BOWDENS SILVER

WATER SUPPLY AMENDMENT REPORT

State Significant Development No. 5765

March 2022

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

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BOWDENS SILVER

ABN: 37 009 250 051

Water Supply Amendment Report

for the

Bowdens Silver Project

Prepared for:

Bowdens Silver Pty Limited
ABN: 37 009 250 051

Sydney Office
Level 11, 52 Phillip Street
SYDNEY NSW 2000

Telephone: (02) 8316 3997
Facsimile: (02) 8316 3999
Email: information@bowdenssilver.com.au

Operations Office
68 Maloneys Road
LUE NSW 2850
P.O. Box 1115
MUDGEE NSW 2850

Telephone: (02) 6373 6420

A Silver Mines Limited company

Prepared by:

R.W. Corkery & Co. Pty. Limited
Geological & Environmental Consultants
ABN: 31 002 033 712

Telephone: (02) 9985 8511
Email: admin@rwcorkery.com

Brooklyn Office:
1st Floor, 12 Dangar Road
PO Box 239
BROOKLYN NSW 2083

Orange Office:
62 Hill Street
ORANGE NSW 2800

Brisbane Office:
Level 54, 111 Eagle Street
BRISBANE QLD 4000

Ref No. 429/39

March 2022

R.W. CORKERY & CO. PTY. LIMITED

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CONTENTS

Page

CONTENTS

Page

CONTENTS

Page

APPENDICES

FIGURES

CONTENTS

Page

TABLES

ACRONYMS

AACE	additional annual capital expenditure
AIP	*Aquifer Interference Policy 2012*
AWBM	Australian Water Balance Model
BAR	Biodiversity Assessment Report
BCS	Biodiversity Conservation and Sciences Directorate
BoM	Bureau of Meteorology
BOS	Biodiversity Offset Strategy
BSAL	Biophysical Strategic Agricultural Land
DoE	Department of Environment
DPE	Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EP&A Act	*Environment Planning and Assessment Act 1979*
ESC	erosion and sediment control
ESD	ecologically sustainable development
FBA	Framework for Biodiversity Assessment
GDE	groundwater dependent ecosystem
GHD	GHD Pty Ltd
HDPE	high density polyethylene
ICC	initial capital cost
IPC	Independent Planning Commission
LAS	Lighting, Art & Science Pty Limited
LEP	Local Environment Plan
LGA	Local Government Area
LMD	leachate management dam

LSC	land and soil capability
MWRC	Mid-Western Regional Council
NAF	non-acid forming
NRAR	Natural Resources Access Regulator
OEH	Office of Environment and Heritage
PM	particulate matter
POEO Act	*Protection of the Environment Operations Act 1997*
Q&A	question and answer
RLA	Richard Lamb and Associates
RWC	R.W. Corkery & Co. Pty Limited
SEPP	State Environmental Planning Policy
SLR	SLR Consulting Australia Pty Ltd
SMD	Soil Management Designs
SRD	State and Regional Development
SSD	State Significant Development
TSF	Tailings Storage Facility
TSP	total suspended particle
TTPP	The Transport Planning Partnership Pty Ltd
VLAMP	NSW Voluntary Land Acquisition and Mitigation Policy
WM Act	*Water Management Act 2000*
WRE	waste rock emplacement
WRM	WRM Water and Environment Pty Ltd

EXECUTIVE SUMMARY

INTRODUCTION

This *Water Supply Amendment Report* has been prepared by R.W. Corkery & Co. Pty. Limited on behalf of Bowdens Silver Pty Limited (Bowdens Silver) to support an application to amend Development Application SSD 5765 (SSD 5765) for the Bowdens Silver Project (the Project). The Project comprises the proposed mine and its associated infrastructure which would be located approximately 26km east of Mudgee and approximately 2km to 3km northeast of Lue, within the Mid-Western Regional Local Government Area (LGA) of New South Wales. The proposed amendment involves:

- removal the previously proposed water supply pipeline as a Project component;
- amendment to the Mine Site layout to support the proposed integrated water management and supply strategy; and
- amendment to the alignment of the 500kV transmission power line to reduce the visual impact of the infrastructure.

An *Environmental Impact Statement* (EIS) was prepared for the Project and publicly exhibited from Tuesday 2 June 2020 until Monday 27 July 2020. During this period, the public were invited to make submissions on the Project and NSW Government agencies also reviewed the EIS and supporting documentation. A comprehensive response to the matters raised in these submissions was presented in the *Submissions Report* for the Project. At the same time, an initial amendment to the development application was requested to include the proposed re-alignment of the 500kV power transmission line that currently traverses the proposed open cut pit. This request for amendment was supported by an *Amendment Report* that was publicly exhibited from 20 July 2021 to 16 August 2021 with a response to these submissions presented in the *Amendment Submissions Report* that was submitted to DPIE in February 2022.

The application to amend SSD 5765 is being made under Clause 55AA of the *Environmental Planning and Assessment Regulation 2000*[1]. Approval for the proposed amendment must be provided by the consent authority (in this case, the Independent Planning Commission (or their delegate)).

BACKGROUND TO THE PROPOSED AMENDMENT

The Project, as presented in the EIS and SSD 5765 comprised three main components.

- 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.
- 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.

[1] The *Environmental Planning and Assessment Regulation 2021* will commence from 2 March 2022 and the regulation guiding amendment to development applications will be Section 37.

- A "water supply pipeline corridor" extending approximately 58.5km from the Mine Site to the Ulan Coalfields to supply the Project with make-up water required for processing and dust suppression.

At the time the Project's EIS was published, Bowdens Silver proposed to construct a buried pipeline from the Ulan coalfields to the Mine Site to convey water for use in Project-related activities. This pipeline was to supply make-up water to supplement Mine Site water sources, principally rainfall and runoff captured in operational areas and licensed open cut pit groundwater inflows.

Water supply sources and reliability are a crucial component of the Project. Throughout the development application process, Bowdens Silver has continued to investigate measures to reduce Project-related water demand and increase the Project's capacity to recover, recycle, store and re-use process water and stormwater. Concurrent with these investigations, Bowdens Silver continued to assess groundwater resources in the vicinity of the Mine Site as a water source for the Project. These investigations have resulted in the development of an integrated water management and supply strategy.

DESCRIPTION OF THE PROPOSED AMENDMENT

The following key strategies would be implemented to support water management at the Mine Site.

- Water demand would be reduced by a higher rate of water recycling within the processing circuit. This is estimated to reduce the Project's processing demand by 390 megalitres per year (ML/year).
- Water stored in the TSF and other water management infrastructure would be managed to reduce the water surface's exposure to evaporation.
- Clean water captured within the Mine Site would be separated as much as possible from water in containment zones so there is always sufficient water for dust suppression.
- Water sources would be prioritised to ensure that operational requirements and the function of containment dams is not compromised at any time.

The strategy provides the Project with a secure water supply that is sourced solely within the Mine Site. On average, the integrated water management and supply system would provide 99.4% of total processing demand and 99.8% total dust suppression requirements over the Project-life.

The various assessments presented in this report comprehensively demonstrate that this strategy would not be likely to increase the Project's impacts on users of surface water and groundwater resources. As a result, a water supply pipeline is no longer required for the Project.

The integrated water management and supply strategy would require the amendment of the Mine Site layout to incorporate the following components (numbered for reference to **Figure ES-1**):

1. Paste thickener plant and associated infrastructure (such as water transfer pipelines).

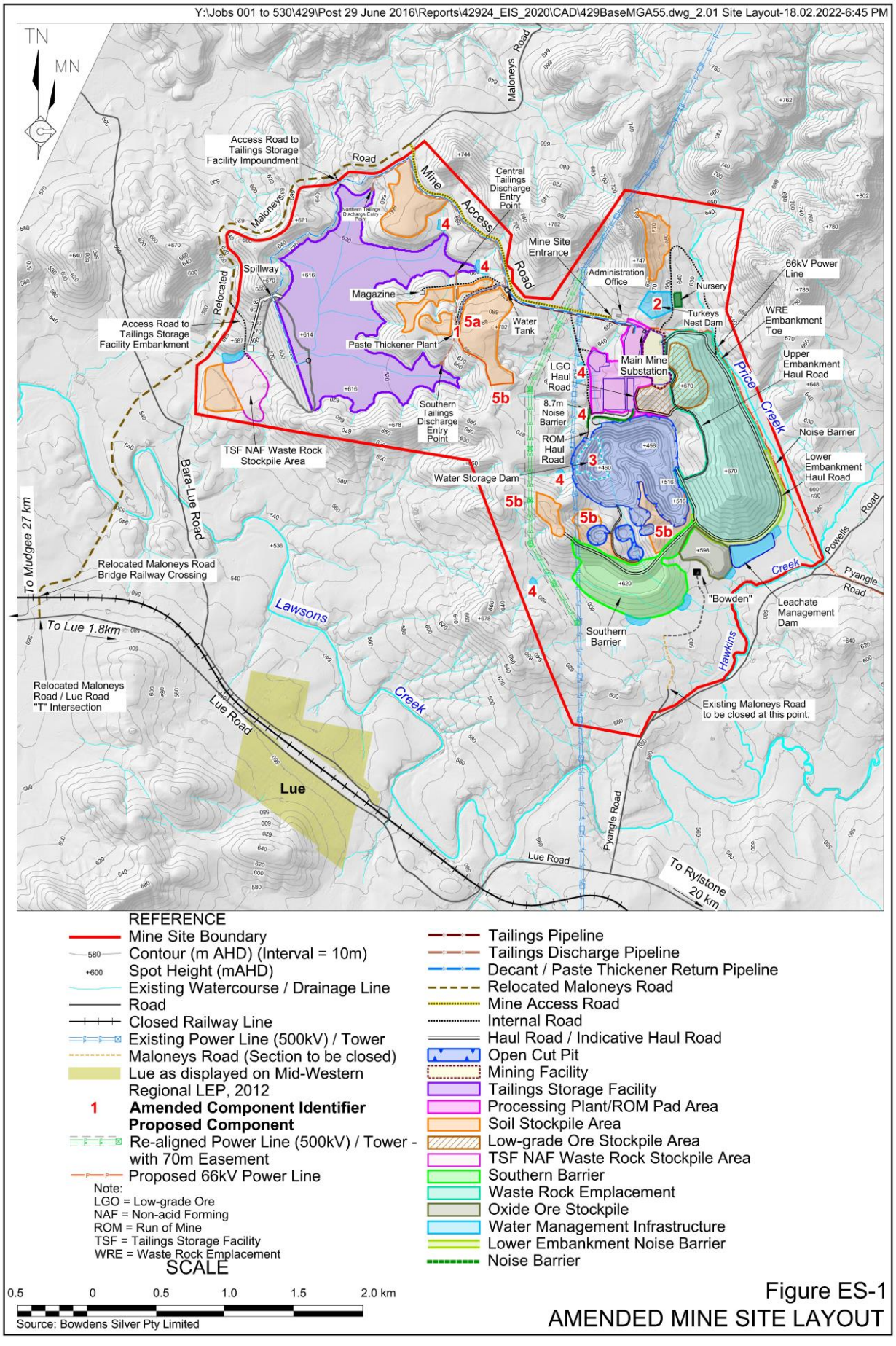


Figure ES-1
AMENDED MINE SITE LAYOUT

2. 130 megalitre (ML) turkeys nest dam (increased from 65ML).
3. 130ML water storage dam to store clean water pumped from maximum harvestable rights dams within the Mine Site.
4. Six additional harvestable rights dams constructed within the Mine Site boundary.
5. Amend soil stockpiles S5 and S6 to provide for the installation of the paste thickener plant and to reduce areas of potential indirect impact from Project-related activities.
6. The use of water production bores, previously intended to supply groundwater during the site establishment and construction, would be extended for advanced dewatering of the open cut pit[2].

The integrated water management and supply strategy required the amendment of the Mine Site layout to incorporate infrastructure required to support the strategy. In addition, minor refinements to the Mine Site layout have been incorporated to provide a more compact Mine Site with infrastructure location selected to minimise indirect as well as direct impacts.

The principal issue raised in response to the Amendment Report and the proposed re-alignment of the 500kV power transmission line was the potential visual amenity impacts of the proposed alignment. Bowdens Silver commissioned GHD Pty Ltd (GHD) to review and undertake modelling of the alignment to assess if an alternative may provide a better outcome in terms of visual amenity for landholders to the west and southwest of the Mine Site, while ensuring there was suitable clearance from mining and that the terrain may support the infrastructure. An alternative alignment to the 500kV transmission power line is now proposed that mitigates the visual impacts of the re-alignment that is necessary for the development of the main open cut pit.

The removal of the water supply pipeline would result in the following outcomes.

- Total surface disturbance for the Project would be reduced from 495.54ha to 457.42ha (once additional areas are accounted for).
- An area of 54.66ha that would have been disturbed for the water pipeline construction and use would not be required. The area comprised 15.12ha of native vegetation and 39.54ha of cleared land.
- The removal of the pipeline avoids the need for impacts to Ausfeld's Wattle (*Acacia ausfeldii*), which is listed as a vulnerable threatened species in NSW.
- Project-related disturbance is no longer required in the Mudgee-Wollar key breeding area for the Regent Honeyeater as defined by the *National Recovery Plan for Regent Honeyeater* (DoE, 2016).
- There is no longer the need to establish easements on private and public land for the construction of the pipeline.
- Construction-related impacts would be avoided including traffic, noise and dust generation.
- There is no longer the need to establish stand-alone reverse osmosis water treatment facilities and associated management of produced brines for the pipeline.

[2] Location not shown on **Figure ES-1**.

- Under boring of watercourses would no longer be required.
- Traffic associated with ongoing maintenance of the pipeline would not be required.
- Removal of substantial capital, operating and maintenance costs for the water pipeline infrastructure.

While the water supply pipeline provided a greater level of water supply certainty for the Project, the assessed reliance on the integrated water management and supply strategy and the opportunity to avoid the above impacts is considered preferable to Bowdens Silver.

CONSULTATION

Bowdens Silver has undertaken consultation with a range of NSW Government agencies throughout the development application and assessment process to provide updates on the Project. Both the NSW Department of Planning, Industry and Environment and Mid-Western Regional Council have been consulted with specific regard to the proposed amendment.

The water supply arrangements for the Project have been raised on numerous occasions with local community members and organisations. To keep the community updated on the water supply for the Project, Bowdens Silver have utilised the following measures:

- Personalised letters and emails were sent to local residents and landowners outlining the integrated water management and supply strategy, an invitation to a Virtual Information Session and options to obtain information directly from Bowdens Silver.
- A media release was distributed to local radio stations and the Mudgee Guardian newspaper outlining the integrated water management and supply strategy and an invitation to a Virtual Information Session.
- Advertisements were placed in the Mudgee Guardian newspaper advising the opportunity to participate in the Virtual Information Session.
- A Virtual Information Session, held on 10 December 2021.
- A meeting of the Community Consultative Committee held on 8 December 2021.
- A summary of the integrated water management and supply strategy is available on the Bowdens Silver website.

ENVIRONMENTAL FEATURES, SAFEGUARDS AND IMPACTS

The components and features of the existing environment within and in the vicinity of the Mine Site have been studied in detail and used to inform the design of the Project to avoid or minimise potential impacts.

The Mine Site is located within a rural area principally used for cattle and sheep grazing with some nearby private residences in closer proximity. However, there is substantial intervening natural topography shielding the Mine Site from views and providing natural attenuation to potential noise and dust impacts. Therefore, the Mine Site's location enables the positioning of major components in a manner which maximises operational efficiencies, whilst reducing impacts and generally obscuring the Project from views.

This *Water Supply Amendment Report* focusses on the assessment of potential impacts associated with the following.

- Interception and use of surface water within the proposed integrated water management and supply system dams (refer **Figure ES-2**).
- The loss of baseflow on the availability of water for downstream users in the Lawsons Creek water source.
- The volumes of groundwater abstracted from proposed advanced dewatering (production) bores.
- Predictions of the volumes of groundwater that would inflow to the open cut pit as mining progresses.
- Potential impacts associated with the availability of groundwater to other registered groundwater users.
- The changes to vegetation clearing from the proposed amendments to the Mine Site layout.

All other environmental aspects of the Project that were assessed for the EIS would not be affected by the proposed amendment.

Surface Water

The *Updated Surface Water Assessment* prepared by WRM Water and Environment Pty Ltd (WRM, 2022) identifies the extent to which the Project would alter the surface water regime within and downstream of the Mine Site, taking into account the proposed integrated water management and supply strategy.

Water balance modelling prepared by WRM (2022) confirms that the integrated water management and supply strategy would be capable of meeting all Project-related water demand throughout the Project-life, including under low rainfall conditions. This model also demonstrates that water captured in the containment zone of the integrated water management and supply system (that is, areas in which there is a risk that runoff water quality may not satisfy regulatory requirements) can be captured and stored without needing to discharge from the Mine Site. **Figure ES-2** presents the infrastructure components of the Project's integrated water management and supply system.

WRM (2022) identified that during operations, flow rates in Hawkins and Lawsons Creeks would reduce by 1.2% to 4.5% whereas post-mine closure, flow rates would reduce by 0.3% and 1.4%. This would cause Lawsons Creek flows greater than 1ML/day to occur on two fewer days per year. Bowdens Silver holds water licensing entitlement from the Lawsons Creek Water Source to meet the predicted peak losses during operations. These include 123ML for runoff intercepted by the tailings storage facility and the 14ML predicted operational peak baseflow reduction.

Potential impacts to surface water resources would be managed through the implementation of an approved Water Management Plan that would include a program for ongoing monitoring and management.

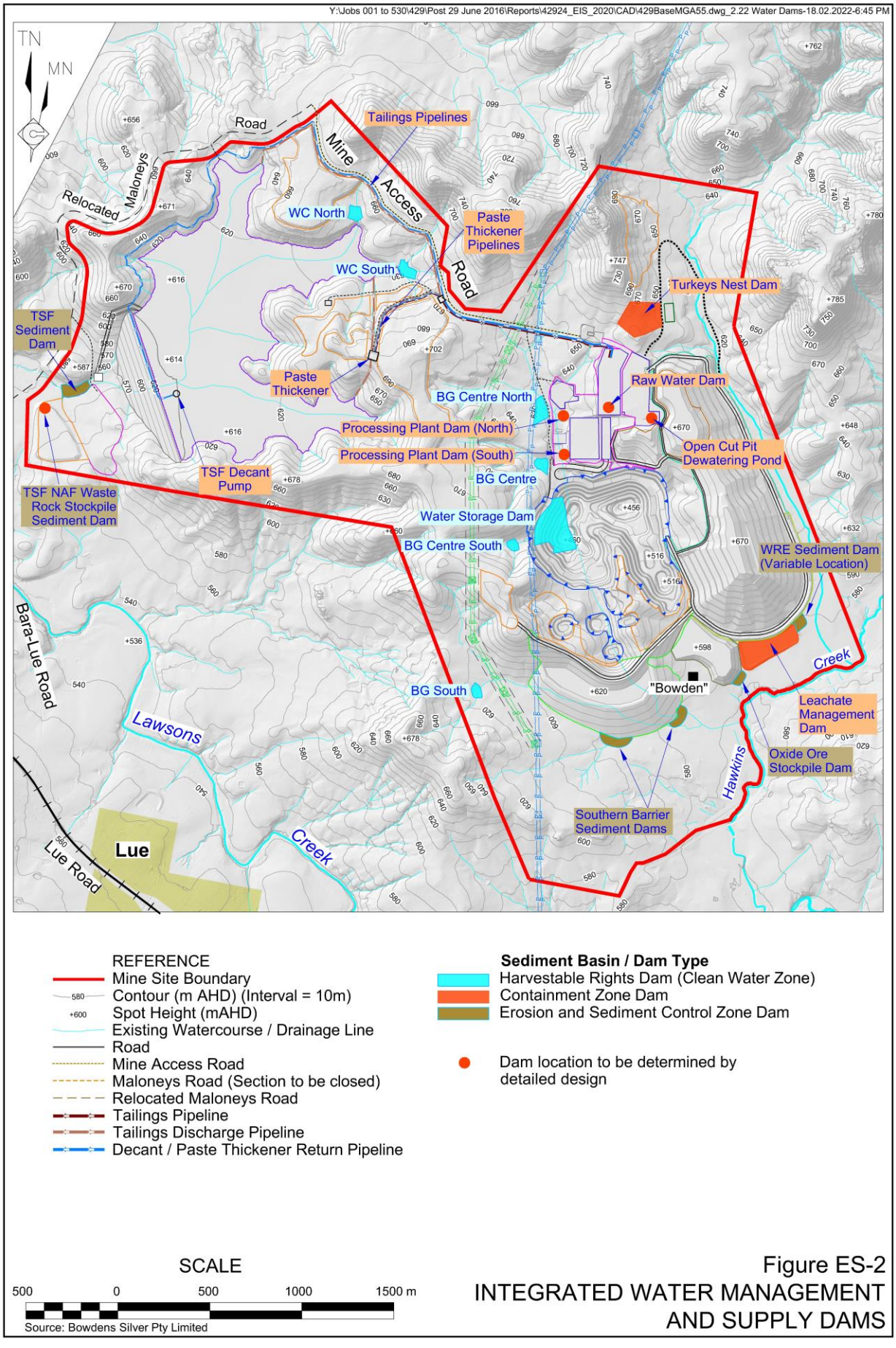


Figure ES-2
INTEGRATED WATER MANAGEMENT AND SUPPLY DAMS

The conclusions of WRM (2022) remain consistent with those presented for the EIS, namely that the Project would result in negligible reductions in flow and availability of water to downstream users whilst not adversely impacting off-site property or infrastructure as a result of flooding.

The *Updated Surface Water Assessment* (WRM, 2022) including the updated final void pit lake water balance were subject to peer review by Mr Tony Marszalek, Principal at ATC Williams. This peer review concluded that WRM's assessment was fit for the purpose of predicting change to the surface water setting and assessing impacts associated with downstream flows and potential impacts to downstream water users.

Groundwater Resources

An *Updated Groundwater Assessment* has been prepared by Jacobs (Australia) Pty Limited (Jacobs, 2022) and details the assessment of the Project's groundwater impacts. Jacobs (2022) includes a technical modelling report that details the assessment of the proposed amendment utilising the peer reviewed groundwater model developed for the Project.

Whilst groundwater drawdown greater than 2m is predicted at only one privately-owned registered groundwater bore, Jacobs (2022) considers this prediction is the result of model conservativism. Potential impacts to groundwater availability at this registered bore would be subject to compensatory measures, should they be required.

Following the cessation of mining operations, the extent of groundwater drawdown would continue to expand for a period of 16 years, followed by minor fluctuations until the maximum extent is reached approximately 50 years post-mining. The predicted impacts to groundwater availability and quality remain acceptable during this period and therefore long-term impacts to the groundwater setting are not expected.

Direct groundwater take through groundwater inflows and advanced dewatering, plus the indirect take from baseflow reduction contribution to Hawkins and Lawsons Creeks is accounted for by water access licences held by Bowdens Silver.

Revised final void pit lake water balance modelling prepared by WRM (2022) informed Jacobs' assessment of the final void's influence on the local groundwater system. This assessment identified that maximum final void pit lake water levels would be approximately 25m below the pit crest (spill) level and the final void would act as a terminal groundwater sink.

Potential impacts to groundwater resources would be managed through the implementation of an approved Water Management Plan that would include a program for ongoing groundwater monitoring and management.

Based on the outcomes of the groundwater modelling and assessment for the proposed amendment, it is considered that potential impacts to the groundwater setting are within the bounds of the impacts predicted and assessed in the EIS. Therefore, the proposed amendment would not increase the overall groundwater impacts of the Project which remains permissible under the Aquifer Interference Policy.

Terrestrial Ecology

Potential impacts to terrestrial biodiversity have been assessed in a *Biodiversity Assessment Report* (BAR) prepared by EnviroKey (EnviroKey, 2022), whilst the approach to satisfying the Project's biodiversity offsetting obligations of the Project is presented in a Biodiversity Offset Strategy (BOS) prepared by Niche Environment and Heritage (Niche, 2022).

Throughout the design process, Bowdens Silver has endeavoured to minimise impacts upon biodiversity values to the greatest extent possible. The proposed amendments to the Mine Site reduce indirect impacts to biodiversity and present a more compact layout.

The key changes to the biodiversity-related Project outcomes as a result of refinements to the Mine Site layout, removal of the water supply pipeline corridor and the recommendations of BCS include the following.

- Total Project-related disturbance (native vegetation and previously cleared areas – mostly paddocks) has reduced from 495.54ha to 457.42ha.
- The area of native vegetation clearing is slightly reduced, but mostly consistent with that originally assessed (381.17ha as opposed to 381.71ha in the EIS).
- The vegetation types impacted by the Project have reduced from 11 to 6 in the updated assessment.
- The total area of Box Gum Woodland that would need to be cleared for the Project has reduced from 182.26ha to 180.17ha.
- There is no longer impact required to the Ausfeld's Wattle (*Acacia ausfeldii*), which was a species credit species candidate for the Project and located solely within the water supply pipeline corridor.
- There is no longer impact required in the Mudgee-Wollar key breeding area for the Regent Honeyeater as defined by the *National Recovery Plan for Regent Honeyeater* (DoE, 2016). The proposed native vegetation disturbance would occur in areas of potential foraging and breeding habitat for the Regent Honeyeater although the species was not identified at the Mine Site despite comprehensive survey targeting the species.

Components of the Mine Site were refined to further address the BCS recommendation to avoid native vegetation impacts, where possible. While the total area of native vegetation clearing is largely the same, a more compact Mine Site is now proposed that limits opportunity for indirect impact and includes in the assessment of disturbance areas that may remain vegetated but that are located between mining components and likely to be subject to indirect impacts.

In total, the Project would result in the removal of 381.17ha of native vegetation of variable condition. This includes 180.17ha of Box-Gum Woodland which is listed as an endangered ecological community under the *Biodiversity Conservation Act 2016*, of which 146.72ha is also classified as a critically endangered ecological community under the *Environmental Protection and Biodiversity Conservation Act 1999*. As the removal of this vegetation cannot be avoided, biodiversity offsetting obligations in the form of ecosystem credits have been calculated for the Project. In the absence of biodiversity offsetting, EnviroKey (2022) consider the impact to Box Gum Woodland would be significant. However, residual impacts to Box Gum Woodland would

be accounted for through substantial biodiversity offsetting as presented in the Biodiversity Offset Strategy for the Project (Niche, 2022) and result in large areas of this vegetation community being conserved in perpetuity.

Impacts to threatened fauna has been assessed and a biodiversity offsetting obligation estimated in species credits for the following six species.

- Koala (*Phascolarctos cinereus*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Regent Honeyeater (*Anthochaera phrygia*)
- Silky Swainson-pea (*Swainsona sericea*)
- Small Purple-pea (*Swainsona recta*)
- Large-eared Pied Bat (*Chalinolobus dyweri*)

EnviroKey (2022) concluded that, excluding the Regent Honeyeater, the Project would not result in any significant impacts upon migratory or threatened species. Further consideration of impacts to the Regent Honeyeater identified that the species was not identified in comprehensive targeted field surveys but would remain subject to offsetting. EnviroKey (2022) concluded that the Project would:

- not lead to a long-term decline in the size of a population of the Regent Honeyeater;
- not reduce the area of occupancy to the detriment of the Regent Honeyeater; and
- be unlikely to result in the introduction of species or diseases that are potentially harmful to the Regent Honeyeater.

EnviroKey (2022) also concluded that the Project would result in the establishment of a significant biodiversity offset which would provide in perpetuity security for potential foraging and breeding habitat for the Regent Honeyeater on land that may otherwise have been subject to intense agricultural activity over time.

The assessment presented in the BAR confirms that while 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 offsetting strategy.

Visibility

The principal issue raised in response to the proposed re-alignment of the 500kV power transmission line was the visibility of the proposed alignment and in particular transmission towers supporting the power lines. GHD has prepared the *Bowdens Silver Mine Existing TransGrid 500kV Transmission Line – Realignment Option Study* (GHD, 2022) which models and assesses an alternative alignment for the 500kV power transmission line. Subsequently, Richard Lamb and Associates (RLA) was commissioned to review the visual amenity outcomes of the new alignment and respond to matters raised in community submissions relating to visual amenity.

An alignment located at least 300m from the open cut pit has now been selected for the 500kV power transmission line as this location was considered to provide a safe offset distance from mining activities while also improving visual amenity outcomes for landowners to the west and southwest of the Mine Site. The alignment also considers the risk of sterilising potential resource in the vicinity of the open cut.

Based on the conclusions presented in GHD (2022), the new alignment is preferred based on the following factors.

- The number of transmission towers to be relocated is reduced.
- The Proposed Alignment is located at a greater distance from surrounding residences compared with the EIS Alignment, as presented in the EIS and *Amendment Report*.
- There is an overall reduced visual impact from the Proposed Alignment.

RLA (2022) presents detailed visual analysis for four private residences (R35, R36A, R37 and R87) including cross-section plans. In summary, RLA made the following general conclusions regarding the visual impact of the 500kV power transmission line re-alignment.

- The visual impacts of the re-alignment would be mitigated by the proposed final alignment presented by GHD (2022).
- The alignment proposed in GHD (2022) provides for improved visual amenity outcomes compared to that presented in the EIS and Amendment Report. This is due principally to the distance of the towers from vantage points at private properties.
- The potential visibility of the re-aligned 500kV power transmission line would be greater than the existing alignment at properties located to the west of the proposed alignment.
- The visibility of the towers and the land that may be cleared for an easement for the power line would remain low or negligible.
- The character and quality of the visual landscape for private properties would not significantly change.
- Views of the 500kV power transmission line and towers may be possible within Lue, however, these would be largely screened by existing vegetation and infrastructure. The character and quality of the visual landscape within the village of Lue would not significantly change.
- The extent of the visual impact as assessed in the EIS remains valid, if not improved. The assessment of visual impact has not been underestimated.

The visual impacts associated with mining components is largely unchanged since the public exhibition of the EIS. No components of the Mine Site would be visible from Lue village given the substantial ridges present between Lue and the Mine Site. Views from the public road network of some components within the Mine Site would be possible at some locations and it is acknowledged that the Project would result in changes in the visual landscape in the vicinity of the Mine Site with views from six private residences possible at certain stages of development

(two of which are Project-related, having entered into agreements with Bowdens Silver). The development of the Project would result in changes in the visual landscape in the vicinity of the Mine Site. However, the limited visibility of the mining activities within the Mine Site and the range of visual controls would achieve an acceptable level of impact.

Visual impact associated with the re-location of the 500kV power transmission line have been mitigated to the extent possible and review of visual impacts has concluded there would be no significant changes to the character and quality of the visual landscape for privately-owned residences and from within Lue.

Summary of Environmental Assessment Outcomes for the Amended Project

Appendix 9 presents an overview of the conclusions to environmental impact assessment presented in the EIS with the conclusions to environmental impact assessment for the amended Project.

PROJECT EVALUATION AND JUSTIFICATION

The proposed amendment strengthens the Project's credentials as an ecologically sustainable mining operation. All assessments undertaken for the proposed amendment have identified that the Project's impacts remain consistent with those presented in the EIS. Whilst it would require additional surface disturbance within the Mine Site, by changing the way water is sourced and managed, the proposed amendment removes the water supply pipeline and its associated surface disturbance and impacts. Bowdens Silver has undertaken thorough scientific assessment of the potential impacts of the Project and assumed conservative settings to inform development of preventative measures that would limit the potential for adverse environmental impacts. This includes the conservation of biological diversity through offsetting of residual impacts to biodiversity values. Social equity would be achieved for the amended Project through the broad distribution of benefits including directly within the local community and across generations. The environmental impacts would not expand over the long term or result in a direct cost to future generations. Finally, as demonstrated by its actions since the EIS was published, Bowdens Silver remains committed to selecting Project components that are designed to limit local impacts and manage the outcomes of development. This clearly shows that Bowdens Silver places appropriate value on the environmental resources within and surrounding the Mine Site.

The Project may also be evaluated in terms of the suitability of the Mine Site for the proposed use, that is mining for minerals and associated processing and site management activities. There are a range of matters that relate to the location, setting and development context of the Mine Site and indicate whether the Project is a suitable land use. The mineral resource is considered to be one of the largest undeveloped silver deposits in Australia and is located in an area that features natural topographic barriers to amenity impact, a reliable water supply and options for access that limit the need for heavy vehicles to regularly drive through Lue. Open cut mining is permissible in the location and key planning matters have been resolved through the design and the proposed management of the Mine Site. The potential for impact to local water resource users and other land use conflicts as well as impacts to cultural heritage and biodiversity values have been thoroughly assessed and it is concluded that changes associated with the Project would be acceptable, assuming the implementation of a range of comprehensive management and monitoring measures.

Finally, a range of Project features and outcomes have been identified in documentation for the Project that justify the conclusion that the Project would be in the public interest. These include the following.

- Bowdens Silver has designed a Project that ensures efficient development of the Mine but which also considers the likely experience of the Mine for the local community and the predicted short-term and longer-term environmental outcomes.
- The environmental features of the Mine Site would permit the necessary water resource requirements to be sourced on-site and managed efficiently, reducing the previously expected reliance on external parties and infrastructure for water supply.
- There is a strong indication of the need for environmentally and socially sound projects to support the regional economy, especially in the Lue, Kandos, and Rylstone localities.
- Bowdens Silver considers that the Project would be of sufficient scale to provide a boost to the local economy but not cause substantial adverse environmental or social impacts.
- The outcomes of environmental, economic and social assessments for the Project have confirmed that the Project would operate in accordance with the legislation, policies and guidelines developed to ensure responsible environmental practices for development.
- The Project is considered to be consistent with the principles of ecologically sustainable development, would satisfy all relevant planning considerations and would achieve the objectives of the Project.
- The environmental, economic and social assessments have not only considered the immediate impacts of the operation but also longer-term outcomes involving potential land use conflict and residual impacts to resources (such as groundwater) that may be utilised by others. In each case, worst case scenario outcomes were considered to ensure a precautionary and conservative approach to impact assessment was taken.
- Bowdens Silver has made a range of clear commitments to the public that would be given legal force by way of conditions of a development consent.
- The Community Investment Program would ensure that the economic outcomes are distributed locally, while programs for environmental and social monitoring, regular reporting and auditing of performance would ensure that the commitments to responsible environmental management are achieved.
- The legacy of the Project has been considered with regards to the rehabilitation and final land use options and mechanisms to preserve the existing character of Lue, while providing sufficient economic stimulus to ensure its sustainability.

The residual environmental outcomes of the Project are not predicted to impose an unacceptable cost to future generations. Predicted outcomes are thoroughly understood and have been conservatively estimated. There are no substantial uncertainties that may result in unexpected and

unacceptable consequences. The management of environmental risks would occur through conditions of consent that direct the proposed mitigation and management commitments including comprehensive monitoring programs and environmental performance measures. These commitments would be described in a series of environmental management plans that would be prepared prior to commencement of the Project and be implemented as approved by relevant NSW Government agencies. The outcomes of environmental monitoring and assessment against performance criteria would be published in annual reporting and communicated to the local community through access to the Bowdens Silver website, Community Consultative Committee meetings and ongoing direct consultation.

The Project, incorporating the proposed amendment, continues to be considered in the public interest as it would provide an acceptable balance of environmental and social outcomes, whilst generating substantial economic and social benefits for the local, regional and State economies.

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:

- remove the previously proposed water supply pipeline as a Project component;
- amend the Mine Site layout to support the proposed integrated water management and supply strategy; and
- amend the alignment of the 500kV transmission power line to reduce the visual impact of the infrastructure.

This document (the *Water Supply Amendment Report*) has been prepared to support an application to amend Development Application, SSD 5765 (SSD 5765) made under Clause 37 of the *Environmental Planning and Assessment Regulation 2021*[3]. The document has been prepared with regard to the *State significant development guidelines – preparing an amendment report – July 2021* published by the NSW Department of Planning, Industry and Environment (DPIE). The Project comprises the proposed mine and its associated infrastructure which would be located approximately 26km east of Mudgee within the Mid-Western Regional Local Government Area (LGA) of New South Wales (see **Figure 1.1**). The Project would be located approximately 2km to 3km northeast of Lue.

An *Environmental Impact Statement* (EIS) (RWC, 2020a) for the Project was publicly exhibited from Tuesday 2 June 2020 until Monday 27 July 2020. During this period, the public were invited to make submissions on the Project and NSW Government agencies also reviewed the EIS and supporting documentation. A comprehensive response to the matters raised in these submissions was presented in the *Submissions Report* for the Project (RWC, 2021). At the same time, an initial amendment to the development application was requested to include the proposed re-alignment of the 500kV power transmission line that currently traverses the proposed main open cut pit. This request for amendment was supported by an *Amendment Report* that was publicly exhibited from 20 July 2021 to 16 August 2021 with a response to these submissions presented in the *Amendment Submissions Report* that was submitted to DPIE in March 2022.

Approval for the proposed amendment must be provided by the consent authority (in this case, the Independent Planning Commission (IPC) (or their delegate)).

1.2 BACKGROUND TO THE PROPOSED AMENDMENT

The Project, as presented in the EIS and SSD 5765 comprised 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.

[3] The *Environmental Planning and Assessment Regulation 2021* commenced on 2 March 2022. The amendment to the Project associated with the 500kv power transmission line was made under Clause 55 of the *Environmental Planning and Assessment Regulation 2000* (which is now repealed).

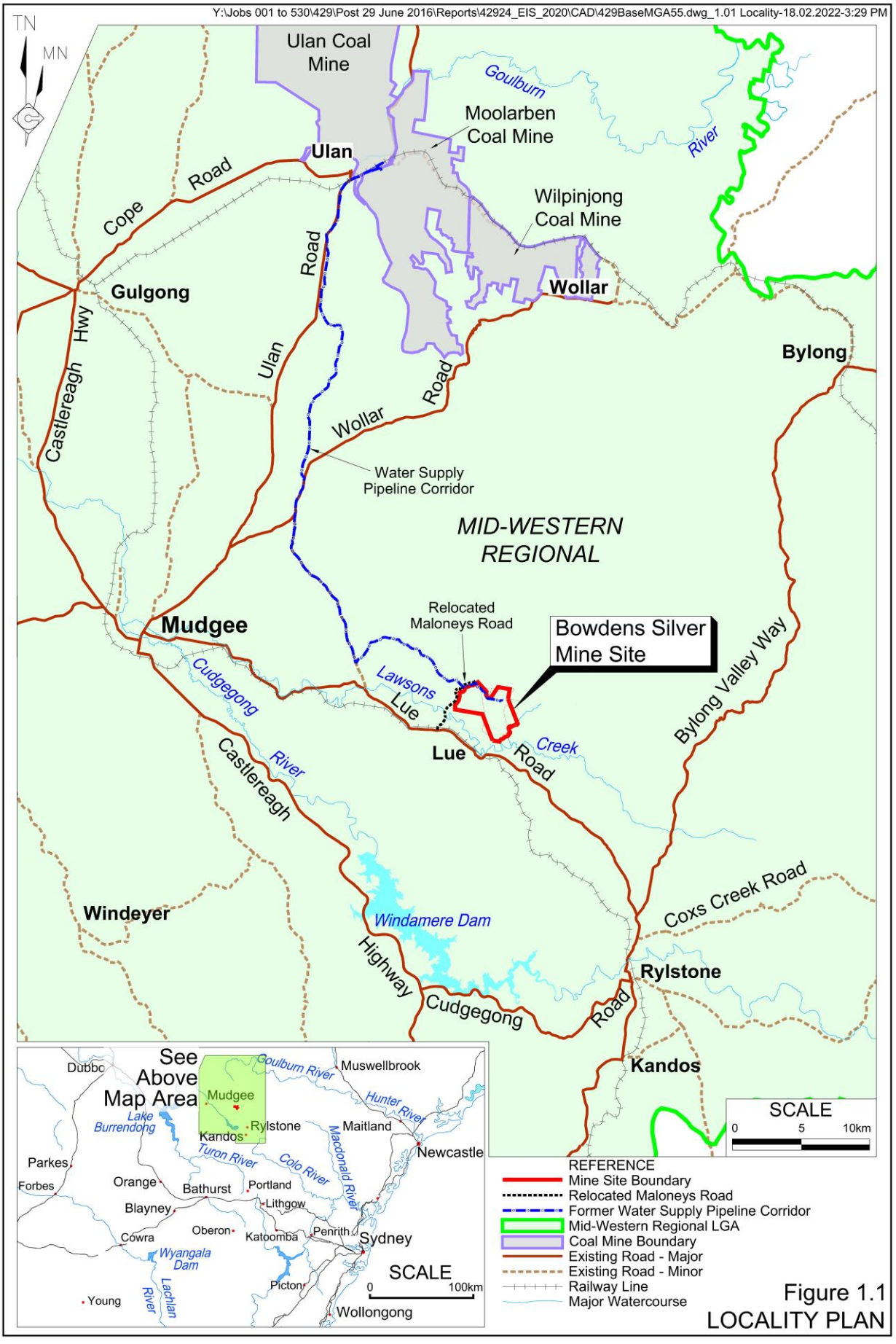


Figure 1.1
LOCALITY PLAN

- 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 Coalfields to supply the Project with make-up water required for processing and dust suppression.

At the time when the EIS for the Project was finalised, Bowdens Silver proposed to construct a buried pipeline from the Ulan coalfields to the Mine Site that could convey up to 5.5ML of water per day. The water supply pipeline was intended as a make-up water supply that added to other sources within the Mine Site, principally rainfall and runoff captured in operating areas and groundwater inflows that would be used under licence.

Since public exhibition of the EIS, Bowdens Silver has been investigating a range of measures to reduce Project-related water demand and increase the Project's capacity to recover, recycle, store and re-use process water and stormwater. Concurrent with this optimisation process, Bowdens Silver has continued its assessment of groundwater resources in the vicinity of the Mine Site as a water source for the Project. Arrangements for the water supply pipeline were also subject to commercial agreements regarding water supply from this source and negotiations regarding these agreements are not yet finalised. The outcomes of the water optimisation process have resulted in reduced water demand for operations and identified additional sources of water that may be relied upon. As a result, Bowdens Silver has developed an integrated water management and supply strategy that relies solely on water sources within the Mine Site.

The formerly proposed water supply pipeline is no longer required for the development however, it may be investigated as a water supply in the future, subject to a separate development application at that time. As this water optimisation program and integrated water management strategy supports the use of on-site water sources, the previously proposed water supply pipeline has been removed from the development application. This has the benefit of also removing the physical disturbance required to construct the pipeline and associated environmental impacts (both from construction activities and to biodiversity through removal of vegetation).

The integrated water management and supply strategy would also require the amendment of the Mine Site layout to incorporate the following components:

1. Paste thickener plant and associated infrastructure (such as water transfer pipelines).
2. 130 megalitre (ML) turkeys nest dam (increased from 65ML).
3. 130ML water storage dam to store clean water pumped from maximum harvestable rights dams within the Mine Site.
4. Six additional harvestable rights dams constructed within the Mine Site boundary.
5. Amend soil stockpiles S5 and S6 to provide for the installation of the paste thickener plant and to reduce areas of potential indirect impact from Project-related activities.
6. The use of water production bores, previously intended to supply groundwater during the site establishment and construction, would be extended for advanced dewatering of the open cut pit.

The integrated water management and supply strategy required the amendment of the Mine Site layout to incorporate infrastructure required to support the strategy. In addition, minor refinements to the Mine Site layout have been incorporated to provide a more compact Mine Site with infrastructure location selected to minimise indirect as well as direct impacts.

The principal issue raised in response to the *Amendment Report* and the proposed re-alignment of the 500kV power transmission line was the visibility of the proposed alignment. Bowdens Silver commissioned GHD Pty Ltd (GHD) to review and undertake modelling of the alignment to assess if an alternative may provide a better outcome in terms of visual amenity for landholders to the west of the Mine Site, while ensuring there was suitable clearance from mining and that the terrain may support the infrastructure. An alternative alignment to the 500kV transmission power line is now proposed that mitigates the visual impacts of the re-alignment that is necessary for the development of the main open cut pit.

Further information on the proposed amendments is provided in Section 3.

This *Water Supply Amendment Report* focusses on the assessment of potential impacts associated with the following.

- Interception and use of surface water flow within the proposed Mine Site water management system.
- The loss of baseflow on the availability of water for downstream users in the Lawsons Creek water source.
- The volumes of groundwater abstracted from proposed advanced dewatering (production) bores.
- Changes to the previous predictions of the volumes of groundwater that would inflow to the open cut pit as mining progresses.
- Potential impacts associated with changes to the availability of groundwater to other registered groundwater users.
- The change to required vegetation clearing as a result of the proposed amendments to the Mine Site layout and construction of water management infrastructure including harvestable rights dams.
- The change to required vegetation clearing and visual amenity impacts as a result of the proposed alignment of the 500kV power transmission line that would be re-aligned from its existing location in Year 3 of operations.

1.3 DOCUMENT FORMAT

This report describes the proposed amendment to the Project and outlines the outcomes of the assessments focused on the proposed changes required to support the integrated water management and supply strategy. The strategic context for the Project is reviewed in light of the proposed amendment and the statutory context for the application is presented to demonstrate how the Project satisfies the legislative requirements of the application. The *Amended Project Description* for the Project is presented as **Appendix 1** and presents an updated description of the Project, as it is proposed. An updated summary of all proposed environmental management and mitigation measures is presented as **Appendix 2**.

This report also presents an overview of the outcomes of technical assessments undertaken to support the proposed amendment to the Project or to update assessment outcomes in light of the changes that are proposed. The following technical assessments are presented as appendices to this report.

- An *Updated Surface Water Assessment*, prepared by WRM Water and Environment Pty Ltd (WRM, 2022) is reproduced in full as **Appendix 3**.
- An *Updated Groundwater Assessment* (Jacobs, 2022) is provided as **Appendix 4**.
- An *Updated Biodiversity Assessment Report* has been prepared by EnviroKey (2022) and is reproduced in full as **Appendix 5**.
- The *Biodiversity Offset Strategy* for the Project has also been updated by Niche Environment and Heritage (Niche, 2022) and is presented as **Appendix 6**.
- GHD was commissioned to technically assess the proposed alignment and has prepared a report titled *Bowdens Silver Mine Existing TransGrid 500kV Transmission Line – Realignment Option Study* which is presented as **Appendix 7**.
- Richard Lamb and Associates (RLA) was commissioned to review the update to the proposed 500kV power transmission line alignment and respond to the comments presented in public submission. The RLA *Response to Submission from Lue Action Group on Visual Impacts* is presented as **Appendix 8**.

A summary of environmental assessment outcomes presented in the EIS and the environmental assessment outcomes for the amended Project is presented in **Appendix 9**.

Finally, a statutory compliance table for the Project is presented in **Appendix 10** and an updated Schedule of Lands for the Project is presented as **Appendix 11**. No additional lands have been added within the Mine Site, with the updated Schedule of Lands reflecting only the removal of the water supply pipeline corridor.

2. STRATEGIC CONTEXT

2.1 INTRODUCTION

The following subsections present the strategic context for the Project in the context of the previous documents that have been presented to support the development application and the proposed amendments. Broadly, the strategic context for the Project remains largely unchanged as a result of the proposed amendment. This includes the strategic importance of the Project from a resource and social/economic perspective and the constraints on the Project related to its setting.

2.2 RESOURCE DEMAND AND USE

The strategic context for the Project is described in the EIS and remains largely unchanged as a result of the proposed amendment. 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. During the 2021 calendar year, silver prices averaged approximately US$25 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 *Amended Project Description* that is provided as **Appendix 1**. A JORC compliant Ore Reserves statement and Feasibility Study 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 proposed integrated water management and supply strategy renders the Project self-sufficient for water and as these resources are accounted for by Bowdens Silver's entitlements, these resources would be available to support any future expansion opportunity.

Recent highly successful exploration activities have indicated significant potential for future development, specifically underground mining development. While not a component of the current application, the presence of high-grade mineralised zones at depths of up to 300m in the vicinity of the open cut pit support longer-term prospects beyond the currently projected life of the Project. Bowdens Silver has been undertaking substantial drilling programs and has commenced pre-feasibility studies to further define the potential underground mining resource.

2.3 LOCAL SOCIAL AND ECONOMIC CONTEXT

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 *Economic Assessment*.

Feedback from consultation with the local communities of Lue, Rylstone and Kandos as well as within Mudgee and surrounds 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. A total of 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.

2.4 REGIONAL AND LOCAL PLANNING

Regional planning documents that are relevant to the Project include the Central West and Orana Regional Plan 2036 (CWO Regional Plan) and the Dark Sky Planning Guideline (DPE, 2016).

The CWO Regional Plan presents a range of goals for the region that covers 125 666km^2 and 20 local government areas. These include to encourage:

- a diverse regional economy;
- a stronger, healthier environment and diverse heritage;
- quality freight, transport and infrastructure networks; and
- dynamic, vibrant and healthy communities.

The Dark Sky Planning Guideline (DPE, 2016) provides guidance and technical information on lighting design requirements for developments within the Dark Sky Region – an area which comprises the land within a 200km radius of Siding Spring Observatory. The potential impacts of the Project on the Siding Spring Observatory are described in the *Lighting and Sky Glow Assessment* prepared by Lighting, Art & Science Pty Limited (LAS, 2020). Consultation was also undertaken with the Director of Siding Spring Observatory to establish the quantum of any potential impacts from the Project on astronomical operations at the Siding Spring Observatory. It has been confirmed that the night sky brightness above the observatory as a result of the Project would be negligible.

The principal local planning instrument for the Project is the Mid-Western Local Environmental Plan (Mid-Western LEP) 2012. Under that plan, the Mine Site and relocated Maloneys Road are located wholly within land zoned RU1 – Primary Production with open cut mining is permissible with consent within this zone. The Project is also located on land mapped under additional local provisions for groundwater vulnerability (Clause 6.4) and biodiversity sensitivity (Clause 6.5) within the Mid-Western LEP.

The objectives for the land zoning and for vulnerable and biodiversity sensitive land are discussed in detail in Section 4. In summary, it is considered that the Project would be consistent with the Mid-Western LEP and would not compromise the achievement of the relevant objectives of the plan.

2.5 REGIONAL AND LOCAL LAND USE

A key consideration for the Project is the location of the Mine Site in relation to nearby land users. Section 3.21 of the *Submissions Report* responds to submissions that commented on proximity of mining to private residences. Whilst the Mine Site is located within 2km to 3km of Lue, it is topographically shielded from most private residences. This site attribute provides for the natural attenuation of Project-related noise and air quality impacts whilst also obscuring the Mine Site from view. It is noted that planning for the Mine Site, detailed assessment and proposed mitigation measures have been developed with the objective to avoid impacts where possible. Where impacts would occur, the objective has been to mitigate and manage them throughout the Project life. Management of environmental impacts would include comprehensive monitoring to demonstrate compliance with the development standards that would be described in conditions of consent and/or inform adaptive management measures.

While some locations would have views of the Mine Site, no private residences or public views of mining infrastructure would be possible from Lue. Submissions relating to the proposed re-alignment of the existing 500kV power transmission line expressed concerns about the change in view of powerline infrastructure. This has been mitigated through a further change to the alignment but it is noted that views of the 500kV power transmission line would be possible, though would not alter the visual character of the area[4].

A key consideration for the Project relates to the potential for land use conflicts between the proposed mining activities and the existing agricultural uses of nearby land. An Agricultural Impact Statement (RWC, 2020b) prepared for the Project concluded that the land within the Mine Site was of limited agricultural capability. Following a review of nearby agricultural land uses and proximity to the mining activity, it was also concluded that the Project would have negligible to minor adverse impacts upon the agricultural resources and enterprises in the region. Bowdens Silver sought and obtained a Site Verification Certificate on 8 November 2017 which confirms that there is no contiguous Biophysical Strategic Agricultural Land (BSAL) within the Mine Site boundary.

[4] The assessment of visual impact associated with the re-aligned 500kV power transmission line is presented in Section 3.2 of the Amendment Submissions Report.

2.6 AGREEMENTS

There are three types of agreements relevant to the strategic context for the Project. These include the following.

- A Planning Agreement between Bowdens Silver and the Mid-Western Regional Council (MWRC).
- Purchase or lease agreements with landowners.
- Negotiated agreements in accordance with the NSW Voluntary Land Acquisition and Mitigation Policy (VLAMP).

The terms of the Planning Agreement have been agreed between Bowdens Silver and MWRC and are presented in **Table 2.1**. Total contributions to MWRC would exceed $4.7 million over the duration of mining operations, comprising $3.0 million for community infrastructure and $1.7 million towards road maintenance.

Table 2.1
Terms of MWRC Planning Agreement

Purpose	Development contribution	Date for payment
Community Infrastructure	$500,000 (representing a lump sum upfront portion of the 1% of the ICC[1]).	Within one calendar month of the Construction Commencement Date.
Community Infrastructure	$500,000 (representing a lump sum upfront portion of the 1% of the ICC[1]).	Within one calendar month of the Production Commencement Date.
Community Infrastructure	Balance of the ICC[1] contribution (being $1.46 million) payable in equal instalments being $94,200 per annum (subject to CPI adjustment).	Annually for 15.5 years, commencing 12 months after the Production Commencement Date.
Community Infrastructure	1% of AACE[2].	Within one calendar month following the financial year in which AACE is incurred.
Road Maintenance Contribution[3]	$1,705,000 payable in equal instalments being $110,000 per annum (subject to CPI adjustment).	Annually for 15.5 years, commencing 12 months after the Production Commencement Date.

[1] ICC: the initial capital cost of the Development totalling $246 million (with 1% of the ICC being $2.46 million).

[2] AACE: the additional annual capital expenditure for the Development totalling $54 million, which will be incurred over the life of the mine (with 1% of the AACE being $0.54 million).

[3] Road Maintenance Contribution: calculated over the length of Lue Road and Bylong Valley Way from Mudgee to Rylstone totalling 51km.

A range of confidential lease or purchase agreements have been reached with landowners in the region. Some agreements have involved direct purchase or access and use while others provide for the option to purchase land. Any property that is the subject of this type of agreement is considered Project-related.

The *Noise and Vibration Assessment* for the Project (prepared by SLR Consulting, 2020) predicted exceedances of noise criteria at several residences at stages of the development despite the adoption of a comprehensive suite of feasible and reasonable mitigation measures. Agreements with the owners of residences that would experience significant or marginal/moderate exceedances would be required to be prepared in accordance with the NSW Government's Voluntary Land Acquisition and Mitigation Policy (VLAMP). Bowdens Silver is

continuing negotiations with the relevant landowners to reach agreed terms for any future acquisition or preference for mitigation at the property. As described in Section 4.2.2.5 of the EIS, measures to mitigate predicted noise levels at the properties may include installation of mechanical ventilation (such as air conditioning) and/or commissioning of a range of architectural improvements. The architectural improvements required would be determined during an inspection of the residence by an acoustic specialist and experienced builder. Properties that were predicted to experience negligible exceedances of noise assessment criteria would be offered mitigation with agreements relating to negligible impacts to be established following approval of the Project. These agreements for properties that have negligible exceedances are over and above the requirements of VLAMP.

2.7 ALTERNATIVE WATER MANAGEMENT AND SUPPLY CONSIDERATIONS

A comprehensive review of alternatives considered during planning for the Project is presented in Section 1.5.7 of the EIS. With regards to the proposed amendments, several alternative options were considered in investigating water use optimisation and alternative water sources. These include the following.

- Water production bores in targeted locations on Bowdens Silver-owned land and neighbouring properties.
- Alternative locations and sizing for dams within the Mine Site including harvestable rights dams.
- Alternative design features within the TSF that would allow water to be removed and returned to the processing circuit.
- Alternative external sources of water that might connect to the Project via an alternative water supply pipeline.
- Substantial increase to the water storage dam capacity.
- Delay the Project while securing the necessary commercial negotiations regarding water supply via the water supply pipeline.

Each of these options has been considered and eliminated with preference for the proposed integrated water management and supply strategy on the basis of water use efficiency, environmental impacts (water and other impacts such as native vegetation disturbance), rehabilitation implications and costs, cost efficiency and timing.

At no time has Bowdens Silver considered the option to directly source water from Lawsons Creek or Hawkins Creek.

3. DESCRIPTION OF THE AMENDMENTS

3.1 INTRODUCTION

This subsection presents a description of the proposed integrated water management and supply strategy that would provide all Project-related water requirements and the management of water within the Mine Site. This strategy justifies the decision to remove the water supply pipeline from the Project. The complete (and updated) description of the entire Project is provided in **Appendix 1**. The following subsections provide a summary of the integrated water management and supply strategy and infrastructure that would be constructed to support the approach. A water balance summary is presented based on the outcomes of assessment to support the strategy. The amendments to the Mine Site layout, including the proposed alignment of the 500kV transmission power line, and the implications of removing the water supply pipeline are then discussed.

3.2 WATER MANAGEMENT

3.2.1 Surface Water Management

The proposed amendment would not alter the overall strategy for the management of surface water within the Mine Site that was presented in the EIS. This strategy is based on the separation of water from three different sources based on anticipated water quality:

- **Containment Zone**: Due to the potential for impaired water quality, groundwater seepage and surface runoff from the open cut pit, the TSF, processing plant area, oxide ore stockpile and leachate management dam would be managed within a closed water management system (containment zone). Water accumulating within the containment zone would be the first priority water source for recycling in the processing plant and pumped to either dams in the processing plant (open cut pit dewatering pond or the raw water pond) or the turkeys nest dam.
- **Erosion and Sediment Control (ESC) Zone:** Runoff (sediment-laden water) from disturbed areas within the Mine Site, but outside of the containment zone, would be directed to sediment dams. Whilst Bowdens Silver's long-term objective is to discharge water collected within the sediment dams to the downstream environment, the predicted and assessed impacts in the *Updated Surface Water Assessment* (WRM, 2022) considers this water as retained within the Mine Site. Water collected within ESC zone dams, that is deemed unsuitable for release, would be pumped to the turkeys nest dam for use in processing operations.
- **Clean Water Zone:** Bowdens Silver would ensure the volume of water potentially impacted by the Project is minimised by diverting (clean water) runoff from undisturbed areas away from disturbed areas. During operations, a clean water diversion channel would divert the upper catchment of Blackmans Gully that would be unaffected by Project-related activities into Price Creek. Clean water diversion channels are also proposed to divert Blackmans Gully and its associated tributary catchments away from the main open cut pit both during operations and after mine closure. Existing and proposed harvestable rights dams located in the clean water zone would collect clean runoff for pumping to the proposed water storage dam and use in Project-related activities.

3.2.2 Integrated Water Management and Supply Strategy

As noted in Section 1.2, Bowdens Silver has been investigating ways to reduce Project-related water demand and to increase the Project's capacity to recover, recycle, store and re-use water. These investigations have occurred concurrently with technical assessment of groundwater resources in geological structures identified at depth from exploration drilling activities.

The proposed integrated water management and supply strategy comprises multiple components that interact to provide water security for the Project without the need for water sourced from the Ulan coalfields. A key objective of this strategy has been to increase the security of the Project's water supply by reducing the Project's water demand and limiting evaporative losses. The following key strategies would be implemented to support water management at the Mine Site.

- Water demand would be reduced by a higher rate of water recycling within the processing circuit.
- Water stored in the TSF and other water management infrastructure would be managed to reduce the water surface's exposure to evaporation.
- Clean water captured within the Mine Site would be separated as much as possible from water in containment zones so there is always sufficient water for dust suppression.
- Water sources would be prioritised to ensure that operational requirements and the function of containment dams is not compromised at any time.

A comparison of the EIS water supply strategy and the proposed integrated water management and supply strategy is provided in **Table 3.1**. Whilst most components in the strategy remain as described in the EIS, an additional component (paste thickener plant) has been incorporated to optimise the recovery and re-use of water for processing operations. Furthermore, to ensure supplementary water supplies are available in the absence of the water supply pipeline, groundwater supplied via advanced dewatering (production) bores forms a key component of the proposed strategy.

Table 3.1
Water Supply Strategy: EIS and Proposed Amendment

EIS	Proposed Amendment
Surface water collected in the leachate management dam for recycling and reuse in processing operations.	Retained
Surface water collected in TSF decant pond for recycling and reuse in processing operations.	Retained
Groundwater and surface water accumulating within the open cut pit for recycling and reuse in processing operations.	Retained
Surface water collected within the sediment dams (but unsuitable for release).	Retained
Surface water collected under harvestable rights entitlements.	Retained
Tailings dewatered in TSF and pumped to processing plant from decant pond.	Amended: Tailings dewatered in paste thickener plant (reclaim water) and pumped to processing plant.
Supplementary water supplied externally from the Ulan Coalfields.	Removed: supplementary water supplied via advanced dewatering (production) bores.

A comparison of the proposed amendment to water management and supply infrastructure and the relevant aspects of Project presented in the EIS is provided in **Table 3.2**. The locations of relevant components are presented on **Figure 3.1**.

Table 3.2
Comparison of Amended Components of the Project

EIS Water Management Components	Proposed Amendment
Tailings thickening using high-rate thickener in processing plant domain. Tailings dewatered in TSF and pumped to processing plant from decant pond.	Tailings thickening using paste thickener plant located on the central ridge between the processing plant and TSF. Tailings dewatered directly in paste thickener plant (reclaim water) and pumped to processing plant.
65ML turkeys nest dam.	130ML turkeys nest dam.
External supply of water via the water supply pipeline.	Advanced dewatering from groundwater production bores.
Surface water collected within sediment dams or authorised under harvestable rights entitlements.	Surface water collected within six additional harvestable rights dams pumped to a 130ML water storage dam.
Soil stockpiles S5 and S6 on central ridge between open cut pit and TSF	Soil stockpiles S5 and S6 amended to allow for paste thickener plant installation and to reduce vegetation clearing. Additional soil stockpile capacity provided in vicinity of open cut pit

Following the commencement of mining operations, water to facilitate ore processing and dust suppression activities throughout the Mine Site would be drawn from the following sources which are listed preferentially in order and type of use.

1. Surface water collected in the clean water zone under harvestable rights entitlements for use in dust suppression activities.
2. Paste thickener reclaim water for recycling and reuse in processing operations.
3. Surface water collected by the leachate management dam (containment zone) for recycling and reuse in processing operations.
4. Surface water and decant collected by the TSF (containment zone) for recycling and reuse in processing operations.
5. Groundwater and surface water accumulating within the open cut pit (containment zone) for recycling and reuse in processing operations and for dust suppression within the open cut pit.
6. Surface water collected within the sediment / containment dams (ESC zone, but unsuitable for release).
7. Groundwater abstracted from production bores (advanced dewatering) for use in processing and / or dust suppression activities (not shown on **Figure 3.1**).

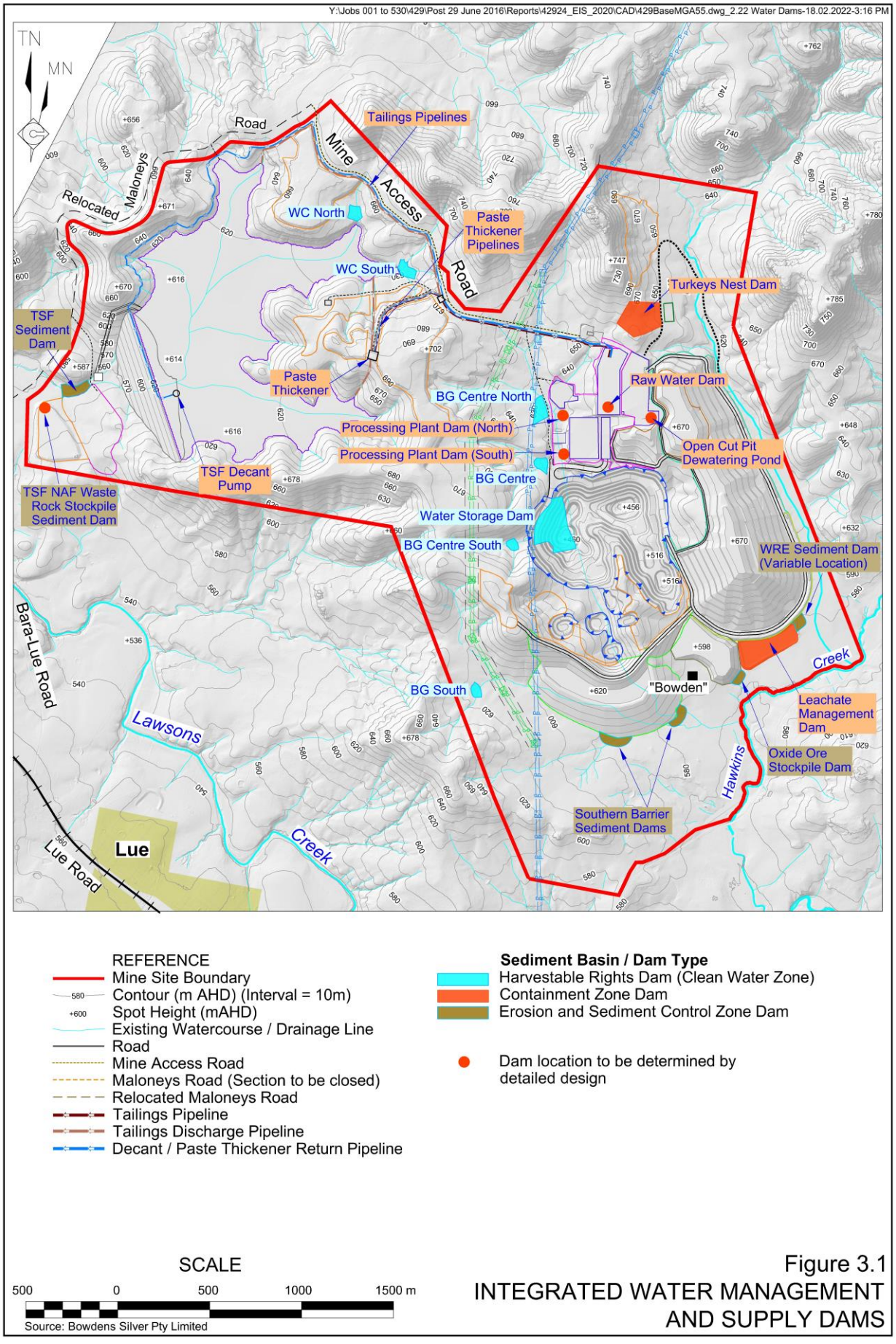


Figure 3.1
INTEGRATED WATER MANAGEMENT AND SUPPLY DAMS

The following subsections describe each of the water management and supply infrastructure components and how each would be constructed and used to support water management within the Mine Site.

Harvestable Rights Dams

Bowdens Silver proposes to construct six harvestable rights dams to capture runoff from undisturbed (clean water zone) catchments within the Mine Site. Water collected within these harvestable rights dams would be used for dust suppression activities. This water would either be pumped directly to a standpipe for water cart filling or to the 130ML water storage dam.

These dams, including the water storage dam would be sized, constructed and operated under Section 53 of the *Water Management Act 2000* whereby Bowdens Silver is entitled to maximum harvestable rights entitlement of 180.6ML that is based on a contiguous landholding of 2 580ha.

Details of each harvestable rights dam and the water storage dam is provided in **Table 3.3** with their locations shown on **Figure 3.1**.

Table 3.3
Harvestable Rights Dams

Dam	Location	Catchment	Capacity (ML)
WC North	Upstream of TSF	Walkers Creek	2.2
WC South	Upstream of TSF	Walkers Creek	2.4
BG Centre (North)	West of processing plant	Blackmans Gully	4.3
BG Centre	West of haul road	Blackmans Gully	3.0
BG Centre (South)	West of open cut pit	Blackmans Gully	1.3
BG South	West of southern barrier	Blackmans Gully	1.6
Water Storage Dam	Western section of open cut pit	None	130

Paste Thickener Plant

The paste thickener plant would thicken the tailings stream from the processing plant to produce tailings with a 63% w/w solids content. As this thickening process would reclaim water from the tailings stream prior to deposition in the TSF, it would significantly reduce the make-up water requirements of the Project. Previously, the EIS presented an annual average make-up water requirement for the processing plant which, when operating at its design capacity, needed 1 482ML/year. With the inclusion of the paste thickener, Bowdens Silver would reduce the annual processing plant make-up water requirement by 390ML to 1 092ML/year.

The tailings slurry would be transferred via pipeline from the processing plant to the paste thickener plant which would operate in a similar manner to the previously proposed high-rate thickener. However, the paste thickener incorporates additional design features that encourage gravity separation of the solids via settling. This process results in a high solids content tailings "paste" that would then be transferred to the TSF via pumps and a pipeline. All water reclaimed by the paste thickening process would then be returned to the processing plant via a water return pipeline for recycling in processing operations.

The location of the paste thickener plant and the tailings slurry, water return and tailings discharge pipelines are shown on **Figure 3.1**.

Leachate Management Dam

The leachate management dam (LMD) would remain as originally described in the EIS and form part of the containment zone. In summary, this 80ML HDPE[5] lined water storage would be a containment dam for collecting runoff and leachate from the waste rock emplacement (WRE). As the LMD would collect water from the WRE that would store potentially acid forming waste rock material, the LMD is a containment structure that has been sized to prevent the release of collected water.

The LMD would be connected to the leachate sump within the active WRE cell via an HDPE pipe. All water collected in the LMD would be pumped to the turkeys nest dam for storage and use in processing operations.

Tailings Storage Facility

The design of the TSF would remain unchanged and would be consistent with that described in the EIS with the additional mitigation retained as described in the Submissions Report. The TSF would form part of the containment zone for surface water management purposes. However, the management strategy for water collected within the TSF's decant pond would be amended. Previously, the water in the decant pond of the TSF was proposed to be returned to the processing plant via a pontoon-mounted pump floating on the decant pond.

Bowdens Silver is now proposing to manage the depth of water in the decant pond via a fixed pumping system with water pumped (via a pipeline) to the turkeys nest dam or directly to the processing plant for recycling in processing operations. Management of the decant pond in this manner would maintain a minimum decant pond depth of approximately 0.5m that would be 1.5m lower than the depth provided by a pontoon-mounted pump. The optimisation of decant pond water recovery would not only increase the water available for operations, but it would also reduce the evaporative losses from the pond surface and the potential for seepage from the TSF.

Open Cut Pit: Groundwater Inflows and Runoff

As described in the EIS, all groundwater inflows, incident rainfall and runoff accumulating in the open cut pits would be pumped from an in-pit sump to the open cut pit dewatering pond. This pond would be situated adjacent to the processing plant and all water used for processing operations.

Sediment / Containment Dams

As described in the EIS, runoff from the processing plant area, oxide ore stockpile and WRE are likely to have elevated dissolved metals levels. This (mine affected) water would be managed within a closed water management system (containment zone). All runoff in this zone would be captured in containment dams and pumped to the turkeys nest dam for recycling for use in processing operations.

Runoff collected from disturbed areas within the Mine Site but outside of the containment zone (sediment-laden runoff), including the southern barrier, would be directed to sediment dams. In order to reduce the potential for sediment-laden runoff generation. Bowdens Silver would rehabilitate and revegetate disturbed areas as soon as practicable. In addition, and to assist in maintaining environmental flows, Bowdens Silver's long-term objective is to discharge water collected within the sediment dams to the natural environment. However, Bowdens Silver is

[5] HDPE: high density polyethylene

continuing a program of geochemical testing to characterise this runoff and determine whether it must be contained to prevent contamination of the downstream environment. Therefore, the design storage capacity of each sediment dam remains as presented in the EIS, namely the 1 in 20 AEP 72 hour design storm runoff volume plus 50% for sediment storage. Pumping infrastructure would be installed to transfer collected runoff within 5 days and for subsequent re-use in operations. Should a strategy to discharge water from sediment dams become feasible, Bowdens Silver would consult with the EPA and DPIE regarding the necessary approvals and licences required to permit this to occur.

As a result of the potential for containment of sediment-laden runoff within the Mine Site, for conservatism the predicted and assessed impacts to downstream flows in both the EIS and the *Updated Surface Water Assessment* (WRM 2022) considered this water as retained within the Mine Site and re-used for operations. Details of the key sediment dams within the Mine Site and their containment storage capacity, as presented in Section 4.6.2 of WRM (2022), is provided in **Table 3.4** with the locations shown on **Figure 3.1**.

Table 3.4
Sediment Dams

Dam#	Location	Capacity (ML)
TSF Embankment	Downstream of TSF Embankment	26
TSF NAF[1] Waste Rock Stockpile	Adjacent to Stockpile	19
Southern Barrier East	Downstream of Southern Barrier	40
Southern Barrier West	Downstream of Southern Barrier	25
Oxide Ore Stockpile	Downstream of Oxide Ore Stockpile	13
Waste Rock Emplacement	Adjacent to Lower Embankment Haul Road	12
Note: 1 Non-acid Forming (NAF)		# See **Figure 3.1**

Advanced Dewatering (Production) Bores

Advanced dewatering involves the abstraction of groundwater from the aquifer(s) in which the proposed open cut pit is situated and in advance of mining. Production groundwater bores would be installed within the bounds of the proposed open cut pit or adjacent to it to abstract the water. By locating these bores in the same area as future mining, groundwater-related impacts are not substantially increased compared to those predicted by mining alone.

Investigations conducted by Bowdens Silver since exhibition of the EIS, and building upon previous studies, have identified zones of enhanced permeability and yields in the vicinity of major geological structures. Bowdens Silver would install advanced dewatering (production) bores at depth, to target geological structures adjacent to the northern perimeter of the open cut pit and thus within the pit's predicted zone of groundwater influence.

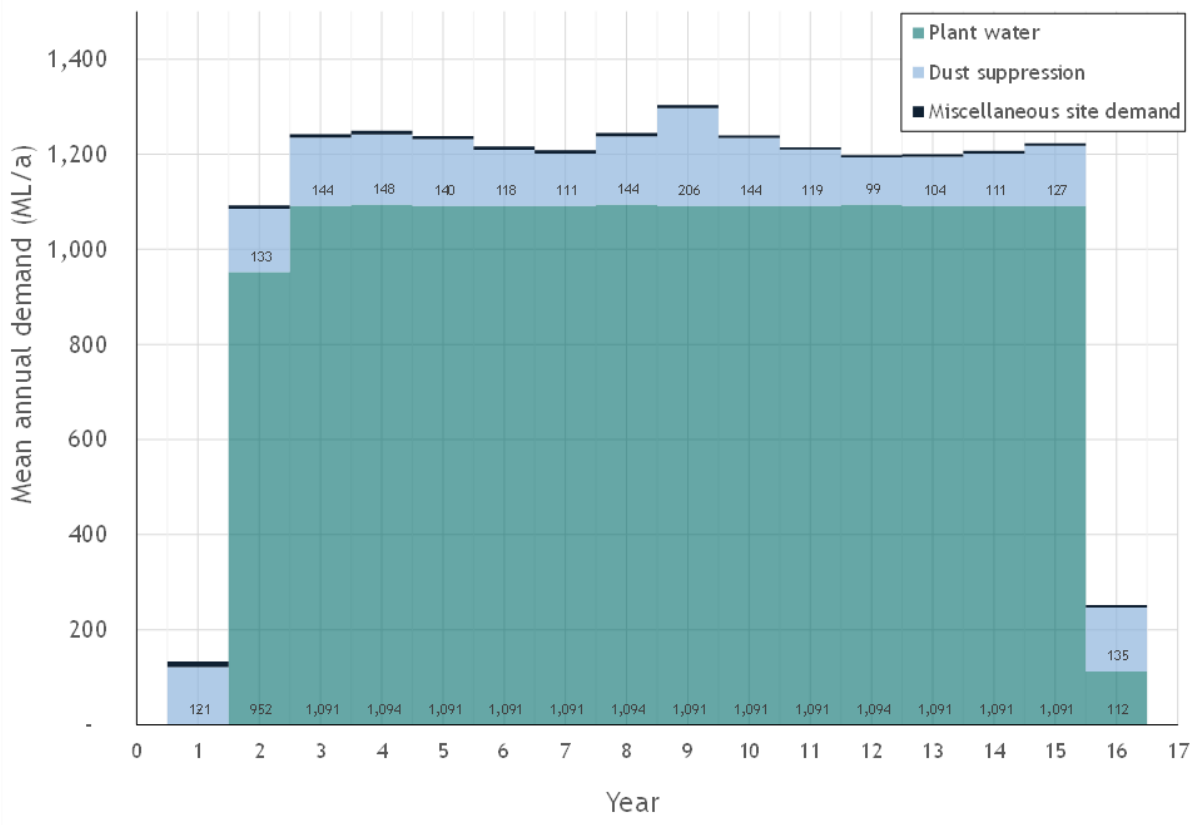
Groundwater would be abstracted at rates up to 10 litres per second to ensure that water is always available for processing and dust suppression. As advanced dewatering would be available to provide make-up water should shortfalls arise from other on-site sources, it removes uncertainties relating to the Project's capacity to meet its water requirements without external sources.

Furthermore, deeper exploration drilling at the Mine Site has confirmed the presence of other, large regional geological structures with significant porosity. Therefore, there is potential for supplementary water supplies that could be sourced from similar hydrogeological environments within land surrounding the Mine Site. However, any future water supply via these bores would be subject to licensing and assessment in accordance with the NSW Aquifer Interference Policy.

3.3 WATER BALANCE

The following subsection provides an overview of the Project's water demand and water sources used to meet the projected demand. WRM (2022) prepared a daily timestep water balance model that utilised historical conditions to assess the site water balance throughout the Project life. The water balance description is drawn from the WRM (2022) modelling outcomes.

The annual average site water demand throughout the Project life, as modelled by WRM (2022), is presented on **Figure 3.2**. Full information on the Project's water balance, including the results of sensitivity analysis and low and high runoff scenarios are provided in Section 5 of WRM (2022) (refer **Appendix 3**).



Source: WRM (2022) – Figure 5.1

Figure 3.2
ANNUAL AVERAGE SITE WATER DEMAND

3.3.1 Water Demand

Processing Plant

When operating at the maximum capacity of 2 million tonnes per annum (Mtpa) ore feed, the processing plant is expected to require approximately 3.0ML/day that represents 1 092ML/year. As noted in Section 3.2.2, the EIS presented an annual average make-up water requirement for the processing plant of 1 482ML/year. This processing water demand has been reduced by 390ML/year via the inclusion of the paste thickener.

Dust Suppression

Water would be applied to haul roads to supress dust generation during construction and operations. Haul road water demands would vary throughout the Project life due to the changes in the length of haul roads as operations progress. In addition, during dry weather periods, when evaporation is high, more water for dust suppression would be required. Haul road dust suppression demand would be reduced via the use of an approved chemical suppressant / sealant.

In summary, WRM (2022) estimate the average annual dust suppression demand would require[6]:

- Minimum ..... 99ML/year (Year11).
- Maximum..... 206ML/year (Year 8).
- Average.....132ML/year (all years).

Potable Water

During operations, a reverse osmosis plant would produce up to 14 ML/year of potable water from a combination of groundwater and surface water.

Potable water requirements during the site establishment and construction stage would be delivered to the Mine Site by water tanker until the installation and commissioning of the reverse osmosis plant.

Miscellaneous

The water balance contains provision for up to 7.5 ML/year that would be used for miscellaneous purposes around the Mine Site, such as wheel washing of trucks carrying NAF waste rock to the TSF for embankment raises.

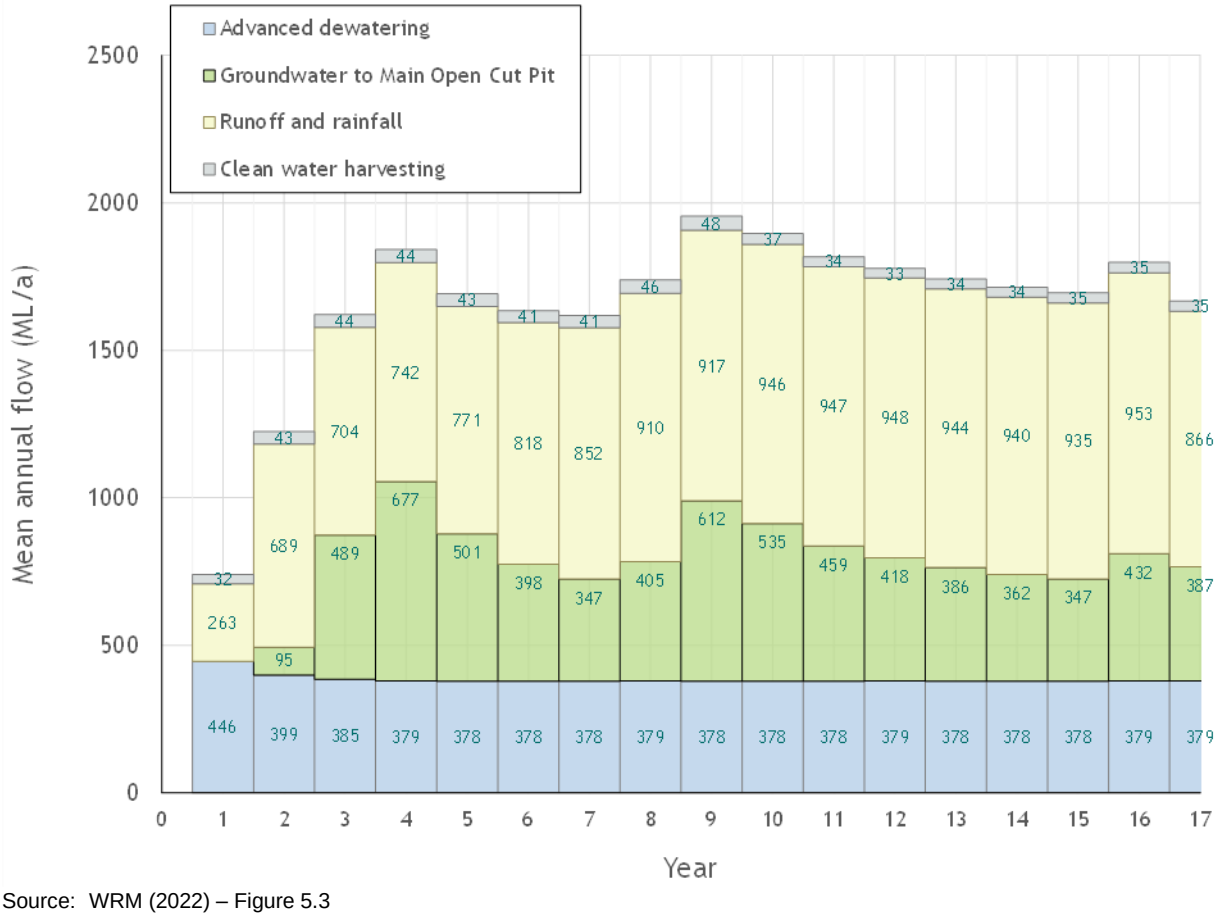
3.3.2 Water Sources

Section 2.10.1 of the *Amended Project Description* (refer **Appendix 1**) outlines each of the sources and quantities of water that Bowdens Silver intends to rely upon during the Project life. The sources of water and their priority for use were provided in Section 3.2.2, namely.

1. Surface water collected under harvestable rights entitlements.
2. Paste thickener reclaim water.
3. Surface water collected within the leachate management dam.
4. Surface water and decant collected within the TSF.
5. Groundwater and surface water accumulating within the open cut pit.
6. Surface water collected within the sediment / containment dams (but unsuitable for release).
7. Groundwater abstracted from advanced dewatering (production) bores.

[6] Refer Table 5.3 of WRM (2022)

The contribution of each of the above sources of water would vary throughout the mine life. With the exception of the paste thickener plant, that reduces overall processing water demand, **Figure 3.3** displays the estimated average annual quantities of water from the sources identified above and over the Project life.



Source: WRM (2022) – Figure 5.3

Figure 3.3
AVERAGE ANNUAL WATER SOURCE INFLOWS

3.3.3 Site Water Balance

A site water balance is an important management tool used to predict water use constraints through the use of a computer-based operational simulation model. Predictions may be generated for:

- the average inflows and outflows of the on-site water management system for a number of representative realisations;
- the quantity of water that would accumulate within the open cut pits, TSF decant pond and leachate management dam;
- the volumes of make-up water required to supplement on-site water demands;
- the risk of uncontrolled releases from the surface water storages to the downstream receiving environment.

Section 5 of WRM (2022) provides details of how each of the inflows and outflows for the integrated water management and supply strategy have been calculated.

Table 3.5 lists the key simulated average annual inflows and outflows to the integrated water management and supply strategy calculated from the water balance for mining years 1 to 14.

Table 3.5
Average Annual Site Water Balance – Years 1 to 14

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	856	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	40	
Ore moisture	83	
Retained tailings moisture		1 141
Evaporation		448
Dust suppression demands supplied		131
Concentrate moisture		18
Other plant losses		20
Dam overflows		0
Annual increase in stored volume		31
Total	**1 789[1]**	**1 789**
[1]Note rounding causes total inflows to amount to 1 790ML.		
Source: WRM (2022) – Table 5.5		

WRM (2022) also tested the sensitivity of the Project's water balance to changes in catchment response using two sets of AWBM parameters, representing low and high runoff scenarios. The resultant average annual site water balances for these scenarios are summarised in **Table 3.6** and **Table 3.7** respectively.

Table 3.6
Average Annual Site Water Balance – Years 1 to 14 – Low Runoff Scenario

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	740	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	22	
Ore moisture	82	
Retained tailings moisture		1 130
Evaporation		356
Dust suppression demands supplied		131
Concentrate moisture		18
Other plant losses		19
Dam overflows		0
Annual increase in stored volume		1
Total	**1 655**	**1 655**
Source: WRM (2022) – Table 5.11		

Table 3.7
Average Annual Site Water Balance – Years 1 to 14 – High Runoff Scenario

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	1 109	
Net groundwater inflows to open cut pit	431	
Advanced dewatering	380	
Clean water harvesting	58	
Ore moisture	83	
Retained tailings moisture		1 146
Evaporation		614
Dust suppression demands supplied		132
Concentrate moisture		18
Other plant losses		20
Dam overflows		0
Annual increase in stored volume		136
Total	**2 061**	**2 061**

Source: WRM (2022) – Table 5.12

WRM (2022) also tested the water balance under a scenario whereby groundwater inflows were assumed to be half the predicted values of Jacobs (2022). The resultant average annual site water balance for this scenario is summarised in **Table 3.8**. Under this scenario, water supply shortfalls could potentially constrain production by 15% on average. Whilst the low groundwater inflow scenario indicates production constraints, Bowdens Silver does not consider this a risk to the financial viability of the Project.

Table 3.8
Average Annual Site Water Balance – Years 1 to 14 – Low Groundwater Inflow Scenario

Item	Inflow ML/a	Outflow ML/a
Rainfall and runoff	811	
Net groundwater inflows to open cut pit	215	
Advanced dewatering	190	
Clean water harvesting	40	
Ore moisture	72	
Retained tailings moisture[1]		989
Evaporation		211
Dust suppression demands supplied		119
Concentrate moisture		15
Other plant losses		17
Dam overflows		0
Annual increase in stored volume		-23
Total	**1 328**	**1 328**

[1]Note that limited water supply would constrain production by approximately 15% on average under this scenario

Source: WRM (2022) – Table 5.13

The site water balance model prepared by WRM demonstrated that the integrated water management and supply strategy could replace the water supply pipeline to reliably supply the Project over the full Project life. **Table 3.9** presents the modelled that volumetric supply reliability for the Project (total water supplied expressed as a percentage of total demand) based on the proposed integrated water management and supply strategy.

Table 3.9
Project volumetric water supply reliability

Demand	Volumetric water supply reliability	
	Average	**Lowest**
Processing plant	99.4%	94.5%
Dust suppression	99.8%	99.5%
Source: WRM (2022) – Table 5.8		

Table 3.9 clearly demonstrates that under average modelled climate conditions and during periods of low rainfall, the Project can be reliably supplied with water for both processing operations and, critically dust suppression activities.

3.3.4 Dam Inflows and Maximum Stored Volumes

The water balance model was also utilised to determine the water management system's effectiveness in the capture and retention of Mine Site runoff. This modelling was undertaken to assess the potential for the release of potentially mine-affected water to the downstream environment. **Table 3.10** summarises the maximum stored water volume modelled storages of dams within the containment (mine affected) and ESC zones of the site water management system. The results shown in **Table 3.10** demonstrates that under the modelled historic climate conditions, all water in these zones can be contained on the Mine Site without release.

Table 3.10
Maximum Modelled Stored Water Volumes

Dam	Nominal Design Capacity (ML)	Maximum Modelled Stored Water Volume (ML)
TSF Decant	Varies	3 340[1]
Pit – final year	N/A	1 157
Pit - prior to final year	N/A	387
WRE leachate management dam	80	60
Oxide ore dam	9[2]	9
Processing plant dams	100	95
Other combined sediment dams (modelled as containment structures)	80[2]	75
[1] Occurs during Year 8 [2] Excludes sediment storage		
Source: WRM (2022) – Table 5.6		

3.4 AMENDED MINE SITE LAYOUT

The integrated water management and supply strategy required the amendment of the Mine Site layout to incorporate the following components that are numbered for ease of reference to **Figure 3.4**.

1. Paste thickener plant: located on the central ridge between the processing plant and the tailings storage facility (TSF).
2. Turkeys nest dam: whilst included in the Mine Site layout presented in the EIS, the size of the turkeys nest dam has been increased from 65 megalitres (ML) to 130ML which necessitates an increase in this dam's footprint in the amended Mine Site layout.
3. Water storage dam: this 130ML dam would be situated in the western section of the open cut pit and used to store clean water pumped from maximum harvestable rights dams within the Mine Site. This dam would be constructed and operated until Year 9 when the dam would be removed to facilitate open cut pit development in accordance with the mining schedule.
4. Harvestable rights dams: six additional harvestable rights dams would be constructed within the Mine Site boundary for the collection of runoff and pumping to the water storage dam.
5. Soil stockpiles: whilst sufficient stockpile areas were included in the Mine Site layout presented in the EIS, the following stockpile areas have been amended:
    a) Stockpile S5: a section has been amended to provide for the installation of the paste thickener plant; and
    b) Stockpiles S5 and S6: sections have been moved to areas in proximity to the open cut pit to reduce areas of potential indirect impact from Project-related activities.

The principal issue raised in response to the *Amendment Report* and the proposed re-alignment of the 500kV power transmission line was the visibility of the proposed alignment and in particular transmission towers supporting the power lines. Bowdens Silver commissioned GHD Pty Ltd (GHD) to review and undertake modelling of the alignment to assess if alternative alignments may be feasible and provide a better outcome in terms of visual amenity for landholders to the west of the Mine Site. The outcomes of this review are discussed in Section 6.5 and presented in the *Bowdens Silver Mine Existing TransGrid 500kV Transmission Line – Realignment Option Study* (hereafter referred to as GHD, 2022) which is provided as **Appendix 7**. The alignment modelled by GHD which is now proposed for the Project is presented in **Figure 3.4**.

In addition, **Figure 3.5** provides a comparison of the following, including distance to the closest privately-owned residences.

- The Existing Alignment is that currently in place across the proposed Mine Site.
- The EIS/Amendment Alignment which was proposed in the EIS and *Amendment Report*.
- The Proposed Alignment that was modelled by GHD (2022).

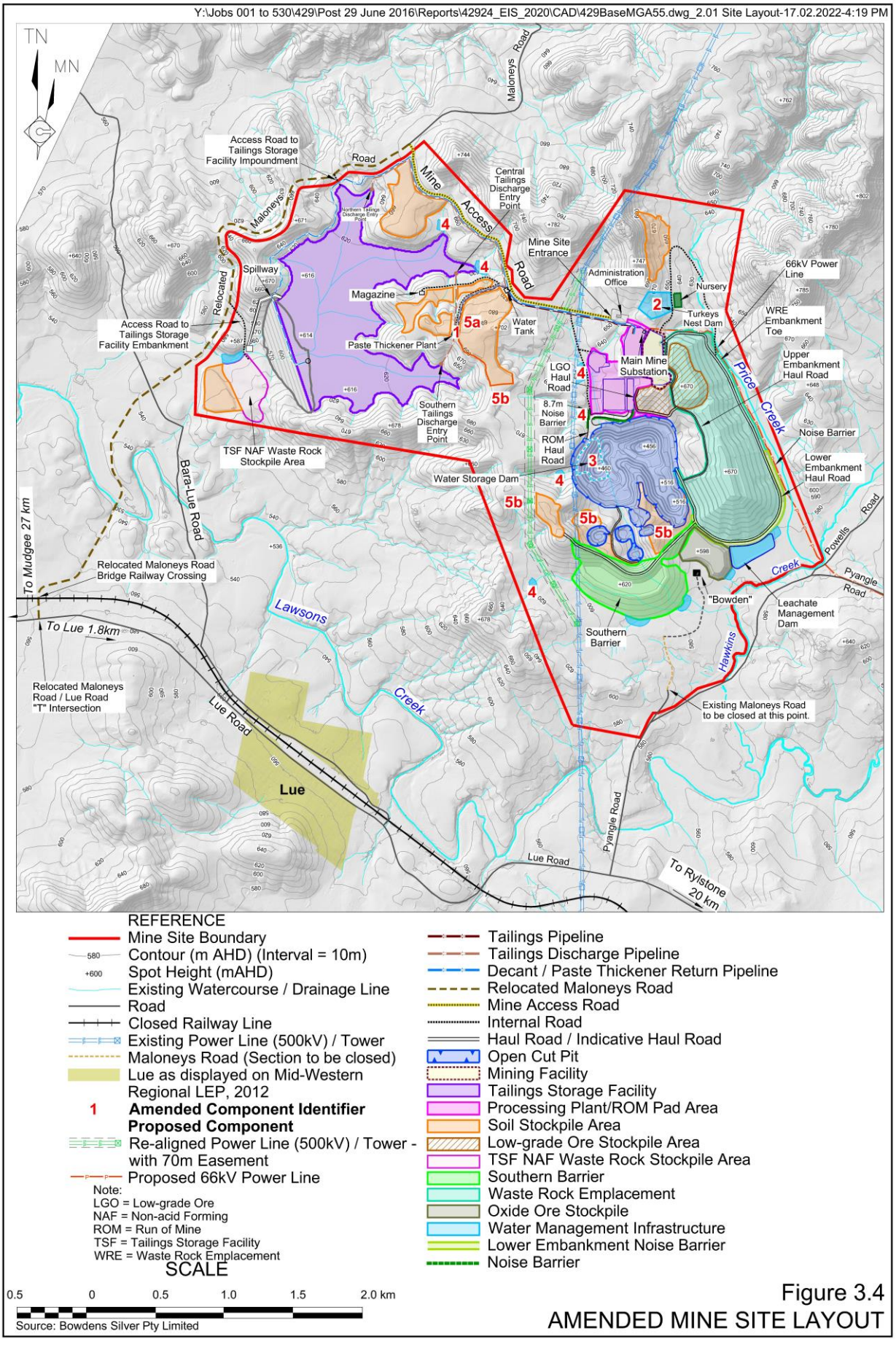


Figure 3.4
AMENDED MINE SITE LAYOUT

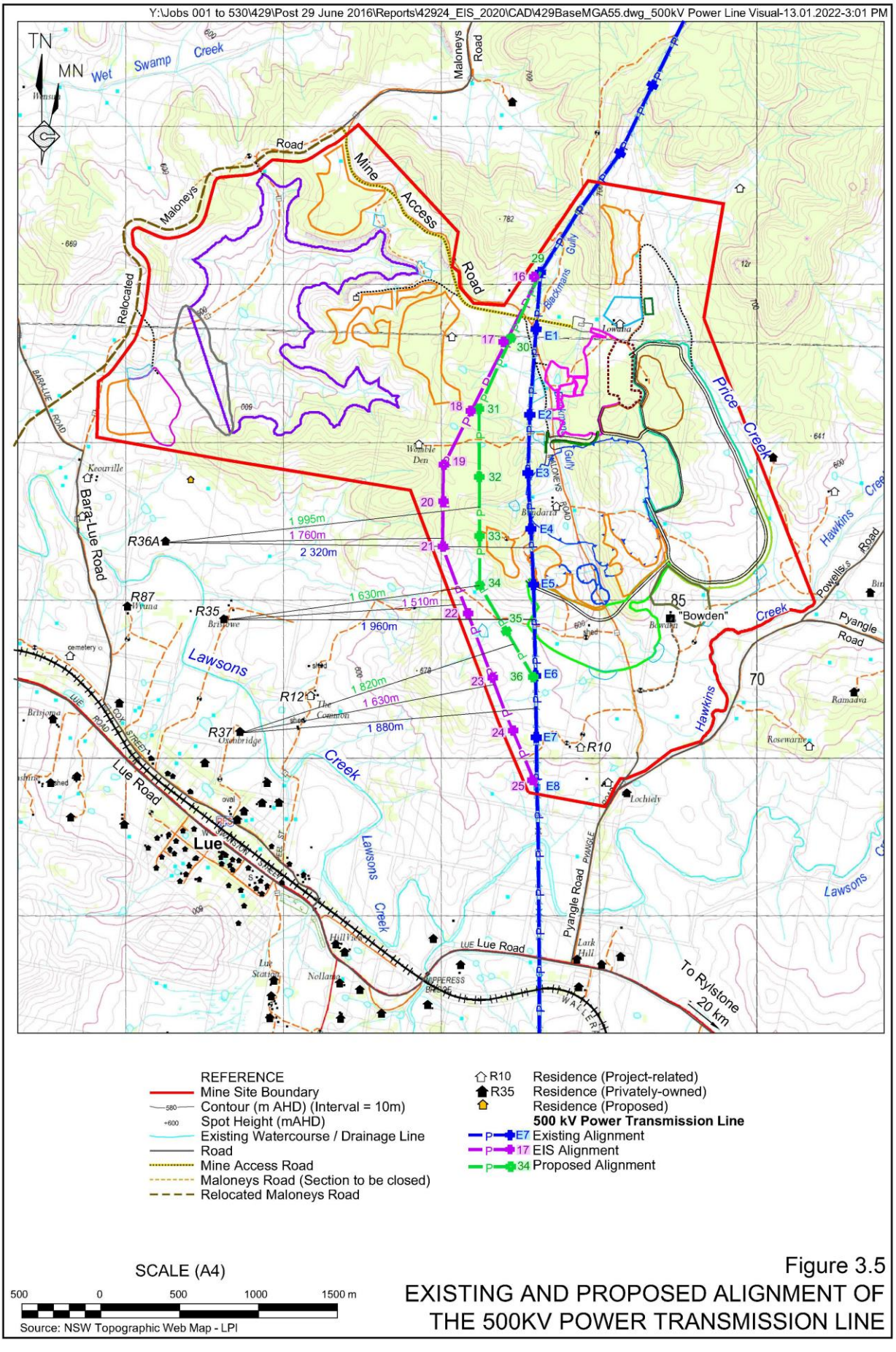


Figure 3.5
EXISTING AND PROPOSED ALIGNMENT OF THE 500KV POWER TRANSMISSION LINE

In addition to the above, minor refinements to the Mine Site layout have been incorporated to address comments from the Biodiversity Conservation and Sciences Directorate of DPIE (BCS) regarding the requirement that all State significant development that would have residual impacts to biodiversity first take measures to avoid impact before consideration of mitigation and finally biodiversity offsetting. This review included consideration of areas that may be subject to indirect impacts. A more compact Mine Site is now proposed with infrastructure location selected to minimise indirect as well as direct impacts. In some cases, areas of indirect impact have been incorporated in the Mine Site disturbance area to ensure that Bowdens Silver are properly accounting for the possible impacts of the development.

3.5 WATER SUPPLY PIPELINE REMOVAL

As described previously, the investigations to optimise water demand and identify alternative sources of water has led to the development of the integrated water management and supply strategy. This strategy has been assessed by WRM (2022) with regards to the reliability of water supply under varying conditions and it has been confirmed that Bowdens Silver may rely upon on-site water sources to supply water for the operation, with only limited and acceptable risks that water is not available, and production may be affected.

In summary, the removal of the water supply pipeline would result in the following outcomes.

- Total surface disturbance for the Project would be reduced from 495.54ha to 457.42ha (once additional areas are accounted for).
- An area of 54.66ha that would have been disturbed for the water pipeline construction and use would not be required. The area comprised 15.12ha of native vegetation and 39.54ha of cleared land.
- The removal of the pipeline avoids the need for impacts to Ausfeld's Wattle (*Acacia ausfeldii*), which is listed as a vulnerable threatened species in NSW.
- Project-related disturbance is no longer required in the Mudgee-Wollar key breeding area for the Regent Honeyeater as defined by the *National Recovery Plan for Regent Honeyeater* (DoE, 2016).
- There is no longer the need to establish easements on private and public land for the construction of the pipeline.
- Construction-related impacts would be avoided including traffic, noise and dust generation.
- There is no longer the need to establish stand- alone reverse osmosis water treatment facilities and associated management of produced brines for the pipeline.
- Under boring of watercourses would no longer be required.
- Traffic associated with ongoing maintenance of the pipeline would not be required.
- Removal of substantial capital, operating and maintenance costs for the water pipeline infrastructure.

While the water supply pipeline provided a greater level of water supply certainty for the Project, the assessed reliance on the integrated water management and supply strategy and the opportunity to avoid the above impacts is considered preferable to Bowdens Silver.

The environmental risks associated with the integrated water management and supply strategy are considered in detail in Section 6.

4. STATUTORY CONTEXT

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.

The statutory context for the Project and the proposed amendment is presented in **Table 4.1**. Statutory compliance matters relating to pre-conditions to exercise the power to grant approval, and the mandatory matters that must be considered by the consent authority, are listed in Tables A10.1 and A10.2 in **Appendix 10**.

Table 4.1
Statutory Context for the Bowdens Silver Project

Matter	Project Relevance
Power to grant consent	The Project is classified as SSD under Section 5(1)(c) of Schedule 1 of the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP). The Project Development Application (DA) will therefore require assessment under Division 4.7 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). In accordance with Section 2.7 of the Planning Systems SEPP, as more than 50 submissions objecting to the Project were received from public individuals and organisations, the Independent Planning Commission will be the consent authority.
Permissibility	The proposed Mine Site is situated on land that is zoned RU1 (Primary Production) under the *Mid-Western Regional Local Environmental Plan 2011* (LEP). The Mid-Western Regional LEP identifies that open cut mining is permissible with consent within this zone and as a result, the Project is permissible with consent.
Other approvals (Consistent Approvals)	Section 4.42 of the EP&A Act identifies a range of approvals that must be applied consistently to any SSD consent granted. The following approvals will be required for the Project and are covered by this requirement. • A mining lease issued under Part 5 of the Mining Act 1992 to permit mining of minerals. An application for a mining lease has been made (MLA601) however, has been paused until the Project development application is determined. • An Environment Protection Licence under Chapter 3 the *Protection of the Environment Operations Act 1997* (POEO Act) to permit mining for minerals as the Project would exceed the 4ha disturbance threshold under Clause 29(2) of Schedule 1 of the POEO Act. • Permits issued by Mid-Western Regional Council under Section 138 of the *Roads Act 1993* for works associated with the proposed relocation of Maloneys Road, intersection works and road upgrades. • Formal closure of a section of Maloneys Road by Mid-Western Regional Council in accordance with Division 3 of Part 4 of the *Roads Act 1993*. • An aquifer interference approval issued under the *Water Management Act 2000.*

Table 4.1 (Cont'd)
Statutory Context for the Bowdens Silver Project

Matter	Project Relevance
Other approvals	Approval under the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* will be required as the Project has been referred to the Commonwealth Department of Agriculture, Water and the Environment and determined to be a controlled action. Therefore, approval from the Commonwealth Minister for the Environment will be required for the Project to proceed. A regional native title claim NSD857/2017 (Warrabinga-Wiradjuri #7) that covers a portion of Crown land within the proposed Mine Site as well as a broad area surrounding the Mine Site was accepted for registration on the Register of Native Title Claims on 1 September 2017 that covers a portion of Crown land within the proposed Mine Site. Before the NSW State government can confer mining rights (through a mining lease) for the Project, a right to negotiate applies under Division 3, Subdivision P and Bowdens Silver must negotiate with the native title claimants regarding the intended mining. Should agreement not be reached on the proposed mining, an arbitration body or a Minister will make a decision regarding whether the mining lease may be granted or not. This process does not influence approval for the Project but must be resolved before the grant of a mining lease under the *Mining Act 1992*. Bowdens Silver has commenced negotiations with the native titles claimants and is proceeding in good faith with that process. In addition to the Mine Site, the Project requires the relocation of Maloneys Road. To the extent the road relocation overlaps areas where native title has not been extinguished, native title will need to be addressed. Bowdens will continue to liaise with the relevant government agencies to ensure that native title is addressed for the road relocation in accordance with the future act provisions under the Native Title Act 1993, as required, including compliance with the associated procedural requirements.
Other approvals (Not integrated into the SSD Assessment)	Other approvals that would be required for the Project but are not covered by the provisions of Sections 4.41 (see below) or 4.42 of the EP&A Act are as follows. • Water Access Licences to account for groundwater inflows to the open cut pit and advanced dewatering (production) bores that would be issued under: – *Water Sharing Plan for the NSW Murray Darling Basin (MDB) Porous Rock Groundwater Sources Order 2020;* – *Water Sharing Plan for the NSW Murray Darling Basin (MDB) Fractured Rock Groundwater Sources Order 2020; and* – *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources.* • Water Access Licences to account for runoff intercepted by the TSF that would be issued under: – *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources.*
Other approvals (Not required)	Section 4.41 of the EP&A Act identifies that if development consent is granted for SSD the following relevant authorisations that would otherwise have been required for the Project are not required. • An Aboriginal Heritage Impact Permit under section 90 of the *National Parks and Wildlife Act 1974*. • A water use approval under section 89 of the *Water Management Act 2000*. • A water management work approval under section 90 of the *Water Management Act 2000*.

5. ENGAGEMENT

5.1 GOVERNMENT AGENCY CONSULTATION

Bowdens Silver has consulted with NSW Government agencies throughout the development application and assessment progress to provide updates on the Project and seek more information concerning requests or recommendations made during agency review of the assessment outcomes. This has included consultation with the Biodiversity, Conservation and Sciences Directorate of DPIE (BCS), DPIE Water and NRAR, Heritage NSW, Mid-Western Regional Council, and Transport for NSW. No specific consultation was necessary regarding the proposed water management and supply strategy.

DPIE (19 November 2021) and Mid-Western Regional Council (2 December 2021) were consulted on the proposed amendment to inform them of the intended removal of the water supply pipeline and inclusion of the integrated water management and supply strategy.

5.2 COMMUNITY CONSULTATION

The water supply arrangement for the Project have been a matter raised on numerous occasions with local community members and organisations. While the water supply pipeline was presented in the EIS and assessed in detail, the final water supply arrangements had not been confirmed. In order to update the community on the water supply for the Project, the following consultation was undertaken.

- Personalised letters and emails were sent to local residents and landowners on 30 November 2021 outlining the updated water management strategy including information to participate in the Virtual Information Session as well as options to seek further information directly from Bowdens Silver.
- A media release was distributed to local radio stations and the Mudgee Guardian newspaper on 30 November 2021 outlining the changes to the Bowdens Silver Project, advising of the Virtual Information Session and the opportunity to ask questions to Bowdens Silver staff and specialist consultants. Advertisements were also placed in the Mudgee Guardian newspaper advising the opportunity to participate in this session.
- A meeting of the Community Consultative Committee was held on 8 December 2021[7].
- A Virtual Information Session was held on 10 December 2021. The session was hosted using virtual technology and live streamed online[8].
- A summary of the updated water management strategy has also been provided on the Bowdens Silver website.

[7] A copy of the CCC meeting minutes from 8 December 2021 (and all previous meetings) can be accessed from the Bowdens Silver website (https://bowdenssilver.com.au/community-consultative-committee-meeting-minutes/)
[8] A recording of the Virtual Information Session is available to download and view from the Bowdens Silver website (https://bowdenssilver.com.au/virtual-information-session/)

These consultation events were organised to inform community members of the proposed amendment to the Project and justify the decision to rely upon the integrated water management and supply strategy. The implications of the removal of the water supply pipeline in relation to water sources for the Project were discussed within the CCC meeting and the Virtual Information Session as well as water availability and water quality implications for local water users. The changes to Project outcomes as a result of the removal of the water supply pipeline were also discussed including the reduced surface disturbance and the necessary changes to the Mine Site layout.

5.3 COMMUNITY FEEDBACK

The CCC is comprised of local community members as well as representatives of the Lue Action Group and the Wellington Valley Wiradjuri Aboriginal Corporation. A number of questions were raised during the CCC meeting held on 8 December 2021 with the matters raised broadly summarised, as follows.

- Queries concerning the timing of decisions on water supply, why it was not considered in the EIS and other Projects that were used as models for the integrated water management and supply strategy.
- Water licence availability.
- Whether the strategy accounted for unexpected weather (for example, high and low rainfall and runoff).
- Concern that the integrated water management and supply strategy focuses upon water reliance on the Mine Site and what the risks to downstream water users and native fauna would be from the strategy.
- Implications for TSF seepage and management.
- General concerns relating to consultation with the community on the amendment.

Discussion with the CCC members also included general Project queries and concerns relating to the need and process for the amendments to the Project, timing for construction of the relocated Maloneys Road relative to operations commencing, planning regulations for mining projects and the economic viability of the Project.

Questions received in advance of the session or during the Virtual Information Session were addressed at the time and covered the following matters.

- Queries relating to potential impacts to downstream water users resulting from the integrated water management and supply strategy.
- Whether satellite technology has been used to identify water sources.
- General concerns relating to risks associated with the TSF and the Company's approach to improving greenhouse gas emission generation in response to Australia's commitments regarding emissions.

No additional direct feedback to the Virtual Information Session has been received since it was held.

5.4 ONGOING CONSULTATION

Bowdens Silver maintains an "open door" policy for interested parties to seek information about the Project from the Bowdens Silver team based at the local Lue office. Bowdens Silver also maintains a comprehensive question and answer (Q&A) portal on its website.

Bowdens Silver will maintain its consultation program as the development assessment process continues. It is acknowledged that this document and specifically the *Amended Project Description* presented in **Appendix 1** is the culmination of investigations and operational and management commitments made to address outstanding uncertainties for the development application and to address matters raised in submissions by Government agencies and the community. Bowdens Silver will continue to inform the community of these changes and the Project as it is now proposed. This would be done through a combination of direct engagement with local residents, open day style meetings, newsletters and other news updates and engagement with the CCC.

Bowdens Silver remains committed to providing a range of sponsorship opportunities to support the local communities that focus on overarching themes of community, education, arts and culture, sport, health and safety. These would be continued as a component of the active Community Investment Program that provides funding for a range of community-led initiatives, organisations, events and schools.

6. ASSESSMENT OF IMPACTS

6.1 INTRODUCTION

In the absence of the water supply pipeline, Bowdens Silver is proposing an integrated water management and supply strategy to meet Project-related water demand (principally processing and dust suppression) and to manage water resources within the Mine Site to improve the reliability of water supply. As noted in preceding sections, this strategy incorporates amendments to how surface water and groundwater resources within the Mine Site are managed and subsequently the environmental risks associated with the Project. The proposed amendment also requires minor changes to the Mine Site layout (described in Section 3.4) which change the biodiversity impacts of the Project. Amendments to the Mine Site layout since the submission of the *Amendment Report* (and update to the Project Description – see **Appendix 1**) include the proposed alignment for the 500kV power transmission line which has been amended to improve visual amenity outcomes at privately-owned residences. The following subsections describe the outcomes of updated assessment for the amended Project including consideration of matters that did not require update to technical assessment reporting.

A summary of the impact assessment outcomes presented in the EIS and the impact assessment outcomes for the amended Project are presented in **Appendix 9**. Some of these outcomes are discussed in detail in this report but may also relate to assessment outcomes presented in the *Submissions Report* for the Project.

6.2 SURFACE WATER

6.2.1 Introduction

The *Surface Water Assessment* prepared by WRM for the Project has been updated to assess the potential impacts of the proposed integrated water management and supply strategy. The *Updated Surface Water Assessment* is reproduced as **Appendix 3** and is referred to as WRM (2022). The principal changes to this report compared to previous versions are associated with the water balance modelling (operations and closure), description of the key features and operation of the site water management system and the assessment of the flow regime of Lawsons and Hawkins Creeks. The regulatory paradigm, data sources, data ranges, and potential surface water impacts of the Project remains unchanged from the original assessment.

The water balance modelling for the Project under the proposed integrated water management and supply strategy is presented in Section 3.3.3. These subsections present the updated assessment of potential environmental risks associated with surface water resources under the Project.

Unrelated to the proposed amendment but also presented in WRM (2022) is the:

- updated final void pit lake water balance modelling undertaken to assess final void pit lake behaviour, which included taking into account climate change conditions that had been presented in recent Intergovernmental Panel on Climate Change publications; and
- updated hydraulic modelling of the proposed bridge that would be the Lawsons Creek crossing of the relocated Maloneys Road.

The implications of the updated final void pit lake and advanced dewatering on local and regional groundwater resources are considered in the *Updated Groundwater Assessment* (Jacobs, 2022) and discussed in Section 6.3.

6.2.2 Existing Environment

6.2.2.1 Introduction

The existing surface water setting for the Project is unchanged from that described in Section 4.7.2 of the EIS. The integrated water management and supply strategy does not rely upon or change the local catchments, watercourses that must be considered for potential impact, nor are additional local water users likely to be impacted. To inform the technical assessment of the integrated water management and supply strategy, a brief summary of the setting is provided in the following subsections, noting that this is consistent with the EIS.

6.2.2.2 Catchment Setting

Regional Setting

The Mine Site is located within the 507 km^2 Lawsons Creek catchment, in the eastern headwaters of the Macquarie River basin. Lawsons Creek flows in a northwesterly direction until it enters the Cudgegong River, immediately north of Mudgee. **Figure 6.1** shows the section of Lawsons Creek catchment in the vicinity of the Mine Site whilst the inset shows the Lawsons Creek catchment in its entirety.

Local Setting and Mine Site

Hawkins Creek, a tributary of Lawsons Creek with a catchment area of 61 km^2, flows in a southwesterly direction parallel to, but set back from, the southeastern boundary of the Mine Site. The Mine Site lies wholly within an area covered by the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources (2012)*: Lawsons Creek Water Source.

The Mine Site is traversed by the following named tributaries of Hawkins Creek and Lawsons Creek (see **Figure 6.1**).

- Price Creek (a south-flowing tributary of Hawkins Creek) with a catchment area of 5.2km^2 with its headwaters draining the sandstone escarpments northeast of the Mine Site. The proposed WRE would be situated on the western side of the Price Creek catchment.
- Blackmans Gully (a south-flowing tributary of Hawkins Creek) with a catchment area of 2.3km^2 and which flows through the centre of the Mine Site. The bulk of the proposed open cut pits and processing plant are located within the Blackmans Gully catchment.
- Walkers Creek (a west-flowing tributary of Lawsons Creek) with a catchment area of 4.9km^2 and comprised of a northern headwater and southern headwater which drain the western side of the Mine Site. The proposed TSF would be located in the upper section of the Walkers Creek catchment.

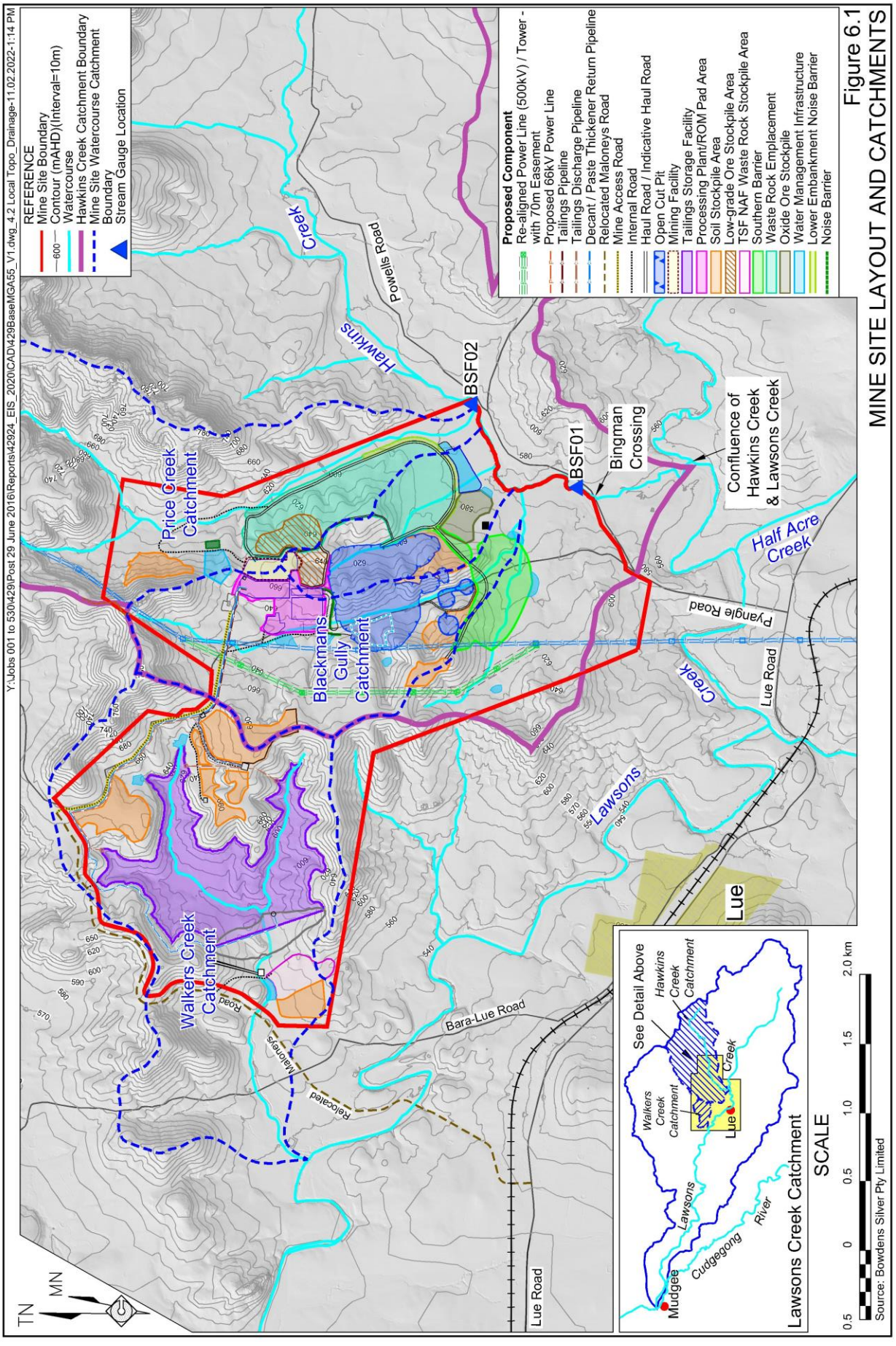


Figure 6.1
MINE SITE LAYOUT AND CATHMENTS
REFERENCE
Mine Site Boundary
Contour (mAHD)(Interval=10m)
Watercourse
Hawkins Creek Catchment Boundary
Mine Site Watercourse Catchment Boundary
Stream Gauge Location
Proposed Component
Re-aligned Power Line (500kV) / Tower - with 70m Easement
Proposed 66kV Power Line
Tailings Pipeline
Tailings Discharge Pipeline
Decant / Paste Thickener Return Pipeline
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
Water Management Infrastructure
Lower Embankment Noise Barrier
Noise Barrier
Price Creek Catchment
Blackmans Gully Catchment
Walkers Creek Catchment
Hawkins Creek
Powells Road
BSF02
BSF01
Bingman Crossing
Confluence of Hawkins Creek & Lawsons Creek
Half Acre Creek
Pyangle Road
Lue Road
Lawsons Creek
Lue
Bara-Lue Road
Relocated Maloneys Road
See Detail Above
Hawkins Creek Catchment
Walkers Creek Catchment
Lawsons Creek Catchment
Mudgee
Cudgegong River
SCALE
0.5 0 0.5 1.0 1.5 2.0 km
Source: Bowdens Silver Pty Limited
TN
MN
Y:\Jobs 001 to 5304\429\Post 29 June 2016\Reports\42924_EIS_2020\CAD\429BaseMGA55_V1.dwg_4.2 Local Topo_Drainage-11.02.2022-1:14 PM

A number of minor unnamed drainage features also cross the Mine Site. Baseline geomorphological conditions in drainage features crossing the Mine Site were assessed as part of the *Watercourse Assessment for the Bowdens Silver Project*, included as Annexure A in WRM (2022).

The Lawsons Creek catchment downstream of its confluence with Hawkins Creek covers an area of 284.5km^2 whereas the Lawsons Creek catchment area downstream of its confluence with Walkers Creek is 272km^2.

6.2.2.3 Streamflow Characteristics

In the absence of site-specific long-term data to characterise streamflow in Hawkins Creek and Lawsons Creek, WRM (2022) used the Australian Water Balance Model (AWBM) model to represent the runoff characteristics of local catchments. The parameters used for AWBM modelling of streamflow in Hawkins Creek and Lawsons Creek, as well as Mine Site runoff, were selected based on calibration to data collected at the Cudgegong River Upstream of Rylstone streamflow gauge (421184) operated by WaterNSW, which is the nearest NSW government streamflow gauge to the Mine Site.

Hawkins Creek

Based on the available flow data, WRM (2022) characterised Hawkins Creek streamflow as ephemeral to semi-perennial in the vicinity of the Mine Site. Discharge in Hawkins Creek is likely to be sustained by groundwater baseflow which Jacobs (2022) estimate is approximately 0.072ML/day. The average daily flow in Hawkins Creek over the period of records was approximately 1.95ML/day or 712ML/year. This quantity of water represents only 1.7% of the total rain falling in the catchment. This low percentage is likely to be attributable to the presence of some large farm dams within the catchment upstream from the Mine Site.

Lawsons Creek

Given the absence of actual flow data, WRM (2022) simulated streamflow within Lawsons Creek and based upon the AWBM, characterised average daily flow in Lawsons Creek. The AWBM prepared by WRM (2022) identified that, below its confluence with Hawkins Creek, streamflow in Lawsons Creek is approximately 19.5 ML/day or 7 136ML/year. Jacobs (2022) calculate that the baseflow groundwater contribution to the annual flow in Lawsons Creek is approximately 0.184ML/day or 67ML/year which represents approximately 1% of the creek's flow. Based on observations in adjacent catchments, runoff within the catchment is estimated to be approximately 4.9% of the total rain falling in the catchment.

Using the AWBM model, WRM (2022) estimated that flows in Lawsons Creek downstream from Walkers Creek are currently greater than 1ML/day for approximately 81% of the time.

6.2.2.4 Water Usage

Due to the prevailing land uses in the vicinity of the Mine Site, it is anticipated that many landholders would utilise their basic rights as landholders under the *Water Management Act 2000* for the collection of overland flow to support agricultural or pastoral production, i.e. in accordance with their harvestable rights. A review of the NSW Water Register identified a total

of 1 496 share components have been issued under the Water Sharing Plan for the Macquarie-Bogan Unregulated and Alluvial Water Sources: Lawsons Creek Water Source, 2012 for extraction by water users downstream of the Mine Site.

The 1 496 share components are distributed amongst 48 water access licences (comprising 36 unregulated river licences and 12 domestic and stock licences) with water access licences ranging between one share component to 147 share components. Up to 970ML of water is able to be extracted annually from Lawsons Creek by 29 landowners holding water access licences and work approvals downstream from Hawkins Creek principally for irrigation with limited stock watering.

Figure 6.2 displays the locations of the properties for which water access licences from the Lawsons Creek Water Source are held in the vicinity of the Mine Site. Almost all of the share components held under these water access licences are used for irrigation.

6.2.3 Potential Surface Water Impacts

WRM (2022) identified a number of aspects of the proposed amendment which could potentially impact on the downstream surface water environment in Hawkins Creek and Lawsons Creek and their tributaries, namely:

Streamflow reduction through:

- interception of runoff by the mine water management system; and/or
- loss of baseflow[9] recharge to streamflow due to impacts on the local groundwater profile (addressed in Section 4.6).

Water availability through:

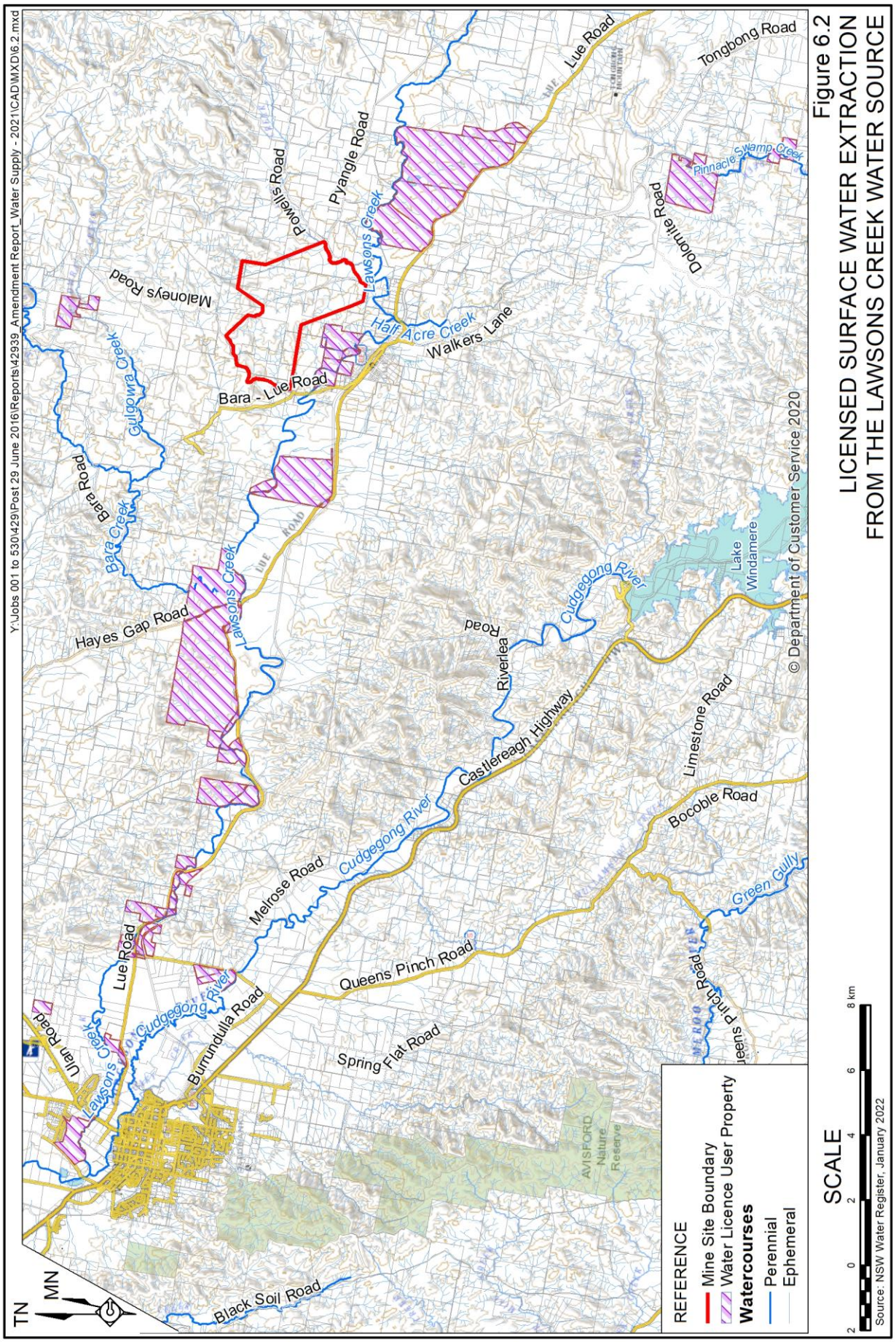
- loss of access for existing water users as the result of streamflow reduction; and/or
- Mine Site water requirements placing additional demand on local surface water resources.

6.2.4 Mitigation and Management Measures

As noted in Section 3.3, the proposed site water management system that would be implemented to manage potential impacts on surface water in the downstream receiving environment within and around the Mine Site would remain unchanged. This proposed strategy for the management of surface water within the Mine Site is based on the separation of water from different sources dependent on anticipated water quality.

Therefore, the mitigation and management measures that would be adopted for the proposed amendment would be the same as those proposed for the mining operations and outlined in Section 4.7.4 of the EIS.

[9] Baseflow is that part of streamflow derived from groundwater discharge and bank storage. Baseflow is considered likely to contribute year round to flows in Hawkins and Lawsons Creeks (Jacobs, 2022)


Y:\Jobs 001 to 530\429\Post 29 June 2016\Reports\42939_Amendment Report_Water Supply - 2021\CAD\MXD\6.2.mxd
Figure 6.2
LICENSED SURFACE WATER EXTRACTION
FROM THE LAWSONS CREEK WATER SOURCE
© Department of Customer Service 2020
Lue Road
Tongbong Road
Pyangle Road
Powells Road
Lawsons Creek
Pinnacle Swamp Creek
Dolomite Road
Malonеys Road
Gulgowra Creek
Half Acre Creek
Walkers Lane
Bara - Lue Road
Bara Road
Bara Creek
Hayes Gap Road
Lawsons Creek
Cudgegong River
Lake Windamere
Riverlea Road
Castlereagh Highway
Limestone Road
Bocoble Road
Green Gully
Melrose Road
Cudgegong River
Queens Pinch Road
Lue Road
Ulan Road
Lawsons Creek
Cudgegong River
Burrundulla Road
Spring Flat Road
Black Soil Road
AMISFORD Nature Reserve
TN
MN
REFERENCE
Mine Site Boundary
Water Licence User Property
Watercourses
Perennial
Ephemeral
SCALE
2 0 2 4 6 8 km
Source: NSW Water Register, January 2022

6.2.5 Assessment of Impacts

6.2.5.1 Introduction

The impacts of the proposed amendment upon the surface water environments within and downstream of the Mine Site have been established by WRM (2022) through the use of computer modelling that also considered the planned management and mitigation measures outlined in Section 4.7.4 of the EIS.

6.2.5.2 Downstream Flows

Downstream water flows would be influenced by the interception of runoff within the Mine Site's integrated water management and supply system. These flows would also experience a loss of baseflow contributions attributable to the localised impacts to the groundwater table as a result of mining operations and advanced dewatering. Details of the runoff interception and baseflow reduction during the operational period and post-mine closure are outlined as follows.

Operational Period

Runoff Interception

The interception of water within the containment zone (under average conditions) within the Mine Site would be a maximum of 177ML/year, i.e. based on the retention of rainfall and runoff within an area of approximately 550ha, i.e. 250ha within the Hawkins Creek catchment and 300ha within the Walkers Creek catchment. This combined area represents approximately 2.0% of the Lawsons Creek catchment downstream of its confluence with Walkers Creek.

Baseflow Reduction

The outcomes of Jacobs (2022) assessment of baseflow reduction are discussed in Section 6.3.6.3. In summary, Jacobs (2022) predict that, as the groundwater table is lowered gradually during the mine life, the baseflow attributable to groundwater in Hawkins and Lawsons Creeks would reduce by up to 0.024ML/day and 0.013ML/day respectively. For the purposes of predicting impacts upon the baseflow in the two creeks (and the groundwater-related amount required for a water access licence), Jacobs (2022) predict a maximum take during operations from the Lawsons Creek Water source of 14.0ML/year.

Combined Runoff Interception and Baseflow Reduction

Based upon the combined runoff interception and baseflow reduction, the Project would result in a peak total average annual loss of approximately 189ML/year during the operational period.

During the operational period:

- the flow in Hawkins Creek for a distance of 3.5km from its confluence with Lawsons Creek would decrease by up to 4.5%;
- the flow in Lawsons Creek between the confluence of Hawkins and Walkers Creeks would decrease by up to 1.2%; and
- the flow in Lawsons Creek downstream from its confluence with Walkers Creek would decrease by up to 2.2%.

Post-Mine Closure

Runoff Interception

The rehabilitation of the WRE and TSF would result in the resumption of flow from both of these components into Hawkins Creek and Walkers Creek. Surface runoff would be retained within the 53.1ha area of the main open cut pit which would result in the retention of 17ML/year or approximately 10% of the surface water retained during the Project life.

Baseflow Reduction

Jacobs (2022) predict that the maximum baseflow reduction post-mine closure would be 19.3ML/year (see Section 6.3.6.2).

Combined Runoff Interception and Baseflow Reduction

Based upon the combined runoff interception and baseflow reduction, the Project would result in a total average annual loss of approximately 35ML/year post-mine closure.

Post-mine closure:

- the flow in Hawkins Creek for a distance of 3.5km from its confluence with Lawsons Creek would decrease by up to 1.4%.
- the flow in Lawsons Creek between the confluence of Hawkins and Walkers Creeks would decrease by up to 0.3%; and
- the flow in Lawsons Creek downstream from its confluence with Walkers Creek would decrease by up to 0.4%.

The relative impact on flows in Lawsons Creek would reduce significantly with increasing distance downstream due to the contribution of other tributaries to total streamflow.

6.2.5.3 Availability of Water to Downstream Surface Water Users

WRM (2022) reviewed simulated daily flows in Lawsons Creek at its confluence with Walkers Creek and established that flows are on average greater than 1ML/day for approximately 81.0% of the time. As a result of the predicted reductions in flows attributable to the Project, flows greater than 1ML/day would occur for approximately 80.5% of the time, i.e. a reduction of 0.5% of the time or up to 2 days per year on average. Similarly, the impact on cease-to-flow periods would be minimal, with flows greater than 0.1 ML/d reducing in frequency from 90.2% to 89.8% of the time during operations, and 89.6% of the time post-mine closure.

This prediction is consistent with the assessment presented in the EIS, namely there would be a negligible change in availability of surface water for downstream users adjacent to Lawsons Creek. This indicates the proposed amendment does not generate additional impacts to those predicted in the EIS.

6.2.5.4 Downstream Water Quality

Potential impacts to downstream water quality may occur through the following.

- Runoff from exposed areas stripped of topsoil/subsoil containing sediment.

- Runoff from exposed NAF waste rock potentially affecting the chemical composition of downstream water.
- Release of contaminated water from the containment zone potentially affecting the chemical composition of downstream water.

The proposed integrated water management and supply strategy would permit greater water use and recycling efficiency, provide alternative water sources within the Mine Site and direct the transfer and storage of water to reduce evaporative losses. The risks associated with runoff from the Mine Site (be it sediment laden, exposure to NAF waste rock or from the containment zone) would be managed through on-site protocols as described in Section 4.7.4 of the EIS and would not change under the proposed amendment. Environmental risks such as pipe rupture associated with the transfer of water within the Mine Site would be consistent if not reduced when compared to the previously proposed water supply pipeline. These risks would also be managed through on-site protocols including routine monitoring and maintenance of pipeline condition.

6.2.6 Conclusion

The *Updated Surface Water Assessment* (WRM 2022) has utilised the computer models prepared for the EIS to contemporise the assessment of the Project to incorporate the integrated water management and supply strategy, whilst adopting the same mitigation measures presented in the EIS. WRM (2022) identified that during operations, flow rates in Hawkins and Lawsons Creeks would reduce by 1.2% to 4.5% whereas post-mine closure, flow rates would reduce by 0.3% and 1.4%. The proposed amendment would not add to the Lawsons Creek flow reduction predicted for the EIS and whereby the Project would cause flows greater than 1ML/day to occur on two fewer days per year. Overall, the proposed amendment would result in negligible reductions in flow and availability of water to downstream users. Bowdens Silver has acquired sufficient WALs from the Lawsons Creek Water Source to meet the predicted peak losses during operations.

As noted in Section 3.3, the water balance model prepared by WRM (2022) established the integrated water management and supply strategy as being capable of reliably meeting Project-related water demand throughout the Project life, even under low rainfall conditions. The only potential production constraint identified by the water balance was low groundwater inflows. However, this would not impair the Project's financial viability. The water balance model also demonstrated that, under modelled conditions, all water captured in the containment zone (that is, TSF and leachate management dam) can be retained within the Mine Site. This means that throughout the Project life there would be no need to discharge from the Mine Site.

WRM (2022) identified that the residual impacts of the Project, incorporating the proposed amendment, on the surface water regime within and surrounding the Mine Site would remain as originally assessed for the EIS. That is, the Project would marginally reduce downstream flows in both Hawkins and Lawsons Creeks through the interception and retention of runoff within the Mine Site and a reduction in baseflow in both creeks. The potential for impacts to surface water quality would be managed over the life of the Project and monitored in accordance with an approved Water Management Plan.

Both the *Surface Water Assessment* (WRM, 2020) and the *Updated Surface Water Assessment* (WRM, 2022) that included the updated final void pit lake water balance, were subject to peer review by Mr Tony Marszalek, Principal at ATC Williams. These peer reviews are included as Annexure C of WRM (2022). Based on the outcomes of his peer reviews, Mr Marszalek

concluded that the assessments were fit for the purpose of assessing impacts associated with downstream flows and potential impacts to downstream water users. As part of his original peer review, Mr Marszalek made three recommendations for future analyses, namely:

- Continued geochemical testing and runoff characterisation from NAF waste rock areas to guide water management;
- Amending design loss parameters where required in the hydrologic modelling of higher annual exceedance probability events; and
- Further refinement of natural catchment Australian water balance modelling parameters.

For conservatism, the *Updated Surface Water Assessment* assumes all runoff from NAF waste rock areas is retained within the Mine Site whilst the parameters used in hydrologic and Australian water modelling were left unchanged. However, Mr Marszalek noted that these further analyses would be unlikely to significantly affect the conclusions of the assessment.

6.3 GROUNDWATER

6.3.1 Introduction

The *Groundwater Assessment* for the Project prepared by Jacobs and presented in the EIS as *Volume 2 Part 5 of the Specialist Consultant Studies Compendium* was updated in June 2021 to address comments received from the Department of Planning, Industry and Environment - Water's review following public exhibition of the EIS. This update included refined modelling in the vicinity of the TSF to assess the efficacy of additional TSF design elements in further reducing potential seepage impacts. This report was presented as Appendix 3 of the Submissions Report for the Bowdens Silver Project (RWC, 2021). Following development of the integrated water management and supply strategy, Jacobs was commissioned by Bowdens Silver to update the calibrated numerical groundwater model prepared to assess the potential impacts of advanced dewatering (production) bores in accordance with the NSW Aquifer Interference Policy. In addition, following the revised final void pit lake water balance modelling prepared by WRM (2022), an assessment of the influence of climate change on final void equilibration was also undertaken. This assessment identified that under historical average and climate change conditions, the final void would act as a terminal groundwater sink with maximum pit lake water levels approximately 25m below the pit crest (spill) level.

The results of these additional assessments are presented in the *Updated Groundwater Assessment* (Jacobs, 2022) that is provided as **Appendix 4**. The *Updated Groundwater Assessment* also includes a technical modelling report as Annexure 9 and a TSF modelling report as Annexure 10.

It is also noted that in the period following public exhibition, the following water sharing plans relevant to the original *Groundwater Assessment* prepared by Jacobs and presented in the EIS, have been updated, namely:

- *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources, 2011*; and
- *Water Sharing Plan for the NSW Murray Darling Fractured Rock Groundwater Sources, 2011*.

However, the regulatory paradigm, data sources, data ranges and potential groundwater impacts of the Project remain unchanged from the original assessment.

6.3.2 Existing Environment

The existing groundwater setting is critical to conceptualising the local and regional groundwater system for the purpose of:

- identifying the implications of changes to the system associated with the proposed amendment; and
- identifying representative parameters for groundwater modelling to predict the behaviour of the setting and modelled conditions (such as advanced dewatering).

A comprehensive summary of the existing environment is provided in Section 4 of the *Updated Groundwater Assessment* (Jacobs, 2022). A brief summary of the groundwater setting is provided in the following subsections to inform the technical assessment of the integrated water management and supply strategy.

Significant fluctuations in groundwater levels were observed in historical groundwater level monitoring of the alluvial aquifers. Over the longer term, Jacobs (2022) established that this variation closely correlated with the cumulative rainfall deviation[10]. However, this correlation was less evident in bores located in hard rock aquifers. Jacobs (2022) also identified the potential for downward or upward flow of groundwater between the shallower alluvial aquifer and the deeper groundwater, and in some paired groundwater monitoring locations the shallow and deeper aquifers appeared to be highly connected. The locations of the groundwater monitoring bores are provided on **Figure 6.3**.

Jacobs (2022) used groundwater level monitoring results to derive the regional groundwater contours shown on **Figure 6.3**. These contours also indicate the direction of groundwater flow. The groundwater levels shown on **Figure 6.3** generally correlate with the local topography and identify that groundwater flows from areas of higher elevation to areas of lower elevation. As a result, a review of **Figure 6.3** identifies variable groundwater flow directions. Local groundwater levels in the main open cut pit area range from around 610m AHD in the north to 585m AHD in the south to southeast. This suggests that in this section of the Mine Site, groundwater flows to the southeast. By contrast, groundwater levels beneath the TSF area range from approximately 600m AHD in the upper valley areas to approximately 560m AHD at the proposed TSF embankment location in the middle of the Walkers Creek valley. This indicates that groundwater in the vicinity of the TSF flows in a southwesterly direction.

Figure 6.3 also identifies a flattening of groundwater contours in the area of the open cut pits. This suggests there is a highly connected fracture network in proximity to the major fault structures. However, it is noted that these results may also be influenced by the high density of drill holes in this location.

[10] The cumulative rainfall deviation is generated by cumulatively summing the residuals between actual monthly rainfall and the long-term average monthly rainfall to graphically present trends in recorded rainfall. Subsequently, the cumulative rainfall deviation provides a historical record of relatively wet and dry periods.

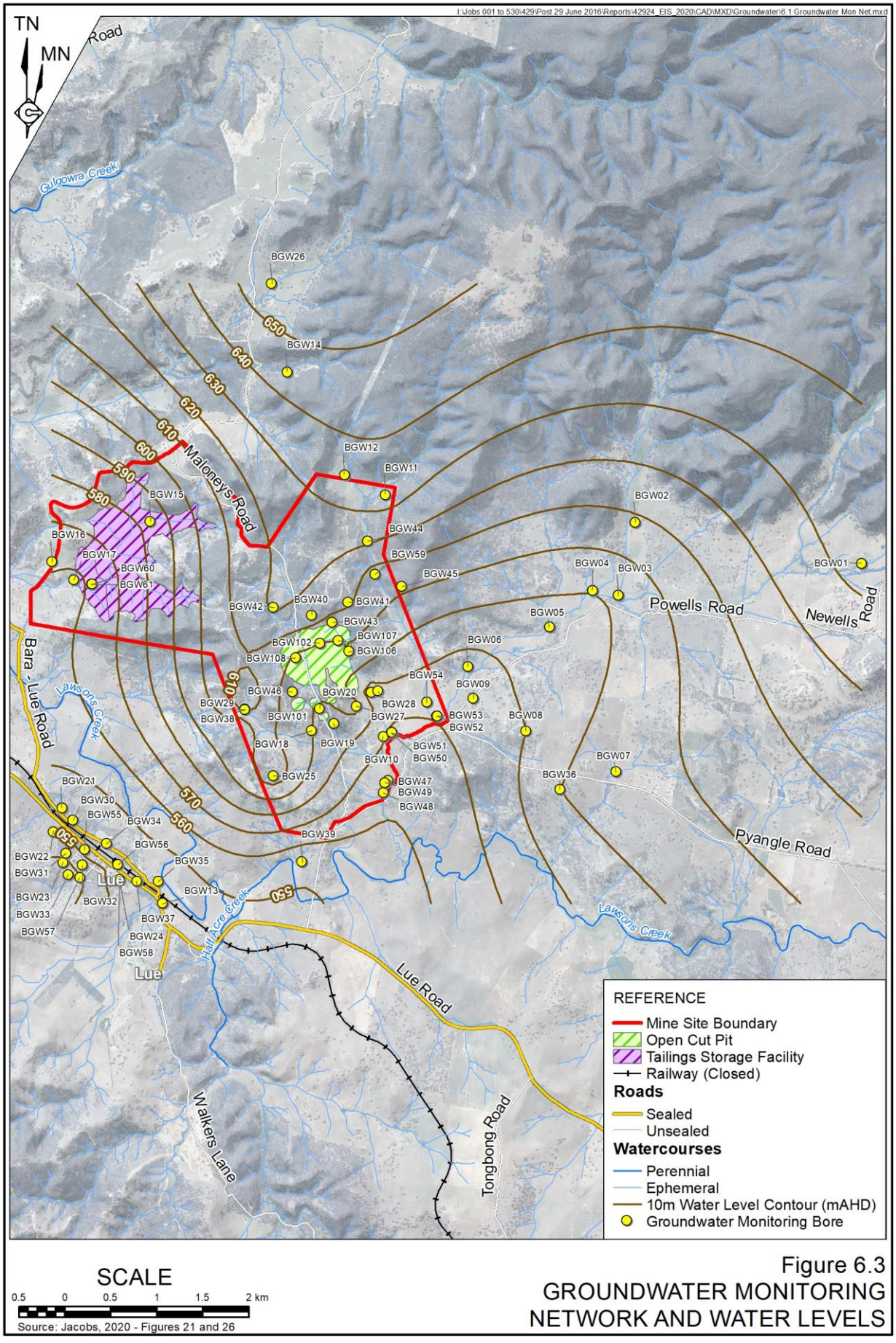


Figure 6.3
GROUNDWATER MONITORING NETWORK AND WATER LEVELS

The groundwater level data also indicates that Hawkins Creek is a groundwater sink, therefore the creek and its adjoining alluvial areas are likely to be a point of regional groundwater discharge.

6.3.2.1 Registered Groundwater Users

Jacobs (2022) searched the WaterNSW database for registered groundwater works within a 10km radius of the proposed open cut pit. This search identified 106 groundwater bores with:

- 24 groundwater bores being used for Bowdens Silver's monitoring program;
- 23 private bores within 2km of Lue; 6 bores have water supply works approvals associated with water access licences that authorise groundwater extraction from 6 to 60ML/year; and
- the majority of private bores being used for stock, domestic and irrigation purposes.

Details of the water access licences and associated groundwater work are summarised on **Table 6.1**.

Table 6.1
Summary of Groundwater WALs within a 10km radius of the Mine Site

WAL	Associated Groundwater Work	Use	Water Source	Extraction Limit (ML)
27907	GW011493	Stock, Irrigation, Domestic	Sydney Basin Murray Darling Basin Porous Rock Groundwater Source	50
35671	GW065121	Irrigation	Sydney Basin Murray Darling Basin Porous Rock Groundwater Source	60
28443	GW802732	Irrigation	Lachlan Fold Belt Murray Darling Basin Fractured Rock Groundwater Source	19
28946	GW042966	Stock, Irrigation, Domestic	Lachlan Fold Belt Murray Darling Basin Fractured Rock Groundwater Source	35
29014	GW066291	Stock, Irrigation, Domestic	Lachlan Fold Belt Murray Darling Basin Fractured Rock Groundwater Source	6
29247	GW062111	Industrial	Lachlan Fold Belt Murray Darling Basin Fractured Rock Groundwater Source	30

Figure 6.4 presents the location of all registered groundwater bores whilst a summary of all registered groundwater works is provided in Annexure 2 of Jacobs (2022).

6.3.2.2 Groundwater Dependent Ecosystems

Review of the Bureau of Meteorology (BoM) Groundwater Dependent Ecosystem Atlas, that is derived from regional studies, identified rivers, springs, or wetlands with moderate to high potential for groundwater interaction, as well as vegetation with moderate to high potential for groundwater interaction as being present within the Mine Site. The locations of high potential GDEs are provided on **Figure 6.4**.

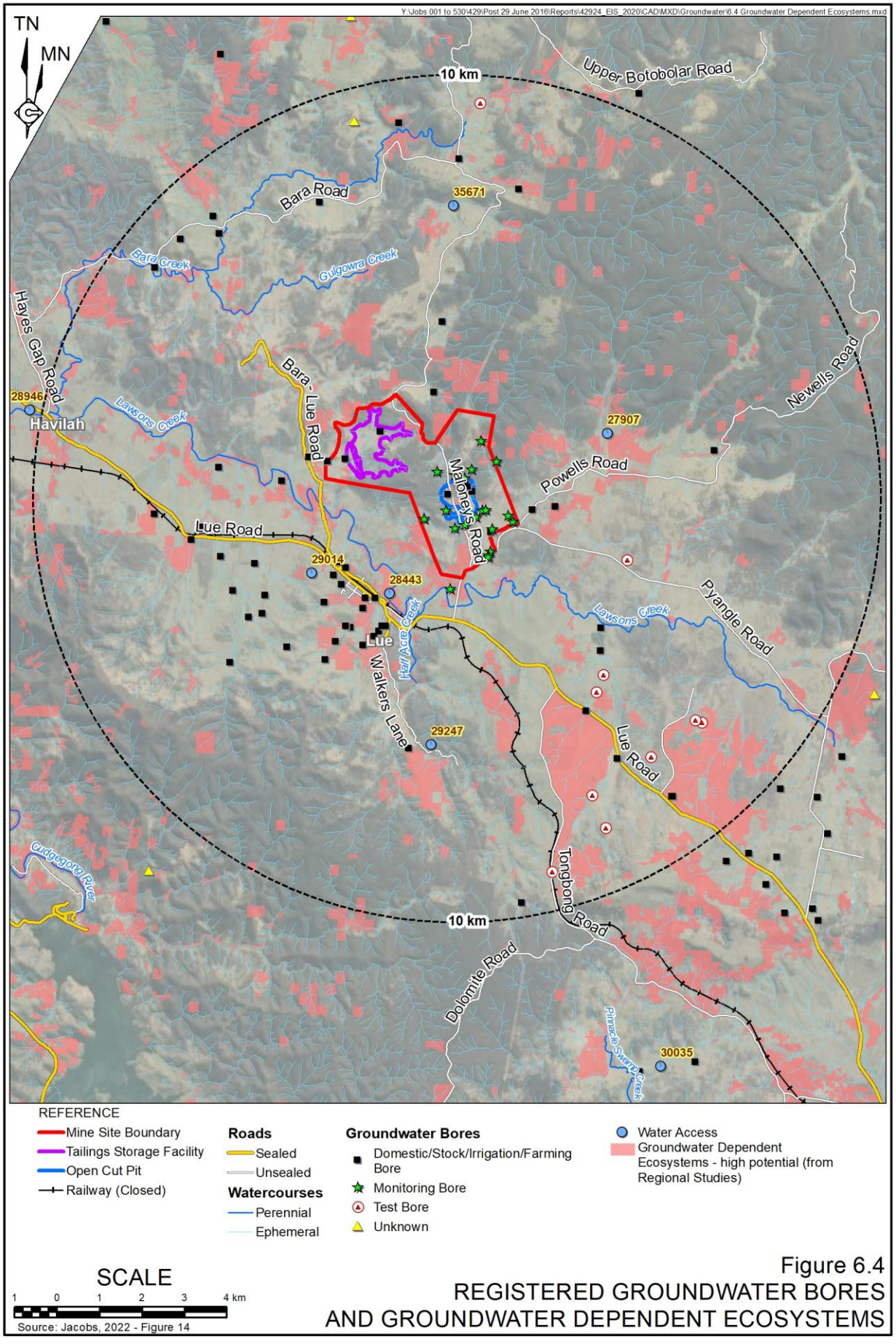


Figure 6.4
REGISTERED GROUNDWATER BORES
AND GROUNDWATER DEPENDENT ECOSYSTEMS

The applicable Water Sharing Plans also identify high priority groundwater dependent ecosystems for the relevant water source. The following high priority groundwater dependent ecosystems are identified by the relevant Water Sharing Plans as being closest to the Mine Site.

- Macquarie Bogan Unregulated and Alluvial Water Sources 2012: None.
- NSW Murray Darling Basin Fractured Rock Groundwater Sources Order 2020.
- *High priority spring*: Bailey Spring, approximately 35km north-northwest of the Mine Site.
- *High priority karst*: Apple Tree Flat and Cudgegong, approximately 14km west and 20km south of the Mine Site (respectively).
- *NSW Murray Darling Basin Porous Rock Groundwater Sources Order 2020*:
  - *High priority spring*: Kellys Springs, approximately 60km north of the Mine Site.
  - *High priority karst*: Ilford, approximately 36km south of the Mine Site.

Other potential groundwater dependent ecosystems within the Mine Site include the following:

River Baseflow Systems

Riverine baseflow systems include ecosystems that are dependent on baseflow in streams and rivers (Dresel et al., 2010). Ecosystems that exist in baseflow dependent streams can themselves be groundwater dependent. Groundwater levels can be important in maintaining flows or pools that sustain ecosystems, particularly during times of drought. Baseflow is considered likely to contribute year round to flows in Hawkins and Lawsons Creeks.

Springs and Seeps

A number of ephemeral seeps and partial wetlands are also present within the Mine Site, particularly in the upper reaches of the minor drainages. Jacobs (2022) inferred these seeps as being the ephemeral expression of a saturated soil profile resulting from the surface expression of sub-surface flows. The majority are inferred by Jacobs (2022) to be reliant on rainfall recharge and sub-flow, rather than regional groundwater. However, one spring (Battery Creek Spring), near the northwestern boundary of the Mine Site is inferred to be sourced from groundwater.

These ephemeral swamps and seeps are often developed as farm dams for stock water supply.

Terrestrial Vegetation

Terrestrial vegetation groundwater dependent ecosystems include vegetation which has seasonal or episodic dependence on groundwater. However, the *Updated Biodiversity Assessment Report* for the Project (EnviroKey, 2022 – **Appendix 5**) notes that none of the terrestrial vegetation present within their study area, including the Mine Site, are likely to be wholly groundwater dependent (obligate phreatophytes).

Stygofauna

The *Aquatic Ecology Assessment* for the Project (Cardno, 2020) identified a number of stygofauna assemblages in the vicinity of the Mine Site. All identified stygofauna taxa are typical of alluvial aquifers in eastern Australia and are not endemic to the area.

6.3.3 Potential Groundwater Impacts

The potential groundwater impacts of the Project when incorporating the proposed amendment include impacts to other registered groundwater users, reductions in streamflow from baseflow loss and natural ecosystems that are dependent on groundwater. The *Aquifer Interference Policy 2012* establishes the minimal impact considerations for groundwater sources that have guided consideration of these potential impacts. The following potential impacts have been considered for assessment.

Groundwater level drawdown due to development of the open cut pit and advanced dewatering, limiting the availability of groundwater for:

- licensed groundwater users; or
- GDEs and other sensitive environmental receptors.

Streamflow reduction and surface water availability through loss of baseflow recharge to surface water systems due to impacts on the local groundwater profile.

Cumulative groundwater impacts may result where the impacts of other groundwater users within the groundwater model domain influences the regional system when assessed in conjunction with the Project's impacts. Other mining operations, which have the potential to exert such an influence, lie between 32km and 44km from the Mine Site and therefore it is considered highly unlikely that cumulative groundwater impacts associated with mining at these operations would occur.

Risks to groundwater quality are assessed in Section 6.4 of Jacobs (2022). The proposed amendment would not change the risks, management or assessment outcomes relating to potential impacts to groundwater quality (through contamination, poor water management or discharge of poor-quality groundwater to the natural environment). Therefore, the outcomes of assessment of impacts to groundwater quality remain as previously presented. That is, potential groundwater quality impacts are not expected beyond 40m from the Mine Site boundary.

6.3.4 Groundwater Modelling Assessment

6.3.4.1 Conceptual Hydrogeological Model

The conceptual model is a descriptive representation of the groundwater system that forms the basis for the numerical groundwater flow model. A summary of the conceptual hydrogeological model prepared by Jacobs (2022) is provided in **Table 6.2**.

Table 6.2
Conceptual Hydrogeological Model

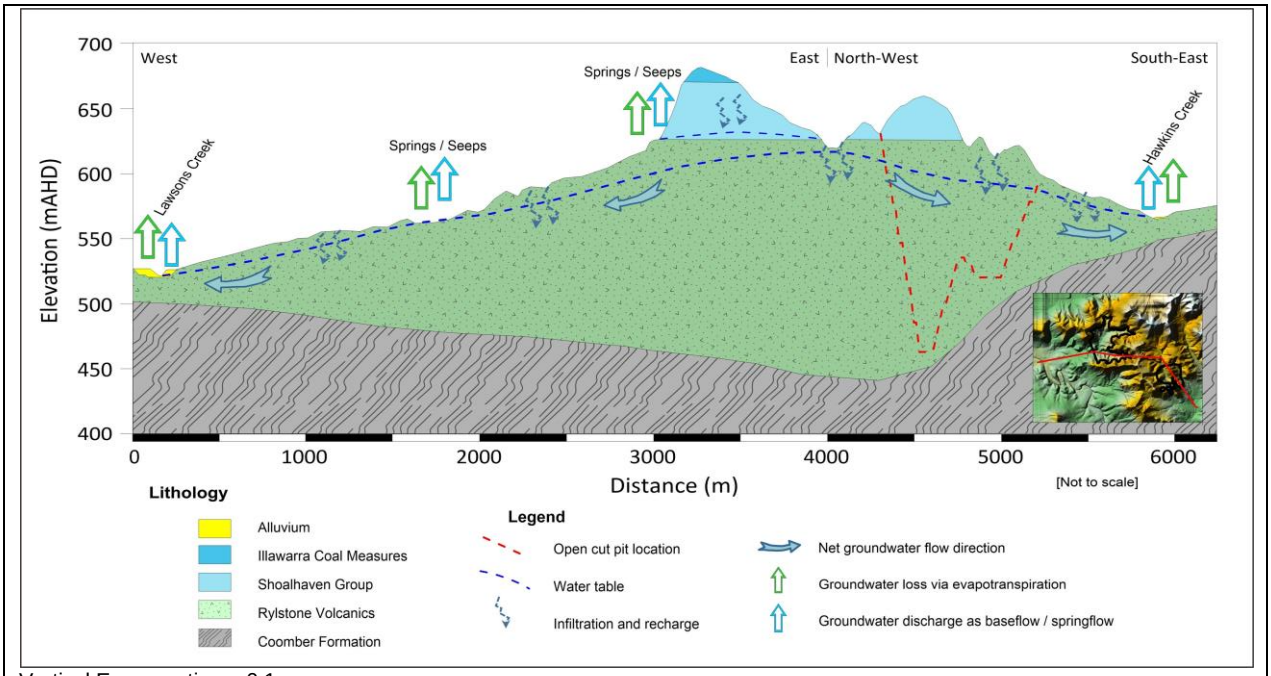
Page 1 of 2

Element	Regional Context	Local Context
Groundwater Recharge	Infiltration of rainfall runoff. Ephemeral streamflow into underlying hard rock aquifers or alluvium. Vertical leakage from Sydney Basin sediments to underlying formations (minor).	Periodic recharge of alluvium from major drainage features (e.g. Hawkins and Lawsons Creeks) at various reach sections.

Table 6.2 (Cont'd)
Conceptual Hydrogeological Model

Element	Regional Context	Local Context
Groundwater Flow	• Alluvium: associated with primary porosity and generally a sub-surface reflection of the associated surface water system. • Rylstone Volcanics: dominated by fracture flow. • Sydney Basin sediments: largely controlled by bedding planes.	• Alluvium: associated with primary porosity and generally a sub-surface reflection of the associated surface water system. • Sydney Basin Sediments: typically dominated by fracture flows with some relict primary porosity. • Rylstone Volcanics: high density and nature of fracturing in the open cut pit means that groundwater flow behaves in a similar manner to a porous rock aquifer.
	• Lachlan Fold Belt: largely topography controlled and surface water drainage.	• Lachlan Fold Belt: typically controlled by fracture flow with reasonably high permeability in the vicinity of major structures.
Major Structures		Inhibit groundwater flow across the structure whilst locally enhancing permeability in its vicinity
Discharge	• Sydney Basin sediments: discharge to the northeast with some vertical leakage. • Lachlan Fold Belt: discharge to the northwest.	Periodic discharge to the alluvial aquifers adjacent to drainage features. Evapotranspiration from riparian and deep-rooted terrestrial vegetation. Groundwater abstraction by advanced dewatering and other groundwater users.

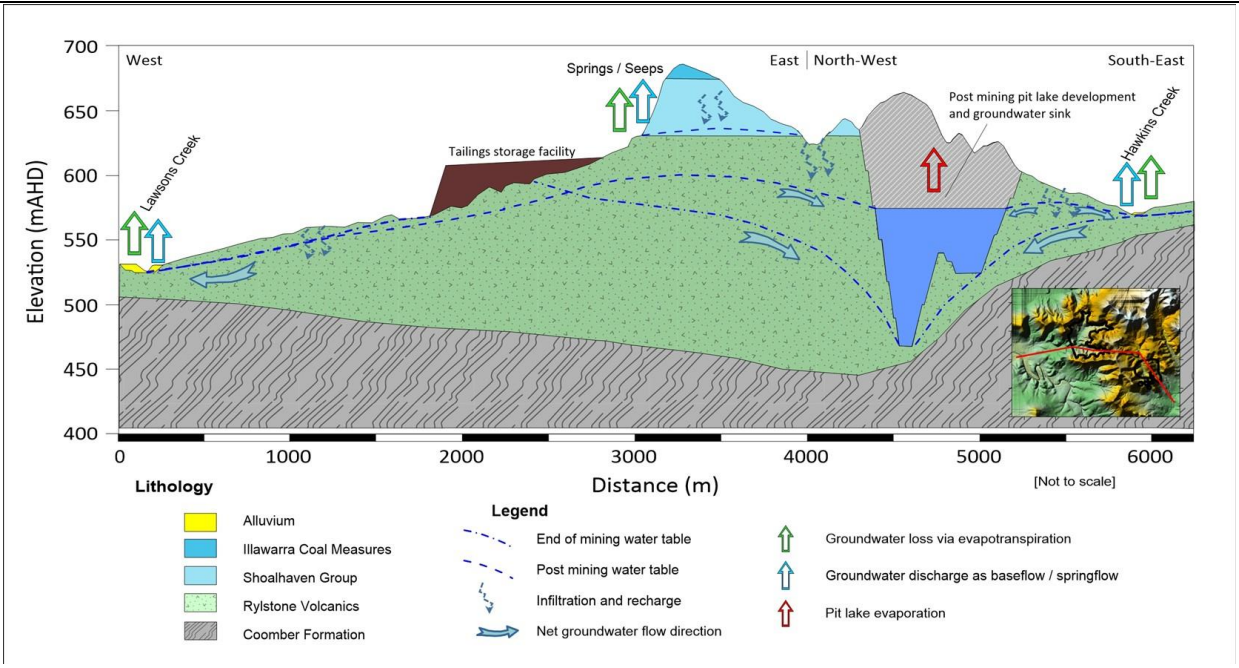
Figures 6.5 and **6.6** present the pre- and post-mining conceptual hydrogeological models.



Vertical Exaggeration = 0.1

Source: Jacobs (2022) – Figure 40

Figure 6.5
PRE-MINING CONCEPTUAL HYDROGEOLOGICAL MODEL



Vertical Exaggeration = 0.1

Source: Jacobs (2022) – Figure 41

Figure 6.6
POST-MINING CONCEPTUAL HYDROGEOLOGICAL MODEL

6.3.4.2 Groundwater Modelling

Groundwater modelling provides for the predictive estimation of groundwater inflows to the main open cut pit and any associated drawdown of the groundwater system due to stresses from pit development and advanced dewatering via production bores. Groundwater modelling also enables the prediction of groundwater movement and flow in the vicinity of the TSF, both during its operation and following its decommissioning and closure. Post-closure modelling also informs predictions of the groundwater system's equilibrium response following the cessation of mining activities, including final void pit lake behaviour to establish its context within the local groundwater setting.

By providing these predictions, the potential impacts to the groundwater environment, local groundwater users, local surface water systems and groundwater dependent ecosystems may be assessed by considering groundwater responses within the modelling domain.

To assess the Project incorporating the proposed amendment, Jacobs (2022) utilised the calibrated numerical groundwater model developed for the EIS to predict and assess the impacts of groundwater abstraction at the proposed advanced dewatering (production) bores. This groundwater model was developed using the long history of data collection within and surrounding the Mine Site to inform both its construction and calibration prior to simulating mining activities. Details of the model development and calibration are presented in Annexure 9 of Jacobs (2022). In accordance with the Australian Groundwater Modelling Guidelines (Barnett et al. 2012), the intended model confidence class is Class 2 – Impact Assessment. This confidence class was supported by Dr Noel Merrick, who undertook a peer review of the model inputs and development, as well as the outcomes of calibration, sensitivity analysis and the uncertainty analysis on predicted outcomes to conclude that the model is "fit for purpose". Dr Merrick's conclusion was also supported by a subsequent peer review undertaken by DPIE Water.

Model Scenarios

Two predictive scenarios were modelled using the calibrated groundwater model.

- No mining (null case) – This scenario provides predictions of groundwater flow and baseflow contribution without mining operations.
- Active mining (mining case) – This scenario predicts drawdown and inflow due to mining operations. This scenario includes a one-year pre-mining period, 15.5 years of mining operations and 200 years post mining.

Advanced dewatering and open cut pit groundwater inflow volumes were obtained directly from the 'mining case' scenario while groundwater drawdown and baseflow reduction was obtained through comparison of the 'mining case' to the setting under the 'null case' scenario over the same period.

Once mining operations are completed, advanced dewatering and sump dewatering of the main open cut pit would cease and groundwater levels would slowly rebound. Net influx to the main open cut pit would include groundwater inflows, rainfall, runoff from the main open cut pit catchment and water pumped from the TSF until that facility is fully rehabilitated. Whilst evaporative losses draw water from the final void pit lake, its water level would continue to increase until equilibrium is reached (inflows equivalent to outflows). The 'mining case' scenario was extended out to 200 years to predict this post-mining recovery of the groundwater system and long-term equilibrium final void pit lake water levels for an average climate scenario and a climate change scenario. These climate scenarios were informed by water balance modelling prepared by WRM (2022).

6.3.4.3 Groundwater Modelling Results (Mining)

Advanced Dewatering (Production Bores)

Advanced dewatering would commence during site establishment with bore yields initially declining before stabilising at approximately 1.0 ML/day (refer Figure 6.7).

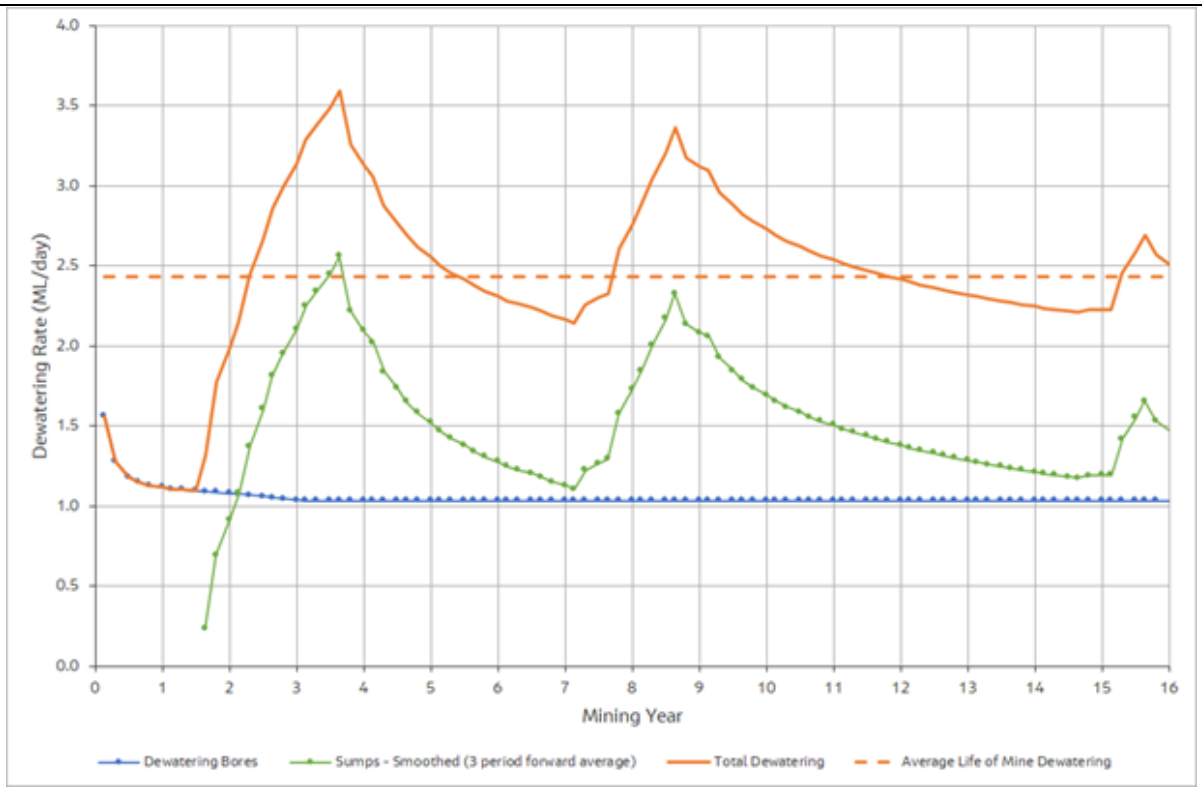
Open Cut Pit Dewatering

Groundwater inflow to the main open cut pit would occur once it is developed below the regional groundwater table. These inflows would be captured in sumps and pumped for use in processing operations.

Figure 6.7 presents the predicted annual groundwater inflow/dewatering rates during mining operations. Total dewatering rates during this period would reach a peak of approximately 3.50ML/day. Groundwater inflow rates would decrease as extraction activities expand laterally at higher elevations with two more peaks during mining operations i.e. in Year 9 as extraction in the open cut pit is developed to its lowest elevation of 456m AHD and then in the final year of mining as extraction in the western section of the main open cut pit reaches a floor elevation of 460m AHD.

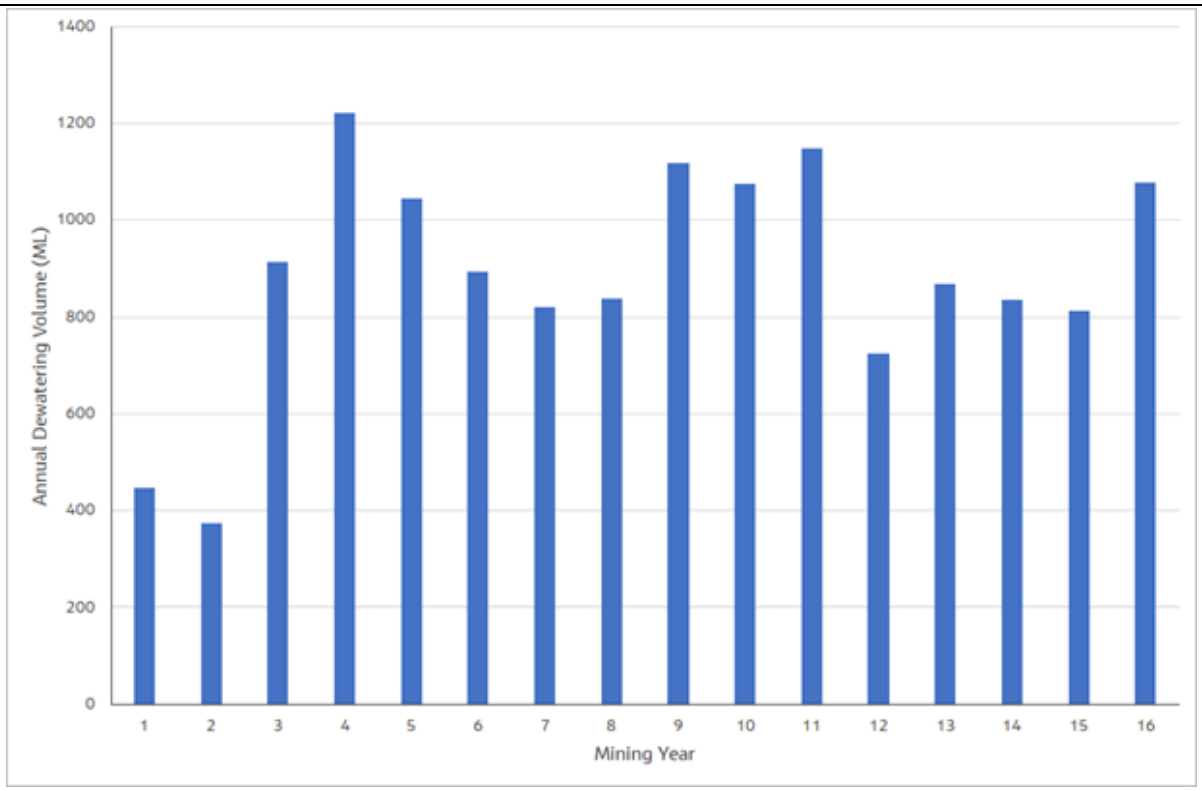
The average rate of total dewatering during the mine life is predicted to be 2.40ML/day.

As shown on **Figure 6.8**, the peak annual total dewatering rate is during Year 4 with a predicted annual volume of approximately 1 222 ML whilst the average annual total dewatering rate is approximately 888ML/year.



Source: Jacobs (2022) – Figure 42

Figure 6.7
PREDICTED DEWATERING CHART



Source: Jacobs (2022) – Figure 43

Figure 6.8
PREDICTED DEWATERING CHART

Groundwater Drawdown

The effects of total dewatering would result in drawdown of groundwater levels in the surrounding regional groundwater system. Predicted drawdown of the regional groundwater system at the completion of mining (15.5 years) is shown in **Figure 6.9**.

Jacobs (2022) predict that, at the end of mining, propagation of drawdown (as represented by the 1m drawdown contour in **Figure 6.9**) would typically be in the order of 1.7km to the east and south, 2.6km to the west and north of the main open cut pit. Drawdown to the northwest would be attenuated due to mounding beneath the TSF, with maximum mounding in the order of 8m. **Figure 6.10** presents a southeast to northeast section, across the Mine Site and showing the predicted water levels at Years 9 and 15.5.

Drawdown in the order of 1m to 2m would extend beneath a 2.3km section of Hawkins Creek at the end of Year 9, with drawdown extending over a 2.8km section of the creek at the end of mining (**Figure 6.9**). The impacted sections of Hawkins Creek would predominantly be located on land owned by Bowdens Silver.

It is noted that the groundwater modelling is likely over-predicting drawdown in the Sydney Basin lithologies (north of the Mine Site) as the hydraulic connectivity between this unit and the Rylstone Volcanics and Coomber Formation would in reality be limited due to the stratified nature of the sediments. As a result, drawdown in these areas is unlikely to be fully realised as predicted by the model.

Baseflow Reduction

The null case baseflow groundwater contribution to Hawkins Creek and Lawsons Creek streamflow predicted by Jacobs (2022) was found to be relatively low, with baseflow at Hawkins Creek (0.072 ML/day) being less than half that of Lawsons Creek (0.184 ML/day).

Jacobs (2022) predict that, as the groundwater table is lowered gradually during the Mine life, the baseflow attributable to groundwater in Hawkins and Lawsons Creeks would reduce by up to 0.026ML/day (9.5ML/year) and 0.014ML/day (5.1ML/year) respectively. However, these peak losses are not coincidental and for the purposes of predicting water access licence requirements to account for baseflow loss, Jacobs (2022) predict a maximum take from the Lawsons Creek Water source of 14.0ML/year (Year 16).

6.3.4.4 Groundwater Modelling Results (Post-Mining)

Groundwater Drawdown

Following the cessation of dewatering activities, Jacobs (2022) predict that the drawdown cone would initially expand until equilibrium is reached between the total groundwater inflows towards the open cut pit and the losses from the open cut pit. However, this expansion does not extend significantly beyond that presented in **Figure 6.9** and diminishes slightly by approximately 50 years post closure. This results in a cone of drawdown, as represented by the 1m drawdown contour shown on **Figure 6.11**, that extends typically less than 2km to the east and south, up to 3km to the west and 2.8km to the north. At this time, predicted drawdown is typically less than 1m at Lawsons Creek, and less than 2m at Hawkins Creek.

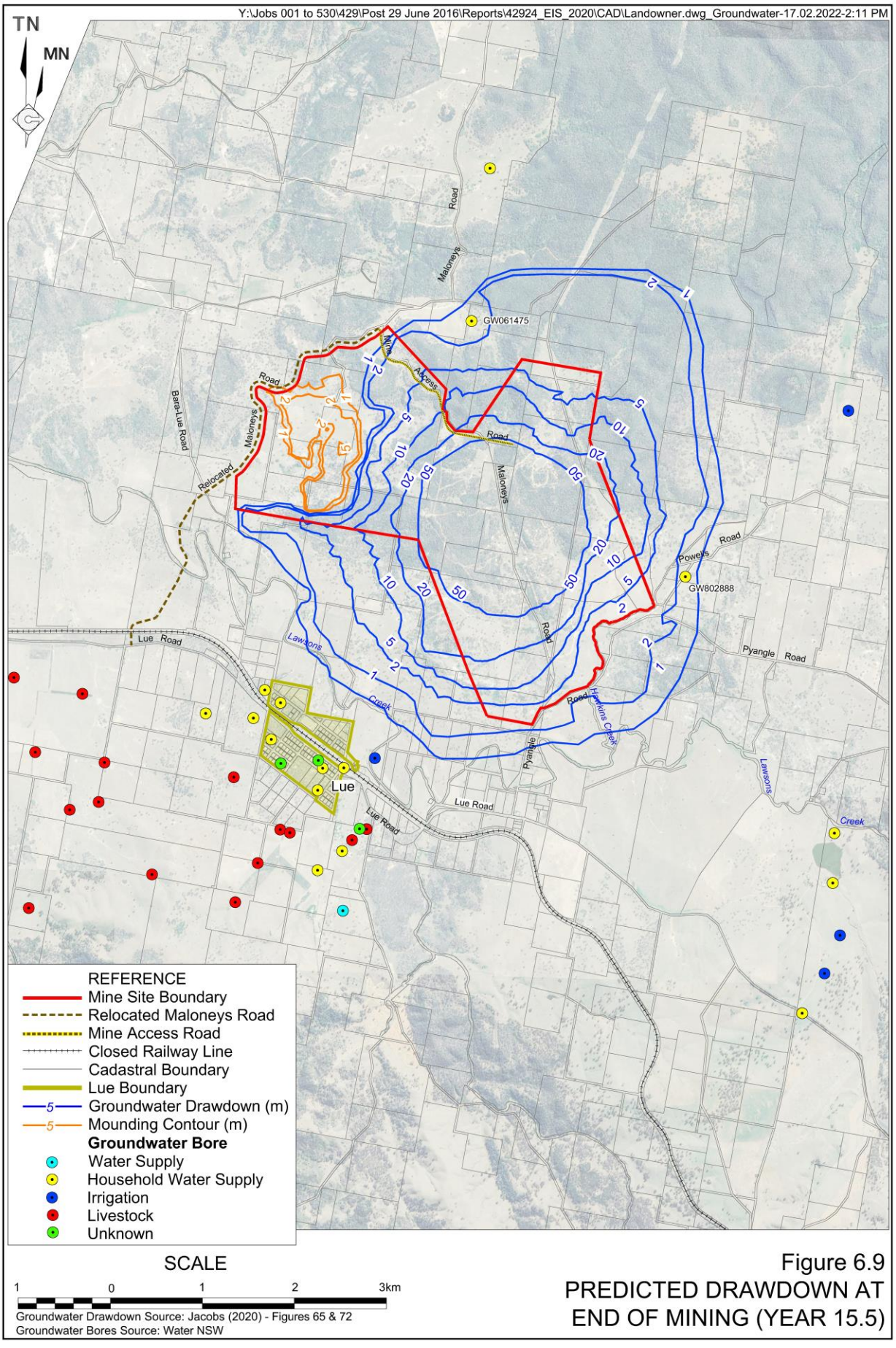
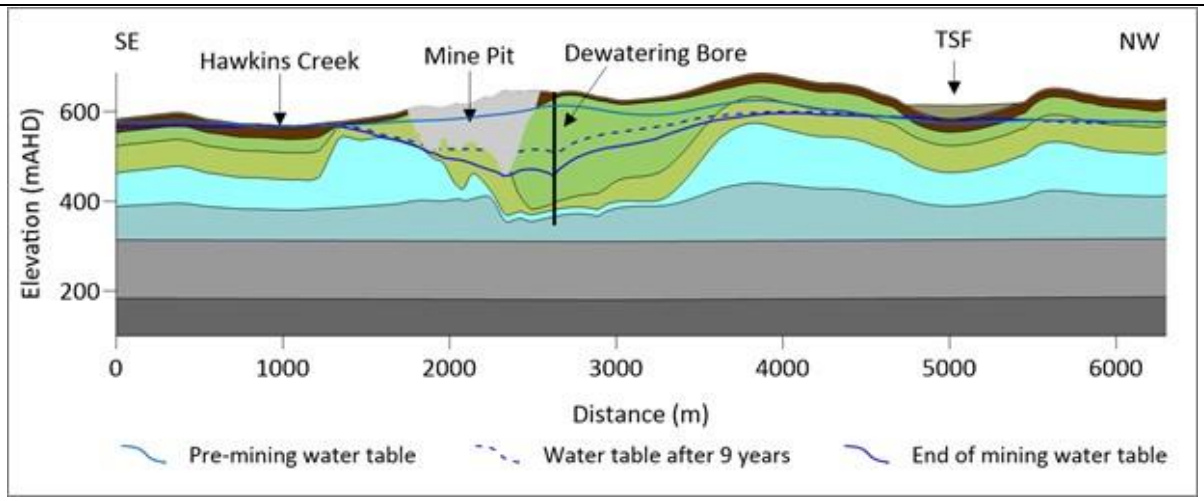


Figure 6.9
PREDICTED DRAWDOWN AT END OF MINING (YEAR 15.5)



Source: Jacobs (2022) – Figure 46

Figure 6.10
PREDICTED WATER LEVEL SECTION FOR MINING YEAR 9 AND END OF MINING

Baseflow Reduction

Project-related baseflow reduction would continue to increase beyond the end of mining until a predicted peak of 19.3ML/year occurs at 15 years post mining. As WRM (2022) identified average annual streamflow in Lawsons Creek as being 7 136ML/year, the peak baseflow loss represents a 0.3% flow reduction. Jacobs (2022) predict the maximum baseflow reduction would be approximately 0.031 ML/day for Hawkins Creek and 0.022 ML/day for Lawsons Creek. These represent a 1.6% reduction in average daily flows in Hawkins Creek (1.95ML/day, WRM (2022)) and a 0.1% reduction in average daily Lawsons Creek flows (19.5ML/day, WRM (2022)). Peak baseflow reductions would then steadily decrease by approximately 45% to 10.7ML/year approximately 50 years post-mining (0.1% flow reduction).

6.3.5 Water Licensing

6.3.5.1 Predicted Dewatering During Operations

Jacobs (2022) predict the total dewatering volumes using the results of groundwater modelling that was then partitioned to determine the water take (either direct or induced) from the relevant groundwater and surface water sources.

During operations, the maximum predicted take from each of the applicable water sources, and therefore the volume of share components for each of the water sources required to be held during mining operations are as follows.

- *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources Order 2020* - Lachlan Fold Belt Groundwater Source (Other) Management Zone – 1 040ML
- *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources Order 2020* - Sydney Basin Groundwater Source – 232.5ML
- *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012* - Lawsons Creek Water Source – 14.0ML

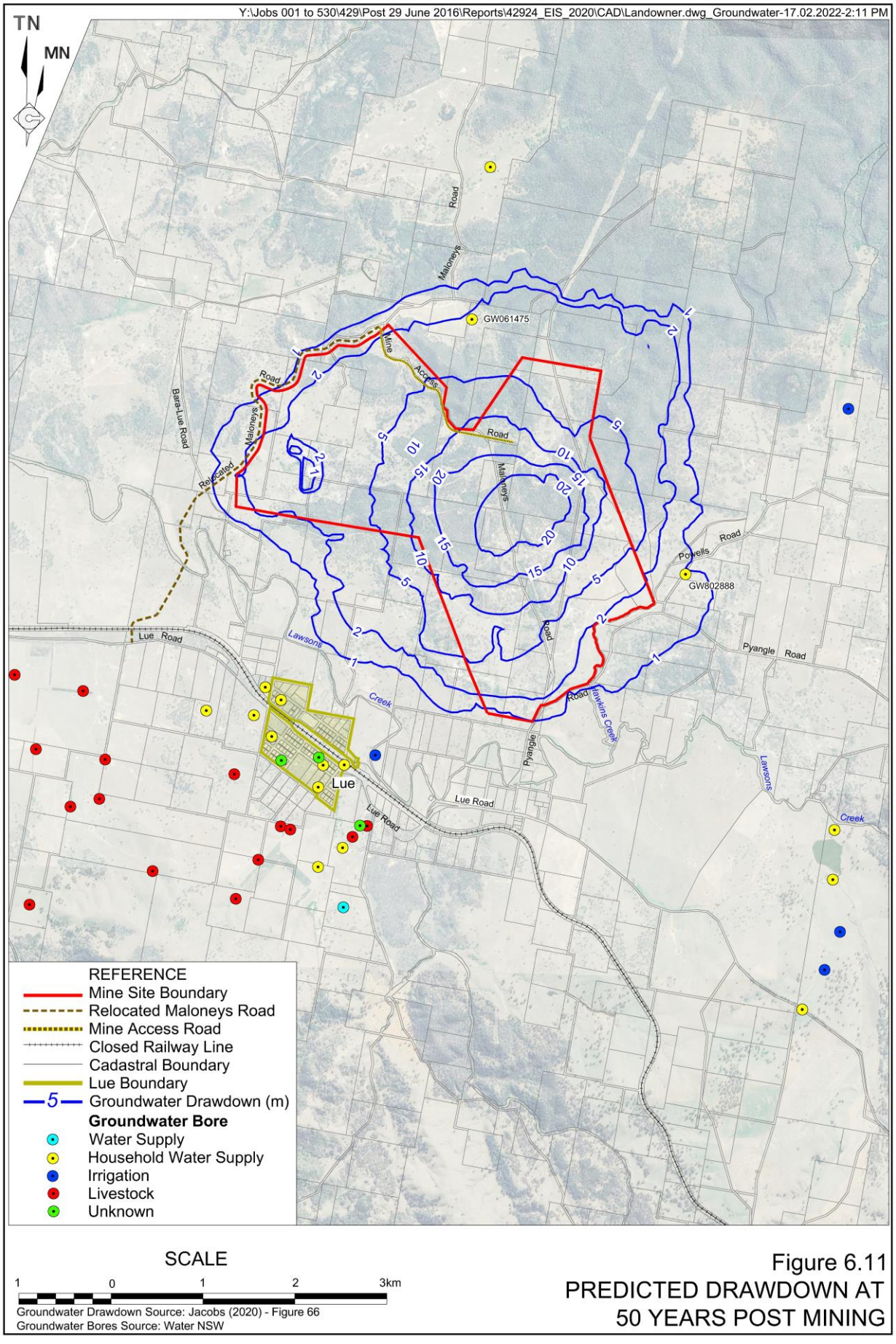


Figure 6.11
PREDICTED DRAWDOWN AT
50 YEARS POST MINING

6.3.5.2 Ongoing Water Take (Post-Mining)

Post-mining, Jacobs (2022) predict that water take will gradually diminish as the mine void is filled by groundwater inflows. Inflows to the pit and therefore the corresponding take from the Lachlan Fold Belt and Sydney Basin Groundwater Sources reduce in the post-mining period compared to those during mining.

However, as noted above, the maximum predicted take from the Lawsons Creek Water Source would increase to 19.3 ML/year approximately 15 years post-mining before reducing to 10.7 approximately 50 years post-mining.

6.3.5.3 Water Access Licences Held by Bowdens Silver

Bowdens Silver holds the following volumetric entitlements to account for the predicted groundwater take from the relevant water sources.

- *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources Order 2020* - Lachlan Fold Belt Groundwater Source (Other) Management Zone – 1 480ML.
- *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources Order 2020* - Sydney Basin Groundwater Source – 194ML.
- *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012* - Lawsons Creek Water Source – 139ML.

Bowdens Silver has also been notified of the successful purchase of an additional 200ML groundwater use entitlements within the Sydney Basin Groundwater Source of the *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources Order 2020.* These entitlements are more than sufficient to account for the maximum predicted requirements presented in Section 6.3.5.1.

The entitlement within the Lawsons Creek Water Source of the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012* accounts for runoff interception by the TSF which is required as its embankment is situated on a third order watercourse. This surface water entitlement is also sufficient to cover the maximum predicted baseflow reduction during mining operations. It is anticipated that, by the time of peak baseflow reduction occurrence (19.3ML/year approximately 15 years post-mining), the TSF would be decommissioned and rehabilitated to permit discharge from its vegetated cover system, therefore, Bowdens Silver does not foresee the need to acquire additional entitlement for the Lawsons Creek Water Source.

6.3.6 Assessment of Impacts

6.3.6.1 Groundwater Users

Potential groundwater drawdown may impact groundwater availability for registered users beyond the Mine Site. Drawdown predicted in modelling (Section 6.3.4) and presented in **Figure 6.9** and **Figure 6.11** identifies drawdown at 11 registered groundwater works with nine being located on Bowdens Silver owned land.

Groundwater modelling predicted that drawdown during operations and post-mining would not affect additional off-site registered groundwater users apart from the two identified in the EIS. The extent of impact at these two registered groundwater bores to the north and east of the open cut pit (GW061475 and GW802888) is summarised as follows.

- GW061475 - Located to the north of the Mine Site with records identifying that this bore is 15m deep and is inferred to be utilising supply from the Illawarra Coal Measures of the Sydney Basin sediments. Predicted drawdown at the end of the mine life is over 2m (see **Figure 6.9**). Jacobs (2022) notes that there is potential for groundwater supply from this bore to be compromised. However, this bore is significantly higher than the main open cut pit, with Jacobs (2022) considering the groundwater model as conservatively predicting drawdown within the Sydney Basin sediments and it is considered unlikely that the predicted drawdown at this bore would eventuate. It is also understood that this bore has been inoperable for a number of years and currently not relied upon by the landowner.
- GW802888 - Located to the east of the Mine Site with records identifying the bore is 51m deep and is inferred to be utilising supply from the Coomber Formation. Maximum predicted drawdown is in the order of 1m to 2m post-mining (refer **Figure 6.9**). Drawdown of this magnitude is not expected to significantly impact supply from the bore.

The above notwithstanding, if water supplies to these groundwater users become compromised due to mining induced drawdown, "make good" provisions would be honoured by Bowdens Silver. Monitoring for potential drawdown impacts at these bores would be an objective of the groundwater monitoring program for the Project.

Drawdown during mining would be marginally greater at GW061475 and similar at GW802888 compared to that previously predicted. The proposed amendment results in a minor (300m) northward expansion of the post-mining drawdown cone from that presented in the EIS, however the predicted outcomes at the two registered groundwater bores are similar to those presented in the EIS. Therefore, the impacts of the proposed amendment on groundwater users remains consistent with those predicted and assessed for the EIS.

6.3.6.2 Groundwater Dependent Ecosystems

There are no high priority groundwater dependent ecosystems within the area of predicted groundwater drawdown. However, the predicted drawdown cone does encompass areas mapped as having a high potential for terrestrial and river baseflow groundwater dependent ecosystems. These areas are predominantly associated with Hawkins and Lawsons Creeks.

Predicted maximum drawdown beneath Hawkins Creek is typically in the range of 1m to 2m, with some localised areas of increased drawdown (3m to 4m). Jacobs (2022) anticipate that predicted drawdown in areas adjacent to Hawkins Creek would not be detrimental to terrestrial vegetation as it has largely been cleared for pasture. Where remnant vegetation does exist, it is expected that this would be sustained by soil moisture and intermittent wetting by rainfall, elevated creek flows, and flooding. Within those areas where drawdown greater than 2m is predicted, and away from Hawkins Creek, terrestrial groundwater dependent ecosystems may potentially deteriorate due to reduced water access. It is noted that the *Updated Biodiversity*

Assessment Report for the Project (EnviroKey, 2022 – **Appendix 5**) considered that none of the assessed terrestrial vegetation is reliant on groundwater access and therefore did not identify any terrestrial groundwater dependent ecosystems.

Predicted maximum drawdown beneath Lawsons Creek is typically of the order of 1m or less.

Of the identified springs and swamp areas, these are maintained by rainfall fed sub-flow within the soil profile and not anticipated to be impacted by mine dewatering. Springs associated with discharge from bedding planes within the Sydney Basin sediments are also unlikely to be impacted by drawdown.

6.3.6.3 Baseflow Contribution

WRM (2022) identifies streamflow in Hawkins and Lawsons Creeks as being ephemeral to semi-perennial. Therefore, low flow conditions in these watercourses are relatively common with peak discharge occurring in response to high rainfall events. During low flow periods, streamflow is inconsistent, with the watercourses reducing to a series of disconnected pools.

During operations, the impact of the proposed amendment on baseflow represents a minor increase on the predictions for Hawkins and Lawsons Creeks presented in the EIS (from 12.9ML/year to 14.0ML/year). Following cessation of operations, the maximum predicted take from the Lawsons Creek Water Source would increase to 19.3 ML/year approximately 15 years post-mining, representing a 0.3% reduction in average annual Lawsons Creek streamflow before reducing to 10.7ML/year approximately 50 years post-mining (0.1% reduction in annual average streamflow).

However, as noted in Section 6.2.5, WRM (2022) does not predict that baseflow reduction would limit availability of water to downstream users. WRM (2022) predict that mean annual Lawsons Creek streamflow downstream of the Mine Site would reduce by 2.2% during operations and 0.4% post-mining.

During periods of no flow when remnant pools are present and where these pools are a direct reflection of regional groundwater levels, there is potential for pool levels to decline inside the area of predicted drawdown (presented in **Figures 6.9** and **6.11**). For remnant pools that are isolated from the regional groundwater system (e.g. impounded by bedrock bars) or which are sustained by smaller perched groundwater systems, pool levels are unlikely to be impacted by mining-related groundwater drawdown. Where permanent pools within the area of predicted drawdown are utilised for water supply, the availability of water in these areas may be compromised. Where this is the case during the Project-life, additional investigations would be undertaken to ascertain their connectivity and reliance on the regional groundwater system and to establish the need for contingency measures.

Whilst the proposed amendment is predicted to result in a further reduction of baseflow contributions to streamflow compared to that presented in the EIS, it does not decrease the availability of water to downstream users. This is demonstrated by WRM's (2022) prediction for streamflow downstream of the Mine Site which is unchanged from the EIS. Therefore, the predicted impacts on downstream users remains consistent with those predicted and assessed for the EIS.

6.3.6.4 Compliance with the NSW Aquifer Interference Policy 2012

Bowdens Silver's interception of groundwater beneath the Mine Site would require licensing under the *Water Management Act 2000* (WM Act) which is the key legislation for the regulation of groundwater-related impacts and water use limits. The *Aquifer Interference Policy 2012* (AIP) is administered under the WM Act and provides the requirements for assessment of aquifer interference activities in NSW. The key components of the AIP are as follows.

- All water use must be accounted for in accordance with the relevant Water Sharing Plan. Water use may include consumptive use (such as pumping from an aquifer) or incidental use (such as evaporative losses from groundwater that has discharged). Licensing is considered in Section 6.3.4.
- The definition and prescription of the concept of ensuring 'no more than minimal harm' through establishing minimal impact considerations relating to water levels, water quality and water pressure. Minimal impact considerations vary depending on the water source and whether the aquifer is considered 'highly productive' or 'less productive'.
- Planning for contingency or mitigating measures should impacts be greater than predicted. Contingency measures are discussed in Section 6.3.7.3.

The Sydney Basin Groundwater Source of the NSW Murray Darling Basin Porous Rock Groundwater Sources and the Lachlan Fold Belt Groundwater Source of the NSW Murray Darling Fractured Rock Groundwater Sources are both considered to be highly productive aquifers based on the AIP criteria requiring that the aquifer:

- has total dissolved solids of less than 1 500 mg/L; and
- contains water supply works that can yield water at a rate greater than 5 L/s.

Shallow alluvial deposits (4m to 6m) in the vicinity of Hawkins Creek and Lawsons Creek have variable levels of saturation and would not be classified as highly productive aquifers on the basis of the AIP criteria above. Notwithstanding this, thicker saturated sequences of alluvium have potential to be highly productive and the alluvial deposits have been considered as such for the purposes of assessments in accordance with the AIP.

A summary of the outcomes from Jacobs' (2022) Level 1 Minimal Impact Considerations of the AIP are presented in **Table 6.3**. Annexure 1 of Jacobs (2022) provides a comprehensive assessment of the Project against the AIP and concludes that the Project would meet the Level 1 Minimal Impact Considerations for highly productive alluvial, porous rock and fractured rock aquifers.

Table 6.3
Level 1 Minimum Impact Considerations – Highly Productive Groundwater Sources

	Consideration	Comment
Water Source: Alluvial Aquifer		
Water Table	1. Less than or equal to a 10% cumulative variation in the water table, allowing for typical climatic post-water sharing plan variations, 40 metres from any: (a) high priority GDE; or (b) high priority culturally significant site, listed in the schedule of the relevant water sharing plan, or A maximum of a 2m water table decline cumulatively at any water supply work.	No significant drawdown is predicted at alluvial water supply works that are not owned by Bowdens Silver.
Water Pressure	A cumulative pressure head decline of not more than 40% of the post-water sharing plan pressure head above the base of the water source to a maximum of a 2m decline, at any water supply work.	Not applicable as the alluvial aquifer is very shallow.
Water Quality	Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity. No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity. No mining activity to be below the natural ground surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three-dimensional extent of the alluvial water source - whichever is the lesser distance) of a highly connected surface water source that is defined as a reliable water supply. Not more than 10% cumulatively of the three-dimensional extent of the alluvial material in this water source to be excavated by mining activities beyond 200m laterally from the top of high bank and 100m vertically beneath a highly connected surface water source that is defined as a reliable water supply.	Jacobs (2022) identifies acceptable outcomes are predicted for all considerations.
Water Source: Porous Rock Water Sources		
Water Table	1. Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any (a) high priority GDE; or (b) high priority culturally significant site, listed in the schedule of the relevant water sharing plan. A maximum of a 2m decline cumulatively at any water supply work.	Acceptable outcomes are predicted for all considerations It is noted that a decline in excess of 2m is predicted at registered bore GW061475, however, given the elevation of the water supply work and its installation within the Illawarra Coal Measures, predicted impacts are considered to be conservative and unlikely to occur.

Table 6.3 (Cont'd)
Level 1 Minimum Impact Considerations – Highly Productive Groundwater Sources

	Consideration	Comment
Water Source: Porous Rock Water Sources (Cont'd)		
Water Table (Cont'd)	2. If more than 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any: (a) high priority GDE; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan then appropriate studies (including the hydrogeology, ecological condition and cultural function) would be required to demonstrate to the Minister's satisfaction that the variation would not prevent the long-term viability of the dependent ecosystem or culturally significant site. If more than 2m decline cumulatively at any water supply work then make good provisions should apply.	Notwithstanding this, in the event that water supply is compromised and attributed to drawdown associated with the Project, make good provisions would apply (see Section 6.3.6.3).
Water Pressure	1. A cumulative pressure head decline of not more than a 2m decline, at any water supply work. 2. If the predicted pressure head decline is greater than requirement 1. above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline would not prevent the long-term viability of the affected water supply works unless make good provisions apply.	Acceptable outcomes are predicted for all considerations
Water Quality	1. Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity. 2. If condition 1 is not met then appropriate studies would be required to demonstrate to the Minister's satisfaction that the change in groundwater quality would not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.	Jacobs (2022) identifies acceptable outcomes are predicted for all considerations
Water Table	1. Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any: (a) high priority GDE; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan. A maximum of a 2m decline cumulatively at any water supply work.	Acceptable outcomes are predicted for all considerations. It is noted that a decline in the order of 1m to 2m is predicted at GW802888. Given this bore is recorded as being 51m deep, a drawdown of this magnitude is not expected to impact on supply from the bore.

Table 6.3 (Cont'd)
Level 1 Minimum Impact Considerations – Highly Productive Groundwater Sources

	Consideration	Comment
Water Source: Fractured Rock Water Sources		
Water Table (Cont'd)	2. If more than 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any: (a) high priority GDE; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan then appropriate studies would be required to demonstrate to the Minister's satisfaction that the variation would not prevent the long-term viability of the dependent ecosystem or significant site. If more than 2m decline cumulatively at any water supply work then make good provisions should apply.	Notwithstanding, in the event that water supply is compromised and attributed to drawdown associated with the Project, make good provisions would apply (see Section 4.6.8.4).
Water Pressure	1. A cumulative pressure head decline of not more than a 2m decline, at any water supply work. 2. If the predicted pressure head decline is greater than requirement 1.(a) above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline would not prevent the long-term viability of the affected water supply works unless make good provisions apply.	Acceptable outcomes are predicted for all considerations
Water Quality	1. Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity. 2. If condition 1 is not met then appropriate studies would be required to demonstrate to the Minister's satisfaction that the change in groundwater quality would not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.	Jacobs (2022) identifies acceptable outcomes are predicted for all considerations as: Given baseline groundwater conditions, seepage from the TSF is not expected to lower the beneficial use of the aquifer. Any potential water quality impacts are not expected beyond 40m from the Mine Site boundary. The post-mining void would remain a groundwater sink. Salinification within the open cut pit lake due to evaporative concentration would be retained within the void.

6.3.7 Management and Mitigation Measures

6.3.7.1 Introduction

All operations within the Mine Site would be managed in accordance with a Water Management Plan for the Project that would be prepared prior to the commencement of mining in consultation with DPIE Water and would be implemented as approved by DPIE. The following section provides a summary of management, mitigation and contingency measures that would be expanded in the groundwater management component of the broader Water Management Plan.

6.3.7.2 Management Measures

The principal proactive management measure for groundwater resources would be a comprehensive groundwater monitoring program. The matters that would be recorded, the frequency of records and reporting in relation to the proposed amendment are presented in **Table 6.4**.

Table 6.4
Groundwater Monitoring

Parameter	Monitoring Frequency	Reporting
Advanced Dewatering Volumes Including flow meter records and hours for all water pumped from the advanced dewatering (production) bores to the turkeys nest dam.	When pumping	Annually
Sump Dewatering Volumes Including flow meter records and hours for all water pumped from the open cut pits to the open cut pit dewatering pond	When pumping	Annually
Groundwater Level Monitoring Groundwater level monitoring at GW061475 and GW802888 would be established (if accessible and subject to landholder confirmation) to provide information on groundwater levels during mining operations and post-mining. Collected data would be reviewed for assessment of trends in groundwater levels against modelling predictions and the make good provisions of the NSW Aquifer Interference Policy.	Bores equipped with high-frequency loggers for continuous data collection	Annually

The groundwater monitoring program would continue beyond the end of the mine life and would be progressively curtailed to retain measurements from the bores providing relevant results relating to the re-establishment of the groundwater levels in the vicinity of the main open cut pit and make-good provisions.

6.3.7.3 Contingency Measures

Contingency measures would be developed in consultation with landowners for GW061475 and GW802888 where there is potential for reduced groundwater availability. This would be important for those locations where impacts may only become apparent post-mining.

6.3.7.4 Groundwater Model Review

Within two years of mining operations commencing, Bowdens Silver would undertake a comprehensive review of the data collected and recalibrate the groundwater model against actual outcomes for groundwater inflow. Any necessary adjustments to groundwater management would be made as a result of this review.

6.3.8 Conclusion

The existing groundwater setting is well understood with the assessment of the Project incorporating the proposed amendment utilising a calibrated numerical groundwater model that has been peer reviewed and deemed “fit for purpose”.

Based on modelling predictions, the key outcomes of the assessment of changes to the groundwater system as a result of the Project include the following.

- During the mine life, groundwater dewatering rates are predicted at an average of 2.4ML/day, with a peak of 3.5ML/day and peak annual inflow of 1 222ML/year predicted in Year 4 of mining. Bowdens Silver holds sufficient entitlements to account for this predicted peak.
- Post-mining, the extent of drawdown would slightly expand to an approximate maximum extent over 50 years. Post-mining inflows would progressively decrease over time as an equilibrium is reached in the final void pit lake.
- A potential decrease in water level of greater than 2m at one registered groundwater bore (GW061475) may occur. However, this bore is damaged and not currently in use and Jacobs (2022) considers the inherent conservatism applied in the model likely overstates drawdown at this location.
- There would not be any impacts to high priority GDEs. The terrestrial vegetation present in the vicinity of the predicted extent of drawdown is not likely to be obligate phreatophytes (i.e. groundwater dependent), and where it does draw on groundwater it is most likely rainfall infiltration that has seeped into the capillary zone, has reached the soil-rock interface, or is stored in perched aquifers. It is considered unlikely that terrestrial vegetation would be impacted by predicted drawdown within the regional groundwater table.
- Baseflow reductions at Hawkins and Lawsons Creeks would occur but this would not impact the availability of water for downstream users except during periods of drought when it may be experienced as a reduction in water levels in remnant pools.
- Potential impacts to groundwater quality are not changed by the proposed amendment, therefore the outcomes of the assessment of impacts remain unchanged. That is, potential risks to groundwater quality would be managed over the life of the Project and are not expected beyond 40m from the Mine Site boundary. The Project is not expected to lower the beneficial use of the aquifer.

Direct groundwater take through groundwater inflows and advanced dewatering, plus the indirect take from baseflow reduction contribution to Hawkins and Lawsons Creeks is accounted for by water licences held by Bowdens Silver.

Based on the outcomes of the groundwater modelling and assessment for the proposed amendment, it is considered that potential impacts to the groundwater setting are well understood and within the bounds of those impacts predicted and assessed in the EIS. Therefore, the proposed amendment does not increase the overall groundwater impacts of the Project which remains permissible under the AIP.

6.4 BIODIVERSITY

Potential impacts to terrestrial biodiversity have been assessed in a *Updated Biodiversity Assessment Report* (BAR) prepared by EnviroKey (2022) and the proposed approach to satisfying the biodiversity offsetting obligations of the Project has been evaluated and presented in a *Biodiversity Offset Strategy* (BOS) prepared by Niche Environment and Heritage (2022). Both

the BAR and the BOS have been updated to account for changes to the Project that are the subject of this *Amendment Report* with the BAR provided as **Appendix 5** and the BOS provided as **Appendix 6**.

The following subsections describe the updates to the BAR and BOS as a result of the proposed amendments to the Project and the final outcomes of these assessments.

6.4.1 Additional Assessment

No further field survey has been required in support of the BAR or the BOS.

The changes to the Mine Site layout as presented in detail in the *Amended Project Description* (**Appendix 1**) and summarised in Section 3.2 and displayed in **Figure 3.5** involved amendments to areas that were previously the subject of extensive ecological field survey including biometric plots / transect surveys undertaken in accordance with the BioBanking methodology requirements of the Framework for Biodiversity Assessment (FBA)[11].

EnviroKey considered the amended Mine Site layout against the outcomes of previous field survey and updated the assessment to account for the following.

1. The changes to the location of Mine Site components and the revised total area required to be cleared of native vegetation (381.17ha as opposed to 381.71ha in the original assessment).
2. Removal of the water supply pipeline corridor and associated vegetation clearing.
3. Comments received from the Biodiversity Conservation and Sciences Directorate of DPIE (BCS) regarding the treatment of potential habitat for some candidate species credit species.

The comments from BCS are addressed in detail in Section 5.2 of the *Amendment Submissions Report*.

6.4.2 Assessment of Impacts

The key changes to the BAR outcomes as a result of refinements to the Mine Site layout, removal of the water supply pipeline corridor and the recommendations of BCS include the following.

- Total Project-related disturbance (native vegetation and previously cleared areas – mostly paddocks) has reduced from 495.54ha to 457.42ha.
- The area of native vegetation clearing is slightly reduced, but mostly consistent with that originally assessed (381.17ha as opposed to 381.71ha in the EIS). This is due to the removal of native vegetation clearing for the water supply pipeline being close to the additional area required for site-based water management structures and infrastructure (for example, the paste thickener).

[11] DPIE has confirmed that the Project can be considered as 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 Accordingly, the BAR and BOS use the Framework for Biodiversity Assessment (FBA) in accordance with the NSW Biodiversity Offsets Policy for Major Projects. This is consistent with the Secretary's Environmental Assessment Requirements (SEARS) for the Project.

- The vegetation types impacted by the Project have reduced from 11 to six in the updated assessment. This was principally due to vegetation types only identified along the alignment of the water supply pipeline no longer being impacted.
- The total area of Box Gum Woodland that would need to be cleared for the Project has reduced from 182.26ha to 180.17ha.
- There is no longer impact required to the Ausfeld's Wattle (*Acacia ausfeldii*), which was a species credit species candidate for the Project and located solely within the water supply pipeline corridor.
- There is no longer impact required in the Mudgee-Wollar key breeding area for the Regent Honeyeater as defined by the *National Recovery Plan for Regent Honeyeater* (DoE, 2016). The proposed native vegetation disturbance would occur in areas of potential foraging and breeding habitat for the Regent Honeyeater although the species was not identified at the Mine Site despite comprehensive survey targeting the species.
- Components of the Mine Site were refined to further address the BCS recommendation to avoid native vegetation impacts, where possible. While the total area of native vegetation clearing is largely the same, a more compact Mine Site is now proposed that limits opportunity for indirect impact and includes in the assessment of disturbance areas that may remain vegetated but that are located between mining components and likely to be subject to indirect impacts.

There were no changes to the EnviroKey (2022) assessment outcomes relating to the following matters. These were identified as potential but not substantial sources of impact that would be managed throughout operations.

- Feral animal occurrence.
- Weed introduction and spread.
- Impacts or enhancement to Key Threatening Processes
- Changes to connectivity and habitat fragmentation.
- Fauna injury and mortality.
- Inadvertent impacts.
- Groundwater drawdown effecting terrestrial vegetation that may be reliant on this water.
- Indirect impacts through noise, vibration or lighting.

There were no changes to the outcomes of the EnviroKey (2022) assessment of Matters of National Environmental Significance as a result of the proposed amendments. EnviroKey (2022) has assessed all relevant species in accordance with the appropriate significant impact assessment criteria. Details of these assessments are presented in Section 5.7 and 5.8 of the BAR with assessment against significant impact criteria presented in Annexure 6 (EnviroKey, 2022 – see **Appendix 5**).

The overall outcomes of assessment presented in the BAR are consistent with those presented in previous iterations of the assessment. That is, that while 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 offsetting strategy.

6.4.3 Impacts Requiring Offsetting

Using the Biobanking Credit Calculator (version 4.0), EnviroKey (2022) has determined the biodiversity offset requirements for the Project as outlined in **Table 6.5** (ecosystem credits) and **Table 6.6** (species credits).

Table 6.5
Ecosystem Credits Required for Biodiversity Offset

Biometric Vegetation Type	PCT	Area Impacted (ha)	Ecosystem Credits Required
CW112 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	277	22.97	1 250
CW263 Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	324	58.69	4 150
CW270 Mugga Ironbark – Red Box – White Box – Black Cypress Pine tall woodland on rises and hills in the northern NSW, South Western Slopes Bioregion	358	0.71	42
CW291 Red Stringybark – Inland Scribbly Gum open forest on steep hills in the Mudgee – northern section of the NSW South Western Slopes Bioregion	323	119.56	6 959
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	281	157.20	10 118
CW217 White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the central western slopes of NSW	273	22.04	1 360
Total		**381.17**	**23 880**
Source: EnviroKey (2022) – Annexure 7			

Table 6.6
Species Credits Required for Biodiversity Offset

Species		Impact	Species Credits Required
Common Name	**Scientific Name**		
Koala	*Phascolarctos cinereus*	381.17ha[1]	9 910
Squirrel Glider	*Petaurus norfolcensis*	381.17ha[1]	8 386
Regent Honeyeater	*Anthochaera phrygia*	381.17ha[1]	29 350
Silky Swainson-pea	*Swainsona sericea*	54 individuals	972
Small Purple-pea	*Swainsona recta*	4 individuals	104
Large-eared Pied Bat	*Chalinolobus dwyeri*	337.80ha	4 391
1. Entire disturbance area considered for impact based on potential for these species to occur.			
Source: EnviroKey (2022) – Annexure 7			

6.4.4 Biodiversity Offset Strategy

The proposed biodiversity offset strategy for the Project is presented in Niche (2022) and summarised in the *Amended Project Description* (see **Appendix 1**). The key features of the biodiversity offset strategy are as follows.

- It is proposed that the required offsets would be met in a staged manner as outlined in **Table 6.7**.
- Bowdens Silver proposes to establish or facilitate the establishment of Biodiversity Offset Sites using Biodiversity Stewardship Agreements.
- 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).
- 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.
- The Biodiversity Offset Strategy would need to be approved by DPIE prior to commencement of any vegetation clearing.

Table 6.7
Staged Offset Requirement

Offset Stage	Year from commencement	Clearing area (native vegetation only)	Proportion of overall clearing/ offset requirement (approx.)
Stage 1*	0-1	233.02ha	61.13%
Stage 2	3-4	77.53ha	20.34%
Stage 3	6-12	70.61ha	18.53%
* Includes clearing associated with the relocated Maloneys Road.			

While the above describes the current offsetting strategy for the Project, it is noted that the NSW Biodiversity Offsetting Scheme provides for a range of alternative options for proponents to satisfy offsetting requirements in accordance with the *Biodiversity Conservation Act 2016*.

6.5 VISUAL AMENITY

As noted in Section 3.4, the principal issue raised in response to the proposed re-alignment of the 500kV power transmission line was the visibility of the proposed alignment and in particular transmission towers supporting the power lines. GHD has prepared the *Bowdens Silver Mine Existing TransGrid 500kV Transmission Line – Realignment Option Study* (GHD, 2022) which is provided as **Appendix 7**. This report models and assesses an alternative alignment for the 500kV power transmission line. Subsequently, Richard Lamb and Associates (RLA) was commissioned to review the visual amenity outcomes of the new alignment and respond to matters raised in community submissions relating to visual amenity. That assessment is presented as **Appendix 8** and presents a detailed visual analysis including cross-sections from four private residences (R35, R36A, R37 and R87).

The following subsections provide a brief summary of the outcomes of the 500kV power transmission line alignment modelling undertaken by GHD (2022) and the outcomes of the RLA review of the proposed alignment. An update to the assessment of visual impacts associated with the Mine Site is also presented. A final assessment of the visual impacts of the amended Project is provided.

6.5.1 Modelling of 500kV Power Transmission Line Alignment

GHD (2022) undertook extensive modelling using PLS-CADD software designed for modelling powerline alignments and completed a visual analysis of the modelled options. GHD assessed potential alignment options spaced from 250m to the west of the open cut pit to the alignment presented in the EIS and *Amendment Report*. Options were spaced by 50m and modelling of tower locations and transmission lines undertaken.

This modelling took into account the results of the vibration analysis undertaken by SLR Consulting (2020) in the *Noise and Vibration Assessment* for the Project that found that a safe offset distance of 201m was required for infrastructure in proximity to the main open cut pit (and subject to blast events).

An alignment located at least 300m from the open cut pit was selected as this location was considered to provide a safe offset distance from mining activities while also improving visual amenity outcomes for landowners to the west and southwest of the Mine Site. The alignment also considers the risk of sterilising potential resource in the vicinity of the open cut. The alignment presented in the EIS and *Amendment Report* was compared to the selected alignment in relation to design parameters and visibility. A summary of this review is presented in **Table 6.8** and the alignment now proposed is presented in **Figure 3.5**. The review of the 500kV power transmission line options refers to the following.

- The Existing Alignment is that currently in place across the proposed Mine Site.
- The EIS/Amendment Alignment is that which is proposed in the EIS and *Amendment Report*.
- The Proposed Alignment is that proposed by GHD (2022).

Table 6.8
500kV Power Transmission Line Alignment Options Review

Page 1 of 2

Assessment Criteria	EIS/Amendment Alignment	Proposed Alignment	Comments
Re-alignment route length	Deviation route length is approximately 3.5km	Deviation route length is approximately 2.7km	The EIS Alignment length is greater than the new alignment and would require two additional structures along the route.
Proximity to surrounding residences	The shortest distance to privately-owned residential property is approximately 1.4km (R35).	The shortest distance to privately-owned residential property is approximately 1.5km (R35).	The EIS Alignment is closer to residential properties than the Proposed Alignment.

Table 6.8 (Cont'd)
500kV Power Transmission Line Alignment Options Review

Assessment Criteria	EIS/Amendment Alignment	Proposed Alignment	Comments
Terrain profile as seen from surrounding residences	Structure views are possible when viewing from private properties.	Structure views are possible when viewing from private properties though views are mitigated by distance.	Some structures appear hidden behind terrain peaks on the EIS alignment route in southern sections, especially from property 35. However, in these locations the Proposed Alignment would not change from existing tower locations and therefore existing impacts would not change or towers would remain obscured. In general, the EIS Alignment is more visually prominent that the Proposed Alignment.
Proximity to mine layout area	Shortest distance to mine layout area is approximately 350m.	Shortest distance to mine layout area is approximately 300m.	The Proposed Alignment is located closer to the mine layout area than the EIS Alignment. Both options satisfy the required safety clearances.
Impact on existing structure duty	There is a deviation angle created at the start of the re-alignment and then again at the structure where the alignment joins to the existing alignment. This requires upgrade to the existing tower to accommodate the angle of deviation.	Compared to the existing alignment, the Proposed Alignment would reduce the deviation angle at the structure where the deviation will begin. (northern end). However, a deviation angle will be created as the line joins back at the existing structure on the southern side.	Both options would reduce the existing deviation angle at the existing structure located to the north. Where the re-located line joins with existing alignment to the south, new deviation angles would be created and the existing structure duty is to be assessed for the new deviation angles. The adjacent span lengths in both options are similar at the existing structure located north.
Terrain profile	The shortest and longest span lengths are 227m and 475m respectively.	The shortest and longest span lengths are 310m and 490m respectively.	There is no significant difference in the terrain profiles. The shorter spans in the EIS Alignment are a result of two additional deviation angles.

Source: After GHD (2022) – Section 10

Based on the conclusions presented in GHD (2022) and summarised in **Table 6.8**, the new alignment is preferred based on the following factors.

- The number of transmission towers to be relocated is reduced.
- The Proposed Alignment is located at a greater distance from surrounding residences compared with the EIS Alignment, as presented in the EIS and *Amendment Report*.
- The EIS Alignment is more visually prominent and there is an overall reduced visual impact from the Proposed Alignment.

6.5.2 500kV Power Transmission Line Visual Impact Analysis

At the completion of the alignment modelling by GHD, RLA was commissioned to review the visual amenity outcomes of the new alignment and respond to matters raised in community submissions relating to visual amenity. This included a response to the assessment commissioned by the Lue Action Group (LAG). That assessment is presented as **Appendix 8**. RLA (2022) presents detailed visual analysis for four private residences (R35, R36A, R37 and R87) including cross-section plans. In summary, RLA made the following general conclusions.

- The visual impacts of the re-alignment would be mitigated by the proposed final alignment presented by GHD (2022).
- The alignment proposed in GHD (2022) provides for improved visual amenity outcomes compared to that presented in the EIS and Amendment Report. This is due principally to the distance of the towers from vantage points at private properties.
- The potential visibility of the re-aligned 500kV power transmission line would be greater than the existing alignment at properties located to the west of the proposed alignment.
- The visibility of the towers and the land that may be cleared for an easement for the power line would remain low or negligible.
- The character and quality of the visual landscape for private properties would not significantly change.
- Views of the 500kV power transmission line and towers may be possible within Lue, however, these would be largely screened by existing vegetation and infrastructure. The character and quality of the visual landscape within the village of Lue would not significantly change.
- The extent of the visual impact as assessed in the EIS remains valid, if not improved. The assessment of visual impact has not been underestimated.

6.5.3 Visual Impacts Associated with the Mine Site

Most of the existing views towards the Mine Site are dominated by the elevated background topography of a dissected sandstone plateau with gently sloping partly cleared or grassed rural areas in the foreground. The Mine Site would be located in this setting and predominantly obscured from view by existing ridgelines. The general setting of the Mine Site varies in scenic quality from moderate to moderate/high with the Mine Site itself of moderate quality. There are extensive areas of similar landscape and land uses in the vicinity.

The visual impacts associated with mining components is largely unchanged since the public exhibition of the EIS. No components of the Mine Site would be visible from Lue village given the substantial ridges present between Lue and the Mine Site. Views from the public road network of some components within the Mine Site would be possible at some locations and it is acknowledged that the Project would result in changes in the visual landscape in the vicinity of the Mine Site with views from six privately-owned residences possible at certain stages of development (two of which are Project-related, having entered into agreements with Bowdens

Silver). **Figure 6.12** presents the locations that would have views of mining components including on public roads. **Table 6.9** presents a summary of the distances between the six residences with views of the Mine Site and the key Project components that would be visible.

Table 6.9
Privately-owned Residences with Direct Views towards Sections of the Mine Site

Residence Reference	Elevation (m AHD)	Distance to Mine Site Component* (m)				
		Open Cut Pit	Southern Barrier	WRE	Low Grade Ore Stockpile	TSF
R4	589.5	1 350	1 270	**730**	1 620	NV
R19	634.5	5 340	5 295	**4 660**	5 080	NV
R39#	575.0	2 260	**1 830**	2 530	3 330	NV
R40	576.4	2 270	**1 770**	2 520	3 400	NV
R47#	585.0	2 250	**1 810**	2 450	3 300	NV
R81	613.1	NV	NV	NV	NV	**2 240**

BOLD = Closest Mine Site component
NV = Not Visible
# see **Figure 6.12**
# Residence is Project-related

Whilst the proposed amendment would require the installation of a range of components within the Mine Site, these are not likely to be visible from public vantage points and would not alter the conclusions of the visual impact assessment.

It is considered that the distance from the viewing locations and Mine Site as well as the proposed visual controls would achieve an acceptable level of impact. Bowdens Silver is currently in discussions with the owner of a single residence that would have close views of the Mine Site with the view from this residence significantly affected in character and quality.

There have been no changes to the management of potential night-time lighting impacts associated with the Project. Lighting of the Project would result in only minimal and acceptable impacts to the built or natural environment and would have negligible impacts on astronomical observatories in the region.

6.5.4 Management and Mitigation Measures

The management and mitigation measures described in Section 4.9.4 of the EIS remain unchanged. These include the following in summary.

- Design measures such as retaining areas of remnant vegetation within the Mine Site, the geometry of the Waste Rock Emplacement and the construction of the Southern Barrier would improve the visual appearance of the Mine Site.
- The alignment of the relocated Maloneys Road has been designed to limit the visibility of the TSF impoundment area for motorists travelling along the new road.
- Bowdens Silver would undertake interim or progressive revegetation of areas completed temporarily or permanently such as the main open cut pit.

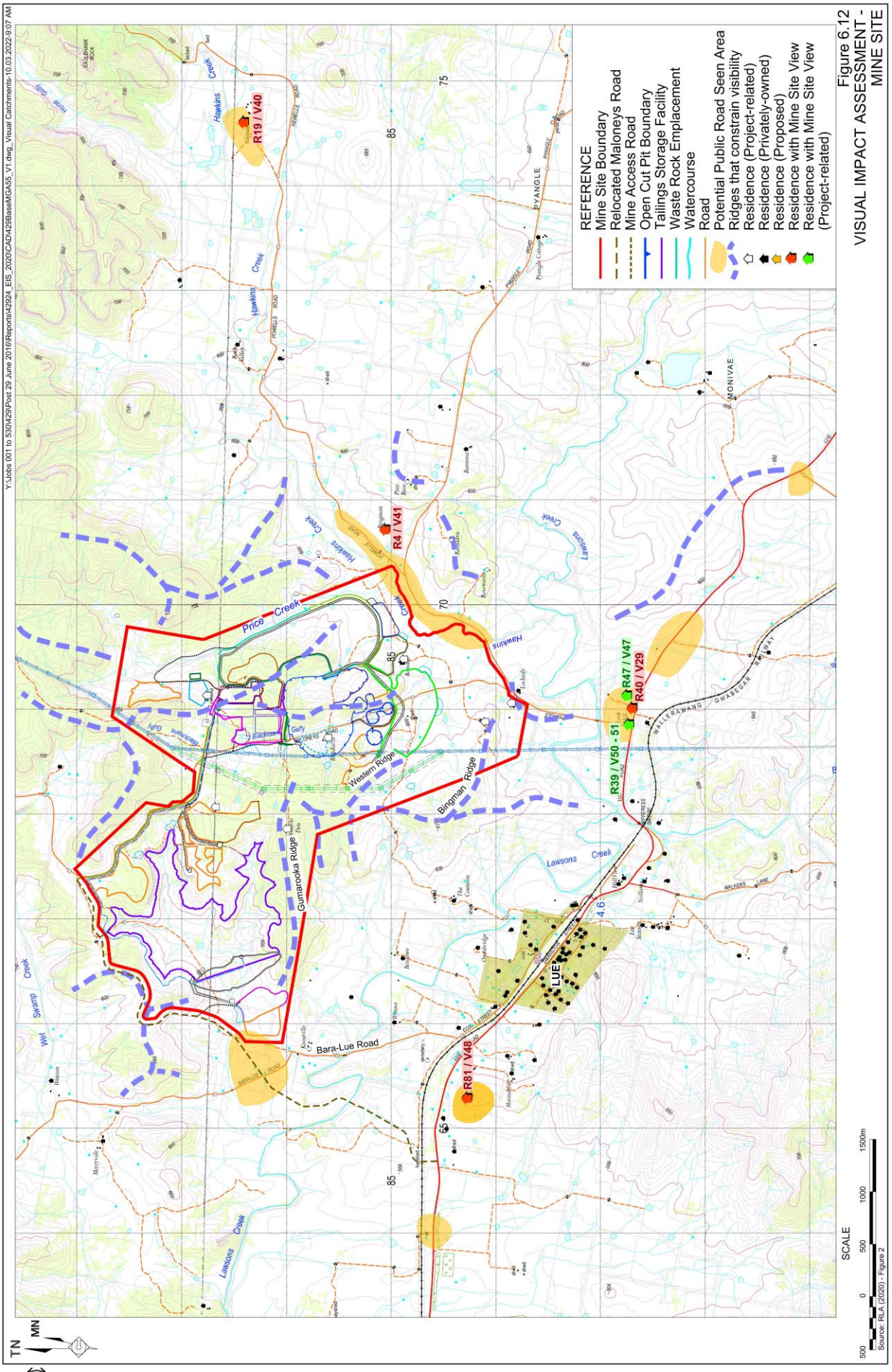


Figure 6.12
VISUAL IMPACT ASSESSMENT - MINE SITE

- Visual screens would be planted in strategic locations.
- Buildings, structures and roadside noise barriers would be painted dark green/grey colours. A range of lighting strategies would be implemented to mitigate lighting impacts on the local environment and at the Siding Spring Observatory and local observatories.
- In the long-term, the successful rehabilitation of the Mine Site would mitigate for changes to the visual landscape.

In addition to the above, Bowdens Silver has committed to change the proposed alignment of the 500kV power transmission line presented in the EIS and *Amendment Report* for the Project to mitigate visual impacts to privately-owned residences. The proposed alignment is presented in **Figure 3.4** and a comparison of the change with the existing and previously proposed alignment provided in **Figure 3.5**.

6.5.5 Assessment of Impacts

The development of the Project would result in changes in the visual landscape in the vicinity of the Mine Site. However, the limited visibility of the mining activities within the Mine Site and the range of visual controls would achieve an acceptable level of impact. Importantly, no mining components would be visible from Lue. Beyond the end of the Project life, the visual impacts of the Project would progressively diminish as the areas of revegetation established progressively over the Project life matures and revegetation of the final landform progresses.

Visual impacts associated with the re-location of the 500kV power transmission line have been mitigated to the extent possible and review of visual impacts has concluded there would be no significant changes to the character and quality of the visual landscape for privately-owned residences and from within Lue.

The potential for lighting impacts on the local environment has been assessed to be minimal. In addition, the impacts of sky glow on the local environment were assessed to be insignificant under both clear sky and cloudy conditions.

6.6 OTHER CONSIDERATIONS

Noise

Section 4.2 of the EIS describes the outcomes of the noise assessment undertaken by SLR Consulting Australia Pty Ltd as part of the overall *Noise and Vibration Assessment* for the EIS and presented in *Volume 1 Part 1 of the Specialist Consultant Studies Compendium* (SLR, 2020).

Management of potential noise impacts during the site establishment and construction stage and operation of the Project would involve the adoption of a range of mitigation measures to reduce noise generation and the propagation of noise beyond the Mine Site. Bowdens Silver would also use a regime of continuous real-time noise monitoring, predictive meteorological systems and site management procedures to ensure that noise limits are not exceeded under noise enhancing meteorological condition at the privately-owned residences surrounding the Mine Site that are

not the subject of a negotiated agreement. For those residences where exceedances of noise criteria are predicted during some stages of the Project, Bowdens Silver has sought to reach negotiated agreements in accordance with the VLAMP.

Mitigation measures to reduce noise-related impacts would be described in the Construction Noise Management Plan (for the site establishment and construction stage) and the Operations Noise Management Plan (for all mining and processing operations). The implementation of these methods accompanied by real-time noise monitoring would allow Bowdens Silver to pre-emptively identify higher than expected noise generation and adjust operations to comply with the Construction Noise Management Levels and Project Noise Trigger Levels.

Noise generating activities associated with the proposed amendment would occur during the site establishment stage, with vegetation clearing and construction activities for the development and installation of the various components for the integrated water management and supply strategy. During operations, periodic and short-term noise generating activities associated with the management and maintenance of these components may occur. However, the proposed amendment would not introduce noise generating activities additional to those already assessed by SLR (2020) and therefore is not likely to affect the outcomes of the noise assessment.

Noise-related impacts associated with the construction and the ongoing maintenance of the water supply pipeline would no longer occur.

Air Quality

Section 4.4 of the EIS describes the outcomes of the air quality assessment undertaken by Ramboll Australia Pty Ltd as part of the *Air Quality Assessment* for the EIS and presented in *Volume 1 Part 2 of the Specialist Consultant Studies Compendium* (Ramboll, 2021).

Ramboll (2021) quantitatively assessed potential air quality impacts resulting from construction and operational activities at the Mine Site using a Level 2 assessment in accordance with the NSW Environment Protection Authority's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2016). Air quality modelling completed by Ramboll (2021) predict no exceedance of the relevant air quality criteria for particulate matter (TSP, PM_{10}, $PM_{2.5}$) at any privately-owned residences or receivers, either from the Project alone or cumulatively. Ramboll (2021) also predict there would be no exceedance of the impact assessment criteria at any receivers (Project-related or private) for metal dust concentrations or respirable crystalline silica.

Notwithstanding the predicted levels, the potential air quality impacts would be monitored and dust generation would be mitigated using a range of measures that would be regularly reviewed and updated through an Air Quality Management Plan.

Dust generating activities associated with the proposed amendment would occur during the site establishment stage with vegetation clearing and construction activities for the development and installation of the various components for the integrated water management and supply strategy. During operations, periodic and short-term dust generating activities associated with the management and maintenance of these components may also occur. However, the proposed amendment would not introduce activities with the potential to generate additional air quality impacts and therefore is not likely to affect the outcomes of air quality assessment as presented in Ramboll (2021) and described in Section 4.4.2.5 of the EIS.

Noise-related impacts associated with the construction and the ongoing maintenance of the water supply pipeline would no longer occur.

Health Risks

In assessing human health risks associated with the Project, EnRiskS (2021) assessed potential impacts arising from changes to air quality, surface water, groundwater and noise. Consideration was also given to mental health and opportunities for health improvement.

EnRiskS (2021) concluded that no health risks of concern have been identified for the off-site community. More specifically, the assessment presented the following conclusions.

- The Project would make a negligible contribution to overall particulate matter exposures with no health risks of concern during any stage of the Project.
- The potential for adverse health impacts within the off-site community due to Project-related surface water and groundwater impacts were considered to be negligible.
- There are no health impacts of concern in relation to noise from the Project. At times, noise from the Project would be audible and distinguishable above background noise levels. While these noises may be distinguishable, they would remain too low to impact upon community health.

As noted above, the proposed amendment would not introduce activities associated with noise and particulate matter emissions additional to those already assessed for the Project. Furthermore, as described in Sections 6.2 and 6.3, impacts on surface and groundwater resources are consistent with those assessed for the EIS.

Therefore, the proposed amendment would not alter the outcomes of the *Human Health Risk Assessment* prepared by EnRiskS (2020).

Aboriginal Heritage

Section 4.14 of the EIS describes the outcomes of the *Aboriginal and Historical Cultural Heritage Assessment* prepared by Landskape Natural and Cultural Heritage Management and presented in the EIS as *Volume 4 Part 13 of the Specialist Consultant Studies Compendium* (Landskape, 2020). This assessment was carried out in accordance with the general requirements of the then NSW Office of Environment and Heritage's *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH, 2011) and included 17 days of archaeological field investigations of the Mine Site and previously proposed water supply pipeline corridor. These field surveys were undertaken with representatives of the local Aboriginal community in attendance.

Landskape (2020) identified a total of 58 sites within the Mine Site and eight sites adjacent to the previously proposed water supply pipeline corridor. There were no sites identified during survey of the proposed relocated Maloneys Road. **Figure 6.13** presents the location of sites within the Mine Site. One site registered on the Aboriginal Heritage Information Management System (AHIMS) was a rock shelter (36-6-0004) that was not located during field survey. This is considered to be due to a poorly defined location within historical records (from 1899). It has been concluded that this site is not within the Mine Site.

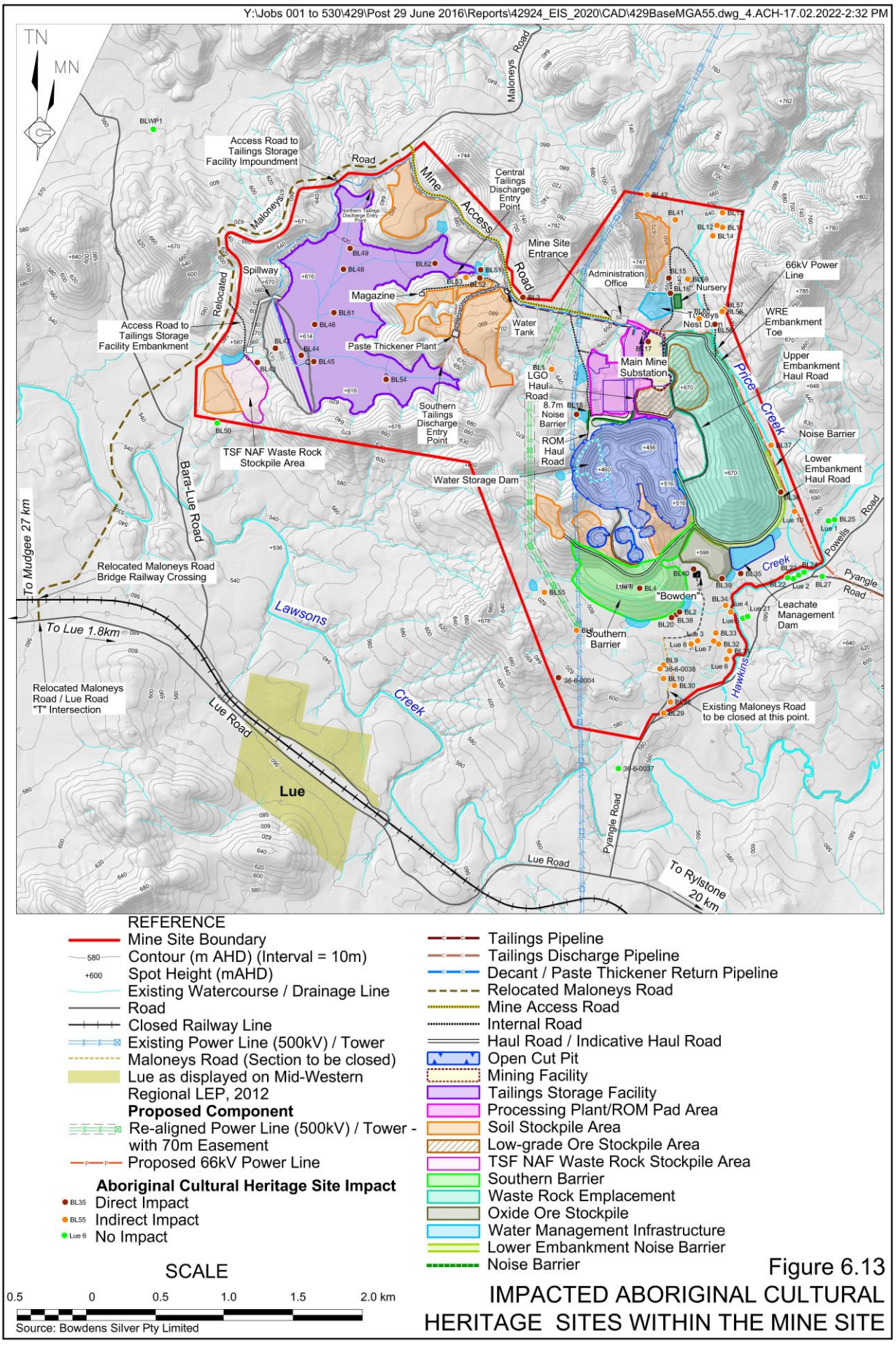


Figure 6.13
IMPACTED ABORIGINAL CULTURAL HERITAGE SITES WITHIN THE MINE SITE

The Project would require the removal of items of Aboriginal cultural heritage significance from 25 identified sites within the Mine Site, one of which (the rock shelter identified as site BL44) would require test excavation. Two sites have already been salvaged under Aboriginal Heritage Impact Permit No. 1132211, issued by OEH in May 2013. Landskape (2020) recommended the items at these sites be collected, analysed, curated and stored in an on-site "Keeping Place". Landskape (2020) concluded that whilst these sites are not of high scientific significance, they hold high cultural significance. A further 31 identified sites within the Mine Site, whilst not directly impacted, would require protection from inadvertent disturbance via the installation of protective barriers.

Of the 25 sites that would be removed, two (BL18 and BL51) are situated in areas proposed to be disturbed as part of the proposed amendment. This disturbance would be associated with the construction of two harvestable rights dams (WC South and BG Centre). Both of these sites had been selected for collection and storage by Landskape (2020) in consultation with representatives of the local Aboriginal community. Therefore, the proposed amendment would not require the destruction of additional items of Aboriginal cultural heritage significance.

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.

Historic Heritage

Section 4.15 of the EIS describes the outcomes of the assessment undertaken and presented in 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.

There were no sites of historic heritage value identified in areas proposed to be disturbed for the proposed amendment.

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.

7. EVALUATION OF MERITS

7.1 INTRODUCTION

A comprehensive evaluation of the Project was 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*.
- Achievement of the objectives of the Project.

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

As described in Section 6, the proposed amendment would change the manner in which water would be sourced and managed within the Mine Site and require additional surface disturbance to accommodate water management infrastructure. This change has permitted the removal of the water supply pipeline and the associated surface disturbance and construction or operational impacts. Following detailed technical review of the proposed amendment, it is concluded that the technical assessment outcomes remain largely consistent with those previously presented, the overall area of land to be used for the Project would be reduced and the previously identified environmental outcomes have been improved. There are no new environmental impacts introduced that have not previously been identified as environmental risks and assessed. The following subsections update the evaluation of the Project in the context of the proposed amendment including a summary of the outcomes of the proposed amendment and consideration of the principles of ecologically sustainable development and the mandatory considerations specified in Section 4.15(1) of the EP&A Act.

7.2 PROJECT AMENDMENT

As described in Section 1.5 of the EIS, mineral exploration within and surrounding the Mine Site has been undertaken since 1989 by Bowdens Silver and others. This has been accompanied by feasibility assessments and numerous environmental studies undertaken by a range of specialist consultants. Subsequently, the design of the Project has evolved over time, culminating with the currently proposed amendment. This design process has been iterative, with feedback provided from the local community through consultation activities, that have been considered in preparing the final design, as presented in this document.

Table 7.1 presents a summary of the key changes to the design that have occurred since Bowdens Silver assumed ownership including the design presented in the EIS and under the proposed amendment.

Table 7.1
Project Design Evolution

Project Component	Previous Ownership	EIS Design	Current Design
Total Resource	Mining of 53 million tonnes of ore and 79 million tonnes of waste rock.	Mining of 30 million tonnes of ore and 47 million tonnes of waste rock.	Unchanged from EIS.
Processing Rate	Processing of 4 million tonnes per annum of ore.	Processing of 2 million tonnes per annum of ore.	Unchanged from EIS.
Water Use	Water requirements averaging 3.5GL per year.	Lower water requirements averaging 1.9GL per year.	Water requirements averaging 1.2GL per year.
Water Source	Water sourced from local groundwater, surface water and other sources (including the Cudgegong River).	Water sourced from groundwater and surface water recovered from within the Mine Site with make-up water supplied by a pipeline from the surplus water within the Ulan Coal Mine and/or Moolarben Coal Mine.	Water sourced from groundwater and surface water recovered from within the Mine Site with make-up water supplied by on-site production bores.
Water Infrastructure	Large water storage dam (3 500ML capacity) required for water capture and storage.	65ML turkeys nest dam planned to store water from pipeline. Advanced dewatering bores to support site establishment and construction only.	Advanced dewatering (production) bores, enlarged turkeys nest dam (130ML), water storage dam (130ML turkeys nest) and six harvestable rights dams.
Ancillary Mine Infrastructure	Infrastructure located closer to Lue.	Relocation of processing plant further north, away from Lue.	The Processing Plant Area is unchanged. A paste thickener plant has been included for increased recovery of water from tailings slurry.
Personnel Accommodation	Construction workers accommodation within the site.	No on-site worker accommodation with all accommodation to be sought locally.	Unchanged from EIS.
Open Cut Pit Scale	A single open cut pit covering approximately 73ha	A main open cut pit and two satellite open cut pits, collectively covering approximately 52ha	Unchanged from EIS.
Tailings Storage Facility	TSF located to the east of the Open Cut Pit within the Price Creek catchment over an area of 181ha and with a capacity of 46 million tonnes.	TSF located to the northwest of the Open Cut Pit within the Walkers Creek catchment over an area of 117ha with a capacity of 30 million tonnes.	Location and design philosophy unchanged however, area of impermeable liner has been increased to reduce seepage potential. Floating decant recovery infrastructure replaced by fixed pumping to increase water recovery and reduce losses from evaporation and seepage.
Mine Site Access	Access via a realignment of Maloneys Road that intersects with Pyangle Road with traffic entering Lue Road to east of Lue.	Access via a realignment of Maloneys Road that intersects directly with Lue Road to the west of Lue, resulting in no mineral concentrate transport through Lue or Rylstone.	Unchanged from EIS.

Throughout the design process, Bowdens Silver's objective has been to design a Project that incorporates all practical, feasible and cost-effective measures that maintain, to the greatest extent, the existing environmental and social amenity of the area whilst supporting a viable Project. Therefore, emphasis has been placed on simplifying the Project's design and environmental footprint. This process has focused on reducing the Project's water demands, the proximity of Mine Site components to Lue and surrounding privately-owned residences and improving the environmental outcomes of the Project. Changes to the Project design have been discussed with the local community (through direct consultation, Open Day events (actual and virtual), newsletters and the Community Consultative Committee).

A range of documents present in detail the feedback received from the community in response to the Project and various design changes. These documents include the Project's *Social Impact Assessment*, prepared by Umwelt (Australia) Pty Ltd and presented as *Volume 6 Part 17* of the *Specialist Consultant Studies Compendium* and the responses to matters relating to the potential social impacts of the Project in the *Submissions Report*.

7.3 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

Clause 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* specifies the required contents of an Environmental Impact Statement, with Clause 7(1f) describing the need for a justification of development in accordance with the principles of ecologically sustainable development (ESD) and Clause 7(4) defining the principles of ESD. A comprehensive evaluation of the Project against the principles of ESD was presented in Section 6.1.3 of the EIS. The principles seek to encourage development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs through the following principles.

- The precautionary principle, which describes that a lack of certainty regarding potential impact should not be used as a reason for postponing measures to prevent environmental degradation.
- Inter-generational equity in decision making.
- Conservation of biological diversity and ecological integrity.
- Improved valuation of environmental resources.

7.3.1.1 The Precautionary Principle

The precautionary principle has been considered during all stages of the design and assessment of the Project, including the proposed amendment. The technical assessments for the proposed amendment have considered a range of risks that may result in serious and irreversible harm including the following.

- Alterations to the flow regime in local watercourses permanently altering water availability for human and ecosystem use (see Section 6.2)
- Permanent or long-term impacts to the regional groundwater system including risks to groundwater quality and impacting water use and accessibility (see Section 6.3).

- Removal of habitat for threatened native flora and fauna including the critically endangered Regent Honeyeater (see Section 6.4). It is noted the proposed amendment would remove impacts within the Mudgee-Wollar key breeding area for the Regent Honeyeater as defined by the *National Recovery Plan for Regent Honeyeater* (DoE, 2016).

Other Project-related matters, such as noise or air quality impacts have previously been considered for assessment in the EIS. These assessments concluded the associated impacts are able to be mitigated or are reversible. However, each of the matters considered for the Project has been thoroughly assessed with comprehensive scientific methods applied to understand potential risks and to predict environmental outcomes. On the basis of what is known with regards to environmental risks, Bowdens Silver has committed to preventative measures to reduce potential impacts, as much as is reasonable. Environmental monitoring and reporting would be implemented to track trends in environmental outcomes / performance and guide adaptive management practices. In this regard, Bowdens Silver acknowledges where scientific uncertainty exists and has committed to proactive management of residual environmental risks.

7.3.1.2 Social Equity

The extent of the Project's predicted residual environmental impacts does not pose an unacceptable cost to future generations, particularly in relation to post-mining groundwater impacts. Numerical groundwater modelling, extended to 200 years post-mining, identified that an equilibrium water level in the final void pit lake would be established after approximately 100 years. Following the cessation of mining operations, the extent of groundwater drawdown is not predicted to expand significantly as the groundwater system recovers. Rather, the residual drawdown extent would slightly diminish 50 years post-mining to reflect the equilibrium groundwater levels, with the final void acting as a groundwater sink. Regardless of the duration of these impacts, the area of extent of impacts is predicted to be limited to be within 2km to 3km of the main open cut pit and subject to monitoring and contingency allowances.

The natural environment would be enhanced through the in-perpetuity conservation of land proportionate to the offsetting obligations of the Project. This approach, which is consistent with NSW government legislation and policies, ensures that native vegetation clearing for the Project development, is offset through conservation of similar areas that would be available for future generations.

The Project would be consistent with the principle of intra-generational equity via the distribution of economic benefits throughout Australia, at the scale of the State of NSW, within the local community including Lue, Rylstone, Kandos and Mudgee and for individuals employed within the Mine Site. Although the Project is medium term in comparison to some other mining developments, Bowdens Silver continues to invest in local and regional exploration programs to identify further mineral development opportunities. Bowdens Silver has recently identified high grade mineralisation in the vicinity of the proposed open cut pits that supports the longer term prospects of the operation. This includes a potential underground mining development. These opportunities would potentially correspond with a future winding down of coal mining in the region. As mining, notably coal mining, represents the largest industry sector in the Mid-Western Regional LGA, the Project could potentially see the benefits of employment and training in this sector extending beyond the current generation.

A key objective of the Project is to provide for the sustainability of Lue as a village and retention of its character. This has been achieved via the design of a Project that provides direct benefits for the local community, albeit not to the extent that negative impacts to the character of the local community would be felt.

7.3.1.3 Conservation of Biological Diversity and Ecological Integrity

The Project is the culmination of a series of design and planning iterations which has been subjected to comprehensive assessment. Throughout this process, Bowdens Silver has sought to reduce areas of native vegetation clearing so the overall area of potentially impacted native vegetation and flora and fauna habitat is minimised to the greatest practical extent. Furthermore, detailed measures would be implemented to conserve the integrity of stockpiled soil resources for use in rehabilitation activities, which would in part aim to re-establish native ecosystems within the Mine Site.

In addition, the biodiversity offsetting obligations of the Project have been assessed in accordance with the *Biodiversity Conservation Act 2016* and the NSW Biodiversity Offset Scheme. This process maintains the integrity of native vegetation and habitat in locations assessed to be consistent with that removed for the Project. Bowdens Silver would establish or facilitate the establishment of Biodiversity Offset Sites, either on land within or adjacent to the Mine Site (on-site offsets) or on other freehold land within the region. 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.

7.3.1.4 Improved Valuation and Pricing of Environmental Resources

Bowdens Silver has made a range of commitments relating to the implementation of safeguards to avoid or minimise environmental impacts, such as dust suppression to reduce particulate matter emissions. While this may present a short-term cost to the operation, it is acknowledged that the long-term benefit of management is of high value to the Company and to the local environment. This includes Bowdens Silver's commitments for the long-term storage, monitoring and management of tailings material where the proposed design elements to mitigate seepage exceed current NSW EPA requirements. Throughout the Project's consultation, design and assessment stages, considerable efforts have been made to ensure that the rehabilitated landform would remain safe, stable, secure and non-polluting.

Furthermore, as the Project would utilise in-pit and ex-pit production bores, it allows the Project to co-locate aquifer interference activities (open cut pit development and groundwater abstraction) within a single zone of impact that is centred on the Mine Site. Whilst the Project places significant reliance on water resources, its full requirements are accounted for in water licensing permitted under the current water access regime, with no additional demand placed on local water sources other than what is considered permissible by the NSW Government.

The planning process in NSW requires that Applicants adequately consider, assess and value the potential environmental outcomes of development. In assessing the impacts of the proposed amendment, Bowdens Silver has addressed the assessment requirements of all relevant government agencies. This included consideration of the local community's feedback and the local experience of the natural environment.

7.3.1.5 Conclusion

The aim of ecologically sustainable development is to recognise the environmental and social outcomes of development that must be considered if the economic benefits are to be realised in the short and long term. The focus is not on the sustainability of a single action but the sustainability of society between and across generations and the preservation of the ecosystem processes on which life depends. In this regard, the non-renewable aspects of mining have been recognised with objectives for mining development that seek the efficient removal and beneficiation of natural resources for economic benefit alongside detailed consideration of the environmental and social outcomes of these processes.

Bowdens Silver has undertaken thorough scientific assessments of the potential impacts of the proposed amendment and assumed worst case scenario settings to inform development of preventative measures that would limit the potential for adverse environmental impacts. This includes the conservation of biological diversity through offsetting of residual impacts to biodiversity values. Social equity would be achieved for the Project through the broad distribution of benefits including directly within the local community and across generations. The environmental impacts would not expand over the long term or result in a direct cost to future generations. Finally, as demonstrated by its actions since the EIS was published, Bowdens Silver remains committed to selecting Project components that are designed to limit local impacts and manage the outcomes of development. This clearly shows that Bowdens Silver places appropriate value on the environmental resources within and surrounding the Mine Site.

7.4 ENVIRONMENTAL PLANNING INSTRUMENTS

Section 4 and **Appendix 10** provide an overview of the Project's compliance with relevant statutory requirements and where various requirements have been addressed. This includes consistency with the relevant requirements of the *Mid-Western Regional Local Environmental Plan 2011*.

Section 1.3 of the EP&A Act presents the objects of the Act which are presented in **Table 7.2** with a short description of how the Project has addressed and satisfy these objects.

Table 7.2
Objects of the EP&A Act

Page 1 of 3

Object	EIS Coverage
The objects of this Act are as follows:	
a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,	It is considered that the Project would provide for the orderly and professional development and operation of the Mine. At all stages of design and planning for the Project the social and economic outcomes that would be experienced in the community have been considered. The Project has been designed to avoid environmental impacts as much as possible and would mitigate or manage residual impacts to an acceptable level.

Table 7.2 (Cont'd)
Objects of the EP&A Act

Object	EIS Coverage
b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,	Section 7.3 discusses how the Project is consistent with the principles of ecologically sustainable development. The Project has been the subject of rigorous technical assessments that, where required, have built upon previous studies and accrued knowledge of the site to develop a robust understanding of the existing setting. This has enabled the prediction of potential impacts and the design of preventative measures, where required, to manage the risk of impact. It is considered that the Project would be developed in an efficient manner whilst taking into account the value of environmental and social resources to the local and regional community both now and in the future.
c) to promote the orderly and economic use and development of land,	Detailed technical assessments have been undertaken to understand the existing setting including through comprehensive exploration programs and assessment of ore characteristics. This has facilitated the design of a Project that not only maximises the economic use of the land but also provides for appropriate staging, the ongoing management of by-products, staffing and supply planning, progressive and final rehabilitation and community-related programs and investment. In this regard, the considerable effort put into the detailed planning would ensure that the Project is developed to promote the orderly and economic use and development of the site.
d) to promote the delivery and maintenance of affordable housing,	While not directly relevant to the Project, it is not expected that the supply and availability of housing in the region would significantly change due to the anticipated employment benefits of the Project.
e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,	Consideration of residual impacts to biodiversity values has been undertaken in accordance with the *Biodiversity Conservation Act 2016*. Direct disturbance of native vegetation and potential native fauna habitat has been avoided where possible. A biodiversity offsetting strategy would ensure that residual biodiversity impacts are accounted for and consistent with the impacts proposed.
f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),	The Project would require the salvage of artefacts from 25 sites that have high Aboriginal cultural heritage value. However, these sites have been assessed to have mostly low or low to moderate scientific, aesthetic or educational significance. A further 31 sites within the Mine Site would not be directly impacted and would be protected from inadvertent disturbance over the Project life. Of the three historic heritage sites identified within the Mine Site, all have been assessed as having a generally low historic heritage value. It is not anticipated that the Project would significantly constrain the sustainable management of built and cultural heritage.
g) to promote good design and amenity of the built environment,	The Project would not influence the design of the built environment. It is acknowledged that the community within and immediately surrounding Lue would experience mine noise for the first time. However, the noise that would be generated has been previously assessed and it is predicted that the noise levels experienced would be low and at a level recognised by the EPA's Noise Policy for Industry (2017) as being acceptable to most people and unlikely to cause annoyance.

Table 7.2 (Cont'd)
Objects of the EP&A Act

Object	EIS Coverage
g) to promote good design and amenity of the built environment, (Cont'd)	The potential amenity impacts within Lue and the surrounding area, which would be managed over the Project life through: • commitments to upgrade or improve local infrastructure such as the relocation of Maloneys Road to the west of Lue such that Project-related heavy traffic through Lue would be limited; • physical components of the Mine Site such as the Southern Barrier that would obscure views of the Mine; • adaptive blast designs that consider potential impacts at privately-owned residences; • preventative management incorporating meteorological forecasting, comprehensive monitoring and response protocols; and • reactive management protocols to address community complaints.
h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,	The buildings that comprise the processing facilities within the Mine Site have been carefully designed and located to permit their necessary function while providing reasonable access and facilities to maintain the safety of occupants.
i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,	The assessment requirements addressed in the EIS and feedback from Council, relevant State government agencies and the Commonwealth Government have also informed the technical assessments for the Project.
j) to provide increased opportunity for community participation in environmental planning and assessment.	Section 3 of the *Social Impact Assessment* for the Project described the extensive community consultation and engagement activities that have been undertaken during the design and planning for the Project. Furthermore, Bowdens Silver has continued its community consultation and stakeholder engagement to present and discuss the implications of the Project.

7.5 PLANNING AGREEMENT

The terms of the Planning Agreement have been agreed between Bowdens Silver and MWRC and are described in Section 2.6 and **Table 2.1**. In summary, the Planning Agreement provides for Bowdens Silver to make contributions towards the following.

- $3.0 million in contributions towards community infrastructure to support the region. These contributions would be staged over the life of the Project and be applied in accordance with the strategies and actions in the MWRC Community Strategic Plan and 4 year Delivery Program.
- $1.7 million in road maintenance contributions to be applied towards the maintenance of Lue Road and ancillary roads that MWRC considers will be impacted by the Project. All works are to be undertaken at the sole discretion of MWRC.

These contributions represent only one component of Bowdens Silver's commitment to remaining a participant in the Mid-Western region and the local community. In particular, Bowdens Silver would continue and expand investment in the local community through its Community Investment Program. The program would continue to provide support and investment towards a range of community-led initiatives and programs that focus upon Lue and surrounding areas. Bowdens Silver has a clearly communicated objective to engage with the local community, to be involved in local initiatives and be a contributing member of the local community.

7.6 OUTCOMES OF ENVIRONMENTAL ASSESSMENT

7.6.1 Introduction

The following subsections present a brief summary of the outcomes of technical environmental, social and economic assessment for the Project. The majority of identified risks would be managed throughout the life of the Project through a range of management and monitoring commitments. These commitments would be described in a comprehensive suite of environmental management plans that would be prepared prior to commencement of the Project and be implemented as approved by the relevant NSW Government agency.

7.6.2 Biophysical Impacts

7.6.2.1 Noise and Blasting

The design of the Mine Site, the selection of the type and number of mobile equipment used on site and operational hours for the Project have largely been influenced by the noise assessment for the Project.

Despite the proposed implementation of reasonable and feasible noise mitigation measures, it is predicted that residents at some privately-owned properties may periodically experience an exceedance of the relevant noise limits during adverse weather conditions and worst-case operational intensity. In summary, it is predicted that there may be significant exceedances (>5dB(A)) at one residence and moderate exceedances (3dB(A) to 5dB(A)) at three residences. Bowdens Silver has explained the outcomes and their likelihood to the small number of affected landowners and is continuing to negotiate agreements in accordance with the VLAMP with those affected. Where agreement is not reached before determination of the application, Bowdens Silver is comfortable that conditions of consent commit the Company to continue negotiations on an agreement for the duration of predicted impact.

It is also predicted that there would be negligible exceedances (1dB(A) to 2dB(A)) of relevant noise limits at three privately-owned residences. A change in noise level of 2dB is not generally perceptible to the human ear and therefore mitigation and/or property acquisition is not triggered under the VLAMP. Despite there being no requirement under the VLAMP to do so, Bowdens Silver has proposed a "goodwill" offer to affected landowners to provide tailored mitigation measures at properties in consultation with a builder and an acoustic specialist. These agreements would be negotiated in the event approval is granted, noting that any agreement must be voluntary and cannot be imposed on either party.

Since the EIS was published, Bowdens Silver has reached agreements with some landowners and therefore the number of affected properties has been reduced from that originally presented.

Blasts would be designed to ensure that both ground vibration and airblast overpressure levels comply at all privately-owned residences without a VLAMP agreement. Blasts would be periodically heard but their effects would be within both comfort and damage criteria. Blasting notifications would be provided to interested parties that have registered with Bowdens Silver.

7.6.2.2 Air Quality and Greenhouse Gas Emissions

Through detailed and conservative modelling, the *Air Quality Assessment* (Ramboll, 2021) has predicted that there would be no exceedances of the relevant air quality criteria for particulate matter (TSP, PM_{10}, $PM_{2.5}$) at any privately-owned residences or receivers, either from the Project alone or cumulatively. It is also predicted that there would be no exceedance of the impact assessment criteria at any receivers (Project-related or private) for metal dust concentrations, respirable crystalline silica or hydrogen cyanide.

The predicted annual average Scope 1 Greenhouse Gas emissions generated by the Project would represent approximately 0.02% of total Greenhouse Gas emissions for NSW and 0.004% of total Greenhouse Gas emissions for Australia.

7.6.2.3 Groundwater Resources

An *Updated Groundwater Assessment* has reaffirmed that the Project would meet the NSW Aquifer Interference Policy's Level 1 Minimal Impact Considerations for highly productive, alluvial, porous rock and fractured rock aquifers and that the predicted impacts are acceptable under this policy. A decrease in groundwater level of greater than 2m at one privately-owned registered groundwater bore is predicted, however, Jacobs (2022) considers the groundwater model is conservatively predicting drawdown at this bore. Potential impacts to groundwater availability at the registered bore would be subject to compensatory measures, should they be required.

Following the cessation of mining operations, the extent of groundwater drawdown would continue to expand for a period of 16 years, followed by minor fluctuations and expansion until 50 years post-mining when the maximum extent would be reached. As noted above, this may impact one registered groundwater user with predicted drawdown greater than 2m. However, for all other registered users, the predicted impacts to groundwater availability and quality remain acceptable for that period and therefore long-term impacts to the groundwater setting are not expected.

All water take through groundwater inflows and subsequent dewatering and reduced baseflow contributions to Hawkins and Lawsons Creeks are accounted for by the water licensing entitlements held by Bowdens Silver.

It is considered that groundwater system behaviour and therefore potential impacts to the groundwater setting are well understood and would be managed through the implementation of the Water Management Plan that includes a program for ongoing groundwater monitoring and management. Monitoring of groundwater levels and quality in the network of on-site monitoring bores and selected off-site private bores would provide valuable data to assess actual changes to the setting and enable comparison against groundwater model predictions.

7.6.2.4 Surface Water Resources

The *Updated Surface Water Assessment* prepared by WRM (2022) identified the extent to which the Project would alter the surface water regime within and downstream of the Mine Site.

The detailed site water balance model prepared by WRM (2022) has confirmed that the integrated water management and supply strategy would reliably supply Project-related water demand throughout the Project life, including under low rainfall conditions. The water balance model also demonstrated that, under modelled conditions, all water captured in the containment zone (i.e. tailings storage facility and leachate management dam) can be retained within the Mine Site. This means that throughout the Project life there would be no need to discharge this water from the containment zone.

WRM (2022) identified that during operations, flow rates in Hawkins and Lawsons Creeks would reduce by 1.2% to 4.5% whereas post-mine closure, flow rates would reduce by 0.3% and 1.4%. During operations and post-mining, the Project would result in flows greater than 1ML/day occurring on two fewer days per year. Overall, the Project would result in negligible reductions in flow and availability of water to downstream users. Bowdens Silver has acquired sufficient water licensing entitlement from the Lawsons Creek Water Source to meet the predicted peak losses during operations. These include 123ML for runoff intercepted by the tailings storage facility and the 14ML predicted operational peak baseflow reduction.

The flood study for the Project has concluded that noticeable changes in flood levels and velocities would be largely confined to the Mine Site and on land owned by Bowdens Silver. Any expected increases in flood velocities in Hawkins and Lawsons Creeks would be negligible and would not adversely impact off-site property or infrastructure.

7.6.2.5 Terrestrial Ecology

Throughout the design process, Bowdens Silver has undertaken to minimise impacts upon biodiversity values to the greatest extent possible. This process involved the preparation of a ‘traffic light’ model, utilising results of field surveys, to visualise areas of high, medium and low biodiversity value so that disturbance of high value areas could be minimised to the extent possible. In addition to considerations during the EIS process, changes to the Mine Site layout presented for the proposed amendment have considered opportunities to reduce indirect impacts to biodiversity and present a more compact layout. Notably, the removal of the proposed water supply pipeline removes all impacts to the BC Act listed Ausfeld’s Wattle and avoids disturbance of vegetation within the Mudgee-Wollar key area for Regent Honeyeater.

In total, the Project would result in the removal of 381.17ha of native vegetation of variable condition. This includes 180.17ha of Box-Gum Woodland which is listed as an endangered ecological community under the BC Act, of which 146.72ha is also classified as a critically endangered ecological community under the EPBC Act. As the removal of this vegetation cannot be avoided, biodiversity offsetting obligations in the form of ecosystem credits have been calculated for the Project. In the absence of biodiversity offsetting, EnviroKey (2022) consider the impact to Box Gum Woodland would be significant. However, residual impacts to Box Gum Woodland would be accounted for through substantial biodiversity offsetting as presented in the Biodiversity Offset Strategy for the Project (Niche, 2022) and result in large areas of this vegetation community being conserved in perpetuity.

Impacts to threatened flora and fauna has been assessed and a biodiversity offsetting obligation calculated in species credits for six species not considered to be satisfactorily offset through the ecosystem credit obligations. The six species for which species credit obligations have been calculated include the following.

- Koala (*Phascolarctos cinereus*)
- Large-eared Pied Bat (*Chalinolobus dyweri*)
- Regent Honeyeater (*Anthochaera phrygia*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Silky Swainson-pea (*Swainsona sericea*)
- Small Purple-pea (*Swainsona recta*)

For the Koala, Squirrel Glider and Regent Honeyeater, all native vegetation that would be removed from within the Mine Site has been considered potential habitat and subject to offsetting.

EnviroKey (2022) concluded that, excluding the Regent Honeyeater, the Project would not result in any significant impacts upon migratory or threatened species. Further consideration of impacts to the Regent Honeyeater identified that the species was not identified in comprehensive targeted field surveys but would remain subject to offsetting. EnviroKey (2022) concluded that the Project would:

- not lead to a long-term decline in the size of a population of the Regent Honeyeater;
- not reduce the area of occupancy to the detriment of the Regent Honeyeater; and
- be unlikely to result in the introduction of species or diseases that are potentially harmful to the Regent Honeyeater.

EnviroKey (2022) also concluded that the Project would result in the establishment of a significant biodiversity offset which would provide in perpetuity security for potential foraging and breeding habitat for the Regent Honeyeater on land that may otherwise have been subject to intense agricultural activity over time.

The assessment presented in the BAR confirms that, 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 offsetting strategy.

7.6.2.6 Aquatic Ecology

An *Aquatic Ecology Assessment* (Cardno, 2020) concluded that the greatest potential impact to aquatic ecology would occur only in the event of an accidental release of poor-quality water. This risk would be effectively managed given the design of the Project and the ongoing management and monitoring measures that would be aimed at preventing the release of such water to the surrounding watercourses.

The interception of surface flow on site and groundwater drawdown as a result of the open cut pits would result in a minor reduction in surface flow in Hawkins and Lawsons Creeks. It has been assessed that the likely impacts to aquatic habitat would be minor. The potential loss of stygofauna and their habitat due to direct displacement or groundwater drawdown has also been assessed to represent minor potential impacts.

7.6.2.7 Traffic and Transportation

The Project would result in additional traffic on the local road network, especially during site establishment and construction. However, once operations have commenced only limited numbers of heavy vehicles would be required (principally supply and service vehicles). Potential traffic-related impacts would be avoided or mitigated through improvements to the road network including the relocation of Maloneys Road and intersection treatments to suit traffic requirements. Additional management measures to avoid or mitigate the impacts of the increased traffic in the locality would be implemented in accordance with a Traffic Management Plan.

TTPP (2020) concluded that 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, assuming the implementation of the proposed mitigation and management measures.

7.6.2.8 Soils and Land Capability

A *Soil and Land Capability Assessment* (SMD, 2020) was undertaken to guide the management of soils and to determine potential impacts to soils and land capability resulting from the Project. SMD (2020) identified that the existing land within the proposed disturbance areas predominantly Land and Soil Capability (LSC) Class 6 with subordinate areas being either Class 3, 4 or 5 and reflecting the steep topography and heavy vegetation over much of the Mine Site.

Bowdens Silver would maintain or improve the capability of the land wherever possible throughout the Project life. Given the implementation of the proposed soil stripping and soil stockpile management measures, a similar level of LSC would be maintained following the rehabilitation of disturbed areas within the Mine Site, except for the final void pit lake. SMD (2020) identified no Biophysical Strategic Agricultural Land (BSAL) within the Mine Site and a Site Verification Certificate, confirming this, was issued by the then DPE on 8 November 2017.

7.6.2.9 Aboriginal Heritage

A total of 58 sites of Aboriginal cultural heritage significance have been identified within the Mine Site. Of these, 25 identified sites would be directly impacted and require collection and curation, one of which would be subject to test excavation. Two sites have already been salvaged under Aboriginal Heritage Impact Permit No. 1132211, issued by OEH in May 2013. A further 31 identified sites within the Mine Site, whilst not directly impacted, would require protection from inadvertent disturbance via the installation of protective barriers.

All sites have been identified by the registered Aboriginal parties to be of high cultural significance. The majority of sites are considered by Landskape (2020) to be of low scientific, educational and aesthetic significance except for six that are of low to moderate scientific significance and one that is considered of moderate scientific, education and aesthetic significance.

Artefacts that would be directly impacted would be collected, properly curated and stored in an on-site "Keeping Place". Bowdens Silver proposes to facilitate an Indigenous Technical Heritage Mentorship Program that would be implemented through a Heritage Management Plan for the Project. An archaeologist would coordinate the Aboriginal object recording, collection, analysis and curation process with younger members of the Aboriginal community using this as an opportunity to learn the necessary archaeological techniques. The process would also involve the participation of an Aboriginal elder to provide the cultural heritage context. Post-mining, the artefacts would be replaced within rehabilitated areas in consultation with representatives of the local Aboriginal community.

7.6.2.10 Historic Heritage

The *Aboriginal and Historical Cultural Heritage Assessment* undertaken by Landskape (2020) identified three sites of potential historical heritage significance within the Mine Site. Landskape (2020) concluded that the sites were of low significance on all criteria except for one that was potentially of moderate local significance for its research potential. None of the sites would meet the thresholds for consideration of State heritage significance. All sites would be removed with salvage of the items identified within the hut ruins. All items would be archived for future access.

7.6.2.11 Visibility

The *Visibility Assessment* of the Project (RLA, 2020) established that the catchment in which the Project components would be visible is comparatively small in that these components would only be directly visible from six rural residences (two of which are Project-related, having entered into agreements with Bowdens Silver), a section of Lue Road, 2km south of the Mine Site and from scattered rural land throughout the Lue area. None of the Project components would be visible from Lue given the substantial ridges present between Lue and the Mine Site. These ridges constitute a significant visual barrier between Lue and the Mine Site.

Overall, the limited visibility of the mining activities within the Mine Site and the range of visual controls would achieve an acceptable level of impact.

A lighting and night glow assessment (LAS, 2020) determined that, with the implementation of the mitigation measures, the Project would comply with the limits for dark rural environments as stipulated in AS/NZS 4282:2019 *Control of the Obtrusive Effects of Outdoor Lighting*.

Calculations to determine the illuminance of sky particles at varying levels above the Mine Site were also provided to the Siding Spring Observatory who concluded that the night sky impacts of the Project would be negligible. Similar negligible impacts were identified for the local astronomical observatories in the Mudgee, Ilford and Breakfast Creek localities.

The re-aligned 500kV power transmission line would be visible from private residences, principally due to the presence of the new towers. The 500kV power transmission line may also be viewed from certain locations within Lue but would be largely screened by existing vegetation and infrastructure. RLA (2021) reviewed the proposed alignment and concluded that the character and quality of the visual landscape would not significantly change at private residences or from within Lue. Bowdens Silver has mitigated views of the 500kV power transmission line by locating it further away from private properties, taking into consideration a buffer to mining operations.

7.6.2.12 Public Safety Hazards

Dangerous Goods

The assessment of hazards relating to dangerous goods was undertaken by Sherpa (2020) for the Project. It was determined that, with the implementation of standard controls and safeguards, the use and storage of sodium cyanide, cyanide solution and Class 5.1 ammonium nitrate-based blasting agents would result in very low off-site environmental and safety risks. It was identified that all qualitative environmental risk criteria identified in *Hazardous Industry Planning Advisory Paper No. 4 Risk Criteria for Land Use Safety Planning* would be met by the Project. It has been further determined that the transport route for sodium cyanide would be a low risk to the biophysical and human environment with the implementation of standard controls and safeguards.

Bush Fire

A bush fire assessment undertaken by RWC concluded that it is likely that the Project would be able to operate with suitable Asset Protection Zones around key Mine Site components and comply with all requirements stipulated by the RFS.

It is recognised that the Mine Site includes heavily wooded areas, and therefore the potential for bush fire to spread both within the Mine Site and adjacent to the Mine Site would be high if management measures were not adopted to mitigate this hazard. The risk of bush fire hazard ignited from within the Mine Site would be minimal with the implementation of the proposed bush fire management measures.

7.6.2.13 Agricultural Resources, Land Uses and Enterprises

An Agricultural Impact Statement prepared by RWC (2020b) concluded that the proposed management and mitigation measures identified throughout the EIS to manage potential impacts to soil resources, surface water, groundwater, air quality and the existing noise and vibration environment, would also effectively minimise any potential impacts to agricultural resources within privately-owned land around the Mine Site and throughout the Mid-Western Regional LGA.

Whilst the Project would marginally reduce the availability of agricultural land throughout the Project life, the continued operation of the Bowdens Farm and the proposed progressive rehabilitation schedule, would ensure that the Project would only have minor to negligible impacts on land used for agriculture both during and after the Project life. It is noted that these impacts would largely be contained to land with low agricultural activity and productivity comprising steeply sloping and/or heavily vegetated areas.

RWC (2020b) further identified that the commitment from Bowdens Silver to provide a range of jobs throughout the Project life would provide a significant source of off-farm income to local farmers and agricultural enterprises within the Region.

7.6.3 Social and Economic Impacts

7.6.3.1 Health Considerations

Given human health is a key social consideration, a detailed human health risk assessment (EnRiskS, 2021) has been undertaken to assess the potential physical health risks relating to the predicted / assessed changes in air quality, surface water, groundwater, and noise. Mental health matters and opportunities for health improvements have also been considered. EnRiskS (2021) concluded that no health risks of concern have been identified for the off-site community. Furthermore, peer review commissioned by DPIE and undertaken by Drew Toxicology Consulting "*acknowledges health risk from lead exposure from mine emissions is very low*" and was in agreement with the EnRisks conclusions. The key outcomes for each aspect are summarised as follows.

Air

The assessment of air quality determined that impacts derived from the Project would make a negligible contribution to overall exposures to the assessed metals and there are no health risk issues of concern relevant to the Project (during both the site establishment and construction stage and operations). These conclusions apply to all members of the community, adults and children as well as sensitive individuals.

An assessment of impacts resulting in emissions of respirable crystalline silica and hydrogen cyanide have also been undertaken with both predicted to be well below their respective health criteria at both Project-related and privately-owned residences and receivers.

Water

Based on the assessments undertaken, the potential for adverse health impacts within the off-site community due to impacts to surface water and groundwater as a result of the Project is considered to be negligible.

Noise

Based on the predicted noise levels and potential mitigation measures, the potential for adverse health impacts within the off-site community associated with noise generated during construction and operations is considered to be negligible.

Mental Health

The Project has the potential to result in mental health impacts, principally stress and anxiety due to uncertainties and perceived impacts, as well as positive mental health benefits, principally resulting from employment and income opportunities. The proposed management measures would minimise the negative impacts and maximise the mental health benefits.

7.6.3.2 Social Considerations

The social impact considerations and outcomes are largely consistent with those presented in the EIS (Section 6.2.3.2) and *Social Impact Assessment* (Umwelt, 2020). Extensive consultation and engagement with key stakeholders within both the Lue district and wider Mid-Western Regional LGA have been undertaken with a range of both negative and positive social risks identified.

Key social impacts identified include impacts relating from property acquisitions, impacts on social amenity (as a result of noise, visual and traffic impacts); changes to sense of community, community cohesion and culture; and conflict as a result of competing land uses. In addition to these impacts, stakeholders have raised concerns relating to impacts upon health and wellbeing; Aboriginal cultural heritage; population change as a result of construction and operational workforce influx and subsequent impacts to community services.

Key social benefits identified include potential economic benefits to the region through employment, procurement and business opportunities – providing a much needed social and economic stimulus. In addition, regional community members also suggested that the increase in population as a result of workforce influx associated with the Project, may have a positive impact on the LGA in relation to service provision.

In order to minimise the potential negative social impacts relating to the Project and enhance the positive benefits, Bowdens Silver would adopt the following key mitigation and enhancement strategies.

- Expansion of the existing Community Investment Program that focuses on enhancement initiatives for Lue, Rylstone, Kandos and other key communities in the Mid-Western Regional LGA.
- Development of a local employment and procurement strategy to maximise the economic benefits of the Project within in the Mid-Western Regional LGA that would involve:
  - giving preference to hire of local employees; and
  - informing local businesses of the goods and services required for the Project and encouraging them to meet the requirements of the Project for supply contracts.
- Development of a Good Neighbour Program and employment of a dedicated Community Liaison Officer to maintain and further develop Company-community relationships and manage monitoring and management commitments.
- Implementation of a Planning Agreement with the Mid-Western Regional Council to contribute to the provision of public amenity and public services, transport and/or other infrastructure requirements.
- Development of a Social Impact Management Plan that provides for monitoring and evaluation of social and community aspects of the Project and the application of adaptive management to minimise potential impacts and maximise benefits.
- Prepare an appropriate complaint receipt / response and incident notification / reporting processes to respond to community concerns and complaints.

- Regular public reporting of relevant statistics, monitoring results and engagement outcomes in order to keep the community informed, maintain transparency, and to remain accountable.

With the implementation of these measures, the positive social benefits of the Project would be maximised and negative social impacts would be minimised.

7.6.3.3 Economic Considerations

The *Economic Assessment* for the Project has analysed the Project using both Cost Benefit Analysis and Local Effects Analysis methodologies. In summary, the results of the Cost Benefit Analysis conclude that the Project is estimated to deliver the net economic benefits presented in **Table 7.3** (i.e. following the inclusion of environmental, social and cultural costs). It is notable that at the time the EIS was prepared, a long-term silver price of US$20 per ounce was assumed for assessment. During the 2021 calendar year, silver prices averaged approximately US$25 per ounce, a significant change.

Table 7.3
Net Economic Benefits

Scale	Base Benefit	Base plus Employment Benefits
Globally	$78M	$181M
National	$89M	$192M
NSW	$44M	$146M

The Local Effects Analysis and supplementary Local Effects Analysis also considered the impacts at a local scale. In terms of employment, during operation the Project would provide between 73 and 129 net direct Full-time Equivalent jobs and, with flow-on effects, between a further 74 and 132 net indirect Full-time Equivalent jobs. Employment effects would be even greater when allowance is made for people who migrate into the region. The Full-time Equivalent jobs should not be confused for the proposed employment of up to 320 personnel during site establishment and construction and between 190 and 228 personnel during operations[12].

The Cost Benefit Analysis and Local Effects Analysis therefore demonstrate that there would be substantial economic and employment benefits resulting from the Project. In relation to negative effects, the *Economic Assessment* concluded the following.

- There would be very small and inconsequential impacts upon agricultural economic activity.
- Impacts on wages would not likely be significant. Where upward pressure on local area wages does occur, it would attract skilled labour to the local area leading to downward pressure on wages.

[12] The incremental full time equivalent direct employment from a project to the locality is estimated as the increase in net income (average mining wage minus average wage) divided by the average net income in the mining industry. That is, it is an estimate of the number of full time equivalent jobs created using increased wages as a metric rather than a straight head count – see Section 3.3.2 of the *Economic Assessment* (Gillespie, 2020)

- Based on 15% of the operational workforce migrating to the area, in comparison to the existing population and number of unoccupied dwellings located in the Mid-Western Regional LGA, the potential impact on housing and rental prices would likely be positive but negligible.
- Some impacts to property values would be expected where a property is likely to be impacted by noise, air, visual impacts etc albeit at levels assessed to be acceptable. Where these impacts are contained / mitigated, no impact to property value would be expected to occur.

In order to mitigate potential negative economic impacts and to maximise positive economic and employment benefits, a range of measures would be implemented. The following measures have been described in the review of social considerations for the Project (above) but it is noted that they would also have an economic benefit.

- Development of a local employment and procurement strategy.
- Providing ongoing training and certification opportunities for local community members to ensure they have the necessary skills to work in mining.
- Implementation of a Planning Agreement with Mid-Western Regional Council.
- Development of a Community Investment Program dedicated to Lue, Rylstone, Kandos and other key communities in the Mid-Western Regional LGA.

7.7 SUITABILITY OF THE SITE

Site selection for a mining development is determined principally by the location and accessibility of the mineral resource that is the target of the operation. Additional to this are the infrastructure components necessary to support mining and processing operations, including site access, the provision of services such as power to supply the site and waste management. As planning for development progresses, other constraints are reviewed including key environmental and social elements of the local setting such as proximity to private residences, biodiversity, Aboriginal and historic heritage and available water resources. Further to this, the statutory context of the development establishes the community's preference for development, as presented in Commonwealth and NSW legislation, relevant policies and guidelines as well as local planning instruments. Bowdens Silver has taken an iterative approach to Project planning with options and alternatives assessed and amended, as needed. Bowdens Silver's objective in this process has been to seek outcomes that balance the needs of the Project whilst minimising adverse residual environmental and social impacts. This approach has included a comprehensive consultation program that sought community feedback on the proposed Project design. The following subsections present a justification for the proposed use of the land for mining as it relates to the location and setting of the Mine Site.

7.7.1 Mineral Resource

The Mine Site has been the subject of a comprehensive, long-term resource investigation program of exploration drilling and assessment of ore characteristics. This robust approach, supported by a Feasibility Study and a JORC compliant Ore Reserve Statement, has allowed Bowdens Silver

to progress the development application with confidence. This program has continued with recent exploration activity identifying high-grade mineralised zones at depths of up to 300m in the vicinity of the main open cut pit. This suggests significant potential exists for future development, specifically underground mining development that supports longer-term prospects and highlights the strategic importance of the resource. Bowdens Silver believes the mineral resource at the Mine Site to be the largest undeveloped silver deposit in Australia.

7.7.2 Mine Site Location

The Mine Site is located within 2km to 3km of the village of Lue, with some nearby private residences in closer proximity to the Mine Site. However, there is substantial intervening natural topography that shields the Mine Site from views from Lue and most residences and provides natural attenuation to noise propagation and dust dispersion. There would be views of some Mine Site components from some private residences and public vantage points, however these have been assessed to be acceptable, except at Residence 4 with whom Bowdens Silver is currently discussing a negotiated agreement that covers predicted environmental impacts. While planning for mine development focuses initially on mineralised ore within the open cut pits, detailed planning is required to locate supporting infrastructure including key components such as the processing facility, waste rock emplacement and the tailings storage facility. The Mine Site's location has enabled major components such as these, to be positioned in a manner that maximises operational efficiency whilst reducing noise and dust generating activities and generally obscured from views. Bowdens Silver considers that the Project would be of sufficient scale to provide a boost to the local economy but not cause substantial adverse environmental or social impacts.

7.7.3 Project Water Supply

As a secure water supply is critical to the Project principally for dust suppression and processing operations, the Mine Site has been the subject of detailed water resource investigations and studies. Insufficient water supply has the potential to impact production levels and the efficiency of operations. Whilst the previously proposed water supply pipeline provided a means to supplement on-site water sources, there were uncertainties relating to commercial agreements, construction and operation of the pipeline and the associated costs. These uncertainties led Bowdens Silver to reassess its water strategy and informed its decision to remove that component of the Project. In its stead, the integrated water management and supply strategy increases water re-use and recycling efficiencies within the Mine Site whilst promoting strategies that reduce evaporative losses. In addition, advanced dewatering within or adjacent to the open cut pit, provides water and locally constrains impacts on water resources.

By locally obtaining its water requirements, Bowdens Silver would reduce its environmental footprint whilst accounting for the water resources used under the current regulatory paradigm. The conclusion to the detailed assessment of this strategy has been that Bowdens Silver can rely on water sources within the Mine Site, without the need for external supply. This approach not only supports the water supply security of the Project but limits commercial risks. In addition, Bowdens Silver can rely on water sources within the Mine Site without substantial risk to other surface water and groundwater users (in terms of water availability and quality including contamination risks associated with the TSF and management of waste rock material).

7.7.4 Mine Site Access

Bowdens Silver has committed to relocating the existing Maloneys Road which currently passes through the proposed Mine Site. This relocation would join Lue Road, west of Lue to provide access to the Mine Site. The relocation of Maloneys Road would be supported by a bridge crossing of Lawsons Creek to provide continued public access to areas north of Lue Road that would also be less susceptible to flooding. By relocating Maloneys Road, Bowdens Silver would ensure that the majority of operational heavy vehicle traffic would not be required to pass through Lue.

7.7.5 Site Planning Context

The Project would satisfy all planning and legislative requirements that relate to the location of the Mine Site. Under environmental planning, open cut mining within the Mine Site is permissible and all matters relating to mining processes and efficiency (mining lease), pollution and its mitigation (environment protection licensing), water use accounting (water access licensing) and residual biodiversity impacts (offsetting obligations and to satisfy approval under the EPBC Act) have been comprehensively assessed.

7.7.6 Potential for Land Use Conflict

Bowdens Silver is aware of the long history of agricultural production in the broader region, including its reputation for wine making and other boutique industries. Bowdens Silver sought and obtained a Site Verification Certificate on 8 November 2017 which confirms that there is no contiguous Biophysical Strategic Agricultural Land (BSAL) within the Mine Site boundary. An Agricultural Impact Statement prepared for the Project concluded that the land within the Mine Site was of limited agricultural capability. This notwithstanding, an important aspect of Project planning has been to minimise as much as possible the risk of land use conflicts and impacts to agricultural productivity on nearby land. Bowdens Silver has already implemented strategies to retain agricultural use during operations and following closure and rehabilitation of the Mine Site.

The Project has also been designed to limit changes to local amenity including noise, air quality, and views of Project components. However, several landowners have informed Bowdens Silver of their concerns and expectations regarding changes to the peaceful enjoyment of their landholding. Although the assessment of the Project has concluded that it would be developed in accordance with NSW guidelines and legislation designed to limit unacceptable amenity impacts, there would be changes to the local setting including the re-alignment of an existing 500kV power transmission line, increased traffic and mining noise would be heard (albeit at acceptable levels under the majority of circumstances).

7.7.7 Cultural Heritage Values

Sites of cultural heritage significance identified within the Mine Site would require careful and sensitive management but would not constrain the development of the Project. Comprehensive archaeological field surveys of the Mine Site identified 56 sites of Aboriginal cultural heritage value and three items of historic heritage value. A total of 25 sites of Aboriginal cultural heritage significance and all three historic heritage sites would be directly impacted by the Project. While

all items of Aboriginal sites hold cultural heritage significance to the Aboriginal community, the sites within the Mine Site were considered by Landskape (2020) to be of low to medium scientific, educational and aesthetic significance. Each of the historic heritage sites were assessed to be of low to medium significance.

7.7.8 Biodiversity Values

The Mine Site holds substantial biodiversity value given the type and condition of native vegetation present and its likely habitat value for native flora and fauna including some threatened vegetation communities and species. As a result, Bowdens Silver has maintained a policy to avoid native vegetation clearing where possible and developed a 'traffic light model' contingent on the sensitivity of vegetation to impact to inform decisions about locating Mine Site infrastructure. Bowdens Silver has already implemented an environmental monitoring program that has identified Koala and threatened flora not identified in field survey due to the inconsistent nature of flowering behaviour (Silky Swainson-pea and Small Purple-pea). In addition, Mine Site planning has considered indirect impacts by either accounting for impact in areas between site infrastructure or relocating site components to ensure the Mine Site has a compact design, where feasible.

The biodiversity values within the Mine Site have been identified through comprehensive field surveys by EnviroKey (2022) and with biodiversity offsetting considered for residual impacts that could not be avoided.

- A total of 372 flora species (269 native and 103 exotic) were identified within the Study Area selected by EnviroKey (2022).
- A total of 170 fauna species were identified within the Study Area selected by EnviroKey (2022) including:
  - 123 species of bird;
  - 23 species of mammal;
  - 18 species of reptile; and
  - 6 species of frog.
- Six different vegetation communities of varying condition have been identified in the Mine Site.
- Some of the vegetation communities are Box Gum Woodland, portions of which are also classified as a critically endangered ecological community under the EPBC Act. Large areas of Box Gum Woodland consist only of scattered paddock trees as the area has been grazed historically and at present.
- A total of 16 threated fauna and flora species were identified in field surveys and monitoring by Bowdens personnel.
- Although not identified in survey or monitoring, the Mine Site is potential habitat for the Regent Honeyeater and Squirrel Glider.

The Mine Site is also surrounded by land that is owned by Bowdens Silver and contains similar vegetation communities and flora and fauna habitat values. An on-site biodiversity offset area was subject to initial survey and a 795ha area may be secured under a Biodiversity Stewardship Agreement. This would account for a large proportion of the offsetting obligations of the Project with expanded areas onsite and in other locations in the region also subject to preliminary assessment. Bowdens Silver is confident it would be able to satisfy all of the biodiversity obligations of the Project.

7.8 REVIEW OF SUBMISSIONS

Section 4.15(d) of the EP&A Act requires that the consent authority take into account any submissions made in accordance with the Act or the *Environmental Planning and Assessment Regulation 2000*. While it is the responsibility of the consent authority to consider these submissions, Bowdens Silver and its consultants have reviewed and responded to matters raised in submissions received by DPIE following public exhibition of the EIS and the *Amendment Report* for the 500kV power transmission line. While refinements to the Project have been made in response to these submissions, the conclusions of technical assessment have remained largely consistent throughout this process. Bowdens Silver has endeavoured to consider and comprehensively respond to matters raised in relation to the Project. It is considered that no matters raised in submissions constrain the approval of the Project.

Bowdens Silver has also considered the requests for information, comments and recommendations provided by NSW Government agencies and MWRC in response to the application. Refinements in response to these matters has improved Project outcomes and further justified development of the Project.

7.9 THE CONSEQUENCES OF NOT PROCEEDING WITH THE PROJECT

The consequences of not proceeding with the Project remain largely unchanged since the EIS was published and include the following.

- The lost opportunity to mine a strategically significant deposit with substantial prospects for future development.
- Refusal may also influence other local mineral exploration by both Bowdens Silver and others and therefore forego the opportunity to diversify the local mining industry (currently dominated by coal mining).
- The numerous uses and demand for silver, zinc and lead and the associated pricing indicate that the Project would easily market its concentrates and would be viable. The products of the Project would need to be sourced from elsewhere if the Project were not to proceed and the associated economic and social benefits would be foregone.
- The overwhelming support for the Project in the region is evident from the 682 individual submissions that supported the Project from residents of the Mid-Western Regional LGA in response to the matters in the EIS. This is a strong indication of the need for environmentally and socially sound projects to support

the regional economy, especially in the Lue, Kandos, and Rylstone localities. If the Project were not to proceed the opportunity for local employment, procurement of services and direct local benefits (such as through the Community Investment Program) would be lost.

- Diversification of industry and opportunity in communities is important to maintain resilience and sustainability. The Mid-Western Regional LGA is a diverse region with coal mining being by far the largest local industry representing approximately 47% of economic output for the region. The balance of the top 5 industry sectors (construction, agriculture, real estate and manufacturing) contributes approximately 27% of the Mid-Western Regional LGA's economic output. Recent focus on the climate implications of coal mining and use, as evident from scientific analysis, community objection and political pressures places increased pressure on this industry. The apparent reliance on new coal mine developments and coal mine expansions may not be an appropriate long-term strategy for the region. It is therefore important that there is diversity through growth in other industry sectors. The Bowdens Silver Project would be an example of such diversification.

7.10 THE PUBLIC INTEREST

The consideration of the public interest presented in Section 6.4 of the EIS noted that the feedback from the community in the form of public submissions would provide some indication of the public interest with regards the Project. The nature and source of submissions in response to the EIS confirms the following.

- There is overwhelming support for the Project generally (1 504 submissions or 79% of all submissions supported the Project).
- There is overwhelming support for the Project in the Mid-Western Regional LGA (682 submissions or 74% of all submissions from this area supported the Project).
- Within the area described as 'Lue and surrounds'[13], 95 submissions objected to the Project (62%) and 57 submissions supported the Project (37%).
- For those submissions that listed an address as being within Lue, 45 submissions opposed the Project (52%) and 40 supported the Project (46%). This is consistent with feedback in community surveys completed for the SIA for the Project.

The most frequently identified matters in submissions regarding the EIS referred to the benefits of employment and workplace training that the Project would provide (905 submissions) and direct reference to the economic benefit to the local community (342 submissions).

A total of 129 submissions were received by DPIE following public exhibition of the *Amendment Report* for the 500kV power transmission line.

- 10 individual submissions from members of the general public supported the Project (8.0%).

[13] "Lue and surrounds" has been defined as residents of Lue, Breakfast Creek, Bara, Camboon, Havilah, Hayes Gap, Monivae and Pyangle.

- 105 individual submissions from members of the general public opposed the Project (84.0%).
- 10 submissions from organisations opposed the Project (8.0%).

Of the 105 individual public submissions received that objected to the Project, 43 were provided by residents of 'Lue and surrounds'. This proportion of public submissions reflects the local nature of potential impacts associated with the re-alignment of the 500kV power transmission line.

Through the development application process, Bowdens Silver has maintained its focus on demonstrating that it could achieve the objectives of the Project. These include the following.

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 positive social and economic stimulus for the Mudgee, Rylstone, Kandos and districts.

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

The majority of these objectives seek to enhance the public benefits of the Project. A comprehensive review of these objectives and how they would be achieved is presented in Section 6.1.5 of the EIS. A range of Project features and outcomes have been identified in documentation for the Project that justify the conclusion that the Project would be in the public interest. These have been collated here and adapted to incorporate the proposed amendment.

- Bowdens Silver has designed a Project that ensures efficient development of the Mine but which also considers the likely experience of the Mine for the local community and the predicted short-term and longer-term environmental outcomes.
- The environmental features of the Mine Site would permit the necessary water resource requirements to be sourced on-site and managed efficiently, reducing the previously expected reliance on external parties and infrastructure for water supply.
- There is a strong indication of the need for environmentally and socially sound projects to support the regional economy, especially in the Lue, Kandos, and Rylstone localities.

- Bowdens Silver considers that the Project would be of sufficient scale to provide a boost to the local economy but not cause substantial adverse environmental or social impacts.
- The outcomes of environmental, economic and social assessments for the Project have confirmed that the Project would operate in accordance with the legislation, policies and guidelines developed to ensure responsible environmental practices for development.
- The Project is considered to be consistent with the principles of ecologically sustainable development, would satisfy all relevant planning considerations and would achieve the objectives of the Project.
- The environmental, economic and social assessments have not only considered the immediate impacts of the operation but also longer-term outcomes involving potential land use conflict and residual impacts to resources (such as groundwater) that may be utilised by others. In each case, worst case scenario outcomes were considered to ensure a precautionary and conservative approach to impact assessment was taken.
- Bowdens Silver has made a range of clear commitments to the public that would be given legal force by way of conditions of a development consent.
- The expanded Community Investment Program would ensure that the economic outcomes are distributed locally, while programs for environmental and social monitoring, regular reporting and auditing of performance would ensure that the commitments to responsible environmental management are achieved.
- The legacy of the Project has been considered with regards to the rehabilitation and final land use options and mechanisms to preserve the existing character of Lue, while providing sufficient economic stimulus to ensure its sustainability.

The residual environmental outcomes of the Project are not predicted to impose an unacceptable cost to future generations. The residual environmental outcomes of the Project have been discussed in Section 7.6. Predicted outcomes are thoroughly understood and have been conservatively estimated. There are no substantial uncertainties that may result in unexpected and unacceptable consequences. The management of environmental risks would occur through conditions of consent that direct the proposed mitigation and management commitments including comprehensive monitoring programs and environmental performance measures. These commitments would be described in a series of environmental management plans that would be prepared prior to commencement of the Project and be implemented as approved by relevant NSW Government agencies. The outcomes of environmental monitoring and assessment against performance criteria would be published in annual reporting and communicated to the local community through access to the Bowdens Silver website, Community Consultative Committee meetings and ongoing direct consultation.

The Project, incorporating the proposed amendment, continues to be considered in the public interest as it would provide an acceptable balance of environmental and social outcomes, whilst generating substantial economic and social benefits for the local, regional and State economies.

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