

Appendix F

Traffic and Access Impact Assessment

Broken Hill Battery Energy Storage System Project

Traffic and access impact assessment

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Traffic and access impact assessment

Client: AGL Energy Limited

74 115 061 375

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia

T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com

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Table of contents

Executive summary		i
1.0	Introduction	1
	1.1	1
	1.2	2
	1.2.1	2
	1.2.2	2
	1.3	3
2.0	Project description	4
	2.1	4
	2.1.1	4
	2.1.2	5
	2.1.3	5
	2.1.4	6
	2.1.5	8
	2.2	9
	2.2.1	9
	2.2.2	9
3.0	Legislative and policy context	10
	3.1	10
	3.2	10
4.0	Methodology	11
	4.1	11
	4.2	11
	4.2.1	11
	4.2.2	11
5.0	Existing environment	12
	5.1	12
	5.2	15
	5.2.1	15
	5.2.2	15
	5.2.3	16
	5.2.4	18
	5.3	19
	5.3.1	19
	5.3.2	20
	5.4	22
6.0	Impact assessment	23
	6.1	23
	6.1.1	23
	6.1.2	24
	6.1.3	24
	6.1.4	24
	6.1.5	24
	6.2	25
7.0	Mitigation and management measures	26
	7.1	26
	7.2	26
8.0	References	27

List of Tables

Table 1	Secretary's Environmental Assessment Requirements	2
Table 2	Historical AADT growth trends near the Site	17
Table 3	Background traffic - growth rates	17
Table 4	Estimate of current traffic flows on the Barrier Highway near the Site	18
Table 5	Rail services at Broken Hill Station	19
Table 6	Frequencies of bus services in Broken Hill	21
Table 7	2022 peak construction traffic flows on the Barrier Highway west of Broken Hill	23
Table 8	Mitigation and management measures	26

List of Figures

Figure 1	Construction site accesses	7
Figure 2	Construction routes	8
Figure 3	Key roads and land uses in the Project Area	14
Figure 4	Crashes near the Site	16
Figure 5	TfNSW Permanent Traffic Counter location	17
Figure 6	Existing rail and coach services	20
Figure 7	Existing bus services	21
Figure 8	Active transport network	22

Executive summary

AGL Energy Limited (AGL) is seeking development consent to construct, operate and maintain a Battery Energy Storage System (BESS) facility located at Broken Hill, NSW with a capacity of approximately 50 megawatts (MW) and up to 100 megawatt-hour (MWh). AECOM Australia Pty Ltd (AECOM) has been engaged to prepare the Environmental Impact Statement (EIS).

The Project comprises the construction and operation of a BESS as well as the connection of the BESS to the nearby TransGrid substation via a 22 kV overhead powerline connecting through a 22 kV busbar at the substation. These elements constitute the 'Project Area'. The proposed location of the BESS is referred to as the 'Site'.

The scope of this report is to review the external traffic movements associated with the Project, with a focus on the construction traffic impacts (noting that the traffic generated by the Project once operational are very low).

This traffic and access impact assessment report is one of a number of technical documents that forms part of the EIS for the Project. This assessment addresses the relevant Secretary's Environmental Assessment Requirements (SEARs), aiming to identify any likely impacts of the Project and to outline mitigation measures, if required, relating to traffic and access during detailed design, construction and operation of the Project.

Existing environment

The Project is located in Broken Hill, NSW, southwest of the Broken Hill town centre, approximately 510 km northeast of Adelaide, South Australia.

The Site comprises two allotments with approximately 100 metres (m) frontage to Pinnacles Place. It is neighboured by industrial developments.

The key road network surrounding the Project includes Pinnacles Place, Pinnacles Road, Kunandah Road, Creedon Street, Silver City Highway and Barrier Highway. These comprise a mix of local and state roads.

Construction activity

The Project is likely to create negligible traffic impacts on the surrounding road network with the peak volume of construction vehicles expected to be up to 20 heavy vehicles and 50 light vehicles per day for delivery of materials, including loading of spoil and waste and concreting activities. Even when considering the worst-case scenario (i.e. all the vehicles arriving in a single peak hour), the traffic volumes are still considered low (less than 100 vehicles per day) especially as the existing traffic demand on key roads surrounding the Site is low. The additional traffic volumes would result in minimal impacts on existing road network adjoining the Site.

There is generally limited public transport services near the Site. The Site is located in an industrial area which is not in close proximity to public transport routes. The closest rail station is Broken Hill Station, located 5 kilometres west of the site and links Dubbo Town Centre to the surrounding regional towns. Regional coach also operate to the town centre in addition to local bus services. The Site sits adjacent the local town, and is more than 1.5km away from the closest local bus network connection. As such the Project, including haulage routes and access locations during construction, is unlikely to affect bus services in the vicinity of the Site. Bus services within the town centre would continue to operate as normal during construction activities. There would be no changes to bus stop locations as a result of the Project. In addition, the Project is not anticipated to require the haulage of construction materials by rail and would therefore not impact the rail network.

There is limited pedestrian and cycle infrastructure immediately surrounding the Site. As such, it is not anticipated for the Project to impact the active transport network near the Site. However, despite no formal active transport infrastructure, a minor level of free pedestrian and cyclist activity is still to be anticipated near the Site. As such, works would be undertaken within the Project Area during construction and in a manner that ensures pedestrians/cyclists routes are maintained where available. Minor construction impacts are anticipated to arise from increased heavy vehicle volumes, with a potentially increased safety risks for pedestrians and cyclists near the Site.

Operational activity

The Project is likely to result in a negligible impact on the surrounding road network as there are expected to be three employees on-site once the Project is operational. The Project is also not expected to result in any changes to the active transport, public transport networks or on private property access.

Environmental management

In the event transport impacts from construction activities were identified, these would be mitigated through a range of management measures including the development of a Construction Traffic Management Plan, which would form part of an overarching Construction Environmental Management Plan for the Project.

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by AGL Energy Limited (AGL) to prepare an Environmental Impact Statement (EIS) to assist with obtaining development consent to construct, operate and maintain a battery energy storage system (BESS) facility with a capacity of approximately 50 megawatts (MW) and up to 100 megawatt-hour (MWh) at Broken Hill (hereafter referred to as 'the Project'), NSW.

1.1 Project context and overview

The Project comprises a BESS with a capacity of approximately 50 MW and up to 100 MWh. Key features of the Project include:

- Construction and operation of a BESS; and
- Connection of the BESS facility to the nearby TransGrid substation via a 22 kV overhead powerline connecting through a 22 kV busbar at the substation.

The proposed location of the battery facility (the Site) is on two lots at 74 to 80 Pinnacles Place, Broken Hill NSW 2880 (Lots 57 and 58 of DP 258288). The Site is located approximately 120 m east of the TransGrid Broken Hill substation located at 76 Pinnacles Road, Broken Hill NSW 2880 (Lot 2 of DP 1102040). The Project would also involve the installation of an overhead transmission connection between the Site and the TransGrid Broken Hill substation, which would traverse Lot 7302 DP1181129, being land classified as Commons. The Site and the transmission line easement constitute the 'Project Area'.

The Project would be generally comprised of the following components:

- Lithium-ion (Li-ion) batteries inside battery enclosures
- Inverters
- Medium voltage transformers up to 22 kV
- Cabling and collector units
- Connection to an existing 22 kV electrical switchyard including minor works to connect the BESS to the TransGrid Broken Hill substation
- Temporary site office and then a permanent control and office building
- Asset Protection Zone (APZ)
- Site access, internal roads and car parking
- Drainage and stormwater management
- Other ancillary infrastructure including security fencing, lighting and CCTV.

It is currently anticipated that construction of the Project would take up to 12 months, starting in 2021 and being completed in 2022.

Construction works would be likely to comprise:

- Enabling works:
 - Site clearance activities
 - Installation of erosion and sediment controls and site fencing
 - Provision of construction power
 - Minor earthworks to form a level BESS pad, switchyard area and construction laydown areas, including potential import or export of fill as required
 - Development of site access

- Civil, structural, mechanical and electrical works
 - Connections to surrounding utilities, as required
 - Structural works to support BESS facilities
 - Construction of supporting structures, e.g. office building, workshop, and transmission line landing gantry
 - Delivery, installation and electrical fit-out of BESS
 - Construction of transmission connection between the Site and the TransGrid Broken Hill substation including installation of supporting structures, stringing the transmission line, and works at the transmission line landing gantry on site-and the 22 kV busbar at the substation
 - Transportation of plant, equipment, materials and workforce to and from the Site, as required
- Commissioning
 - Testing and commissioning activities
- Demobilisation
 - Provision of landscaping, as required
 - Removal of construction equipment and rehabilitation of construction areas.

A construction laydown area would also be provided on the Site. Minor earthworks would be required across this Site, including levelling the Site to ensure a suitable development footprint and establishment of site access. Excavations within the Site would be to a maximum depth of 3 m.

1.2 Purpose of this report

1.2.1 Assessment objectives

The overarching objectives of this report are as follows:

- to form part of the EIS for the Project
- to identify if there are any potential transport impacts of the Project during construction and operation stages of the Project
- to outline mitigation measures, if required, relating to transport during the construction and operation stages of the Project
- to address the relevant SEARs as outlined in **Section 1.2.2**.

1.2.2 Secretary's environmental assessment requirements

The SEARs issued by the Department of Planning, Industry and Environment (DPIE) relating to transport and where these requirements are addressed in this report, are outlined in **Table 1**.

Table 1 Secretary's Environmental Assessment Requirements

SEARs requirement	Where addressed in this document
an assessment of the peak and average traffic generation, including over-dimensional vehicles, construction worker transportation and transport of materials by rail;	Construction traffic is discussed in Section 2.1 . An assessment of construction traffic impacts is presented in Section 6.1 with operational impacts discussed in Section 6.2 .

SEARs requirement	Where addressed in this document
an assessment of the likely transport impacts to the site access route (including Pinnacles Road, Pinnacles Place and any temporary access proposed from the adjacent Crown Land), site access point, particularly in relation to the capacity and condition of the roads;	The assessment of the construction impacts is presented in Section 6.1 . Operational impacts are discussed in Section 6.2 . Condition of the haulage routes is discussed in Section 2.1.5 .
a cumulative impact assessment of traffic from nearby developments;	Addressed in Chapter 17 Other matters of the EIS
a description of any proposed road upgrades (including temporary roads) developed in consultation with the relevant road and rail authorities (if required); and	Construction vehicle access arrangements are presented in Section 2.1.2 .
a description of the measures that would be implemented to mitigate any transport impacts during construction.	Environmental mitigation measures are discussed in Section 7.0 .

In addition to the SEARs, Transport for NSW (TfNSW) issued specific requirements for the Project in relation to traffic and access (refer to Appendix A of the Environmental Impact assessment).

1.3 Structure of this report

This report is structured as follows:

- **Section 1.0** provides an introduction to the Project
- **Section 2.0** describes the Project and the anticipated operation and construction activities
- **Section 3.0** provides the policy context for the Project
- **Section 4.0** discusses the methodology adopted for the transport assessments, including key data sources and assumptions
- **Section 5.0** establishes the existing transport context in the vicinity of the Project, including consideration of the existing road network, public transport and active transport network
- **Section 6.0** provides an overview of the impact of the additional construction-related traffic on the study area, including consideration of proposed heavy vehicle access, construction routes and construction worker movements. This section also presents an assessment of the operational traffic and access impacts of the Project
- **Section 7.0** describes the management measures identified to mitigate the Project impacts.

2.0 Project description

2.1 Construction activities

The proposed construction activities for the Project are identified in **Section 1.1** and discussed in detail in Chapter 4 of the EIS for the Project. The construction laydown areas would be provided within the Project Area (refer to **Figure 1**).

Construction activities would comprise four main activities as follows:

- Enabling works
- Civil, structural mechanical and electrical works
- Commissioning
- Demobilisation.

2.1.1 Construction vehicles

Various plant and equipment are likely to be required to facilitate the construction activities. Light vehicles will be required for all phases of construction. The final equipment and plant requirements would be determined by the construction contractor. Indicative plant and equipment requirements were categorised for each construction activity for the Project and would include a combination of the following:

- Enabling works
 - Front end loaders
 - Dump trucks
 - Road trucks
 - Water Trucks
 - Excavators
 - Graders
 - Compactors
 - Light vehicles
- Civil, structural, mechanical and electrical works
 - Front end loaders
 - Dump trucks
 - Road trucks
 - Excavators
 - Graders
 - Scrapers
 - Compactors
 - Water trucks
 - Concrete trucks and pumps
 - Elevated work platforms
 - Cranes
 - Concrete saws and grinders
 - Compactors and rollers

- Scrapers
- Backhoe
- Generators
- Light vehicles, heavy rigid and articulated trucks (including multi trailer), low loaders
- Commissioning
 - Elevated work platforms
 - Cranes
 - Generators
 - Light vehicles
- Demobilisation
 - Road trucks
 - Water Trucks
 - Backhoe
 - Compactors
 - Light vehicles
- Maintenance equipment
 - Chainsaws
 - Tractors
 - Light vehicles
 - Woodchippers/ mulchers.

During the construction phase of the Project, construction vehicles would be required for transporting materials and equipment from Adelaide along the existing road network to the Project Area. It is anticipated that up to 20 heavy vehicle movements per day on average would be required to access the Site during the peak construction period of the Project for material delivery, concreting activities and loading/unloading of spoil and waste removal. The majority of the vehicles listed above would be considered heavy vehicles. In addition, it is not anticipated rail will be used for haulage of any required construction materials.

The size of vehicles used for haulage would be consistent with the access route constraints, safety and identified worksite constraints. Some construction activities may require access by vehicles up to 25/26m long B-doubles. Access requirements and arrangements for these vehicles would be defined in the Construction Traffic Management Plan (CTMP), which would be prepared by the construction contractor during subsequent design stages.

2.1.2 Construction workers

It is anticipated that up to 50 construction workers would be required during the peak construction period. Construction workforce would likely be sourced locally, where available and feasible. Worker parking spaces would be provided on Pinnacles Place near the Site (discussed further in **Section 6.1.2**).

All workers and sub-contractors engaged during the construction phase would be inducted prior to the commencement of works. The induction would identify the construction haulage routes, local speed zones, worksite protocols, parking facilities and emergency and incident management strategies.

2.1.3 Working hours

Construction of the Project is expected to commence late 2021 and take approximately 12 months to complete, pending Project approval. The majority of construction work would be limited to standard construction hours, as defined by the *Interim Construction Noise Guideline* (2009):

- 7:00 am to 6:00 pm, Monday to Friday;
- 8:00 am to 1:00 pm, Saturdays; and
- no work on Sundays or public holidays.

Certain works or specific activities including but not limited to concrete pours may also require works outside of the standard hours. Approval from relevant authorities would be sought for any out of hours work and any sensitive receptors would be notified.

2.1.4 Construction access

Construction vehicles would access the Project Area from Pinnacles Place, through an access point established off the road. This access location would serve as the main access point linking the Project to the primary road network in Broken Hill. An internal loop road would also be established to facilitate vehicle movements within the Site.

Further, the unclassified road running parallel to the western side of the Site, within the easement on Lot 7302 DP1181129, would be used to access the transmission line easement during construction. A temporary access point from the Site would be provided through to this unclassified road to allow for the construction of the transmission line.

The Site would also have an emergency access gate, located in the south west end of the Site boundary. It is expected that this would be used in emergencies during the construction and operation stages. In addition, this emergency access might also be used during construction to access the transmission line corridor.

Site accesses are shown in **Figure 1**.



Legend

- Project Area
- Site
- TransGrid Broken Hill Substation
- 22kV Bus
- Indicative overhead transmission line
- Office building
- Battery
- Inverter
- Medium voltage auxiliary switchboards
- Transformer
- Laydown area/operational parking area
- Access road
- Permeable surface
- Railway
- Haulage route
- Site access point

**FIGURE 1:
CONSTRUCTION
ACCESS**

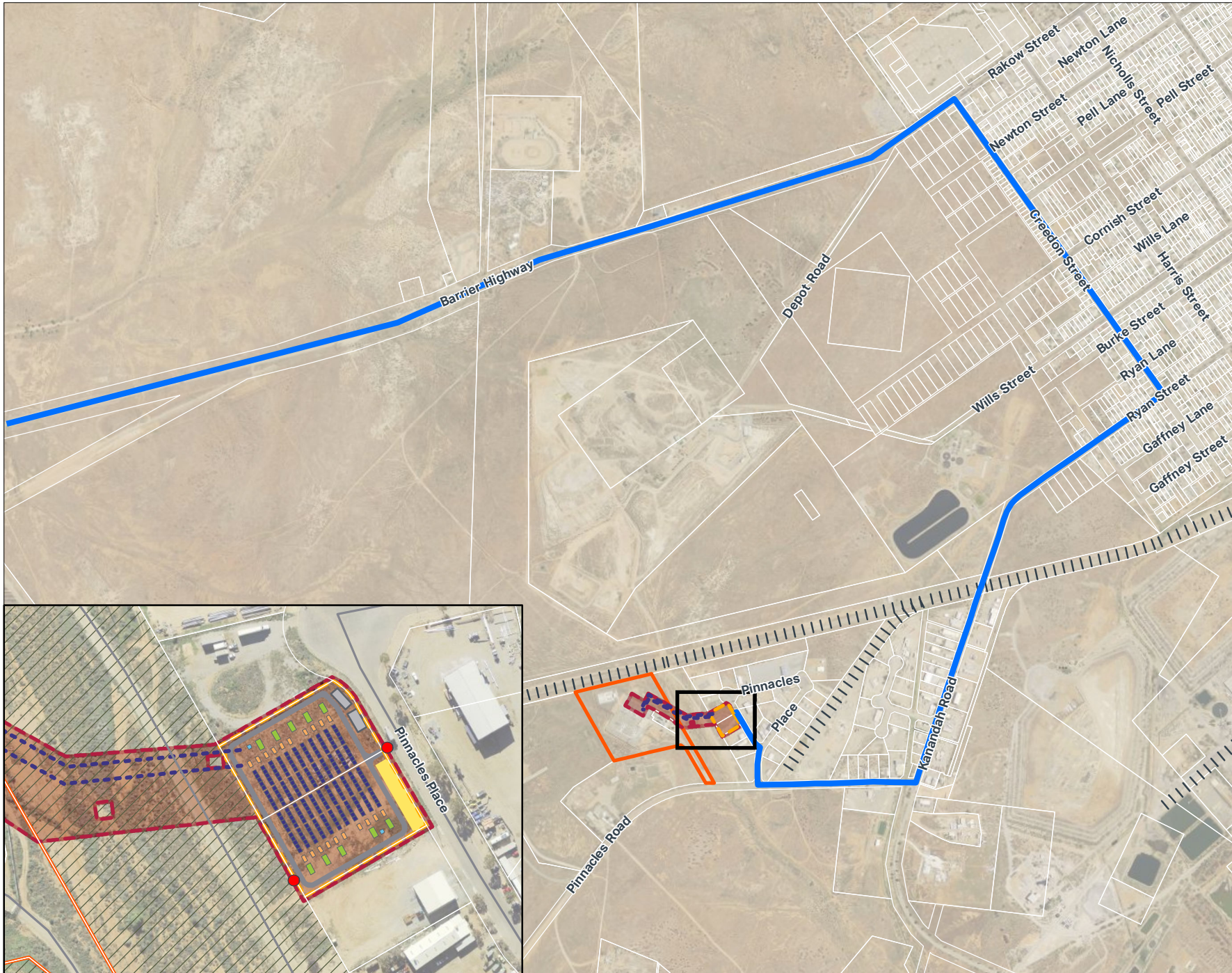
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2.1.5 Construction routes

Construction vehicles approaching the site would enter/exit via the access point provided off Pinnacles Place. The largest truck requiring access to the Project Area would be a 25/26m long B-double for delivery of materials, loading/unloading of spoil and waste removal. Concrete trucks would also be required.

Figure 2 presents proposed access routes to the Project Area, as well as the TfNSW approved B-double routes surrounding the Project Area. The primary Project Area access is located to the west of Pinnacles Place, which connects to Barrier Highway via Pinnacles Road. These roads are approved B-double routes which provide high clearances and sufficient road widths to accommodate larger vehicles, making it ideal for the construction haulage routes.

Construction vehicles are expected to travel to the Project Area from Adelaide using the following routes:

- Pinnacles Place
- Pinnacles Road
- Kennandah Road
- Creedon Street
- Barrier Highway.

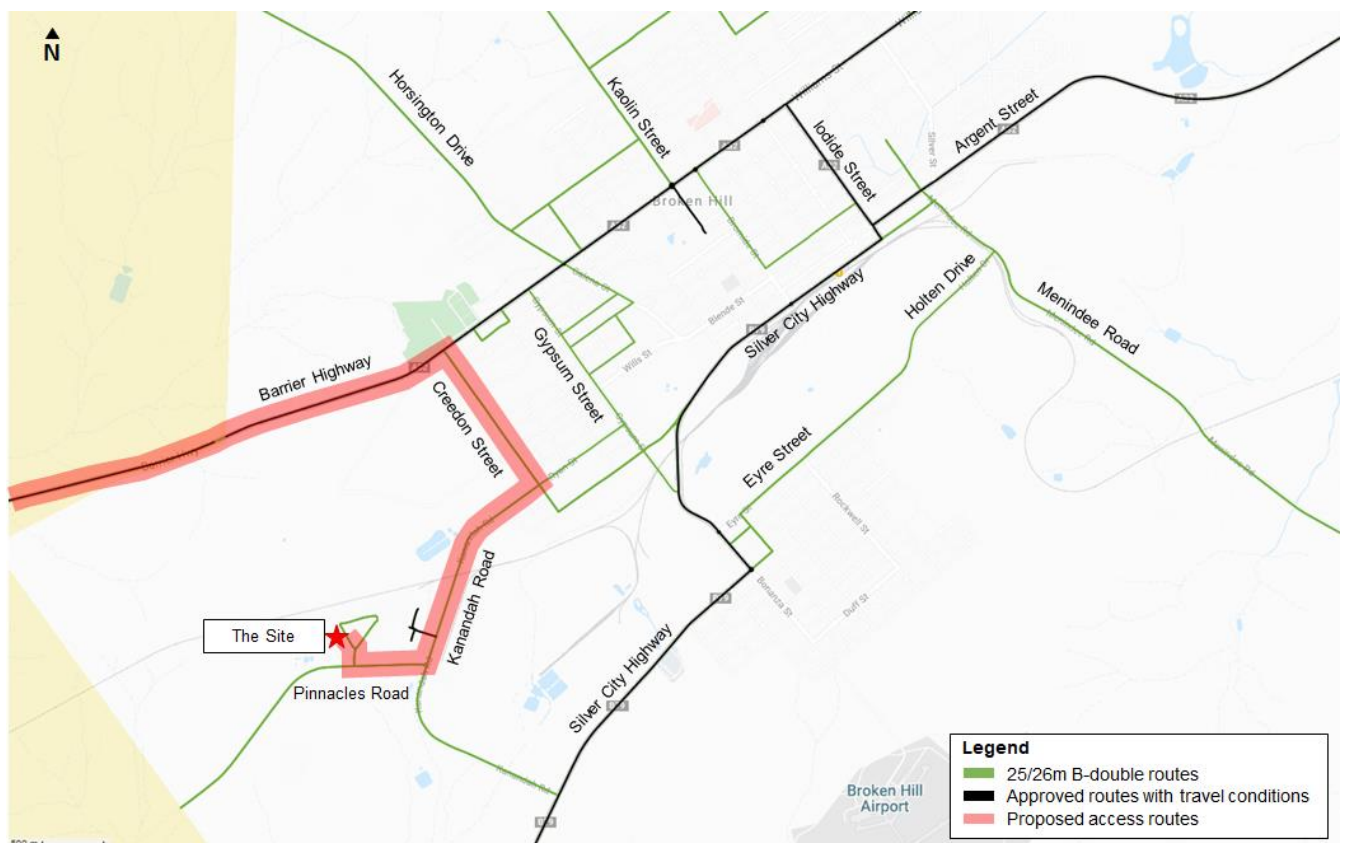


Figure 2 Construction routes

Source: TfNSW, 2021 (modified by AECOM)

2.2 Operational stage

2.2.1 Working hours

The Project would operate 24 hours a day, 7 days a week. It is anticipated that the Project would require between one and three full time employees during operation. The BESS would typically be managed remotely and staffed as required during planned and unplanned maintenance periods.

2.2.2 Access and parking

Access to the Site would be maintained via a single access point provided off Pinnacles Place during the operational stage of the Project. The secondary access provided along the western boundary of the Site would also be retained for use as an emergency access and egress gate.

Up to three car parking spaces would be provided on the Site once the Project is operational to meet the staff parking requirements for the Project.

3.0 Legislative and policy context

3.1 Relevant guidelines

The following guidelines were considered during the preparation of this traffic and access impact assessment report:

- *Guide to Traffic Management – Part 3: Traffic Studies and Analysis* (Austroads, 2020);
- *Guide to Traffic Generating Developments Version 2.2* (RTA, 2002);
- *Technical Direction TDT2013/4a – Guide to Traffic Generating Developments* (Roads and Maritime Services, 2013); and
- *Guide to Traffic Management – Part 12: Integrated Transport Assessments for Developments* (Austroads, 2020) and *the complementary Roads and Maritime Supplement* (RMS Austroads Guide Supplements, RMS, 2013).

These guidelines provide an overview of available methods for undertaking transport studies and analysis, aspects of traffic generation considerations relating to developments as well as guidance on identifying, assessing and mitigating traffic impacts, which have been used to inform this assessment.

3.2 Local planning context

Consideration was given to the following planning instruments in the preparation of this traffic and access impact assessment report:

- Broken Hill Local Environmental Plan 2013 (LEP 2013); and
- Broken Hill Development Control Plan 2016 (DCP 2016).

The LEP 2013 outlines the local environmental planning provisions, requirements and considerations for development land in Broken Hill in accordance with the relevant standard environmental planning instrument, while the DCP 2016 supplements this and outlines objectives and controls to guide development within the Broken Hill local government area (LGA).

Although the Project is to be determined by DPIE as a State Significant Development project, local plans have been considered for requirements and compliance.

4.0 Methodology

4.1 Scope of assessment

The scope of the Project includes establishing the potential traffic and access impacts of the Project during the construction and operation stages and can be summarised as follows:

- establish the existing traffic and access conditions near the Site, as well as the active transport and public transport networks near the Site
- confirm the location of access points, anticipated vehicle movements and likely routes during the construction of the Project
- prepare a qualitative impact assessment of the potential impacts of the Project on the local traffic and access environment during construction and operation of the Project
- Identify the likely impacts or access constraints for heavy vehicles and propose any mitigation measures for managing these impacts should they be required for the Project.

4.2 Data sources and assumptions

4.2.1 Data sources

The following data/ information were used to inform this assessment:

- a desktop assessment of the site and its surrounds based on available aerial photography and other GIS mapping information
- traffic volumes obtained from TfNSW permanent classifier located on the Barrier Highway
- construction information for the Site including construction traffic numbers and access arrangements, staging of construction works, work hours and workforce numbers
- plans showing the Project Area layout
- other documents and data, as referenced in this report.

4.2.2 Assumptions

The assessment of the traffic and access impacts were based on the following assumptions:

- traffic operation was determined based on a desktop review of the available traffic information at a permanent classifier on the Barrier Highway (Station Id BKHSTC) east of the Site to establish the following:
 - background traffic growth rates near the Site
 - anticipated background traffic flows in 2021
 - future traffic flows for the peak construction year in 2022 and the opening year in 2023
 - future traffic flows 10 years after opening in 2033
- assessment of the construction impacts using peak construction volumes with all vehicle movements being carried out during standard construction hours
- assessment of operational impacts with the number of staff to be employed on site and parking provision.

5.0 Existing environment

5.1 Context

Broken Hill is located in the far west of NSW within the Broken Hill LGA, approximately 510 km northeast of Adelaide. Broken Hill is bounded by Scotia to the south, Silverton and Fowlers Gap to the north, Little Topar and Menindee to the east and South Australia to the west.

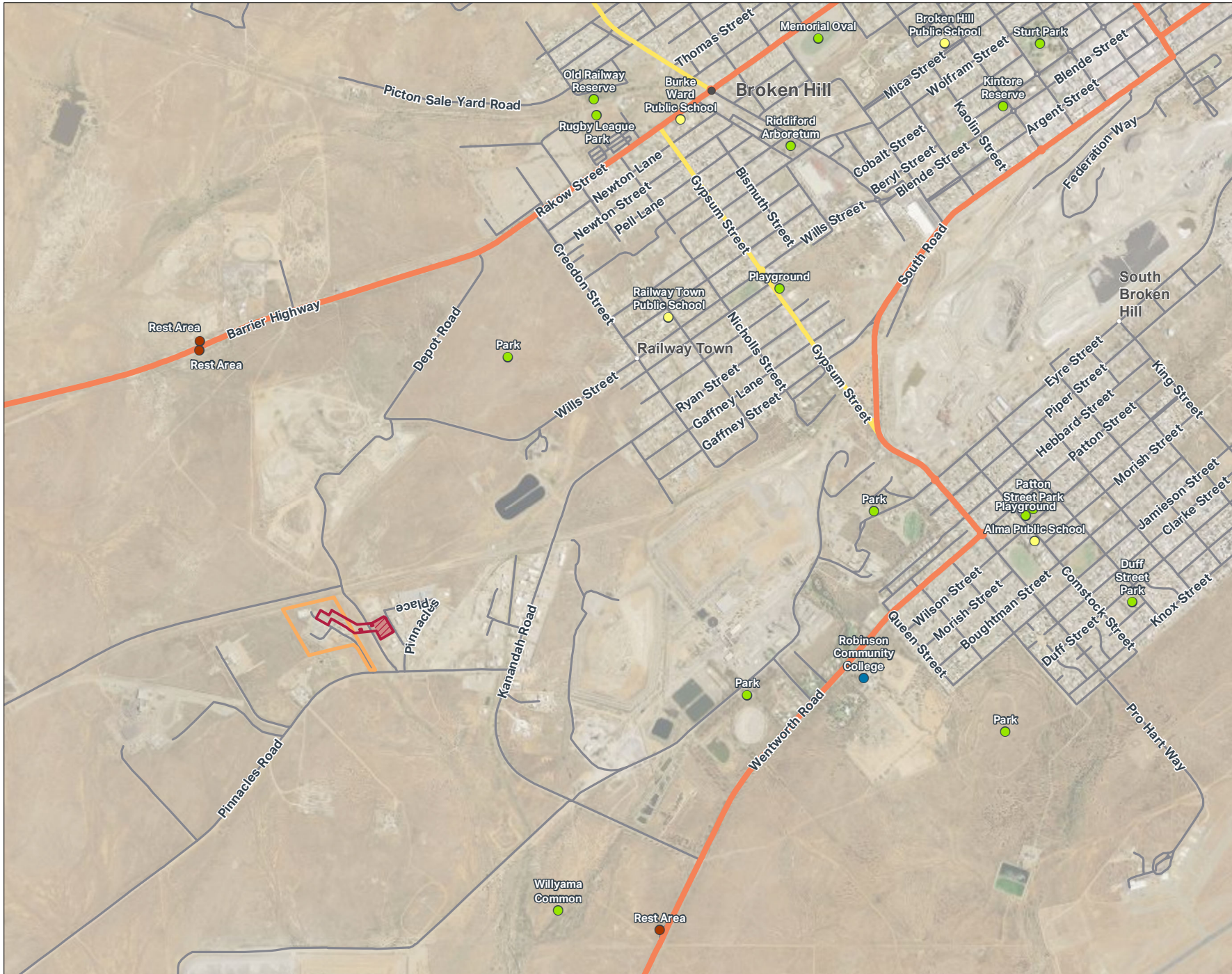
The Site is located southwest of the Broken Hill town centre. The Site is comprised of two allotments having approximately 100 m frontage to Pinnacles Place. It is neighboured by industrial developments.

The Site is located on the western side of Pinnacles Place. Pinnacles Place provides local access to the adjoining industrial precincts and local land uses and connects to the wider road network via Pinnacles Road. **Figure 3** illustrates some key roads and land use features surrounding the Site.



Legend

- Project Area
- Site
- TransGrid Broken Hill Substation
- State Road
- Regional Road
- Local Road
- Education Facility
- Park
- Primary School
- Roadside Rest Area



**FIGURE 3:
THE SITE AND
THE LOCAL CONTEXT**

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5.2 Road network

5.2.1 Key roads

The road network in the vicinity of the Site includes Pinnacles Place, Pinnacles Road, Kanandah Road, Creedon Street, Silver City Highway and Barrier Highway. **Figure 3** shows the major road network surrounding the Site.

Pinnacles Place

Pinnacles Place is a local road aligned in a north-south direction near the Site. The road provides access to industrial land uses. In the north, it provides direct access to the Site to the west and connects to Pinnacles Road in the south. The road has one lane in each direction with an undivided carriageway. The road provides on-street parking and has limited footpaths to cater for pedestrians .

Pinnacles Road

Pinnacles Road is a local road aligned in an east-west direction near the Site. The road connects Pinnacles Place in the west to Kanandah Road in the east. It has an undivided carriageway providing one lane in each direction. Formal on-road parking is not provided. However a verge located on the southern side of the road may be used for off-road parking during the day. There are limited footpaths to cater for pedestrians provided along the road.

Kanandah Road

Kanandah Road is a regional road. It is aligned in an east west direction near the Site, intersecting with Pinnacles Road in the west and Creedon Street in the north and Silver City Highway in the south. The road has a divided carriageway, providing one lane in each direction. South of Pinnacles Road, the posted speed limit is 50 km per hour in the northbound direction and 80 km per hour in the southbound direction. No parking or footpaths are provided on either side of the road.

Creedon Street

Creedon Street is a collector road located on the western boundary of the Broken Hill town centre. It is generally aligned in a north-south direction east of the Site, connecting to Barrier Highway in the north and Kanandah Road in the south. The road has a divided carriageway, configured with one lane in each direction. In addition, parking is provided on either side of the road. The properties fronting the road predominantly comprise residential dwellings. As such, footpaths are generally provided on one or both sides of the road.

Silver City Highway

Silver City Highway is classified as a State Road (State Road 22) generally running in the north-south direction east of the Site. It intersects with Kanandah Road and runs through the Broken Hill town centre. Near Kanandah Road, the carriageway is divided, providing one lane in each direction with a short lane into Kanandah Road in the northbound direction. Silver City Highway intersects with Barrier Highway at Lodide Street in the Broken Hill town centre. South of Kanandah Road, the posted speed limit on the highway is 110 km per hour for vehicles travelling southbound and 80 km per hour for vehicles travelling northbound into the town centre. No parking or footpaths are provided on either side of the road.

Barrier Highway

Barrier Highway is a classified State Road (State Road 8) generally running in the east-west direction north of the Site. The highway connects Adelaide in the southwest to Dubbo and Sydney in the east. It intersects with Silver City Highway via Lodide Street at the Broken Hill town centre. The highway is configured with one lane in each direction, within a divided carriageway. The posted speed limit is 80km per hour for vehicles travelling eastbound into the Town Centre. Parking and footpaths are generally provided on both sides of the road within the town centre.

5.2.2 Road safety

TfNSW provides interactive crash and casualty statistics by LGA which was reviewed so as to obtain a general understanding of crash statistics in close proximity of the Site. These interactive crash

statistics provided an overview of all crashes for the four-year period between 2015 and 2019. The location of these crashes within the local area near the Site is shown in **Figure 4**.

The review of the crash data indicates that only a small proportion of crashes occurred near the Site location and on the road network immediately surrounding the Site.

One crash occurred on Kanandah Road, north of Pinnacles Road, resulting in moderate injury and involved vehicles travelling in opposing directions. Two crashes occurred at the intersection of Creedon Street and Barrier Highway. These crashes were non-casualty crashes with one crash being a right rear crash and another resulting from the vehicle leaving the carriageway.

Outside these locations, a large proportion of crashes occurred within the Broken Hill town centre on both the State roads and the local network traversing the town centre.

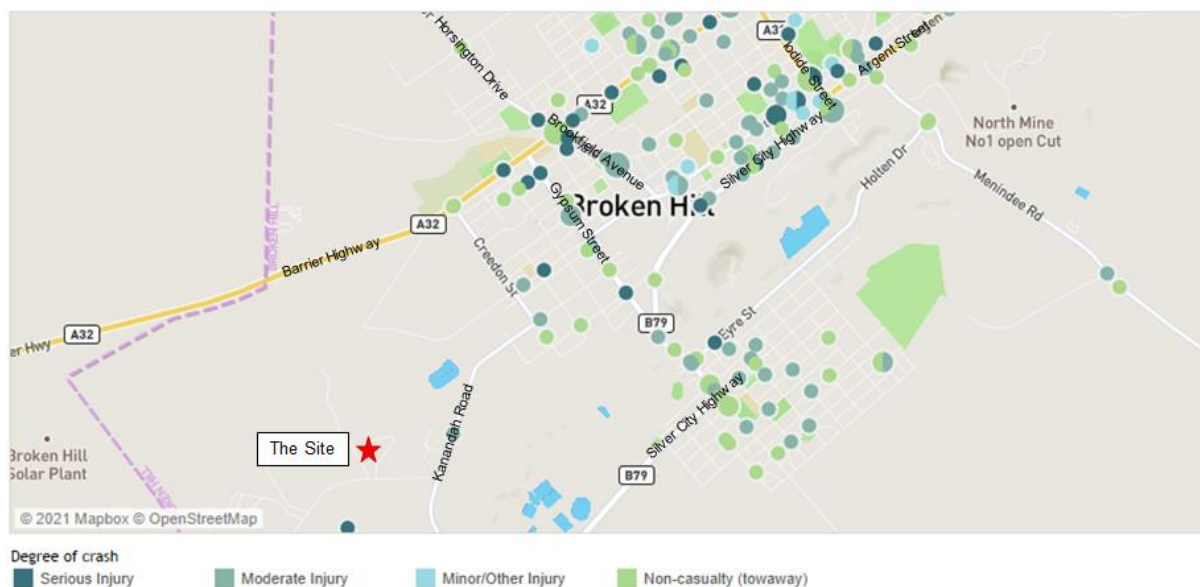


Figure 4 Crashes near the Site

Source: TfNSW, 2021 (modified by AECOM)

5.2.3 Traffic demand

The Site is located in a regional area, characterised with low traffic volumes and there are no significant trip attractors or generators located near the Project Area. As such, it has been determined that traffic counts are not required for the assessment of existing traffic demand near the site.

In lieu of traffic counts, traffic demand in the Project Area has been obtained based on publicly available information taken from the TfNSW permanent classifier located on the Barrier Highway east of the Site (Station Id BKHSTC). Another TfNSW sample classifier is also available closer to the Project Area (west of the Site), however, the traffic volume data at this classifier is available only till 2009. Therefore, traffic volume information from the permanent classifier east of the Project Area has been utilised for the purposes of this assessment.

Growth rates

As stated above, a TfNSW permanent classifier (Station Id BKHSTC) is located on the Barrier Highway, east of the Project Area and east of the Broken Hill town centre, as shown in **Figure 5**. This counter is located approximately 15 km (or 15 minutes drive) from the Project Area. It is acknowledged that this permanent classifier may include trips travelling in and out of the Broken Hill town centre. However, given the regional nature of the Project Area, it is concluded that the traffic flows observed at this permanent classifier location will be representative of the traffic levels in the Project Area.

As such, the historical annual average daily traffic (AADT) growth patterns at this permanent classifier have been obtained and presented in **Table 2**. These flows take into account holiday and seasonal variations and provide an accurate representation of background traffic flows throughout the year.

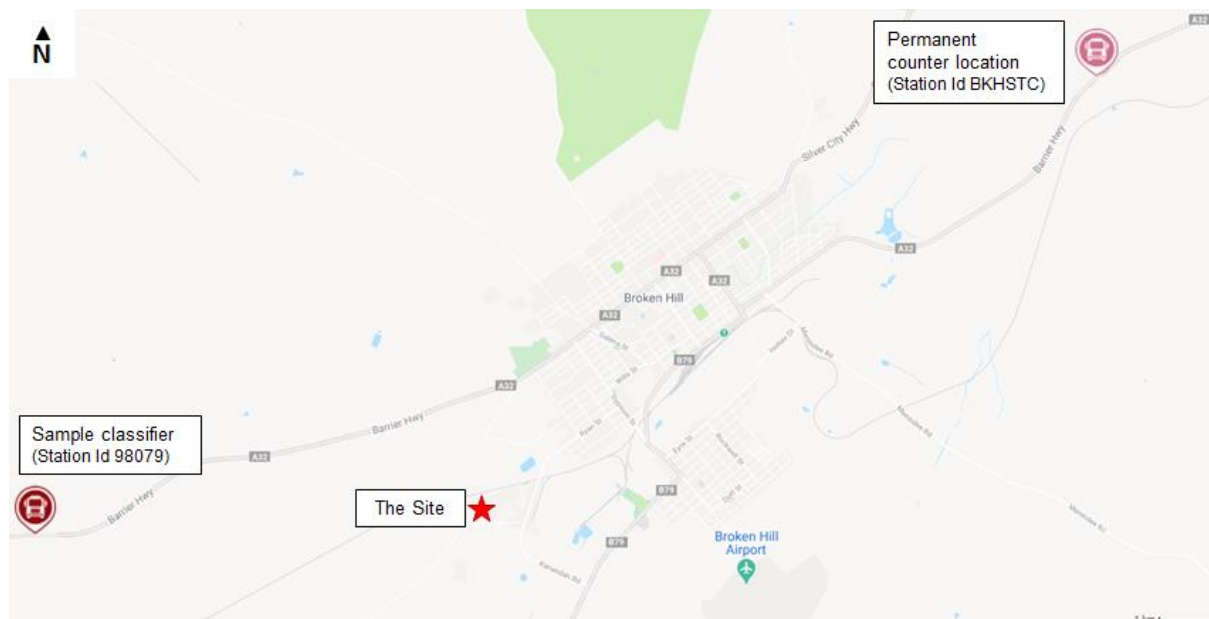


Figure 5 TfNSW Permanent Traffic Counter location

Source: TfNSW, 2021 (modified by AECOM)

Table 2 Historical AADT growth trends near the Site

Direction	Vehicle type	Annual average daily traffic (AADT) ¹										
		2010	2011	2012	2013 ²	2014 ²	2015	2016 ²	2017	2018	2019	2020
Eastbound	Light vehicles	222	234	215	-	-	211	-	209	214	246	199
	Heavy vehicles	99	102	93	-	-	93	-	97	106	106	100
Westbound	Light vehicles	225	237	224	-	-	193	193	197	204	231	184
	Heavy vehicles	102	106	106	-	-	109	103	108	119	119	113
Combined	Light vehicles	447	471	439	-	-	404	-	406	418	477	383
	Heavy vehicles	201	208	199	-	-	202	-	205	225	225	213

1. Station ID BKHSTC is a permanent classifier and the AADT shown is in vehicles.

2. Traffic flows for 2013 and 2014 are not available for both directions while traffic flows for 2016 are not provided for the westbound direction.

Source: TfNSW, 2021

The traffic flows presented in **Table 2** were used to determine the average annual growth rate, which are summarised in **Table 3**. Flows from this permanent classifier further indicate that peak period flows for the morning peak are between 8am and 9am and for the afternoon peak between 3pm and 4pm.

Table 3 Background traffic - growth rates

Traffic flows ¹	2010	2011	2012	2013	2014	2015	2016 ²	2017	2018 ²	2019	2020 ³	Average ⁵
AADT Eastbound	321	336	308	-	-	304	-	306	320	352	299	318
AADT Westbound	327	343	330	-	-	302	296	305	323	350	297	319

Traffic flows ¹	2010	2011	2012	2013	2014	2015	2016 ²	2017	2018 ²	2019	2020 ³	Average ⁵
AADT Combined	648	679	638	-	-	606	-	611	643	702	596	640
Annual growth rate ⁴	-	5%	-6%	-	-	-	-2%	3%	5%	9%	-15%	3.9%

1. AADT shown is in vehicles.

2. 2015-2016 and 2016-2017 annual growth rate has been determined for traffic flows in the westbound direction.

3. 2019-2020 annual growth rate is excluded from the average due to a significant decrease in traffic flows potentially resulting from the COVID-19 pandemic effects.

4. The annual growth rates have been rounded to the nearest integer.

5. Average annual growth rate was estimated based on annual growth rates for the last five years (excluding 2020).

The negative annual growth rate of 15 per cent observed during 2020 has been excluded from the calculations, as the decrease is assumed to be likely due to the effects of the COVID-19 pandemic. The pandemic generally resulted in reduced traffic volumes due to the public health orders in NSW and/or personal choices made in response to Government recommendations to minimise the risk of exposure to, and potential spread of, the virus.

The review of the historical AADT data obtained from the TfNSW permanent classifier between 2016 and 2020 (excluding 2020) presented in **Table 3** indicate that the average annual increase in background traffic along Barrier Highway over the last five years (excluding 2020) is around 4 per cent.

Current traffic demand

In order to estimate the current background traffic flows in the Project Area, the average annual background growth rate of 4 per cent determined in **Table 3** was applied to the traffic flows observed at the permanent counter location (Station Id BKHSTC) in 2019. **Table 4** provides an estimate of traffic flows during 2021 along the Barrier Highway, east of the Project Area. The estimates indicate that the average AADT on the Barrier Highway west of Broken Hill in 2021 is likely to be approximately 757 vehicles.

Table 4 Estimate of current traffic flows on the Barrier Highway near the Site

Year	AADT Combined ¹	AM Peak (8am-9am)	PM Peak (3pm-4pm)
2019 ²	702	48	56
2021	757	52	60

1. AADT shown is in vehicles.

2. Traffic volumes are based on traffic flows at Station ID BKHSTC in 2019.

Construction traffic generated by the Site is proposed to arrive from Adelaide, from the west of the Project Area. Therefore, traffic data from a previously available TfNSW Sample Classifier (Station Id 98079) located on the Barrier Highway, approximately 18 km west of Broken Hill as shown in **Figure 5** was reviewed to determine the traffic levels and compare with the traffic levels for the same year at the permanent classifier (used for this assessment) east of the Barrier Highway. Review of traffic data for previous years indicate that traffic volumes on the Barrier Highway west of the Project Area is lower than the section of the Barrier Highway east of the Project Area. Therefore, it is concluded that traffic flows included in **Table 4** represent a worst-case scenario for the background traffic in the Project Area.

5.2.4 Road network performance

The existing year 2021 traffic volumes, as estimated on the Barrier Highway west of Broken Hill town centre near the Site, are low (around 757 AADT). The Broken Hill Solar Power Plant Environmental Assessment report (2012) indicates the Barrier Highway is designed to accommodate approximately 1,500 vehicles per day. As such, the Barrier Highway has sufficient capacity to accommodate current traffic flows observed on the road. Therefore, it was concluded that intersection modelling is not required to assess road network performance.

5.3 Public transport

The Project Area has generally limited public transport services due to the low population density, current land uses and consequently low demand for public transport services. However, the area around Broken Hill town centre has a considerable public transport network comprising rail and bus services connecting the surrounding town centres and Sydney.

Regional trains and coaches operate from Broken Hill Station and the town centre respectively. Buses also operate within the town centre, serving the local catchments.

5.3.1 Rail and coaches

Regional trains service Broken Hill, linking it to the wider regional network and Sydney.

Coach services also operate at Broken Hill town centre, connecting the town centre to Dubbo, Mildura and Adelaide. In addition, NSW TrainLink and Transport for NSW are trialling new coach services connecting Broken Hill to Adelaide and Mildura.

The number of rail and coach services servicing Broken Hill Station and the town centre during the AM and PM two-hour peak periods is shown in **Table 5**.

Figure 6 shows Broken Hill Station in the context of the Sydney Trains network. Rail and coach services at the Broken Hill Station provide regional access to the wider rail network and Sydney with limited services.

Table 5 Rail services at Broken Hill Station

Direction	Stop location	Weekday AM (6:00am – 9:00am)	Weekday PM (3:00pm – 6:00pm)
Rail services			
Broken Hill – Bourke – Brewarrina – Coolabah – Lightning Ridge – Dubbo – Sydney (Central)	Broken Hill Train Station	1	-
Coach services			
858 – Broken Hill Town to Adelaide Central Bus Station	Broken Hill Town Coach Stop	1	-
587 – Broken Hill Town to Mildura	Broken Hill Town Coach Stop	1	-
590 – Broken Hill Town to Dubbo	Broken Hill Town Coach Stop	-	-

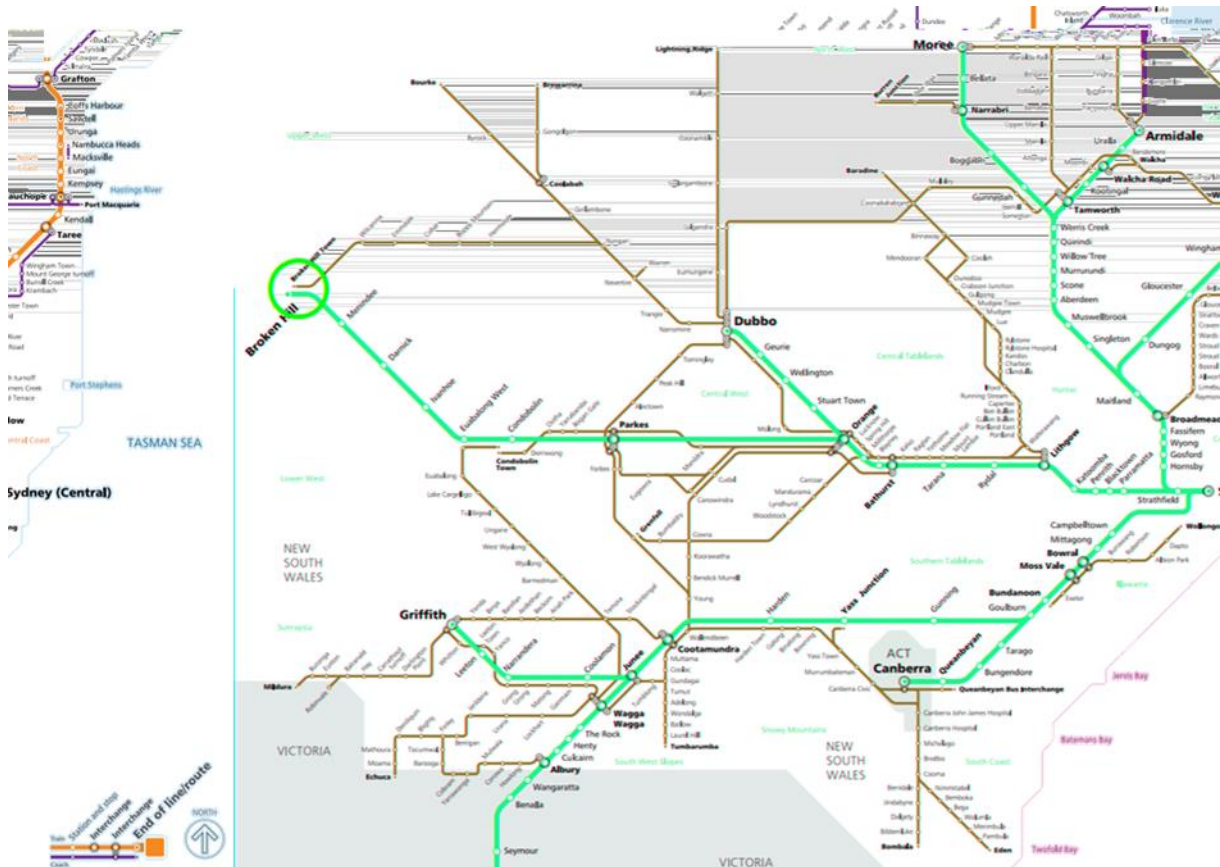


Figure 6 Existing rail and coach services

Source: Sydney Trains, 2021

5.3.2 Bus network

A number of bus routes operate at Broken Hill, connecting the town centre to the local and regional network.

ComfortDelGro Corporation (CDC) Broken Hill, a local bus operator, operates a number of school bus routes and six regular bus routes in the area. The regular bus services that operate in and around the Broken Hill town centre are:

- Route 590: Broken Hill CBD to Broken Hill North via Chapple St (Loop Service)
- Route 591: Broken Hill CBD to Broken Hill South via Centro Westside (Loop Service)
- Route 591A: Broken Hill CBD to Broken Hill South & Hillside (Loop Service)
- Route 592: Broken Hill CBD to Thomas via Broken Hill Base Hospital (Loop Service)
- Route 592A: Broken Hill CBD to Thomas & Broken Hill North (Loop Service)
- Route 593: Broken Hill CBD to Hillside via Centro Westside (Loop Service)

CDC Broken Hill also operates bus services between Broken and Menindee and Wilcannia during the morning peak. The nearest bus corridor to the Site is Silver City Highway (Bonanza Street) and Gypsum Street, which connect to Barrier Highway in the north. Route 591, 591A and 593 operate on this corridor. Bus routes operating in Broken Hill are shown in **Figure 7**.

The frequency of public bus services in Broken Hill is relatively limited. This is reflected in the low public transport mode-share for the area. Service frequencies are shown in **Table 6**.

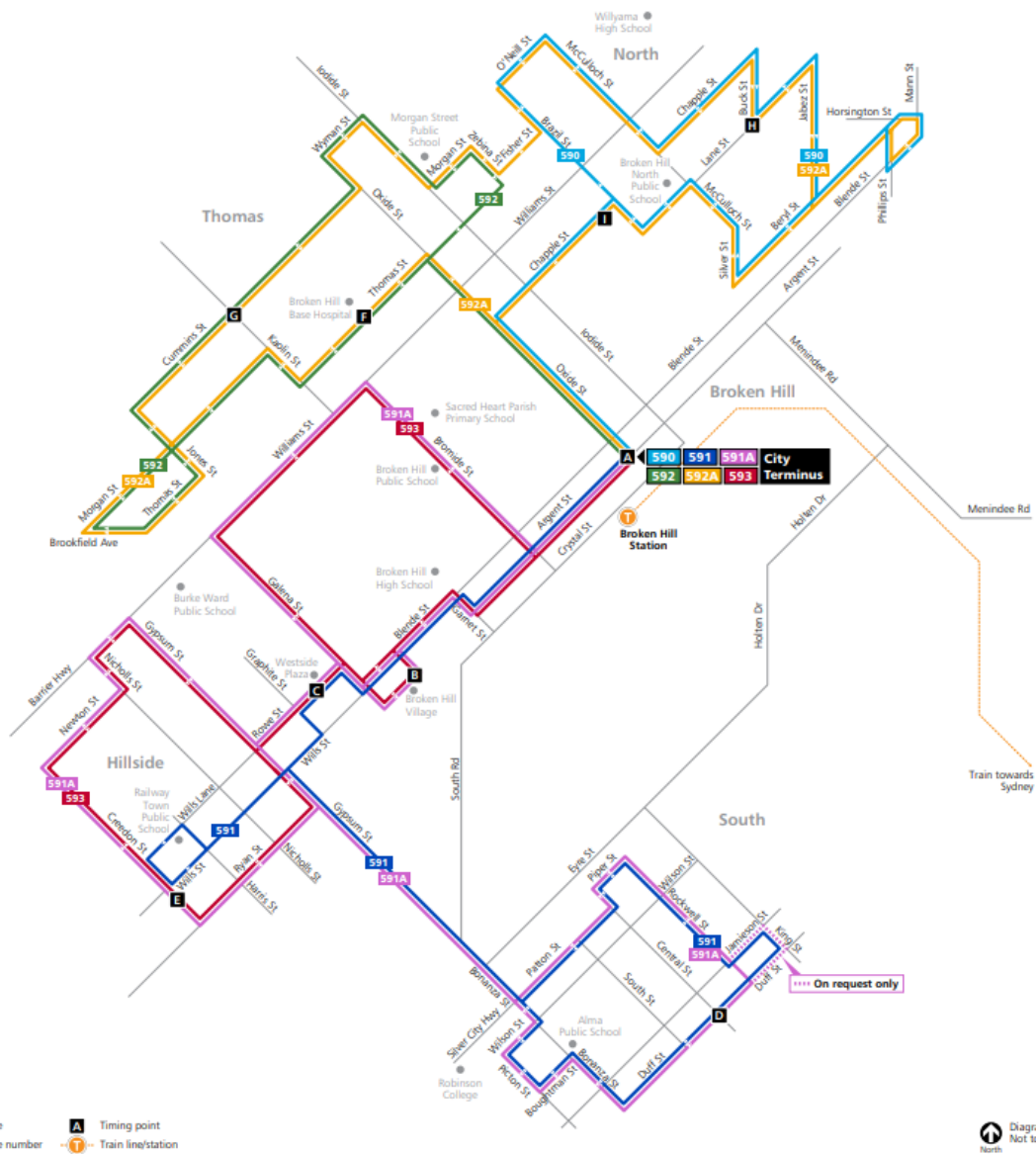


Figure 7 Existing bus services

Source: CDC Broken Hill, 2021

Table 6 Frequencies of bus services in Broken Hill

Route	Description	Weekday AM (6:00am – 9:00am)	Weekday PM (3:00pm – 6:00pm)
590	Broken Hill CBD to Broken Hill North via Chapple St (Loop Service)	2	-
591	Broken Hill CBD to Broken Hill South via Centro Westside (Loop Service)	2	-
591A	Broken Hill CBD to Broken Hill South & Hillside (Loop Service)	1	3
592	Broken Hill CBD to Thomas via Broken Hill Base Hospital (Loop Service)	2	-

Route	Description	Weekday AM (6:00am – 9:00am)	Weekday PM (3:00pm – 6:00pm)
592A	Broken Hill CBD to Thomas & Broken Hill North (Loop Service)	1	2
593	Broken Hill CBD to Hillside via Centro Westside (Loop Service)	2	-

5.4 Active transport

There are limited walking and cycling facilities in the immediate vicinity of the Project Area. Given the nature of the land uses surrounding the Project Area primarily consist of industrial land uses with some low-density residential areas, the provision of footpaths is limited in the areas surrounding the Project Area. There are no existing cycling facilities available near the Project Area.

Walking and cycling facilities are primarily provided at the Broken Hill town centre. Footpaths are generally provided on both sides of the road within the road network at the town centre. **Figure 8** shows the existing cycle facilities at the Broken Hill town centre. There are several off-road cycleway facilities traversing the town centre. In the vicinity of the Project Area, there are off-road cycle facilities along Silver City Highway, which connect to some low and moderate difficulty routes within the town centre.

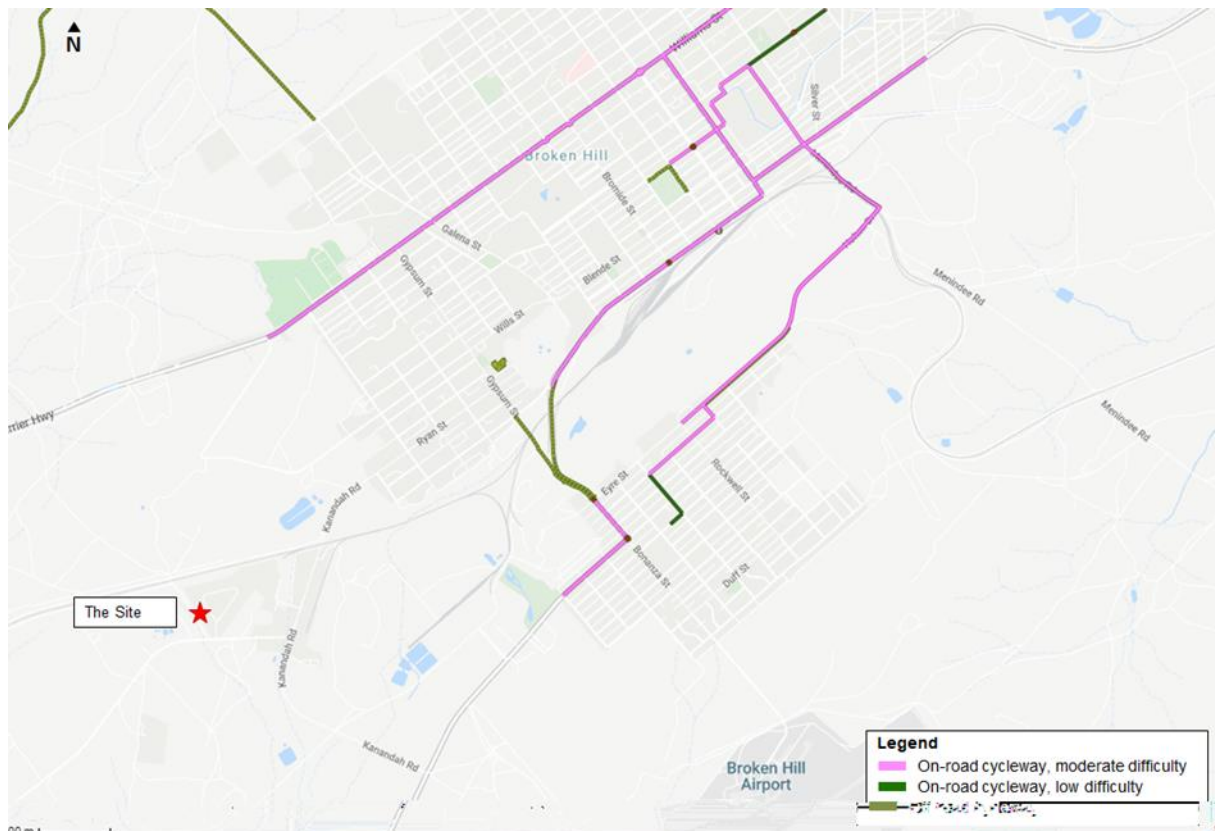


Figure 8 Active transport network

Source: TfNSW, 2021

6.0 Impact assessment

6.1 Construction impacts

The Project Area would be established as a construction site off Pinnacles Place for the construction of the Site. Construction vehicles are proposed to access the Project Area from Pinnacles Road via the Barrier Highway. Construction traffic would be utilising the intersection of Barrier Highway/ Creedon Street to access the Project Area. Construction laydown areas and site offices would be established within the Project Area. Construction of the Site is expected to commence late 2021 and take approximately 12 months to complete, pending Project approval. As such, it is assumed that peak construction would occur in 2022.

The traffic flows for the peak construction year in 2022 without the Site construction traffic were based on the existing traffic flows determined for 2021 and outlined in **Section 5.2.3**, using an annual average background traffic growth rate of around 4 per cent.

The anticipated peak background traffic flows in 2022 without the Site are presented in **Table 7**.

Table 7 2022 peak construction traffic flows on the Barrier Highway west of Broken Hill

Year	AADT ¹	AM Peak (8am-9am)	PM Peak (3pm-4pm)
2022	787	54	63

1. AADT shown is in vehicles.

6.1.1 Road network

As outlined in **Section 5.2.4**, traffic volumes on the road network in 2022 without the Site are low. Therefore, it was determined that only a qualitative assessment is sufficient to assess the road network performance. In addition, traffic generated by construction vehicles, including construction trucks and construction workers, is expected to be low given the nature of the construction of the Site, and would likely fluctuate depending on the Site construction stage. Up to 50 construction workers are required per day during peak construction periods of the Site to facilitate the construction works. In addition, up to 20 heavy vehicles per day are anticipated on average to access the Project Area during the construction period.

In order to consider a worst-case scenario for assessing the construction traffic impacts, it is assumed that all construction worker vehicles arrive during the same peak hour. This would represent 50 light vehicles accessing the Project Area during the peak construction year. However, given the construction works are proposed to commence at 7am and finish at 6pm, the peak construction period of the Site would not likely coincide with the road network peak. In addition, the construction workforce is likely to be sourced locally, and shuttle buses would be considered, if required, to transport construction workers from the town centre to the Project Area, further reducing the impacts of the Site on the surrounding road network.

On a typical day, given that construction activities are proposed to be carried out over 11 hours per day and assuming construction heavy vehicle movements are equally distributed across the day, around two heavy vehicles would access the Project Area during peak hours. As such, it is expected that traffic impacts generated from construction traffic would be negligible.

No temporary diversions are proposed to accommodate the construction of the Site. If required, the potential locations of temporary diversions would need to be identified through a CTMP. Road Occupancy Licence (ROL) and Traffic Control Plans (TCP) would also be prepared, as required.

The construction haulage routes are approved B-double routes and therefore they are considered to be in an appropriate condition to accommodate construction traffic associated with the Project. Given that traffic volumes associated with the Project are low, the Project is not anticipated to have a significant impact on the condition of existing haulage routes.

6.1.2 Access and parking

Some short-term localised impacts have the potential to occur at the access to the Project Area off Pinnacles Place in the form of delay to road users. These potential impacts would be temporary and localised, and likely only affect one road user at a time due to the low traffic levels on Pinnacles Place.

No impacts are anticipated at secondary access points due to low construction traffic volumes likely to be generated by the Site.

Accesses, including the main access off Pinnacles Place will be reviewed during subsequent design stages to ensure construction vehicles can safely enter the Site and turning paths can safely be accommodated on Site.

Construction workers would park on Pinnacles Place, near the Project Area. Construction of the Site would require a workforce of up to 50 workers during peak construction periods. It is proposed that the workforce would be sourced locally where available and feasible. A review of aerial photos of the Site and surrounding area shows that the majority of the Pinnacles Place industrial area has rear to kerb parking along the road, including the Site frontage. Assuming a car parking width of 2.4 m and the introduction of a new entrance to the Site, the Site frontage alone has capacity for around 30 cars. The remainder of light vehicles could either park on the Site or opposite the site on Pinnacles Place.

If required, shuttle bus movements would be considered from the Broken Hill town centre to the Project Area to limit car parking impacts on the road network immediately surrounding the Site. Overall, construction of the Project is anticipated to have a minor impact on car parking availability on Pinnacles Place and the road network immediately fronting the Project Area.

The Site would not impact accesses to other properties near the Project Area during the construction.

6.1.3 Road safety

Construction traffic volumes are expected to be low during peak construction periods with up to 20 heavy vehicles and 50 light vehicles anticipated. These volumes are negligible, especially when compared with the traffic volumes on key arterial roads connecting to the construction Project Area.

In addition, the review of crashes on the road network immediately surrounding the Project Area that propose to be used for access by construction vehicles indicates that there is a low incident rate.

There is a risk of construction vehicles interacting with pedestrians, cyclists and motorists on the road network surrounding the Project Area, including when construction vehicles are entering and exiting the Project Area. Potential impacts on road safety for all users during construction would be mitigated through the implementation of a CTMP and other measures, as discussed in **Section 7.0**.

6.1.4 Public transport

Bus services in the vicinity of the Site are unlikely to be impacted during construction. Bus services at the Broken Hill town centre would continue to operate as normal during construction activities and bus routes would not be impacted during the construction of the Site, given construction activities would be limited within the Project Area. No changes to bus stop locations are anticipated as a result of the Site.

In addition, haulage of construction materials to the Project Area by rail is not anticipated during the construction of the Site. As such, no impacts are anticipated on the rail network near the Site.

6.1.5 Active transport

During construction, works would be undertaken in a manner to ensure pedestrian and cyclist movements around the Site are maintained. However, given there are no existing formal walking or cycling facilities bordering the Site, temporary disruptions are not anticipated. Therefore, the Site is not anticipated to cause any major impacts to pedestrian and cyclist movements in the Project Area.

Appropriate signage, line marking and/or traffic controllers would be positioned to notify pedestrians and cyclists of any temporary arrangements. Impacts during construction would be managed through the development of a CTMP. The community would be notified in advance of any planned works which would impact pedestrian or cycle infrastructure through regular project notifications.

6.2 Operational impacts

The Site is anticipated to require up to three staff members during the operational stage. Heavy vehicles are not anticipated to regularly access the Site during operation, with heavy vehicle access only required for maintenance work or battery unit replacements, should this be required. As a result, the traffic generation during operations would be low, and as such is not expected to impact the road network surrounding the Site.

Up to three car parking spaces would be provided once the Site is operational. Given between one and three full time employees would be present on-site, the amount of parking proposed to be provided for the Site is considered appropriate. As such, the Site is not forecast to impact the availability of parking in the Project area.

Background traffic volumes during the future operational years of the Site in 2023 and 10 years post-opening in 2033 was estimated based on the traffic flows determined for 2021 and using an average background traffic growth rate of 4 per cent, as outlined in **Section 5.1**.

The anticipated flows during the future years without the Site are in the order of 817 AADT in 2023 and 1194 AADT in 2033, with less than 100 vehicles per hour anticipated during both the morning and afternoon peak periods.

7.0 Mitigation and management measures

7.1 Overview

This chapter describes the environmental management approach for traffic, transport and access during the construction and operation of the Site. This chapter also includes the mitigation and management measures for the Site to manage transport impacts from construction and operational activities.

The mitigation and management measures described would be included in a CTMP developed for the Site and included as part of the Construction Environmental Management Plan (CEMP) for the Site.

7.2 Mitigation and management measures

Table 8 outlines the mitigation and management measures that would be implemented to minimise traffic and access impacts during construction of the Site.

Due to low staffing requirements during the operation of the Site and given there are no operational impacts likely due to the Site, mitigation and management measures have not been identified for the Site during operations.

Table 8 Mitigation and management measures

Ref	Mitigation and management measures	Timing
T1	<p>A Construction Traffic Management Plan (CTMP) would be prepared, in consultation with Broken Hill City Council and other relevant stakeholders, and include the following measures:</p> <ul style="list-style-type: none"> Vehicle access to and from the Project Area would be designed and managed to minimise safety risk to pedestrians, cyclists and motorists and to help ensure that construction vehicles can safely enter the Site. All trucks would enter and exit the Project Area in a forward direction and outside of peak periods, where this is feasible, to minimise traffic impacts on the surrounding network during the peak periods Near the site access, appropriate signage, line marking and/or traffic control measures would be used to direct and guide pedestrians, cyclists and motorists past the Project Area during high usage times Construction worker parking along Pinnacles Place and on-site would be reviewed as required to understand if the local parking capacity is likely to be exceeded and whether additional measures are required to reduce parking demand (e.g. shuttle buses). 	Construction

8.0 References

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