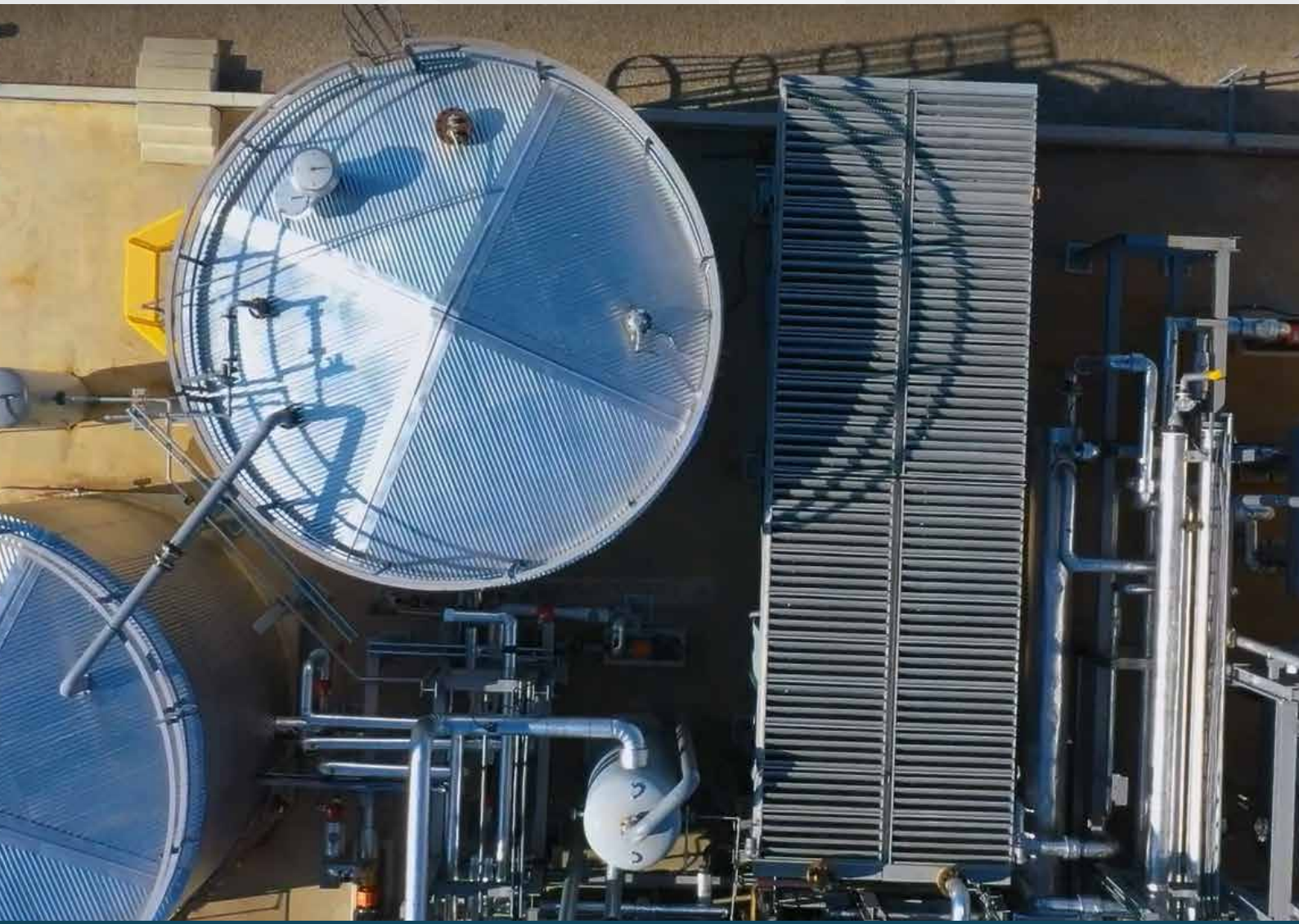
SILVER CITY ENERGY STORAGE

Silver City Energy Storage Project

ENVIRONMENTAL IMPACT STATEMENT

FINAL - AUGUST 2023



HYDROSTOR

umwelt
Environmental & Social Consultants

SILVER CITY ENERGY STORAGE PROJECT

Environmental Impact Statement

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
A-CAES NSW Pty Ltd

Project Director: John Merrell
Project Manager: Penelope Williams
Report No. 21982/R05
Date: August 2023

Environmental & Social Consultants

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt and A-CAES NSW Pty Ltd would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Disclaimer

This document has been prepared for the sole use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Umwelt (Australia) Pty Ltd (Umwelt). No other party should rely on this document without the prior written consent of Umwelt.

Umwelt undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. Umwelt assumes no liability to a third party for any inaccuracies in or omissions to that information. Where this document indicates that information has been provided by third parties, Umwelt has made no independent verification of this information except as expressly stated.

©Umwelt (Australia) Pty Ltd

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	John Merrell	11 August 2023	John Merrell	11 August 2023

Silver City Energy Storage Project

SILVER CITY ENERGY STORAGE

PROJECT SUMMARY

AUGUST 2023

This Summary provides a high-level non-technical overview of the Environmental Impact Statement (EIS) assessment outcomes. For further information on the Project and assessment outcomes please read the EIS.

What is the Project?

A-CAES NSW Pty Ltd (A-CAES NSW) is proposing the Silver City Energy Storage (SCES) Project (the Project), which will use Hydrostor's proprietary advanced compressed air energy storage (A-CAES) technology to provide large-scale, long-duration energy storage for Broken Hill and the Far West of NSW.

The Project includes the SCES Facility and a new 220 kV electricity transmission line approximately 16km in length. The proposed SCES Facility is to be co-located on the Potosi Mine site, approximately 3km northeast of Broken Hill between the Silver City and Barrier Highways. The proposed transmission line passes between South Broken Hill and the airport, connecting to an existing Transgrid substation in Pinnacles Road.

The Project responds directly to the energy policy of the Commonwealth and NSW governments, moving toward net zero energy generation and supporting the increased development and utilisation of renewable energy. As a large energy generation and storage system, the Project will also deliver direct benefits to the electricity grid, improving system strength and reliability. The Project will replace ageing diesel-fired turbines used for backup power in Broken Hill with a new low-emissions technology that results in a wide spectrum of benefits for the power system and the region.

The Project involves the design, construction and operation of the SCES Facility, including ancillary power, water and road infrastructure. The key project components include:

- **The SCES Facility, comprising two 100 mega watt (MW) generator trains for producing 200MW of electrical power and associated infrastructure and civil works**
- **An underground compressed air storage cavern of approximately 250,000m3 and a depth of 600m below ground, located immediately below the SCES Facility and connected by an air and water shaft**
- **A 350ML (maximum capacity) water storage reservoir with a new connection to the existing Stephens Creek raw water pipeline**
- **A high-voltage 220kV transmission line approximately 16km long, predominantly above ground on monopoles**



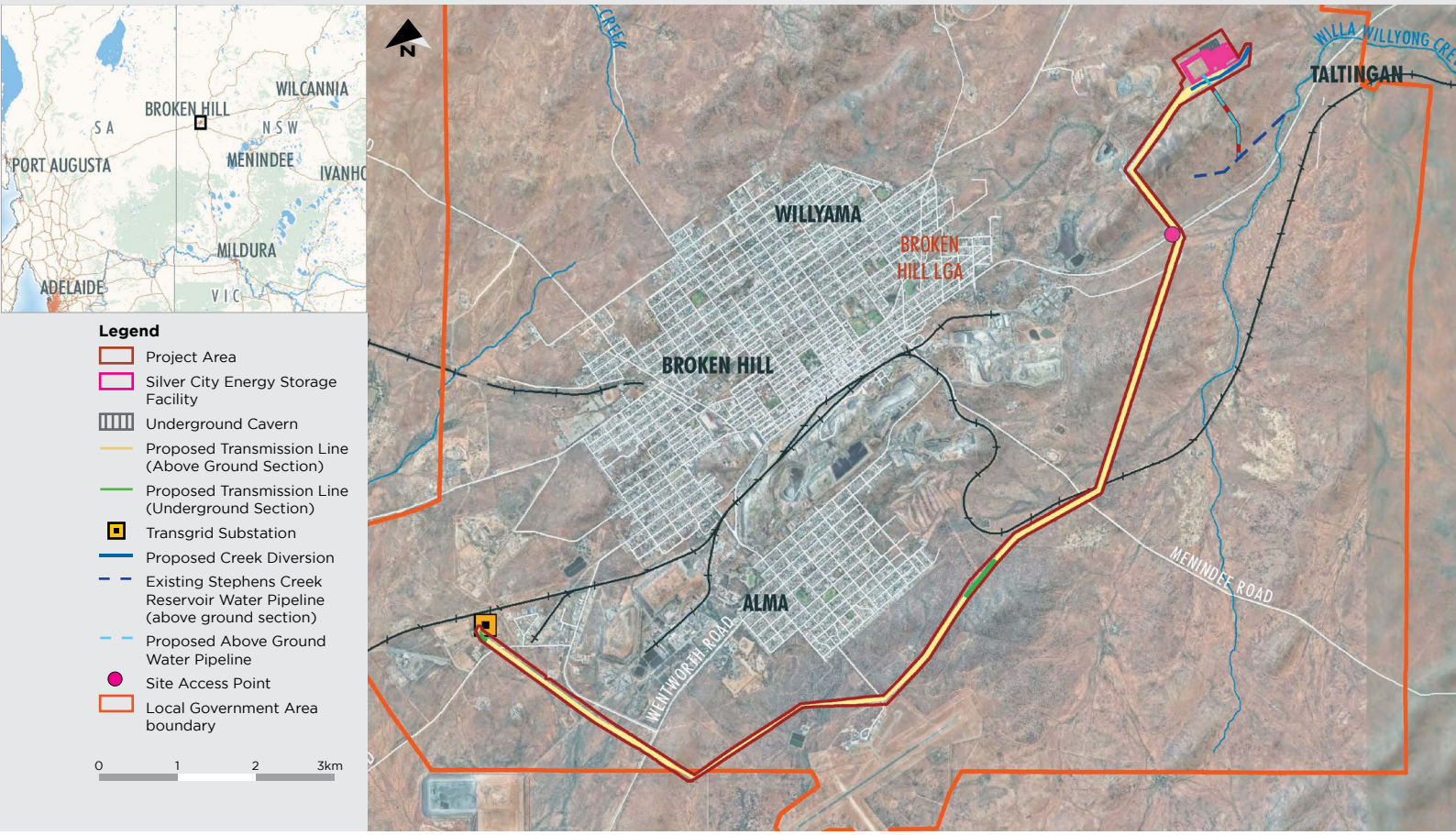


Figure 1: Project locality

A-CAES technology uses electricity from the grid when it is plentiful or in low demand, to compress air from the atmosphere. Heat from the compression of air is recovered and stored as high-pressure hot water, and the compressed air injected into a deep underground cavern via an air shaft. The air remains in the cavern, sealed under pressure by the weight of water in the water shaft and the water storage reservoir at the surface. When energy is in demand, the compressed air stored in the cavern is released, combined with the stored heat from the hot water, propelling a turbine generator to generate electricity.

Project Capacity:

- **200 megawatt (MW) generation and 1600 megawatt hours (MWh) of energy storage, including a reserve of 250 MWh (50 MW of electricity for up to 5 hours) to provide back-up power to Broken Hill and the Far West**

The Project's co-location with the existing Potosi Mine minimises the potential for environmental impacts through the use of existing mining land and use of some of the existing mining infrastructure.

The operation will co-exist with the mining operations and, once the operations reach the end of their economic life, will provide a long-term post mining land use for the site.

The Project Area is approximately 200 ha and includes areas of freehold and Crown Land. The proposed disturbance area for the Project within the total Project Area is approximately 46ha.

The SCES Facility site is approximately 28ha with a further 3ha for the water pipeline and both areas will require vegetation removal. The transmission line construction and management will require a 50m wide easement (total area of approximately 80ha), however, vegetation removal along the transmission line will be limited to approximately 15.3ha. Vegetation under 10m in height, within the easement (and outside of the disturbance area) will be retained.

A-CAES has committed to limit the removal of vegetation within the proposed disturbance area and within limited locations within the easement where vegetation is over 10 m in height.

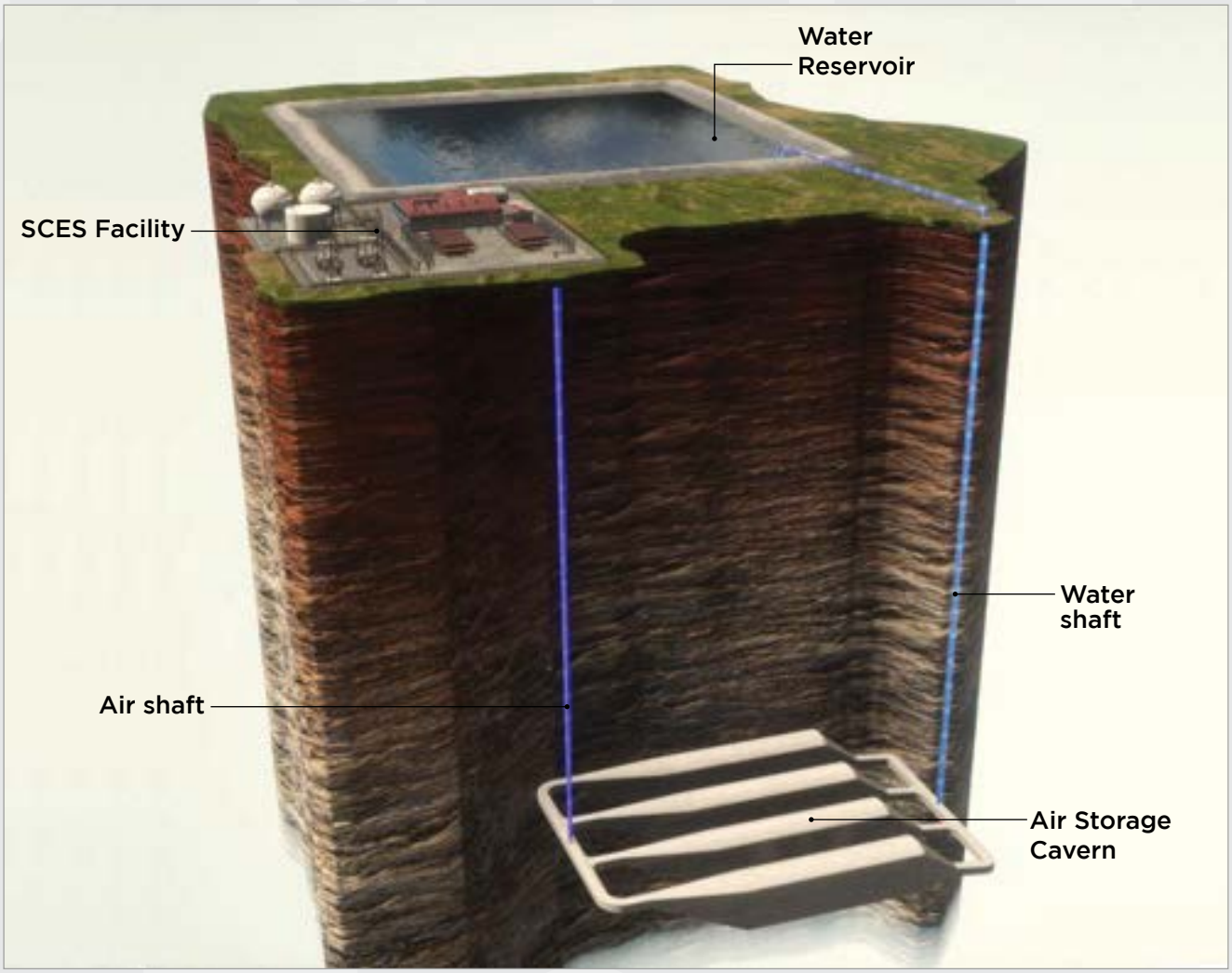


Figure 2: SCES Facility

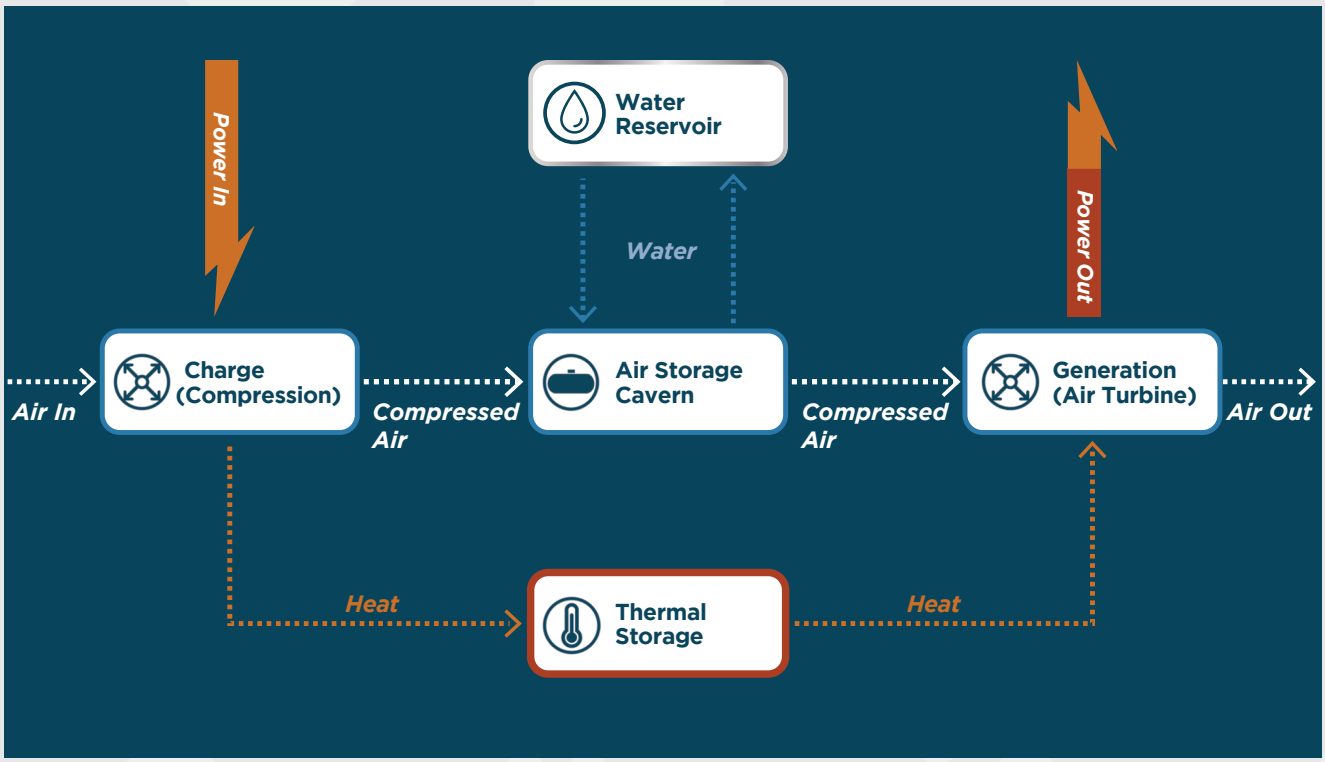


Figure 3: A-CAES Technology

Why is the Project Needed?

The NSW Government's Electricity Strategy and Electricity Infrastructure Roadmap (Electricity Strategy) identifies Broken Hill and the surrounding region as highly suitable for both solar and wind energy generation. Over 250MW of renewable energy generation in the Broken Hill area is currently being curtailed and subject to significant revenue reductions as a result of impediments to power transfer and usage.

Broken Hill is also currently supported by two diesel-fired turbines, operated by Transgrid, which provide backup power during both planned and unplanned outages of the existing X2 transmission line, extending over 300km between Buronga and Broken Hill. These diesel-fired turbines are approaching the end of their operational life and a new energy security solution is required for Broken Hill.

Transgrid applied the Regulatory Investment Test for Transmission (RIT-T) process to assess the long-term options for maintaining reliable energy supply to Broken Hill. The RIT-T process concluded that the continued operation of the existing diesel-fired turbines would be pursued as an interim measure, followed by the implementation of the Project as the preferred backup power supply option. The existing diesel-fired turbines will continue temporarily to provide network support until the Project is operational, at which point the existing diesel-fired turbines will be decommissioned.

Benefits of the Project include:

- enhanced energy security and reliability for Broken Hill and the Far West by provision of a low-emission technology replacement for existing diesel-fired turbines which are approaching the end of their operational life
- generation of approximately 36 enduring jobs (26 direct and 10 indirect) during the operation and maintenance phase
- firming (maintenance and output) of variable and intermittent power sources with significant energy storage to increase renewable energy use in the NSW power system
- leveraging existing mining investment, providing additional land use outcomes during the operational life of the Potosi Mine and a unique post-closure mining land use for the site
- providing significant economic benefits to the Broken Hill economy and to NSW through capital and operational expenditure
- supporting existing and new renewable energy projects in Broken Hill and the Far West
- generation of 780 full time equivalent (FTE) job years (over three-year construction timeframe) with an average of 260 FTE workers per year and peak of 400 FTE workers
- provide ongoing financial assistance through Community Benefit Agreements that provide direct benefit to the local community, with a focus on skills; training and education; community energy; local heritage; enhancement of the environment; social housing and cultural heritage awareness.

What Project Alternatives were investigated?

The Transgrid RIT-T process involved an Expression of Interest and Tender that invited the submission of any technology solutions that could satisfy the backup power requirements needed by Broken Hill and the Far West. From those solutions tendered, Transgrid considered the alternative options and concluded that the Project was the preferred option.

The Potosi Mine site was selected as the proposed location due to favourable geological conditions, utilisation of the existing underground mine development for access to the right depth, and utilisation of the existing mine support infrastructure to support construction. This location provides a significant buffer distance to other land uses, including the extent of the main residential areas of Broken Hill. Alternative locations for the SCES Facility within the Potosi Mine site were investigated, with the proposed location selected on the basis that it was immediately above the deepest part of the Potosi Mine, close to the existing mine access shafts, and did not directly conflict with mining operations.

The proposed transmission alignment was selected in the basis that relative to all other options, it reduced land use conflict (including land subject to determined Native Title), minimised the impact to biodiversity values, and maintained separation distances from sensitive receivers including residential dwellings, tourist attractions and non-indigenous heritage places. Three transmission alignment options were investigated including a northern alignment, central alignment and the southern (proposed alignment).

The northern alignment was rejected on the basis of significant visual impacts and interaction with numerous recreational and environmental areas of significance, whilst the central alignment was rejected on the basis of easement width restrictions, unfavourable ground conditions and interactions with non-indigenous heritage structures of significance. The southern alignment will involve the creation of new easements in freehold and Crown land.



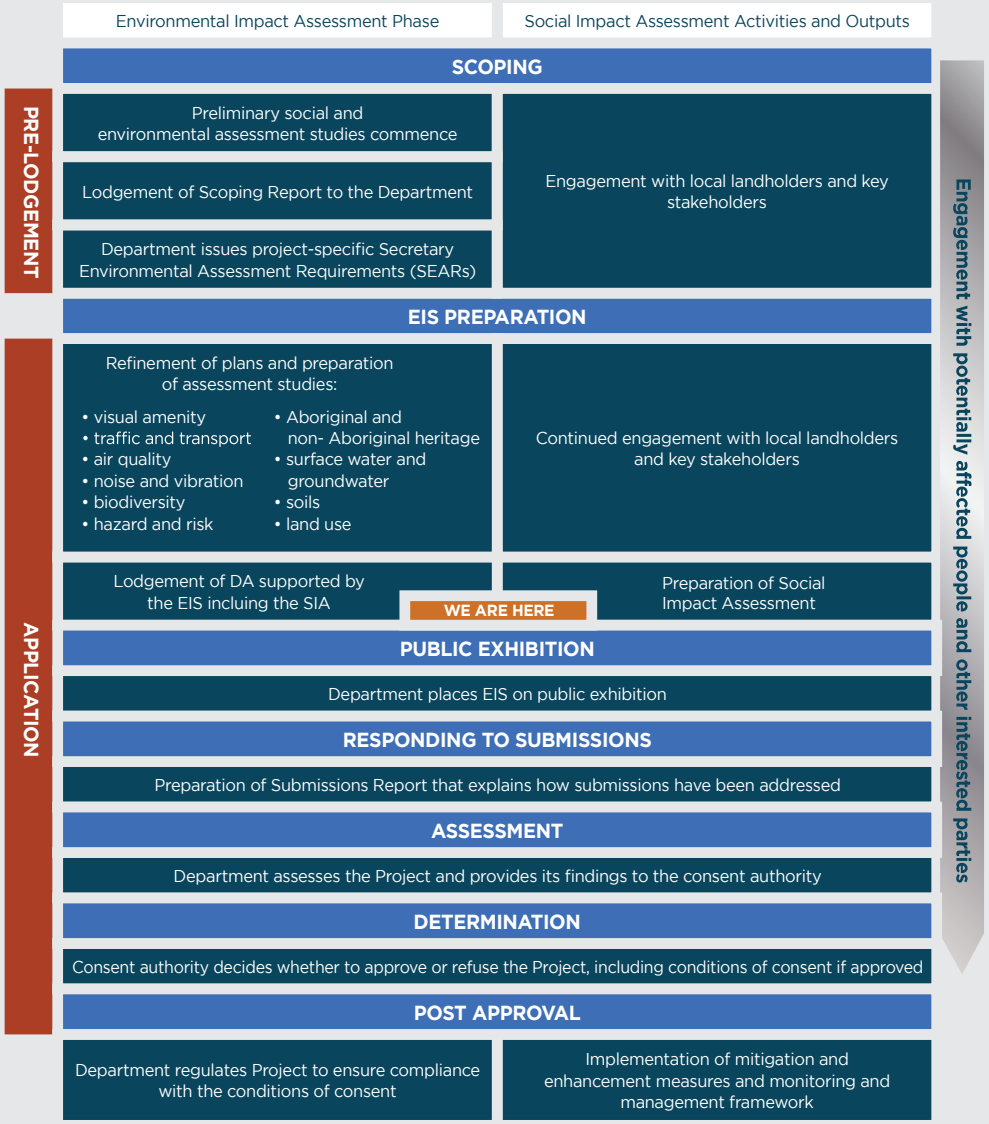
Planning and Approval Process

The Project requires approval under the NSW environmental and planning legislation. Under NSW Planning legislation, the Project is State Significant Development and requires approval under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The EIS prepared for the Project describes the Project, its impacts (both positive and negative), how the impacts are proposed to be managed, mitigated and offset, the benefits and the justification. The NSW Minister for Planning and Public Spaces (delegated to the Department of Planning and Environment) or the Independent Planning Commission (IPC) will determine if the Project is approved to proceed. The project is referred to the IPC for determination if public objections to the Project exceed 50, any reportable political donations are made by A-CAES or if the Broken Hill City Council object to the Project.

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary environmental and planning regulatory instrument relevant to the Project at the Commonwealth level. Under the EPBC Act, approval from the Commonwealth Minister for the Environment and Water is required for any action that may have a significant impact on Matters of National Environmental Significance (MNES). If an 'activity' is likely to have a significant impact on a MNES then it may be a 'controlled action' and require approval from the Commonwealth Minister for the Environment and Water.

The Project was referred under the EPBC Act to the Minister via the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) and was determined not to be a controlled action. Therefore, further assessment and approval under the EPBC Act is not required.

Figure 4
Environmental and social Impact assessment process



Key Project Milestones

NOVEMBER 2019
Trangrid RIT-T Process commenced and Hydrostor commenced Project constraints assessments and land negotiations

OCTOBER 2021
RIT-T Project Assessment Draft Report released indicating the Project as top ranked supply option for Broken Hill

APRIL 2022
Community Information Session in Broken Hill

AUGUST 2022
Scoping Report submitted to DPE to request SEARs for the Project

SEPTEMBER 2022
SEARs issued by DPE

DECEMBER 2022
Second Community Information Session in Broken Hill

JUNE 2023
DCCEEW referral determination – Project is not a controlled action and no further assessment required under the EPBC Act

JULY 2023
Completion of Environmental and Social Impact Assessment and stakeholder consultation

Stakeholder Engagement

A-CAES NSW is committed to engagement with all relevant stakeholders and to undertaking genuine and meaningful engagement with the community as part of planning and assessing the Project. This includes a focus on developing long-term relationships and maintaining open lines of communication. Efforts have been made to consult the broader Broken Hill community, including through community information sessions and providing information (e.g. newsletters) to residents of Broken Hill.

To date, there has been limited broader community interest in the Project, however, the interest received has been predominately positive with very limited concern relating to potential Project impacts.

Ongoing consultation has also been undertaken with the Broken Hill City Council, government agencies, service providers (including Transgrid and Essential Water), businesses and various non-government organisations and interest groups. This includes an engagement process undertaken with the local First Nations communities. This engagement has been ongoing throughout the assessment process and will be ongoing during the life of the Project, should it be approved.



Assessment and Mitigation of Impacts

The Project has been designed through a comprehensive process that incorporated the findings of environmental studies, community and stakeholder feedback and engineering design considerations. A-CAES NSW has engaged with stakeholders throughout the Project planning and assessment process and has designed the Project to deliver significant benefits whilst minimising negative impacts.

Biodiversity

The disturbance area associated with the Project largely comprises areas that have previously been disturbed and historically cleared for mineral extraction purposes.

Overall, the site is dominated by native remnant arid vegetation, with creek lines generally having a high level of exotic weedy flora species present. Fauna habitat is limited with no large hollow bearing trees observed and minor areas of low-lying rocky habitat.

No Threatened Ecological Communities (TECs) and no threatened fauna or flora species were recorded within the Project Area during survey. A-CAES NSW has committed to limit vegetation removal along the transmission line to areas of vegetation over 10m in height.

A-CAES has also committed to the development and implementation of biodiversity management measures which will include pre-clearance and tree-felling procedures, non-inhibiting fauna fencing, traffic control, weed management, fencing and access control, erosion and sediment control and workforce education and training.
Where impacts to biodiversity cannot be avoided, the NSW Biodiversity Assessment Process requires use of the NSW Government online credit calculator to generate the associated biodiversity credits, informed by the results of the biodiversity survey and associated area of impact.

The credits then need to be offset by A-CAES NSW prior to construction commencing.
A-CAES NSW is currently proposing to utilise a combination of different options to secure the biodiversity credits required to offset the residual impacts of the Project on biodiversity.



Tree Dtella (*Gehyra variegata*)

Aboriginal Cultural Heritage

The Project Area falls on the land of the Wilijakai or Wiljaali people and within the Broken Hill Local Aboriginal Land Council (LALC) area. An Aboriginal Cultural Heritage Assessment (ACHA) was undertaken to assess the potential impact of the Project on Aboriginal cultural heritage in consultation with the Broken Hill Local Aboriginal Land Council and other Registered Aboriginal Parties. The ACHA included field survey and a test excavation program.

Survey and test excavation results:

- **A total of 65 sites were recorded within the Project Area during field survey, including previously recorded and newly recorded sites.**
- **A total of 70 test pits were excavated across seven test zones within four landforms during the test excavation program. 69 Artefacts were recovered from four test zones located within three of the four identified landforms.**

Within the context of assessing Aboriginal cultural heritage, spiritual values are often closely tied to social values. During the consultation process RAPs indicated that the Project Area is part of a broader landscape of cultural significance utilised for foraging activities. The Project Area contains archaeological sites that establish a link to these traditional cultural activities. These specific sites recorded within the Project Area and the broader landscape of Broken Hill are assessed as being of high Aboriginal cultural value.

In total 47 Aboriginal archaeological sites would be impacted by the Project, this includes 3 with high archaeological significance (which will be partially impacted), 6 with moderate-high archaeological significance and 3 low-moderate archaeological significance. The remainder have low archaeological significance. For the sites within the transmission line easement, as much of the easement will remain undisturbed, there will only be partial impacts to many of these sites. These impacts will be primarily related to pole construction and access tracks which will only impact discrete areas.

Based on the synthesis of the evidence collected during field survey and test excavation, the ACHA recommends a program of staged salvage prior to construction impacts, with surface salvage occurring across the disturbance area and subsurface salvage within landforms with predicted high archaeological sensitivity and sites with moderate-high (or greater) archaeological potential. A-CAES NSW will develop an Aboriginal Cultural Heritage Management Plan (CHMP) in consultation with the Broken Hill LALC and RAPs and relevant government agencies, to manage Aboriginal cultural heritage values during construction and operation of the Project.



Historic Heritage

Given the rich history of Broken Hill, the Project Area is located in the vicinity of several heritage items listed on the Broken Hill Local Environmental Plan as well as the NSW State Heritage Register. Broken Hill, as a local government area is also listed on the National Heritage List due to its national heritage value as 'City of Broken Hill'.

The Historic Heritage Assessment included a review of the documented heritage values for the area and survey of the Project Area.

There are no historic heritage items located within the Project Area and the Project will not result in any physical impact to individually listed heritage items. The Historic Heritage Assessment also considered the archaeological potential of the Project Area which was found to be low due to the Project Area being subject to high levels of disturbance.

The significant elements of the National Heritage Listing of the City of Broken Hill associated with the Project Area are generally related to the views and landscape characteristics of Broken Hill and associated mining activities, with the exception of the original vegetation regeneration area established in the 1930s. Approximately 2.2 km of the transmission line is located within the boundary of the original Regeneration Area, however, ecological survey for the Project did not identify any historical plantings within the Project Area that could be remnants of this historically significant period.

Given the significance of views and landscape characteristics to the National Heritage Listing for Broken Hill, the assessment considered the potential for the Project to impact on these values. The assessment found that the proposed infrastructure is in character with the existing industrial elements of the current viewshed. Although the proposed infrastructure will be visible mostly at a distance from a limited number of viewing points around Broken Hill, the nature of the infrastructure will not be out of character given so much of the landscape is dominated by mining/industrial development at a large scale.

The Historic Heritage Assessment concluded that Project would not have a significant impact on the National Heritage values of the City of Broken Hill.

Noise and Vibration

Noise and Vibration associated with both the construction and operation of the Project has been assessed as part of the EIS.

Noise model predictions indicate that operational noise levels are predicted to comply with the relevant criteria at all sensitive receivers, with the exception of one dwelling where A-CAES NSW has a Project-specific agreement in place with the landowner. Impacts associated with the operation of the transmission line are considered minimal.

The noise modelling results and analysis indicate that noise mitigation measures will be required to minimise the potential construction noise impacts on the communities surrounding the Project Area. Most of the receivers predicted to be potentially impacted by the construction of the Project, relate to the transmission line rather than the SCES facility.

Given the transient nature of the transmission line works, construction works will not occur in any one location for a long period of time and so potential noise impacts at any residential receiver are anticipated to be short in duration. No receivers were predicted to be highly noise affected.

Blasting is proposed for the construction of the underground cavern with this blasting to be generally consistent with the blasting associated with the existing Potosi mining operations. No adverse impacts are predicted, with blast vibration levels predicted to readily comply with the relevant criteria at the nearest receiver. A-CAES NSW has committed to the development and implementation of appropriate noise and vibration management, mitigation and monitoring measures associated with the construction and operation of the Project.



Air Quality

Air quality risk associated with the Project relates primarily to generation of dust from construction activities, with the highest potential dust emissions being generated near the SCES Facility, where the majority of material handling and earthworks would occur. The Air Quality Assessment indicates that through the implementation of standard air quality mitigation measures the associated risk is low. Construction of the transmission line will require relatively minor earthworks and as such a "Very Low" air quality risk rating was determined.

Emissions during operation of the SCES facility will occur from venting the heated (maximum temperature of approximately 30 degrees Celsius) compressed air. No "air pollutants" will be emitted from the venting process (air from the atmosphere will be used to create compressed air and this same air will be released back into the atmosphere as part of the power generation process). There will be minor emissions associated with maintenance of equipment and the use of emergency diesel generators to operate critical systems during emergency events.

The EPA, as part of its assessment recommendations, requested a discussion of the potential impacts of the emissions of warm air propelling the turbines. This temperature may, on occasions, be higher than ambient conditions, however, based on modelling predictions there will not be any impact to sensitive receivers or overflying aircraft.

Future projections of fuel usage and electricity consumption were used to determine the GHG emissions from the Project. The SCES Facility will extract energy from the grid when there is excess electricity, and this will generally occur when the renewable generation is in surplus. This, in turn, means that emissions due to electricity consumption from the SCES Facility will be driven largely by renewables, and much lower GHG emissions than from an average grid generation mix. There will also continue to be limited use of a diesel generator during the Project operation.

The estimated GHG emissions associated with the construction and operation of the Project represent a very small fraction of Australia's emission. Additionally, the estimated emissions associated with the operation of the Project will decrease over time through the continued decarbonization of the grid.

Traffic and Transport

The SCES Facility will be accessed directly from Silver Peak Road (which is the existing Potosi Mine access road) via the Barrier Highway. The transmission Line will have multiple access points with the main access provided from Kanandah Road/ Pinnacles Road, Silver City Highway, Wentworth Road/Picton Street and Menindee Road. Appropriate temporary access points will be established to temporary construction access roads.

The majority of components to construct the SCES Facility will be delivered via the Barrier Highway with offshore delivery of components expected to be received into port in South Australia and then transported via heavy vehicle (over-size, over-mass (OSOM) where required) to Broken Hill.

The Traffic Impact Assessment found that the existing road network and key intersections have high levels of service and significant spare capacity. Therefore, no road network or intersection upgrade works are required to accommodate traffic associated with the Project.

The majority of Project traffic generation will be associated with the construction phase of the Project. The traffic assessment found that the road network has substantial existing capacity to cater for the predicted traffic volumes and that the road network will continue to operate at a high level of service.

A-CAES NSW has committed to the development and implementation of a detailed Construction Traffic Management Plan (CTMP). The CTMP will address the management and mitigation of potential traffic related impacts.



Water Resources

The potential for the Project to impact on both surface water and groundwater was assessed as part of the EIS. This included consideration of water supply, flooding and flows, water quality and interaction with groundwater associated with the underground cavern.

Water supply:

- **Construction (prior to construction of the pipeline) – water will be supplied via the existing Potosi Mine supply**
- **Reservoir Fill - 300 ML over 12 months via the new pipeline and Essential Water supply agreement**
- **Potable water demands, will be minor and supplied by a small purification system or water tanker**

Given the water for the initial fill of the reservoir will be extracted over an extended period of time, there are not expected to be any impacts on the availability of water for other water users that rely on water supply from Stephens Creek Reservoir and Umberumberka Reservoir. Essential Water has indicated to ACAES that the required volume of water for filling the Reservoir is available based on current demands.

Throughout the construction phase of the Project, appropriate erosion and sediment controls will be implemented and maintained. The SCES Facility design includes a water management system which captures and manages rainfall runoff within the surface facilities. The nature and extent of flooding within the Project Area provides for relatively low flood risk to both infrastructure and risk to life. Due to the minimal change to existing flood conditions as a result of the Project, no specific flood management measures are required.

A groundwater risk assessment was undertaken for potential impacts to groundwater associated with the construction, operation and decommissioning phases of the Project. The overall risk rating was determined to have a low risk to groundwater with the implementation of appropriate management/mitigation measures. A-CAES NSW has committed to the implementation of appropriate surface water and groundwater management, mitigation and monitoring measures to appropriately manage the potential interaction of the Project with water resources.

Hazards

Preliminary Hazard Screening

The EIS considered if the Project would meet the definition of a 'hazardous industry' based on the materials to be stored, used and transported as part of the Project. The assessment concluded that the Project is not potentially hazardous as defined under the State Environmental Planning Policy (Resilience and Hazards).

Geotechnical Stability

A geotechnical review was undertaken in relation to the construction of the underground cavern. It is noted that the process of excavating the cavern is similar to the underground mining activities that currently occur at the site. The Project will not result in any off-site geotechnical hazard event scenarios as:

- geotechnical investigation undertaken over 20 years of mining operations at Perilya confirm geology is suitable for cavern construction and operation of ACAES technology
- seismic activity in the area is extremely low and therefore cavern collapse associated with an earthquake is unlikely
- the cavern is approximately 600 m below ground level and there will be no impacts including any subsidence at the surface in the event of a collapse
- the cavern footprint is within the site boundary
- if the cavern were to be overcharged (i.e. excess air pressure), air will discharge through the water shaft onsite and will not impact off-site areas due to separation distances to the site boundary
- plant will be fitted with controls including pressure relief valves, mechanical isolation valves and the cavern is designed to provide buffer air capacity limiting the likelihood of overcharging the cavern
- preventative maintenance programs will be implemented to maintain equipment integrity
- site security will restrict access to the SCES Facility by the public and non-Project personnel

Bushfire

The Project Area is mapped as Bushfire Prone Land and therefore a bushfire assessment was undertaken for the Project. The assessment concludes that bushfire risk can be appropriately managed through the implementation of a bushfire emergency management plan including Asset Projection Zones, access, water supply, construction management practices and evacuation procedures.

Electromagnetic Fields

EMF occurs wherever electricity is produced, transmitted or used, and so is commonly found in everyday life including in household electrical devices. In Australia, electrical devices and infrastructure such as transmission lines and substations, operate at a frequency of 50 Hz which falls within the Extremely Low Frequency (ELF) range of EMF (between 0 and 300 Hz).

EMF modelling was completed for the transmission infrastructure considering a range of different transmission infrastructure arrangements relevant to the Project. In all cases, the modelling found that magnetic field strength will be at least 5 times lower than the upper safe limit recommended for human exposure.

Aviation Safety

The design of the transmission line has been refined in consultation with the Airport Operator to minimise any interaction with aviation activities. This has included lowering the height of a section of the transmission line in the vicinity of the airport. The Airport Operator and the Civil Aviation Safety Authority (CASA) have confirmed they have no objection to the Project and no lighting or marking of transmission lines or poles is required.

CASA has also confirmed that it does not consider the heated compressed air projected from the SCES Facility to be a hazard to aircraft operations and no further assessment or mitigation and management is required.

Social

A Social Impact Assessment (SIA) was undertaken to assess the likely social consequences of the Project and work with A-CAES NSW to develop options to improve outcomes for people.

SIA involves understanding impacts from the perspectives of those involved in a personal, community, social or cultural sense.

A stakeholder engagement program was implemented for the Project to gain input from the community and other stakeholders and understand their perspectives on the Project.

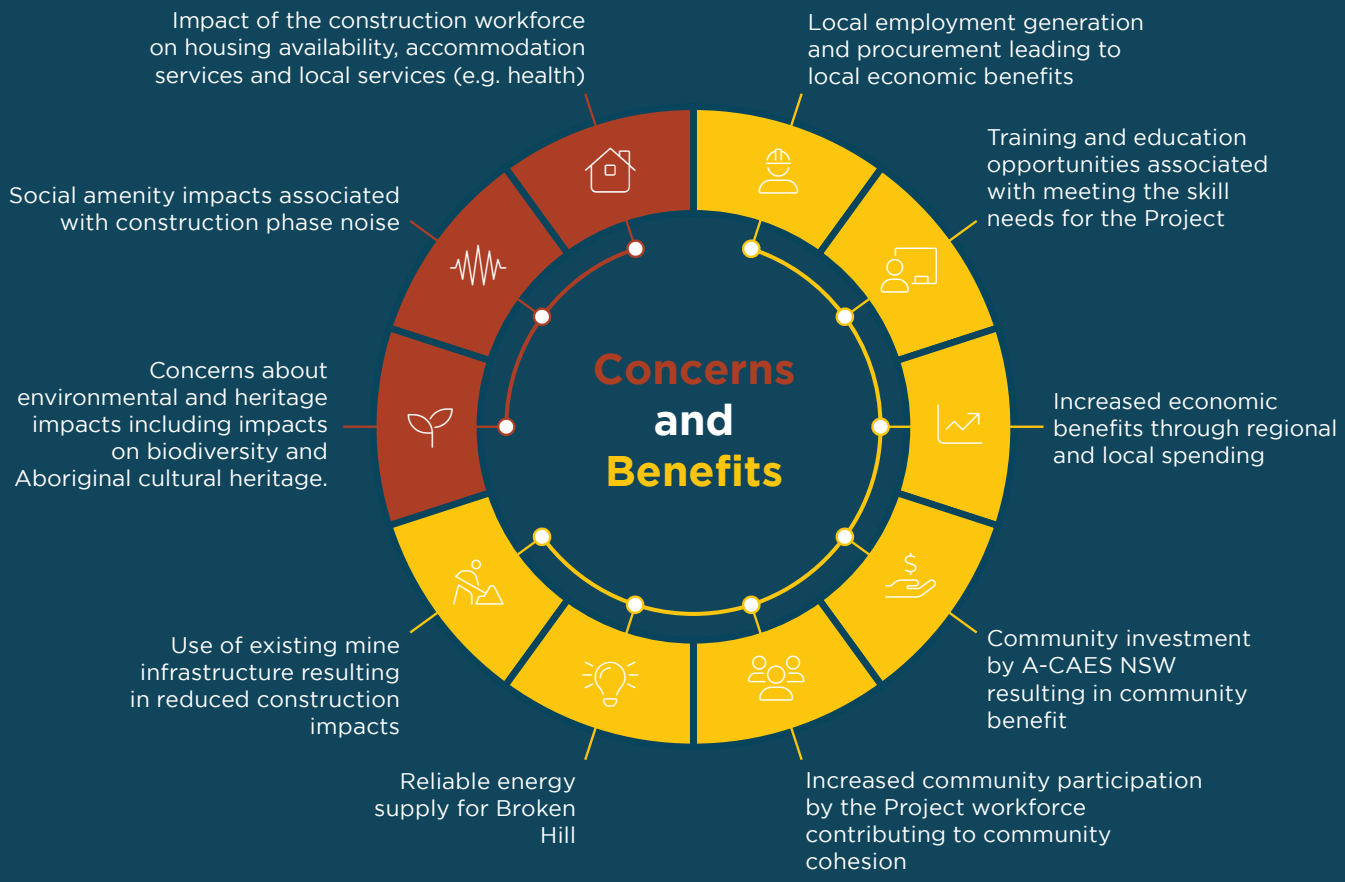
Despite contacting the broader Broken Hill township, and using media communications in the region, there was limited participation by various stakeholders, particularly the broader community, potentially suggesting a lack of interest or concern relating to the Project given the number of opportunities provided to provide feedback to the engagement process.

During consultation stakeholders were most concerned about:

- Impact of the construction workforce on local housing, health care and retail services

Perceived positive impacts associated with the Project included:

- Reliable energy supply for Broken Hill
- Opportunity for local employment and procurement of businesses/services
- Investment through a community benefit fund for Broken Hill



A-CAES NSW is in the process of developing Community Benefit Agreements (CBAs) with a number of stakeholders and has identified a number of initiatives in collaboration with relevant stakeholders that are currently being explored:

The Broken Hill Local Aboriginal Land Council (BHLALC)

A long-term program of tertiary scholarships (TAFE and University) for Aboriginal students; a cultural heritage awareness training program (internal and external); a social housing program and co-development of shared facilities.

The Broken Hill City Council (BHCC)

Support for community energy via development of commercial models, implementation of preferred models and supply of energy assets; identification and restoration of a Council-owned heritage listed building or structure for shared and community use.

Landcare Broken Hill (LBC)

Support of the establishment of a native seedling nursery for environmental restoration, revegetation and offset projects; development and installation of an educational and interactive display on renewable energy and energy storage; environmental restoration of Wilya Willalong; creek drainage from Imperial Lake and creation of a recreational nature walk.

A-CAES NSW has also committed to the development and implementation of:

- Community Engagement Strategy
- Indigenous Participation Plan; and
- Accommodation, Employment and Procurement Strategy

The SIA concludes that the identified negative social impacts of the Project can be reasonably mitigated or managed to reduce their significance, with positive impacts having the potential to be enhanced if appropriate strategies are put in place.

Economic

The Economic Impact Assessment concludes the Project will provide the following:

Increase the real economic output of Broken Hill by a cumulative total of **$3.5 billion** (with a net present value of $728 million, using a 7% real discount rate) and NSW as a whole by a cumulative total of **$1.7 billion** (with a net present value of $601 million, using a 7% real discount rate)

Increase the real income of Broken Hill by a cumulative total of **$642 million** (with a net present value of $192 million, using a 7% real discount rate) and NSW as a whole by a cumulative total of **$1.0 billion** (with a net present value of $662 million, using a 7% real discount rate)

Generation of **780 FTE job years** (over three years) with an average of 260 FTE workers per year and peak of 400 FTE workers

Generation of approximately **36 enduring jobs** (26 direct and 10 indirect) during the operation and maintenance phase



Figure 5 - Rendered model of proposed SCES Facility

Visual

A-CAES NSW has reduced the visual impact of the Project as far as practical through siting and Project design. Given the scale of the proposed infrastructure and expanse of the Project Area, some parts of the Project (primarily the transmission line) will be visible.

Overall, the visual assessment concluded that the Project will result in a low visual impact and is not predicted to impact on the existing visual character, given that in the areas where the Project will occur, the landscape is dominated by existing mining/industrial land use. Due to surrounding topography and distance, views of the proposed SCES facility from sensitive receivers are restricted and therefore no material visual impacts are predicted associated with the SCES Facility. Views of the proposed transmission line will vary along the alignment, however, as indicated in the photomontages, will be generally consistent with the existing visual character with existing transmission infrastructure and other mining/industrial infrastructure within the existing viewshed.

Views of the transmission line are largely restricted from the closest residential areas and the majority of views along the alignment will be from public viewpoints, particularly roadways.

The alignment of the transmission line around the southern boundary of Broken Hill, has been designed to avoid visually sensitive receptors (heritage listed items, dense residential development, and scenic tourist areas). While parts of the transmission line will be visible from multiple locations, the majority of views from sensitive locations will be restricted.

The underground operations associated with the construction of the SCES Facility will operate during the night, however, construction of the surface facility will occur during daytime construction hours only. Surface lighting associated with the underground works will be minimal and relevant management and mitigation measures including appropriate directional lighting will be implemented to avoid any potential impact to residences.

Operational and security lighting required for the SCES Facility, will be minimal low-level lighting. The detailed design process for lighting will be undertaken in accordance with AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting requirements.



Photomontage Viewpoint 2 - After



Photomontage Viewpoint 6 - After

Land Resources and Land Use Conflict

Project will modify the existing land use within the Project Area by adding energy generation land use to the existing mining land use that will continue, with the two land uses coexisting.

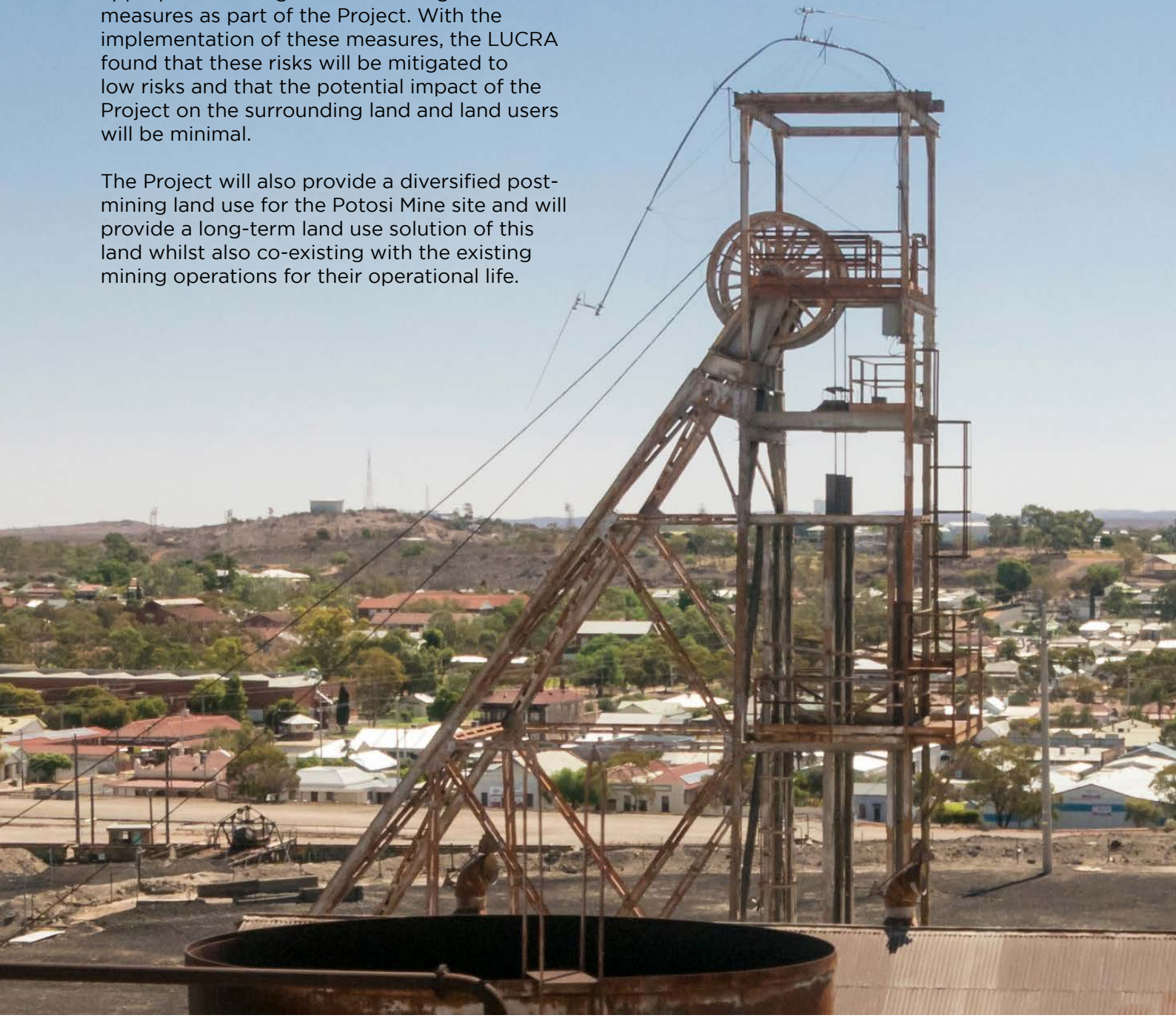
A land use conflict risk assessment (LUCRA) has been completed for the Project following the relevant NSW government guideline. The key potential land use conflict risks include those associated with traffic (during construction and decommissioning), air quality, noise and lighting. These issues have been subject to assessment as part of the EIS and A-CAES NSW has committed to implement appropriate management and mitigation measures as part of the Project. With the implementation of these measures, the LUCRA found that these risks will be mitigated to low risks and that the potential impact of the Project on the surrounding land and land users will be minimal.

The Project will also provide a diversified post-mining land use for the Potosi Mine site and will provide a long-term land use solution of this land whilst also co-existing with the existing mining operations for their operational life.

Waste

Waste management as part of the Project will be carried out in accordance with relevant legislation and guidelines and based on the principles of the waste hierarchy (prevent, reduce, reuse, recycle, recover, dispose). A-CAES NSW will develop and implement a waste management plan to guide management of waste.

On-site waste management will include the appropriate separation and storage of waste streams to enable recycling and reuse wherever possible to reduce associated environmental impacts and impact to the capacity of local waste management facilities.



Conclusion and Justification for the Project

A-CAES NSW has proceeded with the Project as a direct response to the reliability supply issues in Broken Hill and as the preferred option identified by Transgrid through the RIT-T process. The proposed co-location of the SCES Facility within the Potosi Mine site was selected due to favourable geological conditions, utilisation of the existing underground mine development for access to the right depth, utilisation of the existing mine support infrastructure to support construction and ability to effectively manage environmental and social impacts. The Project will also provide a diversified post-mining land use for the Potosi Mine site that leverages existing mining investment.

An iterative approach to Project design has been applied to the Project design and throughout the preparation of this EIS. The conceptual layout for the SCES Facility and transmission line corridor has been subject to ongoing refinement with the aim of minimising associated environmental, cultural and social impacts.

The Project will provide long-term, strategic benefits to Broken Hill and the State of NSW, including:

- Providing innovative technology to achieve a long-duration grid-scale energy storage solution that aligns with the State of NSW's transition to a renewable energy-based system, contributing to reducing greenhouse gas emissions and the impacts of climate change
- Contributing to maintaining reliability and security of the electricity network assisting with meeting current load demand
- Supporting provision of the firming required to meet the rising contribution of renewables in the transitioning energy mix
- Providing enhanced energy security for Broken Hill whilst providing low emission energy replacement for the existing diesel-fired turbines which are approaching the end of their operational life
- Infrastructure investment of approximately $638 million
- Providing ongoing financial assistance through the Community Benefit Agreements that provide direct benefit to the local community, with a focus on: skills, training and education; community energy; local heritage; enhancement of the environment; social housing and cultural heritage awareness. Generation of employment through both the construction and operation phase and providing significant benefit to the regional and State economy

The EIS concluded that through the implementation of appropriate best practice management, the potential environmental and social impacts associated with the Project can be appropriately avoided or managed.

Given the identified need for the Project, the net benefit and commitment from A-CAES NSW to appropriately manage the potential environmental and social impacts associated with the Project, it is considered the Project would result in a net benefit to Broken Hill, the Far West Region and the broader NSW community.

EIS Declaration

Project Details	
Project Name	Silver City Energy Storage (SCES) Project
Application Number	SSD-47065463
Address of the land in respect of which the development application is made	Refer to Schedule of Lands in **Appendix 1**
Applicant Details	
Applicant Name	A-CAES NSW Pty Ltd
Applicant Address	Suite 8.02, Level 8, 420 St Kilda Road, Melbourne Victoria, 3004
Details of person by whom this EIS was prepared	
Name	Penelope Williams
Address	Umwelt (Australia) Pty Limited, 75 York St, Teralba NSW 2284
Professional Qualifications	Bachelor of Environmental Science
Declaration by Registered Environmental Assessment Practitioner	
Name	John Merrell
Registration Number	R80008
Organisation registered with	EIANZ
Declaration	The undersigned declares that this EIS: • has been prepared in accordance with the Environmental Planning and Assessment Regulation 2021; • contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates; • does not contain information that is false or misleading; • addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project; • identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments; • has been prepared having regard to the Department's State Significant Development Guidelines – Preparing an Environmental Impact Statement; • contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development; • contains a consolidated description of the project in a single chapter of the EIS; • contains an accurate summary of the findings of any community engagement; and • contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.
Signature	
Date	14 August 2023

Table of Contents

Summary i

EIS Declaration xx

1.0 Introduction 1

1.1 Background 1

1.2 Proponent 2

1.3 Project Overview 3

1.4 Impact Avoidance and Mitigation 6

1.5 Project Objectives 8

1.6 Related Development 10

2.0 Strategic Context 14

2.1 Electricity Generation Market 14

2.1.1 Broken Hill and Surrounds 15

2.2 International Commitments 16

2.2.1 UNFCC Paris Agreement 16

2.3 National Policy and Commitments 16

2.3.1 Australian Energy Policy 16

2.3.2 2020 Integrated Systems Plan (ISP) 17

2.4 NSW State Policy and Commitments 17

2.4.1 NSW Electricity Strategy 2019 17

2.4.2 NSW Electricity Infrastructure Roadmap 2020 18

2.4.3 NSW Net Zero Plan Stage 1: 2020–2030 20

2.5 Local and Regional Context 20

2.5.1 Far West Regional Plan 2036 20

2.5.2 Broken Hill Local Strategic Planning Statement 2020–2040 21

2.6 Environmental Context 22

2.6.1 Regional Context 22

2.6.2 Land Use and Ownership 23

2.6.3 Natural, Cultural and Built Features 23

2.7 Cumulative Impacts 31

2.8 Project Alternatives Considered 34

2.8.1 Alternative Site Locations 34

2.8.2 Alternative Transmission Line Alignments 34

2.8.3 The 'Do-Nothing Option' 35

2.9 Project Related Agreement and Programs 35
2.9.1 Land Agreements 35
2.9.2 Indigenous Participation Plan 36
2.9.3 Voluntary Planning Agreements 36
2.10 Project Benefits 36
3.0 Project Description 38
3.1 A-CAES Technology Overview 38
3.2 Project Summary 40
3.3 Project Area 41
3.4 Project Components 44
3.4.1 SCES Facility 44
3.4.2 220 kV Transmission Line 50
3.4.3 Perilya Operational Modifications 55
3.5 Service and Utility Supply Arrangements 55
3.5.1 Water Supply 55
3.5.2 Telecommunication 56
3.5.3 Sewer and Waste 56
3.6 Construction Activities 56
3.6.1 Proposed Construction Activities 56
3.6.2 Temporary Ancillary Construction Works 57
3.6.3 Transport Routes and Traffic Movements 57
3.6.4 Construction Staging, Duration and Hours 58
3.6.5 Construction Workforce 58
3.7 Operation and Maintenance 60
3.8 Decommissioning 60
4.0 Statutory Context 62
5.0 Engagement 65
5.1 Community and Stakeholder Engagement Plan 65
5.2 Stakeholder Engagement 66
5.2.1 Key Stakeholders 66
5.3 Government Agency/Authority Consultation 69
5.4 Community Views 73
5.5 Ongoing Engagement 75
6.0 Assessment and Mitigation of Impacts 76
6.1 Preliminary Environmental and Social Risk Analysis 76
6.2 Biodiversity 77

6.2.1 Existing Biodiversity Values 78
6.2.2 Avoidance and Minimisation of Impacts 83
6.2.3 Impact Assessment 85
6.2.4 Biodiversity Mitigation and Management 87
6.2.5 Biodiversity Credit Impact Summary 87
6.2.6 Biodiversity Offset Strategy 88
6.3 Aboriginal Cultural Heritage 88
6.3.1 Existing Aboriginal Heritage Context 89
6.3.2 Consultation 90
6.3.3 Results 91
6.3.4 Assessment of Significance and Impacts 92
6.3.5 Mitigation and Management Measures 95
6.4 Historic Heritage 96
6.4.1 Existing Heritage Values 96
6.4.2 Methodology 101
6.4.3 Assessment of Impacts 101
6.4.4 Mitigation and Management Measures 103
6.5 Noise and Vibration 103
6.5.1 Existing Acoustic Environment 104
6.5.2 Noise and Vibration Assessment Criteria 107
6.5.3 Methodology 109
6.5.4 Noise and Vibration Impact Assessment 109
6.5.5 Noise and Vibration Management and Mitigation Measures 116
6.6 Air Quality 117
6.6.1 Air Quality Impact Assessment 117
6.6.2 Greenhouse Gas and Energy Assessment 119
6.6.3 Air Quality Mitigation and Management Measures 121
6.7 Traffic and Transport 122
6.7.1 Existing Transport Network and Site Access 122
6.7.2 Traffic Generation 123
6.7.3 Assessment of Impacts 124
6.7.4 Mitigation and Management Measures 126
6.8 Water Resources 127
6.8.1 Surface Water 128
6.8.2 Groundwater 141
6.9 Hazards 144
6.9.1 Preliminary Hazard Screening 144

6.9.2 Geotechnical Stability 148
6.9.3 Public Safety 150
6.9.4 Bushfire 154
6.9.5 Land Contamination 158
6.9.6 Electromagnetic Fields 158
6.9.7 Aviation Safety 159
6.9.8 Dam Safety 160
6.10 Social Impact Assessment 161
6.10.1 Methodology 161
6.10.2 Social Baseline 162
6.10.3 Impact Assessment 164
6.10.4 Social Management, Mitigation and Enhancement Strategies 174
6.11 Economic 175
6.12 Visual Amenity 177
6.12.1 Methodology 177
6.12.2 Existing Landscape Setting 181
6.12.3 Visual Analysis 184
6.13 Land Resources and Land Use 199
6.13.1 Site Suitability 199
6.13.2 Land Use Assessment 200
6.13.3 Compatibility with Existing Land Use 205
6.13.4 Land Use Conflict 205
6.14 Waste Management 206
6.14.1 Waste Classification 206
6.14.2 Waste Disposal 208
6.14.3 Mitigation and Management Measures 208
6.15 Cumulative Impacts 210
6.15.1 Assessment Methodology 210
6.15.2 Identified Developments 211
6.15.3 Assessment of Cumulative Impacts 213
6.15.4 Management and Mitigation 215
7.0 Justification of the Project 217
7.1 Environmental, Social and Economic Impacts 217
7.2 Suitability of the Project Site 218
7.3 Ecologically Sustainable Development 219
7.3.1 The Precautionary Principle 220
7.3.2 Intergenerational Equity 221

7.3.3 Conservation of Biological Diversity 221
7.3.4 Valuation Principle 221
7.4 Conclusion 223
8.0 References 224

Figures

Figure 1.1 Project Location 4
Figure 1.2 Project Overview 5
Figure 1.3 Avoidance and Mitigation 9
Figure 1.4 Related Development 13
Figure 2.1 Renewable Energy Mapping NSW 19
Figure 2.2 Land Zoning 25
Figure 2.3 Land Ownership 26
Figure 2.4 Mining Titles 27
Figure 2.5 Topography and Hydrology 29
Figure 2.6 Geology 30
Figure 2.7 Regional Development 33
Figure 3.1 A-CAES Technology Overview 39
Figure 3.2 Project Layout 43
Figure 3.3 Project Layout – SCES Facility 45
Figure 3.4 SCES Facility 46
Figure 3.5 Underground Workings 49
Figure 3.6 Transmission Line – Part 1 52
Figure 3.7 Transmission Line – Part 2 53
Figure 3.8 Transmission Line – Part 3 54
Figure 5.1 Key Stakeholder Groups 67
Figure 6.1 Vegetation Mapping 80
Figure 6.2 Groundwater Dependent Ecosystems 84
Figure 6.3 Recorded Aboriginal Sites 93
Figure 6.4 Staged Salvage Locations 94
Figure 6.5 Historic Heritage Context 99
Figure 6.6 Noise Catchment Areas and Monitoring Locations 106
Figure 6.7 Start-up Charge Cycle – Predicted Operational Noise Levels Under Noise-Enhancing Meteorological Conditions (F class – 0.5 m/s), $L_{Aeq,15minute\ dB(A)}$ 112
Figure 6.8 Start-up Discharge Cycle – Predicted Operational Noise Levels Under Noise-Enhancing Meteorological Conditions (F class – 0.5 m/s), $L_{Aeq,15minute\ dB(A)}$ 113
Figure 6.9 Standby Mode – Predicted Operational Noise Levels Under Noise-Enhancing Meteorological Conditions (F class – 0.5 m/s), $L_{Aeq,15minute\ dB(A)}$ 114
Figure 6.10 Surface Water Management Schematic 132
Figure 6.11 Existing Case Flood Extent – Project Area 134
Figure 6.12 Existing Case Flood Extent – SECS Facility Area 135
Figure 6.13 Project Case – 1% AEP Flood Depths 136

Figure 6.14 Surface Water Monitoring Locations 140
Figure 6.15 Bushfire Prone Land Map 155
Figure 6.16 SIA Program Phases 162
Figure 6.17 View Point Locations 180
Figure 6.18 Landscape Character Map 183
Figure 6.19 Radial Analysis – Line of Load Lookout 186
Figure 6.20 Viewpoint 2 – Radial Analysis 187
Figure 6.21 Viewpoint 2 – Photomontage 188
Figure 6.22 Viewpoint 3 – Radial Analysis 189
Figure 6.23 Viewpoint 3 – Photomontage 190
Figure 6.24 Viewpoint 4 – Radial Analysis 191
Figure 6.25 Viewpoint 5 – Radial Analysis 192
Figure 6.26 Viewpoint 4 – Photomontage 193
Figure 6.27 Viewpoint 5 – Photomontage 194
Figure 6.28 Viewpoint 6 – Radial Analysis 195
Figure 6.29 Viewpoint 6 – Photomontage 196
Figure 6.30 Soils 201
Figure 6.31 Land and Soil Capability 204

Photos

Photo 6.1 Narrow channel with exposed bedrock in the section of third order stream proposed for diversion 82
Photo 6.2 PCT 136 Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone along a section of the third order stream to be diverted by the Project 82

Graphs

Graph 3.1 Indicative Construction Sequence 59
Graph 6.1 Projections of the Electricity Generation Mix in Australia 121

Tables

Table 1.1 Proponent Contact Details 2
Table 2.1 Alignment of the Project with Directions in the Far West Regional Plan 2036 (adapted from NSW Government, 2017) 21
Table 2.2 Existing and Proposed Developments in the Vicinity of the Project Area 32
Table 3.1 Project Summary 40
Table 3.2 Modifications to Perilya Operations 55
Table 3.3 Project Phases and Associated Activities 56

Table 4.1	Statutory provisions applicable to the Project	62
Table 5.1	Engagement Mechanisms	67
Table 5.2	Local Stakeholders Consulted – Scoping and EIS Phase	68
Table 5.3	Government Agency/Authority Consultation	70
Table 5.4	Perceived Community Concerns and Benefits	74
Table 6.1	Plant community types identified within the Disturbance Area	78
Table 6.2	Summary of residual direct impacts (SCES Facility)	85
Table 6.3	Summary of residual direct impacts (Transmission line)	86
Table 6.4	Biodiversity Credit Summary	88
Table 6.5	ACHA – Overview of Consultation	90
Table 6.7	Heritage Items within 2 km of Project Area	96
Table 6.8	National heritage listing contributory elements within the vicinity of the Project Area	100
Table 6.9	Noise Monitoring Locations	104
Table 6.10	Noise Monitoring Results, dB(A)	104
Table 6.10	Operational receivers in proximity to SCES Facility	105
Table 6.12	Project Noise Trigger Levels – Residential Receivers – $_{LAeq}$(15min), dB(A)	107
Table 6.13	Project Noise Trigger Levels For Non-Residential Receivers – $_{LAeq}$(15min), dB(A)	107
Table 6.13	Construction Noise Management Levels for Residential Receivers	108
Table 6.15	Road Traffic Noise Assessment Criteria for Residential Land Uses	108
Table 6.16	Estimated GHG emissions during construction	120
Table 6.17	Operational Water Management System Components	130
Table 6.18	Proposed Case Water Level and Velocities	133
Table 6.19	Hazardous Materials Inventory	145
Table 6.20	Hazardous Materials Transport	147
Table 6.21	Identified Risks to Public Safety and Associated Assessment Findings	151
Table 6.22	Local Challenges and Opportunities	163
Table 6.23	Social Impact Significance	165
Table 6.23	Community Benefit Agreements	174
Table 6.25	Waste Classification and Expected Waste Types	207
Table 6.26	Indicative Waste Types and Management Activities – Construction and Operation Phase	208
Table 6.26	Cumulative Impact Summary	211

Appendices

Appendix 1	Schedule of Land
Appendix 2	Secretary's Environmental Assessment Requirements
Appendix 3	Consolidated Management and Mitigation Measures
Appendix 4	EPBC Referral Decision Notice
Appendix 5	Statutory Compliance Tables
Appendix 6	Biodiversity Development Assessment Report
Appendix 7	Aboriginal Cultural Heritage Assessment Report
Appendix 8	Historic Heritage Impact Assessment Report
Appendix 9	Noise and Vibration Impact Assessment

Appendix 10 Air Quality and GHG Assessment
Appendix 11 Traffic and Transport Impact Assessment
Appendix 12 Surface Water Impact Assessment
Appendix 13 Groundwater Impact Assessment
Appendix 14 PHA – Consultation Documentation
Appendix 15 Conceptual Design Report
Appendix 16 Risk Analysis
Appendix 17 Electromagnetic Field Assessment
Appendix 18 Aviation Impact Assessment
Appendix 19 Social Impact Assessment
Appendix 20 Economic Impact Assessment
Appendix 21 LUCRA
Appendix 22 Cumulative Impact Summary

1.0 Introduction

A-CAES NSW Pty Ltd (A-CAES NSW, the Proponent) is proposing the Silver City Energy Storage (SCES) Project (the Project) which will use Hydrostor's proprietary advanced compressed air energy storage (A-CAES) technology to provide large-scale, long duration energy storage for Broken Hill and the broader region (200 mega-watt (MW) and 1600 mega watt hours (MWh)).

This technology uses excess energy from the electricity grid (when power generation exceeds demand) to compress air from the atmosphere and store it before later releasing this air through a generator to create power. Effectively the system operates as a large-scale, low emission energy storage system that will support two purposes:

- At a **regional and national scale**, the Project is an enabler in NSW's energy transition. It will provide the firming (maintenance of output from variable and intermittent power sources) and storage needed as the energy market transitions away from fossil-fuel dependency to more intermittent and renewable sources.
- At a **local scale**, the Project provides security of energy supply to Broken Hill and the Far West region by replacing the existing diesel-fired turbines that currently provide backup power in the event of an outage. In turn, this has a flow-on effect of providing greater certainty for additional local renewable energy generation investment as the Project can take excess energy generated and use this to create compressed air; providing a market for this otherwise excess energy.

The Project has been designed through a comprehensive process that incorporated the findings of environmental studies, community and stakeholder feedback, and engineering design considerations. A-CAES NSW has engaged with stakeholders throughout the Project planning and assessment process and has designed the Project to minimise impacts whilst realising the benefits of the Project.

The Project is State significant Development (SSD) as defined under State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP) and requires development consent under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This Environmental Impact Statement (EIS) provides an assessment of the environmental, social and economic impacts of the Project. This document is intended to assist the community, Council, government agencies and other stakeholders to understand the Project and its benefits and impacts. This EIS is also intended to provide the necessary information to the consent authority to make an informed decision on the overall merits of the Project.

1.1 Background

The NSW Government's Electricity Strategy and Electricity Infrastructure Roadmap (Electricity Strategy) identifies Broken Hill and the surrounding region as suitable for both solar and wind energy production zones. Over 250 megawatts (MW) of renewable energy generation has been connected to the grid in the Broken Hill area in recent years is currently being curtailed and subject to significant revenue reductions as a result of local electricity network reliability issues. Broken Hill is also currently supported by two back-up diesel-fired turbines, operated by Transgrid, which operate during both planned and un-planned outages of the X2 transmission line into Broken Hill. These diesel-fired turbines are approaching the end of their operational life and a new energy security solution is required for Broken Hill.

Transgrid applied the Regulatory Investment Test for Transmission (RIT-T) process to assess the long-term options for maintaining reliable energy supply to Broken Hill. The RIT-T process concluded that the continued operation of the existing diesel-fired turbines would be pursed as an interim measure, followed by the implementation of the Project as the top ranked energy supply option. Transgrid has acquired the existing diesel-fired turbines from Essential Energy and will temporarily use them to provide network support until the Project is operational, at which point the existing diesel-fired turbines will be decommissioned (refer to **Section 2.1**).

The Project was also selected as one of only six projects in the Pre-investment study category of the NSW Emerging Energy Program (EEP). The Project has received funding from the EEP as well as private investment and is supported by the Australian Renewable Energy Agency (ARENA).

The Project includes the SCES Facility and an approximately 16 km 220 kV electricity transmission line (refer to **Figure 1.1**). The SCES Facility is proposed to be co-located on the Potosi Mine site approximately 3 kilometres (km) northeast of Broken Hill. The proposed transmission line passes to the south of the City of Broken Hill to connect to an existing Transgrid substation to the southwest. The Project Area encompasses all components of the Project (refer to **Figure 1.2**).

A-CAES technology uses energy from the grid (when it is plentiful such as when renewable energy generation is strong) to compress air from the atmosphere, recover and store the heat from compression and inject the compressed air into an underground cavern. The air remains in the cavern, sealed under pressure from water in a surface reservoir. When needed to generate electricity, the compressed air stored in the cavern is released and combined with the recovered and stored heat and discharged through an air turbine which generates the required electricity; the technology is discussed further in **Section 3.0**.

1.2 Proponent

A-CAES NSW Pty Ltd is the Proponent and is a subsidiary of Hydrostor Australia Holdings Pty Ltd (Hydrostor). Hydrostor is the world's leading renewable energy developer specialising in large-scale compressed air energy storage facilities. Hydrostor is a private company founded in 2010 in Toronto, Canada and has developed the A-CAES technology that forms the basis of the Project. Large A-CAES projects are currently being developed across Australia and in the USA, United Kingdom, Canada and Chile. The contact details for the Proponent are included in **Table 1.1**.

Table 1.1 Proponent Contact Details

Requirement	Details
Proponent	A-CAES NSW Pty Ltd
Contact Full Name/s	Kristel Ross
Postal Address	Suite 8.02, Level 8, 420 St Kilda Road, Melbourne Victoria, 3004
Street Address (Project Site)	Lot 7320 DP 1201053 Broken Hill NSW
ABN	86 644 102 858

1.3 Project Overview

The Project includes the installation, operation and maintenance of the SCES Facility and ancillary infrastructure associated with the construction and operation of the Project. The key project components include:

- SCES Facility including two 100 MW Turbine/Generator/Compressor Trains, switchyard, office/warehouse/guardhouse and utilities (fuel and water storage)
- 300 ML above ground water reservoir and above ground water pipeline
- 250,000 cubic metre underground cavern with air and water shaft to connect to the SCES Facility on the surface
- approximately 16 km 220 kV transmission line.

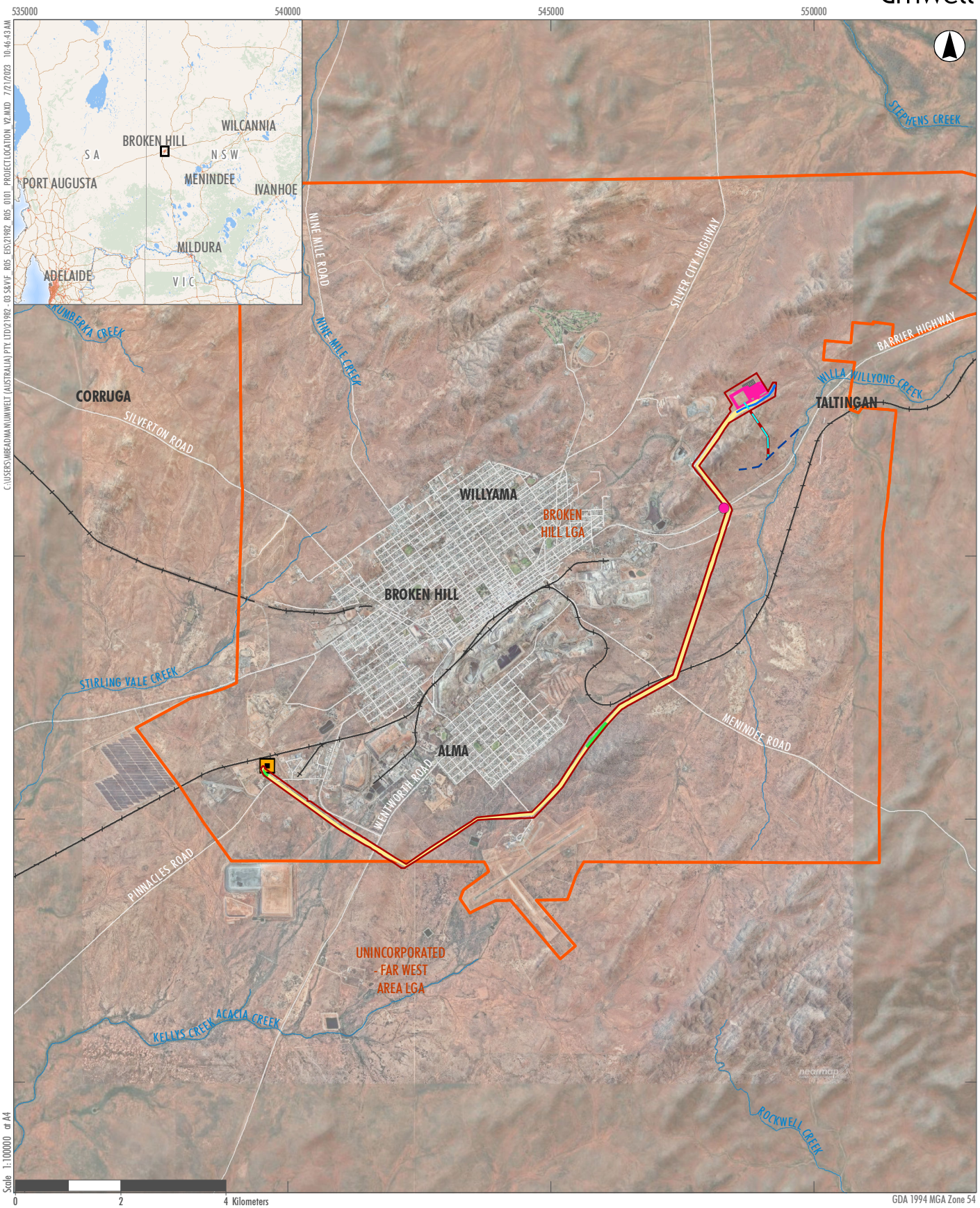
The SCES Facility will be located on the Potosi Mine site. The Potosi Mine site is located approximately 3 km from Broken Hill and is comprised of a combination of Crown Land and freehold land owned by Perilya Broken Hill Limited (Perilya). Perilya has been granted a mining lease over these areas, specifically, Consolidated Mining Lease 5 (CML5) which is expires on 6 June 2038.

The approximately 250,000 cubic metre underground cavern will be located approximately 600 m below the surface, with air and water shafts that will connect the cavern to the surface infrastructure.

While the Project will interact with Perilya's existing mining operations, all associated excavation works to establish the underground cavern will be undertaken as part of this Project. No change is proposed to the existing Potosi mining operations, however, the existing development consents applicable to the existing mining operation will require minor modification to accommodate the Project (refer to **Section 1.6**). A-CAES NSW has a commitment with Perilya regarding the full construction and operational life of the Project.

The geology of the Potosi Mine site is well understood, with geotechnical investigations indicating the geological conditions are suited to the Project. The existing Potosi underground entrance and underground workings will be utilised to provide access to facilitate construction of the proposed underground cavern removing the need to create a decline or shaft to commence construction of the cavern.

The proposed 16 km 220 kV transmission line has been designed with sections of both overhead and underground line with the overhead line designed at a varying height. The design is the result of detailed site analysis to avoid adverse impacts to existing land uses, particularly the Broken Hill Airport. The transmission line will provide for connection of the SCES Facility to the existing Transgrid Kanandah Road substation located to the southwest of Broken Hill.



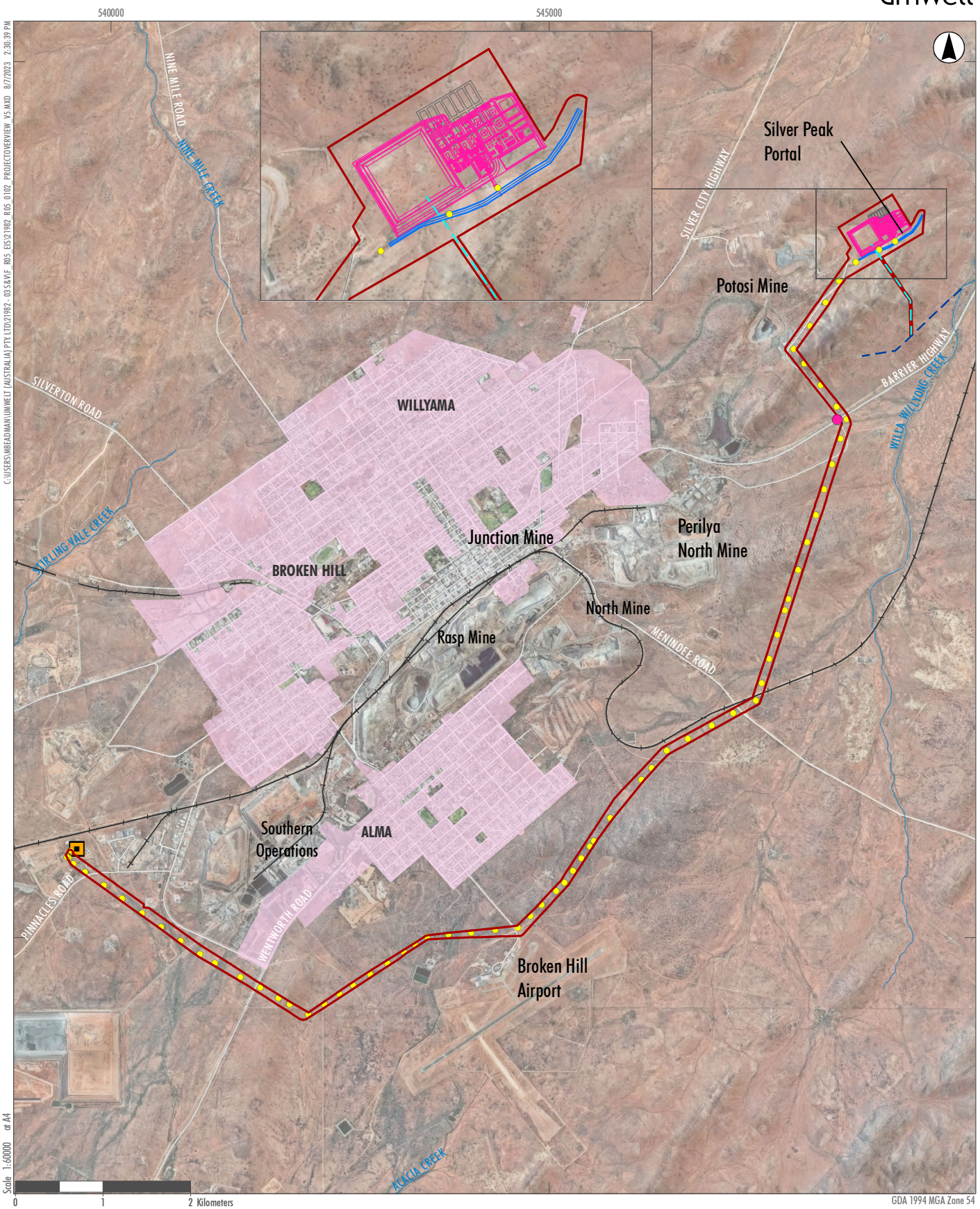
Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Proposed Transmission Line (Above Ground Section)
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Site Access Point
- Local Government Area boundary
- Drainage Line
- Railway Line
- Road

FIGURE 1.1

Project Location

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Tranmission Pole Location
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Broken Hill Residential Area (zoned R1 General Residential Broken Hill LEP)
- Site Access Point
- Drainage Line
- Railway Line
- Road

FIGURE 1.2

Project Overview

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

The Project will provide peak power of 200 MW and approximately 1600 MWh of energy storage capacity. As at the date of this document, A-CAES intends to provide various services to third parties under the following contractual arrangements:

- Following consultation with Transgrid, a reserve capacity of 250 MW will be built into the system exclusively for Transgrid to deliver 50 MW of electricity or up to 5 hours of uninterrupted dispatchable power, available at all times, to address reliability issues at Broken Hill pursuant to a network support agreement.
- Storage services to EnergyAustralia Pty Ltd pursuant to an energy storage services agreement.

The Project will also dispatch energy into the National Electricity Market (NEM).

As the Project is for the purpose of electricity generating works with a capital investment of more than $30 million, it is therefore classified as SSD under the Planning Systems SEPP and requires development consent under Part 4 of the EP&A Act.

1.4 Impact Avoidance and Mitigation

As discussed in **Section 1.1**, the Project was identified as the preferred option by the Transgrid RIT-T process to address supply reliability issues in Broken Hill. This process considered a range of alternative options to meet the energy reliability needs of Broken Hill and concluded that the Project was the preferred option as it provides for the use of clean energy consistent with the general transition of the electricity sector to low emission technologies.

The Potosi Mine site was selected as the proposed location for the Project due to favourable geological conditions, opportunity to use an existing brownfield mining area and to use existing mining infrastructure. The Project also provides for a diversified post-mining land use for the Potosi Mine. The site also has a suitable buffer distance to other land uses including the residential limits of development for the City of Broken Hill.

The ideal design scenario for A-CAES technology is location of the cavern approximately 600 m below the surface and directly below the surface infrastructure (alternate locations require increased cavern volume or loss of installed generation capacity). The location of the SCES Facility is also constrained by the existing topography and mining related infrastructure and overburden emplacement areas. The Potosi Mine also adjoins a Range Danger Area for a long bore rifle range where development is prohibited, with the SCES Facility sited to avoid this area. Siting of the infrastructure has also considered land subject to Native Title within and adjoining Potosi Mine.

Two locations for the SCES Facility within the Potosi mine site were investigated. The proposed location is preferred due to being immediately above the deepest part of the Potosi Mine (Level 20/21) and close to the existing mine access shafts. The alternative site location that was considered was immediately south of the proposed SCES Facility location (refer to **Section 2.9** and **Section 3.0** for further detail).

The proposed SCES Facility has been sited to reduce the level of associated new ground disturbance as far as practicable. The SCES Facility will be located within an existing brownfield mine site and will partly utilise existing mine infrastructure (access portals) and underground mining areas. The proposed surface infrastructure has been located partially within areas approved for disturbance under the existing Perilya Development Consents. An existing Potosi Mine access road and existing intersection to the Barrier Highway will provide access to the SCES Facility.

Connection to the grid is required, which is proposed to be through the existing Transgrid substation located to the southwest of Broken Hill. This location provides for connection to existing electricity infrastructure and has been designed to avoid and minimise impact as far as practicable following a review of alternate alignment options.

Three transmission alignment options were investigated during the initial design phase of the Project (refer to **Figure 1.3**). The three options considered were:

Northern Alignment – located on the northern boundary of the City of Broken Hill using new and existing easements. The northern alignment was restricted by a combination of large areas associated with the Broken Hill Regeneration Area (established in the 1930s to revegetate the edges of the City to provide protection from dust storms) and Environmental Protection Zoning, Native Title, conflicting land use (shooting complex, racecourse and golf course) and potential cumulative impact due to existing multiple transmission lines. This alignment would also be visible from a number of residential properties located at higher elevation with northern views towards Silverton and require consideration of potential cumulative impacts associated with Silverton windfarm. There are also a number of existing easements associated with existing transmission infrastructure along this alignment which would make establishing a new easement difficult.

Central Alignment – located across the Perilya North Mine and then through the existing mined area located in the centre of the City of Broken Hill using a combination of new and existing easements. The central alignment, while the shortest route and predominately across existing disturbed land was constrained due to conflicts with existing infrastructure and land use. This alignment would require demolition of existing Perilya transmission infrastructure and underground design which is problematic due to geotechnical conditions (predominately rock) and requirement for blasting in close proximity to sensitive land uses. There were also multiple listed heritage items within close proximity associated with the National Listing of Broken Hill applying further constraint to this alignment.

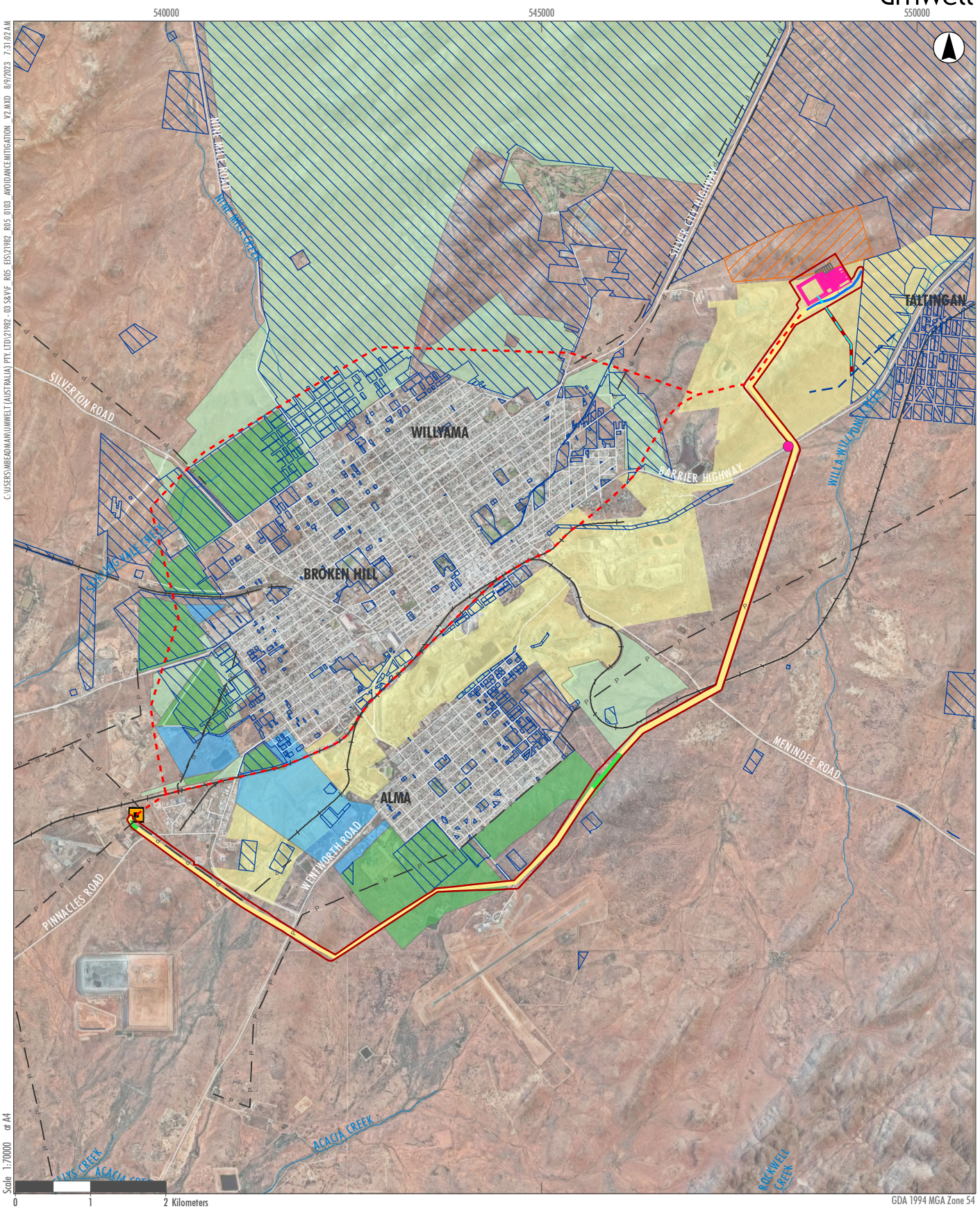
Southern (proposed) Alignment – The southern alignment includes a combination of existing and new easements predominately located on Perilya and Crown owned Land, where land subject to Native Title can be avoided. It potentially requires widening of some current powerline easements and some new easements running south around the southern boundary of the City of Broken Hill.

The alignment does extend partially into the southern Regeneration Area (length of approximately 450 m northeast and 2 km northwest of the airport) to avoid constraints associated with the Broken Hill Airport and the existing Wastewater Treatment Plant. Vegetation within this area is predominately arid shrubland, with a small area approximately 1 hectare (ha), where the vegetation extends beyond 10 m in height. Removal of vegetation within the regeneration area has been avoided as far as practicable through Project design. This includes siting of Project infrastructure and the ability to retain the majority of the vegetation within the associated easement due to the nature of the vegetation and predominately low height (further detail is provided in **Section 6.2**). The proposed alignment also reduces interaction with sensitive receivers including residential land use, tourism and historic heritage values minimising associated amenity impacts (visual, noise, traffic).

1.5 Project Objectives

The objectives of the Project are to:

- provide a cost-effective, reliable, long term energy storage solution to the Broken Hill and broader Region
- provide a low emission replacement option to the existing diesel fired combustion turbine backup system which is approaching the end of its operational life
- provide capacity to enable greater renewable energy connection and improve the economics of renewable energy development, encouraging future renewable energy projects in the Broken Hill area
- reduce disturbance associated with the development of the Project through siting within an existing mine site and utilisation of existing infrastructure and excavation areas
- provide both direct and indirect employment and economic benefits through the use of local and regional goods and services, associated with the construction and operations phase
- provide economic benefit through the implementation of a proposed community benefit fund that will invest in local community projects and initiatives
- maintain positive long-term relationships with all stakeholders.
- implement the Project in an environmentally responsible manner to minimise Project specific and cumulative environmental and social impacts
- develop comprehensive mitigation and management strategies to mitigate and offset predicted impacts associated with the Project.



C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY. LTD\21982 - 03 S&VF - R05 - EIS\21982_R05_0103_AVOIDANCEMITIGATION_V2.MXD 8/9/2023 7:31:02 AM

Scale 1:70000 at A4

Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Proposed Transmission Line (Above Ground Section)
- Proposed Transmission Line (Underground Section)
- Alternate Transmission Line Corridors
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Site Access Point
- Existing Electricity Network
- Drainage Line
- Railway Line
- Environmental Protection Zone Areas outside the early regeneration areas
- Former Regeneration Areas that are not part of the Environmental Protection Zone
- Original Regeneration Areas that are now zoned Environmental Protection
- Native Title determined areas
- SP1 - Mining zoned area
- Rifle Club Exclusion Zone

FIGURE 1.3

Avoidance and Mitigation

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

1.6 Related Development

The Project will be developed in close proximity to existing and proposed mining operations undertaken by Perilya. Pasminco Limited commenced mining at the Potosi Mine in 1996, with the Mine acquired by Perilya in 2002.

Exploration at the Potosi Mine commenced in 1971 when the Silver Peak Shaft was sunk as an exploratory shaft, further exploration followed in 1971, culminating at the discovery of the Potosi deposit. The mine commenced as an open cut pit before later progressing to underground mining.

Following acquisition of the mine in 2002 and following approval of the Development Consent (DA) 448/2004 in 2004, Potosi recommenced mining in 2007 with the Potosi Open Cut pit being used to develop an underground exploration decline to allow better definition and access to the underground resources. Since then, the mine has continued underground to a maximum of approximately 600 m below ground and extending approximately 1.6 km northeast along the Line of Lode from the open cut pit. There are two separate Perilya mining areas in this part of the Perilya mining lease holdings, both subject to separate Development Consents issued by Broken Hill City Council under the EP&A Act:

- the Potosi Mine – currently operates subject to (DA) 448/2004, which was issued on 7 April 2004, and subject to modifications on 8 April 2008, 20 October 2011, 27 October 2011 and 12 May 2014
- the Flying Doctor Deposit – has commenced works subject to Development Consent (DA) 336/2008, which was issued on 20 November 2012, and allows for open cut mining of the Flying Doctor Deposit but is yet to commence full-scale mining.

The two mining areas are also subject to a number of management plans, leases and licences, as outlined below:

- Potosi Mine:
    - Part of CML 5 under the *Mining Act 1992* (Mining Act).
    - Mining Operations Plan (MOP 801/06), which commenced on 1 January 2020, and has a nominal completion date of 31 December 2026.
    - Rehabilitation Management Plan (RMP 801/08) August 2022 which commenced on 1 August 2022, and expires on 6 June 2038 for CML5.
    - Environment Protection Licence (EPL 2683) issued under the *Protection of the Environment Operations Act 1997* (POEO Act).
- Flying Doctor Deposit:
    - Part of CML 5 and Part of CML 6 (expires 23 January 2038), issued under the Mining Act.
    - Perilya is currently seeking approval of:
        - a Rehabilitation Management Plan (RMP)
        - an EPL issued under the POEO Act applicable to the approved Flying Doctor mining operations.

The Mining Lease and Development Consent boundaries and relevant interaction with the Project layout are shown on **Figure 1.4**.

The existing Potosi Mine (DA) 448/2004 and Flying Doctor Deposit (DA) 336/2008 (and associated management plans, leases and licences) will require modification to accommodate the Project as discussed below.

Perilya Approvals

DA 448/2004 for the Potosi Mine, provides for mining and development of infrastructure to support the underground mining. Originally established as an open cut pit, the operations converted to underground to follow the deposit to depth. While DA 448/2004 does not specify a mine life or end date for operations, based on current production rates at the Potosi Mine and the extent of known resources, mining operations are indicated to be completed by 2024, unless extended due to the identification of further resources.

Further northeast from the Potosi Mine, the Flying Doctor Deposit is located nearer to the surface. DA 336/2008 for the Flying Doctor Deposit allows for extraction of ore and waste rock by open cut mining methods and construction of associated infrastructure. Works associated with DA 336/2008 have been commenced; however, full-scale mining within the Flying Doctor Deposit is yet to commence.

The SCES Facility will be located above the Potosi underground mine workings approximately 1.5 km from the Potosi Pit at almost the furthest underground extent of the mine, with the existing workings to provide access for the new underground storage cavern development. The site of the surface infrastructure associated with the SCES Facility overlaps with a part of the surface ancillary operational areas provided for by DA 336/2008 for the Flying Doctor Deposit. The Project does not impact on the mining areas associated with the Flying Doctor Deposit. Consultation with Perilya has indicated that the Project and the mining operations can coexist and that the Project will not constrain the development of the Flying Doctor Deposit. In relation to overlapping parts of the Project Area and the existing development consent areas, minor changes to the approved Flying Doctor ancillary operational areas and Potosi Mine rehabilitation and final land use will be required. These changes will be undertaken by Perilya and do not form part of the Development Application for the Project.

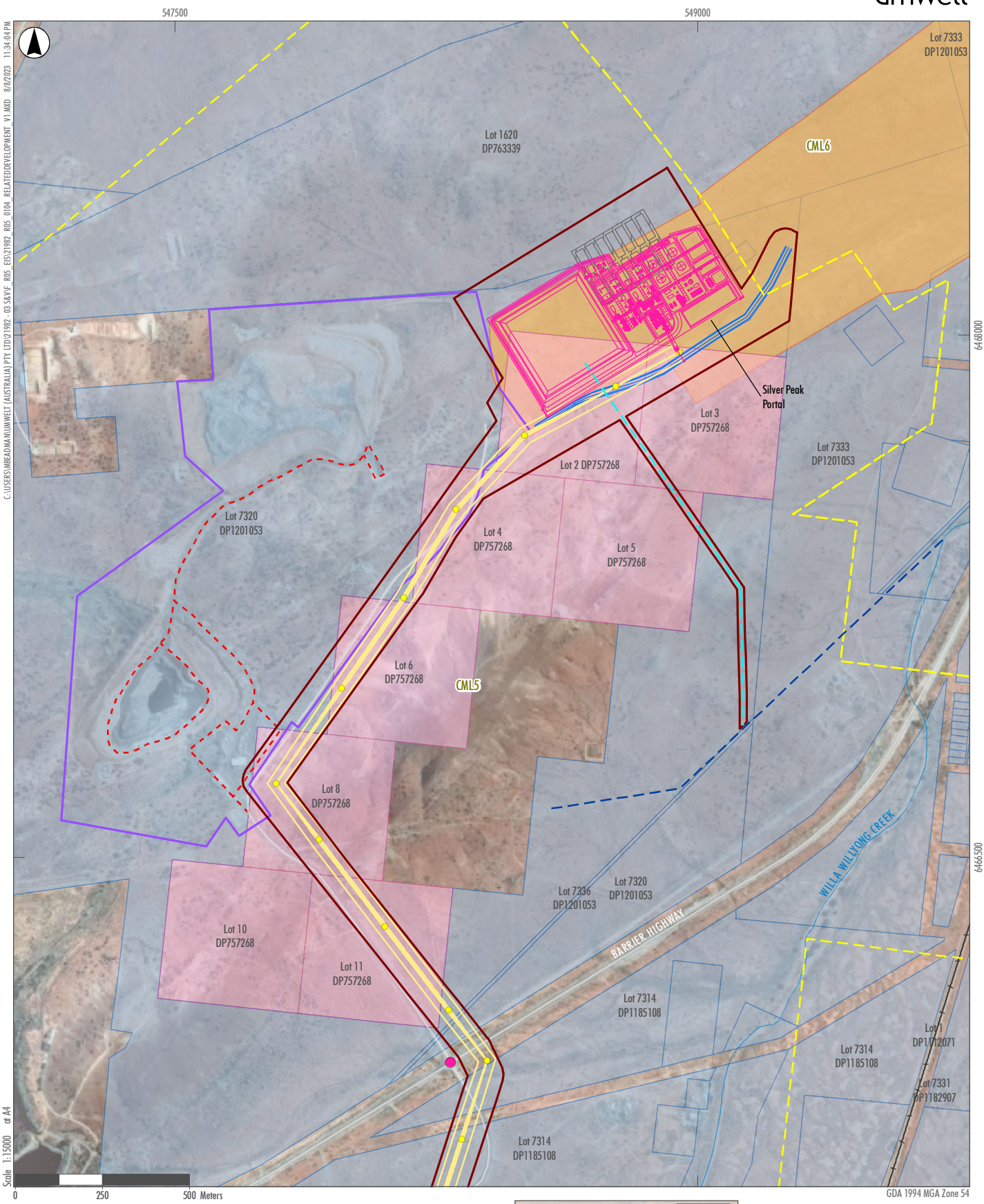
Mining operations at Potosi Mine are undertaken in accordance with the Potosi Mining Operations Plan (MOP 801/06), RMP 801/08 and EPL 2683, which will require minor modifications including to the timing and design of the proposed rehabilitation to accommodate the Project. This will require variation of RMP 801/08 to change the final land use of the site, and to MOP801/06 to change the requirement that prior to decommissioning all waste rock be returned underground for structural support purposes or relocated to the Potosi Mine void.

Exploration activities undertaken by Perilya indicate there is not an economically viable resource present within the area proposed to be excavated to accommodate the proposed cavern. Subsurface drilling in close proximity to the proposed underground storage cavern indicates no mineralisation of economic interest for extraction and processing. The extracted material will be bought to the surface and utilised to complete the civil site preparation including reservoir construction. In the extremely unlikely event that excavation of rock for the storage cavern demonstrates any materials of economic interest for extraction and processing, Perilya will process the material under CML5 and DA448/2004 with the residual waste rock to be utilised for rehabilitation activities associated with the existing mining operations. Appropriate modifications will be made to DA 448/2004 and DA 336/2008 to allow this process to occur.

All excavated material will be tested to confirm its suitability for use for construction works associated with the Project. Should the material not be suitable for construction works the material will be transferred to Perilya and managed in accordance with its existing management controls.

There are currently two portals providing access to the underground workings at the Potosi Mine (refer to **Figure 1.4**). The Potosi Mine has an original portal to the underground workings from within the Potosi Open Pit. As mining extended further north from the Potosi Pit, a second portal was created (the Silver Peak portal). These two portals provide access to the existing Potosi underground workings. Underground mining at Potosi Pit has existing tunnels and drives on 21 levels down to 600 m below ground level. Once construction is complete the underground storage cavern will no longer require access and the portals will no longer be utilised in relation to the Project. Maintenance and/or rehabilitation of the portals will remain the responsibility of Perilya and does not form part of the Project.

Perilya will bear responsibility for the changes required to the existing approvals and management plans for the Potosi and Flying Doctor mining operations and Broken Hill City Council will be the consent authority for the proposed modifications to DA 448/2004 and DA 336/2008. This process is expected to be undertaken concurrently with the assessment of this Project but does not form part of this Project and is therefore not assessed in this EIS.



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Tranmission Pole Location
- Proposed Transmission Line (Above Ground Section)
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Mine Access Road
- Site Access Point
- Perilya Owned Land
- Crown Land
- Mining Lease Boundaries
- Potosi Mine Boundary
- Flying Doctor Boundary
- Drainage Line
- Railway Line
- Road

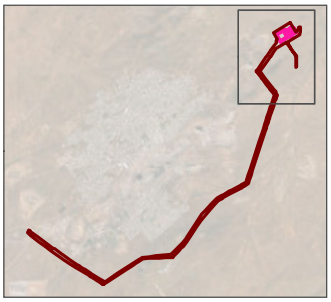


FIGURE 1.4

Related Development

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

2.0 Strategic Context

This section outlines the strategic context for the Project including relevant international agreements and Federal and State strategic planning policies. This section also outlines the justification for the Project.

2.1 Electricity Generation Market

The National Electricity Market (NEM) is the wholesale market through which generators and retailers trade electricity in Australia (except for Western Australia and the Northern Territory). With all the NEM states and territories setting net zero targets, the NEM is seeing changes in energy generation composition.

The NEM was established in a primarily fossil-fuel dominated market. It is currently undertaking a process of modernisation to accommodate the transition to greater renewables and alternative technologies (National Electricity Market | energy.gov.au). These distributed electricity sources mean that establishing stability in the grid through firming and storage capacity is a key foundation for accessible and affordable electricity supply to consumers. According to the 2020 Integrated System Plan (ISP) (AEMO, 2020) (refer to **Section 2.3.2**), 45 GW of new dispatchable resources will be required by 2040 to firm up the inherently variable nature of distributed and large-scale renewable generation. The Project proposes to provide firming and storage capacity in the Broken Hill area.

During 2020 to 2021, fossil fuels contributed 73% of the total NEM electricity generation, including coal (53%), gas (18%) and oil (2%). Reflecting the clean energy transition, the share of coal in the electricity sector has continued to decline in contrast to the beginning of the century when coal's share of electricity generation exceeded 80%. Nationally, the share of wind and solar energy generation tripled in the five years to 2019, with the share of renewable electricity generation expected to increase to 57% by 2030 and 84% by 2050 (Energy Networks Australia, 2019). In the past five years, the proportion of Australia's electricity that comes from renewables has almost doubled, increasing from 16.9% in 2017 to 32.5% in 2021 (Clean Energy Council, 2022). In 2022, it has been reported that renewables accounted for 34.8% of Australia's electricity demand (Stockhead, 2023).

Like other states and territories in the NEM, NSW is currently in a clean energy transition to increase renewable electricity generation and to build a reliable, affordable and sustainable electricity future to support a growing economy (NSW Government, 2019). In NSW during 2020 to 2021, renewable energy accounted for 27% of electricity generation (17,128 GWH) (DCCEEW, 2022a). Whilst the transition has commenced, coal-fired power currently dominates NSW electricity. However, with all five of the current coal-fired power stations in NSW being scheduled to retire between 2023 and 2043 (AEMO, 2019), there will be increased demand for alternative baseload and dispatchable power in the NEM. This increased demand will be met by renewables and energy storage technologies.

NSW has a strong pipeline of renewable energy projects which will contribute to achieving the current transition targets, however, significant investment is required to achieve sufficient renewable energy supply and storage to effectively support NSW's transition to renewable energy and provide supply stability following the retirement of the existing fossil fuel generated supply (refer to **Section 2.4**).

The Project fits within the current strategic direction of the NSW and Australian governments approaches to energy generation, being the transition to renewables and the reliability of the grid. The low emission dispatchable electricity from the Project will assist with improving the stability and reliability of the electrical grid within the Broken Hill Region, whilst replacing the existing diesel-fired turbine electricity back up system and reducing greenhouse gas emissions.

2.1.1 Broken Hill and Surrounds

Broken Hill is part of the south-western transmission network and is supplied by a single 220 kV transmission line, Line X2, from Buronga that is approximately 260 km long. Any planned or unplanned outages on Line X2 potentially create electricity supply issues for Broken Hill and the surrounding area. The reliability of energy supply at Broken Hill is currently provided by two diesel-fired turbines previously owned and operated by Essential Energy.

Transgrid is a significant transmission operator in the NEM and is legally bound to adhere to reliability standards as set by NSW Independent Pricing and Regulatory Tribunal (IPART). To meet that standard in Broken Hill it relies upon the diesel-fired turbines. After Essential Energy's decision to divest the turbines, the turbines were acquired by Transgrid in January 2022. With the turbines nearing their operational life, Transgrid commenced a Regulatory Investment Test for Transmission (RIT-T) to identify options to provide ongoing reliable energy supply to Broken Hill (refer **Section 2.1**).

2.1.1.1 Transgrid Regulatory Investment Test for Transmission RIT-T

As discussed in **Section 1.0**, Transgrid has applied the RIT-T process to identify long-term options for maintaining reliable energy supply to Broken Hill. The RIT-T Project Assessment Conclusions Report (PACR) (Transgrid, 2022) presents the final preferred option for maintaining energy supply to Broken Hill.

The PACR concludes that the continued operation of the existing diesel-fired turbines as an interim measure, followed by network support provided by the Project is the top ranked option for maintaining energy reliability in Broken Hill. Transgrid acquired the existing diesel-powered turbines at Broken Hill from Essential Energy and will temporarily use them to provide network support until the Project is operational, at which point the existing diesel-powered turbines will be decommissioned.

The PACR concludes the Project is the preferred option for maintaining energy supply to Broken Hill due to:

- a greater expected net benefit
- use of clean energy consistent with the general transition of the electricity sector to low emission technologies
- support of the use of innovative solutions to meeting network needs, which may provide an example that can be adopted more widely
- ability to efficiently accommodate future additional mining load at Broken Hill (should it eventuate)
- a lower level of unavailability due to outages (reducing the risk of disruption to customer supply in Broken Hill).

2.2 International Commitments

2.2.1 UNFCC Paris Agreement

Australia is one of the 195 countries from around the world that has signed the Paris Agreement, which was made under the United Nations Framework Convention on Climate Change (UNFCCC). The Paris Agreement aims to:

- hold the increase in the global average temperature to below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels
- increase the ability [of nations] to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production
- make finance flows consistent with a pathway towards low greenhouse gas emissions and climate resilient development.

Australia signed the Paris Agreement on 22 April 2016. The obligations under the Paris Agreement will drive national greenhouse gas policy up to 2030. Australia's commitment to the Paris Agreement includes reducing greenhouse gas emissions to 43% below 2005 levels by 2030 (DEECCW, 2022b).

The Project will contribute to meeting Australia's commitment made under the Paris Agreement. Once the Project is operational, it will provide low emission energy storage which is fundamental to providing dispatchable power in the clean energy transition and thus meeting national and international emission reduction goals.

2.3 National Policy and Commitments

2.3.1 Australian Energy Policy

The Powering Australia Policy is a key component of Australia's climate change strategy and energy policy framework; it comprises four major pillars:

- Restoring Australian leadership.
- Backing industry, agriculture and carbon farming.
- Transport.
- Electricity and gas.

The first of these four pillars outline seven key objectives, one of which directly supports and underpins the justification for the Project, which is to assist with the transition to renewable energy to reduce Australia's emissions to 43% below 2005 levels by 2030.

In August 2022, the Climate Change Bill (Cth) set a target to reduce national emissions by 43 per cent from 2005 levels by 2030 and net zero emissions by 2050.

The Project is aligned with the Australian Government's Energy Policy, through its key objectives of supporting the NEM to provide reliable electricity, developing energy storage infrastructure that supports the transition to renewable energy.

2.3.2 2020 Integrated Systems Plan (ISP)

The 2020 Integrated System Plan (ISP) is the second ISP prepared by the Australian Energy Market Operator (AEMO). The first ISP guided governments, industry and consumers on the investments needed to achieve an affordable, secure and reliable energy future, while meeting required emissions trajectories. The second ISP responds to the latest technology and developments in policy, system and economy (AEMO, 2020).

According to the ISP, 45 GW of new dispatchable resources will be required by 2040 to firm up the inherently variable nature of distributed and large-scale renewable generation. Further, the ISP identifies that utility-scale energy storage can shift the timing of renewable energy production, reduce the magnitude of new intra-regional transmission required, and provide firming support during peak loads or when renewable production is low (AEMO, 2020).

The 2020 ISP considers all types of dispatchable storage. The ISP splits dispatchable storage into: Shallow storage (up to 2 hours duration), Medium storage (4 to 12 hours duration) and Deep storage (24 hours or more duration). The Project aims to provide medium storage (approximately 6 to 8 hours) of dispatchable energy to Broken Hill, to replace the existing back-up diesel-powered combustion turbines which are approaching the end of their operational life.

The ISP highlights that innovative system services that provide essential system security requirements are needed to transform a system that has relied on non-renewable energy generation in the past to provide ongoing energy demands. The Project and its innovative technology would produce a long-duration grid-scale energy storage solution aligning with AEMO's strategy to assist with the transition to a renewable energy-based system while also contributing to maintaining the reliability and security of the electricity network.

2.4 NSW State Policy and Commitments

2.4.1 NSW Electricity Strategy 2019

The NSW Electricity Strategy 2019 (the Strategy) provides an overview of the current and projected electricity status in NSW and states the aims for the electricity system which are to provide reliable, affordable and sustainable electricity. According to the NSW Government, the State's existing fleet of power stations are reaching the end of their operational lives, causing increasing reliability risks to be experienced by the transmission system (NSW Government, 2019).

The Strategy encourages approximately $8 billion of private investment into the NSW electricity system, which includes $5.6 billion of investments into regional NSW, over a 10-year period (NSW Government, 2019). The Strategy also aims to provide 1,200 new jobs, mostly in regional NSW, and lead to a $3.4 billion net economic benefit for the entire State (NSW Government, 2019).

The Project is consistent with the objectives of the Electricity Strategy, in aiming to provide a low emission, reliability solution and electricity generation that is cost effective.

2.4.2 NSW Electricity Infrastructure Roadmap 2020

The NSW Electricity Infrastructure Roadmap 2020 (the Roadmap) is the State's plan to drive the transition of the state's electricity sector to a cheap, clean and reliable system underpinned by wind and solar power. Its enabling legislation, the *Electricity Infrastructure Investment Act 2020* (NSW), passed both houses of NSW Parliament with strong bi-partisan support and was enacted into law on 2 December 2020 (NSW Government, 2020).

The Roadmap promotes three key policy measures:

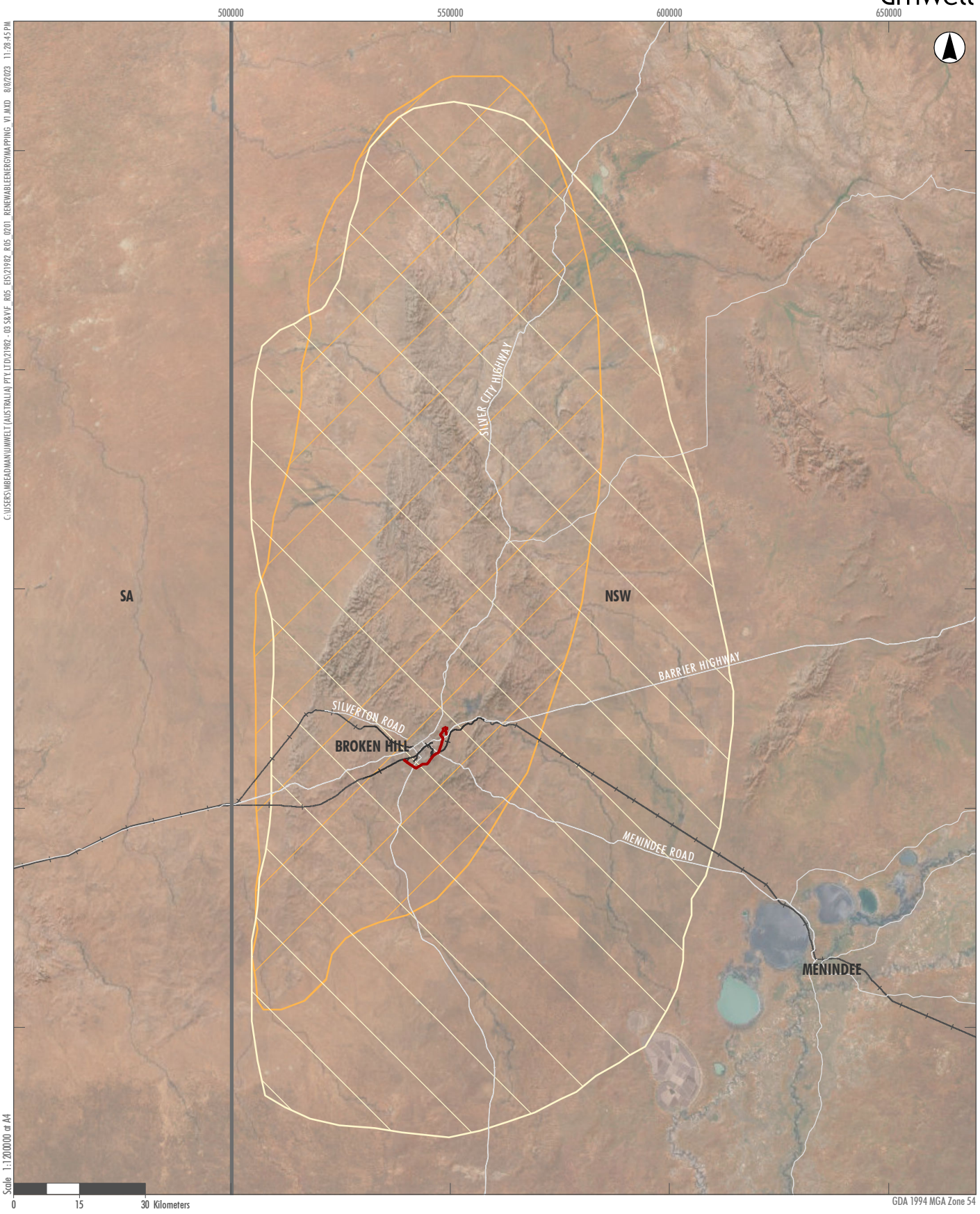
- new generation to replace retiring coal-fired power stations
- new network infrastructure to deliver energy to customers
- new storage and firming to better respond to our electricity needs and improve the reliability of the grid.

The Roadmap is intended to provide the private sector with certainty to invest in the infrastructure needed to deliver at least:

- 12 gigawatts of new renewable electricity generation
- 2 gigawatts of long-duration storage.

Broken Hill and the surrounding region have been identified as a significant solar and wind resource (refer to **Figure 2.1**). Although regional renewable development is progressing with the construction of the Silverton wind and solar farm and the Broken Hill Solar Plant, this existing and future renewable development is being curtailed and is subject to revenue reductions as a result of grid/network stability issues. The Project directly reflects the intentions of the Roadmap through:

- providing storage (via new technology) and firming
- improving reliability of the grid through dedicated local reserve capacity, which in turn provides improved certainty for further local investment in renewable technology (by providing a market for energy during periods where generation exceeds demand).



Legend

- Project Area
- State Border
- Railway Line
- Roads

Solar and Wind Energy Zone

- Solar Energy Zone
- Wind Energy Zone

FIGURE 2.1

Renewable Energy Mapping NSW

Image Source: ESRI Basemap (2022) Data source: DFSI (2023); SAGDD (2023)

2.4.3 NSW Net Zero Plan Stage 1: 2020–2030

The Net Zero Plan Stage 1: 2020-2030 (the Plan) aligns with the NSW Strategy and Roadmap and set out the NSW Government's proposed action on climate change and a goal to reach net zero emissions by 2050. It outlines the NSW Government's plan to grow the economy, create jobs and reduce emissions over the next decade.

The Plan aims to fast-track emissions reduction over 10 years and prepare the State to take further action in the following decades (NSW Government Department of Planning, Industry and Environment (DPIE), 2020). It is focused on the next decade because rapid changes in technology make identifying the lowest cost path to net zero difficult, with plans for subsequent decades to be developed in the future.

The Project directly supports the intent of reducing emissions by providing a lower-emission alternative to grid stability in the Broken Hill Region. The increased stability provides a foundation to attract further local investment in renewable technologies.

2.5 Local and Regional Context

2.5.1 Far West Regional Plan 2036

The *Far West Regional Plan 2036* presents a broad reaching and detailed vision for 2036 for a unique part of Western NSW. The vision is summarised as having a diverse economy, supported by the right infrastructure, an exceptional natural environment and resilient communities. The vision seeks growth in the renewable energy sector, including wind, solar and bioenergy generation to promote local jobs across smaller communities and provide opportunities for associated industries.

With most communities within the Far West largely focused around the mining and agriculture industries the Plan notes that they can be more vulnerable to economic downturn. The Plan aims to *promote the efficient use of infrastructure and cluster compatible land uses in the right places to support the regions competitiveness and productivity*.

The plan seeks to support the Far West to become a leader in renewable energy and climate change adaption. Direction 4 of the Plan is to diversify energy supply through renewable energy generation.

The Plan states that Broken Hill can capitalise on investment in renewable energy to develop generation and associated secondary industries including research, project management, installation, and asset management. The specific actions of the Plan in relation to renewable energy include:

- identify areas and project sites with renewable energy potential, and infrastructure corridors with access to the electricity network, to inform land use planning
- promote best practice community engagement to realise community benefits for all utility-scale renewable energy projects
- facilitate small-scale renewable energy projects using bioenergy, solar, wind, small-scale hydro, geothermal or other innovative storage technologies through local environment plans.

In addition, the Plan recognises that capitalising on opportunities to co-locate renewable energy generation at resource or industry sites can attract other similar industries. The Project is consistent with the vision of the Plan through direct economic benefit supporting future renewables development in the region as shown in **Table 2.1**.

Table 2.1 Alignment of the Project with Directions in the Far West Regional Plan 2036 (adapted from NSW Government, 2017)

Regional Plan Direction	Project alignment with Directions
2: Protect productive agricultural land and plan for greater land use compatibility	The Project Area does not contain any areas of productive agricultural land.
3: Sustainably manage mineral resources	The Project will assist with a sustainable and reliable energy storage solution to continue to support the development of mineral resource projects in the Broken Hill region.
4: Diversify energy supply through renewable energy generation	The Project will provide a low emission, alternative energy storage solution for the Broken Hill Region. This will assist with providing stability to the grid which may encourage further renewable development within the region.
13. Protect and manage environmental assets	No areas of high biodiversity value or Threatened Ecological Communities have been recorded within the Project Area. Where impacts to biodiversity are unavoidable, appropriate mitigation and management will be implemented through construction, operation, and decommissioning. A Biodiversity Development and Assessment Report (BDAR) has been prepared for the Project in accordance with the Biodiversity Assessment Method (BAM) and is provided in full in **Appendix 6**, with the findings summarised in **Section 6.2**.
18. Respect and protect Aboriginal heritage assets	The Project layout has been developed to avoid and minimise impact to identified Aboriginal cultural heritage constraints as far as practicable. An Aboriginal Cultural Heritage Assessment (ACHA) has been prepared, in consultation with the Registered Aboriginal Parties (RAPs) including field survey (with test excavation). The ACHA is attached as **Appendix 7** with the findings summarised in **Section 6.3**. An Aboriginal Cultural Heritage Management Plan (ACHAMP) will be prepared and implemented in consultation with the RAPs, to manage impacts to Aboriginal Cultural Heritage during construction and operation will include a salvage program (surface and subsurface), unexpected finds protocol and continued engagement with the RAPs.
22. Collaborate and partner with Aboriginal communities	Local Aboriginal stakeholders have been engaged during the preparation of the ACHA. A-CAES NSW has also engaged directly with the Broken Hill Local Aboriginal Land Council regarding the Community Benefit Agreement to be implemented as part of the Project. A-CAES NSW is also preparing an Indigenous Participation Plan (IPP) to be implemented as part of the Project.

2.5.2 Broken Hill Local Strategic Planning Statement 2020–2040

The *Broken Hill Local Strategic Planning Statement* (LSPS) *2020-2040* (BHCC, 2020) acknowledges the potential for changes in population, business opportunities, and in the environment and the need to plan now for growth and development. The LSPS focuses on the key land-use planning issues and actions required to be implemented into the future. The LSPS recognises that renewable energy resources are a key strength of the region given its arid climate, and that Broken Hill is becoming a hub for renewable energy lending itself to existing and planned large scale solar and wind developments.

A central objective of the LSPS is to support the existing industry base as well as emerging opportunities to grow and support Broken Hill City to become a more resilient regional centre. The LSPS identifies a number of key focus areas for action which includes utilities and connectivity. This action includes support to existing communities and catering for future growth with a focus on maintaining existing infrastructure as well as continued planning for new and improved facilities. The Project will support achievement of this central objective by always providing a dedicated energy reserve for reliability support services at Broken Hill.

The LSPS indicates Council will continue to encourage further industry research into options to supply more of the electricity supply needs of Broken Hill and the surrounding area from renewable energy. The Project will provide improved energy security for Broken Hill and support further renewable energy development in the area.

2.6 Environmental Context

2.6.1 Regional Context

The Project is located within the Broken Hill Local Government Area (LGA) in the Far West Region of NSW (refer to **Figure 1.1**). The Far West Region is expansive, covering an area from Lightning Ridge, near the Queensland border, to the Murray River townships near the Victorian border, and along the South Australian Border (NSW Government, 2017). The region has a population of 44,717. Broken Hill is considered the only city within the Far West Region, with a population of 17,558 in 2021, accounting for almost 40% of the total regional population (Australian Bureau of Statistics (ABS), 2021).

The LGA of Broken Hill is approximately 50 km from the South Australian Border. The closest capital city to Broken Hill is Adelaide, (located approximately 500 km away). Sydney is located 940 km from Broken Hill to the east-southeast.

Far West NSW's economy is significantly focused on mining and agriculture, specifically extensive pasturing. There continues to be a push from State Government to improve overall connectivity and infrastructure in the region to develop economic and social capacity within the region and to strengthen local communities (NSW Government, 2017).

Broken Hill has a long history of mining and is the location where the Broken Hill Proprietary Company Limited (now evolved into BHP Billiton) first commenced operations. Mining and mining exploration continues in and around the township, with major mining projects in the area including Cobalt Blue/Broken Hill Prospecting and Carpentaria Resources Hawson's Iron Project currently in development. These projects are all set to increase the workforce employed in mining in Broken Hill.

Recently, there has been a focus on increasing renewable energy projects in the region, with the first large scale renewable project (Silverton Wind Farm), which is located in the Barrier Ranges approximately 25 km to the north-west of Broken Hill, now operational. The Broken Hill Solar Plant has also been operating since 2015. The Solar Plant has a capacity of 53 MW and is located around 5 km southwest of Broken Hill, occupying approximately 140 hectares of Crown Land. Both Silverton Wind Farm and the Broken Hill Solar Plant are owned and operated by AGL, with the company recently announcing a battery energy storage system (BESS) to be built on the outskirts of Broken Hill, expected to be operational in 2023 (refer to **Section 2.7** for further detail).

2.6.2 Land Use and Ownership

The SCES Facility and majority of the proposed transmission line alignment is located within the Broken Hill LGA. A short section (~400 m) of the transmission line crosses into the Unincorporated Far West Region, (refer to **Figure 2.2**). The Project Area covers multiple land zonings. The proposed SCES Facility is located on land zoned Special Purpose 1 (SP1) (mining). The transmission line traverses SP1 (mining), Rural Landscape (RU2), Private Recreation (RE2), Special Purpose 2 (SP2)(water supply systems) and Environmental Conservation and Environmental Living land zonings. The length of transmission line within the Unincorporated Far West Region does not have any applicable zoning. The Local Environmental Plan (LEP) zone mapping is illustrated in **Figure 2.2**.

The Project Area (including both the SCES Facility and transmission line) extends across multiple different land uses, with the proposed SCES Facility sited within the existing Potosi Mine mining operation on land used for mining purposes. As discussed in **Section 1.6**, the proposed SCES Facility overlaps with existing and approved mining areas associated with the Potosi Mining operations.

The SCES Facility is surrounded predominately by vacant mining land. There are commercial properties located to the north and west with the closest property associated with the Broken Hill Pistol Club. A telecommunications (NBNCo Satellite Compound) is located to the northeast and Outback Astronomy (outdoor stargazing business) located approximately 1.3 km to the east.

The transmission line traverses mining, rural and industrial land uses. Small areas of recreational land use zones are also traversed in proximity to the southern side of Broken Hill City, which are currently subject to various land lease agreements including golf and gun clubs. The transmission line also skirts the Broken Hill Airport; to avoid the Airport the alignment enters part of the Broken Hill Regeneration Area for a short distance (two sections approximately 450 m and 2 km in length) before connecting to the existing Transgrid substation; refer to **Figure 2.3**.

The closest residence (R1) is located approximately 900 m east of the SCES Facility. There is also a residence (R2) located within the Outback Astronomy business and an additional residence (R9) approximately 1.3 km and 1.9 km east of the SCES Facility across the Barrier Highway. An additional five residences (R3, R4, R6, R7, and R8) are located between 2 and 3 km from the SCES Facility. All other residences and the main residential areas within Broken Hill City are located >3 km from the SCES Facility (refer to **Figure 2.3**). The proposed transmission line, at the closest point is approximately 500 m south of the main residential areas of Broken Hill with the exception of one residence (R17), which is located approximately 80 m west of the proposed transmission line (refer to **Figure 2.3**).

The Project Area is approximately 200 ha and contains (wholly or partly) 30 cadastral lots, refer to **Appendix 1**. The majority of land within the Project Area is Crown Land, other landowners include Perilya, Broken Hill Council and one private landowner (refer to **Figure 2.3**). The Project Area is subject to mineral exploration licences and/or is subject to a mining/production lease; these are illustrated on **Figure 2.4**.

2.6.3 Natural, Cultural and Built Features

The area that encompasses Broken Hill was occupied by Aboriginal people for thousands of generations prior to colonisation. The three major language groups for Broken Hill region include Barkindji, Mayyankapa and Nyiimpaa. The Project Area is not on land subject to potential Native Title claim, however, adjoins land associated with the determined Barkandji Traditional Owners Native Title Claim (NCD2015/001); refer to **Section 6.3** for further detail.

The City of Broken Hill is listed on the National Heritage List (ID: 105861), the listing comprises the entire Broken Hill City Council LGA boundary and applies to the Project Area. The listing is linked to the historic mining operations associated with Broken Hill and acknowledges its industrial nature and significance in developing mining operations within Australia.

The closest National Park, State Park or Conservation Reserve is the Boolcoomatta Conservation Reserve (located in South Australia), approximately 69 km to the west. Kinchega National Park is located approximately 84 km to the southeast and Mutawintji National Park is located about 100 km to the northeast of the Project Area. The Imperial Lakes Nature Park is located to the southwest of the SCES Facility, this is a private nature park owned by Broken Hill Landcare.

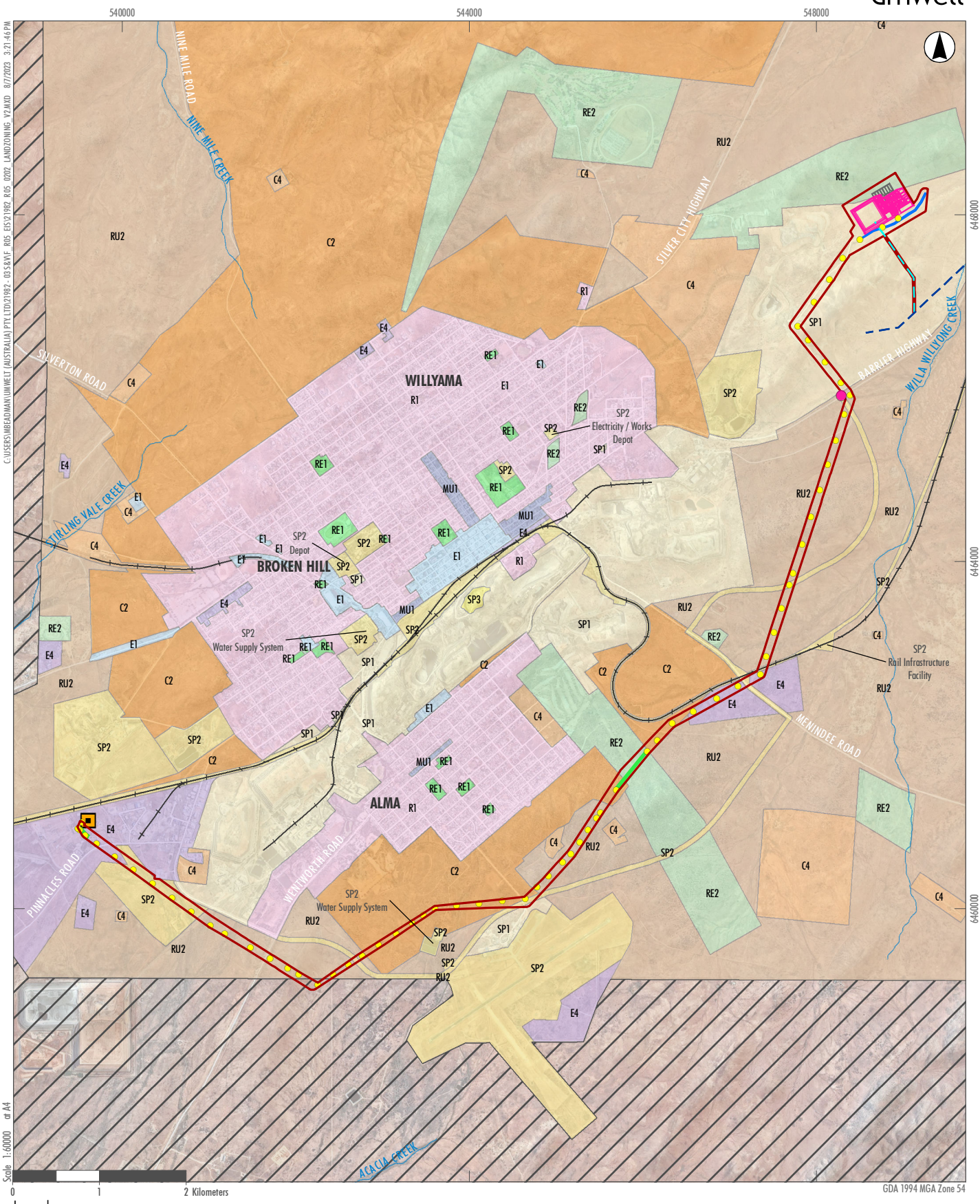
The topography of the Project Area varies between 260 mAHD and 300 mAHD, with elevations of up to 315 mAHD along the proposed transmission alignment (refer to **Figure 2.5**). The area within and surrounding the Project Area is predominantly undulating with areas of steeper slopes associated with overburden emplacement. The local site catchment associated with Potosi Mine has an average slope of approximately 6%, with the gradient falling from the western to the eastern extent of the catchment.

The climate within the Project Area is arid, with average rainfall of 246 mm of rainfall each year and evaporation highest from October to March. January is usually the wettest month (28 mm over 2.4 rain days) and July is usually the driest month (17 mm over 2.8 rain days). Regionally, January is typically the warmest month with mean daily maximum temperatures generally ranging from 16°C in July to 34°C, with July the coolest.

Prevailing winds are generally from the south and north to northeast during the morning period and south to west and northwest during the afternoon period. Wind speed is generally lowest in the autumn months and strongest in the spring months (BoM, 2023).

The Project Area is located within the broader Darling River catchment and the SCES Facility is located within the immediate catchment of Willa Willyong Creek (to the south-east of the SCES Facility) which drains in a north-easterly direction to Stephens Creek Reservoir (refer to **Figure 2.5**). Stephens Creek Reservoir is located approximately 6 km to the north-east of the SCES Facility which provides a backup water supply to Broken Hill and surrounding region.

The transmission line alignment passes through the catchments of Willa Willyong Creek (4th order stream), Kellys Creek (4th order stream) and Acacia Creek (3rd order stream; a tributary of Kellys Creek) traversing a number of unnamed first, second and third order tributaries to these three creeks (refer to **Figure 2.5**). These creeks are ephemeral (only flow for brief periods as a direct result of rainfall). Kellys Creek is a tributary of Stirling Vale Creek which is in turn a tributary of Pine Creek which drains in a south-easterly direction toward the Darling River which is approximately 100 km to the south-east of the Project Area.



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Site Access Point
- Drainage Line
- Railway Line
- Road

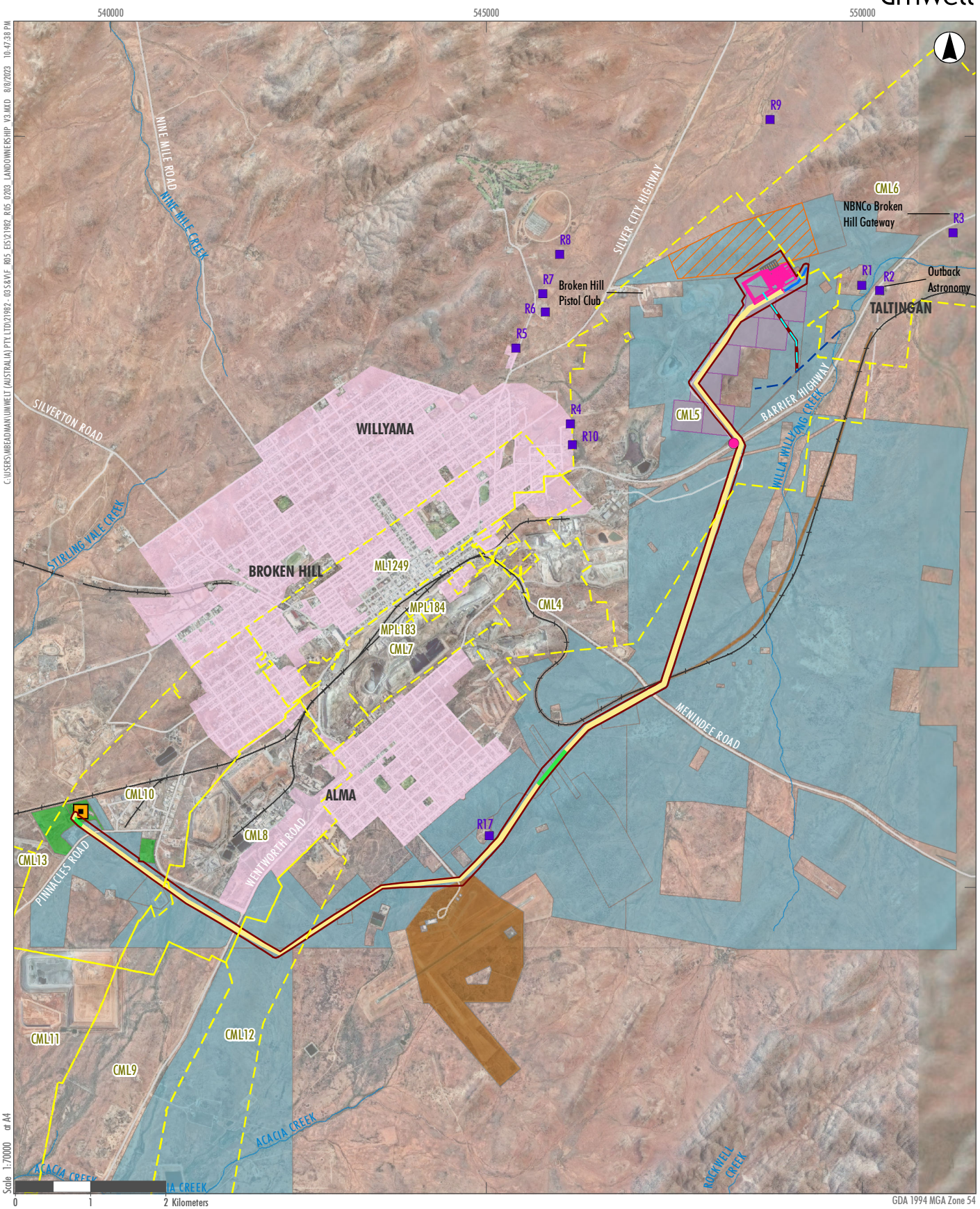
EPI Land Zoning

- C2 Environmental Conservation
- C4 Environmental Living
- E1 Local Centre
- E4 General Industrial
- MU1 Mixed Use
- R1 General Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU2 Rural Landscape
- SP1 Special Activities
- SP2 Infrastructure
- SP3 Tourist
- Unincorporated Far West Region - No Zoning

FIGURE 2.2

Land Zoning

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



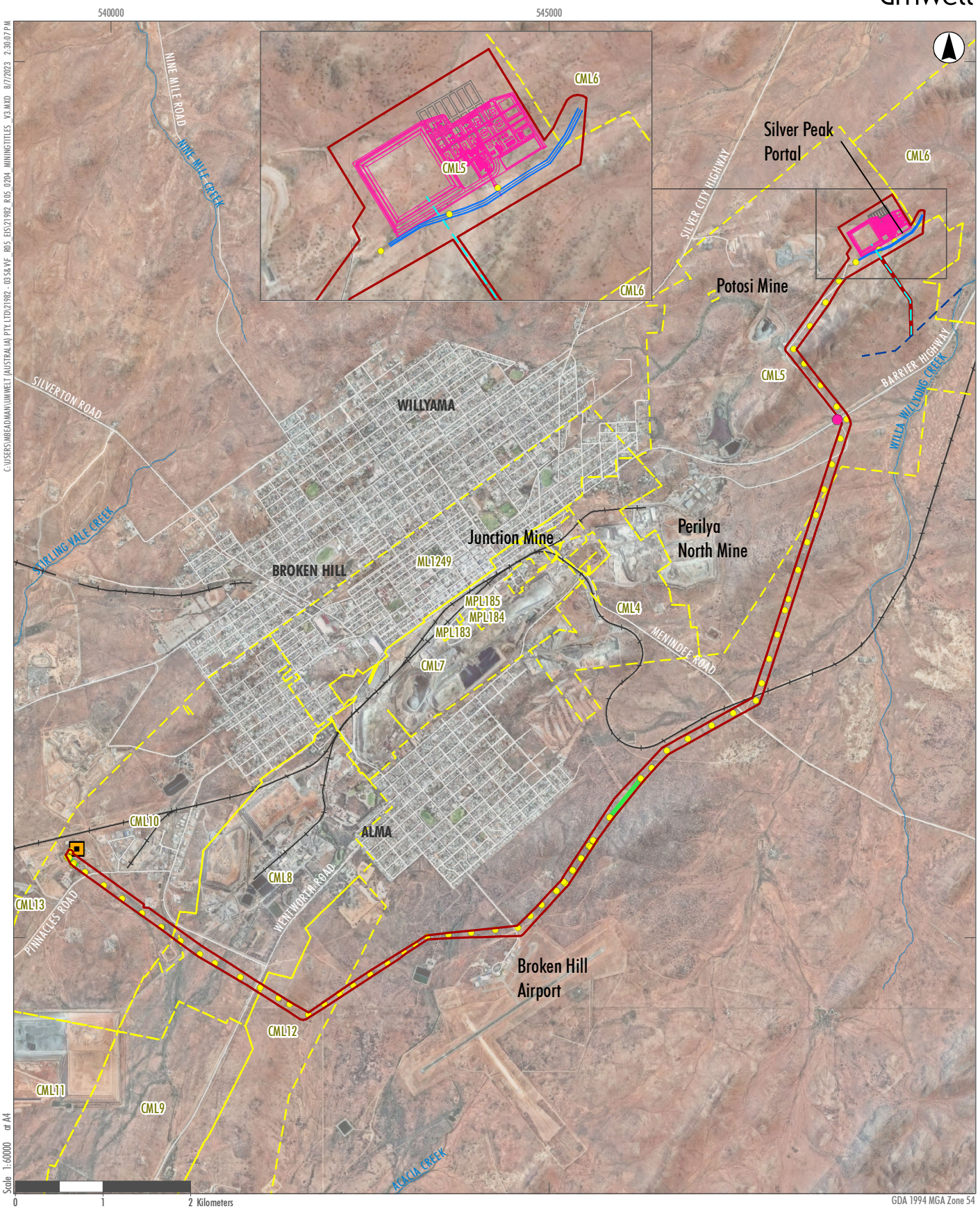
Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Proposed Transmission Line (Above Ground Section)
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Site Access Point
- Perilya Owned Land
- Freehold Land
- Crown Land
- Government Authority Controlled Land
- Broken Hill Residential Area (zoned R1 General Residential Broken Hill LEP)
- Mining Lease Boundaries
- Rifle Club Exclusion Zone
- Residential Receiver
- Drainage Line
- Railway Line
- Road

FIGURE 2.3

Land Ownership

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023); MinView (2023)



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Tranmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Site Access Point
- Mining Lease Boundaries
- Drainage Line
- Railway Line
- Road

FIGURE 2.4

Mining Titles

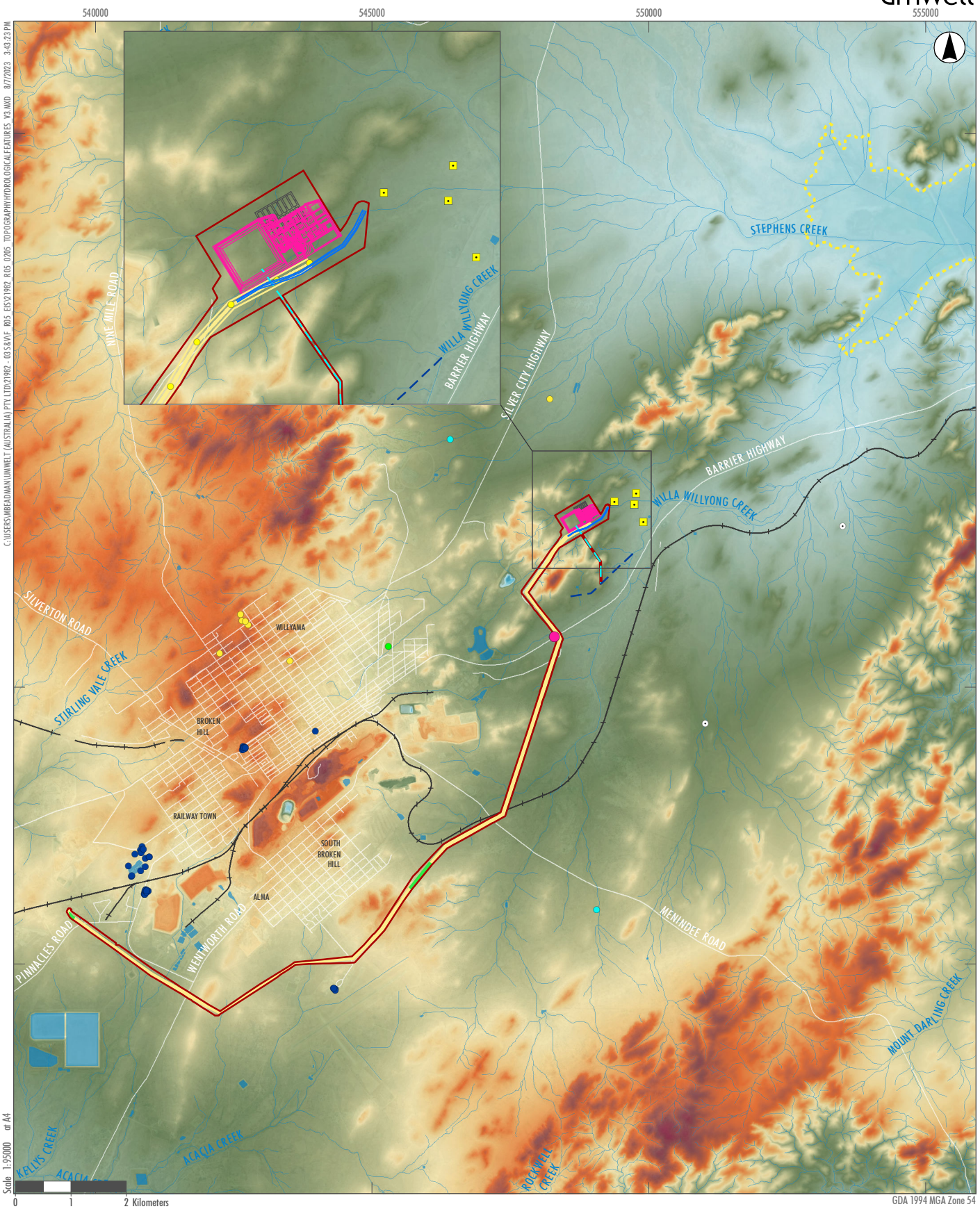
Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023); Minview (2023)

The main groundwater units within the Project Area are the Quaternary colluvium and the Proterozoic hardrock. The colluvium is present at surface within the Project Area and is likely to be largely unsaturated due to limited rainfall in the region and high evapotranspiration; however, there is the potential for short term recharge following rainfall events. The Proterozoic Hardrock within the Project Area has some groundwater occurrence associated in areas where the Hardrock is fractured around fault and shear zones. The available data indicates the presence of groundwater in the Hardrock unit is currently influenced by the long history of mining in the region, with groundwater levels ranging between 2.5 and 19.5 metres below ground level (mbgl) (Umwelt, 2023).

The main water supply for the Broken Hill township is via the 270 km Wentworth to Broken Hill pipeline from the River Murray, with secondary supply provided by the Stephens Creek Reservoir. There are 57 registered bores within 10 km of the Project, ranging in depth from 2 m to 141.5 m, with the majority of bores installed for monitoring purposes. The closest water supply bore is 2 km to the north of the Project Area (refer to **Figure 2.5**).

The area is geologically complex forming part of the Willyama Supergroup which includes ore bodies containing zinc, lead and silver. The Willyama Supergroup is composed of high-grade metamorphic rocks with igneous intrusions, volcanic and sedimentary deposits. The Hardrock geology within the Project Area includes the Proterozoic Upper Fryers Metasediments and the Hores Gneiss with a depth of weathering to approximately 80 m depth (refer to **Figure 2.6**). The ore body at Broken Hill is a large base metal deposit, predominantly composed of lead, zinc and silver and extends more than 7 km along a northeast strike and included more than 280 million tonnes of lead-zinc-silver, prior to mining (CMJA, 2006).

Within the Potosi Mine, the rock formation is composed of the Potosi Gneiss (a quartz-feldspar-biotite-garnet gneiss) which is an extremely competent rock. Intrusions of coarse-grained pegmatite (igneous) are also to be expected. There are two major shear zones present including the Globe Vauxhall Shear and the Western Shear along with numerous faults. The Potosi Gneiss rock formation is characterized by an abundance of spotty garnets, medium to fine grained quartz, feldspar and biotite mica. It is typically massive and very strong, refer to **Appendix 16** for further detail.



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Proposed Transmission Line (Above Ground Section)
- Proposed Transmission Line (Underground Section)
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Site Access Point
- Stephens Creek Reservoir
- Water Storage
- Drainage Line
- Railway Line
- Road

Flying Doctor Bores
- Monitoring

NGIS Bore Type
- Monitoring
- Other
- Stock and Domestic
- Unknown
- Water Supply

Modelled Terrain
- High : 422m
- Low : 197m

FIGURE 2.5

Topography and Hydrology

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY LTD\21982 - 03 S&V\F_R05_EIS\21982_R05_0206_GEOLOGY_V2.MXD 6/8/2023 1:05:01 PM

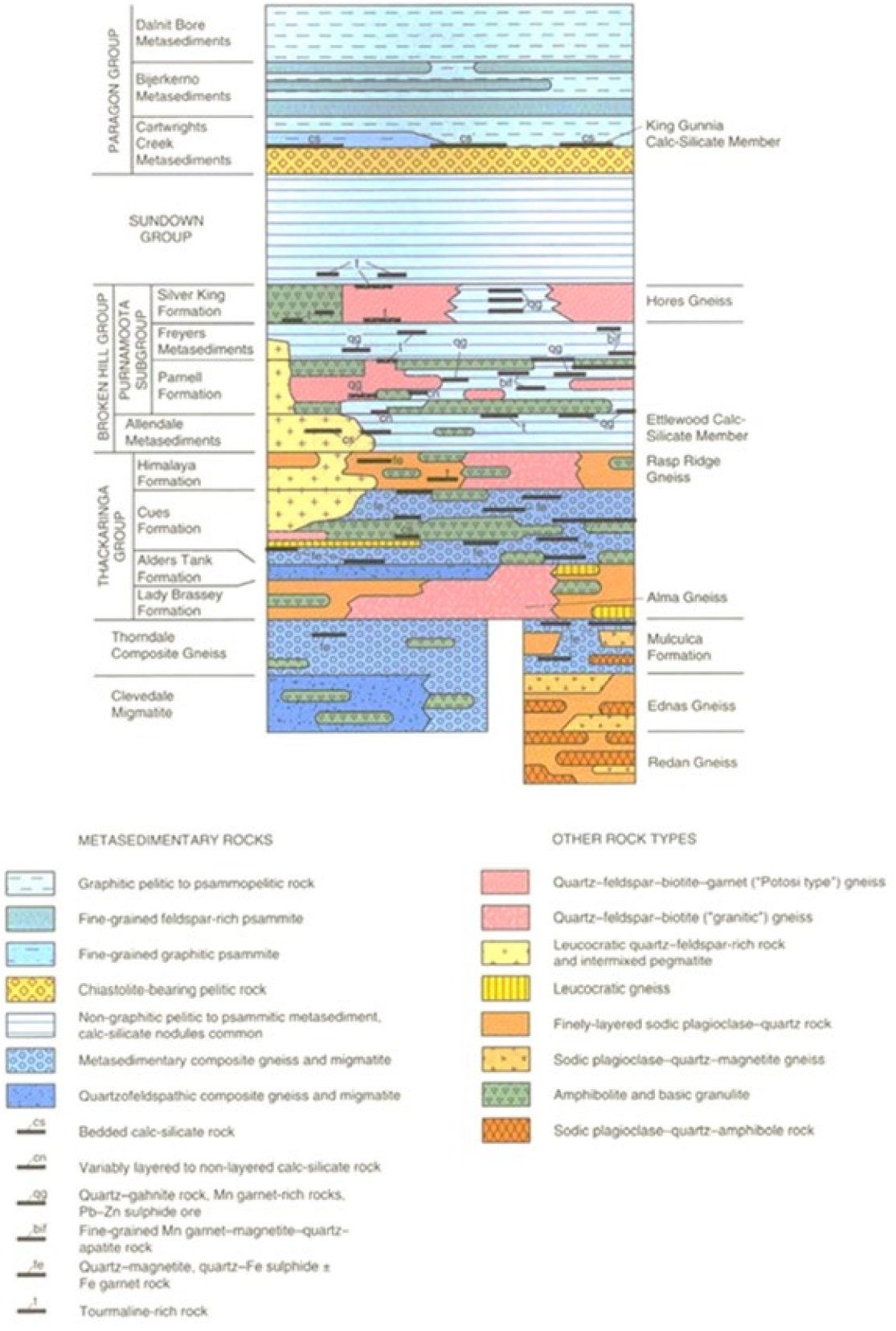


FIGURE 2.6

Geology

Image Source: CMJA (2006)

The Project Area largely comprises areas that have previously been disturbed and historically cleared for mineral extraction purposes. Six different plant community types (PCTs) have been mapped within the Project Area, including:

- PCT41 River Red Gum open woodland wetland of intermittent watercourses mainly of the arid climate zone (Transmission Line).
- PCT123 Mulga – Dead Finish on stony hills mainly of the Channel Country Bioregion and Broken Hill Complex Bioregion (SCES Facility and Transmission Line).
- PCT136 Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone (SCES Facility and Transmission Line).
- PCT150 Bottlewasher – Copperburr grassland of the arid zone (Transmission Line).
- PCT155 Bluebush shrubland on stony rises and downs in the arid and semi-arid zones (SCES Facility and Transmission Line).
- PCT 158 Old Man Saltbush – mixed chenopod shrubland of the semi-arid hot (persistently dry) and arid climate zones (north-western NSW) (Transmission Line).

Fauna habitat within the Project Area is limited. Surveys across the Project Area have detected no large hollow bearing trees. Some low-lying rocky habitat has been detected. The Project Area has been subject to various degrees of disturbance associated with historic mining and industrial land use and multiple areas are also subject to rubbish dumping. The creek lines generally have a high level of exotic flora species present. Overall, the site is dominated by native remnant arid land vegetation.

2.7 Cumulative Impacts

As discussed in **Section 1.6**, the proposed SCES Facility will be co-located within the existing Potosi Mine. Other existing and proposed developments surrounding the Project Area predominately relate to existing and proposed mining development and renewable energy (solar, wind and battery storage).

The Cumulative Impact Assessment (CIA) Guidelines for State Significant Projects (DPIE, 2021) require the consideration of a project together with the impacts of other relevant future and existing projects in order to determine the potential cumulative impacts.

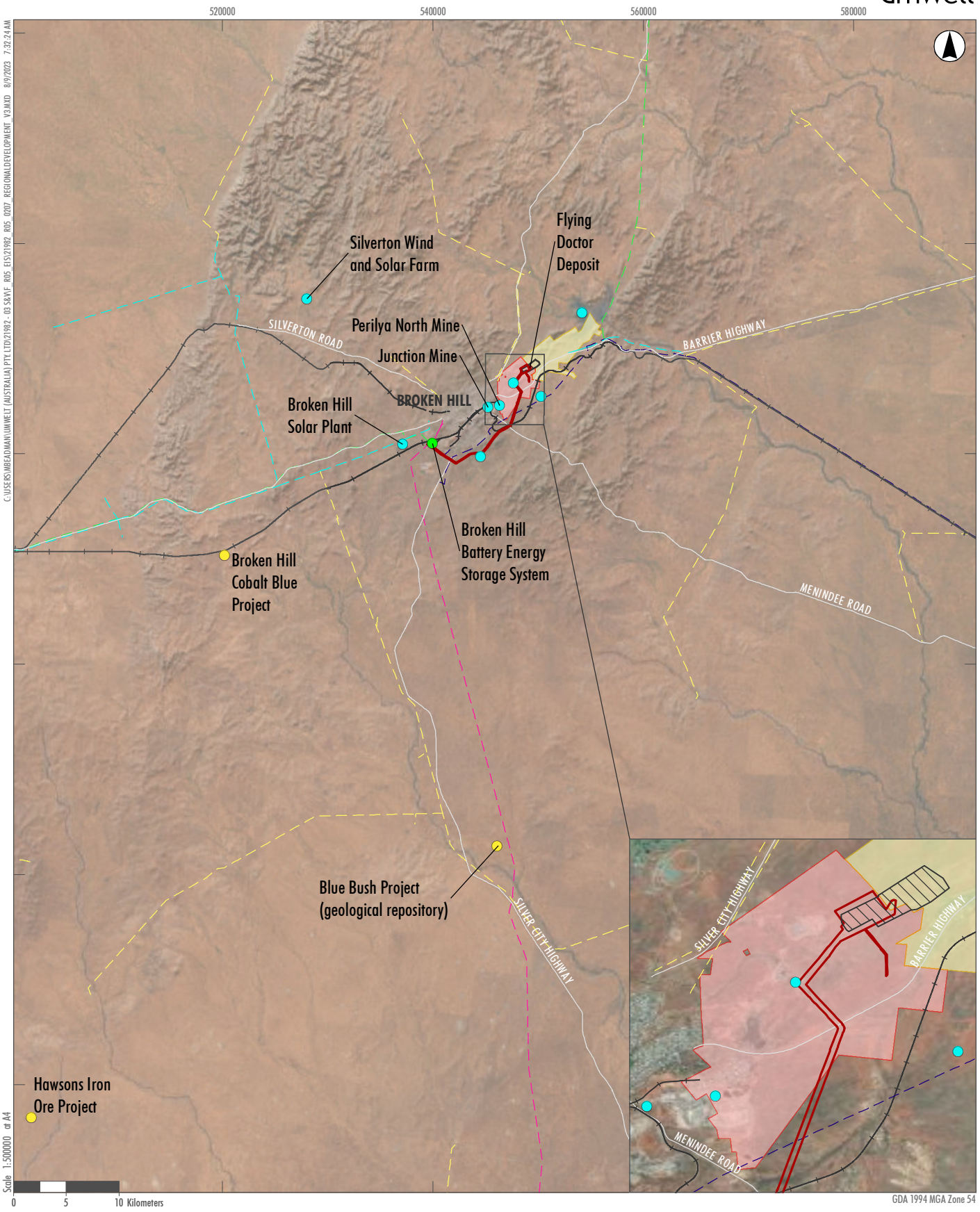
The cumulative impact assessment prepared for the Project has predominately focused on the relevant existing and proposed projects in the vicinity of the Project Area and the City of Broken Hill as outlined in **Table 2.2** and shown on **Figure 2.7**. The cumulative impact assessment of the Project, including the methodology for determining which projects are relevant for consideration for particular issues is presented in **Section 6.15**.

Table 2.2 Existing and Proposed Developments in the Vicinity of the Project Area

Name (Development / Developer)	Project Type	Location from Proposed SCES Facility	Status
Perilya Potosi and Flying Doctor Mining Operations	Mining	Overlapping Project Area	Operational
Perilya Broken Hill North Mining Operations	Mining	~4 km southwest	Operational
Junction Mine	Mining	~6 km southwest	Operational
Perilya Southern Mining Operations	Mining	~9 km southwest	Operational
Observatory Broken Hill	Other	~2 km southeast	Operational
Broken Hill Airport	Other	~8 km southwest of SCES Facility. Transmission line skirts Airport boundary.	Operational
Silverton Wind Farm	Wind	~12 km northwest	Operational
Broken Hill Solar Plant	Solar	~10 km southwest	Operational
Broken Hill Battery Energy Storage System	Other	~8 km southwest	Approved
Broken Hill Cobalt Blue Project	Mining	~30 km southwest	Under Assessment
Blue Bush Project	Waste	~50 km south	Under Assessment
Hawsons Iron Ore Project	Mining	~70 km southwest	Under Assessment

Due to the co-location of the SCES Facility on the Potosi Mine, the key potential cumulative impacts are expected to be associated with:

- Traffic and Transport Impacts – associated with general construction traffic impacts in the locality due to movements to/from the Project Area (predominately the area associated with the SCES Facility) and Over Size Over Mass vehicle movements along the proposed traffic routes to the Project Area.
- Noise – associated with general construction activities and operational noise undertaken within the Project Area and road traffic noise associated with vehicle movements to and from the Project Area.
- Social/Economic – including demand on accommodation, services, and businesses (supply/demand for products and services).



Legend

- Project Area
- Flying Doctor Project Area
- Railway Line
- Roads

Mining Lease Boundaries

- CML5
- CML6

Existing Electricity Transmission Lines

- 19.1kV
- 220kV
- 22kV
- 33kV
- 66kV

SSD Development

- Approved
- Operational
- Proposed

FIGURE 2.7

Regional Development

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023); MinView (2023)

2.8 Project Alternatives Considered

Broken Hill was identified as a location for the Project through the RIT-T process. No alternative sites outside of the Potosi Mine site were considered for the implementation of the Project, however, alternative locations within Potosi Mine were investigated and as discussed in **Section 1.4**, alternative transmission alignments were also investigated.

2.8.1 Alternative Site Locations

The Potosi Mine site was selected as the proposed location due to favourable geological conditions, utilisation of existing disused mining areas and of existing mine infrastructure, machinery and underground workings. It also provides a suitable buffer distance to other land uses including from the residential areas of Broken Hill.

Two locations for the SCES Facility within the Potosi Mine site were investigated. The proposed location is preferred due to being immediately above the deepest part of the Potosi Mine (Level 20/21) and close to the existing mine access shafts.

The alternative site location considered was immediately south of the preferred site location. This location also had favourable geological conditions, however, the depth of the existing underground mining in this location was not suitable. Additionally, this location would be closer to receivers within the vicinity of the Project Area.

2.8.2 Alternative Transmission Line Alignments

Three transmission alignment options were investigated during the initial design phase of the Project (refer to **Figure 1.3**). The three options considered were:

Northern Alignment – located on the northern boundary of the City of Broken Hill using new and existing easements. The northern alignment was restricted by a combination of large areas associated with the Broken Hill Regeneration Area and Environmental Protection Zoning, Native Title and potential cumulative impact due to existing multiple transmission lines. The Broken Hill Regeneration Areas were established in the 1930s to revegetate the edges of the City to provide protection from dust storms.

Central Alignment – across the Perilya North Mine and then through the existing mined area located in the centre of the City of Broken Hill using a combination of new and existing easements. The central alignment, while predominately disturbed is constrained due to conflict with existing infrastructure and land use. There are also multiple listed heritage items within close proximity associated with the National Listing of Broken Hill applying further constraint to this alignment.

Southern (proposed) Alignment – the southern alignment includes a combination of existing and new easements predominately located on Perilya and Crown owned Land, where land subject to Native Title can be avoided. It potentially requires widening of some current powerline easements and some new easements running south around the southern boundary of the City of Broken Hill.

The proposed alignment was selected based on reduced land use conflict (including land subject to determined Native Title), impact to biodiversity values and separation from sensitive receivers including residential land use, tourism and historic heritage values.

2.8.3 The 'Do-Nothing Option'

The 'do nothing option' would imply that the Project is not developed and would therefore forgo the Project's identified benefits. Significant social and economic benefits will be created through capital investment and provision of direct and indirect employment opportunities during the construction and operation of the Project. The 'do-nothing option' also results in a lost opportunity for a diversified post-mining land use for the Potosi Mine.

The 'do nothing option' would avoid the environmental and social impacts associated with the construction, operation and decommissioning of the Project, such as biodiversity and Aboriginal heritage impacts, and amenity impacts (noise and traffic). These impacts are, however, considered to be manageable through the implementation of the management and mitigation measures outlined in **Appendix 3**.

A-CAES NSW has proceeded with the Project as a direct response to reliability supply issues in Broken Hill and as the preferred option identified by Transgrid through the RIT-T process. Irrespective, Transgrid will still be obliged to implement a solution to the reliability supply issues in Broken Hill. Under the 'do-nothing option' for this Project, a sub-optimal solution would need to be implemented by Transgrid.

2.9 Project Related Agreement and Programs

Through the development of the Project design and the stakeholder engagement process, A-CAES NSW has developed and implemented a number of Project related agreements and benefit sharing programs.

2.9.1 Land Agreements

As outlined in **Section 1.6**, A-CAES NSW has secured a long-term land agreement with Perilya which will cover the full operational life of the Project. The areas of Crown Land associated with the location of the proposed SCES Facility require a Special Purpose Lease which is currently being pursued. Landowners consent for lodgement of the DA has been secured from all landowners relevant to the Project Area.

Long-term access to tenure will be secured through a term lease under Division 5.5 of Part 5, Section 5.16 of the *Crown Land Management Act 2016* (CLM Act). A-CAES NSW received direct dealing approval from the NSW Department of Planning and Environment (Crown Lands Department) to negotiate the term lease (and associated easements required for the transmission line) on 2 March 2023 and is currently in the process of negotiating the term lease to secure the required long-term access to tenure for the SCES Facility.

As the SCES Facility will be located on part of Crown Land forming part of the Willyama Common, the Crown Lands Department is currently in discussions with Council regarding revoking the Willyama Common over this area. The transmission line comprises a mixture of:

- Crown Land
- Crown Land subject to perpetual leases
- Crown Land forming part of Willyama Common
- freehold land owned by Perilya
- freehold land owned by Transport for NSW.

A-CAES is currently in the process of negotiating and finalising options for easements with each of the relevant landowners, land managers and relevant stakeholders to secure options for easement over land forming part of the transmission line.

A-CAES NSW also have a negotiated agreement with the landowner associated with Residence No.1 (R1) to address the exceedance of noise criteria associated with the Project. This dwelling is therefore considered an associated dwelling.

2.9.2 Indigenous Participation Plan

A-CAES NSW is developing an Indigenous Participation Plan (IPP), to be implemented as part of the Project. The IPP will being developed in consultation with Broken Hill Local Aboriginal Land Council (BHLALC), the Wilyakali and Barkindji Aboriginal Corporations and the Department of Education, Skills, and Employment as part of A-CAES NSW's broader engagement with the Broken Hill community. The IPP aims to investigate options for prioritising the employment of local Indigenous people and commit to the implementation of specific procurement actions to ensure the local and regional Aboriginal community continue to have the opportunity to be involved in the Project through the construction and operational phases.

2.9.3 Voluntary Planning Agreements

A Voluntary Planning Agreement (VPA) is not proposed. A-CAES NSW is implementing a Community Benefit Agreement with Broken Hill City Council to provide support for community energy via development of commercial models, implementation of preferred models and supply of energy assets. The agreement will also involve the identification and restoration of a Council-owned heritage listed building or structure for shared and community use.

2.10 Project Benefits

A-CAES NSW is developing a range of Community Benefit Agreements to distribute direct benefits to the community including Broken Hill City Council, Landcare Broken Hill, the Broken Hill Local Aboriginal Land Council (LALC), a renewable energy training fund and a community benefits small grants fund, refer to **Section 6.10** for further detail.

More broadly the Project will provide long-term, strategic and economic benefits to Broken Hill and the State of NSW, including:

- enhanced energy security for Broken Hill whilst providing low emission energy replacement for the existing diesel-fired turbines which are approaching the end of their operational life
- the firming required to meet the rising contribution of renewables in the transitioning energy mix
- generation of 780 full time equivalent (FTE) job years (over three years) with an average of 260 FTE workers per year and peak of 400 FTE workers.
- generation of approximately 36 enduring jobs (26 direct and 10 indirect) during the operation and maintenance phase
- diversify the use of the existing mining land and provide a long-term post mining land use for the Potosi Mine site

- accelerate the opportunity for, and support of, the development of future renewable energy projects in the Broken Hill region
- provide ongoing financial assistance through the Community Benefit Agreement to ensure direct benefit from the Project to the local community, including local schools, training or education as well as grants or support for local community, environmental and/or sporting groups.

3.0 Project Description

This section describes the layout, location and function of all infrastructure to be constructed and operated as part of the Project. Descriptions of the construction, operation and decommissioning phases of the Project are also provided.

3.1 A-CAES Technology Overview

Using only water and compressed air, A-CAES technology provides a long-duration grid-scale energy storage solution. The A-CAES technology uses energy from the grid when it is plentiful to compress air from the atmosphere and injects it into the underground cavern. The air remains in the cavern, sealed under pressure from the water reservoir above the cavern. The compressed air is then released from the cavern and generates electricity through an air turbine producing power at the time it is needed (refer to **Figure 3.1**).

When the system is charging (charge cycle) electricity is drawn from the grid and used to drive the air compressors, converting the electrical energy to heat and air. The heat is stored separately at the surface within thermal storage tanks for later use during the discharge cycle. The compressed air is charged into the storage cavern and the water is displaced via a connecting shaft into the surface reservoir. This maintains a constant pressure of the air within the cavern.

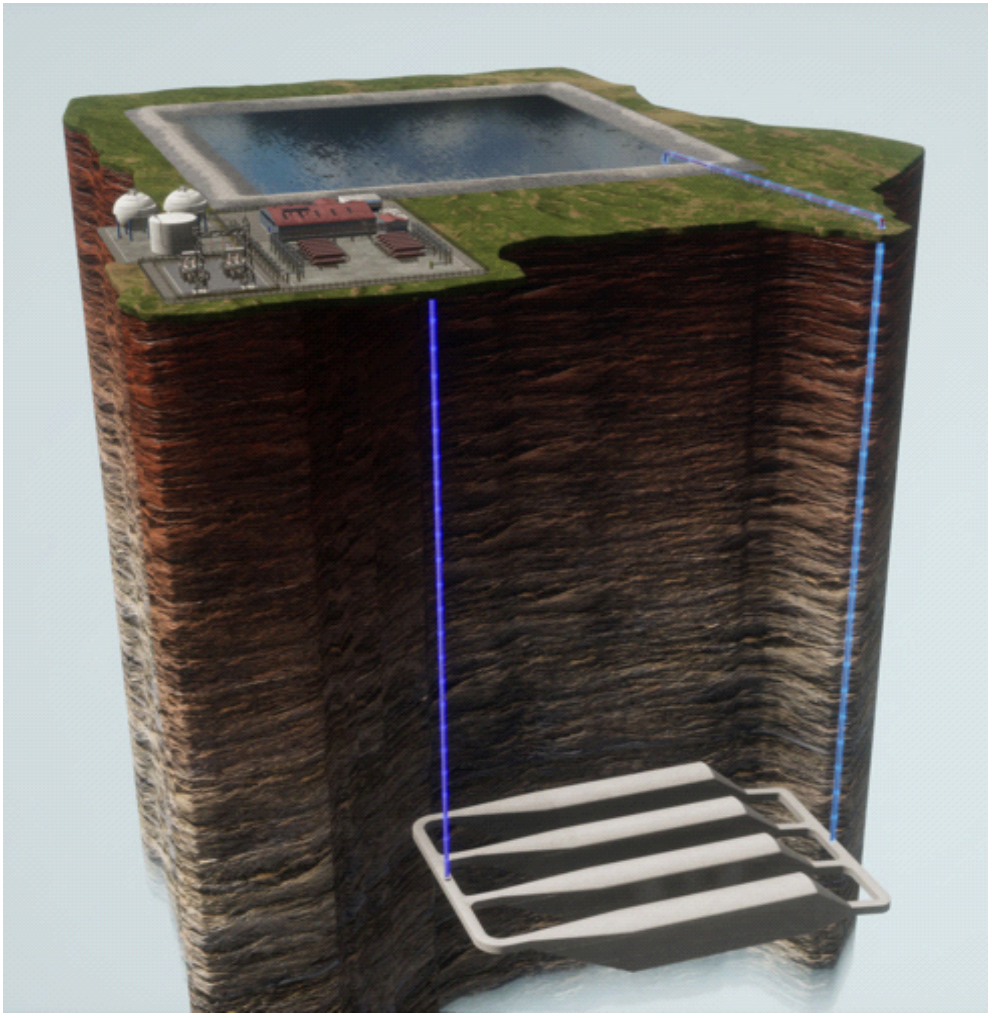
The air remains in the cavern, sealed under pressure from the water in the reservoir until electricity is required. When needed to generate electricity (discharge cycle) compressed air is discharged from the cavern, which allows the water to re-flood the cavern. The high-pressure air exiting the cavern is re-heated using the heat stored during the charge cycle, this air then used to drive the air expansion turbine generators, converting the energy back to electricity and transmitting it into the grid. The combined compressed air, underground cavern and water storage is designed to provide a long-term clean energy storage solution that does not use fossil fuels or hazardous materials to store energy.

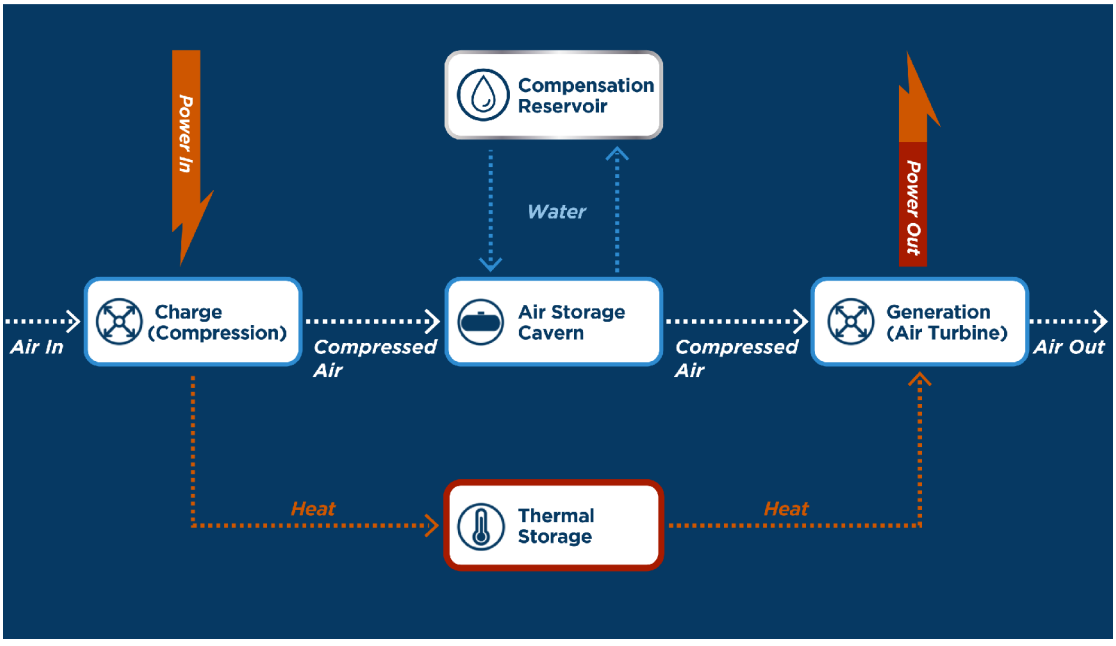
In addition to the storage of electricity for use on the broader NEM, the SCES Facility will maintain a reserve capacity of 250 MW to provide back-up electricity generation to Broken Hill during times of planned and unplanned outages. This will replace the existing back-up diesel-powered combustion turbines which are approaching the end of their operational life.

The frequency of the charging and discharging cycles is dependent on the requirement of the grid. The SCES Facility can be charged daily and can remain charged for long durations before discharging. However, when charged for long durations additional maintenance plant is required such as electrical heaters which form part of the proposed plant. Outside of the charging and discharging cycles the SCES Facility is maintained in standby mode. During standby mode the plant is maintained by various pumps, heaters and coolers.

If significant maintenance is required the plant would undergo a complete shutdown, where the entire plan would be shut down and depressurised.

C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY LTD\21982 - 03 S&V\F_R05_EIS\21982_R05_0301_ACAESTECHNOLOGYOVERVIEW_V2.MXD 8/10/2023 5:10:46 PM
Scale 1:0 at A4





Note: Not to Scale

FIGURE 3.1

A-CAES Technology Overview

Image Source: Hydrostar (2022)

3.2 Project Summary

A summary of the Project, listing details of the proposed development for which approval is sought, is summarised in **Table 3.1**.

Table 3.1 Project Summary

Key Element	Description
Life of the Project	50 years (operations)
Project Area	Approximately 200 ha (SCES Facility ~45 ha, transmission line corridor ~155 ha. The Project is located across 30 cadastral lots, refer to Schedule of Lands **Appendix 1**.
Disturbance Area	Approximately 46 ha (SCES Facility ~31 ha, transmission line corridor ~15 ha – including areas of temporary disturbance associated with access and laydown areas).
Project Area Access	SCES Facility – Silver Peak Road (existing Potosi Mine access road) via the Barrier Highway. Transmission Line – key access points from Kanandah Road/Pinnacles Road, Silver City Highway, Wentworth Road/Picton Street and Menindee Road.
SCES Facility	SCES Surface Facility: • 2 x 100 MW Turbine/Generator/Compressor Trains. • Switchyard, Office, Warehouse and Guardhouse and other facilities associated with the operation of the SCES Facility. • Utilities storage (fuel/water). • Water Reservoir (~200 m x 300 m) ~300 ML. • Underground Cavern ~250,000 m^2 (~600 m below ground level). • 1 Air and 1 Water shaft connecting the underground cavern and surface infrastructure. • Above ground water pipeline (~1 km) to connect to existing Stephens Creek Pipeline.
Transmission Line	~16 km 220 kV transmission line • Overhead line (18 m–25 m in height Pole No. 33–40) with 50 m easement. • Overhead line (30 m–36 m in height Pole Nos. 1–32 and 41–70) with 50 m easement. • Inground section between pole No. 29 and 30 and both overhead and inground options relating to connection to existing substation (to be confirmed during detailed design) with 20 m easement.
Ancillary transmission connection works	Ancillary works within substation including creation of hardstand, installation of connection infrastructure and re-configuration works.
Temporary Construction Facilities	Temporary construction facilities include: SCES Facility: • site compound including storage areas, offices, ablution facilities, and car parking • laydown areas for storing plant and equipment, and for deliveries, • areas to store excavated material and construction waste storage areas. Transmission Line: • access roads for pole erection and maintenance • brake and winch pads for conductor installation • laydown and storage areas.

Key Element	Description
Construction water use and supply	Water for construction will be supplied via water tanker from Potosi Mine (for non-potable usage). Potable water will be supplied via water tanker and stored in the construction compound. First fill of Water Reservoir will be supplied via the proposed pipeline (subject to water supply agreement with Essential Water). Approximately 250-300 ML will be required over a 12-month timeframe.
Construction Timeframe	Approximately 36 months.
Construction hours	Construction activities associated with the SCES surface facilities and transmission line would be undertaken during standard construction hours i.e.: • 7:00 am to 6:00 pm Monday to Friday. • 8:00 am to 1:00 pm on Saturdays. • No works on Sunday or public holidays. With the exception of activities which are inaudible at any neighbouring receivers, emergency work, and deliveries and dispatches where required by authorities for safety reasons – these would be undertaken on a 24-hour basis. Underground works associated with establishing the cavern will be conducted on a 24-hour basis.
Construction Transport Route	Project components will be delivered via road from the Port of Adelaide via the Barrier Highway.
Construction workforce	Up to 400 (during peak construction period - ~6 months).
Operational water use	Water usage associated with ongoing operations will be provided through recovery of water from the compression of air, captured surface water, groundwater inflows associated with Perilya Mining operations and/or continued supply from the Stephens Creek Reservoir, subject to licence requirements.
Operations workforce	Approximately 26.
Capital investment Value	$639 Million.

3.3 Project Area

The Project Area is approximately 200 ha, extending from the Potosi Mine located approximately 3 km northwest of Broken Hill to the existing Transgrid substation located on the western side of Broken Hill (refer to **Figure 3.1**).

The Project Area comprises 30 land lots including freehold and Crown Land, as listed in **Appendix 1**.
The Project Area was established as the survey area to inform the detailed assessment of the Project and includes all aspects of the Project including the proposed SCES Facility and the proposed transmission line.

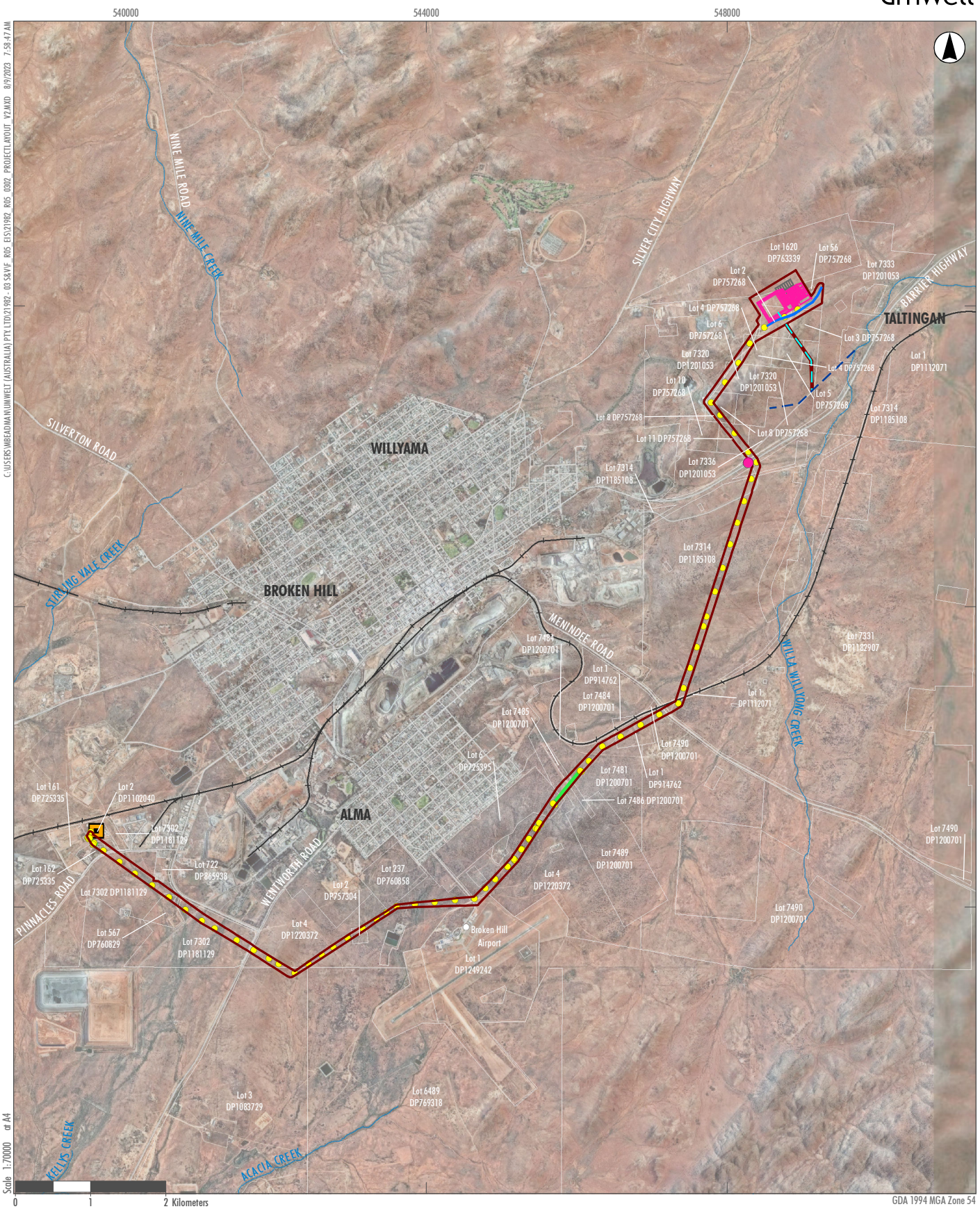
The Project Area will be subject to partial disturbance associated with the Project. A total disturbance area of approximately 46 ha is proposed, this captures all disturbance associated with the SCES Facility and the transmission, including:

- the SCES Facility, underground cavern, creek diversion, above ground pipeline and access
- transmission line and all associated works:
    - access track along the transmission line (approximately 4 m wide)
    - underground line sections (approximately 8 m wide)
    - transmission line pole locations and areas required for pole erection and conductor installation
    - construction laydown and storage areas.

The proposed disturbance area is shown on **Figure 3.3**, **Figure 3.6**, **Figure 3.7** and **Figure 3.8**.

The proposed transmission line has an associated 50 m easement, however, given the nature of the vegetation (low height) along this proposed easement, A-CAES has committed to limit the removal of vegetation within the proposed disturbance area and within limited locations within the easement where vegetation is over 10 metres in height (comprising PCT 41 River Red Gum Open Woodland in condition zones high weed cover and planted, along with planted street trees). Vegetation under 10 m in height, within the easement (and outside of the disturbance area) will be retained.

This vegetation within the easement will either be removed or pruned depending on location. For the purposes of the EIS, it is assumed this vegetation will be removed (as a worst-case scenario). The total area applicable to the easement is approximately 80 ha, with vegetation removal along the transmission line limited to approximately 15.9 ha.



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Site Access Point
- Property Boundaries
- Drainage Line
- Railway Line
- Road

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

FIGURE 3.2

Project Layout

3.4 Project Components

The Project includes two key components, the SCES Facility and the transmission line. These components are outlined in detail in the following sections.

3.4.1 SCES Facility

3.4.1.1 SCES Surface Facility

The SCES Surface Facility includes the following components:

- two 100 MW Air-Expansion Turbine Generator/Compressor Trains
- heat exchangers and thermal storage tanks (hot and cold)
- switchyard, office/warehouse/guardhouse and other facilities associated with the operation of the SCES Facility
- utilities for fuel and water storage
- access, parking and security fencing.

An indicative layout of the proposed surface facilities is provided in **Figure 3.3**, with a more detailed conceptual layout of the SCES Facility provided in **Figure 3.4**. The Project will be subject to further detailed design prior to construction with the potential for some further design refinements to the conceptual layout shown.

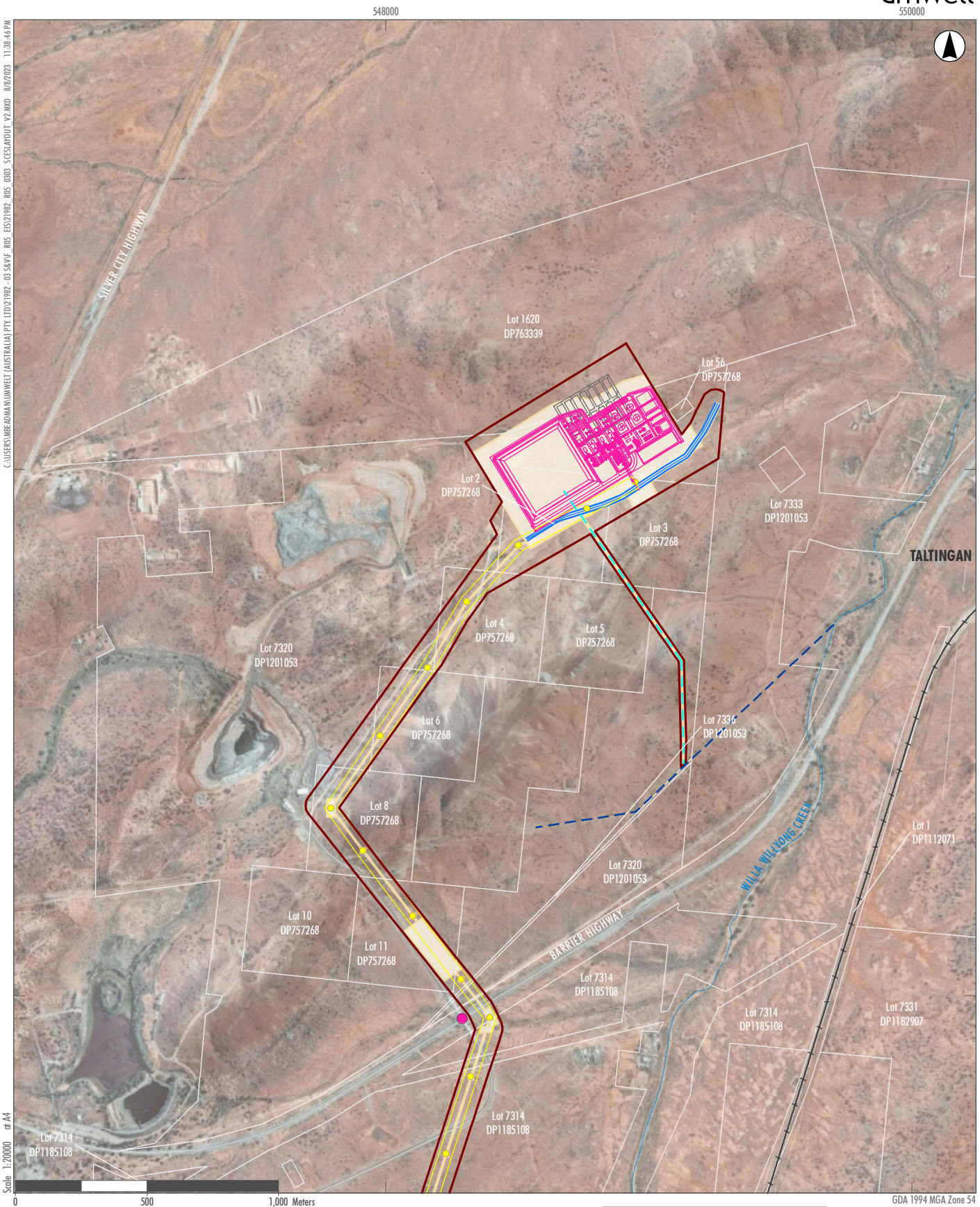
The surface infrastructure houses the energy storage drivetrains. Each drivetrain includes a series of compressors and an air-expansion turbine generator. The drivetrains are supported by a thermal management system made up of hot and cold thermal tanks, heat exchangers and fan coolers.

The surface infrastructure has been located on site with consideration of the existing topography and associated environmental and cultural constraints, however, requires co-location with the underground cavern. In order to operate efficiently, the surface facilities have been sited directly above the deepest level of the existing mining operations (approximately 600 m below surface) where the underground cavern will be constructed (refer to **Figure 3.4**).

The SCES Facility will also contain utilities such as fuel and water storage and include a switchyard to connect to the proposed transmission line.

The SCES Facility will be accessed from the Barrier Highway via the existing Potosi Mine Access Road (Silver Peak Road). An internal access road will be constructed from Silver Peak Road to the SCES Facility via formalising an existing access track. This would include widening the existing track to approximately 6 m and forming a compacted gravel all weather access for construction and operational vehicles (refer to **Figure 3.3**). During construction, parking will be available within the temporary laydown areas. Suitable parking areas for operational staff will be provided within the SCES Facility compound.

The perimeter of the SCES Surface Facility will be enclosed by security fencing to restrict public access to the SCES Facility and the area immediately surrounding the associated infrastructure. Fencing will be subject to detailed design, however, will be designed in accordance with relevant Australian Standards.



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Line Easement
- Tranmission Pole Location
- Disturbance Area
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Site Access Point
- Property Boundaries
- Drainage Line
- Railway Line
- Road

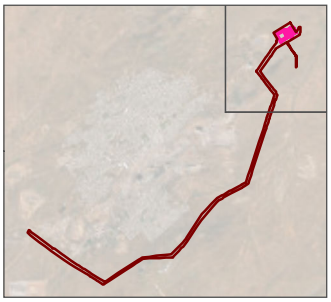


FIGURE 3.3

Project Layout
SCES Facility

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Line Easement
- Transmission Pole Location
- Disturbance Area
- Proposed Creek Diversion
- Proposed Above Ground Water Pipeline
- Property Boundaries

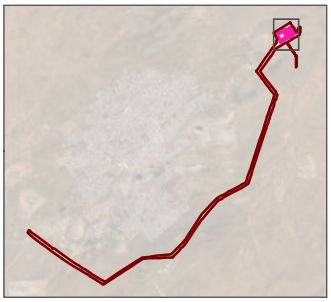


FIGURE 3.4

SCES Facility

Image Source: Nearmap (2022) Data source: DSFI (2023)

3.4.1.2 Underground Cavern

As discussed in **Section 2.6.3**, the geotechnical conditions at the Potosi Mine are characterised by strong competent rocks. The dominant rock types are tightly packed and have a high metamorphic grade which provides low rock mass porosity and permeability. In summary, this means that the rock is very strong and has low water permeability; these conditions are favourable to the Project in supporting the proposed underground cavern.

There are currently two mine portals providing access to the underground workings, the Potosi Mine Portal (located within the Potosi Pit) and the Silver Peak Portal. These two portals provide access to the existing underground mining areas at the proposed cavern depth (approximately 600 mbgl). The existing portals and workings will be utilised to construct the cavern. Once construction is complete, access to the cavern would no longer be required and the ongoing use and/or rehabilitation of the portals would be undertaken by Perilya.

The current plan of the Potosi Mine indicates that Level 20/21 (approximately 600 mbgl) has several existing parallel tunnels and drives (refer to **Figure 3.5**). These existing workings will provide access to the cavern construction location with excavation works proposed to provide the cavern storage, with a total volume of approximately 250,000 m^3. The cavern will be constructed using conventional drill and blast mining methods similar to the methods currently used at the existing Potosi Mine to form a group of separate parallel excavated areas (known as drifts) approximately 9 m wide x 15 m high. Detailed design of the cavern will be subject to further review following detailed geotechnical investigations and engineering design (prior to construction).

Excavated rock will be crushed underground and brought to the surface. This material will be stored at the surface within the proposed disturbance area and used to complete civil construction on site including the water reservoir with any excess material taken by Perilya to use in mine rehabilitation works. No excavated material will be transported offsite. A total of approximately 378,000 m^3 of rock will be excavated.

Exploration activities undertaken by Perilya indicate the area does not contain minerals and any processing of minerals is unlikely to be required, however, should mineral quantities requiring processing be encountered, the material will be bought to the surface and processed by Perilya, under the provisions of DA 448/2004 (subject to modification); refer to **Section 3.4.3** for further detail. Any material not suitable for construction uses will be transported to the existing Potosi Mine overburden emplacement areas.

The cavern will be sealed from the remainder of the existing underground mine workings. Sealing the cavern will involve the installation of concrete bulkheads, sealed with pressure injected grout. Sealing the cavern protects the surrounding mining operations and also the operation of the SCES Facility providing a sealed system. These works will also provide for the opportunity for future expansion of the SCES storage capacity, if required. Any such proposed expansion would be subject to a separate approval process and be based on future energy demands.

Any fractures or cracks within the cavern encountered during construction will be sealed, however, given the low porosity and permeability characteristics of the rock, the application of a sealant to the interior of the cavern is not expected to be required. The underground cavern will be connected to the surface infrastructure via two shafts, one for the conveyance of air, the other for water from the surface to the cavern. The lower end of the water shaft will extend into a sump which will be constructed below the cavern floor to ensure that a water seal is maintained at all times during operation. The lower end of the air shaft will be located at the high point in the roof of the cavern.

The cavern is a closed system (using the pressure from the water reservoir) to provide sufficient pressure to operate the SCES Facility.

Figure 3.5 Underground Workings

3.4.1.3 Water Reservoir and Pipeline

A purpose-built above ground water reservoir will be constructed to provide hydrostatic pressure for the underground cavern and will be located adjacent to the SCES Facility. The proposed reservoir will have a footprint of approximately 300 m by 300 m with a maximum capacity of approximately 350 ML.

As discussed above, excavated material generated through the construction of the underground cavern will be utilised for the construction of the reservoir. Appropriate testing of excavated material will be undertaken to confirm its suitability for use in the construction of the reservoir with any unsuitable material taken to the Potosi mine site for emplacement.

The reservoir provides a constant head of water to maintain the air pressure in the cavern and refills the cavern when the compressed air is extracted and directed through the air turbines to generate electricity. The design of the reservoir is based on the following:

- maximum capacity of approximately 350 ML
- initial fill (approximately 250–300 ML) from Stephens Creek Reservoir (over an approximate 12-month period to minimise any potential impacts on other water users) and provided with make-up water from Stephens Creek Reservoir as required
- receive inflows from process condensate and direct rainfall on the reservoir surface (no external catchment drains to the reservoir)
- covered with floating shapes to reduce evaporative losses to approximately 90% of evaporation rates
- source of water for thermal fluid and cooling (sprays) and general washdown.

The Project includes an above ground water pipeline (refer to **Figure 3.3**). The proposed above ground pipeline will connect to the existing above ground section of the Stephens Creek Pipeline to the southeast of the proposed SCES Facility. The pipeline will provide the initial first fill of water to the reservoir and ongoing water supply as required. Water supply arrangements are outlined in **Section 3.5.1**.

3.4.1.4 Creek Diversion

The SCES Facility will also require the diversion of an approximately 900 m long reach of the north easterly draining creek commencing at the south-western corner of the Project Area. It is proposed that this creek is diverted along the southern boundary of the SCES Facility as shown on **Figure 3.3**.

The proposed permanent creek diversion has been designed for the 1% annual exceedance probability (AEP) flooding event with consideration of design flows and velocities, bank slopes, bank stability, and soil conditions (refer to **Section 6.8** and **Appendix 12** for further detail).

3.4.2 220 kV Transmission Line

The proposed 16 km 220 kV transmission line has been designed with sections of both overhead and underground line with the overhead line sections designed at a varying height. The design is the result of detailed site analysis to avoid adverse impacts to existing land uses, particularly the Broken Hill Airport. The transmission line will provide for connection of the SCES Facility to the existing Transgrid Kanandah Road substation located to the southwest of Broken Hill.

The transmission line layout is shown in **Figure 3.3, Figure 3.6, Figure 3.7** and **Figure 3.8**, the design includes the following:

- overhead line (varying from 18 m–25 m in height for Pole No. 33–40) with 50 m easement – to avoid impact to obstacle surface limitation (OSL) heights associated with Broken Hill Airport
- overhead line (30 m–36 m in height for Pole Nos. 1–32 and 41–70) with 50 m easement
- inground section between pole No. 29 and 30 – to avoid exclusion area associated with existing gun club.
- overhead and inground options relating to connection to existing substation (to be confirmed during detailed design) with 20 m easement.

The transmission line design is based on the installation of a single monopole, except for the transition areas from overhead to underground. To facilitate the transition from overhead line to underground, the line will split to three poles at pole location No. 29, then transition back to one pole between location numbers 30 to 40. The monopoles are planned to be constructed from galvanised steel with mat finish. These types of monopoles have a slim line appearance offering the best aesthetic option as well as reduced disturbance footprint. Photomontages providing a visual representation of proposed monopoles are provided in **Section 6.12**.

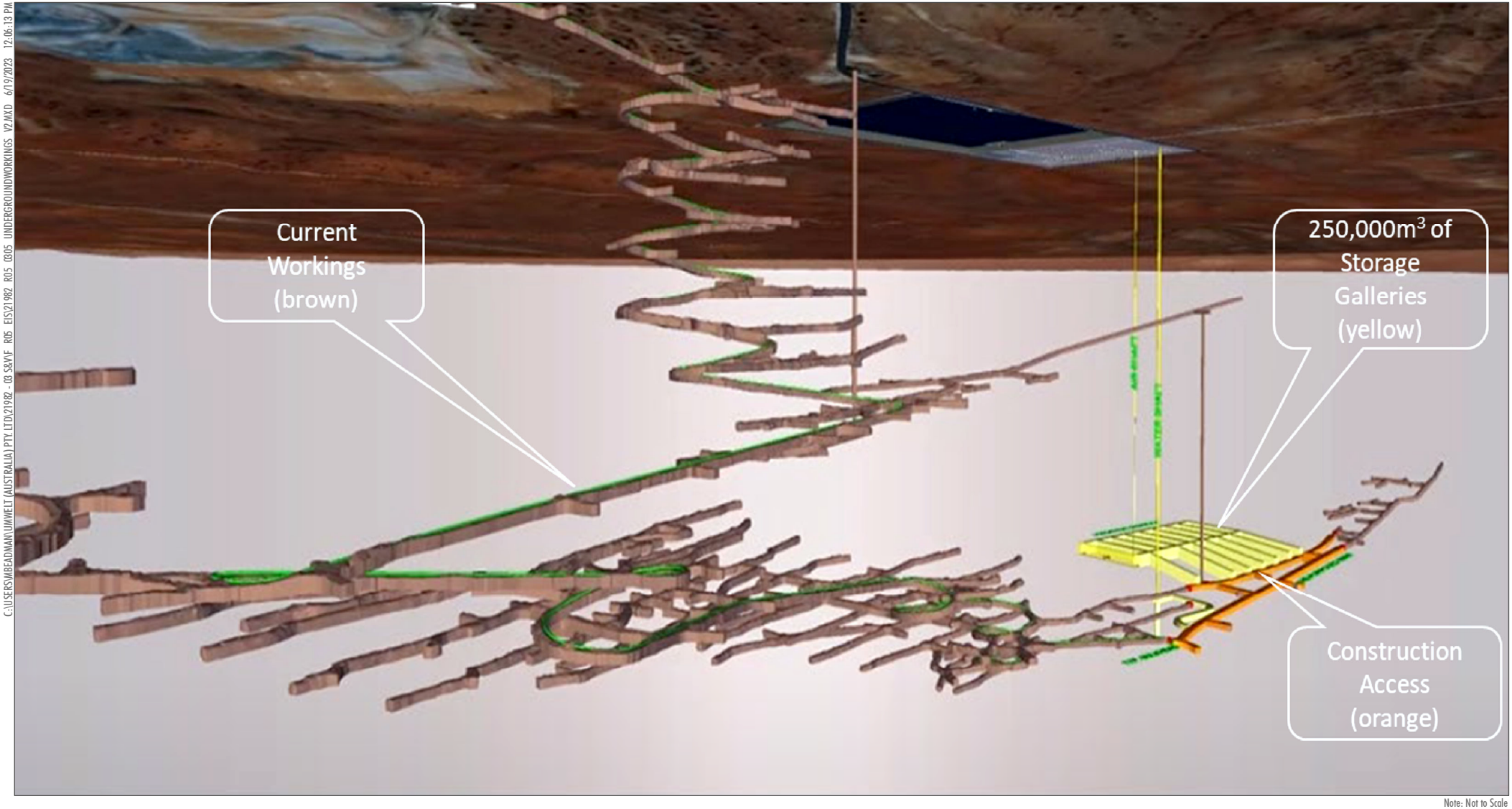
3.4.2.1 Transmission Connection Works

As previously discussed, the transmission line will connect to the existing Transgrid Kanandah Road substation. The current design includes provision for both overhead or underground connection. The overhead and underground connection follow the same alignment, with the final design to be determined during the detailed design phase with Transgrid.

The overhead line option will connect to an existing pole within the substation switch yard before connecting to the switchyard. The underground option will follow the same alignment as the overhead option before connecting to the switchyard.

In order to facilitate the connection, ancillary works will be required within the substation compound. These works will include installation of connection infrastructure and associated hardstand, electrical re-configuration, connection, testing and commissioning works.

C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY LTD\21982 - 03 S&V\F R05 EIS\21982 R05 0305 UNDERGROUNDWORKINGS V2.MXD 6/19/2023 12:06:13 PM



Note: Not to Scale

FIGURE 3.5
Underground Workings

Image Source: Energy Estate (2022)



Legend

- Project Area
- Transmission Line Easement
- Transmission Pole Location
- Disturbance Area
- Site Access Point
- Property Boundaries
- Drainage Line
- Railway Line
- Road

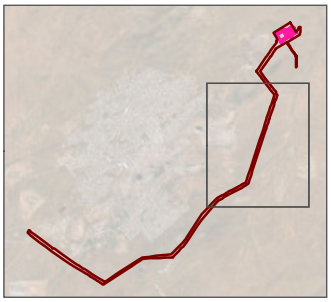


FIGURE 3.6

Project Layout Transmission Line

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



Legend

- Project Area
- Transmission Line Easement
- Transmission Pole Location
- Disturbance Area
- Property Boundaries
- Railway Line
- Road

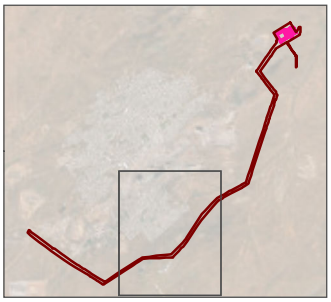


FIGURE 3.7

Project Layout
Transmission Line

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

3.4.3 Perilya Operational Modifications

As discussed in **Section 1.6**, minor modifications to existing Perilya operational consents and management plans will be required to accommodate the Project. These changes are not part of the Project and are included here for information purposes only.

The relevant consents and management plans requiring modification are outlined in **Table 3.2**.

Table 3.2 Modifications to Perilya Operations

Operation	Relevant Consent/Management Plan	Modification required
Potosi Mine	DA 448/2004	Final land use plan to include the Project. Rehabilitation (timing and design) to reflect the changes due to the Project. Material processing and emplacement to reflect the changes due to the Project.
	Mining Operations Plan (MOP 801/06), which continues to apply until its expiry in 2026	Rehabilitation (timing and design) to reflect the changes due to the Project.
	Rehabilitation Management Plan (RMP 801/08) August 2022	Rehabilitation (timing and design) to reflect the changes due to the Project.
Flying Doctor	DA 336/2008	Revised surface operations design to reflect the changes due to the Project.

Perilya will be responsibility for the changes required to the existing approvals and management plans for the Potosi and Flying Doctor mining operations and Broken Hill City Council will be the consent authority for the proposed modifications to DA 448/2004 and DA 336/2008. Although the Project will require the modifications to the existing Perilya approvals to facilitate the construction of the Project, this is a separate process, expected to be undertaken concurrently with the assessment of this Project. The proposed modifications do not form part of this Project.

3.5 Service and Utility Supply Arrangements

3.5.1 Water Supply

A-CAES NSW has entered into a water supply agreement with Essential Water to secure the water supply required for the initial fill and ongoing top up supply (if required) of the proposed the reservoir (250–300 ML over 12 months). This water supply is proposed to be provided via a connection to the existing Stephens Creek to Broken Hill Pipeline. Water usage associated with ongoing operations will be provided through recovery of water from the compression of air, groundwater inflows associated with Perilya Mining operations and/or continued supply via the proposed pipeline as provided by the water supply agreement.

Should supply from Stephens Creek Reservoir not be available, water may be sourced from the WaterNSW Murray River to Broken Hill Pipeline which is now the primary raw water source for Essential Water's Broken Hill potable water treatment plant. Essential Water has indicated that the required volume of water for filling the Reservoir is expected to be available.

Potable water for the amenities use will be supplied to the site via the existing reverse osmosis water treatment plant at the Potosi Mine or trucked to site and stored in a water tanker.

3.5.2 Telecommunication

Telecommunications facilities providing for transmission of voice, data, image, graphic and video information will be installed on site.

3.5.3 Sewer and Waste

Appropriate onsite septic system or composting system will be installed to treat minor quantities of wastewater associated with operation of the Project, subject to securing the relevant local authorisations. Any wastewater from the amenities collected and removed from the site will be done so by a licensed waste contractor.

Other wastes will be classified and removed to an approved facility (landfill, recycling etc). Waste management is described further in **Section 6.14**.

3.6 Construction Activities

3.6.1 Proposed Construction Activities

The proposed construction activities for each phase of the Project are outlined in **Table 3.3**.

Table 3.3 Project Phases and Associated Activities

Project Phase	Proposed Activities
Pre-construction Minor Works	Survey.
	Geotechnical investigative drilling and excavation of test pits and bore holes.
	Minor clearing of native vegetation.
	Establishment of temporary site office and laydown areas/storage compounds.
	Installation of environmental impact mitigation measures (e.g. erosion and sediment controls), temporary fencing and general enabling works.
	Heritage artefact surface and subsurface salvage, biodiversity pre-clearing surveys, inspections, specific habitat feature removal, and relocation.
	Establishment of proposed SCES and transmission line access roads and minor adjustments to services/utilities signage, etc.
Construction Works	Includes all physical works to construct all Project components, including, but not limited to, the construction and installation of the SCES Facility, underground cavern, water reservoir, above ground pipeline, creek diversion and transmission line and establishment or construction of any temporary facilities which were not already established as part of the pre-construction minor works.

Project Phase	Proposed Activities
Operation and Maintenance	Ongoing operation, monitoring (on-site and remote monitoring) and maintenance of all Project infrastructure and land within the SCES Facility boundary and the easement associated with the transmission line, during the operational lifespan of the Project.
	Replacement of major components as required, which may require the use of cranes and ancillary equipment.
Decommissioning	Includes all physical works required for the dismantling and transportation of Project infrastructure and rehabilitation of the Disturbance Area.

3.6.2 Temporary Ancillary Construction Works

Construction of the Project will require the installation of temporary construction facilities for both the SCES Facility and the transmission line, as outlined below.

SCES Facility:

- site compound including storage areas, offices, ablution facilities and car parking
- laydown areas for storing plant and equipment, deliveries, and areas to store excavated material and construction waste storage areas.

Transmission Line:

- Access roads for pole erection and maintenance.
- Brake and winch pads for conductor installation.
- Laydown and storage areas.
- The proposed disturbance captures both temporary and permanent disturbance associated with the Project, ancillary construction areas no longer required following completion of the construction phase will be appropriately rehabilitated.

3.6.3 Transport Routes and Traffic Movements

The SCES Facility will be accessed directly from Silver Peak Road (existing Potosi Mine access road) via the Barrier Highway. No intersection/road upgrade works are required to accommodate traffic associated with the Project. The transmission Line will have multiple access points with main access provided from Kanandah Road/Pinnacles Road, Silver City Highway, Wentworth Road/Picton Street and Menindee Road. Appropriate temporary access points will be established to temporary construction access roads.
The proposed disturbance area provides for a 4 m wide access road the full length of the transmission line, noting this may not be required at all locations and represents a worst-case scenario.

The transport of Project components and construction materials require heavy vehicles including OSOM vehicles. The majority of materials and equipment will be delivered via Barrier Highway with offshore delivery of components expected to be received into Port Adelaide and then transported by heavy vehicle to Broken Hill. No transport of construction materials via rail is proposed.

The source and location of construction materials will be confirmed during the detailed design phase. For the purposes of the assessment of the Project, the number of deliveries and possible routes have been assessed to cover all possible traffic-related aspects of the Project. General heavy vehicle transport could travel from any direction along the surrounding road network depending on origin of the deliveries, e.g., from the south (Wentworth-Mildura area), west (South Australia) and east (Wilcannia and beyond). As previously discussed, heavy vehicle transport from the north is unlikely.

There will be no traffic movements associated with excavated material from constructing the underground cavern, as all excavated material will be utilised on site.

3.6.4 Construction Staging, Duration and Hours

A total construction period of approximately 36 months is expected, with a peak construction phase of 10 months. The indicative construction sequencing of the Project components is outlined in **Graph 3.1**. Construction activities associated with the SCES surface facilities and transmission line would be undertaken during standard construction hours, being:

- 7:00 am to 6:00 pm Monday to Friday.
- 8:00 am to 1:00 pm on Saturdays.
- No works on Sunday or public holidays.

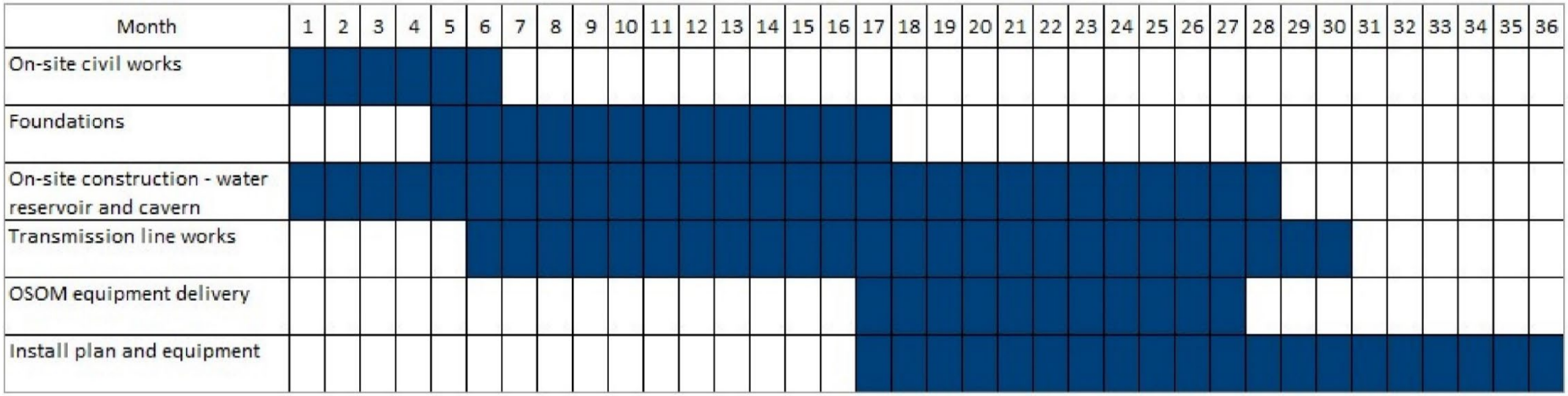
The exceptions to the above times are activities which are inaudible at any neighbouring receivers, emergency work, and deliveries and dispatches where required by authorities for safety reasons – these would be undertaken on a 24-hour basis.

Underground works associated with establishing the cavern will be conducted on a 24-hour basis.

3.6.5 Construction Workforce

It is estimated that on average approximately 400 full time equivalent (FTE) personnel will be on-site during peak construction activities. Construction personnel are expected to include a mix of local workers and specialist contractors likely from outside the region.

Graph 3.1 Indicative Construction Sequence



3.7 Operation and Maintenance

The SCES Facility will operate 24-hours per day, seven days per week. It is estimated that approximately 36 (26 direct and 10 indirect FTE) technical and maintenance personnel will be required for ongoing operation. These personnel will carry out general management and operational/maintenance requirements.

In some cases, plant components may require replacement, which may require heavy machinery (e.g. cranes), these works would be managed using consistent controls with the initial construction work for the establishment of the Project.

Operation of the Project will be subject to a detailed in an Operation Environmental Management Plan (OEMP). Relevant controls that will be incorporated into the OEMP are outlined in **Section 6.0** and summarised in **Appendix 3**.

3.8 Decommissioning

The Project has an expected operating life of approximately 50 years and the agreement with Perilya provides for the continued operation for this timeframe. Following this the three main options apply:

- the SCES continues to operate (subject to continued land agreement, need and relevant approvals)
- the SCES is upgraded or replaced with newer technology (subject to continued land agreement and need)
- the SCES Facility is decommissioned, and associated infrastructure is removed in accordance with the OEMP and the development of a Decommissioning and Rehabilitation Strategy two years prior to closure of the SCES Facility.

Should decommissioning be required:

- Key stakeholders including Perilya and relevant landholders subject to transmission line easement would be consulted regarding the decommissioning and rehabilitation plan.
- All plant associated with the SCES Facility and transmission line infrastructure will be removed, the shafts sealed and the land rehabilitated. If reuse of the water reservoir is not proposed as part of the post closure land use, water remaining in the reservoir will be drained to the underground cavern and any remaining water will be allowed to evaporate.
- Erosion and sediment controls for the decommissioning phase will be implemented as per the construction phase of the Project with a Rehabilitation Management Plan (RMP) developed and implemented as part of the preparation of the Decommissioning and Rehabilitation Strategy.

It is anticipated that the decommissioning and rehabilitation phase, should the entire Project be decommissioned, would take 12–18 months to complete, with the Project Area being returned, as far as practicable, to a condition similar to that which existed prior to the commencement of construction.

Erosion and sediment controls for the decommissioning phase will be implemented as per the construction phase of the Project (refer to **Section 6.8.1**). A Rehabilitation Management Plan (RMP) will be developed prior to decommissioning to guide the rehabilitation of the site, including the rehabilitation of redundant watercourse crossings and stabilisation of disturbed areas.

A-CAES NSW has entered into long-term lease agreement with Perilya for the construction and operation of the SCES Facility. The terms of these agreements make express provision relating to decommissioning and rehabilitation obligations.

4.0 Statutory Context

This section provides an overview of the statutory context for the Project and discusses the application of key legislation and planning provisions to the Project.

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary environmental and planning regulatory instrument relevant to the Project at the Commonwealth level. Under the EPBC Act, approval from the Commonwealth Minister for the Environment and Water is required for any action that may have a significant impact on Matters of National Environmental Significance (MNES). If an 'activity' is likely to have a significant impact on a MNES then it may be a 'controlled action' and require approval from the Commonwealth Minister for the Environment and Water.

The Project was referred under the EPBC Act to the Minister via the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) and was determined to not be a controlled action (EPBC 2022/09415) on 20 June 2023. The decision notice is attached as **Appendix 4**. Further assessment and approval under the EPBC Act is therefore not required.

The NSW EP&A Act is the primary instrument which regulates the environmental impact assessment and approval process for development in NSW.

The Project requires development consent under Part 4 of the EP&A Act. Being development for the purpose of electricity generation with a capital investment value of more than $30 million, the Project is declared to be SSD under the provisions of the Planning System SEPP. As SSD, the Development Application will be lodged with the Department of Planning and Environment (DPE).

In accordance with the DPE EIS Guideline (2021), **Table 4.1** provides a summary of compliance requirements under Commonwealth, State and local legislation relevant to the Project including NSW SEPPs and LEPs.

A review of relevant mandatory considerations and pre-conditions is provided in **Appendix 5**, identifying the relevant statutory requirements for the Project and indicating where they have been addressed in the EIS.

Table 4.1 Statutory provisions applicable to the Project

Category	Comment
Power to grant approval	Section 4.36 of the EP&A Act provides for the declaration of a project as SSD. Under the EP&A Act, the declaration of a project as SSD can be made by meeting the requirements of a SEPP or by the Minister for Planning and Homes. Clause 20 of Schedule 1 of the Planning Systems SEPP prescribes that development for the purpose of 'electricity generating works' that has a capital investment value of more than $30 million is SSD. The Project has a capital investment value of greater than $30 million and is an electricity generating work. Therefore, the Project is declared as SSD and the Development Application for the Project will be subject to the requirements of Division 4.7 of the EP&A Act. The consent authority will be the Minister for Planning and Homes (currently delegated to DPE) or the Independent Planning Commission (IPC) if public objections to the Project exceed 50; any reportable political donations are made A-CAES NSW; and/or the local council objects to the Project.

Category	Comment
Permissibility	**State Environmental Planning Policy (Transport and Infrastructure) 2021** Due to the operation of clause 2.36(1)(b) of State Environmental Planning Policy (Transport and Infrastructure) 2021 (Infrastructure SEPP) and Clause 4.38(3) of the EP&A Act the Project is permissible with development consent. **Broken Hill Local Environmental Plan (LEP) 2013** The proposed SCES Facility is located on land zoned SP1 (mining). The Project is characterised as being 'electricity generating works' for the purposes of permissibility. Electricity generating works are not permissible within the SP1 (mining zone), however, clause 2.36(1)(b) of the Infrastructure SEPP states that development for the purpose of electricity generating works may be carried out by any person with consent on any land in a prescribed non-residential zone. Under this clause the provisions prevail where there are inconsistencies with any other Environmental Planning Instruments (EPIs), including LEPs and therefore the proposed SCES Facility is permissible with development consent. The transmission line traverses land zoned SP1 (mining), RU2, RE2, SP2 (water supply systems) C2 and E4. A short portion of the line also extends into the Unincorporated Far West Region which does not have any applicable zoning. Electricity transmission works are not permissible within the C2 and RE2 zones, however Clause 4.38(3) of the EP&A Act states that development consent may be granted despite the development being partly prohibited by an environmental planning instrument. Therefore, the transmission line component of the Project is permissible with development consent. Consideration of the LEP zoning provisions applying to the land are discussed in **Appendix 5**. **Appendix 5** provides further consideration of other relevant EPIs and how these have been considered in this EIS.
Commonwealth Approvals	***Environment Protection and Biodiversity Conservation Act 1999*** Under the EPBC Act, a referral is required to be submitted to the DCCEEW for any 'action' that is considered likely to have a significant impact on any Matter of National Environmental Significance (MNES). A referral was submitted to DCCEEW on 10 February 2023. The Project was determined to not be a 'controlled action' under the EPBC Act in June 2023. Therefore, further assessment under the EPBC Act is not required. **Heavy Vehicle National Law** Approvals are required for the transport of Project components by OSOM vehicles. The requirements for such OSOM transport have been assessed as part of the Traffic Impact Assessment (refer to **Section 6.7**).
Other State Approvals	**Approvals that are not required** Section 4.41 of the EP&A Act specifies authorisations which are not required for approved SSD. Those are listed below: • *Fisheries Management Act 1994* – a permit under section 201, 205 or 219. • *Heritage Act 1977* – an approval under Part 4, or an excavation permit under section 139. • *National Parks and Wildlife Act 1974* – an Aboriginal heritage impact permit under section 90. • *Rural Fires Act 1997* – a bushfire safety authority under section 100B.

Category	Comment
	• *Water Management Act 2000* – a water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91. **Approvals that must be applied consistently:** Section 4.42 of the EP&A Act requires that several approvals, if required for a SSD, cannot be refused if a development consent is granted and must be substantially consistent with the terms of any development consent granted for the development. Of particular relevance to the Project, these include: • *Protection of the Environment Operations Act 1997* – an environment protection licence under chapter 3. • *Roads Act 1993* – a consent under section 138 for work within a public road. Refer to **Appendix 5** for a summary of all relevant NSW statutory requirements for the Project and where these have been addressed in the EIS.
Pre-conditions to exercising the power to grant consent	Refer to **Appendix 5** for a summary of all relevant pre-conditions to exercising the power to grant consent for the Project and where these have been addressed in the EIS.
Mandatory matters for consideration	Section 4.15 of the EP&A Act describes the matters for consideration in assessing SSD, which includes the provisions of relevant environmental planning instruments, proposed instruments that have been the subject of public consultation, development control plans, planning agreements and statutory regulations. The assessment of SSD must also consider the likely impacts of the development, suitability of the site, and submissions received and the public interest. All relevant matters are addressed in the EIS based on the outcomes of environmental assessments to be undertaken (refer to **Section 6.0**). Mandatory matters for consideration have been addressed in detail in **Appendix 5**.

5.0 Engagement

A-CAES NSW is committed to engagement with all relevant stakeholders and to undertaking genuine and meaningful engagement with the community as part of planning and assessing the Project. This includes a focus on developing long-term relationships and maintaining open lines of communication. A Community and Stakeholder Engagement Plan (CSEP) has been developed for the Project to outline the objectives and approach to stakeholder and community engagement throughout the life of the Project (refer to **Appendix 19**).

Through implementation of the CSEP efforts have been made to consult the broader Broken Hill community, including through open days, and providing information (e.g., newsletters) to residents of Broken Hill. To date, there has been limited broader community interest in the Project, however, the interest to date has been predominately positive with very limited concern relating to potential Project impacts. In addition to consultation with community stakeholders, ongoing consultation has been undertaken with the Broken Hill City Council, government agencies, service providers (including Transgrid and Essential Water), businesses and various non-government organisations and interest groups. This includes an engagement process undertaken with the local First Nations communities. This engagement has been ongoing throughout the assessment process and will be ongoing during the life of the Project, should it be approved.

The SEARs require the EIS to:

- Detail how engagement undertaken was consistent with the Undertaking Engagement Guidelines for State Significant Projects (DPE, 2022a).
- Describe the consultation process and the issues raised and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, an explanation should be provided.

A-CAES NSW has led the engagement relating to the Project with assistance from Umwelt to inform the SIA following the requirements of the NSW Government guidelines and assessment standards including, but not limited to the Undertaking Engagement Guidelines for State Significant Projects (DPE, 2022a) (the Engagement Guidelines), the NSW DPE Social Impact Assessment Guideline for State Significant Projects (2023) (the SIA Guideline) and the SEARs.

An overview of the CSEP including the identified key stakeholders, engagement undertaken, and the outcomes of the consultation process is provided below and specifically in relation to the SIA, in **Section 6.10**.

5.1 Community and Stakeholder Engagement Plan

The Project CSEP outlines the approach, strategy and implementation program to guide stakeholder consultation through all project phases, informing the SIA and broader EIS. The CSEP was prepared early in the Project planning phase to guide stakeholder consultation through all phases of Project assessment, based on the requirements of the NSW Government's SIA Guideline (2023), and the Undertaking Engagement Guidelines for State Significant Projects (DPE, 2022a).

The purpose of the CSEP is to outline the approach and strategy for community and stakeholder engagement across the Project's planning and approvals phase, to inform the Project design, identify assessment issues to be considered in the EIS, to inform the preparation of the Project's SIA and the technical studies, and to assist in identifying appropriate management and mitigation measures as part of the Project.

The specific objectives of the CSEP are to:

- Identify key stakeholders and communities relevant to the development of the Project.
- Facilitate the genuine involvement of stakeholders in the planning and approvals process as well as in developing responses to positive and negative impacts.
- Support understanding of the Project context, including identification of stakeholders and their expectations and aspirations, including identification of any vulnerable or at-risk groups that may be impacted by the Project.
- Guide and support a strategic and coordinated approach to engagement, including specific mechanisms, timeframes and responsibilities during the planning and assessment phase of the Project.
- Ensure that community and stakeholder inputs are considered in the finalisation of the Project design and are effectively integrated into the SIA and other technical assessments within the EIS.
- Meet regulatory requirements for public, stakeholder and community consultation.
- Collaborate with local stakeholders on local benefit sharing strategies to ensure they are co-designed, targeted and appropriate to the Project's operating context.

5.2 Stakeholder Engagement

The following section summarises the engagement methods and activities carried out for the Project prior to and during the preparation of the EIS.

5.2.1 Key Stakeholders

A stakeholder identification process was undertaken for the Project to support the planning and delivery of community and stakeholder consultation. This process involved identifying stakeholders with an interest in the Project, or those directly and indirectly affected. For the SIA, this also included identifying any potentially vulnerable or marginalised groups within the community. Stakeholder groups that were consulted as part of this process are outlined in **Figure 5.1**.



Figure 5.1 Key Stakeholder Groups

Information provision and consultation activities that have been undertaken are outlined in **Table 5.1**.

Table 5.1 Engagement Mechanisms

Mechanisms	Description
Information Provision	
Website	A dedicated Project website page to provide Project information and updates.
Project phone / email	A dedicated Project community email address to enable the community to contact the Project team for information or to provide feedback on the Project.
Local media release	Media release to local media outlets providing Project information and updates.
Project information sheet	Distribution of Project updates and information on Project technology throughout the proximal community.
Consultation	
Project briefings	Formal briefings to key stakeholders and government agencies, with a slide deck to formally introduce or provide updates on the Project.
Community information sessions	Two drop-in community information sessions to present information and updates on the Project with invites distributed to the broader community through a number of mediums.
Personal meetings or interviews	Telephone, online or in-person meetings with individual key stakeholders or small groups.

Mechanisms	Description
Online survey	An online survey to gain feedback from key stakeholders and the broader community on the Project and community needs and values, to be advertised and distributed through various mechanisms.
Service Provider Survey	Surveys undertaken via telephone by Umwelt to understand the capacity and demand for services in the area e.g., housing/accommodation, health, recreational, employment etc.

Table 5.2 provides a breakdown of the stakeholder groups that have participated in the Project's planning and assessment process to date through the engagement mechanisms outlined above. Quantitative and qualitative information collected through consultation and engagement activities has been analysed to inform the identification and analysis of issues discussed in **Section 5.4**.

Table 5.2 Local Stakeholders Consulted – Scoping and EIS Phase

Stakeholder group	Mechanism	Phase 1 – Scoping		Phase 2 – SIA/EIS	
		No. Stakeholders Contacted	No. Participants Engaged	No. Stakeholders contacted	Number Participants Engaged
Traditional Owners	Project briefing	2	2	3	3
Proximal landholders	Personal meeting/interview	4	4	8	8
Local Government	Project briefing	1	3[1]	1	1[1]
Community and Business Groups	Project briefing and interview	4	2	4	4
Environmental Group	Project briefing and interview	2	1	2	2
Local Businesses and Service Providers	Personal meeting/interview	NA	NA	24	9
Recreational facilities	Personal meeting/interview	NA	NA	5	5
Local and Broader Community	Project information sheets	Approximately 8,300 households (Project Info Sheet No. 1. April 2022)	-	To be distributed August 2023	-
	Community information session – April 2022	NA	23	NA	NA
	Community information session – December 2022	NA	NA	NA	17

[1] Refers to number of meetings held, rather than number of individuals consulted. All meetings had multiple attendees, all from Broken Hill City Council.

Stakeholder group	Mechanism	Phase 1 – Scoping		Phase 2 – SIA/EIS	
		No. Stakeholders Contacted	No. Participants Engaged	No. Stakeholders contacted	Number Participants Engaged
	Media statement / advertisements for community information session	3	-	3	-
Total		**8,318**	**35**	**50**	**49**

An additional community information session will be held in Broken Hill following the submission of the EIS, during exhibition.

5.3 Government Agency/Authority Consultation

Agency and government consultation undertaken to-date in relation to the Project is provided in **Table 5.3**, along with some functional stakeholders associated with energy supply. Early agency and authority consultation was undertaken as part of the RIT-T process and feedback in relation to the Project as part of this RIT-T process was largely positive. Consultation with relevant government agencies and authorities continued through the scoping and EIS phase of the Project through various mechanisms to keep agencies informed of progress, to confirm assessment requirements and discuss specialist assessment outcomes for the Project.

No significant issues were raised during consultation with any of the agencies or authorities, however, guidance was provided on matters to be assessed in this EIS. Consultation included Project briefings, discussion of the scope of the specialist assessments and SEARs requirements, tenure arrangements and reporting of specialist assessment results.

Table 5.3 Government Agency/Authority Consultation

Government Agency/Authority	Number of Meetings		Detail
	Scoping	EIS	
Department of Climate Change, Energy, Environment and Water (DCCEEW)	0	2	Pre-referral Meeting. Engagement relating to request for information (RFI) from DCCEEW to inform determination of Referral – refer to **Section 4.0**.
Australian Energy Market Operator (AEMO)	5	2	Ongoing engagement relating to energy services provided by the Project and the current market.
Clean Energy Finance Corporation (CEFC)	2	2	Project meetings to discuss financing the Project, input from CEFC has resulted in the development of a technical due diligence scope. Financing discussions with CEFC will be ongoing through the assessment of the Project.
Australian Renewable Energy Agency (ARENA)	5	Monthly	Registration of an "Intending Market Participant" (achieved 24 June 2022). The Project was also selected as one of only six projects in the Pre-investment study category of the NSW Emerging Energy Program (EEP) and received funding from the EEP as well as private investment and is supported by ARENA. Project updates and engagement regarding energy services to be provided by the Project. Discussions with ARENA will be ongoing through the EIS assessment phase and progression of the Long-Term Energy Service Agreement (LTESA) currently being progressed in relation to the Project.
Department of Innovation, Industry, Science and Research (DIISR)	2	2	Project updates and discussion relation to Project technology, DIISR identified lack of awareness of technology within administrative and regulatory parts of the energy sector and facilitated connections with key stakeholders for technology familiarisation sessions to be conducted (including the Energy Security Board and CSIRO).
Mark Coulton (Federal Member for Broken Hill)	1	2	Project Briefings, no issues noted and generally supportive of the Project.
Royal (Roy) Butler (State Member)	2	2	Attended community Information Session. Project Briefings, no issues noted, supportive due to regional economic benefits of the Project.

Government Agency/Authority	Number of Meetings		Detail
	Scoping	EIS	
Department of Planning and Environment (DPE)	3	1	Three scoping meetings (including DPE Energy, Resources and Hazards teams). Project briefing during EIS phase and discussion relating to noise, cultural heritage management and regulatory pathway (relating to tenure arrangements) refer to **Section 6.5**, **Section 6.3** and **Section 1.6**.
Biodiversity Conservation and Science Division	1	1	Project Briefings. Overview of methodology and results of BDAR provided. No specific issues raised however BCS advised to assess the credit liability applicable to the SCES Facility and transmission line separately, refer to **Section 6.2**.
Department of Planning and Environment - Crown Lands	3	Fortnightly meetings	Regular meetings to discuss access to tenure for Crown Land component of Project Area and associated easements for water and power. Engagement has guided the execution of a Heads of Agreement for direct dealing relating to these property matters with Crown Land. Key issues have been the ability for Crown Lands to provide access to tenure and how this interacts with existing Perilya Mining Leases. This issue has been resolved through Crown Lands support for co-existence of land leases for this Project and the existing Perilya mining leases, refer to **Section 1.6**.
Department of Regional NSW	3	3	Project Briefings, no issues noted, and generally supportive of the Project.
NSW Environment Protection Authority (EPA)	1	1	Project briefing – specifically relating to noise assessment methodology, the EPA provided feedback on how input parameters to noise model might be considered, refer to **Section 6.5**.
NSW Resources Regulator	2	4	Project briefings. Specific focus on determining any regulatory requirements relating to the Project under the *Mining Act 1992* and confirmation relating to classification of excavation works associated with the Project. Feedback indicated belowground component of the Project is not defined as mining under the Mining Act and as a result regulation under the Mining Act would not apply to the Project. Resources Regulator provided advice as to the interaction between mining tenure arrangements and other tenure arrangements. Project land tenure arrangements and regulatory pathway/requirements have been finalised on the basis of this advice, refer to **Section 1.6**.
Transport for NSW (TfNSW)	0	1	Project briefing and specific consultation relating to transmission lines crossing major roadways, no objection or issues raised.

Government Agency/Authority	Number of Meetings		Detail
	Scoping	EIS	
Broken Hill City Council (Elected Members and Administration)	5	8	Project Briefings. Council have assisted with facilitating stakeholder engagement with the community through providing Project updates and information to the community, advertising Project events and use of Council facilities for information sessions. Council have also assisted with land access associated with survey requirements across the Project Area. Key areas of concern for Council is impact to accommodation and services particularly given the potential cumulative impact associated with other large scale projects in the region, refer to **Section 6.10** and **Section 6.15**.
NSW Aboriginal Land Council	0	1	Written project briefing and correspondence relating to the Project, consultation is ongoing.
Essential Water	3	4	Project Briefings relating to water supply to the Project. No issues relating to supplying the Project's maximum demands (raw water not potable water) water being provided from either Stephens Creek Reservoir or Murray River pipeline (dependant on availability at the time), refer to **Section 6.8**. Water Supply Agreement in progress.
Essential Energy	1	2	Project briefings and discussion regarding feasibility of being the main point of connection and potentially providing construction power supply. These formal processes have concluded at the concept stage as they are not required. No issues raised with respect to proposed transmission design.
ARTC	0	3	Project briefings relating to transmission line crossing the railway corridor. Following presentation of design details ARTC have signed an associated access licence agreement.
Broken Hill Airport	1	4	Early engagement undertaken relating to proposed transmission alignment and interaction with the aerodrome obstacle height limits and operation. Engagement undertaken during preparation of the Aviation Impact Assessment (AIA) including review of draft AIA and various meetings to provide direct input and feedback to aviation consideration on refinements to the transmission design, refer to **Section 6.9.7**.
Transgrid	Regular Meetings	Monthly Meetings	Extensive consultation undertaken during RIT-T process. Transgrid has been directly involved in the Project designing the proposed transmission line and providing the connection point and power supply for construction. Specific details of the backup power requirement were considered based on Transgrid issues with backup supply, with these solved technically and commercially in the Network Service Agreement.

5.4 Community Views

The consultation process identified a general level of support for the Project, with all stakeholders who completed the question relating to level of Project acceptance ranking their level of acceptance as 7 or above (where 10 is the highest level of acceptance) for an average of 8.8 out of 10.

Despite contacting the broader Broken Hill township, and using media communications in the region, there was a lack of participation by various stakeholders, particularly the broader community, potentially suggesting a lack of interest or concern relating to the Project given the number of opportunities provided to provide feedback to the engagement process.

The feedback that was received during engagement undertaken has been considered by A-CAES NSW in refining the Project design and have been used to inform the preparation of this EIS including proposed management and mitigation measures.

In accordance with the DPE EIS Guideline, community views on the Project have been considered in the following categories:

- the strategic context, including identifying the key natural and built features that are valued in the area and could be affected by the Project
- the design of the Project and any alternatives considered
- any relevant statutory issues
- community engagement (e.g. the level or quality of engagement carried out during the preparation of the EIS, the community engagement that should be carried out if the Project is approved)
- the economic, environmental and social impacts of the Project
- the justification and evaluation of the Project as a whole (e.g. consistency of project with Government plans, policies or guidelines; merits of the Project)
- issues that are either beyond the scope of the Project (e.g. broader policy issues) or not relevant to the Project.

Based on community surveys undertaken for the SIA (refer to **Section 6.10**), the key themes in community views centre around the environmental and social impacts/benefits of the Project (refer to **Table 5.4**). Stakeholders were most concerned about:

- Impact of the construction workforce on local housing, health care and retail services.

Perceived positive impacts associated with the Project included:

- Reliable energy supply for Broken Hill.
- Opportunity for local employment and procurement of businesses/services.
- Investment through a community benefit fund for Broken Hill.

Table 5.4 Perceived Community Concerns and Benefits

Category	Concerns	Section Addressed	Benefits	Section Addressed
Strategic context	Impacts to existing operations at the mine	**Section 2.0, Section 3.0** and **Section 6.0**	Local industry diversification, decreasing the community's dependence on mining	**Section 2.0, Section 6.10** and **Section 6.11**
Justification and evaluation of the Project			Reliable energy supply for Broken Hill	**Sections 2.0**
Community Engagement	Perceived lack of information relating to the Project	**This Section** and **Section 6.10**		
Economic, environmental, and social impacts of the Project	Impact of construction workforce on the provision of local housing Impact of construction workforce on the provision of health services Impact of construction workforce on provision of retail services Decrease in visual amenity due to light spill from construction Decrease in social amenity due to noise from construction activities Decrease in social amenity due to construction activities Potential for contamination of surface water Perceived decrease in access to water	**Section 6.0**	Investment through a community benefit fund for Broken Hill Opportunities for training and education Indirect economic benefit through local spending and service procurement Opportunity for local employment and procurement of businesses/services.	**Section 6.10** and **Section 6.11**
Project design	Traffic disruption due to construction activities Perceived safety concerns with new project technology	**Section 6.7** and **Section 6.9**	Reuse/repurposing of existing mining infrastructure resulting in reduced construction activities	**Section 3.0** and **Section 6.0**
Issues that are beyond the scope of the Project			Opportunity to increase tourism by showcasing new technology	**Section 6.10**

The SIA (refer to **Appendix 19**) expands on the perceived positive and negative impacts raised during consultation and through assessment of the Project, linking them to the social impact categories of livelihoods, accessibility, way of life, surroundings, social amenity, engagement and decision making, community, health and well-being and culture outlined in the SIA Guideline (DPE, 2023).

5.5 Ongoing Engagement

Ongoing community engagement relating to the Project will be guided by the following industry and government standards and frameworks:

- NSW Government's Undertaking Engagement Guidelines for State Significant Projects (DPE, 2022a).
- The International Association for Public Participation (IAP2)'s Spectrum of Public Participation (2018).

A-CAES NSW will continue consultation through the assessment phase with regular project updates via the Project website, the distribution of a community newsletter (project update) following submission of the EIS and plan hold a community information session in Broken Hill during exhibition of the EIS.

Should the Project be approved, A-CAES NSW will update the CSEP prior to construction commencing. The CSEP will guide ongoing regular consultation with the community to provide transparent information relating to the Project, particularly in relation to management and monitoring. The CSEP will also be reviewed regularly to capture new stakeholders and update the key project messages as the Project progresses.

6.0 Assessment and Mitigation of Impacts

The identification of key environmental, social and economic impacts to be considered in this EIS is based on the identification of:

- the environmental and planning context for the locality (refer **Section 2.0** and Section **4.0**)
- outcomes of the stakeholder engagement process (refer to **Section 5.0**)
- the Project scoping stage assessment and the SEARs for the Project (refer to **Appendix 2**)
- specialist studies completed as part of the preparation of this EIS.

6.1 Preliminary Environmental and Social Risk Analysis

A review of the environmental and social matters relevant to the Project was conducted as part of the preparation of the Scoping Report (Umwelt, 2022) to determine which issues needed to be assessed as part of the EIS and the level of assessment required. This review was undertaken with reference to the categories of assessment matters identified by the DPE Scoping Guideline (DPE, 2022b).

As part of the preliminary environmental and social assessment the potential Project issues were separated into 'Key Issues' and 'Other Matters', as presented in the Scoping Report. Key issues are issues where there is a reasonable likelihood that the Project will have a material impact and detailed assessment was required to fully understand such impacts and identify Project-specific mitigation. Other matters are issues which are not of particular concern and are unlikely to have a material impact and/or the measures to manage the impacts are well understood and routinely used on similar projects.

The identified key issues included:

- **Biodiversity** – the Project will result in disturbance to native vegetation and potential loss of habitat, with the potential to impact threatened species (refer to **Section 6.2**).
- **Aboriginal Cultural and Historic Heritage** – the construction and operation of the Project has the potential to impact Aboriginal cultural heritage and historic heritage values (refer to **Section 6.3** and **Section 6.4**).
- **Noise and Vibration** – specifically noise disturbance to surrounding landholders associated with the construction and operation of the Project, also noise associated with increased traffic during the construction phase (refer to **Section 6.5**).
- **Air Quality and Greenhouse Gas and Energy** – air quality impacts specifically associated with the construction of the Project, including potential greenhouse gas emissions associated with the construction and operation of the Project (refer to **Section 6.6**).
- **Traffic and Transport** – specifically associated with the construction of the Project and potential impacts associated with increased movements and OSOM vehicles (refer to **Section 6.7**).
- **Water Resources** – specifically the potential for the Project to impact both surface water and groundwater resources during construction and operation of the Project (refer to **Section 6.8**).

- **Hazard** – the Project has the potential to result in impacts associated with hazardous material use, geotechnical stability, bushfire, Electromagnetic fields (EMF) and aviation safety (refer to **Section 6.9**).

- **Socio-Economic Impacts** – the Project has the potential to result in both positive and negative social and economic impacts. Potential positive impacts resulting from social and economic benefits through significant capital expenditure, the implementation of the community benefit fund, employment generation and use of services, and the potential for some negative social impact due to potential impacts to nearby landholders and cumulative demand on the workforce and services (refer to **Section 6.10** and **Section 6.11**).

- **Cumulative Impacts** – the construction and operation of the Project has the potential to result in cumulative impacts in the Broken Hill area due to the proposed colocation within Potosi Mine and other existing and proposed land uses including other large state significant projects (refer to **Section 6.15**).

Other issues that were not identified as key issues in the preliminary environmental and social risk assessment, but that nevertheless are addressed in this EIS include **visual impact**, **land use**, **waste management**, **decommissioning and rehabilitation and Dam Safety**, in accordance with the SEARs.

A detailed assessment of each of the identified environmental and social aspects identified for the Project is provided throughout the remainder of **Section 6.0**.

6.2 Biodiversity

The SEARs require an assessment of the biodiversity values and the likely biodiversity impacts of the Project in accordance with the NSW Biodiversity Assessment Method, including:

- a detailed description of the proposed regime for avoiding, minimising, managing and reporting on the biodiversity impacts of the development over time, and a strategy to offset any residual impacts of the development in accordance with the NSW *Biodiversity Conservation Act* 2016 (BC Act)

- an assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities scheduled under the NSW *Fisheries Management Act 1994* (if required), and a description of the measures to minimise and rehabilitate impacts, including impacts to Willa Willyong Creek

- if an offset is required, details of the measures proposed to address the offset obligations.

An assessment of the impacts to biodiversity associated with the Project has been completed and a Biodiversity Development Assessment Report (BDAR) has been prepared by Umwelt (refer to **Appendix 6**). The BDAR prepared for the Project provides an assessment of the biodiversity values of the Project Area, documents the application of the avoid, minimise and offset framework and assesses the biodiversity impacts of the Project.

Extensive survey has been undertaken across the Project Area, however, following completion of the Spring 2022 surveys the Project Area was modified which resulted in additional areas forming part of the Project Area, not subject to previous Spring survey. As a result, for areas that have not been subject to appropriate seasonal survey, species presence has been assumed. Surveys are proposed to be completed during spring 2023 to confirm the presence or absence of these species and the BDAR will be updated during the response to submissions phase of the Project.

For impacts to biodiversity that cannot be avoided, the NSW biodiversity assessment process (the BAM) requires use of the NSW Government derived online calculator to generate biodiversity credits based on the results of the survey and vegetation impacted. All credits then need to be offset prior to the proposed impact occurring.

During the preparation of the BDAR, BCD was consulted and advised that the disturbance area be assessed as two separate BAM calculator cases, one as a standard development relating to the SCES Facility (31.68 ha) and the one as linear development associated with the transmission line (15.26 ha). This advice was incorporated into the preparation of the BDAR.

A summary of key outcomes from the BDAR is provided in the following sections.

6.2.1 Existing Biodiversity Values

The disturbance area largely comprises areas that have previously been disturbed and historically cleared for mineral extraction purposes. Overall, the site is dominated by native remnant arid land vegetation, with creek lines generally having a high level of exotic flora species present. Fauna habitat is limited with no large hollow bearing trees observed and minor areas of low-lying rocky habitat.

6.2.1.1 Native Vegetation

Vegetation within the Project Area has been aligned with NSW Government defined Plant Community Types (PCTs) as identified in **Table 6.1** and shown on **Figure 6.1**. Detailed descriptions of each PCT are provided in the BDAR (refer to **Appendix 6**).

Table 6.1 Plant community types identified within the Disturbance Area

PCT ID	Plant Community Type	Vegetation Zone and Condition	Area (ha) in Development		
			SCES Facility	Transmission Line	Total
41	River Red Gum open woodland wetland of intermittent watercourses mainly of the arid climate zone	Derived Shrubland	0	0.05	0.05
41		High Weed Cover	0	0.04	0.04
41		Planted	0	0.01	0.01
123	Mulga - Dead Finish on stony hills mainly of the Channel Country Bioregion and Broken Hill Complex Bioregion	Dieback	0	0.22	0.22
123		Good	5.21	3.92	9.13
136	Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone	Disturbed – High Weed Cover	0	0.11	0.11
136		Good	3.45	0.09	3.54
150	Bottlewasher - Copperburr grassland of the arid zone	Good	0	1.05	1.05
155	Bluebush shrubland on stony rises and downs in the arid and semi-arid zones	Disturbed	0	0.87	0.87

PCT ID	Plant Community Type	Vegetation Zone and Condition	Area (ha) in Development		
			SCES Facility	Transmission Line	Total
155	Bluebush shrubland on stony rises and downs in the arid and semi-arid zones	Good	22.40	7.77	30.17
158	Old Man Saltbush - mixed chenopod shrubland of the semi-arid hot (persistently dry) and arid climate zones (north-western NSW)	Good	0	0.38	0.38
Nil	Cleared		0.63	0.73	1.36
	Planted Street Trees		0	0.01	0.01
		Total Vegetation	**31.68**	**15.26**	**46.94**

6.2.1.2 Threatened Ecological Communities

No TECs have been identified in the Project Area, including no TECs listed in NSW (BC Act) or at a Commonwealth level (EPBC Act).



Legend

- Project Area
- Disturbance Area

Plant Community Type

- 41 - River Red Gum open woodland wetland of intermittent watercourses mainly of the arid climate zone
- 123 - Mulga - Dead Finish on stony hills mainly of the Channel Country Bioregion and Broken Hill Complex Bioregion
- 136 - Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone
- 150 - Bottlewasher - Copperburr grassland of the arid zone
- 155 - Bluebush shrubland on stony rises and downs in the arid and semi-arid zones
- 158 - Old Man Saltbush - mixed chenopod shrubland of the semi-arid hot (persistently dry) and arid climate zones (north-western NSW)
- Cleared
- Planted Street Trees

FIGURE 6.1

Vegetation Mapping

Image Source: ESRI Basemap (2021); Nearmap (2022) Data source: DPIE (2023)

6.2.1.3 Threatened Species

No threatened fauna species credit species were recorded within the Project Area during the targeted surveys.

No threatened flora species were recorded within the Project Area during surveys and targeted surveys have been completed for all required threatened flora species as per the BAM. However, as noted above, due to Project refinements made following the completion of seasonal surveys, there are small areas within the Project Area (approximately 0.22 ha) where additional seasonal survey is required. As a result, as targeted threatened species surveys have not been completed in these areas, some threatened species have been assumed to be present for the areas where surveys have not been completed in the appropriate season. This is a precautionary approach as per the requirements of the BAM.

These species include:

- Mallee Golden Wattle (*Acacia notabilis*).
- Creek Wattle (*Acacia rivalis*).
- Showy Indigo (*Indigofera longibractea*).
- Yellow-Keeled Swainsona (*Swainsona flavicarinata*).
- Slender Darling Pea (*Swainsona murrayana*).
- Creeping Darling Pea (*Swainsona viridis*).

Based on the results of the survey undertaken across the remainder of the Project Area the presence of these species is considered unlikely. Seasonal survey will be undertaken in Spring 2023 to confirm presence or absence of these species.

6.2.1.4 Aquatic Habitat

All watercourses within the Project Area were dry during survey and are ephemeral. Minimal to absent aquatic habitat exists within the extent of the Project Area due to the highly ephemeral watercourses.

DPI Fisheries define key fish habitat as most permanent and semi-permanent freshwater habitats up to the top of the bank, excluding headwater creeks and gullies. Within the Project Area:

- the first and second order streams along the transmission line are not key fish habitat
- third order streams may meet definition of key fish habitat as semi-permanent, following rainfall events.

The third order streams are classified as class 4 (unlikely key fish habitat) under the Guidelines for Fish Habitat Conservation and Management (DPI, 2013), that is dry gullies or shallow floodplain depressions with intermittent flow following rainfall events only, little or no defined channel, little or no flow or free-standing water. The third order streams are also classed as minimally sensitive key fish habitat being ephemeral aquatic habitat no supporting native aquatic or wetland vegetation. **Photo 6.1** and **Photo 6.2** illustrate the channel and plant community types along the third order stream that will be diverted by the Project.

Photo 6.1 Narrow channel with exposed bedrock in the section of third order stream proposed for diversion



Photo 6.2 PCT 136 Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone along a section of the third order stream to be diverted by the Project



Regional scale groundwater dependent ecosystem (GDE) mapping (BoM, 2022) indicates there are moderate to high aquatic and terrestrial GDEs within 10 km of the Project Area (refer to **Figure 6.2**), however, none are mapped within the Project Area. It is noted that river red gums can have a degree of groundwater dependence. Within the Project Area PCT 41 contains river red gums where minor clearing (0.2 ha) will be required associated with the proposed transmission line.

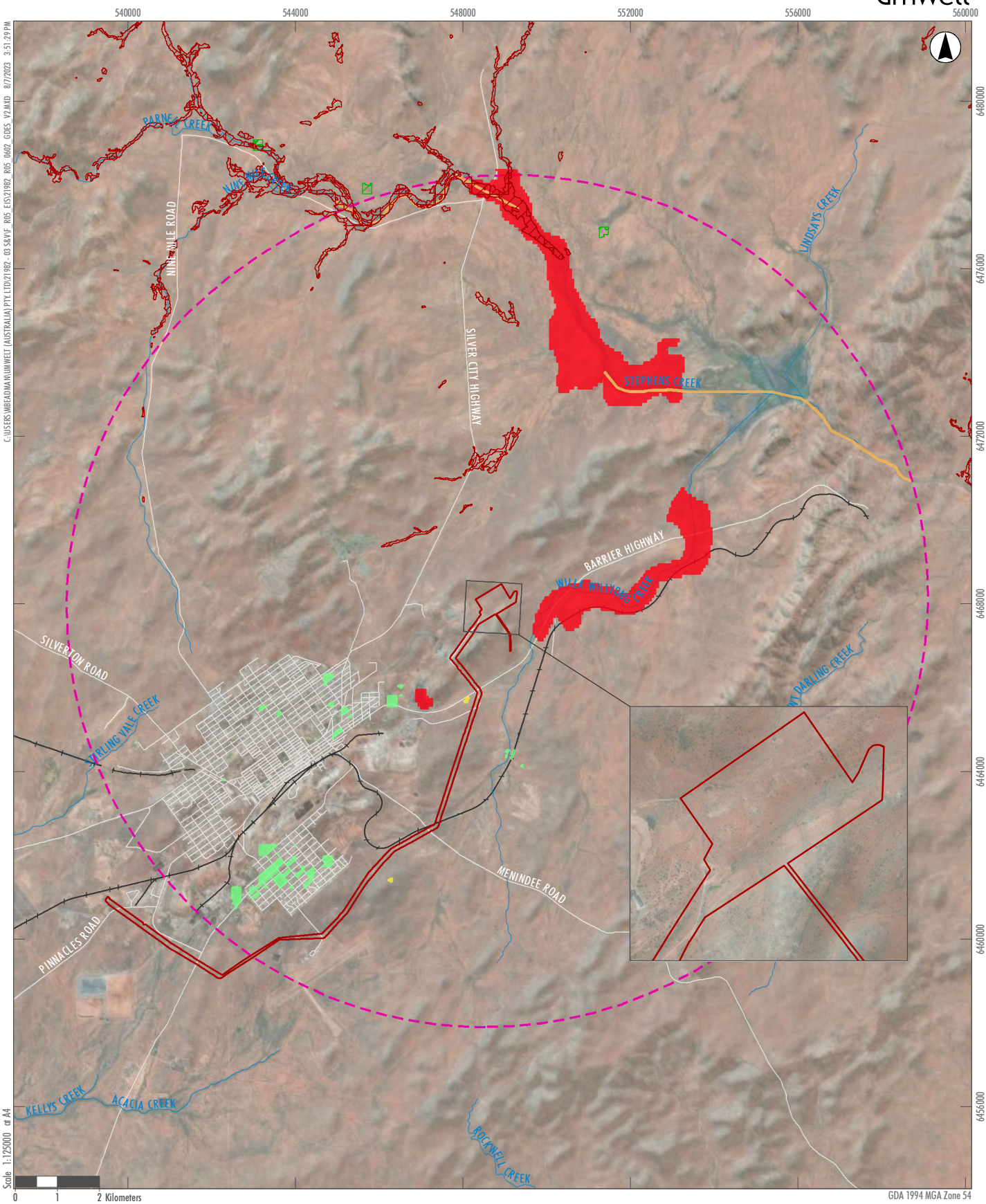
6.2.2 Avoidance and Minimisation of Impacts

As discussed in **Section 1.4**, the proposed SCES Facility has been sited to reduce the level of associated new ground disturbance as far as practicable. The SCES Facility will be located within an existing brownfield mine site and will partly utilise existing mine infrastructure (access portals) and underground mining areas reducing the area of disturbance required. Additionally, three transmission alignments were considered with the proposed alignment selected based on reduced impact to biodiversity values, land use conflict (including land subject to determined Native Title) and separation from sensitive receivers including residential land use, tourism and historic heritage values.

The Project Area was established as an initial 'survey area' and surveyed in its entirety following commencement of the biodiversity surveys. Through Project design and assessment, a disturbance area has been established which is substantially smaller than any of the Project Area iterations. The transmission line has an associated 50 m easement, however, given the nature of the vegetation (low height) along this proposed easement, A-CAES has committed to limit the removal of vegetation within the proposed disturbance area and within limited locations within the easement where vegetation is over 10 metres in height (comprising PCT 41 River Red Gum Open Woodland in condition zones high weed cover and planted, along with planted street trees). This vegetation within the easement will either be removed or pruned depending on location. For the purposes of BDAR it is assumed this vegetation will be removed. The total area applicable to the easement area is approximately 80 ha, with vegetation removal limited to approximately 15.9 ha.

The transmission line also incorporates a low height monopole design which requires the least disturbance, with the narrow tubular design reducing the materials and footing size required for construction in comparison to a tower design.

A-CAES NSW has also committed to the development and implementation of biodiversity management measures as part of the Construction Environmental Management Plan (CEMP) which will include pre-clearance and tree-felling procedures, non-inhibiting fauna fencing, traffic control, weed management, fencing and access control, erosion and sediment control and workforce education and training.



Legend

- Project Area
- Study Area 10km Buffer
- Drainage Line
- Railway Line
- Road

Aquatic GDE

- High potential GDE - from national assessment
- Moderate potential GDE - from national assessment

Terrestrial GDE

- High potential GDE - from regional studies
- Low potential GDE - from regional studies

HEVAE GDE

- High potential
- Low potential

FIGURE 6.2

Groundwater Dependent Ecosystems

Image Source: Nearmap (2022); ESRI Basemap (2022) Data source: DSFI (2023)

6.2.3 Impact Assessment

6.2.3.1 Direct Impacts

The Project will result in direct impacts on biodiversity values including the loss of native vegetation and fauna habitat as a result of clearance works required to construct the Project. As discussed in **Section 6.2.2**, A-CAES NSW has designed the Project to reduce the area of vegetation clearing required for the construction of the proposed transmission line. The total disturbance area associated with the Project is approximately 46.9 ha (SCES Facility 31.7 ha, Transmission Line 15.9 ha).

As discussed in **Section 6.2.1.1**, whilst A-CAES NSW is committed to undertaking all relevant survey to determine the presence /absence of all threatened species across the Project Area, late refinements to the Project has resulted in some minor areas where seasonal survey could not been completed and the requirement to assume presence for select species-credit species (i.e. those species that require separate generation of biodiversity credits under the BAM). It is important to note that based on the survey undertaken within the Project Area to date, the Project is not predicted to impact on these species, however, as targeted surveys have not been completed in these additional areas to date, presence must be assumed as per the BAM. Targeted surveys for species-credit species that have been assumed present are proposed in spring 2023.

Table 6.2 Summary of residual direct impacts (SCES Facility)

Direct impact (Describe the impact on PCT/TEC/EC or threatened species and their habitat)	BC Act status	EPBC Act status	Project phase/ timing of impact	Extent
123 Mulga - Dead Finish on stony hills mainly of the Channel Country Bioregion and Broken Hill Complex Bioregion	-	-	Construction Phase	**Condition zones:** **Good** = 5.21 ha **Total extent** = 5.21 ha
136 Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone	-	-	Construction Phase	**Condition zones:** **Good** = 3.45 ha **Total extent** = 3.45 ha
155 Bluebush shrubland on stony rises and downs in the arid and semi-arid zones	-	-	Construction Phase	**Condition zones:** **Good** = 22.4 ha Total extent = 22.4 ha
Mallee Golden Wattle (*Acacia notabilis)*	Endangered	-	**Assumed present**	**Species polygon** = 1 individual
Creek Wattle (*Acacia rivalis*)	Endangered	-	**Assumed present**	**Species polygon** = 1 individual
Showy Indigo *(Indigofera longibractea*)	Endangered	-	**Assumed present**	**Species polygon =** 0.22 ha
Yellow-Keeled Swainsona (*Swainsona flavicarinata*)	Endangered	-	**Assumed present**	**Species polygon** = 8.42 ha
Slender Darling Pea (*Swainsona murrayana)*	Vulnerable	Vulnerable	**Assumed present**	**Species polygon** = 8.42 ha
Creeping Darling Pea (*Swainsona viridis*)	Endangered	-	**Assumed present**	**Species polygon** = 10.5 ha

Table 6.3 Summary of residual direct impacts (Transmission line)

Direct impact (Describe the impact on PCT/TEC/EC or threatened species and their habitat)	BC Act status	EPBC Act status	Project phase/ timing of impact	Extent
41 River Red Gum open woodland wetland of intermittent watercourses mainly of the arid climate zone	-	-	Construction Phase	**Condition zones:** **Derived Shrubland** = 0.05 ha **High Weed Cover** = 0.04 ha **Planted** = 0.01 ha **Total extent** = 0.1 ha
123 Mulga - Dead Finish on stony hills mainly of the Channel Country Bioregion and Broken Hill Complex Bioregion	-	-	Construction Phase	**Condition zones:** **Dieback** = 0.22 ha **Good** = 3.92 ha **Total extent** = 4.14 ha
136 Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone	-	-	Construction Phase	**Condition zones:** **Disturbed- High Weed Cover** = 0.11 ha **Good** = 0.09 ha **Total extent** = 0.2 ha
150 Bottlewasher - Copperburr grassland of the arid zone	-	-	Construction Phase	**Condition zones:** **Good** = 1.05 ha **Total extent** = 1.05 ha
155 Bluebush shrubland on stony rises and downs in the arid and semi-arid zones	-	-	Construction Phase	**Condition zones:** **Disturbed** = 0.87 ha **Good** = 7.77 ha **Total extent** = 8.64
158 Old Man Saltbush - mixed chenopod shrubland of the semi-arid hot (persistently dry) and arid climate zones (north-western NSW)	-	-	Construction Phase	**Condition zones:** **Good** = 0.38 ha **Total extent** = 0.38 ha

6.2.3.2 Indirect Impacts

The BDAR includes consideration of potential indirect impacts that may occur associated with the Project. These indirect impacts include habitat connectivity, light spill, noise, air quality, water and weed/pest invasion. The BDAR concludes there is potential for these impacts to occur in the areas adjacent to the direct impact areas, however, significant indirect impacts are not predicted considering the biodiversity values present, the nature of the Project and indirect impacts and the management and mitigation measures proposed. All indirect impacts are considered to be manageable with the implementation of appropriate mitigation measures proposed by A-CAES NSW.

6.2.3.3 Aquatic Impacts

Given the ephemeral nature and low quality of the aquatic habitats and considering the design controls in place as part of the Project, impacts to aquatic ecology are anticipated to be limited. Environmental management measures will be implemented to manage water flows and quality and are expected to sufficiently manage any impacts. Water and erosion management controls will be employed to minimise erosion and discharge of sediment and other pollutants during construction and operation, as outlined in **Section 6.8.1**.

Within the Project Area. PCT 41 contains river red gums that will be impacted by the proposed transmission line, however, given that the impacts to this PCT will be limited to minor clearing, negligible impacts to this potential GDE will occur. No other impacts to GDEs are predicted.

6.2.3.4 Serious and Irreversible Impacts

Four threatened species which have assumed presence within the disturbance area (as discussed in **Section 6.2.1.3**), are also listed as serious and irreversible impact (SAII) entities in the Guidance to Assist a Decision-Maker to Determine a Serious and Irreversible Impact (DPIE, 2019). This includes:

- *Acacia rivalis*
- *Indigofera longibractea*
- *Swainsona flavicarinata*
- *Swainsona viridis*

An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct. The outcome of the SAII assessments indicated that the Project is unlikely to result in a serious and irreversible impact on the identified SAII entities due to the small areas of impact associated with the Project. As previously discussed, these species have been assumed as present in part of the Project Area due to seasonal survey constraint with the presence or absence to be confirmed through survey in Spring 2023. Based on the results of the survey undertaken across the balance of the Project Area to date, these species are unlikely to be present.

6.2.4 Biodiversity Mitigation and Management

The CEMP and OEMP will include biodiversity mitigation and management measures comprising workforce education and training, vegetation protection zones, pre-clearance surveys and supervision of clearing works, fencing and access control, erosion and sediment controls, and weed management and fauna exclusion to prevent entrapment within proposed infrastructure areas. Further detail relating to the proposed mitigation and management measures is included in **Appendix 3**.

6.2.5 Biodiversity Credit Impact Summary

Following the application of avoidance and mitigation measures, the BAM assessment identified that the biodiversity credits listed in **Table 6.4** are required to offset the residual biodiversity impacts of the Project. The required credits include a range of threatened species which have been assumed present in areas where targeted surveys have not been completed. The need or otherwise for these credits will be confirmed following the additional surveys proposed to be completed during spring 2023.

Table 6.4 Biodiversity Credit Summary

Entity	Credits Required	
	SCES Facility	Transmission Line
PCT 41 River Red Gum open woodland wetland of intermittent watercourses mainly of the arid climate zone	-	11
PCT 123 Mulga - Dead Finish on stony hills mainly of the Channel Country Bioregion and Broken Hill Complex Bioregion	111	69
PCT136 Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone	71	4
PCT150 Bottlewasher - Copperburr grassland of the arid zone	-	13
PCT155 Bluebush shrubland on stony rises and downs in the arid and semi-arid zones	300	294
PCT158 Old Man Saltbush - mixed chenopod shrubland of the semi-arid hot (persistently dry) and arid climate zones (north-western NSW)	-	11
Mallee Golden Wattle (assumed present) *Acacia notabilis*	2	-
Creek Wattle (assumed present) *Acacia rivalis*	3	-
Showy Indigo (assumed present) *Indigofera longibractea*	6	-
Yellow-Keeled Swainsona (assumed present) *Swainsona flavicarinata*	193	-
Slender Darling Pea (assumed present) *Swainsona murrayana*	129	-
Creeping Darling Pea (assumed present) *Swainsona viridis*	282	-

6.2.6 Biodiversity Offset Strategy

A-CAES NSW currently proposes to retire biodiversity credits associated with the Project through a combination of payment into the Biodiversity Conservation Fund (BCF) and generation of biodiversity credits through the establishment of a Biodiversity Stewardship Agreement (BSA). An application for a price estimate using the BCF has been submitted to Biodiversity Conservation Trust (BCT) and A-CAES NSW is aware of the costs associated with this offsetting approach. A-CAES NSW will also consult with the NSW Credit Supply Taskforce in relation to credit retirement. A-CAES NSW is also currently investigating the purchase of land surrounding the SCES Facility (approximately 32.7 ha) that may be used to generate biodiversity credits through the establishment of a BSA.

6.3 Aboriginal Cultural Heritage

The Project Area falls on the land of the Wilijakai or Wiljaali people and within the Broken Hill Local Aboriginal Land Council (LALC) area.

An Aboriginal Cultural Heritage Assessment (ACHA) was undertaken by Lantern Heritage to assess the potential impact of the Project on Aboriginal cultural heritage (both archaeological and cultural) in consultation with Aboriginal communities.

The ACHA was undertaken in accordance with the SEARs which require an assessment of the impact to Aboriginal cultural heritage items (cultural and archaeological) in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011) and the Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010), including results of archaeological test excavations (if required).

Additionally, the SEARs require evidence of consultation with Aboriginal communities in determining and assessing impacts, developing options and selecting options and mitigation measures (including the final proposed measures), having regard to the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010).

The full ACHA is included in **Appendix 7** the key findings are summarised in the following sections.

6.3.1 Existing Aboriginal Heritage Context

The area that encompasses Broken Hill was occupied by Aboriginal people for thousands of generations prior to colonisation. The principal group to occupy the area around Broken Hill were the Wilijakai or Wiljaali. The three major language groups for Broken Hill region include Barkindji, Mayyankapa and Nyiimpaa. These Aboriginal groups focussed inland on the arid centre, rather than the Murray-Darling system (HO & DUAP, 1996).

The Project Area falls within land that has been occupied by Aboriginal peoples for thousands of years prior to colonial settlement in the area. Aboriginal populations utilised both bodies of water and land resources for a variety of uses including food, medicines and raw materials. It is also likely fire management techniques were used on local vegetation.

While there is some ethnohistorical information available relating to the far western region of NSW, information relating to the places where different activities took place is limited. However, it is likely that the preferred occupation areas would have taken the form of temporary camps used on a seasonal basis, located on alluvial plains or the interface of lower gentle slopes and plains. These preferred site locations would be near to water sources with generally easterly or northerly aspects for warmth of sun and shelter from prevailing winds during the colder months. The landscape was undoubtedly well known to generations of people, and it is established that associations extended to spiritual attachments (i.e., Marnbi dreamtime).

Within the Project Area, there are high points in the landscape with drainage lines that could have provided intermittent water sources that supplemented the more reliable water from Willa Willyong Creek and tributaries of the Darling River. Within the Darling River catchments, a variety of aquatic resources including nardoo, waterfowl, fish, turtles and crayfish were harvested (NSW National Parks and Wildlife Service (NPWS), 2003).

While the vegetation throughout the Broken Hill region has undergone substantial change during the past 150-200 years, the undulating lowlands, ridges of rock outcrop, sandplains and outwash areas would have provided a variety of resources for tools, habitation and food.

During the initial desktop review, a search of the Aboriginal Heritage Information Management System (AHIMs) indicated there were 106 Aboriginal sites or objects listed as being present within the search area (Project Area with 2 km buffer). Of these, 24 were sites previously recorded within or less than 100 metres from the Project Area boundary. The majority of sites were artefact scatters (87). Other site types include 13 quarries, three Potential Archaeological Deposits (PAD) and one each of resource/gathering site, hearth, and ceremonial sites.

6.3.2 Consultation

Consultation with the Aboriginal community regarding the Aboriginal Cultural Heritage Assessment commenced in June 2022 and was undertaken in accordance with the *NSW OEH Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*. The consultation process started in June 2022 with registrations of interest received from five Aboriginal groups/individuals. A summary of the key consultation activities undertaken is provided in **Table 6.5**.

Table 6.5 ACHA – Overview of Consultation

Consultation	Date
Notification to identify potential stakeholders and invitations to register (including public notification)	02/06/2022
invitation to register sent to groups identified by agencies contacted	21/06/2022
Survey methodology provided to the Registered Aboriginal Parties (RAPs)	13/07/2022
Invitation to participate in survey of the Project Area sent to Broken Hill LALC and Barkandji (via NTSCorp)	29/07/2022
Field Survey (associated discussion/consultation during survey) – conducted over 7 days	10/08/2022
Aboriginal Community Meeting – in person meeting held between A-CAES NSW and Broken Hill LALC Board Members to discuss access agreements and the development of the Aboriginal Cultural Heritage Management Plan	28/09/2022
Field Survey – Archaeological Test Excavation Program – test excavation methodology review	15/12/2022
Field Survey – Test Excavation Works (associated discussion/consultation during works) – conducted over 7 days	01/02/2023
ACHA review – Draft ACHA and accompanying Archaeology Report distributed to RAPs for review	13/04/2023
Post review meeting – in person meeting held between A-CAES NSW and Broken Hill LALC to discuss comments received from Broken Hill LALC during review of the ACHA	20/07/2023

Examples of correspondence associated with the consultation process with the Aboriginal groups, feedback received from the RAPs and responses/actions arising from feedback and a summary log of all consultation is included in the ACHAR (refer to **Appendix 7**).

6.3.3 Results

6.3.3.1 Field survey

To inform the preparation of the ACHA, field survey and test excavation of the Project Area was undertaken in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*. Field survey was undertaken over 7 days from 10 to 17 August 2022 and three days on 1, 2 and 9 February 2023.

A total of 65 sites were recorded during field survey of the Project Area, including previously recorded and newly recorded sites. Site features recorded within the Project Area included stone arrangements, grind stone fragments, stone artefact scatters, heat retainer hearths, stone quarries and potential archaeological deposits (PAD). Of the previously recorded sites located within the Project Area, two hearth features and six artefact scatters could not be relocated during the survey. The recorded sites are shown on **Figure 6.3**.

The presence of Aboriginal objects was confirmed across most landform types within the Project Area, however, only a small number of Aboriginal sites were recorded on crest and upper slope landforms. This is likely due to the terrain and exposure to harsh environmental conditions in these areas resulting in unappealing conditions for people to spend extended periods of time. When these areas were accessed, it is likely to have been for a specific purpose such as accessing quartz outcrops for the manufacture of stone tools.

By contrast there was a much larger number of Aboriginal sites recorded near to water sources, and at the interface of lower slopes and plains. In addition, a large percentage of sites were also recorded on landforms associated with sheltered hillsides and creek environments such as tributaries to Willa Willyong Creek.

Based on the results of the field survey, Lantern Heritage recommended a program of test excavation across four sample landforms considered to have moderate and moderate-high or greater archaeological sensitivity.

6.3.3.2 Test Excavation Results

The overall objective of the test excavation program was to collect information about the nature, extent, and integrity of subsurface archaeological deposit in order to assess the significance of the deposits and develop appropriate mitigation methods and determine whether additional salvage excavation may be required prior to construction.

A total of seventy (70) test pits were excavated across seven test zones within four landforms. The presence of artefacts was confirmed at four test zones and within three of the four landforms. 15 of the 70 pits contained artefacts, and 69 artefacts were recovered. The results of the test excavation indicate that despite the various levels of disturbance throughout the Project Area, subsurface archaeological deposits have been shown to occur.

Based on the synthesis of the evidence collected during field survey and test excavation, the ACHA recommends a program of staged salvage with surface salvage occurring across the disturbance area and subsurface salvage within landforms with predicted high archaeological sensitivity and sites with moderate-high (or greater) archaeological potential (refer to **Figure 6.4**) are subject to a staged salvage program prior to construction.

6.3.4 Assessment of Significance and Impacts

Aboriginal cultural heritage sites are assessed under the following categories of significance, derived from the International Council on Monuments and Sites (ICOMOS) Burra Charter (ICOMOS, 2013):

- social or cultural value to contemporary Aboriginal people
- historical value
- scientific/archaeological value
- aesthetic value.

Within the context of assessing Aboriginal cultural heritage, spiritual values are often closely tied to social values. During the consultation process RAPs indicated that the Project Area is part of a broader landscape of cultural significance utilised for foraging activities. The Project Area contains archaeological sites that establish a link to these traditional cultural activities. The various sites recorded within the Project Area and the broader landscape of Broken Hill are assessed as being of high Aboriginal cultural value.

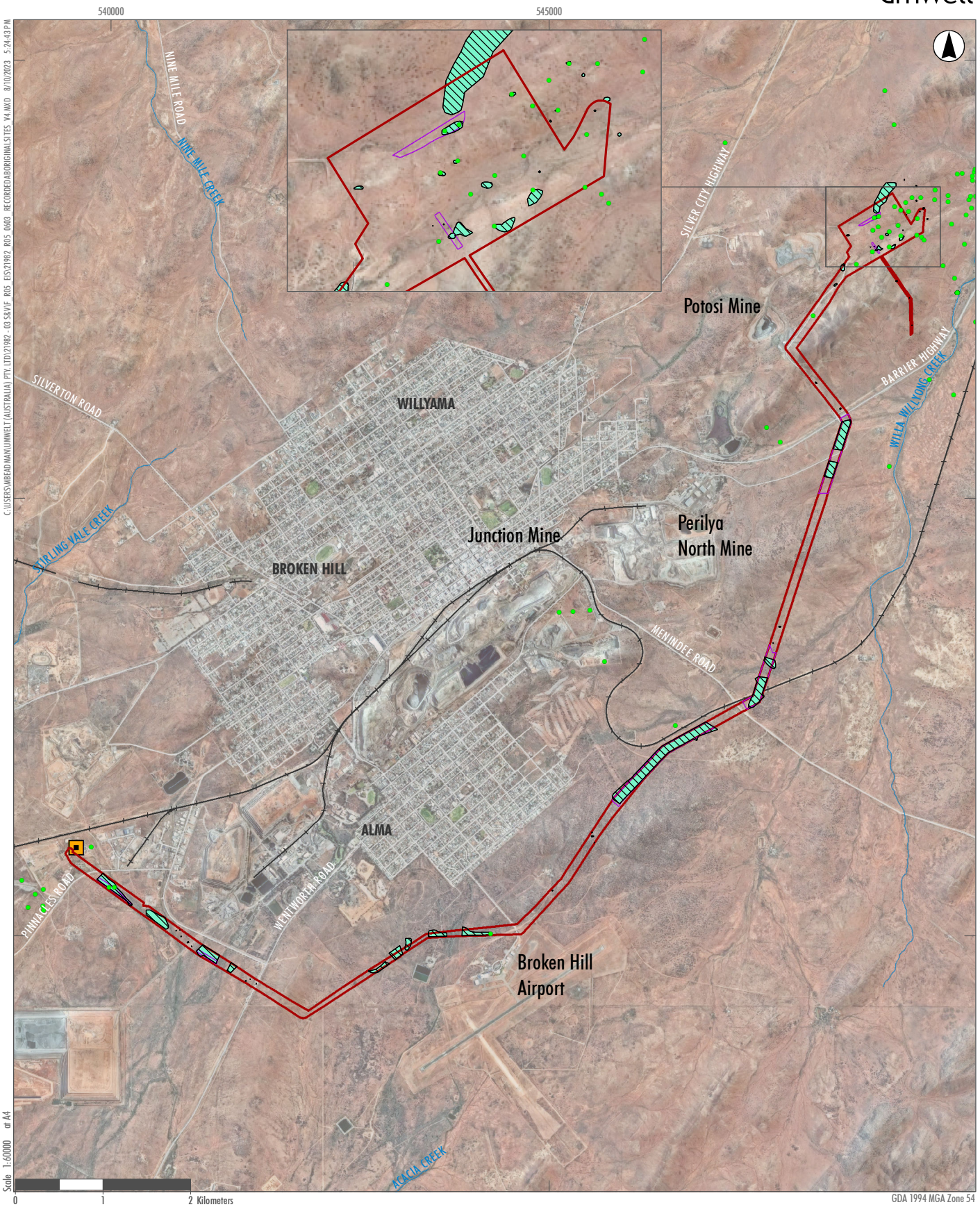
The Project Area is considered to have low-moderate historic values as part of the landscape that contributes to the overall heritage value the City of Broken Hill.

Aesthetic values within the Project Area are most identifiable in terms of the overall landscape. So, while the identified sites may not be important in terms of the aesthetics of the archaeological deposits within them, or particular Aboriginal objects that are present, the vistas from those sites located on crests and in valleys are an important component of their aesthetic values.

The assessed scientific values for the identified sites located within the Project Area have been determined on the basis of the sites' rarity, representativeness, and archaeological potential. **Table 6.6** provides a summary of the archaeological significance and potential impact for recorded sites of high, moderate and low/moderate significance. **Table 6.6** excludes the 44 low significance sites. Three sites were assessed as having high scientific significance, these sites contain high density artefact scatters, intact deposit and unusual features such as grind stone fragments or stone arrangements.

Table . Archaeological Significance Assessment (excluding low significance objects)

Scientific Significance	Number of Sites	Name of sites (AHIMS number)
Low-Moderate	5	BH AFT 8 (#TBC), BH AFT/HTH 15 (#TBC), BH AFT 25 (#TBC), BH AFT 29 (#TBC), BH AFT/HTH 51 (#TBC)
Moderate	2	BH AFT 22 (#TBC), PM-Q6 (#23-5-0123)
Moderate-High	11	BH AFT/HTH 10 (#TBC), BH AFT 18 (#TBC), BH HTH 26 (#TBC), BH AFT 28 (#TBC), BH AFT 46 (#TBC); FD08 (#23-5-0141), BH AFT 14 (#TBC), PM-IF6 (#23-5-0131); FD-IF7 (#23-5-0153) BH1-48 (#23-5-0063), South airports regency area isolated artefacts (#23-4-0682)
High	3	BH AFT/HTH 19 (#TBC), BH AFT 20 (#TBC), Kanandah 1 (#23-4-0640)



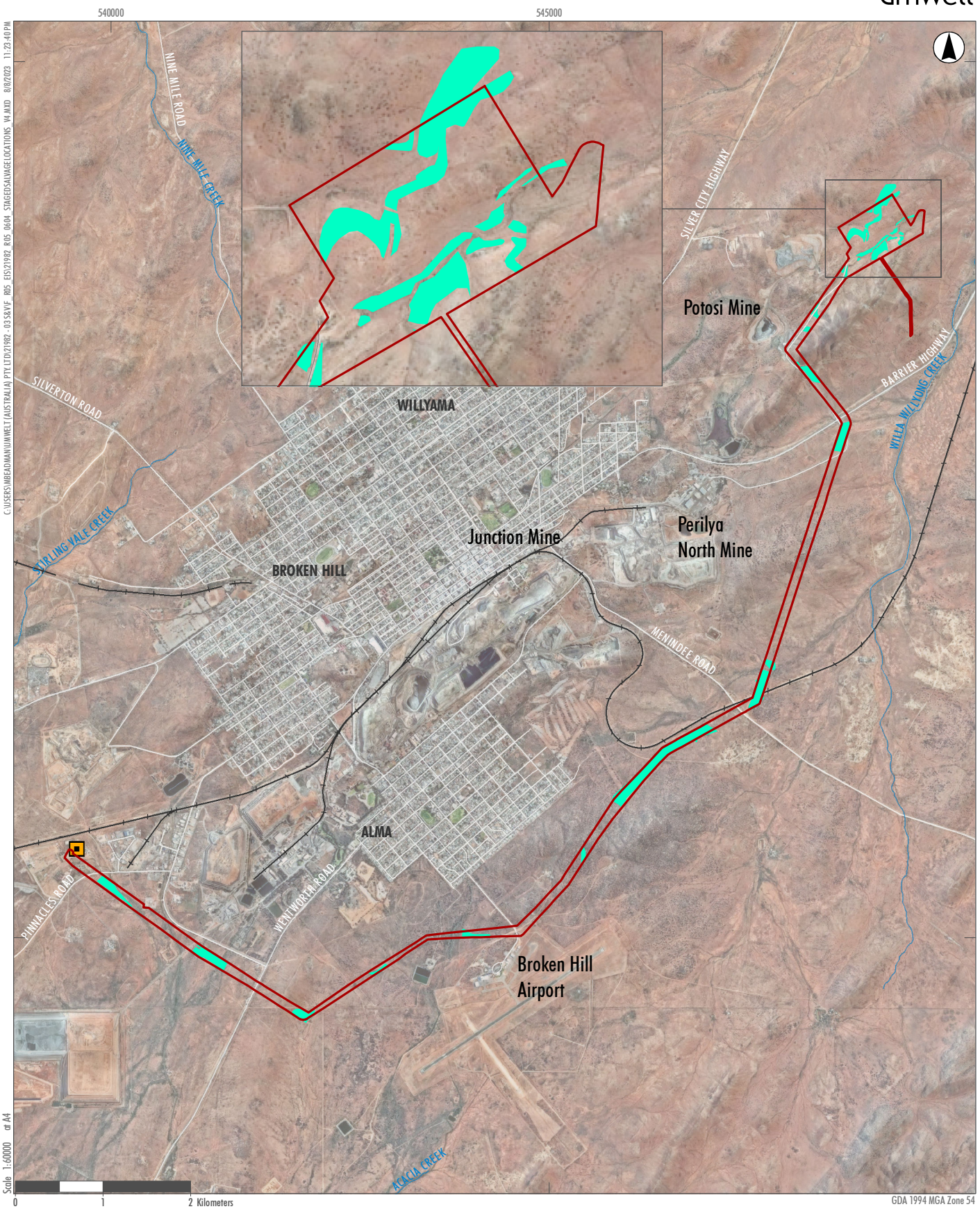
Legend

- Project Area
- Transgrid Substation
- Drainage Line
- Railway Line
- Road
- Recorded Site and/or Site Boundary
- Test Excavation Zones
- Potential Archaeological Deposit
- Previously Recorded AHIMs Sites

FIGURE 6.3

Recorded Aboriginal Sites

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



Legend

- Project Area
- Transgrid Substation
- Drainage Line
- Railway Line
- Road
- Subsurface Salvage Area

FIGURE 6.4

Staged Salvage Locations

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

In total 47 Aboriginal archaeological sites would be impacted by the Project, this includes 3 with high archaeological significance (which will be partially impacted), 6 with moderate/high archaeological significance and 3 Low/moderate archaeological significance. The remainder have low archaeological significance. For the sites within the transmission line easement, as much of the easement will be undisturbed, there will only be partial impacts to many of these sites. These impacts will be primarily related to pole construction and access tracks which will only impact discrete areas.

As discussed in **Section 3.0**, construction related disturbance will be contained within the proposed disturbance area, with the potential for further impact avoidance to be reviewed as part of the detailed design process, providing further avoidance of Aboriginal Heritage, as far as practicable.

6.3.5 Mitigation and Management Measures

The following mitigation and management measures have been developed based on the findings of the ACHA and the consultation process with the RAPs. The mitigation and management measures focus in particular on areas of high archaeological sensitivity and existing sites with predicted moderate-high or greater scientific value and include:

- Preparation of an Aboriginal Cultural Heritage Management Plan (CHMP) in consultation with the RAPs and relevant government agencies, incorporating the following mitigation and management strategies and staged salvage recommendations.
- Avoiding and conserving known sites wherever practicable:
    - Known sites outside of the proposed disturbance area will be avoided and where necessary demarcated with temporary fencing or flagging during construction.
    - Transport routes around the proposed disturbance area will be planned and managed to avoid impacting existing sites or areas of high archaeological sensitivity.
    - Relevant construction personnel will be provided with maps of site boundaries to guide avoidance activities.
    - All construction and SCES Facility workers involved in works with potential to interact with or impact on heritage values will undergo a cultural heritage induction facilitated by the Wilyakali Aboriginal corporation to communicate the importance of protecting cultural heritage, and the legal, ethical, social and practical issues involved.
- During the detailed design phase – reviewing opportunities for further impact avoidance where practicable (e.g., siting the locations of power poles to avoid existing sites and areas of high archaeological sensitivity).
- Where disturbance is unavoidable, implement a program of staged archaeological salvage.
- An unexpected finds protocol will be established and included in the CEMP and OEMP.
- In the event that Ancestral remains, or suspected Ancestral remains, are encountered during any of the proposed construction activities or salvage actions, all work must stop and the procedures outlined in the Salvage Methodology be implemented.

Further detail relating to the proposed mitigation and management measures is provided in **Appendix 3**.

Development and implementation of a staged salvage program will be undertaken prior to construction. Avoidance of impacts will be prioritised during detailed design and areas requiring staged salvage will be confirmed in consultation with the RAPs with consideration of the methodology outlined in **Appendix 7**.

6.4 Historic Heritage

A Historic Heritage Impact Assessment (HHIA) was undertaken by Umwelt in accordance with the SEARs which require an assessment of the impacts to historic heritage having regard to the *NSW Heritage Manual*.

The results of the HHIA are summarised in the following sections with the full report attached as **Appendix 8**.

6.4.1 Existing Heritage Values

The Broken Hill area has a long history associated with mining and associated land uses with the town being initially established to facilitate mining of the Line of Lode. The mining potential of Broken Hill was identified in 1883 by Charles Rasp, a boundary rider from the Mount Gipps Station. Rasp inspected the area known as Broken Hill while mustering sheep in the outer paddocks of the station, and in September 1882 collected mineral samples and took out a small mining lease with David James and Jim Poole to begin prospecting (Blainey, 1968). It took until early 1885 to realise that this was one of the richest mineral lodes ever encountered in Australia (Godden Mackay Logan, 2007) with the Broken Hill Propriety Company Limited (known today as BHP) ultimately set up to progress mining in the area.

The HHIA includes a detailed account of the historic context of the region of Broken Hill, from the time of European arrival and the alienation of lands through the exploration of the early 1800s, and the establishment of mining, transportation networks, towns and settlements. This review of historic context informed the consideration of the general historic archaeological potential of the area.

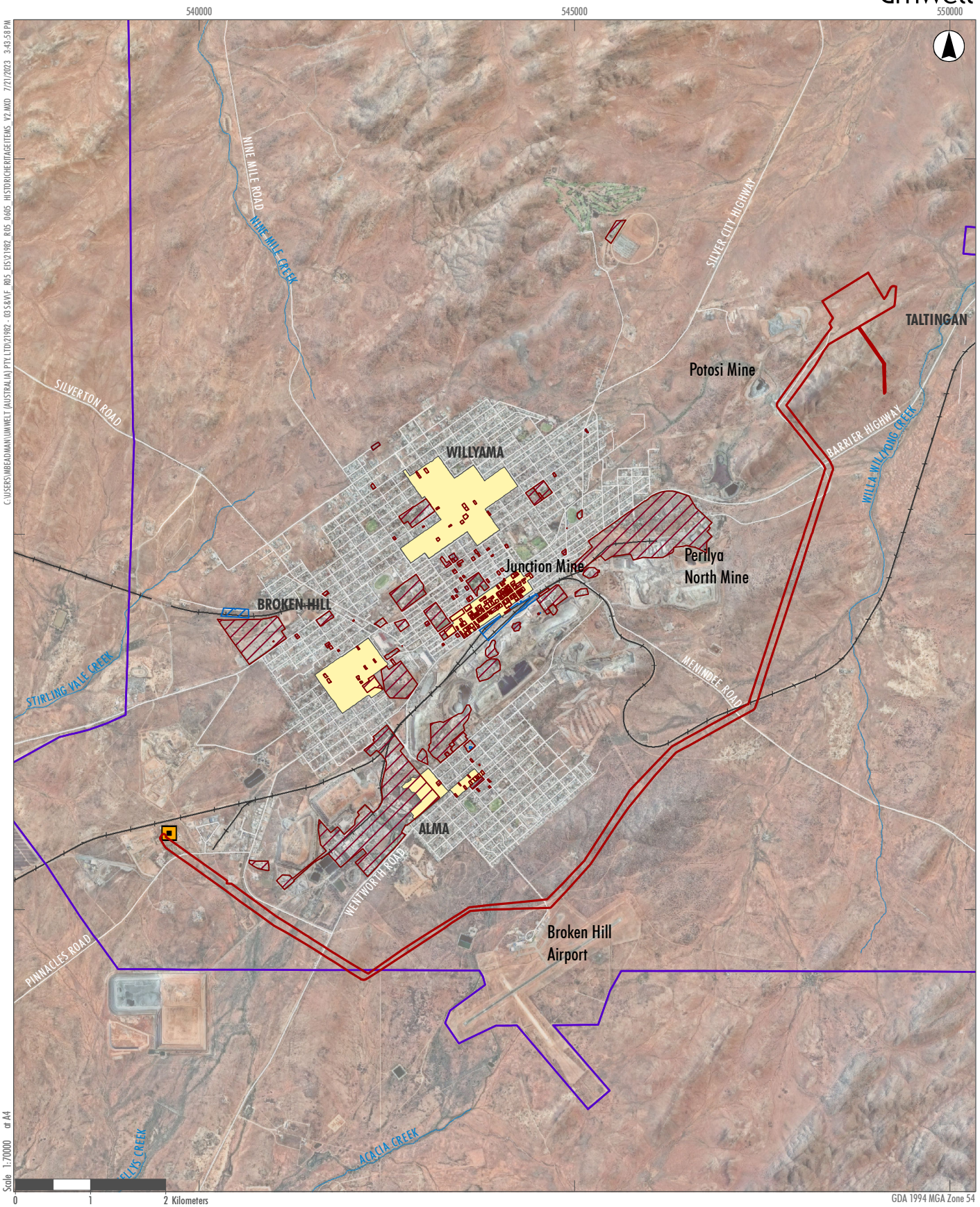
Given the rich history of Broken Hill, the Project Area is located in the vicinity of several heritage items listed on the Broken Hill LEP as well as the NSW State Heritage Register. In addition, Broken Hill, as a local government area is listed on the National Heritage List due to its national heritage value as 'City of Broken Hill' which encompasses the entire Broken Hill LGA. **Table 6.7** provides the details of the heritage listings in the vicinity of the Project Area with these features shown on **Figure 6.5**.

Table 6.6 Heritage Items within 2 km of Project Area

Item #	Item Name	Address	Significance	Distance from Project Area (km)
105861	City of Broken Hill	LGA boundary	National	Includes the Project Area
01770	Central Mine Manager's Residence, former	Piper Street, South Broken Hill	State	1.8
01820	BHP Chimney Ruin of First Offices	Part of Consolidated Mining Lease 7 East of corner of Gaffney and Oxide Streets, Proprietary Square Broken Hill	State	2.4

Item #	Item Name	Address	Significance	Distance from Project Area (km)
01101	Broken Hill Railway Station and yard group	Broken Hill railway, Broken Hill	State	2.6
01819	Broken Hill Mosque	Buck Street, Broken Hill	State	2.7
02002	1915 Picnic Train Attack and White Rocks Reserve	Broken Hill	State	2.8
00690	Walter Sully Emporium	404–408 Argent Street Broken Hill	State	2.9
00082	Seppelts Warehouse	160 Crystal Street Broken Hill	State	2.9
00335	Palace Hotel	227 Argent Street Broken Hill	State	2.9
01423	Broken Hill Post Office	258–260 Argent Street Broken Hill	State	2.9
00181	Trades Hall	34 Sulphide Street Broken Hill	State	3.1
01818	Wesley Uniting Church and Hall Group	Cobalt Street, Broken Hill	State	3.3
00675	Broken Hill Synagogue	165 Wolfram Street Broken Hill	State	3.4
00484	St Josephs Convent, Chapel & Site (former)	Sulphide Street, Broken Hill	State	3.7
I342 - 414	Mining Precinct 10	Various, located to the south of the train line	Local	0.3
I100	Old Broken Hill City Abattoir	41 Kanadah Road, Broken Hill	Local	0.3
I310 - 341	Mining Precinct 9		Local	1.2
C4	Rainbow Avenue Heritage Conservation Area and South Broken Hill Precinct	Patton Street, Bonanza Street Broken Hill	Local	1.2
I223	Union Club Hotel (former)	93 Patton Street, Broken Hill	Local	1.3
I106	Parish Church of St James	143 Wilson Street, Broken Hill	Local	1.3
I9	Baptist Church (former)	127 Patton Street, Broken Hill	Local	1.4
I108	Patton Street Park	147 Patton Street, Broken Hill	Local	1.4
I63	Gladstone Hotel (former)	170 Morish Street, Broken Hill	Local	1.4
I5	Alma Cordials (former Mincham's Blacksmith Shop 1910'1939, Alma Bus Company Pty Ltd Depot 1939'1954*	122 Patton Street, Broken Hill	Local	1.4
I214	The Alma Institute	139 Patton Stret, Broken Hill	Local	1.4
I125	Salvation Army Hall (former)	213 Wilson Street Broken Hill	Local	1.4
I197	South Fire Station	153 Patton Street, Broken Hill	Local	1.5
I4	All Saints Catholic Church (former)	89 Piper Street (corner Bonanza Street), Broken Hill	Local	1.5

Item #	Item Name	Address	Significance	Distance from Project Area (km)
I29	Broken Hill South Post Office (former)	155A Patton Street, Broken Hill	Local	1.5
I198	South Police Station (former)	157 Patton Street, Broken Hill	Local	1.5
I13	Bells Milk Bar	160–162 Patton Street, Broken Hill	Local	1.5
I196	South Broken Hill Hotel	211–215 Patton Street, Broken Hill	Local	1.5
I232	White Jacaranda	226–228 Patton Street, Broken Hill	Local	1.6
I6	Alma Hotel	212 Hebbard Street, Broken Hill	Local	1.7
I236 - 262	Mining Precinct 1 (Rasp Mine, South Mill area)		Local	1.7
I263 - 280	Mining Precinct 2 (Rasp Mine No. 4 and 7 Headframe)		Local	1.7
I116	Radford House	136 Eyre Street, Broken Hill	Local	1.8
I415-I416	Broken Hill City Council Film Studio Precinct (former Central Mine Assay Office and Central Power Station (CPS))	210–230 Eyre Street, Broken Hill	Local	1.8



Legend

- Project Area
- Transgrid Substation
- Drainage Line
- Railway Line
- Road
- Conservation Area - General
- Historic Heritage Item - General
- State Heritage Register Curtilage
- National Heritage List Boundary – Place ID 105861

FIGURE 6.5

Historic Heritage Items

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

6.4.1.1 City of Broken Hill National Heritage Listing

As noted above, the Project Area is located within the curtilage of the national heritage item 'City of Broken Hill', which encompasses the entirety of the Broken Hill LGA. The following is an extract from the summary statement of significance is included in the Australian Heritage Database listing for the City of Broken Hill:

> *The City of Broken Hill has outstanding significance to the nation for its role in creating enormous wealth, for its long, enduring and continuous mining operations, and the community's deep and shared connection with Broken Hill as the isolated city in the desert, its outback landscape, the planned design and landscaping of the town, the regeneration areas and particularly the physical reminders of its mining origins such as the Line of Lone, the barren mullock heaps, tailings, skimps and slagheap escarpment and relict structures. It exhibits historic qualities in its ongoing mining operations since 1883, the current and relict mining infrastructure and its landscape setting. It is significant for its industrial past and the adoption of vanguard industrial relations and management policies, together with its role as a pioneer in setting occupational health and safety standards.*

There are no individually listed heritage items located within the Project Area beyond the broader national heritage listing which applies to the entire Broken Hill LGA.

The National Heritage Values Study for Broken Hill (Davies, 2021) provides a review of the National heritage listing as well as providing a summary of elements within the Broken Hill landscape that contribute to its National heritage significance. The following contributory elements identified by the Values Study (refer to **Table 6.8**) are located within the Project Area or relevant to views associated with the Project Area.

Table 6.7 National heritage listing contributory elements within the vicinity of the Project Area

Item	Site / Attribute	Description
Regeneration	*Regeneration Area*	Located to the southwest of the Line of Lode, within the former Zinc Corporation leases. This area includes the 18 acres that were part of the 'greening of the hill' undertaken in the 1930s to seek to regenerate the land around Broken Hill to reduce dust. **Figure 1.3** shows the location of the regeneration areas relative to the Project Area.
Mining Landscape	Remnant mining structures	c.1950s lift shaft associated with the Perilya north mine located immediately west of the Project Area and outside of the area of disturbance.
	Evidence of early and current lease areas of mines.	c. 1950s lift shaft, current and remnant mine infrastructure, including tailings (located outside but immediately adjacent to the Project Area).
Views	Views to the Line of Lode	The Line of Lode and associated redundant and current mining infrastructure form a crucial landmark within the City of Broken Hill. Views to the Line of Lode are available from all approaches to the township from road and air, as well as from across the desert landscape to the south of the Line of Lode. The topography of Broken Hill means that the availability of views from the Project Area to the Line of Lode are generally limited.
	To the desert landscape	Views within the National heritage place to the desert landscape, particularly from within the township of Broken Hill and from the residential and community buildings within the mining precincts.

Item	Site / Attribute	Description
	From the Line of Lode across the desert	The elevated reaches of the Line of Lode across the desert landscape, particularly to the south, provide uninterrupted views of the desert landscape which surrounds Broken Hill, in stark contrast to the mining infrastructure surrounding the Line of Lode, and the streets, buildings and parks of the Broken Hill township.

6.4.2 Methodology

Following the review of the documented heritage values for the area and survey of the Project Area, the historical archaeological potential of the Project Area was determined by assessing the likelihood that there may be physical evidence relating to the early development and occupation of the Project Area beneath the current ground surface.

Assessing the cultural significance of the Project Area was conducted using the Burra Charter which defines cultural significance as meaning 'aesthetic, historic, scientific, or social value for past, present or future generations'. Cultural significance is defined as being present in the 'fabric, setting, use, associations, meanings, records, related places and related objects' (Australia ICOMOS 2013).

The impact assessment was undertaken following the Heritage NSW guidelines and the Burra Charter and in relation to the consideration of national heritage values, using the self-assessment guidelines in the Commonwealth Government's *Matters of National Environmental Significance, Significant Impact Guidelines 1.1* (Department of Environment, 2013).

The Project has also been assessed against the Significant Impact criteria, as outlined in the Significant Impact Guidelines 1.1 (Department of Environment, 2013). Following these guidelines, a Project is likely to have a significant impact on the National Heritage values of a National Heritage place if there is a real chance or possibility that it will cause:

- one or more of the National Heritage values to be lost
- one or more of the national heritage values to be degraded or damaged, or
- one or more of the national heritage values to be notably altered, modified, obscured or diminished.

6.4.3 Assessment of Impacts

The Project will not result in any physical impact to individually listed heritage items. The key potential heritage impact to be considered is the potential for any impacts on the broader LGA wide National heritage listing (refer to **Section 6.4.3.2**). The Historic Heritage Impact Assessment also considered the archaeological potential of the Project Area which was found to be low as discussed below.

The Project Area has been used primarily for mining or set aside as Crown land following the discovery of silver and complex ore in Broken Hill. The Project Area has also been subject to activities that would have resulted in high levels of disturbance to any historical archaeological remains that may have existed in the area reducing the archaeological potential of the Project Area.

The first documented land uses of the Project Area, associated with pastoral stations would have been largely transient, such as herding of livestock across the landscape, boundary riders and surveying parities. Domestic and other associated agricultural / pastoral activities likely to result in archaeological signatures would have likely focused at or in the vicinity of homesteads or station complexes, none of which have been recorded as being located within the Project Area.

It is unlikely that ephemeral evidence of pastoral land use, boundary riders or other transient activities within the Project Area would have survived intact following high levels ground disturbance occurring across the Project Area. The Project Area is considered to have low to nil archaeological potential associated within the pre-1870s pastoral land use.

The significant elements of the City of Broken Hill associated with the Project Area are generally related to the views and landscape characteristics of Broken Hill and associated mining activities, with the exception of the original regeneration area established in the 1930s. As discussed in **Section 1.4**, approximately 2.2 km of the Project Area (associated with the transmission line) is located within the boundary of the original Regeneration Area. However, ecological survey for the Project did not identify any historical plantings that could be remnants of this historically significant period. The construction and operation of the Project would not result in the removal or alteration to any significant elements which contribute to the National Heritage Values of Broken Hill.

6.4.3.1 Visual Impacts

The views, vistas and setting of Broken Hill and its significant mining landscape are integral to recognising its National heritage values. It is recognised that the SCES Facility and transmission line represent the introduction of new infrastructure across an area of considerable length (approximately 16 km) and therefore the potential of the Project to impact on these views and vistas requires consideration from a heritage perspective.

Significant views and aesthetic characteristics of the City of Broken Hill National heritage place are associated with the views and landmark characteristics of the Line of Lode and other representative elements of the significant mining landscape across the Broken Hill LGA. The setting of Broken Hill, both the residential areas and large mining leases, in the arid landscape are key contributing characteristics to the cultural heritage significance of the City of Broken Hill. The aesthetic values of Broken Hill are not, however, tied to a static point of the historical development of Broken Hill, and also include the evolution of the landscape forms in response to ongoing mining, particularly in response to technological changes.

As identified in the visual impact assessment for the Project (refer to **Section 6.6**), the proposed works would result in negligible to minor (depending on the viewing location) changes to the significant views and vistas within the City of Broken Hill. Due to the discrete location of the SCES Facility and dispersed nature of the new infrastructure associated with the transmission line the Project does not constitute a substantial alteration or addition to the landscape. Additionally, the Project will not result in the loss or partial restriction of significant views to key landscape features that contribute to the significance of the City of Broken Hill.

6.4.3.2 Impact on the National Heritage Values

The Project will include the construction and operation of new infrastructure within the boundaries of the National Place. However, there will be no physical impacts to existing heritage items, and no removal of elements that demonstrate the significant value of the Place. Although the Project will include construction of new structures, this would not result in impacts on the significant views and vistas within Broken Hill nor reduce its aesthetic significance or ability to demonstrate the principal characteristics of the remote mining town and its associated current and historical mining relics. The Project would not affect or impact on the significant geological resources represented by the Line of Lode and other mineral deposits in the area and would not reduce the research potential of the Place.

The proposed infrastructure is also in character with the existing industrial elements of the current viewshed. Although the proposed infrastructure will be visible, the nature of the infrastructure will not be out of character given so much of the landscape is dominated by mining/industrial views.

The Historic Heritage Impact Assessment concluded that Project would not have a significant impact on the National Heritage values of the City of Broken Hill. This assessment finding was confirmed by DCCEEW as part of the assessment of the referral of the Project under the EPBC Act, with DCCEEW confirming that Project would not result in a significant impact on the National Place and therefore does not require approval from the Commonwealth Minister for the Environment and Water.

6.4.4 Mitigation and Management Measures

The Project has been assessed as not having any impacts, or the potential to impact, on the National heritage values of the City of Broken Hill or on any other heritage sites. Therefore, no mitigation or management measures have been recommended, however, the CEMP will include an unexpected finds management measure in the unlikely event that potential items of heritage value are uncovered during construction works.

6.5 Noise and Vibration

Noise and vibration issues from the Project were not raised as a key concern as part of the community engagement program, potentially due to the distances between the Project and residences and the existing mining/industrial nature of the land surrounding the Project. Noise was identified as a key issue in the SEARs and therefore a detailed assessment was completed.

A Noise and Vibration Impact Assessment (NVIA) has been prepared for the Project by Umwelt in accordance with the SEARs and the following guidelines:

- *Interim Construction Noise Guideline* (ICNG), NSW Department of Environment and Climate Change (DECC), 2009.
- *Noise Policy for Industry* (NpfI), Environment Protection Authority (EPA), 2017.
- *NSW Road Noise Policy* (RNP), Department of Environment, Climate Change and Water (DECCW), 2011.
- *Assessing Vibration: A Technical Guideline* (the vibration guideline), Department of Environment and Conservation (DEC), 2006.

- Australian and New Zealand Environment Conservation Council (ANZECC) – Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.
- The NVIA provides an assessment of the potential noise and vibration impacts associated with the construction, operation and decommissioning of the Project and recommends mitigation measures to minimise these impacts.

A summary of the results of the NVIA is provided in the following sections with the NVIA report attached as **Appendix 9**.

6.5.1 Existing Acoustic Environment

As discussed in **Section 2.6.2**, the closest residence (R1) is located approximately 900 m east of the SCES Facility. There is also an additional residence located within the Outback Astronomy business (R2) approximately 1.3 km east of the SCES Facility across the Barrier Highway. Other residences within the surrounding area are located >2 km from the SCES Facility and the main residential areas within Broken Hill City are located >3 km from the SCES Facility (refer to **Figure 2.3**). To simplify the assessment of residential noise impacts and the presentation of results, residential receivers were grouped into Noise Catchment Areas (NCAs), with the NCAs shown on **Figure 6.6**.

To determine the existing noise levels occurring in the vicinity of the Project, background noise monitoring was carried out at two locations as outlined in **Table 6.9**. These monitoring locations were selected to be representative of the potentially affected noise receivers within the respective NCAs.

Table 6.8 Noise Monitoring Locations

ID	Address / Description	Monitoring Period	Location description [1]
L1	18817 Barrier Hwy, Broken Hill (Outback Astronomy – R2) 1,140 m east of SCES Facility	16/11/2022–25/11/2022	The logger was located in the front yard of the property. The microphone was located 1.5 metres above ground level in the free-field.
L2	1 Mann Street, Broken Hill (Broken Hill Outback View Holiday Park) 3,060 m southwest of SCES Facility	16/06/2022–25/11/2022	The logger was located on the eastern side holiday park. The microphone was located 1.5 metres above ground level in the free-field.

Note: 1. Free-field is greater than 3.5 metres from reflective surfaces.

The results of the noise monitoring are summarised in **Table 6.10**.

Table 6.9 Noise Monitoring Results, dB(A)

ID	Rating Background Level (RBL) LA90 15 minute			Ambient noise level [2] Laeq, period		
	Day [1]	Evening [1]	Night [1]	Day [1]	Evening [1]	Night [1]
L1	41	25	17	54	54	51
L2	31	28	24	48	42	39

Notes: [1] Day period is 7:00 am–6:00 pm Monday-Saturday and 8:00 am–6:00 pm Sunday and Public Holidays, evening period is 6:00 pm-10:00 pm and night period is 10:00 pm to commencement of day period.

[2] In accordance with Npfl (Section 2.6), ambient noise levels are free-field noise levels (i.e. no correction from facade reflections).

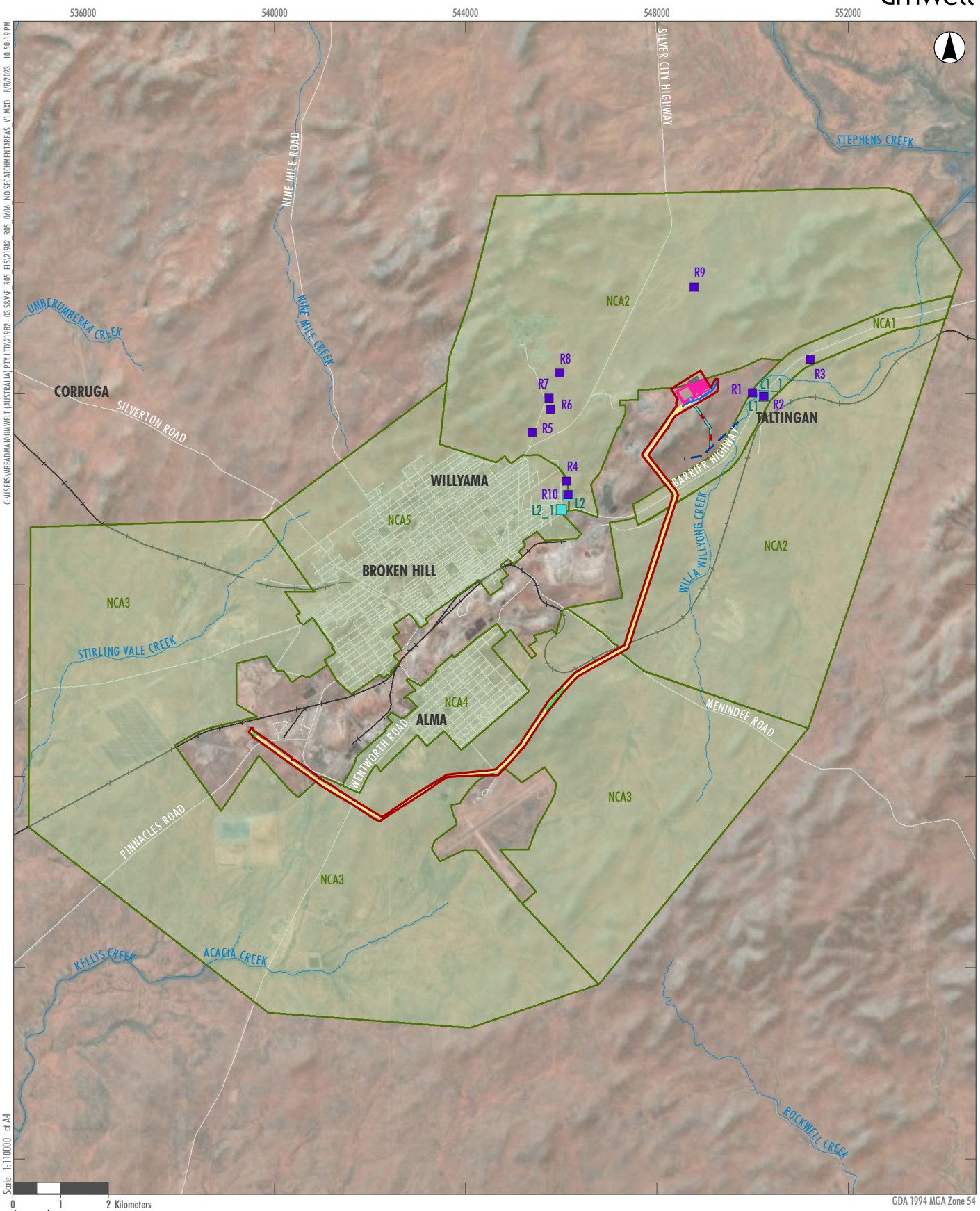
A noise model has been used to determine the potential noise impacts from the SCES Facility at the nearest receivers to this part of the Project. The receivers included in this model are detailed in **Table 6.10** and shown on **Figure 6.6**.

Table 6.10 Operational receivers in proximity to SCES Facility

Noise Catchment Area	Representative Receiver ID	Receiver Type	Receiver details	Approximate Separation Distance to SCES Facility, m
NCA 1	R1 [1]	Residential	Lot 7333 DP1201053	890 m
	R2 [2]	Residential	18817 Barrier Highway, Broken Hill	1,130 m
	R3	Residential	18699 Barrier Highway, Broken Hill	2,170 m
NCA 2	R4	Residential	764 Brady Street, Broken Hill	2,925 m
	R5	Residential	17 Racecourse Road, Broken Hill	3,130 m
	R6	Residential	44 Racecourse Road, Broken Hill	2,640 m
	R7	Residential	46 Racecourse Road, Broken Hill	2,650 m
	R8	Residential	Lot 1098 DP767020	2,470 m
	R9	Residential	770 Silver City Highway, Broken Hill	1,920 m
	R10	Holiday Accommodation	1 Mann Street, Broken Hill Broken Hill Outback View Holiday Park	3,060 m
NCA 1	R11	Commercial	18672A Barrier Highway, Broken Hill NBNCo Broken Hill Gateway	2,210 m
NCA 2	R12	Commercial	19059B Barrier Highway, Broken Hill	2,030 m
	R13	Commercial	Lot 7314 DP1185108	1,950 m
	R14	Commercial	47 Range Road, Broken Hill Broken Hill Pistol club	1,180 m
	R15	Commercial	220 Racecourse Road, Broken Hill Broken Hill Racecourse	3,000 m
	R16	Active Recreation	235 Racecourse Road, Broken Hill Broken Hill Golf & Country Club	2,900 m

Notes: [1] *An agreement between A-CAES NSW and receiver R1 is in place and, therefore is not considered sensitive.*

[2] *Receiver R2 has commercial and residential uses. For this assessment noise impacts are based on a residential receiver, as it has the most stringent noise limits.*



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Proposed Transmission Line (Above Ground Section)
- Proposed Transmission Line (Underground Section)
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Railway Line
- Road
- Noise Catchment Area
- Noise Monitoring Location
- SCES Facility Receivers

FIGURE 6.6

Noise Catchment Areas

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2022)

6.5.2 Noise and Vibration Assessment Criteria

This section outlines the key noise and vibration assessment criteria used the assess the impact of the Project. Further information on these criteria and some further applicable criteria for the detailed assessment are outlined in **Appendix 10**.

6.5.2.1 Operational Noise

The potential operational noise impacts of the Project have been assessed against the NSW Environment Protection Authority (EPA) Noise Policy for Industry (NpfI) (2017).

The NpfI sets noise criteria for a Project considering both the noise impacts of a project alone and cumulative noise impacts by determining a project noise trigger level (PNTL) against which noise emissions are assessed. The PNTLs for the Project for residential receivers are shown in **Table 6.12**. The PNTLs for the non-residential receivers are shown in **Table 6.13**.

Table 6.11 Project Noise Trigger Levels – Residential Receivers – $_{LAeq}$(15min), dB(A)

NCA	Period [1]	Project Noise Trigger Level
NCA 1	Day	46
	Evening	35
	Night	35
NCA 2	Day	40
	Evening	35
	Night	35

Notes: [1] Day period is 7:00 am–6:00 pm Monday-Saturday and 8.00 am-6.00 pm Sunday and Public Holidays, evening period is 6:00 pm–10:00 pm and night period is 10:00 pm to commencement of day period.

Table 6.12 Project Noise Trigger Levels For Non-Residential Receivers – $_{LAeq}$(15min), dB(A)

Receiver	Period	Project Noise Trigger Level[1]
Holiday Accommodation – R10	Day	58
	Evening	48
	Night	43
Active recreation area – R16	When in use	53
Commercial – R11, R12, R13, R14 & R15	When in use	63

Note: [1] PNTL is only applicable when the receiver is in use.

6.5.2.2 Construction Noise

The NSW construction noise guidelines (ICNG) recognises that construction activities could potentially generate higher noise levels than those of an operating facility. The ICNG provides noise management criteria for construction activities. The criteria are intended to guide the need for, and the selection of, feasible and reasonable work practices to minimise construction noise impacts. That is, it is recognised that construction noise may exceed recommended noise management levels (NMLs) but where they do, controls should be implemented to seek to manage these impacts. The construction NMLs for the Project are summarised in **Table 6.13**.

Table 6.13 Construction Noise Management Levels for Residential Receivers

Noise Catchment Area	Noise Management Levels (NML), $L_{Aeq,15minute}$ dB(A)	
	Construction NML [1]	Highly Noise Affected
NCA 1	51	75
NCA 2	45	75
NCA 3	45	75
NCA 4	45	75
NCA 5	45	75

Note: [1] Recommended standard hours: Monday to Friday 7:00 am–6:00 pm; Saturday 8:00 am–1:00 pm.

Construction Vibration

There is the potential for some construction activities to result in vibration. For construction activity, *Assessing Vibration: A Technical Guideline* (DEC, 2006) provides the vibration criteria for dwellings to avoid impacts for both continuous vibration (vibration for an extended period of time such as a compactor operating as part of road construction activities) and intermittent vibration.

Vibration criteria are also established for other infrastructure such as pipelines and heritage structures and specific criteria for blasting should this be required as part of construction activities. The criteria applicable to the Project are specified in **Appendix 9**.

Road Traffic Noise

Noise criteria are also established for road traffic noise to provide for the assessment of any traffic related noise impacts. **Table 6.15** outlines the operational and construction road traffic noise criteria for residential land uses along the access route.

Table 6.14 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Project/Land Use	Assessment Criteria dB(A)	
		Day 7:00 am to 10:00 pm	Night 10:00 pm to 7:00 am
Freeway/arterial/ sub-arterial road	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15hour}$ 60 (external)	$L_{Aeq,9hour}$ 55 (external)

Road Category	Type of Project/Land Use	Assessment Criteria dB(A)	
		Day 7:00 am to 10:00 pm	Night 10:00 pm to 7:00 am
Local Roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	LAeq,1hour 55 (external)	LAeq,1hour 50 (external)

The NSW Road Noise Policy notes that where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet assessment criteria. Any increase in the total traffic noise level as a result of the development should be limited to 2 decibels (dB) above that of the noise level without the development. In assessing noise impact, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

6.5.3 Methodology

The NVIA considered by the construction and operational phases of the Project. With regard to the operation of the SCES Facility, the assessment considers the SCES Facility operating at full capacity. It is noted the SCES Facility is likely to only operate at full capacity during peak hours (day and evening). However, to provide a conservative assessment of the noise impacts, the SCES Facility has been modelled and assessed as operating at full capacity during the night-time period.

The SCES Facility will have both charge (compressing and storing compressed air) and discharge (using the stored compressed air to generate power) cycles. The theoretical daily cycle of the SCES Facility operation used in the noise assessment is as follows:

- Charge cycle duration 8 to 10 hours per day. Charge cycle predominately during daytime.
- Discharge cycle duration 6 to 8 hours per day. Discharge cycle predominately during late daytime / early evening during peak power demand.

Noise levels were predicted using the SoundPLAN environmental noise modelling software package. Further detail relating to noise model inputs, incorporated noise control measures and meteorological conditions used in the assessment (including both neutral and adverse conditions) is provided in the NVIA, refer to **Appendix 9**.

6.5.4 Noise and Vibration Impact Assessment

6.5.4.1 Operational Noise Levels

Operational noise level predictions have been undertaken for the following scenarios:

- charge cycle (start-up and normal operation)
- discharge cycle (start-up and normal operation)
- standby operation.

The start-up cycles will only occur a few times each day for short durations (less than 15 minutes) but as these short periods will generate higher levels of noise they have been included in the noise modelling.

The SCES Facility design incorporates a number of design features which have been included to minimise noise and these have been incorporated into the noise modelling. The final detailed design of the SCES Facility will include relevant noise controls to achieve compliance with the PNTLs at sensitive receivers (except where a noise agreement is in place).

The NVIA found that the operational noise levels are predicted to comply with the PNTLs at all non-involved sensitive receivers, with the exception of R1 where a Project specific agreement is in place with the landowner.

Noise contours for the start-up charge cycle, start-up discharge cycle and standby mode under the noise-enhancing meteorological conditions are presented in **Figure 6.7, Figure 6.8** and **Figure 6.9**. Detailed tabulated modelling results with results for each receiver are presented in the NVIA (refer to **Appendix 9**).

With regard to the potential for sleep disturbance, the maximum noise level at all the receivers was predicted to be a L_{Amax} of 52 dB(A) at receiver R1 and a L_{Amax} 50 of dB(A) at receiver R2. This maximum noise level meets the sleep disturbance criteria of L_{Amax}52dB(A). Accordingly, the Project is predicted to comply with the sleep disturbance criteria at all receivers.

During operation of the electricity transmission network, noise emission (hissing or cracking noise) associated with the power lines can result from an effect called corona discharge (or corona effect). The intensity of the corona discharge and the resulting noise is dependent on meteorological conditions (such as humidity, rain, fog and wind), the concentration of airborne particles (dust, ash) and the state of the conductor surface. This effect can also be minimised through the design of the transmission line.

The NVIA also identified the theoretical distance from the transmission line within corona noise may occur above the night-time PNTL during certain weather (light rainfall and humid conditions) which is 110 m. One residence (R17) occurs within this distance and therefore has the potential to be impacted, however, given the expected limited occurrence of corona discharge in an arid environment, potential impacts are considered minimal.

6.5.4.2 Construction Noise

Construction-related noise levels have been assessed at nearby sensitive receivers surrounding the project area. This included the evaluation of construction scenarios that represent the various construction activities required for the Project.

Without the application of noise mitigation measures, the noise levels from construction activities during standard construction hours were predicted to be greater than the applicable noise management levels at a number of sensitive receivers. The vast majority of these receivers are predicted to be impacted by the construction of the transmission line rather than the SCES Facility. Given the transient nature of the transmission line works, construction works will not occur in any one location for a long period of time and so potential noise impacts at any one receiver are anticipated to be short in duration. No receivers were predicted to be highly noise affected.

The noise modelling results and analysis for unmitigated construction noise levels indicate that reasonable and feasible noise mitigation measures are required to minimise the potential impacts on the communities surrounding the Project Area. The implementation of such controls is proposed as discussed in **Section 6.5.5**.

6.5.4.3 Construction Vibration and Blasting

The construction vibration assessment identified that there are no non-project related structures predicted to impacted by vibration associated with the Project due to the distance of such structures from construction areas. There is one structure, located on the Potosi Mine site, within the theoretical cosmetic damage minimum working distance for some items of construction equipment associated with transmission line construction, however, this issue is addressed by the arrangements in place between A-CAES NSW and Perilya.

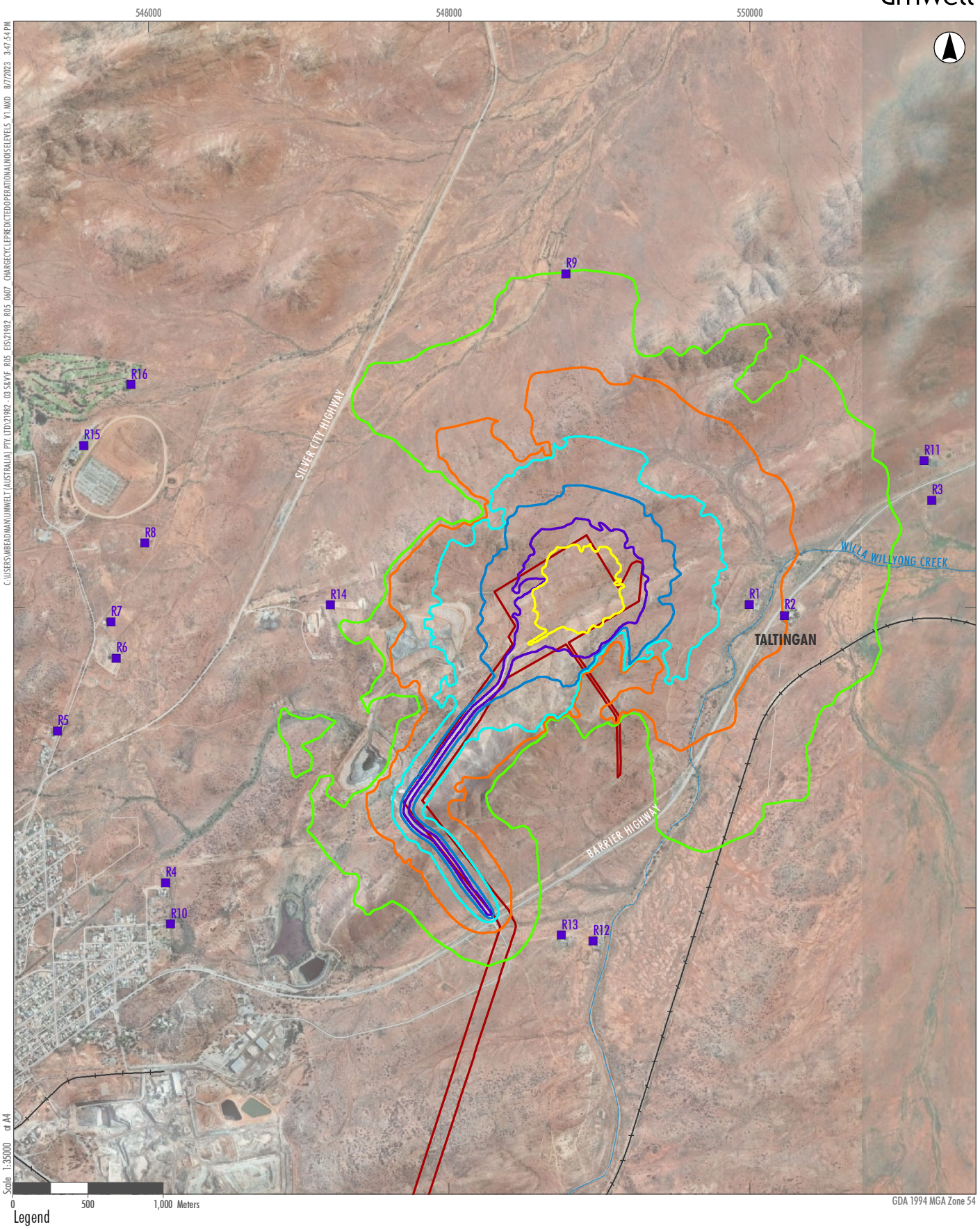
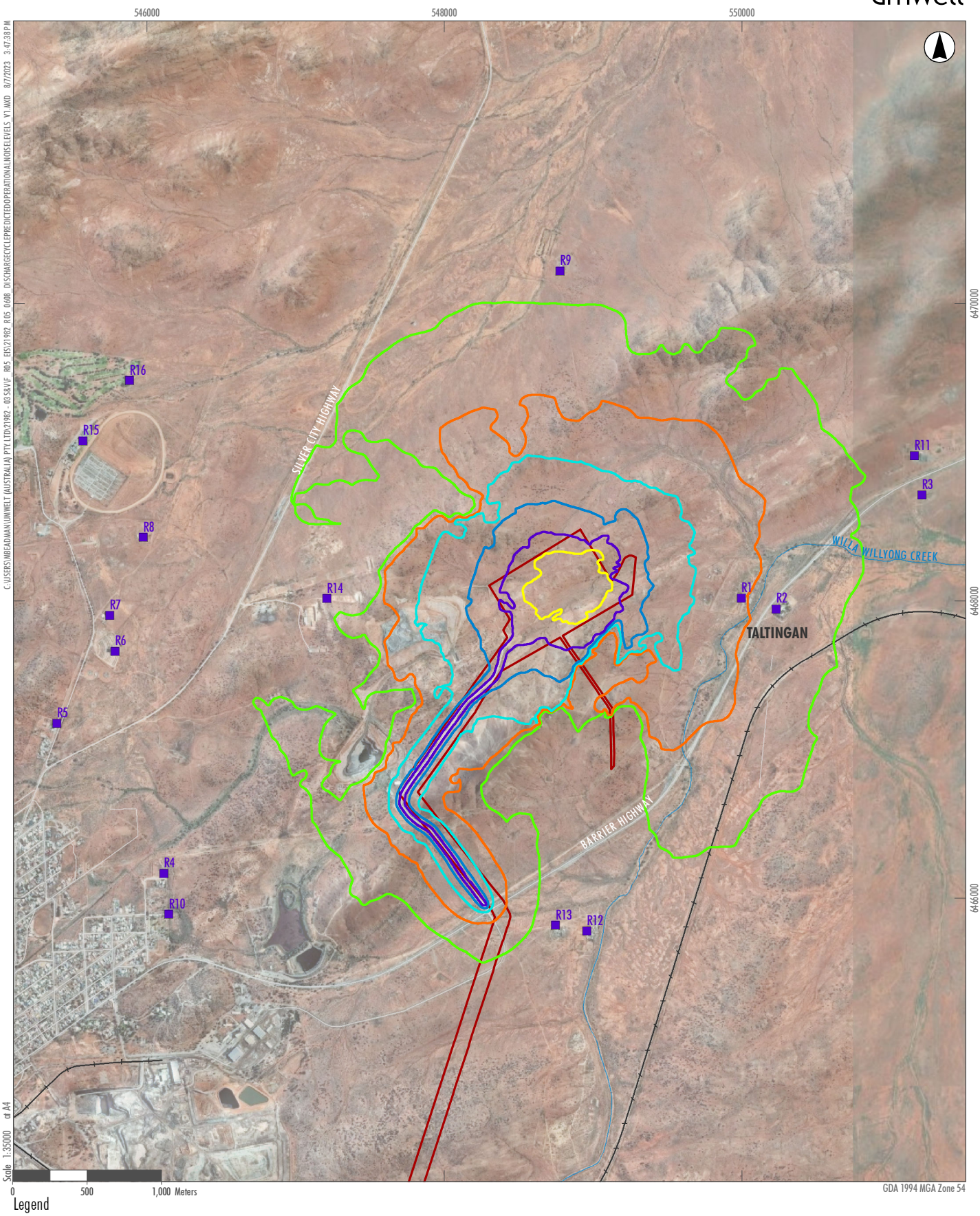


FIGURE 6.7

Start-up Charge Cycle - Predicted Operational Noise Levels Under Noise-Enhancing Meteorological Conditions (F class - 0.5m/s), LAeq(15 min) dB(A)

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



Legend

- Project Area
- Drainage Line
- Railway Line
- Road
- SCES Facility Receivers

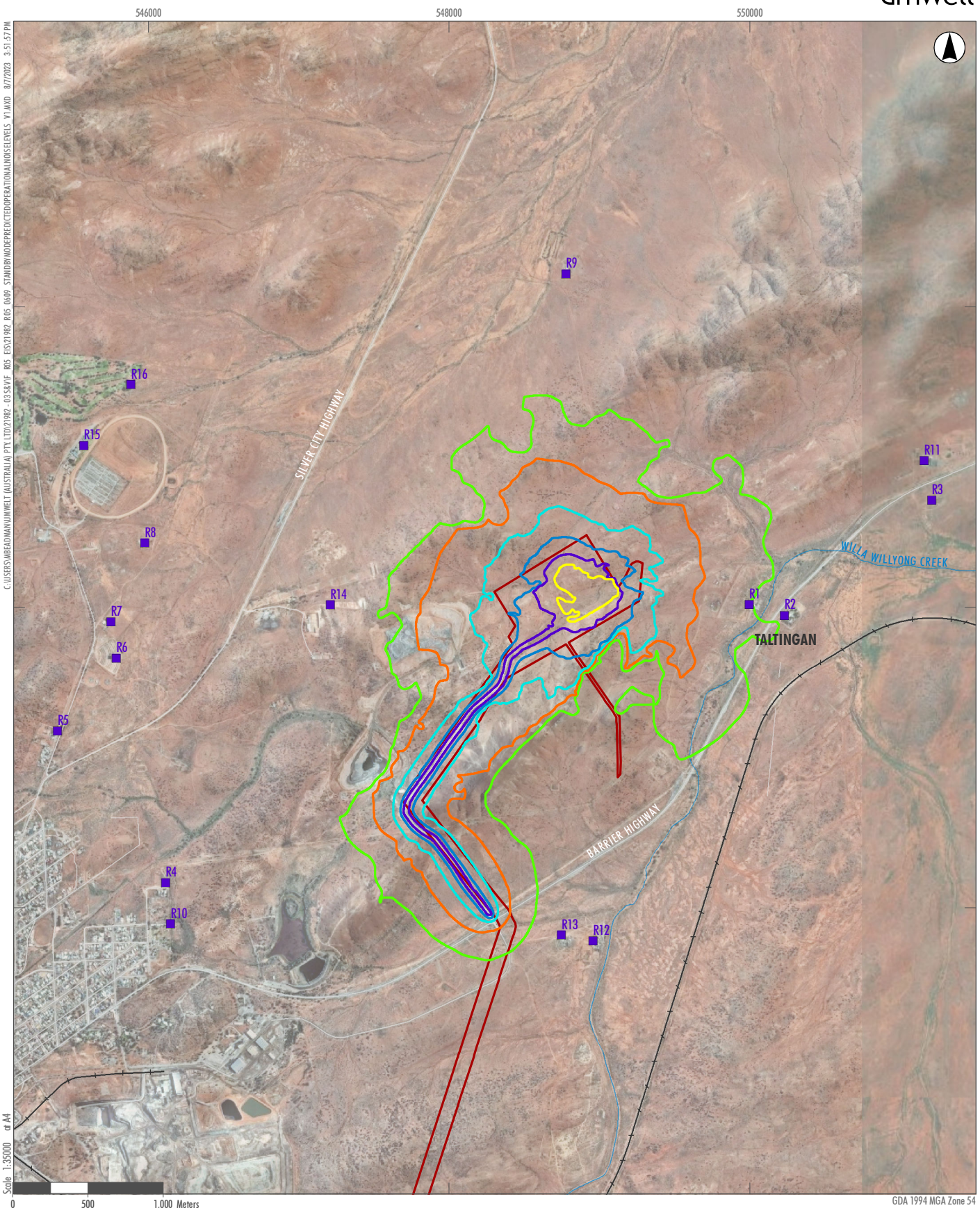
Predicted Operational Noise Levels

- Noise Contour Level 30 dB(A)
- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)

FIGURE 6.8

Start-up Discharge Cycle - Predicted Operational Noise Levels Under Noise-Enhancing Meteorological Conditions (F class - 0.5m/s),

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



Legend

- Project Area
- Drainage Line
- Railway Line
- Road
- SCES Facility Receivers

Predicted Operational Noise Levels

- Noise Contour Level 30 dB(A)
- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)

FIGURE 6.9

Standby Mode - Predicted Operational Noise Levels Under Noise-Enhancing Meteorological Conditions (F class - 0.5m/s), LAeq(15 min) dB(A)

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

In addition, one residential building was identified within the human response minimum working distance for vibration associated with transmission line construction. Receiver R17 is located 80 m from the transmission line Project Area. This falls within the human response minimum working distance of 100 m for vibratory rollers 7 tonnes and heavier with such equipment potentially being used for construction works such as the transmission line access track. Given the large separation distance and the transient nature of transmission line construction works, human disturbance from construction activities is anticipated to be minimal, however, A-CAES will consult with this receiver prior to works commencing in the vicinity of this residence.

Blasting is proposed for the construction of the underground cavern with this blasting to be generally consistent with the blasting associated with the existing Potosi mining operations. Given the blasting is occurring 600 m underground any blast overpressure (i.e. the noise generated by the blast) will be negligible at the nearest receivers. With regard to the potential vibration associated with underground blasting, the NVIA identified that blast vibration is predicted to readily comply with the relevant blast vibration criteria at the nearest sensitive receiver.

6.5.4.4 Road Traffic Noise

The majority of traffic generation for the Project will be during the construction phase. The NVIA found that road traffic noise during construction is predicted to comply with the relative increase criterion of 2 dB(A) and/or be under the NSW Road Noise Policy noise limits. Therefore, adverse construction traffic noise impacts are predicted.

Traffic generation during the operational phase will be small and consequently, road traffic noise during the operational phase is anticipated to be minimal.

6.5.4.5 Cumulative Noise

As discussed in **Section 2.7**, there are several other proposed projects that may occur concurrently with the Project. With the exception of the Broken Hill Battery Energy Storage System project, Broken Hill Cobalt Blue project, Blue Bush project and Hawsons Iron Ore project all other projects considered in the cumulative noise assessment are currently operational and are therefore included in the background noise environment and are considered in the Project noise assessment above. These four projects are located a significant distance (i.e., at least 8 km away) from the SCES Facility and therefore no cumulative impacts associated with the construction of the SCES Facility and these projects are predicted.

In regard to the Project's transmission line works, the only project with the potential to contribute to cumulative noise impacts is the Broken Hill BESS, as all other projects with potential construction phases are located at least 20 km from the Project Area. The NVIA therefore considered the potential for cumulative construction noise at those sensitive receivers located near both project areas. It is understood that the construction of the Broken Hill BESS commenced in 2022 and it is anticipated that the bulk of works will be complete by the time the transmission line works commence (i.e. Q3 2024). Given the transient nature of the transmission line works, cumulative construction noise impacts are anticipated to be low, however, should the construction phases overlap the need for specific management measures will be addressed in the construction noise management plan.

Potential cumulative construction traffic noise impacts may result from the Project and the proposed Broken Hill Cobalt Blue project, Blue Bush project and Hawsons Iron Ore projects dependent on their timing. In the extremely unlikely scenario that all of the projects are constructed concurrently and that all trips travel along the same routes, the cumulative daily traffic movements may require consideration of traffic noise impacts. This issue will also be addressed in the construction noise management plan should the construction phases of the projects overlap.

6.5.5 Noise and Vibration Management and Mitigation Measures

The CEMP and OEMP developed and implemented for the Project will include the following monitoring and management controls to manage potential noise impacts associated with construction activities and site operations:

- noise objectives and targets consistent with the Development Consent
- noise management measures for both the construction and operational stages
- provision of general noise awareness training for key operational staff
- noise monitoring processes implemented at the site to provide for ongoing noise management, including monitoring and determination of compliance with relevant noise criteria provided in the Development Consent (refer to **Appendix 9**)
- stakeholder consultation
- complaint/enquiry handling process including maintenance of a 24-hour community contact line
- a roles and responsibilities matrix, with responsibilities being clearly defined through all levels within the operation.

The CEMP/OEMP will include the development of a noise Trigger Action Response Plan (TARP) that includes an Incident Investigation and Response process that:

- is implemented following notification of elevated noise levels through compliance/validation measurements or complaint
- records the actions taken by site personnel following notification of elevated noise levels including mitigation measures undertaken to achieve compliance
- in the event that an exceedance of the noise impact assessment criteria is identified, guides the notification process for relevant government agencies and any affected landowners within the statutory timeframe.

If a non-compliance is identified or a request for installation of noise impact mitigation measures is received, the CEMP/OEMP will document the corrective or preventative actions to be implemented in accordance with the Development Consent. This will also include a review process required to assess the effectiveness of the corrective/preventative action taken and specify the timeframe for the review following the implementation of the corrective action.

Noise monitoring will take the form of compliance monitoring and validation monitoring. Compliance monitoring will be via a combination of attended monitoring at defined locations and noise loggers. Validation monitoring will take place at the same time as the compliance monitoring to confirm the noise model predictions and accuracy of the noise model.

A combination of attended monitoring and noise logging for compliance assessment is proposed within three months and once following nine months of the commencement of the Project operating at full capacity. As the Project is not predicted to exceed PNTLs and will not vary over the life of the operation, annual compliance monitoring is not considered necessary. Further details of the proposed noise monitoring for the Project are outlined in **Appendix 9**.

6.6 Air Quality

The SEARs require an assessment of the air quality impacts associated with the Project and the potential impacts of air discharge on air traffic. An Air Quality Impact Assessment (AQIA) has been prepared by Airen to address the SEARs (refer to **Appendix 10**). The AQIA also includes a Greenhouse Gas Impact Assessment.

The AQIA involved identifying potential air quality related key issues for further consideration in the assessment. The potential key issues were identified as construction dust and construction and operational greenhouse gas emissions. These issues were the focus of the assessment.

It is noted that the Project will contribute to positive air quality outcomes through supporting the transition to renewable energy and associated reduction in greenhouse gas emissions in comparison to other electricity generating sources such as traditional coal-fired power stations.

6.6.1 Air Quality Impact Assessment

The AQIA identified that construction phase of the Project is likely to result in some dust generation. These emissions will include dust (also referred to as particulate matter) from excavation works, material handling, material transport and wind erosion from exposed areas. Key classifications of particulate matter include:

- total suspended particulates (TSP) being the total amount of dust suspended in the air
- particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM_{10})
- particulate matter with equivalent aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$)
- deposited dust, which is the larger particles of dust that settle onto the ground and other surfaces.

In regard to other air quality emissions, plant and equipment engine exhausts used for the Project also have the potential to generate emissions that include carbon monoxide (CO), oxides of nitrogen (NOx) and particulate matter, and to a lesser extent sulphur dioxide (SO_2).

The AQIA considers the procedures outlined in the *Approved Methods for the Modelling and Assessment of Air Pollutants* (EPA, 2022), which include guidelines for the preparation of meteorological data, reporting requirements and air quality assessment criteria to assess the significance of air quality impacts.

6.6.1.1 Existing Environment

Key characteristics of the existing environment related to air quality include:

- The most common winds in the area are from the south. This pattern of winds means that any air quality emissions generated at and around the proposed SCES Facility will most likely be transported to the north, away from Broken Hill City.
- Air quality in many parts of NSW, including the Far West, was adversely influenced by drought conditions from 2017 to 2019 and lower than average rainfall. A deterioration in air quality conditions over these years was not unique to the Far West and extraordinary events, beyond normal conditions, have been identified as part of annual reviews of monitoring data.
- Monitoring data show an increase in PM_{10}, $PM_{2.5}$ and TSP concentrations at all Broken Hill rural and urban locations from 2017 onwards, reflecting the onset of drought conditions, and increased bushfire activity in 2019 that continued into early 2020 with concentrations decreasing rapidly from 2020 to 2022 as rainfall increased. These conditions led to increases in the number of days when the 24-hour average PM_{10} concentration exceeded the goal of 50 µg/m^3 and increases in the annual average PM_{10} concentrations.
- Annual average $PM_{2.5}$ concentrations were likely to have been at acceptable levels even with extraordinary events in the Far West.
- Monitored annual average deposited dust levels between 2018 and 2021 at Potosi Mine indicate deposited dust levels have not exceeded the 4 g/m^2/month criterion in the past four years (with the exception of one monitor in 2020).

6.6.1.2 Air Quality Risk Assessment

The primary air quality risk for the Project relates to generation of dust from construction activities, with the highest emissions being generated near the SCES Facility, where the majority of spoil handling and earthworks would occur. The AQIA determined a “Medium” unmitigated risk for these activities, with the risk expected to decrease to “Low” through the implementation of standard air quality mitigation measures as proposed to be implemented for the Project. Construction of the transmission line will require relatively minor earthworks and as such a “Very Low” air quality risk rating was determined.

Based on the results of the risk assessment the Project would not cause adverse air quality impacts during construction, based on the assessed low air quality risk. Therefore, the AQIA determined further quantitative assessment was not required for the Project.

6.6.1.3 Venting Air Assessment

Emissions during operation will occur from venting the heated compressed air. No “air pollutants” will be emitted from the venting process (air from the atmosphere will be used to create compressed air and this same air will be released back into the atmosphere as part of the power generation process). There will be minor emissions associated with maintenance of equipment and the use of emergency diesel generators to operate critical systems during emergency events.

The EPA, as part of its assessment recommendations, requested a discussion of the potential impacts of the emissions of hot air servicing the turbines. Maximum air discharge temperatures are expected to be in the order of 30 degrees Celsius. This exhaust temperature may, on occasions, be higher than ambient conditions, therefore further assessment has been undertaken.

A computer-based air dispersion model (TAPM) was used to simulate the horizontal extent of discharged air when the final plume rise height is reached. At this point there will be no further vertical plume rise due to momentum or buoyancy, meaning that the discharged air will be well mixed with the surrounding environment and close to ambient temperature.

There are no specific criteria for which to assess the modelling results however the maximum and 90th percentile extents (with the 90th percentile extent likely more realistic given the intermittent operating conditions) are unlikely to conflict with any surrounding land-uses or sensitive places. In addition, the modelling indicates the maximum height at which the plume vertical velocity falls below a critical vertical velocity of 6.1 m/s was 70 m. This height is unlikely to impact aircraft (refer to **Section 6.9.7** for further assessment of aviation impacts).

6.6.2 Greenhouse Gas and Energy Assessment

The assessment of greenhouse gas (GHG) generation for a Project are presented in terms of 'Scopes' to help understand the direct and indirect impacts of a project. Scopes 1, 2 and 3 are defined by the Greenhouse Gas Protocol (WRI, 2004) and can be summarised as follows:

- Scope 1 – Direct emissions from sources that are owned or operated by the organisation (examples include combustion of diesel in company owned vehicles or used in on-site generators).
- Scope 2 – Indirect emissions associated with the import of energy from another source (examples include importation of electricity or heat).
- Scope 3 – Other indirect emissions (other than Scope 2 energy imports) which are a direct result of the operations of the organisation but from sources not owned or operated by them (examples include business travel, by air or rail, and product usage).

The purpose of differentiating between the scopes of emissions is to avoid the potential for double counting, where two or more organisations assume responsibility for the same emissions.

The GHG inventory completed as part of the AQIA includes all significant sources of GHGs (Scopes 1, 2 and 3) associated with the Project.

Future projections of fuel usage and electricity consumption were used to determine the GHG emissions from the Project. Estimated emissions have considered that the SCES Facility will draw electricity from the grid when plentiful and, at these peak times, the excess will have been generated predominantly by renewables.

6.6.2.1 Construction

The estimated GHG emissions have been calculated based on the construction timeframe, indicative activities and estimated fuel usage from machinery/generators to be used during construction of the Project, as outlined in **Table 6.16**.

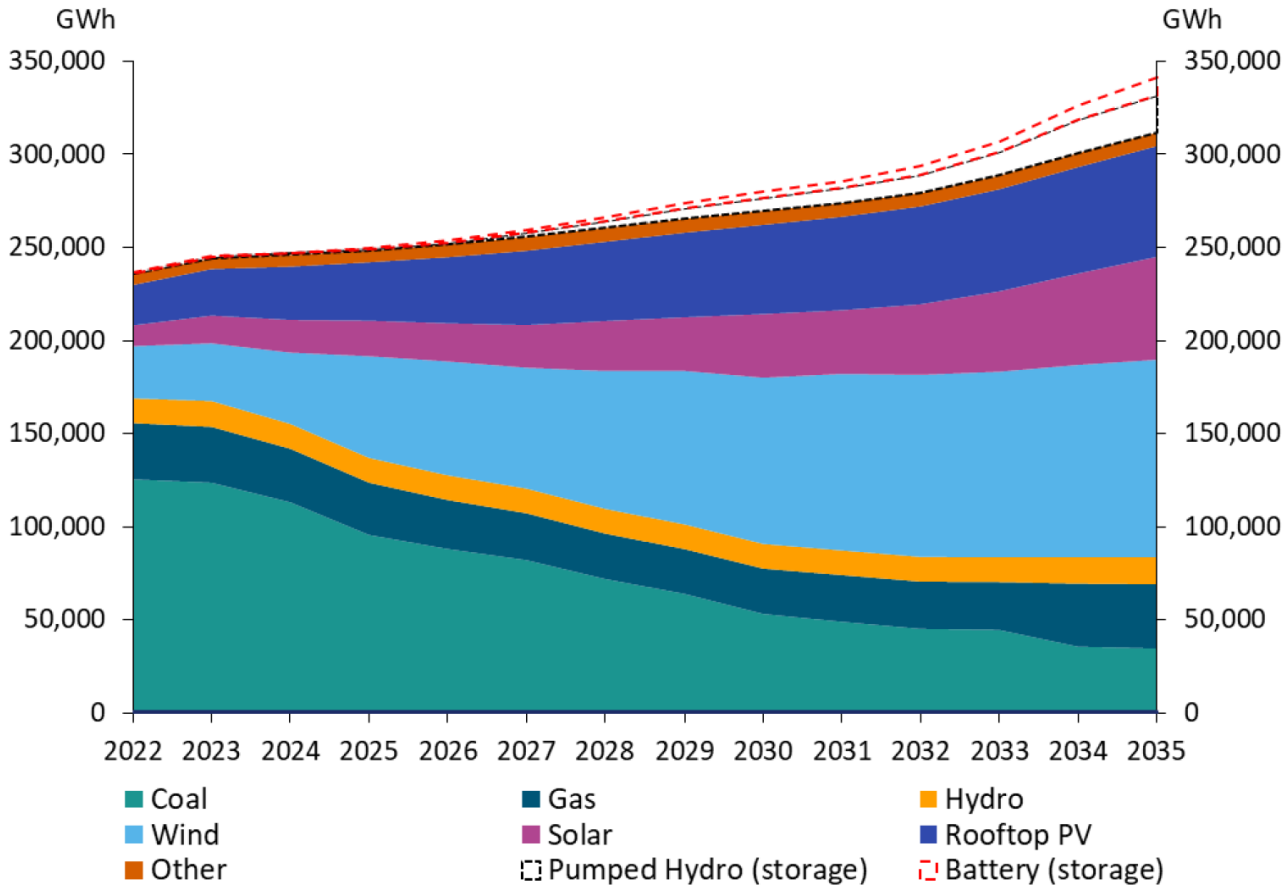
Table 6.15 Estimated GHG emissions during construction

Activity	Usage	Emission factor (kg CO2-e / usage units)			Emissions (t CO2-e/year)			
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Fuel (diesel) usage	662 kL	2721.3	0	138.96	1,800	-	92	1,892
Electricity consumption	183,960,000 kWh	-	0.73	0.06	-	134,291	11,038	145,328
Total					**1,800**	**134,291**	**11,130**	**147,221**

6.6.2.2 Operation

The SCES Facility will extract energy from the grid when there is excess electricity and this will occur when the renewable generation is at a peak. This, in turn, means that emissions due to electricity consumption from the SCES Facility will be driven largely by renewables, and much lower GHG emissions than from an average grid generation mix. There will also continue to be limited use of a diesel generator during the Project operation, with an estimated fuel usage of up to 7,280.6 L/year.

The Department of Climate Change, Energy, the Environment and Water (DCCEEW) has published projections of Australia's emission (DCCEEW, 2022b) including from the electricity sector, and estimates of electricity consumption emission factors over time as the electricity generation mix changes (**Graph 6.1**). The calculated emissions due to electricity consumption are based on DCCEEW projections of the emission factor with increased renewables in the grid. Specifically, it was assumed that the mix of generation at times when the SCES Facility will draw from the grid will be close to the average mix in 2035.



Graph 6.1 Projections of the Electricity Generation Mix in Australia

The estimated emissions are based on the net electricity consumption of the Project. That is, the electricity consumption from the grid less the electricity produced by the compressed air driven turbines. The direct (i.e. Scope 1) emissions from the Project are estimated to be 20 t CO2-e per year. The estimated maximum annual average Scope 1 emissions from the Project (i.e. 0.00002 Mt CO2-e during operation) represent a very small fraction of Australia's 2020 emissions.

Indirect (Scope 2) emissions are estimated to be 7,402 t CO2-e per year with emissions continuing to decrease over time due to the continued decarbonisation of the grid (i.e. closure of coal generators and increasing share of renewables).

6.6.3 Air Quality Mitigation and Management Measures

The AQIA has determined that the Project would represent, at most, a low air quality risk, based on the implementation of standard dust mitigation measures for construction projects being implemented. The CEMP and OEMP will include relevant standard dust mitigation measures, which would typically include:

- watering of haul routes
- minimising vehicle speeds on unsealed roads
- modifying activities if excessive dust is visible

- minimising the areas of disturbed land
- water sprays on stockpile areas
- rehabilitating disturbed land as soon as practicable.

Mitigation of GHG emissions would typically include:

- planning and scheduling works to minimise fuel usage and to maximise energy efficiency
- maintenance of plant and equipment to minimise fuel consumption and associated emissions
- training staff on improvement strategies to minimise fuel usage and maximise energy efficiency.

6.7 Traffic and Transport

The SEARs require an assessment of the construction, operational and decommissioning traffic impacts of the development on the local and State road network including:

- An assessment of the peak and average traffic generation, including vehicles requiring escort, construction worker transportation and transport of materials by rail.
- An assessment of the likely transport impacts to the site access route, site access point(s), any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance.
- A cumulative impact assessment of traffic from nearby developments.
- Details of measures to mitigate and/or manage potential impacts including a schedule of all required road upgrades (including resulting from heavy vehicle traffic haulage routes and haulage routes for vehicles requiring escort), road maintenance contributions, and any other traffic control measures, developed in consultation with the relevant road authority.
- Provide a traffic management plan.

A Transport Impact Assessment (TIA) was prepared by Samsa Consulting and is contained in **Appendix 11**, with the key outcomes of the assessment summarised in the following sections.

6.7.1 Existing Transport Network and Site Access

As discussed in **Section 3.6.3**, the SCES Facility will be accessed directly from Silver Peak Road (which is the existing Potosi Mine access road) via the Barrier Highway. This access is proposed to be used for all major component deliveries including OSOM, heavy and light vehicles. Current vehicle movements associated with the Potosi Mining operations average of 18 trips (mix of light and heavy vehicles) per day entering / exiting the site via Silver Peak Road.

The transmission Line will have multiple access points with the main access provided from Kanandah Road/Pinnacles Road, Silver City Highway, Wentworth Road/Picton Street and Menindee Road. Appropriate temporary access points will be established to temporary construction access roads.

The majority of components to construct the SCES Facility will be delivered via the Barrier Highway with off-shore delivery of components expected to be received into port in South Australia and then transported via heavy vehicle (over-size, over-mass (OSOM) where required) to Broken Hill.

The existing road environment and pavement conditions along both highways are generally good, commensurate with their status as national routes and their suitability for larger heavy vehicles (e.g. B-doubles and road trains).

In the vicinity of Broken Hill, the general road environment of both the Barrier Highway and Silver City Highway can be described as flat terrain with some moderate curved alignments. The road environment and alignment are generally conducive to OSOM and heavy vehicle transport. OSOM vehicle movements will be managed under the National Heavy Vehicle Regulator (NHVR) permit system for OSOM transportation along the major road network.

Generally, the key roads proposed to be used by OSOM vehicles have suitable pavement conditions and are appropriately line-marked with street lighting and kerb and guttering. Traffic volumes along the proposed road network are relatively low and consequently intersection operations and the road network all have significant spare capacity.

Traffic surveys were completed for the Project in November/December 2022 and supplemented with traffic data from the TfNSW 'Traffic Volume Viewer' website as well as available Broken Hill City Council traffic data. Generally, the analysis of traffic survey data indicates the major and minor road networks in the vicinity of the Project Area all have significant spare capacity. It is estimated from the existing high levels of service that a maximum of only approximately 10% to 15% of the available road network / intersection capacity is currently being used.

An evaluation of road safety has been undertaken based on the TfNSW Centre for Road Safety's crash statistics over the latest five-year recording period (2017 to 2021 inclusive). This focussed on the proposed transport routes through the Broken Hill urban area. In general, there is not considered to be any significant road safety risk or exposure along the relevant road network that the Project transport routes are proposed to use.

6.7.2 Traffic Generation

The construction phase will result in increased traffic movements by light vehicles transporting construction staff and light construction deliveries as well as heavy vehicles transporting the Project infrastructure and equipment including OSOM vehicle transport of assorted components. The construction traffic generation will fluctuate over the course of the construction phase dependent on the activities being undertaken.

The key assumptions applied to total traffic generation during peak construction periods is based on the following:

- 400 staff in total, inclusive of transmission line works – maximum (peak) movements arriving at start of shift and departing at end of shift – peak construction periods – approximately 212 light vehicles (cars) or 424 light vehicle trips per day.
- Maximum of 24 light vehicles per day associated with construction staff along the transmission line.
- Up to 30 commercial (heavy) vehicles per day spread out across a working day.
- Additional 4 heavy haul vehicles per day spread out across a working day.
- Up to 24 OSOM vehicles per day spread out across a working day.

The source and location of construction materials will be confirmed during the detailed design phase. For the purposes of the TIA, the number of deliveries and possible routes have been assessed to cover all possible traffic-related aspects of the Project. General heavy vehicle transport could travel from any direction along the surrounding road network depending on origin of the deliveries, e.g. from the south (Wentworth-Mildura area), west (South Australia) and east (Wilcannia and beyond). Heavy vehicle transport from the north is unlikely due to the absence of relevant material sources.

Based on the above directional split, it has been assumed that as a worst case on any given day, all heavy vehicle trips could travel from the south-west via the Broken Hill urban area, up to 50% could travel from the south via the Broken Hill urban area and up to 25% could travel from the east directly to the SCES Facility site access via Silver Peak Road off Barrier Highway.

Traffic generation for heavy vehicles along the transmission line works would likely be a maximum of some 10 heavy vehicles per day including component deliveries. This is a relatively minor traffic generation, resulting in insignificant traffic impact and would occur at multiple locations along the transmission line alignment.

6.7.3 Assessment of Impacts

6.7.3.1 Road Capacity

Construction

To assess the potential impacts associated with the construction phase of the Project on road network operations, the traffic generation of heavy vehicles and the staff traffic generation were added to current daily and peak hour traffic flows to obtain future traffic flows at intersection areas along the affected road network.

Existing intersection operations along the proposed transport routes were all observed to have significant spare capacity with minimal queuing or congestion. A capacity analysis of the intersections indicates and confirms that all are currently operating at level of service (LoS) A (being the highest level of service) with very low average delays per vehicle travelling through the intersections. Once the Project's traffic generation is added to the current traffic flows, a capacity analysis indicates that all relevant intersections will remain at LoS A.

In summary, the addition of heavy vehicles and construction staff traffic during peak construction periods is able to be readily absorbed by the relevant road network and intersections.

Apart from the upgrade of the internal on-site access that connects Silver Peak Road to the proposed SCES Facility, the TIA concluded that road network / intersection upgrade works would not be required to accommodate traffic associated with the Project, especially at the Silver Peak Road / Barrier Highway intersection. Silver Peak Road is a private road and dedicated heavy vehicle route for the existing Potosi Mine with its intersection arrangement with the highway commensurate with this function. Available sight distance along Barrier Highway at the Silver Peak Road junction is in excess of 500 m in both directions, which the TIA found is satisfactory for the 110 km/h speed limit along the highway.

Similarly for the transmission line works, the TIA found that road network / intersection upgrade works would not be required to accommodate traffic associated with these activities.

Operation

The operational phase of the Project includes the general operation and maintenance of the SCES Facility and transmission line.

Traffic generation during operations would be relatively minor. It is estimated operation phase traffic generation would amount to a maximum of approximately 50 trips per day. This level of traffic generation would readily be absorbed into the spare capacity of the existing road network.

Based on the relatively minor traffic generation during operations described above, traffic and road network impacts would be negligible. The current road network has significant spare capacity and all vehicles generated by operations staff would be accommodated within on-site parking areas.

Decommissioning

At the end of the operational life of the Project, should the Project be decommissioned, all infrastructure will be dismantled and removed, noting that the transmission line may be retained and re-purposed. Traffic generation during decommissioning is estimated to be approximately 30% less than the peak traffic generation during construction.

Based on the assessment of the road capacity during the construction phase, traffic and road network impacts would be minimal with only marginal changes from existing conditions. Although the road network conditions at the end of the Project's life in 50+ years are unknown, the TIA considered that based on current conditions, the road network would have significant spare capacity and be able to accommodate the necessary heavy vehicles to be used during the decommissioning.

6.7.3.2 Cumulative Traffic Impacts

The construction phase of the Project has the potential to result in cumulative impacts including those associated with traffic and transport. Interactions with the existing Perilya mining operations represent a key potential cumulative impact consideration for the Project. It is noted that the Perilya operations are existing and so traffic movements associated with these operations have already been considered in the transport assessment as part of existing traffic.

Other current mining operations including the operational Perilya North Mine and Junction Mine, as well as current operations at the Silverton Wind Farm, Broken Hill Solar Plant, Broken Hill Airport (particularly for transmission line construction), Broken Hill Observatory and Broken Hill Battery Energy Storage System have been included in the transport assessment as part of existing traffic conditions, as per the Perilya mining operations. These operations are not anticipated to change traffic movements to any significant extent.

Potential cumulative impacts may result from proposed (under assessment) projects such as the Broken Hill Cobalt Blue Project, the Blue Bush Project and Hawsons Iron Ore Project dependent on their timing. Assuming the worst-case scenario that all three projects are in the construction phase at the same time and that all trips travel along the same routes, the cumulative daily traffic movements could increase by approximately 970 light vehicle trips and 170 heavy vehicle trips in addition to the Project's traffic generation. This would significantly increase traffic throughput along the Broken Hill urban area road network. However, because of the significant spare capacity available, it is anticipated that only up to approximately 50% of road network capacity would be utilised in the worst case.

6.7.4 Mitigation and Management Measures

A-CAES NSW has committed to the development and implementation of a CEMP which will include a detailed Construction Traffic Management Plan (CTMP). The CTMP will address the management and mitigation of potential traffic related impacts.

The management of potential traffic impacts during the construction phase will include:

- Engaging a licensed and experienced transport contractor with experience in transporting OSOM component loads.
- Securing all relevant transport permits and approvals prior to commencement of construction.
- Developing and implementing a comprehensive CTMP in consultation with Broken Hill City Council and the relevant road authorities.
- The CTMP will detail appropriate construction traffic controls and management measures including the following (refer also to the CTMP Framework as drafted in **Appendix 11**):
- Details of transport routes and traffic types to be used for Project related component and material delivery.
- Details of the measures that would be implemented to minimise traffic safety issues and disruption to local users of the transport route(s) during construction or decommissioning works, including, but not limited to, the following:
    - temporary traffic controls, including detours and signage
    - notifying the local community about Project-related traffic impacts
    - minimising potential for conflict with school buses, stock movements and rail services
    - implement measures to minimise development-related traffic on the public road network outside of standard construction hours
    - implement measures to minimise dirt tracked onto the sealed public road network from Project-related traffic
    - providing that loaded vehicles entering or leaving the site have their loads covered or contained
    - providing sufficient parking on-site for all Project-related traffic
    - responding to any emergency repair or maintenance requirements during construction and/or decommissioning
    - a traffic management system for managing OSOM vehicles
    - complying with the traffic conditions in the Development Consent.
- Include a Drivers' Code of Conduct.
- Include the consideration of establishing a 'car pool' initiative or providing shuttle bus services for construction staff from the Broken Hill urban area to minimise the impact of vehicle movements.

To address cumulative transport-related impacts, during the detailed design phase, the construction timeframe will be finalised with consideration of any overlapping timeframes and potential transport impacts resulting from other projects. Should the other projects overlap with the construction phase of the Project, mitigation measures that would be considered to address cumulative transport impacts include:

- scheduling of construction activities and deliveries for each project so that any overlap is suitably managed in order to minimise road transport movements along shared transport routes
- consultation with project developers / construction companies to seek to minimise impacts
- engagement in any region-wide traffic management in conjunction with relevant road authorities, e.g. Council and TfNSW
- targeted dilapidation and reinstatement programs
- collective community consultation programs.

For management of potential impacts during the operations phase, the key measure would be the ongoing maintenance of the internal on-site road access network.

For the decommissioning phase, an updated CTMP would be developed during the preparation of a Project Decommissioning Management Plan (two years prior to closure) to address decommissioning phase traffic impacts.

6.8 Water Resources

The SEARs for the Project require the EIS to address the following key issues in relation to impacts to water resources:

- A site water balance for the development and an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources, and hydrological flows, and measures proposed to monitor, reduce and mitigate these impacts.
- Details of water requirements and supply arrangements for construction, operation and decommissioning, including licensing requirements and water security for other users and water dependent industries.
- Identify likely impacts to any waterfront land, and how the activities are to be designed and implemented in accordance with the DPI Guidelines for Controlled Activities on Waterfront Land (2018) and (if necessary) policy & Guidelines for Fish Habitat Conservation & Management (DPI, 2013).
- A description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004).
- A strategy to manage spoil and enhance any new landforms created if required.
- Assessments were undertaken separately for surface water and groundwater by Umwelt with the results summarised in the following sections. The detailed Surface Water Impact Assessment (SWIA) is attached as **Appendix 12** and the Groundwater Assessment (GWA) **Appendix 13**.

6.8.1 Surface Water

The SWIA considers the potential impacts of the Project on surface water resources within the vicinity of the Project Area including:

- impacts to receiving surface water quality
- the Project water balance including estimation of:
    - the volume of water required to be imported to the water management system (WMS) to supplement operational demands
    - the volume and frequency of discharges from the WMS.
- the impacts of the Project on flood regimes
- impacts to surface water users downstream of the Project
- licencing requirements for any surface water extraction or discharges to receiving waters.

6.8.1.1 Existing Environment

The Project Area is located within the broader Darling River catchment. The proposed SCES Facility is located within the immediate catchment of Willa Willyong Creek which drains in a north-easterly direction to Stephens Creek Reservoir. Stephens Creek Reservoir is located approximately 6 km to the north-east of the SCES Facility and serves as a back-up raw water supply to produce potable water for Broken Hill. The SCES Facility will encroach on a third order tributary of Willa Willyong Creek on the north-western side of the proposed reservoir and require the diversion of an approximately 900 m long reach of the north easterly draining stream commencing at the south-western corner and along the southern boundary of the SCES Facility.

The transmission alignment passes through the catchments of Willa Willyong Creek (4th order stream), Kellys Creek (4th order stream) and Acacia Creek (3rd order a tributary of Kellys Creek) traversing a number of unnamed first, second and third order tributaries to these three creeks. Kellys Creek is a tributary of Stirling Vale Creek which is in turn a tributary of Pine Creek which drains in a south-easterly direction toward the Darling River which is approximately 100 km to the south-east of the Project Area. All streams within the Project Area and immediately downstream (including Willa Willyong Creek, Kellys Creek and Acacia Creek) are ephemeral.

Water take in NSW is managed under a series of Water Sharing Plans development by the NSW Government. The Project Area is located within the Lower Murray – Darling Unregulated Water Source which is in the broader area regulated under the Lower Murray-Darling Unregulated and Alluvial Water Sources Water Sharing Plan (WSP). There are no Water Access Licences (WALs) allocated for this water source within the Project Area or immediately downstream.

The soils within the Project Area are predominantly rudosols, which have moderate erodibility, low salinity and either apedal or weakly structured as defined by the Australian Soil Classification.

6.8.1.2 Surface Water Management

The surface water management controls to be implemented as part of the Project have been designed to mitigate the risk of impacts to surface waters. The key controls are outlined in this section.

Construction Soil and Water Management

Throughout the construction phase of the Project, erosion and sediment controls (ESCs) will be established in general accordance with Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom, 2004) and Volume 2E: Mines and quarries (DECC, 2008) (i.e. the Blue Book).

All ESCs will be installed, managed and maintained in general accordance with the Blue Book to:

- divert clean water around site
- seek to prevent sediment moving off-site and sediment laden water entering any watercourse, drainage line, or drain inlet
- reduce water velocity and capture sediment on site
- minimise the amount of material transported from site to surrounding pavement surfaces.

A Construction Soil and Water Management Plan (CSWMP) will be prepared by a suitably qualified person to facilitate implementation of best practice erosion and sediment controls for the Project.

Spoil Management

Spoil generated during the construction phase of the Project (from underground cavern construction and bulk earthworks) will be utilised for the construction of the Reservoir (refer to **Section 3.4.1.2**). All excavated rock from the cavern will be tested to confirm its suitability for use for construction works to prevent the use of unsuitable material. Any unsuitable material will be managed by the Potosi Mine in accordance with their existing management controls.

Works on Waterfront Land

While the Project design has aimed to avoid works close to or within waterways, several waterway crossings will be required for site access and the transmission line access track. All works on waterfront land will be undertaken in consideration of DPEs *Guidelines for Controlled Activities on Waterfront Land*.

Project waterway crossings will be designed to minimise impacts on stream stability and fish passage and will be designed with reference to:

- Why Do Fish Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI, 2003).
- Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013).

As all of the waterways within and adjacent to the Project Area are ephemeral, there are not expected to be any material issues associated with fish passage for the Project. However, during detailed design, consultation will be undertaken with DPI Fisheries to determine if any of the proposed waterway crossings require consideration of fish passage.

Operational Water Management

The WMS for the surface facilities has been designed to exclude run-on from areas external to the surface facilities, contain rainfall runoff within the surface facilities and consists of the key components outlined in **Table 6.17**. A schematic of the concept design of the WMS is presented in **Figure 6.10**.

Table 6.16 Operational Water Management System Components

Component	Description
Reservoir	• Will receive inflows from process condensate, reject from the reverse osmosis (RO) water treatment plant, return spray water from the adiabatic coolers and direct rainfall on the Reservoir surface (no external catchment drains to the Reservoir). • Will be covered with floating shapes to reduce evaporative losses to approximately 90% of pan evaporation rates. • Will be the source of water for process water make-up and operational water. • Will be operated with a 1 m freeboard to minimise the risk of spills during high rainfall events (this freeboard exceeds the 168 hour, 0.05% annual exceedance probability (AEP) storm rainfall depth of 300 mm). In the highly unlikely event that rainfall results in the Reservoir capacity being exceeded, the Reservoir will spill to a 3rd order tributary of Willa Willyong Creek.
Stormwater Evaporation Dam (SWED)	• Will receive stormwater runoff from the SCES Facility catchment. • Will have a capacity equivalent to the rainfall runoff from the surface facilities catchment over a 24-hour, 2% Annual Exceedance Probability (AEP) storm event. • Will have a sediment storage zone equal to 30% of the water storage zone. • Will have accumulated sediments and salts removed on a regular basis to minimise the likelihood of spills from the SWED during high or prolonged rainfall events containing elevated concentrations of suspended sediment or dissolved solids. • During high or prolonged rainfall events will spill to a 3rd order tributary of Willa Willyong Creek (which drains to Stephens Creek Reservoir).
Water Treatment Plant	Reverse osmosis water treatment process to supply high quality water to supply spray water to the adiabatic coolers.
Stormwater Drainage Network	Stormwater drainage network will be designed to direct all rainfall runoff within the SCES surface facilities catchment (excluding the Reservoir) to the SWED and will incorporate swale drains, pits and pipes as required.
Bunds	All hazardous chemicals required during Project operation will be stored in appropriately sized bunds in accordance with the EPA's Storing and Handling Liquids: Environmental Protection – Participants Handbook to minimize the risk of hazardous chemicals entering the stormwater drainage network.

The conceptual WMS designs presented in **Figure 6.10** and **Table 6.17** are subject to detailed design.

6.8.1.3 Flood Assessment

A flood assessment was undertaken for the Project in accordance with Australian Rainfall and Runoff (ARR2019) guidelines and with consideration of the relevant provisions of the NSW Floodplain Development Manual (2005).

The flood investigation was undertaken for 5%, 1%, 0.5% and 0.2% AEP. AEP is a measure of the likelihood a flood level or flow will be equalled or exceeded in any given year.

Flood modelling of the Project Area was completed using a two-dimensional (2D) TUFLOW flood model. The model provides estimates of flood levels, depth, velocities and flood hazard for each of the modelled design events. The hydraulic model was run for both existing and climate change conditions. Climate change modelling was undertaken using the 0.5 % and 0.2 % AEP year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood-producing rainfall events due to climate change.

The flood modelling results indicate that the existing (i.e. without the Project) flood depths under all AEP scenarios are generally less than 0.3 m along overland flow paths and local depressions with depths of flow within some minor watercourses increasing up to 2 m (with some localised higher depths along local reaches) under the 0.2% AEP scenario. Some areas of Flood Hazard up to Class H5 (unsafe for vehicles and people) is predicted, however, this is well confined to the waterways and drainage lines. To assess the impact of the Project, flood modelling was also undertaken for the Project case including the SCES Facility and proposed creek diversion around the SCES Facility site. The existing case flood extent for the Project Area is shown in **Figure 6.11** and for the Project case in **Figure 6.12**.

C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY. LTD\21982 - 03 S&V\F_R05_EIS\21982_R05_0610_WATERMANAGEMENTSYSTEMSCHEMATIC_V2.MXD 7/14/2023 8:47:17 PM

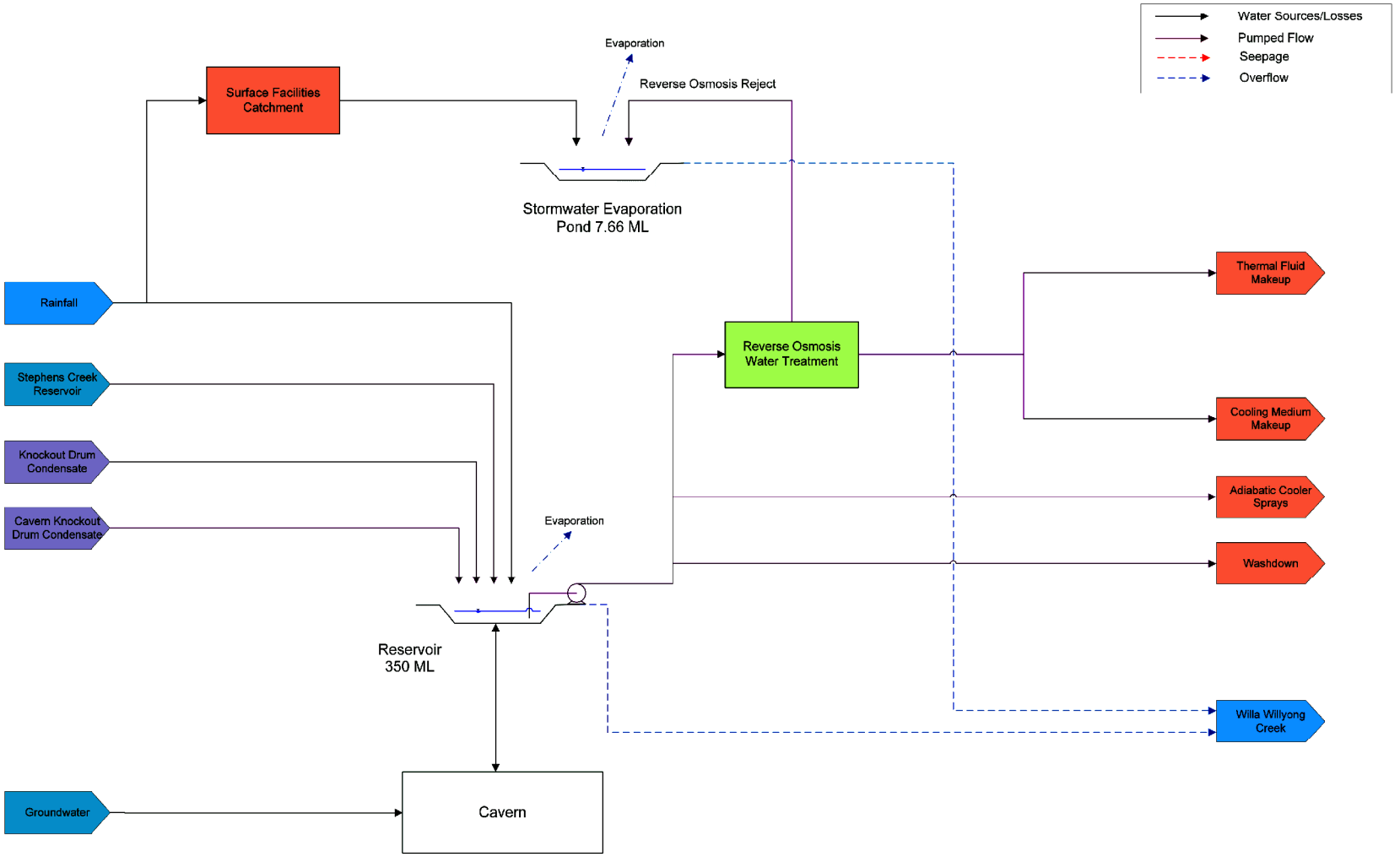


FIGURE 6.10

Water Management System Schematic

Image Source: Umwelt (2023)

The impacts of the Project on flooding in the vicinity of the SCES Facility are provided in **Table 6.8** with the Project case 1% AEP flood depths this area shown on **Figure 6.13**. The works associated with the transmission line are not anticipated to modify the existing topography such that existing flood distributions will be impacted.

Table 6.17 Proposed Case Water Level and Velocities

Event	Maximum Increase in Water Level North of Project Site (m)	Existing Case Water Velocity (m/s)	Proposed Case Water Velocity (m/s)	Maximum Increase in Water Velocity North of Project Site (m/s)
5% AEP	0.22	0.7	1.4	0.70
1% AEP	0.12	1.2	1.5	0.30
0.5% AEP	0.14	2.2	2.6	0.40
0.2% AEP	0.17	2.2	2.6	0.40

The nature and extent of flooding within the Project Area provides for relatively low flood risk to both infrastructure and risk to life. Due to the minimal change to existing flood conditions as a result of the Project, no specific flood management measures are required.

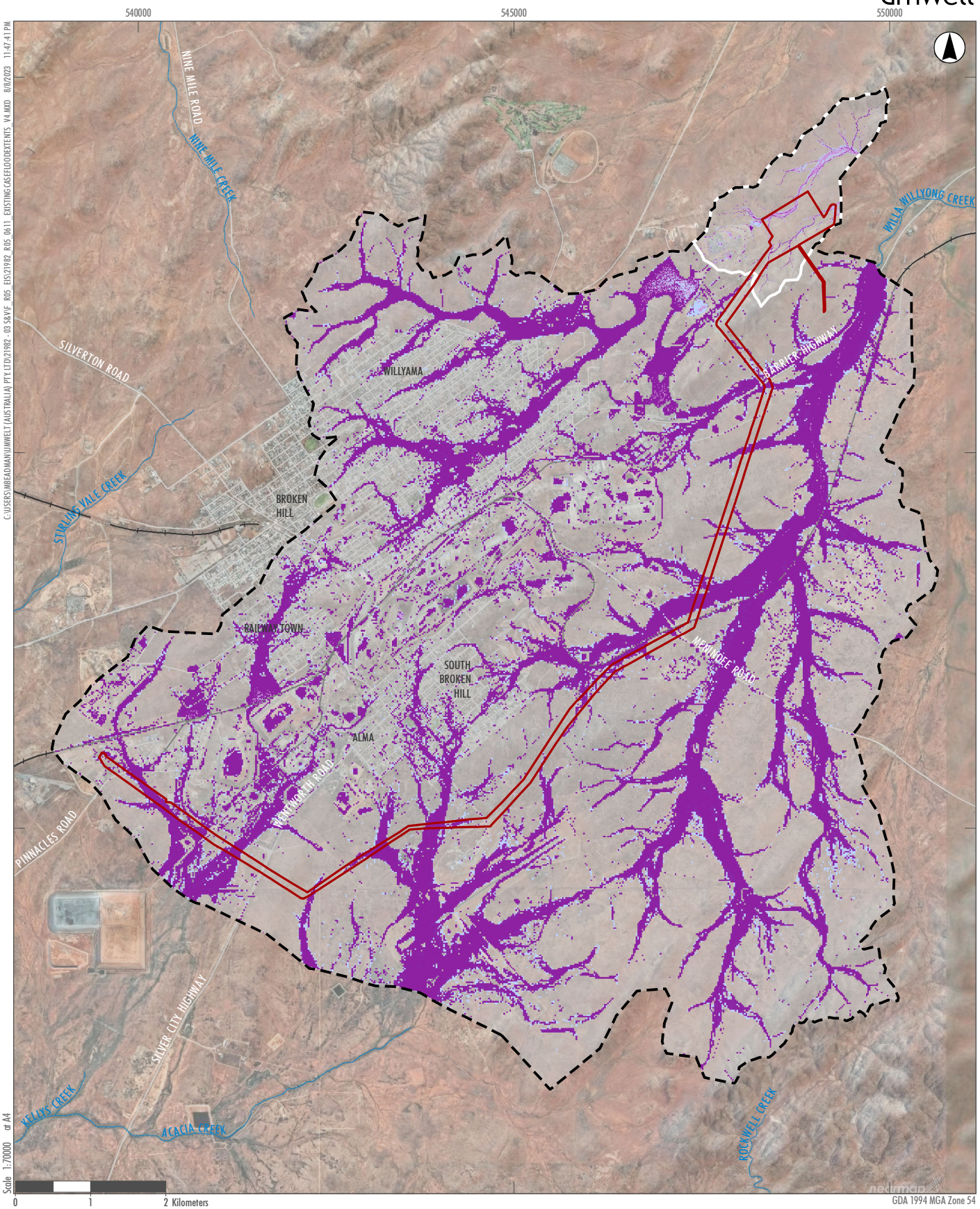
Access road provisions for the transmission line may require new culvert structures at waterway crossings, however, it is proposed that these will be designed in accordance with appropriate design standards to limit any potential flood impact.

6.8.1.4 Water Balance

The Project will require import of water for the reservoir and whilst the region is arid, consideration of the potential for water runoff from the site following larger rainfall events via the Stormwater Evaporation Dam (SWED) is also required. To assess water demand and risk of SWED spill, a water balance model was developed for the Project.

The water balance model simulated the performance of the proposed water management system and estimated the:

- annual gross water balance (i.e. excludes imports and discharges)
- the average monthly Reservoir gross water balance (note that the initial filling of the reservoir is addressed separately and the model assumes it starts full)
- likely volume and frequency of water imports to the Project to meet operational demands
- likely volume and frequency of any controlled and uncontrolled discharges from the Project to manage surplus water captured in the WMS.



Legend

- Project Area
- Drainage Line
- Railway Line
- Road

Model Extent

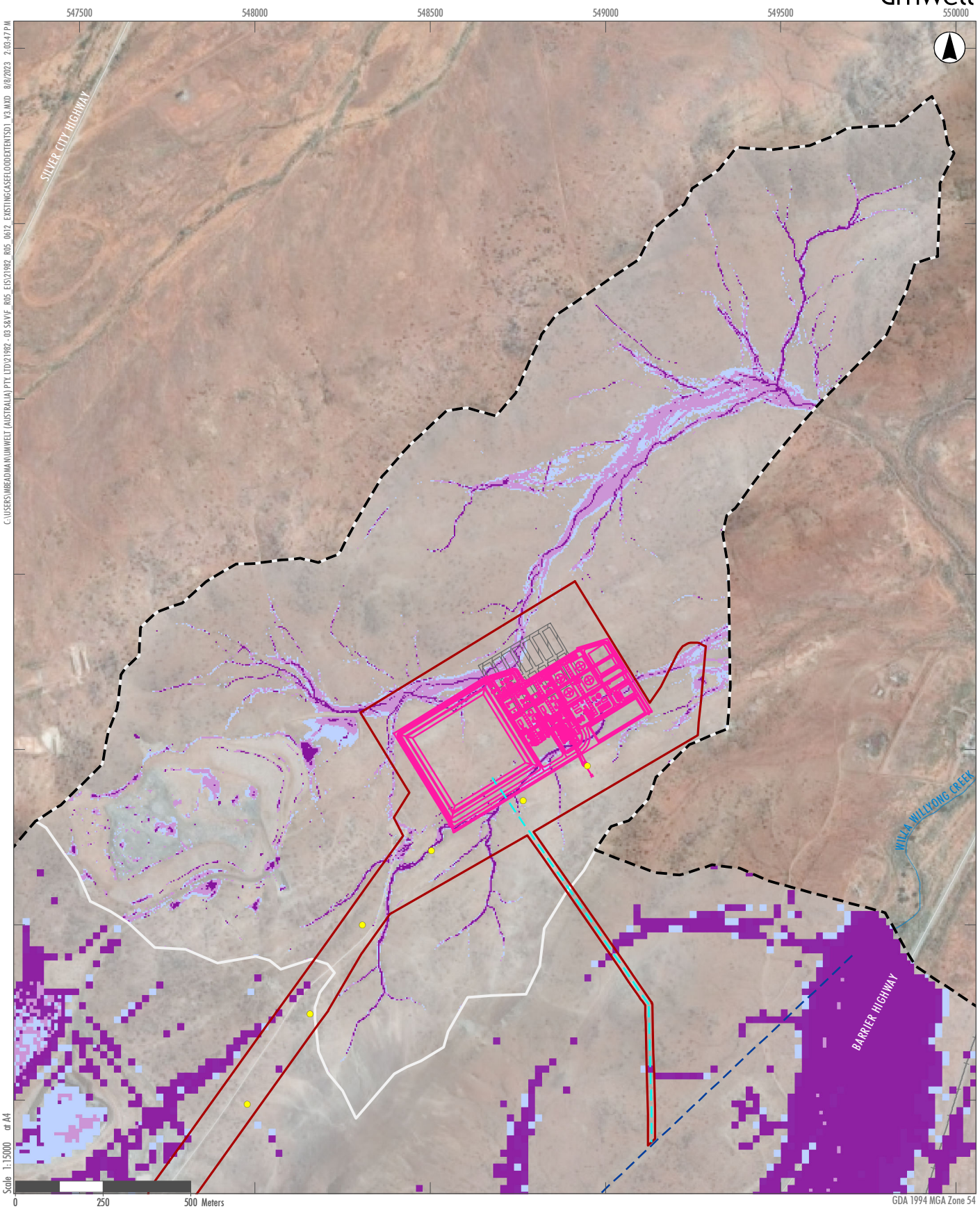
- Domain 1
- Domain 2

- 5% AEP Flood Extent
- 1% AEP Flood Extent
- 0.2% AEP Flood Extent

FIGURE 6.11

Existing Case Flood Extents Project Area

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Railway Line
- Road

Model Extent

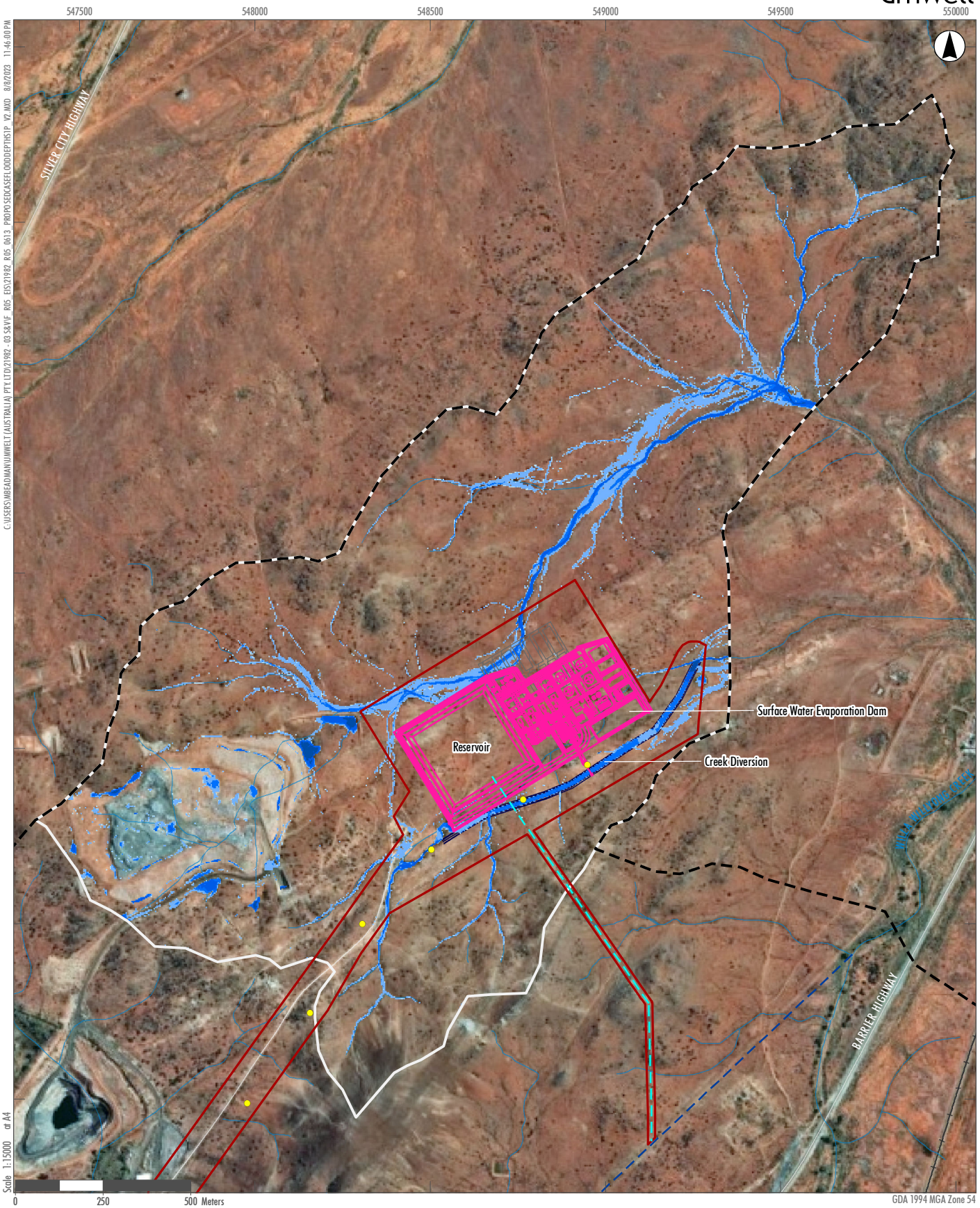
- Domain 1
- Domain 2

- 5% AEP Flood Extent
- 1% AEP Flood Extent
- 0.2% AEP Flood Extent

FIGURE 6.12

Existing Case Flood Extents Potosi Mine

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Railway Line
- Road

Model Extent

- Domain 1
- Domain 2

Modelled Flood Depth (m)

- < 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 3
- > 4

FIGURE 6.13

Proposed Case 1% AEP Flood Depths

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

The water balance results indicate that:

- the Project will operate with an approximately neutral water balance in the wettest years while water deficits are likely during most years and water imports will be required
- the Reservoir never reaches its maximum storage capacity and therefore, even during wet years it is highly unlikely that any spills from the Reservoir to receiving surface waters will occur
- water outflows will exceed water inflows (excluding import) during the warmer months from October through to March
- water inflows (excluding import) will exceed water outflows during the cooler months from April through to September
- water imports will be required in most years with the maximum annual import water demand in the order of 16 ML.

The model indicate that spills from the SWED are only likely during very wet years as a result of high or prolonged rainfall events where the design capacity of the dam is exceeded. The high volumes of surface facilities catchment runoff and broader catchment runoff external to the Project Area will dilute any suspended sediment and dissolved solids spilling from the SWED.

6.8.1.5 Surface Water Impact Assessment

Water Quality

The Project has been designed with water management controls to relevant guidelines to manage water quality and limit the potential for water quality impacts. Impacts on receiving water quality are expected to be negligible for the construction, operational and decommissioning phases of the Project (both the surface facilities and the transmission line) provided that the proposed management and mitigation measures are implemented as proposed and effectively maintained.

Water Flows and Quantity

Through the development and implementation of the CEMP which will include water management controls as outlined in the SWIA, constructing the surface facilities above the flood planning level and constructing the 3rd order stream diversion to accommodate the 1% AEP peak flow storm event, it is considered that the Project is unlikely to have any material residual impacts on flooding or stream stability.

Given the water for the initial fill of the reservoir will be extracted over an extended period of time, there are not expected to be any impact in the availability of water for the Broken Hill potable water supply or other water users that rely on water supply from Stephens Creek Reservoir and Umberumberka Reservoir. However, should supply from Stephens Creek Reservoir not be available, water may be sourced from the WaterNSW Murray River to Broken Hill Pipeline. Essential Water has indicated to ACAES that the required volume of water for filling the Reservoir is expected to be available.

Water demands for other construction and decommissioning activities (e.g. dust suppression) are expected to be relatively minor compared to initial reservoir filling and are therefore not expected to have any significant impact on the availability of water from Stephens Creek Reservoir.

Potable water demands, which will be supplied via water tanker, will also be relatively minor and are not expected to impact on the availability of potable water via water tanker supply to other users.

6.8.1.6 Licencing

The Project is a scheduled activity under the POEO Act and will be required to operate under an Environment Protection Licence.

During construction, undisturbed upslope catchments will be diverted around areas of disturbance. The surface facilities catchment will be designed and constructed to prevent surface water run-on from external undisturbed catchments.

Surface runoff will only be captured to prevent pollution of receiving waters and therefore capture of surface runoff within the Project construction footprint and surface facilities WMS is considered to be exempt from licensing requirements under the *Water Management Act 2000*. There will be no capture of surface water runoff along the transmission line route.

Import water for construction, operations and decommissioning will be purchased from local suppliers including Essential Water. Following decommissioning and site rehabilitation, the site will be free draining with all water storages decommissioned except where they are requested to remain in place to facilitate a post rehabilitation land use and following consideration of any licencing or other needs.

As such, it is considered that the Project will not have a licensable surface water take.

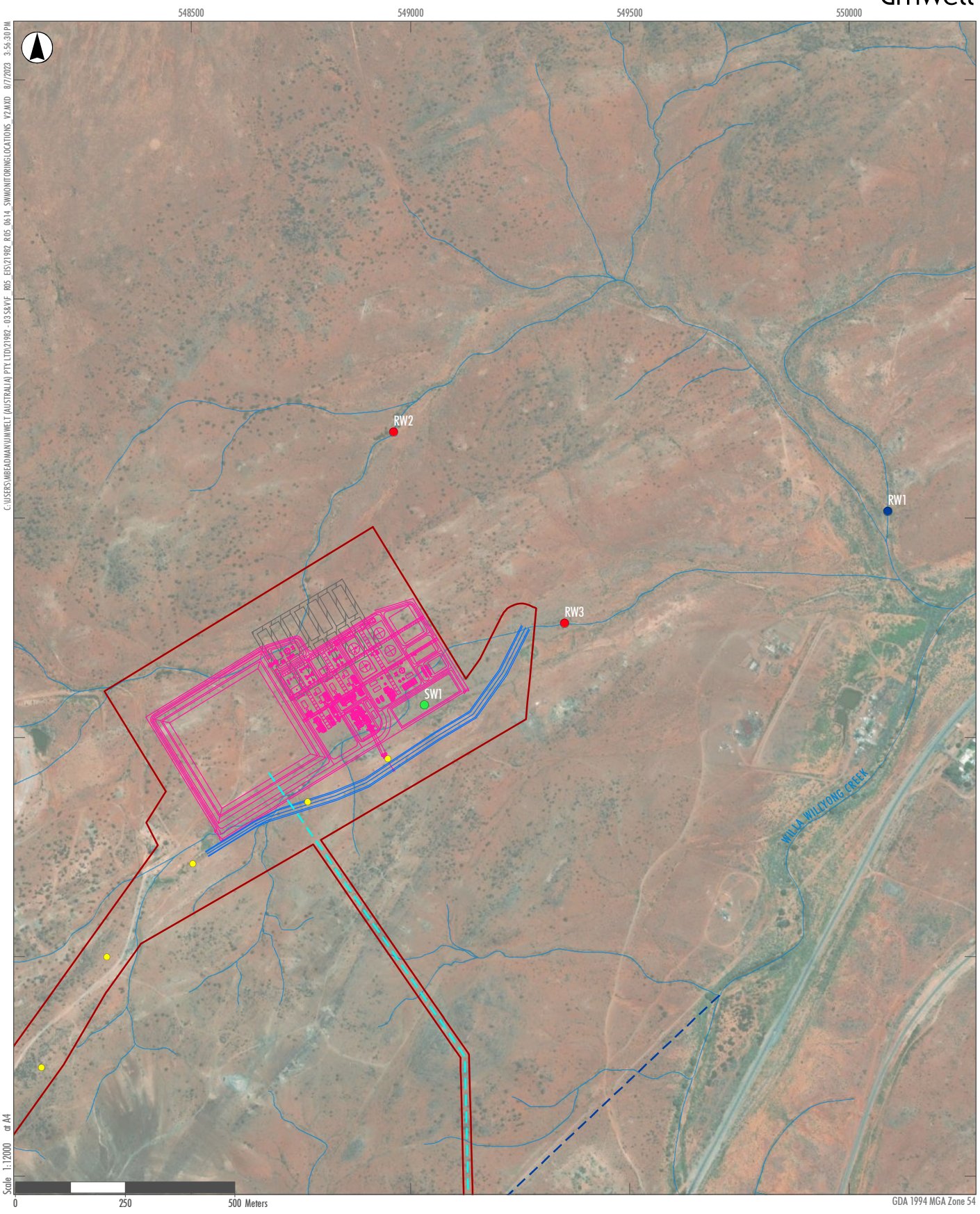
6.8.1.7 Management and Mitigation

A surface water quality monitoring program at the SCES Facility and surrounding area for the operational phase of the Project will be developed through the preparation of the OEMP, the proposed monitoring locations are shown on **Figure 6.14**. Surface water quantity (rainfall, flowmeters and level sensors on the proposed reservoir) monitoring is also proposed, and stream stability and riparian monitoring of the in the impacted 3rd order stream immediately north of the Reservoir, and the upstream and downstream transitions for the channel diversion south of the Reservoir, refer to **Appendix 12** for further detail.

The proposed management and mitigation measures to be implemented as part of the Project to manage and minimise impacts on water resources include:

- The SCES Facility and associated infrastructure will be constructed above the flood planning level, that is to provide an appropriate freeboard for the lowest edge above the maximum 1% AEP flood level.
- The creek diversion will be appropriately designed for the 1% AEP event and considerations will include design flows and velocities, bank slopes, bank stability, and soil conditions.
- All waterway crossings will be designed and constructed in consideration of DPEs Guidelines for Controlled Activities on Waterfront Land.
- As part of the CEMP for the Project a Construction Soil and Water Management Plan will be prepared to outline measures to manage soil and water impacts associated with the construction and decommissioning phases of the Project. This will include a construction phase Erosion and Sedimentation Control Plan in accordance with the Blue Book.

- As part of the development of the OEMP surface water management requirements will be identified for the operational phase of the Project detailing the operational water management strategy, surface water monitoring requirements, surface water performance criteria and reporting requirements (routine and incident reporting).
- A Rehabilitation Management Plan will be developed detailing site stabilisation requirements suitable for the selected post-closure land use. The erosion and sediment controls for the decommissioning phase will be implemented as per the construction phase of the Project.
- The Stormwater Evaporation Dam will be sized to accommodate runoff from a 24 hour, 2% Annual Exceedance Probability (AEP) rainfall event.



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Receiving Water Impact Monitoring Location
- Receiving Water Reference Monitoring Location
- Site Water Monitoring Location

FIGURE 6.14

Surface Water Monitoring Locations

Image Source: ESRI Basemap (2022) Data source: DFSI (2023); Bureau of Meteorology (2023)

6.8.2 Groundwater

The GWIA considers the potential impacts of the Project on groundwater resources including groundwater quality and quantity, within the vicinity of the Project Area.

6.8.2.1 Existing Environment

The main groundwater units within the Project Area are the Quaternary colluvium and the Proterozoic hardrock. The colluvium (an accumulation of rock and soil at the foot of a slope) is present at surface within the Project Area localised along the tributaries of Willa Willyong Creek with a thickness up to around 3 m and is likely to be largely unsaturated due to limited rainfall in the region and high evapotranspiration. There is, however, potential for short term recharge following rainfall events. The is also groundwater in the Proterozoic Hardrock, however, this hardrock has low permeability with very low groundwater yields. The presence of groundwater and flows would be influenced by faults and fractures, with potential for greater amounts of groundwater associated with shear zones.

The available data indicates the presence of groundwater in the hardrock unit is currently influenced by the long history of mining in the region, with dewatering and water transfer on sites, with groundwater levels ranging between 2.5 and 19.5 m below ground level (mbgl). With the dewatering of the underground workings at Potosi, the groundwater level is around 530 mbgl.

The current Potosi workings have been actively dewatered with operations and this is expected to continue for the construction phase of the Project. With closure of mining water levels in the underground workings are likely to recover over time but may be maintained at a lower depth with the commencement of mining at the Flying Doctor Open Cut pit, which is planned to extend down to around 200 m depth.

The available data indicates relatively poor-quality groundwater with brackish to saline water quality (total dissolved solids (TDS) 2200 to 16750 mg/L) and variable pH conditions from acidic to alkaline (pH 2.0 to 8.8), potentially influenced by acid mine drainage or geochemical processes.

The desktop GDE mapping indicates there are no GDEs within the Project Area, however, there are moderate to high aquatic and terrestrial GDEs within 10 km of the Project Area. The closest GDE is located approximately 1 km to the east associated with Willa Willyong Creek.

The High Ecological Values Aquatic Ecosystems (HEVAE) framework shows terrestrial vegetation communities that have a probability of being GDEs, based on the DPIE (2022) Probable Vegetation Groundwater Dependent Ecosystems – Western, derived from the NSW Sharing and Enabling Environmental Data (SEED) portal. The mapping indicates vegetation with a high probability of being a GDE within a 10 km radius of the Project Area, the closest being 1.9 km to the northwest. There are no terrestrial vegetation communities mapped within the Project Area.

6.8.2.2 Potential Impacts to Groundwater

Ongoing dewatering of the Potosi mine will be required during the construction of the Project consistent with the dewatering that has occurred during past mining activity at the site. Dewatering of the existing underground workings suggests inflows ranging between 0.5 Litres per second (L/s) to 5 L/s (approximately 16–158 ML/year) may be encountered during excavation of the underground cavern. Dewatering is unlikely to impact surrounding groundwater users as dewatering of underground workings has been in place at Potosi and other surrounding mines for decades with no impacts identified. However, the presence of groundwater and flows would be influenced by faults and fractures. It is possible greater amounts of groundwater are stored in the zones associated with the shear zones and Line of Lode. This could result in higher inflows (in-rush risk) during the construction phase near these structural zones.

During the construction phase there is potential for seepage to the groundwater table and migration off site if fuel/chemical spills or leaks are not captured and managed. The CEMP will include appropriate management controls for the storage and handling of fuel and chemicals and clean-up of any spills to address this potential risk.

Potential groundwater seepage into the underground site facilities has the potential to impact water quality over time within the surface reservoir. The reservoir is proposed to be lined, minimising potential for mobilisation of impacted water off site and there will be ongoing monitoring of the water quality in the reservoir with management controls for reservoir water quality to be implemented if required.

A groundwater risk assessment was undertaken as part of the GWA for the potential impacts identified in the construction, operation and decommissioning phases of the Project. The overall risk rating for the operational phase was determined to have a low risk to groundwater with the implementation of appropriate management/mitigation measures.

Impacts to Groundwater Users

There is potential for minor localised interception of groundwater during the construction phase, however, any changes would be localised and short-term during construction and consistent with the impacts of the existing mining operation. The closest registered private water supply bore to the Project Area is approximately 2 km to the north, therefore groundwater users are not predicted to be impacted by the Project.

There are no moderate to high aquatic and terrestrial GDEs within the Project Area. The closest GDE is located approximately 1 km to the east of the Project Area associated with Willa Willyong Creek. Therefore, there is no potential for direct impacts to GDEs. Given the limited impacts on groundwater, there are no impacts predicted on groundwater that will have consequential impacts on any GDEs. There are no Ramsar wetlands, wetlands of national significance, or terrestrial protected areas within the Project Area. There are three floodplain wetlands within a 10 km radius of the Project.

6.8.2.3 Aquifer interference Policy

Groundwater within the Project Area is regulated by the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020 and is classified as 'Less Productive' under the NSW Aquifer Interference Policy (AIP).

It is understood the agreement between A-CAES NSW and Perilya that the existing mine dewatering system will continue to operate during the construction phase with all water take by Perilya under its existing groundwater licence. Therefore, all groundwater take associated with the Project will be covered by existing licences under the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020 – Adelaide Fold Belt MDB Groundwater Source WSP.

The GWIA indicates that the predicted impacts associated with the Project are less than the Level 1 minimal impact considerations as described in the NSW Aquifer Interference Policy (AIP) and are acceptable under the AIP framework.

6.8.2.4 Management and Mitigation

The effective management of wastes, chemicals/fuels/oils and clean-up of spills are key issues to avoid the potential for impact on groundwater quality. These controls have been built into the design of the Project (e.g. bunding of chemical stores etc.), with further management measures identified in the relevant assessments in this EIS (e.g. surface water and waste) and to be included in the CEMP and OEMP. Further management measures to be implemented for groundwater include:

- A site water balance will be established based on the groundwater abstraction from underground workings during the construction phase and the water volumes/levels of the water reservoir over the life of the Project. Dewatering will be undertaken by Perilya which will include metering of the dewatering within the vicinity of the Project. Measurement of water pumped in and out of the workings/reservoir will be used to assist in the identification of groundwater make and water accumulation as construction progresses and to inform the site water balance.
- Water samples of pumped (dewatered) water and the surface reservoir will be collected monthly during the construction and operations phase for field analysis of pH and electrical conductivity (EC), with quarterly collection of samples for laboratory analysis of a broader suite of parameters to be defined in the OEMP.
- Any water pumped to the surface as part of the dewatering process will be captured by the existing Potosi Mine water management system. Perilya will maintain current water licence allocations sufficient to cover groundwater take.
- During the detailed design and construction phase additional data on the hydraulic properties and fractures/faults will be collected. Based on new data, the conceptual groundwater model and risk assessment will be reviewed, and management measures refined (if required).

Groundwater Monitoring

Management of groundwater within the Project Area will involve the establishment of a groundwater level and quality monitoring program. Should monitoring indicate the changes in groundwater levels and quality are more extensive or significant than predicted, mitigation measures will be considered. A proposed groundwater monitoring network includes the four existing monitoring bores in the east of the Project Area (GW1 to GW4) and the installation of five new monitoring sites to monitor any potential seepage from the surface reservoir, potential spill/leaks within the surface facilities area and a deeper bore to the north of the Project to monitor any depressurisation within the hardrock that may impact water supply users.

Additionally, two VWPs will be installed down to the cavern depth for ongoing monitoring of groundwater level recovery and changes in groundwater pressure head over time and provide data on the hydraulic properties of the host rock material.

6.9 Hazards

6.9.1 Preliminary Hazard Screening

Under State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 (herein referred to as the Resilience and Hazards SEPP), a preliminary risk screening of a proposed development is required to determine the need for a Preliminary Hazard Analysis (PHA). The preliminary screening involves the identification and assessment of the storage of specific dangerous goods materials. If, at the proposed location, and in the presence of controls, the risk level exceeds the acceptable criteria for impacts on the surrounding land use, the development is classified as 'hazardous' or 'offensive' industry and may not be permissible within most land use zones in NSW.

A 'hazardous industry' is one which, when all locational, technical, operational and organisational safeguards are employed, continues to pose a significant risk. An 'offensive industry' is one which, even when controls are used, has emissions which result in a significant level of offence e.g., odour or noise emissions.

Separate noise/vibration and air quality assessments have been completed for this Project to address potentially offensive impacts (refer to **Section 6.5** and **Section 6.6**). A proposal cannot be considered either hazardous or offensive until it is firstly identified as 'potentially hazardous' or 'potentially offensive' and subject to the assessment requirements of the Resilience and Hazards SEPP.

A proposed development may also be 'potentially hazardous' if the number of traffic movements for the transport of hazardous materials exceeds the annual or weekly criteria outlined in Table 2 of Applying SEPP 33 (DoP, 2011). If these thresholds are exceeded a route evaluation study is likely to be required.

Preliminary risk screening was undertaken for the Project to determine whether or not a PHA was required by comparing the Project storage inventories and transport quantities and frequencies of hazardous materials against the assessment criteria in Applying SEPP 33 (DoP, 2011). The outcomes of the screening process are discussed in the following sections.

6.9.1.1 Storage Quantity Screening

Table 6.19 presents an anticipated inventory of the hazardous materials that will be stored and used for the Project and the relevant Resilience and Hazards SEPP screening thresholds. The comparison of storage inventories with relevant screening thresholds demonstrates that the Project does not trigger the requirement for a PHA based on hazardous materials storage.

It is noted that Class 1 explosives will be utilised for the construction of the cavern, however, Class 1 materials will be stored in the existing approved magazines (one 30,000 kg underground magazine and one 7,500 kg above ground mounded magazine) located at the Potosi Mine site outside the A-CAES Project Area. Class 1 materials will be transported to the cavern construction site as required and used immediately during the construction phase. The maximum quantity of explosives to be stored in the Potosi Mine magazine will not increase and therefore, the off-site risks associated with Class 1 materials storage will remain unchanged. As such, the magazines have not been considered within the Project risk screening.

Table 6.18 Hazardous Materials Inventory

Material	Storage Type	ADG Class/Division (Packing Group)	Proposed Maximum Inventory (kg)	SEPP Screening Threshold (kg)	Triggers Screening Threshold?
ChemTreat BL 1280 (Diemethylhydroxidylamine and hydroquinone)	Packages	9 (III)	57	-[1]	-[1]
ChemTreat CL 2900 (Disodium Molybdate)	Packages (Intermediate Bulk Containers)	-	2,271	-[2]	-[2]
ChemTreat BL 1559 (Cyclohexylamine)	Packages	8 (II) (sub Class 3)	170	25,000	No
ChemTreat CL 2150 (5-chloro-2-methyl-4 isothiazolin-3-one, 2 methyl-4-isothiazolin 3-one)	Packages (Intermediate Bulk Containers)	8 (II)	4,542		No
Sodium Hydroxide (12%)	Packages (Intermediate Bulk Containers)	8 (II)	1,987		No
Sodium Hydroxide (50%)	Packages	8 (II)	454		No
Sulfuric Acid	Packages (Intermediate Bulk Containers)	8 (II)	1,893		No
Hydrochloric Acid	Packages	8 (II)	151		No
Sodium Hypochlorite	Packages (Intermediate Bulk Containers)	8 (II)	946		No
FLOCON 260 (mixture of organic acids)	Packages	8 (III)	379	50,000	No
Sodium Metabisulfite	Packages (Intermediate Bulk Containers)	8 (III)	1,893		No
Aggregate Class 8 Corrosive Materials	Packages	8 (II) and 8(III)	12,416	25,000[3]	No

[1] *No screening threshold in Applying SEPP 33 (DoP, 2011) for Class 9 materials.*

[2] *Material is not classified as a dangerous good under the Australian Dangerous Goods Code for the Transport of Dangerous Goods. by Road & Rail and therefore there is no screening thresholds in Applying SEPP 33 (DoP, 2011).*

[3] *SEPP screening threshold for higher risk category material (i.e. Packing Group II) applied.*

6.9.1.2 Transport Screening

Table 6.20 presents the anticipated Project hazardous materials transport frequencies and quantities as well as the relevant Resilience and Hazards SEPP screening thresholds. The comparison of the anticipated Project hazardous materials transport frequencies and quantities with the relevant screening thresholds demonstrates that the transport of Class 8 and Class 9 materials do not trigger the requirement for a PHA.

As noted in **Table 6.20**, Applying SEPP 33 (DoP, 2011) indicates that the DPE should be contacted for advice in relation to the requirement for a PHA for Class 1 materials transport. Correspondence with DPE in relation Class 1 materials transport is contained in **Appendix 14**. DPE indicated that transport of Class 1 materials for the Project is not potentially hazardous in terms of dangerous goods transport under the Resilience and Hazards SEPP (formerly SEPP 33) provided that Class 1 materials transport remains in accordance with the routes provided to DPE in the correspondence (refer to **Appendix 14**), and the maximum quantity and frequency return to pre-Project levels after Cavern excavation has been completed.

Class 1 material transport routes will remain unchanged for the Project and the maximum quantity and frequency of Class 1 materials will return to pre-Project levels after Cavern excavation has been completed. As such, a Hazardous Industry Planning Advisory Paper (HIPAP 11) Transport of Hazardous Material study is not required.

Table 6.19 Hazardous Materials Transport

Material	ADG Class/Division (Packing Group)	Maximum Transport Quantity (kg)	Peak Weekly Transport Frequency (Cumulative Annual)	Transport Type	SEPP Vehicle Peak Weekly Movement (Cumulative Annual) Threshold	SEPP Minimum Quantity Threshold – Packages (kg)	Triggers Screening Threshold?
ChemTreat BL 1280 (Diemethylhydroxidylamine and hydroquinone)	9 (III)	57	1 (52)	Packages	>60 (>1,000)	-[1]	No
ChemTreat CL 2900 (Disodium Molybdate)	-	2,271	1 (52)	Packages	-	-	-
Aggregate Class 8 Corrosive Materials	8 (II) and 8(III)	10,000	1 (52)	Packages	>500 (>30)	5,000 (2,000)	No
Explosives	1.1B 1.1D 1.4S	30,000	1 (52)	Packages	-[2]	-[2]	-

[1] *No minimum quantity screening threshold for Class 9 materials in Applying SEPP 33 (DoP, 2011).*

[2] *There are no screening thresholds for Class 1 materials in Applying SEPP 33, rather, Applying SEPP 33 (DoP, 2011) indicates that DPE should be contacted for advice.*

6.9.2 Geotechnical Stability

The SEARs require an assessment of potential hazards and risks associated with geotechnical conditions. The area proposed for the cavern is adjacent to and part of the existing Potosi underground mine extracted areas. The geotechnical conditions are therefore expected to be consistent with those encountered at the existing mining operations and are considered to be well understood as in addition to past exploration and drilling work, there is active underground mining which provides valuable information to understand geotechnical conditions. One of the key factors in deciding on this location for the Project was the expectation of suitable geotechnical conditions to allow for the Project.

The following section provides an overview of the results of over 20 years of geotechnical information collected on site at Potosi Mine by Perilya, the design considerations for the Project and associated geotechnical hazard and risk based on information provided by Hydrostor and a Conceptual Design Report developed for the Project by Lane Power and Energy Solutions Inc (refer to **Appendix 15**).

The focus of previous geological investigations undertaken at the Potosi Mine have been to define economic mineralisation and to support mine design, therefore, the primary geological models available are high-grade mineralisation solid wireframe models. On a regional scale the Potosi-Silver Peak mineralisation lies between the Globe Vauxhall Shear (GVS) and the Western Shear Zone (WSZ). These major structures have been modelled on a regional scale using drill core logging (Perilya, 2022).

In addition, the geological models represent the interpreted position of major geological structures in the Potosi Mining area. These include the following:

- Globe Vauxhal shear zone: this is a large regional scale shear zone striking NE-SW and dipping steeply SE. This structure is situated on the southeast side of the Potosi Mine and is not intersected in the mine workings.
- Western shear zone: Very similar to the Globe Vauxhal shear zone and is likely a western splay of this structure. Striking northeast-southwest and dipping steeply southeast. This shear is situated on the northwest side of the Potosi Mine and is noted to have some interaction with Potosi mineralisation in the lower part of the mine (20 to 21 Level) (Perilya, 2022). This interaction has not adversely affected mining in this area.

The geotechnical conditions at Potosi Mine are generally very good and are characterized by strong competent rocks with few joints. The high metamorphic grade and tight packed nature of the dominant lithologies (outside retrograde schist zones) lead to an expectation of low rock mass porosity and permeability.

The geotechnical conditions, as described above, are suited to the establishment of A-CAES technology. In general, A-CAES technology siting is required within hard, impermeable, and sufficiently massive rock formations. A cavern depth of 600 m below ground level is optimal. Formations that sit on active faults, or contain significant cracks and jointing are generally avoided (refer to **Appendix 15** for further detail).

As Potosi Mine is a hard rock mine, there is minimal risk associated with mine subsidence. Seismic events are monitored manually by onsite geotechnical staff as well as via underground seismic monitoring systems. Appropriate mine design has been applied to suit the overburden and ore geotechnical characteristics (Perilya, 2022). The SEARs require consideration of spontaneous ignition, however, there is no carbonaceous material present, therefore there is no risk of spontaneous ignition.

Overall, given the existing geotechnical conditions and review of historical mining operations at Potosi, the risk of encountering geotechnical issues and hazards is considered low. However, detailed geotechnical investigation will be undertaken to inform the detailed design for the Project with appropriate design considerations and implementation of construction and operational controls applied to manage potential geotechnical issues.

To further address the potential geotechnical risk, particularly in relation to public safety, a qualitative risk assessment was undertaken to identify credible cavern failure modes and estimate the consequences (fatalities, injuries, property damage, environmental) and likelihood of cavern failure mode occurrence to off-site receivers. This approach was suggested by the DPE Hazard team during the scoping meeting for the Project held in May 2022.

The detailed risk assessment minutes and risk scoring system applied are contained in **Appendix 16**.
The risk assessment did not identify any credible hazard event scenarios with the potential to have off-site impacts at the surface as:

- Geotechnical investigation undertaken over 20 years of mining operations at Perilya confirm geology is suitable for cavern construction and operation.
- Seismic activity in area is extremely low and therefore cavern collapse associated with an earthquake is unlikely.
- The cavern is approximately 600 m below ground level and there will be no impacts at the surface in the event of a collapse. That is there will be no subsidence and therefore there will be no propagation to the surface facilities process equipment.
- The cavern footprint is within the site boundary.
- If the cavern were to be overcharged (i.e. excess air pressure), air will discharge through water shaft onsite and will not impact off-site areas due to appropriate distances to the site boundary.
- Pressure control will limit compressor output, there will be pressure relief valves on the compressor outlet piping and a sump will be designed into the cavern to provide buffer air capacity limiting the likelihood of overcharging the cavern.
- Well heads at the surface that connect to the cavern are equipped with mechanical isolation valves and an emergency vent, which will be protected from mechanical damage. This will be designed in accordance with relevant standards and preventative maintenance programs will be implemented to maintain equipment integrity. Additionally, well heads will be contained within the footprint of the plant and therefore impacts to off-site receivers associated with a loss of containment from a well head are not considered credible due to the offset from the Project Area boundary.
- Site security will restrict access to the SCES Facility by the public and mining personnel.

Whilst the risk assessment did not identify any off-site risks, it did identify some potential risks associated with the adjoining Potosi Mine and future mining/exploration activities that require management of appropriate controls. To address this issue the detailed Project design will include an exclusion zone around the cavern to prevent drilling or mining adjacent to or above the cavern to ensure the integrity of the cavern and mining personnel.

6.9.3 Public Safety

The SEARs require an assessment of potential hazards and risks including public safety. The focus of this section is to outline the process undertaken to identify and assess potential impacts on public safety, detail the key assessment finding in relation to these issues and identify where these issues are addressed in further detail within this EIS.

To identify potential adverse impacts associated with the Project (including consideration of impacts to public safety) a risk-based assessment approach was utilised during the environmental assessment scoping phase and throughout the preparation of this EIS. During preparation of the specialist assessments, if a potential risk to public safety or human health was identified, further detailed assessment was completed.

Potential risks to public safety or human health have been assessed against accepted safety or health-based assessment criteria established by the NSW Government. Where relevant criteria are predicted to be met or where NSW Government policy stipulates mitigation measures that are to be implemented, no further detailed health risk assessment was determined to be required. This screening of public safety and health risks was undertaken with consideration of the tiered assessment approach outlined in the Environmental Health Risk Assessment – Guidelines for Assessing Human Health Risks from Environmental Hazards (enHealth, 2012). The identified potential risks to public safety and health that required consideration in this assessment, and a summary of the key assessment findings relevant to the identified risk, are provided in **Table 6.21**.

Table 6.20 Identified Risks to Public Safety and Associated Assessment Findings

Issue Identification	Description of Risk to Public Safety or Health	Relevant Assessment	Summary of Key Findings
Noise	Human exposure to noise during construction.	**Section 6.5.4** **Appendix 9**	The noise assessment identified the need for controls to be implemented to assist with managing construction noise impacts, however, no receivers were predicted to be highly noise affected. Potential noise impacts to the surrounding community will be managed through the implementation of reasonable and feasible noise mitigation measures.
	Human exposure to acute and cumulative impact of noise during operation.	**Section 6.5.4** **Appendix 9**	The predicted operational noise levels with noise control measures in place are predicted to comply with the relevant noise targets at all non-associated sensitive receivers.
	Human exposure to low frequency noise causing annoyance.	**Section 6.5.4** **Appendix 9**	The NVIA includes consideration of relevant modifying factor adjustments associated with low frequency noise levels and with consideration of these adjustments predicts that the Project will meet the relevant noise targets at all non-associated sensitive receivers.
	Sleep disturbance from transient noises often with tonal characteristics.	**Section 6.5.4** **Appendix 9**	The maximum noise level at all the receivers was predicted to be a L_{Amax} of 52 dB(A) at receiver R1 and a L_{Amax} 50 of dB(A) at receiver R2. This is not greater than the sleep disturbance L_{Amax} criteria of 52 dB(A). Accordingly, the Project is predicted to comply with the sleep disturbance criteria at all receivers.
Air Quality	Human exposure to particulates (PM_{10}, $PM_{2.5}$, TSP and Deposited Dust).	**Section 6.6** **Appendix 10**	The AQIA indicates that with respect to construction or operational dust concentrations or deposition levels, the Project is considered a "Low" air quality risk. Standard dust mitigation measures for construction projects will be implemented by A-CAES NSW to appropriately manage potential air quality impacts associated with the Project.
	Human exposure to diesel emissions.	**Section 6.6** **Appendix 10**	The AQIA indicates that with respect to construction and operational activities, the Project is considered a "Low" air quality risk. The standard mitigation measure to maintain plant and equipment to minimise fuel consumption and associated emissions will be implemented to manage emission levels.
	Impact to aircraft from vented air.	**Section 6.6** **Appendix 10** **Appendix 18**	The AQIA indicates hot air servicing the turbines is unlikely to be problematic for the existing ambient environment or for regional aircraft operations.

Issue Identification	Description of Risk to Public Safety or Health	Relevant Assessment	Summary of Key Findings
Water Contamination	Contamination of drinking water and health risks associated with human exposure.	**Section 6.8** **Appendix 12**	No adverse impacts to downstream surface water users or groundwater quality are predicted. Water will be appropriately managed on site to ensure any discharge to external waterways are within required guideline values and spill controls will be implemented so that any fuel or chemical spills are appropriately cleaned-up and don't result in water contamination.
	Contamination of surface water and health risks associated with human exposure.	**Section 6.8** **Appendix 12**	As discussed above, the Project is not predicted to result in adverse impacts on downstream water quality and therefore there is negligible risk of contamination of surface waters such that human health impacts could occur.
	Contamination of groundwater and health risks associated with human exposure.	**Section 6.8.2** **Appendix 13**	The GWIA has not predicted any impacts to groundwater quality as a result of the Project and therefore there is negligible risk of contamination of groundwater such that human health impacts could occur.
Bushfire	Direct and indirect health risks associated with bushfire including risk to life.	**Section 6.9.4**	A Bushfire Emergency Management Plan will be developed and implemented in consultation with the RFS to appropriately manage bushfire risk associated with the Project, refer to **Section 6.9.4**. It is considered that potential bushfire risk associated with the Project can be appropriately managed.
Contaminated Land	Health related risks from human exposure to contaminated land.	**Section 6.9.5**	The Project Area does not contain any areas of known contamination that may cause a significant risk of harm to human health or the environment. As with all activities that involve earthworks and industrial activities, activities carried out as part of the Project have the potential to cause contamination if not properly managed. Controls will be put in place to manage this risk as part of the Project including appropriate chemical handling and storage procedures, appropriate waste management systems, spill and emergency response procedures and equipment, and regular inspection and reporting processes.
Dangerous Goods	Health risks associated with the storage, handling and disposal of dangerous goods.	**Section 6.9.1**	The preliminary hazard screening confirms that the storage inventories and hazardous materials transport frequencies and quantities do not trigger the requirement to be considered as potentially hazardous. Appropriate management of hazardous materials will be implemented on site.

Issue Identification	Description of Risk to Public Safety or Health	Relevant Assessment	Summary of Key Findings
Waste	Health risks associated with the handling and disposal of waste including hazardous waste.	**Section 6.14**	A waste management plan will be developed and implemented to manage waste during construction and operation. Waste will be appropriately sorted and stored on site prior to being transported off site by licensed waste management contractors. All licensed waste management contractors are required to have appropriate controls in place to manage risks in accordance with NSW Government guidelines. With these controls in place and considering the nature of hazardous wastes associated with the Project, the risk to human health associated with waste is expected to be low.
Electromagnetic Fields	Health risks associated with exposure to electromagnetic fields.	**Section 6.9.6** **Appendix 17**	EMF modelling was competed for the transmission infrastructure considering a range of different transmission infrastructure arrangements relevant to the Project. In all cases, the modelling found that magnetic field strength will be at least 5 times lower than the upper safe limit recommended for human exposure.
Social	Health risks associated with impact to the social wellbeing of the community including social equity issues such as employment, impacts to access and amenity.	**Section 6.10** **Appendix 19**	The SIA concludes that the identified negative social impacts of the Project can be reasonably mitigated or managed to reduce their significance, with positive impacts having the potential to be enhanced with the implementation of appropriate strategies.

6.9.4 Bushfire

The SEARs require an assessment of hazards and risk associated with bushfire. The Project Area is identified as bushfire prone land by the NSW Rural Fire Service (RFS) bushfire prone land mapping (RFS, 2021) (refer to **Figure 6.15**).

Extensive areas across and surrounding the Project Area have been subject to clearing associated with historical mining operations which reduces the bushfire risk in these cleared areas. The Potosi Mine site is subject to existing bushfire management measures including an established perimeter Asset Protection Zone (APZ) and internal fire breaks to control the spread of any bushfire across the site.

The Project Area is mapped as Category 3 Vegetation on the RFS mapping, which represents lower bushfire risk. This vegetation category is consistent with remnant vegetation, grassland and arid shrubland. Areas associated with Category 3 Vegetation is generally also land subject to ongoing land management practices that actively reduce bushfire risk.

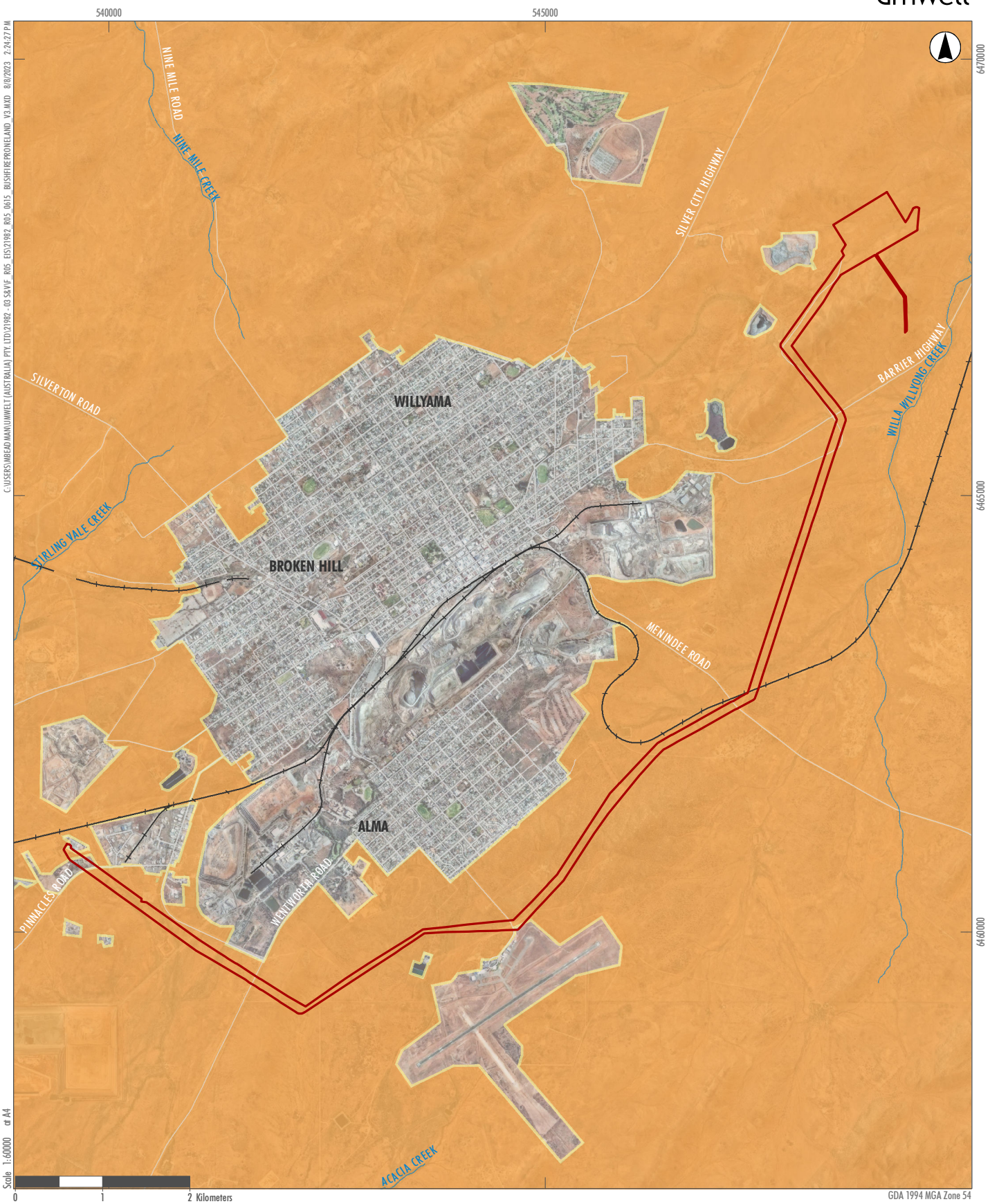
Areas of vegetation remaining within and surrounding the Project Area are predominately arid shrubland which is interspersed across the landscape, representing generally low fuel loads. Larger areas of vegetation are present along waterways across the Project Area and the nearby Imperial Lakes Nature Park, however, significant vegetation connectivity across the landscape is limited.

Weather conditions influence the size, intensity and speed that a bushfire can spread across the landscape. Broken Hill has an arid climate. The bushfire season generally commences in November, with rising temperatures moving into the summer season, and finishes in April. The hot, dry and windy climate during the summer months increases bushfire risk across the region despite lower fuel loads being present.

6.9.4.1 Assessment

The Project is considered 'industrial development' under Chapter 8 (other development) of Planning for Bushfire Protection (PBP) 2019 (RFS, 2019), which requires industrial development on bushfire prone land to satisfy the aims and objectives of PBP 2019. The objectives are to:

- afford buildings and their occupants protection from exposure to a bush fire
- provide for a defendable space to be located around buildings
- provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings
- ensure that appropriate operational access and egress for emergency service personnel and occupants is available
- provide for ongoing management and maintenance of Bushfire Protection Measures
- ensure that utility services are adequate to meet the needs of firefighters.



Legend

- Project Area
- Drainage Line
- Railway Line
- Road

NSW RFS Bush Fire Prone Land

- Vegetation Buffer
- Vegetation Category 3

FIGURE 6.15

Bushfire Prone Land

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

PBP 2019 requires the development of appropriate Bushfire Protection Measures commensurate with the assessed level of risk associated with the Project, the scale of the development and number of people likely to be occupying the site. The provisions within Chapter 7 (Asset Protection Zone (APZ)), access, water supply, services) are required to be used as a base for the development of the bushfire protection measures, with each development assessed on its own merits.

Appropriate APZ's can be applied to the SCES Facility building on the existing APZs at the Potosi Mine site, and the transmission line will be subject to regular maintenance such that the protection of the assets (and associated workforce) and sufficient prevention of the spread of bushfire can be achieved.

The entire Project Area can be accessed from multiple locations in the event of an emergency and adequate water supply and firefighting equipment will be provided on site. The Project will not increase the potential for, or the severity of bushfires within the locality and the risk of onsite activities igniting fire or the spread of bushfire across the Project Area will be addressed through the implementation of appropriate bushfire protection measures.

The proposed bushfire protection measures to be implemented as part of the Project, is outlined in the following sections.

Asset Protection Zones

A minimum APZ of 10 m will be applied to the SCES Facility to provide adequate clearances to combustible vegetation which can be accommodated within the proposed disturbance area. There is limited vegetation within proximity to the SCES Facility and the surrounding area is currently maintained in accordance with Perilya's existing land maintenance practices. The layout of the surface infrastructure includes a perimeter road which will form part of the APZ and provide a clear defendable space to the infrastructure. Vegetation within the APZ will be maintained and kept to a minimum level (disconnected vegetation including tree canopies and shrubs, ground free of leaves and debris).

The proposed transmission line has been designed by Transgrid in accordance with relevant guidelines and regulations including *Electricity Supply (Safety and Network Management) Regulation 2014* and *Utilities (Technical Regulation) Act 2014 – Technical Code*. As discussed in **Section 6.2.2**, vegetation clearing and maintenance with be restricted to the proposed disturbance area and within areas where vegetation extends >10 m in height. Once operational the transmission line will be managed in accordance with the Transgrid Bushfire Management Plan which includes the application of inspection and maintenance activities prior to and during bushfire season.

The Project Area will be appropriately maintained over the life of the Project including vegetation and site maintenance required to maintain APZs.

Access

Access to the SCES Facility is provided via Silver Peak Road, which currently provides access to the existing Potosi Mine and is located off the northern side of Barrier Highway, east of Broken Hill. The proposed internal access road will be constructed to accommodate construction, movement of OSOM vehicles, and operational traffic movements. The access will be suitable for emergency access (all weather, low gradient and <6 m wide). The area surrounding the SCES Facility is also accessible via internal haul roads associated with the Potosi Mining operations.

The transmission line will have multiple access points which will provide access for emergency services, with main access provided from Kanandah Road/Pinnacles Road, Silver City Highway, Wentworth Road/Picton Street and Menindee Road. Appropriate temporary access points will be established to provide construction access roads with select access tracks being retained for access and maintenance purposes.

In summary, the access for bushfire management and control is considered appropriate.

Water Supply

An appropriate dedicated water supply for bushfire protection will be provided on site in the vicinity of the SCES Facility. The volume and location of the water supply will be subject to consultation with the RFS during the development of the Bushfire Emergency Management Plan, to be prepared during the detailed design and pre-construction phase of the Project.

This dedicated water supply will be installed at the commencement of construction and a water cart will also be available for use through the construction phase if required both at the SCES Facility and the transmission line. If required, there will also be the opportunity to in an emergency situation access water in the reservoir.

Services and Management of Equipment

Electrical transmission and connection will be designed, constructed and maintained in accordance with relevant design and safety requirements to prevent faults which may lead to ignition. The transmission line will be subject to operational inspection and maintenance as required by existing Transgrid guidelines and management plans.

Essential equipment associated with the Project (during construction and operation) will be designed and housed in such a way as to minimise the potential impact of bushfires on the capabilities of the infrastructure during bush fire emergencies and reduce bushfire risk to surrounding land.

All construction vehicles will be equipped with some fire firefighting equipment to act within the limits of equipment. Personnel will be provided with relevant training in the event of a fire.

6.9.4.2 Mitigation and Management

The CEMP and OEMP will include the development of a Bushfire Emergency Management Plan developed in accordance with PBP 2019 and in consultation with the RFS. The plan will identify all relevant bushfire risks and mitigation measures associated with the construction and operation of the Project, including:

- detailed measures to prevent or mitigate fires igniting, outlining:
    - APZ locations and management requirements
    - any specific construction management requirements
    - access locations, passing bays and any alternate emergency access
    - water supply and location and any other bush fire suppression systems (including any drenching systems, static water supply, natural water sources)
- construction work that should not be carried out during total fire bans

- availability of fire-suppression equipment
- storage and maintenance of fuels and other flammable materials.
- notification of the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during a bushfire fire danger period to ensure weather conditions are appropriate
- appropriate bush fire emergency management and evacuation plan.

With the implementation of a Bushfire Emergency Management Plan in consultation with the RFS, it is considered that potential bushfire risk associated with the Project can be appropriately managed.

6.9.5 Land Contamination

A search of the EPA's NSW Contaminated Lands Public Record Register undertaken for the Project Area did not identify any areas of reported contaminated land.

The Project Area has been used extensively for mining and industrial activities (and associated land use) since the 1800s. The remainder of the Project Area is undeveloped land which has not been subject to disturbance activities that may lead to contamination. There are no large sources of potential contamination on the Potosi Mine site. Potential contaminants such as fuels and oils are managed with appropriate secondary containment, with containment of low volume potential contamination sources (workshop, tyre wash down bay and processing areas) managed within the existing water management system. Clean-up and appropriate disposal of localised spill events are required by the existing Perilya operations.

As with all activities that involve earthworks and industrial operations, activities carried out as part of the Project have the potential to cause localised contamination if not appropriately managed. Controls will be put in place to manage this risk through the development of appropriate chemical handling and storage procedures in the CEMP and OEMP. This will include storage of fuels and chemicals in appropriately bunded facilities in accordance with relevant Australian Standards, appropriate waste management systems, spill and emergency response procedures and equipment, and regular inspection and reporting processes. The management of waste is discussed further in **Section 6.14**.

6.9.6 Electromagnetic Fields

The SEARs require an assessment of potential hazards and risks associated with electromagnetic fields (EMF) and the proposed grid connection infrastructure against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (1998) *Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields*.

An Electromagnetic Field Assessment has been prepared by Middleton Group and is attached as **Appendix 17**. EMF occurs wherever electricity is produced, transmitted or used, and so is commonly found in everyday life including in household electrical devices. In Australia, electrical devices and infrastructure such as transmission lines and substations, operate at a frequency of 50 Hz which falls within the Extremely Low Frequency (ELF) range of EMF (between 0 and 300 Hz).

The EMF study assessed the electric and magnetic fields that will be emitted by the proposed transmission line and the potential impact on human health, and operation of any nearby sensitive equipment.

EMF limits for this study are taken from the ICNIRP (in accordance with the SEARs). The limit is specified below, based on review of the relevant Australian guidelines and health advice. The limits for exposure to low frequency magnetic fields for the general public are 200 micro-Tesla (µT) for emissions in the 25 Hz to 400 Hz range. Exposure to magnetic field strength greater than the limits specified can cause adverse health effects, although specific exposure duration limits are not specified in the standard.

EMF modelling was completed for the transmission infrastructure considering a range of different transmission infrastructure arrangements relevant to the Project. In all cases, the modelling found that magnetic field strength will be at least 5 times lower than the upper safe limit recommended for human exposure.

No significant electrical equipment or other equipment sensitive to magnetic fields was identified within proximity of the proposed transmission lines. Furthermore, the magnetic field strength beyond 10 m from the transmission line will be below 5 Tesla units (µT). Magnetic field strength diminishes in directly proportional manner to distance from the source. To place the calculated values in context, the Earth's magnetic field strength at Broken Hill is approximately 60 µT. The transmission line is extremely unlikely to introduce any addition risk to equipment maloperation.

The assessment concludes that any transmission line built and operated to relevant current Australian Standards will not pose any EMF exposure risk to human health.

6.9.7 Aviation Safety

An Aviation Impact Assessment (AIA) has been prepared by Aviation Projects (refer to **Appendix 18**) to assess potential impacts to air traffic associated with the Project, in accordance with the SEARs. The AIA includes a review of potential aviation impacts associated with the Project and provides aviation safety advice with respect to relevant air safety regulations, guidelines and procedures, and informs and documents consultation with relevant aviation agencies. The particular focus of the AIA was on the potential for the transmission line near the Broken Hill airport and the emission of warm air from the Project to impact on aviation activities.

The AIA includes a qualitative risk assessment to determine the need for obstacle lighting and marking associated with the transmission line, and has been provided to the aviation regulator, Airservices Australia. Consultation was also undertaken with relevant aviation stakeholders including aerodrome operators, Royal Flying Doctor Service, NSW Rural Fire Service, National Parks and Wildlife Service and Broken Hill City Council (as the airport operator).

6.9.7.1 Assessment

The following sections provide a summary of the results of the AIA. Further detail is provided in **Appendix 18**.

Transmission line

The design of the transmission line has been modified in consultation with the Airport Operator (BHCC) to minimise any interaction with aviation activities. This has included lowering the height of a section of the transmission line in the vicinity of the airport.

The key AIA findings for the transmission line include:

- The transmission line will results in a minor infringement of the Inner Horizontal Surface of the obstacle limitation surface (OLS) associated with the Broken Hill Airport, however, this small infringement is unlikely to create an adverse impact to airport operations or aviation safety. It is also noted that the Airport Operator and the Civil Aviation Safety Authority (CASA) have confirmed they have no objection to the Project and no lighting or marking of transmission lines or poles is required.
- Will not infringe the Runway 14 Approach Surface or the Runway 32 Take-off climb surface components of the OLS associated with Broken Hill Airport.
- Will not infringe any Procedures for Air Navigation Services (PANS-OPS) surfaces.
- Will not have an impact on any air route or Grid Lowest Safe Altitude (LSALT) associated with Broken Hill Airport.
- Will be wholly contained within Class G (uncontrolled) airspace and would not have an impact on operational airspace.
- Will result in a minor infringement of the protection areas of:
    - Non-directional (radio) Beacon (NDB) navigation aid and has therefore been referred to Airservices Australia for assessment.
    - VHF Omni-Range (VOR)/Distance Measuring Equipment (DME) navigation aid and has been referred to Airservices Australia for assessment.
- Will result in a minor infringement of the protection areas of Air Traffic Control surveillance and communication systems.

The infringements listed above have been discussed with the Airport Operator who has confirmed they are acceptable.

SCES Facility

As discussed in **Section 6.6**, the heated compressed air being projected from the SCES Facility was considered in the AIA and was found to be unlikely to adversely affect aircraft operations at Broken Hill Airport. In addition, as the heated compressed air to be emitted by the Project will be emitted at a velocity of >4.3 m/s, A-CAES NSW referred the Project to CASA in accordance with the guidance provided in *Advisory Circular (AC) 139.E-02v1.0 Plume Rise Assessments*. In response CASA confirmed that it does not consider the plume to be a hazard to aircraft operations and no further assessment or mitigation and management is required.

6.9.8 Dam Safety

Declared dams under the *Dam Safety Act 2015*, are dams which can cause major damage or loss to infrastructure, the environment or have major health and social impacts in the event of dam failure.

Under Part 2 Section 4 of the Dams Safety Regulation 2019, a proposed dam is a declared dam if:

- The dam has a wall that is more than 15 metres high.
- Dams Safety NSW is reasonably satisfied that if a dam wall failed it would endanger the life of a person, or result in major or catastrophic level of severity of damage or loss.

The walls of the proposed reservoir will not exceed 15 metres in height and will be designed, constructed and implemented in accordance with relevant construction standards and management requirements. A-CAES NSW considers that the failure of the reservoir would not result in a major or catastrophic consequence under the declared dams consequence categories, however, during detailed design A-CAES NSW will consult with Dam Safety NSW to confirm the consequence category and whether declaration of the reservoir is required.

6.10 Social Impact Assessment

Social Impact Assessment (SIA) is an approach to predicting and assessing the likely social consequences of a proposed action and developing options and opportunities to improve outcomes for people. SIA involves understanding impacts from the perspectives of those involved in a personal, community, social or cultural sense, to provide a complete picture of potential impacts, their context, and implications.

A detailed SIA has been prepared by Umwelt in accordance with the NSW Government's Social Impact Assessment Guideline (DPE, 2023) (SIA Guideline) for SSD to address the requirements of the SEARs which requires an assessment of social impacts associated with the Project (refer to **Appendix 19**).

6.10.1 Methodology

The SIA process involves three key phases, as outlined in **Figure 6.16**.

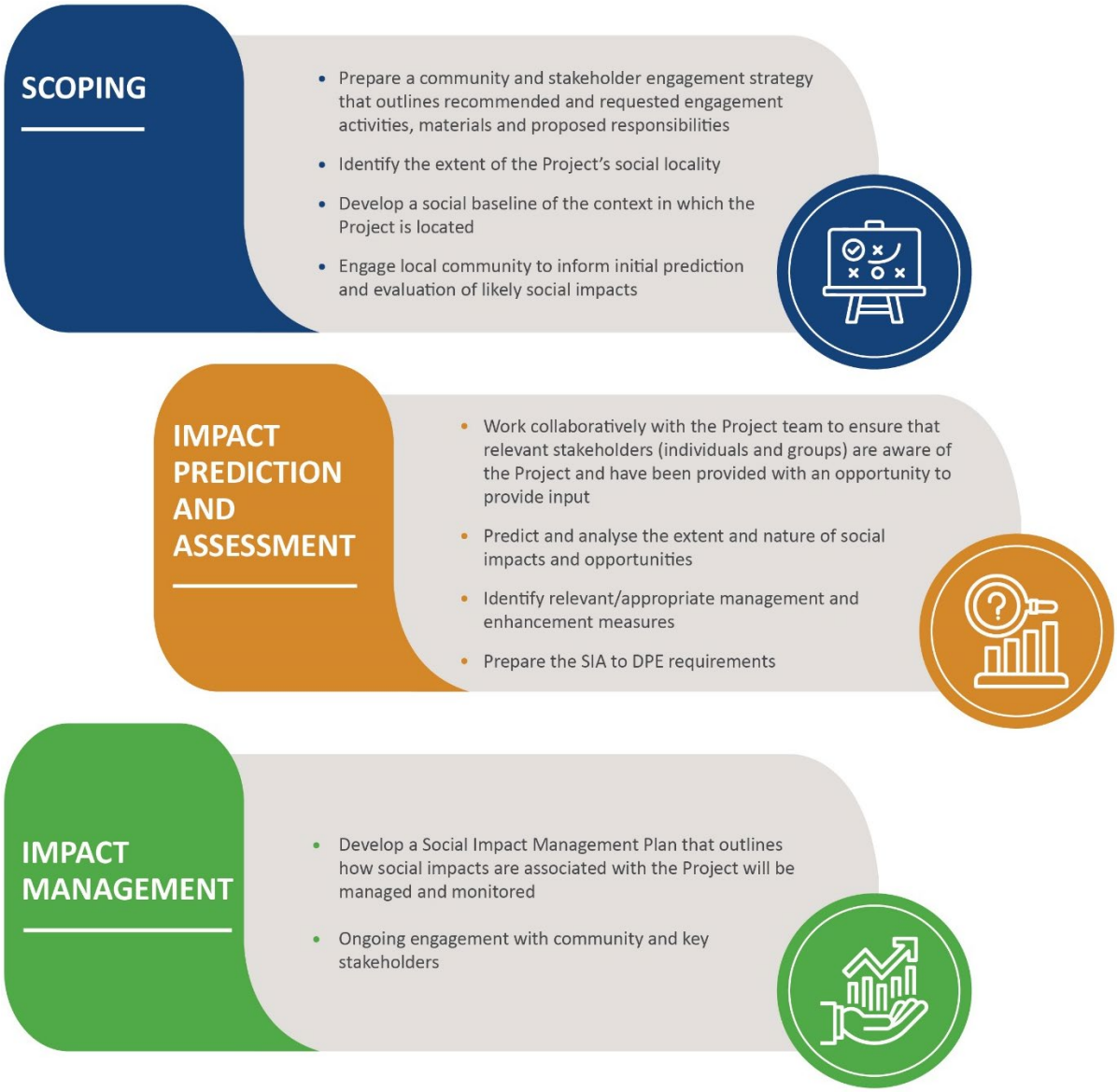


Figure 6.16 SIA Program Phases

source: Umwelt 2023.

6.10.2 Social Baseline

A social baseline profile was completed for the social locality in which the Project occurs (in this case the Broken Hill region). The social profile gathers knowledge to inform an understanding of the existing social environment in which a project is proposed and of potentially affected communities. The social baseline profile is a foundational component of SIA as it provides the basis for which social impacts associated with the Project may be predicted, assessed, monitored and managed over time.

A summary of the social baseline is provided in in **Table 6.22**. These challenges and opportunities have been considered in the assessment of potential social impacts relevant to the Project.

Table 6.21 Local Challenges and Opportunities

Challenges	Capital	Opportunities
	Political	• Support for renewables and new developments in the region by local and state government. • Political parties that support regional development and advocate for regional areas.
• Natural resources have led to a reliance on the mining industry for economic growth. • Semi-arid landscape has meant many industries are not viable.	Natural	• Harnessing natural capital of the region, including wind and solar. • Opportunity to become a renewable hub due to the favourable climate. • Opportunity to reduce environmental footprint by increasing use of renewable resources. • Growth of Broken Hill based on continued natural resource extraction. • Strong support for mining given the communities long connections to mining.
• Aging population. • High proportion of children completing year 9 or below. • Low rates of education and occupation (SEIFA). • More disadvantaged health statistics compared to NSW.	Human	• High number of technicians and trades people to support development. • Drawing on the communities existing strengths to generate employment. • Increase training to align with growth industries and foster employment and population growth. • Upskilling/reskilling of existing workforce. • Attraction of skilled workforce to the region. • Increase local employment and women in employment.
	Cultural	• Ability to draw on a strong sense of community. • Rich Aboriginal culture, and continuing connection to Country and language.
• Potential population decline. • Difficulties attracting workers to the area (i.e., teachers, health care workers etc.). • High rates of crime.	Social	• Community support for sustainable development and renewable energy projects. • Strong base of long-term residents. • Strong sense of community. • Ongoing support for cultural and music festivals amongst the community.
• Dependence on mining and susceptibility to boom-and-bust cycles associated with global markets. • Increasingly high rates of unemployment in 2021. • Low median weekly income.	Economic	• Encourage industry diversification and local investment. • Little rental stress. • Considered an affordable regional suburb. • Opportunity to further enhance tourism in the region. • Focus on tourism to increase economic spend within the LGA.

Challenges	Capital	Opportunities
• Decommissioning of the diesel turbines and subsequent need for increased energy security. • Lack of suitable housing and accommodation. • Capacity to sustain temporary population influx. • Lack of training facilities to upskill local workforce.	Physical	• Development of housing that caters to changing demographics and provides more lifestyle choices. • Increasing new technologies to cater to demand for energy storage systems. • Increasing the efficiency and reliability of utilities and services to the community. • Diversification of energy supply through greater renewable energy supply.

6.10.3 Impact Assessment

Potential social impacts relevant to the Project were determined through feedback from the community and other stakeholders, through the review of the social baseline and through consideration of technical social impacts determined through the preliminary social assessment and a review of the Project.

Table 6.23 provides an evaluation of the likely significance of the positive and negative social impacts associated with the Project, including those identified by the community as outlined in **Section 5.4**, with reference to perceived stakeholder importance and unmitigated significance. The table summarises the Project aspects that have the potential to generate social impacts, describes the social impact itself, its extent (likely affected stakeholders), the importance of the impact (sensitivity/vulnerability) to key stakeholders and groups (from the perspectives of the stakeholders consulted), the duration and/or timing of the impact, and the significance of the impact, with consideration of relevant management measures to ameliorate, mitigate and/or enhance social impacts.

Social impacts have been ranked in terms of their significance from low to very high, with blue representing negative impacts and green representing positive impacts.

Proposed strategies to manage or enhance the predicted impacts are included in the table with the revised impact rating, this includes consideration of the strategies proposed by A-CAES NSW and impact management strategies identified by the community in consultation undertaken to inform the SIA.

The impact assessment has identified that any negative social impacts of the Project can be mitigated or managed to reduce their significance, with positive impacts enhanced with the implementation of appropriate management measures.

As indicted in **Table 6.23**, there are a number of positive social impacts associated with the Project which is consistent with the general feedback received from the community and other stakeholders in Broken Hill which was generally positive. The highest residual risks for identified negative social impacts are medium levels of risk, with appropriate mitigation measures identified for these risks.

Table 6.22 Social Impact Significance

SIA Category	Potential Social Impact on People	Project Aspect [2]	Affected Stakeholder Group	Duration/ Timing	Perceived Stakeholder Significance	Likelihood	Magnitude	Impact Significance	Existing and Potential Mitigation Measures	Residual impact significance
Livelihoods Way of Life	Local employment generation and procurement of local businesses/services resulting in decreased unemployment rates and local economic benefits	C & O	Local businesses Service Providers	Ongoing	High (+)	*Likely*	*Moderate*	**High (+)**	Fostering the use of local contractors and suppliers Development and implementation of local employment and procurement strategy to maximise local employment and procurement where practicable	**High (+)**
			Broader community	Ongoing	High (+)	*Possible*	*Moderate*	**Medium (+)**	Development and implementation of local employment and procurement strategy	**Medium (+)**
Livelihoods Way of Life	Development of human capital through training and education opportunities	C & O	Broader community Students Youth	Ongoing	High (+)	*Possible*	*Minor*	**Medium (+)**	Develop and promote training and upskilling opportunities in the local community in collaboration with local education providers	**High (+)**

[2] C = Construction, O = Operation, A = Assessment

SIA Category	Potential Social Impact on People	Project Aspect [2]	Affected Stakeholder Group	Duration/ Timing	Perceived Stakeholder Significance	Likelihood	Magnitude	Impact Significance	Existing and Potential Mitigation Measures	Residual impact significance
									Development of a local education and training plan seeking to revise and develop new training opportunities in Broken Hill in collaboration with various stakeholders	
Livelihoods Way of Life	Local industry diversification, decreasing the community's reliance on mining and susceptibility to boom and bust cycles	C & O	Broader community	Ongoing	High (+)	*Possible*	*Minor*	**Medium (+)**	Promote training and upskilling opportunities in the local community in collaboration with local education providers Foster the use of local contractors and suppliers	**Medium (+)**
Livelihoods Way of Life	Increased economic benefit through regional and local spending	C & O	Broader community Local businesses Service Providers	Ongoing	High (+)	*Likely*	*Moderate*	**High (+)**	Fostering the use of local contractors and suppliers Development and implementation of a local employment and procurement strategy	**High (+)**

SIA Category	Potential Social Impact on People	Project Aspect [2]	Affected Stakeholder Group	Duration/ Timing	Perceived Stakeholder Significance	Likelihood	Magnitude	Impact Significance	Existing and Potential Mitigation Measures	Residual impact significance
Community	Community investment resulting in community benefit	O	Broader community Local businesses Service Providers	Ongoing	High (+)	*Likely*	Moderate	**High (+)**	Development and implementation of a community benefit fund Development and implementation of a Planning Agreement with Broken Hill Council Implementation of a Community benefit agreement with Broken Hill LALC	**High (+)**
Community	Increased community participation by the project workforce contributing to community cohesion	C & O	Broader community	Ongoing	Medium (+)	*Possible*	*Minor*	**Medium (+)**	Encourage participation of workforce in sporting teams, community groups and events	**High (+)**
Community	Opportunity to contribute to tourist economy by showcasing new technology	O	Broader Community Tourism providers	Ongoing	Medium (+)	*Possible*	*Minor*	**Medium (+)**	Development of a viewing platform, visitor experience and/or educational project signage to facilitate tourism activities and experience	**Medium (+)**

SIA Category	Potential Social Impact on People	Project Aspect [2]	Affected Stakeholder Group	Duration/ Timing	Perceived Stakeholder Significance	Likelihood	Magnitude	Impact Significance	Existing and Potential Mitigation Measures	Residual impact significance
									Collaboration with relevant stakeholders to showcase technology	
Accessibility	Workforce influx due to construction and subsequent impact on local availability of local housing and accommodation services	C	Broader Community Service providers	Temporary	High	*Possible*	Major	**High**	Development of a workforce accommodation and management plan to manage impacts of the Worker Accommodation Facility, in consultation with Broken Hill Council and local accommodation service providers	**Medium**
Accessibility Community	Workforce influx due to construction and subsequent impact on local services e.g., health, retail etc	C	Broader community Service Providers Local Businesses	Temporary	Medium	*Likely*	*Major*	**High**	Development of a workforce accommodation and management plan to manage impacts of the Worker Accommodation Facility, in consultation with Broken Hill Council and local accommodation service providers	**Medium**

SIA Category	Potential Social Impact on People	Project Aspect [2]	Affected Stakeholder Group	Duration/ Timing	Perceived Stakeholder Significance	Likelihood	Magnitude	Impact Significance	Existing and Potential Mitigation Measures	Residual impact significance
Community Accessibility	Reliable energy supply for Broken Hill	O	Broader community	Ongoing	High (+)	*Almost certain*	Major	**Very High (+)**		**Very high (+)**
Health and wellbeing	Increased concern surrounding perceived risk (safety) of Project technology	A	Broader community	Project planning	Low	*Possible*	Moderate	**Medium**	Ongoing communication relating to the application of the Project technology, potential risks and mitigation/ management measures	**Low**
Health and wellbeing	Perceived risk to aviation operators in relation to presence of transmission infrastructure	O	Broader community Service providers	Ongoing	Low	*Unlikely*	Minor	**Low**	Ongoing communication with community and key stakeholders	**Low**
Decision making	Perceived lack of information resulting misinformation spreading within the community	A, C, O	Broader community	Project planning phase	High	Possible	Moderate	**Medium**	Continue open, transparent and accessible communication with the community	**Low**

SIA Category	Potential Social Impact on People	Project Aspect [2]	Affected Stakeholder Group	Duration/ Timing	Perceived Stakeholder Significance	Likelihood	Magnitude	Impact Significance	Existing and Potential Mitigation Measures	Residual impact significance
Livelihoods Health and wellbeing Surroundings	Reduction in access to water due to surface water contamination from the water reservoir	O	Proximal landholders Industry	Ongoing	Low	*Unlikely*	*Minor*	**Low**	Development and implementation of the OEMP Ongoing communication relating to application of Project technology and environmental impacts and mitigation measures	**Low**
Surroundings Accessibility	Perceived decrease in access to water	O	Proximal landholders Industry	Ongoing	Low	Unlikely	Minor	**Low**	Development and implementation of a OEMP Water Supply Agreement with Essential Water Ongoing communication relating to environmental impacts, mitigation measures and monitoring outcomes	**Low**

SIA Category	Potential Social Impact on People	Project Aspect [2]	Affected Stakeholder Group	Duration/ Timing	Perceived Stakeholder Significance	Likelihood	Magnitude	Impact Significance	Existing and Potential Mitigation Measures	Residual impact significance
Surroundings	Decreased visual amenity in the area associated with lighting impacts during construction and operation	C, O	Broader community	Temporary	Low	*Unlikely*	*Minor*	**Low**	Development and implementation of a CEMP and OEMP operational lighting and security lighting installed and maintained in accordance with the Australian Standard AS4282 – 1995 – Control of Obtrusive Effects of Outdoor Lighting Development and implementation of a community complaints / grievance mechanism	**Low**
		C, O	Proximal businesses Road users	Temporary	Low	*Unlikely*	*Minor*	**Low**	Development and implementation of a CEMP and OEMP Development and implementation of a community complaints /grievance mechanism	**Low**

SIA Category	Potential Social Impact on People	Project Aspect [2]	Affected Stakeholder Group	Duration/ Timing	Perceived Stakeholder Significance	Likelihood	Magnitude	Impact Significance	Existing and Potential Mitigation Measures	Residual impact significance
Surroundings	Decreased social amenity in the area associated with construction activities e.g., noise and vibrations	C	Broader community Proximal business	Temporary	Low	*Possible*	*Minor*	**Medium**	Development and implementation of a CEMP Ongoing communication with potentially impacted residents and landholders	**Medium**
Surroundings	Traffic disruptions due to construction activities	C	Broader Community Road users	Temporary	Low	*Possible*	*Minor*	**Medium**	Development and implementation of a CEMP, including a detailed traffic management plan	**Low**
Surroundings	Loss of biodiversity and ecological impacts	C	Broader Community	Ongoing	Low	*Possible*	*Minor*	**Medium**	Biodiversity Offset Strategy	**Medium**
Surroundings	Reuse/repurposing of existing mine infrastructure resulting in reduced construction impacts	C	Broader community	Ongoing	Medium (+)	*Likely*	*Moderate*	**High (+)**	Development and implementation of a CEMP	**High (+)**

SIA Category	Potential Social Impact on People	Project Aspect [2]	Affected Stakeholder Group	Duration/ Timing	Perceived Stakeholder Significance	Likelihood	Magnitude	Impact Significance	Existing and Potential Mitigation Measures	Residual impact significance
Surroundings	Land use change- impact on existing mining operation	O	Perilya Broader community	Ongoing for the life of the mine	Low	*Unlikely*	*Minor*	**Low**	Ongoing communication with Perilya Broader communication around respective operational protocols	**Low**
Culture	Deterioration of Aboriginal cultural heritage	C	Aboriginal stakeholders	Temporary	Medium	*Likely*	*Moderate*	**High**	Development and implementation of an Aboriginal Cultural Heritage Management Plan (ACHMP) in consultation and with RAP's and relevant Government Agencies	**Medium**
Culture	Deterioration of European heritage during construction	C	Broader community Local government	Temporary	Low	*Unlikely*	*Minor*	**Low**	Ongoing collaboration with local council through CBA to address community needs relating to local heritage preservation and management	**Low**

6.10.4 Social Management, Mitigation and Enhancement Strategies

A-CAES NSW has committed to the following key strategies to manage the negative social impacts associated with the Project and to enhance the positive benefits of the Project to the community.

The selection of strategies outlined within this section has considered those proposed by the community during consultation activities; industry benchmarking; strategies proposed within the environmental technical studies; and through consideration of experience gained through similar projects across Australia.

Community Engagement Strategy – A-CAES NSW will develop and implement a Community Engagement Strategy comprising Project-specific stakeholder analysis, identification of target stakeholders by proposed engagement and information provision/ communication mechanisms, roles and responsibilities of the ACAES team and relevant contractors and linkages to other relevant plans such as construction and operational environment management and social impact management plans.

Community Benefit Agreements – A-CAES NSW is in the process of developing Community Benefit Agreements (CBAs) with a number of stakeholders and has identified a number of initiatives in collaboration with relevant stakeholders that are currently being explored. The three organisations that have been actively engaged throughout the development of the CBAs and some of the initiatives being explored as part of these respective agreements are outlined in **Table 6.23**.

Table 6.23 Community Benefit Agreements

Organisation	Proposed Initiatives
The Broken Hill Local Aboriginal Land Council (BHLALC) – that represents the interests of the whole Aboriginal community in and around the Broken Hill Region.	A long-term program of tertiary scholarships (TAFE and University) for Aboriginal students; a cultural heritage awareness training program (internal and external); a social housing program and co-development of shared facilities on BHLALC land.
The Broken Hill City Council (BHCC) – that represents the ratepayers of Broken Hill and the interests of community generally in the Broken Hill region.	Support for community energy via development of commercial models, implementation of preferred models and supply of energy assets; identification and restoration of a Council-owned heritage listed building or structure for shared and community use.
Landcare Broken Hill (LBC) – the most active NGO with wide representation in the community.	Support of the establishment of a native seedling nursery for environmental restoration, revegetation and offset projects; development and installation of an educational and interactive display on renewable energy and energy storage; environmental restoration of Wilya Willalong; creek drainage from Imperial Lake and creation of a recreational nature walk.

To further enhance the positive impacts of the Project, A-CAES NSW also propose to develop a Community Benefit Small Grants Fund with a commitment of $6.5 million over the lifetime of the Project that will be administered by A-CAES NSW and which community organisations can apply to gain support for small initiatives and events; and to develop a Renewable Energy Training Fund with a commitment of $3.5 million over the lifetime of the Project.

Indigenous Participation Plan – A-CAES NSW is developing an Indigenous Participation Plan (IPP) as part of the NSW Long-Term Energy Service Agreement (LTESA) process, in line with the First Nations Guideline released by the NSW Government in 2022.

Accommodation, Employment and Procurement Strategy – to directly address and respond to the social impacts and opportunities of the Project as they relate to construction workforce matters and associated cumulative impacts, A-CAES NSW will develop and implement, an Accommodation, Employment and Procurement Strategy prior to construction of the Project incorporating the following objectives:

- To respond to the community and local accommodation provider views on managing impacts on temporary workforce accommodation and maximising local employment and procurement opportunities.
- To complement and extend the IPP for the Project.
- To maximise the capacity for the Project to generate local benefits through local procurement and employment outcomes.
- To identify options for the effective and appropriate accommodation of workforce associated with the Project.
- To assist in managing the social impacts and opportunities associated with the development and management of a Workers Accommodation Facility.
- To assist in managing indirect impacts on local service provision relating to childcare, schools, hospitals, and police services.

Further detail relating to the scope of the proposed management and mitigation strategies is provided in **Appendix 3** and in the SIA (refer to **Appendix 19**).

The SIA concludes that the identified negative social impacts of the Project can be reasonably mitigated or managed to reduce their significance, with positive impacts having the potential to be enhanced if appropriate strategies are put in place.

6.11 Economic

The Project will result in significant capital expenditure providing economic benefit to the Broken Hill and broader NSW economy as well as providing positive flow on effects through employment, engagement of services and supporting the transition to renewable energy.

As outlined in **Section 5.3**, community sentiment towards the Project is largely positive with the potential economic benefits generating interest and positive feedback. However, there were also some community concerns raised in relation to potential strain on local services due to an influx of the construction workforce and the potential cumulative effects associated with other Projects in the region.

The SEARs require an assessment of the economic impacts or benefits of the Project for the region and the State of NSW as a whole. An Economic Impact Assessment (EIA) was prepared for the Project by ACIL Allen Consulting (ACIL Allen), in accordance with the SEARs. The EIA is provided in **Appendix 20**, with the key findings summarised in the sections below.

The EIA assumes for assessment purposes that the construction of the Project will commence in 2023–24 (depending on approval) and end in 2026–27. The operation phase of the Project was assumed to commence in 2027–28 and continue for 50 years through to 2076–77.

6.11.1.1 Construction and Operation Spending

The capital expenditure associated with the construction phase for the Project is approximately $638 million (including labour costs and contingency) over the initial construction period. This includes the costs to undertake capital expenditure studies, and initial construction of the Project, but does not include any ongoing capital expenditure to sustain the Project, if required. Expenditure in the second year is expected to be approximately $119 million, ramping up to $247 and $272 million in the third and fourth years, respectively. The EIA estimates that around $600 million of this expenditure will take place in NSW including $272 million (or 43 %) within the local Broken Hill region.

The EIA estimates $751 million of operational spending (or $15 million a year) over the period to 2077. Just over 40% of the total operational expenditure will be spent on directly on labour with insurances, consumables and parts comprising a further 16%. A further $318 million is expected to be spent on electricity purchases over the life of the operation.

6.11.1.2 Project Construction Workforce Profile

The construction phase of the Project is expected to require 780 full time equivalent (FTE) job years over three years or an average of 260 FTE workers per year. The peak construction employment will occur in the second year of construction when 400 FTE workers will be employed on the site.

Construction workers will be sourced from the local Broken Hill region or from the broader NSW workforce. Based on current unemployment rates and availability of local skilled works, it is assumed that 10% of the construction workforce will be sourced from the local region. It is also assumed that 83% of employees being either fly-in, fly-out (FIFO) or drive-in, drive-out (DIDO) from elsewhere in NSW, or with people relocating to Broken Hill for employment. In total, it is expected that 78 FTE job years will be sourced from the local Broken Hill region and a total of 650 FTE job years from NSW as a whole.

6.11.1.3 Economic Impacts

As well as generating short-term jobs related to the construction of the Project as outlined in **Section 6.11.1.2**, the Project will also create additional employment in the Broken Hill economy. In addition to the direct jobs generated on-site, the construction and operational phases will require additional quantities of NSW sourced goods and services. Production of these inputs will further increase the demand for labour across the NSW economy.

The EIA found that over the life of the Project (to 2077), employment is expect to increase:

- in the local Broken Hill region by 1,892 employee years (average annual increase of 35 FTE jobs) — This includes direct employment of 1,378 employee years and net indirect employment of 514 employee years (or an annual average of 26 direct and 10 indirect FTE jobs per year, respectively).
- New South Wales as a whole by 2,330 employee years (average annual increase of 43 FTE jobs) — This includes direct employment of 1,950 employee years and net indirect employment of 380 employee years (or an annual average of 37 direct and 7 indirect FTE jobs per year, respectively).

Based on the modelling results presented in the EIA the Project is projected to:

- increase the real economic output of Broken Hill by a cumulative total of $3.5 billion (with a net present value of $728 million, using a 7% real discount rate) and NSW as a whole by a cumulative total of $1.7 billion (with a net present value of $601 million, using a 7% real discount rate).
- Increase the real income of Broken Hill by a cumulative total of $642 million (with a net present value of $192 million, using a 7% real discount rate) and NSW as a whole by a cumulative total of $1.0 billion (with a net present value of $662 million, using a 7% real discount rate).

As outlined in **Section 6.10.4**, A-CAES NSW has committed to a number of key strategies to manage the negative social impacts associated with the Project and to enhance the positive benefits of the Project to the community. These measures include a variety of community benefit funds to appropriately distribute additional economic benefit to the local Broken Hill Community. A-CAES NSW will also prepare and implement an Accommodation, Employment and Procurement Strategy to directly address and respond to the social impacts and opportunities of the Project as they relate to construction workforce matters and associated cumulative impacts.

6.12 Visual Amenity

The SEARs require an assessment of potential visual impacts associated with the Project (including night lighting) of all components (including the transmission line and any other ancillary infrastructure) on surrounding residences, scenic or significant vistas and road corridors in the public domain.

Potential visual impacts associated with the Project were raised as a concern specifically in relation to night lighting, by the nearby property which operates Outback Astronomy, a tourism business specialising in stargazing in Broken Hill which is located 1.3 km from the SCES Facility. If not appropriately managed, light spill has the potential to reduce the dark sky conditions required to conduct this business. The potential impact of night lighting at the SCES Facility has been considered as part of the assessment and appropriate mitigation and management is proposed. A-CAES NSW has discussed the lighting requirements with the operators of the Outback Astronomy and will continue to engage with this business during the detailed design stage to ensure lighting design and management and mitigation are suitable.

6.12.1 Methodology

A visual assessment was undertaken to determine the level of visual impact associated with the Project on residential receivers, any scenic or significant vistas, listed heritage items and from public vantage points.

There are no State or Local legislation, policies or guidelines for visual impact assessment directly relevant to the Project, however, the methods included in the Wind Energy Visual Assessment Bulletin for State Significant Energy Development 2016 (Visual Bulletin) were considered. It is acknowledged that the bulletin relates directly to wind energy development and therefore is not directly relevant to the Project, however, the methods included for determining landscape character and visual sensitivity of the surrounding landscape are relevant to the assessment of the Project. In the absence of a directly applicable guideline the relevant elements from the Bulletin have been considered.

6.12.1.1 Visual Assessment Locations

A review of the potential visual catchment of the Project was undertaken to determine the locations within the surrounding landscape that have potential views of the proposed infrastructure. This was based on a review of aerial photography, topography and the preparation of a series of radial analyses.

This process indicated views of the Project are limited from residential locations due to the site location, orientation of views, intervening topography and built infrastructure. Visibility of the SCES Facility will be limited due to the surrounding topography. The transmission line will be visible from public vantage points predominately associated with crossing existing roads and recreational areas, however, views from residential areas will be limited. Visibility of the transmission line is most prominent at the western end (near the connection to the substation). From this location the transmission line is visible from existing industrial land uses, the adjoining road corridor and listed heritage items (Mining Precinct 10 and the Old Broken Hill City Abattoir).

The following representative assessment locations were selected based on being representative or having the highest potential for visual impact. The visual assessment locations are shown on **Figure 6.17** and described below.

Viewpoint 1 – Line of Lode Lookout – the Line of Lode is the mineral deposit that runs through the centre of Broken Hill, the appearance of this area is characterised by extensive mining operations and associated infrastructure. The Line of Lode lookout is located on top of a large overburden emplacement area, created by historic mining activities, located in the centre of Broken Hill City. The Line of Lode is the centre of the historic mining precinct of Broken Hill. This viewpoint represents potential views of the Project (both the SCES Facility and the Transmission Line) from a scenic/significant vista, this location is also a heritage listed item. The Line of Lode Lookout is orientated towards the Broken Hill City Centre (away from the Proposed Transmission Line) and is located approximately 6 km from the proposed SCES Facility.

Viewpoint 2 – Barrier Highway directly east of the proposed SCES Facility – representing views of the facility from the closest residential receivers, the Broken Hill Outback Observatory and the closest public vantage point (being the Barrier Highway).

Viewpoint 3 – Silver City Highway directly west of the proposed SCES Facility – representing views of the SCES Facility from public vantage points (Silver City Highway) and residential/commercial properties to the west.

Viewpoint 4 – Southern end of Broken Hill Residential Area (near South Broken Hill Golf Club) – representing views of the Transmission Line from residential areas within Broken Hill.

Viewpoint 5 – Southern end of Broken Hill Residential Area (Picton Street) – representing views of the Transmission Line from residential areas within Broken Hill.

Viewpoint 6 – Kanandah Road at the western end of the Proposed Transmission Line – representing public views of the transmission line from Kanandah Road and views from the closest Heritage Listed Items (Mining Precinct 10 and Old Broken Hill City Abattoir).

6.12.1.2 Radial Analysis

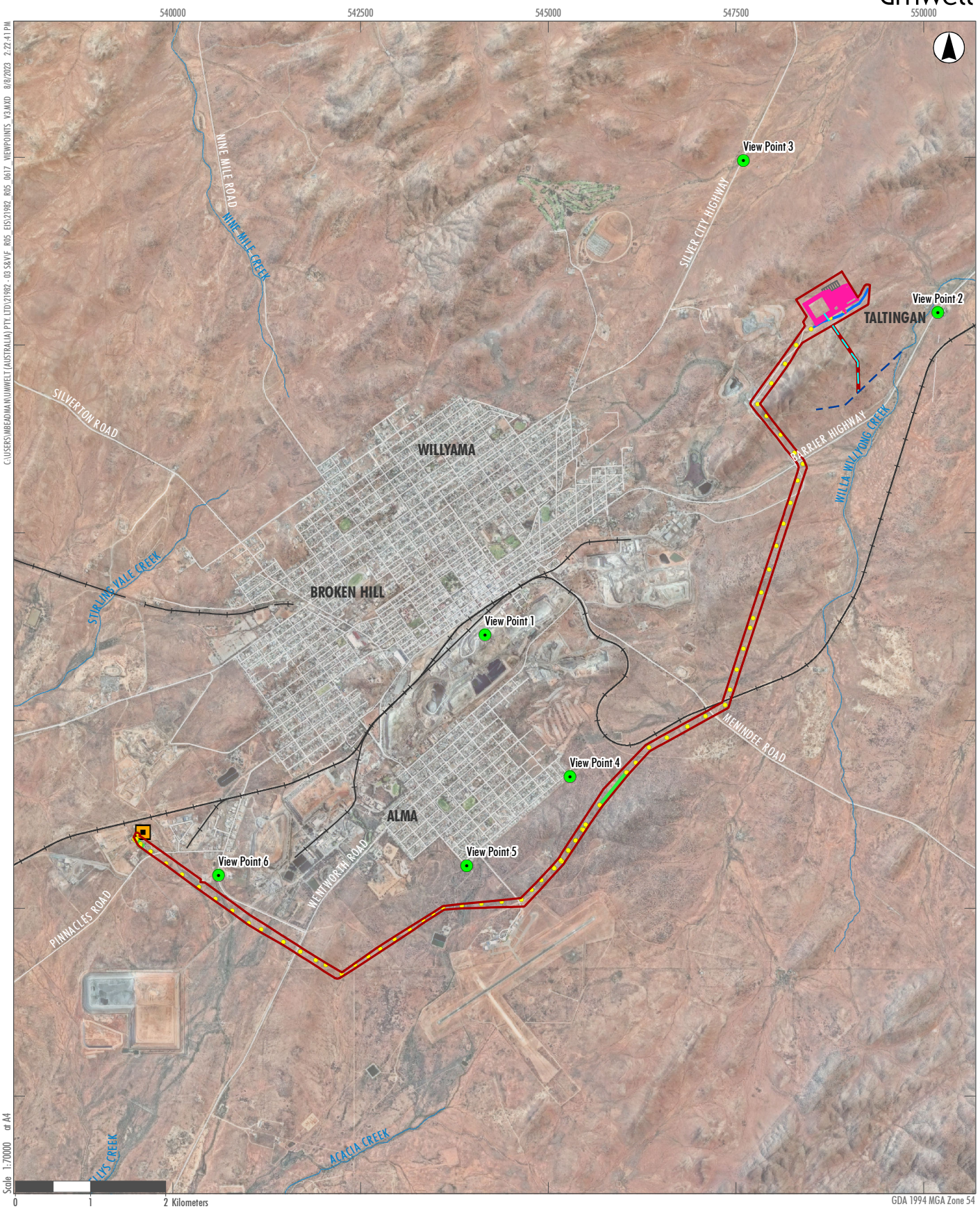
For each viewpoint location radial analyses were developed using 3D topographic information and the electronic Project layout to identify what can theoretically be seen from each vantage point. The radial analysis illustrates what is visible from a height of 1.7 m at that location (i.e. from approximate eye height). It should be noted that the radial analyses are based on topography only and do not include vegetation and existing built infrastructure that may screen the viewshed, so are considered conservative and to inform the identification of potential viewpoints and further detailed assessment.

6.12.1.3 Photomontages

Photomontages were completed for select viewpoint locations where the radial analysis and site visit identified the potential for visibility of the Project infrastructure. The photomontages were developed using photography, 3D topographic information and the electronic Project layout. Preparing the photomontages of the 'before and after' project scenarios illustrate the existing landscape and provides a comparison landscape including the Project infrastructure. For the purposes of this assessment the photo frame includes the indicative location of the infrastructure given its limited visibility.

6.12.1.4 Lighting Assessment

The visual assessment also includes a qualitative assessment of potential lighting impacts with consideration of both direct and indirect (or diffuse lighting effects). Lighting will be required during construction of the SCES Facility and throughout operations providing for operational and security lighting. The lighting assessment also considers the requirements of relevant Australian Standard (Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting).



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Railway Line
- Road
- Viewpoint

FIGURE 6.17

View Points

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

6.12.2 Existing Landscape Setting

Broken Hill is located within an arid landscape and is visually dominated by existing industrial mining development. Broken Hill City is built around an existing open cut mining operation, with a visually dominant overburden emplacement area (mullock dump) which sits between north and south Broken Hill. The Line of Lode lookout sits on top of the emplacement area and provides a view north over the central business district, this is the highest viewpoint in the vicinity of the city. The topography varies across the Project Area with undulating terrain within the Potosi Mining operations, large areas of relatively flat terrain along the transmission line with intervening areas of elevated landforms. Vegetation is dominated by arid low level shrubland with areas of extensive stands of vegetation restricted to areas immediately adjoining drainage lines.

The Project Area extends across multiple different land uses. The SCES Facility is sited within an existing mining operation. Surrounding land uses include mining, commercial, residential, telecommunications (NBNCo Satellite) and the Outback Astronomy. The transmission line traverses mining, rural and industrial land uses predominately characterised by industrial development including existing transmission lines and rail line. Small areas of recreational land use zones are also traversed which are currently subject to various land lease agreements including golf and gun club. The transmission line also skirts the Broken Hill Airport, and in order to avoid the airport the alignment enters part of the Broken Hill Regeneration Area for a short distance before connecting to the existing Transgrid substation, refer to **Figure 6.18**.

Scenic quality as outlined in the Visual Bulletin is based on the presence of key landscape features which are considered to be associated with community perception of high, moderate or low scenic quality. High scenic quality is associated with steep rocky ridges, escarpments, valleys and Gorges, extensive vegetation and visually prominent bodies of water. Moderate is associated with hilly undulating landforms, stands of vegetation and intermittent water bodies. Low is associated with large expanses of flat or gently undulating terrain, extensively cleared vegetation with limited variation and no water bodies.

The nature of the majority of the Project Area and surrounding land use is industrial surrounded by a broader arid landscape. The landforms across the Project Area are flat to undulating with relatively sparse vegetation with the exception of stands along drainage lines. There are also no significant bodies of water. The majority of the Project Area is therefore classified as having low scenic quality, with areas along drainage lines where vegetation is more prominent classified as moderate.

As discussed in **Section 6.4**, Broken Hill is included on the National Heritage List (ID: 105861) which comprises the entire Broken Hill City LGA boundary. The listing is linked to the historic mining operations associated with Broken Hill and acknowledges its industrial nature and significance in developing mining operations within Australia. The criteria of the values of the National Heritage Listing are discussed further in the Heritage Impact Statement, specifically in relation to aesthetic characteristics, the criteria includes the following summary. The aesthetic significance of Broken Hill is demonstrated by:

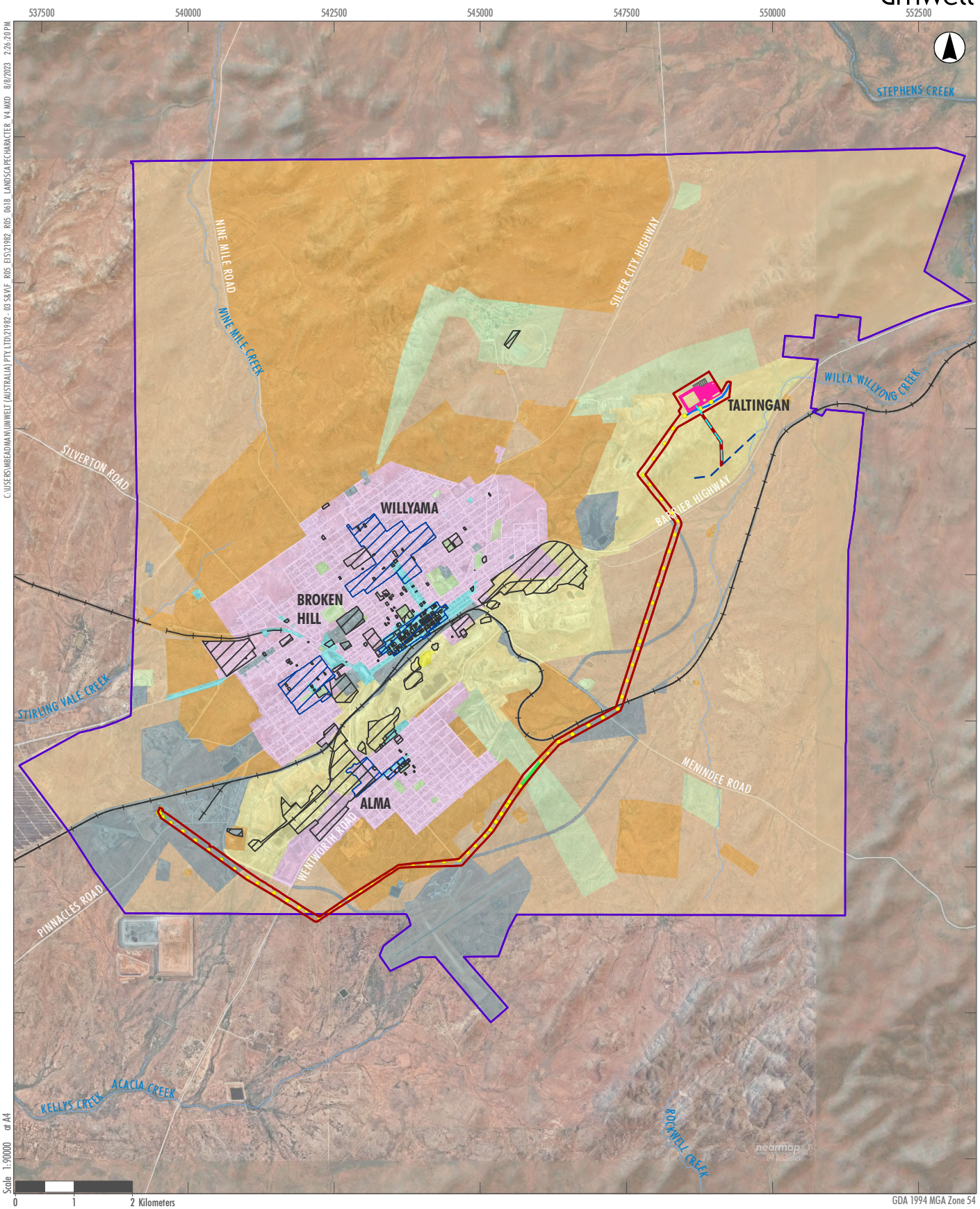
- The dramatic and spectacular but ever-changing landscape form and the still massive scale of the barren mullock dumps along the Line of Lode so close to the central business area of the city.
- The design quality of the streetscapes.
- The distinctive character of existing and relict mining infrastructure.
- The unusual visual qualities of ‘tin’ residential and mining architecture.

Other features representing the aesthetic significance are the contrast between the scale of the mullock dumps and the central business townscape, both dwarfed by the grander scale of the vast outback landscape setting. The views to and from the Line of Lode along the streets and from distant hills, together with close and distant views of mining markers, such as headframes, and mining industry relics. All these factors combined offer evocative and tangible evident of Broken Hills industrial character contrasting with its remote landscape setting. Other aesthetic features include historic nineteenth and twentieth century buildings and precincts and the park and vistas and streetscapes with memorials and artwork.

The aesthetic significance of Broken Hill as outlined above has been considered in the visual assessment and discussed further in **Section 6.12.3**.

The transmission line skirts the southern boundary of Broken Hill City, with no direct impact to any heritage listed items. The closest heritage listed items to the transmission line are the Mining Precinct 10 and the Old Broken Hill City Abattoir, located within the mining zone. Mining Precinct 10 is a conglomeration of several local heritage items located within the Perilya southern leases. The old Broken Hill City Abattoir was constructed by Council in 1908 to resolve issues of poor sanitation within the Broken Hill city limits, particularly associated with 'backyard slaughterhouses'. Its significance is associated with the Mayor at the time, (Mayor Alderman Long) as well as changes in public health ideology at the turn of the century, particularly relating to the understanding of germ theory, the buildings were reported to be in very poor condition in 1987 when a heritage study was completed for the LGA and there are now a number of new industrial buildings on the site. Under the Broken Hill Development Control Plan (BHC, 2016), development within the Line of Lode mining zone must be undertaken in a way that ensures the area continues mining operations.

The night-time scenic quality of the Project Area ranges from typically undeveloped/industrial land use near the proposed SCES Facility to industrial/urban land use along the transmission line. These existing uses contribute to varying levels of night light and glow. The existing mining operations within the vicinity of the proposed SCES Facility operate 24/7 therefore there is a night glow (at times) associated with these operations, although existing management and mitigation at the Potosi Operations is in place to avoid significant impacts to the adjoining Outback Astronomy. Vehicle movements along the Barrier and Silver City Highways also contribute light affecting the night-time scenic quality of the area.



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Transmission Line (Underground Section)
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline

EPI Land Zoning

- Environmental
- Industrial
- Residential
- Business Operations
- Recreation
- Rural
- Tourist
- Mining Operations

- Conservation Area - General
- Historic Heritage Item - General
- National Heritage List Boundary – Place ID 105861
- Drainage Line
- Railway Line
- Road

FIGURE 6.18

Landscape Character Map

Image Source: Nearmap (2022); Nearmap (2022) Data source: DFSI (2023)

6.12.3 Visual Analysis

The aspects of the Project which have the potential to result in visual impact include:

- Construction and operation of the SCES Facility which may include views of the proposed infrastructure from public and private vantage points and potential impacts associated with night lighting.
- Construction and operation of the proposed transmission line including temporary impacts associated with construction and permanent changes to the viewshed.
- Potential impacts associated with views to and from heritage listed items and disturbance and construction activities within the identified Broken Hill Regeneration Areas.

Based on the results of the visual assessment including radial analysis, fieldwork and 3D modelling, views of the proposed infrastructure will be limited. Due to the intervening topography, views of the proposed SCES Facility from both public and private vantage points are limited. Views of the proposed transmission line from any identified sensitive viewpoints are also limited due to the topographic setting and existing urban plan (residential properties orientated way from transmission alignment). Views from public vantage points are generally restricted to those views from road corridors with the exception of the western end of the transmission line which will be visible from the surrounding commercial properties including the heritage listed items Mining Precinct 10 and Old Broken Hill City Abattoir.

The extent of visibility of the proposed SCES Facility during both construction and operation will be similar, with limited views available, however, some larger machinery including cranes may be required during construction which may be visible. Construction of the underground cavern will be undertaken at night. Construction of the surface infrastructure associated with the SCES Facility will be undertaken during daytime construction hours only, therefore night lighting requirements during construction will be limited. Temporary visual impacts associated with the construction of the transmission line may also occur associated with the use of large machinery and ground disturbance associated with laydown areas and pole construction. These impacts are temporary in nature and areas not required for ongoing works will be rehabilitated following completion of the construction phase.

An assessment of each representative viewpoint is provided below.

Viewpoint 1 – Line of Lode Lookout

The Line of Lode Lookout is orientated to the north of Broken Hill and provides views over the north, west and east of Broken Hill (refer to **Figure 6.19**). Views to the northeast where the proposed SCES Facility is located (approximately 6 km from the lookout) are restricted by intervening topography and the proposed infrastructure is not expected to be visible from this location (refer to **Figure 6.19**). The proposed transmission line traverses the southern side of the mining operations that host the lookout with the orientation of the lookout facing away from the proposed transmission line. The north-eastern section of the transmission line sits approximately 3 km from the lookout beyond the intervening mining operations, due to the distance, nature of the infrastructure (with low visibility) and intervening development the proposed transmission line will not be visible and therefore a photomontage has not been prepared from this viewpoint.

Viewpoint 2 – Barrier Highway directly east of the proposed SCES Facility

The radial analysis (refer to **Figure 6.20**) indicates that based on analysis of topography alone, the proposed SCES Facility will be visible from Viewpoint 2 which is representative of the views from the closest public viewpoint (the Barrier Highway) and the closest residential viewpoints being (R1) the closest dwelling and (R2) the Outback Astronomy.

The photomontage (refer to **Figure 6.21**) demonstrates that the existing topography and distance will predominately obscure the SCES Facility from view with only the top of the Facility associated with turbine stacks and the building rooflines within view. Given the limited view of the Facility the potential visual impact from viewpoint 2 is considered low.

Viewpoint 3 – Silver City Highway directly west of the proposed SCES Facility

The radial analysis (refer to **Figure 6.22**) indicates the proposed SCES Facility will not be visible from Viewpoint 3 which is representative of the views from potential public viewpoint (the Silver City Highway) and residential and commercial properties located to the west of the proposed SCES Facility.

The photomontage (refer to **Figure 6.23**) demonstrates that the existing topography and distance will obscure the infrastructure from view. Some aspects of the SCES Facility may be visible from locations along the Silver City Highway, however, these views would be predominately from moving vehicles and predominately obscured by the landscape.

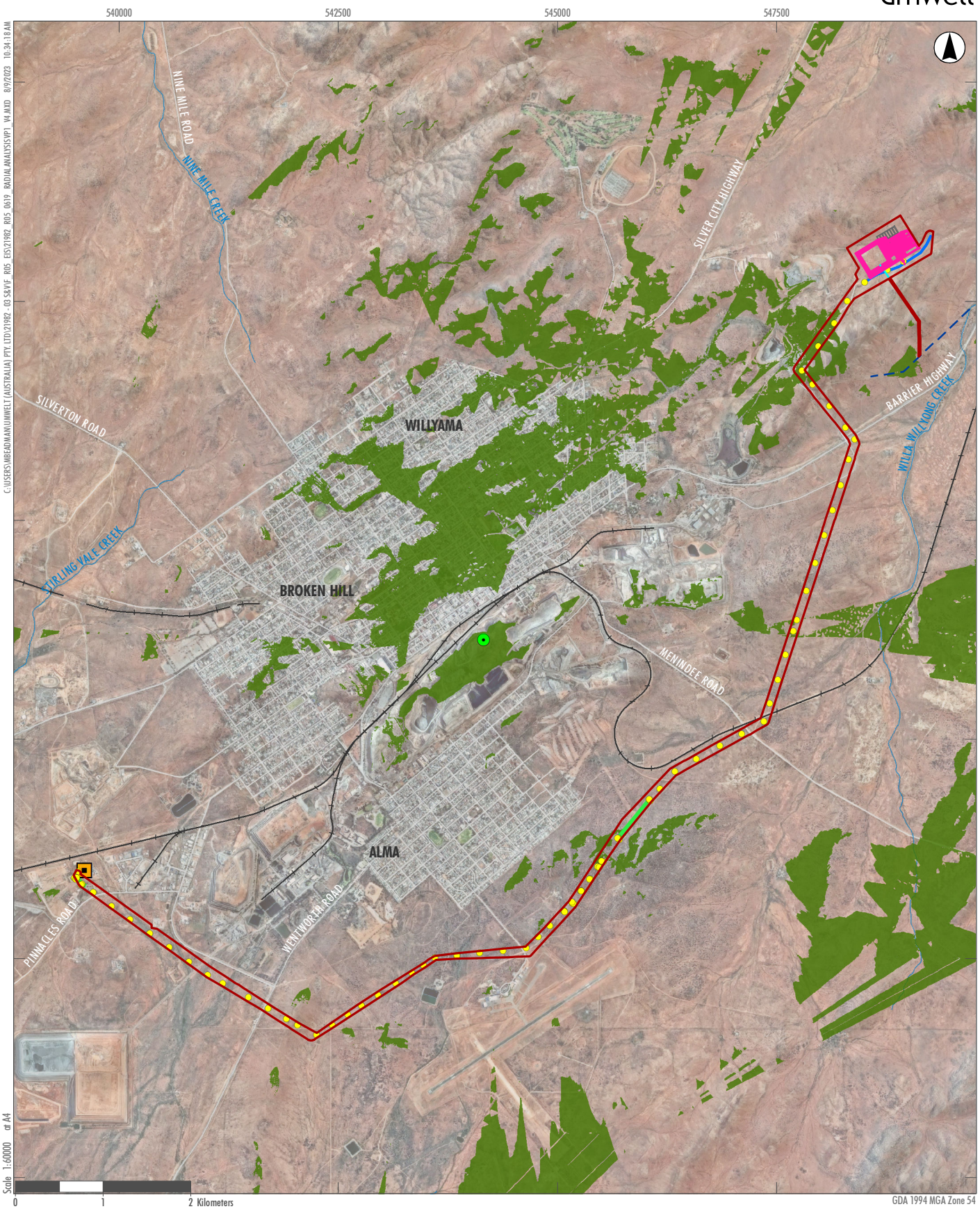
Viewpoint 4 and 5 – Southern end of Broken Hill Residential Area

Viewpoint 4 and 5 represent potential views of the transmission line from the southern residential area of Broken Hill. The radial analysis (refer to **Figure 6.24** and **Figure 6.25**) indicate the transmission line will be visible from these viewpoints, however, due to aspect, distance, and intervening vegetation and infrastructure, the transmission line will be predominately screened from view (refer to **Figure 6.26** and **Figure 6.27**).

Viewpoint 6 – Kanandah Road at the western end of the Proposed Transmission Line

Viewpoint 6 is located on Kanandah Road near the connection point to the Transgrid Substation. The transmission line is visible from the road and surrounding commercial/industrial premises (refer to **Figure 6.28**). This viewpoint is also representative of the closest heritage listed items, the abattoir (~450 m from the transmission line) and the Mining Precinct 10 (~400 m from the Transmission Line). There is a clear line of site from the viewpoint given close proximity of the transmission line (refer to **Figure 6.29**).

Given the views of the transmission line are in the context of surrounding industrial infrastructure (including existing transmission lines) and the linear nature of the transmission infrastructure the visual impact is considered minor. The viewshed currently contains a range of industrial infrastructure and disturbance activities (e.g. past mining, clearing and other activities) which have altered the visual character. The Project is not predicted to materially change the existing visual character and will be a minor element within the visual landscape.



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Railway Line
- Road
- Viewpoint
- Visible Area from Viewpoint

FIGURE 6.19

Radial Analysis
View Point 1

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Tranmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Railway Line
- Road
- Viewpoint
- Visible Area from Viewpoint

FIGURE 6.20

Radial Analysis
View Point 2

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY LTD\21982 - 03 S&VF_R05_EIS\21982_R05_0621_PHOTOMONTAGEVP2_V2.MXD 7/21/2023 4:05:37 PM

BEFORE



AFTER



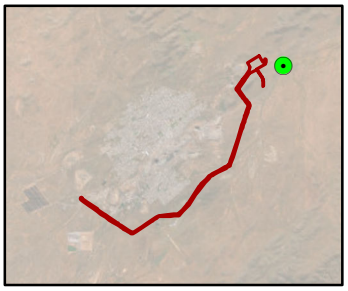


FIGURE 6.21

Photomontage
View Point 2

Image Source: Visual Subconsultant (2023)



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Railway Line
- Road
- Viewpoint
- Visible Area from Viewpoint

FIGURE 6.22

Radial Analysis
View Point 3

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY LTD\21982 - 03 S&VF_R05_EIS\21982_R05_0623_PHOTOMONTAGEVP3_V2.MXD 7/14/2023 8:21:40 PM

BEFORE



AFTER



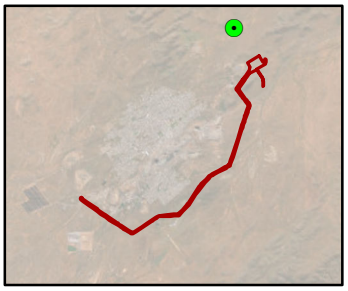
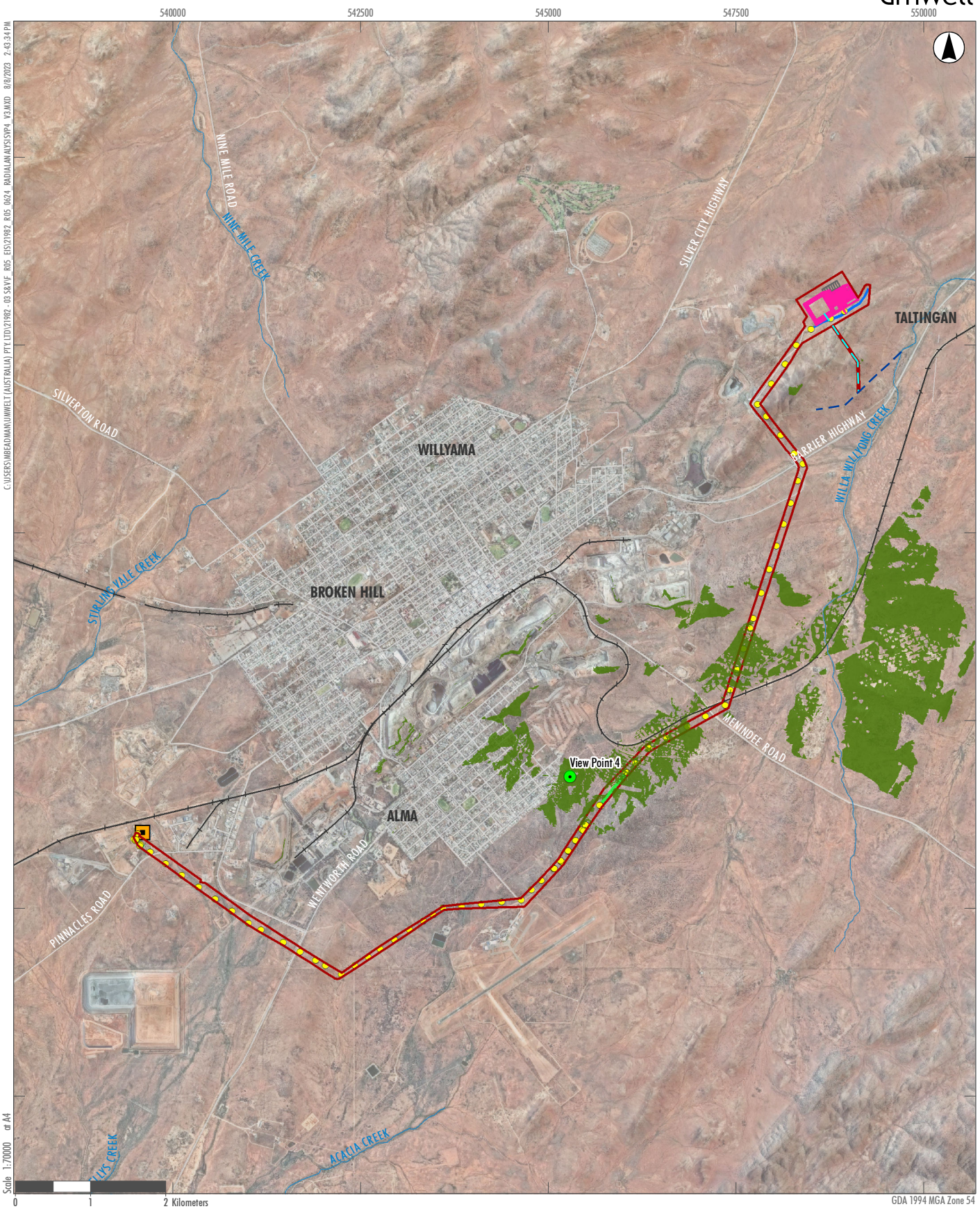


FIGURE 6.23

Photomontage
View Point 3

Image Source: Visual Subconsultant (2023)



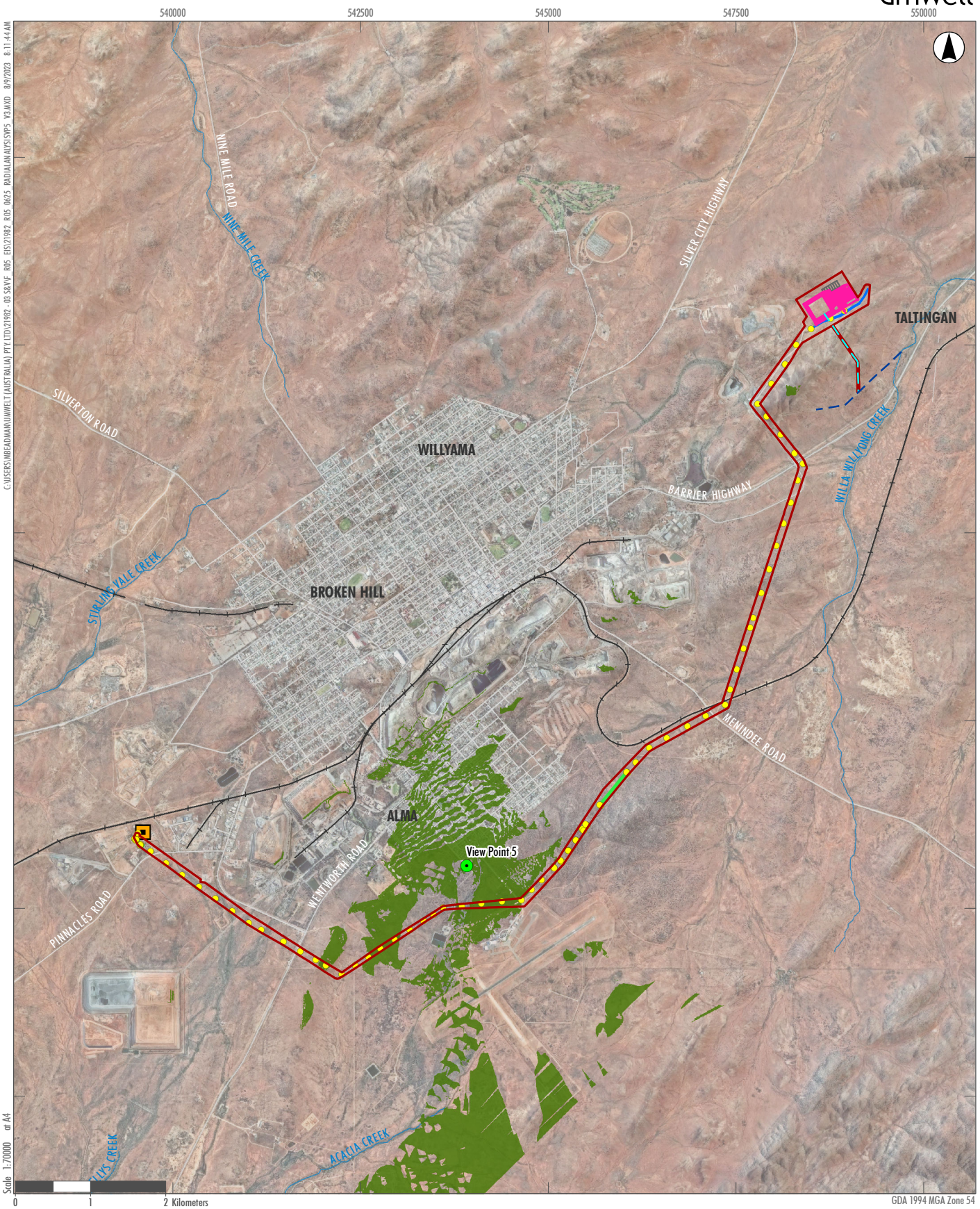
Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Railway Line
- Road
- Viewpoint
- Visible Area from Viewpoint

FIGURE 6.24

Radial Analysis View Point 4

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Railway Line
- Road
- Viewpoint
- Visible Area from Viewpoint

FIGURE 6.25

Radial Analysis View Point 5

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY LTD\21982 - 03 SKVF_R05_EIS\21982_R05_0626_PHOTOMONTAGEVP4_V2.MXD 7/14/2023 8:20:56 PM

BEFORE



AFTER



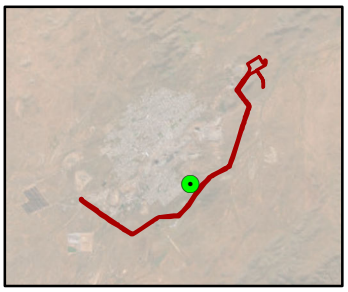


FIGURE 6.26

Photomontage
View Point 4

Image Source: Visual Subconsultant (2023)

C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY LTD\21982 - 03 S&VF_R05_EIS\21982_R05_0627_PHOTOMONTAGEVP5_V2.MXD 7/14/2023 8:48:53 PM

BEFORE



AFTER



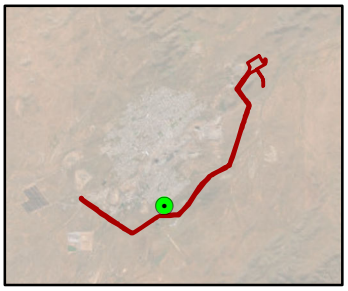
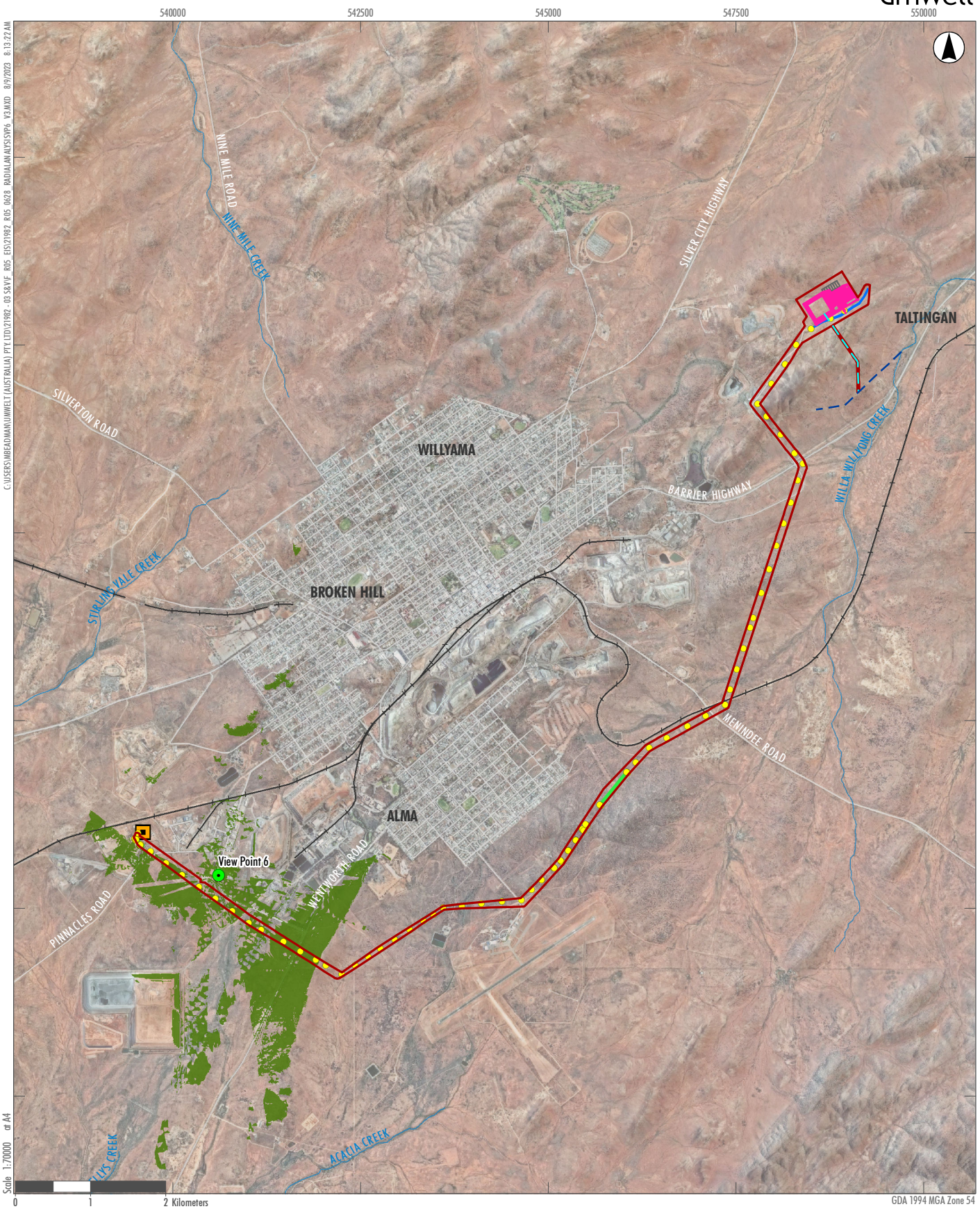


FIGURE 6.27

Photomontage
View Point 5

Image Source: Visual Subconsultant (2023)



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Transmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Drainage Line
- Railway Line
- Road
- Viewpoint
- Visible Area from Viewpoint

FIGURE 6.28

Radial Analysis View Point 6

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY LTD\21982 - 03 S&VF_R05_EIS\21982_R05_0629_PHOTOMONTAGEVP6_V2.MXD 7/14/2023 8:22:35 PM

BEFORE



AFTER



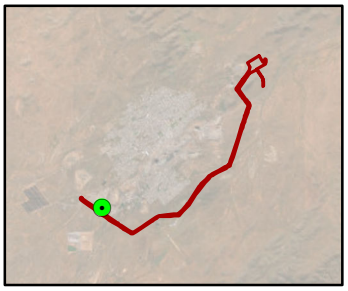


FIGURE 6.29

Photomontage
View Point 6

Image Source: Visual Subconsultant (2023)

The abattoir site will have limited views of the transmission line due to the location of intervening infrastructure and given the nature of the site and reason for listing (relating to use rather than built infrastructure) the transmission line will not impact the heritage nature of the listing. In relation to Mining Precinct 10, the conservation of the mining infrastructure and the heritage listing relates to protecting the mining use of the land, which again relates more so to use than built infrastructure. Given the distance to the Mining Precinct 10 and intervening commercial and industrial premises any change to the viewshed across the mining precinct site will be minimal and any associated visual impact minor in nature.
The Project is not considered to impact on the nature of the mining precinct heritage listing.

6.12.3.1 Summary of Visual Impacts

Given the scale of the proposed infrastructure and expanse of the Project Area, parts of the Project (primarily the transmission line) will be visible, however, through siting and Project design the visual impact has been reduced as far as practicable. Overall, the Project is assessed as having low visual impacts and is not predicted to impact on the existing visual character, which, in the areas where the Project will occur, is dominated by existing mining/industrial land uses. Due to surrounding topography and distance, views of the proposed SCES Facility from sensitive receivers are restricted and therefore no material visual impacts are predicted associated with the SCES Facility.

Views of the proposed transmission line will vary along the alignment, however, as indicated in the photomontages, will be generally consistent with the existing visual character with existing transmission infrastructure and other mining/industrial infrastructure within the existing viewshed. Potential impacts to sensitive receivers and visual impact were considered during the design of the alignment, with the southern alignment selected as it reduces interaction with sensitive land uses and north-facing views from much of the northern periphery of residential Broken Hill, reducing the potential for visual impacts. Views of the transmission line are largely restricted from the closest residential areas and the majority of views along the alignment will be from public viewpoints, particularly roadways.

The alignment of the transmission line around the southern boundary of Broken Hill, has been designed to avoid visually sensitive receptors (heritage listed items, dense residential development, and scenic tourist areas). While parts of the transmission line will be visible from multiple locations, the majority of views from sensitive locations will be restricted. The visual dominance of the transmission line is also reduced through physical design (lower (max 35 m) monopoles) and distance from potential viewpoints. The visual mass of the transmission line is also reduced through the compatibility of the infrastructure with the surrounding industrial land use including multiple different mining operations, industrial business operations, the airport and the Line of Lode mullock dump.

Views of the transmission line will be most prominent at the western end of the alignment near the connection point at the Transgrid Substation. Given the views of the transmission line are in the context of surrounding industrial development and the linear nature of the transmission infrastructure any change to the viewshed and associated visual impact is expected to be minor. Surrounding industrial and commercial properties will also restrict views toward the transmission line from the identified heritage listed sites. Additionally, the listing of these heritage sites relates predominately to the use rather than the built infrastructure therefore the Project will not result in any impact to any listed heritage sites and any change in the viewshed will be minor in nature.

In relation to the National Heritage listing of Broken Hill, although the Project will introduce new development within the boundary of the listing, from the visual analysis conducted here, there will be minimal visual impact. The Project would not result in impact to the aesthetic significance of Broken Hill outlined in the Heritage listing, with no impact to the landscape form, Line of Lode and mining infrastructure (existing and relic), no impact to the quality of the streetscapes and significant separation distance from the residential and mining architecture.

6.12.3.2 Lighting Assessment

As discussed in **Section 6.12.1.4**, lighting will be required during construction of the SCES Facility and throughout operations.

The underground operations associated with the construction of the SCES Facility will operate during the night, however, construction of the surface infrastructure associated with the SCES Facility will occur during daytime construction hours only. Surface lighting associated with the underground works will be minimal and relevant management and mitigation measures including appropriate directional lighting will be implemented to avoid any potential impact to residences, noting that there are minimal residential properties in the vicinity of the SCES Facility site. With the exception of R1 (900 m) and the Outback Astronomy business (1.3 km), other residences within the area surrounding the SCES Facility are located >2 km and the main residential areas within Broken Hill City are located >3 km from the SCES Facility.

Operational and security lighting will be required for the operation of the SCES Facility, however, only minimal lighting is required and no lighting is proposed to be installed at height. The detailed design process for lighting will be undertaken in accordance with AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting requirements. Additionally, A-CAES NSW will consult with the Outback Astronomy during the development of the detailed design to address any specific lighting requirements relating to this business.

6.12.3.3 Visual Impact Mitigation and Management

Project design has sought to address potential impacts though the siting of the proposed SCES Facility and the route of the proposed transmission line, including reducing the potential for visual impacts. To assist with further minimising the potential visual impacts associated with the Project, the following management controls and further detailed design will be implemented:

- Any mobile or temporary lighting required during the construction phase will be managed to reduce any potential offsite impacts. Management will include restricted lighting only within areas requiring lighting, use of directional lighting away from the adjoining residential and use of shielding including physical shielding and use of any vegetation and topography (if possible). The CEMP will include the development and implementation of appropriate procedures associated with the placement of mobile lighting to reduce for potential associated impacts.
- Temporary disturbance required during construction will be rehabilitated as soon as practicable following the completion of construction.
- All new fixed lighting associated with the SCES Facility (operational lighting and security lighting) will be installed and maintained in accordance with the Australian Standard AS4282 – 1995 – Control of Obtrusive Effects of Outdoor Lighting.
- A-CAES NSW will consult with the Outback Astronomy during the development of the detailed design to address any specific lighting requirements relating to this business.

6.13 Land Resources and Land Use

The SEARs require the assessment of the following specific issues relating to land suitability and conflict:

- a detailed justification of the suitability of the site and that the site can accommodate the proposed development having regard to its potential environmental impacts, permissibility, strategic context and existing site constraints
- an assessment of impacts of the Project on:
    - soils, including management of spoil generated by the Project
    - the geotechnical stability of the site
    - existing land uses on the site and adjacent land, including flood prone land, Crown lands, mining (including mine safety, operations and rehabilitation), quarries, mineral or petroleum rights
    - a cumulative impact assessment of nearby developments.
- an assessment of the compatibility of the development with existing land uses, during construction, operation and after decommissioning, including:
    - consideration of the zoning provisions applying to the land, including subdivision (if required)
    - completion of a Land Use Conflict Risk Assessment in accordance with the Department of Industry's Land Use Conflict Risk Assessment Guide.

6.13.1 Site Suitability

The Project Area is considered to be a suitable location for the Project being an existing mine site that is in a suitable location and has suitable environmental and physical conditions for the Project. The site also has suitable buffer distances to residences, Broken Hill and other sensitive land uses. The site can suitably accommodate the Project having regard to its potential environmental impacts, permissibility, strategic context and existing site constraints. The use of this site will also provide a suitable post-mining land use for the Potosi mine. As outlined in **Section 2.0**, **Section 4.0** and **Section 6.0** of this EIS the Project Area is a suitable location for the Project on a policy basis, is suitable from a land use planning perspective and the predicted residual environmental impacts can be appropriately mitigated and managed.

As discussed in **Section 2.0**, the Project was identified as the preferred option by the Transgrid RIT-T process to address supply reliability issues in Broken Hill. This process considered a range of alternative options to meet the energy reliability needs of Broken Hill and concluded that the Project was the preferred option as it provides for the use of low emission energy consistent with the general transition of the electricity sector to renewable energy technologies.

As outlined in **Section 4.0**, the Project is permissible with development consent, due to the operation of Clause 2.36(1)(b) of the Infrastructure SEPP.

The site selection process has been informed by assessments of the potential impacts of the development on the existing land uses both within and surrounding the Project Area, including detailed consultation and collaboration with Perilya regarding Project design and implementation. Consideration of the compatibility of the Project with the existing land uses, during construction, operation and after decommissioning has been considered in the relevant assessments undertaken to inform the EIS.

In summary, suitability of the Project Area is based on:

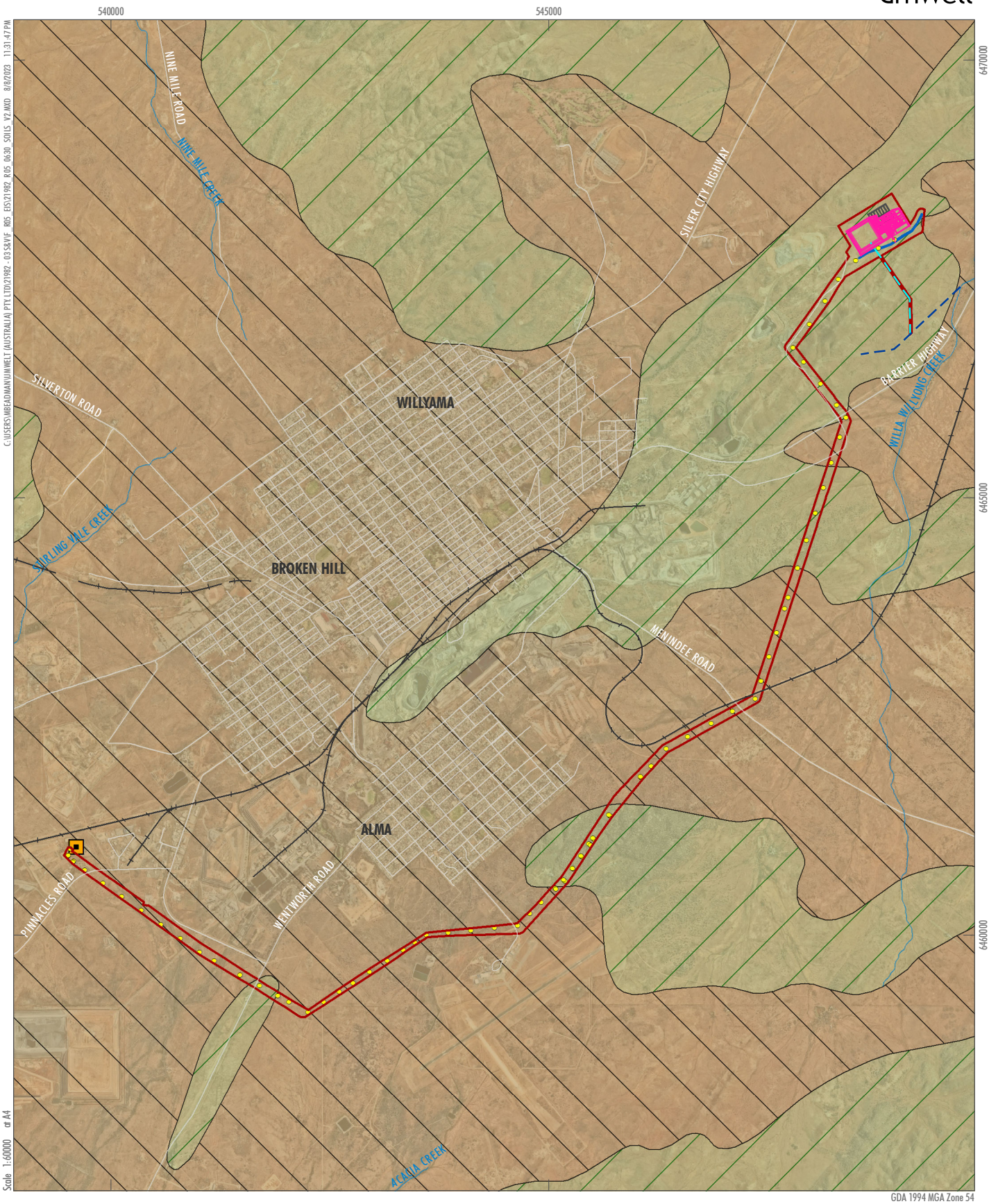
- compatible geological conditions
- suitable depth of existing underground mining areas at Potosi Mine with existing access
- the ability to co-locate the Project without impacting the Potosi Mining Operation and provide an opportunity for a diversified post-mining land use
- access to major transport networks
- compatible land use zoning within the Project Area and surrounding landholdings
- ability to reduce impact to adjoining land use through project alignment and design
- land use and ownership lends itself to the implementation of required land lease and easement agreements
- availability land of a suitable scale for a viable commercial-scale energy storage project with low density residential receivers
- residual environmental impacts can be managed with appropriate mitigation and management.

6.13.2 Land Use Assessment

6.13.2.1 Soils

A review of eSpade (DPE, 2022) indicates the soils within the Project Area as predominantly rudosols, which are either apedal or weakly structured as defined by the Australian Soil Classification (ASC). Rudosol soils have a low salinity, as confirmed by the State-wide Hydrogeological Landscapes (HGL) mapping showing that the area within and surrounding the Project Area has a low land salinity rating.

The Project Area is located within the Desert Loams and Lithosols Dominant Great Soils Group (GSG), both characterised with shallow depth and coarse grain. The Barrier Range and Nine Mile Land Systems also apply to the Project Area. The Barrier Land System (LSBr), with the higher slopes incorporating lithosols, solonized brown soils and sands with minor to moderate watersheeting, rilling and gullying of drainage lines and minor scalding in foot slopes. The Nine Mile Land System is characterised by sandy topsoils and red clay subsoils, forms of erosion are minor to moderate scalding, minor water-sheeting and with areas of riling and gullying. The soil land systems and soil groups are shown in **Figure 6.30**.



Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Tranmission Pole Location
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Railway Line
- Drainage Line
- Road

Dominant Great Soil Group (GSG)

- Desert Loams (DL)
- Lithosols (L)

Land System

- Barrier (Br)
- Nine Mile (Nm)

FIGURE 6.30

Soils

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

Based on work completed by Perilya (2018), four principal soil types are present at Potosi Mine, including clay loams, sandy clay loams, skeletal or remnant, and aeolian soils. Soil range in thickness between 1 and 3 m, and only 0.5 m on the surrounding slopes, with no soil present on the ridges. Elevated base metal concentrations are present in soils throughout the Potosi Mine area with higher concentrations near old workings possibly attributed to run off or natural mobilisation and deposition of the metals. Sodic soils are common in the arid region of Broken Hill and contain more than 15% exchangeable sodium. The soils are largely unstable with poor physical and chemical properties which impede water infiltration (Perilya, 2018).

Modelled soil properties sourced from the SEED Database (DPE, 2021) for the Project Area are presented in the SWIA, refer to **Appendix 12**, with the modelled soil properties for the soils at Potosi Mine indicating that the soils:

- consist of topsoils ranging from a fine to course texture while subsoils are fine textured
- are moderately erodible
- have a slightly acidic topsoil to neutral subsoil pH
- are non-saline
- consists of non-sodic topsoil (exchangeable sodium percentage (ESP) < 6%) and some subsoils that are slightly sodic and may exhibit some dispersive behaviour
- have low fertility, indicated by a low cation exchange capacity (CEC) and low organic carbon.
- The modelled soil properties indicate that the soils along the proposed transmission alignment:
- range from fine to course texture and are moderately erodible
- have a slightly acidic topsoil to neutral subsoil pH
- are non-saline
- consist of non-sodic topsoils (ESP < 6%) that are not likely to be dispersive and slightly sodic subsoils that may exhibit some dispersive behaviour
- have low to moderate fertility, indicated by a low to moderate CEC and low organic carbon.

Land and Soil Capability

Land and soil capability mapping is sourced from the Seed Dataset provided by DPE. The mapping is based on classification of lands into eight classes which indicate the varying capability of the land to sustain land use. Class 1 is land capable of sustaining high soil impact and Class 8 represents land that is only capable of sustaining low impact. The capability classification is determined “through the assessment of eight key soil and landscape limitations (water erosion, wind erosion, salinity, topsoil acidification, shallow soils/rockiness, soil structure decline, waterlogging and mass movement)” (DPE, 2021). The Project Area is located across land classified as Class 6 and Class 7, as shown in **Figure 6.31**.

Land classified as Class 6 has very severe limitations for many land uses. Limitations may be overcome with highly specialised practices. Land classified as Class 6 is often used for low intensity land uses, such as low intensity grazing (DPE, 2021).

Land classified as Class 7 has extremely severe limitations which is incapable of sustaining most land uses, with these limitations unable to be overcome. Land management practices can be extremely severe on the land if limitations not managed and in land of this class DPE recommends that disturbance of native vegetation should be minimal (DPE, 2021).

Soil Erosion and Sedimentation

As outlined in the SWIA (refer to **Appendix 12**) and **Section 6.8.1**, throughout the construction phase of the Project, erosion and sediment controls (ESCs) will be established in general accordance with Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom, 2004) and Volume 2E: Mines and quarries (DECC, 2008) (the Blue Book).

The Project erosion and sediment control design standards and anticipated erosion and sediment controls to be implemented during the construction phase are outlined in detail in the SWIA. Should the Project be approved and constructed, a Construction Soil and Water Management Plan (CSWMP) will be prepared by a suitably qualified person to facilitate implementation of best practice erosion and sediment controls for the Project.

Spoil and excavated material will be utilised for construction and temporary stockpiling may occur during construction. Appropriate erosion and sediment control measures will be applied to all stockpile areas throughout the construction phase.

As outlined in **Section 6.8.1**, appropriate erosion and sedimentation controls will be developed and implemented as part of the CEMP and OEMP.

6.13.2.2 Geotechnical Suitability

The Geotechnical conditions are discussed in detail in **Section 6.9.2**. The geotechnical conditions, as described in **Section 6.9.2** are suited to the establishment of A-CAES technology. Additionally, the proposed cavern depth of 600 m below ground level (partially provided by the existing underground mining area) is optimal.

6.13.2.3 Existing Land Use

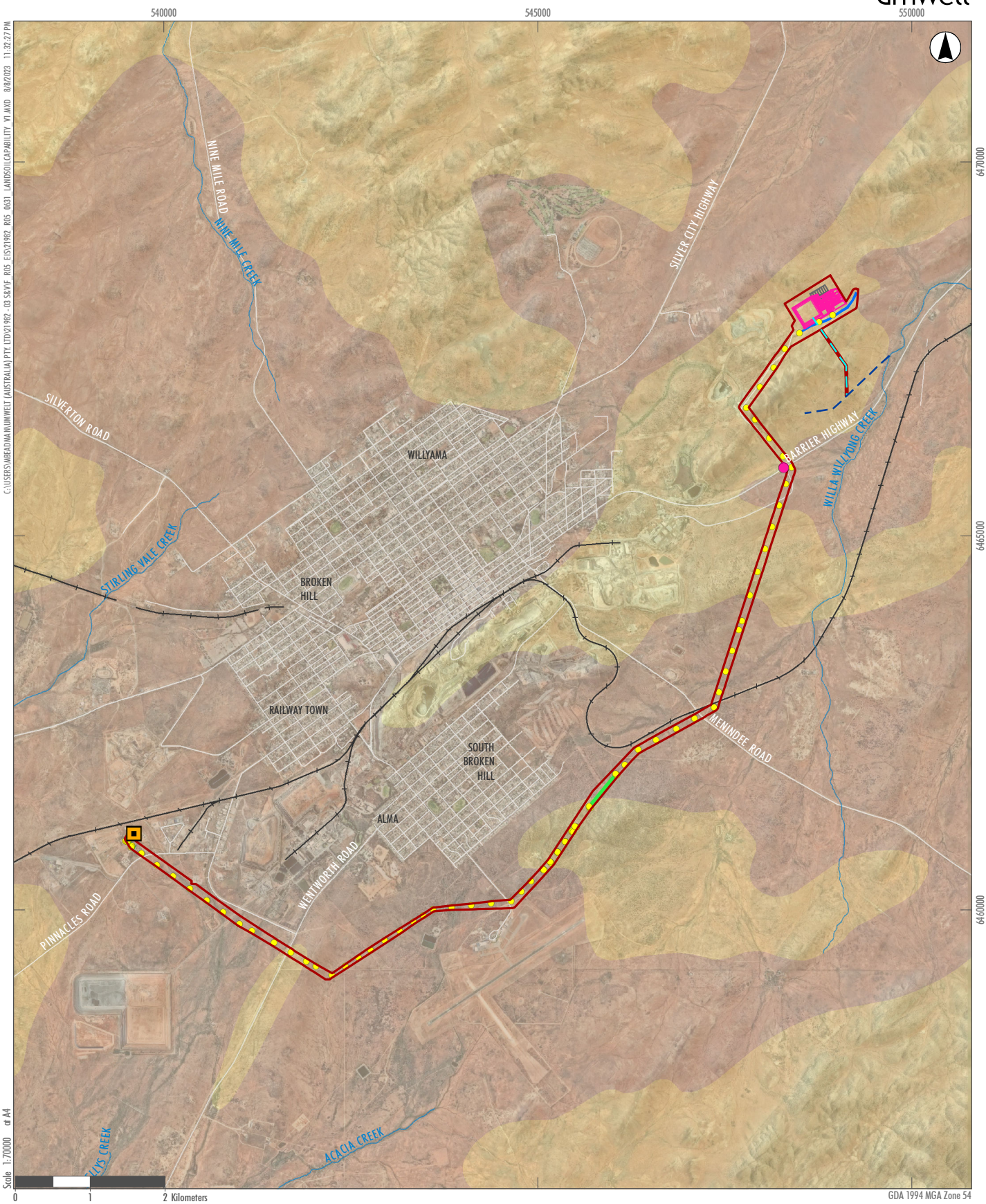
As outlined in **Section 2.8**, the Potosi Mine site is the ideal location for the construction and operation of the Project for a range of reasons. The Project can be co-located within the Potosi Mine site without impacting on the ability for ongoing mining operations and has a buffer distance from residential areas. The transmission line alignment and associated easements can also be accommodated without significantly impacting existing land uses with all existing land uses able to continue. As discussed in **Section 2.8.2**, the transmission line route was selected following a route options assessment as among other factors, this route was considered to avoid the potential for land use conflicts.

Flood Prone Land

No flood prone land or flood management areas are identified within the Project Site. A flood Impact Assessment has been undertaken and is summarised in **Section 6.8.1** indicating that the Project will not materially impact on flooding or be materially impacted by flooding.

Crown Land

As discussed in **Section 1.6**, A-CAES NSW is seeking to secure a Special Purpose Lease from Crown Lands. The Special Purpose Lease will be in place prior to construction and in combination with the agreement with Perilya will provide relevant tenure for the Project. Appropriate easement agreements for relevant Crown Land and all land parcels along the transmission line are also in progress. As discussed in **Section 2.9.1**, discussions with NSW Department of Planning and Environment (Crown Lands Department) are well progressed.



C:\USERS\MBEADMAN\UMWELT (AUSTRALIA) PTY LTD\21982 - DS S&V\F_ROS_EIS\21982_ROS_0631_LANDSOILCAPABILITY_V1.MXD 8/8/2023 11:32:27 PM

Scale 1:70000 at A4

Legend

- Project Area
- Silver City Energy Storage Facility
- Underground Cavern
- Tranmission Pole Location
- Proposed Transmission Line (Underground Section)
- Transgrid Substation
- Proposed Creek Diversion
- Existing Stephens Creek Reservoir Water Pipeline (above ground section)
- Proposed Above Ground Water Pipeline
- Site Access Point
- Drainage Line
- Railway Line
- Road

Land and Soil Capability

- Extremely severe limitations - Land incapable of sustaining most land uses. Limitations cannot be overcome.
- Very severe limitations - Land incapable of sustaining many land use practices (e.g. cropping, moderate to high intensity grazing and horticulture). Highly specialised practices can overcome some limitations.

FIGURE 6.31

Land and Soil Capability

Image Source: ESRI Basemap (2022); Nearmap (2022) Data source: DFSI (2023)

Mining

The Project will be co-located on the Potosi Mine site and the Project will coexist with the existing and future mining operations. The Project does not impact on the mining areas associated with the Potosi Mine or the Flying Doctor Deposit. The Project will not preclude the continuation of mining operations at Potosi Mine and will provide for a diversified post mining land use.

Appropriate safety controls including fencing, exclusion zones and operational controls will be implemented on site to protect the general public and the Potosi operations workforce, refer to **Section 6.9.2** and **Section 6.9.3** for further detail.

Cumulative Assessment

The cumulative impacts associated with the Project are assessed in detail in **Section 6.15.3**. While there are other Projects that may be under construction concurrently with the Project, these projects are generally located well away from the Project and appropriate management and mitigation measures are proposed to address the associated cumulative impact which primarily relate to cumulative construction workforce and traffic.

6.13.3 Compatibility with Existing Land Use

As outlined in **Section 2.6**, the Project Area covers multiple land zonings. The proposed SCES Facility is located on land zoned SP1 (mining). The transmission line traverses SP1 (mining), RU2, RE2, SP2 (water supply systems) E2 and E4 land zonings. The length of transmission line within the Unincorporated Far West Region does not have any applicable zoning. The Local Environmental Plan (LEP) zone mapping is illustrated in **Figure 2.2**. As outlined in **Section 4.0**, the Project is permissible with development consent, due to the operation of Clause 2.36(1)(b) of the Infrastructure SEPP. Considering the nature of the Project, the zonings and the existing land uses, the Project is considered to be compatible with the existing land uses with the proposed design measures (e.g., limiting transmission line height to minimise interactions with Broken Hill Airport) and management measures to be implemented as part of the Project.

No subdivision of land is proposed as part of the Project.

6.13.4 Land Use Conflict

A land use risk identification and ranking process has been undertaken in accordance with the DPI Land Use Conflict Risk Assessment (LUCRA) Guide (2011) (refer to **Appendix 21**).

The Project will modify the existing land use within the Project Site by adding energy generation land use to the existing mining land use that will continue, with the two land uses coexisting. The LUCRA identifies any potential incompatibilities (in the absence of mitigation measures as required by the LUCRA assessment guidelines) between the surrounding land use and the proposed land use for key Project phases.

Key land use conflict risks include those associated with traffic (during construction and decommissioning), air quality, noise and lighting. These issues have been subject to assessment as part of the EIS and appropriate management and mitigation measures have been identified (refer to **Section 6.5**, **Section 6.6**, **Section 6.7** and **Section 6.12**).

A-CAES NSW has committed to implement appropriate management and mitigation measures as part of the Project. With the implementation of these measures, the potential impact of the Project on the surrounding land and land users will be minimal. Additionally, upon decommissioning of the Project, all above ground structures not required for the ongoing use of the land will be removed and the land rehabilitated so that the areas occupied by the Project can be fully rehabilitated.

The implementation of these management strategies reduces the risk rating of the potential land use incompatibilities highlighted in the LUCRA risk assessment, and thus reduce the risk associated with land use conflicts for the Project. The objective of the LUCRA risk assessment is to identify and define controls that lower the risk ranking score to 10 or below. The LUCRA risk ranking process for the Project found that all risks are appropriately mitigated to a risk ranking lower than 10 and, therefore, no further management and mitigation is required, refer to **Appendix 21** for further detail.

6.14 Waste Management

The SEARs require the EIS to identify, quantify and classify the likely waste streams to be generated by the Project during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.

Appropriate and best-practice waste management will be implemented as part of the Project in accordance with the following legislation and guidelines:

- *Protection of the Environment Operations Act 1997* (POEO Act).
- Protection of the Environment Operations (Waste) Regulation 2014.
- *Waste Avoidance and Resource Recovery Act 2001* (WARR Act).

The Waste Classification Guidelines – Part 1: Classifying wastes (EPA, 2014a) have also been referred to in the preparation of this assessment. Best practice waste management involves implementation of resource management hierarchy principles as specified in the WARR Act, and the principles of ecologically sustainable development, which include:

- avoidance of unnecessary resource consumption
- resource recovery (including reuse, reprocessing, recycling and energy recovery)
- disposal, including management of all disposal options in the most environmentally responsible manner in accordance with the Waste Avoidance and Resource Recovery Strategy 2014-2021 (EPA, 2014b).

6.14.1 Waste Classification

The Waste Classification Guidelines: Part 1 Classifying Waste (EPA, 2014a) provide direction on the appropriate classification of waste, specifying requirements for management, transportation, and disposal of each waste category. Should waste be found to be unsuitable for reuse or recycling, disposal methods would be selected based on the classification of the waste material in accordance with the Waste Classification Guidelines.

Construction and Operation

The potential waste streams expected to be generated by the Project during the construction and operational phases are identified in **Table 6.25** and estimated waste quantities are included in **Table 6.26**.

The construction period of the Project will result in the largest contribution of waste (approximately 95%), most of which will be required to be disposed of off-site. Onsite use of waste would be limited to reuse of excavated materials, including topsoil, excavated rock and sediment recovered from erosion and sediment control devices which will be reused onsite to construct the reservoir and as general fill material. Waste generated during construction would mainly arise from works associated with site preparation, construction of accessways and the construction of operational infrastructure.

During operation waste generation would be limited to minor quantities of putrescible waste from staff amenities, redundant equipment, used oils and general waste from maintenance activities. Under the waste definitions in the POEO Act, most of the waste generated during the construction phase would be classified as general solid waste, either putrescible or non-putrescible (refer to **Table 6.25**).

Some materials such as oils and lubricants, redundant equipment and metals may require infrequent replacement over the operational life of the Project and there will be some disposal of these used materials (e.g. replacement oil) and equipment which has reached its operational life.

Table 6.24 Waste Classification and Expected Waste Types

Activity	Waste Classification	Expected Waste Type
Construction	Liquid Waste	Waste oils, lubricants and liquids, paint, and sewage ablutions.
	General Solid Waste (Non-Putrescible)	Green waste from site establishment and clearing of Disturbance Area, spoil from site earthworks, excavated rock, concrete, footings and laydown area waste, timber and packaging (including pallets), plastic packaging, other plastics (PET), cardboard packaging, paper, glass, empty chemical drums, oil spill clean-up material, metal offcuts and damaged metal (ferrous and non-ferrous), electronics and electrical infrastructure, recyclable domestic waste, and PPE.
	General Solid Waste (Putrescible)	Domestic waste.
Operation	Liquid Waste	Waste oils, lubricants and liquids, paint, and sewage ablutions.
	General Solid Waste (Non-Putrescible)	Timber and packaging (including pallets), plastic packaging, other plastics (PET), cardboard packaging, paper, glass, empty chemical drums, paint, oil spill clean-up material, metal offcuts and damaged metal (ferrous and non-ferrous), electronics and electrical infrastructure, recyclable domestic waste, and PPE.
	General Solid Waste (Putrescible)	Domestic waste.

Decommissioning

A Decommissioning and Rehabilitation Plan will be developed for the Project prior to closure which will include a detailed review of the associated waste streams and recycling/disposal options available at the time.

6.14.2 Waste Disposal

Waste generated by the Project will be managed in accordance with the waste management hierarchy principles. While many wastes can be avoided, recycled or reused, some wastes will need to be disposed of to landfill, and in this case A-CAES NSW will liaise with the relevant local authorities and service providers to ensure appropriate disposal is undertaken.

There are several locations for off-site recycling and disposal of construction waste generated by the Project. Broken Hill City Council's waste management Facility is equipped to accept mixed commercial and industrial waste, including general waste, green waste, recyclables, oil and batteries.

Specific resource recovery facilities and waste collection contractors would be selected during detailed design and contract development stages of the Project and documented in the CEMP and OEMP.

6.14.3 Mitigation and Management Measures

The CEMP and OEMP will include the development of a waste management plan, including a detailed breakdown of waste types and quantities in accordance with relevant legislation and guidelines. The waste management plan will outline the measures and strategies to be implemented on site to manage, reuse, recycle and safely dispose of waste including:

- separation and storage of recyclable and non-recyclable materials
- reuse and collection/transportation of waste
- procedures for tracking waste storage and disposal.

On-site waste management will include the appropriate separation and storage of waste streams to enable recycling and reuse wherever possible to reduce associated environmental impacts and impact to the capacity of local waste management facilities.

Should the Project require decommissioning, A-CAES NSW will prepare and implement an RMP prior to decommissioning to guide the rehabilitation of the site, which will include a detailed review of the associated waste streams and recycling/disposal options available at the time. At the end of the operational life of the Project, all above ground infrastructure will be dismantled and removed from the Project Site and recycled in accordance with best practice at the time.

Potential management actions that may be required to manage waste have been identified for each potential waste type identified in **Table 6.26**, including indicative quantities (construction and operations phase). It is noted that the majority of the indicative waste quantities are applicable to the construction phase (95%) of the Project, as outlined in **Table 6.26**.

Table 6.25 Indicative Waste Types and Management Activities – Construction and Operation Phase

Waste Types	Waste Stream	Estimated Quantity	Management Actions
Green waste	Reuse	NA	Recycled.
Spoil from earthworks/ Excavated Material	Reuse	378,000 m^3	Recycled on site – used for construction.

Waste Types	Waste Stream	Estimated Quantity	Management Actions
Concrete	Recycle	200 tonnes	Separated on site and stored. Reused on site where possible or off site, alternatively transported off site for recycling by appropriately licensed contractor.
Oils and lubricants	Hazardous Waste	50,000 L	Stored within bunded area in appropriately sized tanks/containers. Collected on a regular basis by a licensed waste contractor(s) and transported to an appropriately licensed facility for recycling.
Paint, solvents, detergents and adhesives	Liquid Waste	15,000 L	Stored appropriately then transported from site and disposed of by appropriately licenced contractor.
Septic Tank Waste	Sewerage	300 kL	Treated on site in approved septic system or compositing system with removal of final waste products at appropriate intervals by licensed contractor.
Plastic packaging	Recycle	40 kg	Separated on site and stored in recycling bins for periodic transportation off site to applicable recycling facilities by appropriately licensed contractor.
Cardboard and paper Packaging		1 tonne	
Glass		50 kg	
General recyclables		2 tonne	
Timber	Reuse/General Solid Waste (Non-Putrescible)	100 kg	Pallets will be returned to suppliers or reused on site where possible. All other timber will be reused on site where possible or stored and transported off site for recycling by appropriately licensed contractor.
General office/ domestic waste	General Solid Waste (Putrescible)	5 tonnes	Stored in covered bins for periodic transportation offsite to landfill facilities by appropriately licensed contractor. Where located in open areas, the bins would be fitted with animal-proof lids.
PPE	Reuse/Recycle or disposal	1 tonne	PPE will be stored on site for reuse or periodic transportation offsite to applicable recycling facilities by appropriately licensed contractor.
Metals (ferrous and non-ferrous)	Recycle or disposal	60 tonnes	Scrap metal will be stored on site for transportation to appropriate recycling facilities (if available) by appropriately licensed contractor.
Empty chemical/ hydrocarbon drums	Reuse/Recycle	300	Reused on site or stored for recycling (if possible) then transported to appropriate recycling facilities by appropriately licensed contractor.
Electronics and electrical infrastructure	Reuse/ Recycle/General Solid Waste (Non-putrescible)	100 tonnes	Where possible components will be reused, sold as scrap, recycled or re-purposed.

6.15 Cumulative Impacts

As discussed in **Section 2.7**, there are currently 11 existing and proposed projects within the vicinity of the Project Area. When considered in isolation, the environmental, social, economic and other impacts associated with a development may be considered minor, however, these minor impacts may be more substantial when the impact of multiple developments are considered.

The SEARs require the EIS to include an assessment of the likely impacts of all stages of the development, including any cumulative impacts of existing or proposed developments in the region, taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice including the *Cumulative Impact Assessment Guideline* (DPIE, 2021).

This section presents an assessment of the potential cumulative impacts associated with the construction and operation of the Project when considered together with other developments and activities occurring near the Project and presents the approach to the management of these impacts. This assessment was conducted following the requirements the SEARs and the NSW *Cumulative Impact Assessment Guidelines for State Significant Projects 2021* (CIA Guidelines).

6.15.1 Assessment Methodology

In accordance with the CIA Guidelines a cumulative scoping assessment was undertaken to identify the potential for cumulative impacts to occur associated with the Project (refer to **Appendix 22**).
The methodology used in the scoping summary is outlined below.

Nearby developments with the potential to result in cumulative impacts with or as a result of the Project were identified using the following sources:

- NSW DPE Major Projects website including renewable and other projects in the area.
- Google Maps.
- Broken Hill Council development application register.
- Transport for NSW current projects register (relative to transport routes).

Developments for further consideration were selected based on the following screening criteria:

- **Location** – proximity to areas and activities assessed as part of each stage of the Project.
- **Timeframe** – relevant projects recently completed or likely to be carried out at some point during the construction, operation and/or decommissioning of, and would interact with, the Project.
- **Scale** – potential impacts of a scale that could cause cumulative impacts with each staged assessment.
- **Status** – the stage of the Project at the time of each staged assessment (including forecast timeframes for construction and operation). Stages includes approved projects, proposed projects and local strategic plans.

Depending on the nature of the identified potential cumulative impact issue, either a qualitative or a quantitative assessment was undertaken. Generally, potential cumulative impacts have been qualitatively assessed, with the expected cumulative impacts determined based on the likelihood of impact and scale of interaction between the Project and those identified for the cumulative assessment (refer to **Table 6.27**). In some cases, a detailed assessment (traffic, noise and social) was carried out to identify and assess the potential cumulative impacts of the Project.

6.15.2 Identified Developments

Projects that may contribute to the cumulative impacts with the Project are summarised in **Table 6.27**. These projects are in various stages of delivery and planning, with a number of projects yet to be approved by the relevant authority and therefore whether or not they will proceed and the timing of them proceeding are uncertain. The likely impacts of these developments will be assessed by the relevant approval authority as part of the development consent process for each individual development. Available information has been used to estimate likely timing for these projects, assuming they proceed.

As outlined in the cumulative scoping summary provided in **Appendix 22**, impacts associated with the operations phase of the Project and other projects within the area will be limited with the majority of the potential impacts associated with the construction phase (particularly traffic, noise and social impacts). Therefore, developments that are already operational or currently under construction are considered unlikely to result in material cumulative impacts with the Project as there would be limited or no overlap of construction activities. It is also noted that the occurrence of these existing developments are considered in the existing environment assessments for the Project. For example, the existing traffic, noise, air quality and demand for accommodation and services associated with these existing developments are all considered in the baseline/background conditions for these particular issues. The incremental impacts of the Project added to these baseline conditions as part of the assessments of these issues throughout **Section 6.0** and have therefore considered the existing impacts of all existing developments in the assessment process.

In some instances, sufficient detail relating to the developments is not currently available to inform a detailed assessment. However, where construction timeframes are not known, predictions have been made about the likelihood of overlapping construction periods, based on the most current and publicly available information at the time of writing this EIS.

Table 6.26 Cumulative Impact Summary

Project	Detail	Detailed Assessment
Perilya Potosi and Flying Doctor Mine	**Overlapping Project Area.** Existing mining operations. Mining at Potosi expected to complete in 2023 when mining at Flying Doctor will commence. Construction and Operation of the Project will overlap with the continuation of mining operations	Noise and Vibration Traffic and Transport Social and Economic
Perilya Broken Hill North Mine	**Approximately 4 km southwest of the Project Area.** Existing mining operations Ongoing operations will overlap with the construction and operations phase of the Project– due to separation distance unlikely to result in cumulative impact.	Noise and Vibration Traffic and Transport

Project	Detail	Detailed Assessment
Junction Mine	**Approximately 6 km southwest of the Project Area.** Existing mining operations Ongoing operations will overlap with the construction and operations phase of the Project – due to separation distance unlikely to result in cumulative impact.	Traffic and Transport
Observatory Broken Hill	**Approximately 2 km southeast of the Project Area.** Operational Development. Construction and operation phase will overlap with operation of observatory. The observatory will not materially contribute to impacts and so the focus of the assessments has been on the potential for the Project to impact on the observatory which is considered in each of the relevant assessments including noise and visual (including lighting) in particular.	Not applicable
Broken Hill Airport	**Approximately 8 km southwest of SCES Facility. The transmission line skirts the Airport boundary to the south.** Operational development. Impacts associated with the construction and operation of the Project, in particular the transmission line, and the potential impacts on airport operations is considered as part of EIS.	Traffic and Transport
Silverton Wind Farm	**Approximately 12 km northwest of the Project Area.** Operational development. Negligible overlapping impacts during construction and operation due to separation distance.	Negligible – no further assessment
Broken Hill Solar Plant	**Approximately 10 km southwest of the Project Area.** Operational development. Negligible overlapping impacts during construction and operation due to separation distance.	Negligible – no further assessment
Broken Hill Battery Energy Storage System	**Approximately 8 km southwest of the Project Area.** Approved development. Construction and commissioning expected to be completed prior to construction of Project. The noise impact assessment considers the potential overlap of the construction of the Batter Energy Storage System and the Project, however it is understood that construction has commenced and will likely to be completed prior to construction of the Project commencing. Should construction overlap the given the transient nature of the transmission line works, cumulative noise impacts are anticipated to be low. Additionally, appropriate noise management and mitigation measures will be implemented to address potential construction noise impacts.	Noise and vibration
Broken Hill Cobalt Blue Project	**Approximately 30 km southwest of the Project Area.** Under Assessment – Prepare EIS. Approval and construction timing unknown however potential for construction timeframes to overlap – potential cumulative impact related to traffic and transport and services. Negligible overlapping impacts during operations due to separation distance.	Traffic and Transport Social and Economic Noise and vibration

Project	Detail	Detailed Assessment
Blue Bush Project	**Approximately 50 km south of the Project Area.** Under Assessment – Prepare EIS. Approval and construction timing unknown however potential for construction timeframes to overlap – potential cumulative impact related to traffic and transport and services. Negligible overlapping impacts during operations due to separation distance.	Traffic and Transport Social and Economic Noise and vibration
Hawsons Iron Ore Project	**Approximately 70 km southwest of the Project Area.** Under Assessment – Prepare EIS. Approval and construction timing unknown however potential for construction timeframes to overlap – potential cumulative impact related to traffic and transport and services. Negligible overlapping impacts during operations due to separation distance.	Traffic and Transport Social and Economic Noise and vibration

6.15.3 Assessment of Cumulative Impacts

Detailed cumulative assessment has been undertaken where the requirement has been identified through the cumulative scoping assessment (refer to **Appendix 22**) relevant to the Project. As summarised in **Table 6.26**, this assessment has focused on particular identified projects and relevant potential cumulative impacts, this includes the potential cumulative traffic and transport, noise and social impacts.
These cumulative impacts are discussed in the sections below.

6.15.3.1 Traffic and Transport

As discussed in **Section 6.7.3**, the construction phase of the Project has the potential to result in cumulative impacts associated with traffic and transport. Interactions with the existing Perilya mining operations represent a key potential cumulative impact consideration for the Project. It is noted that the Perilya operations are existing and so traffic movements associated with these operations have already been considered in the transport assessment as part of existing traffic.

Other current mining operations including the operational Perilya North Mine and Junction Mine, as well as current operations at the Silverton Wind Farm, Broken Hill Solar Plant, Broken Hill Airport (particularly for transmission line construction), Broken Hill Observatory and Broken Hill Battery Energy Storage System have been included in the transport assessment as part of existing traffic conditions, as per the Perilya mining operations. These operations are not anticipated to change traffic movements to any significant extent.

Potential cumulative impacts may result from proposed (under assessment) projects such as the Broken Hill Cobalt Blue Project, the Blue Bush Project and Hawsons Iron Ore Project dependent on their timing. Assuming the worst-case scenario that all three projects are in the construction phase at the same time and that all trips travel along the same routes, the cumulative daily traffic movements could increase by approximately 970 light vehicle trips and 170 heavy vehicle trips in addition to the Project's traffic generation. This would significantly increase traffic throughput along the Broken Hill urban area road network. However, because of the significant spare capacity available in the road network, it is anticipated that only up to approximately 50% of road network capacity would be utilised in the worst case and that therefore whilst traffic volumes would materially increase if this overlap occurred and this would impact on the community, the total traffic volumes would remain well with the design capacity of the road network.

A-CAES NSW has committed to the development and implementation of a Construction Traffic Management Plan (CTMP) to appropriately manage and mitigate traffic related impacts. The development of the TMP will include consideration of potential cumulative traffic impacts and required management and mitigation measures including options to reduce traffic (e.g. provision of bus transport for construction workers) and to minimise overlap in scheduling of construction activities (refer to **Section 6.7.4**).

6.15.3.2 Noise

There are several other proposed projects that may occur concurrently with the Project and therefore the potential for cumulative noise impacts requires consideration. With the exception of the Broken Hill Battery Energy Storage System project, Broken Hill Cobalt Blue project, Blue Bush project and Hawsons Iron Ore project all other projects considered in the cumulative noise assessment are currently operational and are therefore included in the background noise environment and are considered in the Project noise assessment provided in **Section 6.5**. These four projects are located a significant distance (i.e. at least 8 km away) from the SCES Facility and therefore no cumulative impacts associated with the construction of the SCES Facility and these projects are predicted.

In regard to the Project's transmission line works, the only project with the potential to contribute to cumulative noise impacts is the Broken Hill BESS, as all other projects with potential construction phases are located at least 20 km from the Project Area. The NVIA therefore considered the potential for cumulative construction noise at those sensitive receivers located near both project areas. It is understood that the construction of the Broken Hill BESS commenced in 2022 and it is anticipated that the bulk of works will be complete by the time the transmission line works commence (i.e. Q3 2024). Given the transient nature of the transmission line works, cumulative construction noise impacts are anticipated to be low, however, should the construction phases overlap the need for specific management measures will be addressed in the construction noise management plan.

Potential cumulative construction traffic noise impacts may result from the Project and the proposed Broken Hill Cobalt Blue project, Blue Bush project and Hawsons Iron Ore projects dependent on their timing. In the extremely unlikely scenario that all of the projects are constructed concurrently and that all trips travel along the same routes, the cumulative daily traffic movements may require consideration of traffic noise impacts. This issue will also be addressed in the construction noise management plan should the construction phases of the projects overlap.

6.15.3.3 Social / Economic

The SIA considers the potential cumulative social impacts associated with the Project, particularly as the broader region heavily relies on the services of Broken Hill. The concurrent construction of the other projects identified in the region may further intensify both negative and positive social impacts experienced by local communities across the region and/or could result in cumulative changes to the community when considered in conjunction with the Project.

As discussed in **Section 6.10**, given the low unemployment rate of residents in the LGA with related skills (2%) and the number of residents within the construction industry (441 people), it is unlikely that a significant proportion of the workforce will be able to be sourced locally. Additionally, there will be specialist jobs that will be unable to be sourced from within the local population. Therefore, for the purposes of the SIA, it has been assumed that a maximum of 10% of the construction workforce will be local, with 90% of the workforce drawn from outside the Broken Hill LGA.

Burdge (2004) suggests that any increase or decrease in population greater than 5% may be considered a significant population impact. A 5% population increase would equate to approximately 879 people, whereas a 90% incoming Project workforce would equate to a temporary population increase in peak times of 360 people. Therefore, whilst the Project alone may not result in a significant population change across the LGA, it is likely that cumulative workforces, associated with other projects in the region may result in population change that is greater than 5% should the construction of the projects occur concurrently. However, the SIA notes that existing decrease in population in Broken Hill and the anticipated continued decline in population may soften the impact of incoming Project workforces.

Given the anticipated impacts of the incoming Project workforce on local accommodation provision and the limited capacity of local providers to accommodate this workforce, A-CAES NSW plan to develop a Workers Accommodation Facility. It is anticipated that the Workers Accommodation Facility will be located on privately owned land and will have the capacity to accommodate 90% of the peak construction period workforce. The Workers Accommodation Facility will be subject to a separate assessment and approval process in consultation with Broken Hill City Council.

The impact of an influx of a temporary construction workforce on other local service provision was also noted in the SIA, particularly childcare, schools, hospitals, and police services; with local government representatives identifying the potential for cumulative impacts associated with the Project and project development in the region.

It is proposed that the Workers Accommodation Facility will provide a number of facilities and services to the workforce to manage the impact on local services. An Accommodation, Employment and Procurement Strategy will also be developed prior to construction that will detail the inclusions of the Workers Accommodation Facility and protocols for managing impacts associated with the incoming Project workforce.

6.15.4 Management and Mitigation

Traffic

A-CAES NSW has committed to the development and implementation of a CEMP which will include a detailed CTMP, which will address the management and mitigation of potential cumulative traffic impacts associated with the Project.

Noise

Should the construction phases of the transmission line and the Broken Hill BESS overlap the need for specific management measures will be addressed in the CEMP in the construction noise management plan.

Potential cumulative construction traffic noise impacts will be addressed in the construction noise management plan should the construction phases of relevant projects overlap. This will include potential noise mitigation measures to reduce construction-related traffic noise including:

- Car-pooling and the use of buses/mini-vans to reduce the total number of light vehicle movements.
- Where reasonable and feasible, coordination and/or staging of arrival and departure times for construction-related traffic between the Project, Broken Hill Cobalt Blue project, the Blue Bush project and Hawsons Iron Ore project. Given these non-related projects are located significant and varying distances from Broken Hill, it is possible that arrival and departure times of construction-related traffic will differ between the projects anyway.

Social/Economic

As discussed in **Section 6.10.4**, A-CAES NSW will prepare and implement an Accommodation, Employment and Procurement Strategy, prior to construction of the Project, to directly address and respond to the social impacts and opportunities of the Project as they relate to construction workforce matters and associated cumulative impacts.

7.0 Justification of the Project

This section provides a conclusion to the EIS. It includes discussion of the justification for the Project, taking into consideration the associated environmental and social impacts and the suitability of the site, to assist the consent authority to determine whether or not the Project is in the public interest.

7.1 Environmental, Social and Economic Impacts

The Project fits within the current strategic direction of the NSW and Australian governments approaches to energy generation, being the transition to renewables and ensuring the reliability of the grid. The low emission dispatchable electricity from the Project will assist with improving the stability and reliability of the electrical grid within the Broken Hill Region, whilst replacing the existing diesel-fired turbine electricity back up system and reducing greenhouse gas emissions.

An iterative approach to Project design has been applied to the Project design and throughout the preparation of this EIS. The conceptual layout for the SCES Facility and transmission line corridor has been subject to ongoing refinement with the aim of minimising associated environmental, cultural and social impacts.

The environmental, cultural, social, and economic impacts of the Project have been identified and were subject to a detailed environmental assessment based on:

- assessment of the site characteristics (existing environment)
- focused consultation with relevant government agencies including with Broken Hill City Council
- engagement with the local community and other stakeholders
- environmental and social risk analysis
- application of the principles of ESD, including the precautionary principle, intergenerational equity, conservation of biological diversity and valuation and pricing of resources
- expert technical assessment.

The key issues associated with the Project were subject to comprehensive specialist assessment to identify the potential impacts of the Project on the existing environment and community. These assessments are detailed in **Section 6.0** and the appendices to this EIS.

As outlined in **Section 6.0**, the potential environmental, cultural and social impacts associated with the Project can be appropriately managed through the implementation of appropriate management, mitigation and monitoring measures. A consolidated list of the proposed management and mitigation measures is provided in **Appendix 3**.

The impacts of the Project have been kept to a minimum through:

- obtaining a detailed understanding of the issues and impacts by scientific evaluation and stakeholder engagement
- detailed Project planning considering the environmental, social and cultural constraints of the locality and investigated various Project alternatives which resulted in changes to the Project that reduced impacts
- active engagement with key stakeholders, including proximal landholders and interested stakeholders in Broken Hill, to identify key concerns and issues and to allow these to be considered in the Project design process
- a commitment to proactive and appropriate strategies to avoid, minimise, mitigate, offset or manage a range of potential environmental and social impacts (refer to **Section 6.0** and **Appendix 3**).

The detailed impact assessment undertaken concludes that with the implementation of feasible and reasonable mitigation measures, the Project can proceed within acceptable environmental standards.

7.2 Suitability of the Project Site

A-CAES NSW has proceeded with the Project as a direct response to reliability supply issues in Broken Hill and as the preferred option identified by Transgrid through the RIT-T process. The proposed co-location of the SCES Facility within the Potosi Mine site was selected due to favourable geological conditions, utilisation of existing mining areas, existing mine infrastructure for access and ability to suitably manage environmental and social impacts. The Project will also provide a diversified post-mining land use for the Potosi Mine site.

In summary, suitability of the Project Area is based on:

- compatible geological conditions
- suitable depth of existing underground mining areas at Potosi Mine with existing access
- the ability to co-locate the Project without impacting the Potosi Mining Operation and provide an opportunity for a diversified post-mining land use
- access to major transport networks
- compatible land use zoning within the Project Area and surrounding landholdings
- ability to reduce impact to adjoining land use through project alignment and design
- land use and ownership lends itself to the implementation of required land lease and easement agreements
- availability land of a suitable scale for a viable commercial-scale energy storage project with low density residential receivers
- residual environmental impacts can be managed with appropriate mitigation and management.

The location of the Project including the scale, design, technology and layout have been developed through consideration of a number of alternatives (as outlined in **Section 2.8**) to maximise the benefit to the locality and region in the long term, whilst minimising impacts to the environment during construction, operation and decommissioning. The Project is considered to be justified and in the public interest because the Project:

- Is suitably located in proximity to Broken Hill to achieve connection to the grid providing a direct solution to existing reliability and storage issues. The Project will also provide support for the development of future renewable energy projects in the Broken Hill region.
- Is suitably located in an area that has been predominately disturbed by previous land use and can co-exist with the existing mining operations, diversifying the use of the existing mining land and providing a long-term post mining land use.
- Is situated adjacent to compatible land uses with sufficient separation distances to dwellings to appropriately manage potential impacts to amenity associated with the construction and operation of the Project.
- Is accessible to a major highway with sufficient operating capacity.
- Would create short term and long-term employment opportunities and economic benefits to the local and regional economy.

7.3 Ecologically Sustainable Development

An object of the EP&A Act is to encourage Ecological Sustainable Development (ESD) within NSW. This Section provides an assessment of the Project in relation to the principles of ESD.

To justify the Project with regard to the principles of ESD, the benefits of the Project in an environmental and socio-economic context should outweigh any negative impacts. The principles of ESD encompass the following:

- the precautionary principle
- intergenerational equity
- conservation of biological diversity
- valuation, pricing, and incentive mechanisms.

Essentially, ESD requires that current and future generations should live in an environment that is of the same or improved quality than the one that is inherited.

7.3.1 The Precautionary Principle

The EP&A Regulation defines the precautionary principle as:

> *'if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*
>
> *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
>
> *(ii) an assessment of the risk-weighted consequences of various options.'*

In order to achieve a level of scientific certainty in relation to potential impacts associated with the Project, the EIS includes an extensive evaluation of all the key components of the Project. Detailed assessment of all key issues and necessary management procedures has been conducted and is comprehensively documented in this EIS.

The assessment process has involved a detailed analysis of the existing environment (refer to **Section 2.0** and **Section 6.0**), desktop analysis, site specific survey and where applicable the use of scientific modelling to assess and determine potential impacts as a result of the Project (such as for noise, visual and flooding).

The decision-making process for the design, impact assessment and development of management processes associated with the Project has been transparent in the following respects:

- Government authorities, landholders potentially affected by the Project, the local community, the Aboriginal community, and other stakeholders were consulted during preparation of this EIS (refer to **Section 5.0**). This enabled comment and discussion regarding potential environmental and social impacts, informed Project refinement and design (where possible) and informed the development of the proposed environmental and social management procedures.

- The community has been engaged throughout the development and assessment of the Project through a range of mechanisms including one-on-one meetings, a community information session, and a community information sheet, amongst other mechanisms (refer to **Section 5.0**) which provided stakeholders with both Project information and results and the opportunity to provide feedback to inform Project outcomes.

- A-CAES NSW has committed to the development and implementation of CEMP and OEMP, which will implement appropriate best practice management and will incorporate all identified mitigation and management measures identified in this EIS. The Project would also be subject to an independent auditing and verification process consistent with relevant requirements for SSD projects. The CEMP and OEMP will incorporate all proposed management and mitigation committed to in this EIS (refer to **Appendix 3**).

7.3.2 Intergenerational Equity

The EP&A Regulation defines the principle of intergenerational equity as:

> *...that the present generation should ensure that the health, diversity, and productivity of the environment are maintained or enhanced for the benefit of future generations.*

Intergenerational equity refers to equality between generations. It requires that the needs and requirements of today's generations do not compromise the needs and requirements of future generations in terms of health, biodiversity and productivity.

As discussed in **Section 2.0**, the Project fits within the current strategic direction of the NSW and Australian governments approaches to energy generation, being the transition to renewables and the reliability of the grid to build a reliable, affordable and sustainable electricity future for NSW. The low emission dispatchable electricity from the Project will assist with improving the stability and reliability of the electrical grid within the Broken Hill Region, whilst replacing the existing diesel-fired turbine electricity back up system and reducing greenhouse gas emissions.

The Project also provides a post-mining land use for the Potosi Mine site providing a beneficial outcome for future generations in the Broken Hill area by providing a productive use for this land that benefits the local community through improving energy security.

Any residual environmental impacts will be addressed through the implementation of the proposed CEMP and OEMP, to apply appropriate best practice management incorporating all identified mitigation and management measures identified in this EIS.

7.3.3 Conservation of Biological Diversity

The EP&A Regulation identifies that the principle of conservation of biological diversity and ecological integrity should be a fundamental consideration in the decision-making process. The conservation of biological diversity refers to the maintenance of species richness, ecosystem diversity and health and the links and processes between them. All environmental components, ecosystems and habitat values potentially affected by the Project have been assessed in the BDAR (refer to **Appendix 6**). Potential biodiversity related impacts are outlined in this EIS (refer to **Section 6.2**) and measures to address any potential negative impact are outlined in the BDAR (refer to **Appendix 6**) and summarised in **Appendix 3**.

Project location and design refinement has maximised the use of existing disturbed areas and avoids and minimises impact to identified biodiversity as far as practicable. Following the application of avoidance and mitigation measures, the biodiversity assessment has identified the biodiversity credit requirement to offset the residual impacts of the Project and the required management and mitigation measures to be implemented. The principle of Conservation of Biological Diversity is considered to be satisfied through minimising impacts through the Project design process and appropriate implementation of the NSW Biodiversity Assessment Method process.

7.3.4 Valuation Principle

The goal of improved valuation of natural capital has been included in Agenda 21 of Australia's Intergovernmental Agreement on the Environment.

The principle has been defined in the EP&A Regulation as follows:

> *That environmental factors should be included in the valuation of assets and services, such as:*
>
> *i. polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance, or abatement;*
>
> *ii. the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste; and*
>
> *iii. environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

The Project is considered to address the principal of valuation of natural capital through a number of mechanisms as outlined below.

Project siting and design refinement has maximised the use of existing disturbed areas reducing the level of new disturbance required to construct the proposed infrastructure, minimising impacts on higher value natural resource areas. Predominately low height vegetation across the transmission line corridor means that much of the vegetation in the easement can be retained, reducing the level of vegetation disturbance and management required within the associated easement.

The construction and operation of the Project will be subject to an Environment Protection Licence which will include conditions that relate to pollution prevention and monitoring. A-CAES NSW will pay an annual fee to hold this licence.

Erosion and sediment control measures outlined in **Section 6.8** will be incorporated into the CEMP and OEMP, developed in accordance with relevant legislation and guidelines and implemented for all stages of the Project to control and manage potential impacts to surface water which is a valuable natural resource. Water supply for the Project will be via a commercial agreement with the local water authority recognising the value of this resource.

The Project will replace the existing diesel-fired turbine electricity back up system reducing greenhouse gas emissions and encouraging renewable energy development through provision of capacity to the grid.

Reasonable and feasible noise mitigation measures will be implemented to minimise the potential construction noise impacts on the communities surrounding the Project Area. No exceedance of relevant noise and air quality criteria for the operation phase of the Project is predicted at any residential dwelling (where an agreement is not in place with the landowner). The CEMP and OEMP will also include relevant noise management, mitigation and monitoring measures.

Appropriate and best-practice waste management will be implemented as part of the Project.

Project design and assessment considerations have included the costs of the proposed management measures to minimise the potential environmental and social impacts. This also includes the additional costs associated with the potential establishment and management of ecological offsets to address the ecological impacts associated with vegetation removal.

7.4 Conclusion

As outlined in **Section 7.3**, the Project has been assessed against the principles of ESD as required by the EP&A Act and EP&A Regulation. This assessment has indicated that while the Project, like any large-scale development, has associated environmental and social impacts, these impacts can be effectively managed, mitigated and offset and the development will result in social and economic benefit to Broken Hill.
The assessment therefore concludes that the Project is consistent with the principles of ESD. The Project will provide long-term, strategic benefits to Broken Hill and the State of NSW, including:

- Using innovative technology to provide a long-duration grid-scale energy storage solution that aligns with the State of NSW's transition to a renewable energy-based system reducing greenhouse gas emissions and the impacts of climate change.
- Contributing to maintaining reliability and security of the electricity network assisting with meeting current load demand.
- Supporting provision of the firming required to meet the rising contribution of renewables in the transitioning energy mix.
- Providing enhanced energy security for Broken Hill whilst providing low emission energy replacement for the existing diesel-fired turbines which are approaching the end of their operational life.

The Project will also provide direct financial benefits to the regional and local community, including:

- Infrastructure investment of approximately $638 million.
- Increasing the real economic output of Broken Hill by a cumulative total of $3.5 billion (with a net present value of $728 million, using a 7% real discount rate) and NSW as a whole by a cumulative total of $1.7 billion (with a net present value of $601 million, using a 7% real discount rate).
- Increasing the real income of Broken Hill by a cumulative total of $642 million (with a net present value of $192 million, using a 7% real discount rate) and NSW as a whole by a cumulative total of $1.0 billion (with a net present value of $662 million, using a 7% real discount rate).
- Generation of 780 FTE construction phase job years (over three years) with an average of 260 FTE workers per year and peak of 400 FTE workers.
- Generation of approximately 36 enduring jobs (26 direct and 10 indirect) during the operation and maintenance phase.
- Providing ongoing financial assistance through the Community Benefit Agreement to ensure direct benefit from the Project to the local community, including local schools, training or education as well as grants or support for local community, environmental and/or sporting groups.

Through the implementation of appropriate best practice management, the potential environmental and social impacts associated with the Project can be appropriately avoided or managed. The Project has generally received strong support from the stakeholders that participated in the engagement process, with the proposed management and mitigation measures addressing the identified community concerns and social impacts. Given the identified need for the Project, the net benefit and commitment from A-CAES NSW to appropriately manage the potential environmental impacts associated with the Project, it is considered the Project would result in a net benefit to Broken Hill, the Far West Region and the broader NSW community.

8.0 References

AEMO. (2019). *Draft 2020 Integrated Systems Plan.* Retrieved October 24, 2022

AEMO. (2020). *2020 Integrated System Plan.* Retrieved October 24, 2022, from https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en

Austalian Government Department of Industry and Science. (2015). *Energy White Paper 2015.* Retrieved October 21, 2022, from https://apo.org.au/sites/default/files/resource-files/2015-04/apo-nid54017.pdf

Australian Bureau of Statistics (ABS). (2021). Broken Hill: 2021 Cencus All personal QuickStats. Retrieved April 04, 2023, from https://abs.gov.au/census/find-census-data/quickstats/2021/LGA11250

Australian Government Clean Energy Regulator. (2018). Retrieved October 21, 2022, from Renewable Energy Taget: https://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/How-the-scheme-works

Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2021). Retrieved October 21, 2022, from International climate change commitments: https://www.dcceew.gov.au/climate-change/international-commitments

Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2022a). *Australian Energy Update 2022.* Retrieved October 24, 2022, from https://www.energy.gov.au/sites/default/files/Australian%20Energy%20Statistics%202022%20Energy%20Update%20Report.pdf

Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2022b). Australia's emissions projection 2022. Retrieved April 04, 2023, from https://www.dcceew.gov.au/sites/default/files/documents/australias-emissions-projections-2022.pdf

Australian Government Department of Environment (DoE). (2013). *Matters of National Environmental Significance - Significant Impact Guidelines 1.1.*

Australian Government Department of Environment and Energy (DoEE). (2019). Retrieved October 21, 2022, from A fair deal on energy.: https://www.energy.gov.au/publications/fair-deal-energy

Australian Labor Party (ALP). (2021). *Powering Australia.* Retrieved October 24, 2022, from https://keystone-alp.s3-ap-southeast-2.amazonaws.com/prod/61a9693a3f3c53001f975017-PoweringAustralia.pdf

Bergstrom, P. (2008). *Potosi North and Potosi Extended Geotechnical Review.*

Blainey, G. (1968). The Rise of Broken Hill.

Broken Hill City Council (BHCC). (2020). *Broken Hill Local Strategic Planning Statement 2020-2040.* Retrieved October 24, 2022, from https://www.brokenhill.nsw.gov.au/Council/Other-strategies-documents/Broken-Hill-Local-Strategic-Planning-Statement-2020-2040

Bureau of Meteorology (BoM). (2022). Groundwater Dependent Ecosystems Atlas. Retrieved April 04, 2023, from http://www.bom.gov.au/water/groundwater/gde/

Bureau of Meteorology (BoM). (2023). Retrieved October 25, 2022, from Climate statistics for Australian locations: http://www.bom.gov.au/climate/averages/tables/cw_047048.shtml

Clean Energy Council. (2022). *Clean Energy Australia Report 2022.* Retrieved October 24, 2022, from https://assets.cleanenergycouncil.org.au/documents/resources/reports/clean-energy-australia/clean-energy-australia-report-2022.pdf

Coffey Geotechnics Pty Ltd (Coffey). (2010). *Silver Peak Shaft Hydrogeological Assessment.*

Davies, P. (2021). *National Heritage Values Study for Broken Hill.*

Energy Networks Australia. (2019). Retrieved October 24, 2022, from The Demise of Coal: https://www.energynetworks.com.au/news/energy-insider/the-demise-of-coal/

enHealth. (2012). Guidelines for assessing human health risks from environmental hazards. Retrieved April 04, 2023, from https://www.health.gov.au/resources/publications/enhealth-guidance-guidelines-for-assessing-human-health-risks-from-environmental-hazards?language=en

GHD. (2006). *Report for Potosi Open Cut: Drainage Analysis.*

Godden Mackay Logan. (2007). Perilya North and South Leases, Broken Hill – Draft Conservation Management Plan – Draft for Consultation.

HO & DUAP. (1996). Regional Histories: Regional Histories of New South Wales. Heritage Office and Department of Urban Affairs and Planning.

ICOMOS, A. (2013). The Burra Charter: The Australian ICOMOS charter for places of cultural significance.

International Comission on Non-Ionizing Radiation Protection (ICNIRP). (1998). Guidelines for limiting exposuire to Time-varying Electric, Magnetic and Electromagnetic Fields. Retrieved April 30, 2023, from http://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf

Landcom. (2004). Managing Urban Stormwater: Soils and construction - Volume 1. Retrieved April 04, 2023, from https://www.environment.nsw.gov.au/research-and-publications/publications-search/managing-urban-stormwater-soils-and-construction-volume-1-4th-editon

Logan, G. M. (2007). *Perilya North and South Leases - Broken Hill - Draft Conservation Management Plan.*

NSW Environemnt Protection Authority (EPA). (2022). Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wale. Retrieved April 04, 2023, from https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/air/22p3963-approved-methods-for-modelling-and-assessment-of-air-pollutants.pdf?la=en&hash=79991C3AD2F7A1FAEC34EBAA857E7D0CCDDD1B24

NSW Environment Protection Authority (EPA). (2014a). Waste Classification Guidelines Part 1: Classifying Waste. Retrieved April 04, 2023, from https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/wasteregulation/140796-classify-waste.pdf

NSW Environment Protection Authority (EPA). (2014b). NSW Waste Avoidance and Resource Recovery Strategy 2014–21. Retrieved April 04, 2023, from https://www.epa.nsw.gov.au/~/media/EPA/Corporate%20Site/resources/wastestrategy/140876-WARR-strategy-14-21.ashx

NSW Government. (2011). *NSW 2021: A Plan to Make NSW Number One.* Retrieved October 24, 2022, from https://www.ipc.nsw.gov.au/sites/default/files/file_manager/NSW2021_WEBVERSION.pdf

NSW Government. (2013). *NSW Renewable Energy Action Plan 2013.*

NSW Government. (2017). *Far West Regional Plan 2036.* Retrieved October 25, 2022, from https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/Plans-for-your-area/Regional-plans/Far-West-Regional-Plan-2036.pdf?la=en

NSW Government. (2018). *NSW Renewable Energy Completion Report.*

NSW Government. (2019). *NSW Electricity Strategy.* Retrieved October 24, 2022, from https://www.energy.nsw.gov.au/sites/default/files/2022-08/2019_11_NSW_ElectricityStrategyDetailed.pdf

NSW Government. (2020). Retrieved 10 21, 2022, from NSW Electricity Strategy: https://www.energy.nsw.gov.au/nsw-plans-and-progress/government-strategies-and-frameworks/nsw-electricity-strategy

NSW Government. (2020). Retrieved October 24, 2022, from Electricity Infrastructure Investment Act 2020: https://legislation.nsw.gov.au/view/pdf/asmade/act-2020-44

NSW Government Department of Environment and Climate Change (DECC). (2008). Managing Urban Stormwater: Soils and construction - Volume 2E. Retrieved April 04, 2023, from https://www.environment.nsw.gov.au/research-and-publications/publications-search/managing-urban-stormwater-soils-and-construction-volume-2e-mines-and-quarries

NSW Government Department of Environment and Conservation (DEC). (2006). Assessing Vibration: a technical guideline. Retrieved April 04, 2023, from https://www.environment.nsw.gov.au/resources/noise/vibrationguide0643.pdf

NSW Government Department of Environment, Climate Change and Water (DECCW). (2010). Aboriginal Cultural Heritage Consultation Requirements for Proponents.

NSW Government Department of Environment, Climate Change and Water (DECCW). (2010). Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW. Retrieved April 04, 2023, from https://www.environment.nsw.gov.au/research-and-publications/publications-search/code-of-practice-for-archaeological-investigation-of-aboriginal-objects-in-nsw

NSW Government Department of Planning (DoP). (2011). Applying SEPP 33 : hazardous and offensive development application guidelines. Retrieved April 04, 2023, from https://catalogue.nla.gov.au/catalog/2038673

NSW Government Department of Planning and Environment (DPE). (2021). State significant development guidelines – preparing an environmental impact statement. Retrieved April 04, 2023, from https://www.planning.nsw.gov.au/sites/default/files/2023-03/ssd-guidelines-preparing-an-environmental-impact-statement.pdf

NSW Government Department of Planning and Environment (DPE). (2022a). Undertaking Engagement Guidelines for State Significant Projects. Retrieved April 30, 2023, from https://www.planning.nsw.gov.au/sites/default/files/2023-03/undertaking-engagement-guidelines-for-ssp.pdf

NSW Government Department of Planning and Environment (DPE). (2022b). State Significant Development Guidelines - preparing a scoping report. Retrieved April 30, 2023, from https://www.planning.nsw.gov.au/sites/default/files/2023-03/ssd-guidelines-preparing-a-scoping-report.pdf

NSW Government Department of Planning and Environment (DPE). (2023). Social Impact Assessment Guideline for State Significant Projects. Retrieved April 30, 2023, from https://www.planningportal.nsw.gov.au/sites/default/files/documents/2023/GD1944%20SIA%20Guideline_NEW%20VI_14_02_23.pdf

NSW Government Department of Planning, Industry and Environment (DPIE). (2019). Guidance to assist a decision-maker to determine a serious and irreversible impact. Retrieved April 04, 2023, from https://www.environment.nsw.gov.au/research-and-publications/publications-search/guidance-to-assist-a-decision-maker-to-determine-a-serious-and-irreversible-impact-2019

NSW Government Department of Planning, Industry and Environment (DPIE). (2020). *Net Zero Plan Stage 1: 2020-2030.* Retrieved October 24, 2022, from https://www.energy.nsw.gov.au/sites/default/files/2022-08/net-zero-plan-2020-2030-200057.pdf

NSW Government Department of Planning, Industry and Environment (DPIE). (2021). *Cumulative Impact Assessment Guidelines for State Significant Projects.* Retrieved October 25, 2022, from https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/Policy-and-legislation/SSPT-Guidelines/GD1259-RAF-Assessing-Cumulative-Impacts-Guide-final.pdf

NSW Government Department of Primary Industries (DPI). (2003). Why do fish need to cross the road? fish passage requirements for waterway crossings. Retrieved April 04, 2023, from https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/202693/Why-do-fish-need-to-cross-the-road_booklet.pdf

NSW Government Department of Primary Industries (DPI). (2013). Policy and guidelines for fish habitat conservation and management. Retrieved April 04, 2023, from https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/634694/Policy-and-guidelines-for-fish-habitat.pdf

NSW Government Office of Environment and Heritage (OEH). (2011). Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW. Retrieved April 04, 2023, from https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Aboriginal-cultural-heritage/guide-to-investigating-assessing-reporting-aboriginal-cultural-heritage-nsw-110263.pdf

NSW National Parks and Wildlife Service (NPWS). (2003). The Bioregions of NSW, thier biodiversity, conservation and history. National Parks and Wildlife Service.

Perilya Broken Hill Ltd (Perilya). (2018). Mining Operations Plan for the Potosi Operations (2018-2020).

Perilya Broken Hill Ltd (Perilya). (2022). Geology Notes – Potosi Mine. Provided by Perilya October 2022. .

R.W. Corkery & Co. Pty. Limited (RWC). (2019). *Potosi Operations (2020-2026) Mining Operations Plan.*

Stockhead. (2023). Power Up: What's up for energy in 2023? Retrieved April 30, 2023, from https://stockhead.com.au/energy/power-up-whats-up-for-energy-in-2023/

Transgrid. (2022). Maintaining reliable supply to Broken Hill: RIT-T - Project Assessment Conclusions Report. Retrieved April 30, 2023, from https://www.transgrid.com.au/media/y23izxmo/transgrid-pacr_broken-hill-supply.pdf

Umwelt. (2022). *Silver City Energy Storage Project Scoping Report.*

World Resources Institute (WRI). (2004). The Greenhouse Gas Protocol. Retrieved April 04, 2023, from http://pdf.wri.org/ghg_protocol_2004.pdf



umwelt
Environmental & Social
Consultants

Umwelt (Australia) Pty Limited
T| 1300 793 267 E| info@umwelt.com.au www.umwelt.com.au