CHAPTER 4

PROJECT DESCRIPTION

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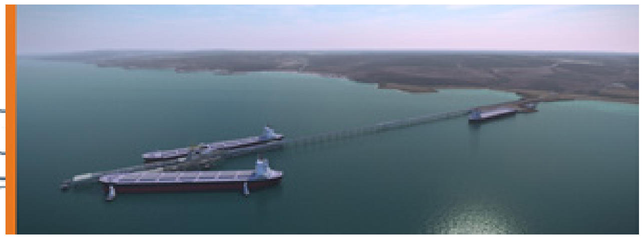

4 Project Description

This chapter describes the different components of the proposed CEIP Infrastructure including the various phases and timing for construction and operation activities. The proposed mine near Warramboo is not described in detail in this chapter as it is subject to a separate approval process under the *Mining Act 1971*. A brief description of the proposed mine is given in Section 4.1 to provide context of the overall CEIP, as the CEIP Infrastructure will provide supporting facilities and connections to the proposed mine. An overview of the CEIP and the linkages between the CEIP Infrastructure and the proposed mine is shown in Figure 4-1.

The major components of the CEIP Infrastructure are:

- **Infrastructure corridor** – The proposed infrastructure corridor will connect the proposed mine site with the proposed port site. It includes:
    - A railway line between the mine site and the port site for the movement of the magnetite concentrate (refer to Section 4.2.1)
    - A rail maintenance track
    - A water pipeline from a borefield to the mine site (refer to Section 4.2.2)
    - A transmission line connecting the mine site to the high voltage electricity network (refer to Section 4.2.3)
- **Port** – A proposed port development at Cape Hardy for the export of the magnetite concentrate and the importation of modules (refer to Section 4.3)
- **Long-term employee village** – An accommodation village is proposed adjacent to the township of Wudinna for the permanent mine site workforce (refer to Section 4.4)

The expected Construction phase activities and programme for the CEIP Infrastructure are outlined in Section 4.5, while information on operation activities is provided in Section 4.6. A summary of the CEIP Infrastructure components is provided in Section 4.8.

4.1 Proposed Mine

The mining schedule incorporates two-three years of pre-stripping and construction of surface facilities followed by 25 years of mining. It is proposed that the mine will produce 21.5 million tonnes (Mt) of magnetite concentrate per annum following a staged ramp up over 2.5 years.

An overview of the proposed mine site including the railway, water pipeline and power transmission line connections is shown in Figure 4-2. The proposed mine site will include an open pit excavation and an on-site iron ore processing facility to produce magnetite concentrate. The ore processing facility will include metallurgical facilities, crushing, grinding and milling facilities, tailings handling and retention. Additional onsite infrastructure will include a small desalination plant for potable water supply, accommodation camp, workshops, warehouses, security and emergency services and rail infrastructure.

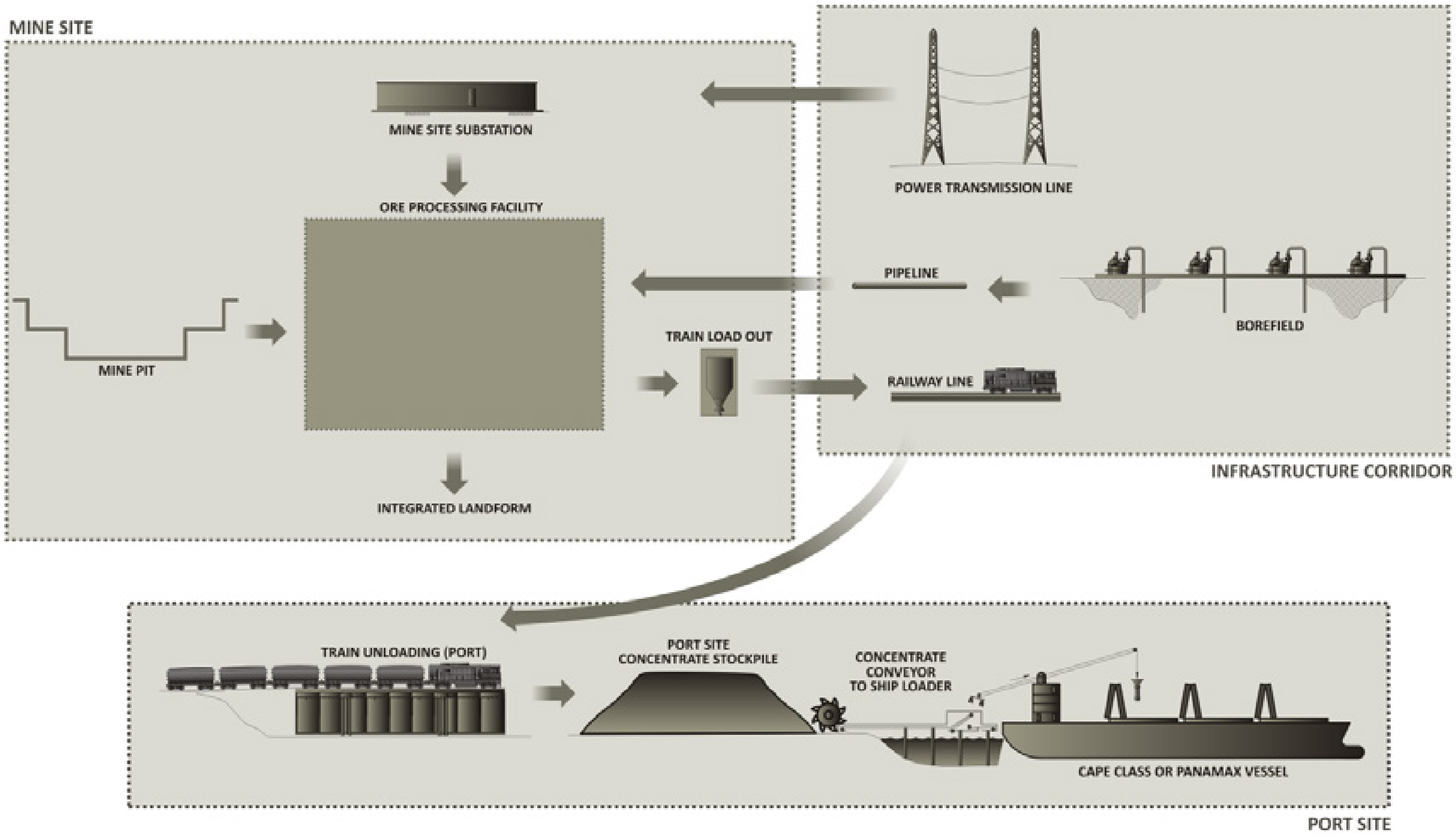

Figure 4-1 Project Flow Chart

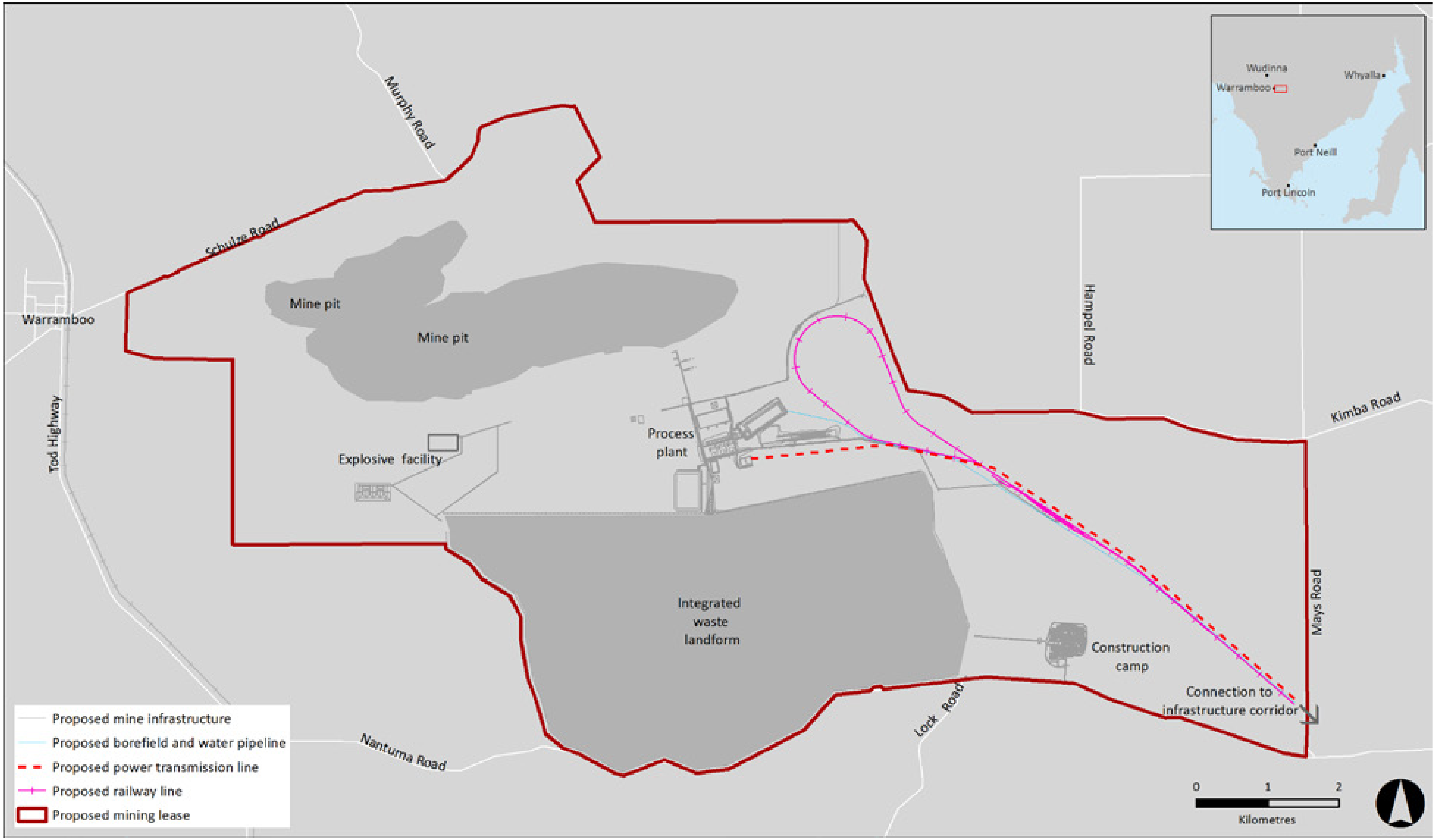

Figure 4-2 Mine Site Overview

4.2 Infrastructure Corridor Design Description

The proposed infrastructure corridor will connect the mine site with the port site, extending approximately 148 km (refer to Figure 4-3). This section describes the proposed infrastructure corridor, including the design principles, the railway line, borefield and water pipeline and the power transmission line.

The proposed railway line and maintenance track will extend along the entire length of the infrastructure corridor, while the water pipeline and power transmission line will join the corridor north of the Birdseye Highway. The infrastructure corridor will therefore range in width from approximately 60 m in the south to approximately 110 m in the north depending on which components are present (refer to Figure 4-4 and Figure 4-5). However additional width will be required in some locations to provide for two rail sidings, a pump station and for earthwork embankments with a maximum width of approximately 150 m.

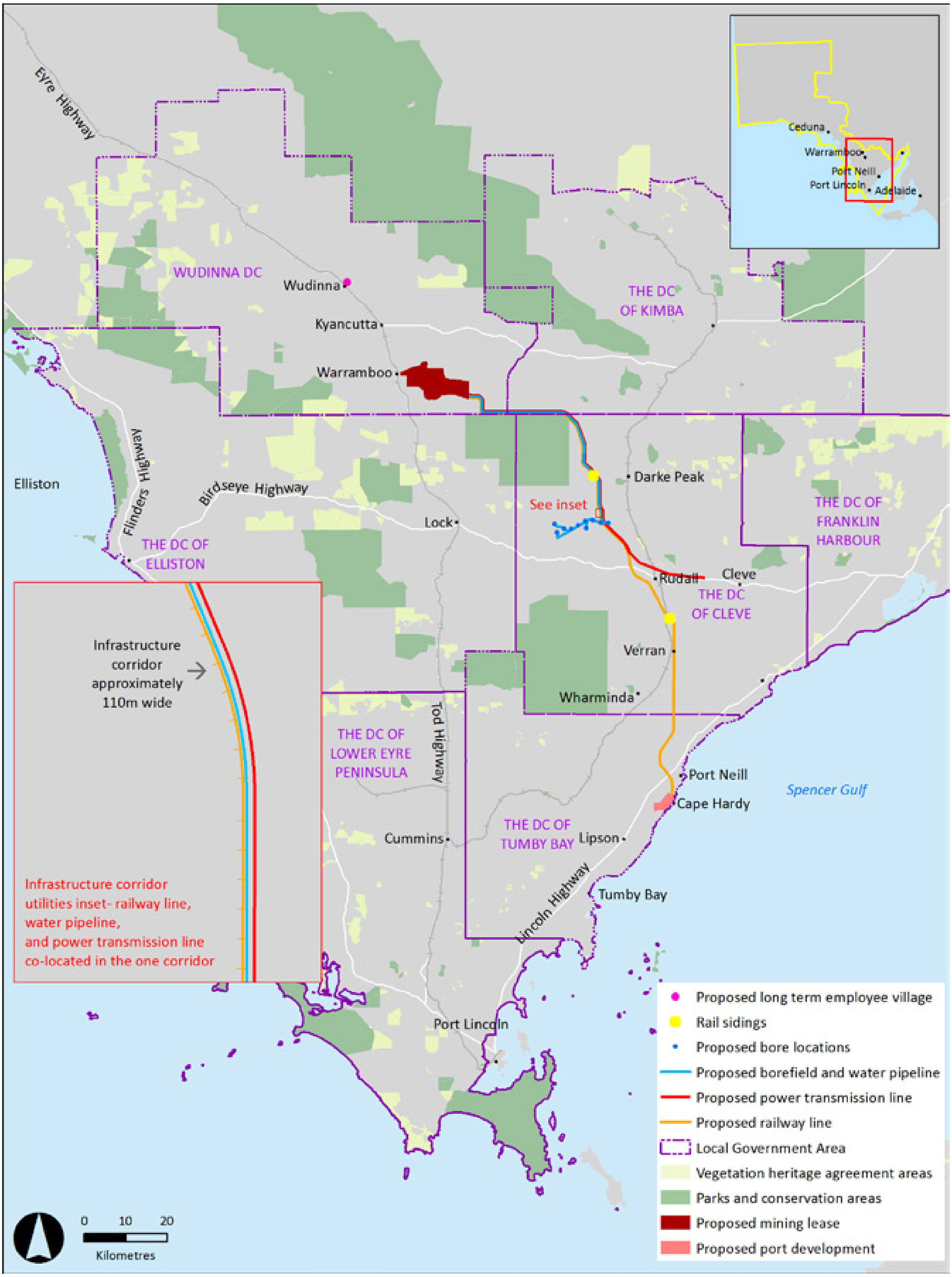

Figure 4-3 Infrastructure Corridor Overview

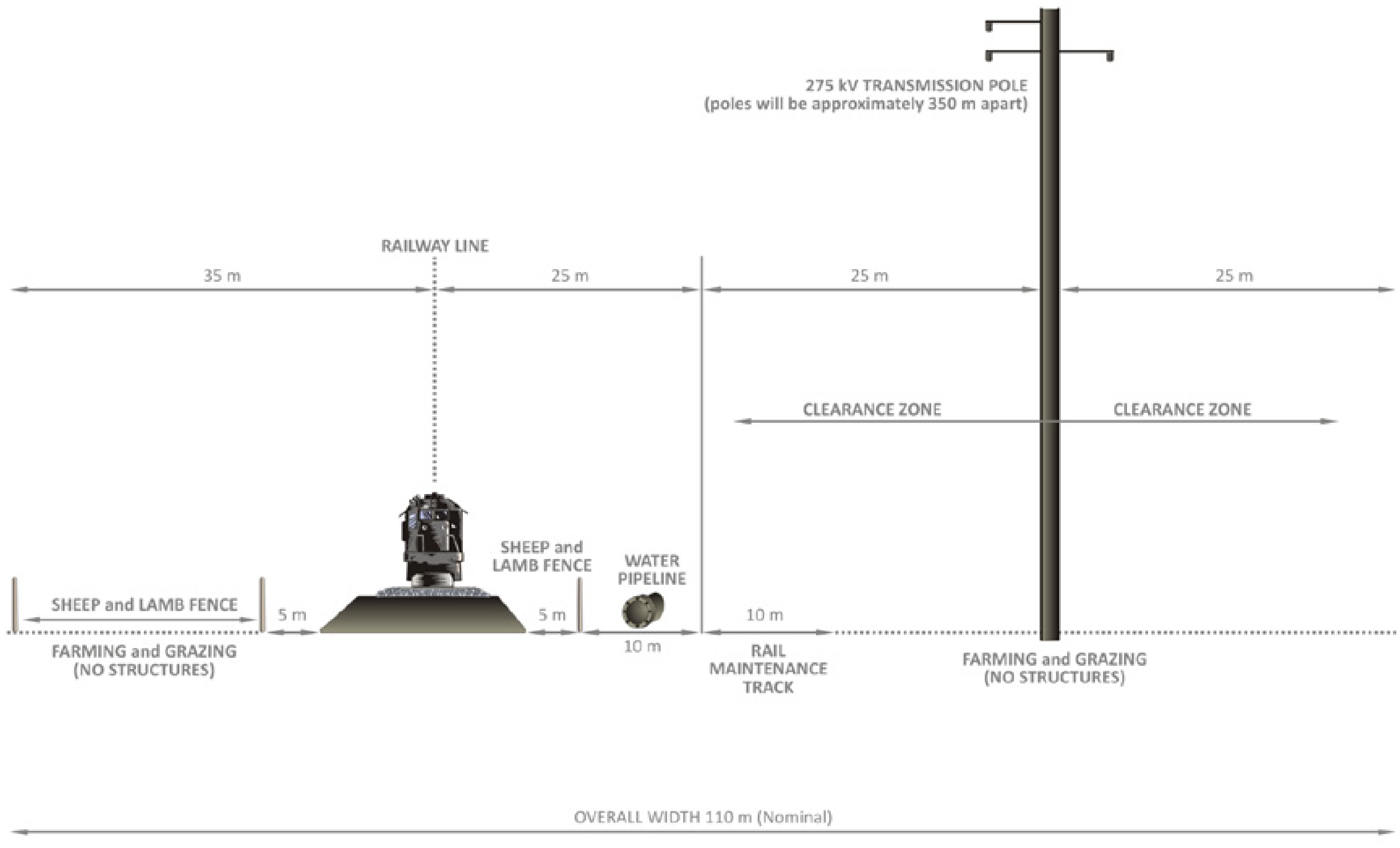

Figure 4-4 Infrastructure Corridor Cross Section

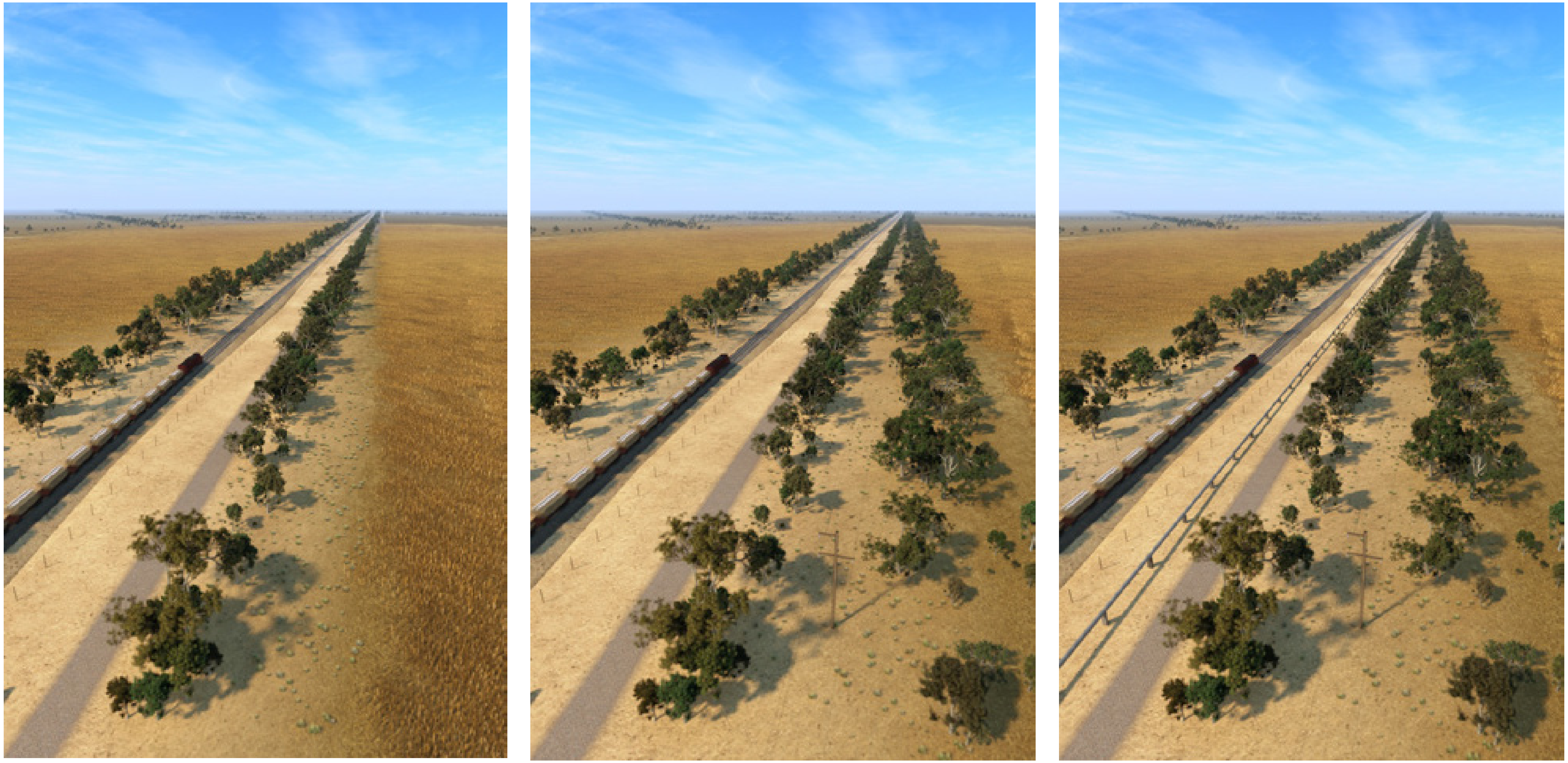

Figure 4-5 Infrastructure Corridor Visualisation (from left to right; southern end of the corridor with railway only, centre section of corridor with transmission line added and northern section of the corridor with railway line, pipeline and transmission line)

4.2.1 Railway Line

The proposed railway line will be a standard gauge, heavy haulage rail system with a single track designed using Australian Rail Track Corporation engineering standards. Two-way passage of trains will be provided through the use of two passing sidings located along the infrastructure corridor. Passing of trains will also be possible through the marshalling yard at the mine site. The railway line will end in a loop at both the mine site (the mine site loop) and the port site (the port site loop). In total, the railway line will be approximately 148 km long, which includes the port site loop (approximately 5 km) and the mine site loop (approximately 13 km). Where required, the railway line will be fenced on both sides to prevent livestock from crossing the line (as shown on Figure 4-4); and access points along the fencing will be negotiated with each landowner. The alignment of the proposed railway line and passing sidings is shown on Figure 4-6, Figure 4-7 and Figure 4-8.

Key aspects of the railway line design including the rail maintenance track, passing sidings, elevation, signage and crossings are described below and information on operation of the proposed railway is included in Section 4.6.

Rail Maintenance Track

A 10 m wide unsealed rail maintenance track will be located within the infrastructure corridor, alternating along either the eastern or western sides of the railway line. It will also provide access to the proposed water pipeline and power transmission line. The track will be gated and sign posted as a private road, with access negotiated individually with directly-affected landowners.

In locations where the railway line will run through sections of cut below ground level, the rail maintenance track will be maintained along the natural ground surface parallel to the rail to minimise additional bulk earthworks. In these deep cutting locations, additional all weather vehicle access will be provided adjacent to a widened track formation to allow for track maintenance and inspection.

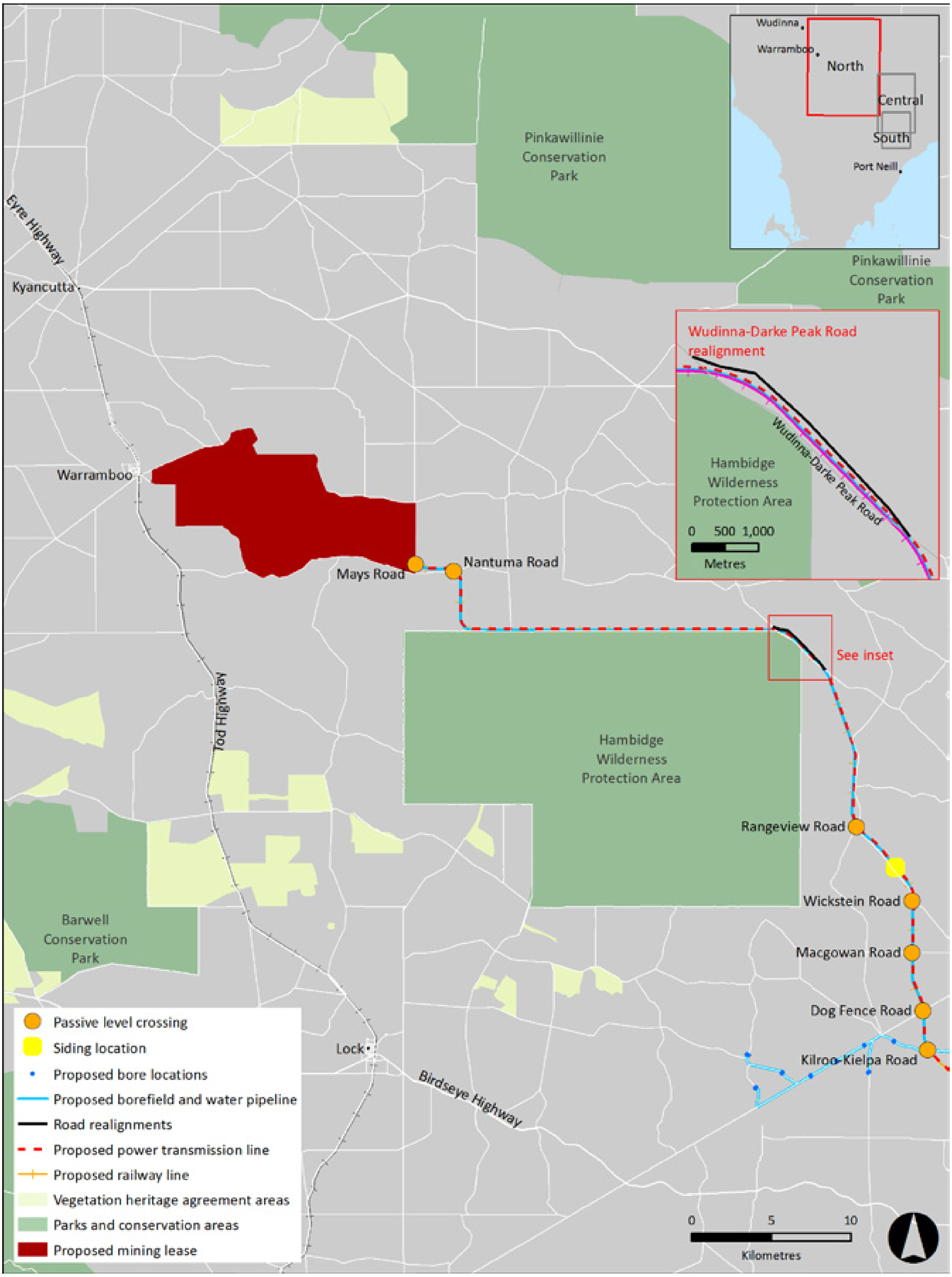

Figure 4-6 Railway Line – Northern Section

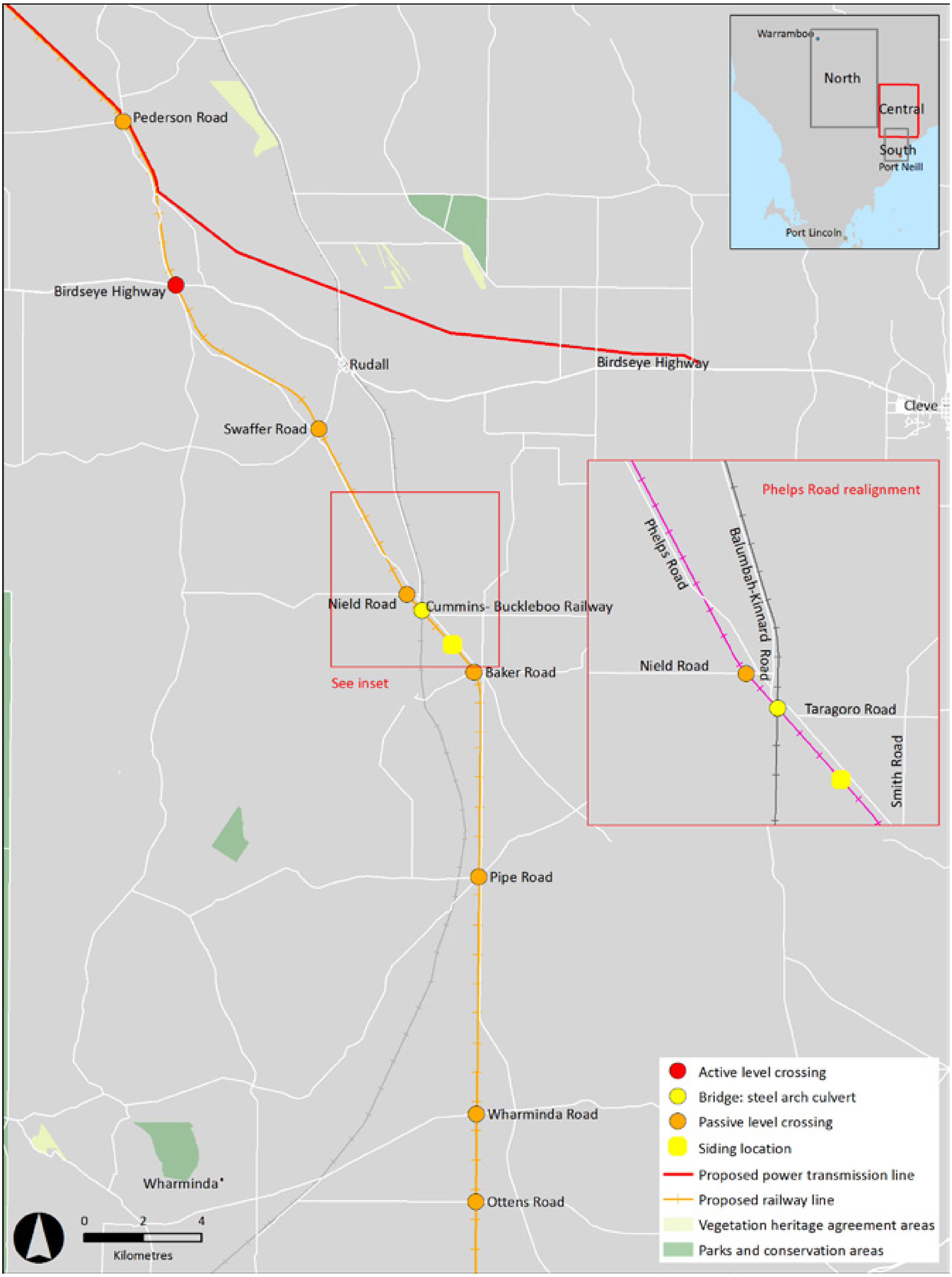

Figure 4-7 Railway Line – Central Section

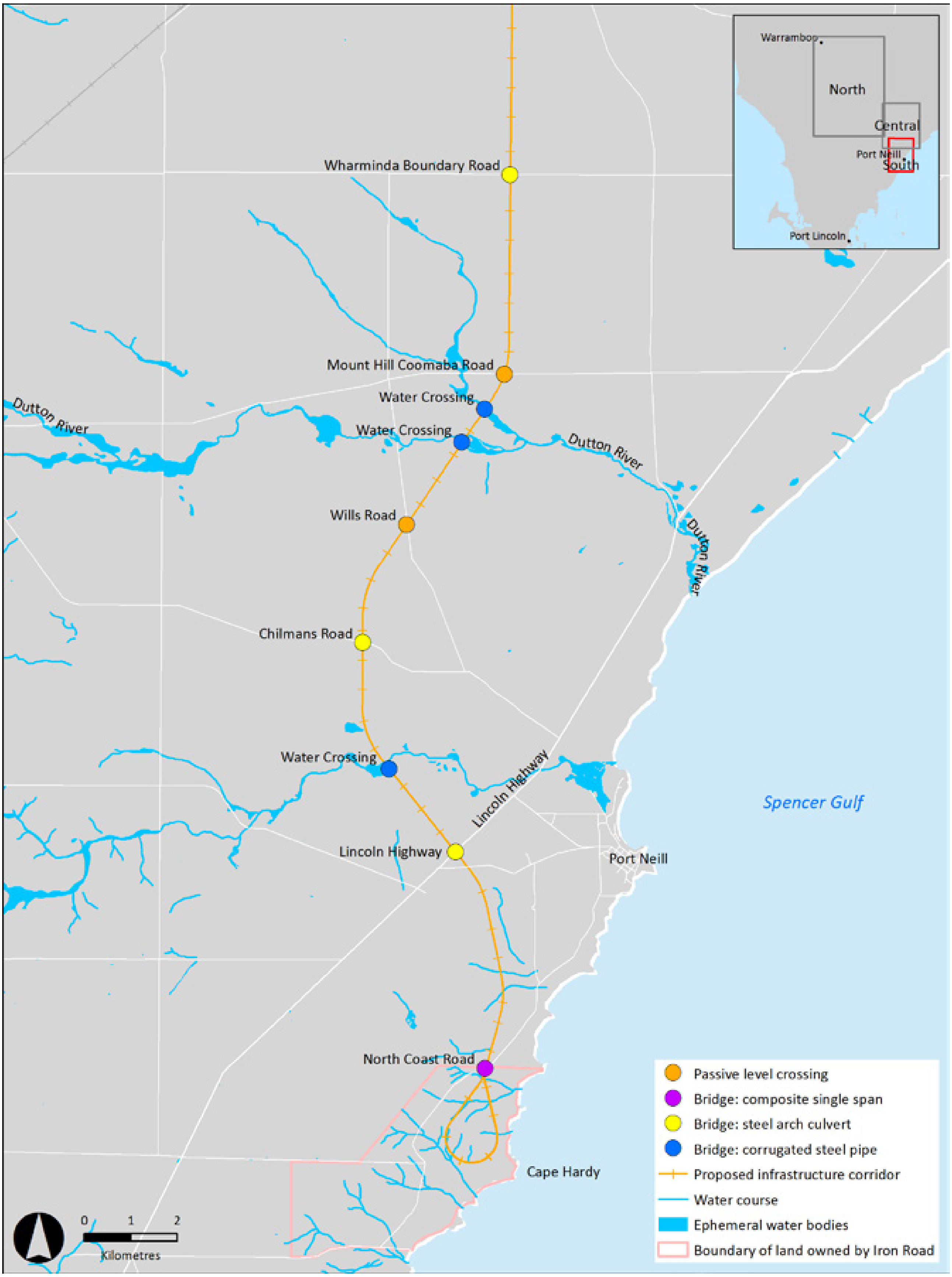

Figure 4-8 Railway Line – Southern Section

Passing Sidings

Two passing sidings are proposed along the main railway line (refer to Figure 4-6 and Figure 4-7). One will be approximately 45 km from the port site and the other will be approximately 110 km from the port site. Both sidings will be approximately 1.8 km in length, which will provide enough room to allow for a complete train to be clear of the main railway line to enable passing.

Railway Line Elevation

The railway line has been designed with maximum longitudinal grades of 1% for loaded trains. To achieve these grades, cut or fill will be required along some parts of the corridor. It is expected that the required fill volume will be supplied from the excavated cut along the railway line, with the exception of the rail ballast which will be sourced from elsewhere (refer to Section 4.5.4 for more detail on cut and fill volumes).

A visualisation of the elevation of the railway line with exaggerated vertical topography is shown in Figure 4-9 to illustrate the difference between the railway line elevation and natural ground level. Typical earthworks cross sections in cut and in fill are shown in Figure 4-10. The embankment slopes have been designed with a maximum grade of 1:2.

Track Signage

Track signage will be provided along the proposed railway line in accordance with AS1742, including:

- Whistle boards on each level crossing and passing siding approach
- Speed signs
- Limit of Authority signs for the rail unloading facility

Railway Line Road Crossings and Road Diversions

The proposed railway line will cross 17 public roads and numerous private farm tracks between the port site and the mine site. Consequently, the proposed design includes a combination of road realignments, level crossings and grade-separated crossings to maintain the connectivity of the road network, subject to negotiation and agreement with the relevant local councils and the Department of Planning, Transport and Infrastructure (DPTI) (refer to Table 4-1, Figure 4-6, Figure 4-7 and Figure 4-8). Level crossings for private farm tracks will be negotiated with landowners as required.

A road overpass is proposed to be constructed to provide grade separation at the North Coast Road, Lincoln Highway and Chilmans Road crossings. A clearance of 7 m will be provided for the railway line in accordance with Austroads requirements for non-electrified freight routes. A rail over road grade separation is proposed for the Wharminda Boundary Road crossing. A clearance envelope of 5.9 m high and 5.0 m wide will be provided for the road.

A typical passive level crossing, including signage layout, for public roads is shown in Figure 4-11. The passive level crossings will have clear sight distances as required by AS 1742.7 to ensure that road vehicles have sufficient sight lines to see oncoming trains. Slight road realignments will occur at each of the proposed level crossings to provide safe intersection angles in line with Austroad requirements.

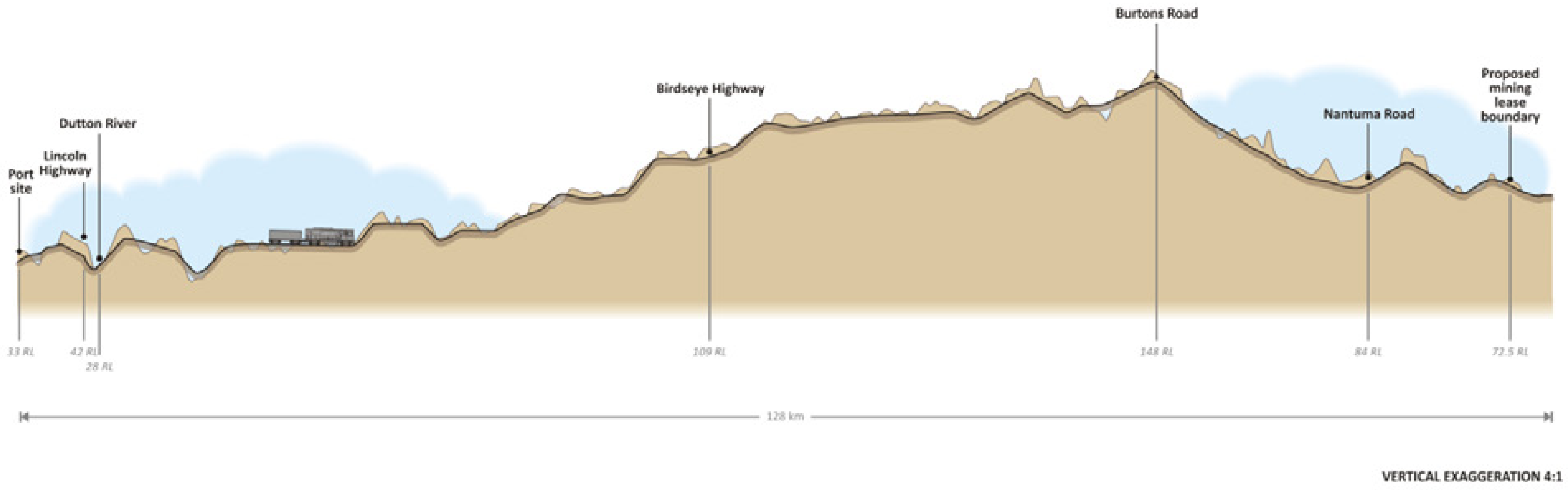

Figure 4-9 Railway Line Elevation Profile on Existing Ground Terrain (topography exaggerated)

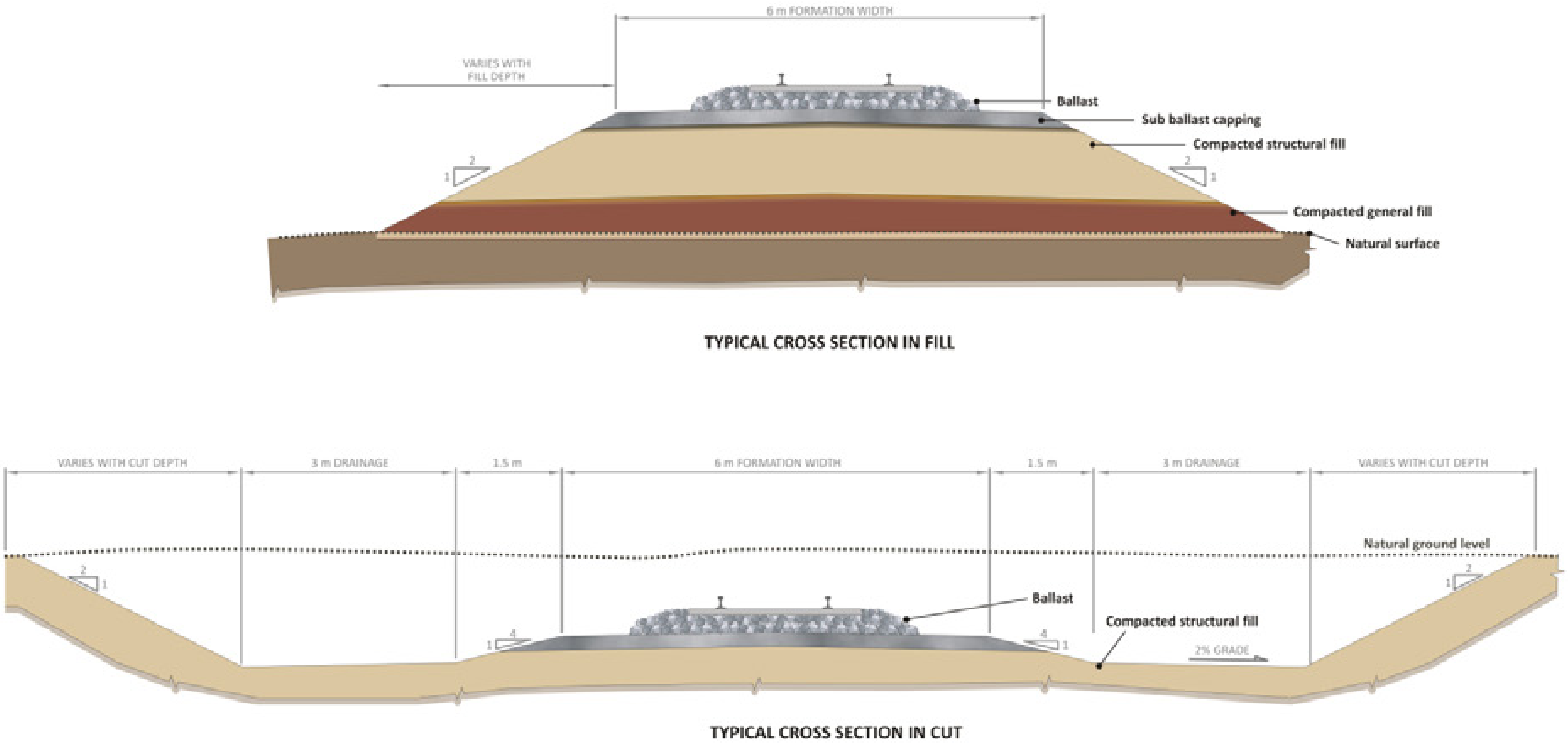

Figure 4-10 Typical Railway Line Cross Sections for Cut and Fill

Table 4-1 Proposed Railway Line Road Crossings and Road Diversions

Road Type/Name	Approximate Design Chainage	Crossing Type
North Coast Road	CH5.070	Bridge – steel girder and concrete deck (road over rail)
Chalmers road	CH9.700	No crossing – proposed road closure, diversion back to Lincoln Highway (east side)
Lincoln Highway	CH10.065	Bridge – multi-plate steel archway (road over rail)
Chilmans Road	CH15.200	Bridge – steel arch culvert (road over rail)
Wills Road	CH18.022	Passive level crossing
Mount Hill Coomba Road	CH21.875	Passive level crossing
Wharminda Boundary Road	CH26.175	Bridge – steel arch culvert (rail over road)
Ottens Road	CH30.595	Passive level crossing
Wharminda Road	CH33.580	Passive level crossing
Pipe Road / Pahls Hill Road	CH41.655	Passive level crossing
Baker Road	CH48.690	Passive level crossing
Nield Road	CH52.205	Passive level crossing
Phelps Road diversion (to avoid crossing)	CH52.200 – CH53.900	No crossing – Phelps Road extended to intersect with Nield Rd
Swaffer Road	CH58.600	Passive level crossing
Birdseye Highway	CH65.785	Active level crossing
Pedersen Road	CH67.900 and CH68.500	No crossing – proposed road realignment to run parallel to west side of rail line
Pederson Road (Brooks Road)	CH71.735	Passive level crossing
Kilroo-Kielpa Road	CH79.225	Passive level crossing
Dog Fence Road	CH81.760	Passive level crossing
MacGowan Road	CH85.525	Passive level crossing
Wickstein Road	CH88.685	Passive level crossing
Rangeview Road	CH94.770	Passive level crossing
Wudinna-Darke Peak Road realignment	CH104.90 - CH109.00	Road realignment (north side) to run parallel with rail line Farm crossing added at CH 105.20
Nantuma Road	CH132.330	Passive level crossing
Mays Road	CH134.850	Passive level crossing

Note: Proposed road crossings, closures and realignments are subject to negotiation and agreement with the relevant local councils and DPTI.

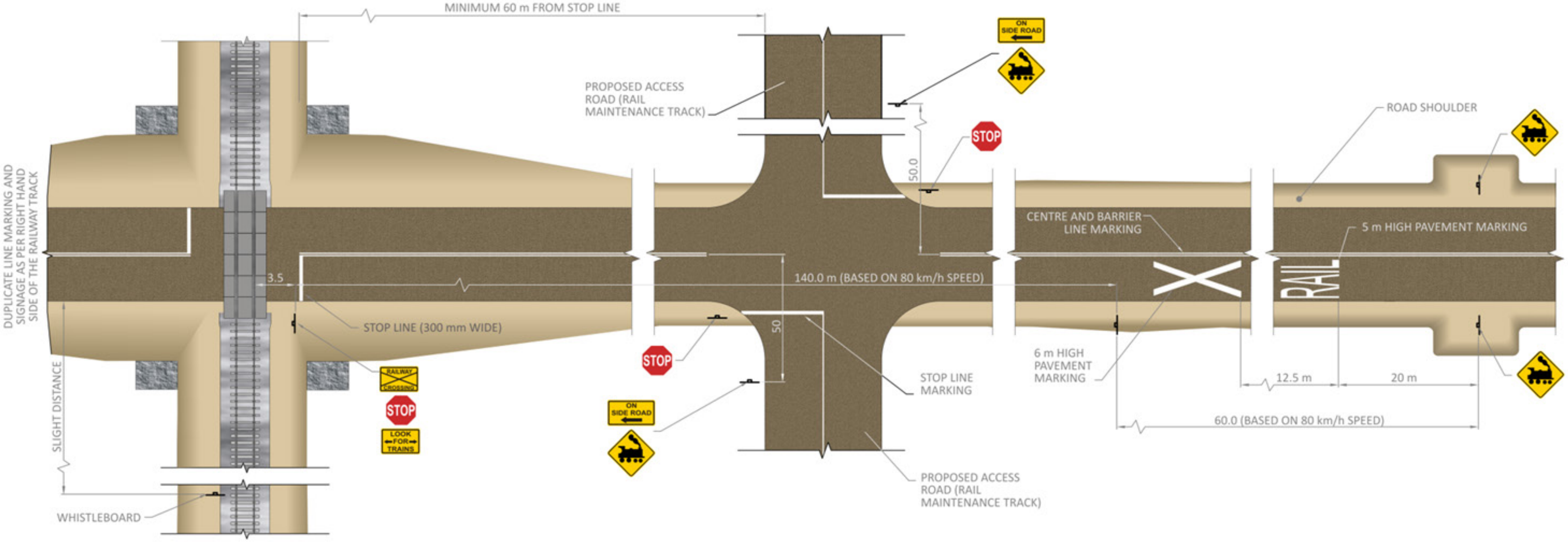

Figure 4-11 Typical Level Crossing (designed in accordance with AS 1742.7)

Cummins-Buckleboo Railway Line Crossing

Grade separation is required for the crossing with the existing Cummins-Buckleboo railway line. It is proposed to build the new CEIP railway line over the existing railway line (refer to Figure 4-12 for a conceptual design of this crossing).

Waterway Crossings and Stormwater Management

The proposed railway line will cross the Driver River, Dutton River and a number of smaller unnamed creeks. These watercourses are ephemeral in nature and are dry for the majority of the year. Bridges are proposed for the Dutton River crossing and one unnamed watercourse (refer to Table 4-2 and Figure 4-8). For other watercourses and overland flow paths, the proposed rail design includes culverts under the rail line which would maintain surface water flows by allowing water to pass under the infrastructure (refer to Figure 4-13). The rail design also takes into account the additional weight of the railway line, formation and train to ensure loads are spread, reducing ground compression thus allowing uninterrupted groundwater flow at the water crossings.

Culverts will be designed to accommodate a minimum of 1 in 20 year rainfall flows. Over the length of the infrastructure corridor, an estimated 400 culverts will be installed at creek crossings, ephemeral drainage lines and local low points to allow movement of water across the infrastructure corridor and maintain natural flows during storm events. Rock armour will be installed immediately downstream of culverts to mitigate erosion.

Where the railway line will be located below the natural ground level (in cut), a surface drain will be located on either side of the rail formation to drain water away from the ballasted formation.

Table 4-2 Proposed Railway Line Water Course Crossings

Water Course	Approximate Design Chainage	Crossing Type
Unnamed water course crossing	CH12400	Bridge – corrugated metal plate arches
Dutton River crossing	CH20100 – CH21000	Bridge – corrugated metal plate arches

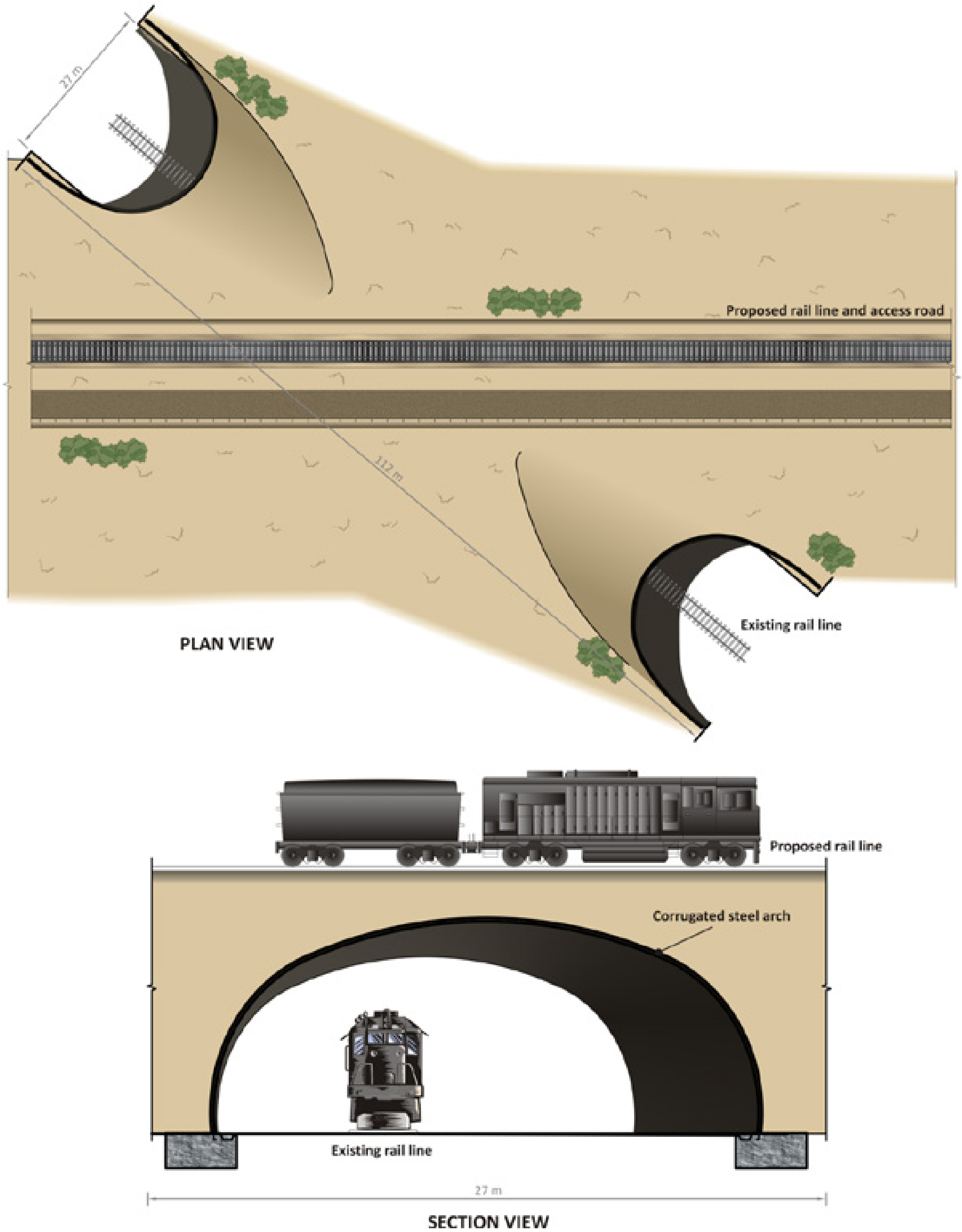

Figure 4-12 Cummins-Buckleboo (GWA) Railway Line Crossing

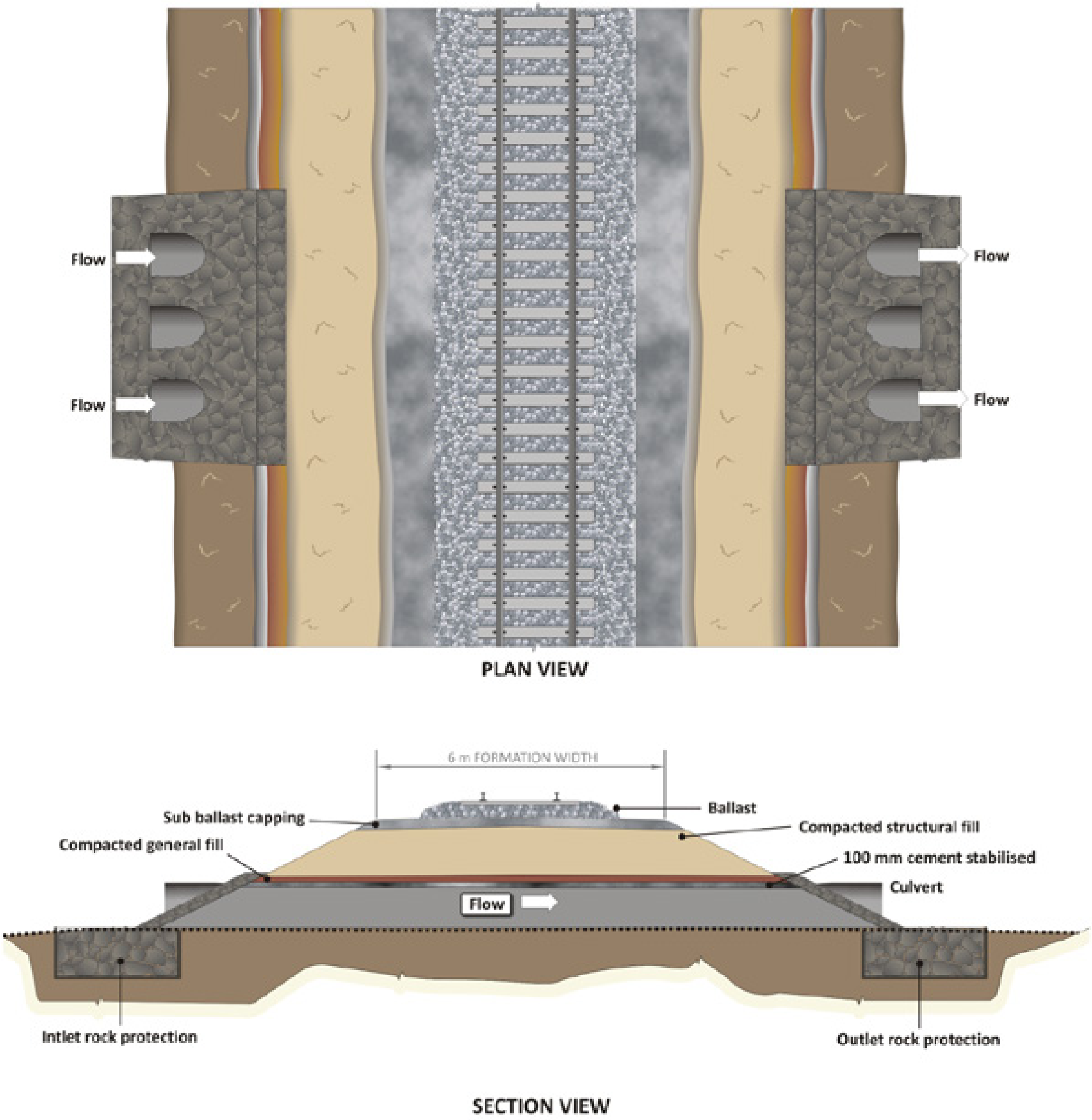

Figure 4-13 Typical Culvert Sections

4.2.2 Borefield and Water Pipeline

The proposed water pipeline has been designed to supply approximately 14 GL per year of saline water from the proposed borefield to the mine site for use in the process plant. A summary of the borefield and water pipeline infrastructure components is provided in Table 4-3.

The proposed borefield will be located approximately 60 km from the proposed mining lease boundary, 7.5 km west of Kielpa, and will extend up to 12 km west of the railway line. The borefield will extract saline groundwater from a Tertiary aquifer located between 150 and 300 m beneath the ground surface. Salinity within this aquifer is in the range of 25,000 mg/L to 40,000 mg/L (refer to Chapter 16, Groundwater, for further information on groundwater characteristics). An overview of the borefield is depicted in Figure 4-14.

The borefield will incorporate 10 bores, each installed to approximately 300 m depth and spaced approximately 2,000 m apart within existing road reserves. Nine of the bores will be located west of the infrastructure corridor, with one located east of the corridor adjacent to the Kilroo-Kiepla Road. The bores will be located within a concrete pad that will also include a control panel for the bore's submersible pump.

The groundwater will transfer from the individual bores via an above ground standard weight carbon steel collection pipeline to a pump station adjacent to the infrastructure corridor (refer to Figure 4-15). From the pump station the water pipeline will deliver the water to a break tank located along the infrastructure corridor. The groundwater will be gravity fed through the water pipeline from the break tank to the groundwater storage dam at the mine site. The pipeline will be constructed above ground and will follow the railway line within the infrastructure corridor.

No return water pipeline is required as wastewater from the mine site ore processing facility will be recycled in the mine plant process water pond and reused in processing and for dust suppression activities and road maintenance at the mine site.

Electrical supply to the submersible bore pumps and pump station will be sourced from the local SA Power Networks distribution network.

Table 4-3 Water Supply and Treatment Major Equipment

Area	Equipment	Description
Water supply borefield	Bores	· Each bore will have capacity to yield 180 m^3/hr · Nominal 300 mm DN Class 12 PVC cased bores to 150 m · The underlying aquifer from 150 to 300 m will be screened with 200 mm DN 316 grade stainless steel wire wound screens
	Submersible Pumps	· Nominal 150 – 200 kW electric submersible pumps. Individual bore pumps to be specified based on installed bore efficiency and pipeline length to booster pump
	Collection Pipelines	· 250 mm, 450 mm and 550 mm DN standard weight carbon steel pipelines lay above ground along road reserves. Pipes will be buried at road crossings
Pump station and water pipeline	Pump station	· 20 m DN break tank, primary and standby pump for total installed capacity of 1200 kW and 20 m^3 surge vessel
	Transfer Pipeline - Pressure	· 21.5 km long pipeline · 550 mm DN standard weight carbon steel pipeline laid above ground
	Break Tank	· 7 m x 4 m square concrete tank plumbed in parallel with the main pipeline · A high flow actuated valve and reducer to step up the pipeline size to 650 mm
	Transfer Pipeline	· 46.7 km long pipeline · 650 mm DN standard weight carbon steel pipeline laid above ground

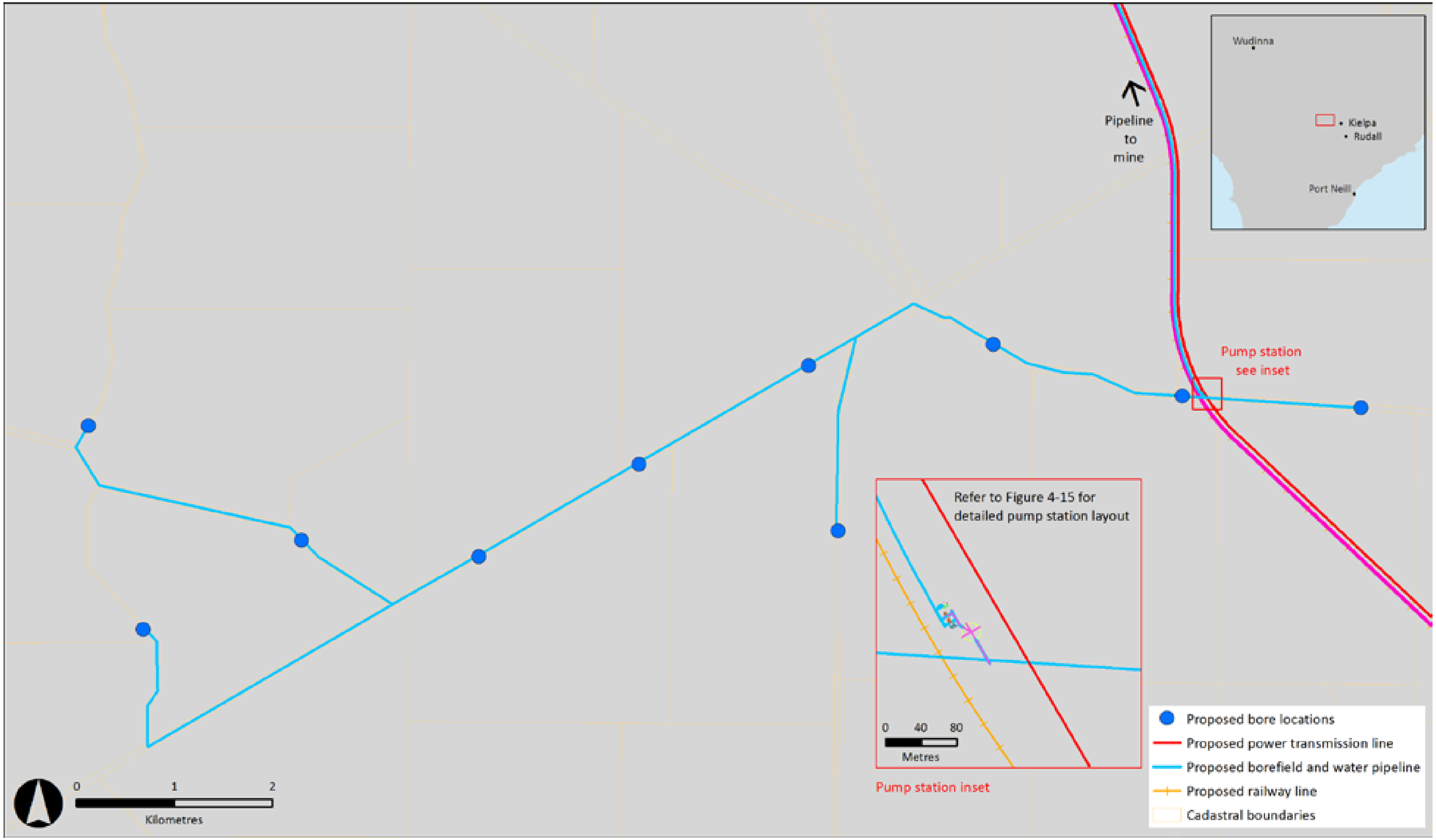

Figure 4-14 Water Supply Borefield

IRON ROAD

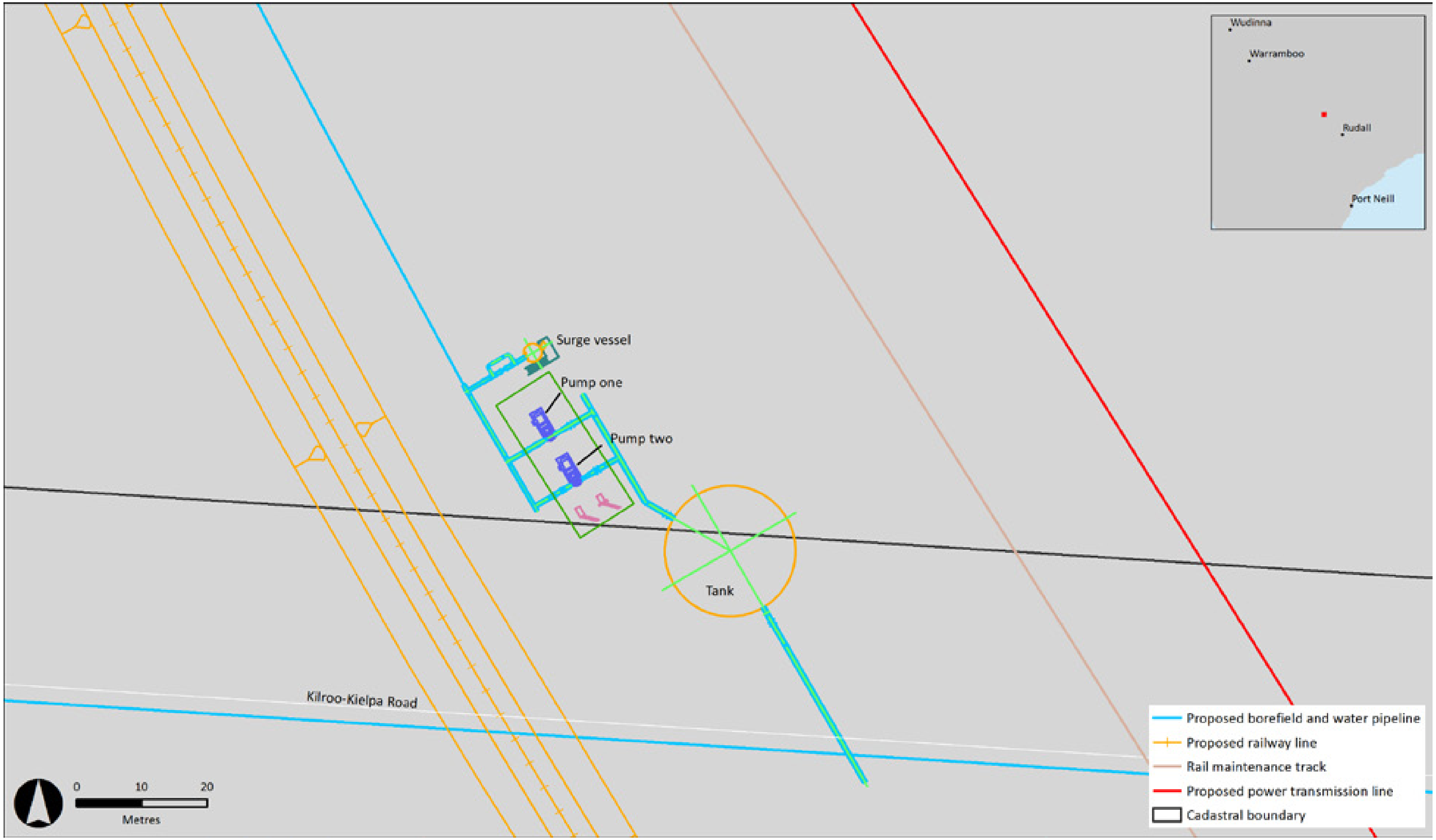

Figure 4-15 Pump Station

4.2.3 Power Transmission Line

The proposed power transmission line is required to connect the mine site to the electricity network. In South Australia, the high-voltage electricity transmission network is managed by ElectraNet and forms part of Australia's National Electricity Market. The proposed power transmission line will connect to the National Electricity Market at the existing ElectraNet substation at Yadnarie. From Yadnarie, the transmission line will run west, parallel to the existing ElectraNet transmission line, until it intersects with the proposed railway line. At this point the transmission line will run parallel to the railway line, forming part of the infrastructure corridor and continuing to the mine site. The proposed route of the transmission line from Yadnarie to the infrastructure corridor is depicted in Figure 4-17.

The power transmission line will be a 275 kV line, predominately utilising steel mono poles between which conductors and earth wires are strung (refer to Figure 4-16). The transmission line will be constructed within a 50 m wide easement to give a 25 m clearance zone either side of the aerial line as required by the *Electricity (General) Regulations 2012* (refer to Figure 4-4).

The span distance between the poles will be approximately 350 m, with the final height of the poles varying dependent on land topography, minimum clearance requirements and localised environmental conditions. In total approximately 200 poles or towers will be required for the power transmission line. The poles will generally have concrete foundation pads that are approximately 2 m^2.

Figure 4-16 Example of Steel Monopole

(source http://www.cowellelectric.com.au/ImageSnowtown1.html)

Construction of the transmission line over road corridors will require the closure of those roads for a short duration to allow the wires and conductors to be safely installed.

Clearance of vegetation within the easement will be undertaken where required to ensure that adequate safety clearance is maintained to the energised transmission line. To minimise clearance, only vegetation which infringes on, or is likely to infringe on, the safety clearance area will be removed or trimmed.

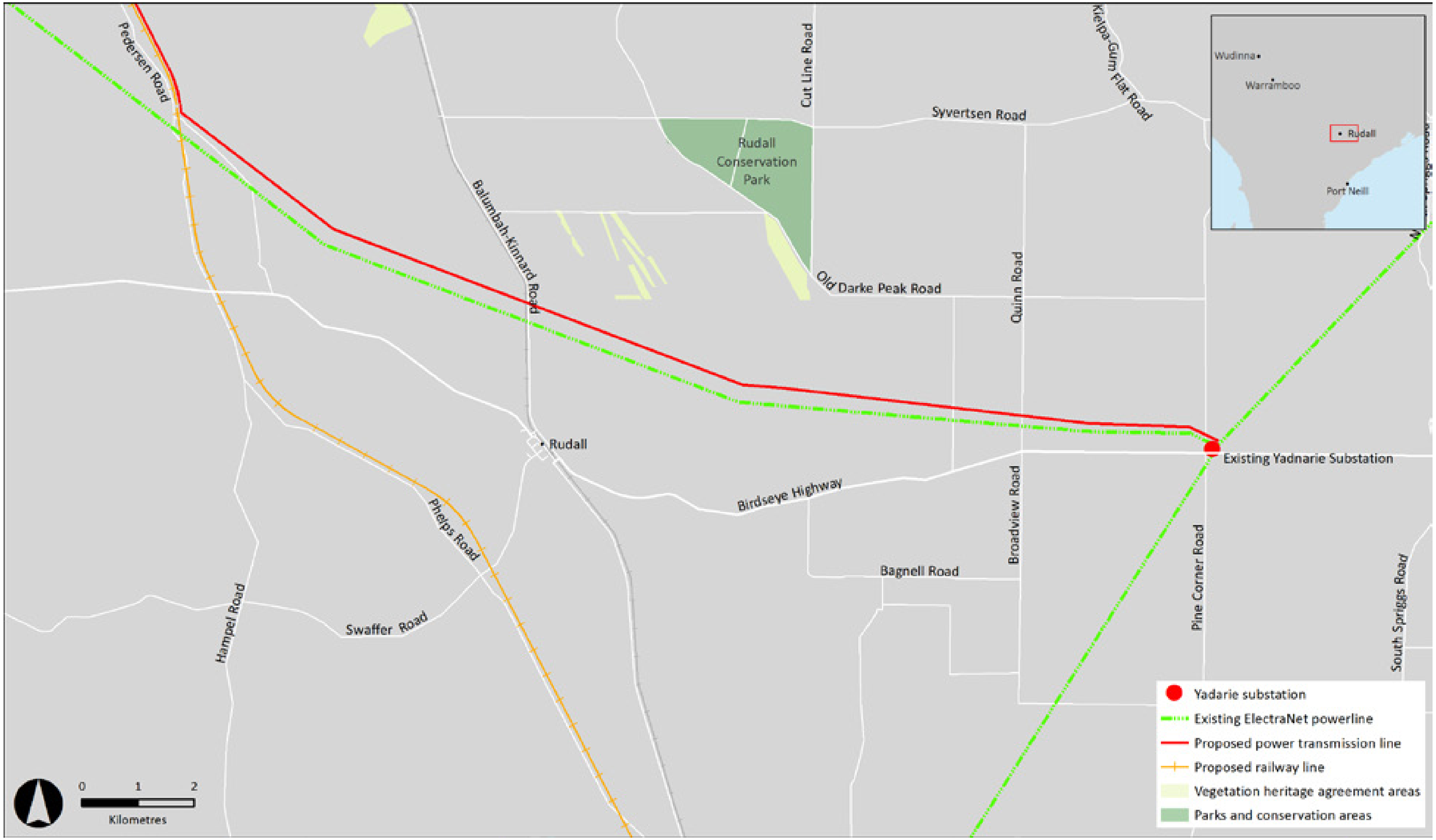

Figure 4-17 Power Transmission Line Overview

4.3 Port Design Description

The proposed port at Cape Hardy has been designed to cater for Panamax and Capesize vessels with a bulk export operating capacity of up to 70 Mtpa. The port infrastructure proposed by Iron Road will have a materials handling capacity to export 30 Mtp; however Iron Road's proposed operation, which is the subject of this application, is for exporting approximately 21.5 Mtpa of magnetite concentrate. The port site includes approximately 1,100 ha of land owned by IRD Port Assets Pty Ltd (a subsidiary of Iron Road), a proposed lease over coastal land of approximately 2 ha for a coastal exclusion zone and approximately 147 ha of marine waters within the port operating limit, subject to agreement with DPTI (refer to Figure 4-18).

A port site entrance may be located off North Coast Road with a security gate proposed at the intersection of North Coast and Brayfield Roads 5 km south of Port Neill. The proposed export and materials handling facilities will be located within an area of approximately 461 ha which will be designated by a security fence (refer to Figure 4-19). Facilities proposed as part of the port development include:

- Materials handling facilities
  - Rail unloading facility
  - Conveyor systems
  - Concentrate stockpile
  - Shiploader
- Marine infrastructure
  - A 900 m long jetty (incorporating 200 m of causeway)
  - A 400 m long wharf at the end of the jetty with two berths
  - Module offloading facility
  - Tug harbour
- Supporting infrastructure
  - Ancillary port administration, customs and stevedoring facilities
  - Plant and equipment workshop and facilities
  - Car parking and internal access roads
  - Road upgrades and realignments
  - Fuel storage
  - Module laydown area
  - Stormwater management
  - 33 kV power line and substation
  - Water supply and wastewater treatment facilities
  - Emergency services facility
  - Communication tower
- Temporary construction camp

These project elements are described in the following sections.

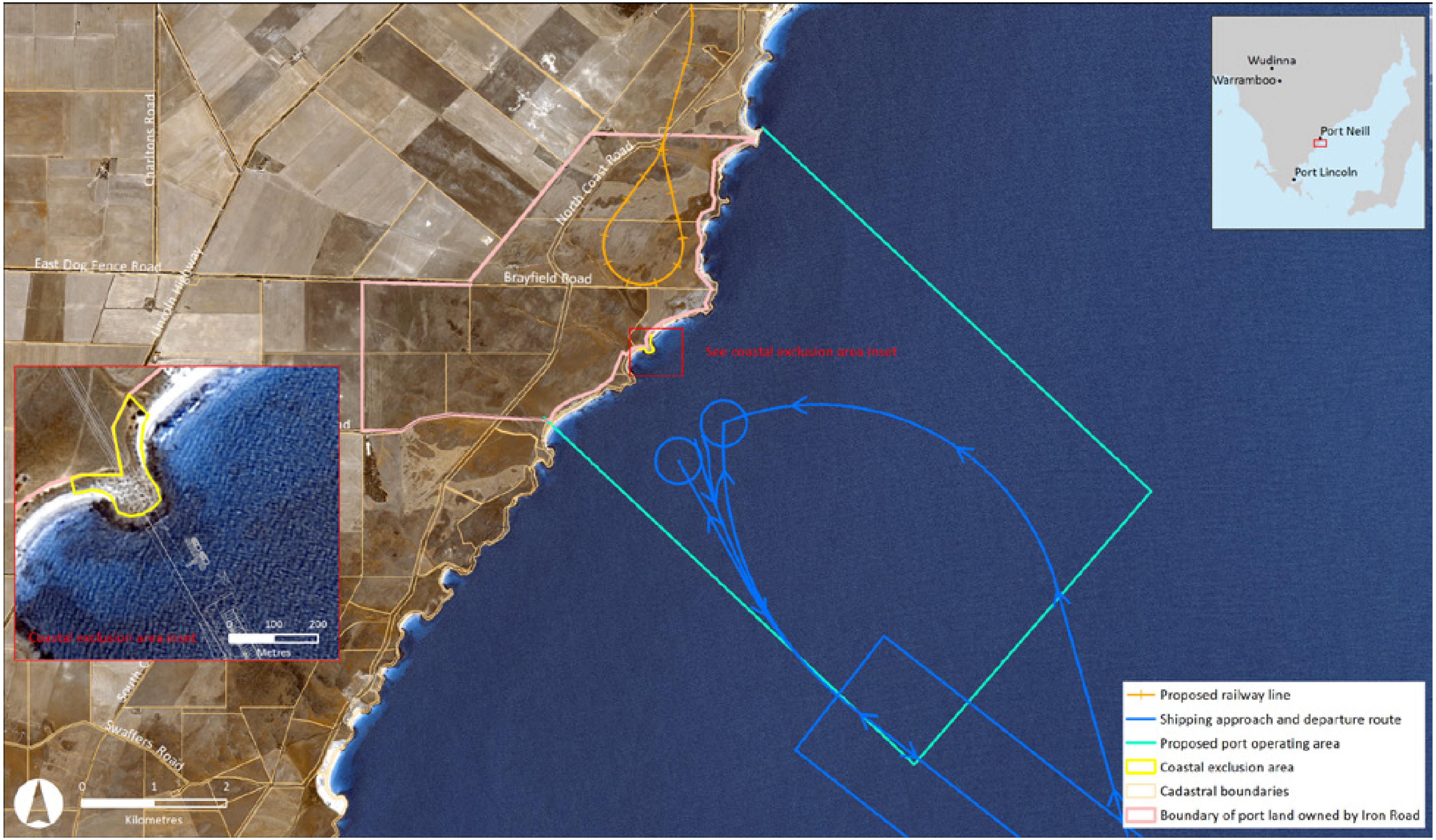

Figure 4-18 Port Site Overview

Figure 4-19 Port Site Infrastructure Layout

4.3.1 Materials Handling

The materials handling facilities, including the rail unloading facility, conveyor systems and concentrate stockpile are shown on Figure 4-20.

Rail Unloading Facility

The magnetite concentrate will be unloaded from the rail wagons in the proposed rail unloading facility which will be located on the port site rail loop approximately 400 m north of the concentrate stockpile. As shown on Figure 4-21, the rail unloading facility consists of a building over the railway line and three receiving hoppers below the railway level. Belt feeders located underneath the chutes will collect the magnetite concentrate and transfer it to the conveyor system. The magnetite concentrate contains 10% moisture which limits dust generation. To capture any dust generated, the rail unloading facility building will contain a dust control system that draws air through filters in order to collect any dust and maintain negative pressure within the building. Any dust collected by the dust control system will be returned to the material stream.

As shown in Figure 4-21, the rail unloading facility has three levels:

- Rail level – the train will pass through this level which also contains the rail unloading facility substation, control room and baghouse. Light vehicle and pedestrian access is also provided.
- Feeder level – this level will contain the hoppers to feed the magnetite concentrate onto the conveyor system below. Pedestrian access will be from internal stairs connecting to either the rail level or the basement level.
- Basement level – this level will contain the conveyor which will transport the magnetite concentrate to the concentrate stockpile. Bobcat and pedestrian access will be provided via a conveyor ramp leading from ground level. Pedestrian access will also be provided via internal and external stairs from the rail level.

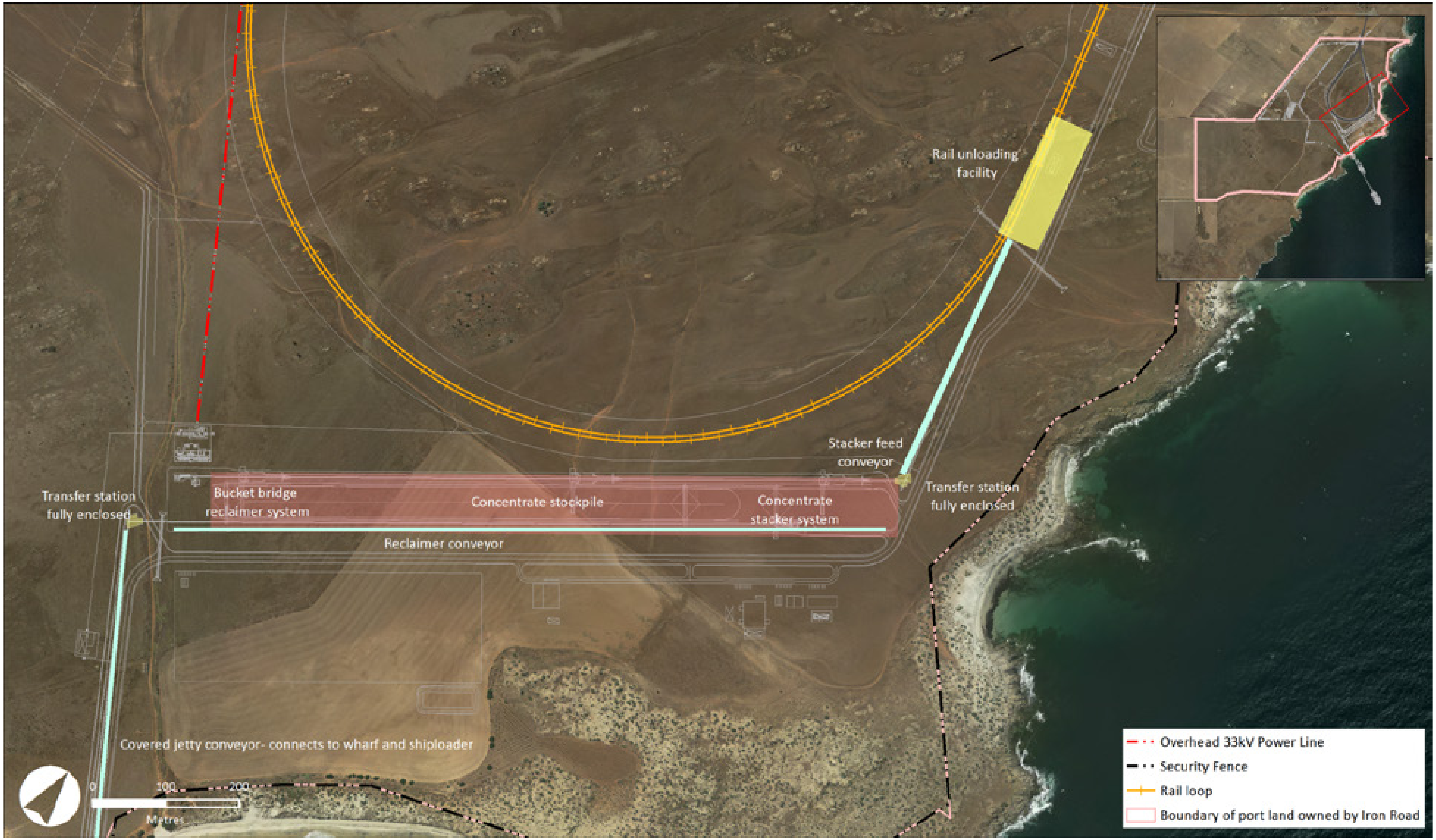

Figure 4-20 Port Site Materials Handling Facilities

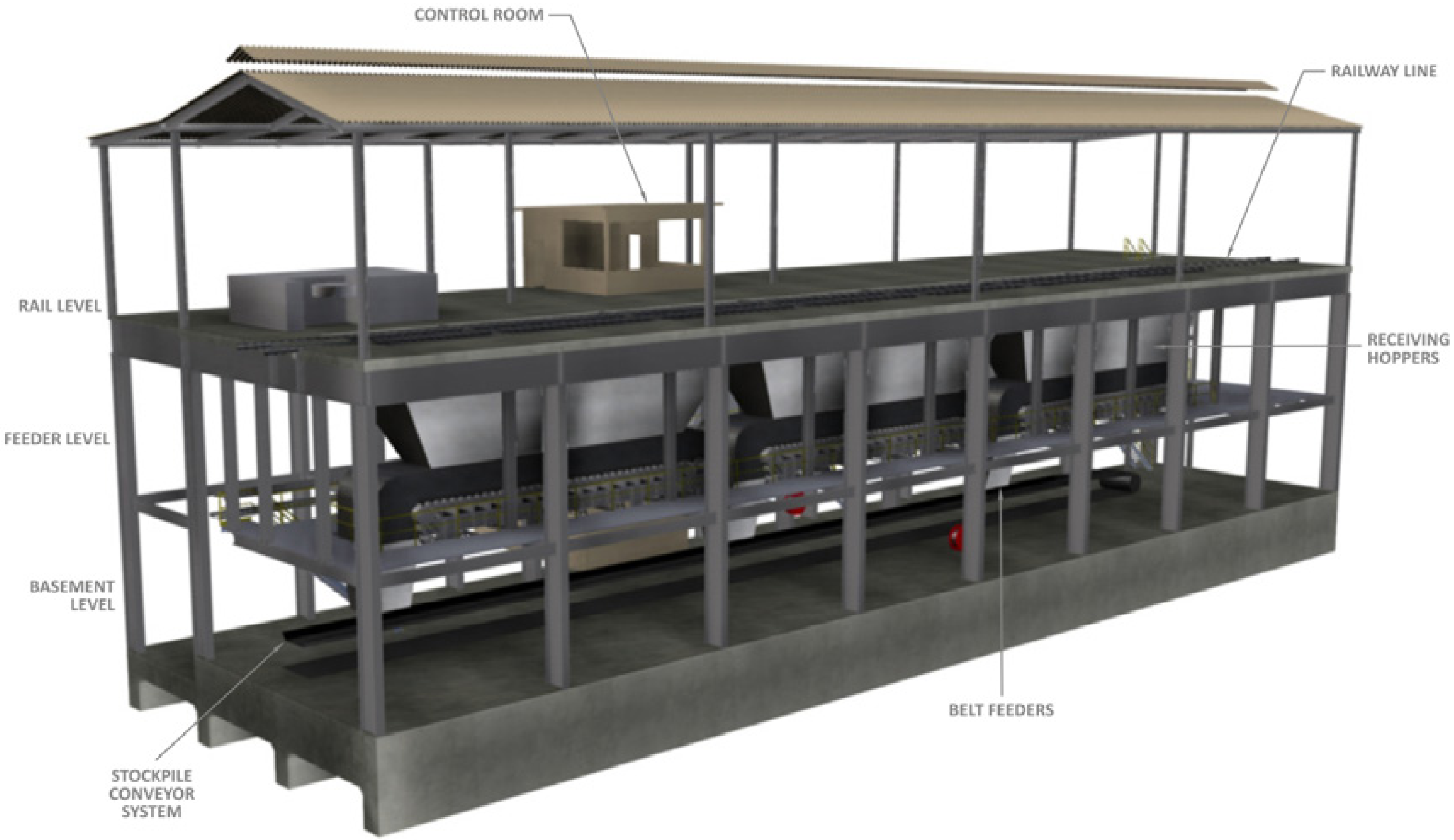

Figure 4-21 Rail Unloading Facility

Conveyor Systems

The proposed port site will include two conveyor systems to connect the materials handling facilities (refer to Figure 4-20). The stacker feed conveyor system will connect the rail unloading facility to the concentrate stockpile and the shiploader conveyor system will connect the concentrate stockpile to the shiploader. The stockpile conveyor system conveyor belts will be 1.6 m wide and the shiploader conveyor system belts will be 1.8 m wide. Both conveyor systems will run at approximately 3 m per second and will be fully covered.

Two transfer stations are included in the conveyor system design to enclose the transfer points where magnetite concentrate is transferred from one conveyor to the next (refer to Figure 4-22). The transfer stations will be clad in colorbond steel or a similar product and will be fitted with dust extraction units. The collected dust is returned to the conveying system. A sample station would be located at the second transfer station to collect concentrate samples for laboratory analysis including chemical composition and moisture level. Moisture (water) can be added at this station to ensure the concentrate meets the product specification of 8-10% moisture content, ensuring safe transport in ship hulls.

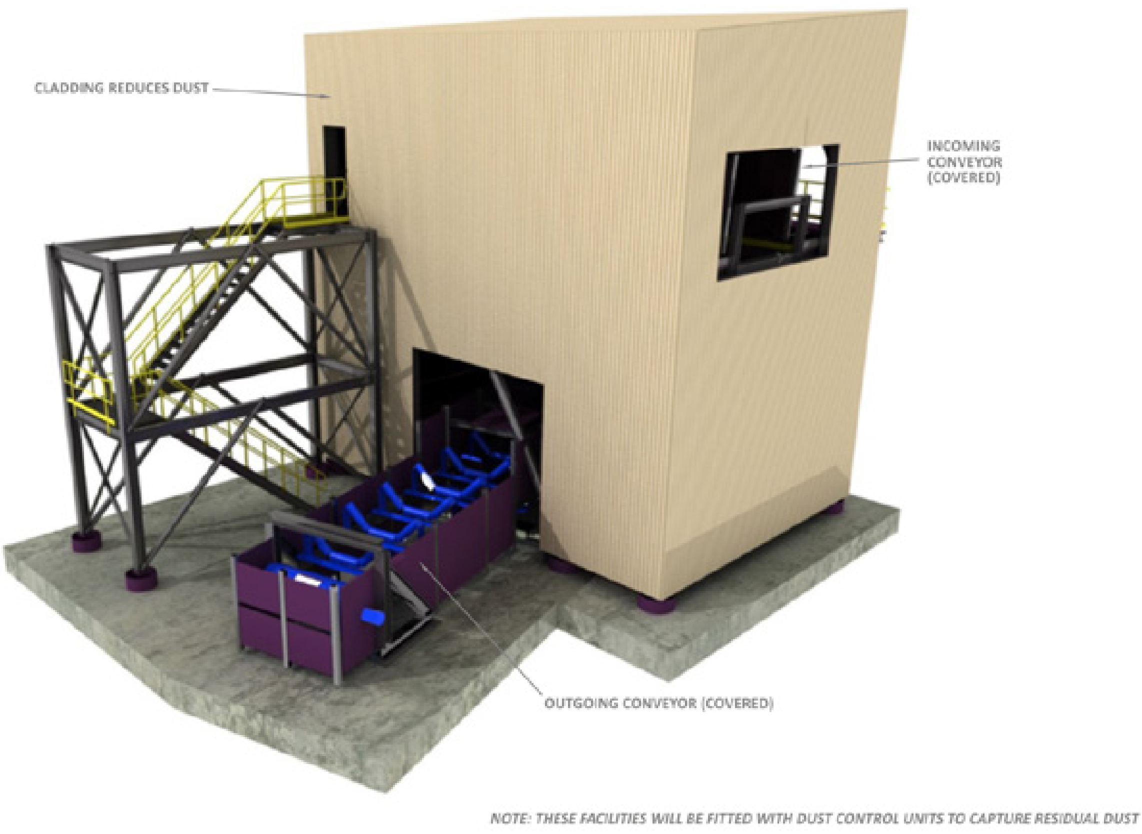

Figure 4-22 Transfer Station

Concentrate Stockpile

The proposed concentrate stockpile will be located on a relatively flat part of the port site, to the northeast of the jetty. The stockpile will be approximately 20 m high, 44 m wide and 660 m long. This stockpile arrangement will allow for the storage of approximately 660,000 t of concentrate, which equates to approximately three to four shiploads of material.

The magnetite concentrate will be deposited on the stockpile in a prism formation using a boom stacker (refer to Figure 4-23). The boom stacker will move up and down the stockpile to place the magnetite concentrate at an even height, and will be fitted with dust suppression sprays to control any dust that may be generated during operations. The magnetite concentrate will have a relatively high moisture content of approximately 10% which will reduce the potential for dust generation (refer to Chapter 10 Air Quality). Additionally, a mobile water cart with spray cannons will apply a veneering agent to the concentrate stockpile to create a cohesive layer over the surface of the concentrate and reduce the emission of wind-generated dust. The veneering agent is widely used throughout industry and is based on natural starches which are biodegradable. A road on either side of the stockpile will allow access for the water cart.

A low height bucket-wheel reclaimer will be used to move the concentrate from the stockpile to the conveyor system feeding the shiploader (refer to Figure 4-24). The low height operation of the reclaimer reduces the potential for wind-generated dust and the machine is also fitted with dust suppression sprays should they be required.

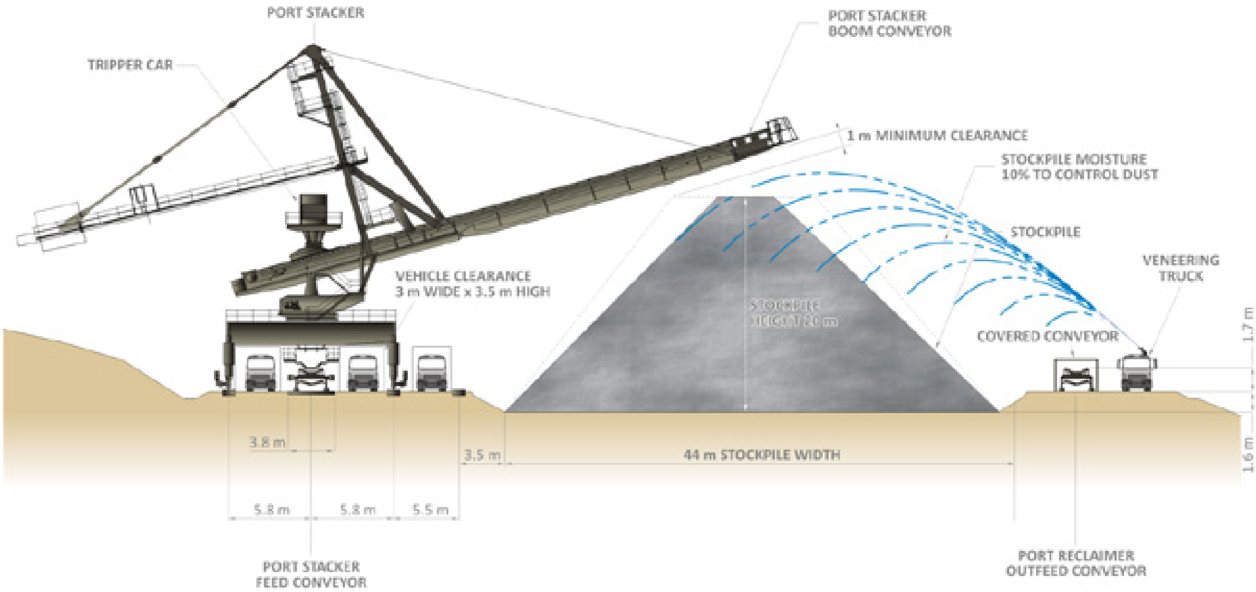

Figure 4-23 Concentrate Stockpile and Boom Stacker

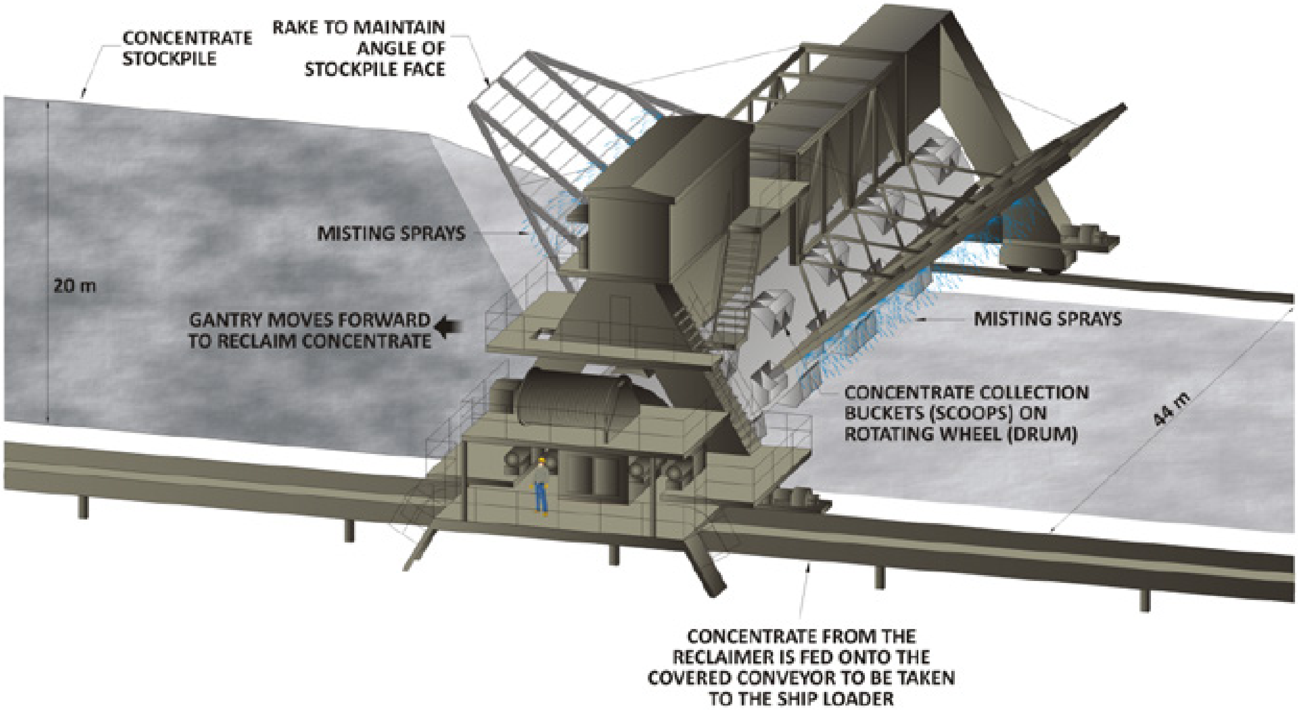

Figure 4-24 Bucket Wheel Reclaimer

Shiploader

A shiploader designed to load Panamax and Cape size vessels with a loading capacity of up to 220,000 Dead Weight Tonnage will be located on the wharf. The shiploader will be able to manoeuvre to reach loading hatches on vessels on either side of the wharf with travel limits of approximately 240 m and a reach of approximately 50 m.

During ship loading, the shiploader boom will be positioned over the loading hatch of the vessel. The shiploader design includes a telescopic chute which will be extended into the loading hatch to be a short distance above the surface of the hold as the concentrate begins to load (refer to Figure 4-25 and Figure 4-27).

As the hold fills, the chute will rise to maintain this short separation distance and minimise dust emitted during loading. Dust is not expected due to the required 8-10% moisture content of the concentrate. Refer to Chapter 10, Air Quality, for further information on dust management for materials handling activities.

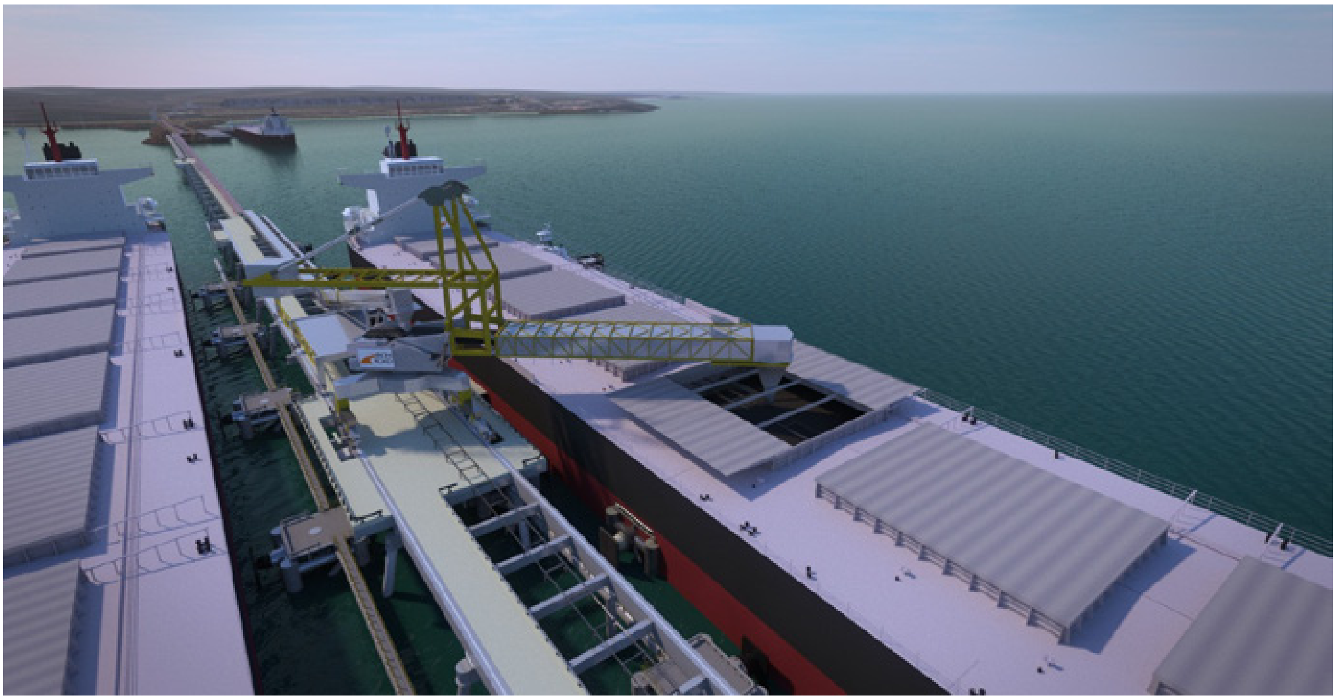

Figure 4-25 3D Representation of Shiploader

4.3.2 Marine Infrastructure

The proposed marine infrastructure at the port site includes:

- A 900 m long main jetty connecting the wharf to the shore (incorporating 200 m of causeway)
- A 400 m long wharf with two shipping berths
- Tug harbour (incorporated into the north eastern section of causeway)
- Module Offloading Facility (incorporated into the south eastern section of causeway)

These facilities are shown on Figure 4-26 and are described in the sections below.

The required berth depth for the port facility is approximately -21.3 m AHD, which allows for the draft of a fully laden Capesize vessel, vessel motion and a safety clearance between the vessel hull and the sea floor. To reach the required water depth, the outer end of the wharf will be approximately 1300 m from the shore line. In order to minimise the maximum vertical motion of the vessels during high wave conditions, the jetty and wharf will have an orientation of 153 degrees True North to align with the average direction of the long period, large wave height.

The jetty and wharf decks have been designed to be above the predicted extreme water level of 2.907 m AHD, with a proposed jetty deck height of 8.4 m AHD at the abutment with the causeway and a wharf deck height of 11.2 m AHD. The predicted extreme water level includes an allowance for storm surge and sea level rise due to climate change, as outlined in Table 4-4. Storm surge refers to the temporary increase in sea level during storm events due to wind and low pressure systems.

Table 4-4 Extreme water level predicted for Cape Hardy

Predicted Extreme Water Level	Height in Metres AHD
Tidal Level – Predicted Highest Astronomical Tide	1.047
Storm surge (from a low pressure system and wind setup during a 500 year ARI event)	0.86
Sea Level Rise to 2100 (Coast Protection Board of SA standard)	1
Total predicted extreme water level	2.907

Figure 4-26 Marine Infrastructure Layout

Jetty

The proposed jetty infrastructure includes:

- A 200 m long causeway reclamation between the shore and module offloading facility
- A 700 m long jetty structure
- Jetty deck which will provide support for the magnetite concentrate conveyor and a roadway for vehicles and pedestrians

The jetty will provide access to the shiploading wharf for the magnetite concentrate, operational personnel and maintenance equipment. The proposed jetty deck is approximately 13 m wide. This provides for a 3.6 m wide single lane roadway, jetty conveyor and walkway. The roadway will generally be used by small vehicles but will occasionally be transited by small commercial vehicles and mobile cranes. Lighting, power and telecommunications outlets will be provided at intermittent locations along the jetty.

Wharf

The proposed wharf infrastructure includes:

- A 400 m long wharf deck for supporting the rail-mounted shiploader, conveyors, roadway and services deck areas
- Outer Berth (east side) with berthing and mooring structures
- Inner Berth (west side) with berthing and mooring structures

A cross section of the wharf is shown in Figure 4-27.

The wharf deck will be approximately 24 m wide. The roadway will generally be 4.2 m in width, except for at the end of the wharf where it will be wider to provide a vehicle turn around. The wharf deck will have a height of approximately 11.2 m AHD. This will give the shiploader enough height to be clear of the hatch of an empty Capesize vessel (refer to Figure 4-27).

Nine berthing and mooring structures (dolphins) will be provided on each of the two berths. The dolphins will maintain the berthed vessels at a suitable distance from the wharf structure (refer to Figure 4-27 and Figure 4-29).

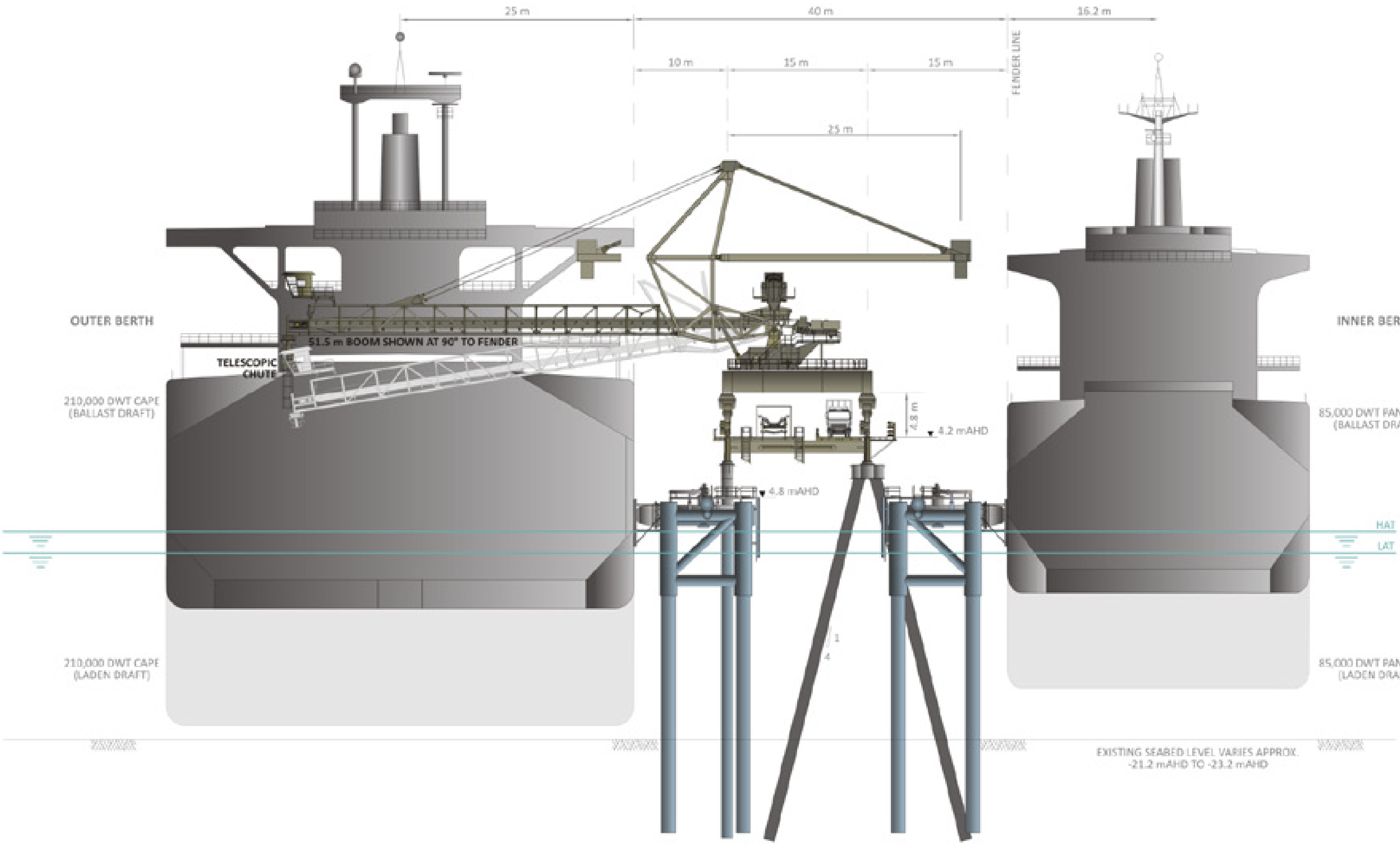

Figure 4-27 Wharf Cross Section

Figure 4-28 3D Representation of Wharf and Jetty

Figure 4-29 3D Representation of Dolphins

Tug Harbour

A sheltered tug facility is proposed to accommodate tugs and other small vessels needed to operate the proposed port. The tug harbour will be required in order for the tugs to moor safely when not in use during extreme wave conditions. The tug harbour incorporates part of the jetty causeway and an additional causeway spur to the east of the main jetty (refer to Figure 4-30 and Figure 4-31). Within the tug harbour, a sheltered tug jetty approximately 36 m long and 8 m wide will be constructed parallel to the main jetty. The tug jetty will have a steel-piled concrete deck and provide sheltered berthing for the safe mooring of harbour tugs and pilot boats. The tug jetty will be connected to the main jetty via an 18 m long, 4 m wide access way. The causeway reclamation will be constructed from rock material cut from the port onshore works.

Module Offloading Facility

Iron Road is proposing to use modules for construction of large equipment at the mine site, such as the process plant. This will involve the prefabrication of equipment off-site into modules, which would then be transported to site and assembled on site during construction. This construction method requires import facilities capable of offloading the large modules, which is proposed in the form of a module offloading facility at the port site. The facility will consist of a roll on/roll off ramp and a lift on/lift off wharf.

The module offloading facility will be located to the east of the main jetty and to the south of the tug harbour. Similar to the tug harbour, it will also incorporate the jetty causeway and the causeway spur in order to provide a secure berth for heavy lift ships (refer to Figure 4-30 and Figure 4-31).

The roll on/roll off berth will enable heavy modules and other project cargo to be unloaded. The cargo will be driven off the stern ramp of a heavy lift vessel using a self-propelled module transporter. The lift on/lift off wharf (approximately 20 m wide and 80 m long) will enable smaller cargo units to be lifted ashore directly onto road trucks using the cranes on board the heavy lift ships. The single berth at the module offloading facility will provide for a range of vessel types and sizes and will be able to accommodate a heavy lift ship up to 217 m in length.

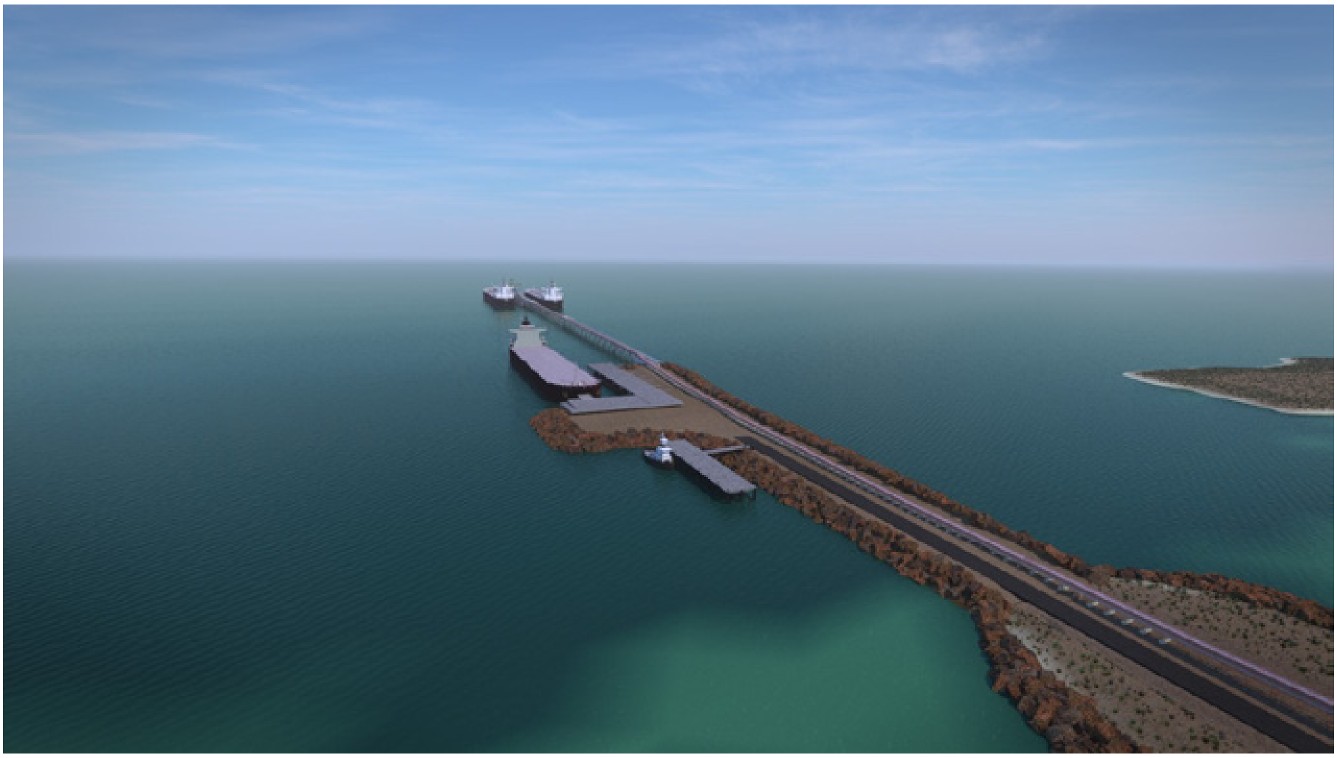

Figure 4-30 3D Representation of MOF and Tug Harbour

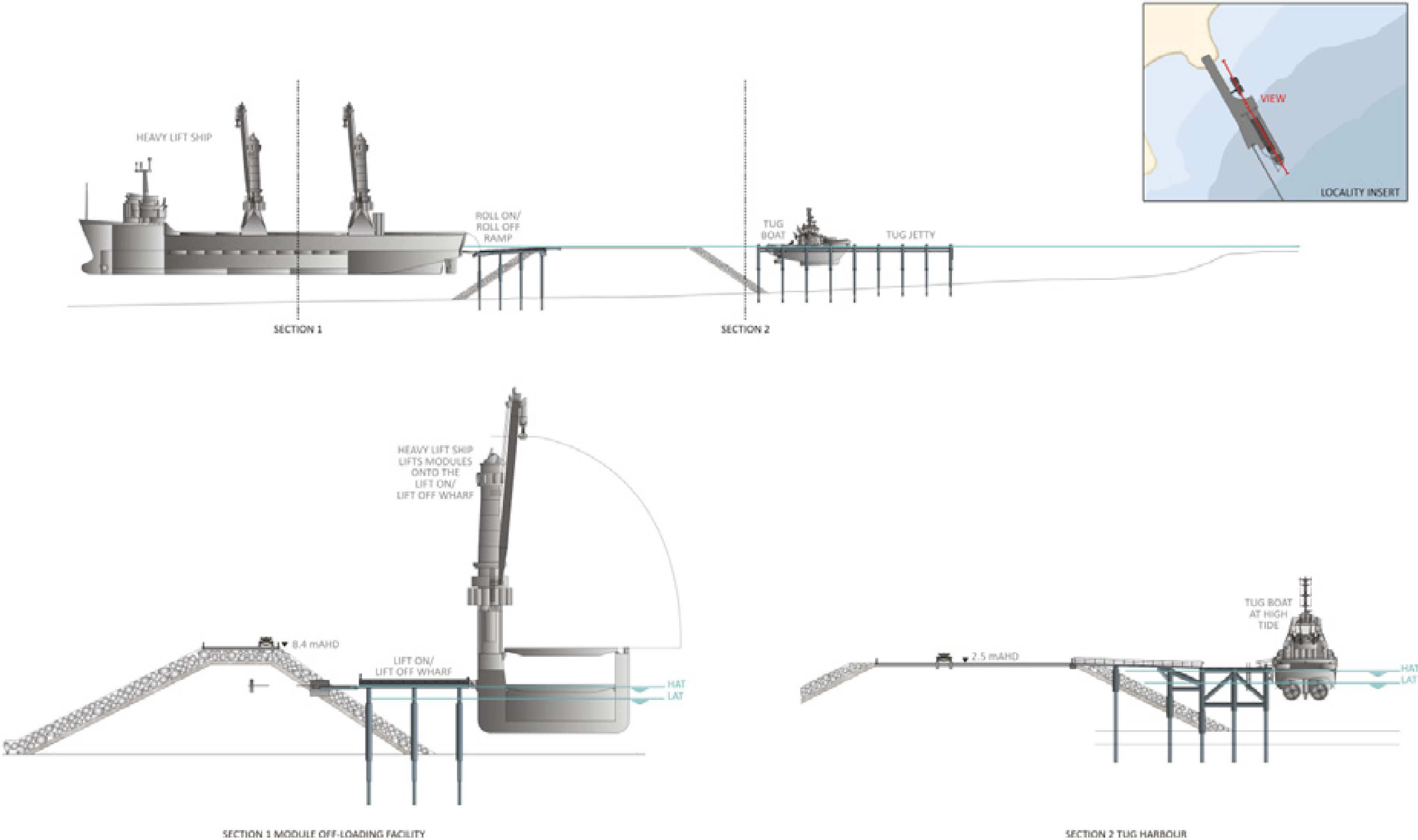

Figure 4-31 Tug Harbour and Module Offloading Facility Cross Section

4.3.3 Supporting Infrastructure

A number of ancillary facilities will be located at the proposed port site to support port operations. These include:

- Administration and functional buildings
- Car parking and access
- Fuel storage and refuelling facilities
- Module laydown area
- Stormwater management infrastructure
- Electricity infrastructure
- Water supply infrastructure
- Wastewater treatment
- Security infrastructure
- Communications

These facilities are described briefly in the sections below.

Buildings

The administration and functional buildings will be located in the east of the port site, adjacent to the concentrate stockpile (refer to Figure 4-32) and will include:

- Administration building
- Emergency services building to house both the medical and fire services. It would consist of a small observation / treatment room, as well as a garage to house the medical emergency vehicle and mobile fire tenders.
- Control room(s)
- Storage warehouse to store maintenance spares for operations
- Maintenance workshop to be used for maintenance of port site equipment
- Ablutions facility and crib room
- Customs office
- Harbour Master / Stevedore shipping office

The buildings will be modular transportable buildings.

Figure 4-32 Administration and Functional Buildings

Car Parking and Access

The proposed main gate access to the port site will likely be located at the intersection of Brayfield Road and North Coast Road. An upgrade of the relevant roads is proposed to provide for increased traffic volumes including a higher proportion of heavy vehicles. The upgrades would include shoulder widening and increasing the extent of the sealed pavement to allow for the required turning movements (refer to Chapter 18 Traffic and Transport for more information on road upgrades).

North Coast Road traverses through the centre of the port site from north to south and will remain a public road. A short section (approximately 350 m) of North Coast Road is proposed to be realigned in the north of the port site (refer to Figure 4-33) to provide for the new bridge over rail.

Within the port site, car parking for staff and visitors will be provided adjacent to the administration building (refer to Figure 4-32).

Internal access roads will link the port site entrance with the administration and support facilities, jetty, concentrate stockpile and port site rail loop.

Access roads will be located on the northern and southern side of the concentrate stockpile and along the length of the conveyors to provide access for light and operational service vehicles (such as cranes) as well as the water cart.

Fuel Storage and Refuelling Facilities

Fuel will be delivered to the port site by A-double tanker road trains and stored in facilities adjacent to the workshop. Light vehicles will be refuelled from standard-rate bowsers at this location, whilst the trains will be refuelled at the proposed mine site, marshalling yard.

The proposed storage tanks are twin-skinned, self-bunded units. The fuel delivery, storage and refuelling area will be fully bunded hardstand with impervious runoff collection storage and fire protection systems which meet Australian Standards and EPA liquid storage guidelines.

Diesel will be the only fuel used during normal operation at the project site. Unleaded vehicles will be refuelled off site at Port Neill.

Module Laydown Area

A module laydown area will be located north of the jetty. This hard stand area of compacted road base will be approximately 150 m wide and 400 m long. It will provide a storage area for modules and other cargo received through the module offloading facility.

The module offloading facility will operate in accordance with a bio-security management plan to ensure compliance with the *Quarantine Act 1908* and the *Quarantine Regulations 2000* and the requirements of the Australian Government's Department of Agriculture to prevent biosecurity risks. The module laydown area on the port site (refer to Section 4.3.3) will be used to securely place the imported modules for inspection or treatment if required. Once the modules have been cleared by both the Department of Agriculture's bio-security officers and the Australian Customs and Border Protection Service, they will either be transported to the mine site or used for construction of the proposed port.

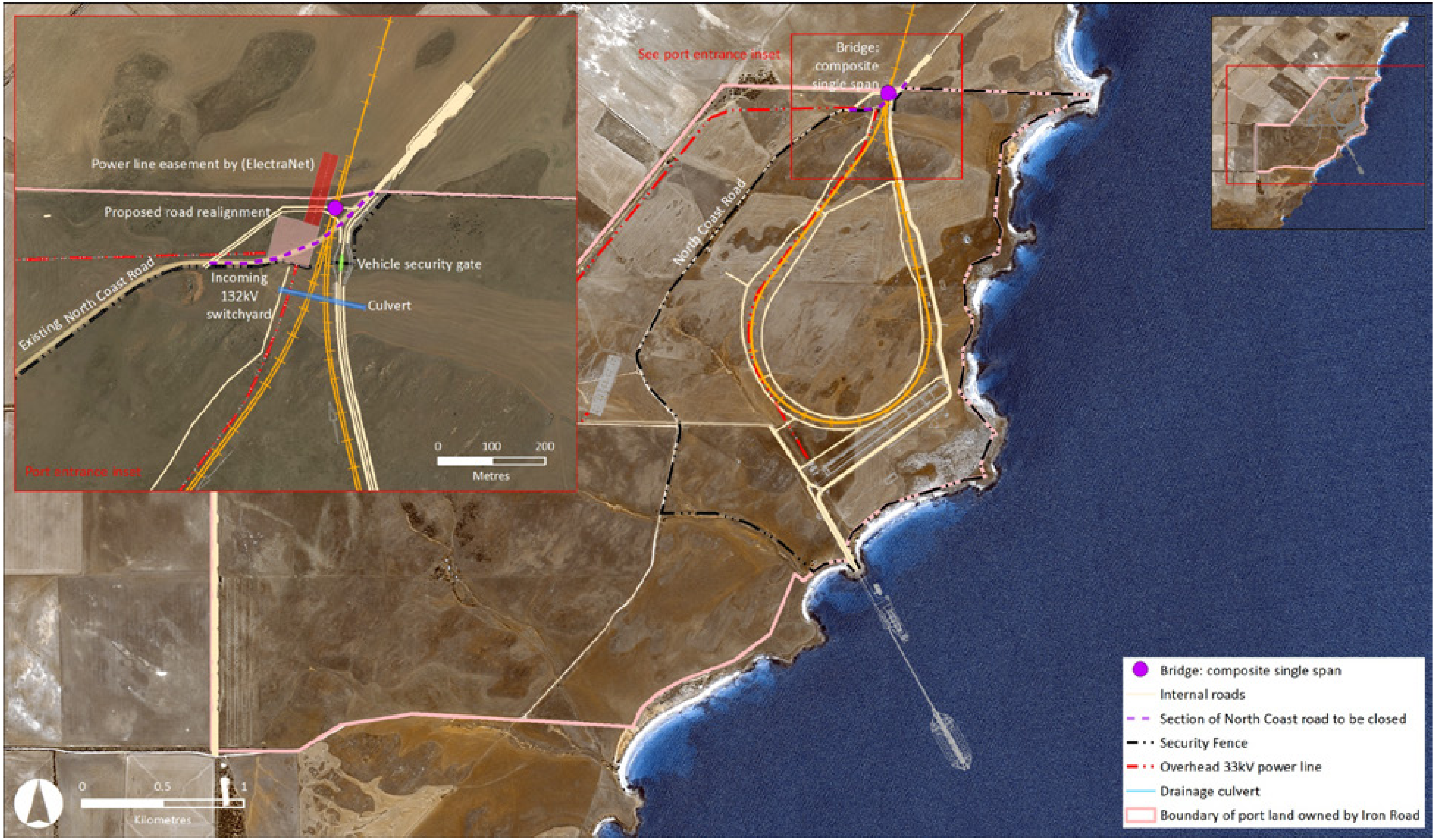

Figure 4-33 Port Site Roads and Access

Stormwater Management

The proposed materials handling infrastructure and rail loop extends across an unnamed creek and several minor drainage lines. Culverts will be installed at creek crossing locations to allow runoff to pass underneath the constructed infrastructure during rainfall events of up to 1 in 20 year flows. As the creek lines currently exhibit scour, rock armour will be installed downstream of the culverts to minimise potential for further erosion. Various open channel water slowing points will be employed.

Rainfall running off the stockpile, module laydown areas and hardstand at the rail unloading facility will be directed to sedimentation basins (as shown in Figure 4-34) which will allow any mobilised concentrate and suspended solids to settle and water to evaporate rather than being discharged to the environment. Sediment will be periodically removed from sedimentation ponds to maintain performance and will be disposed of appropriately in accordance with EPA requirements.

Road runoff will be directed to roadside swales, which will be top-dressed with topsoil to encourage vegetation growth. In the immediate vicinity of inlet structures and locations of high velocity, swales will be rock-lined to slow flows and minimise soil erosion. These swales have been shown to capture and retain suspended solids, which are considered likely to constitute the majority of the contaminants from this run-off.

Areas which pose a contamination risk to stormwater (such as light vehicle re-fuelling) will be bunded (as outlined above), with disposal of waste by a licensed contractor.

Rainfall on areas of the port site undisturbed by development will be allowed to follow existing natural drainage paths. It is not intended that this water be harvested or treated. Natural flows within existing drainage lines will be diverted around or through port infrastructure into the creeks or natural drainage areas which normally receive the stormwater, with appropriate sedimentation structures prior to discharge.

Vehicle washdown areas will be established and managed in accordance with the EPA information sheet *Stormwater Management for Wash Bays (2004)*.

Stormwater management is discussed in further detail in Chapter 15 Surface water.

Figure 4-34 Stormwater Management

Electricity

Power will be provided to the port site by a 132 kV transmission line to be built and operated by ElectraNet, which is not subject to this EIS. A high voltage substation will be located near the port site entrance to convert the high voltage supply to a lower voltage for use within the port site. A 33 kV power line will connect from the high voltage substation to the main substation located to the north of the concentrate stockpile (refer to Figure 4-35). Additional substations will be located within the port site as part of the power supply. Reticulation of power between these substations will be underground.

Water Supply Infrastructure

SA Water will provide a water supply to the proposed port site from the existing water pipeline adjacent to the Lincoln Highway though a new connection along Brayfield Road. Water demand for the port site will be approximately 224 ML per year. The water supply will be supplemented by the collection of roof run-off in rainwater tanks for use on site.

Wastewater Treatment

Wastewater and sewage from the ablutions and kitchen facilities at the port site will be treated on site via an aerobic system and utilised for the watering and maintenance of vegetation and/or landscaping where possible in accordance with South Australian Government requirements.

Security and Communications Infrastructure

A chainlink mesh fence will be installed around the perimeter of the active part of the port site (refer to Figure 4-18). High visibility warning signage and instructions on entering the site will be provided at regular intervals around the fence and native vegetation screening grown where appropriate.

A gatehouse with a security checkpoint will be located adjacent to the main entrance to the site to monitor and control site access. Vehicle gates to the main access road will be remotely controlled from the gatehouse and automated rail gates will be provided for the railway line.

Vehicle and pedestrian gates will also be located at the access point to the jetty which will include lockable turnstiles or swing gates for pedestrians, separate lockable vehicle swing gates, and fencing along the sides of the jetty up to the first pylon to mitigate access of the beach.

A communications tower is proposed to be located in the northwest of the port site.

Figure 4-35 Port Site Transmission Line and Sub Stations

4.3.4 Construction Camp

A temporary construction camp to house up to 650 construction workers will be located in the west of the port site, outside the security fence. The construction camp will have access from Brayfield Road and will be self-sufficient, providing accommodation, dining, laundry and recreation facilities for the workers. The camp site will be fenced with a controlled entrance.

Generally, all buildings will be of a pre-fabricated modular construction, transported to and installed on the site. The buildings will be finished in colorbond steel with zincalume roofing. The construction camp will be removed once construction of both the port site and infrastructure corridor has been completed.

The header tank for the construction camp water supply will be connected with the existing SA Water pipeline at the Lincoln Highway through the new water supply pipeline along Brayfield Road.

An indicative layout of the construction camp is shown on Figure 4-36. The camp will include the following facilities:

- Dining and kitchen building
- A licenced 'wet mess'
- Generators with associated fuel storage to provide power
- Temporary packaged wastewater treatment system
- Communications facility, including phone and internet access
- Access road and car parking
- Laundry
- Waste disposal
- Self-bunded diesel fuel storage tanks with transfer pumps and automatic control, with sufficient storage for seven days run time
- Bus parking, bus stop area and car parking areas
- Recreation building, gym and multi-purpose sports court

Figure 4-36 Port Site Construction Camp Layout

4.4 Long-Term Employee Village

The proposed long-term employee village will be located to the northwest of the township of Wudinna on a site up to 5 ha in size. The exact location of the village is being determined in consultation with Wudinna DC, however it will be located within the investigation zone as shown on Figure 4-37. It will be operated as a drive in, drive out (DIDO) facility to accommodate Iron Road's mine site and railway line operational workers, which will be approximately 300 people and will also include an administration building, dining and kitchen building, car parking, recreation and other facilities as described in Table 4-5.

Iron Road is flexible around the final layout and design of the village and is working collaboratively with Wudinna DC to ensure an optimal outcome for the Wudinna community. The facility would nominally include accommodation units, ancillary buildings, car parking areas and landscaping as summarised in Table 4-5. The inclusion of recreational facilities and amenities within the complex or potential upgrade of existing local facilities will depend on negotiations with Wudinna DC and local businesses to maximise the opportunities for the local community to benefit from investment in the town.

The long-term employee village will utilise town water (SA Water) supplies, with sewage incorporated into the town Community Wastewater Management Scheme. Harvested stormwater and reused wastewater can utilised by Wudinna DC for irrigation of public open space. In addition, water sensitive urban design principles will be incorporated including the collection of roof run-off in rainwater tanks for use on site.

Where practical, rainfall runoff from the long-term employee village will be directed into the existing Council stormwater management system for open space irrigation purposes. Where connection to the Council stormwater management system is not practicable, runoff will be directed to swales for infiltration and evaporation as per existing natural processes.

An indicative layout of the village is shown in Figure 4-38. All boundary setback areas with frontage to roads will include landscaping with appropriate fast growing trees and shrubs, in consultation with the Wudinna DC and local EP NRM officer. The internal accommodation areas will be landscaped for screening and shade purposes.

Table 4-5 Indicative Long-Term Employee Village Components

Operations Village Component	Description
Accommodation Units	· Prefabricated structures of four units, each comprising outward facing bedrooms with ensuite bathrooms. · Arranged in clusters, nominally of four buildings with a shared common services area for air-conditioning units and hot water services. · Each room will be fitted with individual split system air conditioning units, controlled locally.
Administration and Reception	· The administration building will be the main welcome point for all personnel arriving for the first time, and returning residents.
Dining and Kitchen Building	· The building will include a dining area and servery · The back room will incorporate a kitchen, cool rooms, storage areas for dry goods and chilled products, and a preparation area. · The building will also provide transit lounge facilities for workers departing at the end of a roster.
Recreational Facilities	· A number of barbeque areas and shelters will be included throughout the accommodation areas. Shelters will generally provide a barbeque, table and seats, and will have an enhanced landscape setting.

Operations Village Component	Description
Laundry Facilities	· Laundry units are located at node points within the layout of the accommodation units.
Car parking	· Long-term and short-term visitors' parking spaces will be provided.
Internal Movement Network	· From the site access point, parking and servicing areas will branch from a single spine road that provides access to individual accommodation areas, common areas and the infrastructure facilities. · The spine road will be 9 m wide and will be finished in asphaltic concrete. Within the accommodation areas, 3 m wide paths will be provided for fire access and servicing of units by light vehicles, such as golf carts.

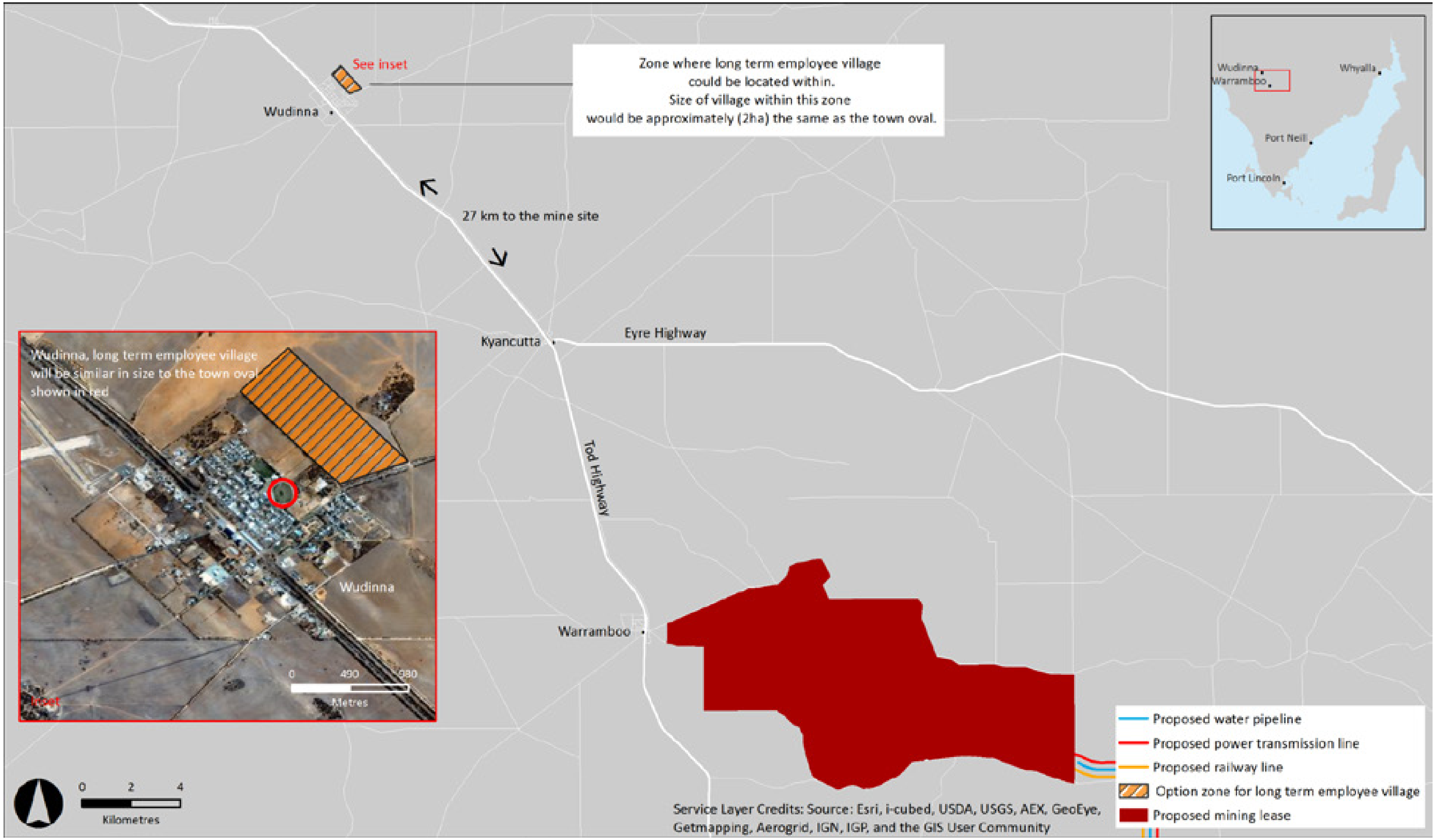

Figure 4-37 Long-Term Employee Village Location

Figure 4-38 Example Layout for Long-Term Employee Village

4.5 Construction Phase

Construction activities for the CEIP Infrastructure will occur seven days a week during day time hours over a three year construction period. Occasional night works may be required during the Construction phase and these would be managed through the Construction Environmental Management Plan (CEMP) to ensure compliance with the Environment Protection (Noise) Policy 2007 and to minimise disturbance to sensitive receivers to acceptable levels.

This section describes the construction programme and workforce, construction laydown areas, earthworks, concrete batching, construction modules, supporting services and waste management during construction of the CEIP Infrastructure.

4.5.1 Indicative Construction Programme and Workforce

Construction of the CEIP Infrastructure will take approximately 3 years from the commencement of early works to the first shipment of concentrate as outlined in Figure 4-39. During this time the construction workforce is expected to peak at approximately 900 people. An indicative breakdown of the construction workforce is shown in Table 4-6. Up to 650 construction workers will be housed at the temporary construction camp at the port site, while others will be housed at the construction camp on the proposed mine site with the mine site construction workforce. The workforce to construct the long-term employee village is included in the mine site construction workforce of approximately 1,050 people.

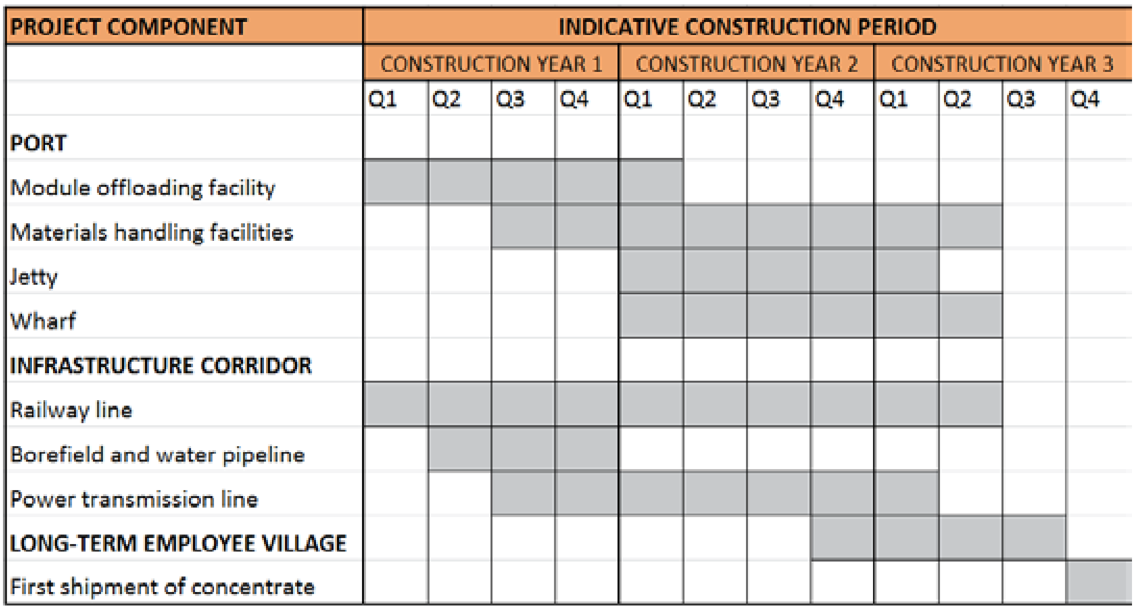

Figure 4-39 Indicative Construction Programme

Table 4-6 Construction workforce

CEIP Component	Construction Workforce
Infrastructure Corridor	500
Port	400
Mine	1050
Head Office	540
Total	**2,490**

4.5.2 Temporary Laydown Areas

Temporary laydown pads will be provided at the port site and along the infrastructure corridor for use during construction. These hardstand areas will be paved using crushed rock and provided with temporary access to accommodate construction traffic. Areas that are not required after the completion of site construction activities will be rehabilitated by removal of pavement materials, followed by contouring, ripping of bulk earthworks and topsoil spreading.

Along the infrastructure corridor, earthwork staging areas will be located approximately every 15 km to allow for construction support facilities and equipment storage. A staging area for each bridge along the infrastructure corridor will also be provided to allow storage and pre-fabrication, crane access and inspection of modules/components prior to lifting. Temporary laydown pads will be provided at the port site for:

- Bulk materials staging (rail and rail furniture/sleepers/ballast/quarried products and so on)
- Two module staging areas
- Marine early onshore and offshore works
- Construction camp
- Engineering, procurement and construction contractor facilities

4.5.3 Module Offloading Facility Construction

The rock armour for the module offloading facility and tug harbour will be built out from the headland using boulders (approximately 1 m^3 in size) and reclaimed clean fill from the landside construction area (refer to Section 4.5.4).

The use of large sea based construction equipment will be avoided, reducing the number of vessels required to access the near shore environment, and minimising sediment suspension and turbidity associated with dredging, vessel scour, propwash and anchoring. Vehicle access, storage and laydown areas on beaches will be restricted to minimise disturbance of the coastal habitat.

4.5.4 Earthworks and Materials Crushing and Screening

Earthworks will be required at the port site for construction of the rail loop, rail unloading facility, building pads, marine causeway and other support facilities. As described in Section 4.2.1, earthworks will also be required along the railway line to maintain a relatively flat gradient. At the port site, the cuttings for the rail loop and rail unloading facility will require blasting, which will occur over a period of approximately five to six months.

Cut and fill will occur in stages to minimise the amount of soil exposed at any given time, and rehabilitation of exposed sites will occur as soon as practicable. In addition, the total cut and fill volumes for the CEIP Infrastructure have been balanced where possible, with excavated materials to be reused as fill within the project site, to avoid offsite sourcing or disposal of fill. For example, rock excavations from the rail loop cutting at the port site will be used for construction of the marine causeway and module offloading facility (subject to assessment once excavated). It is proposed that rail ballast material will also be sourced from within the rail excavations at the port site or from a ballast supplier. The estimated earthworks quantities for cut and fill are shown in Table 4-7. The estimated earthwork quantities will be revised during detailed design with the aim of balancing overall cut and fill to the extent practicable.

In order to enable re-use of the excavated materials, a dedicated materials crushing and screening plant will be established within the port site boundary to process the materials for use in construction. The materials crushing and screening plant will produce:

- Scour protection facing class rock and concrete aggregate for landside and marine works
- Scour protection, road pavement and capping material for rail works in the infrastructure corridor

Table 4-7 Port Site and Infrastructure Corridor Estimated Earthworks Quantities

Separable Portions	Total Cut (m^3)	Total Fill (m^3)
Port site		
Concentrate Stockpile	100,500	169,500
Port site rail loop and rail unloading facility	1,172,500	637,000
Aggregate for port landside and marine concrete		9,500
Marine Causeway		329,000
Remainder of port site (landside)	28,000	116,000
Infrastructure corridor		
Rail earthworks capping layer		292,000
Rail maintenance track		238,500
Rail Ballast		167,500
Total cut	6,546,500	
Total general and structural fill (Including Road Fly-Overs)		6,039,000
Estimated Total	**7,847,500**	**7,998,000**

4.5.5 Concrete Batching Activities

The estimated concrete demand for construction of the port site is approximately 9,500 m^3. In order to supply concrete, a concrete batch plant will be established in close proximity to the construction activities on the port site. It is intended that the facility will be operated by a third party industry specialist, who will supply concrete directly to each contractor responsible for works packages. It is anticipated that the concrete batch plant will have a production capacity of up to 90 m^3 of concrete per hour.

4.5.6 Modules

Iron Road intends to use modular construction methods for large scale infrastructure and buildings at both the mine site and port site. This method involves performing a majority of the construction work at an off-shore pre-assembly yard and shipping the substantially completed assemblies to the proposed module offloading facility at the port site using lift on/lift off and roll on/roll off ships (refer to Section 4.3.2). Examples of module types are shown in Figure 4-40.

Modularised components of the proposed port are likely to include:

- The main cell of the rail unloading facility
- Transfer towers
- Sample station
- Dust extraction buildings
- Conveyors
- Jetty and wharf deck
- Shiploader

Super Pre-Assembled Module (S-PAM)

Pre-Assembled Module (PAM)

Pre-Assembled (PAR) Pipe rack and/or Conveyor Gallery

Vendor Assembled Unit (VAU)

Figure 4-40 Example of Module Types

4.5.7 Construction Water Supply

A construction water supply will be required for construction activities including:

- Dust suppression (earthworks and access roads)
- Earthworks (material conditioning and compaction)
- Concrete batching plant
- Construction camp and offices potable supplies

Saline ground water supplied from two water supply wells (one in the Kielpa geological domain, and one in the Verran geological domain) will be used for earthworks, dust suppression and material placement at the port site and along the infrastructure corridor. Groundwater will be transferred from these water supply wells to designated water points in the northern and southern sections of the infrastructure corridor and to the port site by 110 mm HDPE pipelines. Each well would operate continuously for two years and water demand at each water point would be 430 m^3/day (GWS 2013).

Potable water for the port site construction camp and for concrete batching would be supplied from the new SA water connection (refer to Section 4.3.3).

4.5.8 Construction Power Supply

Construction contractors will be responsible for providing power for the construction activities. It is anticipated that power will be supplied by diesel generators.

4.5.9 Temporary Site Offices and Amenities

Temporary buildings will be used at the port site to provide construction site offices and amenities during the Construction phase. Separate buildings and facilities are anticipated for:

- Engineering, procurement and construction and earthworks contractors
- Mechanical contractors
- Structural, mechanical, piping and concrete laydown area
- Marine contractors

4.5.10 Construction Waste Management

Iron Road will develop a waste management plan to be implemented as part of the CEMP. Specific measures to be incorporated in the waste management plan will include:

- A procurement policy to encourage purchase and use of materials with recycled content, minimal packaging and materials that can be recycled at their end of life, or returned to the provider for recycling/re-use.
- Construction waste will be separated into different streams to facilitate recycling and will be removed from the site by a licensed contractor.
- Liquid waste (including hydrocarbons, paints and solvents) will be stored in sealed drums or containers in a bunded area before removal from the site by an EPA-licensed contractor for recycling, where possible, or disposal to a licensed facility.
- During construction, temporary ablution facilities will be serviced by pump-out tanker trucks, used with off-site disposal by a licensed contractor.

The framework for the CEMP is described in Chapter 24 Environmental Management.

4.6 Operation Phase

The CEIP Infrastructure will operate 24 hours per day for 365 days per year. This section provides information on the operational workforce, operation of the proposed railway line, water supply and port site and waste management.

4.6.1 Operational Workforce

A total of approximately 100 employees will be required for the port site operations and 40 for the infrastructure corridor (for operation of the railway), as shown in Table 4-8. On top of the permanent workforce, a small number of additional workers will be required for shutdown activities which will occur periodically as part of an annualised task (for approximately six to eight weeks per year). Table 4-8 also shows the proposed mine workforce and workers based in the Adelaide head office for the CEIP.

To support 24 hour operations, staffing will be required on a continuous basis, with day and night shifts for production and many service and maintenance activities. However, some specialised maintenance areas, such as workshops, may operate as a day shift only. Management, technical and administrative roles on site will generally follow a standard five day week.

Table 4-8 Operational Workforce

CEIP component	Infrastructure Corridor	Port	Mine	Head Office	Total
Employees	40	70	260	60	430
Contractors	-	30	300		330
Total permanent workforce	**40**	**100**	**560**	**60**	**760**
Shutdown (not part of permanent workforce)	-	10	300		310

4.6.2 Railway Line Operations

A train consisting of two locomotives and 138 wagons will transport the magnetite concentrate from the mine site to the port site. The total length of the train would be approximately 1.3 km. The bottom dumping rail wagons will be covered prior to the train leaving the mine site (refer to Figure 4-41 for an example of a covered rail wagon).

Six loaded trains per day will be required to transport 21.5 Mtpa from the mine site, which will require three trains running two return trips each per day. A speed limit of 80 km per hour would be enforced for both loaded and unloaded trains along the main line. A lower speed limit of 10 km per hour would apply for the mine and port site loops. An indicative overview of the rail operations, including travel time is shown in Figure 4-42.

The rail operations will be controlled from a network operations control office located on the mine site. Remote signal locations along the railway line will be solar powered with high capacity PV cell panels and battery storage. A mobile diesel generator will also be provided at each location for backup with fuel storage to operate for five days. The networks operations control office would monitor the status of the solar system, including any unauthorised removal of PV panels, battery charge and use of generators. UHF base stations will also be placed adjacent to trackside signalling infrastructure.

At the active level crossing on the Birdseye Highway, flashing light controls would be activated when an approaching train is 4 km away, based on the requirements of AS1742.7. Passive level crossings will be controlled using signage in accordance with AS1743.7. All level crossings will be equipped with wayside UHF intercom with a direct line to the networks operations control office.

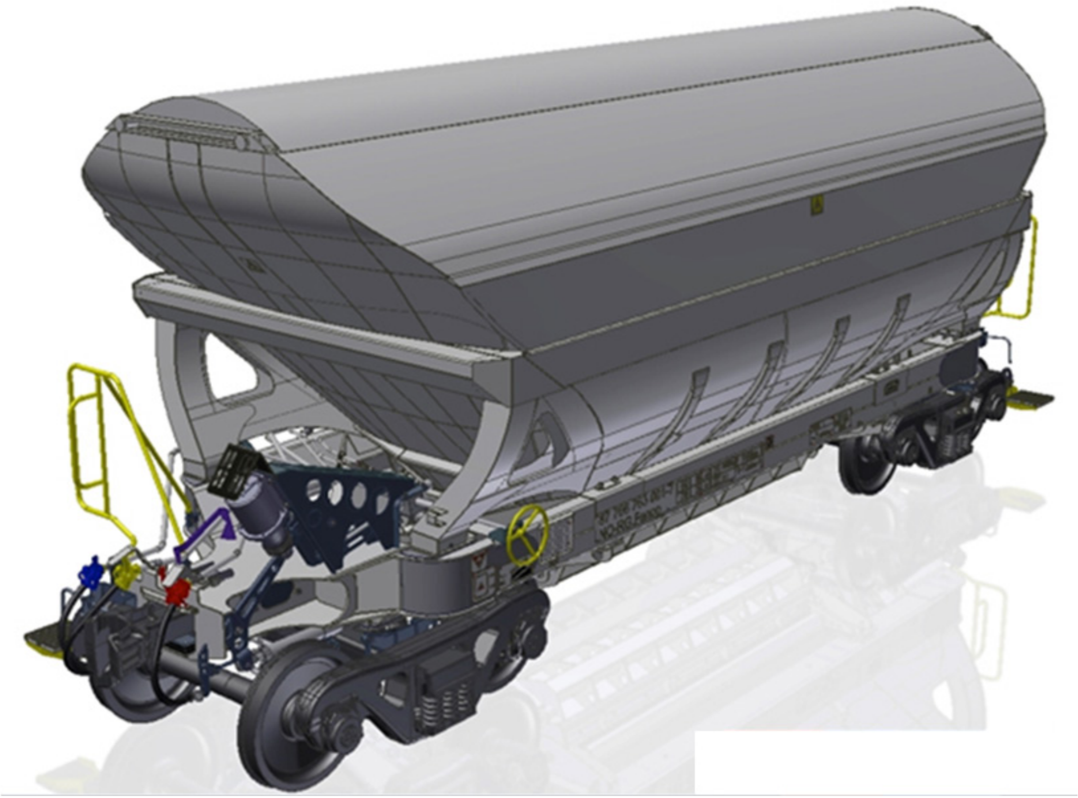

Figure 4-41 Example of a Covered Rail Wagon

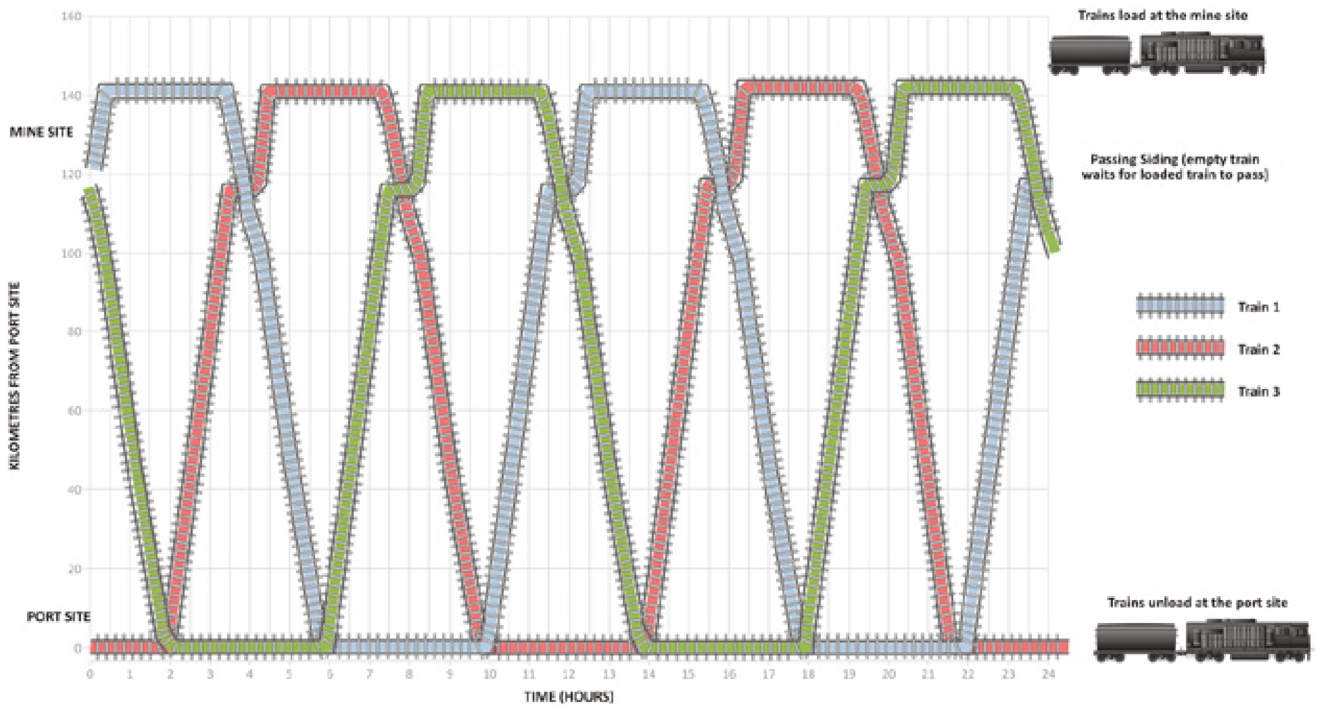

Figure 4-42 Indicative Railway Line Operations

Maintenance facilities for the rail wagons and locomotives will be located on the proposed mine site and are therefore outside of the scope of this EIS. However, track maintenance and breakdown assistance for trains would be provided through service vehicles and trucks with Hi-Rail conversions to enable them to run on the railway line.

4.6.3 Water Supply

The water supply and treatment system will generally operate automatically with minimal operator intervention. Non routine operations and maintenance activities are described in Table 4-9.

Table 4-9 Water Supply Operations and Maintenance Activities

Equipment	Operations and Maintenance Activities
Borefield	Pump retrieval and maintenance as required.
	Bore flushing, swabbing and disinfection as required.
Pump Stations	Operator involvement if pressure set points require adjustment to compensate for fouling of the transfer pipeline.
Transfer Pipeline	Bi-weekly inspection of the transfer pipeline (checking the general condition of the pipeline and surrounds as well as checking for leaks). Three-monthly inspection of air valves (replacing/maintaining valves as required). Three-monthly stroking of automated and manual stop valves.
Break Tank	The maintenance requirements for this facility are expected to be limited to annual inspection (and possible cleaning) of the break tank, including internals.

4.6.4 Port Operations

Operation of the port site will include materials handling activities to unload the magnetite concentrate from the rail wagons, store it and then load it into vessels for export, maritime activities to manage ship arrivals and departures, maintenance and port site security. These activities are outlined in the sections below.

Materials Handling

The materials handling process, from delivery of the magnetite concentrate at the rail unloading facility to ship loading is shown on Figure 4-43. Operation of the materials handling system will be automated where possible, with remote control from the administration building.

Operation of the rail unloading facility will be fully automated. The train will maintain continuous motion through the rail unloading facility at a very slow speed of approximately 0.8 km/h. The rail wagon bottom dumping doors will open once the wagon is inside the facility, emptying the magnetite concentrate into the hoppers below (refer to Section 4.3.1). An automatic wagon vibrator machine will shake the wagon if required to empty the wagon completely. The underside doors are closed prior to leaving the building with the lids remaining on during the unloading procedure. Manual operation of the facility will also be possible from a control room which will be located with the rail unloading facility substation.

Online moisture analysis will be provided on the conveyor from the rail unloading facility to monitor the moisture content of the concentrate. An automated sampling system will operate from the second transfer station to collect representative 'as-shipped' samples of the magnetite concentrate.

Operation of the conveyor systems and the concentrate stockpile boom stacker and bucket-wheel reclaimer will also be fully automated. However, the shiploader will have an on-board operator.

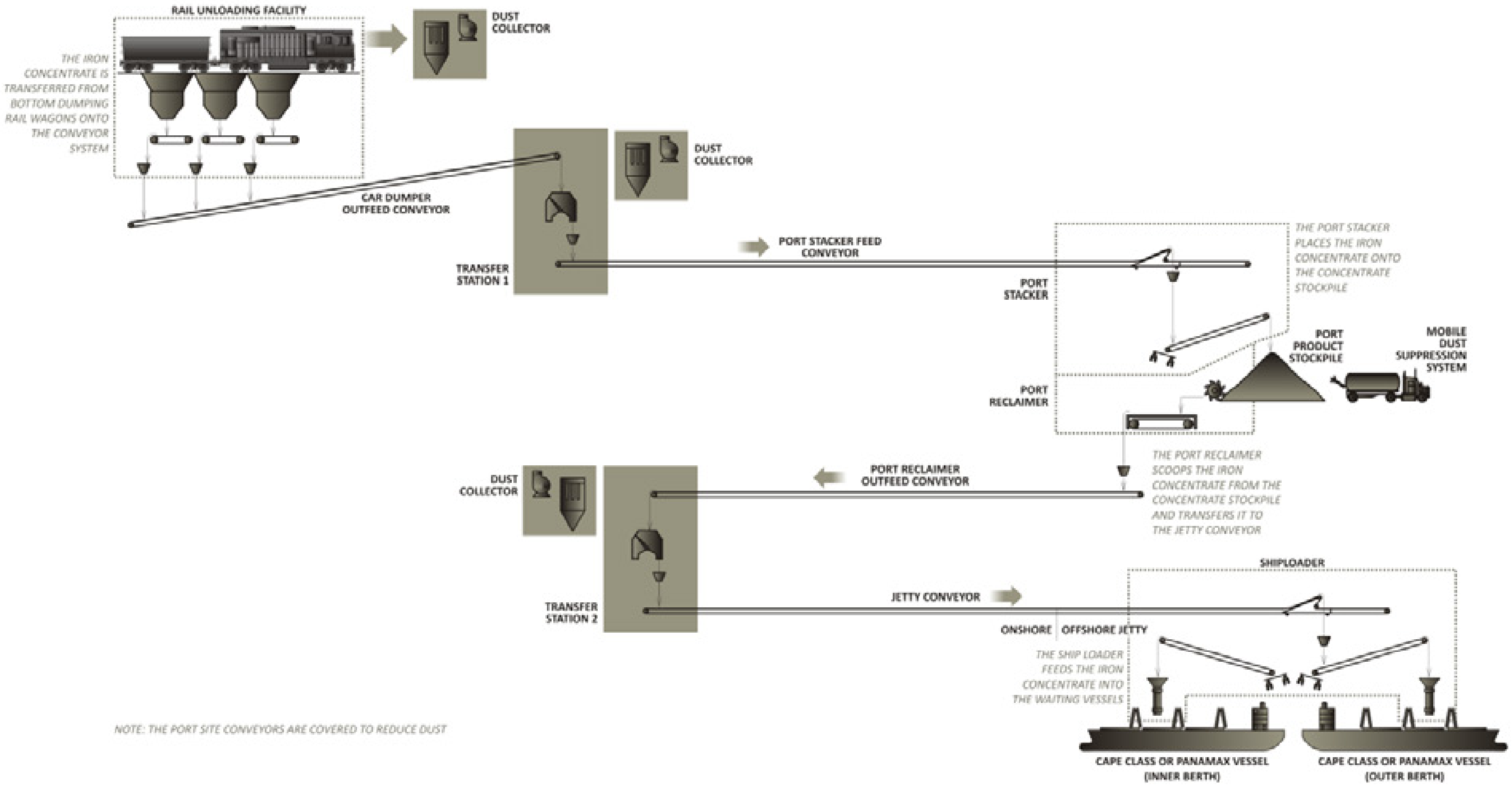

Figure 4-43 Materials Handling Process Flow Diagram

Port Approaches

The port site will receive approximately 145 vessels per year, which on average will be three vessels per week. Ships will enter Spencer Gulf and then proceed directly to the port site at Cape Hardy. Ships would approach and depart from the port facilities via a nominated approach route (fairway) bearing 128˚ - 308˚ from the main Spencer Gulf shipping channel. The fairway is of sufficient natural depth so as not to require dredging. A designated anchorage area in the vicinity of the proposed port operating limit is proposed for ships waiting to berth and load cargo at the port site. The fairway and anchorage area are shown on Figure 4-44. They would be marked on charts but not delineated in the field by navigation beacons or buoys, unless specifically required to mark navigational obstructions.

Subject to agreement with DPTI, the proposed port operating limit would be designated as the limit of jurisdiction of the port operator. It is anticipated that this will encompass the waters in the immediate area of the port site, but may not encompass the anchorage area as well (refer to Figure 4-44). The port operator will ensure that vessels bound for Port Neill or other destinations can freely pass the port site.

Navigation lights and day marks will be provided to indicate the preferred approach route to the facility. It is proposed to include a sector light on the outer end of the wharf indicating the alignment of the loading wharf for vessels approaching from the southeast. Another set of sector lights will be positioned on the shoreward end of the wharf to indicate the limits of navigable depth and preferred alignments for vessels approaching from the northeast or at the Inner Berth (refer to Figure 4-44).

Ship Arrival

Pilotage will be provided for ships arriving at the port site. If the berth is occupied, it is expected that ships will make their way to the anchorage area without needing a pilot. The pilot will board near the anchorage area to bring the ship in along the final part of the approach route, turn the ship with tug assistance, and berth it alongside the wharf (refer to Figure 4-45). Moored vessels would be facing offshore when at berth.

Ship Departure

At completion of loading, a marine surveyor will undertake a draft survey to calculate the total tonnage of product loaded which will then be certified in consultation with the ships master. The associated maximum loaded draft will be agreed given the state of the tide at departure, sea and swell and minimum under keel clearance conditions.

The tugs will assist vessels to depart from the port facility by pulling the loaded ships off the berth after line release and providing escort until the ship gains sufficient speed.

Ballast Water Management

Iron Road will ensure that ballast water management is consistent with International and Australian requirements, with no discharge into Australian waters. Ships under charter to Iron Road will be required to comply with all International and local laws, including the convention for the Control and Management of Ships 'Ballast Water and Sediments' (refer to Chapter 14 Marine and Coastal Environment).

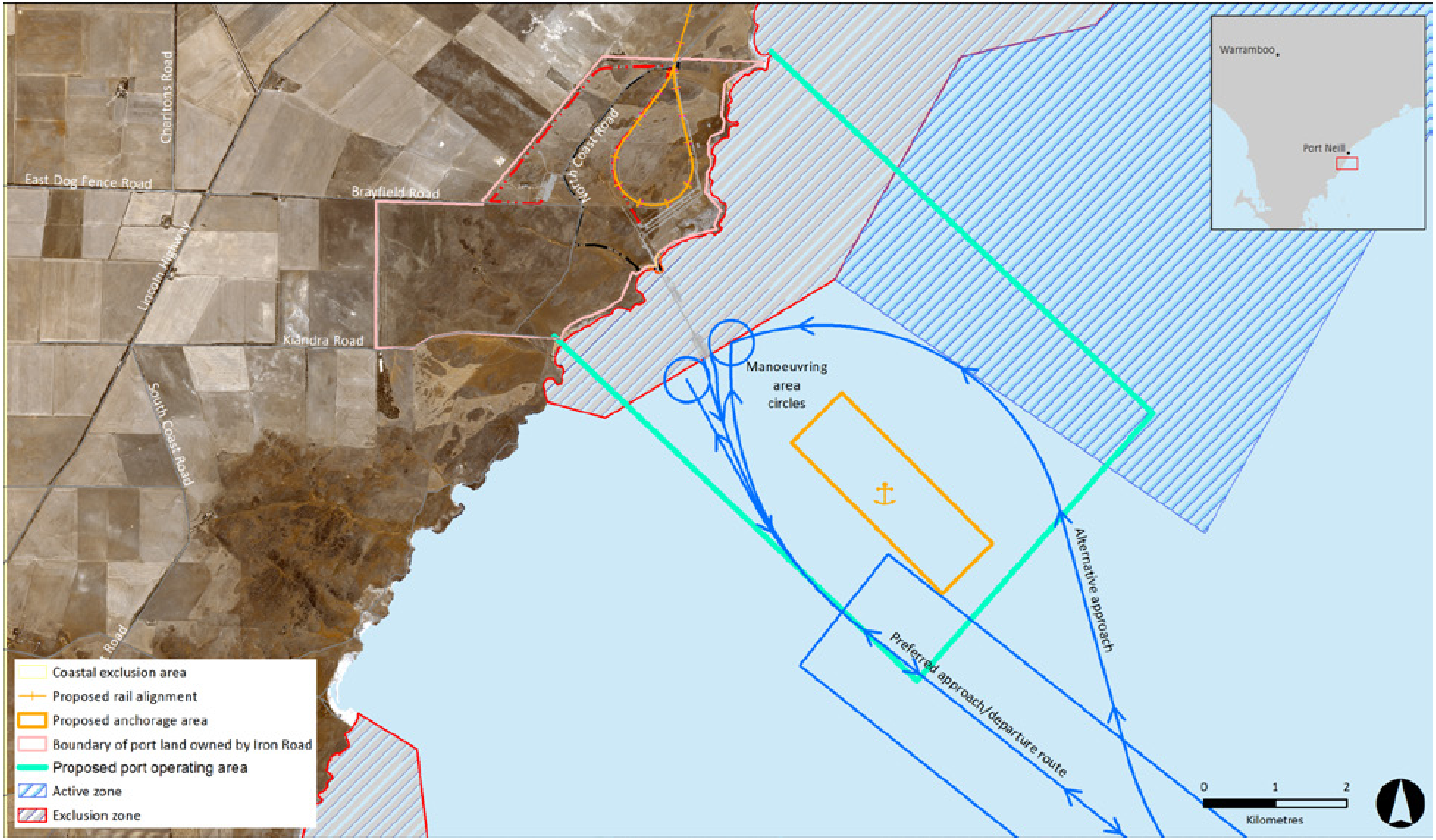

Figure 4-44 Port Operation Limits and Anchorages

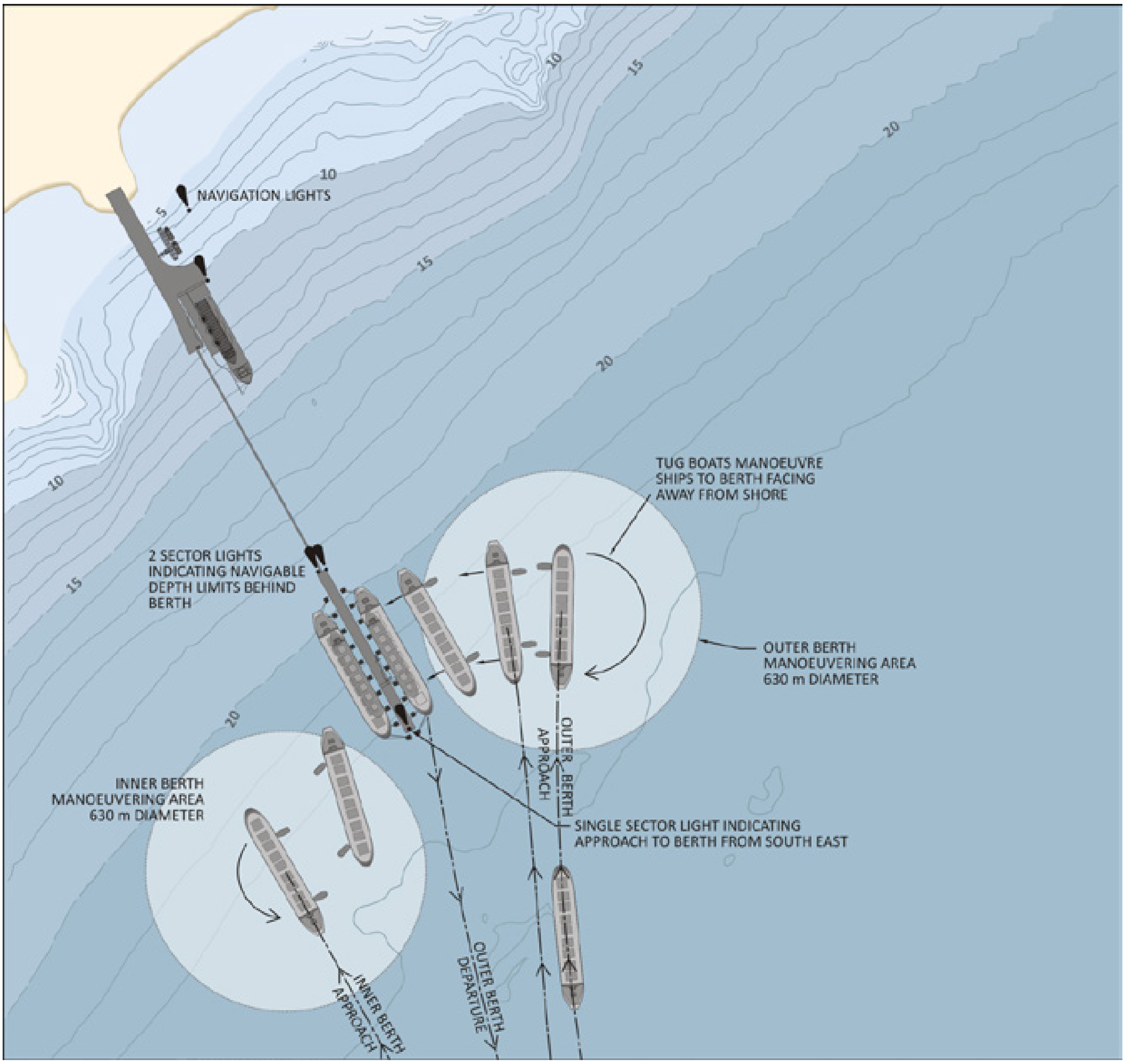

Figure 4-45 Vessel Movements

Figure 4-46 3D Representation of Tugs Manoeuvring a Vessel

Maintenance

A maintenance area for the port stacker and reclaimer will be located at the north-eastern end of the concentrate stockpile. Maintenance activities for the wharf will include:

- Change-out of energy absorbing fenders and fender panels
- Maintenance of mooring equipment (i.e. quick-release hooks)
- Maintenance of the shiploader and its component parts
- Replacement of the wharf conveyor belt
- Maintenance / replacement of wharf conveyor drives or motors

Other maintenance activities such as fender panel and mooring hook change-out would occur from a floating plant. Shiploader maintenance would be undertaken with a separately deployed mobile crane of sufficient capacity to lift off components of the shiploader and place them onto trucks or low-loaders.

A dedicated maintenance area for the shiploader will be located on the wharf.

Port Site Security and Control Systems

The port site will have control systems for equipment control, site-wide communications and security to provide safe and efficient control and monitoring of all equipment and for corporate communications between systems and staff.

Public access to the coastline in the vicinity of the proposed jetty will be restricted as required by a port declaration under the *Harbors and Navigation Act 1993* in due course. The proposed coastal exclusion area and port operating limits where public access will not be permitted are shown on Figure 4-18.

Security at the port site would be governed by a maritime security plan in accordance with the Australian Government's *Maritime Transport and Offshore Facilities Security Regulations 2003*. Security treatments, including fencing, controlled site access and electronic security systems would be installed at the port site in accordance with the plan. The electronic security system will support the physical security treatments and include an Electronic Access Control System (EACS) and a Closed Circuit Television (CCTV) System. The EACS is a tool to manage personnel movements once they enter the site and will involve a hierarchy of access permissions to various facilities such as to the buildings and the jetty. CCTV systems are able to perform several functions, namely video surveillance, intrusion detection and alarm verification. CCTV cameras would be installed at key locations across the port site.

Other components of the port site control systems will include:

- Sequencing and Regularity Control
- Basic Process Control System
- Safety Control System
- Condition Monitoring System
- Substation and Power Systems
- Water Systems
- Port Unit Control Systems
- Ethernet Network Infrastructure

4.6.5 Waste Management

All recyclable waste will be separated into different streams to facilitate recycling and removed by a licensed contractor. Iron Road will liaise with the Wudinna and Tumby Bay Councils to develop or upgrade transfer facilities for recyclable waste that can be shared with the community. A composting facility will be established for putrescible waste for the construction camps. Other inert waste will be disposed of in the Wudinna and Tumby Bay landfills with the facilities upgraded if necessary, in consultation with the Council.

E-waste, including electrical and electronic equipment will be containerised and provided to an appropriate facility in Adelaide for recycling.

4.7 Rehabilitation Strategy

During the construction of the CEIP Infrastructure, ground disturbance footprints will be minimised and vegetation will be retained wherever possible. Progressive rehabilitation of disturbed ground will be undertaken as soon as practicable. As set out in the CEMP (refer to Appendix AA), rehabilitation strategies will include use of locally indigenous plant species, use of existing seedbank from stockpiled material where practicable, and align with regional NRM objectives where possible.

The CEIP Infrastructure will service the proposed mine which has an estimated production life of 25 years. During the later stages of mining, it is expected that liaison with the relevant local councils, local landowners and other key stakeholders, including user groups, will occur to determine future management or decommissioning of infrastructure. It is expected that the railway line and loop, port infrastructure and transmission line will be retained based on negotiation with the State Government and potential private investors for future use.

Decommissioning and removal of site infrastructure, if required, would involve site assessment and remediation planning, including removal of fuel and chemical storage and wastewater treatment facilities in accordance with the relevant legislation and standards.

4.8 Summary

A high level summary of the CEIP Infrastructure components is provided in Table 4-10.

Table 4-10 Snapshot of CEIP Infrastructure Components

CEIP Infrastructure Component	Measurement
Infrastructure Corridor	
Infrastructure corridor length (mine boundary to port boundary)	130 km
Infrastructure corridor area (railway line, rail maintenance track, water pipeline and earthworks from the mine boundary to port boundary)	743 ha
Total rail length (including railway line and loops within mine and port boundaries)	148 km
Length of water pipeline from the pump station to the mining lease boundary	56 km
Length of main collector pipeline that runs centrally through the borefield to the pump station	14 km
Combined lengths of connector pipelines from the central borefield pipeline to the bores	7 km
Area of borefield and collector pipeline	42 ha
Length of power transmission line from the Yadnarie substation to the infrastructure corridor	20 km
Length of power transmission line along infrastructure corridor to the mining lease boundary	56 km
Area of power transmission line pole footprint (Yadnarie substation to the mine site)	43 ha
Operational workforce (approximately)	40 people
Port Site	
Port site loop (rail length)	5 km
Distance from port site to Port Neill (port site entrance to edge of town)	5 km
Area of port land owned by Iron Road entity, IRD Port Assets Pty Ltd	1,100 ha
Proposed port site coastal exclusion zone	2 ha
Proposed port operating area (marine waters)	243 ha
Area of “active” Port land (within the security fence)	461 ha (42% of available land)
Length of causeway (part of jetty)	200 m
Length of jetty	900 m
Length of wharf	400 m
Operational workforce (approximately)	100 people
Approximate number of ship arrivals per year	145
Long-Term Employee Village	
Area of long-term employee village	Up to 5 ha

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