE AND PROJECT LIFE

2.1.3 Approvals Required

Based upon the design of the Project and understanding of relevant environmental issues, the Bowdens Silver Project would require the following approvals to proceed.

1. Development Consent issued under the *Environmental Planning and Assessment Act 1979* (EP&A Act) as the Project, being for the purposes of mining-related works with a capital investment value of greater than $30 million, is classified as a State Significant Development under the *State Environmental Planning Policy (State and Regional Development) 2011,* for which approval is required from the Minister for Planning or his/her delegate.
2. An approval from the Commonwealth Minister for the Environment and Energy under the *Environment Protection and Biodiversity Conservation Act 1999 Cth* (EPBC Act) as the Project has been determined to be a controlled action under the EPBC Act.

3. A Mining Lease issued under the *Mining Act 1992* for the area nominally referred to as the Mine Site[2]. The issuing authority would be the Minister responsible for the administration of the *Mining Act 1992* or his/her delegate.

4. An Environment Protection Licence issued under the *Protection of the Environment Operations Act 1997.* The issuing authority would be the Environment Protection Authority (EPA).

5. Several Water Access Licences to cover the amounts of groundwater and surface water intercepted during mining operations, above that which is permitted under the maximum harvestable rights provisions of the *Water Management Act 2000*. The issuing authority would be the DPIE Water operating under the *Water Management Act 2000* and in accordance with:

    i. the *Water Sharing Plan for the Unregulated and Alluvial Water Sources 2012, Lawsons Creek Water Source;*

    ii. the *Water Sharing Plan for the NSW Murray-Darling Basin Fractured Rock Groundwater Sources 2011, Lachlan Fold Belt Groundwater Source; and*

    iii. the *Water Sharing Plan for the NSW Murray-Darling Basin Porous Rock Groundwater Sources 2011, Sydney Basin Groundwater Source.*

6. One or more permit(s) issued under the *Roads Act 1993* by Mid-Western Regional Council to:

    i. undertake intersection works on Lue Road;

    ii. construct a new section of the road referred to as relocated Maloneys Road; and

    iii. install the water supply pipeline beneath public roads and administered by Council.[3]

7. The necessary agreements with TransGrid (as the relevant network operator) would be required for a network modification for the proposed re-alignment of the 500kV power transmission line including a Modification Processes Agreement and Offer to Modify.

8. Appropriate approvals and licences from SafeWork NSW for the on-site storage (detonators, boosters/primers only) and use of explosives and notification of dangerous goods stored and used on site.

9. All necessary approvals from Mid-Western Regional Council for construction, erection and/or placement of buildings, structures and appropriate sewage treatment systems for the Project.

[2] The exact area of the mining lease is yet to be finalised – it may or may not exactly coincide with the Mine Site as displayed on **Figure 2.1**.
[3] The Roads and Maritime Services would be a concurrence authority for those activities for classified public roads, e.g. Ulan Road.

10. All necessary approvals from the managing agent of the Country Regional Network (on behalf of Transport for NSW), with regard to the railway bridge for the relocated Maloneys Road.
11. One or more licences or leases required to occupy Crown Land for the relocated road and water supply pipeline.

The alignment of the water supply pipeline corridor, as displayed on **Figure 1.3**, has been discussed during consultation with 17 of the 19 landowners[4] along the corridor. It is acknowledged that access to all areas that are intended to be used for the water supply pipeline has not be possible to date. Finalising the necessary agreements and alignment of the pipeline would occur before receipt of development consent. However, the assessments undertaken to date indicate that the proposed alignment is acceptable. In the event a minor adjustment to the alignment of the corridor is required at the request of a landowner or for an engineering design reason following the receipt of development consent, Bowdens Silver would identify this requirement with the relevant authorities and undertake the necessary assessments to accompany an application to modify the alignment for the new corridor section. To date it is expected that this would not be required.

An approval to construct the required 66kV power transmission line to the Mine Site would be sought separately in accordance with Part 5 of the EP&A Act. Power supply requirements for the Project are discussed in more detail in Section 2.11.3. It should be noted that assessment of the power supply infrastructure and associated works is not included here but would be addressed in a future application to the relevant energy provider.

2.1.4 Other Agreements

Bowdens Silver is in the process of progressing a number of agreements in relation to the Project. While not formal approvals, and in some cases not strictly necessary for approval and commencement of the Project, these agreements would be subject to terms as agreed between the relevant parties.

Planning for the supply of make-up water for the Project has identified the option to source water from the Ulan Coalfield via a dedicated water supply pipeline. Bowdens Silver acknowledges that the ability to transfer water from the Ulan Coalfield is dependent on reaching agreement on the operational and commercial terms that would apply to any such arrangement, and the entry into a formal water sharing agreement.

Assessment for various stages of the development has identified that, despite the adoption of a comprehensive suite of feasible and reasonable mitigation measures, noise levels generated by the Project may be experienced at some residences at levels that exceed the assessment criteria. Agreements with the owners of residences that would experience marginal/moderate exceedances would be required in accordance with the NSW Government's Voluntary Land Acquisition and Mitigation Policy (VLAMP). The mitigation offered to landowners under agreement is discussed in more detail in Section 4.2.2.6.

[4] The remaining two landowners have not been able to be contacted to date.

The current Biodiversity Offset Strategy is for Biodiversity Stewardship Agreements to be sought over land within the Mine Site and other properties to establish areas for in-perpetuity biodiversity conservation in order that the residual biodiversity impacts of the Project are offset. The biodiversity offset strategy is discussed in more detail in Section 2.17.

It is noted that Bowdens Silver has negotiated a range of agreements with landowners that would result in purchase or lease of properties should approval for the Project be granted. The details of these agreements are confidential, however where appropriate, any property over which there is such an agreement is included in the EIS and relevant technical assessments as Project-related.

2.2 GEOLOGICAL SETTING AND RESOURCES

2.2.1 Regional Geology

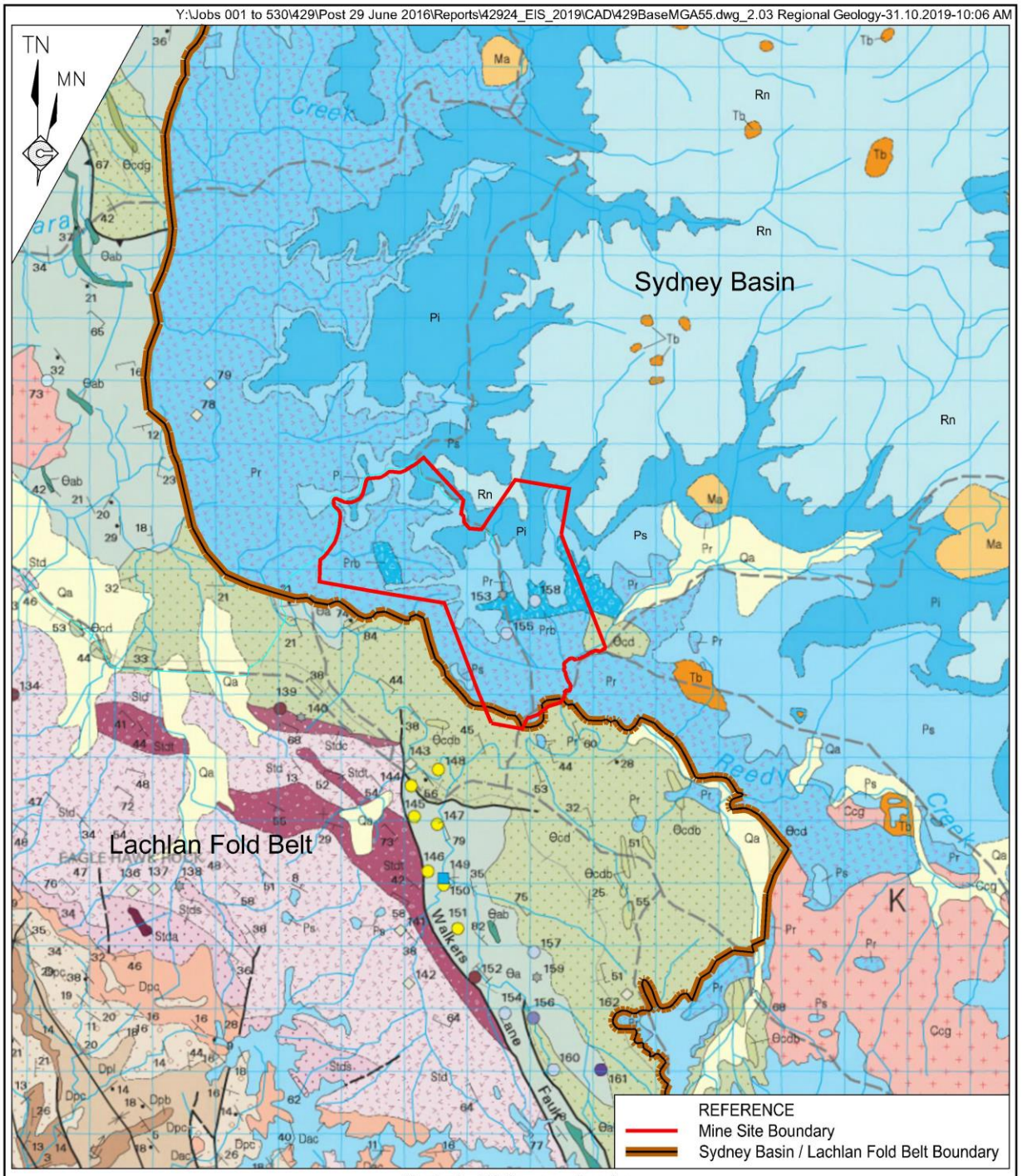
The Mine Site is situated near the northeastern margin of the Lachlan Fold Belt, one of the main components of the Tasman Fold Belt System, and the western edge of the Sydney Basin. **Figure 2.3** presents an extract of the geological map of the Mudgee to Rylstone district displaying the locations of the geological units of the Lachlan Fold Belt and the Sydney Basin together with more recent igneous rocks and Quaternary alluvium.[5]

2.2.2 Mine Site Geology

The Bowdens silver deposit is a carbonate-silver-base metal associated low-sulphidation epithermal deposit. The deposit is hosted principally within siliceous volcanic rocks of the early Permian Rylstone Volcanics (approximately 290 million years old) that unconformably overlie a sequence of Ordovician aged metasediments (approximately 460 million years old). The Rylstone Volcanics which range in thickness from 10m to >200m comprise mainly rhyolitic ignimbrites, tuffs and volcanic breccias and are partially overlain by the Snapper Point Formation of the Shoalhaven Group sediments of the Sydney Basin. **Figure 2.4** displays the surface geology within and adjacent to the Mine Site. **Plate 2.1** displays the colour and appearance of the various rock types defined within and immediately surrounding the Mine Site.

The bulk of the mineralisation within the proposed open cut pits occurs as a thick zone extending from surface, and near surface, to vertical depths of at least 180m. Drilling undertaken to date has identified mineralisation to depths of approximately 330m below the natural ground surface, i.e. below the proposed depth of the main open cut pit.

5 It is noted that Bowdens Silver proposes to establish an explosives magazine on site for emergency use only, i.e. in the event any explosives, primers or detonators need to be stored overnight.



Geological Reference - Lue Area

CAINOZOIC UNITS	Qa	Quaternary Alluvium	MOUNT KNOWLES GROUP	Dpb	Bumberra Formation
	Tb	Tertiary Basalt		Dpc	Buckaroo Conglomerate
MESOZOIC IGNEOUS ROCKS	Ma	Mesozoic Igneous Rocks		Dpl	Lawsons Creek Shale
SYDNEY BASIN	Rn	Narrabeen Group	TANNABUTTA GROUP	Std	Dungeree Volcanics
	Pi	Illawarra Coal Measures		Stdc	Dungeree Volcanics (polymictic conglomerate)
	Pr	Rylstone Volcanics			
	Pr(b)	Rylstone Volcanics (volcanic breccia & conglomerate)		Stdt	Dungeree Volcanics (volcanic conglomerate)
KANDOS GROUP	Ps	Shoalhaven Group	CABONNE GROUP	Øcd	Coomber Formation (mafic volcanic sandstone)
	Ccg	Pyangle Pass Granite		Øcdg	Coomber Formation

SCALE
1 0 1 2 3 4 5 km
Source: Mudgee 1:100 000 Geological Map (2000)

Figure 2.3
REGIONAL GEOLOGICAL SETTING

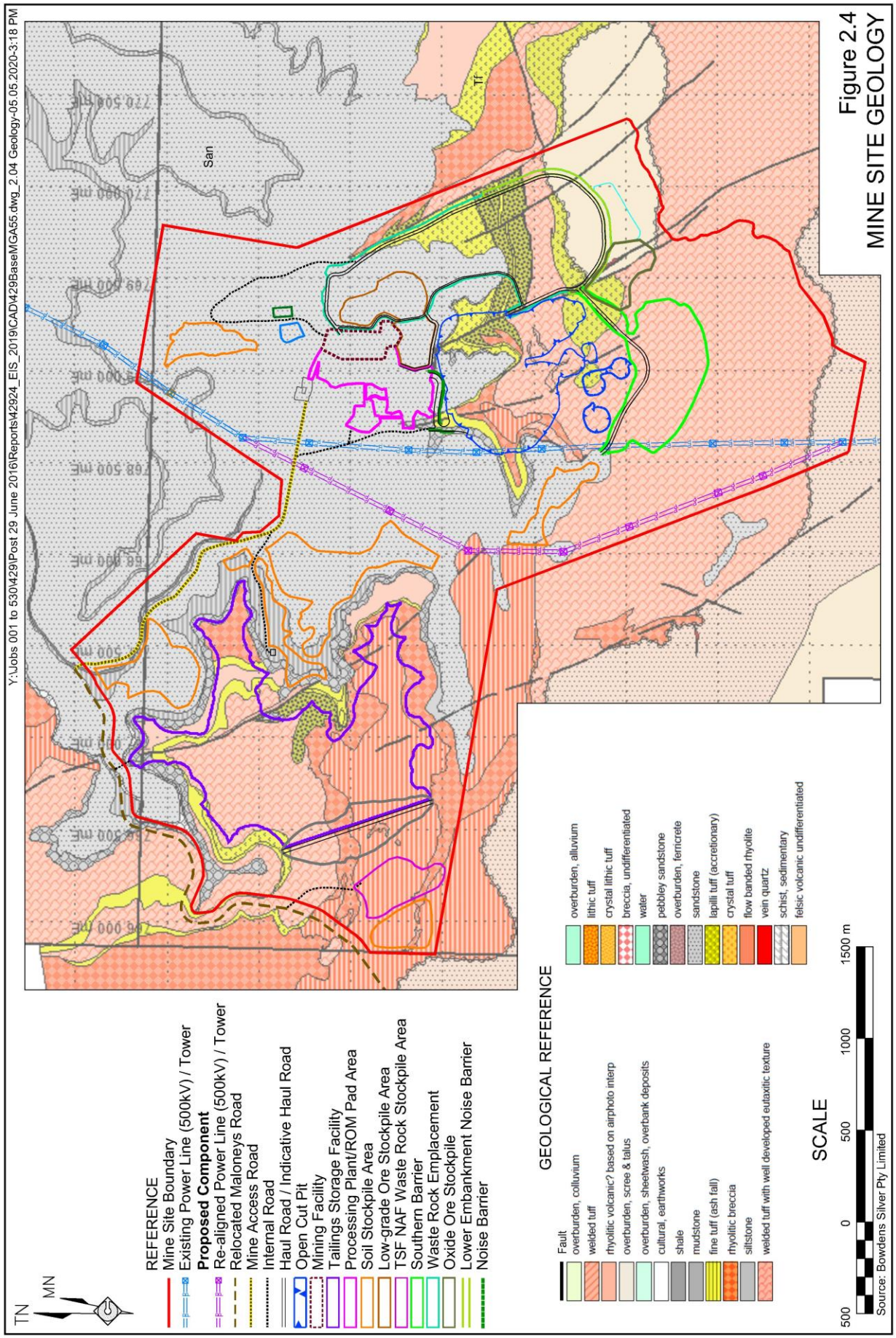


Figure 2.4
MINE SITE GEOLOGY
Y:\Jobs 001 to 530\429\Post 29 June 2016\Reports\42924_EIS_2019\CAD\429BaseMGA55.dwg_2.04 Geology-05.05.2020-3:18 PM
San
Tf
TN
MN
REFERENCE
Mine Site Boundary
Existing Power Line (500kV) / Tower
Proposed Component
Re-aligned Power Line (500kV) / Tower
Relocated Maloneys Road
Mine Access Road
Internal Road
Haul Road / Indicative Haul Road
Open Cut Pit
Mining Facility
Tailings Storage Facility
Processing Plant/ROM Pad Area
Soil Stockpile Area
Low-grade Ore Stockpile Area
TSF NAF Waste Rock Stockpile Area
Southern Barrier
Waste Rock Emplacement
Oxide Ore Stockpile
Lower Embankment Noise Barrier
Noise Barrier
GEOLOGICAL REFERENCE
Fault
overburden, colluvium
welded tuff
rhyolitic volcanic? based on airphoto interp
overburden, scree & talus
overburden, sheetwash, overbank deposits
cultural, earthworks
shale
mudstone
fine tuff (ash fall)
rhyolitic breccia
siltstone
welded tuff with well developed eutaxitic texture
overburden, alluvium
lithic tuff
crystal lithic tuff
breccia, undifferentiated
water
pebbley sandstone
overburden, ferricrete
sandstone
lapilli tuff (accretionary)
crystal tuff
flow banded rhyolite
vein quartz
schist, sedimentary
felsic volcanic undifferentiated
SCALE
500
0
500
1000
1500 m
Source: Bowdens Silver Pty Limited

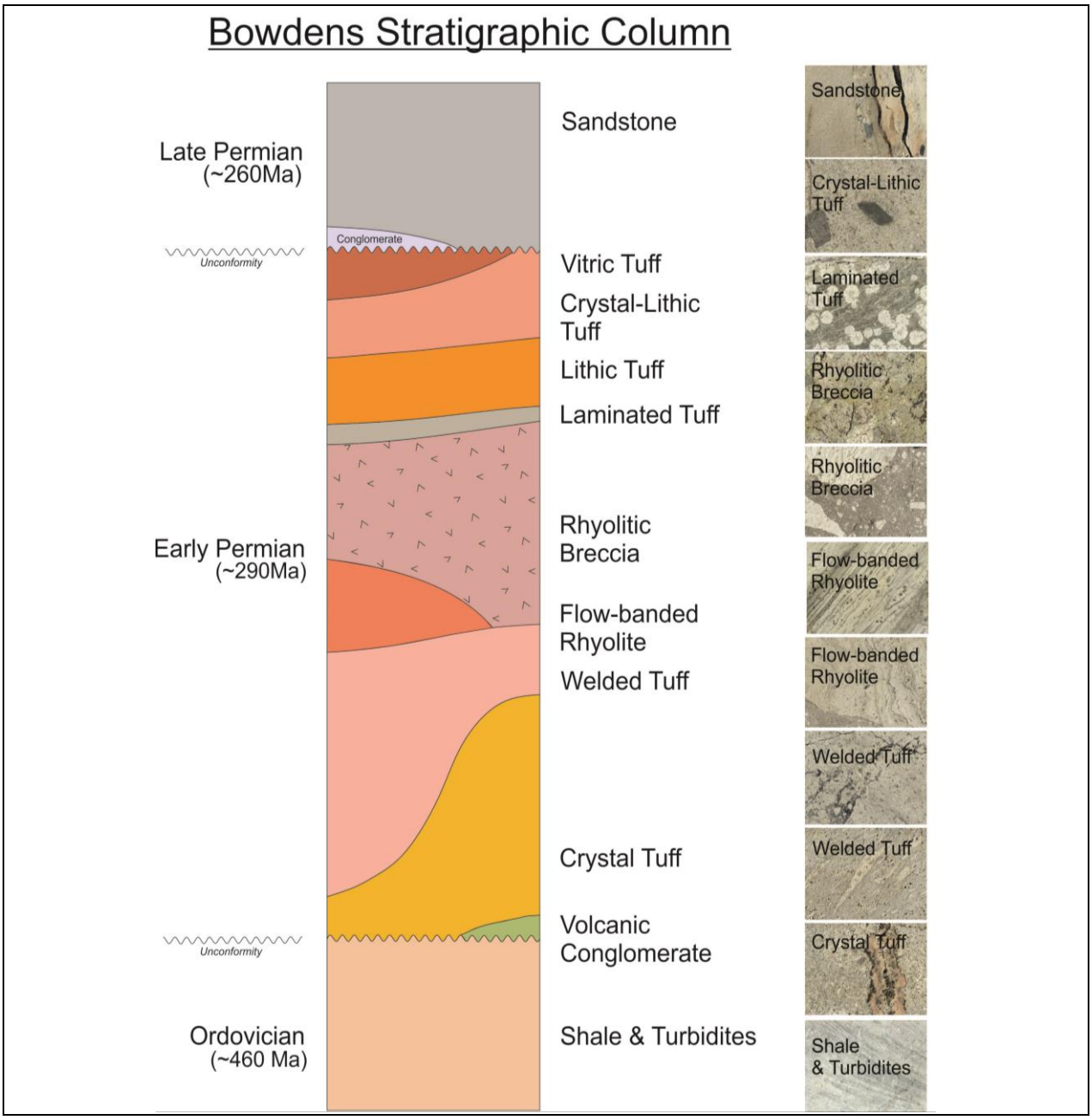


Plate 2.1 Bowdens Stratigraphic Column and Representative Rock Types

A proportion of the rocks within the proposed open cut pits display mineral alteration with an assemblage of clays (illite-smectite), sericite, silica, adularia and carbonate. **Plate 2.1** highlights that the bulk of the rock types to be extracted from the open cut pits are a light cream to light brown in colour, a factor that would potentially contribute to increased visibility of the extraction operations and the placement of the waste rock within the embankment of the TSF, WRE and the southern barrier.

The siliceous volcanic rocks comprising the ore and waste rock contain varying proportions of free silica. Laboratory testing of representative samples of each of the ore and waste rock established that the free silica concentration in the ore and waste rock is typically 47% and 64% respectively.

2.2.3 Ore Reserves

An Ore Reserve Statement, which complies with the JORC [6] standard, was completed for the Bowdens silver deposit in May 2018 by AMC Consultants Pty Ltd (see **Table 2.1**). The silver, zinc and lead grades are expressed in either grams per tonne (g/t) or percentage (%) in accordance with the conventions set out in the JORC standard.

Table 2.1
Ore Reserve Statement – 18 May 2018

Reserve Category	Tonnes (Mt)	Reserve Grades			Contained Metal		
		Ag (g/t)	Zn (%)	Pb (%)	Ag (Moz)	Zn (kt)	Pb (kt)
Proved	28.6	69.75	0.44	0.32	64.05	125.11	91.43
Probable	1.3	53.15	0.43	0.29	2.27	5.74	3.91
Total	**29.9**	**69.01**	**0.44**	**0.32**	**66.32**	**130.84**	**95.33**
Mt = million tonnes		g/t = grams per tonne			Moz = million ounces		kt = thousands of tonnes
Source: AMC Consultants Pty Ltd							

The Ore Reserve Statement presented in **Table 2.1** is based on data from approximately 83 500m of drilling in 653 drill holes that comprise reverse circulation holes (80%) and diamond drill holes (20%). This information has been sourced from recent drilling by Bowdens Silver and previous drilling undertaken by Kingsgate Consolidated Limited, Silver Standard Australia Pty Limited, GSM Exploration Pty Limited and CRA Exploration Pty Limited. The ore reserves listed in **Table 2.1** have been calculated following the design of the open cut pits in which the recovery of silver, zinc and lead minerals has been optimised, i.e. with respect to the quantity of recoverable ore and its ratio to the quantity of overburden extracted to recover the defined ore.

For the purposes of the EIS, Bowdens Silver has defined three types of recoverable ore.

i) Primary Ore: Unweathered silver, zinc and lead sulphide minerals within the host rock with a silver grade exceeding a nominated cut-off grade of 30g/t.

ii) Low Grade Ore: Unweathered silver, zinc and lead sulphide minerals within the host rock with a silver grade marginally below the nominated cut-off grade of 30g/t.

iii) Oxide Ore: Weathered silver, zinc and lead minerals within the host rock with a silver grade exceeding a nominated cut-off grade[7].

Bowdens Silver proposes to extract and process all primary ore and extract and stockpile all low grade ore. The low grade ore would be processed subject to prevailing silver prices and potentially blended with the primary ore. The oxide ore would not be able to be processed within the processing plant on site however, it would be separately stockpiled adjacent to the southwestern side of the WRE for processing should this become feasible in the future, either on or off site.

[6] 2012 Joint Ore Reserves Committee, i.e. the "Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves".
[7] It is not proposed to process the oxide ore recovered from the open cut pit – see further discussion in Section 2.6.2.

Based upon the studies to optimise the recovery of the defined ore from the open cut pits and ultimate design of the open cut pits, the recoverable primary and low grade ore within the proposed open cut pits is estimated to be approximately 29.9 million tonnes at an average grade of 69g/t silver, 0.44% zinc and 0.32% lead. This corresponds to total in situ quantities of approximately 66.3 million ounces of silver, 130 000 tonnes of zinc and 95 000 tonnes of lead.

The recoverable primary and low grade ore would be mined in conjunction with approximately 1.8 million tonnes of oxide ore and 46.3 million tonnes of waste rock. The stripping ratio of waste rock to ore would be approximately 1.6:1.

2.2.4 Further Resource, Grade Control and Infill Drilling Operations

Bowdens Silver intends to undertake further exploration beyond the current projected base of the main open cut pit and the western boundary of the main open cut pit to establish whether any ore is recoverable either by open cut or underground mining method, from those areas.

Grade control and infill drilling operations would be routinely undertaken in conjunction with the blast hole drilling program to identify and delineate ore and waste rock mining blocks. All grade control samples would be analysed within an on-site laboratory, whilst infill samples would be analysed to establish total carbonate concentration and thus sub-classify the waste rock to be mined.

2.3 SITE ESTABLISHMENT AND CONSTRUCTION ACTIVITIES

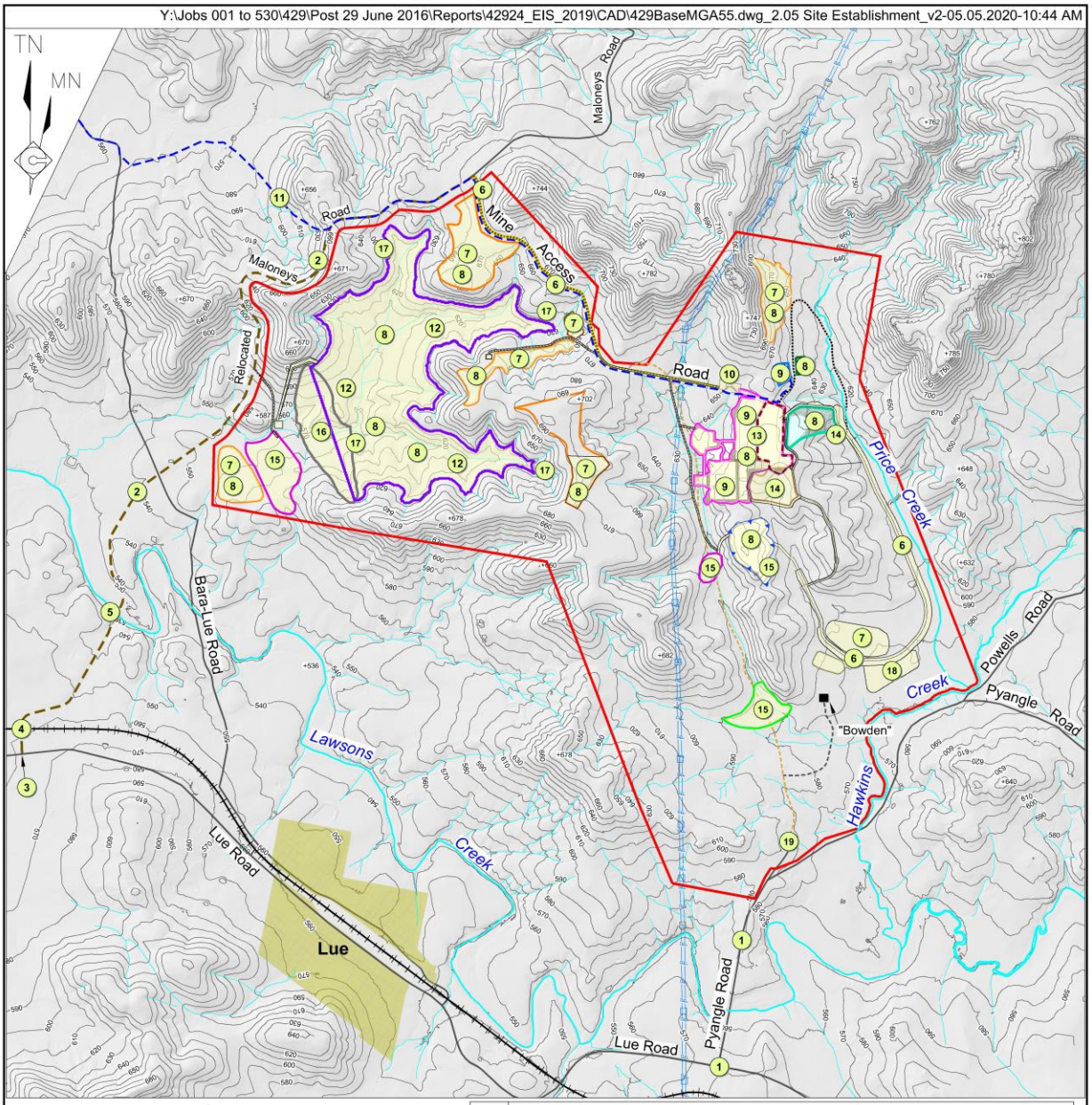
2.3.1 Introduction

The site establishment and construction activities for all key components within the Mine Site would be sequenced to achieve the commencement of concentrate production approximately 18 months after the commencement of the site establishment and construction stage. The locations of the key activities to be undertaken during the site establishment and construction stage are presented in **Figure 2.5** and listed in **Table 2.2**, displaying an indicative construction schedule. For the purposes of the assessment of impacts during the site establishment and construction stage, distinction is made between the period from Months 1 to 6 and from Months 7 to 18. **Figure 2.5** distinguishes between those activities that are planned during the first 6 months, the period from Month 7 to Month 18 or throughout the entire 18 month site establishment and construction stage.

During the initial 6 months, construction activities would be confined to off-site road construction, land clearing, vegetation clearing, soil stripping and some initial earthworks within the Mine Site.

During the 12 month period between Months 7 and 18, the bulk of the on-site activities would be undertaken (including the commencement of the mining pre-strip) involving considerably more earthmoving equipment and a greater area of disturbance.

A brief description of general preparatory activities and the proposed hours of operation during this period is provided in the following subsections. A description of the site establishment and construction components of the key infrastructure within the Mine Site is included in the description of that infrastructure in later subsections. Details of the number and type of equipment to be used during this stage is presented in Section A5.2 (**Appendix 5**).



REFERENCE
- Mine Site Boundary
- Road
- Closed Railway Line
- Existing Power Line (500kV) / Tower

Proposed Component
- Indicative Pipeline Corridor
- Relocated Maloneys Road
- Mine Access Road
- Internal Road
- Haul Road
- Open Cut Pit
- Tailings Storage Facility Boundary
- Waste Rock Emplacement Boundary
- Processing Plant/ROM Pad Area
- Mining Facility
- Soil Stockpile Boundary
- NAF Waste Rock Stockpile
- Southern Barrier
- Low-grade Ore Stockpile Boundary
- Disturbance During Site Establishment and Construction Stage

	Construction Activities
1	Upgrade Pyangle Road (to the Mine Site)
2	Construct Relocated Maloneys Road
3	Construct Relocated Maloneys Road/Lue Road Intersection
4	Construct Relocated Maloneys Road Bridge Railway Crossing
5	Construction of Lawsons Creek Crossing
6	Construct Internal Access Roads & Install Services
7	Establish Soil Stockpile Areas
8	Vegetation Clearing & Soil Stripping
9	Excavation / Earthworks for Processing Plant Site
10	Install Administration Offices and Amenities
11	Construct Water Supply Pipeline
12	Preparation of TSF Impoundment Area
13	Processing Plant, Mining Facility Construction and Assembly
14	Establish Stage 1 Low Grade Ore Stockpile & Initial Cell of Waste Rock Emplacement Initial Development of Main Open Cut Pit, Ore & Waste Rock Extraction and
15	Stockpiling / Placement
16	Construct Initial TSF Embankment
17	Construct Decant Pond Area & Tailings Pipeline
18	Construct Leachate Management Dam
19	Close Maloneys Road Following Opening of Relocated Maloneys Road

SCALE
0.5 0 0.5 1.0 1.5 2.0 km

Base Map Source: Bowdens Silver Pty Limited

Figure 2.5
SITE ESTABLISHMENT AND CONSTRUCTION ACTIVITIES

Table 2.2
Indicative Site Establishment and Construction Schedule

Construction Activity	Month																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Approvals, Engineering and Procurement																		
Secondary approvals																		
Engineering/detailed design																		
Procurement																		
Off-site Road Network																		
Survey and mark out key boundaries																		
Install erosion and sediment controls, vegetation clearing and soil stripping																		
Construct relocated Maloneys Road																		
Construct relocated Maloneys Road/Lue Road Intersection																		
Construct new crossing across Lawsons Creek																		
Construct relocated Maloneys Road Rail Bridge																		
Site Earthworks and Infrastructure																		
Survey and mark out key boundaries																		
Install erosion and sediment controls																		
Vegetation clearing, soil stripping and stockpiling																		
Construct internal roads, culverts, drains and underground services																		
Establish low grade ore stockpile area 1 and WRE Cells 1 and 2																		
Construct/install administration offices/amenities, etc.																		
Processing Plant and Mining Facility																		
Earthworks/footings																		
Plant construction/assembly/installation																		
Piping/Electricals																		
Instrumentation																		
Commissioning																		
Open Cut Pit Development																		
Vegetation clearing																		
Soil Stripping																		
Ore and waste rock extraction																		
Tailings Storage Facility and Pipeline																		
Vegetation clearing, soil stripping and ripping																		
Construct interception dams																		
Tailings impoundment area preparation																		
Delivery of NAF Waste Rock and Crushing																		
Construct Initial Embankment																		
Lining of decant area																		
Install decant return and monitoring infrastructure																		
Install Tailings and Decant Pipelines																		
Water Pipeline and Power Transmission Lines																		
Construct Water Pump Stations (2)																		
Install Water Pipeline																		
Construct 66kV Power Transmission Line																		

Source: Bowdens Silver Pty Limited

2.3.2 Preparatory Activities

The boundaries of all areas to be disturbed during the site establishment and construction stage would be surveyed and marked out prior to the commencement of disturbance in the respective operational areas. Key boundaries and locations would be marked with painted posts and recorded on relevant site construction plans and documents (e.g. Rehabilitation Management Plan and/or Environmental Management Strategy or Sub-plans).

Where necessary, the existing fencing within the operational areas would also be removed, with suitable materials salvaged for use elsewhere within Bowdens Silver's landholdings or recycled. The existing 11kV power transmission lines (and poles) within the Mine Site would be removed by or on behalf of the distribution network service provider. Residences and related farm buildings within the proposed disturbed areas within the Mine Site would either be relocated for use as offices or demolished, with the useful building materials recycled.

A program of initial earthworks would be undertaken firstly to establish the surface water management system (erosion and sediment control) and secondly, to develop the required operational areas. No substantial earthworks would commence in each operational area until sign-off confirming that all required erosion and sediment controls are in place.

Vegetation clearing would be undertaken initially by one or more firewood and mulching contractors who would remove the vegetation only in areas for approved mine components. During all vegetation clearing, any available seed would be collected and timber either mulched or set aside for fencing, habitat relocation/reconstruction or off-site beneficial uses such as saw logs, firewood or fencing.

Topsoil and subsoil removed during the site establishment and construction stage would either be re-used as part of the initial stabilisation / rehabilitation activities or stockpiled in nominated soil stockpile locations (see Section 2.16.4 and Section 4.13 with additional information presented in Section A5.3.2.2). The soil stockpile areas displayed on **Figure 2.5** would not be fully cleared during the site establishment and construction stage. Some stockpile areas or parts thereof would be cleared progressively prior to topsoil and subsoil removal throughout the early years of operation.

A construction office comprising transportable buildings would be established in the vicinity of the proposed administration offices and all necessary communications and other services installed. The construction contractor would also install temporary workshop and materials management facilities and construct internal roads required for site establishment and construction activities generally within the areas or alignments of the long term mine components.

2.3.3 Site Establishment and Construction Hours

Table 2.3 lists the proposed hours of operation during the site establishment and construction stage. No activities would be undertaken on Sundays.

Table 2.3
Site Establishment and Construction Hours

Construction Activity	Monday to Friday	Saturday
Site Earthworks and Infrastructure (and within main open cut pit)	7:00am – 10:00pm[1]	7:00am – 6:00pm
Processing Plant	7:00am – 10:00pm[2]	7:00am – 6:00pm
Tailings Storage Facility	7:00am – 6:00pm[3]	7:00am – 6:00pm[3]
Off-site Road Construction	7:00am – 6:00pm[3]	8:00am – 1:00pm
Water Pipeline and Transmission Line Installation	7:00am – 8:00pm[3]	8:00am – 6:00pm[3]

1. Subject to demonstrating noise limits can be satisfied during this period
2. Only low-noise/inaudible activities would be undertaken beyond 6:00pm during the latter stages of construction and commissioning
3. Daylight hours only

2.4 MINING OPERATIONS

2.4.1 Introduction

Mining operations would effectively commence in Month 7 of the site establishment and construction stage with the main open cut pit pre-strip. Mining would be undertaken using conventional open cut drill and blast, load and haul mining methods. This would involve the sequential removal/storage or mulching of vegetation, the stockpiling of topsoil and subsoil (where recoverable), the removal/placement or stockpiling of waste rock and the recovery of ore.

This subsection presents information relating to the mining operations from the site establishment construction stage to the end of mining including the design of the open cut pits, mining methods and mine sequencing. **Appendix 5** (Section A5.3) includes details of the proposed vegetation clearing, soil stripping and annual production rates together with indicative mobile equipment list.

2.4.2 Open Cut Pit Design and Mining Sequence

The design of the main open cut pit and the two satellite pits has been undertaken through a series of pit optimisation realisations carried out by AMC Consultants Pty Ltd (AMC) using Whittle Four-X pit optimisation software. **Figure 2.6** presents the conceptual final layout and cross-sections of the main open cut pit and the two satellite pits highlighting the relative depths of extraction at various years throughout the mine life. The rim of the main open cut pit varies from 597m AHD within the current alignment of Blackmans Gully to 652m AHD on its northeastern edge. The deepest section of the main open cut pit of 456m AHD, approximately 180m below natural ground level, would be reached in about Year 9 of the Project. The open cut pits have been designed using the following parameters.

- Operational bench height: 5m
- Maximum terminal bench height = 25m
- Maximum face angle: 65º
- Berm width: 9m
- Nominal ramp width: between 15m and 25m
- Ramp gradient: 1 in 10 (10%)

Development of the main open cut pit would commence in about Month 7 of the site establishment and construction stage with vegetation clearing, followed by the stripping and stockpiling of topsoil and subsoil. This stage is referred to as the open cut pit pre-strip. Emphasis would be placed in this stage upon the recovery of sufficient non-acid forming (NAF) waste rock for the construction of the initial TSF embankment and the accumulation of sufficient ore on the ROM pad to enable the processing plant to be commissioned. Any low grade ore recovered during this stage would be transported by haul truck to the first stage of the low grade ore stockpile area east of the ROM pad. During the main open cut pit pre-strip, all potentially-acid forming (PAF) waste rock would be recovered and transported by haul truck and placed in Cell 1 of the WRE, i.e. to the east of the mining facility (see **Figure 2.1**). All oxide ore extracted during the development of the open cut pits would be transported to the oxide ore stockpile area southwest of the WRE (see **Figure 2.1**).

Figure 2.7 displays the indicative mining sequence from the end of the site establishment and construction stage to Year 15. Mining activities would be concentrated in the eastern side of the main open cut pit until about Year 8 after which mining activities would extend to the western limit of the main open cut pit. Beyond Year 10, extraction would be confined to the main open cut pit increasing in depth as displayed in the cross-sections in **Figure 2.6**.

Dual lane (25m wide) and single lane (15m wide) ramps would provide for operations with roadside drainage and safety bunds. Horizontal switchbacks would also provide flat turning surfaces to reduce wear and tear to the haul trucks. All ramps would be positioned to achieve the shortest possible distance from the limits of the open cut pits to the ROM pad, low grade ore stockpile, oxide ore stockpile and the WRE. Two entry/exit ramps would be included in the design of the main open cut pit, namely one to the north (mainly for transportation of ore or waste rock of an evening and ore during the night-time) and one to the east (mainly for waste rock and oxide ore for waste rock during the day). The northern exit ramp from the main open cut pit would not be developed until about Year 3 of operations. Access and egress from the two satellite pits would occur via a single ramp for each pit.

These design features would be reviewed and optimised following further geotechnical investigations to establish open cut pit wall stability and extraction requirements.

2.4.3 Mining Operations

2.4.3.1 Extraction of Friable Material

Following removal of vegetation and soil materials as described in **Appendix 5** (Section A5.3.2.2), mining would commence with the removal of any friable weathered materials. Where present, these materials would be directly extracted using an excavator or ripped and pushed up using a bulldozer and loaded into haul trucks using an excavator or front-end loader. Extracted material would be loaded into haul trucks for transportation to the WRE, low grade ore stockpile or other locations where waste rock is being used for construction of infrastructure (e.g. TSF embankment). Exploration to date indicates friable weathered material occurs from the base of the subsoil to depths of between approximately 20m and 30m.

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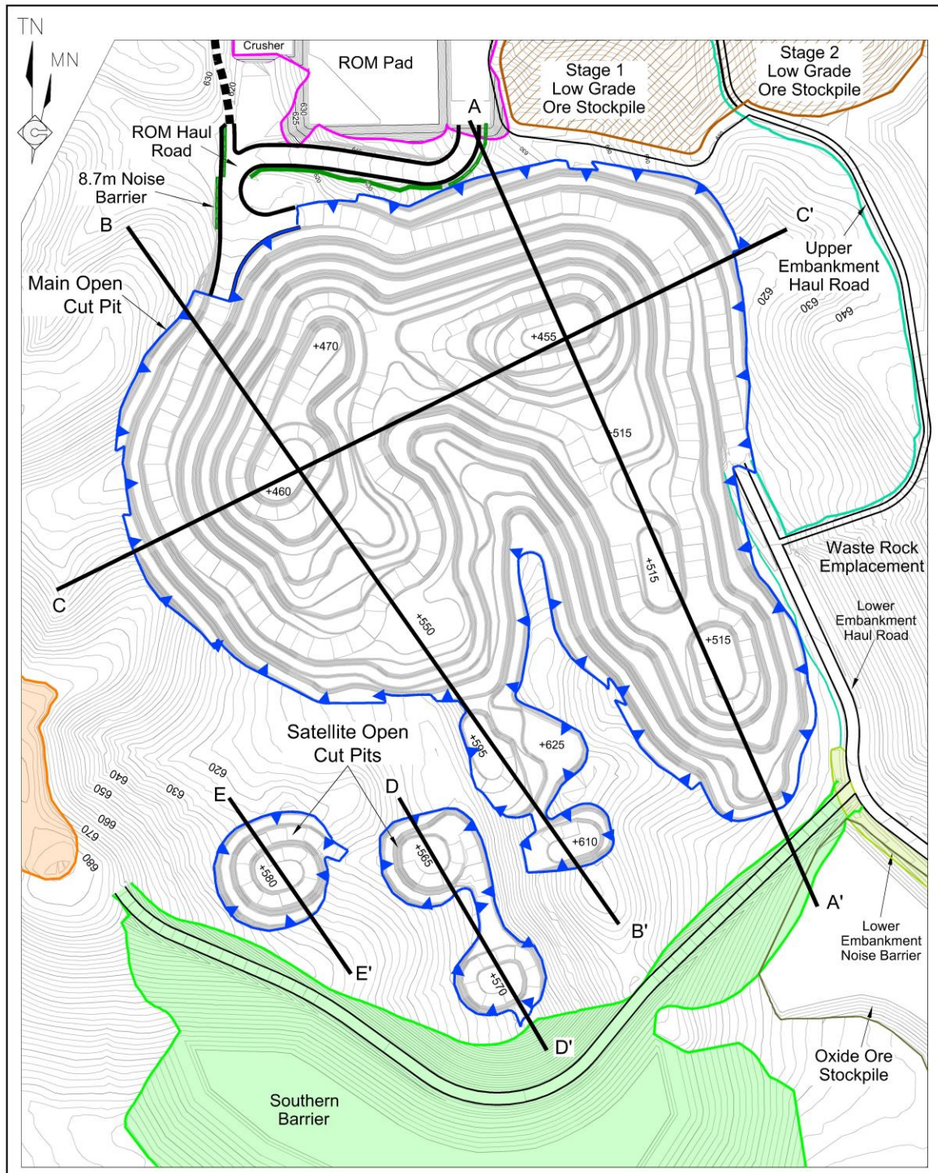

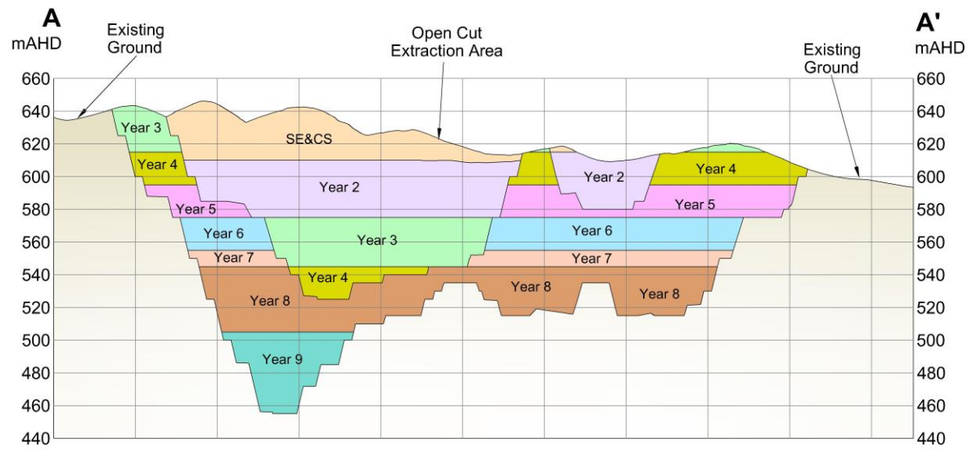

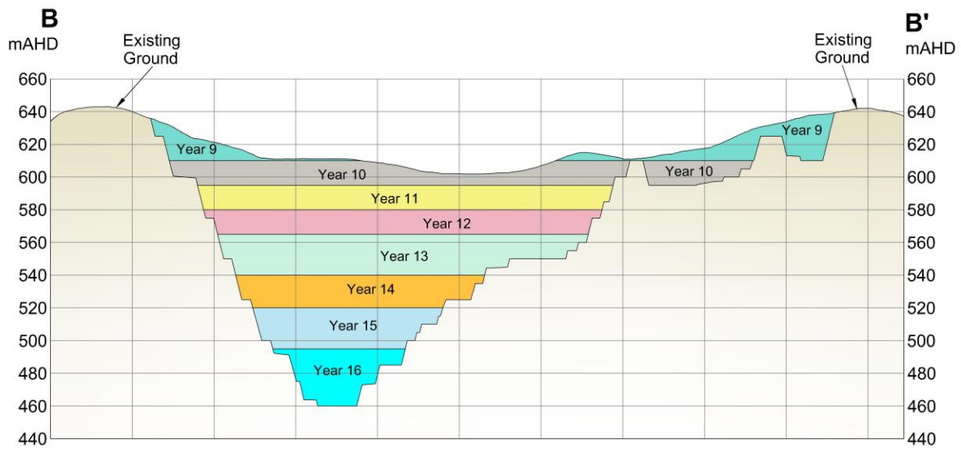

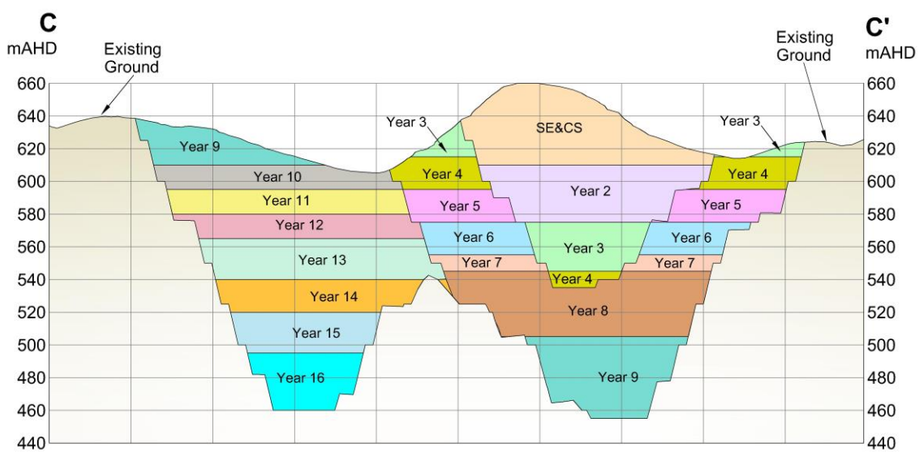

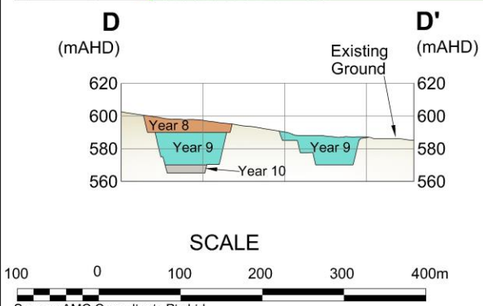

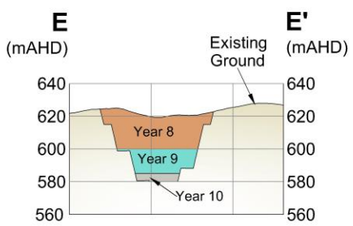

REFERENCE
Contour (m AHD) (Interval = 2m)
Proposed Component
Haul Road (Varying Width)
Open Cut Pit Boundary
Processing Plant
Soil Stockpile Area
Low-grade Ore Stockpile Area
Southern Barrier
Waste Rock Emplacement
Oxide Ore Stockpile
Lower Embankment Noise Barrier
Noise Barrier Built by Shipping Containers
Vertical exaggeration in all cross-sections = 2x

Figure 2.6
OPEN CUT PIT LAYOUT AND CROSS-SECTIONS

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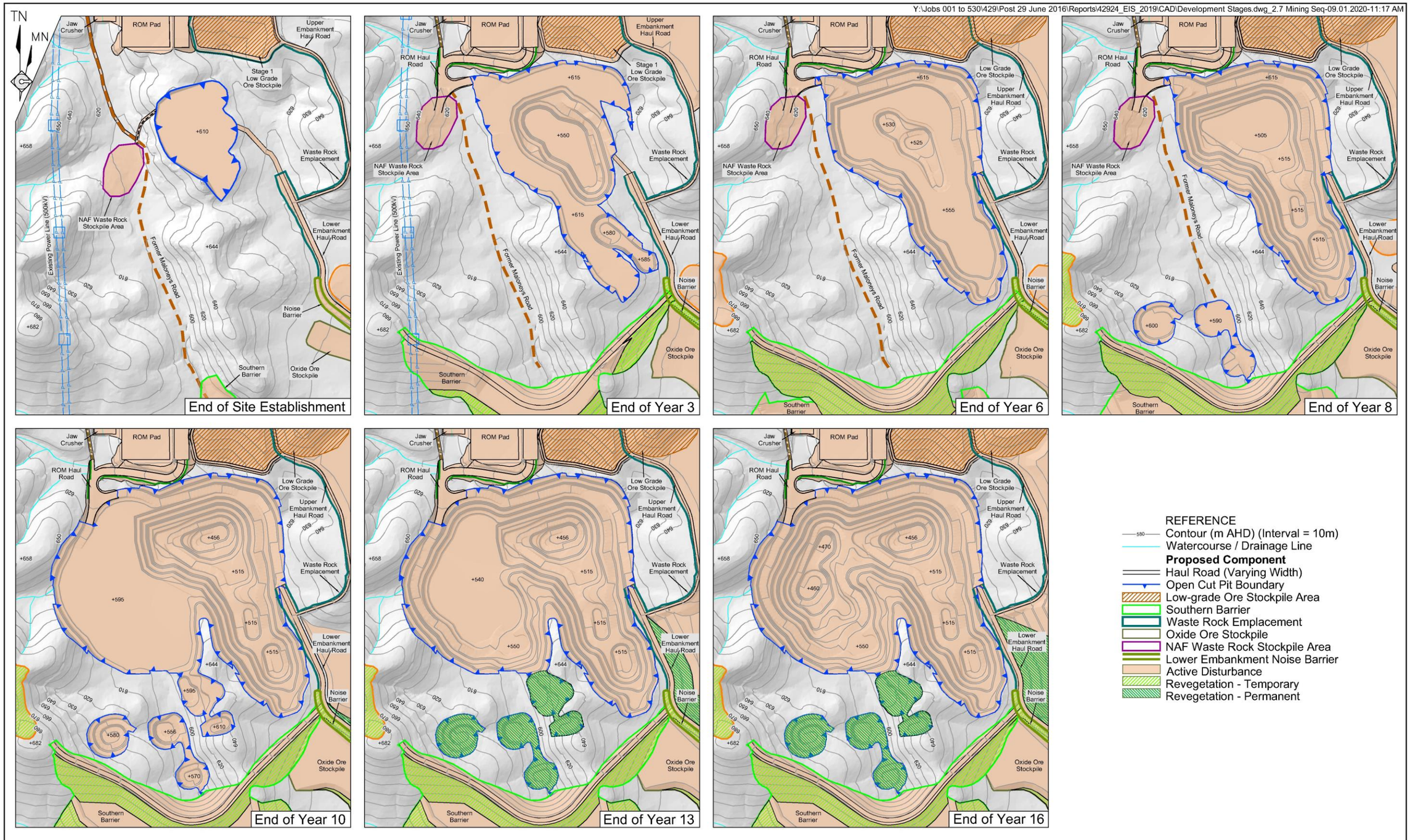

Source: AMC Consultants Pty Ltd

Figure 2.7
MINING SEQUENCE

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2.4.3.2 Drill and Blast

The bulk of the ore and waste rock would require blasting following removal of the friable weathered materials, principally to achieve the required level of fragmentation to enable the ore to be processed. Drilling would be undertaken typically 2 to 3 days in advance of each blast to allow the drill cuttings to be analysed for metal grades and to sub-classify any waste rock present into the respective category (see Section 2.5.2) so as to inform the planning undertaken following the routine infill drilling (see Section 2.2.4). Each blast would yield an average of 25 000t of fragmented rock with maximum yields up to approximately 60 000t. Drilling and blasting would be a regular activity within the open cut pits with blasts generally initiated 3 to 5 days per week from Monday to Saturday[8].

The emphasis in blasting would be upon fragmentation of the rock in situ rather than heaving it away from a defined face. This approach would ensure the reliability of metal grades identified during the drilling of the blast holes to assist to identify whether the fragmented rock is ore, low grade ore, oxide ore, NAF waste rock or PAF waste rock.

Blast hole drilling would be undertaken by up to two production drills. Drill and blast production would be carried out on a bench with a height of approximately 5m (5.5m with sub-drill). The burden and spacing for each blast would be adjusted to reflect the rock type to be blasted and any inherent features present. An indicative pattern of drill holes in the waste rock would be 4.6m x 4.9m with a blasthole diameter of 152mm and 0.48kg of explosives per bank cubic metre. An indicative pattern of drill holes in the ore would typically be 3.3m x 3.6m with a hole diameter of 127mm and 0.65kg of explosives per bank cubic metre. The drill pattern used would depend upon the type of explosive used and reflect observations about the extent of fragmentation achieved. Drill patterns would be regularly reviewed to ensure fragmentation is being optimised. The explosives, together with the primers and detonators used for each blast would be transported by the blasting contractor to the Mine Site on the day of each blast. The quantity of explosives transported to the Mine Site on the day of each blast would vary from approximately 5 tonnes to 16 tonnes thereby requiring either one mobile manufacturing unit (up to 9t of explosives) or one unit with a trailer (up to a total of 18t of explosives). It is noted that Bowdens Silver proposes to establish a transportable explosives magazine on site for emergency use only, i.e. in the event any explosives, primers or detonators need to be stored overnight.

The typical maximum instantaneous charge (MIC) for a blast would be in the order of 216kg in waste rock and 117kg in ore, although the MIC would be varied in line with on-site experience and Bowdens Silver's commitment to satisfy all blast limits at all privately-owned residences without VLAMP agreements (see Section 4.3.4.1) throughout the mine life. While production blasting would take place in 5m benches, a flitch height of 2.5m would be used in excavating and loading ore and waste rock.

Pre-split blasting would be adopted to achieve the required stability of the final or terminal open cut pit walls, particularly in the fresh rock zones.

[8] The frequency of blasting would largely depend upon the quantity of rock to be fragmented during each blast, i.e. if all blasts fragmented 25 000t per blast, there would be approximately 240 blasts per year, whereas if all blasts fragmented 60 000t per blast, there would be approximately 100 blasts per year.

Bulk ammonium nitrate emulsion or ammonium nitrate/fuel oil (ANFO) would be used in production blasting. The selection of the type of explosive used would reflect a range of parameters including the presence or absence of water within each bench to be blasted. All drill and blast operations would be supervised by a suitably qualified and experienced blasting engineer or shot-firer.

Bowdens Silver would establish a protocol to inform interested surrounding landowners and residents about the timetable for blasts. Whenever possible, blasts would be initiated generally at a similar time of day. Further information on the management of blasts and the proposed design and operational safeguards is provided in Section 4.3.

2.4.3.3 Load and Haul

Following completion of each blast, boundaries between ore and each type of waste rock would, if required, be identified and marked out on the fragmented materials using paint, tape or similar materials. Fragmented material would then be loaded into haul trucks using a hydraulic excavator and transported to the ROM pad, WRE, the southern barrier or any infrastructure component being constructed using NAF waste rock.

At the commencement of mine production, one excavator, used in backhoe configuration, would be matched with a fleet of three off-road 90t capacity haul trucks. The trucking requirements would increase over time as the open cut pits deepen and haul distances increase. The initial strategy for the placement of waste rock would involve its placement in such a manner that the placed material provides a noise barrier for subsequent deliveries of waste rock to the WRE or the southern barrier. It is anticipated an additional 90t capacity haul truck would be required at around Year 3 of the mine's operation.

2.5 WASTE ROCK MANAGEMENT

2.5.1 Introduction

During mining operations, material containing insufficient quantities of silver, zinc and/or lead to justify processing would be identified as part of infill drilling and potentially during the analysis of blast hole cuttings. The waste rock emplacement (WRE) would be the sole repository for all PAF waste rock extracted from the open cut pits which would be transported via the internal haul road network to the WRE for placement and encapsulation. All NAF waste rock would be transported via the internal road network (and a 1.4km section of the relocated Maloneys Road) to its point of use for on-site construction activities such as the staged development of the TSF embankment, backfilling of satellite pits east and west, placement in the southern barrier for subsequent retrieval and for rehabilitation activities.

This subsection describes the characteristics of the waste rock that would be generated throughout the mine life, its management and uses including the design and development sequence of the WRE and the use of waste rock in the development of the southern barrier. The use of waste rock for the construction of the TSF embankment is discussed in Section 2.8. Section A5.4 (in **Appendix 5**) further provides information regarding the waste rock characterisation, quantities and the design/construction of the WRE.

2.5.2 Waste Rock Characterisation and Quantities

Static and kinetic testing of a representative set of waste rock samples by Graeme Campbell and Associates (GCA) has enabled the waste rock within the proposed open cut pits to be classified according to the total sulphur content within either the weathered or primary (unweathered or fresh) zones.

- Weathered Zone
  - WZ1: Total Sulphur content < 0.3% (NAF)
  - WZ2: Total Sulphur content ≥ 0.3% (PAF)
- Primary (Unweathered or fresh) Zone
  - PZ1: Total Sulphur content < 0.1% (NAF)
  - PZ2: Total Sulphur content 0.1% to < 0.3% (NAF)
  - PZ3: Total Sulphur content ≥ 0.3% (PAF)

The detailed results of the testing and the implications upon the management of the different types of waste rock are presented in GCA (2020).

The two waste rock types classified as PAF (WZ2 and PZ3) would account for approximately 26.6 million tonnes (or 57% of the total volume of waste rock to be generated throughout the mine life). The quantity of each PAF waste rock classification and their approximate percentage of the total volume of PAF waste rock is as follows.

- WZ2 4.1 million tonnes (9%)
- PZ3 22.5 million tonnes (91%)

The three waste rock types classified as NAF (WZ1, PZ1 and PZ2) would account for approximately 19.8 million tonnes (or 43% of the total volume of waste rock to be generated throughout the mine life). The quantity of each NAF waste rock sub-classification and its approximate percentage of the total volume of NAF waste rock is as follows.

- WZ1 10 million tonnes (50%)
- PZ1 3.5 million tonnes (18%)
- PZ2 6.3 million tonnes (32%)

A breakdown of the annual volumes of waste rock produced is presented in **Appendix 5**.

2.5.3 Waste Rock Storage and Encapsulation

Bowdens Silver proposes to utilise and/or store the 19.8 million tonnes of NAF waste rock recovered during the mining operations as a construction material within the following.

- WRE: (progressive construction of the lower and upper embankments, haul road, flood protection bund, noise barrier and cover and capping to produce the final landform at the end of the Project life)
  - 0.6 million tonnes for WRE construction.
  - 2.5 million tonnes for WRE cover and capping.

- TSF: (staged construction and retained landform at the end of the Project life)
  - Up to 7.3 million tonnes for construction (Stage 1 = 2.0Mt; Stage 2 = 2.2Mt; Stage 3 = 3.1Mt).
  - 5.7 million tonnes for TSF capping.
- Southern Barrier: stockpile landform removed at the end of the Project life
  - Initial Barrier (approximately 4.9 million tonnes): comprising the initial Stage 1 development of the southern barrier, constructed by end of Year 6 and retained until the end of the mine life when the materials would be progressively removed and utilised for rehabilitation across the Mine Site.
  - Extended southern barrier (maximum of approximately 3.9 million tonnes): progressively developed in stages over the mine life and utilised for the stockpiling of construction material for the staged development of the TSF embankment raises or the closure and capping of the WRE and TSF. The southern face of this temporary landform would be retained over the mine life.
- Satellite pits east and west and the southern sections of the main open cut pit: backfilling upon completion
  - Up to 1.9 million tonnes.

The WRE would be designed and constructed to encapsulate the 26.6 million tonnes of PAF waste rock that would be generated throughout the mine life.

Table A5.9 within **Appendix 5** provides an annual summary of NAF waste rock storage and utilisation. It is anticipated that the Southern Barrier would progressively be removed as the stored material is used for rehabilitation activities with an estimated surplus of 1.8 Mt of NAF waste rock available for additional rehabilitation works.

2.5.4 Waste Rock Emplacement

2.5.4.1 Design

The proposed layout of the WRE is presented in **Figure 2.8** and has been designed to provide for the long term storage and encapsulation of compacted PAF waste rock in a constructed landform that would be developed via a sequence of seven cells. The WRE would effectively form an integrated landform between the ridge immediately east of the main open cut pit and Price Creek. The indicative design criteria for the WRE are as follows.

- Area – 77ha
- Maximum elevation – 670m AHD
- Height of each lift – 10m
- Width of construction berms – 4m
- Slope of final external faces – 1:3 (V:H)

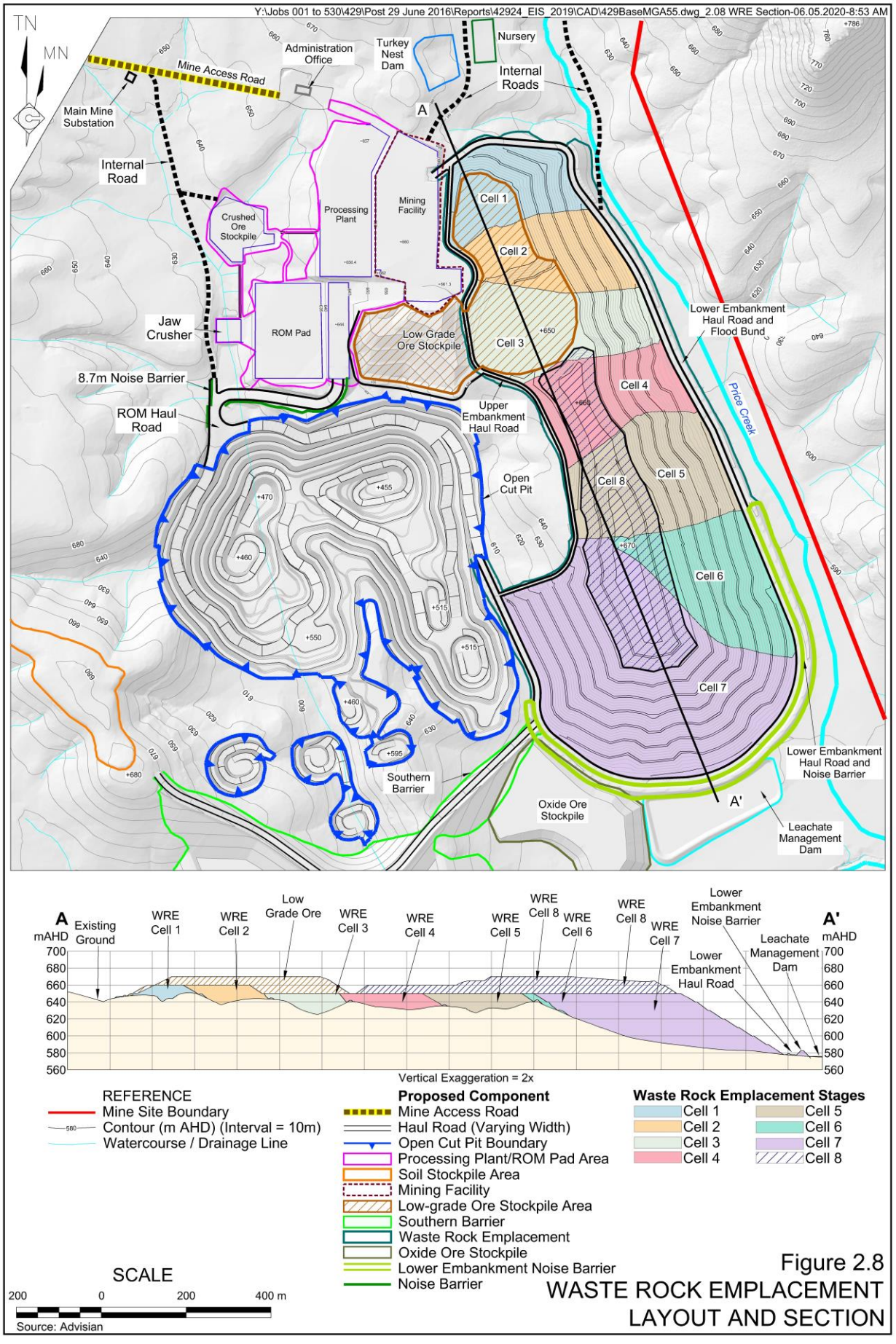

Figure 2.8
WASTE ROCK EMPLACEMENT LAYOUT AND SECTION

The WRE would also include the following design elements that have been included for the purpose of waste rock management and access and environmental management.

- Internal drainage system and leachate management dam.
- A 1.5mm low permeability HDPE liner.
- Upper, lower and intercell embankments.
- WRE lower embankment haul road.
- A flood protection bund.
- A noise barrier.

Further details of the design elements of the WRE and its construction are presented in **Appendix 5** (Section A5.4.4).

2.5.4.2 Development

The construction of the WRE would commence in the north with vegetation clearing, topsoil and subsoil removal and storage and the excavation of the required area for waste rock placement in WRE Cell 1 and WRE Cell 2. Following vegetation clearing and soil removal, construction of the WRE design components would commence with the construction of the lower embankment and haul road (including flood bund and noise barrier) along the entire downstream perimeter of the WRE. As well the construction of the upper embankment and two intercell embankments (Cell 1 and Cell 2) that would provide the anchor points for the 1.5mm HDPE liner would be installed to underlie the emplaced PAF waste rock and intercept seepage. Excavated material from within the footprint of the WRE, as well as NAF waste rock from the open cut pits, would be utilised for the construction of the WRE embankments.

The leachate management dam, adjacent to a southern section of the lower embankment, would be constructed as part of the site establishment and construction activities and would involve the excavation of the dam area, construction of the dam embankment using the excavated material, and installation of a 1.5mm thick HDPE liner. Once constructed, the dam would be connected to the leachate sump within the active WRE cell via HDPE pipe.

Once the construction of WRE Cell 1 and Cell 2 and the leachate management dam has been completed, it would be feasible to begin placing the PAF waste rock within Cell 1.

During mining operations, each of the WRE cells would be developed in sequential lifts (approximately 10m high). Typically, this would occur from the lower embankment of the respective cell, up and west towards the main open cut pit. This would enable the construction of a series of noise bunds, typically 5m higher than the lift level, that would be constructed along the outer perimeter of the respective lift and relied upon during the progressive development of the WRE. The PAF waste rock would then be placed in the respective cell in horizontal layers of approximately 2m depth, spread and compacted using a bulldozer to achieve a density of approximately 2t/m^3 so as to achieve a stable, level and compacted surface. PAF waste rock would be transported from the open cut pits using haul trucks which would transport the material

to the respective cell and lift via the lower embankment haul road. As the incremental 10m lifts increase the height of the cell being developed, some of the PAF waste rock may be transported from the open cut pits via the haul road on the upper embankment.

2.5.4.3 Development Sequence

Figure 2.9 displays the sequential development of the WRE from north to south. The indicative operational years for each of the cells are as follows.

- Cell 1: site establishment and construction stage – Year 1
- Cell 2: Year 1
- Cell 3: Year 1 – Year 2
- Cell 4: Year 2 – Year 3
- Cell 5: Year 3 – Year 4
- Cell 6: Year 4 – Year 5
- Cell 7: Year 6 – Year 15

Following the completion of each lift, the PAF waste rock would be capped and covered with compacted, clayey material that would be obtained either during the development of the WRE cells or from the stockpiled subsoil material that would be stripped from the disturbed areas of the Mine Site during the site establishment and construction stage.

2.5.5 Southern Barrier

The southern barrier would be the repository for all excess NAF waste rock not required for the on-site construction activities. The southern barrier would be developed across Blackmans Gully, directly south of the open cut pits for the purpose of stockpiling NAF waste rock that would subsequently be utilised for closure and rehabilitation activities. In addition to being proximal to the open cut pits, thus resulting in shorter haul distances for waste rock, the principal selection criterion for the location of the southern barrier was to provide for a noise and visual barrier that would shield the open cut pits, ROM pad, processing plant and associated mining infrastructure from points to the south of the Mine Site.

The southern barrier would comprise an initial barrier which would incorporate a 15m wide haul road with a 5m high noise barrier along the crest and an extended barrier (see **Figure 2.10**). Apart from the NAF waste rock that would be required to construct components such as the WRE embankments, lower embankment haul road and bunds as well as the TSF embankment, the southern barrier would be the principal destination for all NAF waste rock generated during mining operations.

Figure 2.10 presents the overall footprint of the southern barrier, including cross-sections through the initial barrier and the extended barrier. The indicative elements of the southern barrier are as follows.

- Area – 32ha
- Key elevations
  - Initial barrier (including access road acoustic barrier), Blackmans Gully - 640mAHD
  - Extended barrier, maximum elevation – 625mAHD

- Height of each lift – 10m
- Slope of final faces
  - Initial barrier - 1:3 (V:H)
  - Extended barrier - 1:4 (V:H)
- Maximum volume of stockpiled NAF waste rock – 8.8 million tonnes (Year 12)

Section A5.4.5 (**Appendix 5**) provides information on the staged construction of the southern barrier.

2.6 LOW GRADE AND OXIDE ORE STOCKPILES

Low grade ore and oxide ore generated by the mining operations would be stockpiled throughout the mine life. Processing of these materials would be dependent upon either the economic conditions (low grade ore) or treatment (processing) requirements (oxide ore). In the event they are not processed, quantities of the low grade ore and oxide ore may remain in part, or in full at the end of the Project life.

2.6.1 Low Grade Ore

2.6.1.1 Introduction

Geological investigations established that, of the 29.9 million tonnes of recoverable ore, approximately 6.1 million tonnes contains silver equivalent grades that are less than but approaching 30g/t and which are considered uneconomic at current or projected silver prices and therefore considered as low grade ore. Bowdens Silver proposes to make provision to stockpile up to 2.7 million tonnes of low grade ore adjacent to and above the three northern cells of the WRE to allow for the selective processing of this material should either economic conditions support its processing or to manage process grade control. Given the capacity of the processing plant would be approximately 2 million tonnes per year and the quantity of primary ore extracted in a number of years would not approach 2 million tonnes, it is likely that a considerable proportion of the low grade ore would be processed during most years of operation.

2.6.1.2 Characterisation

Static and kinetic testing of a representative set of waste rock samples by Graeme Campbell and Associates (GCA, 2020) has enabled the low grade ore to be classified according to the total sulphur content within either the weathered or primary (unweathered) zones of the Bowdens silver deposit. As a consequence of the testing, the low grade ore is anticipated to exhibit similar variation in geochemical behaviour to that of the waste rock sub-classifications described in Section 2.5.2. However, given there would be no segregation of the low grade ore based upon its acid-forming potential, all low grade ore would be treated as PAF.

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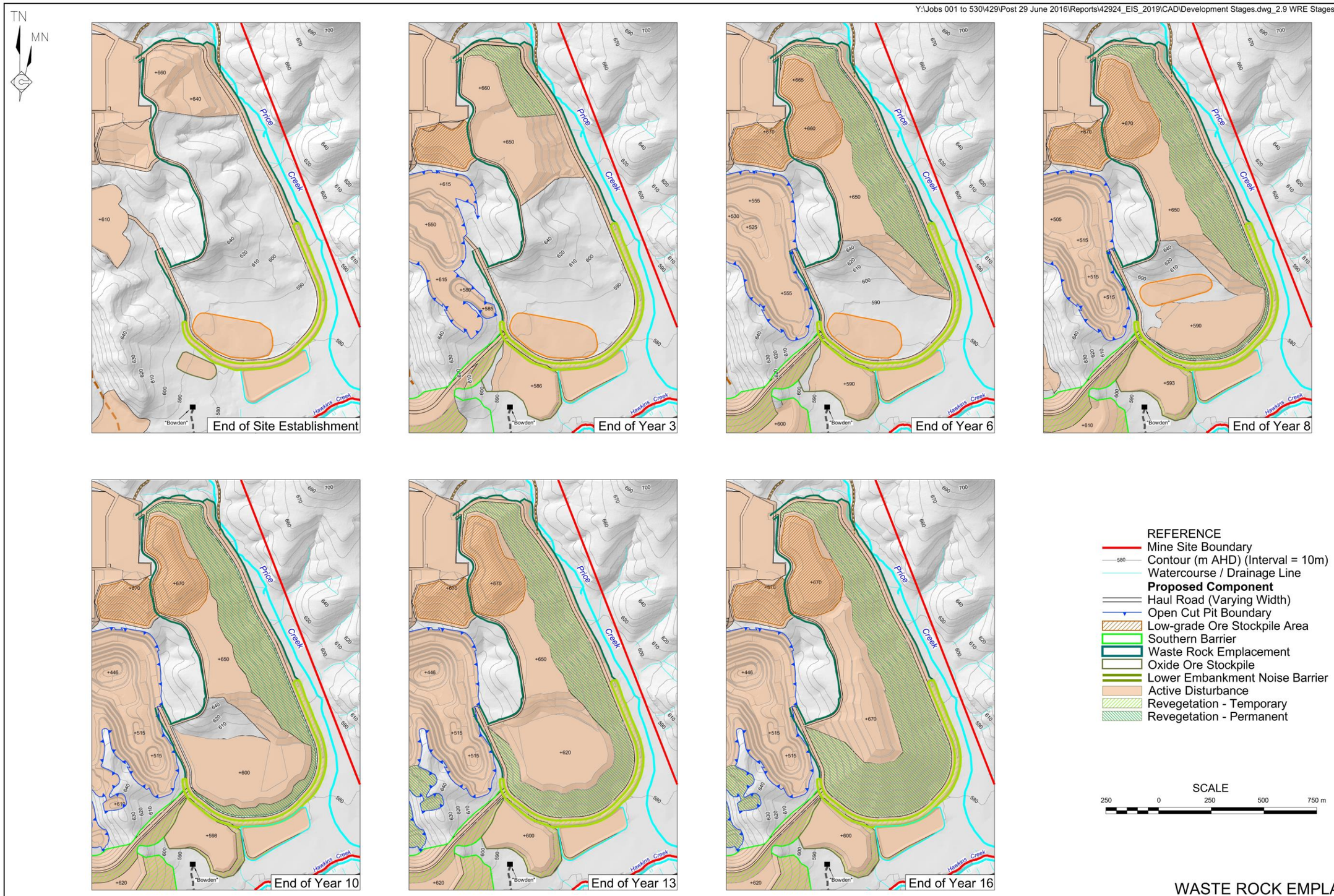

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Figure 2.9
WASTE ROCK EMPLACEMENT
DEVELOPMENT SEQUENCE

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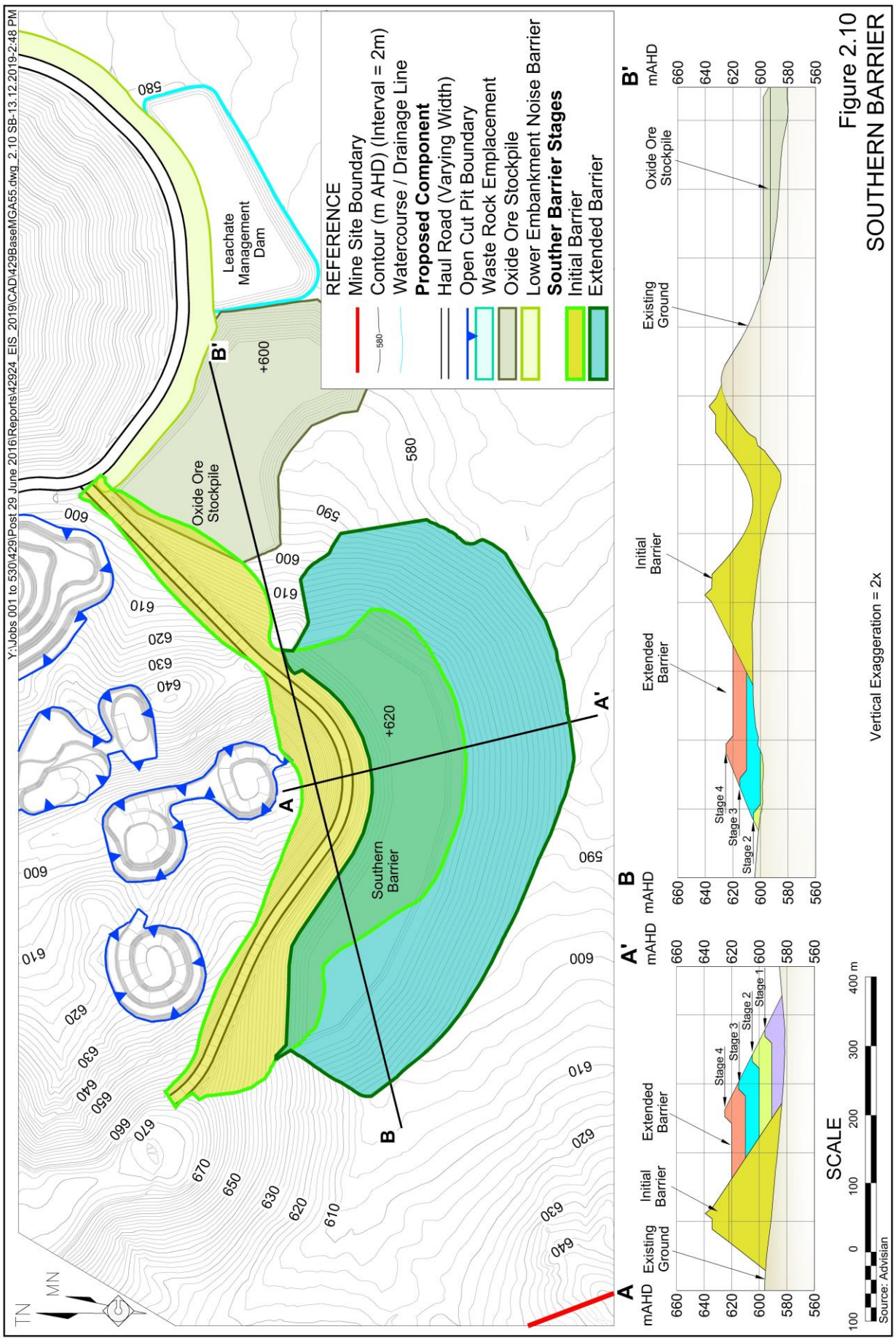
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REFERENCE
Mine Site Boundary
Contour (m AHD) (Interval = 2m)
Watercourse / Drainage Line
Proposed Component
Haul Road (Varying Width)
Open Cut Pit Boundary
Waste Rock Emplacement
Oxide Ore Stockpile
Lower Embankment Noise Barrier
Souther Barrier Stages
Initial Barrier
Extended Barrier
Leachate Management Dam
Oxide Ore Stockpile
Southern Barrier
+600
+620
A
A'
B
B'
TN
MN
Existing Ground
Initial Barrier
Extended Barrier
Stage 1
Stage 2
Stage 3
Stage 4
mAHD
SCALE
Source: Advisian
Vertical Exaggeration = 2x
Figure 2.10
SOUTHERN BARRIER

2.6.1.3 Low Grade Ore Stockpile Design

Figure 2.11 displays the layout of the low grade ore stockpile and the sections through the eastern and western sections of the stockpile. The low grade ore stockpile would be developed in two distinct sections with the western section (5ha) located east of the ROM pad, whilst the eastern section (9ha) would be placed on the initial three completed cells of the WRE from 650mAHD. The key design features of the low grade ore stockpile are as follows.

- Total design capacity: 1.3Mm^3 (2.6 million tonnes).
  - Western section – 0.4Mm^3 (0.8 million tonnes)
  - Eastern section – 0.9Mm^3 (1.9 million tonnes)
- Maximum elevation: 670m AHD (western section)
- Width of construction berms – 4m
- Slope of final faces – 1:3 (V:H)

Details of the development of the low grade ore stockpile are presented in **Appendix 5** (Section A5.5).

2.6.2 Oxide Ore

Geological investigations have established that approximately 1.8 million tonnes of oxidised rock mined would have sufficient silver, zinc and lead grades to warrant processing. However, processing of this ore would not be possible in the on-site processing plant as the plant is designed to solely process sulphide ores. Rather than mixing the oxide ore with the benign waste rock within the WRE, Bowdens Silver proposes to establish a dedicated stockpile area adjacent to the southwestern corner of the WRE for oxide ore. Its separate storage would provide the opportunity at some future date for the ore to be processed on site or at another location in conjunction with other similar ore.

Figure 2.11 displays the location of the oxide ore stockpile, covering an area of 8ha with a maximum elevation of approximately 600m AHD. Further details of the construction of the oxide ore stockpile is presented in **Appendix 5** (Section A5.5.2). This location would enable the ultimate integration of the oxide ore stockpile into the final WRE landform should the processing of this material prove uneconomic.

The key design features of the oxide ore stockpile are as follows.

- Design capacity: 0.9Mm^3 (1.8 million tonnes).
- Maximum elevation: 600m AHD.
- Width of construction berms – 4m.
- Slope of final faces – 1:3 (V:H).

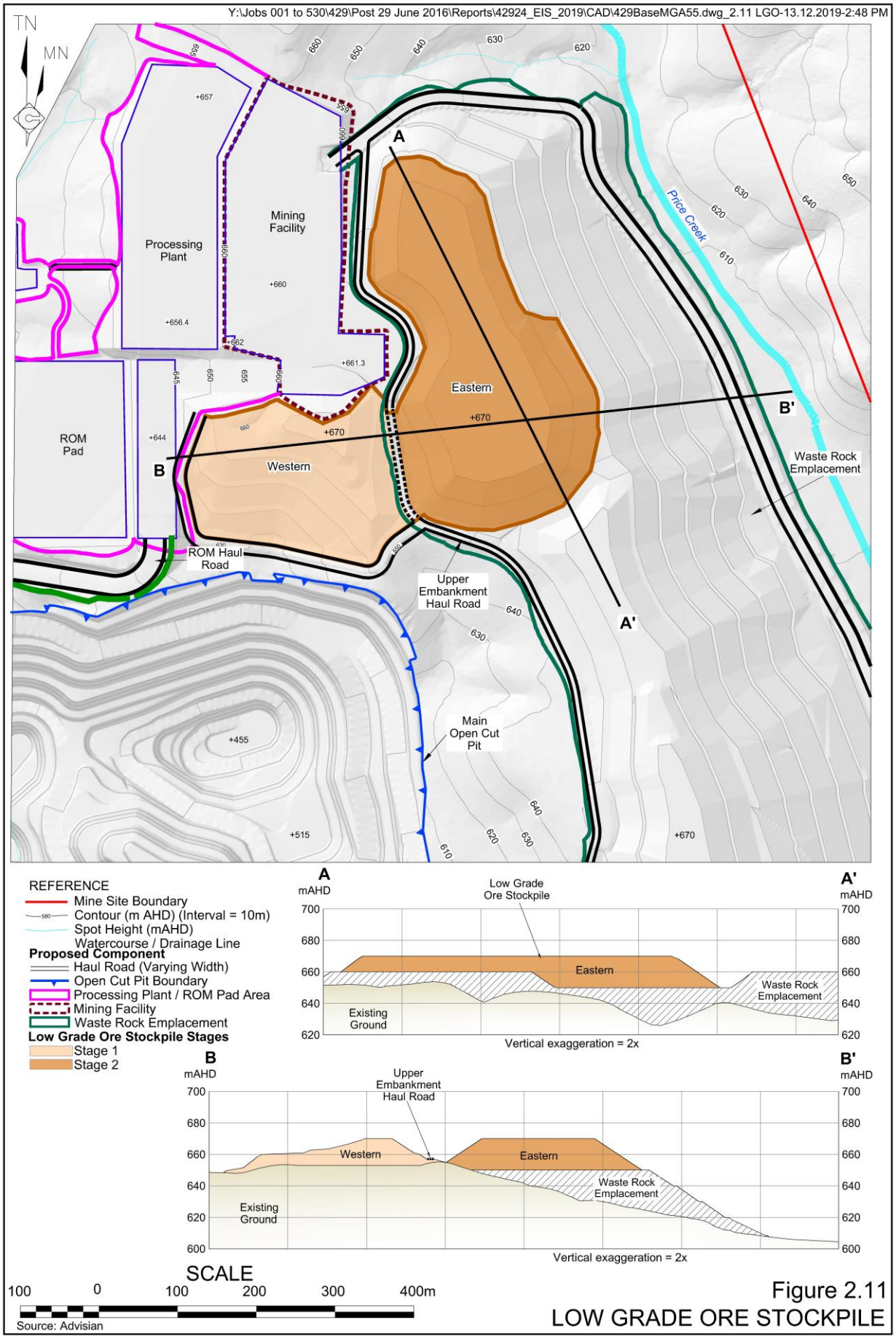

Figure 2.11
LOW GRADE ORE STOCKPILE

2.7 PROCESSING OPERATIONS

2.7.1 Introduction

Bowdens Silver proposes to process all ore extracted from the open cut pits within an on-site processing plant to produce two mineral concentrates, namely:

- a silver/lead concentrate; and
- a zinc concentrate (with a small content of silver).

Based upon the processing of the defined 29.9 million tonnes of ore, Bowdens Silver would produce approximately 310 000t of mineral concentrates throughout the mine life, approximately 60% of which would be zinc concentrate and approximately 40% silver/lead concentrate. The bulk of the silver recovered would be within the silver/lead concentrate. Annual production of mineral concentrates would vary from approximately 20 000t to 30 000t with the quantity and proportion varying annually and reflecting the proportion of the recovered minerals in the ore extracted.

2.7.2 Processing Plant Design and Process Flowchart

The processing plant has been designed to process approximately 2 million tonnes per annum of ROM ore to produce silver/lead and zinc concentrates using sequential flotation. The processing plant includes the following principal components.

- A single stage primary jaw crusher.
- A crushed ore stockpile and reclaim.
- A semi-autogenous grinding (SAG) mill, ball mill and pebble crusher.
- Reagent mixing and distribution.
- A silver/lead flotation circuit comprising roughers, rougher concentrate re-grind and cleaners.
- Silver/lead concentrate thickening and filtration.
- A zinc flotation circuit comprising roughers, rougher concentrate re-grind and cleaners.
- Zinc concentrate thickening and filtration.
- Concentrate bagging/containerisation facilities and storage.
- Tailings thickening and pumping.

Figure 2.12 displays the conceptual layout of the processing plant whilst a simplified overall process flowsheet for the plant is shown in **Figure 2.13**. The components of the processing plant that would be enclosed are highlighted on **Figure 2.12**. The design maximises the use of gravity flow although some pumping would be required. **Figure 2.14** displays a perspective sketch of the main components of the processing plant.

Y:\Jobs 001 to 530\429\Post 29 June 2016\Reports\42924_EIS_2019\CAD\Supplied Layout CURRENT\Layout Current V3.dwg_2.12 Processing Plant-13.12.2019-3:47 PM

TN MN

Bagging Facility
Mini Sparge Unit
Reagent Store
Reagent Mixing and Distribution
Lime Area
Ball Bunker
Substations
Substation
Switch Room
Air Services (with roof only)
Switch Room
Concentrate Containers
Reagents
Grinding & Milling Circuit
Filtration Facility
Zinc / Silver Flotation Circuit
Ball Mill
Sag Mill
Silver / Lead Flotation Circuit
Process Water / Gland Water Tank
Conveyor
Conveyor
Tailings Thickener
Substation
Raw Water Pond
Main Open Cut Pit
To Mine Facility
Processing Area
See detail above
Reverse Osmosis Plant
Transfer Tower
Conveyor
ROM Pad
ROM Haul Road
Crushed Ore Stockpile
Conveyor
Primary Jaw Crusher
Shipping Containers
To Main Open Cut Pit
Transfer Tower

REFERENCE
Buildings / Walls

SCALE
5 0 5 10 15 20 25 m
50 0 50 100 150 200 250 m

Source: GR Engineering Services Limited

Figure 2.12
PROCESSING PLANT LAYOUT

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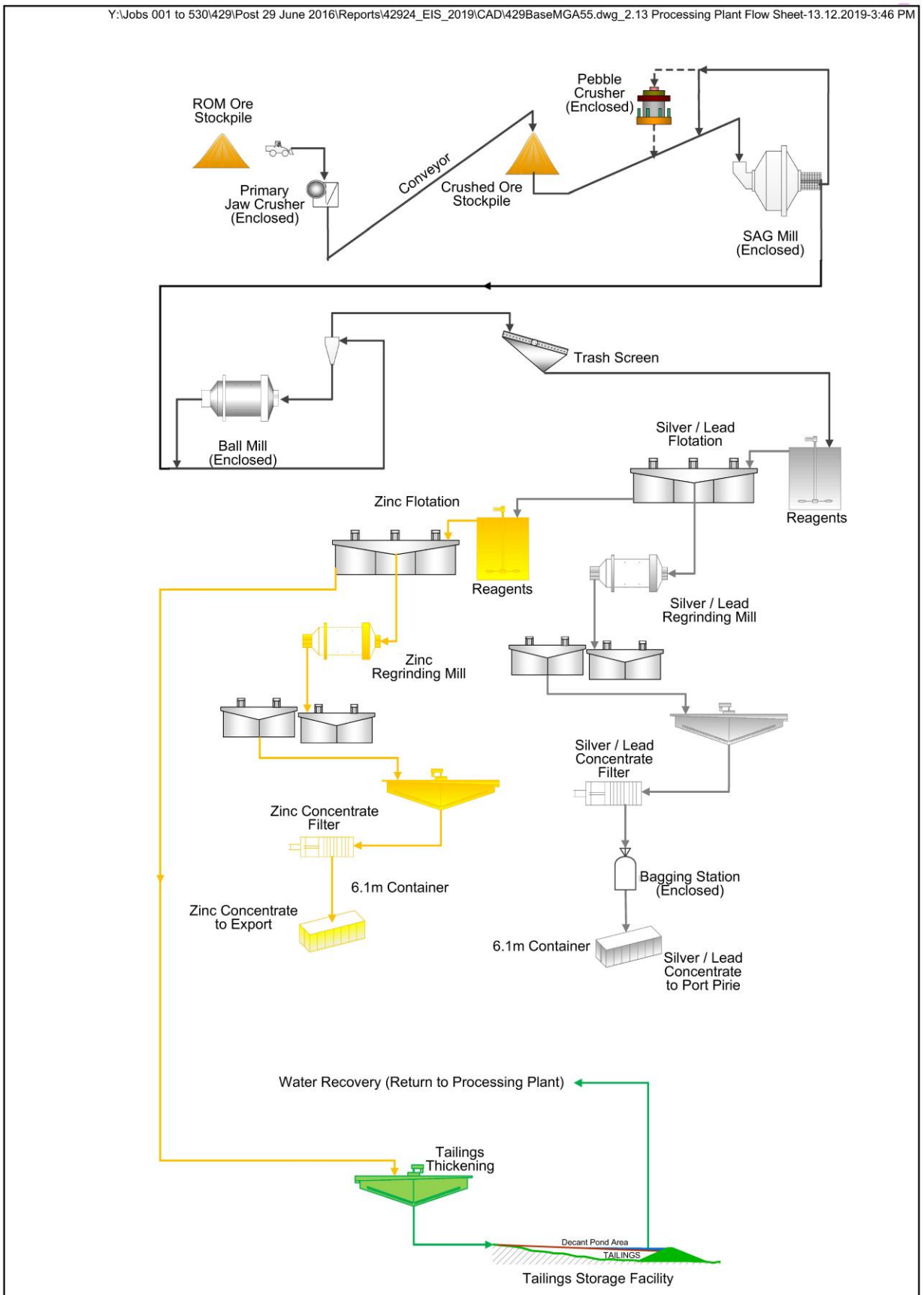

Figure 2.13
PROCESSING PLANT FLOWSHEET

Source: GR Engineering Services Limited

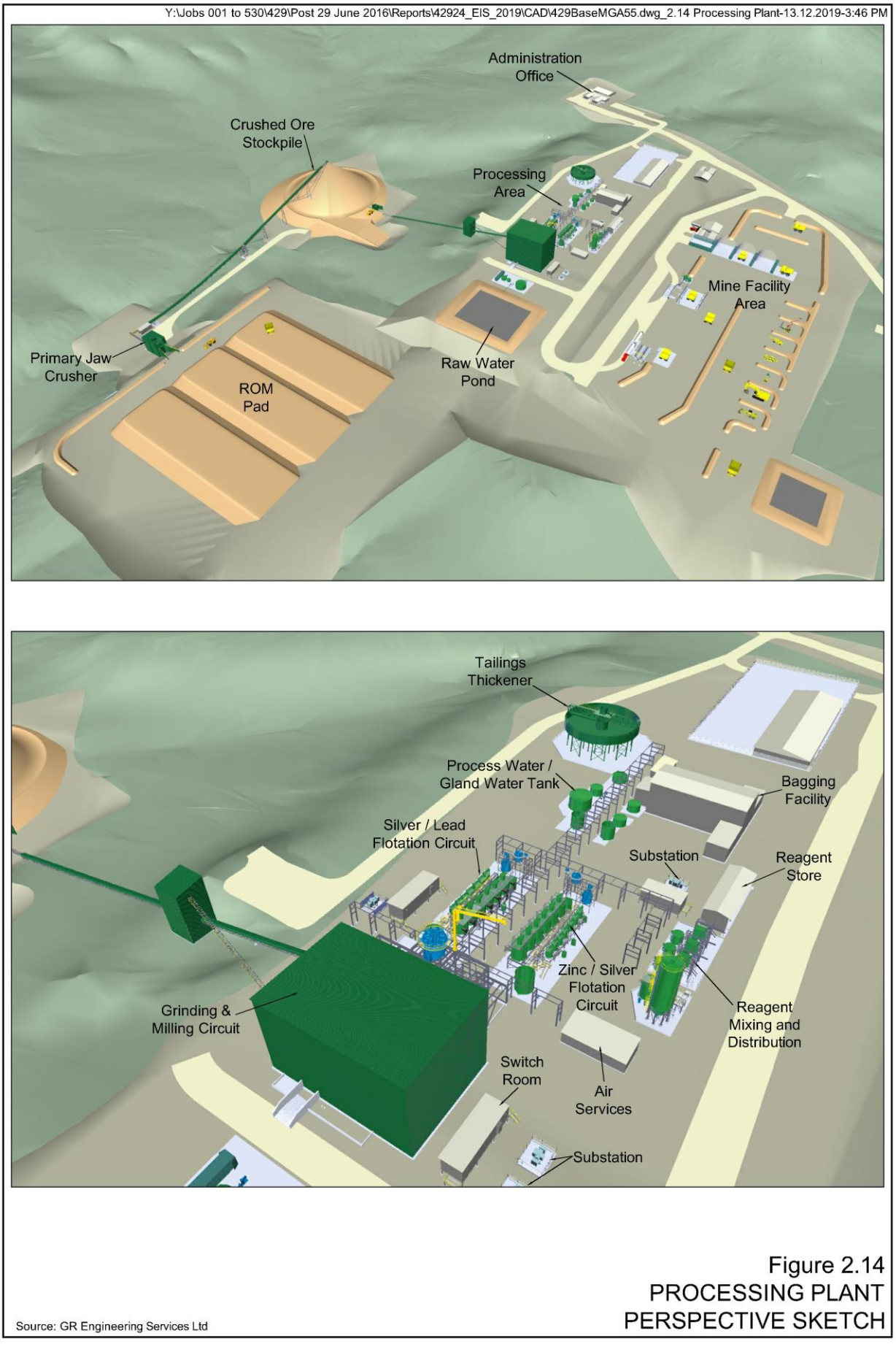

Figure 2.14
PROCESSING PLANT
PERSPECTIVE SKETCH

Source: GR Engineering Services Ltd

2.7.3 Reagent Management

Table 2.4 lists the reagents that would be used within the processing plant in order of expected annual consumption together with their function, chemistry, storage, quantities, the maximum quantity held on site at any time, annual usage and fate of each reagent. Section 4.16.1.3 discusses the on-site management and use of sodium cyanide in the context of the potential hazard created by this chemical.

Table 2.4
Processing Plant Reagents

Reagent	Chemistry	Function	Form / Container	Annual Usage (tpa)	Maximum Quantity on Site	Fate of Reagents
Hydrated lime/ soda ash	$CaOH/Na_2CO_3$	pH Adjustment	Powder / 60t silo	1 236	60t	Tailings
Zinc sulphate	$ZnSO_4.7H_2O$	Zinc Depressant	Powder / 1t bulk bag	610	50t	Tailings
Copper sulphate	$CuSO_4.5H_2O$	Activator	Powder / 1t bulk bag	450	40t	Tailings
MIBC	Methyl Isobutyl Carbinol	Frother	Liquid / 800kg IBC	222	20t	Tailings / Decomposed
Sodium cyanide#	NaCN	Zinc Depressant	Pellets / Isotainer	190	20t	Tailings / Decomposed
Flocculant	Anionic polyacrylamide	Flocculation	Powder / 0.8t bulk bag	139	12t	Tailings
Lead collector	Na - diisobutyl dithiophosphinate	Lead Collector	Liquid / 1000L IBC	24	4t	Most to Concentrate / Balance to Tailings
Zinc collector	Na isobutyl dithophosphate	Zinc Collector	Liquid / 1000L IBC	22	4t	Most to Concentrate / Balance to Tailings
Caustic Soda	NaOH	pH Adjustment	Flake / 25kg bag	2.5	1t	Tailings
Antiscalant	Polycarboxylic acid or similar	Antiscalant	1000L IBC	20	4t	Tailings

* IBC = Intermediate Bulk Container # NaCN would be added with a concentration of 66mg/L

Details of the initial development of the processing plant and mining facility as well as individual processing components and the management of the mineral concentrates, process water and reagents is presented in **Appendix 5** (Section A5.6).

2.8 TAILINGS MANAGEMENT

2.8.1 Introduction

As part of the processing operation, a thickened tailings slurry (from which the majority of the silver, zinc and lead minerals would be removed) would be pumped to the tailings storage facility (TSF) situated in the western section of the Mine Site in the valley of Walkers Creek (see **Figure 2.15**). The preliminary design of the TSF has been undertaken by ATC Williams Pty Ltd, engineers specialising tailings management. The report describing the preliminary design of the TSF is reproduced as Part 16A of the Specialist Consultant Studies Compendium

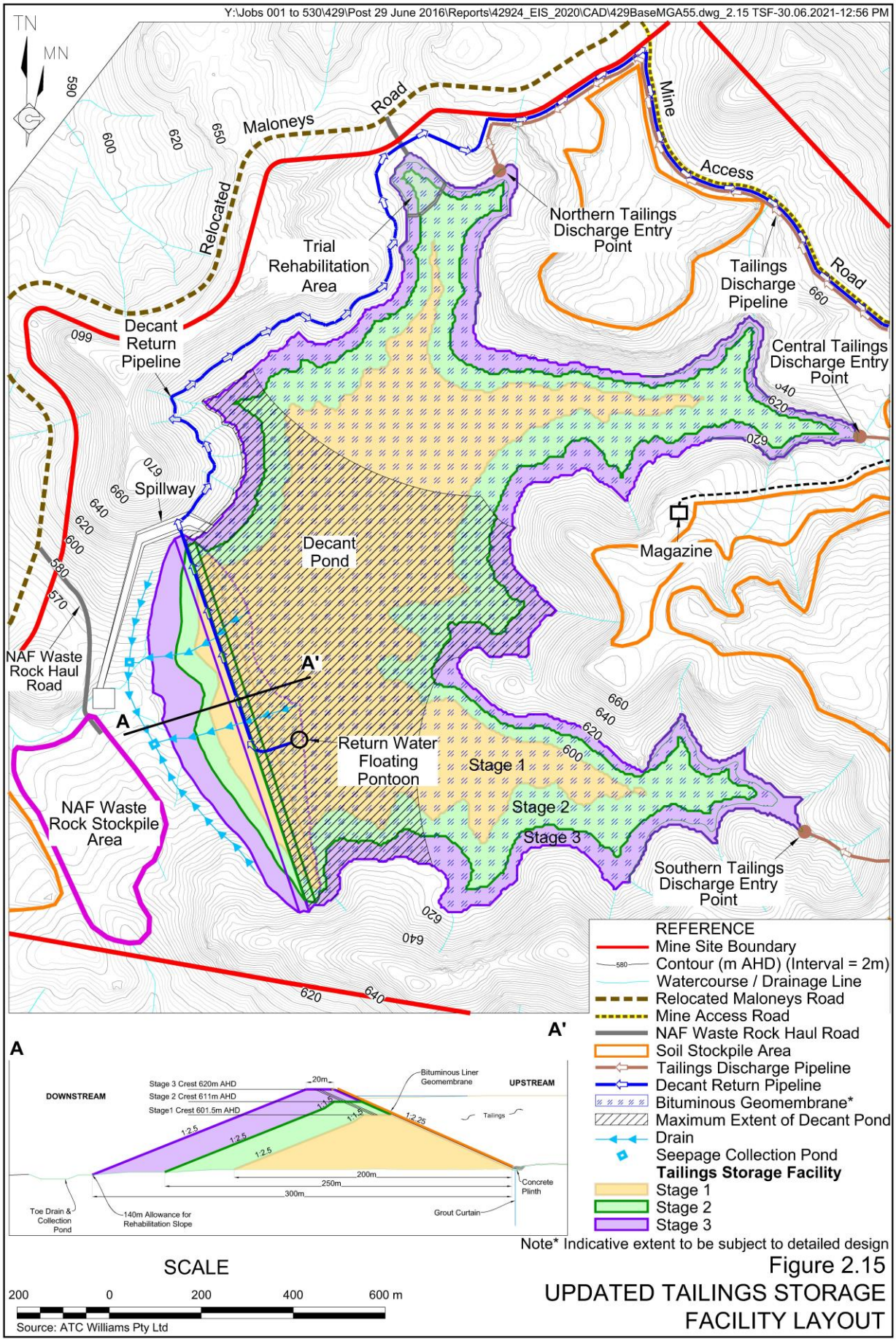

Figure 2.15
UPDATED TAILINGS STORAGE FACILITY LAYOUT

The TSF would comprise an embankment which would be constructed in three stages and an area behind the embankment referred to as the impoundment area in which to store the tailings and water released from the tailings. The TSF embankment would be constructed with its raises progressing downstream, as opposed to the upstream tailings dam raise method that has been associated with recent overseas tailings dam failures. Since the tailings decant water would sit against the TSF embankment, the embankment has been designed as a conventional water retaining embankment with a bituminous liner.

A NAF waste rock stockpile area covering approximately 10ha would be established immediately downstream from the TSF embankment for the storage of NAF waste rock transported from the main open cut pit until it is used in the construction of each raise for the TSF embankment. A mobile crushing and screening plant would be positioned within the TSF NAF waste rock stockpile area to produce the required crushed products for the construction of the TSF embankment. During the early stage of each crushing campaign, a barrier built from shipping containers would be positioned to mitigate noise generated by the plant in the event insufficient waste rock is available for use as an acoustic barrier.

Appendix 5 (Section A5.7) provides an overview of the characteristics of the tailings, details of the TSF components and the construction and operation of the TSF.

2.8.2 Tailings Storage Facility Design

2.8.2.1 Design Objectives

The tailings impoundment area would be contained by an embankment across the upper section of the valley of Walkers Creek. A plan showing the TSF layout is shown in **Figure 2.15**. The key design objectives of the TSF are as follows.

- To minimise water losses through seepage through the embankment and floor of the impoundment.
- To provide tailings, decant and rainfall storage capacity with sufficient freeboard to prevent overtopping of the TSF embankment.
- To provide a robust and serviceable structure, in particular the embankment, under operational and earthquake loadings.
- To provide capacity for the controlled discharge via an emergency spillway in rare and extreme rainfall events whilst maintaining the structural integrity of the TSF embankment[9].
- To manage the available storage volume effectively to maximise the return of decant water to the processing plant for recycling and reuse.
- To maximise the utilisation of construction materials drawn from the main open cut pit.

[9] All tailings storage facilities must be designed and operated at all times with a minimum freeboard (capacity) to retain design floods without the need to discharge. Subsequently, whilst no operational discharge from the TSF is proposed, ANCOLD and NSW DSC require the TSF design considers safe discharge during a rainfall event which exceeds the TSF design flood so as to maintain the structural integrity of the TSF. This is achieved via an emergency spillway that can pass higher floods in a controlled fashion and safely direct flows away from the embankment.

2.8.2.2 Design Criteria

The TSF would be designed, constructed and operated in accordance with the Australia National Council on Large Dams (ANCOLD) 2012 Guidelines on Tailings Dams under the supervision of Dams Safety NSW (DS NSW) for the provision of secure and safe tailings storage and to meet the design objectives outlined above. The overarching intent of these guidelines is for the TSF to have minimal impact on the existing surrounding environment.

The design criteria for a given dam are based on the "Consequence Category" for the structure that is determined through the evaluation of the potential consequences should water and tailings be released from the TSF as a result of dam failure.

The design criteria for the TSF are based on a High C Consequence Category that is required by the DS NSW for a TSF which impounds PAF waste rock in a rural environment. The key elements of the design criteria adopted from the ANCOLD guidance are as follows.

- Design Storage Allowance: 72-hour 1% AEP[10] (100 year) rainfall event, i.e. 100 year ARI[11].
- Contingency Freeboard (to dam embankment crest): 0.5m.
- Wave Run-up (to spillway invert): 0.5m.
- Emergency Spillway Capacity: 0.00001% AEP (100 000 year) rainfall event, i.e. 100 000 year ARI.
- Seismic Event (embankment stability):
  - Operating Basis Earthquake: 0.001% AEP (1 000 year ARI); and
  - Maximum Design Earthquake: 0.0001% AEP (10 000 year ARI).

Key design features of the TSF are as follows.

- Embankment footprint area = 16ha
- Impoundment surface area = 103ha
- Total area of disturbance – approximately 117ha.
- Development stages (embankment raises) – three.
- Method of embankment raise – downstream type.
- Maximum crest of embankment:
  - Stage 1 – 601.5m AHD (38m above the lowest natural ground level).
  - Stage 2 – 611m AHD (47m above the lowest natural ground level).
  - Stage 3 – 620m AHD (56m above the lowest natural ground level).
- Maximum capacity:
  - Stage 1 – 6 million tonnes

[10] AEP = Annual Exceedance Probability
[11] ARI = Average Recurrence Interval

  - Stage 2 – 10 million tonnes (cumulative, 16 million tonnes).
  - Stage 3 – 14 million tonnes (cumulative, 30 million tonnes).
- Embankment crest widths – 12m to 20m and embankment base widths – 200m (Stage 1), 250m (Stage 2), 300m (Stage 3).
- Method of tailings deposition – down valley discharge from three locations (northern, central and southern tailings discharge points) connected to tailings pipeline.
- Method of water and decant management – collected and pumped from a floating pontoon on the decant pond for return via a water return pipeline for reuse in the process circuit.
- Embankment construction – zoned rockfill with low permeability geomembrane / clay zone on the upstream face, a bituminous geomembrane (BGM) liner, curtain grouting along upstream toe, with connection of the BGM and grout curtain via a concrete plinth along the upstream toe.
- Indicative plans are to install a BGM liner (in addition to surface preparation) over the entire impoundment area, where feasible, to mitigate seepage potential. However, the maximum extent of the BGM would be refined through technical assessment during detailed design of the TSF and may be reduced, provided environmental impacts are not exacerbated.
- Embankment construction material – benign, NAF waste rock from the open cut pits as well as material stripped from within the TSF footprint.
- The perimeter of the impoundment area would be marked by a track retained for access, when required.

2.8.2.3 Geotechnical Considerations

A program of field investigation was conducted by ATC Williams Pty Ltd in May and June 2017 involving borehole drilling, test pit excavation and in-situ permeability tests to establish the condition and type of foundation materials, estimate the permeability of the foundation material and to identify any high permeability zones in the foundation material.

Foundation material samples were also collected during the investigation to identify the properties of the foundation materials and the potential for construction materials within the TSF footprint.

The investigation identified the following.

- Foundation material:
  - Depth to rock: 0.55m to 6.8m
  - Rock strength:
    - Valley west – moderate to very high
    - Valley east – weak to moderate

- Foundation permeability: 6.9 x 10^{-6}m/s to 1.6 x 10^{-10}m/s
- Site construction materials:
  - High plasticity clay
  - Medium to low plasticity clay
  - Sandy clay
  - Gravelly clay
  - Clayey sand
  - Clayey gravel

2.9 ROAD TRAFFIC AND TRANSPORTATION

2.9.1 Access to the Mine Site

Access to the Mine Site is currently provided via Lue Road, Pyangle Road and Maloneys Road (**Figure 2.16**). Lue Road is the main road between Mudgee and Rylstone whilst Pyangle Road and Maloneys Road are local roads.

Access to the Mine Site during the early stages of the site establishment and construction stage (until approximately the end of Month 6) would be provided by the existing road network, i.e. principally using Pyangle Road (from Lue Road) and Maloneys Road. Although warranted under existing traffic conditions, Bowdens Silver would widen the road shoulder on the southern side of Lue Road at the intersection of Lue Road and Pyangle Road to safely accept traffic generated for the Project.

Access to the Mine Site during the latter stages of the site establishment and construction stage (from about Month 7) and the entire operational stage would be via Lue Road, relocated Maloneys Road and the mine access road.

Whilst it would be necessary for some heavy vehicles accessing the Mine Site during the initial 6 months of the site establishment and construction stage to transit through Lue, it is envisaged that by establishing access to the Mine Site from Lue Road to the west of Lue early in the development of the Project, very few heavy vehicles delivering components and consumables would pass through Lue in order to gain access to the Mine Site.

2.9.2 Relocated Maloneys Road

A 4.5km section of the existing Maloneys Road traverses the Mine Site. Consequently, Bowdens Silver proposes to permanently close that section of road and relocate it to a new location west of its current alignment (see **Figure 2.17**), forming a new section of public road. The relocated section of Maloneys Road would link the retained northern section of Maloneys Road with Lue Road and include a newly constructed "T-intersection" 1.8km west of Lue (see Section 2.9.2.1), a new railway bridge crossing (see Section 2.9.2.2) and a new crossing of Lawsons Creek (see Section 2.9.2.3). The section of road which is to be closed and relocated would require closure pursuant to the relevant provisions of the *Roads Act 1993*.

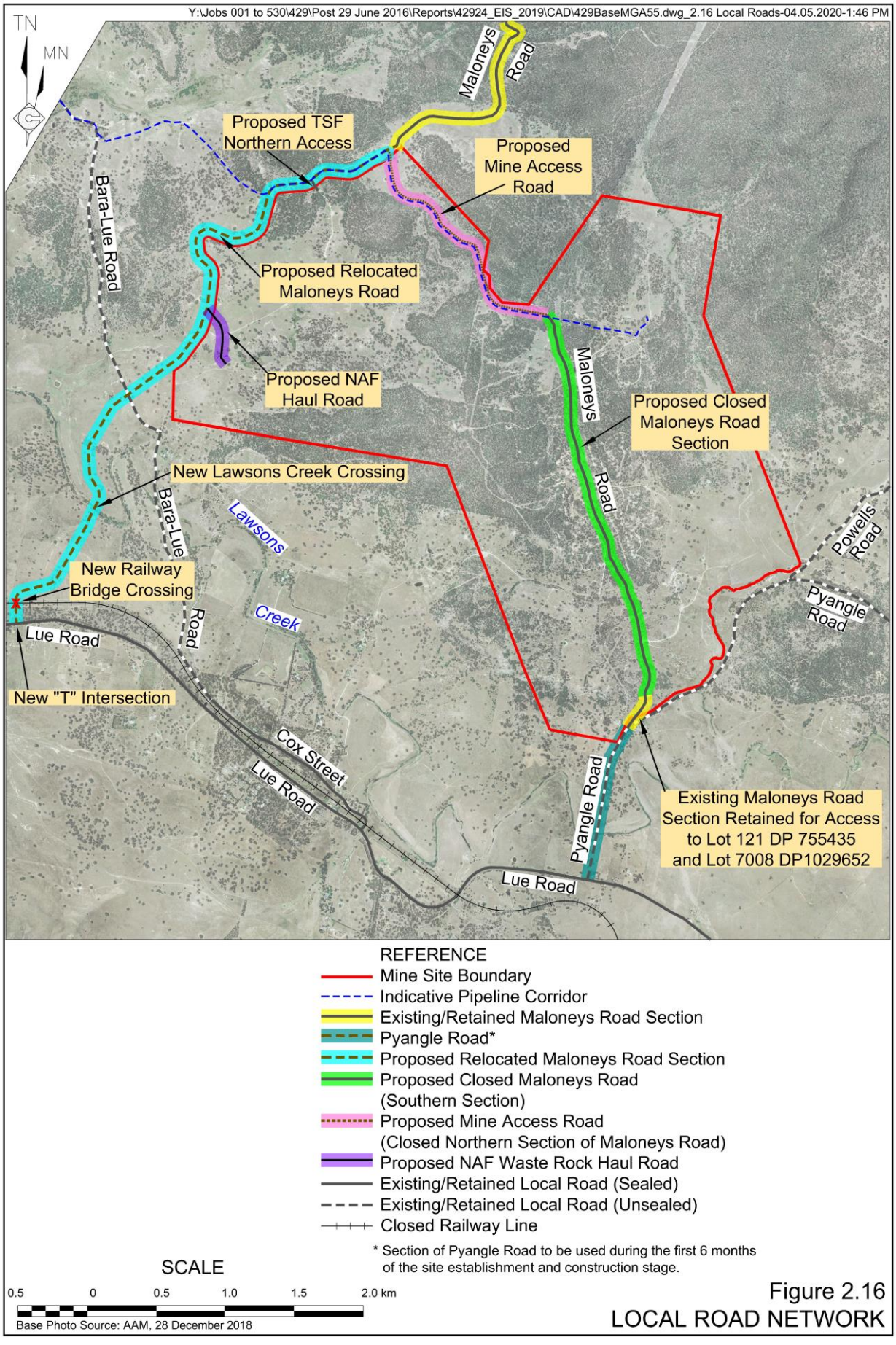

Figure 2.16
LOCAL ROAD NETWORK

Once the relocated Maloneys Road is opened to traffic and the section of road through the Mine Site is formally closed by Mid-Western Regional Council, Bowdens Silver would place a gate at the southern end of the section of the former Maloneys Road that is closed and removed from public use. A 350m section of the former Maloneys Road would be maintained to provide access to Lot 121 DP 755435 and Lot 7008 DP 1029652. Bowdens Silver would continue to use the southern section of the former Maloneys Road (principally with light vehicles) to access the existing Bowdens exploration office and core library facilities. **Figure 2.17** displays the indicative alignment of the relocated Maloneys Road and the extent of cut and fill. The road would be constructed beyond the western boundary of the Mine Site to minimise the visibility of the activities within the Mine Site to motorists travelling along the road.

The full 5.2km length of the relocated Maloneys Road, from Lue Road to its connection with the retained Maloneys Road north of the Mine Site would be progressively sealed to achieve a Type 4 class road suitable for B-double vehicles. The section of Maloneys Road from the north beyond the intersection with the mine access road would be retained in its current form. Following the receipt of development consent, details of the road alignment and associated infrastructure would be prepared in consultation with Council, DPI-Water and Transport for NSW's managing agent for the Country Regional Network (rail).

Details regarding the construction of the relocated Maloneys Road are presented in Section A5.8 (**Appendix 5**). All sections of road and associated infrastructure would be constructed during Months 3 to 6 of the Site Establishment and Construction Schedule (see **Table 2.2**) and would be completed in its final form prior to closure to the public of the section of Maloneys Road within the Mine Site.

The key design parameters of the relocated road are as follows.

- Total width – up to 11m, comprising.
  - 2 x lane widths of 3.5m;
  - 2 x shoulder widths of 1.0m; and
  - V drains up to 2.0m wide.
- Proposed maximum speed – 100km/hr (Note: This is the same speed limit posted on the existing Maloneys Road).

Further details regarding the additional infrastructure proposed for the relocated Maloneys Road are presented in the following subsections.

2.9.2.1 Relocated Maloneys Road/Lue Road T-Intersection

The relocated Maloneys Road/Lue Road T-intersection (see **Figure 2.17**) would be designed in accordance with Austroads design guidance and would comprise the following elements.

- An at-grade, 95m long single deceleration lane, left turn in for eastbound vehicles entering the relocated Maloneys Road from Lue Road.
- An at-grade, left turn out and 108m long single acceleration lane with merge for vehicles exiting the relocated Maloneys Road, entering Lue Road and travelling east towards Lue.

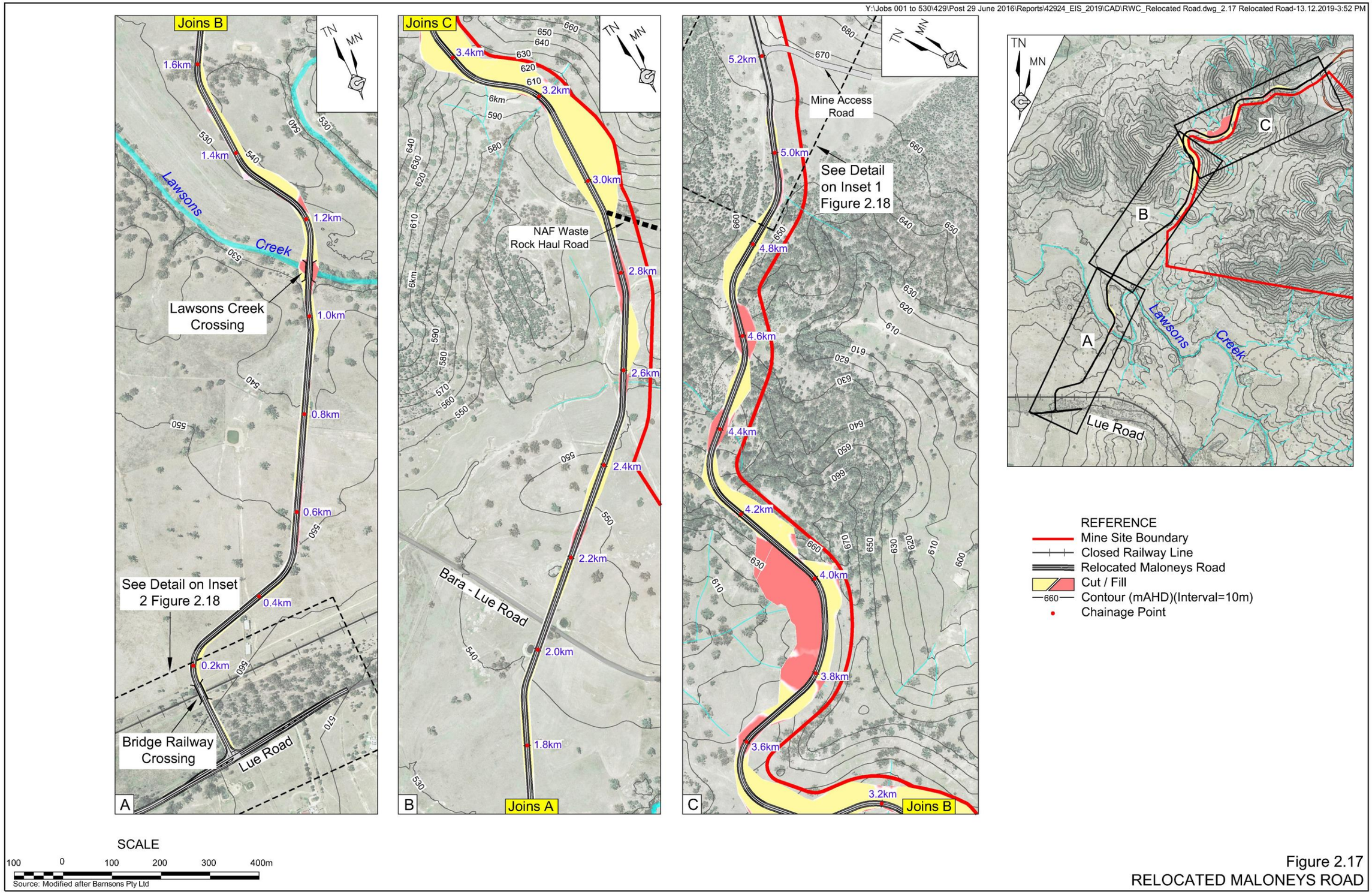

Figure 2.17
RELOCATED MALONEYS ROAD

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- A 108m long centre deceleration lane on Lue Road for westbound vehicles undertaking a right turn into the relocated Maloneys Road.

These lanes would be created by local widening, sealing and line marking of Lue Road.

The construction of the intersection would be undertaken in Months 3 and 4 to enable vehicular access to the proposed new railway bridge crossing.

2.9.2.2 Relocated Maloneys Road Railway Crossing

A new railway crossing would be constructed across the closed Wallerawang-Gwabegar Railway Line (see **Figure 2.18**). The crossing would involve the design and construction of a bridge in accordance with the Australian Standard, AS 5100:2017 (Bridge Design) and Country Rail Network construction standards. The bridge would be a dual lane concrete structure constructed with pre-cast concrete piles, headstocks, deck planks and retaining walls together with appropriate approach earthworks. The bridge would be completed with steel guardrails.

2.9.2.3 Lawsons Creek Crossing

The relocated Maloneys Road would cross Lawsons Creek via a new crossing that would be constructed approximately 1.2km downstream of the current Bara-Lue Road crossing of Lawsons Creek.

The proposed floodway crossing would be designed to be overtopped by flows within Lawsons Creek during the modelled 10% Annual Exceedance Probability, or 10-year average recurrence interval rainfall event (WRM, 2020), and constructed to resist the damaging effects of any overtopping.

In order to maintain habitat connectivity for aquatic fauna, the floodway would be constructed with a series of reinforced concrete box culverts, whereby the culverts would be designed to pass a lesser flood and sustain flows whilst the floodway would provide access during flood events up to a 10% (1 in 10) AEP flood event.

The road would be closed to light vehicle access once the depth of flow over the floodway reaches 200mm although heavy vehicle access would be maintained until a flow depth of 500mm is exceeded.

Figure 2.19 presents the indicative design elements of the floodway crossing and the location of the proposed Lawsons Creek crossing. The design parameters would generally follow the guidance presented in the document *"Floodway Design Guide"* (MRWA, 2006).

2.9.3 Site Establishment and Construction Traffic

2.9.3.1 Mine Site and Relocated Maloneys Road

Table 2.5 lists the range of light vehicles, buses and heavy vehicles that Bowdens Silver anticipates would travel to and from the Mine Site on a daily basis throughout the site establishment and construction stage. Distinction is made between the traffic movements prior to and after the construction of the relocated Maloneys Road, i.e. the long-term access to the Mine Site.

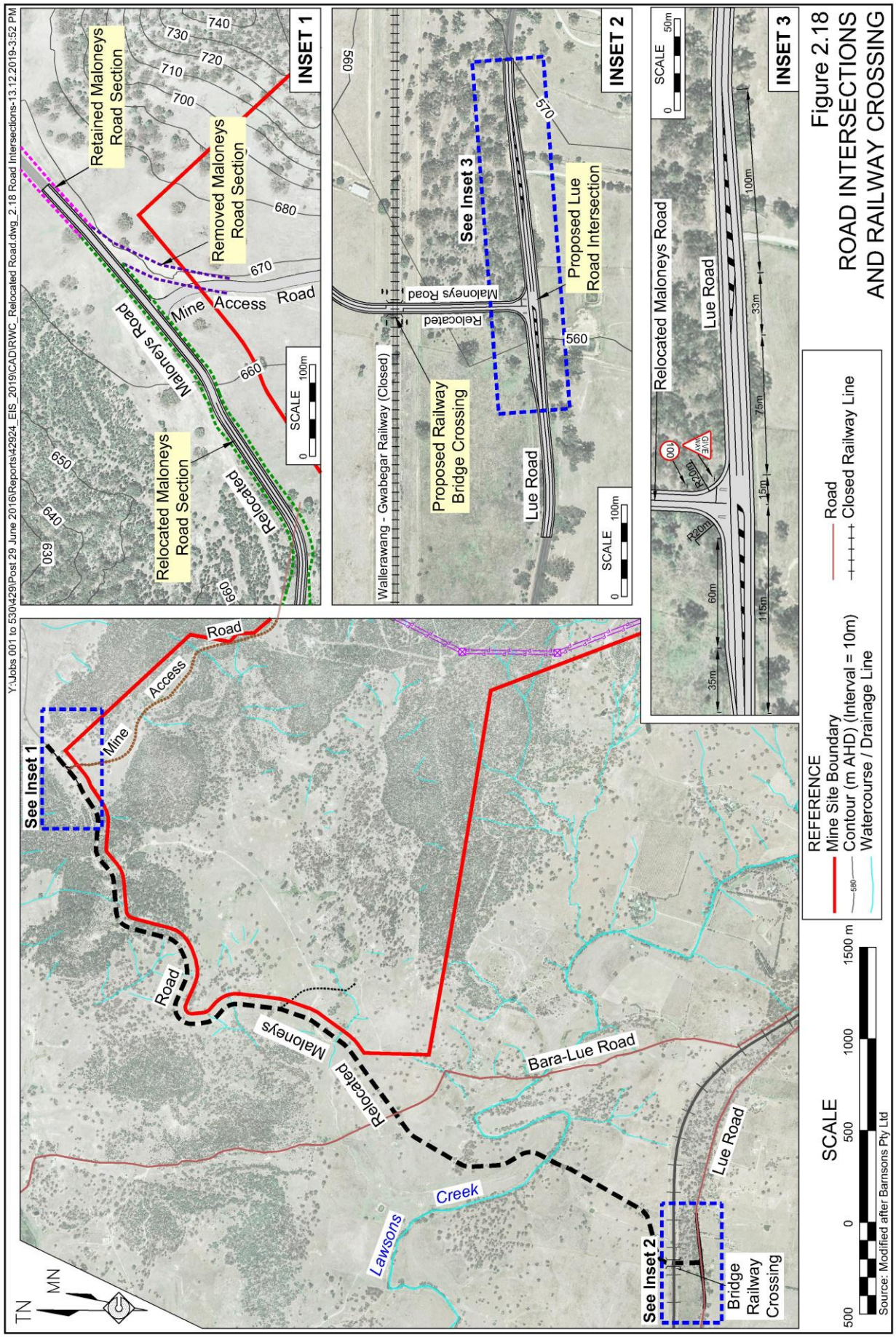
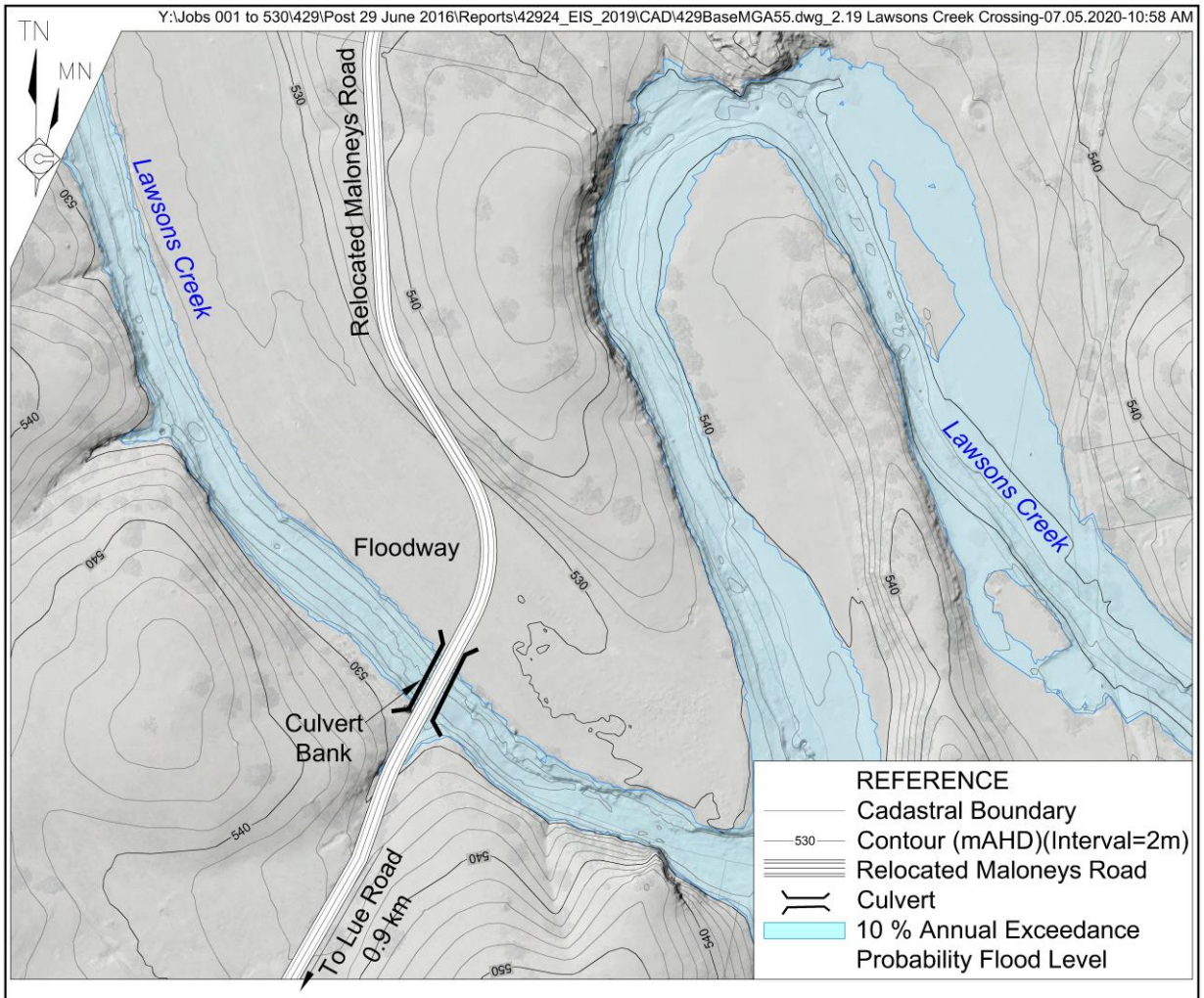
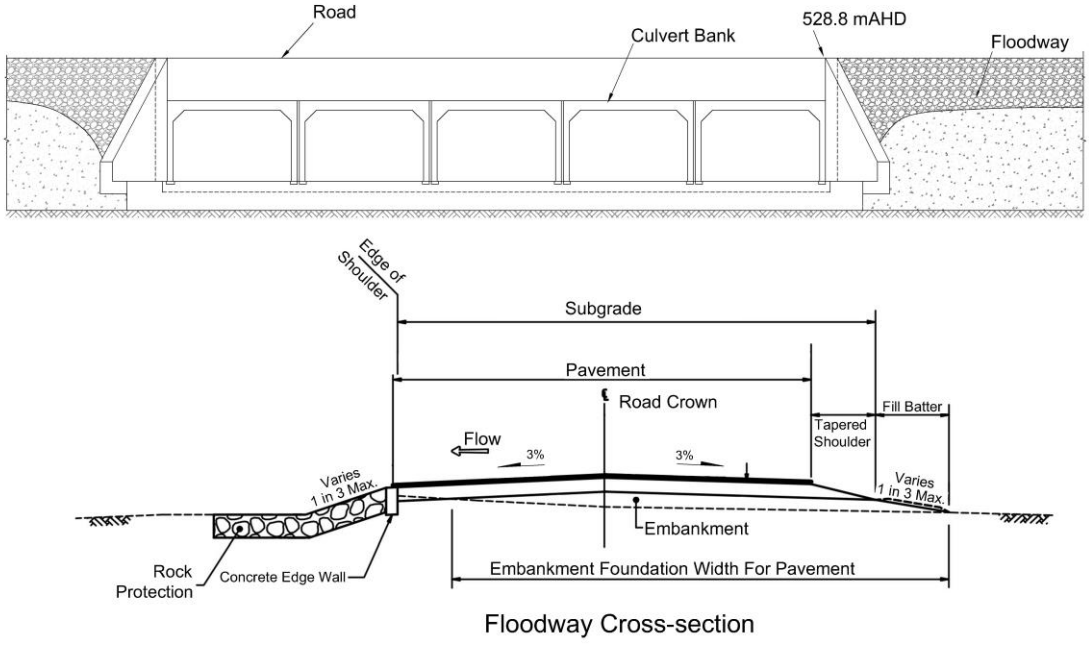


Figure 2.18
ROAD INTERSECTIONS AND RAILWAY CROSSING





Floodway Cross-section

SCALE

50 0 50 100 150 200 250 m

Flood Level Source: WRM Water and Environment
Culvert Concept Source: Transport and Main Roads, QLD (2018)
Floodway Cross-section Source: Main Roads, WA (2006)

Figure 2.19
INDICATIVE LAWSONS CREEK CROSSING

Table 2.5
Daily Traffic Movements During Site Establishment and Construction Stage

	Light Vehicles	Buses	Heavy Vehicles	Oversize Vehicles	TSF Haulage	Total
Month 6 with Existing Road Network						
Lue Road east of Pyangle Road	42	4	10	4	0	**60**
Lue Road through Lue	78	4	32	4	0	**118**
Pyangle Road Lue Road to Maloneys Road	120	8	42	8	0	**178**
Maloneys Road Pyangle Road to Secondary mine access road	120	8	42	8	0	**178**
Month 13 With Relocated Maloneys Road						
Lue Road east of Pyangle Road	70	4	10	4	0	**88**
Pyangle Road Lue Road to Maloneys Road	40*	0	0	0	0	**40**
Maloneys Road Pyangle Road to Secondary mine access road	40*	0	0	0	0	**40**
Secondary mine access road	40*	0	0	0	0	**40**
Lue Road through Lue	82	4	10	4	0	**100**
Lue Road west of Relocated Maloneys Road	130	4	32	4	0	**118**
Relocated Maloneys Road Lue Road to TSF Embankment	160	8	42	8	0	**218**
Relocated Maloneys Road Mine Access Road to TSF Embankment	160	8	42	8	266	**484**
New mine access road	160	8	42	8	266	**484**
* Comprises light vehicle trips for exploration personnel travelling to and from the Bowdens office and core library						

It is anticipated that the level of heavy vehicle traffic would be limited during the initial 4 to 6 months period. The bulk of the heavy vehicle traffic would be related to the transportation of heavy machinery to the Mine Site for initial construction activities including the construction of the relocated Maloneys Road.

Bowdens Silver has programmed the delivery of the bulk of the mobile equipment to be used in the open cut pit development and the delivery of processing plant components until after the relocated Maloneys Road and mine access road are constructed.

From about Month 7 until the end of the site establishment and construction stage, approximately 2.04 million tonnes of NAF waste rock would be transported from the main open cut pit to the footprint of the TSF starter embankment (or TSF Stage 1). A fleet of B-double trucks capable of transferring approximately 50t of NAF waste rock per load would be used during this 12 month period. Approximately 41 000 truck loads would be transported from the NAF waste rock stockpile adjacent to the main open cut pit (see **Figure 2.1**) via:

- an upgraded section of the former Maloneys Road within the Mine Site;
- the mine access road; and

- a 1.4km section of the relocated Maloneys Road, i.e. from the intersection of the mine access road and relocated Maloneys Road and the entrance to the TSF embankment site.

The 41 000 truck loads would require six B-doubles each undertaking approximately 20 loads per day between 7:00am and 6:00pm or an average of 11 return trips per hour, Monday to Sunday, public holidays excluded, thereby generating an average of 22 movements per hour.

Additional periods of heavy vehicle traffic would be experienced during the construction / installation of the processing plant (Months 8 to 14) and during the construction/installation of the water pipeline (commencing approximately Month 8) when excess material from the trenching of the pipeline is transported to the Mine Site for placement/use.

Light vehicle traffic would largely comprise passenger vehicles with a small proportion of light trucks. It is envisaged that some personnel accommodated within Mudgee would travel daily to the Mine Site by bus at the start and finish of each day. In the event that a substantial number of personnel are domiciled in Rylstone and/or Kandos, an additional bus service would also be provided. Whilst the majority of light vehicle traffic would utilise the relocated Maloneys Road and mine access road, a small number of light vehicles, used by exploration personnel would continue to use Pyangle Road and the existing Maloneys Road to access the Bowdens exploration office and core library throughout the Project life.

Heavy vehicles would include rigid trucks, semi-trailers, tankers and B-doubles delivering equipment and plant items, consumables, processing reagents and other supplies.

A total of approximately 95 oversized loads, principally low loaders, would be required to deliver processing plant components and mobile equipment. In addition, approximately 45 oversized loads (>2.5m wide but <3.4m wide) would be delivered to the Mine Site, predominantly for site transportable buildings. These loads would be delivered principally from Month 13 of the site establishment and construction stage (see **Table 2.2**).

Bowdens Silver would ensure that all oversize and overweight vehicles have the appropriate permits and approvals and would be appropriately escorted, when required. It is noted that the required permits and approvals would be obtained by the road transportation contractors.

2.9.3.2 Water Supply Pipeline

The contractor constructing the water supply pipeline would utilise a range of vehicles throughout the construction period namely, low loaders (for delivery of earthmoving equipment), trucks for the delivery of the pipe and sand and the transfer of excess spoil back to the Mine Site, and a range of light vehicles. The overall number of heavy vehicles on any one day would typically be less than 12 and light vehicles less than 20 with these vehicles spread across a number of sites.

2.9.4 Operational Traffic

Table 2.6 lists the range of light vehicles, buses and heavy vehicles Bowdens Silver anticipates would travel to and from the Mine Site throughout the operational Project life. Each vehicle travelling to the Mine Site would generate two vehicle movements (vehicle in/vehicle out).

Table 2.6
Daily Traffic Movements Throughout the Life of the Operations

	Light Vehicles	Buses	Heavy Vehicles	TSF Haulage[A]	Mineral Concentrate	Total
Lue Road east of Pyangle Road	58	12	2	0	0	**72**
Pyangle Road Lue Road to Maloneys Road	40	0	0	0	0	**40**
Maloneys Road Pyangle Road to Secondary mine access	40	0	0	0	0	**40**
Secondary mine access road	40	0	0	0	0	**40**
Lue Road Pyangle Road to Relocated Maloneys Road	70	12	2	0	0	**84**
Lue Road west of Relocated Maloneys Road	98	16	8	0	6	**128**
Relocated Maloneys Road Lue Road to TSF Embankment	116	28	10	0	6	**160**
Relocated Maloneys Road TSF Embankment to mine access road	116	28	10	102[B]	6	**262**
Mine access road	116	28	10	102[B]	6	**262**

[A] Occurs during Years 1 to 8 of operations only

[B] Years 1 to 3 (Stage 2) reducing to 86 trips per day in Years 4 to 8 (Stage 3)

Operational traffic movements would principally be generated by mine and exploration personnel attending or departing the Mine Site for work. In order to limit traffic generation at key shift changeover, Bowdens Silver proposes to offer bus transportation to employees, in addition to adopting staggered shifts times across the administration, mining, processing and maintenance functions.

Due to the staggering of shifts and the use of a bus service to transport personnel during the peak shift changeover periods, the anticipated peak light vehicle and bus movements would occur as follows.

- Morning peak (between 5:30am and 8:00am Monday to Friday) - approximately 95 light vehicle movements (i.e. 80 inbound and 15 outbound) and 4 bus movements (i.e. 2 inbound and 2 outbound).
- Afternoon shift change (between 1:30pm and 3:00pm) - approximately 8 light vehicle movements (i.e. 4 inbound and 4 outbound).
- Day shift end (between 4:00pm and 4:30pm Monday to Friday only) - approximately 40 light vehicle movements (outbound only) and 2 bus movements (i.e. 1 inbound and 1 outbound).
- Evening peak (between 5:30pm and 7:30pm) - approximately 50 light vehicle movements (i.e. 15 inbound and 35 outbound) and 2 bus movements (i.e. 1 inbound and 1 outbound).
- Evening shift end (between 10:00pm and 10:30pm) – approximately 4 light vehicle movements (outbound only).

Details of light and heavy vehicles movements during each hour are presented in the Traffic and Transport Assessment (SCSC Part 11) (TTPP, 2020).

Additional light vehicle movements would also occur throughout the day as a result of visits by equipment/supply representatives, consultants and government agency representatives. It is expected that, on average, this would result in a further five light vehicle trips (10 movements) per day.

In addition to trucks transporting concentrates, it is anticipated that, on average, one to two heavy loads vehicle trips (two to four movements) would occur daily for delivery of fuel, explosives and other consumables.

Between Years 2 and 8 of the mine life, for the construction of the second and third raises of the TSF, Bowdens Silver would continue to utilise the fleet of three B-double trucks capable of transporting approximately 50t of NAF waste rock per load from the main open cut pit or satellite pits to the TSF embankment via a 1.4km section of the relocated Maloneys Road to the TSF embankment site. Approximately 2.3 million tonnes and 3.2 million tonnes of waste rock would be transported respectively for the second and third raises of the TSF embankment requiring approximately 46 000 truck loads over a period of approximately 36 months to complete the Stage 2 TSF embankment raise and approximately 64 000 truck loads over a period of approximately 60 months to complete the Stage 3 TSF embankment raise. During Years 1, 2 and 3, this would result in approximately 51 loads (102 truck movements per day) (7:00am to 6:00pm) or approximately five loads per hour (10 movements). During Years 4 to 8, approximately 43 loads would be transported daily to the TSF embankment area and generating approximately 86 truck movements or approximately four loads per hour. Between Years 1 and 8 of the mine life, it is anticipated that the transportation of NAF waste rock would be confined to Monday to Saturday, i.e. six days per week, public holidays excluded.

2.9.5 Concentrate Despatch

Based on the annual production of between 20 000t and 30 000t of mineral concentrates, average daily product despatches would be approximately one to three truckloads generating two to six heavy vehicle movements Monday to Saturday, public holidays excluded. B-double trucks would be used to transport the concentrate containers in order to maximise the load carried and minimise the number of truck movements.

The silver/lead concentrate would be transported in 2t capacity sealed bulk bags that would be loaded by forklift into 6.1m shipping containers for despatch to the lead smelter in Port Pirie in South Australia, approximately 1 350 km from the Mine Site. Each shipping container destined for Port Pirie would be loaded with approximately 22t of concentrate and each truck carrying silver/lead concentrate would carry two shipping containers, i.e. approximately 44t of concentrate per load. Shipping containers bound for Port Pirie would be transported by road from the Mine Site to either Parkes or Kelso (near Bathurst) and from either Parkes or Kelso by rail to Port Pirie. In total, between approximately 200 and 290 loads of silver/lead concentrate would be despatched annually or one to two loads per day.

The zinc concentrate would be transported by road in sealed containers to either the Port of Newcastle or Port Botany for shipment to an overseas zinc refinery. The number of loads of zinc concentrate despatched would be between approximately 280 and 410 per year or one to two loads per day.

Figure 2.20 displays the proposed transport routes to Port Pirie, Port of Newcastle and Port Botany. All routes involve a common route from the Mine Site to Mudgee via Lue Road beyond which trucks travelling to Port Pirie travel westward. Those trucks destined for the Port Newcastle travel northward then eastward whilst those destined for Port Botany would travel southward and then eastward.

Figure 2.21 displays the transport routes to be used by trucks travelling through Mudgee.

The routes used by trucks transporting the concentrate to Parkes or Kelso, from where they would be transferred to rail and transported to Port Pirie, are as follows.

Silver/Lead Concentrate to Parkes

Silver/lead concentrate would be transported to Parkes by road, a distance of 242km through Wellington and Parkes on B-double trucks along the following route (as displayed on **Figure 2.20A**).

- Relocated Maloneys Road, Lue Road, Ulan Road, Short Street to Douro Street (Castlereagh Highway (B55)) and Goolma Road to Wellington (130km); and
- Mitchell Highway, through Molong to Escort Way via Peabody Road, before turning towards Parkes via Henry Parkes Way 0.69413to Parkes (154km).

It is anticipated that one return trip (two movements) involving loading the containers, transportation to Parkes, unloading the containers and the return trip to the Mine Site would take approximately 9 hours.

Silver/Lead Concentrate to Kelso

Silver/lead concentrate would be transported to Kelso, a distance of 205km, along the following route (as displayed on **Figure 2.20A**).

- Relocated Maloneys Road, Lue Road, Ulan Road, Short Street to Douro Street (Castlereagh Highway (B55)) (33km);
- Castlereagh Highway (B55) to Great Western Highway (118km); and
- Great Western Highway to Kelso (54km).

It is anticipated that one return trip (two movements) involving loading the containers, transportation to Mudgee, unloading the containers and the return trip to the Mine Site would take approximately 6 hours.

Zinc Concentrate to Port Botany

In the event zinc concentrate is transported to Port Botany, a distance of 327km, it would be transported via Mudgee on B-double trucks along the following route (as displayed on **Figure 2.20B**).

- Relocated Maloneys Road, Lue Road, Ulan Road, Short Street to Douro Street (Castlereagh Highway (B55)) (33km);
- Castlereagh Highway (B55) to Great Western Highway (A32) (118km); and
- Great Western Highway (A32), M4, M7 and M5 to Port Botany (176 km).

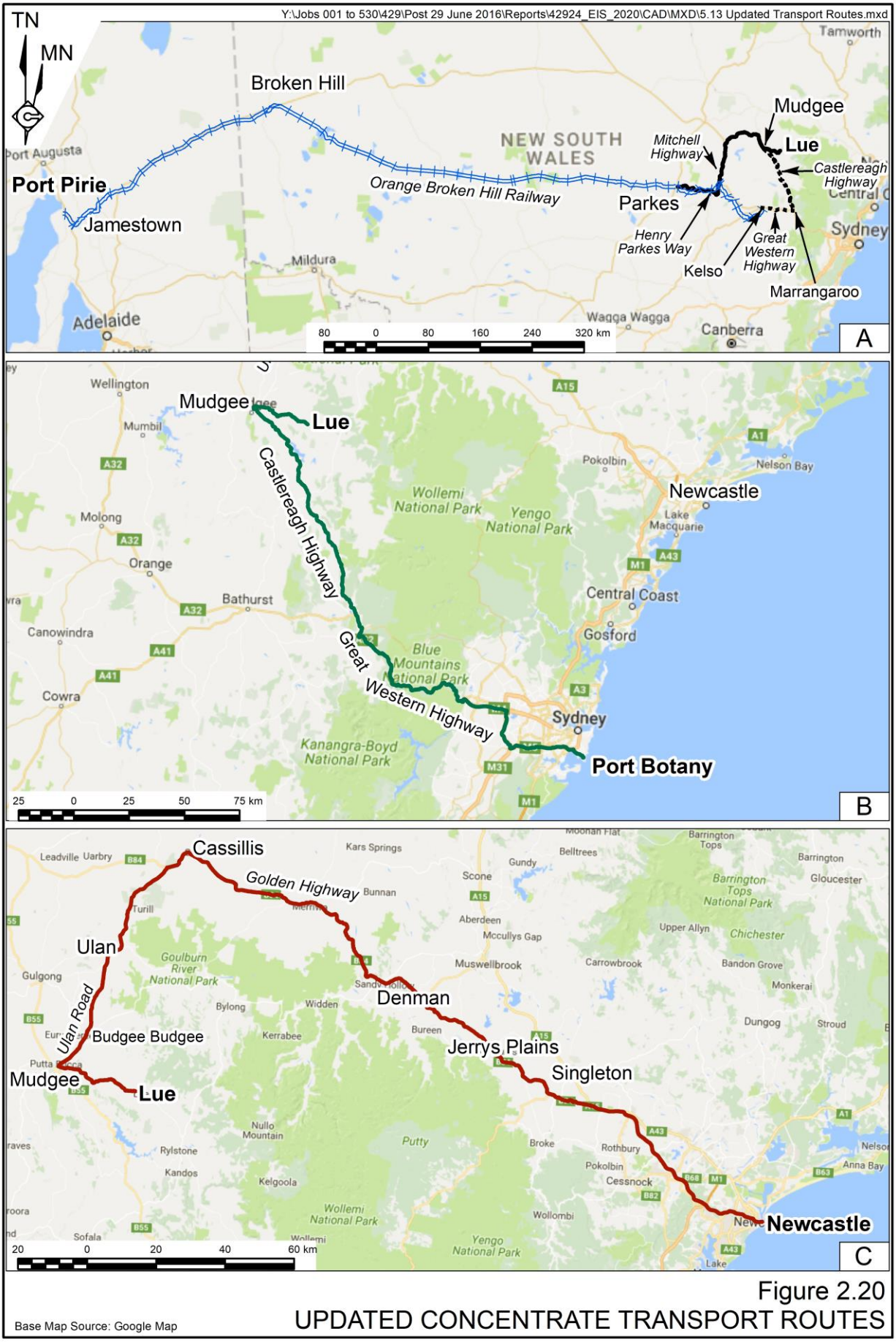


Figure 2.20
UPDATED CONCENTRATE TRANSPORT ROUTES

Base Map Source: Google Map

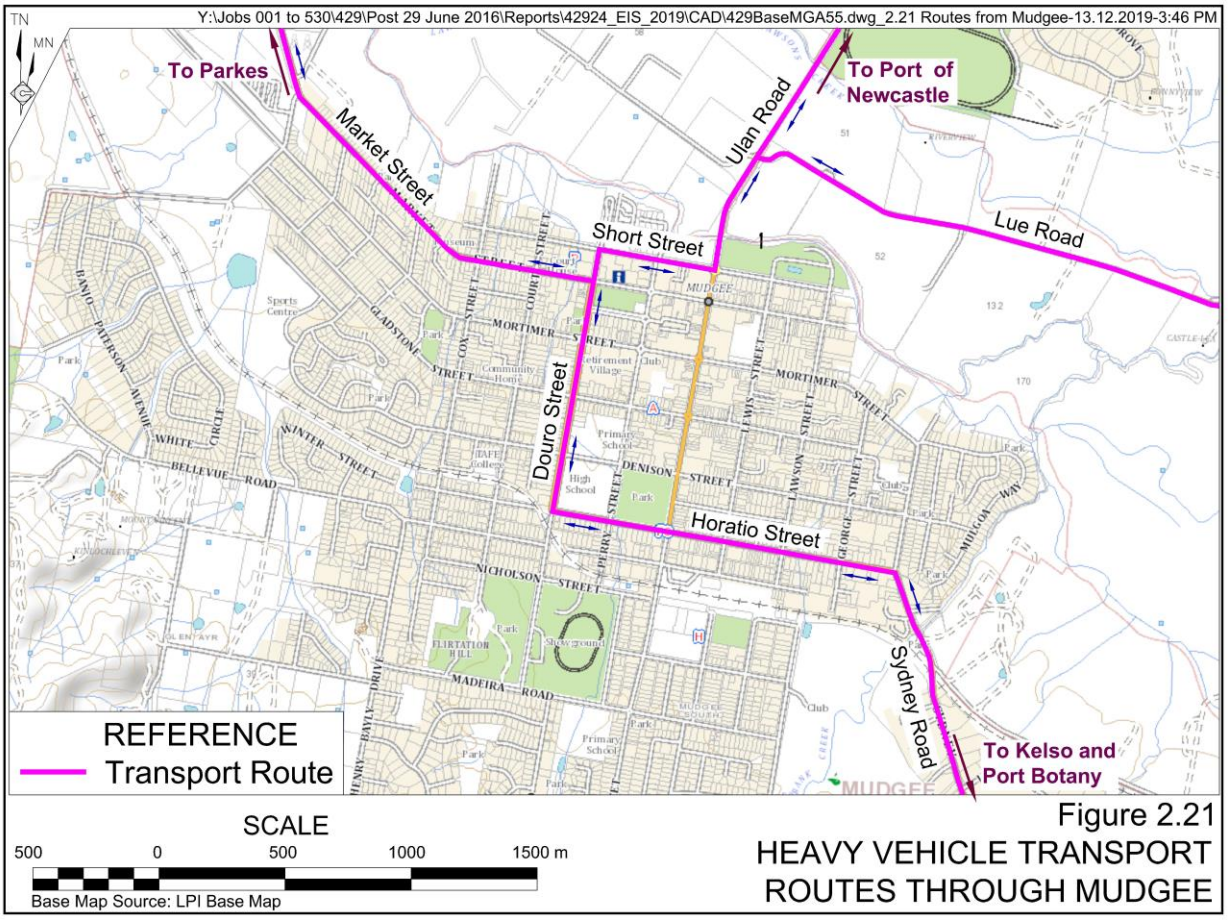


Figure 2.21
HEAVY VEHICLE TRANSPORT ROUTES THROUGH MUDGEE

It is anticipated that one return trip (two movements) involving loading the containers, transportation to Port Botany, unloading the containers and the return trip to the Mine Site would take approximately 10 hours.

Zinc Concentrate to Port of Newcastle

In the event the zinc concentrate is transported to the Port of Newcastle, a distance of 334km, it would be transported on B-double trucks via Mudgee and Ulan along the following route (as displayed on **Figure 2.20C**).

- Relocated Maloneys Road and Lue Road to Ulan Road (31 km);
- Ulan Road to Golden Highway (71 km); and
- Golden Highway, New England Highway, M15, John Renshaw Drive (B68), Maitland Road, Industrial Drive (232 km).

It is anticipated that one return trip (two movements) involving loading concentrate, transportation to the Port of Newcastle, unloading and the return trip to the Mine Site would take approximately 9 hours.

2.10 WATER SUPPLY

2.10.1 Water Sources and Projected Usage

During the site establishment and construction stage, approximately 0.5 to 1.0ML/day of water would be required principally for dust suppression and achieving the optimum moisture content in those components or areas where compaction is required. Water during this period would be drawn from on-site groundwater bores and water storages.

Once operations commence, water would be required principally for the processing of ore extracted from the open cut pits with lesser quantities required for dust suppression on the crushing and screening equipment and haul roads throughout the Mine Site. Average daily water use would require up to approximately 5.0ML of water for both processing and dust suppression (Year 8).

Water sources for the Project would include the following sources listed preferentially in order and type of use.

1. Surface water collected by the leachate management dam for recycling and reuse in processing operations.
2. Groundwater and surface water accumulating within the open cut pit for recycling and reuse in processing operations.
3. TSF return decant water for recycling and reuse in processing operations.
4. Surface water collected within the sediment dams (but unsuitable for release) or authorised under harvestable rights entitlements for use in dust suppression activities.
5. External supply of excess water from the Ulan Coalfield.

Considerable reliance would be placed upon water pumped from external supply during the first 2 years of operations as:

- regular volumes of return water from the TSF would not occur at the long term rate until approximately 6 months after processing commences; and
- groundwater recovered from the base of the open cut pit would not achieve the projected sustained inflows until about the end of the second year of operations.

Once reliable quantities of TSF return water and groundwater are achieved, on average approximately 2.8ML would be recovered daily from the thickeners and TSF. Other sources of make-up water for processing and dust suppression would include surface water (2.1ML/day on average) and groundwater (1.75ML/day)[12] drawn from the main open cut pit. It is noted that each of these daily estimates represent average values and would fluctuate on a daily basis. The leachate originating from the WRE and captured in the leachate management dam would also be used in processing (without treatment), however, no specific reliance would be placed on this water until later in the mine life.

[12] This quantity assumes approximately 30% of inflows evaporate on the open cut pit faces.

Average annual predictions of water use for dust suppression throughout the Mine Site indicate that between 0.42ML and 0.87ML of water would be required daily. The principal sources of water suitable for use in dust suppression would be on-site groundwater bores, surface water and groundwater recovered from the open cut pits and potentially on-site sediment dams, in the event the quality of the water is not suitable for release.

The predicted maximum annual water access licence requirement from the respective water sources during mining would be as follows.

- *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources Order, 2020*- Sydney Basin Murray Darling Basin Groundwater Source – 194ML.
- *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources Order, 2020*- Lachlan Fold Belt Murray Darling Basin Groundwater Source - (Other) Management Zone – 907ML.

Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Source 2012 – Lawsons Creek Water Source – 136ML.These requirements include groundwater inflows to the open cut pit, surface water captured due to the construction of the TSF on a third order stream and the predicted baseflow reduction to Lawsons Creek and Hawkins Creek. Bowdens Silver has secured sufficient allocation to account for peak groundwater inflows during mining and would secure the necessary surface water licence allocation prior determination of the application.

In order to ensure sufficient water is always available on a continuous basis for processing and dust suppression, Bowdens Silver proposes to construct a buried pipeline from the Ulan Coalfield to the Mine Site that could convey up to 5.5ML of water per day, thereby removing any uncertainties related to the availability of other water sources on site. Surplus water from the Ulan Coalfield would be pumped to the Mine Site via the proposed water supply pipeline. All water sourced via the water supply pipeline would be pumped to a turkeys nest dam with any excess diverted to the TSF. An outline of the proposed water supply pipeline is presented in the remainder of this subsection with the indicative alignment of the corridor displayed on **Figure 2.22**.

Water sourced via the water supply pipeline would preferentially be treated near the initial section of the pipeline. This would permit better quality water to be pumped within the pipeline and to be received at the Mine Site. Water treatment would involve a reverse osmosis plant with the following options considered.

- Water treatment using existing approved facilities at one or both of the mines.

  This option would result in minimal additional management requirements as water treatment would be consistent with that currently approved. The management of process inputs, power supply and waste products (principally brine) have been assessed and approved. This option would be subject to a commercial agreement on water treatment.

- Water treatment at an intermediate location along the water supply pipeline on privately-owned land under a lease agreement.

  This option would require a dedicated reverse osmosis plant to be commissioned and operated by Bowdens Silver. An area of up to approximately 250m^2 for the treatment facility and additional area for an evaporation dam may be required. Water treatment infrastructure that achieves 75% to 94% recovery of water has been investigated by Bowdens Silver as well as the use of evaporation ponds or a Brine Crystalliser Plant. It is projected that, based on treatment of 5.5ML/day (the maximum pipeline capacity), in the order of 350kL of brine would be produced at 94% recovery efficiency.

  Under this option, environmental considerations such as lining of evaporation ponds, transport and disposal of waste materials and vegetation clearing for development of the infrastructure would need to be reviewed in detail. While this option is not preferred, it is feasible for the Project. Assuming the successful management of water within lined evaporation ponds, minor additional traffic levels associated with transport of waste materials to the Mine Site, and the disposal and encapsulation of waste materials in the TSF, this option would be expected to result in only a minor contribution to the cumulative environmental outcomes of the Project.

- Water treatment at the Mine Site, should it still be required.

  Once water has been transported to the Mine Site, it may require a low level of treatment to ensure it is suitable for use in processing operations. Dedicated brine management facilities or evaporation ponds would not be required as brine would be pumped directly to the TSF. No additional land would need to be disturbed for this option as the treatment plant would be located adjacent to existing proposed facilities.

It is acknowledged that the use of water treatment facilities installed and managed by others would be subject to commercial arrangements being reached between the relevant parties. Bowdens Silver would resolve the location and management of water treatment for the water supply pipeline coincident with finalisation of commercial arrangements for water supply.

Treated water would have an electrical conductivity in the order of 800µS/cm. **Table 2.7** lists the anticipated water quality after treatment.

Once processing operations are underway, Bowdens Silver intends to maximise the use of groundwater collected in the open cut pits and maximise the recovery and re-use of water in the processing operations. Water sourced via the water supply pipeline would essentially be make-up water supplying shortfall after water from all on-site sources is used. WRM calculate that the quantity of make-up water used for processing from the water supply pipeline would range from 0ML/day to 4.1ML/day.

Potable water requirements during construction would be delivered to the Mine Site by water tanker until such time as a reverse osmosis (RO) plant is installed on site. The RO plant would be used during operations to treat a combination of groundwater, surface water and mine water to produce up to 37 500 litres of potable water daily or approximately 14ML/year.

Table 2.7
Indicative Treated Water Quality from Ulan Coal Mine

Analyte#	Concentration	Analyte#	Concentration
pH	7.5	Mercury	0
EC	790	Nickel	0.02
Aluminium	0.004	Nitrate (as N)	0.09
Arsenic	0.00003	Potassium	10
Cadmium	0.0001	Selenium	0
Calcium	38	Silver	0.00008
Chloride	38	Sodium	64
Copper	0.0003	Sulphate	260
Fluoride	0.2	Total Alkalinity (as $CaCO_3$)	30
Iron	0.025	Total Nitrogen	0.08
Lead	0.00003	Total Phosphorus	0.004
Magnesium	27	Zinc	0.028
Manganese	0.3		
# All analytes expressed in mg/L except pH (pH units) and EC (µS/cm)			

The recent prolonged drought being experienced across NSW has prompted Bowdens Silver to consider contingency strategies available to permit ongoing operations during drought conditions. Discussions with the relevant parties regarding make-up supply has also included the need for operational contingencies should make-up water not be available from either operation. Bowdens Silver has investigated the reliable supply of groundwater from production bores within the Mine Site or on surrounding properties owned by Bowdens Silver. It is noted that Bowdens Silver has access to approximately 1 066ML of groundwater entitlements to provide for peak groundwater inflow. Therefore, these entitlements could also be called upon outside of peak groundwater inflow periods.

Jacobs (2020) has identified that supplementary groundwater supply is possible via the installation of additional groundwater bores within the Mine Site and surrounds. Previous investigations have identified that enhanced permeability and useful yields are possible from fractured rock aquifers in the vicinity of the major geological structures. In addition, deeper exploration drilling at the Mine Site and beyond 600m in depth has confirmed large regional structures with significant porosity that have the potential to accommodate productive aquifers. Ongoing supplementary water supplies may also be sourced from similar hydrogeological environments within land surrounding the Mine Site. While using this source of water as a sole source of water for the Project would be constrained by the potential for unpredictable permeability and yield, with the necessary investigations and bore installation, groundwater would provide an alternative water supply option, if required.

It is acknowledged that, should water sources that rely on rainfall (within the Mine Site or elsewhere) be constrained, Bowdens Silver would need to adjust the rate of production in accordance with the water available. This may lead to an eventual short-term shut down of the operation. However, this constraint is the same experienced across all metalliferous mines throughout NSW and Australia in these conditions and demonstrates the Project's reliance on the supply of water. Bowdens Silver is confident that such constraints would be managed appropriately to maintain the long-term viability of the operation.

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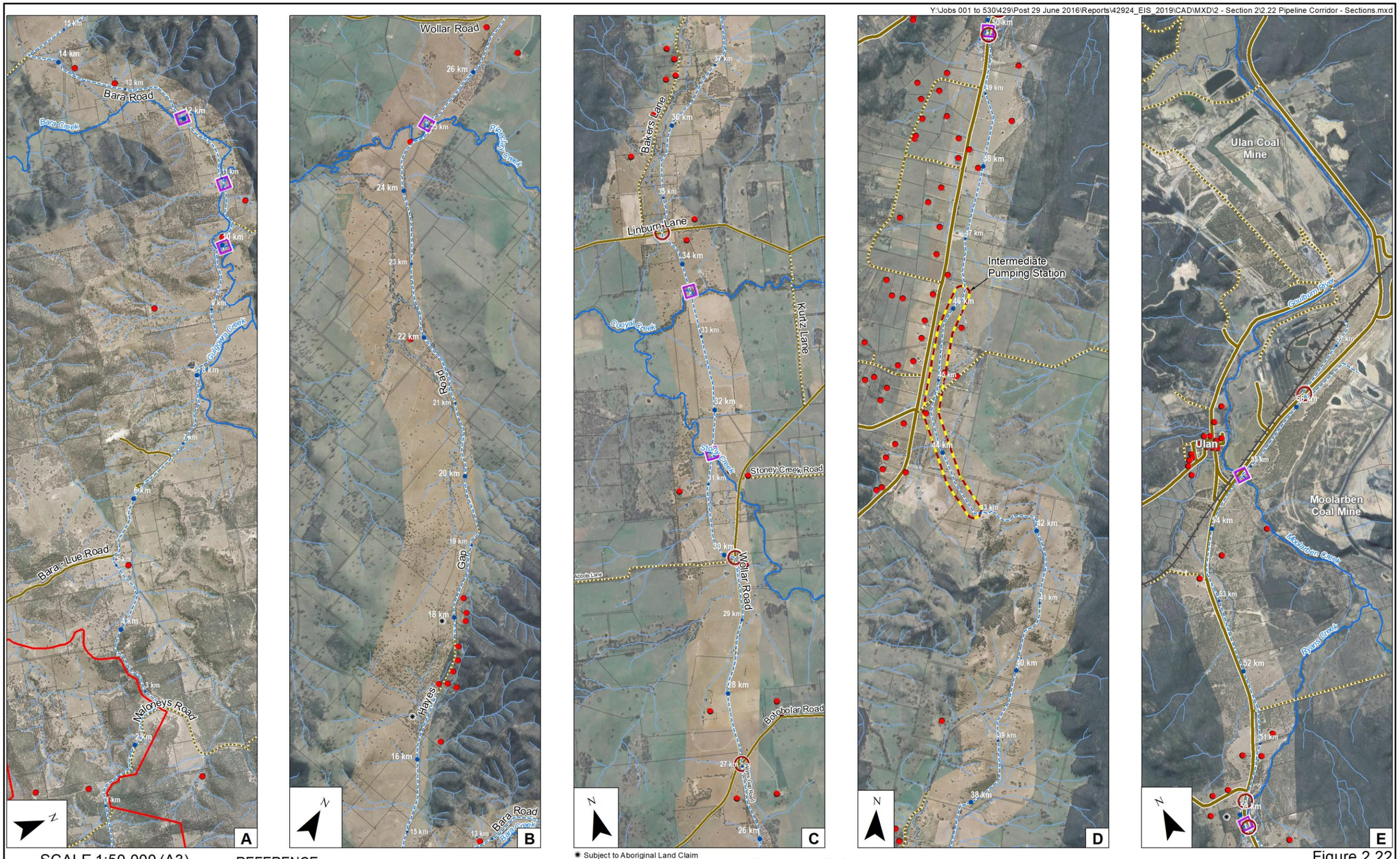

SCALE 1:50 000 (A3)

500 0 500 1000 1500 2000 m

Base Photo Source: Google Earth (4 Decemeber 2015)

REFERENCE

- Mine Site Boundary
- Indicative Pipeline Corridor
- Intermediate Pumping Station
- Residence
- Railway

Roads
- Sealed
- Unsealed

Watercourses
- Perennial
- Ephemeral
- Underbored Perennial Watercourse
- Underbored Sealed Road

* Subject to Aboriginal Land Claim

Figure 2.22
WATER SUPPLY
PIPELINE CORRIDOR

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2.10.2 Pipeline Corridor

Figure 2.22 displays the indicative water supply pipeline corridor with chainages commencing at 0km at the Mine Site. With the exception of the two pumping stations, the easement created for the water supply pipeline would be approximately 10m wide. The pumping stations would require an area of approximately 20m x 20m.

The corridor traverses a distance of approximately 58.5km. The corridor length and exact location from the off-take point to the water source within the Ulan Coalfield is yet to be determined.

Approximately 33.8km (or 60%) of the pipeline to the off-take point would be constructed on privately-owned, freehold land with the remaining 22.6km (or 40%) constructed within public formed or unformed road reserves or Crown land.

The freehold land section of the water supply pipeline corridor would principally traverse land used for agricultural purposes including grazing and cropping. It is noted that whilst sections of remnant vegetation would also be intersected by the pipeline, this land is also generally used for grazing.

The contractor responsible for the construction of the pipeline would liaise with landowners within and adjacent to the water supply pipeline corridor to ensure that access during the construction period is maintained with minimal impact. Bowdens Silver would maintain contact with the landowners within the corridor throughout the Project life to ensure that any concerns regarding the operation and maintenance of the pipeline are addressed as quickly as possible.

The pipeline would intersect a number of constructed infrastructure and natural watercourses, as follows.

1. Beneath six sections of sealed roads.
2. Adjacent to or within approximately 18.5km of unsealed rural roads.
3. Eight perennial watercourse crossings.
4. Across numerous ephemeral watercourses or depressions.

Figure 2.22 displays the indicative locations of each of these constructed infrastructure and natural watercourses along the water supply pipeline corridor.

2.10.3 Pipeline Design

The pipeline would be designed to carry flows of up to 64L/sec or 5.5ML/day. The maximum pressures expected to be experienced along the pipeline would be 20 bar reflecting the approximately 220m elevation difference between Ulan (420m AHD) and the proposed processing plant (640m AHD).

The pipeline would be a combination of 375mm internal diameter ductile iron cement lined (DICL) and high density polyethylene (HDPE) pipe that would incorporate the following range of equipment and components.

- Up to four pumping stations would be used, one located at the start of the pipeline, a third station located at the reverse osmosis plant (if required) and a fourth at an intermediate location as a booster to pump the water the remaining distance to the Mine Site. Should water treatment occur at the water source, the third pumping

station would not be required. The intermediate location of the booster pump would be in the vicinity of chainages 42km to 46km in the Cooks Gap area in an area where electrical power is close nearby. Both pumping stations would include two pumps which would be operated in a duty / standby arrangement. These would be rotated on a regular basis to achieve equal rates of wear and thus delay the need for maintenance and bearing replacement.

- Each pumping station would be located within a security-fenced compound (approximately 400m^2 in area) that would include a covered steel water storage tank and enclosed structure (container or shed) which would house the duty and standby pumps – see **Plate 2.2**.
- Isolation valves would be installed along the pipeline to enable access to any particular section for maintenance / repair works. These valves would be located inside concrete pits at regular intervals of approximately 2km to 4km. An off-take fire hydrant would be installed at a number of the isolation valves along the pipeline near existing roads to enable water to be recovered for firefighting purposes, if required. **Plate 2.3** displays a typical valve pit.
- Air release valves would be located in concrete pits at the highest points along the pipeline route to prevent the accumulation of air in those reaches.
- Scour valves would be located in concrete pits at the lowest points along the pipeline route to allow collection of water, if necessary from particular reaches of the pipeline.

Plate 2.2 Typical Pumping Station Facilities

Plate 2.3 Typical Valve Pit

A fibre optic communications cable would be laid in the same trench as the pipeline to provide efficient communications from the instrumentation located at each of the valves and pre-determined locations, particularly with respect to leak detection procedures to be incorporated along the pipeline.

It is proposed that the pipeline would be laid in a trench approximately 0.65m wide and between 1.2m and 1.4m deep for the bulk of its length. The exact depth of the trench would be determined by the contractor during its excavation. **Figure 2.23** displays a typical section through a trench with the pipe positioned on a bedding material

(typically sand or screened subsoil/excavated material) and covered by approximately 0.775m of backfilled material, including approximately 0.15m of topsoil.

Crossing of perennial watercourses would involve either the use of existing structures such as bridges[13] or culverts or directional underboring methods. The smaller ephemeral watercourses / depressions would be traversed by a trench in which case an appropriate concrete/rip rap rock cover would be placed above the completed section(s) to prevent any future erosion.

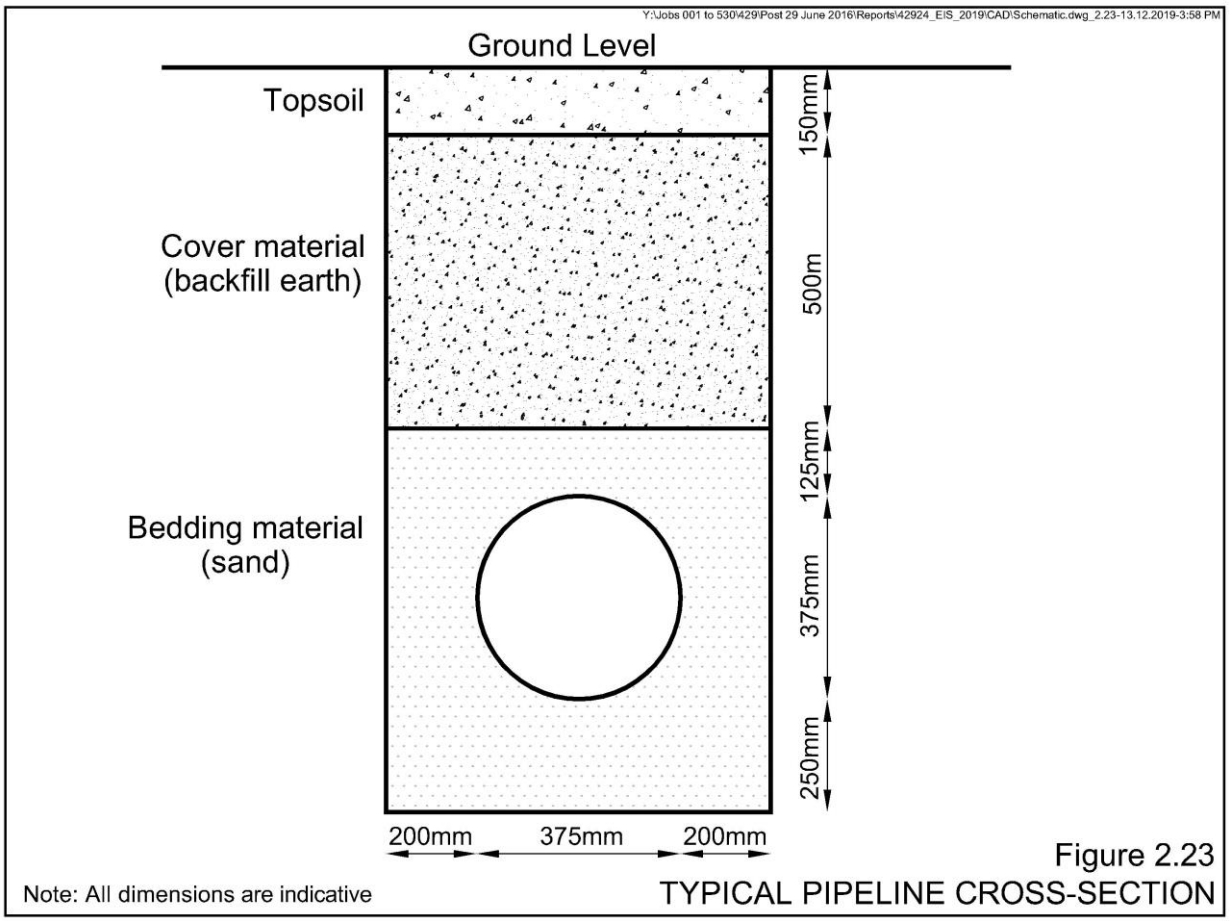


Figure 2.23
TYPICAL PIPELINE CROSS-SECTION

[13] Attaching the pipeline to the bridge crossing the Goulburn River at Chainage 53.8km is understood to be feasible. Further investigations would be undertaken following the receipt of development consent to confirm this with a Section 138 permit application lodged with the RMS.

All sealed roads traversed by the pipeline would similarly involve underboring beneath whereas the pipeline would be placed in a trench excavated across or along any unsealed roads. The approach to crossing beneath or through roads would be determined in consultation with the Mid-Western Regional Council (MWRC). The contractor responsible for the pipeline installation would provide Council with all relevant details regarding the location, depth, clearances and traffic control for each crossing. In the event of the pipeline crossing beneath sealed roads, DICL pipes would be required. All construction work within any road reserves would be undertaken in accordance with the conditions imposed by MWRC on the Section 138 Consent for the works. The concurrence of the RMS would be sought for any pipeline-related construction activities across any classified road or road reserve.

It is proposed that the pipeline construction would involve the disturbance width of up to approximately 10m of land within the corridor although the width of disturbance could be as low as 6m. **Figure 2.24** displays a typical section across the pipeline corridor and the range of components.

It is noted that some localised conditions may require this typical section to be modified, i.e. in conjunction with the landowner or MWRC.

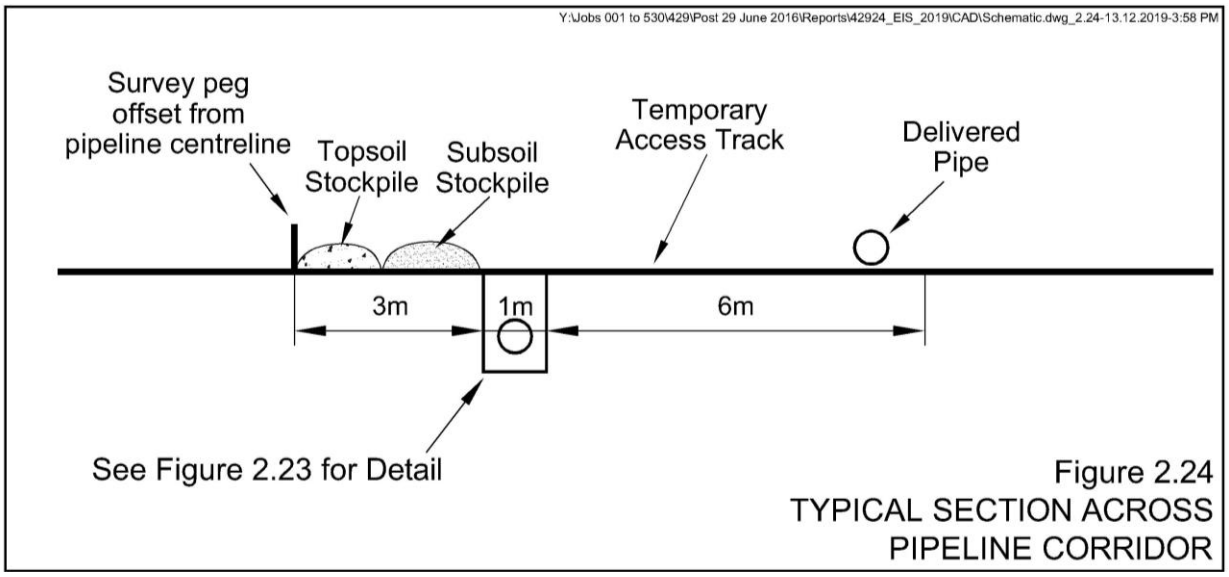


Figure 2.24
TYPICAL SECTION ACROSS PIPELINE CORRIDOR

2.10.4 Pipeline Construction

It is proposed that the pipeline contractor would deploy a number of crews to undertake the nominated tasks. The individual crews would undertake the following.

1. Vegetation clearing, fence removal (and replacement) and grading the construction corridor.
2. Unloading and stringing the pipe.
3. Joining sections of ductile iron cement lined (DICL) pipe or welding HDPE pipes and fitting if using HDPE.

4. Trench excavation and pipeline installation of pipe with valve fitting and backfilling of trench.
5. Underboring sealed roads and watercourses.

Details of the activities involved in the construction of the water supply pipeline are presented in **Appendix 5** (Section A5.9).

It is proposed that these crews would operate independently in a sequential manner to achieve the required efficiencies and minimal periods of disturbance. In total, it is anticipated the pipeline contractor would employ approximately 35 persons on a full-time equivalent basis throughout the construction program, of which approximately 10 persons are anticipated to be employed by local subcontractors.

All crews would be required to undertake their tasks in a manner consistent with the development consent for the Project and the contractor's quality, health, safety and environmental policies.

It is envisaged that approximately six compounds each of approximately 0.2ha, would be established along the length of the pipeline for the storage of pipe, joints, backfilling sand etc. The contactor would select these sites near the water supply pipeline corridor on cleared privately-owned land in much the same manner as the MWRC or RMS would during road upgrading campaigns. Each selected compound site would be the subject of an agreement with the landowner. Each compound would be verified to have no ecological or Aboriginal heritage constraints prior to its establishment and use.

The construction of the intermediate pumping station (see **Figure 2.22**) would be undertaken concurrently with the construction of the pipeline so that it is completed in time for the commissioning of the pipeline. The intermediate station would be located in the Cooks Gap area between Chainages 42km and 46km. Connection of power to the pumping stations would be sought from Essential Energy's three phase powerlines that run parallel along these chainages.

It is estimated that the water supply pipeline would be constructed in a period of approximately 10 months subject to the duration of inclement weather conditions. Towards the end of the pipeline construction, commissioning would commence through a combination of tests using air and/or water. Water for the testing would be delivered in water tankers to the relevant valve pits. All water used in the commissioning process would ultimately end up at the Mine Site.

It is planned that the contractor's crew installing the pipeline would achieve the excavation, placement and backfilling of approximately 400m of the pipeline each operational day, however, this may vary depending on local environmental and inclement weather conditions.

The construction program would be undertaken over a period of up to 10 months between 7:00am and 6:00pm, Monday to Friday, and 8:00am and 1:00pm, Saturday, public holidays excluded.

2.10.5 Pipeline Operations

Once the pipeline has been fully tested, pumping of water would commence at the required rate. Bowdens Silver proposes to operate the pipeline at a relatively constant flow rate 24 hours per day, 7 days per week with all water pumped to the 8ML raw water dam within the processing area. Any excess water to that required for processing or dust suppression would be pumped to a turkeys nest storage dam located immediately west of the on-site nursery.

Regular maintenance would be undertaken along the full length of the pipeline to ensure it is operating fully in accordance with the required specifications.

2.10.6 Pipeline Decommissioning

In the event that a third party does not require the pipeline and associated infrastructure upon cessation of mining operations, the pipeline and the pumping stations and valves would be decommissioned. The decommissioning would involve:

- the removal of all equipment at the pumping stations and re-establishment of the former landform and vegetation;
- the removal of all valves and instrumentation and backfilling of all pits; and
- removal of the pipeline, backfilling and rehabilitation of the trench – in the event this is a requirement of the landowner.

A rehabilitation program similar to that undertaken during the construction stage would be undertaken following the backfilling of the trench.

2.11 SITE INFRASTRUCTURE AND SERVICES

2.11.1 On-site Road Network

Bowdens Silver would maintain a network of internal light vehicle and off-road haul roads to provide access between the main open cut pit, processing plant and other operational areas throughout the Mine Site.

A series of haul roads would be constructed to enable haul trucks to transport waste rock from the open cut pits to the WRE and ROM ore to the ROM pad (see **Figure 2.8**). It is anticipated that the WRE upper and lower embankment haul roads from the eastern side of the main open cut pit, would be in use for the life of the mine whereas the northern ROM haul road would be in use from about Year 3 of operations.

It is proposed to upgrade a section of the existing Maloneys Road between the main open cut pit and the mine access road to provide access for the B-double trucks transporting NAF waste rock to the TSF embankment from the site establishment and construction stage until about Year 8.

Other internal haul roads may be semi-permanent and relocated as required to maintain minimum haul distances and optimum grades, whilst minimising potential noise impacts. Roads located in the open cut pits would be designed and constructed to a maximum gradient of 10%, with all two-way traffic roads designated for use by mining equipment formed to a minimum width of three times the maximum width of the largest vehicle, plus berms and drainage features. All haul roads would be all-weather roads.

The light vehicle road network would comprise all remaining roads within the Mine Site that would not accommodate off-road vehicles and include access roads to the mining facility, TSF, magazine, primary jaw crusher, processing plant and other minor roads. The main internal road from the main security gate to the processing plant and mining facility would be approximately 9m wide. This road would be the principal route within the Mine Site for the delivery of processing consumables and fuel. All other internal roads on the Mine Site would typically be 4m to 5m wide.

2.11.2 Buildings

Bowdens Silver would establish the administration buildings, site offices and amenities block close to the entrance gate north of the proposed processing plant (see **Figure 2.1**). A car park would also be constructed adjacent to the administration buildings to provide parking for the mine workforce and visitors. The site buildings and their indicative dimensions would include the following.

- Gatehouse (3.3 m x 12 m);
- Safety and ERT complex (10m x 14m);
- Main administration building (14m x 20m);
- Training facility (6m x 12m);
- Processing plant office (12m x 14m);
- Change rooms (16m x 12m);
- Processing plant control room within processing plant (3m x 12m);
- Milling control room (3m x 6m);
- Mining office (15m x 14.4m);
- Analytical laboratory (33m x 14m);
- Mining warehouse and light vehicle workshop facility (18m x 36m);
- Mining heavy vehicle and light vehicle workshop facility (65m x 18m);
- Product packaging shed (6m x 35m);
- Reagents storage shed (30m x 6m); and
- Processing plant workshop/warehouse facility (4m x 18m).

2.11.3 Power

2.11.3.1 Mine Site Power Supply

Bowdens Silver estimates that the annual power consumption would be approximately 84 000 MW hours, with the total power consumption through the mine life in the order of 1 510GW hours.

As noted in Section 2.1.3, approval for the construction and use of the necessary power supply infrastructure to supply the Project is not being sought at this time. A separate application in accordance with Part 5 of the EP&A Act would be sought from the relevant energy provider.

A range of options for reliable supply of electricity have been identified, each with its own requirements for augmentation or upgrade of facilities in order for reliable supply to be possible. However, preliminary technical enquiries have been sent to both TransGrid and Endeavour Energy have identified the viability of reliable supply. A summary of the seven options considered and the feedback from the relevant energy provider to date is provided in **Appendix 9**.

Electricity would be supplied via a 66kV transmission line that would terminate at the Mine Site's Main Mine Substation (see **Figure 2.1**) that includes a 66kV/11kV transformer in which the voltage would be reduced to 11kV before being distributed throughout the Mine Site from the main 11kV switchboard. It is expected that within the Mine Site electricity would be distributed via underground cables. All site components, including all crushing, grinding, flotation activities as well as power for the administration areas would operate from mains power. The only main component that would not be powered from mains power is the TSF decant pump which would be powered by an independent diesel generator.

In the event of a power outage or failure, Bowdens Silver would utilise an 800kW emergency diesel generator connected to the power system to allow plant lighting to function normally and selected machinery within the processing plant to operate. It is envisaged that no more than 0.5 MW would be required for emergency power. Emergency generators would also be retained on site for the key pumps used to transfer water to the raw water dam.

2.11.3.2 Re-alignment of 500kV Power Transmission Line

The Mine Site is traversed by the existing No. 5A3 Bayswater to Mt Piper and 5A5 Wollar – Mt Piper 500kV power transmission line. The quad bundle conductor double circuit 500kV power transmission line would be re-aligned to allow the open cut mining operation to proceed towards the western boundary of the main open cut pit. **Figure 2.1** displays an indicative alignment of the existing 500kV power transmission line and the proposed re-aligned section of the line.

The exact location of the re-aligned section of the line would be determined by TransGrid following the completion of three stages of investigation.

Stage 1: A desktop investigation incorporating a review of the available environmental information (principally from the EIS and supporting assessments), a review of the indicative route and development of a concept design route and transmission line profiles (to ensure sufficient ground clearance exists) and the development of a construction program, including the ability to minimise power outages when the new line is commissioned.

Stage 2: A scoping study including on-site investigations such as geotechnical studies.

Stage 3: A detailed design stage for all of the work involved in the construction, connection of the new transmission line and dismantling of the existing transmission line.

Whilst detailed staged investigations would not commence until the commencement of the Project, TransGrid has advised Bowdens Silver that "*there is no engineering reason for the line realignment to be unfeasible and that network outages, constructability and design can all be managed*". A Modification Processes Agreement would be entered into with TransGrid to facilitate Stage 1 to 3 and a Relocation Agreement would be required for the procurement and construction activities. It is estimated that the re-aligned line would be constructed during Year 3 of operations.

The proposed re-aligned power transmission line would be approximately 3km in length comprising 10 to 14 new steel towers, each approximately 45m to 60m high, i.e. comparable to the existing towers. The re-aligned section of line would be located wholly within the Mine Site on land owned by Bowdens Silver.

Overall, it is estimated the construction and dismantling of the line would take approximately 6 to 10 months. All works would be undertaking during the site establishment and construction stage within the proposed hours of operation listed in **Table 2.3**, i.e. consistent with construction activities for infrastructure projects. Between 20 to 30 persons would be employed by a contractor to construct and dismantle the power transmission line.

2.11.4 Fuel

The mining equipment fleet would be diesel-fuelled with bulk diesel stored adjacent to the workshop in self-bunded above-ground tanks with a total capacity of approximately 220 000L. The more mobile equipment such as the haul trucks would be refuelled adjacent to the on-site tanks within a bunded refuelling pad while the less mobile equipment such as the bulldozers, excavators and drills would be refuelled in pit using a mobile service truck.

Annual average diesel fuel usage for the mobile equipment operating within the Mine Site is estimated to be approximately 7.8ML/year. The trucks transporting the NAF waste rock during the construction of the initial TSF embankment would use approximately 1.2ML, whilst the transport of NAF waste rock to the TSF in the subsequent years would use between approximately 0.5ML and 0.8ML annually. In total, the annual average diesel fuel usage would be approximately 8.0ML until about Year 9 after which it would revert to 6.2ML/year. The fuel consumption would vary across the life of the mine in accordance with the destinations for the waste rock around the Mine Site.

Fuel would be delivered in B-double tankers at a rate of approximately two loads per week.

2.11.5 Consumables Storage and Maintenance

The workshop and warehouse facilities would incorporate storage areas for all mine consumables and would have properly designed and constructed drainage systems incorporating adequate hydrocarbon management and storage facilities designed in accordance with relevant Australian Standards (AS 1940:2017 – the Storage and Handling of Flammable and Combustible Liquids), including an oily water separation facility and waste oil storage areas.

Appropriate spill response measures and equipment would be maintained for hydrocarbons and any chemical storage.

2.11.6 Explosives

As discussed in Section 2.4.3.2, ANFO-based bulk explosives or customised emulsions would be used within the open cut pits to fracture the overburden and ore with NONEL or electronic detonators and boosters used for blast initiation. The ammonium nitrate prill, emulsion, diesel and other blasting products would be transported to the Mine Site as required by a licensed contractor on the day of each blast where the blasting products would be mixed as required, loaded into the pre-drilled holes and initiated.

A transportable magazine would be placed within a fenced compound in a location approved by the Resources Regulator. An indicative location for the transportable magazine is displayed on **Figure 2.1**.

2.11.7 Other Chemicals/Hazardous Materials

Table 2.4 lists the suite of chemicals and reagents to be used within the Mine Site.

2.11.8 Communications

Telephone, internet and data transfer requirements would be provided to the offices and amenities area, workshops and processing plant through a microwave radio network linking the Mine Site to the existing mobile telephone network as the Mine Site does not currently have access to fibre optic cables. Should fibre optic technology become available during the mine life, this would be investigated and potentially installed. Alternatively, a sole purpose wireless relay station could be set up to link into the national broadband network in Mudgee. Mobile phones and 2-way radio would also be used.

2.12 EMPLOYMENT

2.12.1 Site Establishment and Construction Stage

It is estimated that a workforce of up to 320 personnel would be required throughout the 18 month site establishment and construction stage. It is noted that the total number of personnel includes 74 persons from head offices involved with management, procurement, engineering, drafting, administration etc. The number of personnel on site would vary throughout this stage with the average full-time equivalent employment of 131 persons during the 18 month period.

Bowdens Silver anticipates the site establishment and construction workforce would comprise persons engaged under the following employment arrangements.

- Employed by the contractor appointed to construct the processing plant (likely to be based either in Sydney, Newcastle, Wollongong or interstate).
- Employed by local contractors or service providers either employed directly or sub-contracted to undertake specific tasks, e.g. site earthworks, crushing and screening construction materials, cleaning and rubbish removal.
- Employed directly by Bowdens Silver and drawn from local towns, villages and surrounds.

During the 6 to 8 month period when the 500kV power transmission line would be re-aligned (prior to Year 4), approximately 30 personnel would be employed by the contractor undertaking this activity.

Bowdens Silver proposes that all construction personnel engaged from outside the surrounding communities would rely upon temporary accommodation in the Mudgee / Rylstone / Kandos area.

2.12.2 Operations

The operations workforce is expected to vary between approximately 190 and 228 personnel. **Table 2.8** presents the summary of daily and total employment level throughout the mine life with a distinction made between the periods when mining is undertaken during the day only, of a day-time and evening and 24 hours per day. The variation is attributed to the variation in the number of mining shifts per day. When mining is undertaken during the day only, a total of 46 persons would be employed, i.e. on the basis of 7 days on and 7 days off whereas when mining is undertaken during the day and evening or 24 hours per day, a further 24 persons would be employed.

Whilst the bulk of the jobs associated with the Project would be full-time, Bowdens Silver would be supportive, where practical, to offer a range of part-time jobs that would be suited to a number of workers, e.g. off surrounding properties to earn an off-farm income.

Table 2.8
Summary of Daily and Weekly Employment

Personnel	Weekday	Weekend	Total Weekly
Mining - Day Only			
Administration, Technical and Professional	42	nil	42
Mining (7 days on / 7 days off) (1 x 12hr shift)	23	23	46
Processing Plant, Maintenance and Technical (4 days on / 4 days off)	42	42	84
Exploration	20	nil	20
Total	**127**	**65**	**192**
Mining – Day / Evening			
Administration, Technical and Professional	42	nil	42
Mining (7 days on / 7 days off) (2 x 8hr shift)	35	35	70
Processing Plant, Maintenance and Technical (4 days on / 4 days off)	48	48	96
Exploration	20	nil	20
Total	**145**	**83**	**228**
Mining – Day / Evening / Night			
Administration, Technical and Professional	42	nil	42
Mining (7 days on / 7 days off) (2 x 12hr shift)	35	35	70
Processing Plant, Maintenance and Technical (4 days on / 4 days off)	48	48	96
Exploration	20	nil	20
Total	**145**	**83**	**228**

The personnel listed in **Table 2.8** would be employed directly by Bowdens Silver or through the mining contractor or other contractors employed on site. The bulk of the operations workforce would be sourced from either Mudgee or Rylstone, Kandos and Lue and nearby smaller towns and villages. Bowdens Silver has estimated that at least 40% of the on-site workforce would be drawn from the Rylstone/Kandos area. Many of the workforce from the former Kandos Cement Works have expressed their interest in working at the Mine Site, rather than travel considerable distances to the various coal mines north of Mudgee at which they have worked since the Kandos Cement Works ceased operations.

Bowdens Silver does not plan to build any housing in Mudgee, Rylstone, Kandos or Lue.

2.13 HOURS OF OPERATION, SHIFTS AND PROJECT LIFE

2.13.1 Hours of Operation

Table 2.9 displays the proposed hours of operation for the key operational activities within the Mine Site. Site establishment and construction hours have previously been outlined in **Table 2.3**.

Table 2.9
Hours of Operation

Activity	Days	Hours
Clearing / topsoil and subsoil removal	Monday to Saturday[1]	7:00am to 6:00pm[2]
Blasting	Monday – Saturday[1]	10:00am to 4:00pm
Mining	7 days	7:00am to 6:00pm 7:00am to 10:00pm[3] 24hrs[3]
NAF waste rock transfer to the TSF embankment	Monday – Saturday[1]	7:00am – 6:00pm
Processing	7 days	24hrs
Concentrate Despatch	Monday to Saturday[1]	7:00am to 6:00pm[4]
Maintenance	7 days	24hrs
Rehabilitation	Monday to Saturday[1]	7:00am to 6:00pm[2]

Notes: 1 Public Holidays excluded.
2 Daylight hours only.
3 Subject to demonstrating noise limits can be satisfied during the evening and night-time periods.
4 Excluding 7:30am to 8:30am and 3:30pm to 4:30pm (School bus period) – when heavy vehicles (other than buses) must not travel on Lue Road.

During the early stages of mining, after the site establishment and construction stage, operational hours would continue to be confined to day-time only. Bowdens Silver proposes to progressively extend mining operations into the evening and ultimately 24 hours per day subject to demonstrating the relevant noise limits set for the mine can be complied with during those periods. Based upon the outcomes from the noise assessment it is anticipated that evening and night-time mining operations would commence in Year 2 and Year 3 respectively.

Section 4.2.2.5 includes discussions on how Bowdens Silver intends to modify its evening and night-time mining operations in order to satisfy the relevant noise limits. It is noted that there would be some occasions throughout the mine life when it would be necessary to revert to day/evening or only day mining operations in order to satisfy the noise criteria nominated in the environment protection licence for the Project.

2.13.2 Workforce Shifts

Operations would be undertaken in staggered shifts across the administration, mining, processing, maintenance and exploration functions.

- Administration, Technical, Professional and Exploration Personnel – 8 hour shift, five days (Monday to Friday) with two days off (Saturday and Sunday).
- Mining Personnel – the number of shifts per day would vary throughout the mine life depending upon the restrictions relating to noise compliance. Mining personnel would work 7 days on / 7 days off. Typical shift arrangements would be as follows.
  - Day only: one x 11 hour shift from 7:00am to 6:00pm
  - Day / Evening: two x 8 hour shifts from 6:30am to 2:30pm and 2:00pm to 10:00pm
  - Day / Evening / Night: two x 12 hour shifts from 7:00am to 7:00pm and 7:00pm to 7:00am.
- Processing Plant & Maintenance Personnel – varied shifts per day working 4 days on / 4 days off rotation, with typical shift arrangements as follows.
  - Day only: one x 12 hour shift from 6:00am to 6:00pm
  - Day / Evening: two x 8 hour shifts from 6:00am to 2:00pm and 2:00pm to 10:00pm
  - Day / Evening / Night: two x 12 hour shifts from 6:00am to 6:00pm and 6:00pm to 6:00am.

Table 2.10 lists the planned number of personnel per shift for the administration, technical and professional roles; mining; and processing plant, maintenance and technical roles and the respective shift times.

2.13.3 Mine Life and Project Life

For the purposes of this document, the mine life refers to the period of the 18 month site establishment and construction stage and the 15 year period of processing and concentrate manufacture, i.e. the mine life would be 16.5 years.

The Project life refers to the mine life and the estimated 7 year final rehabilitation and maintenance period (commencing 0.5 years before the end of processing), i.e. a total of 23 years. **Figure 2.2** displays schematically the duration of each of the key components of the Project.

It is anticipated that the completion of the rehabilitation of the surface of the TSF would take the longest period of time, i.e. in the order of 4 years. A 3-year period of maintenance is proposed, although greater clarity on the duration of the maintenance period would be determined during the post operational period. Bowdens Silver is committed to maintaining the revegetation and water management processes, particularly with respect to the leachate reporting to the leachate management dam. Over time the quantity of leachate would reduce until leachate generation ceases. Relinquishment of the mining lease over the entire Mine Site would only occur once all revegetation satisfies the requirements of the Resources Regulator and leachate generation from the WRE ceases. It may be feasible to progressively relinquish the section of the mining lease where all rehabilitation constructions have been satisfied.

Table 2.10
Workforce Shift Arrangements and Total Employment

Personnel	Days	Shift Arrangements		Workforce per Shift	Workforce Total
Administration, Technical and Professional	Monday to Friday	8:00 am to 4:00 pm 5 days on/2 days off		42	42
Exploration				20	20
Mining	7 days	7 days on/7 days off			
		Day only	6:30am to 6:30pm	23	46
		Day / evening	6:30am to 2:30pm	23	70
			2:00pm to 10:00pm	12	
		Day / evening / night	7:00am to 7:00pm	23	70
			2:00pm to 10:00pm	3	
			7:00pm to 7:00am	9	
Processing Plant, Maintenance and Technical	7 days	4 days on/4 days off 4 nights on/4 nights off			
		Day only*	6:00am to 6:00pm	37	84
			6:00pm to 6:00am	5	
		Day / evening*	6:00am to 6:00pm	37	96
			2:00pm to 10:00pm	1	
			6:00pm to 6:00am	10	
		Day / evening / night*	6:00am to 6:00pm	37	96
			2:00pm to 10:00pm	1	
			6:00pm to 6:00am	10	
* Shift configurations dependent upon mining shift arrangements					

The Project life may be extended depending on the results of future exploration and drilling activities, particularly at depth beneath the main open cut pit. That said, the Feasibility Study for the Project indicates that the previously defined mineral resources beneath the main open cut pit do not contain sufficient mineral grades to warrant their extraction.

2.14 GENERAL WASTE MANAGEMENT

2.14.1 Introduction

The principal non-production wastes that would be generated during the proposed site establishment and construction stage and subsequent operations would include the following.

- Residual materials remaining after the demolition of the four residences, farm buildings and fencing within the active area of the Mine Site.
- General domestic type wastes from the on-site offices, shower blocks, workshop and processing facilities and routine maintenance consumables.
- Scrap steel, hydrocarbons including waste oil and other wastes remaining from equipment maintenance.

- Sewage.
- Reverse osmosis brine generated on-site from treatment for potable water.

2.14.2 Demolition Materials

All efforts would be taken to re-use any suitable building materials recovered during the demolition of the four residences. All unusable materials would be disposed of at either the Mudgee Waste Depot or Kandos Waste Transfer Station. Any asbestos waste would be fully wrapped to meet Council's requirements for acceptance at Council's waste facilities or another suitably licensed facility.

Suitable fencing materials recovered would be re-used on Bowdens Silver's properties retained for ongoing agricultural uses and any unusable fencing wire and metal posts would be set aside for metal recycling.

2.14.3 Domestic Type Waste

Domestic type wastes would be treated as general waste. Two collection streams would be provided with recyclables separated and placed in bins or collection skips fitted with lids or covers. The principal recyclables collected would be steel, aluminium, glass, paper and cardboard. Bins and/or collection skips would be located in areas or adjacent to buildings in which the wastes are generated and collected on an as needs basis by Council or licensed waste contractors. The maximum quantity of wastes stored would not exceed the maximum quantity nominated by the EPA and the contents disposed of at either the Mudgee Waste Depot or Kandos Waste Transfer Station.

Bowdens Silver estimates approximately 450m^3 of domestic mixed solid waste and 280m^3 of recyclables would be produced annually. Mid-Western Regional Council has advised Bowdens Silver that Council would be prepared to accept this quantity of wastes.

2.14.4 Maintenance Waste

Routine maintenance of mobile mining and earthmoving equipment would be undertaken within the on-site workshop or, in the case of any major refurbishment activities which cannot be undertaken on site, at equipment maintenance facilities away from the Site.

Waste oil would be stored in a 5 000L self-bunded waste oil tank within the mining facility from where it would be collected and removed from site for disposal/reuse by an appropriately licensed waste recycler. All other waste hydrocarbons associated with equipment maintenance would be stored in a concrete bunded area, designed in accordance with relevant Australian Standards (AS 1940:2017 – the Storage and Handling of Flammable and Combustible Liquids), to await collection. An oily water separation facility would be installed, with the separated hydrocarbons sent to the recycling tank and the treated water reporting to the process water tank.

All routine maintenance consumables and non-hazardous solid wastes would be treated as general mixed solid waste. Separate bins or collection skips would be maintained at the workshops for cardboard and metals.

2.14.5 Sewage

All sewage generated during site establishment and construction would be managed through temporary systems. These systems would likely be pump-out systems and would be maintained by a licensed contractor.

For the operational period, it is proposed to construct and operate an appropriately sized sewage management system within the footprint of the processing plant, capable of managing sewage from up to 150 persons per day. All water treated through the system would either be irrigated or used as process water (treated waste water discharged to TSF for recycle to the process plant.). Any waste water used for irrigation from the systems would be undertaken in compliance with the EPA's guidelines "*The Use of Effluent by Irrigation*" with the remaining water treated in compliance with Australian Standard AS/NZS 1547:2012 "*On-site Domestic Wastewater Management*".

2.14.6 Reverse Osmosis Brine

All saline brine generated by the on-site potable water reverse osmosis plant would be pumped to the process water tank for entry into the process water circuit.

2.15 SAFETY/SECURITY MANAGEMENT

2.15.1 Public and Employee Safety

It is Bowdens Silver's policy that each person working on or visiting the Mine Site would be provided with a safe and healthy environment and that facilities and equipment would be kept secure from unauthorised access. In order to achieve this, Bowdens Silver would implement recruitment, induction and training programs to achieve the following objectives.

- Comply 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;
- Collaborate with local emergency services in training and security initiatives;
- Ensure all contractors adopt and maintain Bowden Silver's policy objectives and safety standards at all times; and
- Undertake regular drug and alcohol testing in accordance with Bowdens Silver's Fitness for Work Policy.

Further to the above, the following operational safety controls would be installed within the Mine Site.

- A safety bund wall approximately 2m high would be constructed around the perimeter of the main open cut pit. This bund would be constructed at the time when mining operations are being undertaken close to the boundary of the main open cut pit.
- Signs identifying blasting times would be installed adjacent to the entrance of the Mine Site from the relocated Maloneys Road and in Lue. The issue of blast notification would be the subject of ongoing discussions with the community.
- Where internal 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.
- 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.
- 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 NSW Resources Regulator (January 2018).

Central to all aspects of public and employee safety would be the adoption of a pro-active approach to workplace safety, the preparation of a Work Health and Safety Policy to cover all activities at the Mine Site and strict compliance at all times with the requirements of the relevant regulations, Acts and Australian Standards (including AS 1470-1986 Health and Safety at Work – Principles and Practices).

Bowdens Silver is committed to ensuring the safety of all visitors and the general public and would adopt a set of procedures when member of the general public visit the Mine Site. A number of the security measures outlined in 2.14.2 would assist in achieving the safety of the general public at all times, including the period following the cessation of mining and processing, when final rehabilitation is underway.

2.15.2 Mine Site Security

Bowdens Silver recognises that the proximity of the Mine Site to Lue and the relocated Maloneys Road would necessitate the implementation of procedures and controls to protect the safety of the public. In order to ensure that access to the Mine Site is restricted to authorised personnel only, the following items would be implemented to ensure that members of the public do not access the Mine Site at any time, unless authorised.

- Installation of a security fence around the perimeter of the key operational areas within the Mine Site, with the exception of areas where rugged topography naturally restricts access. The security fence would consist of a combination of a cyclone fence and a five strand barbed wire rural fence.
- A security gate would be installed in the vicinity of the mine entrance. This would be the only vehicular access point to the operational sections of the Mine Site. Visitor and non-authorised vehicles would be required to report to the gate house before being permitted to enter the operational sections of the Mine Site.
- 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 signs would be positioned as appropriate to the location of the mining activities at any given time.
- Signs identifying blasting procedures and times would also be installed at the mine entrance.

2.16 REHABILITATION, MINE CLOSURE AND FINAL LAND USES

2.16.1 Introduction

Rehabilitation of all areas disturbed by mining-related activities would be an integral part of the Project to be undertaken by and paid for by Bowdens Silver. Emphasis would be placed upon progressively creating final landforms, wherever practicable, and re-establishing soil profiles and vegetation essential to achieving the preferred final land use(s) during and following the cessation of operations. The nature of the Project dictates, however, that the disturbed areas associated with the main open cut pit, processing area and TSF would remain active throughout the mine life and as a consequence, the opportunity to undertake progressive rehabilitation of these components would be minimal.

Rehabilitation activities within the Mine Site would be planned and undertaken in accordance with a Rehabilitation Management Plan to be submitted to the Resources Regulator and approved following the issue of development consent and grant of the mining lease for the Project, and prior to the commencement of any mining-related activities within the Mine Site. The Plan would also address all rehabilitation-related requirements nominated in the development consent for the Project.

The proposed rehabilitation strategy for the Project has been designed with reference to the following documentation.

- Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth Government, 2016).
- Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth Government, 2016).
- Towards Closure – Mine Rehabilitation in the Australian Minerals Industry (MCA, 2015).
- Strategic Framework for Mine Closure (ANZMEC, 2000).
- Safety Bund Walls around Abandoned Open Pit Mines (WA Department of Industry and Resources, 1997).

This subsection focusses upon outlining rehabilitation activities planned within the Mine Site and during the construction of the relocated Maloneys Road between the Mine Site and Lue Road. The rehabilitation activities are addressed for the site establishment and construction stage and for each of the key domains within the Mine Site. For each domain within the Mine Site, the specific rehabilitation objectives are defined together with relevant design information, rehabilitation procedures and specific success criteria. Details of how each rehabilitation component would be undertaken is presented in **Appendix 5**.

This subsection concludes with an overview of the sequence of rehabilitation activities across the entire Mine Site throughout the Project life and Bowdens Silver's plan for rehabilitation monitoring and maintenance and ultimately mine closure together with discussions regarding interim and final land uses.

2.16.2 Rehabilitation Objectives

Bowdens Silver recognises that the rehabilitation of the areas disturbed throughout the mine life is an integral component of the Company's development strategy. Bowdens Silver is committed to the integration of sustainable development principles in all components of the Project, particularly for rehabilitation and mine closure, as the ongoing productivity of much of the Mine Site is important for future generations. In this regard, Bowdens Silver recognises that, given the nature of some of the Project components, there would be a need for some different land uses within parts of the Mine Site and variations to species composition from those within the existing ecosystems in other parts of the Mine Site.

In the short term, Bowdens Silver's objectives would be to commence rehabilitation as soon as practical in areas no longer required for mining in order to improve long-term outcomes and to temporarily rehabilitate areas not required in the short term (but that may be disturbed later) in order to stabilise disturbance and, by doing so, minimise visual impacts, dust generation and erosional sedimentation until further mining-related disturbance is required.

Bowdens Silver's longer term rehabilitation objectives are that:

- the rehabilitated landform is safe, stable and sustainable particularly with regards to soils and hydrology;

- components of the final landform, including diversion channels, are re-instated or stabilised with native vegetation to specifically provide fauna habitat and corridors;
- the surrounding environment is not polluted by any mine-related activity during the mine life or following mine closure;
- the contaminated areas remaining on site, namely the WRE and TSF are appropriately covered and vegetated to ensure the materials in both component areas does not contribute to any off-site pollution.
- the rehabilitated final landform requires low levels of maintenance;
- the approach to rehabilitation is continually reviewed based on site specific knowledge, research and monitoring; and
- the mining lease over the rehabilitated landforms can be progressively relinquished and the security returned progressively within a reasonable timeframe after the successful completion of rehabilitation activities.

2.16.3 Planning

Successful rehabilitation of mining-related disturbance can only be achieved with diligent and structured planning, a practice implemented for the Bowdens Silver Project. The elements of the rehabilitation for the Project relied upon in planning involved the following.

1. Baseline Data Collection

The key data collected has included the following.

- Climate Data
  - long term daily average rainfall, rainfall intensity, temperature and evaporation - this data is summarised in Section 4.1.2.
- Soils Data from Soil Management Designs
  - this data is summarised in Section 4.13 and focusses upon the chemical and physical properties of the soils within the Mine Site that influence erosion potential and their value as a growth medium.
- Vegetation and Ecosystems Data
  - vegetation communities, threatened species, canopy cover and rooting depths- this data is summarised in Section 4.10.
- Fauna presence and populations
  - known fauna habitat, existing fauna corridors, threatened species.
- Topography and Drainage Data
  - detailed contours (from LIDAR mapping), defined major and minor watercourses.

2. Waste Rock Characterisation

Considerable emphasis has been placed upon the characterisation of the waste rock to be extracted from the open cut pits. Details of the characterisation studies are provided in the Materials Characterisation Assessment (Part 3 of the SCSC) with a summary included in EIS Sections 2.5.2 and Section A5.4.2 (**Appendix 5**). This information has assisted to identify what quantities and types of NAF waste rock would be produced and during which stages of the mining operation. Importantly, this information is required principally for the covers to be constructed on the final landform surfaces of the WRE and TSF.

3. Landform Design

All of the key components of the Mine Site have been designed initially as functional operational components with emphasis placed, wherever possible, upon minimising the disturbance footprint yet achieving a stable and safe structure that reflects best practice for each component. Upon completion of the preliminary design of each component, the approach to the final landform design commenced, (such as the WRE and TSF), where emphasis was placed on the design of a long-term cover. For the processing area and mining facility, emphasis was placed upon re-profiling the area to blend the final landform into the surrounding natural topography.

4. Surface Water Management

Each of the final landforms for each domain would provide for the long-term management of surface water with consideration of diversion, collection and discharge, if appropriate.

5. Seed and Fertiliser Selection

The stabilisation of disturbed areas around the Mine Site and long term growth of vegetation for habitat development would be achieved through the growth of a range of trees, shrubs and ground covers. In order to temporarily stabilise disturbed areas, particularly slopes, emphasis would be placed upon the use of exotic grasses suited to the planting season. Details of the seed and fertiliser selection are provided in **Appendix 5** (Section A5.10.2.2).

6. Defining Success Criteria

Bowdens Silver has defined the success criteria for each component of the Mine Site to be rehabilitated focussing on key long term objectives outlined in Section 2.16.2. Individual performance and completion criteria would be established for each component and presented in the Rehabilitation Management Plan for the Project following the receipt of development consent and prior to the initial disturbance for the Project.

7. Stakeholder Consultation

During the community consultation program undertaken by Bowdens Silver, a number of aspects relating to the rehabilitation and final use of the Mine Site were raised, particularly with respect to stability of the final slopes, water quality runoff and weed management.

The community open day held on 15 June 2019 provided an opportunity for interested persons to provide comments on the final landform, planned revegetation strategies and long term land uses. Feedback received on the open day related to the following.

- *The water quality within the final lake.*
- *The extent of native vegetation on the final landform.*

- *Will Bowdens Silver continue to own the land on which the main open cut pit, TSF and WRE are located?*
- *When will Bowdens Silver sell the areas of land currently owned after the completion of the Project?*
- *The proportion of revegetated areas within the Mine Site returned to grazing.*

The 3D interactive model presented to the community at the open day on 15 June 2019 provided interested persons with the opportunity to comment on the final landform and extent of progressive revegetation.

Once sufficient detail was available on each Project component and the possible approach to their rehabilitation established, discussions were sought with two local Landcare Groups, namely Bingman Landcare (based in Lue) and Watershed Landcare (based in Mudgee), and the Aboriginal stakeholders involved in the cultural heritage assessment for the Project.

Both Landcare groups chose not to provide input to the rehabilitation design component of the Project as they claimed they had no knowledge of the overall project and the type of disturbance requiring rehabilitation. Bingman Landcare, a group that formed the Lue Action Group, has formally recorded that the group opposes the Project as the environmental impacts, that they assume would occur as a result of the Project, are "directly at odds" with their key values and primary focus to look after their local environment. Watershed Landcare, a group which is related to the Bingman Landcare with a number of common members, expressed similar sentiments to those of Bingman Landcare that their "input was only being sought on a very narrow subject" given their group had a range of core interests such as water quality, soil health, biodiversity, impacts on agriculture and other socio-economic issues.

Discussions held with the Aboriginal stakeholders regarding the final landform established that, whilst they did not endorse the configuration of the final landforms, there was support for the replacement of the artefacts salvaged during the mine life on those parts of the final landform that would be stable long term, preferably near where they were originally located.

2.16.4 Rehabilitation Domains

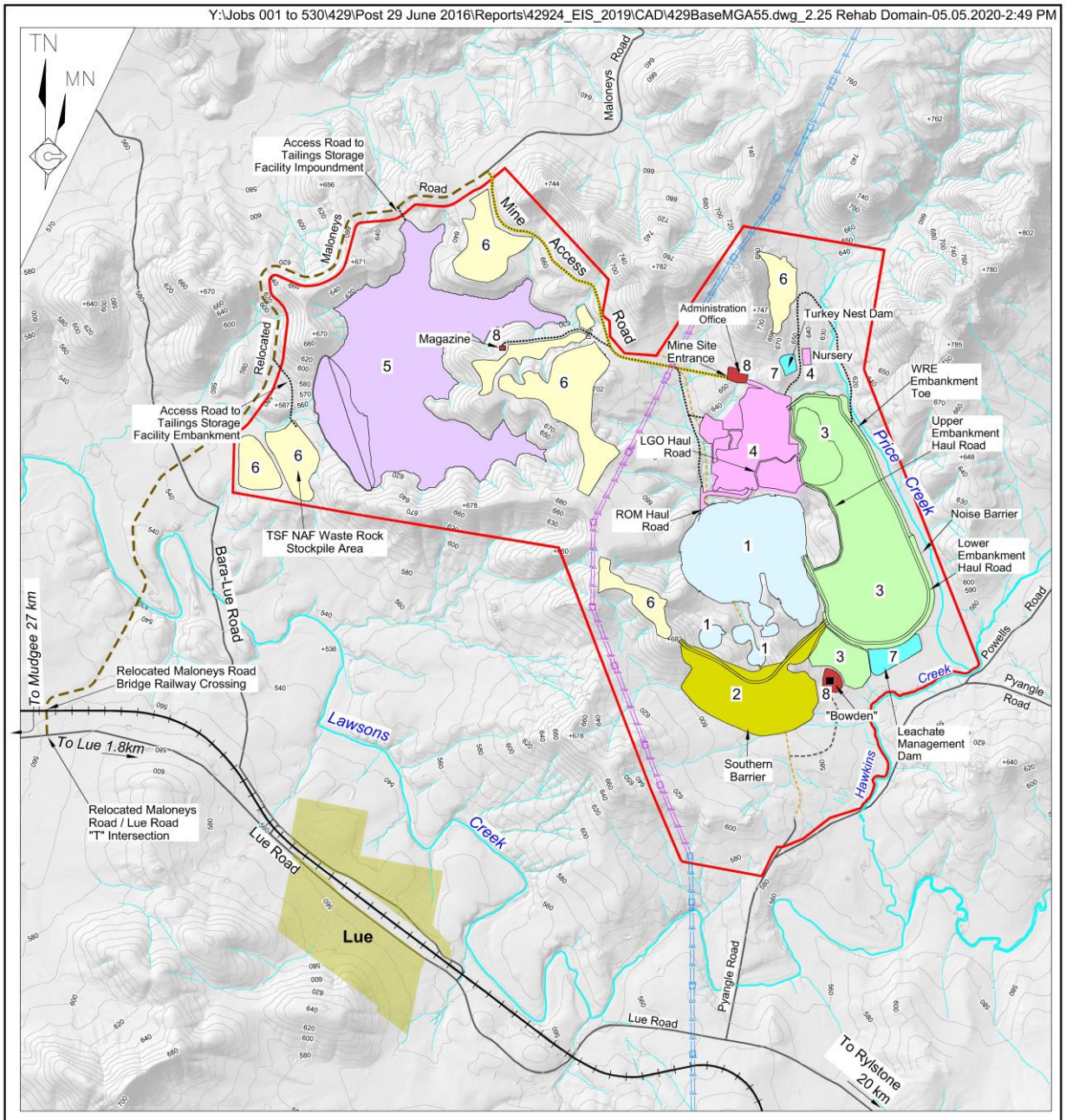
Rehabilitation domains refer to areas of related disturbance based on similar activities and/or use prior to rehabilitation and for which rehabilitation and decommissioning activities would be similar. **Figure 2.25** displays the boundaries of eight domains within the Mine Site and a description of each domain is as follows.

Domain 1 – Open Cut Pits

This domain would include the main open cut pit and the two satellite pits together with a setback of approximately 50m from the boundary of the main open cut pit to provide for safety bunding required during the mine life and beyond. The two long term accesses to the main open cut pit would also be included in this domain.

Domain 2 – Southern Barrier

This domain includes the entire footprint of the southern barrier and a 25m setback from its boundary to accommodate activities on the edge of the domain.



REFERENCE
- Mine Site Boundary
- Contour (m AHD) (Interval = 10m)
- Spot Height (mAHD)
- Existing Watercourse / Drainage Line
- Road
- Closed Railway Line
- Existing Power Line (500kV) / Tower
- Maloneys Road (Section to be closed)
- Re-aligned Power Line (500kV) / Tower
- Relocated Maloneys Road
- Mine Access Road
- Internal Road
- Haul Road / Indicative Haul Road

Rehabilitation Domains
- Domain 1 - Open Cut Pits
- Domain 2 - Southern Barrier
- Domain 3 - Waste Rock Emplacement
- Domain 4 - Processing Area and Mining Facility
- Domain 5 - Tailings Storage Facility
- Domain 6 - Stockpile Areas
- Domain 7 - Water Management Structures
- Domain 8 - Other Infrastructure

Note:
LGO = Low-grade Ore
NAF = Non-acid Forming
ROM = Run of Mine
TSF = Tailings Storage Facility
WRE = Waste Rock Emplacement

SCALE
0.5 0 0.5 1.0 1.5 2.0 km

Source: Bowdens Silver Pty Limited

Figure 2.25
REHABILITATION DOMAINS

Domain 6 – Stockpile Areas

This domain includes all soil stockpile areas outside the key component areas within the Mine Site that would be used to stockpile topsoil and subsoil recovered during the mine life and used for long term rehabilitation of the Mine Site. A total of six soil stockpile areas would be created within the Mine Site, referenced as Domain 6 on **Figure A5.3**. The NAF waste rock stockpile area located adjacent to the TSF embankment is also included in this domain.

Domain 7 – Water Management Structures

This domain includes all dams outside the key component areas used to manage sediment-laden water across the Mine Site together with the leachate management dam.

Domain 8 – Other Infrastructure

The domain includes the remaining buildings on the Mine Site including the administration building and amenities, the Bowdens exploration office and core library, the explosives magazine and the remaining tracks and roads across the Mine Site.

2.16.5 Final Landform

Figure 2.26 displays the final landform across the Mine Site at the end of the Project life. The key features of the final landform would be as follows.

1. The main open cut pit would be left as a void covering approximately 53ha and allowed to progressively fill largely with groundwater as most surface water would be diverted around the void.
2. The two small satellite open cut pits would be fully backfilled and their surfaces returned to pre-mining levels.
3. The WRE would remain as a north-south oriented ridge similar in elevation to surrounding ridges. The leachate management dam would be retained until leachate is no longer being generated. The dam would be removed and the former landform established in this area.
4. The TSF would remain as a self-draining landform with the upper surface shaped to direct all runoff to the closure spillway on the northwestern side of the former embankment.
5. The oxide ore stockpile would remain integrated with the southwestern side of the WRE.
6. The area formerly occupied by the processing plant and mining facility would be recontoured to create an undulating landform.
7. The area formerly occupied by the southern barrier would be recontoured to a landform similar in form to the pre-Project landform.
8. All soil stockpile areas would be re-established to their pre-Project landform.

Further information on the landforms for the above component areas of the Mine Site are provided in **Appendix 5**. Rehabilitation Procedures

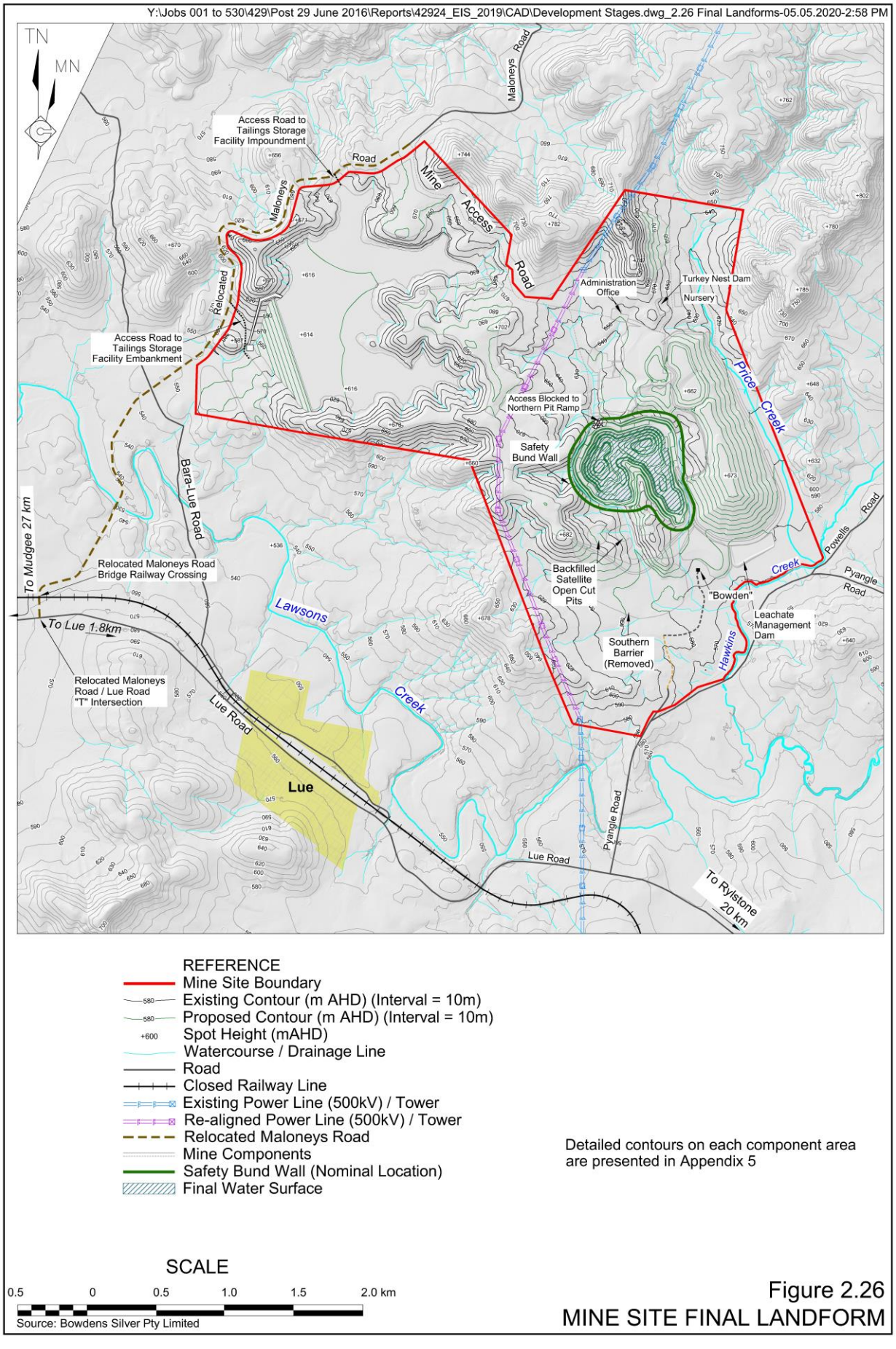


Figure 2.26
MINE SITE FINAL LANDFORM

Appendix 5 presents details of the rehabilitation procedures and relevant success criterion to be adopted throughout the site establishment and construction stage and for all key components within the Mine Site.

2.16.6 Revegetation Planning and Progressive Revegetation Sequence

As discussed in Section 2.16.1, a number of Project components would remain active throughout the mine life without the opportunity to progressively rehabilitate the areas of disturbance. However, wherever possible for other Project components, progressive rehabilitation would be implemented.

Figure 2.27 displays the areas within the Mine Site that would be the subject of either temporary or permanent revegetation for a number of representative years throughout the mine life. The temporary revegetation would occur on:

- all soil stockpiles; and
- the southern faces of the southern barrier and WRE.

Permanent revegetation would commence on the WRE in Year 2, the TSF embankment and TSF NAF stockpile area in about Year 9, the satellite open cut pits in about Year 12, and two areas of the TSF impoundment during Year 16.

Following the completion of the final landform, all disturbed areas, with the exception of the open cut pit, would be revegetated in the manner described in the previous subsections.

Overall, it is anticipated the full range of rehabilitation activities would be completed within approximately 7 years of the completion of mining.

2.16.7 Rehabilitation Monitoring and Maintenance

Bowdens Silver's commitment to effective rehabilitation would involve an ongoing monitoring and maintenance program following both the progressive and end-of-Project operations. Monitoring throughout the Project life would involve the following.

- 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.
- Evidence of any acidic runoff.

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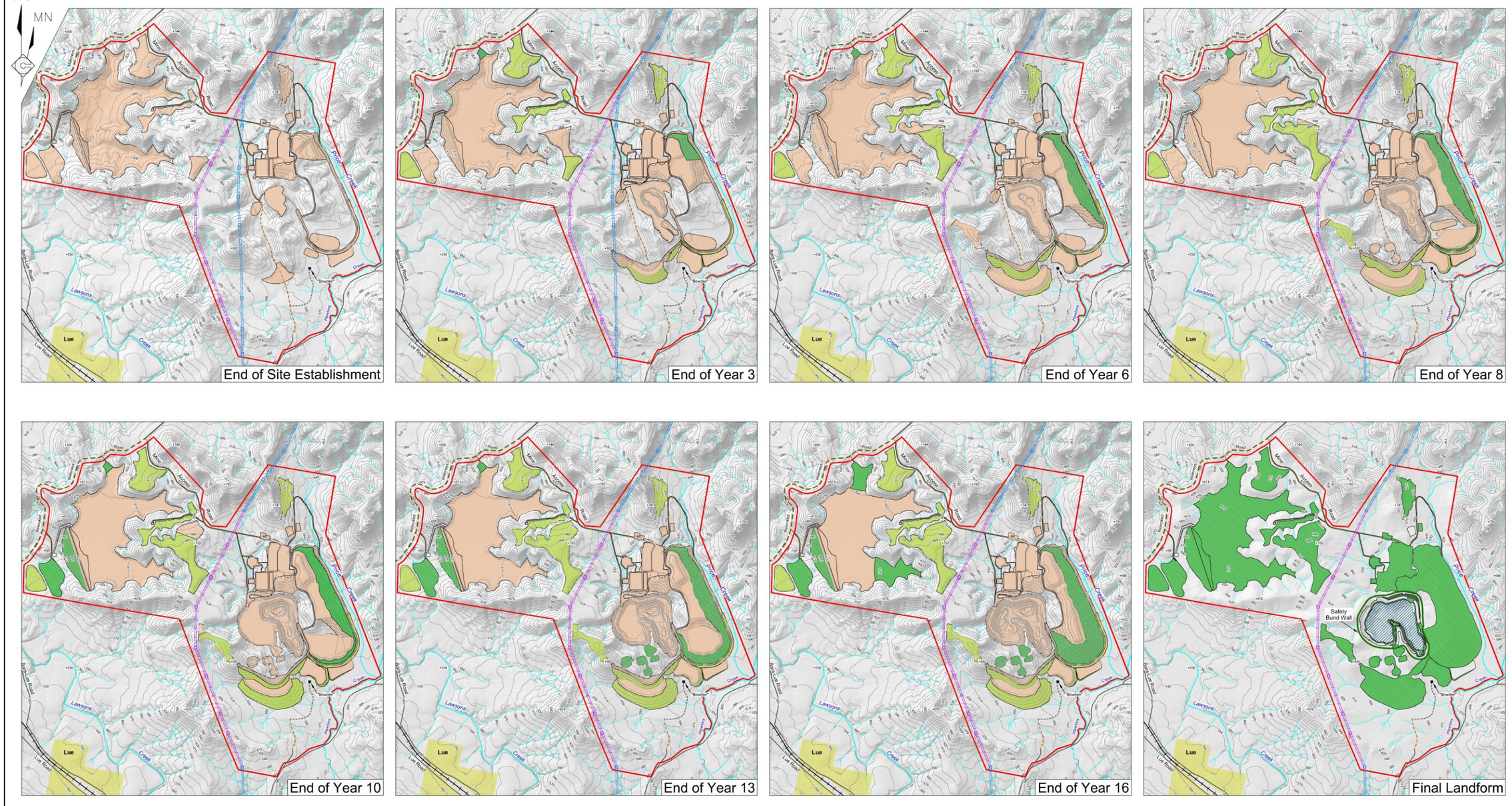

Figure 2.27
PROGRESSIVE REVEGETATION SEQUENCE

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Should any of the above identify a sub-optimal performance, 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 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 rocky fill, subsoil or topsoil, or re-designing 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 would be placed on post-mining rehabilitation monitoring and maintenance. Rather, maintenance would continue until such time as the objectives outlined in Section 2.16.2 are achieved to the satisfaction of the relevant government agencies.

2.16.8 Interim and Final Land Uses

A range of regional and local strategic documents were reviewed during the design process to identify suitable post-rehabilitation land uses. The key documents which were considered include the following.

- *Central West and Orana Regional Plan 2036*
- *Mid-Western Regional Local Environmental Plan 2012*
- *Mid-Western Region Towards 2030 Community Plan*
- *The Mid-Western Regional Comprehensive Land Use Strategy 2010*

Sections 3.2.3.5 and 3.2.3.6 present a detailed discussion of how the Project has been designed to meet the objectives of these documents. Broadly, however, these documents emphasise the importance of balancing land uses within the region to minimise potential land use conflicts. The importance of agriculture, the natural environment and industry (including mining) are recognised in each of these documents. These objectives are reflected in the rehabilitation objectives of the Project and the proposed final land uses within the Mine Site which principally comprise land for grazing and nature conservation.

Interim Land Uses

Undisturbed land within the Mine Site would principally be used for nature conservation throughout the mine life and would comprise approximately 356ha of land used for passive nature conservation and 199ha which would form part of the Project's biodiversity offset area. Grazing would not be undertaken within the biodiversity offset area, however, controlled grazing would

be undertaken periodically on land used for passive nature conservation to reduce bush fire fuel loads to acceptable levels. A total of 35ha of land within and 547ha immediately surrounding the Mine would be retained for agricultural purposes throughout the mine life on land owned by Bowdens Silver. The majority of this land would comprise modified pasture suitable for improvement and/or cropping thus ensuring stocking rates are maintained or improved, wherever possible. A single lifestyle lot (18ha) would be maintained within the southeastern quadrant of the Mine Site throughout the mine life.

A more detailed analysis of the changes in pre-Project and interim land uses is provided in Section 4.18.6.

Final Land Uses

Beyond the end of the Project life, it is anticipated that approximately 699ha of land within the Mine Site would be returned to agricultural production with approximately 252ha permanently removed from production. The land within the Mine Site to be permanently removed from production would include the void left by the main open cut pit (53ha) and the on-site biodiversity offset area (199ha). A single lifestyle lot (49ha) would be located in the southeastern quadrant of the Mine Site.

A more detailed analysis of the changes in pre- and post-Project land uses is provided in Section 4.18.6.

2.16.9 Mine Closure

2.16.9.1 Introduction

This subsection provides an overview of Bowdens Silver's approach towards mine closure, however, preparation for mine closure is a substantial commitment and would be reviewed and upgraded progressively throughout the life of the mine.

2.16.9.2 Mine Closure Completion Criteria

The individual rehabilitated areas would be monitored against the following broad completion criteria throughout the Project life, i.e. both during and following the period of mining operations, with the performance against each considered by the Resource Regulator when assessing any subsequent application for the relinquishment of the mining lease (or parts thereof) covering the Mine Site.

- The rehabilitated landform is clean and tidy, and free of rubbish, metal and derelict equipment/structures.
- Areas of the rehabilitated landform nominated for agricultural production are progressively returned for that use as soon as practicable. All sediment dams would be retained as farm dams within the future Bowdens farm.
- The rehabilitated landform is suitable for the proposed subsequent agricultural land use(s) and is compatible (as far as possible) with the surrounding land fabric and land use requirements.

- The uses of the rehabilitated landform are consistent with the capability of that landform.
- The rehabilitated landform is sustainable in terms of the intended land use(s), i.e. is stable and the maintenance needs are no greater than those of similar surrounding lands unaffected by mining activities.
- The rehabilitated landform integrates areas of re-established native vegetation and undisturbed native vegetation specifically to maintain or improve wildlife corridors.
- The rehabilitated landform provides for fauna habitat in nominated areas.
- The rehabilitated landform does not cause unacceptable air or water pollution, or other adverse environmental effects.

Success criteria for each of these broad completion criteria would be detailed within the MOP for the Project.

Site specific criteria for each of the rehabilitation domains would be detailed in a Mine Closure Plan prepared at least 5 years prior to the cessation of approved activities.

2.16.9.3 Timetable

As discussed in Section 2.13.3, Bowdens Silver proposes that the final rehabilitation activities would be undertaken over a period of approximately 7 years. Beyond that time it is envisaged some minor maintenance may be required. The completion of the mine closure program would occur when there is no further seepage from both the TSF and WRE and the respective collection dams can be removed.

2.16.9.4 Rehabilitation Security

The Division of Mining, Exploration and Geoscience (MEG) will require Bowdens Silver to lodge a bank guarantee to cover the cost of rehabilitation of the activities/land disturbance undertaken throughout the mine life in the event the Company defaults on its rehabilitation responsibilities. The quantum of the rehabilitation security would be calculated through the use of the MEG's Rehabilitation Calculation Tool and revised either annually or biennially to ensure the security is appropriate for the extent of rehabilitation required. The progressive rehabilitation undertaken would be taken into account when rehabilitation security is calculated.

2.17 BIODIVERSITY OFFSET STRATEGY

2.17.1 Introduction

For State significant development in NSW, residual impacts to biodiversity values must be offset in accordance with the relevant policies, guidelines and legislation. Niche (2020) were commissioned to review the outcomes of the assessments undertaken by EnviroKey (2020) and prepare a Biodiversity Offset Strategy for the Project.

In accordance with the SEARs provided by DPIE (**Appendix 2**), the Project is a "pending or interim planning application" under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* and the environmental assessment may be undertaken under former legislation including the *Threatened Species Conservation Act 1995* and former Section 5A of the EP&A Act. The transitional arrangements are designed to permit applications that were formally in progress at the time of legislation changes to be completed under that legislation. This approach does not provide any advantage in approach other than the benefit of saving time and cost in repeating assessment work that was already underway. Accordingly, Niche (2020) addressed the requirements of the *Framework for Biodiversity Assessment* (FBA) (OEH, 2014a) in accordance with the *NSW Biodiversity Offsets Policy for Major Projects* (OEH, 2014b).

2.17.2 Biodiversity Offset Requirements of the Project

An update to the BAR presented with the EIS was provided with the Submissions Report for the Project. The update included refinement to the assessment and two additional species credit species. Using the OEH Biobanking Calculator (version 4.0), EnviroKey (2021) has determined the biodiversity offset requirements for the Project as outlined in **Tables 2.11** (ecosystem credits) and **Table 2.12** (species credits).

Table 2.11
Ecosystem Credits Required for Biodiversity Offset

Biometric Vegetation Type	Area Impacted (ha)	Ecosystem Credits Required
CW112 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	21.80	1 187
CW242 Blue-leaved Stringybark open forest of the Mudgee region, NSW central western slopes	1.04	48
CW249 Derived grassland of the NSW South Western Slopes	5.18	60
CW263 Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	56.65	4 006
CW270 Mugga Ironbark – Red Box – White Box – Black Cypress Pine tall woodland on rises and hills in the northern NSW, South Western Slopes Bioregion	0.77	46
CW272 Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo)	0.65	38
CW291 Red Stringybark – Inland Scribbly Gum open forest on steep hills in the Mudgee – northern section of the NSW South Western Slopes Bioregion	112.62	6 545
CW299 Rough-barked Apple – Blakely's Red Gum – Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region	0.76	29
CW111 Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	159.24	9 957
CW216 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	1.24	35
CW217 White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW	21.70	1 339
Total	**381.65**	**23 290**
Source: EnviroKey (2021) – Modified after Table 32 and Table 33		

Table 2.12
Species Credits Required for Biodiversity Offset

Species		Impact	Species Credits Required
Common Name	**Scientific Name**		
Koala	*Phascolarctos cinereus*	140.36ha	3 669
Squirrel Glider	*Petaurus norfolcensis*	182.27ha	4 010
Regent Honeyeater	*Anthochaera phrygia*	288.48ha	22 213
Silky Swainson-pea	*Swainsona sericea*	64 individuals	1 152
Small Purple-pea	*Swainsona recta*	4 individuals	104
Ausfeld's Wattle	*Acacia ausfeldii*	120 individuals	9 240
Source: EnviroKey (2021) – Modified after Table 35 and Table 36			

2.17.3 Biodiversity Offset Strategy

It is proposed that the required offsets would be met in a staged manner as outlined in **Table 2.13**. A staged approach to offsetting has been implemented for several State significant developments and requires that the biodiversity offset requirements for each stage be satisfied prior to vegetation clearing for that stage, or where a Biodiversity Stewardship Agreement is proposed (as would be the most likely outcomes for the Project), within 12 months of commencement of clearing. It is noted that the Biodiversity Offset Strategy must be approved by DPIE prior to vegetation clearing commencing.

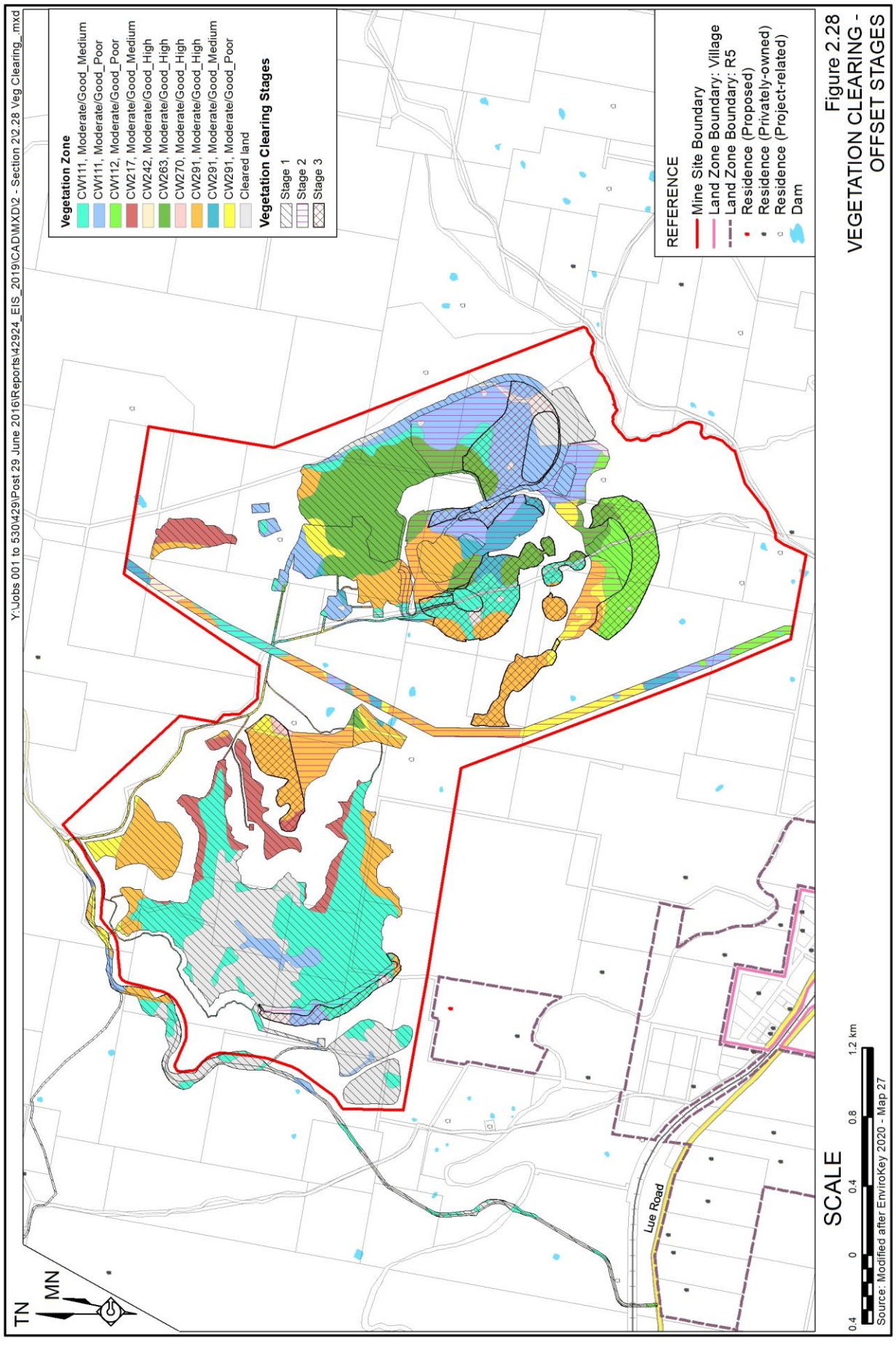
Table 2.13
Staged offset requirement

Offset Stage	Year from commencement	Clearing area (native vegetation only)	Proportion of overall clearing/ offset requirement (approx.)
Stage 1*	0-1	222.77ha	58.36%
Stage 2	3-4	82.36ha	21.58%
Stage 3	6-12	76.61ha	20.07%
* Includes clearing associated with the relocated Maloneys Road and water supply pipeline.			

A detailed summary of the biodiversity credits required for each offset stage is presented graphically in **Figure 2.28**. Calculations of the offsetting obligations in each Offset Stage would be presented in a Biodiversity Offset Strategy that would be prepared in accordance with development consent conditions and in consultation with BCD and DPIE.

To satisfy the Project's offset requirements Bowdens Silver propose to establish or facilitate the establishment of Biodiversity Offset Sites using Biodiversity Stewardship Agreements. It is noted that this is the preferred/optimum option for offsetting by DPIE. The Biodiversity Offset Sites would be established either on land within or adjacent to the Mine Site (on-site offsets) or on other freehold land within the region where offsets can be sourced under the FBA rules (off-site offsets).

The proposed on-site offsets would be established on land owned by Bowdens Silver and cover a combined area of 795ha. The on-site offsets would generate approximately 9 939 credits, meeting 43% of the Project's overall ecosystem credit offset requirement and 71% of the Stage 1 requirements.


Y:\Jobs 001 to 530429\Post 29 June 2016\Reports\42924_EIS_2019\CAD\MXD\2 - Section 2\2.28 Veg Clearing_.mxd
Vegetation Zone
CW111, Moderate/Good_Medium
CW111, Moderate/Good_Poor
CW112, Moderate/Good_Poor
CW217, Moderate/Good_Medium
CW242, Moderate/Good_High
CW263, Moderate/Good_High
CW270, Moderate/Good_High
CW291, Moderate/Good_High
CW291, Moderate/Good_Medium
CW291, Moderate/Good_Poor
Cleared land
Vegetation Clearing Stages
Stage 1
Stage 2
Stage 3
REFERENCE
Mine Site Boundary
Land Zone Boundary: Village
Land Zone Boundary: R5
Residence (Proposed)
Residence (Privately-owned)
Residence (Project-related)
Dam
Figure 2.28
VEGETATION CLEARING - OFFSET STAGES
TN
MN
Lue Road
SCALE
0.4
0
0.4
0.8
1.2 km
Source: Modified after EnviroKey 2020 - Map 27

The locations for prospective off-site offset sites have been determined following a desktop assessment that included analysis of existing vegetation mapping and species records with particular emphasis on areas mapped as BGW and proximity to previous Regent Honeyeater, Koala and Squirrel Glider records. A short-list of ten properties were identified with each landholder subsequently contacted with an expression of interest. To date no off-site offset sites have been finalised, however of the ten properties identified, seven landholders have so far expressed interest in the creation of a stewardship site (which would be facilitated by the Applicant).

Given the extent of native vegetation within the identified properties it is likely that the residual offset obligation would be met through establishment of one or two of the ten candidate properties. Bowdens Silver is therefore confident that the offsetting obligations for the Project would be satisfied by this approach. Upon confirmation of the available off-site offset areas, further fieldwork would be undertaken to determine the ecosystem and species credits that would be generated at these sites and confirm that the generated biodiversity credits would satisfy the offsetting requirements of the Project.

If necessary, any residual offset requirements would be satisfied by purchasing available credits from the market, through payment into the NSW Biodiversity Conservation Trust Fund, or other supplementary measures, subject to agreement. Niche (2020) placed the credits required for the Project onto the Biobanking credit register with several parties expressing interest in selling ecosystem and species credits. This indicates that suitable credits area available on the market. This option would be investigated further should the proposed strategy not be achievable. However, as noted above, this is considered unlikely.

The Biodiversity Offset Strategy would be approved by DPIE prior to commencement of any vegetation clearing.

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Appendix 2

Updated Summary of Environmental Management and Monitoring Measures

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Table A2.1
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure		Timing*
1. Noise			
Minimise noise-related impacts from all mobile earthmoving equipment.	1.1	Use noise attenuated mobile equipment comprising low noise or extra quiet mobile equipment where practical.	Ongoing.
	1.2	Restrict bulldozers to operate in 1st gear when operating out of the open cut pits.	Ongoing.
	1.3	Install broadband noise “quacker” style reversing alarms on all mobile equipment.	Ongoing.
	1.4	Progressively construct the lower embankment noise barrier around the WRE and southern barrier.	Ongoing.
	1.5	Position acoustic barriers up to 8.5m high adjacent to the main open cut pit haul road and northern exit to the ROM pad.	Prior to evening mining operations.
Minimise noise-related impacts from fixed plant.	1.6	Use full or partial enclosures to attenuate noise from fixed plant where practical.	Construction stage.
	1.7	Use low noise specifications, low noise idlers, soft-flow chutes and silencers.	Ongoing.
	1.8	Install mid-high frequency noise conveyor alarms.	Construction stage.
	1.9	Position nearfield acoustic barriers around the TSF crushing/screening plant.	During TSF embankment construction stage.
Continuous delivery of waste rock of an evening and ore at night.	1.10	Optimise the evening waste rock haul route to maximise the barrier effect from the existing topography and temporary acoustic bunds within the active WRE areas.	Prior to evening mining operations.
	1.11	Optimise the night-time ore haul route to maximise the barrier effect from the existing topography and acoustic barriers adjacent to the main open cut pit haul road to the ROM pad.	Prior to night-time mining operations.
Manage noise generated by the Project to levels that are compliant with conditional noise criteria.	1.12	Schedule potentially intrusive activities in day-time and/or favourable weather conditions, where feasible.	Ongoing.
	1.13	Establish and operate a real-time noise monitoring network at key residential receivers or at intermediate locations to identify the need to modify operations or shut down plant and equipment during noise enhancing weather conditions.	Ongoing.
	1.14	Establish and maintain a continuous meteorological monitoring network for the Project.	Ongoing.
Proactive Liaison with potentially affected residents.	1.15	Discuss planned activities and effectiveness of noise controls with residents in close proximity to each construction site.	During site establishment and construction stage.
	1.16	Discuss with all residents/occupiers of properties at which noise levels are predicted to exceed the Project Noise Trigger Level their actual experience of the noise that is audible.	Ongoing.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure		Timing*
2. Blasting and Vibration			
Proactively record baseline conditions for ongoing assessment of structural change impacts (where they are suspected to occur).	2.1	Commission structural surveys of all privately-owned residences within 2km of all open cut pits (subject to the agreement of the landowner and/or occupier).	Prior to the first blast (where agreement of the landowner and/or occupier has been provided).
Compliance with blasting criteria at all privately-owned residences / receivers.	2.2	Design all blasts within the Mine Area to meet airblast overpressure and ground vibration criteria at all privately-owned residences / receivers without VLAMP agreements.	All blasts.
	2.3	Provide notification of blasts to occupants of residences within 2km of each blast (subject to individual arrangements with landowners and/or occupiers).	At least 24 hours prior to each blast.
	2.4	Maintain a blast notification board at locations in Lue with notifications posted at least 24 hours prior to each blast.	At least 24 hours prior to each blast.
3. Air Quality			
Reduce dust generated by vehicles on site.	3.1	Apply site-wide vehicle speed limits and confine vehicle travel to designated routes.	Ongoing.
	3.2	Actively maintain and water haul roads (with records kept of daily water use).	Ongoing.
Reduce dust generated during extraction and processing.	3.3	Minimise travel speed and the distance travelled by bulldozers and coordinate activities to reduce push and haul distances and double handling.	Ongoing.
	3.4	Use of water sprays and/or dust aprons/collectors for drill rigs.	During drilling.
	3.5	Confirm proper stemming column length in each hole.	Prior to each blast.
	3.6	Minimise drop heights when loading ore, waste rock and soil.	Ongoing.
	3.7	Enclose the ROM feed hopper on three sides and operate water sprays during ore placement into the hopper.	Ongoing.
	3.8	Apply water during crushing operations.	During crushing operations.
	3.9	Progressively rehabilitate (both temporary and long-term) disturbed areas as applicable to the temporary / long-term use.	Ongoing as areas become available.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure	Timing*
3. Air Quality (Cont'd)		
Undertake site activities without exceeding EPA air quality criteria or goals.	3.10 Implement a proactive dust management system through a combination of the following. i) Meteorological forecasts - to predict when the risk of dust emissions may be high (due to adverse weather) ii) Visual monitoring - to provide an effective mechanism for proactive control of dust at source, before it leaves the Mine Site. iii) Real-time meteorological and air quality monitoring – to provide alerts for appropriate personnel when short-term dust levels increase, to allow management of the location and intensity of activities or increased controls.	Ongoing during operations and rehabilitation works involving earthmoving.
	3.11 Test the concentration of lead and other metals, initially monthly and then at frequencies determined through ongoing review.	At commencement of air quality monitoring and ongoing (with frequency regularly reviewed).
4. Greenhouse Gas		
Reduce GHG emissions during the design, construction, and operation of the Mine.	4.1 Rehabilitate and supplement areas cleared of vegetation within additional biodiversity offset areas, which would be improved through ongoing management of the vegetation.	Progressively during operations and ongoing.
	4.2 Consider energy efficiency during the final design of processing plant with energy efficient systems installed where reasonable and practicable.	Prior to construction stage.
	4.3 Operate plant and equipment to maximise efficiency, with mine planning used to minimise vehicle wait times and idling.	Ongoing.
	4.4 Procure locally produced goods and services where feasible and cost effective to reduce transport fuel emissions.	Ongoing.
	4.5 Review cut and fill balances for earthworks to make sure that material is transported the least possible distances.	Prior to and during construction activities.
5. Groundwater		
An accurate understanding of the characteristics of the groundwater inflows to the open cut pits from all sources.	5.1 Conduct monitoring in nominated groundwater bores within and surrounding the Mine Site.	As documented in the Water Management Plan.
	5.2 Record water pumped from the open cut pits and assess annual water use to compare against licenced entitlements.	Ongoing with review annually.
Proactive awareness and understanding of potential changes to groundwater availability and quality.	5.3 Conduct monitoring in nominated groundwater bores within and surrounding the Mine Site, including 'regional control' sites.	As documented in the Water Management Plan.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure		Timing*
5. Groundwater (Cont'd)			
Minimal contamination of groundwater resources by surface activities.	5.4	Management of surface water flows in accordance with the sites surface water management plan.	Ongoing.
	5.5	Construction of the TSF in accordance with detailed design.	Ongoing.
	5.6	Monitoring of groundwater quality and implementation of remedial actions.	Ongoing and in the event of an exceedance of any agreed parameters.
Appropriate compensation for any actual loss of groundwater availability in registered groundwater bores.	5.7	Establish acceptable contingency measures with potentially impacted landowners, should they be required in the event that the predicted lowering of the groundwater table eventuates.	Prior to operations intercepting the groundwater table for those landowners predicted to be impacted. In response to monitoring data for all others.
An accurate groundwater model.	5.8	Review groundwater model prepared by Jacobs (2021) once data is available on actual inflows to the open cut pits and use this data to validate the model.	Within 2 years of extraction intercepting the regional groundwater table.
A plan for groundwater management post-mining.	5.9	Prepare a Final Void Management Plan that takes into account management requirements post-mining.	Prior to completion of mining.
6. Surface Water			
Maximise diversion of clean water around disturbed areas to maintain flows to downstream watercourses.	6.1	Divert runoff from a 50ha area in upper Blackmans Gully catchment to Price Creek.	Site establishment and construction stage.
	6.2	Divert Blackmans Gully away from the main open cut pit and satellite open cut pits.	Site establishment and construction stage.
Maximise discharge of water from sediment dams to downstream watercourse (after treatment) as a preferential approach for management. Capture, store and re-use water where this is not feasible.	6.3	Construct and manage sediment dams to collect sediment-laden water from the TSF, TSF NAF stockpile area, southern barrier, oxide ore stockpile, WRE perimeter embankments.	Site establishment and construction stage and ongoing.
	6.4	Construct all sediment dams in accordance with Volume 2E of *Soils and Construction – Managing Urban Stormwater* (DECC, 2008)	Site establishment and construction stage.
Maintain the active storage capacity of all sediment dams.	6.5	Discharge water satisfying EPL conditions within 5 days of rainfall event, i.e. after confirming acceptable water quality – assuming either sediment settlement or flocculation.	Following rainfall event causing storage capacity.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure		Timing*
6. Surface Water (Cont'd)			
Avoid discharge of any contaminated water from the containment zone.	6.6	Pump all water from the open cut pits to the open cut dewatering pond (for use in the processing plant).	As required.
	6.7	Pump all decant water to the raw water pond for use in the processing plant.	Continuous.
	6.8	Collect all runoff from the processing plant area and mining facility in the processing plant dams.	Ongoing.
	6.9	Pump water from the Leachate Management Dam to the raw water dam.	Continuous.
	6.10	Pump brine from on-site Reverse Osmosis Plant to raw water dam.	Ongoing.
	6.11	Construct and maintain bunding around all tanks containing chemicals	Site establishment and construction stage and ongoing.
	6.12	Undertake regular inspections of all pipelines and containment structures to monitor for leaks.	Ongoing during use of water supply pipeline.
Avoidance of overflow from the TSF to downstream watercourses.	6.13	Monitoring the water level in the decant pond.	Continuously.
	6.14	Cease pumping water from external supply source when TSF water level is $\leq$4.7m below the emergency spillway invert level.	As required.
Ensure all hydrocarbons contained within the Mine Site.	6.15	Store all diesel and waste oil in self-bunded above ground tanks	Ongoing.
	6.16	Refuel all mobile equipment (in the mining facility) in dedicated areas with perimeter bunding and spill kits.	Ongoing.
	6.17	Store all 205L/20L drums in bunded storage area(s)	Ongoing.
	6.18	Collect and remediate hydrocarbons – contaminated earth.	As required.
	6.19	Maintain an oil-water separator within the workshop / maintenance area.	Ongoing.
Manage the storage, use and spill management of other potential contaminants.	6.20	Store a range of potentially hazardous materials within bunded areas or containers at the Mine Site in accordance with a chemicals management system.	Ongoing.
	6.21	Implement and maintain a pump-out sewage management system by a licenced contractor.	Ongoing.
	6.22	Reuse all brine generated by the reverse osmosis plant in processing.	Ongoing.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure		Timing*
7. Health Risks			
Ensure dust is controlled on site to prevent further contamination.	7.1	Prepare and implement an Air Quality Management Plan outlining the measures to manage air emissions (consistent with those considered and outlined in the Air Quality Impact Assessment).	Prior to site disturbance activities and ongoing.
Prevent contamination of surface water downstream of the Mine Site to maintain water quality standards.	7.2	Implement the Project's Water Management Plan.	Ongoing.
Manage and minimise noise and blasting impacts from the Project on the surrounding population.	7.3	Develop and implement a Construction Noise Management Plan, Blast Management Plan and Operational Noise Management Plan.	Ongoing.
Management of perceived risks and confirmation of actual impacts.	7.4	Offer lead blood level testing to Lue and district residents.	Prior to site disturbance activities and at regular intervals during operation.
	7.5	Publication of environmental monitoring results relating to lead in air and water to reduce uncertainty regarding the extent of impacts.	Ongoing during operations.
	7.6	Maintain an open-door policy and implement a good neighbour program involving regular and ongoing community engagement, providing opportunity to discuss and provide information in relation to impact monitoring and management.	Ongoing.
Management of potential mental health impacts and maximisation of positive mental health benefits.	7.7	Provide support for health service programs in the region as part of Bowden Silver's Community Investment Program.	Ongoing.
	7.8	Maximise local employment to reduce fly-in/fly-out and drive-in/drive-out employees.	Ongoing.
	7.9	Management of noise impacts so as to reduce potential for sleep disturbance (and associated mental health impact).	Ongoing.
8. Visibility and Lighting			
Reduce the impact of the Project on the visual amenity at private residences and public roads.	8.1	Undertake progressive rehabilitation of the Site focusing particularly on the revegetation of visible disturbed areas.	Ongoing.
	8.2	Enhance the existing tree screen adjacent to Pyangle/Powells Roads.	Ongoing and expanded from site establishment and construction.
	8.3	Plant tree screens around the outer southern perimeter of the southern barrier and TSF.	As it is developed.
	8.4	Adopt a dark grey/green colour scheme for site buildings and roadside noise barriers.	During site establishment and construction.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure		Timing*
8. Visibility and Lighting (Cont'd)			
Ensure Project-related lighting does not unreasonably impact the surrounding environment or operations at the Siding Spring Observatory and local astronomical observatories.	8.5	Ensure all lighting complies with AS/NZS 4282:2019 – Control of the Obtrusive Effects of Outdoor Lighting (as amended from time to time).	Ongoing.
	8.6	Ensure all light sources have appropriate correlated colour temperatures.	Ongoing.
	8.7	Ensure all floodlights have a maximum upcast angle of 10 degrees.	Ongoing.
	8.8	Ensure that lights with diffusing covers or with visible bare lamps that emit light above the horizontal plane are not used on the outside of buildings or structures.	Ongoing.
	8.9	Restrict the use of floodlight towers to periods of active operation.	Ongoing.
9. Terrestrial Ecology / Biodiversity			
Avoid and minimise impacts on terrestrial vegetation and animal habitats wherever possible.	9.1	Delineate areas of native vegetation that are to be removed to prevent accidental damage or removal of retained vegetation.	Prior to each vegetation clearing program.
	9.2	Restrict vehicles, persons and machinery from entering areas of retained vegetation (unless for required environmental monitoring or other valid purpose) to avoid unnecessary impacts to vegetation and habitat.	Ongoing.
	9.3	Implement a pre-clearance Survey Protocol for areas of native trees and shrubs including a two-stage clearing protocol for all hollow-bearing trees.	Prior to each vegetation clearing program.
	9.4	Mark all hollow-bearing trees to be removed and catalogue their species and approximate dimensions.	Prior to each vegetation clearing program.
	9.5	Implement a seed collection plan with measures and procedures to collect, maintain and propagate from native seed sources.	Ongoing to the extent required for rehabilitation.
	9.6	Prepare and implement a feral animal management plan including an inspection program to monitor for feral animal issues.	Ongoing.
	9.7	Prepare and implement a weed management plan to monitor and, as required, control weed species within the Mine Site.	Ongoing.
Rehabilitate disturbed areas to create a final landform that maintains or improves biodiversity values of the Site.	9.8	Prepare a Rehabilitation Management Plan in accordance with the latest NSW Resources Regulator requirements / guidelines.	Prior to any ground disturbance.
Secure biodiversity offsets to offset residual biodiversity impacts.	9.9	Implement an approved biodiversity offset strategy.	Progressively in accordance with approved staging.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure	Timing*
9. Terrestrial Ecology / Biodiversity (Cont'd)		
Minimise the risk of fauna interaction with the TSF / Cyanide.	9.10 Construct the TSF in a way that minimises the risk of shallow ponds forming on uneven ground after rain events.	During TSF construction.
	9.11 Contour the floor of the TSF during construction to avoid island formation.	During TSF construction.
	9.12 Prepare and implement a Cyanide Management Plan including measures to contain cyanide, maintain levels within the prescribed limits, monitor and inform the need for contingency measures.	Prior to use of cyanide.
10. Aquatic Ecology		
Avoid and minimise impacts on aquatic vegetation and habitats where possible.	10.1 Where practical, treat water to be released from all existing dams to eradicate the invasive eastern gambusia.	Prior to any discharge of water from existing dams.
	10.2 Screen any discharge pipes to minimise any eastern gambusia from entering surrounding watercourses, if treatment in 10.1 is not successful.	Ongoing during water discharges.
	10.3 Underbore any watercourses where significant water flows are present at the time of the construction of the water supply pipeline.	During water supply pipeline construction.
	10.4 Implement a monitoring program within Hawkins and Lawsons Creeks and associated alluvial aquifers to monitor potential impacts to aquatic biota, habitat and stygofauna.	Prior to the commencement of construction activities and ongoing throughout operations.
11. Traffic and Transport		
Achieve safe and efficient road transport operations.	11.1 Prepare and implement a detailed Traffic Management Plan, incorporating a Driver's Code of Conduct, to safely manage any traffic impacts during all stages of the Project.	3 months prior to commencement of the site establishment and construction stage and for the Project-life.
	11.2 Deliver equipment and consumables necessary for the construction and operation of the Project and despatch mineral concentrates outside heavy vehicles restriction periods designated as school bus operation times.	Ongoing.
Mitigate potential traffic impacts to local road users.	11.3 Spread commencement and finish times of operational shifts at different times throughout the day.	Ongoing.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure	Timing*
12. Soils and Land and Soil Capability		
Minimise the clearing of native vegetation for the stockpile.	12.1 Undertake a weed control program (if required) in areas to be stripped of topsoil.	Prior to soil stripping.
	12.2 Where practical, transfer salvaged subsoil and topsoil directly to rehabilitation areas.	During soil stripping campaigns.
	12.3 Limit topsoil stockpile heights to 2m and stabilise with a well-fertilised non-persistent cover crop.	Ongoing.
	12.4 Limit subsoil stockpiles height to 5m and 1m of topsoil and stabilise with a well-fertilised non-persistent cover crop.	Ongoing.
Encourage organic carbon accumulation, promote microbial activity and minimise erosion.	12.5 Increase the thickness of topsoil and subsoil placed on the southern barrier to effectively provide an additional area to stockpile soil.	During southern barrier construction.
Minimise losses through erosion caused by the practices of soil stripping to maximise the value of soil as a resource for rehabilitation purposes.	12.6 Selectively strip topsoil and place in rehabilitation areas or in nominated stockpile areas.	During soil stripping campaigns.
	12.7 Add lime to the topsoil and subsoil prior to each scraping pass.	During soil stripping campaigns.
	12.8 Apply coarse grade gypsum prior to stripping and stockpiling of the 'Alluvium – medium quality' Soil Landscape Unit where required.	During soil stripping campaigns.
	12.9 Avoid stripping or spreading soils when either very dry or wet.	During soil stripping campaigns.
Minimise the impact on soil resources, terrestrial vegetation during stockpiling.	12.10 Prevent vehicle access on soil stockpiles, except where required for monitoring, seeding, addition of soil ameliorants, or weed control.	Ongoing.
	12.11 Place silt-stop fencing immediately down-slope of all stockpiles until stable vegetation cover is established. Return all material recovered from the silt-stop fencing to the stockpile.	Ongoing.
	12.12 Implement a weed eradication program should unacceptable weed generation be observed on soil stockpiles.	Ongoing.
	12.13 Establish and maintain an inventory of topsoil and subsoil resources (available and stripped) and reconcile with rehabilitation requirements.	Ongoing.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure	Timing*
13. Aboriginal Cultural Heritage		
Provide appropriate protection to the existing and any unknown Aboriginal artefacts.	13.1 Undertake archaeological field surveys with the local Aboriginal community of the areas within the water supply pipeline corridor and the proposed relocated Maloneys Road corridor that have not yet been surveyed.	Prior to any surface disturbance within the subject areas.
	13.2 Prepare and implement a Heritage Management Plan to manage those identified and any potentially unknown sites of Aboriginal heritage value within the Mine Site, relocated Maloneys Road and the water supply pipeline corridor.	3 months prior to commencement of the site establishment and construction stage and for the Project-life.
	13.3 Install and maintain protective barriers around all identified Aboriginal cultural heritage sites within the Mine Site that are located in areas that would not be disturbed by Project-related activities.	Prior to the commencement of the site establishment and construction stage.
	13.4 Adjust the water supply pipeline route, where feasible, to avoid disturbance of any identified Aboriginal cultural heritage sites.	During the site establishment and construction stage.
	13.5 Install and maintain protective barriers around identified Aboriginal cultural heritage sites in the vicinity of the water supply pipeline corridor and the proposed relocated Maloneys Road corridor for the duration of construction activities.	During the site establishment and construction stage.
	13.6 Arrange for the full salvage and storage in a "Keeping Place" of Aboriginal objects at all identified Aboriginal cultural heritage sites that would be directly impacted as the result of Project-related disturbance.	Prior to disturbance commencing and in accordance with a Heritage Management Plan.
Prevent further inadvertent impact if any Aboriginal cultural heritage sites are identified.	13.7 Stop work immediately and report the find to BCD and a qualified archaeologist to assess the significance of the site. If the site contains bones indicative of a human burial, notify the Police immediately.	Ongoing.
14. Historic Heritage		
Provide appropriate protection to the existing and any unknown historic heritage sites.	14.1 Prepare and implement a Heritage Management Plan to manage those identified and any potentially unknown sites of historic heritage value within the Mine Site, relocated Maloneys Road corridor and the water supply pipeline corridor.	3 months prior to commencement of the site establishment and construction stage and for the Project-life.
Prevent further inadvertent impact if any historic heritage sites are identified.	14.2 Stop work immediately and report the find to BCD and a qualified archaeologist to assess the significance of the site.	Ongoing.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure	Timing*
15. Public Safety Hazards		
Ensure the risk of bush fire attack is minimised at key Mine Site components.	15.1 Maintain appropriate Asset Protection Zones around key Mine Site components.	Ongoing.
	15.2 Ensure employees are trained in the proper use of firefighting equipment held on site.	Ongoing.
	15.3 Make Mine Site firefighting equipment available to the local Rural Fire Service in the event of a bush fire on land surrounding the Mine Site.	As required.
Minimise the risk of bush fire ignition from mining operations.	15.4 Restrict work in heavily vegetated areas.	During high fire danger periods.
	15.5 Develop procedures for hot works to prevent ignition sources for a bush fire.	Ongoing.
	15.6 Consult with the local Rural Fire Service.	Prior to each bush fire season and any controlled burns.
Ensure leaks and spills of sodium cyanide and cyanide solution are avoided on site and leaks and spills of sodium cyanide during transport are avoided.	15.7 Ensure bunding around the on-site mini sparge system complies with AS NZS 4452:1997.	Ongoing.
	15.8 Ensure the processing area is bunded to contain any processing leaks.	Ongoing.
	15.9 Ensure operators in contact with cyanide are licenced and trained in emergency response and/or HAZMAT.	Ongoing.
	15.10 Ensure cyanide transporters are certified as compliant with the Cyanide Code's Principles and Transport Practices.	Ongoing.
	15.11 Ensure cyanide transporters are compliant with the *Australian Dangerous Goods Code* with drivers and vehicles licensed to transport DGs.	Ongoing.
Minimise risks associated with the on-site use and storage of blasting agents (e.g. ANFO and ANE).	15.12 Implement quality assurance procedures to ensure blasting agents meet required specifications.	Ongoing.
	15.13 Ensure blasting agents are packaged in accordance with the *Australian Dangerous Goods Code*.	Ongoing.
	15.14 Ensure appropriate separation distances between blasting agents and the Mine Site boundary are maintained.	Ongoing.
	15.15 Ensure emergency response and evacuation procedures are in place.	Ongoing.
16. Economic		
Maximise local employment training, and engagement.	16.1 Develop and implement a Local Employee and Procurement Strategy.	Site establishment and construction.
	16.2 Give preference to local employees.	Ongoing.
	16.3 Provide ongoing training and certification opportunities for local community members to ensure they have the necessary skills to work in mining.	Ongoing.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure	Timing*
16. Economic (Cont'd)		
Involvement with local businesses to boost local economy.	16.4 Inform local businesses of the goods and services required for the Project.	Ongoing.
	16.5 Provide service provision opportunities and compliance requirements of business to secure contracts.	Ongoing.
	16.6 Collaborate with local businesses and encourage local businesses to meet the requirements of the Project for supply contracts.	Ongoing.
	16.7 Develop relevant networks to assist qualified local and regional businesses tender for provision of goods and services to support the Project.	Ongoing.
Support local sporting, social and community groups to ensure community directly benefits from the Project.	16.8 Implement a Planning Agreement with the Mid-Western Regional Council.	Agreement in place prior to commencement of site establishment and construction.
	16.9 Develop and implement a Community Investment Program.	Initial funding released within 12 months of commencement of mining operations. Then ongoing during operations.
17. Social		
To enhance local values and address community needs within the Lue, Rylstone, Kandos, Mudgee and surrounding localities.	17.1 Develop and implement a Community Investment Program.	Ongoing. Expanded program prior to commencement of mining operations. Then ongoing.
Contribution to the provision of public amenity and public services, transport or other infrastructure requirements as agreed with Council.	17.2 Implement a Planning Agreement with the Mid-Western Regional Council.	Agreement in place prior to commencement of site establishment and construction.
Maximisation of the economic benefits of the Project within in the Mid-Western Regional LGA.	17.3 Develop and implement a Local Employee and Procurement Strategy.	Prior to the commencement of site establishment and construction.
Maintenance and further development of Company-community relationships.	17.4 Develop and implement a Good Neighbour Program which outlines ongoing and effective communication and engagement.	Prior to the commencement of mining operations.
	17.5 Employ a dedicated Community Liaison officer to manage the ongoing engagement and monitoring and management commitments.	Ongoing.

Table A2.1 (Cont'd)
Updated Environmental Management and Monitoring Measures

Desired Outcome	Measure	Timing*
17. Social (Cont'd)		
Wholistic and adaptive management based upon monitoring/feedback and evaluation to minimise potential negative impacts and enhance benefits from the Project.	17.6 Develop and implement a Social Impact Management Plan that provides for monitoring and evaluation of social and community aspects of the Project and applies adaptive management to minimise potential impacts and maximise benefits.	Prior to commencement of mining operations.
	17.7 Prepare and implement appropriate complaint receipt / response and incident notification / reporting processes.	Ongoing during operations.
Keeping the community informed, maintaining transparency, and remaining accountable.	17.8 Public reporting of relevant statistics, monitoring results and engagement outcomes.	Ongoing during operations.
18. Seepage Management		
Reduce and manage seepage risks from the TSF.	18.1 Install a system of vibrating wire and standpipe piezometers upstream and downstream of the foundation grouting, beneath the embankment, at the toe of the embankment.	During site establishment and construction.
	18.2 Install groundwater monitoring bores downgradient of the TSF to monitor for any seepage migration.	During site establishment and construction.
	18.3 Monitor all vibrating wire and standpipe piezometers as well as groundwater monitoring bores during and following TSF operations.	As described in a Water Management Plan.
	18.4 Undertake inspections of the tailings discharge pipelines, water return pipeline, discharge points, decant system and decant pond, all of which would be fully documented, and where appropriate photographed.	As described in a TSF Operations and Maintenance Plan.
	18.5 Undertake weekly inspections of the external embankment and associated structures, the tailings beach, decant pond level and all monitoring installations.	As described in a TSF Operations and Maintenance Plan.
	18.6 Prepare a comprehensive Trigger Action Response Plan that is associated with monitoring outcomes.	As described in a Water Management Plan.
	18.7 Comply with all reporting and regulatory requirements of DPIE, EPA and Dams Safety NSW throughout the life of the development.	As required.
	18.8 Undertake independent reviews and audits against contemporary engineering and environmental standards.	As required.

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Appendix 3

TransGrid Submission to EIS

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Rose-Anne Hawkeswood

From: Lauren Player <Lauren.Player@transgrid.com.au> on behalf of Easements&Development <Easements&Development@transgrid.com.au>
Sent: Wednesday, 10 June 2020 3:50 PM
To: Rose-Anne Hawkeswood
Cc: Easements&Development
Subject: TG ID P2020/0034 - Bowdens Silver Mine (SSD 5765) - Invitation to Comment

Hi Rose,

TG Ref: **TG ID P2020/0034**

Proposal: **Bowdens Silver Mine (SSD 5765) - Invitation to Comment**

Thank you for referring to TransGrid for review.

Please be advised of the following comments:

Property Comments:

- Given the 59km stretch of pipeline, any intersections with TransGrid infrastructure and easements within that stretch will need to comply with our easement terms and also receive TransGrid's consent.

- As with the road re-location, the relevant roads authority will provide comment on the proposal and we should be privy to any decisions made that intersect our infrastructure.

- As always, if there is no impact on TG easements or freehold land, then the proponent is free to do as they please. But we encourage that TransGrid's future network expansion intentions are factored into any decisions.

Environmental Comments:

Section 2.1.3 of the EIS states that:
"Bowdens Silver would seek to finalise approval in accordance with Part 5 of the EP&A Act from TransGrid for the re-alignment. This agreement would be finalised prior to commencing operations within the Mine Site."
"An approval to construct the required 132kV power transmission line to the Mine Site would be sought separately in accordance with Part 5 of the EP&A Act. It should be noted that assessment of the power supply infrastructure and associated works is not included here but would be addressed in a future application to the relevant energy provider."

TransGrid will not be seeking any approval for the existing transmission line relocation or new power supply (132kV transmission line) under Part 5 of the EP&A Act.
It is the responsibility of the proponent to ensure that all works associated with their project, including relocation of the transmission lines and grid connection works, are included in the development approval for the overall Silver Mine project.

TransGrid has had initial discussions with the mine for both the TL relocation and power supply. As indicated in the EIS, TransGrid will need to enter into formal agreements (Modification Agreement and a Connection Agreement) with the mine to undertake further scoping and finalise the works to support both the load supply and the TL relocation .

If you have any questions regarding the above, please do not hesitate to contact our team.

Kind regards,

Lauren Player
Development Assessment Officer | Network Planning and Operations

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