

CHAPTER 2

EXISTING ENVIRONMENT



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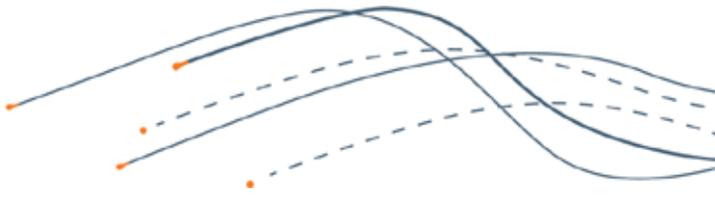
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2 Description of the Existing Environment

This chapter provides an overview of the existing environment relevant to the establishment of the proposed mining lease. The existing environment is described in accordance with the requirements of the Ministerial Determination. Further details regarding existing environmental values are discussed in conjunction with the relevant impact assessment (Chapters 7 to 23).

2.1 Overview of Local Communities

This section provides a brief overview of the local communities surrounding the site of the proposed mining lease. A detailed overview of the towns and local communities is provided in Chapter 21 (Land Use and Tenure) and Chapter 22 (Social Environment).

The proposed mining lease is located within the Wudinna District Council (DC) which covers an area of approximately 5,400 km² (ABS 2013a), encompassing the townships of Warrambo, Kyancutta, Wudinna, Yaninee and Minnipa. The prime source of income within Wudinna DC is agriculture-related industry, predominantly cereal cropping, sheep and beef. At the 2011 Census, the Wudinna DC had a resident population of 1,253 people (ABS 2012a) and had experienced population declines in the preceding five years, a trend which is forecast to continue (DPLG 2011).

The Warrambo township is the closest population centre located approximately 5 km west of the mine pit and 750 m west of the proposed mining lease boundary. The Warrambo township and surrounding area comprised around 47 people and 30 dwellings at the 2011 Census (ABS 2012b).

Wudinna is the main service centre within the Wudinna DC and is located approximately 26 km northwest of the proposed mine. The proposed long-term employee village will be located immediately adjacent to the Wudinna township. Wudinna has a resident population of 557 people (ABS 2012a) which is around 45% of the total population of the Wudinna DC area.

The proposed mine is located in the south-eastern corner of the Wudinna DC, which is bordered by the DC of Kimba (6 km east of the proposed mining lease boundary), the DC of Elliston (3 km south of the proposed mining lease boundary) and the DC of Cleve (9 km southeast of the proposed mining lease boundary). The DC of Kimba covers an area of approximately 4,000 km² and its major township is Kimba, located approximately 60 km east of the proposed mining lease boundary. The DC of Elliston covers an area of approximately 6,500 km² and includes the township of Lock, located approximately 30 km south of the proposed mining lease boundary. The DC of Cleve covers an area of approximately 4,500 km² and includes the township of Darke Peak, located approximately 40 km southeast of the proposed mining lease boundary.

The Eyre Peninsula is served by a number of regional centres, including Port Lincoln on the lower Eyre Peninsula, Whyalla and Port Augusta in the Upper Spencer Gulf and Ceduna on the far west coast. By road, Whyalla is approximately 245 km east of the proposed mining lease boundary; Port Augusta is approximately 255 km east; Port Lincoln is approximately 185 km south; and Ceduna is approximately 235 km northwest.

2.2 Proximity to Infrastructure and Housing

This section provides an overview of residential areas surrounding the proposed mine, the location of social infrastructure and services and the proximity of other infrastructure.

2.2.1 Housing and Services

As indicated in Figure 2-1, the nearest township to the proposed mine site is Warrambo, which offers no retail or other services beyond a small post office and a sports/community club and oval located to the north of the township.

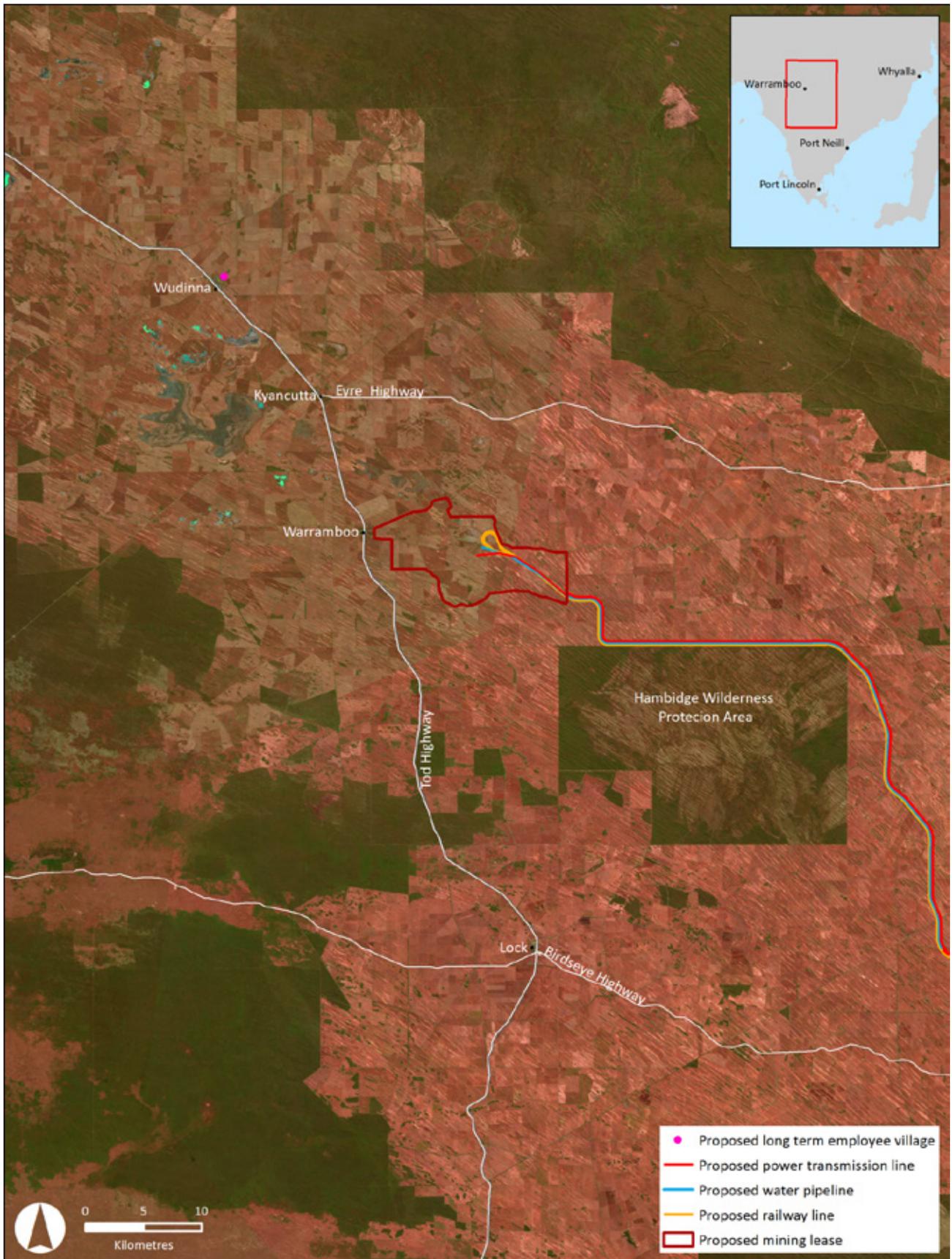


Figure 2-1 Proximity of the Proposed Mining Lease Area to Townships

Wudinna is the main service centre for the Wudinna DC and provides a range of social and recreational services in addition to a variety of retail and business services, including a supermarket, bakery, butcher, pharmacy, newsagent, rural suppliers, accommodation and eateries. As at the 2011 Census, there were 256 dwellings within Wudinna, all of which were detached dwellings. More than 90% of these dwellings were occupied (ABS 2013b).

Lock is located directly south of the proposed mine and is a small service centre for the surrounding rural community. A summary of the services and facilities available in each of these townships is provided in Table 2-1. In 2011, the residential population of Lock was 432, accommodated in 239 dwellings (ABS 2013c).

Table 2-1 Services and Facilities in Local Townships

	Wudinna	Warrambo	Lock
School	✓		✓
Kindergarten	✓		✓
Library	✓		✓
Childcare	✓		
Hospital	✓		
General Practice/Medical Centre	✓		✓
Family/Welfare/Counselling	✓		✓
Dentist	✓		
Police	✓		✓
Country Fire Service	✓	✓	✓
State Emergency Service	✓		
Ambulance	✓		✓
Banking/EFTPOS	✓		✓
Post Office	✓	✓	✓
General Store/Supermarket	✓		✓
Internet Access	✓	✓	✓
Vehicle Repairs	✓		✓
Fuel	✓		✓
Motel/Hotel	✓		✓
Caravan/Camping	✓		✓
Café/Restaurant	✓		✓
Liquor License	✓		✓
Swimming Pool	✓		
Recreation and Sport Facilities	✓	✓	✓

There are currently three inhabited dwellings within the proposed mining lease. An additional 53 dwellings are located on properties within 5 km as depicted in Figure 2-2.

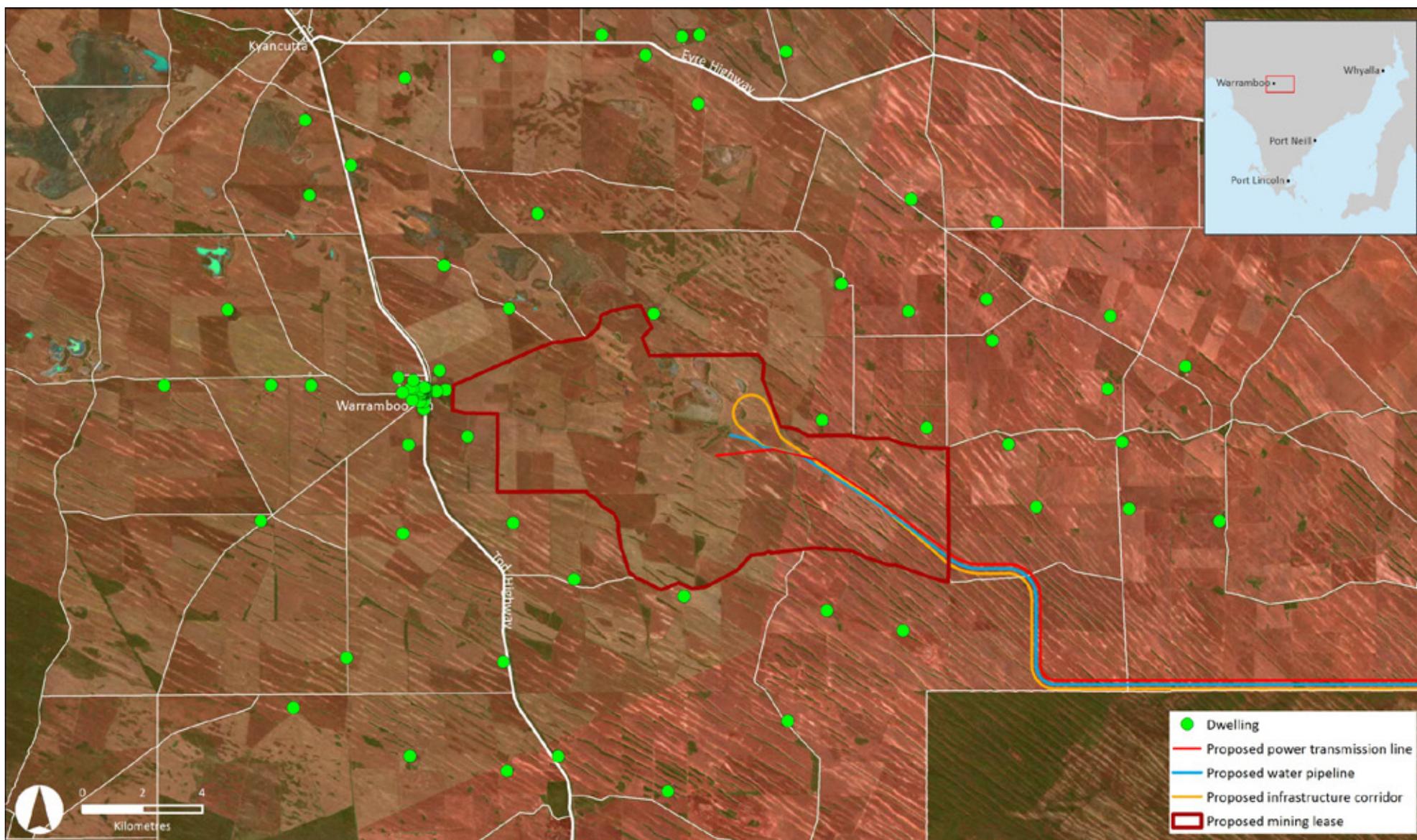


Figure 2-2 Housing within 5 km of the Proposed Mining Lease Area

2.2.2 Exempt Land and Waivers of Exemption

The Mining Act was established to, among other things, facilitate the extraction of the minerals resources which are owned by the State. To facilitate this mineral extraction in areas where pre-existing land uses exist, the Mining Act sets out the process to be followed and includes the requirements for both the proposed mining operator and the landowner.

In summary, the Mining Act (Section 9) sets out a variety of different land uses which fall within the category of 'exempt land' and means that mining operations cannot be undertaken on that land unless a certain process has been undertaken which requires the consent of the landowner.

Categories of 'exempt land' include land used as a cultivated field (eg cropping land) and land that is situated within 400 m of a dwelling or within 150 m of a building, spring, well, reservoir or dam.

Where exempt land exists, the person who has the benefit of the exemption must agree to the conduct of any mining operations. This is referred to as "waiving the exemption" and must be set out in a formal agreement between the person who has the benefit of the exemption and the mining operator and be accompanied by appropriate compensation.

The majority of the land within the proposed mining lease is exempt land by virtue of it being used for cropping or other agricultural purposes, or due to the existence of housing and other buildings such as shearing sheds. However, there are many areas of remnant native vegetation, including within HA869, which are not classified as 'exempt land'.

Figure 2-3 shows the areas of native vegetation, the known locations of dwellings and other buildings and identifies that all other land is exempt by virtue of it being used for cropping or other agricultural purposes. There are no known springs, wells, reservoirs or dams in the area. Table 2-2 sets out the land titles, the person entitled to an exemption and reason for the exemption for all land located within the boundary of the proposed mining lease.

Table 2-2 Exempt land within the Proposed Mining Lease boundary

Name of person entitled to exemption	Certificate of Title	Reason for exemption
Leanne Fay Traeger (registered proprietor); Iron Road Limited (lessee); and Colin Sampson, Carmen Sampson and Troy Sampson (sub-lessees)	CT 5474/844	Cropping land; within 150 m of buildings
David John Murphy and Wendy Karen Murphy	CT 5255/886 & CT 5971/434	Cropping land; within 150 m of buildings
Colin Geoffrey Sampson and Carmen Elizabeth Sampson	CT 5359/856 & CT 5550/29	Cropping land; within 150 m of buildings
DK & BM Murphy Nominees Pty Ltd	CT 5328/6	Cropping land; within 400 m of dwelling; within 150 m of buildings
GA Veitch Pty Ltd (registered proprietor); Georgina Veitch and Leon Veitch (lessees)	CT 5429/702, CT 5184/280 & CT 5945/769	Cropping land; land within 150 m of buildings
Fred Heath Nominees Pty Ltd	CT 5566/577	Cropping land; within 400 m of dwelling; within 150 m of buildings
Daniel John Van De Vorstenbosch and Patricia Kate Van De Vorstenbosch	CT 5391/108	Cropping land; within 150 m of buildings

At the time of writing, Iron Road had not entered into any Waivers of Exemption; however, the process to commence negotiations in this regard has commenced by the service of the relevant Mining Act notice (Form 23A Waiver of Exemption – Request) on each of the landowners, including lessees. Note that the service of this notice is mandatory under the Mining Act (Section 9AA).

It is Iron Road's intention to negotiate the sale and purchase of all the land comprised within the proposed mining lease prior to the commencement of mining operations on those individual parcels. At the very least Iron Road will (and must) enter into appropriate access arrangements, including the "waiving" of any exempt land, before it can commence mining operations on that exempt land.

Iron Road will discuss and negotiate relevant agreements (such as Option to Purchase and Access and Compensation or similar) with each of the landowners. Those agreements will set out relevant matters such as the parties, purchase price, compensation, access to land (including details of exempt land, the waiving of exempt land and any conditions relating to the exemption) and other matters relating to entry and the commencement of mining operations. A statement setting out the cooling-off rights of the person who is waiving the exemption will also be included (Regulation 6 of the Mining Regulations 2011).

The sale and purchase of land is voluntary, as is a person's decision regarding whether or not to waive the benefit of an exemption. However, should a landowner decide not to negotiate an access agreement or the parties cannot reach agreement for some reason, the matter can be referred to the Environment, Resources and Development Court for a resolution.

As discussions and negotiations with landowners and their legal representatives are confidential and commercially sensitive in nature, it is not appropriate to provide any further information.

Iron Road will continue to engage with all landowners and believes that open and constructive discussions will result in a reasonable prospect of gaining full access to land in due course.

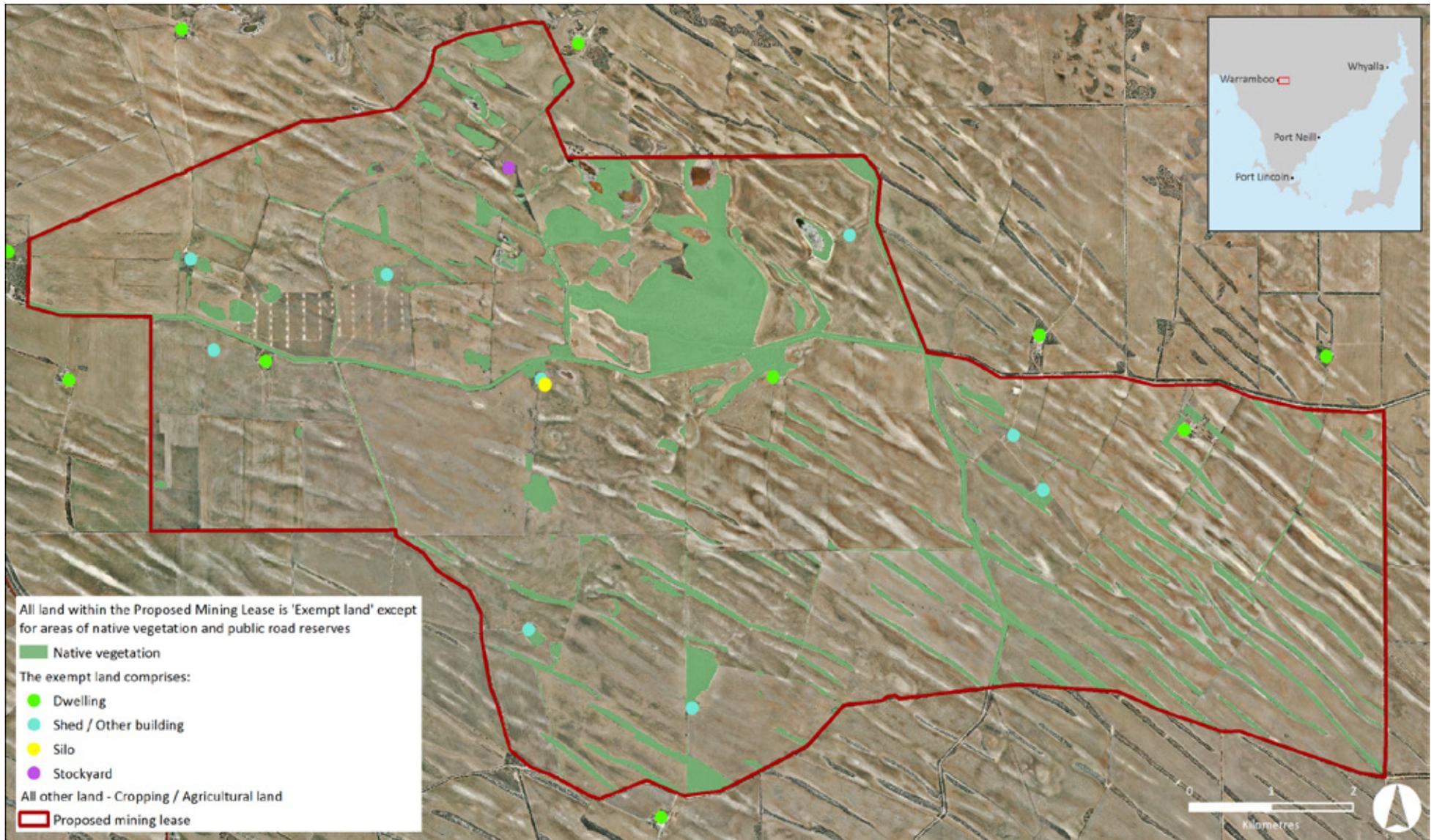


Figure 2-3 Exempt Land Areas

2.2.3 Utilities

The Eyre Peninsula is connected to a range of electricity, water, gas and communications networks that service residential, agricultural and industrial users. Existing mining operators on the Peninsula have utilised pre-existing infrastructure during project development. It is widely considered that existing infrastructure is largely at capacity, with little scope for additional demand to be supported (Deloitte 2013).

The location of the mine site in relation to existing utilities infrastructure is depicted in Figure 2-4.

Electricity

Electricity on the Eyre Peninsula is provided from the South Australian Electricity Grid via the transmission (ElectraNet) and distribution (SA Power Networks) networks. The South Australian Grid is connected to the National Electricity Market via two interconnector systems. South Australian electricity supply is sourced from coal fired power stations at Port Augusta (16%), nine gas fired power stations (65%), various wind farms (17%) and diesel generation (2%) (Deloitte 2013). The generation capacity in South Australia is typically consistent with the current peak demand requirements without reliance on the interconnectors.

Within the Eyre Peninsula, electricity is transmitted via the South Australian Electricity Grid, comprising a 275 kV network to Cultana. From Cultana, 132 kV lines supply Yadnarie, Wudinna and Port Lincoln. There are other local sections of transmission lines throughout the Peninsula connecting wind farms and existing mining projects.

The existing electricity network offers limited opportunities for additional demand without significant upgrade as the infrastructure is near capacity (Deloitte 2013).

Water Supply

The SA Water Eyre Peninsula pipeline delivers treated River Murray water between Kimba and Lock. The pipeline has the capacity to supply up to 1.4 GL of water to the Eyre Peninsula and was established to ease the pressure on groundwater basins (SA Water 2008). River Murray water currently supplies approximately 39% of the region's water requirements (Deloitte 2013).

Aside from River Murray water, the remaining reticulated water supply for much of the Eyre Peninsula comes from a number of well-fields. Those groundwater supplies are located near Port Lincoln, between Lock and Elliston and numerous groundwater basins at Polda, Uley-Wanilla, Uley South and Lincoln. Groundwater sources currently supply approximately 37% of the region's water requirements (Deloitte 2013).

The Tod River is the only permanently flowing waterway on the Eyre Peninsula and has a capacity of 11,300 ML (SA Water 2014). The Tod Reservoir currently supplies approximately 7% of the region's water requirements (Deloitte 2013).

Dams and recycled water provide another key water resource on most areas of the Peninsula, especially in areas outside of the reticulated water scheme. Dams and recycled water sources currently supply approximately 6% and 11% of the region's water requirements respectively (Deloitte 2013).

Gas

Gas supply to the Eyre Peninsula is limited to a connection from the Moomba to Adelaide pipeline system which has a connection to Whyalla. This connection has a capacity of 24 TJ/day, with the majority currently utilised within Whyalla. As such, there is limited capacity for additional gas demand without significant upgrade (Deloitte 2013).

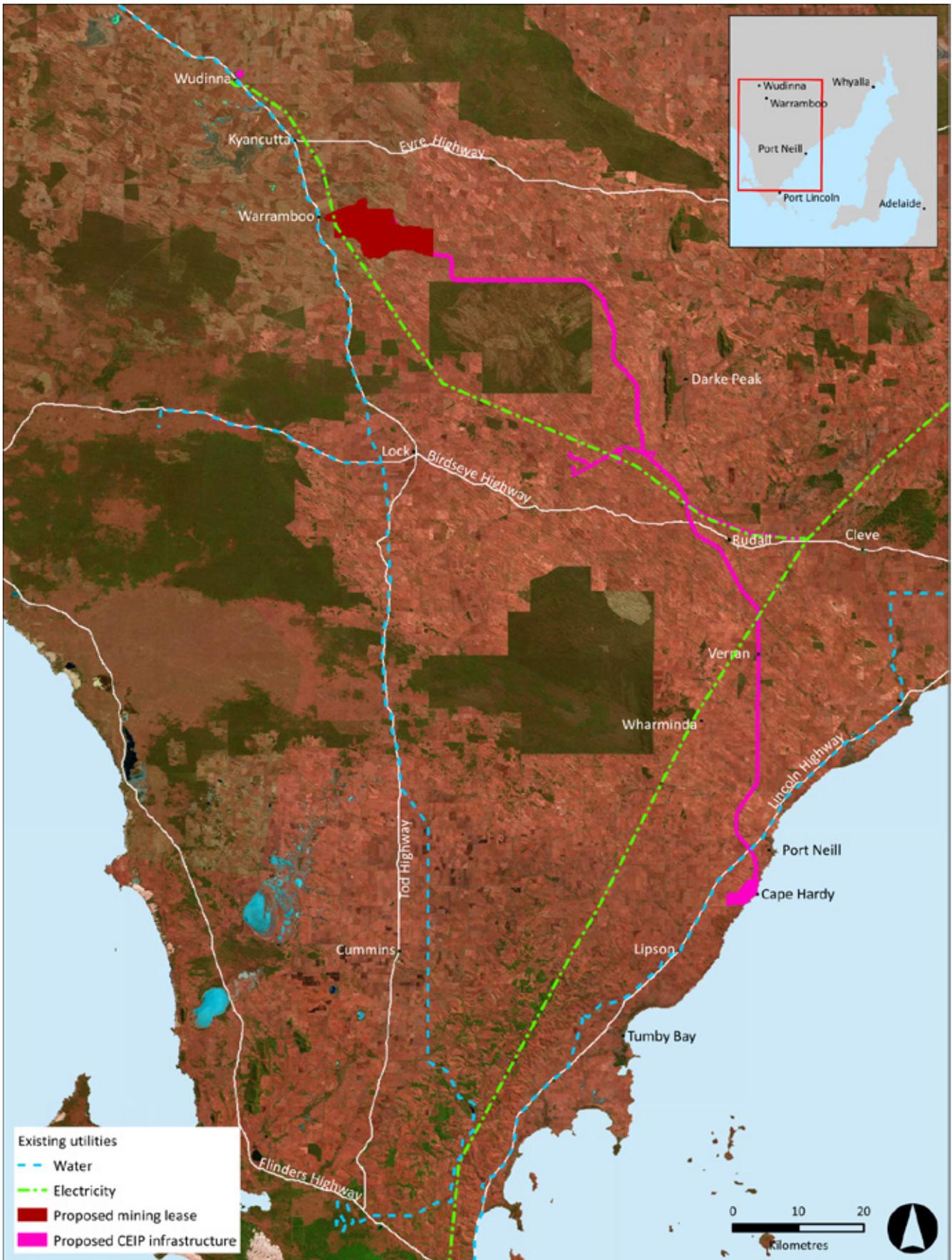


Figure 2-4 Utilities Infrastructure

2.2.4 Transport

This section provides an overview of the existing road, rail, air and maritime transport infrastructure located on the Eyre Peninsula. The location of the mine site in relation to existing transport infrastructure is presented in Figure 2-5.

Road

The proposed mining lease is located 245 km by road from Whyalla and 189 km by road from Port Lincoln. The Tod Highway is the closest major road, running north to south approximately 1 km west of the proposed mining lease boundary, connecting Kyancutta and Lock via Warrambo. It consists of a single carriageway with one lane in each direction and on average, approximately 220 vehicles travel along the Highway each day.

The Eyre Highway is also within close proximity, located approximately 5 km north of the proposed mine site. The Eyre Highway traverses the top of the Eyre Peninsula between Port Augusta and Ceduna and joins with the Tod Highway at Kyancutta where the Tod Highway ceases and the Eyre Highway continues on to Wudinna and beyond. It consists of a single carriageway with one lane in each direction, carrying on average between 700 and 800 vehicles per day.

Both the Tod Highway and Eyre Highway are maintained by the South Australian Department for Planning, Transport and Infrastructure.

Kimba Road runs perpendicular to the Tod Highway from Warrambo to Kimba and is maintained by both DC Wudinna and DC Kimba and is a single carriageway unsealed pavement of approximate 5.9 m in width. The average number of vehicles the road carries per day is unknown; however it is likely substantially less than the Tod Highway, assumed to be between 100-150 vehicles per day. Kimba Road will run through the proposed mining lease and will therefore need to be realigned to allow for the construction and operation of the mine (refer Chapter 3 for further details).

A detailed description of the local road network is provided in Chapter 8.

Rail

The Thevenard to Port Lincoln narrow gauge rail network is located 800 m west of the proposed mining lease and runs parallel to the Tod Highway. The rail network is operated by Genesee and Wyoming Australia Pty Ltd (GWA) and originates near Ceduna, approximately following the Eyre Highway to Kyancutta. It then turns south, following the Tod Highway from Kyancutta through Warrambo, Lock and Cummins to the south, before deviating to the southeast near the Flinders Highway and heading towards Proper Bay Road. The rail line loops around Kathai Conservation Park and enters Port Lincoln from the southwest.

The Buckleboo rail line is a narrow gauge railway extending from Buckleboo to Port Lincoln via Kimba, Darke Peak, Rudall, Verran and Cummins and is also operated by GWA. The nearest point of the line is approximately 40 km east of the proposed mine.

A new railway line is proposed as part of the CEIP to transport the iron concentrate from the mine at Warrambo to Iron Road's proposed deep sea water port at Cape Hardy. The proposed railway line will be approximately 145 km long and will cross the Buckleboo railway line near its intersection with the Balumbah to Kinnard Road.

Air

The proposed mining lease will be located between two commercial airports, the closest being Port Lincoln and the next closest being Whyalla. Additional airfields (non-commercial) are located at Wudinna, Kimba, Cowell, Lock, Tumby Bay, Cummins and Elliston. To support the CEIP, it is proposed that the Wudinna airport will be upgraded to accommodate commercial flights. That upgrade will be undertaken by the Wudinna DC which is the owner and operator of the airport.

Ports

There are four existing ports in the Eyre Peninsula region: Port Thevenard, Port Bonython, Port Lincoln and Whyalla (Deloitte 2013). The Port of Thevenard at Ceduna on the west coast is managed by Flinders Ports and exports approximately three million tonnes of produce per annum. Additional capacity for export is constrained by the depth of water (and consequently ship type) and the site has limited room for expansion as it abuts residential and recreation areas.

Port Bonython at Whyalla is owned by the State Government and is operated by Santos for the export of approximately 250,000 tonnes of hydrocarbon products per annum. Additional capacity for export is constrained by the safety and practical implications of integrating with the existing uses at the site associated with the hydrocarbon processing plant.

Port Lincoln is managed by Flinders Ports and exports between 1-3 million tonnes per annum of predominately grains and seeds. Export volumes are dependent on the amount of agricultural product generated in a given year. Expansion of Port Lincoln is constrained by the need to move product through the township and the impact to the amenity of the community.

The Port of Whyalla is South Australia's largest export facility, exporting approximately 12 million tonnes of hematite iron ore per annum. The Port is owned by the State Government and operated by Arrium Limited who has recently expanded the facility to double its capacity to allow for additional export from their existing mines in the Middleback Ranges.

None of the existing or planned ports on the Eyre Peninsula are suitable for the export of Iron Road's proposed 21.5 Mtpa of iron concentrate. Iron Road announced in December 2012 that after a comprehensive technical and environmental review of all existing and planned ports in the area, it proposed to establish a new deep sea port at Cape Hardy to facilitate the export of iron concentrate from the proposed mine at Warrambo. Cape Hardy is located approximately 7 km south of Port Neill on the east coast of the Eyre Peninsula and will have a capacity of 70 Mtpa so that third parties can utilise the facility.

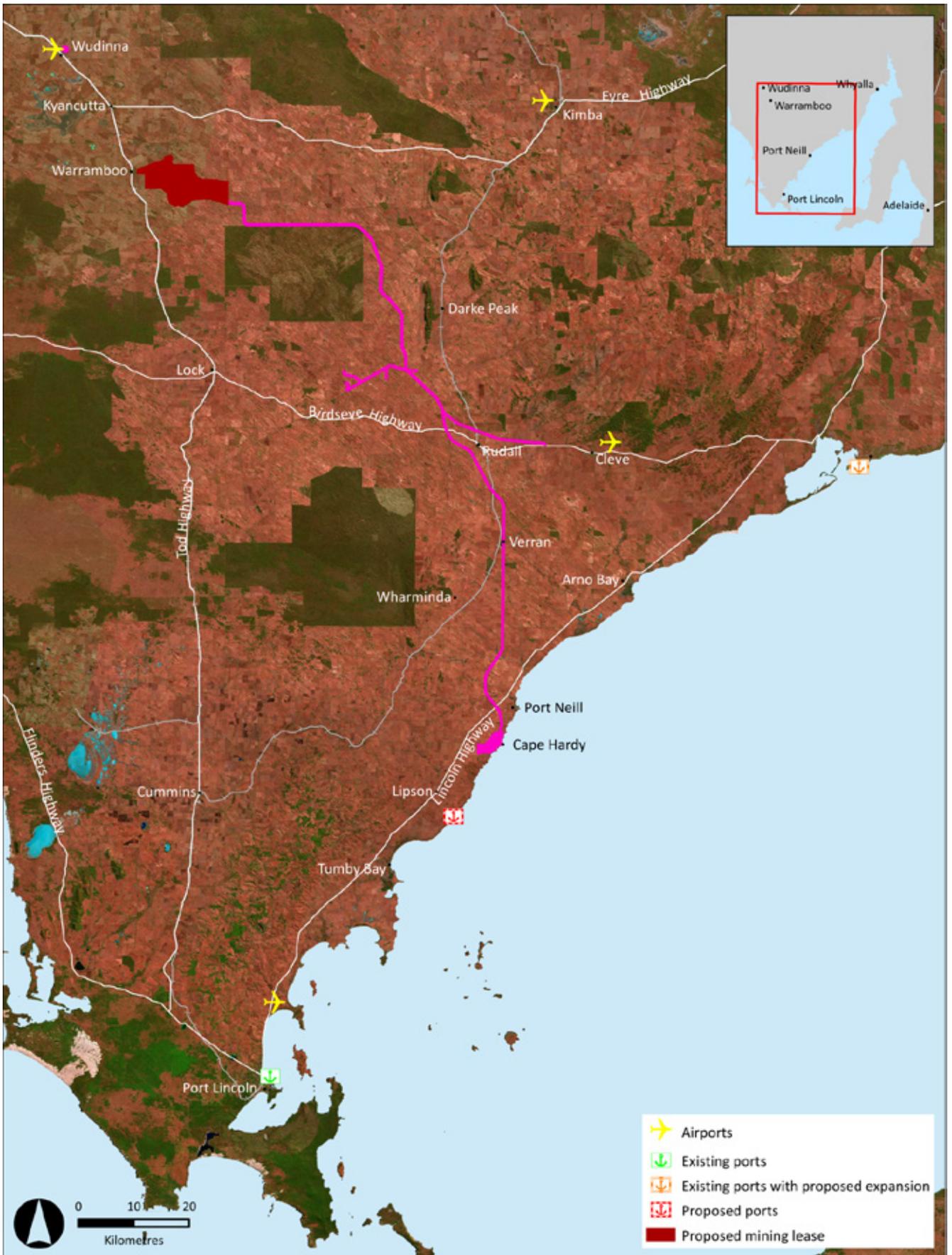


Figure 2-5 Transport Infrastructure

2.3 Planning Framework

This section provides an overview of the relevant strategies and policies applicable to the CEIP, including the contribution of the proposed mining lease to the achievement of relevant objectives and goals. The zoning of the proposed mining lease and a summary of the relevant planning policy is also provided.

2.3.1 South Australia’s Strategic Plan

South Australia’s Strategic Plan (2011) provides a framework for the ongoing growth and development of the State and was developed based on seven strategic priorities:

- Creating a vibrant city
- Safe communities, healthy neighbourhoods
- An affordable place to live
- Every chance for every child
- Growing advanced manufacturing
- Realising the benefits of the mining boom for all
- Premium food and wine from our clean environment

Development of the CEIP will assist the South Australian Government in achieving the goals outlined in South Australia’s Strategic Plan. A brief overview of the contribution of the CEIP to the strategic priorities outlined in South Australia’s Strategic Plan is provided in Table 2-3. Further detail is provided in Chapter 23 and Appendix R.

Table 2-3 Strategic Alignment of CEIP

Strategic Priority	Relevance to CEIP
Creating a vibrant city	<p>The CEIP represents a significant investment to the Eyre Peninsula region, resulting in regional economic benefits. Beyond the Eyre Peninsula, the project is estimated to contribute an average of \$518 million per annum to Gross State Product (GSP) during construction and an average of \$2.7 billion per annum during operation. Direct and indirect employment in SA as a whole is expected to increase to an average of 3,027 jobs during construction and 1,985 jobs during operation. The economic benefits experienced throughout South Australia will support the ongoing growth and development of the Adelaide CBD, indirectly supporting job growth and a vibrant CBD.</p>
Safe communities, healthy neighbourhoods	<p>During operations, the mine workforce is proposed to be accommodated within a designated long-term employee village adjacent to the township of Wudinna, providing a significant population boost to the district and long-term support to local businesses and services.</p> <p>Wudinna DC is currently preparing a structure plan for the Wudinna township to support the proposed long-term employee village. The structure plan is being funded by Iron Road with the key objectives of:</p> <ul style="list-style-type: none"> • Maximising economic benefits to existing service providers • Promoting integration with Wudinna and the co-sharing of facilities and services • Maximising opportunities for the adaptive reuse of the long-term employee village when no longer needed by Iron Road

Strategic Priority	Relevance to CEIP
An affordable place to live	Rather than placing pressure on the existing housing stock, accommodation for staff at the mine site will be provided on-site during construction and in the long-term employee village adjacent to Wudinna during operation. In addition, the CEIP represents a significant upgrade to the infrastructure of the Eyre Peninsula, including roads, electricity network and the Wudinna airport that will all benefit the community and region. These improvements will be funded by the private sector, rather than requiring public investment.
Every chance for every child	The whole of the CEIP project will provide an estimated 2,490 jobs during construction and 760 ongoing jobs during operation. In addition, the CEIP will provide opportunities for training and development. Direct and indirect employment in SA as a whole is expected to increase to an average of 3,027 jobs during construction and 1,985 jobs during operation.
Growing advanced manufacturing	The mine site includes on site-processing of the resource, representing a significant local investment in advanced manufacturing, supporting additional employment and building technical capability.
Realising the benefits of the mining boom for all	As a standalone project, the CEIP will provide a significant economic stimulus to South Australia and will directly provide an estimated 2,490 during construction and 760 ongoing jobs during operation. In addition, the CEIP Infrastructure has the potential to unlock significant third party investment through the delivery of a new export facility with capacity for third parties, a reinforced electricity supply to the Eyre Peninsula and improved rail infrastructure to the central Eyre region. The successful delivery of the CEIP will also contribute significant royalty payments to the State, furthering the benefits of the project.
Premium food and wine from our clean environment	Although the export of grain is not proposed as part of this EIS, Iron Road has signed a memorandum of understanding (MOU) with a global grain handling organisation. This MOU provides for both parties to jointly investigate the export of grain via the proposed port (subject to necessary upgrades and regulatory approvals) and may provide an alternate export pathway for agriculture on the central Eyre Peninsula. Approved clearance of native vegetation requires achievement of a Significant Environmental Benefit (SEB) offset. Iron Road is liaising with the Eyre Peninsula NRM Board about potential environmental programmes which would be suitable to offset the impact from clearance of native vegetation.

Other State Strategies and Policies

A range of additional State documents outline the strategic direction relevant to the CEIP as a whole, as depicted in Table 2-4.

Table 2-4 State Strategic Framework

Title	Objective	Relevance
State Natural Resources Management (NRM) Plan	To manage and protect South Australia's natural resources.	The State NRM Plan seeks to develop NRM capability in SA, sustainably manage natural resources and improve the condition and resilience of natural systems. Approved clearance of native vegetation requires achievement of a SEB offset. Iron Road is liaising with the Eyre Peninsula NRM Board about potential environmental programmes which would be suitable to offset the impact from clearance of native vegetation. Further information of relevance to the State NRM Plan is provided in Chapters 11 and 12.

Title	Objective	Relevance
South Australia's Waste Strategy	South Australia's Waste Strategy is underpinned by two key objectives; to: avoid or reduce the amount of overall waste; and maximise the useful life of materials by making them last longer through re-use and recycling.	The mine site will generate waste during construction, operation and closure. Iron Road have committed to minimise waste to landfill, with waste products recycled, or re-used on site for an alternate purpose.
SA Greenhouse Gas Strategy	Provides a framework for all of South Australia's greenhouse targets and commitments to be met in a comprehensive and coordinated manner.	The CEIP as a whole will have a large energy requirement. Significant improvements of >75% reduction in total CO ₂ emissions have been achieved during the design stages. Where practicable, renewable energy sources will be used and energy efficiency measures incorporated to contribute toward the achievement of SA's greenhouse gas reduction objectives.

2.3.2 Wudinna DC Development Plan

The area comprising the proposed mining lease is zoned Primary Production in the Wudinna DC Development Plan. That Zone envisages economically productive, efficient and sustainable primary production. The Warramboos township is located within a Settlement Zone, to accommodate low density housing and small scale community and business facilities. The grain handling infrastructure located east of Warramboos is within the Bulk Handling Zone, restricting the establishment of sensitive uses such as additional dwellings that would conflict with the existing grain facilities.

The zoning of the mine site is presented in Figure 2-6, with the relevant Development Plan policy summarised in Table 2-5. The planning policy summary highlights the need for Iron Road to be socially and environmentally conscientious in the design, operation and closure of the mine site, to minimise land use and traffic conflict and to give consideration to the appearance of the mine operation and its impact on landscape character.

Table 2-5 Development Plan Policy Summary

Policy Area	Summary of Provisions
General	Development should be compatible with other uses in the locality. Infrastructure should be economically provided, minimising negative social and environmental impact.
Transportation and Access	Development and associated points of access should provide for safe and efficient use of vehicles, making best use of existing infrastructure. Transport corridors should be sited to not unreasonably interfere with the health and amenity of sensitive land uses. Industrial and commercial vehicle movements should be directed away from residential areas. Direct vehicle access points to the Eyre Highway should be avoided. Vehicle parking areas should incorporate landscaping and reduce opportunities for crime.

Policy Area	Summary of Provisions
Mineral Extraction	<p>Development of mining activities to contribute to the sustainable growth of the mining industry. Impacts on the quality and level of groundwater resources should be minimised.</p> <p>Sensitive land uses should be protected from environmental nuisance such as dust or vibration resulting from mining operations.</p> <p>Mining areas should be removed from public view through the orientating of the quarry face, the provision of densely vegetated and/or mounded land.</p> <p>Mining developments should make adequate provision for rehabilitation of the site.</p>
Natural Resources	<p>Natural resources and the environment should be retained, protected and restored.</p> <p>Development should maximise the use of stormwater to encourage the sustainable development of water resources.</p> <p>Native flora, fauna and ecosystems should be protected, retained conserved and restored. Development should facilitate the linking of existing native vegetation to support habitats suitable for the movement of fauna.</p> <p>Areas known to be at risk of erosion, site contamination or other land degradation should be protected from inappropriate development.</p>
Rural Development	<p>Development should foster economically productive, efficient and environmentally sustainable primary production.</p> <p>The scenic qualities of rural landscapes should be protected.</p> <p>The development of wind farms should be encouraged.</p> <p>Development should not occur within 500 m of a National Park, Conservation Park, Wilderness Protection Area or significant patch of remnant native vegetation.</p>
Design and Appearance	<p>Development should be of a high standard of design that responds to and reinforces the positive aspects of the local environment.</p> <p>Buildings, landscaping and signage should have a coordinated appearance that enhances the visual attractiveness of the locality.</p> <p>Outdoor lighting should not result in light spillage to adjacent land.</p>
Hazards	<p>Development should be limited on areas susceptible to natural hazard risk including flooding and bushfire.</p> <p>Environmental values and ecological health should be protected from the disturbance of acid sulphate soils.</p> <p>An appropriate assessment and remediation of contaminated land should be undertaken to ensure the site is appropriate for its intended use.</p> <p>Hazardous materials should be appropriately stored, contained and handled to minimise risk to life, property and the environment.</p>
Infrastructure	<p>Infrastructure should be provided in an economical and environmentally sensitive manner.</p> <p>The visual impact of infrastructure facilities should be minimised.</p> <p>Where possible, existing infrastructure should be utilised in an efficient and cost-effective manner.</p>

Other Local Strategies and Policies

A range of local documents outline the regional strategic directions of relevance to the mine site and are discussed in Table 2-6. Note that Section 122 of the *Local Government Act 1999* requires all Councils to maintain a Strategic Management Plan.

Table 2-6 Local Strategic Framework

Title	Objective	Relevance
Wudinna DC 2012-2017 Community Plan	<p>Identifies the priorities and strategic direction for Council, including:</p> <ul style="list-style-type: none"> • Create a cohesive and thriving community • Provide a built environment that meets the needs of the wider community • Sustainable management of the environment • Actively promote business and commercial opportunities 	<p>The CEIP will provide a significant economic stimulus to South Australia and the Eyre Peninsula region, providing an estimated 2,490 jobs during construction and 760 ongoing jobs during operation. The job growth is anticipated to support economic growth throughout the Eyre region and the Wudinna DC.</p> <p>Wudinna DC is currently preparing a structure plan for the Wudinna township to support the proposed long-term employee village. The structure plan is being funded by Iron Road with the key objectives of:</p> <ul style="list-style-type: none"> • Maximising economic benefits to existing service providers • Promoting integration with Wudinna and the co-sharing of facilities and services • Maximising opportunities for the adaptive reuse of the village following use by Iron Road
Eyre Peninsula Natural Resource Management Plan	<p>The Plan was developed under the <i>Natural Resources Management Act 2004</i> and establishes long-term targets over 20 years and shorter-term targets to be achieved within one to five years. The plan has been developed based on achieving:</p> <ul style="list-style-type: none"> • Healthy and productive natural resources and natural systems • Using and managing natural resources within environmental constraints • Progressive and vibrant communities and industries valuing our natural resources • Effective partnerships based on knowledge driving natural resource management 	<p>Approved clearance of native vegetation requires achievement of a SEB offset. Iron Road is liaising with the Eyre Peninsula NRM Board about potential environmental programmes which would be suitable to offset the impact from clearance of native vegetation.</p>

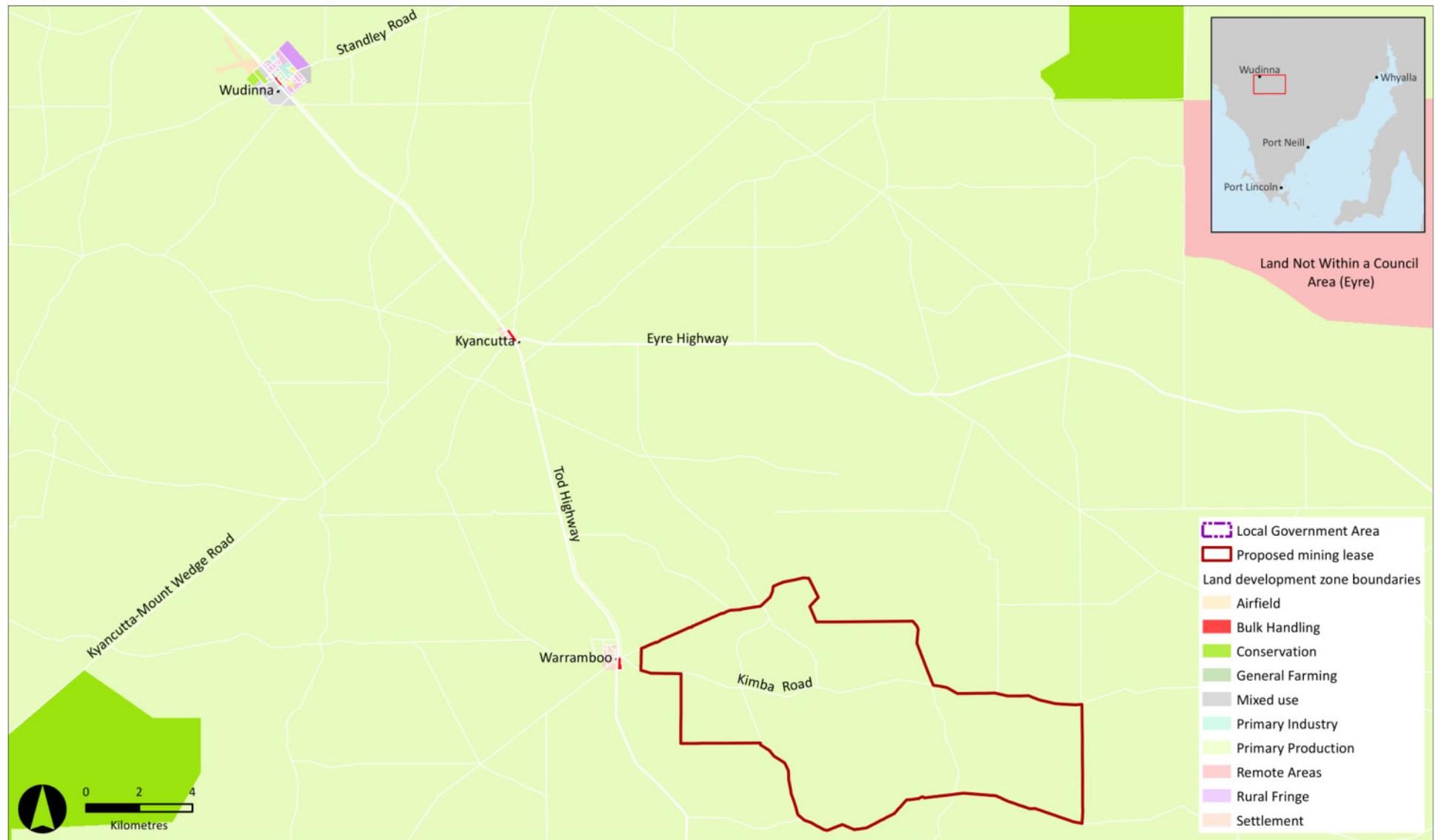


Figure 2-6 Proposed Mining Lease Area Zoning

2.4 Topography and Landscape

The central Eyre Peninsula is dominated by sand dune covered plains. Isolated peaks such as Darke Range and Caralue Bluff are visible from the mine site, with elevation typically increasing northeast of Darke Peak and north of Wudinna. The gentle, undulating topography (Plate 2-1 and Plate 2-2) continues to the northeast of the Peninsula, with several areas of higher elevation near Cowell. The majority of the mine site lies within the dunal planes and is less than 100 m AHD. The topography of the area is depicted in Figure 2-7.



Plate 2-1 Undulating Farmland within the Proposed Mining Lease Area (April 2014)



Plate 2-2 Undulating Farmland within the Proposed Mining Lease Area (October 2011)

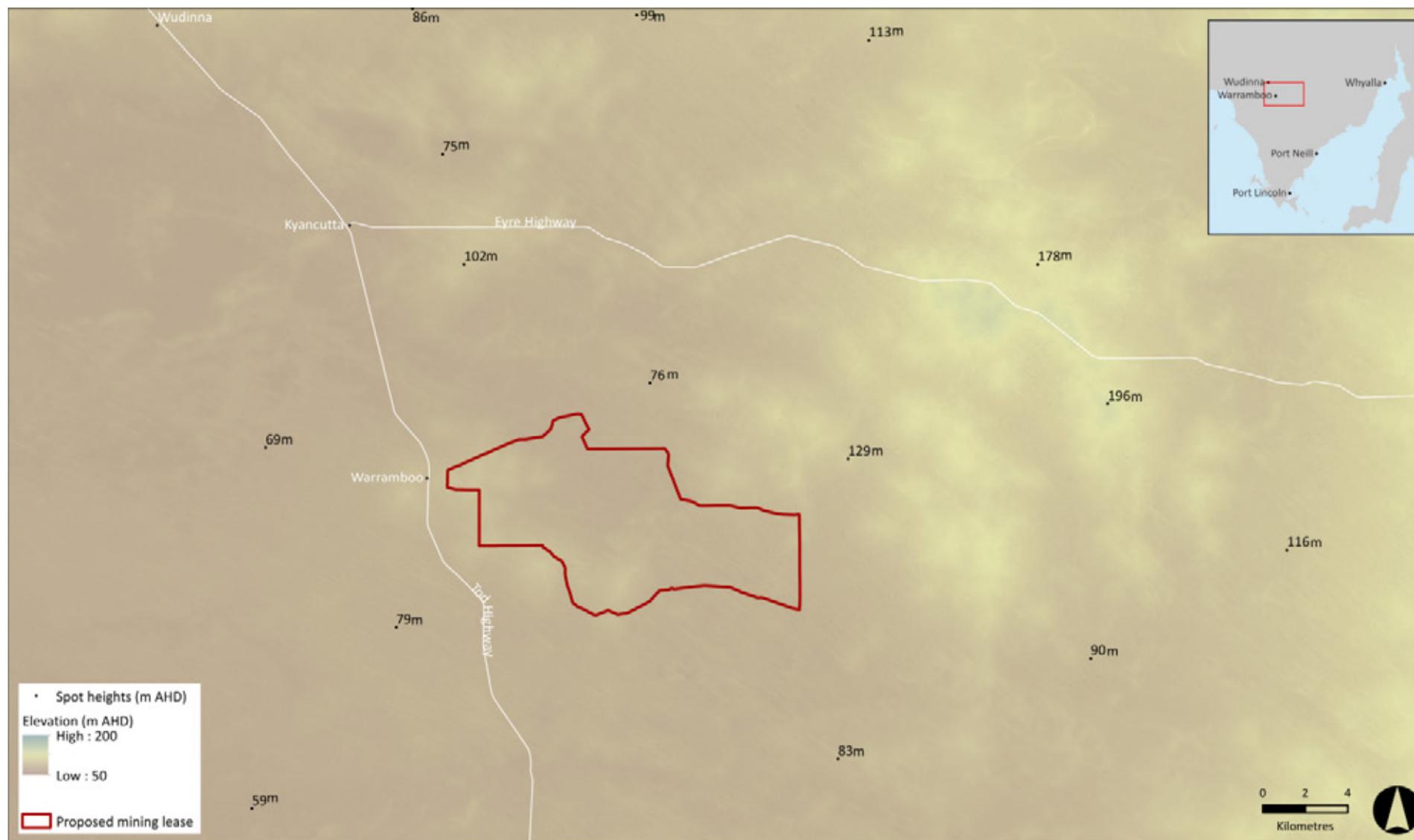


Figure 2-7 Local Topography

2.5 Climate

Climatic conditions are the primary driver influencing natural ecosystems within the region. In addition, they also represent a major factor in influencing the level of impact and risk for the various factors discussed in this document. For example, wind speed and patterns affect dust and particulate transfer, whilst rainfall can impact erosion, groundwater recharge and stormwater management. This section provides an overview of existing climatic conditions on the Eyre Peninsula relevant to the construction, operation and closure of the proposed mine.

2.5.1 Temperature and Rainfall

The Bureau of Meteorology (BOM) distinguishes Australia into six climate zones based on temperature and humidity. The Eyre Peninsula is located within the 'hot summer, cool winter' zone, as is the Adelaide Metropolitan area. Despite being located within the same climate zone, the Eyre Peninsula experiences significantly different weather patterns to Adelaide. Mean annual rainfall on the Eyre Peninsula ranges from 263 mm at inland areas such as Wudinna, to 381 mm at coastal locations such as Port Lincoln (BOM 2013). Comparatively, Adelaide typically receives a higher level of rainfall, with a mean of 543 mm per annum (BOM 2013). Differences in temperature are also noted when comparing locations on the Eyre Peninsula and Adelaide. Mean annual maximum and minimum temperatures at Adelaide range from 22.3°C to 12.2°C, compared to 25.1°C to 10.2°C in Wudinna and 23.5°C to 10.3°C at Kimba (BOM 2013). A comparison of mean monthly temperature and rainfall patterns between Adelaide and various locations on the Eyre Peninsula is provided in Figure 2-8.

Relative humidity in South Australia is generally very low. It is usually highest in winter and lowest in summer and is highest in coastal areas. Within the locality of the mine site, mean annual relative humidity (at 3 pm) is 48% in Cleve and 36% in Wudinna (BOM 2013).

The nearest weather station to the mine site is the Kyancutta station, however, hourly data is not available. The next nearest station providing hourly data is located at Wudinna. As such, the complete set of data recorded at the Wudinna station is preferred. All other stations utilised also provide hourly data which can be used as a comparison between meteorological conditions at the various locations. Weather data from Kyancutta is provided in Appendix J.

2.5.2 Wind

At Wudinna, morning northerly winds are predominant in the winter, autumn and spring months, with strong south-easterly winds in summer months. Afternoon breezes are predominantly from the south in summer and autumn, the west in spring and from the northwest in winter. Roses of wind direction versus wind speed measured at 9am and 3pm at Wudinna are shown in Figure 2-9 and Figure 2-10 (BOM 2012).

2.5.3 Natural Hazards

This section identifies natural hazards that may affect the construction, operation or closure of the mine site.

Storm Events

The Eyre Peninsula region experiences few severe storm events. On average, five to ten days of thunder are observed on the Peninsula each year (BOM 2013a). Similarly, a low density of total lightning flashes is observed on the Peninsula with an average of 0-1 flashes per square kilometre each year (BOM 2013a). South Australia and the Eyre Peninsula are unaffected by tropical cyclones with an average of zero cyclones per annum (BOM 2013b).

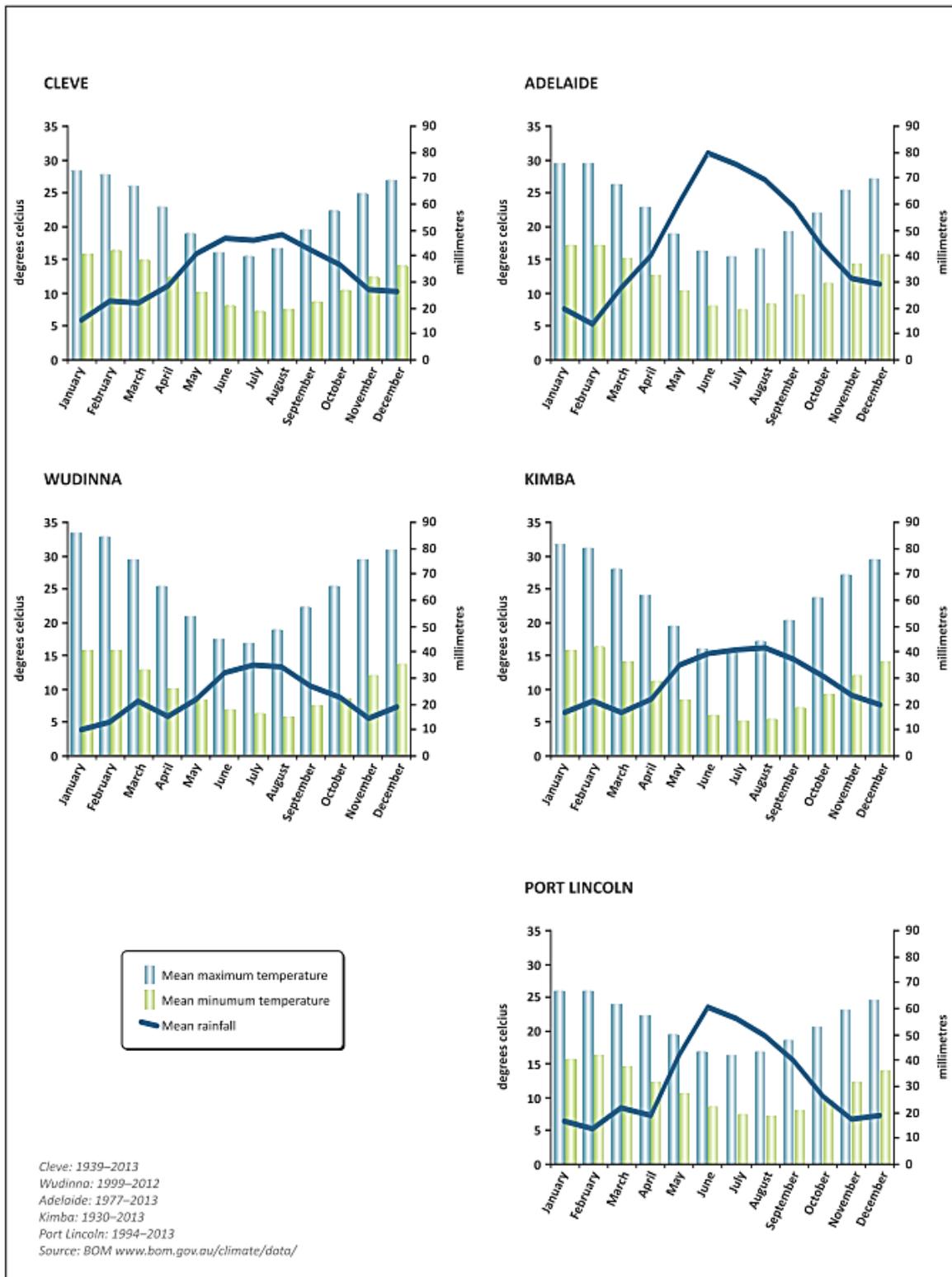


Figure 2-8 Climatic Conditions



Figure 2-9 Seasonal Wind Roses (9am Wudinna)

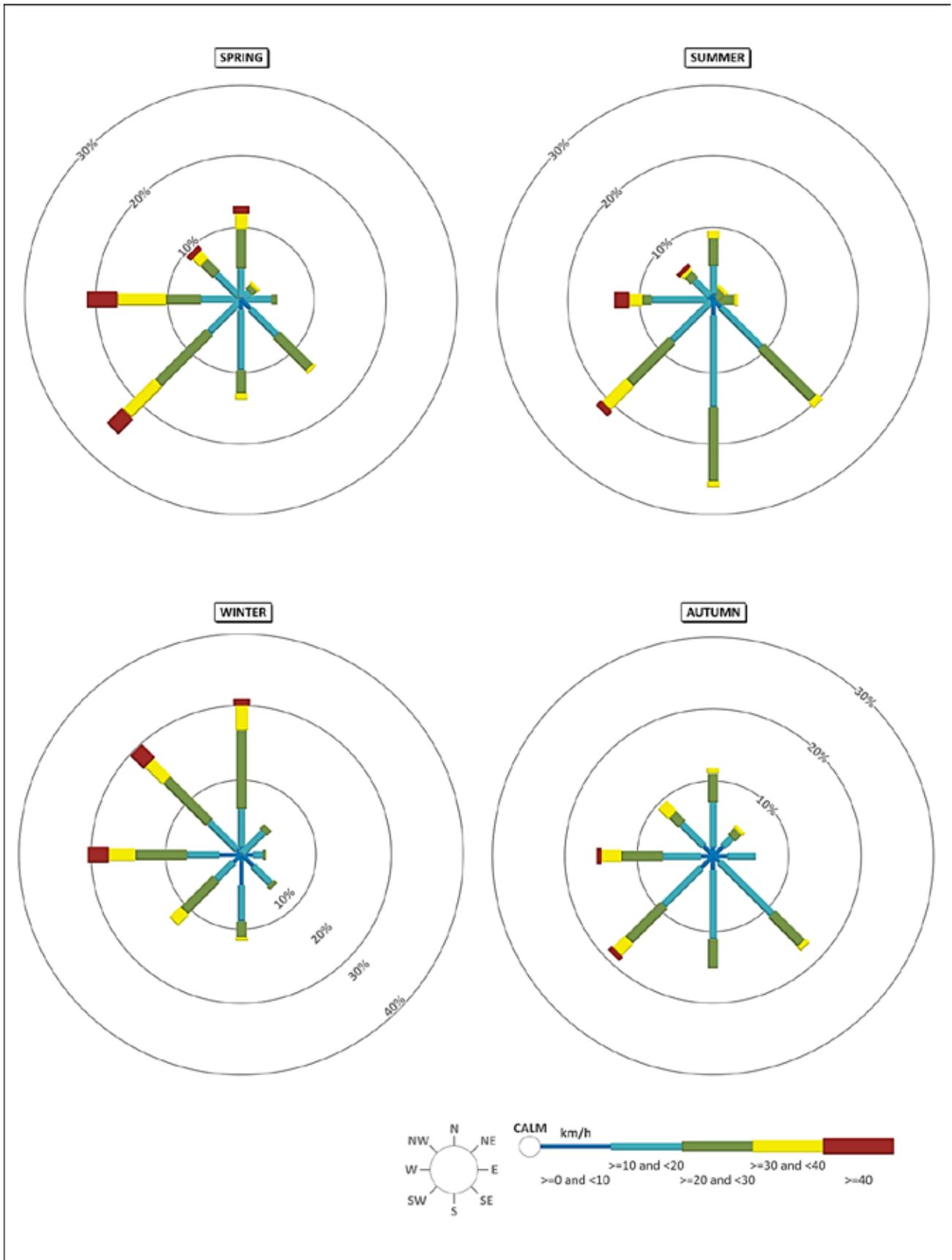


Figure 2-10 Seasonal Wind Roses (3pm Wudinna)

Drought

Drought hazards in Australia have no identifiable pattern; however the risk of drought in any given area is directly associated with the index of rainfall variability. The index of rainfall variability indicates how rainfall will vary in a given location from year to year (BOM 2013c). The majority of coastal areas in Australia exhibit lower variability, meaning the rainfall will tend to be relatively consistent from one year to the next. Conversely, areas in central Australia tend to have high rainfall variability, meaning rainfall is likely to be irregular from one year to the next. The Eyre Peninsula is bisected by Goyder's Line which identifies land in South Australia which receives more than 30 cm of rain annually and is able to support sustainable agriculture. Goyder's line runs from approximately Arno Bay, northwest to approximately Ceduna (State Library of South Australia 2014). In recent times, severe rainfall deficiencies have been observed across much of the Eyre Peninsula and the CEIP project area, as shown in Figure 2-11 (BOM 2014a).

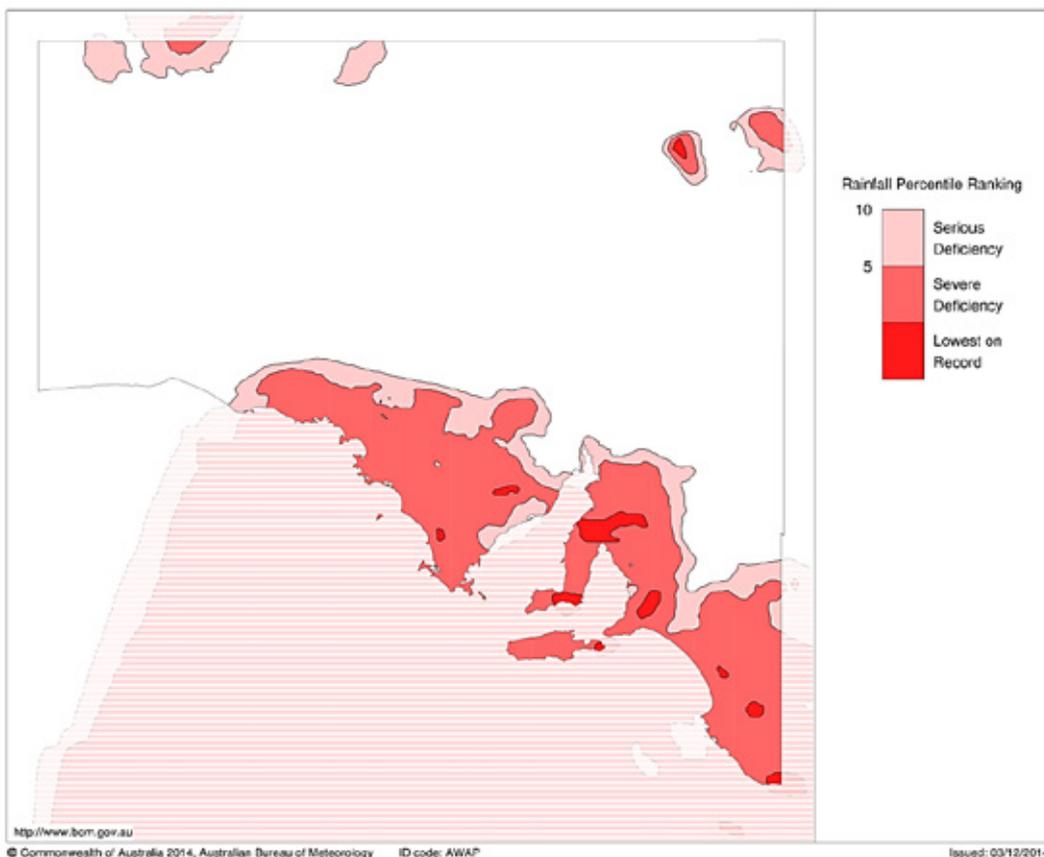


Figure 2-11 South Australian Rainfall Deficiency 1 September to 30 November 2014

Fire

South Australia's climatic conditions provide an ideal environment for frequent bushfires. Typically, incidences of bushfire are more frequent in dry summer conditions. To protect people and property, fire bans are implemented annually during high risk months. Fire bans within the Eastern Eyre Peninsula, Lower Eyre Peninsula and West Coast districts (the location of the CEIP) were applied from 1 November to 30 April during the 2013-14 fire danger season (CFS 2014). Remnant vegetation coverage on the Eyre Peninsula is patchy, predominantly limited to designated conservation areas, with the majority of the region cleared for agricultural purposes. As such, there are predominantly low fuel loads, resulting in quick burning grass fires in the agricultural regions.

Historically, research indicates that South Australia can expect serious fires within the State in six or seven years out of ten (CFS 2014a). A summary of known historical significant fires on the Eyre Peninsula is provided in Table 2-7 (CFS 2014a).

Table 2-7 Historical Significant Fire Events on Eyre Peninsula

Date	Location	Area Affected
1933-34	Eyre Peninsula	Unknown
1938-39	Eyre Peninsula	Unknown
1943-44	Eyre Peninsula	Unknown
1959	Wudinna	76,000 Ha
1968-69	Murdinga	8,000 Ha
February 2001	Tulka	14,000 Ha
2002	Gawler Ranges	15,000 Ha
January 2005	Wangary	78,000 Ha
January 2009	Port Lincoln (Proper Bay)	252 Ha
December 2009	Port Lincoln	650 Ha
January 2014	Ceduna (Yumburra Conservation Park)	46,000 Ha

2.6 Geohazards

This section identifies geohazards that may affect the construction, operation or closure of the mine site.

Regional Geology

The oldest rocks of the Eyre Peninsula are the Achaean Sleaford Complex, comprising ortho and para-gneisses, granite, granodiorite, felsic volcanics, phyllite and marble. Regionally, these form the basement of the Gawler Craton. The sequence was metamorphosed to upper amphibolite/granulite facies during the Sleafordian Orogeny. This metamorphism had the effect of coarsening the mineral grain size within the gneissic textures of the local rock assemblages. The para-gneisses are a quartz, biotite feldspar, garnet gneiss with accessory sillimanite, zircon and spinel. Isolated pods of biotite-garnet and cordierite-sillimanite quartz-feldspar also occur. The area was again subject to metamorphism during the Kimban Orogeny. The effect of the Kimban event in the Central Eyre area was slight retrograde metamorphism evidenced by mineral assemblages that include chlorite and sericite. The Sleaford Complex has very limited exposure and is almost entirely covered by younger Pleistocene-Holocene sediments (Appendix M).

The major crustal structures which separate east and west Eyre Peninsula have been recognised in regional geophysical investigations. The transition from Achaean rocks in the west of the peninsula to Proterozoic rocks in the east includes the north-south trending Kalinjala shear zone. There is evidence that Achaean rocks also form the basement below eastern Eyre Peninsula.

Geochronology

The magnetite gneiss occurrence at Warramboos has previously been assumed to be an iron-rich component of the Sleaford Complex described above and thus of the same age, ca. 2500Ma (Figure 2-12).

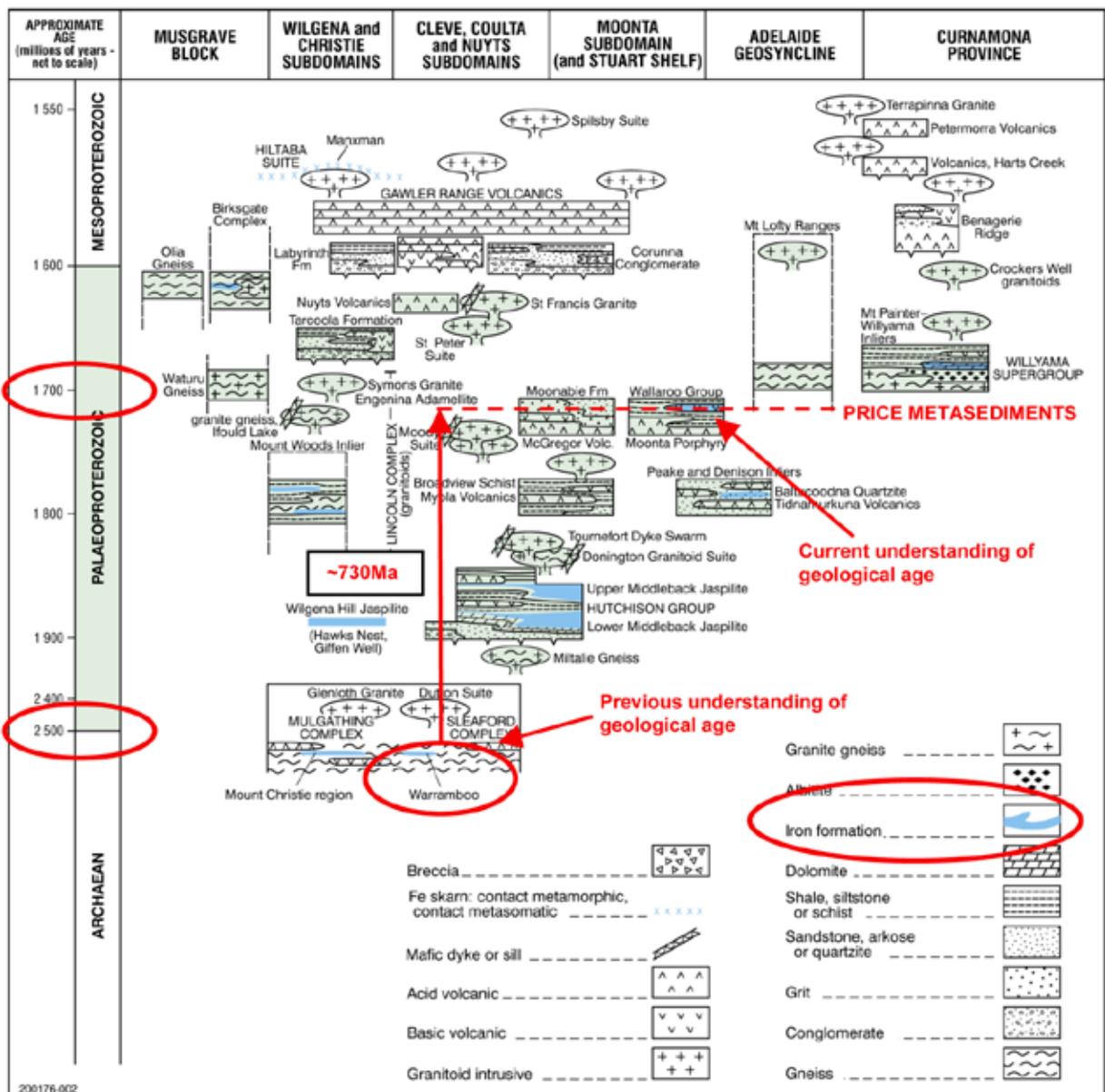
Based on relict-rounded detrital zircon grains and whole rock compositions, Pontifex (2000) suggested that the Warramboos magnetite gneiss may represent metamorphosed clastic sediment.

In a recent PhD study by Kathleen Lane at the University of Adelaide, zircon uranium-lead geochronology of the country rock (the enveloping 'barren' gneiss at Warramboo), indicates that sedimentary precursors to the gneiss formation were deposited ca. 2480-2470 Ma with coeval igneous intrusions, consistent with the Sleaford Complex basement rocks of the Eyre Peninsula.

However, substantially younger zircon populations were identified within the Warramboo magnetite gneiss, with ages between ca. 1900-1750 Ma. This represents a 730 Ma difference in geological age between the Warramboo magnetite gneiss and enveloping 'barren' gneiss.

Such age disparity is significant and interpreted as a cover-basement relationship where the magnetite gneiss footwall and hangingwall contacts define a highly-deformed, major unconformity.

Furthermore it has been demonstrated that the magnetite gneiss at Warramboo correlates with the ca. 1750 Ma ferruginous Price Metasediments, comprising iron-rich phyllite exposed along the south-western edge of the southern Eyre Peninsula near Coffin Bay.



Red highlights the likely position of the Warramboo Magnetite Gneiss within the stratigraphic column (from *Iron Ore in South Australia, Commodity Review 8, PIRSA (2000)*)

Figure 2-12 Stratigraphic correlations of Archaean to Mesoproterozoic iron-rich rocks in South Australia.

Further work is underway to confirm the basement-cover relationship identified by the geochronology and to ascertain the nature of the unconformity. These are often zones of alteration and fluid movement associated with ore mineralisation. Identifying the geochemical signature of the unconformity would also define stratigraphy and the development of more precise exploration models.

Monazite-based uranium-lead geochronology data from Warrambo show that the rocks underwent deformation and metamorphism during the ca. 1735-1700Ma Kimban Orogeny, indicating that the development of the magnetite gneiss mineralogy at Warrambo occurred during this time. The formation of the magnetite mineralisation at Warrambo is proposed to have occurred through in-situ concentration of iron minerals during melting and melt loss within the magnetite bearing gneiss associated with high-temperature metamorphism. In this process 'gangue' minerals were concentrated into migrating silicate melts, leaving behind the iron-rich magnetite gneiss that defines the current orebody.

Geology

Within the mine site, a zone of weathered bedrock and thin sedimentary cover is superimposed on the basement gneiss. Regolith was encountered in the reverse circulation drilling, varying in depths from approximately 30 to 80 m.

Surface materials include Aeolian sands and thin sheets of unconsolidated to silcretised alluvium. A zone of up to 2 m of calcrete is present either at or within 1 m of the surface. The Aeolian sand dunes reach a maximum thickness of 10 m to 30 m and present as linear features in the landscape.

Interpretation of diamond core from drilling identified four main rock types within the mine site:

- Quartz-feldspar-biotite gneiss
- Quartzbiotite-feldspar-garnet gneiss (footwall)
- Quartz-feldspar-magnetite-garnet-biotite gneiss
- Biotite-quartzamphiboloite ± magnetite schist

The magnetite mineralisation is characterised by two main rock types. The first is fairly uniform disseminated coarse grained magnetite gneiss and the second is a banded magnetite gneiss comprising layers of disseminated coarse grained magnetite.

Geological Instability

The Australian continent is located completely within the Australian Plate and consequently there are no major active faults. There are many large inactive faults in Australia with no geomorphic evidence of recent movement (Geoscience Australia 2004). No major fault zones were identified at the mine site in the drill core logging data (Coffey 2014).

Given the geology and topography of the project area, the mine site is observed to be stable and not at risk of landslip. Supporting these observations, the central Eyre Peninsula has no recorded incidences of landslip (Geoscience Australia 2015a).

No karst features have been identified within the area of the mine site or the proposed CEIP Infrastructure. The nearest identified karst features are on the west coast of the Eyre Peninsula and in the coastal areas of the Nullarbor Plain (Geoscience Australia 2015b).

Seismic Events

The mine site is located within an area not considered to be at significant risk of earthquakes. The majority of earthquakes in South Australia occur within the Mount Lofty Ranges and the Flinders Ranges. The Earthquake Hazards Zones Map for South Australia (DPTI 2012) shows that the central Eyre Peninsula is located within an area of the state that has a hazard factor of less than 0.11 (i.e. not subject to earthquake loads in accordance with AS1170.4). Seismic events are rare and typically small in nature. The South Australian Seismology Report (Love et al. 2010) indicates that no seismic events were recorded in proximity to the mine site, as indicated in Figure 2-13.

Geochemistry

Samples were analysed to determine properties and the presence of sulphur within the area of the mine site. The following observations were made (MWH 2015, presented in Appendix O):

- 2.7% of the total samples contained greater than 1.0% sulphur
- 8.1% of the total samples contained greater than 0.5% sulphur
- 21% of the total samples contained greater than 0.2% sulphur
- Elevated sulphur values are distributed across the project area
- 9.6% of the total samples contained greater than 2.0% calcium oxide (neutralising material)

In nearly all cases, elevated sulphur values are offset by neutralising material. Additional information regarding soil properties within the area of the mine site and potential impacts on public safety and soil and land quality are discussed in Chapters 7 and 13 respectively.

An analysis of composite samples from the proposed mine site for naturally occurring asbestos and other fibres was undertaken in accordance with AS4964-2004 for qualitative identification of asbestos in bulk samples. No asbestos was detected.

The potential for presence of Respirable Crystalline Silica (RCS) is not considered to represent a risk to public safety. Further details are provided within the public safety impact and risk assessment presented in Chapter 7.

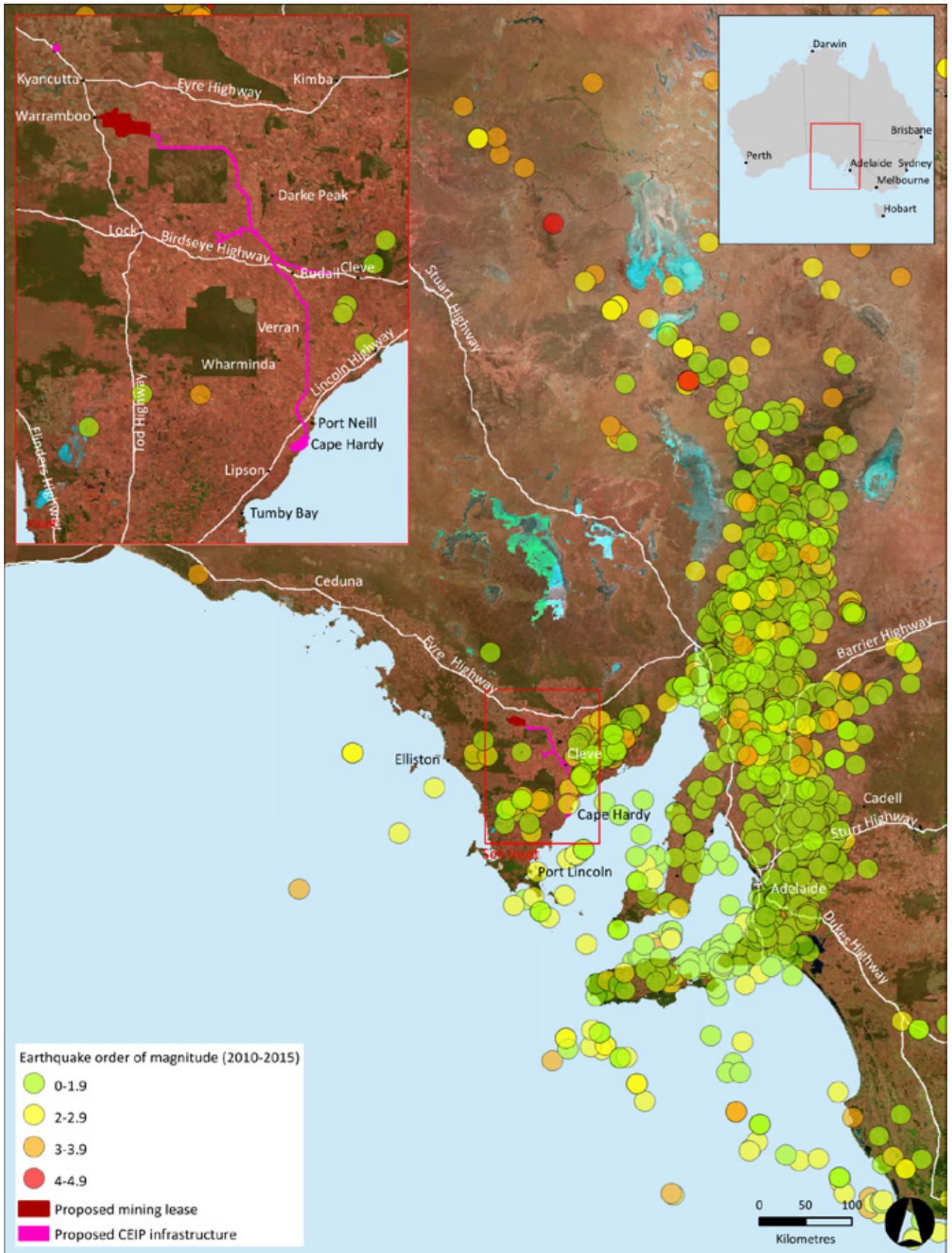


Figure 2-13 Seismic Activity in South Australia

2.7 Proximity to Conservation Areas

A number of conservation areas and nature reserves are located throughout the Eyre Peninsula, covering approximately 14% of the total land area (refer to Figure 2-14). Those of most relevance to the mine site are discussed below.

Hambidge Wilderness Protection Area (WPA) (Plate 2-3) is located approximately 3.8 km southeast of the mine site. Hambidge WPA covers approximately 38,000 Ha and was proclaimed a WPA under the *Wilderness Protection Act 1992* in 2004; one of the first WPA's to be proclaimed on mainland South Australia.

The vegetation of the Hambidge WPA is dominated by mallee communities, with small areas of woodland and shrubland. Several species of conservation significance are known to occur within the WPA, including the Malleefowl (*Leipoa ocellata*) which is vulnerable at a national and state level. The WPA also potentially supports populations of the Sandhill Dunnart (*Sminthopsis psammophila*) which is nationally endangered and considered vulnerable at a state level. The Hambidge WPA receives minimal visitor use, with the majority of visitors entering to visit a small elevated viewing point locally known as Prominent Hill (DEH 2007).



Plate 2-3 View South Towards Hambidge Wilderness Protection Area (Darke Range in background)

The Darke Range Conservation Park is located west of Darke Peak and covers an area of approximately 700 Ha (DEWNR 2011). Darke Range Conservation Park represents a ridgeline approximately 10 km long supporting dense Broombush shrubland and mallee (Brandle 2010).

Federation Lookout (Plate 2-4) is located at the southern end of the Range and was constructed in 2001 to commemorate Australia's Centenary of Federation. The lookout is an 800 m walk from the car park and a directional plaque shows local points of interest (District Council of Cleve 2014).



Plate 2-4 Darke Range Viewed from Federation Lookout

Other nearby conservation areas include the Barwell Conservation Park (17 km south of the mine site), Bascombe Well Conservation Park (34 km south of the mine site), Cocata Conservation Park (17 km west of the mine site), Pinkawillinie Conservation Park (10.5 km north of the mine site), Poolgarra Conservation Reserve (25 km east of the mine site) and Caralue Bluff Conservation Park (33 km east of the mine site). Conservation areas in the locality of the mine site are shown on Figure 2-14.

A vegetation heritage agreement (HA 869), pursuant to Section 23 of the *Native Vegetation Act 1991* has been established on a portion of land within the proposed mining lease. HA869 is located centrally near the northern boundary over portions of Sections 25 and 29, Hundred of Warrambo (CT5359/856 and CT5550/29). No other heritage agreements have been established over land located within or adjoining the proposed mining lease that may be impacted by the proposed development. Impacts to HA 869, including potential impacts to fauna and native vegetation are discussed further in Chapters 11 and 12 respectively.

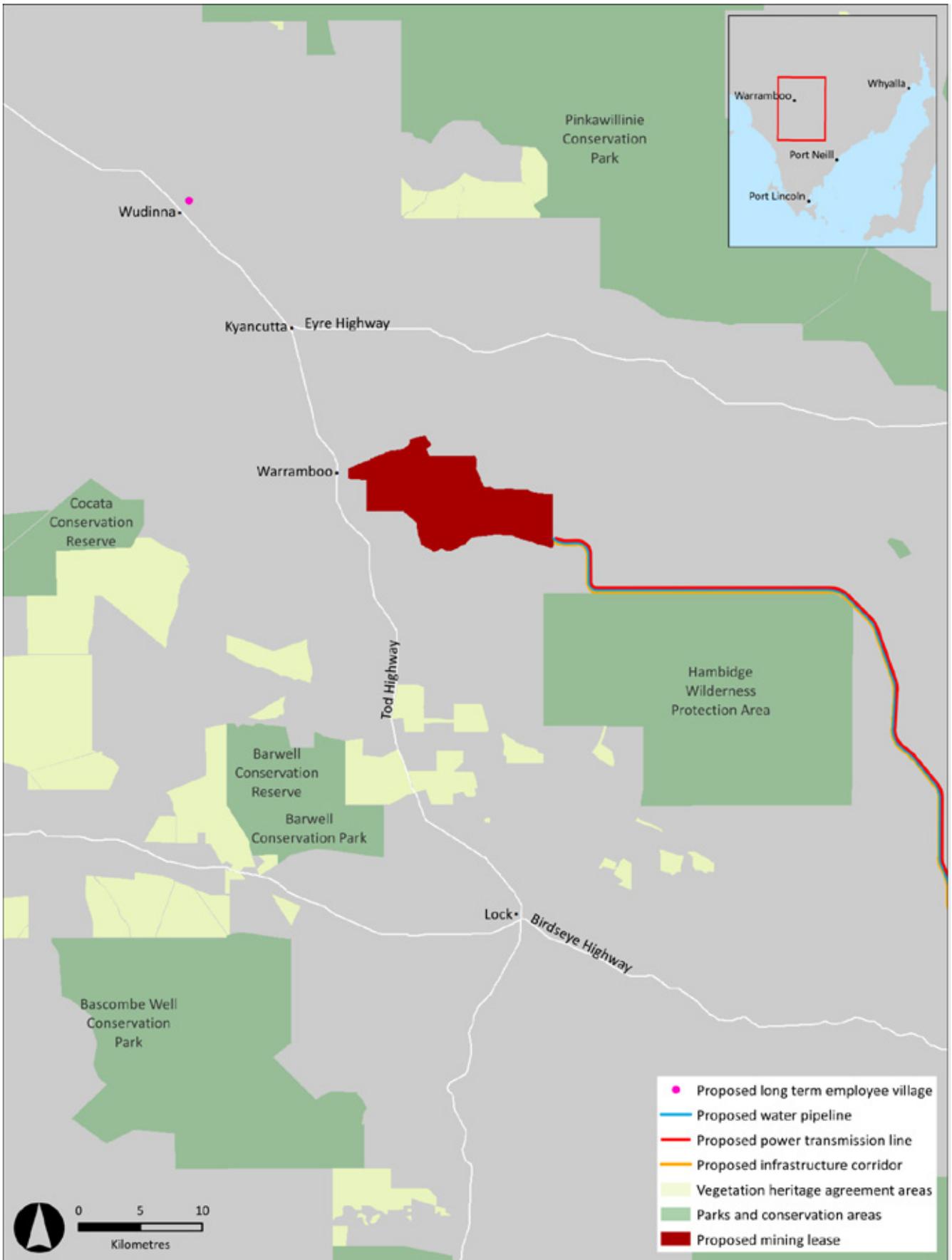


Figure 2-14 Conservation Areas