PART A
Introduction, project background and description

INLAND RAIL

CHAPTER A8
# Construction of the proposal


**Narromine to Narrabri**
Environmental Impact Statement

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

IR_1929

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# A8. Construction of the proposal

This chapter provides an outline of the indicative construction activities likely to be used to construct the Narromine to Narrabri project (the proposal). It includes an indicative construction methodology, timing, likely resources and proposed access arrangements.

## A8.1 Overview and approach

Construction of the proposal would commence once all necessary approvals are obtained. It is anticipated that construction would commence in late 2021 and take about four years to complete.

The indicative approach to construction is described in sections A8.2 to A8.7. Detailed construction planning, including timing, staging and work sequencing, would be confirmed once construction contractors have been engaged. Further information on the construction program and timing is provided in section A8.8.

Overall, the construction strategy is based on an approach of dividing the proposal site into four construction areas, with each construction area made up of a number of smaller work areas. The construction areas, shown in Figure A8.1, are as follows:

- Narromine—the southern end of the proposal site to Wyuna Road
- Gilgandra—Wyuna Road to Merriwindi State Forest
- Pilliga—Merriwindi State Forest to the northern end of Pilliga East State Forest
- Narrabri—from the northern end of Pilliga East State Forest to the northern end of the proposal site.

Construction in each area would generally involve the following main phases of work:

- Pre-construction activities (described in section A8.2)
- Site establishment and preliminary activities (described in section A8.3)
- Main construction works (described in sections A8.4 and A8.5)
- Testing and commissioning (described in section A8.6)
- Finishing and rehabilitation (described in section A8.7).

To facilitate construction, each construction area would contain a range of construction features, including borrow pit/s, construction compounds, laydown and storage areas, temporary workforce accommodation, concrete batching plants, welding yards and concrete precast yard (described in section A8.9). Indicative construction resources, workforce, traffic and access arrangements, and utility works are described in sections A8.10 to A8.12.

The construction information described in this chapter is preliminary and is based on the current stage of the design. It provides an indicative construction methodology that retains flexibility for the successful contractor to refine and optimise aspects of the approach. The construction methodology would be refined as the design progresses and once the construction contractor is engaged. A final construction methodology and program would be developed by the construction contractor based on the conditions of approval and the mitigation and management measures provided in this document.

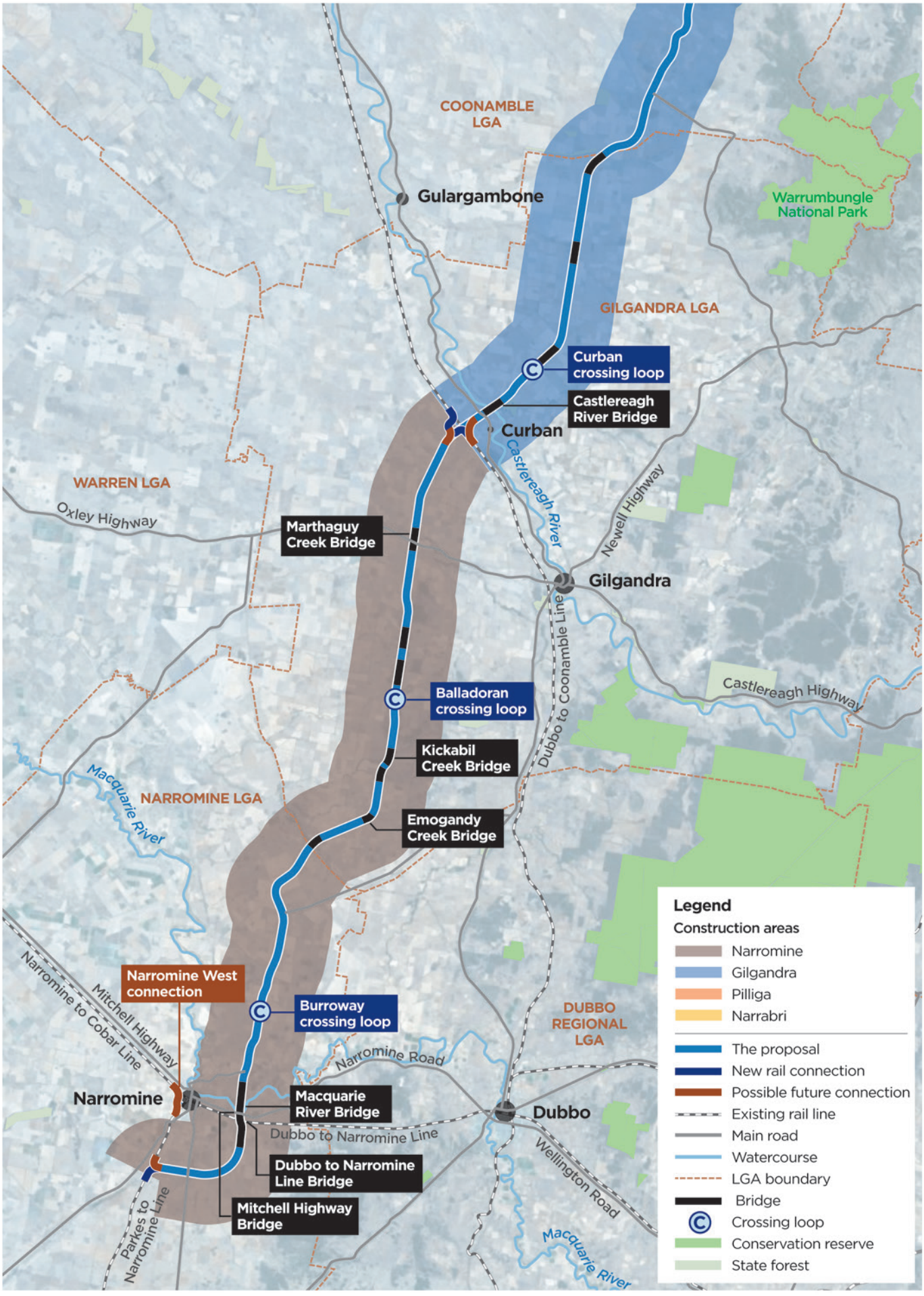



Figure A8.1 **Construction areas (map 1)**

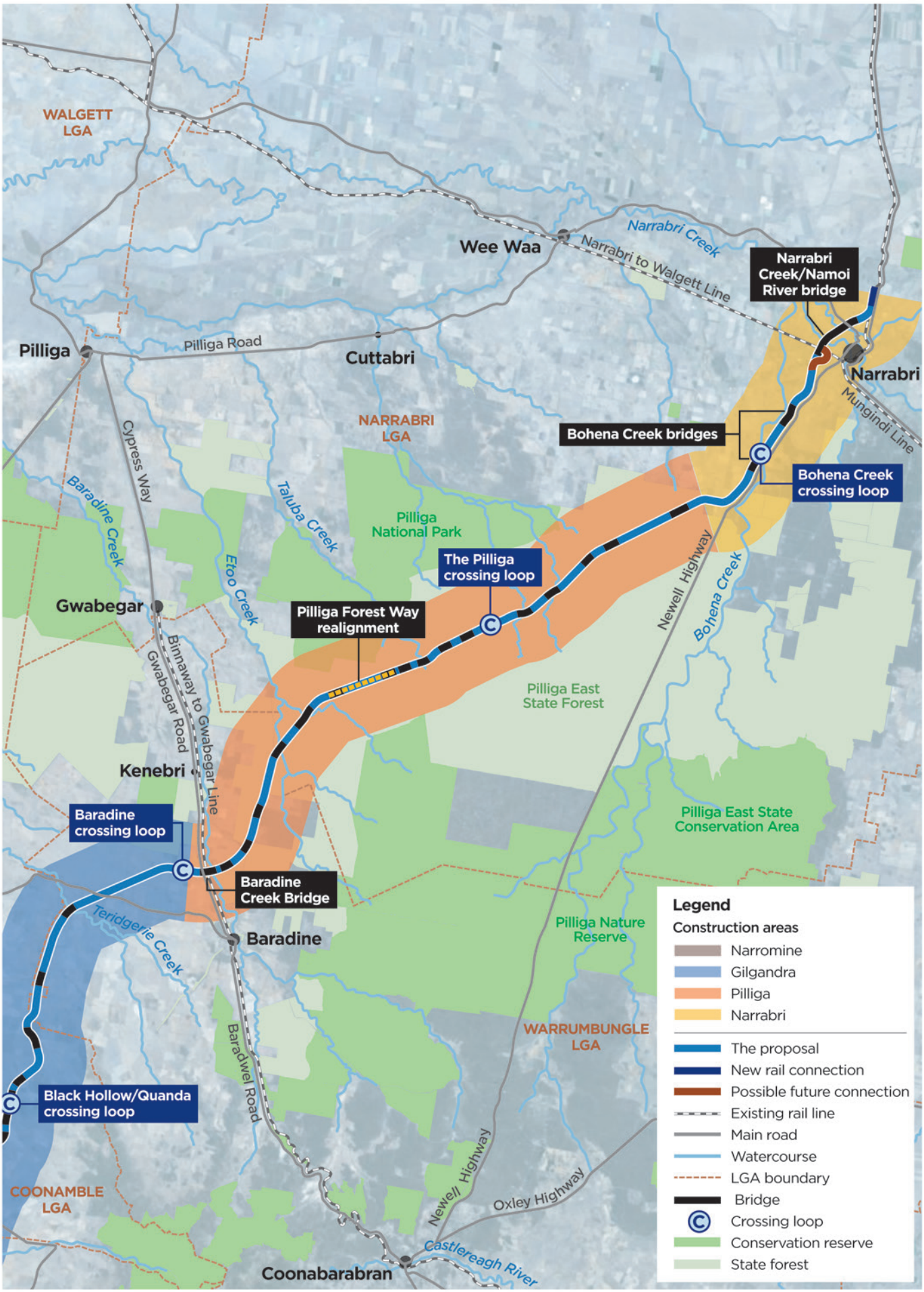



Figure A8.1 **Construction areas (map 2)**

### A8.1.1 Approach to avoiding or minimising impacts during construction

The approach to design development and preliminary construction planning undertaken to date has included a focus on avoiding and/or minimising, as far as practicable, the potential for impacts during all stages, as shown in Figure A7.1. The study area has a number of constraints and characteristics, such as limited access and poor soil conditions, which have influenced development of the construction methodology to date.

The indicative construction methodology described in sections A8.2 to A8.7 has been developed with consideration given to the associated constraints (including key environmental features and land uses). It has also considered other issues identified during the early stages of the design and environmental assessment process. The key constraints that have influenced the indicative construction methodology are summarised in Table A8.1, together with how the methodology has been developed to avoid/minimise potential impacts.

**TABLE A8.1 KEY CONSTRAINTS AND HOW POTENTIAL CONSTRUCTION APPROACH HAS AVOIDED/MINIMISED IMPACTS TO DATE**

| Key constraint | Approach to avoiding/minimising impacts |
|---|---|
| Limited site access | To minimise impacts on road infrastructure, land use and properties, construction areas would be accessed via existing roads together with the proposed haul roads within the proposal site (see section A8.10.5). |
| Soil impacts | Black soils are adversely affected by wet weather. It can be difficult to achieve the desired moisture content and required compaction for foundation and formation works, which could result in significant impacts on the construction timeframe.<br>To manage this issue, the extent of construction in areas of black soils has been minimised and a high-quality haul road would be provided along the proposal site.<br>To minimise exposed areas and potential erosion, required clearing within the proposal site would be undertaken in a staged manner. |
| Construction resource use | The cut-and-fill balance for the proposal has been refined to minimise the need to import material. In addition, borrow pits have been identified to provide construction materials, and would also be used for backfilling of spoil. This would reduce the demand on commercial suppliers and ensure spoil does not go to landfill.<br>The early delivery of some of the track and sleepers required is also proposed to spread the requirements for resources over a longer timeframe and ensure undue demand is not placed on the available commercial suppliers. |
| Construction traffic from materials haulage | The location of borrow pits has been determined so that the haulage distances are minimised and the potential for significant amount of truck movements, including through town centres and the Pilliga East State Forest, has been reduced or avoided completely.<br>To minimise construction traffic movements and associated impacts on the public road network, haul roads/construction access tracks would be constructed within the construction footprint (see section A8.11.2). This would enable materials and personnel to be transported within the proposal site as far as practicable, minimising traffic on local roads.<br>Early delivery of some construction materials would assist in minimising the potential for traffic and access impacts (see section A8.2). |
| Socio-economic benefits | The proposed locations of the temporary workforce accommodation facilities (for which approval is sought) have been developed in consultation with councils, to maximise the potential for economic benefits to towns in the study area and minimise the potential for social impacts. |
| Limited water supplies | Deep aquifer bores have been proposed as the preferred option for construction water supply, with consideration of the limited availability of water in the upper aquifer and lack of surface water within the region (see section A6.3.5). This approach also minimises the risk of being unable to secure existing water licences. |
| Minimising construction impact | Where practicable, the area that would be directly impacted by construction (the proposal site) has been minimised to the width of the formation and haul roads. |

## A8.2 Pre-construction activities

To prepare for the main construction works, construction materials would be delivered to the multi-function compounds at Narromine, Curban and Narrabri (see section A8.9.2) up to about six months prior to the commencement of site establishment activities. These deliveries would also be ongoing during the later phases of construction.

At this stage it is anticipated that early delivery of construction materials would consist of rail tracks and sleepers.

The early delivery of these materials would assist with minimising the potential for traffic and access impacts during other construction phases. It would also ensure undue demand is not placed on available commercial suppliers. The tracks and sleepers would be delivered to the multi-function compounds by trains using the existing rail network. Laydown areas within the compounds would be established and appropriate environmental and safety (e.g. fencing) controls installed.

No other construction activities are proposed during this phase.

## A8.3 Site establishment and preliminary activities

Site establishment would generally involve the following activities:

- Consult landowners/occupants, where required, and ensure land access is available
- Install site environment management and traffic controls, including drainage and erosion management controls, in accordance with the construction environmental management plan (CEMP)
- Erect temporary site fencing to ensure construction areas and areas to be impacted are clearly delineated
- Vegetation clearing and removal, where required, including slashing, mulching and stockpiling within the proposal site for reuse
- Establish construction infrastructure, including borrow pits, construction compounds and temporary workforce accommodation (see section A8.9)
- Establish haul roads (see section A8.11)
- Utility relocation or protection where required (see section A8.12)
- Prepare the site for main construction works (levelling, grading and/or compacting, as required)
- Commence delivery and stockpiling of bulk materials, including ballast and capping
- Install water infrastructure, including sedimentation dams and bores
- Establish concrete precast yards and commence production.

## A8.4 Main construction works—rail infrastructure

### A8.4.1 Main rail line

As described in section A7.3, the proposal involves constructing a new section of rail line. Main line track works would include foundation, formation and track works, as described in this section. Figure A8.2 shows the typical activities that would be used to construct the main line.

**Foundation and formation works**

The general methodology for the foundation and formation works is as follows:

- Survey and identify area
- Clearing and grubbing, if required
- Strip topsoil and any unsuitable materials along the alignment and stockpile within the proposal site for reuse in site rehabilitation
- For cuts—excavate to the desired level using excavators and/or scrapers, and transport for temporary stockpiling (as required), and reuse in areas of fill
- For fills—prepare surface material and place, grade and compact material in appropriate layers to build to the required level
- Install drainage infrastructure
- Install formation material, grade and compact to the required level.

### Track works

The general methodology for constructing the track is as follows:

- Place ballast, sleepers and rail tracks on top of the new formation
- Tamp and profile the ballast around the sleepers and line to a smooth alignment
- Install signalling/communication infrastructure, as required
- Tie-in to existing rail lines and/or previously constructed sections of track.

## A8.4.2 Crossing loops

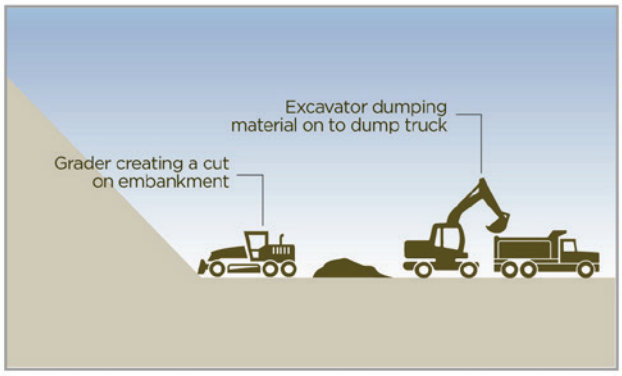
The general methodology for constructing crossing loops is as follows:

- Excavate for the length of the crossing loop
- Place and compact formation material
- Place ballast, sleepers and rail tracks on top of the new formation
- Tamp and profile the ballast around the sleepers and line to a smooth alignment
- Install signalling/communication and power infrastructure, as required.

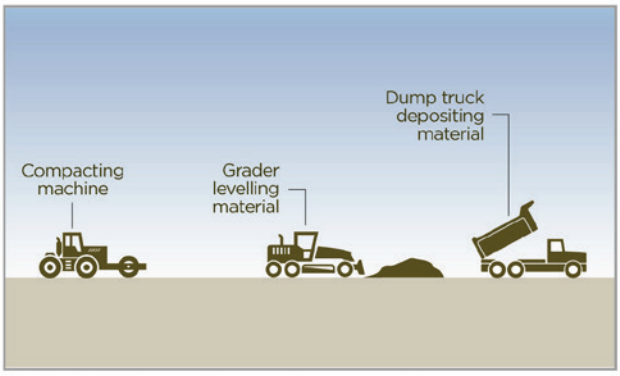
## A8.4.3 Turnouts

The general methodology for constructing turnouts is as follows:

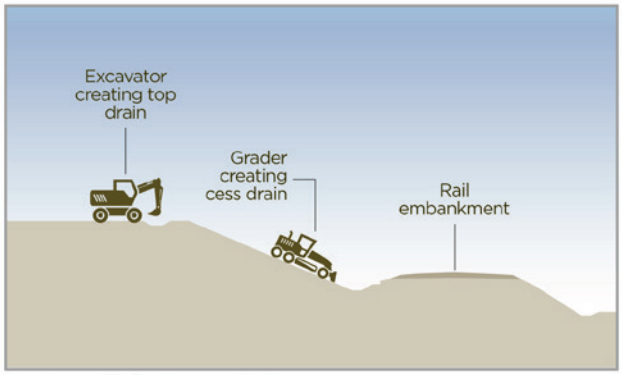
- Carry out formation improvement works, as required
- Install ballast, sleepers and rails
- Install control mechanisms (points motor, power supply, etc.).



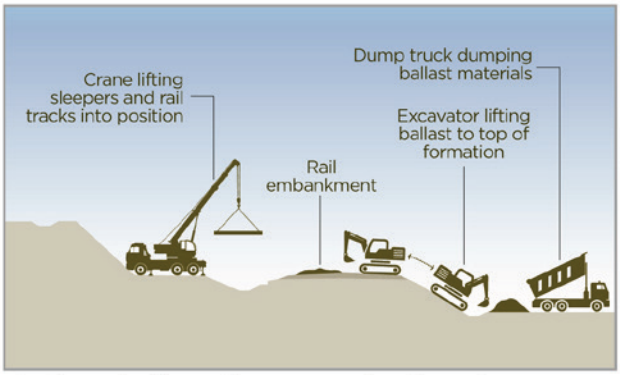

**1.** Strip topsoil and excavate (for cuts) or build (for fills) to required surface level



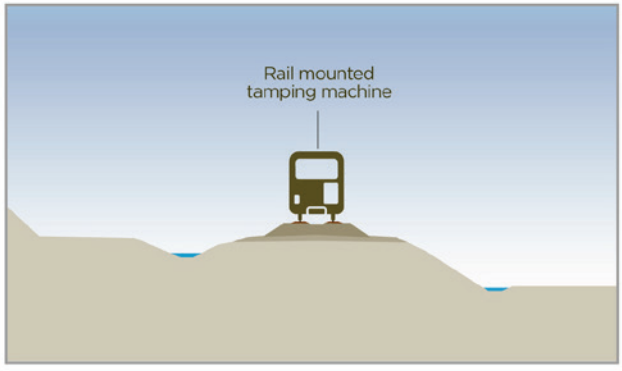

**2.** Install formation and compact



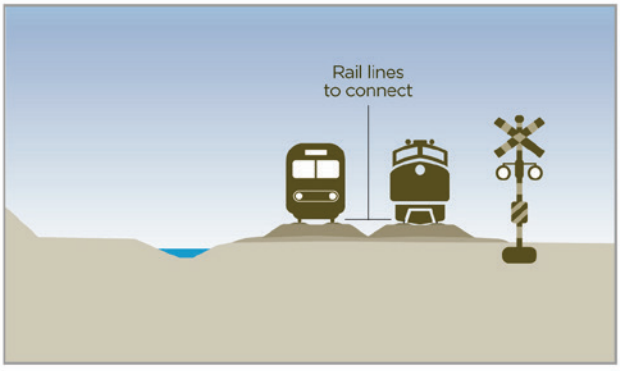

**3.** Install drainage infrastructure




**4.** Place ballast, sleepers and rail tracks on top of the new formation




**5.** Tamp and profile the ballast around the sleepers and line to a smooth alignment




**6.** Install signalling/communication infrastructure and tie-in to existing rail lines

**FIGURE A8.2 TYPICAL CONSTRUCTION ACTIVITIES FOR TRACK WORKS**

### A8.4.4 Level crossings

The general methodology for level crossings is as follows:

- **New level crossings**
  - Excavate area to the required depth and prepare base material
  - Place and compact sub-base
  - Install drainage, as required
  - Install signalling/communication, as required
  - Lay and compact base course layers
  - Provide standard road signs and road markings
  - Install active crossing equipment, as required
  - Divert traffic to new road and remove redundant controls and infrastructure
  - Install permanent fencing, as required.
- **Upgrading controls**
  - Remove existing controls
  - Excavate to a suitable depth, as required
  - Place new formation material and ballast
  - Replace track and surface panel, as required
  - Install new controls
  - Provide standard road signs and road markings.

### A8.4.5 Bridges and culverts

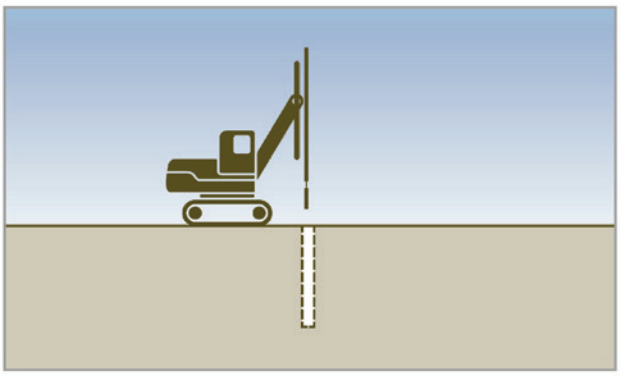
#### Bridge works

The general methodology for bridges works is as follows:

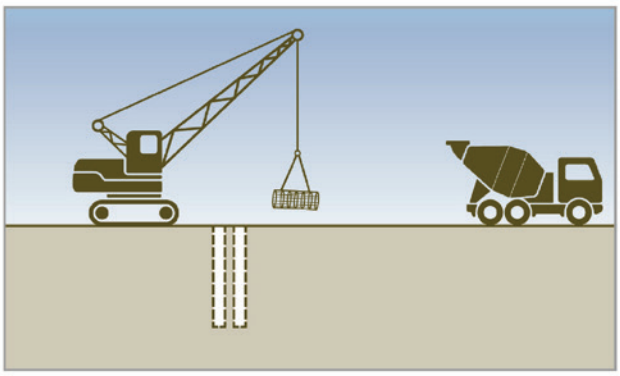
- Install bored or driven piles at abutments and piers
- Construct reinforced soil walls at each end of the bridge
- Construct column extensions and pier headstocks
- Install girders or planks and construct reinforced concrete deck
- Install expansion joints and steel traffic barrier railing
- Place ballast mat, ballast, sleepers and rail on top of the new bridge
- Tamp and profile the ballast under and around the sleepers and weld tracks.

Figure A8.3 shows the typical activities that would be used to construct large bridges in the proposal site.

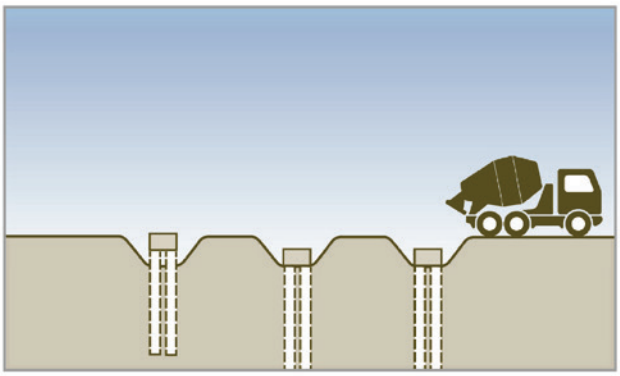
Provided there is enough water present, a barge would be used to construct the bridge piers for the bridges over the Macquarie River and Narrabri Creek/Namoi River. The barge would be lifted by crane into the river. During these activities there may be disruptions to navigational access within the river. All other bridges would be constructed by conventional means with no obstruction to water flow.



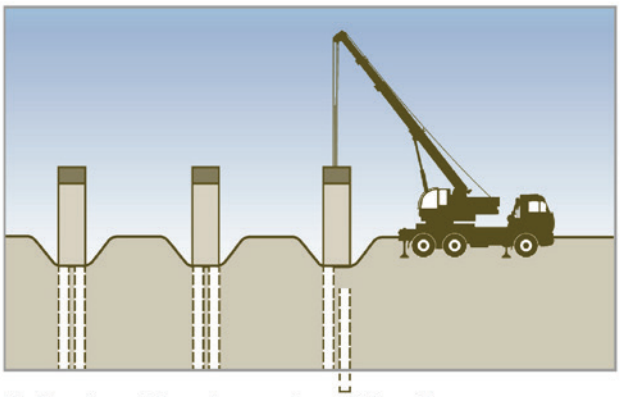
**1.** Drill holes or drive piles with rotary piling rig



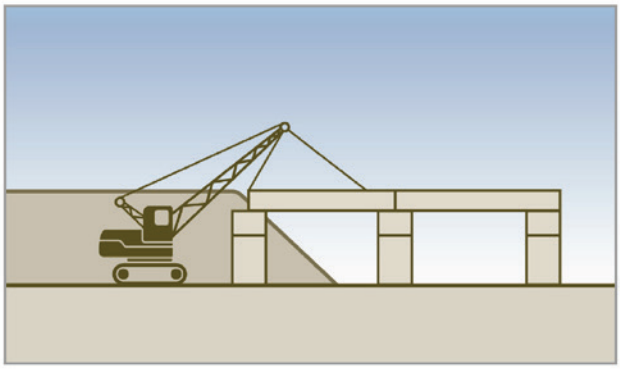
**2.** Install reinforcing cage and pour concrete (only if holes drilled)



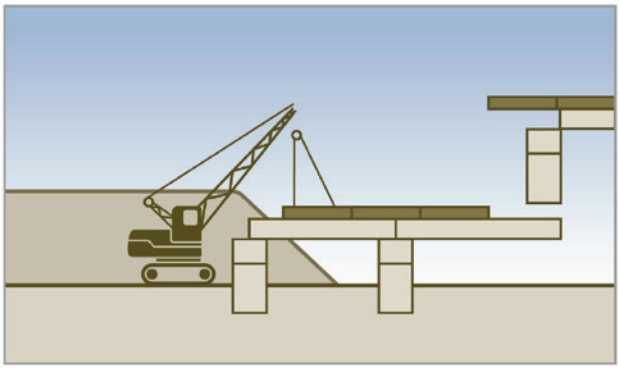
**3.** Form and pour pilecaps



**4.** Construct the pierson top of the pilecaps



**5.** Install superstructure beams with mobile crane



**6.** Pour bridge deck and install side barriers, finishes, etc.

**FIGURE A8.3 TYPICAL CONSTRUCTION ACTIVITIES FOR LARGE BRIDGES**

### Culvert works

The general methodology for culvert works is as follows:

- Excavate area to the required depth and prepare base material
- Place and compact bedding material, pour base slab in situ
- Place prefabricated culvert structures on the new formation area
- Backfill culvert
- Form and pour in-situ elements of the structure (wing walls, top pad, etc.)
- Install scour protection and rip rap as required
- Place and compact formation material over culvert structure
- Place ballast mat, ballast, sleepers and rail on top of the culverts
- Tamp and profile the ballast under and around the sleepers and weld tracks.

## A8.4.6 Rail connections

Rail connection works would be undertaken to connect the proposal with existing rail lines, as described in sections A7.3.5 and A7.3.6. These works, which include constructing the Narromine West connection, would affect small sections of the existing lines, as shown in Figure A7.4 to Figure A7.8.

The general methodology for rail connection works is as follows:

### New sections of rail line

The foundation, formation and track works for the new sections of rail line would be as described in section A8.4.1.

### Tie-ins with existing rail lines

The general methodology for 'tying in' the new connections with existing rail lines would be as follows (as required, depending on the characteristics of the existing line):

- Remove fastenings, rail and sleepers up to the tie-in point
- Excavate the existing ballast and earth formation to the tie-in point
- Place new earth into the excavated area and compact to the tie-in point
- Place ballast, sleepers and rail tracks on top of the formation
- Tamp and profile the ballast around the sleepers and line to a smooth alignment
- Install signalling/communication infrastructure, as required.

# A8.5 Main construction works—road infrastructure

## A8.5.1 Changes to the local road network

The general methodology for changes to the road network is as follows:

- Survey and identify area
- Clearing and grubbing, if required
- Undertake earthworks to remove surface layers, including identifying and stripping suitable topsoil, and stockpiling for future use or removal
- Import embankment, foundation and select materials, and fill to the road formation levels
- Install new culverts and subsoil drains
- Install new utility infrastructure
- Install new kerbs and gutters
- Construct the road pavements, including placing and compacting select fill, the base course, and the wearing surface (either spray seal or asphalt)
- Construct tie-ins to existing roads
- Install new streetlights (where required)
- Undertake progressive landscaping and tree planting
- Undertake line-marking and install signage.

The methodology would vary depending on the nature of the road and whether the works construction is of a new road alignment or a road closure.

### A8.5.2 Operational access roads

The indicative methodology for constructing the operational access roads would be as follows:

- Clear and strip area of topsoil, and stockpile for stabilisation and rehabilitation works
- Proof roll the surface to highlight any soft spots
- Install sub-base and base materials using materials with appropriate cross fall
- Compact base materials
- Construct running surface using all-weather materials.

The methodology would vary depending on whether the particular section of access road is a formal road or informal tracks (see section A7.3.8).

## A8.6 Testing and commissioning

Testing and commissioning of the rail line and communications/signalling systems would be carried out to ensure that all systems and infrastructure are designed, installed and operating according to ARTC's operational requirements. Testing for connections to other rail lines would also be required for those sections of track. This work may need to be undertaken during scheduled maintenance possessions or other periods when existing rail lines are not operational. Commissioning would also require obtaining regulatory approval prior to the proposal commencing operation.

## A8.7 Finishing and rehabilitation

All disturbed areas not required for ongoing operations would be rehabilitated. Finishing and rehabilitation would be undertaken progressively and would include the following typical activities:

- Demobilise or relocate construction compounds and facilities
- Remove all materials, waste and redundant structures from the proposal site
- Decommission all temporary work site signs
- Remove temporary fencing
- Establish permanent fencing
- Decommission site access roads that are no longer required, including reinstatement of topsoil and vegetation, where required
- Restoration of disturbed areas, as required, including revegetation, where required.

Site rehabilitation would be carried out in accordance with the rehabilitation strategy (described below).

Where there is benefit to the local community, the potential for retaining facilities installed for construction (e.g. bores and sedimentation basins) would be investigated and negotiated in consultation with relevant stakeholders (e.g. local councils). Any legislative approvals associated with retention and ongoing use of these facilities would be the responsibility of the party who takes ownership.

### Rehabilitation strategy

A rehabilitation strategy would be prepared to guide rehabilitation planning, implementation, monitoring and maintenance of disturbed areas outside the operational footprint (such as compounds, access roads and other areas disturbed during construction within the proposal site that would not be the location of final operational infrastructure). The strategy would:

- Identify rehabilitation objectives and criteria
- Establish roles and responsibilities
- Define rehabilitation actions and requirements
- Define monitoring and maintenance requirements.

In general, rehabilitation would be undertaken in two stages. The first stage would involve stabilisation immediately following disturbance, such as at the completion of construction work in a particular area. The second stage would involve longer-term rehabilitation. This would be carried out on disturbed areas not required as part of the proposal's operational footprint.

The strategy would include:

- Site-specific guidance and specifications
- Requirements in relation to landform and soil/ground surface re-establishment
- Reinstatement of natural drainage patterns
- Rehabilitation of riparian areas disturbed during construction
- Rehabilitation of temporary construction areas to agreed pre-existing conditions
- Revegetation specifications and requirements
- Establishment of appropriate native grass species within the rail corridor, where practicable, to minimise exposed surfaces
- Opportunities to enhance local biodiversity and habitat value.

The rehabilitation strategy would integrate with the urban design and landscape plan (see section A7.6), which would define landscaping requirements.

The strategy would be prepared by a suitably qualified consultant, in consultation with relevant stakeholders (including councils and the community) and with consideration of:

- ARTC's *Inland Rail Landscape and Rehabilitation Strategy* and *Inland Rail Landscape and Rehabilitation Framework*
- The borrow pit rehabilitation strategy (provided in Appendix K)
- Rehabilitation requirements described in Technical Report 1—Biodiversity development assessment report
- Conditions of approval for the proposal.

## A8.8 Construction program and timing

### A8.8.1 Program

It is anticipated that overall construction would take about 48 months, subject to weather conditions. An indicative construction program is shown in Figure A8.4.

Connections with existing rail lines (see section A7.3.6) would be undertaken during scheduled rail corridor possession periods.

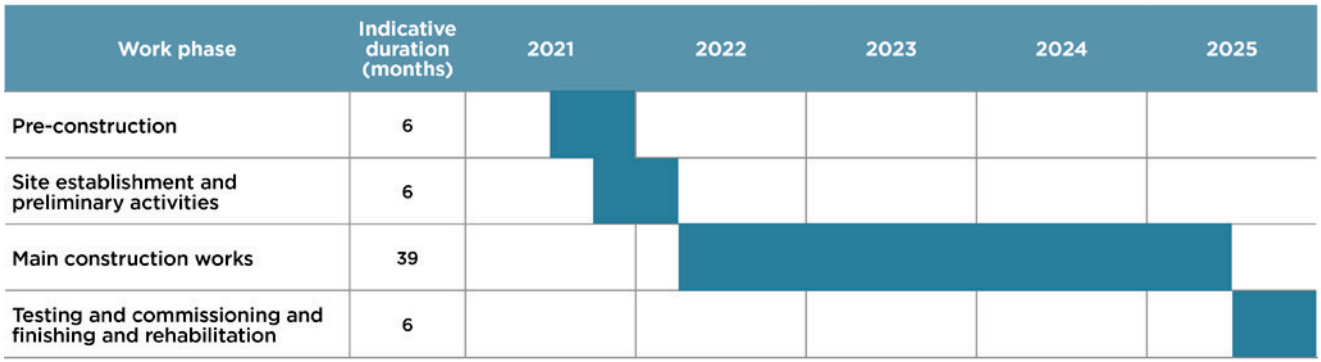



**FIGURE A8.4 INDICATIVE CONSTRUCTION PROGRAM**

### A8.8.2 Working hours

The *Interim Construction Noise Guideline* (DECC, 2009) recommends standard hours for construction work (see Table A8.2).

**TABLE A8.2 INTERIM CONSTRUCTION NOISE GUIDELINE RECOMMENDED STANDARD HOURS FOR CONSTRUCTION WORK**

| Work type | Recommended standard hours of work |
|---|---|
| Normal construction | Monday to Friday: 7am to 6pm<br>Saturday: 8am to 1pm<br>No work on Sundays or public holidays |
| Blasting | Monday to Friday: 9am to 5pm<br>Saturday: 9am to 1pm<br>No blasting on Sundays or public holidays |

#### Primary proposal construction hours

To shorten the length of construction as far as practicable and minimise associated disruptions to the community, the following primary proposal construction hours are proposed:

- Monday to Friday: 6am to 6pm
- Saturday: 6am to 6pm
- Sundays: 6am to 6pm
- Public holidays: no work.

No work would be undertaken every alternate week between the hours of 1pm on Saturday and 7am on Monday, except in the following circumstances:

- Where potentially affected receivers agree that the work can be undertaken
- Where construction noise levels do not exceed the rating background level by more than 5 dB(A) at residential receivers
- No more than the noise management levels specified in the *Interim Construction Noise Guideline* (DECC, 2009) (Table 3) at non-residential sensitive receivers.

It is estimated, at this stage of the design process, that constructing the proposal during the primary proposal construction hours would reduce the overall construction program by up to six months.

The following activities would only be undertaken during the recommended standard hours for blasting as per Table A8.2:

- Blasting (only proposed at borrow pits C and D, if hard rock is encountered at depth)
- Rock breaking or crushing.

These activities would occur during the following hours:

- Monday to Friday: 9am to 5pm
- Saturday: 9am to 1pm
- Sundays and public holidays: no work.

Relevant legal controls on work hours would also be considered in determining work schedules, including the possibility that work may be allowed outside these times in some situations.

#### Work outside the primary proposal construction hours

Discrete construction activities would also be undertaken outside the primary proposal construction hours as described below.

**Work where there are no sensitive receivers**

Where required, and where there are no sensitive receivers with the potential to be affected by noise and vibration impacts, work may be undertaken up to 24 hours a day, 7 days a week.

### Work during rail corridor possessions

Some works associated with connections/interactions with existing rail lines may be carried out during scheduled rail corridor possession periods (that is, the times that the movement of trains along the rail corridor are stopped for maintenance). This could include, for example, connecting tracks, abutment/pier works, girder installation, concrete deck installation and some finishing works. Rail corridor possessions are typically for a 72-hour period, four times a year. During possessions, works may need to be carried out on a 24-hour basis.

The proposed interactions with other rail lines are described in section A7.3.

### Other out-of-hours construction activities

The following activities are also proposed to be undertaken outside the primary proposal construction hours:

- Delivery of oversized plant or structures where required by the police or other authorities for safety reasons
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Large concrete pours for the Macquarie River, Castlereagh River and Narrabri Creek/Namoi River bridges, to allow it to be completed in one pour and avoid high temperatures during the daytime
- Girder/bridge deck installation at bridges on selected public roads, to minimise impacts on road users and workers
- Utility works (such as connections) to minimise disruption to customers.

The above works are not expected to exceed 48 hours at any one location. The proposed locations of out-of-hours construction activities (where locations can currently be defined) are shown in Figure A8.5.

### Managing out-of-hours work

Work outside the primary proposal construction hours would be undertaken in accordance with the Inland Rail NSW Construction Noise and Vibration Management Framework (see Appendix L) and in accordance with an out-of-hours work protocol that would be prepared as part of the CEMP (described below).

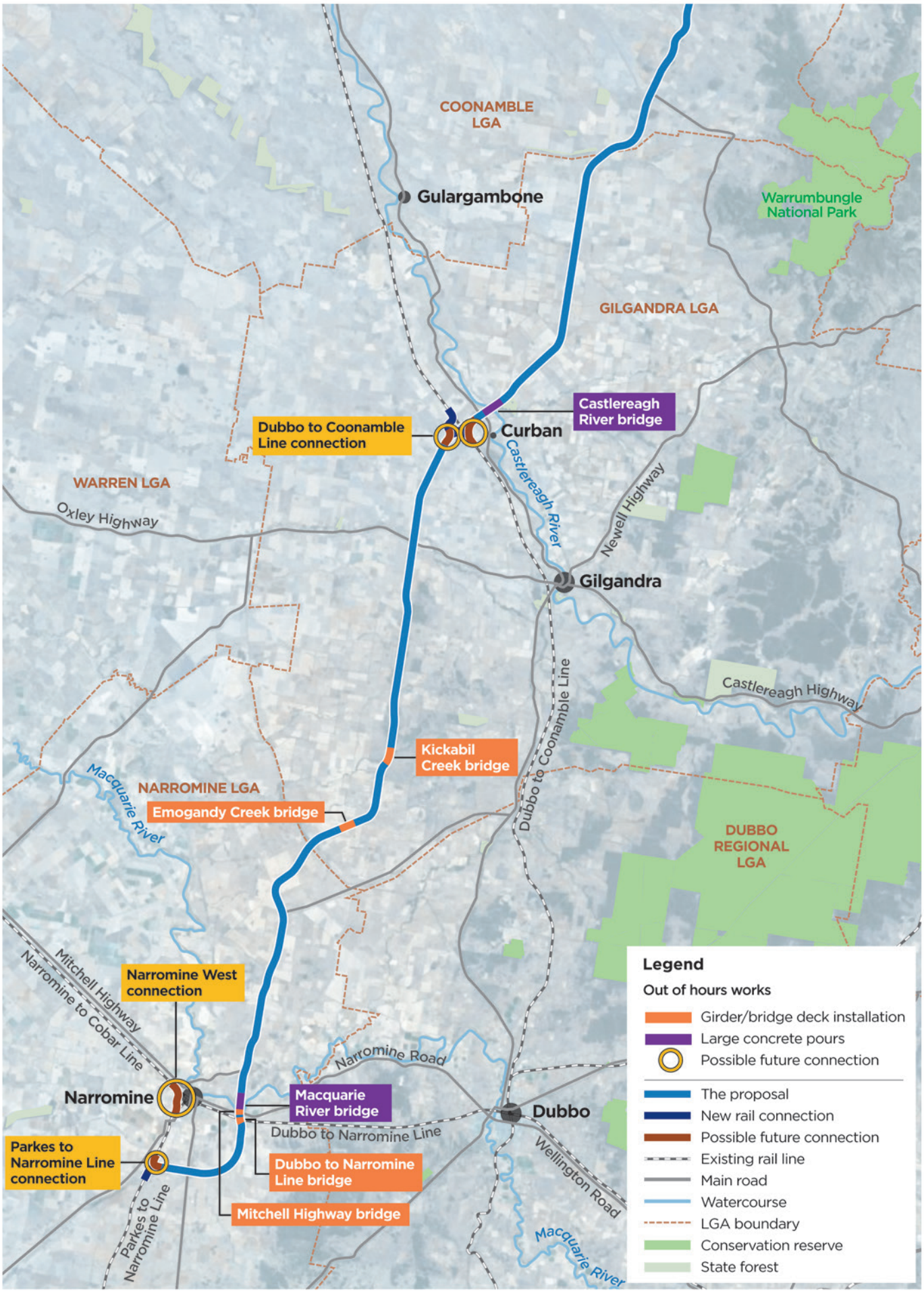



Figure A8.5 **Proposed location of out-of-hours works (map 1)**

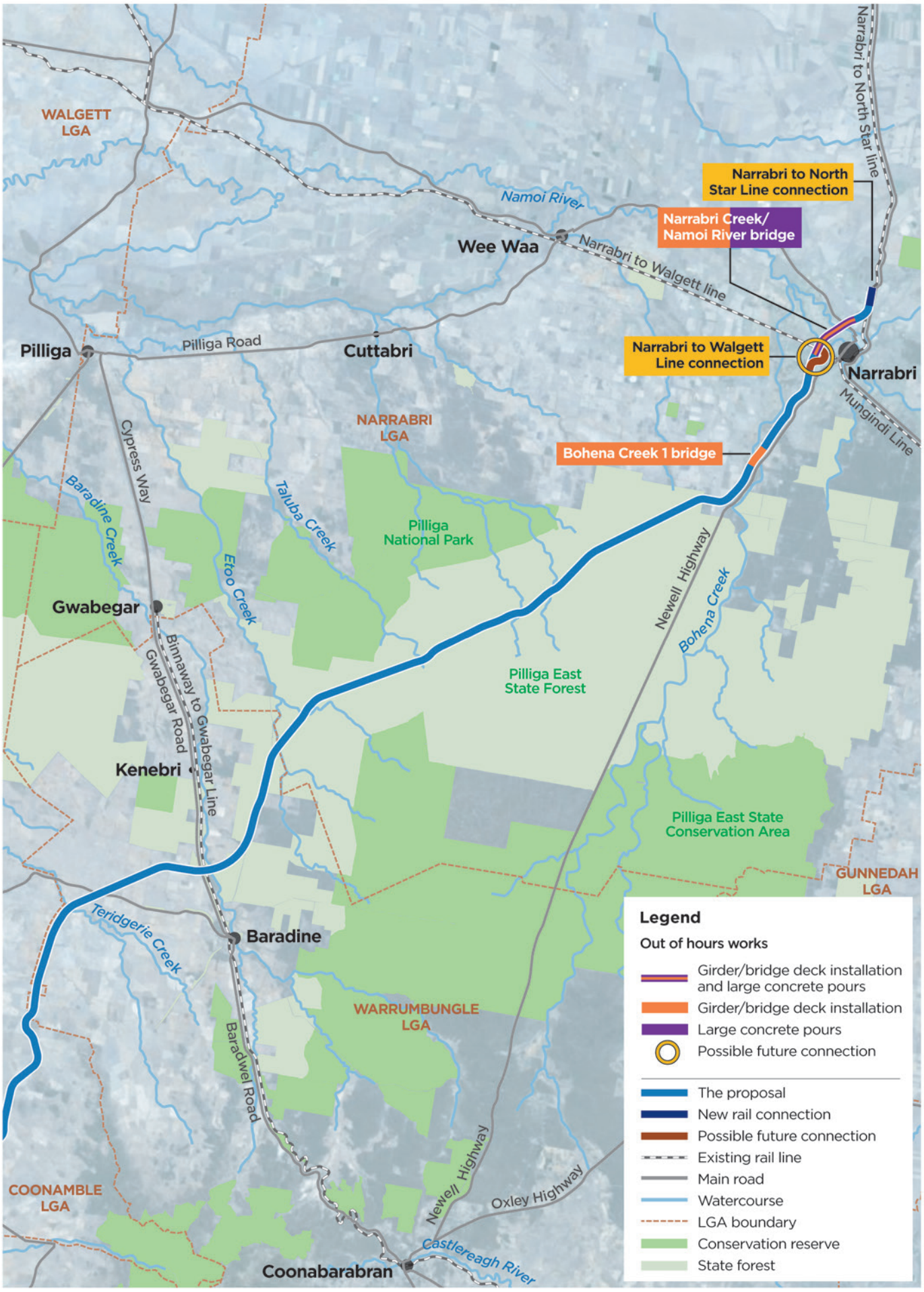



Figure A8.5 **Proposed location of out-of-hours works (map 2)**

**Out-of-hours work protocol**

An out-of-hours work protocol would be prepared to guide the assessment, management and approval of works outside of the primary proposal construction hours. The protocol would be developed to ensure that out-of-hours work are managed effectively during construction, to avoid incidents and reduce impacts on the community. The protocol would be prepared in consultation with key stakeholders (including the NSW EPA) and be approved prior to works commencing. It would:

- Be consistent with the *Inland Rail NSW Construction Noise and Vibration Management Framework* for the proposal (see Appendix L)
- Be prepared in accordance with the conditions of approval for the proposal
- Take into account the results of the construction noise assessment and the recommended management measures described in chapter B8
- Address the requirements of the environment protection licence for the proposal
- Provide guidance for the preparation of out-of-hours work plans for each construction area and for key works (including for each bridge works location), which would be prepared in consultation with key stakeholders and the community
- Document procedures to control potential impacts
- Identify responsibilities for implementation and management, including managing complaints.

## A8.9 Construction infrastructure

Construction would require a range of supporting infrastructure as described in the following sections. The locations of key construction infrastructure are shown in Figure A1.3. Further detail is provided in the maps in Part E.

The following construction infrastructure would include, as relevant:

- Erosion and sedimentation controls, such as sedimentation basins (see section A8.9.8)
- Flooding protection measures and bunding to prevent inundation up to the 5% AEP flood event
- Appropriate bunding and storage of hazardous materials in accordance with relevant Australian standards
- Connections to public roads, which would be designed in accordance with relevant standards and in consultation with the relevant road manager.

### A8.9.1 Borrow pits

#### Proposed locations and quantities

As described in section A6.3.4, four borrow pits are proposed to supply general and structural fill. The borrow pits are proposed at the following locations (see Figure A1.3).

- Borrow pit A—Tantitha Road, Narromine
- Borrow pit B—Tomingley Road, Narromine
- Borrow pit C—Euromedah Road, Narromine
- Borrow pit D—Perimeter Road, Narrabri.

These are the borrow pits for which approval is being sought; however, following detailed design and construction planning, the contractor may decide on an alternative material supply strategy and/or additional borrow pits. Other borrow pits would be subject to additional assessment and approval.

The borrow pits have been selected based on preliminary geotechnical investigations, consultation with the landowner and fill requirements for the proposal. The rationale for each of the borrow pits is as follows:

- Borrow pits A and B—a large volume of fill is required south of the Macquarie River where there are no cuts along the alignment to supply this material. If the borrow pits were not established, a significant number of truck movements would be required through Narromine from the north side of the Macquarie River, resulting in unacceptable impacts.
- Borrow pit C—a large volume of fill is required in the area north of the Macquarie River where there are a limited number of cuts along the alignment to supply this material. In addition, preliminary geotechnical investigations have identified a substantial shortage of structural fill in this area, which can be obtained from this borrow pit. Haulage from other parts of the alignment to the north is economically unfeasible and would result in a significant number of truck movements on the public road network and unacceptable impacts.
- Borrow pit D—a large volume of fill is required in the northern parts of the proposal site where there are a limited number of cuts along the alignment to supply material. Haulage from other parts of the alignment to the south is economically unfeasible and would result in a significant number of truck movements on the public road network and unacceptable impacts.

Further information on the process used to select the preferred borrow pit locations and the options considered is provided in section A6.3. The indicative volumes of fill proposed to be excavated from each borrow pit are summarised in Table A8.3. These volumes may not be excavated from all borrow pits, with final volumes likely to be lower in some pits subject to further geotechnical investigations during detailed design. As such, these indicative volumes represent the maximum potential size for each borrow pit. Extraction at each borrow pit would not exceed the volume requirements specified as part of the construction environment protection licence.

**TABLE A8.3 INDICATIVE VOLUMES OF MATERIALS TO BE EXCAVATED FROM BORROW PITS**

| Location | Indicative depth (m) | Total general fill ($m^3$) | Total structural fill ($m^3$) | Other fill ($m^3$) | Total ($m^3$) |
|---|---|---|---|---|---|
| Borrow pit A—Tantitha Road, Narromine | 2 | 85,000 | 200,000 | 25,000 | 310,000 |
| Borrow pit B—Tomingley Road, Narromine | 4.5 | 115,000 | 290,000 | 65,000 | 470,000 |
| Borrow pit C—Euromedah Road, Narromine | 13 | 45,000 | 340,000 | 280,000 | 665,000 |
| Borrow pit D—Perimeter Road, Narrabri | 10 | 135,000 | 600,000 | 220,000 | 955,000 |

As noted in section A8.8.2 blasting would be undertaken at borrow pits C and D if hard rock is encountered at depth.

## Layout, access and facilities

Figure A8.6 shows an indicative layout for the borrow pits.

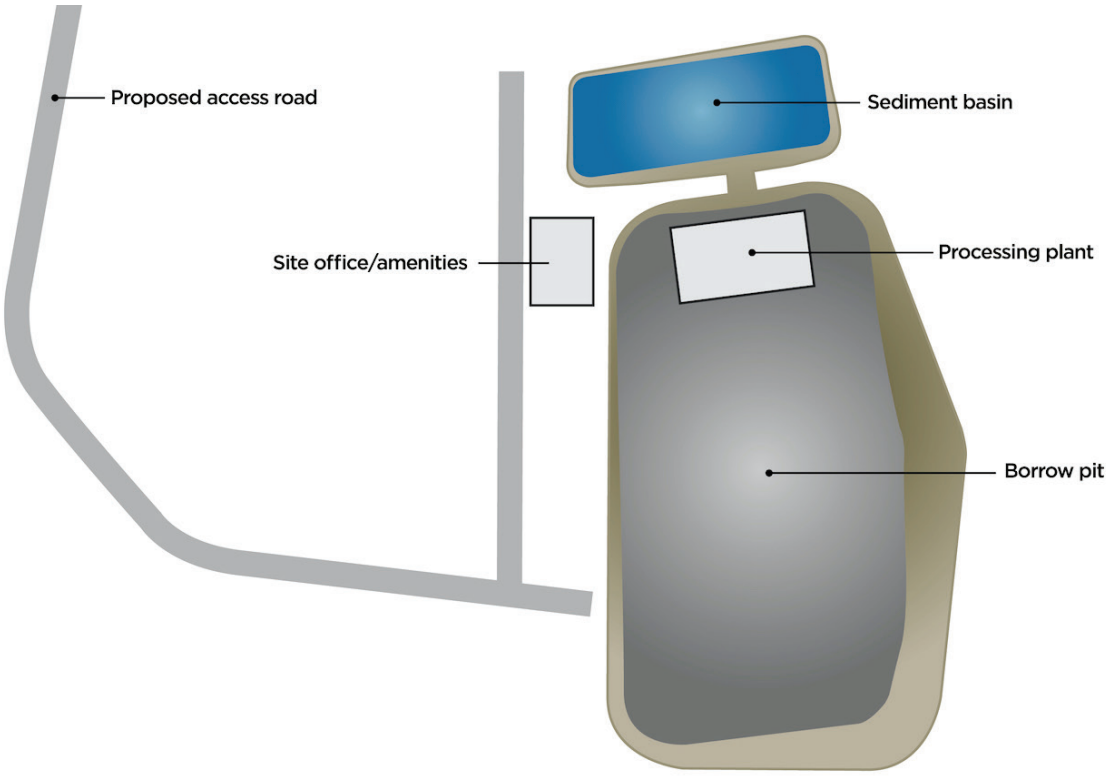



**FIGURE A8.6 BORROW PIT—INDICATIVE LAYOUT**

Access from borrow pits to the proposal site would be via new access roads connecting the borrow pit to the nearest public road, then via the public road network to the proposal site, as shown in the maps in Part E.

The borrow pits would include the following typical facilities to support their operation:

- Site offices
- Staff and workforce amenities
- Diversion drains (for up-slope surface flow) and sedimentation basins
- A crushing plant (for oversized excavated material).

## Rehabilitation

Following extraction of all required material from the borrow pits, all facilities would be removed and the pits would be stabilised and rehabilitated. Rehabilitation of the borrow pits would be undertaken in accordance with the borrow pit rehabilitation strategy (provided in Appendix K) and as described in chapter C3. It is proposed to use spoil (that does not meet design specifications or cannot be feasibly used within the rail formation) from the main construction works to assist with the reshaping of the borrow pits. The management of spoil is described in section A8.10.2 and chapter D2.

### A8.9.2 Multi-function compounds

#### Overview

Three main compounds, known as multi-function compounds, would be established at Narromine South, Curban and Narrabri West (see Figure A1.3). The multi-function compounds would be located on land that has been, or would be, acquired or to be leased for the proposal by ARTC. The compounds would include a range of facilities to support construction (see Table A8.4) and would be used for the duration of construction (about 48 months).

Establishing these compounds would consolidate as many facilities as possible in discrete locations, minimising the potential for impacts compared with distributing required facilities throughout the proposal site.

All multi-function compounds would require new connections to public roads. The compounds would be powered by generators. Sewage would be captured into holding tanks and would be pumped out as required. Water would be stored in water tanks with fresh water delivered, as required. It is expected the site communication would be via a dedicated satellite link or other connection. All stormwater captured on each of the multi-function compounds would be reused for irrigation, dust suppression or discharged via an onsite sedimentation basin.

Two of the compounds would also house temporary workforce accommodation (see section A8.9.4).

Key facilities and activities proposed to be undertaken at multi-function compounds are listed in Table A8.4. Further information on each compound is provided below.

**TABLE A8.4 KEY ACTIVITIES AND FACILITIES PROPOSED AT MULTI-FUNCTION COMPOUNDS**

| Features | Narromine south | Curban | Narrabri west |
|---|---|---|---|
| Office and amenities (e.g. office, crib facilities, parking, amenities) | ✓ | ✓ | ✓ |
| Laydown area | ✓ | ✓ | ✓ |
| Other materials storage | ✓ | ✓ | ✓ |
| Topsoil storage | ✓ | ✓ | ✓ |
| Fixed concrete batching plant (see section A8.9.5) | × | ✓ | ✓ |
| Mobile concrete batching plant (see section A8.9.5) | ✓ | × | × |
| Fuel/hazardous material storage and bunded refuelling area | ✓ | ✓ | ✓ |
| Vehicle wash bays | ✓ | ✓ | ✓ |
| Maintenance areas | ✓ | ✓ | ✓ |
| Temporary workforce accommodation (see section A8.9.4) | ✓ | × | ✓ |
| Welding yard (see section A8.9.6) | ✓ | ✓ | ✓ |
| Concrete precast yard (see section A8.9.7) | × | ✓ | × |
| Groundwater extraction bores | ✓ | × | × |

#### Narromine South multi-function compound

The Narromine South multi-function compound is proposed to be located where the proposal would connect with the Parkes to Narromine section of Inland Rail, about 8 km south of Narromine. It would have an area of about 158 hectares (ha).

This compound would mainly support construction activities undertaken to the south of Narromine, including construction of the Macquarie River bridge.

Access to the compound would be provided by a new access road, about 1.8 km long, from Tomingley Road. Some bulk materials, such as rail and sleepers, may also be delivered to the compound by rail using the Parkes to Narromine Line, as described in section A8.2.

The compound would support a range of construction activities as listed in Table A8.4. In particular, it would include a welding yard (see section A8.9.6) and temporary workforce accommodation (see section A8.9.4).

### Curban multi-function compound

The Curban multi-function compound is proposed to be located where the proposal would connect with the Dubbo to Coonamble Line, about 20 km north-west of Gilgandra. It would have an area of about 118 ha.

This compound would mainly support construction activities between Leeches Creek Road and Baradine, including construction of the Castlereagh River bridge.

Access to the compound would be from Bardens Road and Wyuna Road, which border the compound and provide regional connectivity via the Castlereagh Highway. Some bulk materials, such as rail and sleepers, may also be delivered to the compound by rail using the Dubbo to Coonamble Line, as described in section A8.2.

The compound would support a range of construction activities, as listed in Table A8.4. In particular, it would include a welding yard (see section A8.9.6) and a concrete precast yard (see section A8.9.7). The workforce would mainly be accommodated in the temporary workforce accommodation in Gilgandra (see section A8.9.4).

### Narrabri West multi-function compound

The Narrabri West multi-function compound is proposed to be located where the proposal would connect with the Narrabri to Walgett Line, about 4 km south-west of the Narrabri town centre. It would have an area of about 102 ha.

This compound would mainly support construction activities between the Pilliga East State Forest and the northern end of the proposal site, including the bridge over Narrabri Creek/Namoi River.

Access to the compound would be from Yarrie Lake Road, which borders the compound. Some bulk materials, such as rail and sleepers, may also be delivered to the compound by rail using the Narrabri to Walgett Line, as described in section A8.2.

The compound would support a range of construction activities as listed in Table A8.4. In particular, it would include a welding yard (see section A8.9.6) a concrete precast yard (see section A8.9.7) and temporary workforce accommodation (if required—see section A8.9.4).

## A8.9.3 Other compounds

Other compounds to support construction would be required at regular locations along the proposal site, with three general types of compound areas proposed:

- Structure compounds
- General compounds
- Minor compounds.

Access to construction compounds would be provided via a new connection to the nearest public road or from within the construction footprint (where it is not located close to a public road).

The locations of compounds are shown in Part E.

### Structure compounds

Structure compounds would be located at the Macquarie River, Castlereagh River and Narrabri Creek/Namoi River bridge sites. Construction of these larger bridges would require a specialised workforce, and equipment such as barges (Macquarie River and Narrabri Creek/Namoi River only), piling rigs and large cranes. Laydown areas would also be required for larger items, such as bridge girders.

Some features, such as crane pads, would need to be provided on either side of the watercourse due to reach and weight restrictions on equipment. Barge access at the Macquarie River would also be required due to the need to install bridge piles within the watercourse. It is proposed to crane the barge into the watercourse.

Key facilities and activities proposed to be undertaken at these compounds, the estimated size and proposed access points are listed in Table A8.5.

**TABLE A8.5 STRUCTURE COMPOUNDS—KEY ACTIVITIES AND FACILITIES**

| Features | Macquarie River | Castlereagh River | Narrabri Creek/ Namoi River |
|---|---|---|---|
| Size (ha) | 18 | 16 | 9 |
| Office and amenities (e.g. office, crib facilities, parking, amenities) | ✓ | ✓ | ✓ |
| Barge and launch area | ✓ | × | × |
| Pads for large cranes | ✓ | ✓ | ✓ |
| Laydown area | ✓ | ✓ | ✓ |
| Other materials storage | ✓ | ✓ | ✓ |
| Topsoil storage | ✓ | ✓ | ✓ |
| Fuel/hazardous material storage and bunded refuelling area | ✓ | ✓ | ✓ |
| Maintenance areas | ✓ | ✓ | ✓ |
| Fixed concrete batching plant (section A8.9.5) | ✓ | ✓ | ✓ |
| Primary access point | Mitchell Highway | Castlereagh Highway | Yarrie Lake Road |

## General compounds

General compounds would be located about every 10 km along the proposal site to support general construction activities within the construction area.

General compounds would have an area of about 4 ha and would include some or all of the following activities:

- Office and amenities (e.g. office, crib facilities, parking, amenities)
- Laydown area
- Other materials storage
- Topsoil storage
- Mobile concrete batching plant (see section A8.9.5)
- Fuel/hazardous material storage and bunded refuelling area
- Maintenance areas.

An indicative layout of a general compound is shown in Figure A8.7.

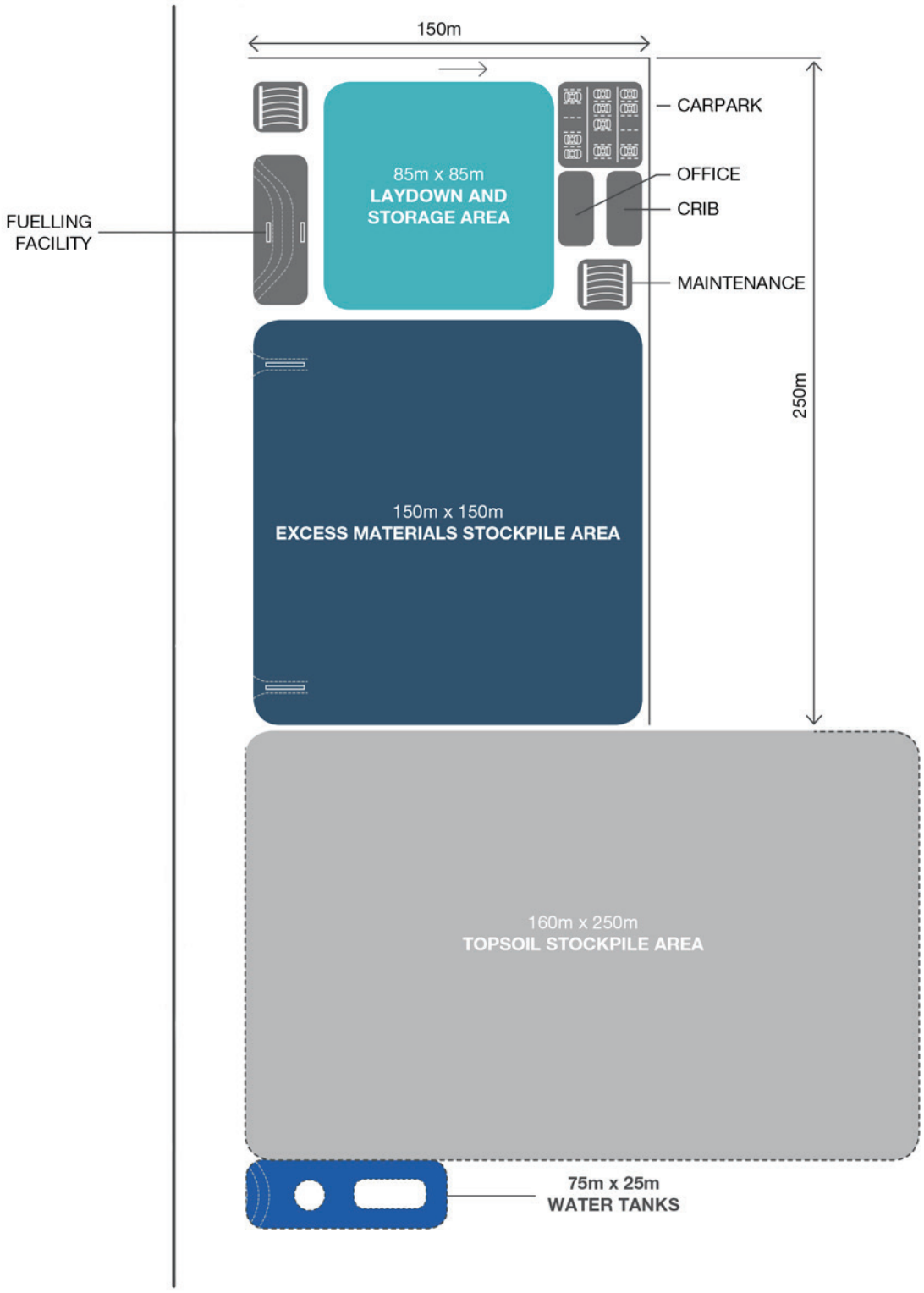



**FIGURE A8.7** **TYPICAL LAYOUT OF A GENERAL COMPOUND**

### Minor compounds

Minor compounds would be located about every 5 km along the proposal site, between the general compounds, and would support construction activities within the construction area.

Minor compounds would have an area of about 1 ha and would include some or all of the following activities:

- Office and amenities (e.g. office, crib facilities, parking, amenities)
- Laydown area
- Other materials storage.

In addition to the minor compounds, other small compounds would be established, as required, along the proposal site, at various locations, to support construction activities (e.g. at new level crossings). These would generally be limited to office/toilet facilities, parking and small laydown areas, and would be contained within the construction footprint.

## A8.9.4 Temporary workforce accommodation

### Overview

To accommodate the construction workforce, the proposal includes temporary workforce accommodation near the main towns along the proposal site. Temporary workforce accommodation would be established at the following locations:

- Within the Narromine South multi-function compound
- Narromine North
- Gilgandra
- Baradine
- Within the Narrabri West multi-function compound.

The proposed locations, which are shown in Figure A1.3 and in Part E, were identified in consultation with councils and with consideration of the following:

- Access to the proposal site
- Flood levels
- Appropriate land zoning
- Availability of suitable land
- Availability of services (e.g. power, water and sewage) (as required).

Each temporary workforce accommodation is expected to operate for the duration of construction (about 48 months) and accommodate up to 500 people. The sites would incorporate facilities for workers and construction activities, generally, including:

- Accommodation
- Recreational facilities, where required
- Ablutions, laundry facilities and kitchen facilities, including waste disposal facilities
- Construction support requirements including offices, line pipe laydown/stockpile sites, workshops, maintenance building and storage areas
- Tanks for water and fuel storage
- Generators (if required)
- Sewage and water tanks
- Parking.

The accommodation would take the form of standard relocatable remote facilities that can be established in about 12 weeks and are transportable by road. Figure A8.8 shows an indicative layout for the temporary workforce accommodation.

It is proposed to supply potable water to the Narromine North and Baradine temporary workforce accommodation facilities by extracting groundwater from groundwater bores and treating the water (as required) onsite. For these facilities, it is proposed that wastewater generated by site amenities would be treated onsite using package treatment plants. The package plants would generate treated wastewater, which could be reused at the accommodation facilities (for irrigation) or at other locations. The treatment plants would be expected to have membrane biological reactor technology, which produces high-quality reclaimed water suitable for various beneficial reuses, including recycling and irrigation.

For the Narromine South, Gilgandra and Narrabri West temporary workforce accommodation facilities, it is proposed to provide potable water by connecting the facilities to the towns' existing water supply network. For these facilities, it is proposed that wastewater would be disposed of by connecting the facilities to the towns' existing wastewater collection and treatment systems.

The preferred option/s for the provision of potable water and disposal of wastewater at the temporary workforce accommodation facilities would be confirmed by the construction contractor during detailed construction planning, in consultation with the relevant councils.

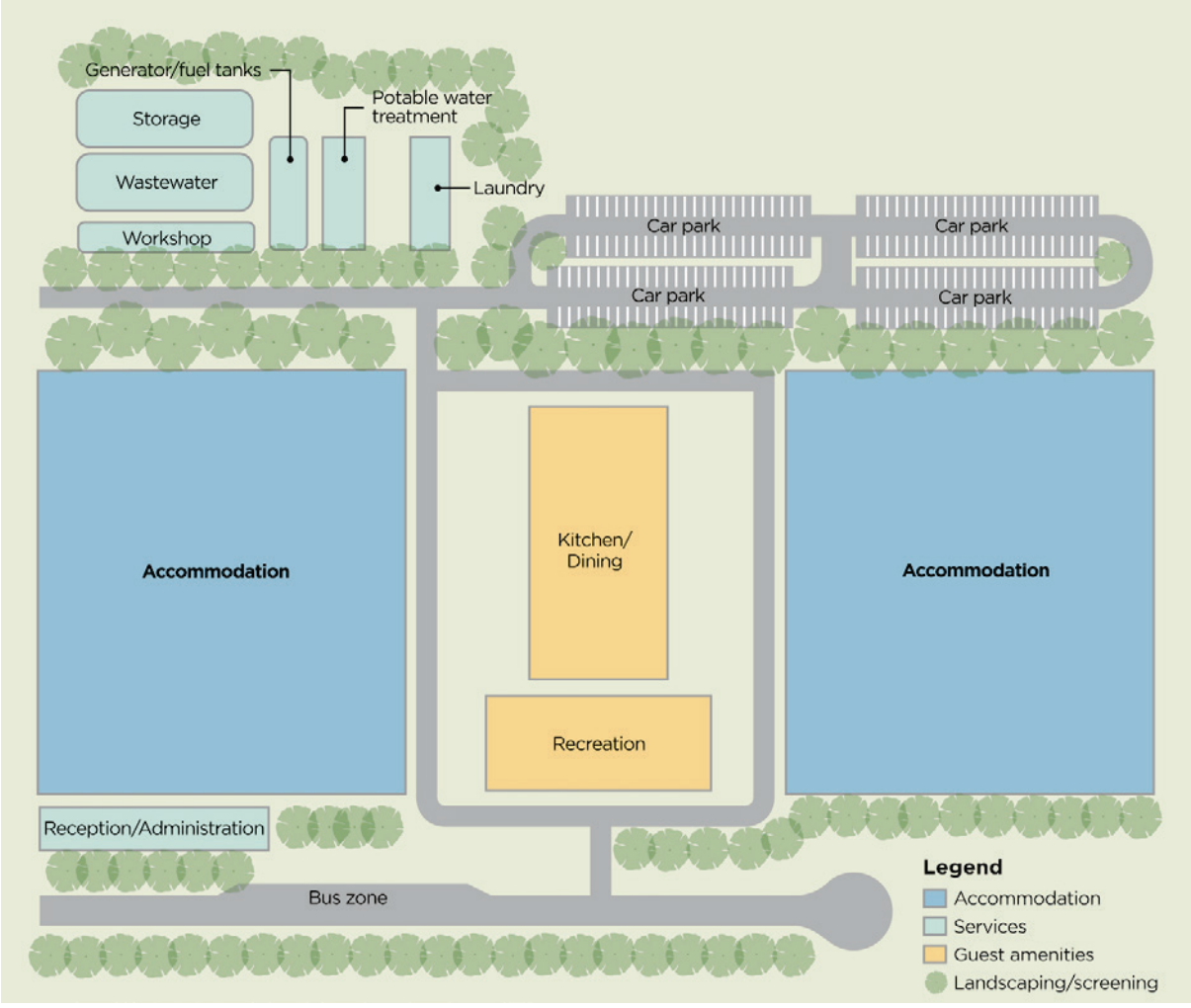



**FIGURE A8.8 TEMPORARY WORKFORCE ACCOMMODATION—INDICATIVE LAYOUT**

## Narromine temporary workforce accommodation

Two temporary workforce accommodation locations are proposed at Narromine:

- Narromine North—located north-east of Narromine
- Narromine South—within the Narromine South multi-function compound.

In the event that both sites are established, they would have a combined capacity of up to 500 people.

### Narromine North temporary workforce accommodation

The proposed site for the Narromine North temporary workforce accommodation is located on Euromedah Road, about 11 km north-east of Narromine.

This site would mainly support construction activities to the north of Narromine, including the Macquarie River bridge. Access to the site would be provided by a new connection off Euromedah Road.

The site is not subject to flooding for events up to the 1% AEP flood event.

### Narromine South temporary workforce accommodation

The proposed site for the Narromine South temporary workforce accommodation is located within the Narromine South multi-function compound (see section A8.9.2), about 8 km south of Narromine.

This site would mainly support construction activities to the south of Narromine, including the Macquarie River bridge and other construction activities south of the Macquarie River.

The site is partially inundated during the 1% AEP flood event and appropriate protection measures (such as elevating buildings on stilts) would be required.

## Gilgandra temporary workforce accommodation

The proposed site for the Gilgandra temporary workforce accommodation is located on the north-western edge of Gilgandra, on Federation Street, about 1.5 km from the town centre.

This site would mainly support construction activities between Leeches Creek Road and Baradine, including the Castlereagh River bridge.

Access to the site would be provided by a new connection off Federation Street.

The site is not subject to flooding for events up to the 1% AEP flood event.

## Baradine temporary workforce accommodation

The proposed site for the Baradine temporary workforce accommodation is located on the western edge of Baradine, on Lachlan Street, about 1 km from the town centre. The site is adjacent to an existing accommodation facility (Camp Cypress Cabin and Caravan Park).

This site would primarily support construction activities between Black Hollow and Pilliga East State Forest.

Access to the site is available off Lachlan Street.

The site is not subject to flooding for events up to the 1% AEP flood event.

## Narrabri temporary workforce accommodation

There is an existing temporary workforce accommodation facility located at Narrabri. This facility, known as Narrabri Village, is operated by Civeo and is located at 96 Old Gunnedah Road, Narrabri, about 2 km to the south of the town centre. Part or all of the workforce may be able to be accommodated at this facility, which provides about 500 rooms.

In the event that accommodation at Narrabri Village is not available, temporary workforce accommodation would be provided within the Narrabri West multi-function compound (see section A8.9.2), located about 4 km south-west of the Narrabri town centre.

This site would mainly support construction activities between the Pilliga East State Forest and the northern end of the proposal site, including the bridge over Narrabri Creek/Namoi River.

Access to the site would be provided by a new connection off Yarrie Lake Road.

The site is partially inundated during the 1% AEP flood event and appropriate protection measures (such as elevating buildings on stilts) would be required.

### A8.9.5 Concrete batching plants

The proposal would predominantly be constructed using precast concrete modules as far as practicable; however, elements of the proposal (e.g. larger bridges at the Macquarie River, Castlereagh River and Narrabri Creek/Namoi River) would require substantial volumes of concrete, for which local supply capability is limited. In addition, parts of the proposal site are located in remote locations that are not supported by local suppliers or are too far for delivery of pre-batched concrete. As a result, fixed and mobile batching plants would be established as part of the proposal to meet the required concrete demands.

Concrete from the batching plants would be delivered to the required locations within the proposal site using the haul roads (as far as practicable) within the proposal site. Wastewater (including wash-down water) from all batching plants would be captured, stored and reused/recycled, as far as practicable, in a sedimentation basin.

#### Fixed batching plants

It is proposed to establish fixed concrete batching plants within the following compounds:

- Curban multi-function compound (see section A8.9.2)
- Structure compounds at the Macquarie River, Castlereagh River and Narrabri Creek/Namoi River bridges (see section A8.9.3)
- The general compound at the crossing of Gwabegar Road, given its remoteness to the other sites.

The batching plants would have an approximate area of to 40 m by 170 m, accommodating a water tanker, concrete trailer and storage of materials, including aggregate and sand.

The production capacity of the plants would be up to 200 cubic metres per hour.

#### Mobile batching plants

Mobile concrete batching plants would also be established within general compounds, where in-situ concrete is required and road transport is not feasible. The need for a mobile batching plant would be determined by the construction contractor. These plants are expected to have a capacity of up to 50 cubic metres per hour, and a footprint up to 15 m by 10 m in area.

### A8.9.6 Welding yard

A welding yard would be established within the multi-function compounds at Narromine South, Curban and Narrabri West (see section A8.9.2). The yard would be used to weld short rail lengths into longer lengths (up to 400 m long). The welding yards would include the following facilities:

- Dedicated facilities for unloading short rail lengths
- Automatic short rail feeder
- Power roller line
- Inspection stations
- Long welded rail stockpile.

The welded lengths of rail would be transported along the haul roads to select locations within the proposal site on a progressive basis.

### A8.9.7 Concrete precast yard

Due to the large amount of concrete materials required, such as bridge girders, beams and piles and culverts, it is proposed to establish a concrete precast yard within the multi-function compound located at Curban (see section A8.9.2). This site has ready access to the Oxley Highway and Dubbo to Coonamble Line, to enable materials to be delivered to the site by major transport routes. Suitable services (power and water) are also available at this location. Wastewater from the facilities would be captured, stored and reused/recycled, as far as practicable, in a sedimentation basin.

The yard would have a footprint of about 500 m by 200 m, to account for the precast facilities and laydown area, plus space for storage of materials, including aggregate, lime, concrete and sand. It would also include a concrete batching plant as described in section A8.9.5.

### A8.9.8 Sedimentation basins

#### Sedimentation basins

Sedimentation basins would be provided at regular intervals along the proposal site, including at all key construction infrastructure, such as compounds and temporary workforce accommodation sites.

Water contained within sedimentation basins would be discharged to the nearest watercourse prior to, or immediately following, forecast rainfall events that are likely to produce watercourse flows. Appropriate scour protection would be provided at the outlets. The basins would include overflow bypass structures to enable stormwater discharge during heavy storm events where the design capacity of the sediment basins may be exceeded.

Alternatively, water may be reused (as a supplementary source to the primary water supply) during construction, for activities such as dust suppression.

## A8.10 Construction resources

### A8.10.1 Workforce numbers

Construction would require an estimated workforce of up to about 2,000 people. For the majority of the construction period, the workforce would average up to about 500 people in each of the four construction areas, to suit staging of construction works. For some limited items of work, an additional short-term workforce may also be required.

During site establishment and preliminary activities, testing and commissioning, and finishing and rehabilitation, the workforce numbers would vary but would typically be up to 1,200 people across the four construction areas.

### A8.10.2 Construction materials

#### Ballast, capping and fill

As described in section A6.3.4, construction would require a range of materials.

Preliminary volume requirements and sources are summarised in Table A8.6. All volumes have been estimated based on preliminary geotechnical investigations and would be subject to further refinement during detailed design. Further information on the options considered to develop the preferred material supply option is provided in section A6.3.4.

**TABLE A8.6 PRELIMINARY ESTIMATE OF CONSTRUCTION MATERIAL VOLUMES**

| Earthworks | Estimated volume ($m^3$) | Source |
|---|---|---|
| **Ballast and capping** | 1 million | Offsite commercial quarries |
| **Structural fill** | 1.3 million | Proposal cuts and borrow pits |
| **General fill** | 3.5 million | Proposal cuts and borrow pits |

Subject to confirmation and the gaining of any necessary approvals, the following local quarries are proposed to be used for capping and ballast:

- Boral quarry in Talbragar, Dubbo
- Holcim quarry in Sheraton Road, Dubbo
- MAAS Group Warren's Quarry in Sheraton Road, Dubbo
- Wave Hill quarry, Narrabri.

Once the contractor confirms the quarries that would be used, any truck movements would be via existing heavy vehicle routes from these quarries to the construction footprint.

As described in section A6.3.4, there would be an excess of 690,000 $m^3$ of general fill that would be generated during construction and is unable to be used to meet the proposal's fill requirements. It is proposed to use this excess material to reshape and rehabilitate the borrow pits. As the proposed borrow pits are located on private land and would be subject to lease agreements with the landowner, the extent to which this option could be used would be confirmed during detailed design and construction planning in consultation with the landowner.

The earthworks requirements for the proposal would be subject to further refinement during detailed design and construction planning, and following detailed geotechnical investigations. This would seek to minimise the final volume of spoil as far as practicable.

Further information on waste (including spoil) management is provided in chapter D2.

## Water

Water is required over the length of the proposal site for a range of activities, including:

- Earthworks and formation preparation and material conditioning
- Haul road and access road maintenance
- Dust suppression
- Concrete production
- Vehicle and equipment wash down
- Temporary workforce accommodation and site services at compounds.

Final water requirements would be subject to weather conditions and the methodology selected by the construction contractor. Based on preliminary construction planning, it is estimated that a total of about 4,635 mega litres (ML) would be required (see Table A8.7). This would equate to an estimated average use of about 4.3 mega litres per day over the length of proposal site.

**TABLE A8.7 ESTIMATED TOTAL CONSTRUCTION WATER REQUIREMENTS**

| Use | Volume (ML) |
|---|---|
| Earthworks and formation preparation and materials conditioning | 1,850 |
| Dust suppression (stockpiles and haul roads) | 2,270 |
| Concrete production | 25 |
| Wash down | 20 |
| Potable water (the majority of which would be for the temporary workforce accommodation) | 470 |
| **Total** | **4,635** |

Water for earthworks and dust suppression comprise the bulk of the water requirements. The volume required would vary along the proposal site based on the areas of cuts and fills. Generally, there is limited opportunity to substantially reduce the need for water during construction; however, opportunities to reduce water use would be further explored during detailed design and construction planning, including the potential use of additives and use of different materials for haul roads.

As described in section A6.3.5, the deep aquifers that underlie the proposal site have been identified as the preferred option for water supply.

A total of 12 bore fields are proposed to provide construction water. An indicative bore field layout is shown in Figure A8.9.

Groundwater would be extracted via these deep bores and pumped to the surface continuously (i.e. 24 hours per day, 7 days per week) where it would be stored in large temporary water tanks with an adjacent overflow pond. Water trucks would then collect the water from a fill point for use in the proposal site.

It is anticipated that potable water for the temporary workforce accommodation and compounds would be provided by either connections to the existing potable water supply network or through the extraction and potential treatment of groundwater. The preferred option/s would be confirmed by the construction contractor during detailed construction planning.

The construction water balance, and the potential impacts of the proposed approach to supplying construction water on the existing groundwater system, are considered in chapter B2.

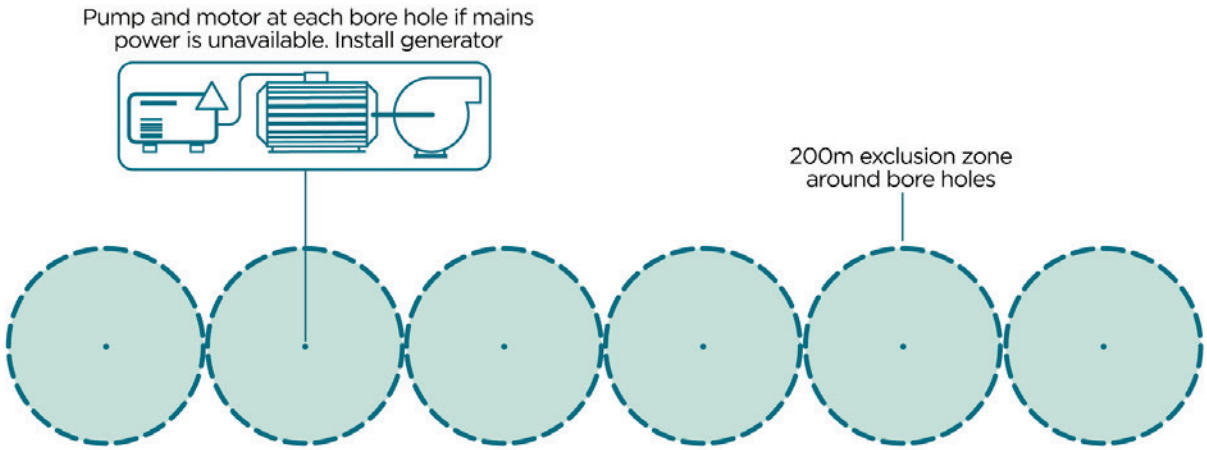



**FIGURE A8.9 INDICATIVE BORE FIELD LAYOUT**

### Other materials

Other materials required for construction include sleepers, rail and concrete, with estimated amounts provided in Table A8.8. Sleepers and rail are proposed to be delivered to the proposal site via existing rail lines during pre-construction (see section A8.2). Concrete would be supplied either by commercial suppliers or onsite batching plants (see section A8.9.5).

**TABLE A8.8 OTHER MATERIALS REQUIRED FOR CONSTRUCTION**

| Type of material | Estimated amount |
|---|---|
| Sleepers | 510,000 |
| Rail (main line) | 612 lineal kilometres |
| Concrete | 220,000 cubic metres |

## A8.10.3 Plant and equipment

A range of plant and equipment would be used as summarised in Table A8.9. The final equipment and plant requirements would be confirmed by the construction contractor.

**TABLE A8.9 INDICATIVE CONSTRUCTION PLANT AND EQUIPMENT**

| Construction phase | Equipment type | |
|---|---|---|
| Pre-construction | ▸ Trucks<br>▸ Water carts<br>▸ 25–30 tonne excavators<br>▸ Scrapers | ▸ Cranes<br>▸ Dozers<br>▸ Light vehicles<br>▸ Ancillary equipment |
| Site establishment and preliminary activities | ▸ Trucks<br>▸ Water carts<br>▸ 25–30 tonne excavators<br>▸ Scrapers<br>▸ Backhoes | ▸ Cranes<br>▸ Dozers<br>▸ Light vehicles<br>▸ Ancillary equipment |
| Main construction works (general) | ▸ 75–80 tonne excavators<br>▸ 40 tonne dump truck<br>▸ Compactors<br>▸ Water carts<br>▸ Lube truck<br>▸ Fuel truck<br>▸ Low loader<br>▸ Franna crane<br>▸ Road tippers | ▸ Bulldozers<br>▸ Graders<br>▸ Vibratory compactors<br>▸ Backhoes<br>▸ Light vehicles<br>▸ Ancillary trucks<br>▸ Forklifts and loaders<br>▸ Large mobile crane |

| Construction phase | Equipment type | |
|---|---|---|
| Main construction works—rail infrastructure (track works) | ▸ Rail laying machine<br>▸ Dozer<br>▸ Excavator | ▸ Mobile crane<br>▸ Graders<br>▸ Light vehicles |
| Main construction works—rail infrastructure (bridges) | ▸ 750 tonne crane<br>▸ 250 tonne crane<br>▸ 100 tonne crane<br>▸ Franna cranes<br>▸ Barge (Macquarie River only) | ▸ Concrete agitators and pumps<br>▸ Piling rig<br>▸ Low loader<br>▸ Light vehicles<br>▸ Ancillary vehicles |
| Main construction works—road infrastructure | ▸ Excavators<br>▸ Vibratory compactors<br>▸ 25–30 tonne excavators | ▸ Water carts<br>▸ Graders<br>▸ Bulldozers |
| Testing and commissioning | ▸ Light vehicles | ▸ Ancillary vehicles |
| Finishing and rehabilitation | ▸ Water carts<br>▸ Bulldozers<br>▸ Graders<br>▸ Road tippers | ▸ 25–30 tonne excavators<br>▸ 40 tonne dump truck<br>▸ Light vehicles |

### A8.10.4 Site services

Services such as water, sewer, electricity and telecommunications would need to be supplied to each of the work areas and construction compounds for use in site offices and amenities. Where these utilities are located close to the sites, opportunities to connect to existing sources would be explored with relevant providers; however, at this stage, it is proposed that all facilities would be self-sufficient for utilities due to the remoteness of the proposal site. Portable amenities blocks would be used that can be pumped out at regular intervals by suitably licensed contractors. Local power generation from portable generators would be installed and diesel resupplied using mobile refuelling services for construction plant and equipment.

### A8.10.5 Temporary land requirements

Construction would require temporary use of land for the duration of the construction period (referred to as the construction footprint). In addition to the indicative permanent land requirements described in section A7.5, some land would be required during construction only. These areas, which are listed in Appendix F and shown in the maps in Part E, would be required for some key construction infrastructure and compounds not located within the operational footprint, to provide access to construction work areas, and to facilitate manoeuvring of construction plant and machinery.

Lease agreements for temporary land requirements that are in addition to the permanent land requirements would be established with the relevant landowners.

Further information is provided in chapter B12.

## A8.11 Construction access

The general strategy for construction access to the proposal site is as follows:

- Rail—existing rail lines would be used to deliver bulk materials, where possible. This would include delivery of rail and sleepers commencing during the pre-construction phase (see section A8.2)
- Road—the existing public road network would be used for external delivery of all materials from commercial suppliers and borrow pits, and for the movement of the workforce (e.g. to and from temporary workforce accommodation)
- Proposal haul roads—these would be established within the construction footprint and used for the movement of bulk earthworks between cuts and fills, and the movement of other materials and the workforce along the proposal site.

The following sections describe the proposed access routes to and within the proposal site and indicative construction traffic numbers.

### A8.11.1 Access to the proposal site

#### General

Indicative access routes to each construction work area are shown in the maps in Part E. Deliveries from the wider region would use the regional public road network to link with these access routes.

New access (where required) from public roads would be provided via a new temporary connection. All connections to public roads would be designed to the appropriate standard and in consultation with the road manager.

#### Borrow pits

Access from borrow pits to the proposal site would be via new access roads connecting the borrow pit to the nearest public road, then via the public road network to the proposal site. Indicative access routes for each borrow pit are listed in Table A8.10 and shown in the maps in Part E.

**TABLE A8.10 BORROW PITS**

| Location | Primary route | Secondary route | Tertiary route |
|---|---|---|---|
| Borrow pit A—<br>Tantitha Road, Narromine | Tantitha Road | Pinedean Road | Tomingley Road |
| Borrow pit B—<br>Tomingley Road, Narromine | Tomingley Road | n/a | n/a |
| Borrow pit C—<br>Euromedah Road, Narromine | Euromedah Road | Eumungerie Road (crossing) | n/a |
| Borrow pit D—<br>Perimeter Road, Narrabri | Newell Highway (crossing)<br>Newell Highway (to north side of Narrabri) | n/a | n/a |

### A8.11.2 Access within the proposal site

To minimise construction traffic movements and associated impacts on the public road network, haul roads would be constructed within the construction footprint. The haul roads would generally be located next to the final rail alignment with temporary public road crossings provided, as required. All public road crossings would be designed to the appropriate standard and in consultation with the road manager.

The haul roads would generally allow for:

- Safe separation of light and heavy vehicles within the proposal site
- Heavy vehicle haulage (i.e. cut/fill movements) along the proposal site
- Plant and equipment deliveries, including equipment relocation between work fronts and compounds
- Personnel movements between work fronts, using both mini buses and light vehicles.

The haul roads may not be continuous along the proposal site and would vary depending on:

- The volume of material to be moved
- Property boundaries
- Environmental and other constraints (e.g. ecological and heritage features)
- Geographical limitations (e.g. watercourses that cannot be easily traversed).

### A8.11.3 Construction traffic numbers

Construction vehicle movements would comprise both heavy and light vehicles and would vary across the proposal site depending on the construction activity being undertaken. Indicative construction traffic volumes are summarised in Table A8.11. To minimise construction traffic movements, it is proposed to transport most of the workforce between the proposal site and the temporary workforce accommodation in buses. It is also proposed to transport construction materials along the proposal site (via the proposed construction haul roads—see A8.11.2), where practicable.

**TABLE A8.11 INDICATIVE CONSTRUCTION TRAFFIC VOLUMES**

| Vehicle type | | Movements per day (two-way) | Indicative peak-hour movements (two-way) |
|---|---|---|---|
| **Mobilisation/demobilisation** | | | |
| Light vehicles | Cars and utilities | 182 | 21.5 |
| Heavy vehicles | Concrete delivery | 34 | 3.6 |
| | Capping and ballast | 16 | 2 |
| | Borrow pits | 50 | 10.3 |
| | Workforce | 44 | 5.3 |
| **Main construction works** | | | |
| Light vehicles | Cars and utilities | 376 | 44.5 |
| Heavy vehicles | Cappin and ballast | 171 | 20.4 |
| | Borrow pits | 103 | 12.2 |
| | Borrow Pits | 495 | 58.3 |
| | Workforce | 106 | 12.8 |

## A8.12 Utility relocation or protection

Preliminary investigations and consultation have identified that a number of utilities would need to be relocated, adjusted or protected, with affected utilities including:

- Electricity (Essential Energy and TransGrid)
- Gas (APA Group and Santos)
- Telecommunications (Telstra, Nextgen and AARNet)
- Water and wastewater (relevant councils).

These utility relocations and adjustments would generally be contained with the proposal site; however, consultation with utility providers is ongoing and confirmation of the final treatment solution would occur during detailed design.

### Potential impacts and management framework

A utilities management framework (provided in Appendix J) has been prepared, adopting a risk-based approach to avoiding and/or minimising impacts associated with the relocation and/or adjustment of public utilities affected by the proposal. The framework provides a consistent approach to the assessment and management of public utilities relocation/adjustment across all proposal activities. An outline of the framework is provided below.

The utilities management framework comprises the following activities:

- Confirm affected utilities
- Design response to potential conflict with a public utility including whether the utility can be avoided
- Detailed assessment of requirements to meet utility owners specifications
- Ongoing consultation with asset owners and relevant stakeholders
- Environmental assessment, particularly for relocation works outside the proposal site using a risk based environmental assessment following the Australian Standard for risk management –*AS/NZS ISO 31000:2009, Risk management—Principles and guidelines* (Standards Australia/Standards New Zealand, 2009)
- Construction management, which identifies typical mitigation measures
- Rehabilitation and re-instatement protocols following utility relocation/adjustment in roadways, footpaths and open space areas
- Communications and notifications that can be expected and how these would be managed.

## A8.13 Public safety

Potential risks to the health and safety of site workers, users, visitors, and the local community during construction include:

- Working within an operating rail environment when undertaking rail connection works
- The operation of vehicles and construction equipment onsite
- The transportation of equipment, excavated spoil and material to and from site
- Construction failures or incidents resulting in flooding, inundation or excavation collapse.

In addition to the above, there is the potential for risks to pedestrian/public safety resulting from unauthorised access to construction work areas.

The potential for the above activities to cause health and safety impacts on the local community is considered to be minimal, based on the remote nature of the majority of the proposal site.

NSW workplace safety laws require construction sites to have adequate site security, which includes appropriate fencing. All construction work would be isolated from the general public. The construction contractor would need to ensure that construction sites are secure at all times and take all practicable actions to prevent entry by unauthorised persons.

Health and safety risks during construction would be managed by the implementation of standard workplace health and safety requirements.

A work health and safety management plan and safe work method statements would be developed in accordance with regulatory requirements.