8. Construction of the proposal

This chapter provides an outline of the indicative construction activities likely to be used to construct the proposal. It includes a summary of the proposed timing, an indicative construction methodology, likely resources, and proposed access arrangements. This information is preliminary only, and is based on the current stage of the design. The construction methodology would be refined as the design of the proposal progresses, and once the construction contractor is engaged.

8.1 Overview of construction scope and approach

Construction of the proposal would commence once all necessary approvals are obtained, and the detailed design is complete. It is anticipated that construction would take about 18 months, commencing in mid 2018, and concluding in late 2019.

The construction methodology, sequencing and durations would be confirmed once a possession strategy has been agreed with affected train operators, track stakeholders, and relevant government departments. The possession strategy would define the times that rail traffic would not be permitted to operate along the existing rail corridor. An indicative possession strategy is provided in Table 8.1

Construction along the existing rail corridor would depend on the possession strategy however, it is anticipated that progress would be from south to north, and involve three main stages:

- stage 1 – Parkes to Goonumbla
- stage 2 – Goonumbla to Narwonah
- stage 3 – Narwonah to Narromine.

Construction of the Parkes north west connection and the Brolgan Road overbridge would be undertaken in parallel with the above stages.

8.1.1 Approach to avoiding or minimising impacts during construction

Mitigation and management measures applicable to the design, pre-construction and construction stages would be implemented to avoid or minimise the construction impacts described in chapters 9 to 26. Mitigation measures are provided in each chapter in Part C, and are summarised in chapter 27. The measures include preparing and implementing a construction environmental management plan (CEMP) including detailed sub-plans.

The CEMP would be prepared for the construction phase of the proposal by the responsible construction contractor. The CEMP would provide a centralised strategy through which all potential environmental impacts would be managed during construction, and would include detailed management measures to avoid or minimise potential impacts. The requirements for the CEMP are described in chapter 27. An outline of the CEMP, including the required sub-plans, is provided in Appendix K.

8.2 Indicative construction methodology

For each stage, construction would typically involve:

- site establishment (described in section 8.2.1)
- main construction works (described in sections 8.2.2 to 8.2.6)
- testing and commissioning (described in section 8.2.7)
- finishing works (described in section 8.2.8).

The construction methodology would be further developed and confirmed during detailed design.

8.2.1 Site establishment

Site establishment would generally involve:

- consult landowners/occupants where required
- install site environment management and traffic controls in accordance with the CEMP
- establish site compounds and facilities
- clear vegetation
- erect temporary fencing
- establish site access roads where required
- utility relocations as required
- deliver and stockpile materials including rail, sleepers, ballast, culverts and structural fill.

8.2.2 Track works

Track upgrading

A general methodology for the main proposed forms of track upgrading is provided below:

- Skim reconditioning:
  - remove fastenings, rail and sleepers and stockpile to one side of the rail corridor
  - trim and level the existing ballast bed and compact
  - place concrete sleepers and rail track on prepared ballast bed and weld up rails
  - place new ballast on top of the sleepers
  - tamp and profile the ballast around the sleepers and line to a smooth alignment.
- Track reconstruction:
  - remove fastenings, rail and sleepers and stockpile to one side of the rail corridor
  - excavate the existing ballast and earth formation
  - place new earth and recycled ballast into the excavated area and compact
  - place new ballast on top of the earth formation and compact
  - place concrete sleepers and rail tracks on prepared ballast bed and weld up rails
  - place new ballast on top of the sleepers
  - tamp and profile the ballast around the sleepers and line to a smooth alignment.

Culverts

Where required, culverts would be removed and replaced as described below. Culvert replacement would be undertaken online (the structure would be replaced in the same location). Culverts would be pre-cast off-site, and installed along the proposal site as the track upgrading works progress.

Culvert removal

- remove existing culvert structure (either concrete or steel pipes)
- excavate to the required depth
- place and compact bedding material.

Culvert replacement

- place pre-fabricated culvert structures on the new formation area and fasten together
- place ballast, sleepers and rail on top of the culverts and tamp and profile the ballast under and around the sleepers and weld up tracks.

Crossing loops

The general methodology for constructing crossing loops is as follows:

- excavate beside the existing track for the length of the crossing loop
- place and compact formation material
- place ballast, sleepers and rail tracks on top of the new formation
- install signal equipment and associated equipment
- testing and commissioning.

Turnouts

The general methodology for constructing turnouts is as follows:

- cut existing track, remove and dispose of existing turnout (at existing sidings only)
- undertake formation improvement works as required
- install ballast and rails
- install control mechanisms (points motor, power supply etc)
- testing and commissioning.

Drainage

The general methodology for drainage construction is as follows:

- prepare survey control points for planned excavation of cess drains
- excavate earth material from the side of the existing track formation, and trim and compact base and sides of the drain
- form spoil mounds.

8.2.3 Level crossings

The general methodology for level crossings is as follows:

- 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.
- Consolidating level crossings:
  - complete road works and appropriate road signage to redirect traffic
  - remove level crossing signs and road markings
  - upgrade tracks as described in section 8.2.2.

8.2.4 Parkes north west connection

Construction of the Parkes north west connection would generally involve the following:

- undertake cut and fill earthworks
- place imported formation material
- place bottom ballast
- place track consisting of fastenings, rail and sleepers on bottom ballast
- place ballast on top of the track
- tamp and profile the ballast around the sleepers and tracks
- construct cess drainage
- provide signalling and communications.

8.2.5 Brolgan Road rail overbridge

Construction of the overbridge would generally involve the following:

Bridge works

- construct cast-in-place piles at abutments and piers
- construct reinforced soil wall abutment on the northern and southern side of the bridge
- construct column extensions and pier headstocks
- install super T girders and construct reinforced concrete deck including end diaphragms
- install throw screens
- install expansion joints and steel traffic barrier railing
- install waterproof membrane and asphalt.

Embankment and pavement works

- place bulk general fill to construct approach embankments
- construct new pavement, including placing and compacting select fill, sub base and asphalt wearing surface
- tie into existing Brolgan Road.

Finishing works

- rehabilitate disturbed areas in accordance with the rehabilitation plan
- line marking and sign posting
- final site clean-up.

8.2.6 Earthworks

Earthworks would be required:

- where upgrades to the formation are required
- to widen existing embankments and cuttings to meet design requirements
- to construct the Parkes north west connection and Brolgan Road overbridge
- to construct culverts.

Minor earthworks would also be required to construct the ancillary infrastructure and undertake the ancillary works associated with the proposal.

8.2.7 Testing and commissioning

Testing and commissioning (checking) of the rail line and communication/signalling systems would be undertaken to ensure that all systems and infrastructure are designed, installed, and operating according to ARTC's operational requirements.

8.2.8 Finishing works/reinstatement

All construction sites, compounds and access routes would be returned to the same or better condition than prior to construction commencing. Site reinstatement and rehabilitation would be undertaken progressively during the works and would include the following activities:

- demobilise site compounds and facilities
- remove all materials, waste and redundant structures from the works sites
- forming, and stabilising of spoil mounds
- decommission all temporary work site signs
- remove temporary fencing
- establish permanent fencing
- decommission site access roads that are no longer required
- restoration of disturbed areas as required, including revegetation where required.

Site rehabilitation would be undertaken in accordance with the rehabilitation plan, which would form a sub-plan of the CEMP (described in chapter 27).

8.3 Timing, staging and working hours

8.3.1 Timing and staging

An indicative construction program is shown in Figure 8.1. As described in section 8.1, construction along the existing rail corridor would be undertaken in three stages, subject to agreement with relevant stakeholders. The stages are shown in Figure 8.2. For each stage, rail traffic would be diverted as described in Table 8.1.

Construction of the Parkes north west connection and the Brolgan Road overbridge would be undertaken in parallel with stages one and two along the existing rail corridor.

For the works along the existing rail corridor, it is anticipated that it would take about eight to 10 weeks to construct a 4.5 to five kilometre section of track. This does not include location specific works such as culverts or the relocation of services and utilities.

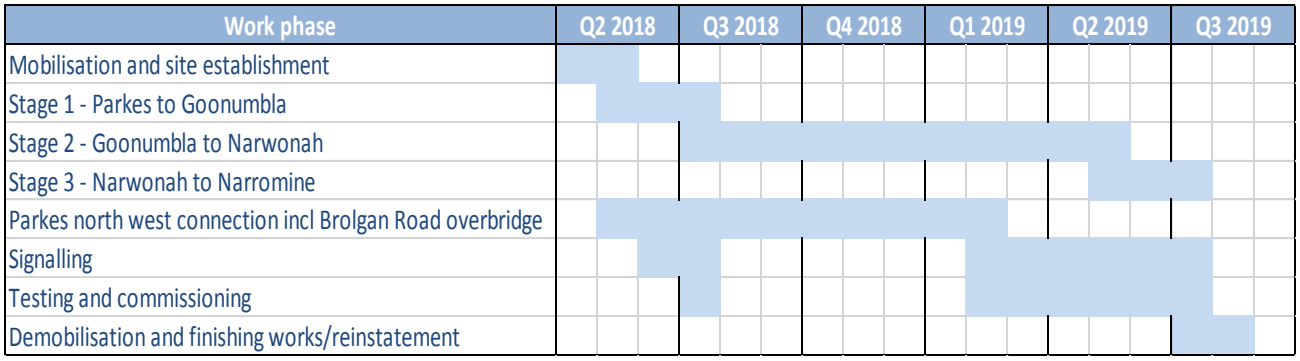

Figure 8.1 Indicative construction program

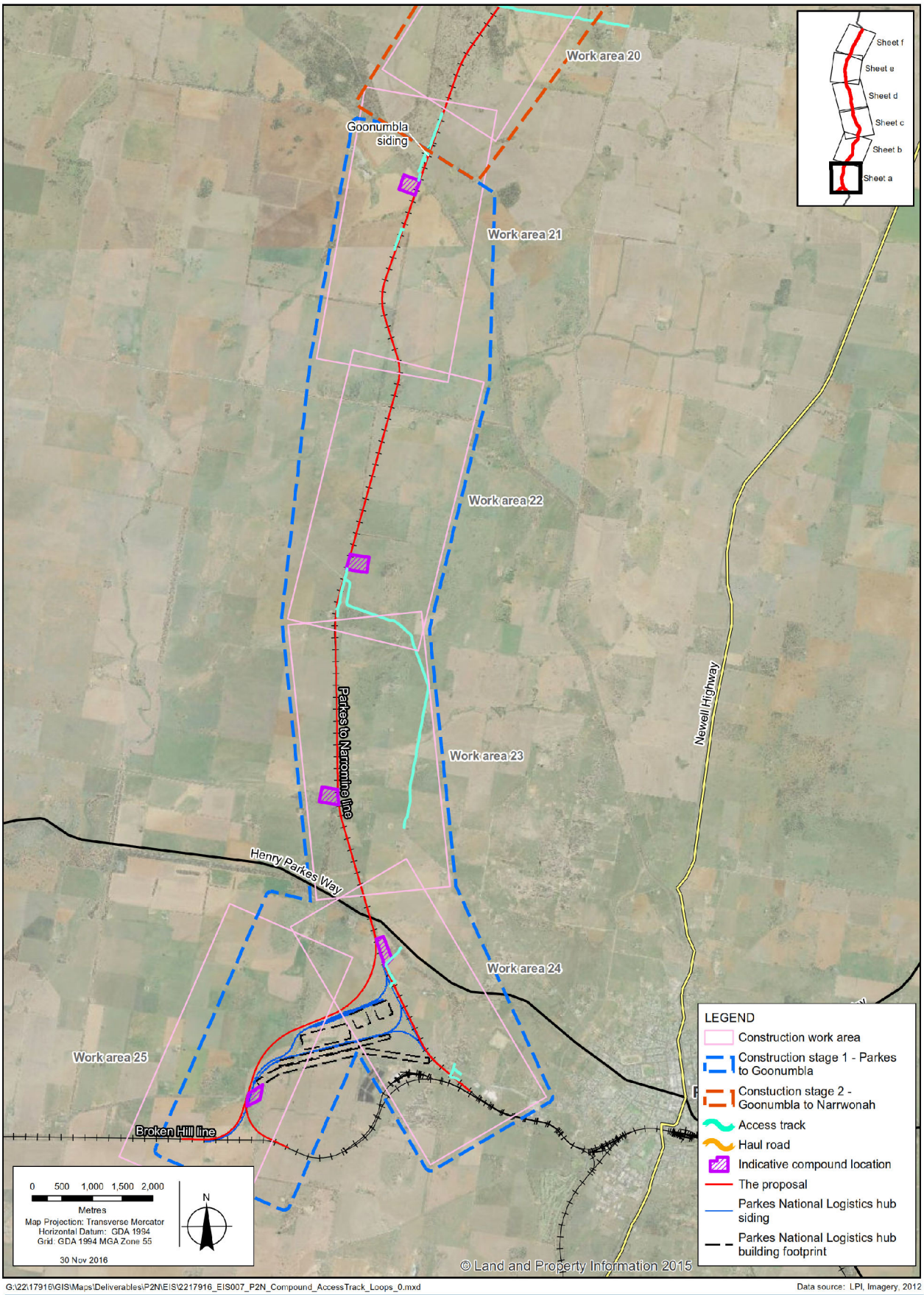

Figure 8.2a

Construction work stages, work areas and compounds

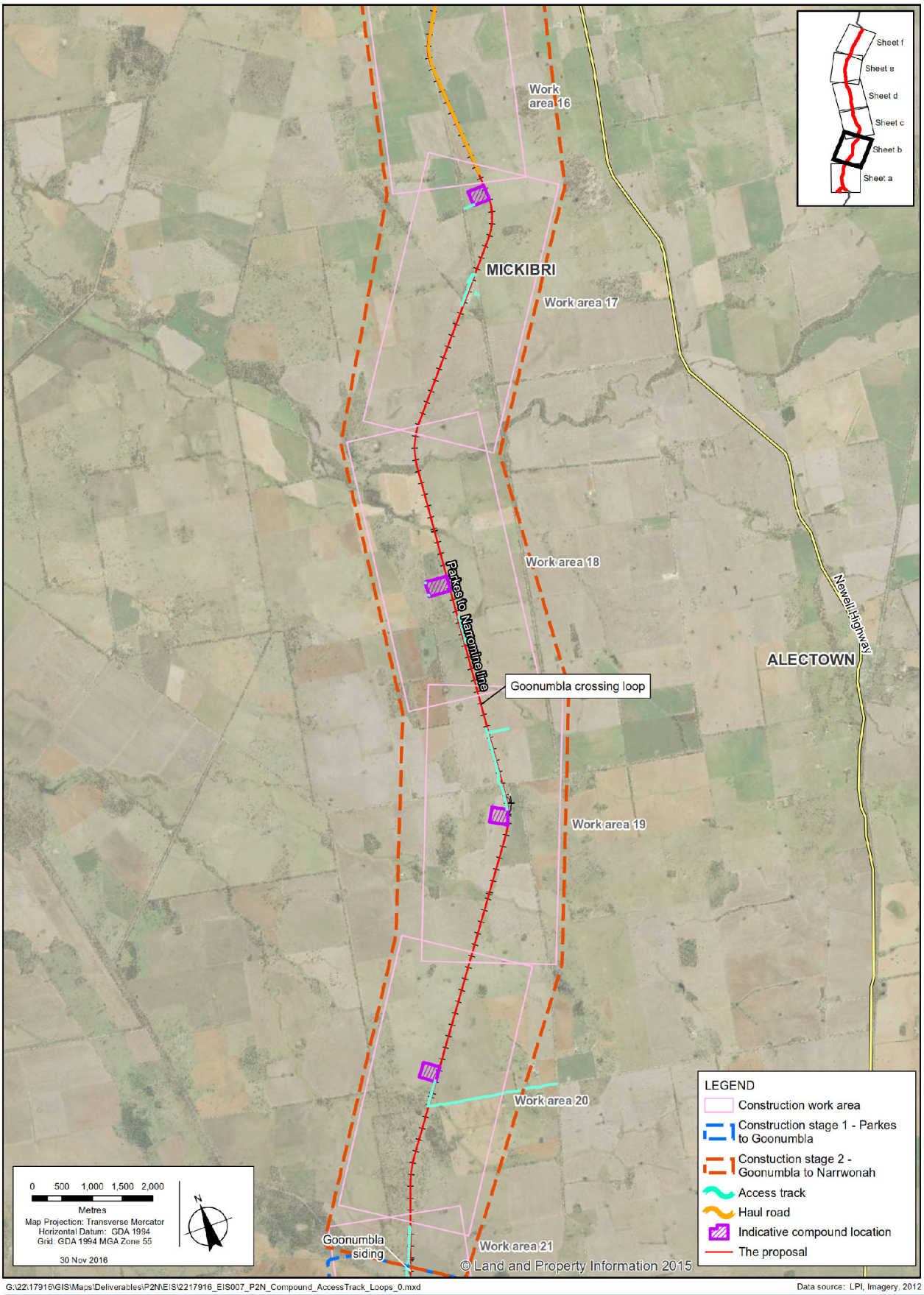

Figure 8.2b

Construction work stages, work areas and compounds

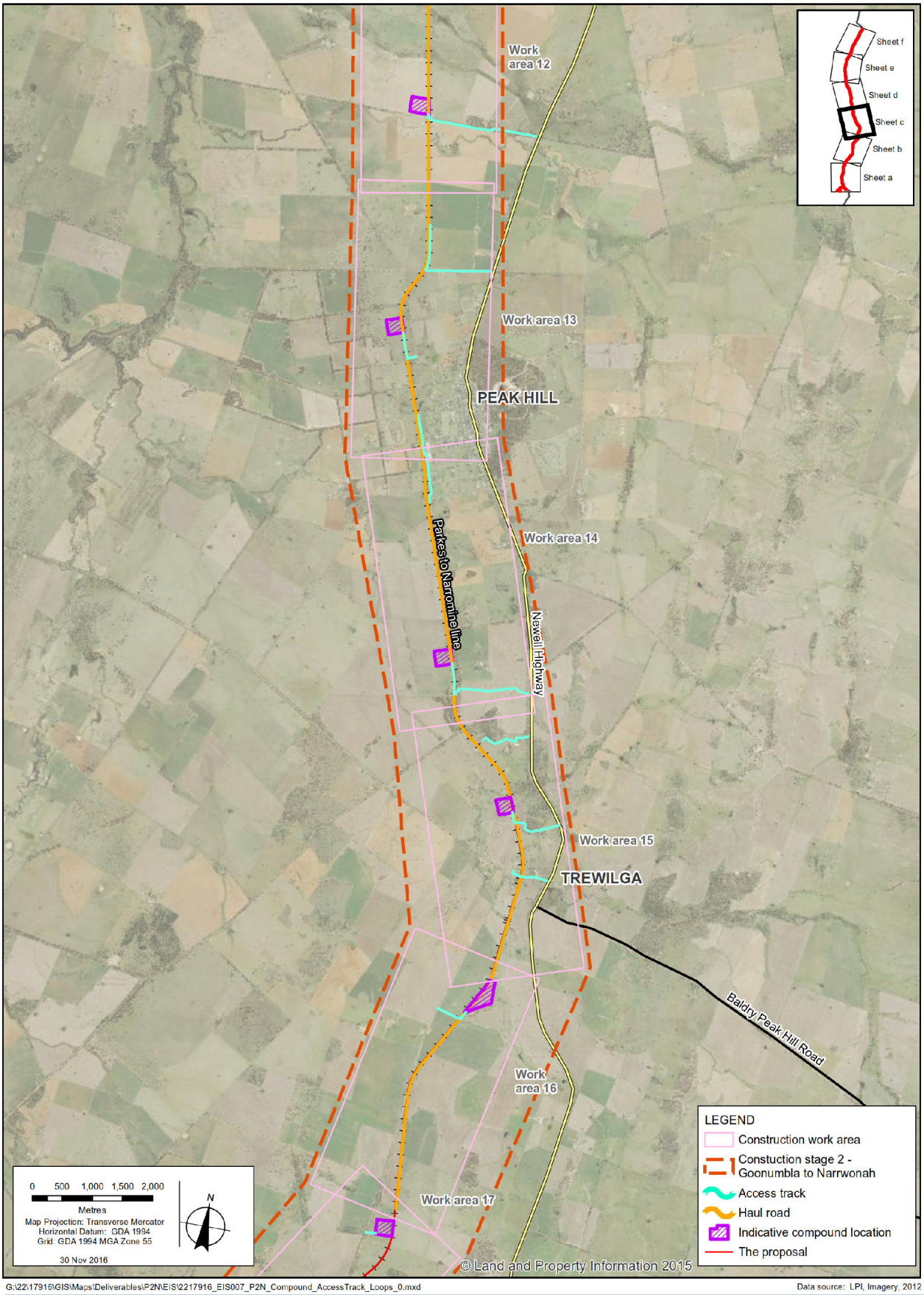

Figure 8.2c

Construction work stages, work areas and compounds

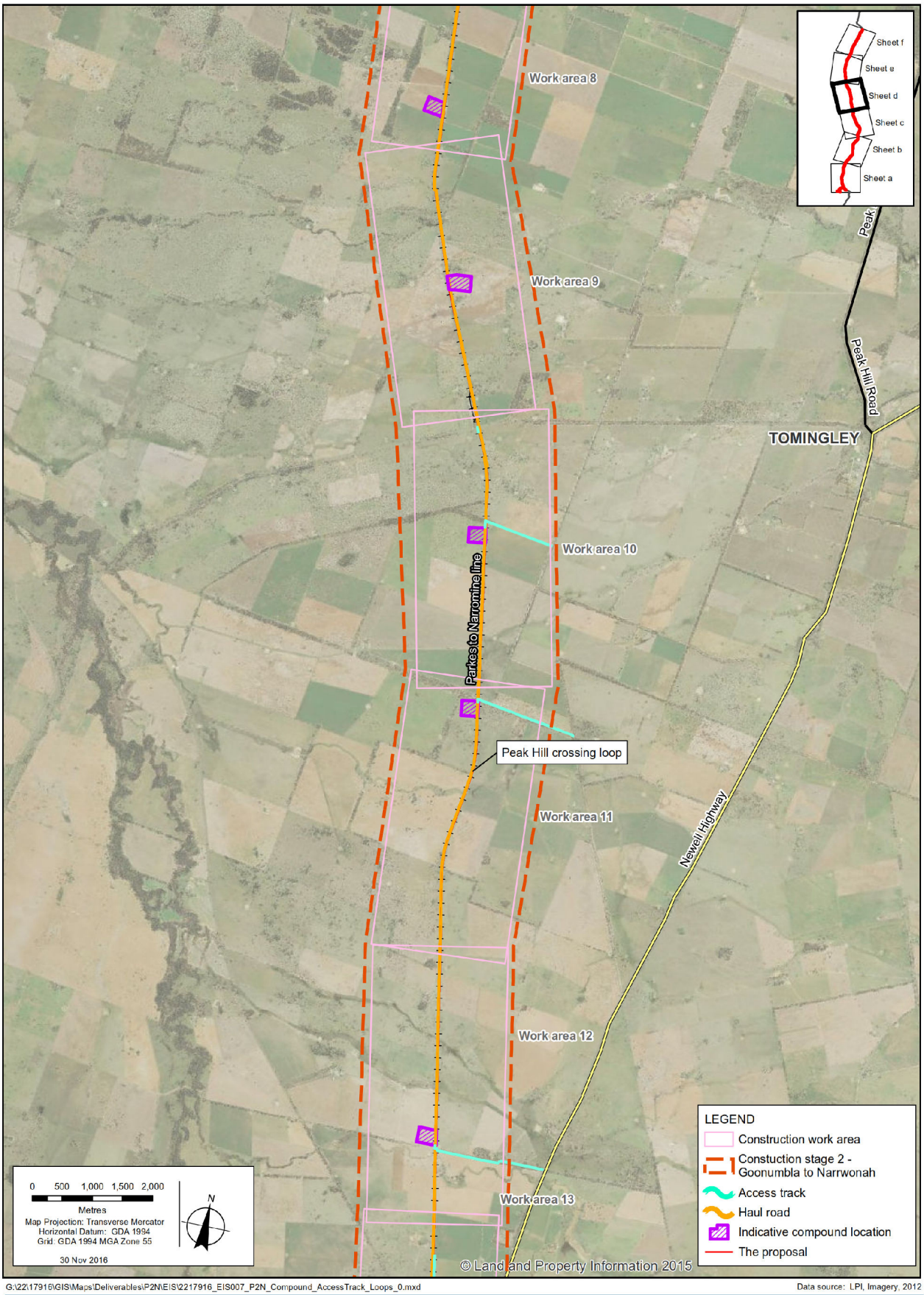

Figure 8.2d

Construction work stages, work areas and compounds

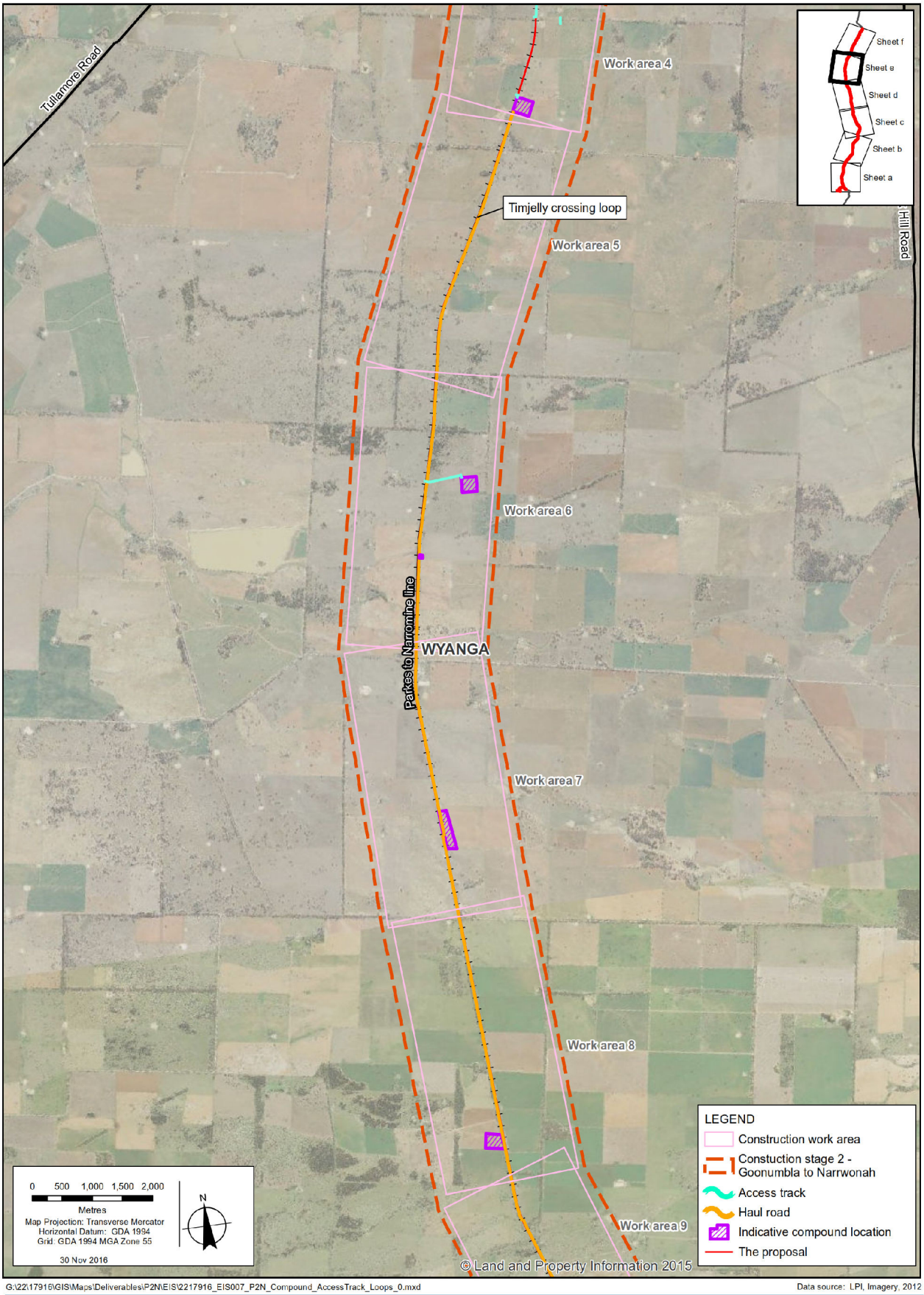

Figure 8.2e

Construction work stages, work areas and compounds

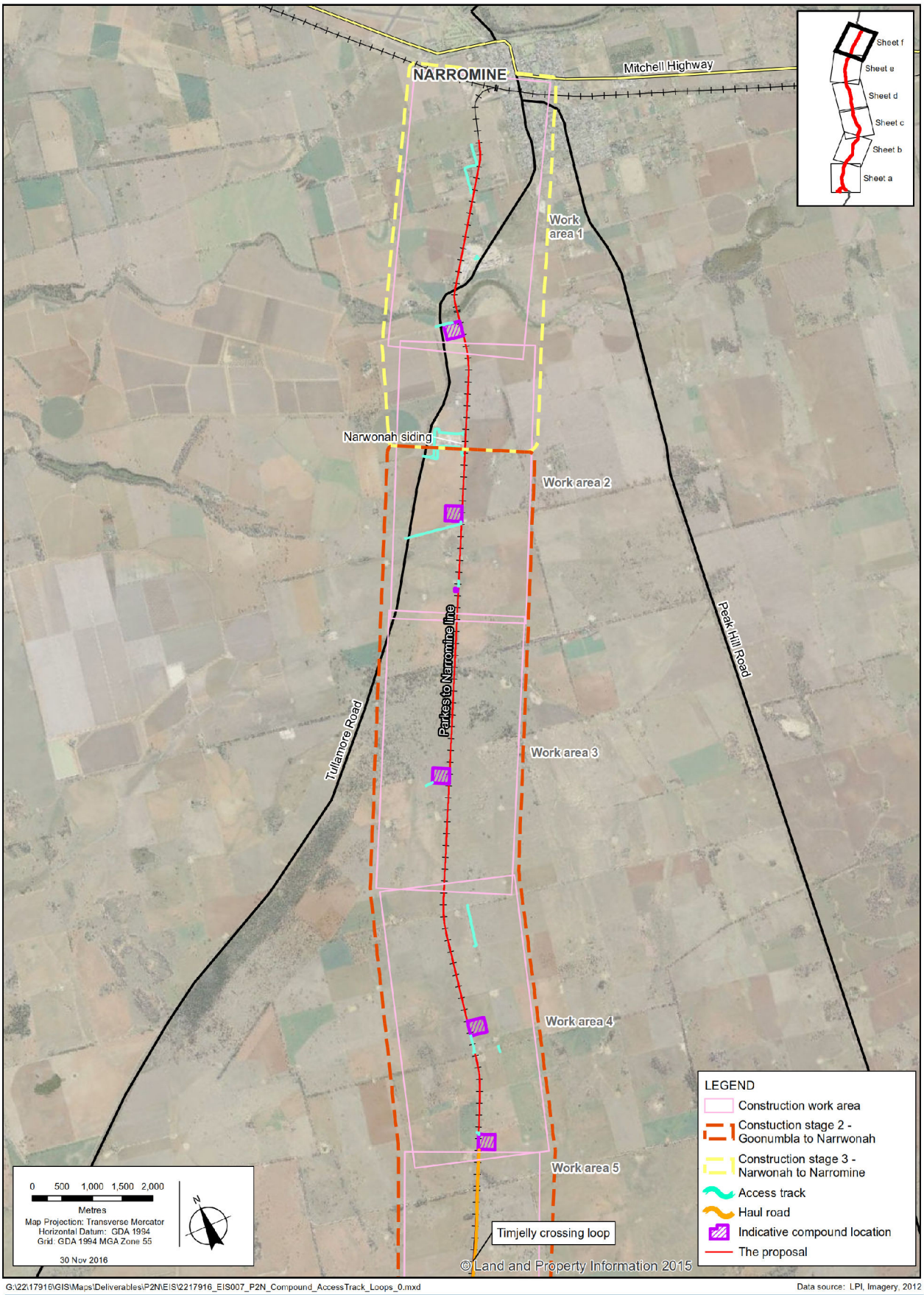

Figure 8.2f

Construction work stages, work areas and compounds

Table 8.1 Construction staging for work in the existing rail corridor

Stage	Location	Distance (km)	Rail traffic
1 – Parkes to Goonumbla	Located between the southern end of the proposal site (described in section 2.2 and including the Parkes north west connection) and the Goonumbla siding, which is located about 17 km north of the southern end of the proposal side, just north of Bogan Road	17	Redirected north through Narromine via the Main Western line
2 – Goonumbla to Narwonah	Located between the Goonumbla siding, and the Narwonah grain siding, which is located about 5 km south of Narromine	85	Redirected south from Goonumbla and north from Narwonah
3 – Narwonah to Narromine	Located between the Narwonah grain siding and the northern end of the proposal site (described in section 2.2)	5	Redirected south from Narwonah

8.3.2 Working hours

Construction working hours

Construction work would be undertaken during the following primary proposal construction hours:

- Monday to Friday: 6 am to 6 pm
- Saturday: 6 am to 6 pm
- Sundays and public holidays: 6 am to 6 pm.

Works would also be undertaken during 24 hour possessions, where required.

Works during recommended standard working hours

Recommended standard hours for construction work are contained in the *Interim Construction Noise Guideline* (DECC, 2009) and are as follows:

- Monday to Friday: 7 am to 6 pm
- Saturday: 8 am to 1 pm
- Sundays and public holidays: no work.

Near residential receivers, activities resulting in impulsive or tonal noise emissions would be limited to these hours, except as permitted by the EPL.

Works outside recommended standard working hours

Construction activities would be undertaken outside recommended standard working hours during the following times:

- Monday to Friday: 6 am to 7 am
- Saturday: 6 am to 8 am and 1 pm to 6 pm
- Sundays and public holidays: 6 am to 6 pm
- 24 hours during possessions.

Work undertaken during these hours would include:

- work that meets the relevant noise and vibration criteria described in chapter 11
- where a negotiated agreement has been reached with affected receivers, where the prescribed noise and vibration levels cannot be achieved
- delivery of materials required by the police or other authorities for safety reasons
- work required in an emergency
- work approved through an EPL
- work approved through an 'out of hours work protocol' prepared as part of the CEMP, and in accordance with the conditions of approval for the proposal.

Work during possessions

Some minor works may also be undertaken 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, the connection of the tracks at either end of each stage, and some finishing works. During possessions, works may need to be undertaken on a 24 hour basis.

8.4 Construction compounds

Two types of compound areas are proposed; minor compound/storage areas and larger compound sites.

Minor compounds/storage areas are areas that would be used for the assembly of adjacent infrastructure such as culverts and turnouts. These compounds would be located within the rail corridor.

Larger compound sites would be established for general construction activities associated with each stage of work. For the purposes of the EIS, it is assumed that temporary compounds would be sited outside the existing rail corridor every 4.5 to five kilometres (one for each work area described in section 8.3.1). Indicative compound locations are shown in Figure 8.2.

Each larger compound site would contain:

- stockpiles
- track infrastructure laydown area
- bunded refuelling area
- fencing as required
- office area including parking, offices and ablutions
- mobile plant and equipment
- hazardous material storage.

The design of the proposal has been developed so that infrastructure would either be constructed in place (for example, welding of track) or prefabricated structures would be used (for example, culverts). Therefore, activities undertaken at compound sites would include the following:

- site office operations
- delivery and stockpiling of various construction materials including rail, sleepers, ballast, culverts and structural fill
- movement of plant and equipment
- maintenance of site environmental management controls.

Not all of the above activities would be undertaken at every compound site.

The location of compounds would be determined based on the following criteria:

- at least 50 metres from watercourses and outside the ARI 20-year flood zone
- where no or only minor clearing would be required, and not within areas identified as threatened communities or species habitat
- no significant impacts to utilities, primarily gas and electricity
- at least one kilometre from the nearest residence or other noise sensitive receiver where possible
- not on or near sites with known Aboriginal or non-Aboriginal heritage value
- minimise use of private land
- where safe access to the road network and rail corridor can be provided
- relatively flat land.

8.5 Construction resources

8.5.1 Workforce

For the majority of the construction period, the workforce would average about 150 people. For some limited items of work an additional short-term workforce may be required.

8.5.2 Materials

The proposal would require quantities of various materials including fill, ballast, concrete sleepers, rail, precast concrete units, ready mix concrete and water. The majority of these materials would be used during track formation works, with the exception of precast concrete units and ready mix concrete which would be used for construction of concrete structures including culverts and bridges.

Subject to confirmation and the gaining of any necessary approvals, the following local quarries are proposed to be used for structural fill, capping and ballast (ballast would be delivered by train, other materials by truck):

- Goonumbla quarry
- Unger quarry
- Narromine Council borrow pit.

This would be further investigated and confirmed during detailed design.

8.5.3 Plant and equipment

A range of plant and equipment would be used during construction. The final equipment and plant requirements would be identified by the construction contractor. An indicative list of plant and equipment that would be used for each construction stage is provided in Table 8.2.

Table 8.2 Indicative construction plant and equipment

Construction phase	Plant and equipment	
Establishment	▸ trucks ▸ cranes	▸ clearance equipment such as chainsaws and chippers
Utility relocations and property adjustments	▸ excavators ▸ rigid and articulated trucks ▸ jackhammers ▸ cranes ▸ concrete pumps ▸ welding equipment	▸ concrete saws ▸ light vehicles ▸ concrete trucks ▸ generators ▸ oxy-cutting equipment
Earthworks and drainage	▸ excavator ▸ jackhammers ▸ rigid and articulated trucks ▸ compactors ▸ water carts ▸ generators	▸ bulldozers ▸ boring machines ▸ graders ▸ profilers ▸ vibrating rollers ▸ trucks and trailers
Track works	▸ 25-30 tonne excavators ▸ 40 tonne dump truck ▸ vibratory roller ▸ water cart ▸ crane ▸ trucks and trailers	▸ graders ▸ bulldozer ▸ lighting ▸ skid steer loader ▸ front end loader
Road overbridge and pavement works	▸ excavators ▸ rigid and articulated trucks ▸ drilling rigs and boring machines ▸ cranes ▸ concrete trucks and pumps ▸ generators ▸ welding equipment ▸ trucks and trailers	▸ compactors ▸ graders ▸ paving machines ▸ slip-forming machines ▸ vibrating rollers ▸ water carts ▸ road marking machine
Finishing and landscaping	▸ milling machines ▸ piling machines ▸ trucks ▸ rollers	▸ generators ▸ oxy-cutting equipment ▸ sprayers ▸ trucks

8.5.4 Site servicing requirements

Utilities and services such as water, sewer, electricity and telecommunications would need to be supplied to each of the work and compound sites 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, particularly for electricity. Where connections are not available, power would be provided by generators.

Water would be required for dust control, site compaction and reinstatement during construction. A number of potential water sources have been investigated, including extraction of groundwater or surface water, private bores and watercourses. This would be further explored prior to construction in consultation with local councils and landowners. Where water is not available, it would be transported to the sitpe via tanker truck and stored in temporary storage tanks. Potable water for human consumption would be supplied via bottled water or potable water tanks. Non-potable wash water would be supplied by the use of trailer-mounted storage tanks.

Portable toilet facilities would be used where existing infrastructure is unavailable and sewage pump out services utilised to remove waste off site.

8.6 Transport, access and haulage arrangements

8.6.1 Access to construction work areas

Access to the construction work areas would be from public roads or existing access routes which are located within the rail corridor. An access track runs parallel to the rail line along the majority of the alignment.

Potential access routes to each construction work area are listed in Table 8.3. Generally, access to construction stage 1 and the southern end of construction stage 2 would be from Parkes, while the northern construction areas would be accessed from Narromine or Dubbo.

Table 8.3 Potential construction access routes to work areas

Construction work area (as shown in Figure 8.2)	Primary route	Secondary route	Tertiary route
25 and 24	Dalton Street	Middleton Street	Brolgan Road
	Dalton Street → Henry Parkes Way	-	-
23	Dalton Street → Henry Parkes Way	Moulten Street	Back Trundle Road
22	Dalton Street → Henry Parkes Way	Moulten Street	Back Trundle Road → Nanardine Lane
	Newell Highway	Bogan Road	Wyatts Lane
21	Newell Highway	Bogan Road	-
20	Newell Highway	Bogan Road	Plowman Lane → access track
19	Newell Highway	Alectown West Road	-
	Newell Highway	Bogan Road	Plowman Lane

Construction work area (as shown in Figure 8.2)	Primary route	Secondary route	Tertiary route
18	Newell Highway	Alectown West Road	-
	Newell Highway	Alectown West Road	Mickibri Road → Barber Lane
17	Newell Highway	Alectown West Road	Mickibri Road
	Newell Highway	Claremont Lane	
16	Newell Highway	Claremont Lane	Mickibri Road
15	Newell Highway	Trewilga Road	-
	Newell Highway	Access track	-
14	Newell Highway	Access track	-
	Newell Highway	Whitton Park Road	-
13	Newell Highway	Whitton Park Road	Access track
	Newell Highway	Kitto's Bridge Road	-
12	Newell Highway	Access track	-
11	Newell Highway	Sharah's Access Road	-
10	Newell Highway	Tomingley West Road	Back Tomingley West Road → access track
	Newell Highway	Tomingley West Road	-
9	Newell Highway	Tomingley West Road	Peak Hill Railway Road
8	The McGrane Way	Peak Hill Railway Road	-
	Newell Highway	Tomingley West Road	Peak Hill Railway Road
7	The McGrane Way	Peak Hill Railway Road	-
	Newell Highway	Tomingley Road	Wyanga Road
6	The McGrane Way	Peak Hill Railway Road	-
	Newell Highway	Tomingley Road	Wyanga Road → Peak Hill Railway Road
5	The McGrane Way	Peak Hill Railway Road	-
	Newell Highway	Tomingley Road	Wyanga Road → Peak Hill Railway Road
4	The McGrane Way	Peak Hill Railway Road	-

Construction work area (as shown in Figure 8.2)	Primary route	Secondary route	Tertiary route
	Newell Highway	Tomingley Road	Wyanga Road → Peak Hill Railway Road
3	The McGrane Way	Peak Hill Railway Road	-
	Newell Highway	Tomingley Road	Narwonah Road
2	The McGrane Way	Access track	-
1	The McGrane Way	Access track	-
	Dandaloo Street	Old Backwater Road	-

8.6.2 Access to compounds

Access routes to compounds would be determined based on the following criteria:

- provision of a suitability wide road to achieve a single lane, two-way access
- provision of adequate turning circles for crane and heavy vehicles - at least a 25 metre turning radius capability
- minimal property impacts by using access alignments within and adjacent to the rail corridor and existing agreed property access roads as far as practicable
- provision of more than one access point where possible to allow access from either road direction.

8.6.3 Haul routes

While a detailed haulage program has not yet been developed, it is expected that the majority of the proposal's components would be delivered by rail from various locations. Other transport would be undertaken by heavy vehicles using the Newell Highway and Henry Parkes Way and then local roads and existing access roads along the rail corridor.

It is likely that rail components, including sleepers, ballast, and track, would be transported to the work areas via dedicated rail trains; while pre-fabricated concrete units, fill and equipment deliveries would most likely be via road from suppliers.

8.6.4 Construction traffic numbers

Construction vehicle movements would comprise both heavy and light vehicles as listed in Table 8.4.

Table 8.4 Vehicle movements for each stage of construction

Vehicle type		Numbers on site per day	Movements per day	Indicative peak hour movements (one-way)
Light vehicles	Cars and utilities	75	170	75
	Total light vehicles	***75***	***170***	***75***
Heavy vehicles	Light trucks	8	24	8
	25 seater buses	3	6	3

Vehicle type		Numbers on site per day	Movements per day	Indicative peak hour movements (one-way)
	Haulage and delivery trucks	28	200	28
	Total heavy vehicles	***39***	***230***	***39***

Light vehicle movements would largely be based on the amount of construction workers travelling to site each day. Based on an average workforce of 150 people, up to 150 private vehicles could travel to and from the proposal site per day. However, given the remote nature of many of the construction work areas, buses would be provided for construction workers. Workers are likely to use a combination of buses and light vehicles to travel to the proposal site.

8.7 Public utilities

Consultation with public utility authorities is being undertaken as part of the design process to identify and locate existing utilities, and incorporate utility authority requirements for relocations and/or adjustments.

Preliminary investigations have indicated that a number of utilities would need to be relocated or adjusted as part of the proposal. This would be undertaken in consultation with the utility authorities during detailed design.

Desktop review of 'Dial Before You Dig' data indicated that the proposal would impact on a number of services. Additional services investigations would be undertaken during detailed design. Consultation has commenced with the various utility providers regarding their requirements for relocation or protection of the services impacted by the proposal.