Maitland to Minimbah Third Track Project
Submissions Report
Including Preferred Project Report
September 2010









Australian Rail Track Corporation

Maitland to Minimbah Third Track Project

Submissions Report including Preferred Project Report

September 2010

H8R-REP-S2G-ENV-0019-0

Part C
Preferred Project

Part C Preferred Project

5. Preferred Project

As a result of the community consultation process and further consideration of the project implementation, this section describes the proposed modifications to the Project as described in the Environmental Assessment.

5.1 The Revised Project

As described in Sections 1.5 and 1.6, the description of the Project provided in Chapter 7 of the Environmental Assessment has been amended due to the proposed staging of construction, and through amendments to the Project design and construction methodology.

Table 5-1 summarises the key elements of the Project and the phases during which they would be constructed.

Table 5-1 Major Project Elements

Project Elements	
Earthworks	**Phase 1 and Phase 2** ◗ Major cut and fill earthworks along the route. ◗ Other minor earthworks.
Track	**Phase 1** ◗ Approximately 21.9 kilometres of new track including turnouts and junctions between chainages 196.100 kilometres and 209.840 kilometres, and between chainages 216.340 kilometres and 224.200 kilometres
	Phase 2 ◗ Approximately 8.1 kilometres of new track including turnouts and junctions between chainages 209.840 kilometres and 216.340 kilometres (Branxton to Greta), and chainages 194.500 kilometres and 196.100 kilometres (Farley to Telarah)
Drainage	**Phase 1** ◗ Track drainage. ◗ Amendments to 30 culverts for cross drainage. ◗ Other drainage works around new structures.
	Phase 2 ◗ Track drainage. ◗ Re-alignment of Sawyers Creek. ◗ Amendments to 23 culverts for cross drainage. ◗ Other drainage works around new structures.

Project Elements	
Bridges	**Phase 1** ◗ Demolition of the existing rail overbridge at Old North Road, Allandale. ◗ A new rail underbridge at Allandale Road, Allandale. ◗ A new rail underbridge for an unnamed tributary of Anvil Creek (chainage 207.776 kilometres). ◗ A new rail underbridge at Black Creek, Belford. ◗ A new rail underbridge at Jump Up Creek, Belford.
	Phase 2 ◗ A new rail underbridge at Stony Creek and Wollombi Road, Farley. ◗ Closure of the stock crossing at Farley. ◗ Demolition and replacement of the existing rail underbridge at an unnamed tributary of Anvil Creek, Greta (chainage 209.989 kilometres). ◗ A new rail underbridge at Sawyers Creek, Greta. ◗ Modification of the existing rail overbridge at Bridge Street, Branxton.
Station Modifications	**Phase 1** ◗ Modifications to Lochinvar Railway Station.
	Phase 2 ◗ Modifications to Greta Railway Station. ◗ Modifications to Branxton Railway Station.

5.2 Project Modifications

Several modifications to the Project as described in Chapter 7 of the Environmental Assessment are proposed. These modifications have resulted due to:

- Amendments to the design of the Project (such as track design, access tracks and drainage) that have generally resulted in a reduction in the overall earthworks footprint of the Project.
- Amendments to the proposed construction methodology that would reduce the potential impact of the Project (such as improved construction traffic management by revision of construction compound locations).
- Modifications to the proposed operation noise and vibration attenuation.
- A review of the overall ARTC rail improvement program has identified that the Project construction could be staged without compromising the ability to improve rail services in the short term.
- Minor design amendments required to facilitate the staging of the Project.

The modifications are consistent with the Project described in Chapter 7 of the Environmental Assessment and have not significantly changed the potential environmental impact of the Project.

These modifications are summarised by the following:

- Amendments to the earthworks design required for the third track, including modification to the design of the Down side access track.

- A reduction in the required property acquisition resulting from the amendments to the earthworks design.
- Additional potential spoil disposal areas and the addition of potential sources of appropriate track construction material adjacent to the rail corridor (known as borrow pits).
- Alternative and proposed new locations for construction compounds (primary and secondary) and associated changes to traffic access and management.
- The proposed phasing of construction of the Project: deferment of the construction of the third track (and associated earthworks, infrastructure and construction support facilities) between chainages 209.840 kilometres and 216.340 kilometres (Branxton to Greta), and chainages 194.500 kilometres and 196.100 kilometres (Farley to Telarah).
- To facilitate operations until construction of the final phase is completed, installation of rail turnouts would be required at the following chainages:
  - 216.340 kilometres (Branxton).
  - 209.840 kilometres (Greta).
  - 196.100 kilometres (Farley).

Table 5-2 provides a detailed summary of the proposed modifications to the Project from that described in Chapter 7 of the Environmental Assessment. Figure 5.1 shows the revised Project layout, while Figure 5.2 displays the revised Project description. Revised design drawings are provided in Appendix G.

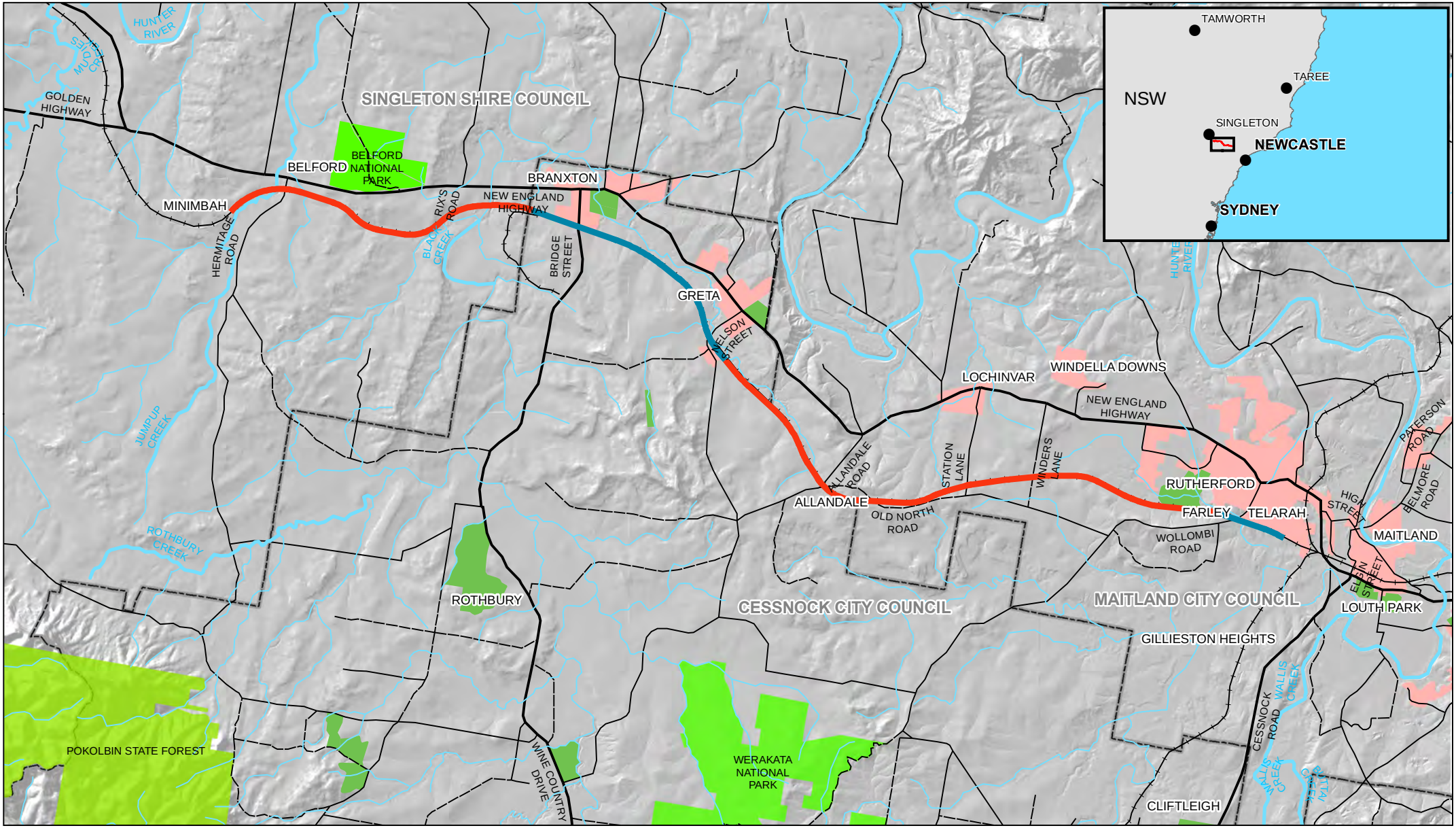
A detailed description of these proposed changes is provided in Section 5.2 to Section 5.11.

Table 5-2 Proposed Project Changes

Design Element	Proposed Changes
Rail Corridor:	
Rail Corridor Access Tracks	The access tracks on the Down side would generally be at existing ground level and not at track level (at the top of cuttings and bottom of fill embankments).
Earthworks:	
Cut and Fill	Cut and fill requirements reduced due to Down side access track generally following existing ground levels.
	Revision of blasting requirements.
Spoil Management	Several additional potential locations identified for the disposal of excess spoil material deemed unsuitable for use in construction of the third track.
Borrow Pits	Several potential locations identified as sources of appropriate rock and other material for construction of embankments for the third track.
Drainage	Amendments to the proposed track and cess drainage.
	Use of reinforced concrete pipes or corrugated metal pipes instead of precast concrete box culverts.

Design Element	Proposed Changes
Construction Compounds	Relocation of primary construction compound at Station Street Branxton to near Black Creek Branxton (access via Rix's Road).
	Proposed secondary compound at Gardiner Street Rutherford.
Traffic and Access	Construction vehicles from the Gardiner Street Rutherford to utilise the intersection of the New England Highway and Shipley Drive Rutherford.
Vegetation Clearance	Vegetation clearance increased from approximately 61.8 hectares to approximately 66.2 hectares, including approximately 3.1 hectares of threatened flora species and 54 scattered trees (increased from 2.7 hectares and 50 trees).
Property Acquisition	Entire or partial acquisition of 107 lots from 79 landowners.
Construction Staging:	
Track Design	Deferment of construction of the third track between: ◗ Chainages 209.840 kilometres and 216.340 kilometres (Branxton to Greta) ◗ Chainages 194.500 kilometres and 196.100 kilometres (Farley to Telarah)
	Installation of rail turnouts at chainages: ◗ 216.340 kilometres (Branxton) ◗ 209.840 kilometres (Greta) ◗ 196.100 kilometres (Farley)
Earthworks	Deferment of cutting and filling required for construction of the third track in the sections described above.
Bridges and Structures	Deferment of construction of the following bridges and structures: ◗ Wollombi Road and Stony Creek Underbridge (chainage 195.555 to 195.595 kilometres). ◗ Stock Crossing Underpass (chainage 195.666 kilometres). ◗ Unnamed Tributary of Anvil Creek Underbridge (chainage 209.989 kilometres). ◗ Sawyers Creek Underbridge (chainage 211.010 kilometres). ◗ Bridge Street Overbridge (chainage 215.018 kilometres). ◗ Culverts between chainages 194.500 kilometres and 196.100 kilometres, and chainages 209.840 kilometres and 216.340 kilometres.
Drainage	Deferment of Sawyers Creek realignment.
Railway Stations	Deferment of works at Branxton and Greta Railway Stations.

Design Element	Proposed Changes
Construction Compounds	Primary construction compounds to be located at: ◗ Station Lane, Lochinvar ◗ Near Black Creek, Branxton
	Secondary construction compounds to be located at: ◗ Gardiner Street, Rutherford ◗ Old North Road, Lochinvar (demolition of existing bridge) ◗ Allandale Road, Allandale (at new underbridge location) ◗ Hermitage Road, Belford
	Deferment of construction compound establishment at: ◗ Wollombi Road, Farley ◗ Nelson Street, Greta
Traffic and Access	Deferment of installation of traffic lights at: the intersection of the New England Highway and Wollombi Road Rutherford; and the intersection of the New England Highway and Station Street Branxton.
Vegetation Clearance	Deferment of clearance of approximately 53.2 hectares, including approximately 1.9 hectares of threatened flora species and 52 scattered trees.
Noise Attenuation	Deferment of construction of the proposed noise wall between chainages 194.340 kilometres and 194.880 kilometres until construction of the third track between chainages 194.500 kilometres and 196.100 kilometres.
	Deferment of the proposed noise attenuation at locations between chainages 209.840 kilometres and 216.340 kilometres (Branxton to Greta) and chainages 194.500 kilometres and 196.100 kilometres (Farley to Telarah) until construction of the third track between these chainages.
Completion of Deferred Works	Completion of deferred works between chainages 209.840 kilometres and 216.340 kilometres (Branxton to Greta) and between chainages 194.500 kilometres and 196.100 kilometres (Farley)
Operations	Trains to revert to the existing Up Main between chainages between chainages 194.500 kilometres and 196.100 kilometres, and chainages 209.840 kilometres and 216.340 kilometres.
	Trains would be required to idle at the end of the third track at chainages 216.340 kilometres (Branxton) and chainage 196.100 kilometres (Farley).
Biodiversity Offsetting	Biodiversity offsets to be provided for the approximately 13.0 hectares to be cleared in the initial phase of construction (Phase 1).
	Deferment of offsetting the approximately 53.2 hectares that would be cleared for the construction of the third track between chainages 209.840 kilometres and 216.340 kilometres (Branxton to Greta); and chainages 194.500 kilometres and 196.100 kilometres (Farley to Telarah)



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0 600 1,200 2,400 3,600 4,800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Proposed Project Construction Phase 1
- Proposed Project Construction Phase 2
- Railway
- Watercourse
- Highway
- Unsealed
- Main Road
- Minor Road
- LGA
- Recreation Areas
- State Forest
- National Park
- Built Up Area

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Maitland To Minimbah Third Track Submissions Report

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Revision A
Date August 2010

Proposed Project Construction Phases

Figure 5.1

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Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

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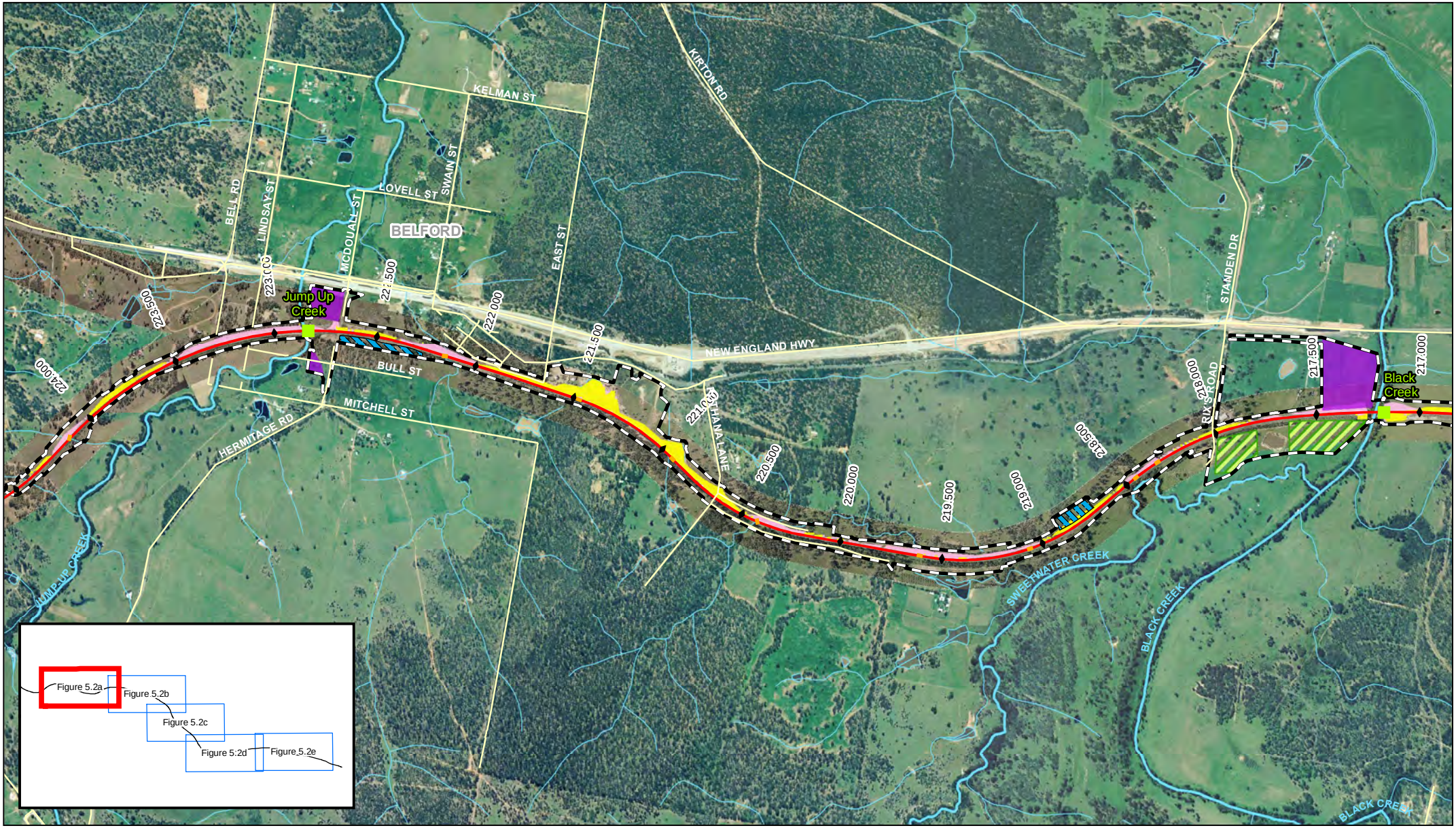

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0 95 190 380 570 760

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Proposed Station Modification
- Proposed Station Relocation
- Proposed New Underbridge
- Proposed Third Track
- Proposed Modification of Existing Underbridge
- Proposed Culvert Extensions
- Revised Construction Impact Zone
- Watercourse
- Potential Spoil Areas
- Areas Requiring Cut
- Areas Requiring Fill
- Site Compounds
- Potential Borrow Pits
- Potential Screening Mounds

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Maitland To Minimbah Third Track
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Job Number 22-14471
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Date August 2010

Revised Project Location

Figure 5.2a

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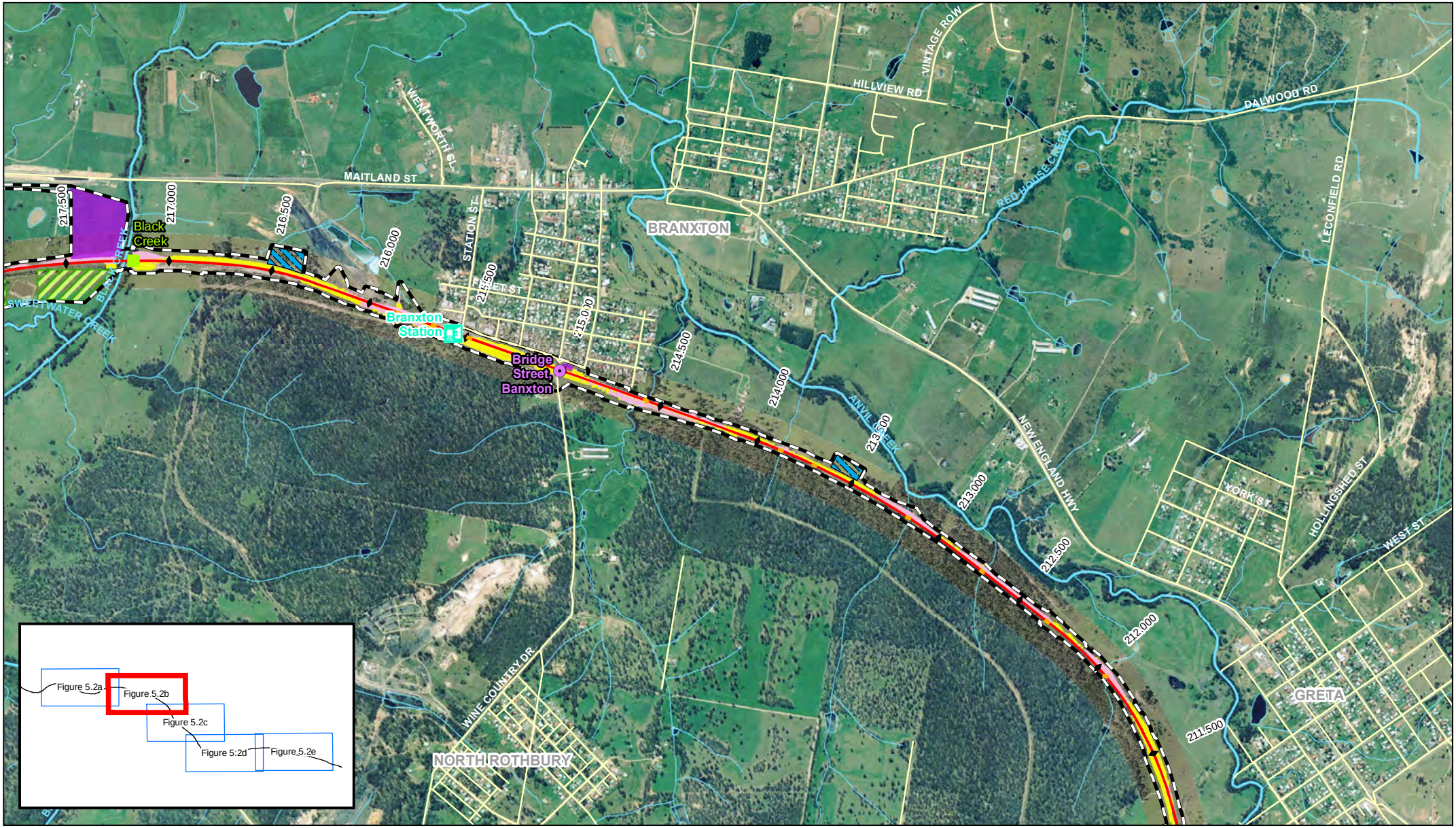

1:25,000 (at A4)

0 95 190 380 570 760

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Proposed Station Modification
- Proposed Station Relocation
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- Potential Screening Mounds

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Date August 2010

Revised Project Location

Figure 5.2b

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1:25,000 (at A4)

0 95 190 380 570 760

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Proposed Station Modification
- Proposed Station Relocation
- Proposed New Underbridge
- Proposed Third Track
- Proposed Modification of Existing Underbridge
- Proposed Culvert Extensions
- Revised Construction Impact Zone
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- Areas Requiring Cut
- Areas Requiring Fill
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- Potential Borrow Pits
- Potential Screening Mounds

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Revised Project Location

Figure 5.2c

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0 95 190 380 570 760

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Proposed Station Modification
- Proposed Station Relocation
- Proposed New Underbridge
- Proposed Third Track
- Proposed Modification of Existing Underbridge
- Proposed Culvert Extensions
- Revised Construction Impact Zone
- Watercourse
- Potential Spoil Areas
- Areas Requiring Cut
- Areas Requiring Fill
- Site Compounds
- Potential Borrow Pits
- Potential Screening Mounds

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Maitland To Minimbah Third Track
Submissions Report

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Date August 2010

Revised Project Location

Figure 5.2d

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1:25,000 (at A4)

0 95 190 380 570 760

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Proposed Station Modification
- Proposed Station Relocation
- Proposed New Underbridge
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- Areas Requiring Fill
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- Potential Borrow Pits
- Potential Screening Mounds

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Revision	A
Date	August 2010

Revised Project Location

Figure 5.2e

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Data Source: DPT of Lands: DCDB - 2007, Aerial Photography - 2006. Created by: msmiljkovski, tmorton, fmackay

Track Design

5.2.1 Track Alignment

The key change to track design is that the third track offset (the distance of the centre of the third track from the centre of the existing Up Main) is proposed to have a minimum distance of 7.5 metres, as opposed to a minimum of 8.0 metres as proposed in Table 7-12 of the Environmental Assessment.

This reduced distance is still compliant with ARTC standards.

5.2.2 Rail Corridor Access Tracks

Rail access tracks are proposed at track level adjacent to the Up Relief. The Down side access track would utilise existing tracks where they exist with access tracks constructed at existing ground level, with minimal earthworks, in the areas where there is no existing access.

A series of connection access tracks are proposed from adjacent roads including Wollombi Road, Winders Lane, Station Lane, Old North Road, Allandale Road, Rix's Road and Hermitage Road. These roads are shown in Figure 5.2.

Rail Access Track Passing Areas

Passing areas have been provided along the Up Relief rail access tracks. These passing bays generally provide a 500 metres interval between passing opportunities and turning bays.

Passing areas have been provided in the form of:

- Widened areas for signalling cabinets and associated signals and track posts.
- Intersection of access track and connection to existing roads.
- Intersection of access track ramps and base of embankments.
- Passing bays (as required between alternate passing areas).

5.3 Property Acquisition and Private Infrastructure

5.3.1 Property Acquisition

Following progression and revision of design of the Project, the strip acquisition to achieve the required width of the new rail corridor would involve the partial or entire acquisition of approximately 107 lots from 79 landowners and would need to occur on both sides of the track. Table 5-3 shows the breakdown of proposed property acquisition within each of the local government areas and between private and government properties.

Table 5-3 Summary of Proposed Property Acquisition

Local Government Area	Number of Properties	Number of Private Properties	Number of Government Properties
Singleton	37	28	9
Cessnock	43	38	5
Maitland	27	26	1

5.3.2 Private Infrastructure

Following progression and revision of design of the Project, the number of dams, bores and structures directly impacted by construction include:

- 13 farm dams where there would be a structural modification/alteration required. This is a reduction from 16 as listed in Section 14.3 of the Environmental Assessment.
- No groundwater bores. This is unchanged from the Environmental Assessment.
- Five structures (such as residential properties, garages, farm sheds, pump houses and stables). This is a reduction from 11 as listed in Section 1.4 of the Environmental Assessment.

Table 5-4 identifies the properties, the number of impacted dams (requiring eventual closure and filling) on each property by the Project, and the overall capacity of the dam/s.

Table 5-4 Details of Dams Impacted by the Project

Property	Number of Dams	Overall Dam/s Capacity (ML)
MMU-002	1	1
MMU-004	1	0.3
MMU-012	4	9
MMU-12.5	1	2.1
MMU-016	1	0.5
MMD-028	2	1.6
MMU-038	1	0.3
MMU-053	1	0.5
MMU-055	1	0.4

5.4 Earthworks

5.4.1 Bulk Earthworks

Due to the removal of major earthworks proposed for the Down side of the Project, the approximate bulk earthworks requirements for the key elements of the Project provided in Section 7.9.2 of the Environmental Assessment have been amended as described below:

- Cut material to be excavated: 1,150,000 cubic metres.
- Fill material required: 450,000 cubic metres.
- Capping material required: 100,000 cubic metres.
- Structural Zone material required: 225,000 cubic metres.
- Maximum cut depth: eight metres.
- Maximum fill depth: 10 metres.
- Spoil: 375,000 cubic metres.

5.4.2 Cut and Fill

Earthworks required for the Project have been amended from that provided in Section 7.9 of the Environmental Assessment due to the following:

- Reduction in track centres and changes to the drainage between the tracks (as discussed in Sections 5.2 and 5.5).
- Minimising earthworks required for the proposed Down side access track (as discussed in Section 5.2).

Typical cross sections illustrating the revised cut and fill earthworks scenarios are illustrated in Figure 5.3 and Figure 5.4.

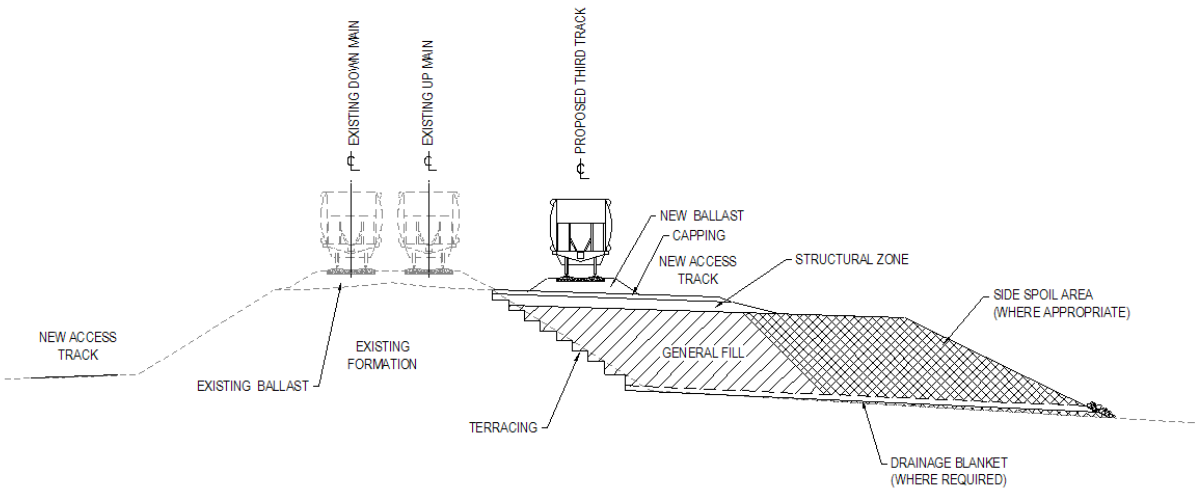


Figure 5.3 Typical Cross Section – Fill

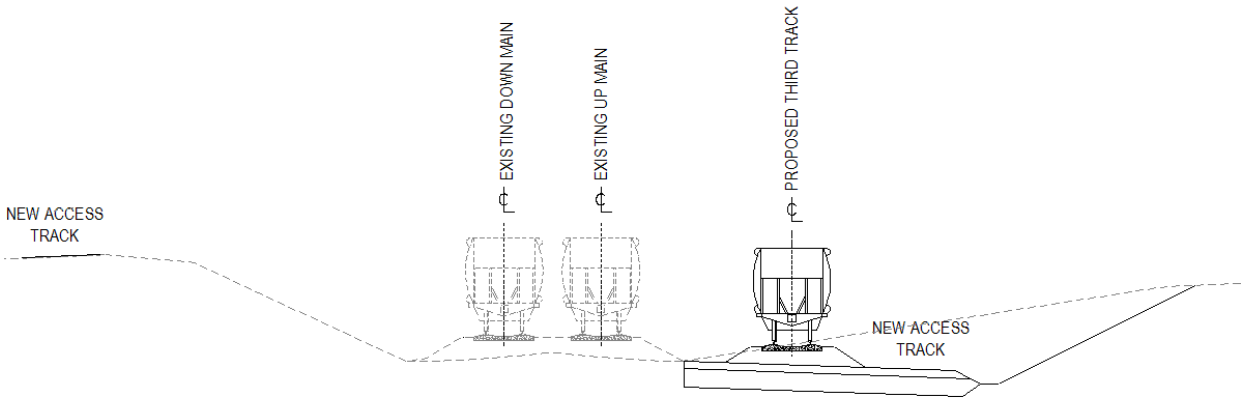


Figure 5.4 Typical Cross Section – Cut

5.4.3 Blasting Requirements

Due to changes in the earthworks required for the Project, the potential blasting locations have been reviewed and revised. Proposed blasting locations have reduced from 14 to 12, while the number of locations requiring blasting on both sides of the corridor has reduced from 12 to three.

Table 5-5 identifies the revised proposed blasting locations.

Table 5-5 Potential Blasting Locations

Chainage (kilometres)	Up or Down Side
195.360 to 195.400	Up
195.960 to 195.980	Up
204.680 to 204.940	Up
205.200 to 205.680	Up
211.540 to 211.760	Up and Down
213.420 to 213.700	Up
214.060 to 214.180	Up and Down
214.900 to 215.460	Down
216.180 to 216.940	Up and Down
218.720 to 218.960	Up
221.100 to 221.360	Up
221.600 – 221.920	Up
222.520 – 222.600	Up
223.840 – 223.960	Up

5.4.4 Spoil Management

As noted in Section 5.4.1, there is an approximate excess of 375,000 cubic metres of spoil material. The proposed soil area locations identified in Table 7-11 of the Environmental Assessment have been reviewed and amended, and include proposed new spoil areas.

Potential spoil area locations are identified in Table 5-6 and shown in Figure 5.2.

Table 5-6 Potential Spoil Area Locations

Chainage (kilometres)	Up or Down Side
196.060 to 196.720	Down side
202.760 to 204.400	Down side
210.650 to 210.730	Down side
217.250 to 218.050	Down side
221.300 to 221.620	Up side

In addition to the spoil disposal areas listed in Table 5-6, a number of locations outside the proposed rail corridor on private property have been identified as potential spoil placement areas during site investigations and negotiations with landholders. The spoil would be placed in narrow corridors parallel to the rail corridor and made available to the landholder to landscape as a visual screening mound.

Screening mounds have been located based on the following criteria:

- Avoidance of clearance of native vegetation.
- Avoidance of disturbance to Aboriginal heritage relics.
- Minimum of 20 metres from a watercourse.
- Agreement with the landholders to receive the rescreening mound.
- Potential screening mound locations are identified in Table 5-7 and shown in Figure 5.2.

Table 5-7 Potential Screening Mound Locations

Chainage (kilometres)	Up or Down Side
201.400 – 202.050	Up
203.325 – 205.000	Down
204.400 – 204.475	Down
204.550 – 204.725	Down
204.800 – 205.000	Down
205.650 – 205.800	Up
205.750 – 205.900	Down

Chainage (kilometres)	Up or Down Side
206.750 – 207.250	Down
207.850 – 207.900	Down
207.975 – 208.425	Down
207.950 – 208.425	Up
208.700 – 208.850	Up
209.200 – 209.275	Down
209.500 – 209.550	Down
209.650 – 209.850	Down

During the construction phase and landholder negotiatiotions, other locations for screening mounds may be identified. Such locations would need to comply with the listed criteria.

5.4.5 Borrow Pits

A number of locations have been identified as potential sources of suitable material required for construction of the embankment for the third track (as described in Table 7-11 of the Environmental Assessment), in addition to material generated through cutting required for construction of the third track. These locations are known as 'borrow pits' and are located in close proximity to the proposed delivery point.

Potential borrow pit locations are identified in Table 5-8 and shown in Figure 5.2

Table 5-8 Potential Borrow Pit Locations

Chainage (kilometres)	Up or Down Side
205.150 - 205.330	Up
213.475 – 213.600	Up
216.350 – 216.525	Up
218.700 – 218.900	Up
222.300 – 222.700	Down

5.5 Drainage

The revised drainage for the Project consists of changes to the following:

- Track drainage
  - Through-ballast cross-fall drainage from existing formation to new cess drains outside Up relief main where possible. Pit and pipe drainage where required to drain between existing and Up relief main track.
- Cess drainage
  - Longitudinal Outer Cess drains, top drains and toe drains within the cess Area.

- Culverts
  - Extension of culverts across the track formation and replacements of existing culverts where required.

5.5.1 Track and Cess Drainage

Track and cess drainage has been revised from that provided in Section 7.13 of the Environmental Assessment. Figure 5.5 provides a cross section of the typical components of the proposed track and cess drainage revisions.

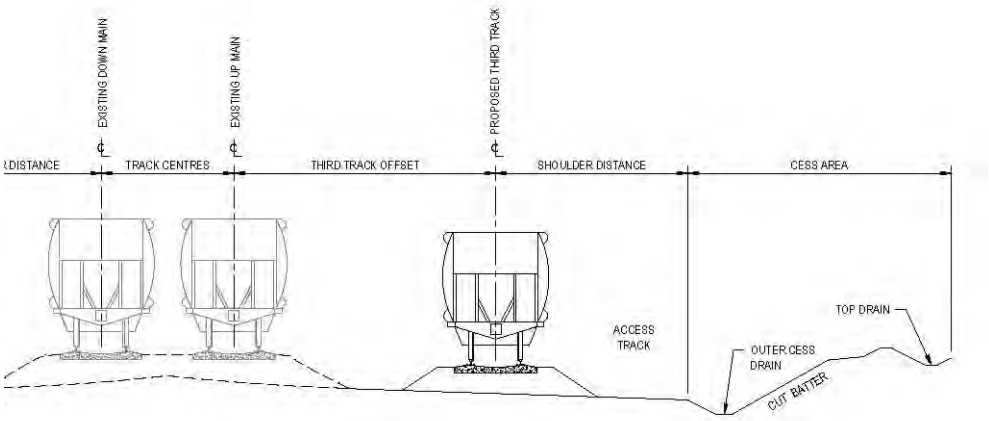


Figure 5.5 Typical Drainage Arrangement Cross Section

5.5.2 Culverts

The only change to the cross drainage culvert design described in Section 7.13.4 of the Environmental Assessment would be that precast concrete box culverts would not be used. Reinforced concrete pipes or corrugated metal pipes would be used in any proposed cross drainage works.

5.6 Construction Compounds

A review was undertaken of the construction compound requirements for the Project, including size and location. From this review, the following changes to construction compounds described in Section 7.19.1 of the Environmental Assessment are proposed:

- Relocation of the primary construction compound proposed at Station Street Branxton to near Black Creek Branxton (adjacent to the track between chainages 217.250 kilometres to 217.475 kilometres). Access would be via Rix's Road. This would also result in the deletion of the secondary construction compound proposed near Black Creek.
- A secondary compound at Gardiner Street Rutherford (adjacent to the track between chainages 197.700 kilometres to 198.700 kilometres).

The proposed primary compound location is consistent with the criteria for such facilities listed in Section 7.19.1 of the Environmental Assessment.

The locations of these compounds are shown in Figure 5.2.

5.7 Traffic and Access

The changes in construction compounds described in Section 5.7 have also resulted in an amendment to the traffic and access requirements:

- As discussed in Section 5.7, the relocated primary compound at Black Creek Branxton would utilise Rix's Road.
- The proposed new secondary compound at Gardiner Street Rutherford would require construction vehicles to access the New England Highway via Shipley Drive Rutherford.

Further detail on traffic impacts and proposed traffic management at these intersections is provided in Section 6.6 and Appendix F of this report.

5.8 Vegetation Clearance

The amendments to the Project design and earthworks have amended the proposed development footprint for the Project. As a result, the amount of vegetation required to be cleared has changed from approximately 61.8 hectares as described in Section 5.2 of the Environmental Assessment to approximately 66.2 hectares.

This includes an increase from 61.1 hectares to 66.2 hectares of endangered ecological communities and an increase from approximately 2.7 hectares (and 50 scattered trees) to approximately 3.1 hectares (and 54 scattered trees) of threatened species.

5.9 Construction Staging

The ARTC and the Hunter 8 Alliance proposes that the construction of the Project would be constructed in two phases as described in Table 5-9.

Table 5-9 Proposed Project Phasing

Project Phase	Project Elements
Phase 1	Construction of the third track and associated infrastructure between chainages 196.100 kilometres and 209.840 kilometres, and between chainages 216.340 kilometres and 224.400 kilometres.
Phase 2	Completion of construction of the third track between chainages 194.500 kilometres to 196.100 kilometres, and between chainages 209.840 kilometres to 216.340 kilometres.

Construction of Phase 1 of the Project would be consistent with the program included in Table 7-30 of the Environmental Assessment.

The timetable for construction of Phase 2 of the Project is to be confirmed, and is dependant on a number of elements, including the required capacity of the rail system to service the needs of the coal industry.

5.9.1 Track

Track Design

As described in Table 5-1, Phase 1 of the Project would involve construction of the third track between chainages 196.100 kilometres and 209.840 kilometres, and between chainages 216.340 kilometres and 224.400 kilometres. Therefore the track would be designed as follows:

- Three tracks between chainages 216.340 kilometres and 224.400 kilometres.
- Two tracks between chainages 209.840 kilometres and 216.340 kilometres.
- Three tracks from chainage 196.100 kilometres to 209.840 kilometres.
- Two tracks from chainage 196.100 kilometres.

To connect the sections of the proposed third track to be constructed during Phase 1 with the existing Up Main, turnouts would be required. Turnouts comprise a length of straight track and a section of curved track that joins the straight track. The curved track includes a moveable section of track. The moveable section is adjusted to allow a train to travel from the curved track to the straight track.

These turnouts would be located at:

- Chainage 216.340 kilometres (Branxton).
- Chainage 209.840 kilometres (Greta).
- Chainage 196.100 kilometres (Farley).

Figure 5.2 shows the proposed location of the turnouts. Preliminary drawings of the turnouts are provided in Appendix G.

These turnouts allow trains travelling on the proposed third track (Up Relief) to transfer to the Up Main, and back onto the proposed Up Relief. The turnouts would remain operational until completion of Phase 2 of the construction and commencement of operation of the third track.

5.9.2 Earthworks

The earthworks required for completion of the Phase 2 section of the third track would not be undertaken until Phase 2 of the Project.

Therefore earthworks between chainages 209.840 kilometres and 216.340 kilometres (Branxton to Greta) and between chainages 196.100 kilometres and 194.500 kilometre (Farley to Telarah) would be limited to those required to facilitate construction of the turnouts described in Section 4.7.1.

5.9.3 Bridges and Structures

Construction of bridges and structures between chainages 209.840 kilometres and 216.340 kilometres (Branxton to Greta) and between chainages 196.100 kilometres and 194.500 kilometre (Farley to Telarah) would be deferred until Phase 2 of the Project. This would include the following:

- Wollombi Road and Stony Creek Underbridge (chainage 195.555 to 195.595 kilometres).
- Stock Crossing Underpass (chainage 195.666 kilometres).
- Unnamed Tributary of Anvil Creek Underbridge (chainage 209.989 kilometres).
- Sawyers Creek Underbridge (chainage 211.010 kilometres).

- Bridge Street Overbridge (chainage 215.018 kilometres).
- All culvert extensions between:
  - Chainages 209.840 kilometres and 216.340 kilometres (Branxton to Greta); and
  - Chainages 196.100 kilometres and 194.500 kilometre (Farley to Telarah).

5.9.4 Railway Stations

The Hunter 8 Alliance is committed to working with its stakeholders to address all environmental and community concerns as a result of the proposed Maitland to Minimbah Third Track Project.

Given the changes to phasing of the Project only Lochinvar Station would be affected by Phase 1.

The Hunter8 Alliance has been regularly liaising with Railcorp with regards to the proposed modifications at Lochinvar Station. The Hunter 8 Alliance is currently working with Railcorp towards an outcome that reflects the issue raised in the submission by Railcorp, such that the modifications at Lochinvar Station are agreed between Railcorp and ARTC especially relating to:

- Maintaining continuous and safe access during construction.
- Reinstating access in the final arrangement that satisfies Railcorp standards and its obligation to continue its implementation of its accessible Transport Action Plan for NSW.

Under the DSAPT and Action Plan the Government (Railcorp) is progressively upgrading rail infrastructure to provide accessible public transport. Negotiations with Railcorp are primarily undertaken by ARTC (a member of the Hunter 8 Alliance) and the CEO's of both organisations have recently nominated two senior managers to lead the discussions (which obviously includes stations outside the project area).

The Hunter 8 Alliance believes that these negotiations should be allowed to continue after issuing of the Project Approval, which is consistent with the submission of both Railcorp and NSW Transport.

Upon agreement between Railcorp and the Hunter 8 Alliance on the Lochinvar Station modifications, the agreed design would be submitted to the Department of Planning for approval (as a condition of the Minister's Conditions of Approval) prior to any works commencing on the Lochinvar Station.

As previously discussed, modifications to Greta and Branxton Stations would be deferred as part of the Phase 2 constructions activities. The timing of Phase 2, and therefore any modifications to the stations required for construction of the third track, is to be determined.

The Hunter 8 Alliance believes that a similar condition be applied to Phase 2 stations (Greta and Branxton) in that agreed plans (between ARTC and Railcorp) would be required to be submitted for approval before construction could begin.

5.9.5 Compounds and Access

Construction Compounds

The two primary compounds (Station Lane, Lochinvar and Black Creek, Branxton) would be required during Phase 1 of the Project. These compounds would potentially contain all the facilities described in Section 7.19.1 of the Environmental Assessment.

However, many of the secondary construction compounds proposed in Section 7.19.1 of the Environmental Assessment would not be required until Phase 2 of the Project. Table 5-10 lists the proposed secondary compounds and the phase of the Project in which they would be required.

Table 5-10 Secondary Construction Compound Locations

Chainage (kilometres)	Side	Description	Possible Activity
Phase 1			
197.700-198.700	Up	Gardiner Street, Rutherford	Satellite Office.
204.540 – 204.800	Up	Old North Road	Satellite Office.
209.174	Up	Arch culvert	Satellite Office.
222.480 -222.880	Up	Hermitage Road, Belford	Satellite Office.
Phase 2			
195.450 – 195.520	Up	Wollombi Road, Telarah	Small laydown area only.
195.660 – 196.120	Down	Wollombi Road, Farley	Satellite Office.
209 .989	Up	Underbridge	Satellite Office.
210.700	Both	Near Greta Railway Station (Nelson Street)	Satellite Office.
211.010	Down	Sawyers Creek	Satellite Office.
215.018	Down	Bridge Street Overbridge	Satellite Office.

Traffic and Access

The changes in construction compounds associated with Phase 1 have also resulted in an amendment to the traffic and access requirements during Phase 1. In addition as discussed in Section 5.7, the proposed new secondary compound at Gardiner Street Rutherford would require construction vehicles to access the New England Highway via Shipley Drive Rutherford.

Table 5-11 identifies the intersections of the New England Highway and roads to be used by construction vehicles, the Phase of the Project during which they would be utilised, and the proposed traffic control measures.

Assessment of the potential impacts associated with the new proposed compound and changes to traffic from the revised compounds is discussed in Section 6.6 and Appendix D.

Table 5-11 Proposed Intersection Treatment Measures

New England Highway Access	Suburb	Proposed Intersection Treatment	Traffic Intersection Performance
Phase 1			
Shipley Drive	Rutherford	None proposed	N/A
Station Lane	Lochinvar	Traffic Controllers	N/A
Rix's Road	Belford	Lane Reduction	LOS B
Hermitage Road	Belford	None proposed	N/A
Phase 2			
Wollombi Road	Telarah	Traffic Signals	LOS A
Nelson Street	Greta	Traffic Controllers	N/A
Station Street	Branxton	Traffic Signals	LOS C

5.9.6 Noise and Vibration Attenuation

Noise Attenuation

Noise attenuation would be provided for existing residences identified as currently exceeding the IGANRIP trigger levels, those predicted to exceed the IGANRIP trigger levels in 2012 (with introduction of the third track), and those predicted to exceed the IGANRIP trigger levels in 2022 (with introduction of the third track).

Table 5-12 and Table 5-13 identify the properties to receive noise attenuation, the proposed attenuation method and the Project phase when the attenuation would be provided.

The proposed noise attenuation comprises of:

1. The Hunter 8 Alliance proposes noise mounds as the preferred noise attenuation option at properties where IGANRIP is triggered for both Phase 1 and Phase 2 of the Project. These noise mounds would be constructed during the relevant construction phases and prior to operation of the third track in these areas. A preliminary review of the locations where attenuation is required indicated that noise mounds could provide the required attenuation.
2. Following Project Approval, and during the construction of relevant phase of the Project, the Hunter 8 Alliance would undertake a detailed inspection of these properties and negotiations with the landholder to confirm whether noise mounds are reasonable and feasible. In the event that noise mounds are determined to not be reasonable or feasible, the Hunter 8 Alliance would consider alternative noise attenuation based on the following priority hierarchy:
   - Noise walls.
   - Architectural treatment (this could include one or more of the various architectural treatments listed in Table 5-14).
   - Property acquisition (if attenuation is not reasonable or feasible).

Table 5-14 identifies the anticipated attenuation that could be provided by the potential attenuation measures.

3. Monitoring of operational noise levels with the third track in place is to be undertaken at properties where the predicted noise levels are predicted to be 2 dB(A) below the IGANRIP trigger levels. If the monitoring confirms the triggering of IGANRIP, the Hunter 8 Alliance would consider reasonable and feasible noise attenuation options as described in Points 1 and 2.
4. Monitoring of operational noise levels with the third track in place for those locations potentially affected by L_{max} events in the vicinity of chainage 216.320 kilometres and chainage 196.100 kilometres turnouts.

The measures described in points one to three would be implemented as appropriate during the construction of Phase 1 and Phase 2 of the Project, and would be operational prior to operation of the third track within these areas.

In addition, a noise barrier to be constructed between chainages 194.340 and 194.880 kilometres to attenuate the urban residences at Telarah prior to the operation of the third track through this section (Phase 2). The noise wall would be approximately 4.5 metres in height, which would provide an estimated 10 dB(A) in noise attenuation. This would be provided as part of Phase 2 of the Project prior to operation of the third track in this area.

Table 5-12 Affected Receivers and Proposed Attenuation– Up Side

Chainage	Noise Catchment Area ID	Affected Receivers	Predicted Initial Year of Trigger	Proposed Form of Attenuation	Phase 1 or Phase 2 Implementation
222.900 – 223.850	U1	All three residences in U1 (MMU-003.5, MMU-004, MMU-005).	2012	Noise Mound	Phase 1
222.300 – 222.700	U2	All land located between the 60dB(A) contour and rail corridor proposed for tourist development (accommodation).	Subject to negotiations with the landholder about the proposed noise attenuation included in their approved site development plan.		
220.350 – 222.300	U3	Six residences in U3 (MMU-012, Lot 1 and 2 Sec 7 / DP 758078, Lot 8 to Lot 10 Sec 7 / DP 758078).	2012	Noise Mound	Phase 1
210.000 – 210.950	U5	Nelson Street (MMU-039, MMU-040) and John Street (MMU-046) residences, Greta.	2012	Noise Mound	Phase 2
205.100 – 206.500	U6	Both residences in U6 (MMU-053 and Lot 6 / DP 1112171).	2022 at MMU-053 2012 at Lot 6 / DP 112171	Noise Mound	Phase 1
202.050 – 202.500	U7	Single residence in U7 (MMU-057).	2022	Noise Mound	Phase 1
200.250 – 201.100	U8	All four residences in NCA U8 (MMU-060 to MMU-062, 510/DP 774517). MMU-061 is the most affected residence in this NCA.	2010 (existing) at MMU-061 2012 at MMU-060 and MMU-062 2022 at 510/DP 774517	Noise Mound	Phase 1
196.400 – 197.400	U9	All land located between the 60dB(A) contour and rail corridor if proposed for residential development.	Subject to negotiations with the landholder about the proposed noise attenuation included in their approved site development plan.		
195.600 – 196.200	U10	Residences on Dumont Close	2010 (existing) for southernmost Dumont Close residence	Noise Mound	Phase 1

Chainage	Noise Catchment Area ID	Affected Receivers	Predicted Initial Year of Trigger	Proposed Form of Attenuation	Phase 1 or Phase 2 Implementation
			2012 for other Dumont Close residences (southern end)	Noise Mound	Phase 2
194.500 – 194.800	U11	All houses directly exposed to the rail lines on Railway Parade and Wentworth Street, Telarah.	2010 (existing)	Noise Wall	Phase 2

Table 5-13 Affected Receivers and Proposed Attenuation – Down Side

Chainage	Noise Catchment Area ID	Affected Receivers	Predicted Initial Year of Trigger	Proposed Form of Attenuation	Phase 1 or Phase 2 Implementation
222.300 – 223.300	D1	MMD-003	2022	Noise Mound	Phase 1
219.250 – 219.700	D3	Pothana Winery (MMD-007)	2012	Noise Mound	Phase 1
218.000 – 218.150	D4	Single residence in D4 (MMD-008)	2012	Noise Mound	Phase 1
209.850 – 210.900	D7	Lloyd Street residences (Lot 81 DP 607773, Lot 106 DP 250308, Lots 4 and 5 DP 976366). Two residences off Mansfield Street (MMD-018.3 and Lot 104 DP 250308). MMD-017, Lot 1 DP 882276, Lot 2 DP 882276.	2012	Noise Mound	Phase 2
209.850 – 210.900	D7	Residences west of Mansfield Street	2022	Noise Mound	Phase 2
206.750 – 209.850	D8	All land located between the 60dB(A) contour and rail corridor if proposed for residential development.	Landholder required to consider operational noise associated with the Project and to provide noise attenuation.		

Chainage	Noise Catchment Area ID	Affected Receivers	Predicted Initial Year of Trigger	Proposed Form of Attenuation	Phase 1 or Phase 2 Implementation
205.950 – 206.300	D9	Three residences east of Lovedale Road (MMD-024, Lot 261 DP / 755211, Lot 32 / DP 846828). One residence west of Lovedale Road (Lot 1 DP 434185).	Existing (2010) at MMD-024 and Lot 261 DP / 755211 2022 at Lot 1 DP 434185 and Lot 32 / DP 846828	Noise Mound	Phase 1
200.800 – 202.500	D11	Clifton House (MMD-029)	Existing (2010) at Clifton House	Noise Mound	Phase 1
		MMD-030 to MMD-032	2022 at MMD-030 to MMD-032	Noise Mound	Phase 1
195.600 – 196.250	D12	Two residences at the eastern end of Wollombi Road (including MMD-041)	Existing (2010)	Noise Mound	Phase 1

Table 5-14 Potential Noise Attenuation Options

Treatment Options	Estimated Noise Attenuation	Comments
Noise Barriers:		
Noise Mound	10 to 15 dB(A).	Dependant on local topography, wall height and mound material.
Noise Wall	10 to 15 dB(A).	Dependant on local topography and wall height.
Architectural Treatment:		
Building Insulation/ Air Conditioning	10 to 15 dB(A) compared to without insulation and with windows open.	Dependant on materials used on building construction.
Property boundary fence (typical 1.8 metre solid fence)	Up to 5dB(A) at ground level. Less than 2dB(A) for upper levels.	Effectiveness is reduced where adjacent track is on an embankment/ higher than the property.
Double Glazed Windows	5 to 10dB(A) where glazing is the weaker noise path.	Dependant on materials used in building construction and condition of the structure.
Acoustic seals to doors and windows	Up to 5dB(A).	Dependant on materials used in building construction.
Ceiling insulation	Up to 5dB(A).	Dependant on materials used in building construction.

Implementation of the Operational Noise Management Plan would be staged consistent with construction of the third track:

- The proposed measures would be implemented at the potentially affected properties adjacent to the Phase 1 works prior to commencement of operations on the third track. This would be noise mounds constructed for 33 residential properties.
- The proposed measures would be implemented at the remaining potentially affected properties prior to commencement of operations on the Phase 2 third track sections. This would be noise mounds constructed for 10 houses and construction of the noise wall at Telarah (as previously discussed).

Operational Vibration

The Noise and Vibration Assessment undertaken for the Environmental Assessment included vibration monitoring along the rail corridor. From this monitoring, and consideration of the proposed increase in operations, it was determined that properties within 40 metres of the rail corridor would potentially have vibration levels exceeding the human comfort criteria in the Assessing vibration: a technical guideline (DECCW 2006) and BS *6472:1992 Evaluation of human exposure to vibration in buildings (1–80 Hz)*.

It should be noted that the 40 metre distance is a conservative estimate. The actual distance would be dependant on a range of factors, including underlying geology and soil type; and building quality, which can vary throughout the Project area.

Within Phase 1 of the Project, four properties are located within 40 metres of the rail corridor and therefore potentially impacted by operational vibration:

- Two residences east of Lovedale Road (MMD-021 and Lot 261 DP / 755211) in NCA D9.
- Clifton House (MMD-029) in NCA D11.
- One residence at the end of Winders Lane, Lochinvar (MMU-061) in NCA U8.

A vibration monitoring program would be developed and implemented for the listed properties prior to the commencement of operations on the third track. This would involve monitoring at the residences to measure the level of vibration in comparison to the relevant standards (human comfort from Assessing vibration: a technical guideline, *BS 6472:1992 Evaluation of human exposure to vibration in buildings (1–80 Hz)*; and structural damage from *German Standard DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of vibration on structures*).

Vibration monitoring would be undertaken at a distance from the existing track equal to that which the third track is designed to be from the residence.

If the monitoring indicates that the criteria were to be exceeded, the Hunter 8 Alliance would enter negotiations with the landholder to determine an appropriate mitigation measure. This may include (but not be limited to):

- Property acquisition.
- Relocation of the existing residence where reasonable and feasible. If relocation is not reasonable or feasible, the landholder would be offered construction of a new residence outside the area of vibration impact.

This process would be implemented at those properties located within 40 metres of the Phase 2 areas following commencement of operations of a third track adjacent to those properties.

5.9.7 Water Supply

Potable Water

Potable water supply to the site compounds would be as follows:

- Black Creek Branxton Primary Compound - approximately 40 staff and 100 construction workers at approximately 20 litres per day equates to approximately 3000 litres per day which would be stored in a site tank and filled with water truck from off site mains supply.
- Station Lane Lochinvar Primary Compound- approximately 40 staff and 100 construction workers at approximately 20 litres per day equates to approximately 3000 litres per day which would be stored in a site tank and filled with water truck from off site mains supply.
- Hermitage Road Secondary Compound - approximately 10 staff and 50 workers at 20 litres per day equates to approximately 1000 to 1500L per day which would be stored in a site tank and filled with water truck from offsite mains supply.

Construction Water

Approximately one million litres per day would be required for construction water for Phase 1 of the Project. Initial investigations have indicated that there are insufficient potable water supplies to provide this volume of water for construction water.

Therefore, the Hunter 8 Alliance proposes the following potential sources of construction water:

- Utilise existing farm dams where they are located within properties acquired for the Project or an agreement has been reached with a landholder.
- Water harvested from construction phase sediment basins.
- Groundwater bores at/ near the following locations:
  - Jump Up Creek (chainage 223.800 kilometres).
  - Black Creek Primary Construction Compound (chainage 217.600 kilometres).
  - Anvil Creek (chainage 208.000 kilometres).
  - Station Lane Primary Construction Compound (chainage 202.750 kilometres).
  - Gardiner Street Rutherford Secondary Construction Compound (chainage 198.000 kilometres).
- Extraction from Black Creek instead of groundwater extraction near this location. This may utilise an existing farm water supply pump on Black Creek.
- The Hunter 8 Alliance would also negotiate with the Hunter Water Corporation to determine if treated effluent is available from the Branxton Wastewater Treatment Plant.

The Hunter 8 Alliance would consult with the NSW Office of Water regarding approvals required under the Water Management Act 2000 regarding surface water and groundwater extraction licences once the exact location and required extraction rates have been determined.

5.10 Operation

As discussed in Section 5.9, upon completion of Phase 1 of the Project, trains using the third track would revert to the existing Up Main between chainages 209.840 kilometres and 216.340 kilometres, and from chainage 196.100 kilometres rather than 194.500 kilometres.

As a result, a maximum of four trains per day would be required to idle at the end of the third track at chainages 216.340 kilometres (Branxton), and one train per day at chainage 196.100 kilometres (Farley). Trains would idle for up to 11 minutes at a time, and a maximum of 39 minutes per day (35 minutes at Branxton, four minutes at Farley). The impact of this idling is assessed in Section 6.7 and in Appendix E.

Upon completion of Phase 2 of the Project, trains would utilise the three tracks as described in Section 7.22 of the Environmental Assessment, with the third track ending at chainage 194.500 kilometres. Operations would revert to as described in Section 7.22 of the Environmental Assessment.

5.11 Biodiversity Offsetting

Changes to the design of the Project have resulted in vegetation clearance increasing to approximately 66.2 hectares, of endangered ecological communities and approximately 3.1 hectares of threatened species, including 54 scattered trees.

Table 5-15 shows the vegetation clearance required for Phase 1 and Phase 2 of the Project, and the approximate area of vegetation required to offset this vegetation clearance.

Table 5-15 Project Vegetation Clearance and Estimated Biodiversity Offsetting Requirements

Project Phase	Proposed Native Vegetation Clearance (hectares)
Phase 1	13.0
Phase 2	53.2
Total	**66.2**

A detailed Biodiversity Offsetting Strategy would be developed and implemented following project Approval. The Strategy would cover both Phase 1 and Phase 2. However, the following program for implementation of the Strategy is proposed:

- Biodiversity offsets to be provided for the approximately 13.0 hectares to be cleared in Phase 1.
- Deferment of implementations offsetting the approximately 53.2 hectares that would be cleared for the construction of the third track during Phase 2 until confirmation of construction of Phase 2.

The Hunter 8 Alliance is currently consulting with the Department of Environment, Climate Change and Water, and the Department of Environment, Water, Heritage and the Arts while developing the Biodiversity Offsetting Strategy. The Hunter 8 Alliance currently proposes to utilise BioBanking as the key element of the Biodiversity Offsetting Strategy.

6. Environmental Assessment

The Hunter 8 Alliance has undertaken a review of the submissions discussed in Chapter 4 and the modification to the Project described in Chapter 5 against the potential environmental issues and mitigation measures described in the Environmental Assessment.

Supplementary impact assessments have been undertaken considering the potential for additional environmental impacts and mitigation measures for the following environmental issues:

- Flora and Aquatic ecology.
- Fauna.
- Aboriginal Heritage.
- Non-Indigenous Heritage.
- Land Use.
- Traffic and Access.
- Noise and Vibration.
- Contamination.

6.1 Flora and Aquatic Ecology

This section identifies the potential changes to impacts to terrestrial flora and aquatic ecology associated with the Project. It also discusses any additional management measures proposed to reduce these potential impacts. A detailed assessment on flora is included in the Flora and Aquatic Ecological Study in Appendix B.

This assessment is based on the revised construction impact zone as shown in Figure 5.2 of this report.

6.1.1 Methodology

The revised construction impact zone includes areas outside of the original investigation area of the Environmental Assessment. Additional ecology field investigations were undertaken to assess the existing flora and aquatic environment in these areas. These additional field investigations also assessed locations that were potentially considered for inclusion in the Project but excluded due to environmental, design, construction or other constraints.

The additional investigation areas were surveyed using the methodology outlined in Section 4.2 in the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment). The survey included:

- Mapping of vegetation communitites.
- Targeted threatened flora survey.
- Aquatic habitat assessment.
- Rapid Appraisal of Riparian Condition (RARC).

The additional investigation areas were surveyed on 20 and 21 May 2010. Surveys were undertaken in autumn and complimented surveys undertaken in adjacent habitat in winter and spring 2009. The original investigation area and additional investigation areas make up the revised investigation area.

Details of the survey and limitations associated with the methodology are outlined in Section 2 of the Flora and Aquatic Ecological Study in Appendix B.

6.1.2 Existing Environment

Vegetation Communities

Eight distinct vegetation communities are present within the original investigation area.

A description of the vegetation communities is presented in Table 5-1 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

The following vegetation communities were recorded in the additional investigation areas:

- Lower Hunter Spotted Gum Ironbark Open Forest.
- Forest Red Gum Open Forest.
- Swamp Oak Riparian Forest.
- Cleared with Scattered Trees/ Open Pasture/ Weedy Area.
- Plantation.

Site investigations show that these vegetation communities documented in the additional investigation areas are consistent with the descriptions outlined in Table 5-1 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

Figure 6.1 includes vegetation mapping of these additional investigation areas.

Endangered Ecological Communities

There are five Endangered Ecological Communities (EECs) listed under the *Threatened Species Conservation Act* 1995 (TSC Act) that occur in the investigation area as described in Section 5.2.1 in the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

The following TSC Act listed EECs are present in the additional investigation areas:

- Hunter Lowland Redgum Forest EEC
- Lower Hunter Spotted Gum-Ironbark Forest EEC.
- Swamp Oak Floodplain Forest EEC.

These EECs documented in the additional investigation areas are consistent with the descriptions outlined in Table 5-1 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

Figure 6.1 includes areas of EEC within the additional investigation areas.

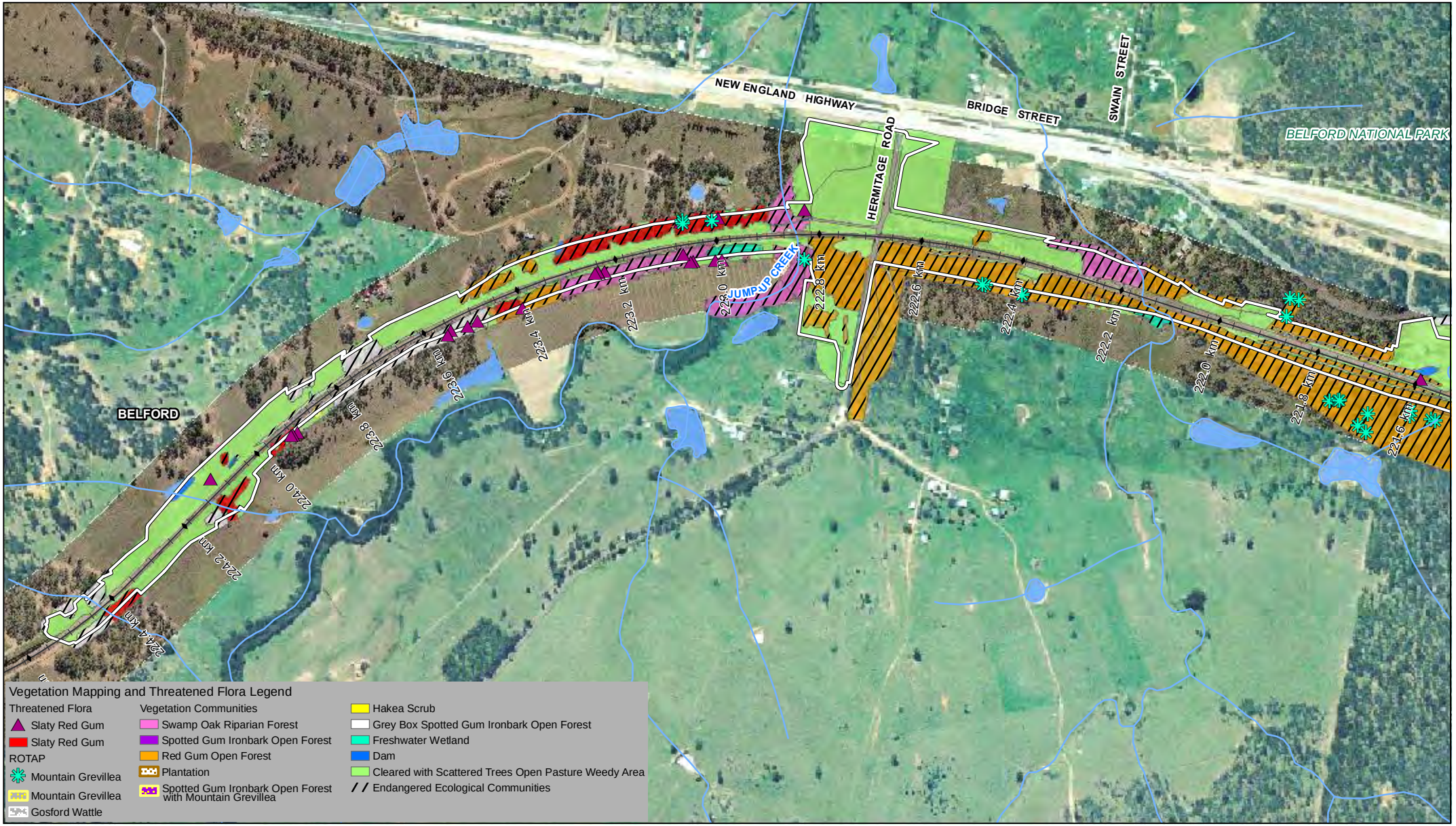
Threatened Flora Recorded, or Likely to Occur, Within the Investigation Area

Slaty Red Gum (Eucalyptus glaucina) was recorded in the original investigation area and the additional investigation areas. No other threatened flora is considered likely to occur within the additional investigation areas.

Mountain Grevillea (Grevillea montana), a Rare or Threatened Australian Plant (ROTAP), was recorded in the original investigation area and additional investigation areas.

Another ROTAP, Gosford Wattle (Acacia prominens), was recorded in Lower Hunter Spotted Gum Ironbark Open Forest within the additional investigation areas at Rutherford.

The locations of Slaty Red Gum, Mountain Grevillea and Gosford Wattle present within the additional investigation areas are shown in Figure 6.1.



1:10,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Revised Construction Impact Zone
- Watercourse
- Watercourse Area

Maitland to Minimbah Third Track Submissions Report

Job Number 22-14471
Revision A
Date August 2010

Vegetation Mapping and Revised Construction Impact Zone Figure 6.1a

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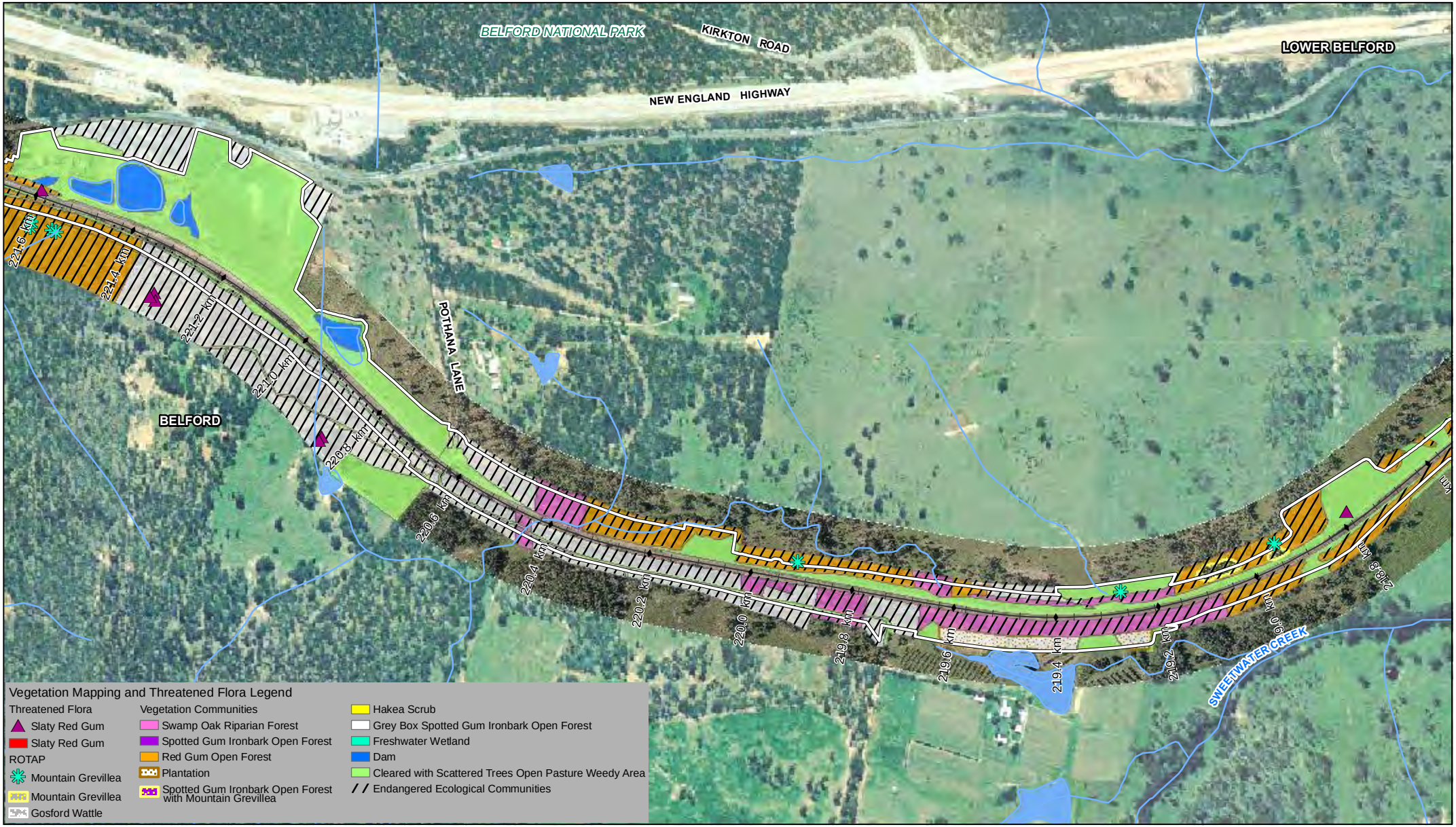

1:10,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Revised Construction Impact Zone
- Watercourse
- Watercourse Area

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Vegetation Mapping and Revised Construction Impact Zone Figure 6.1b

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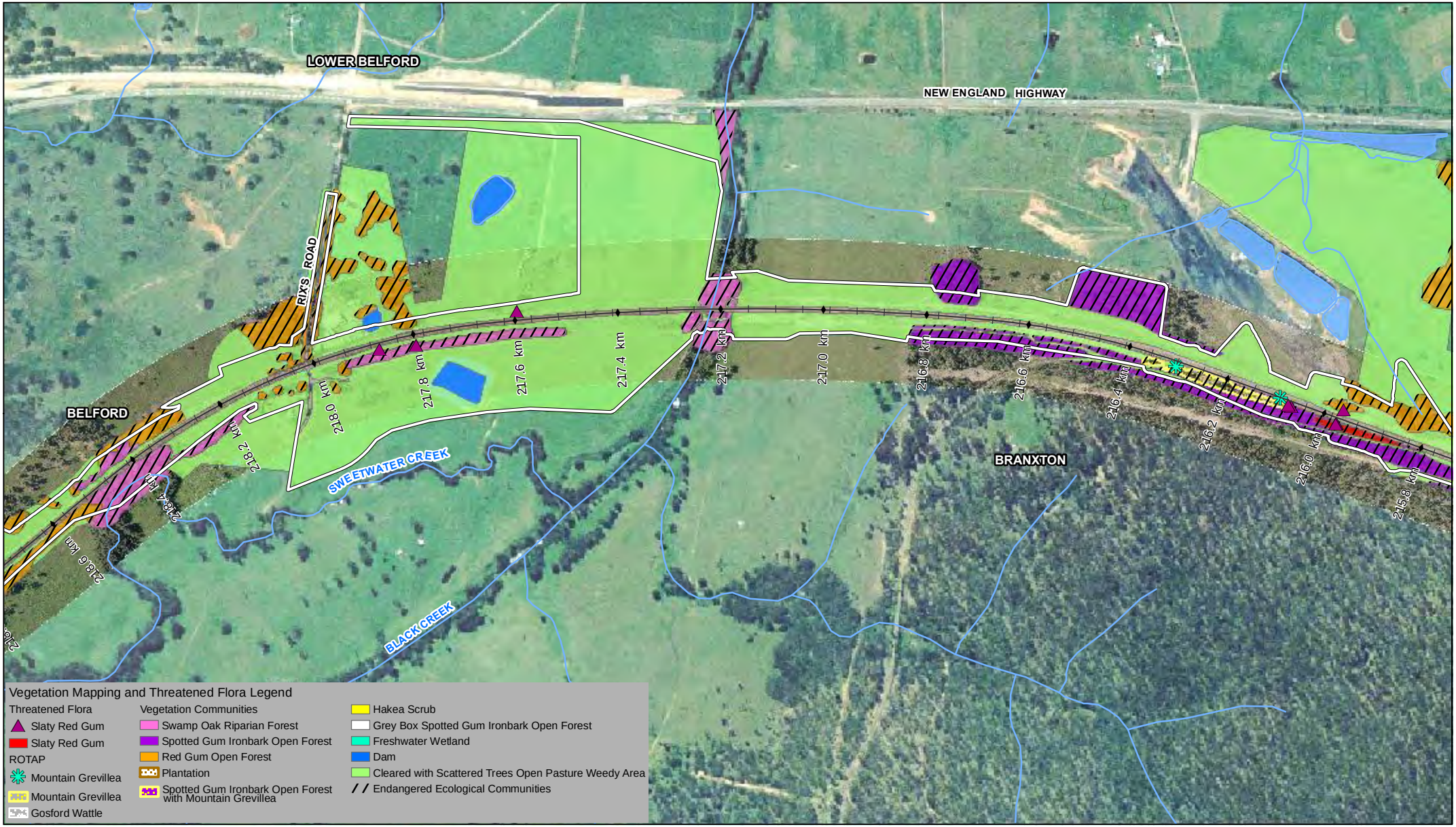

1:10,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Revised Construction Impact Zone
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- Watercourse Area

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Vegetation Mapping and Revised Construction Impact Zone Figure 6.1c

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0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND
- Existing Railway
- Revised Construction Impact Zone
- Watercourse
- Watercourse Area

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Vegetation Mapping and Revised Construction Impact Zone Figure 6.1d

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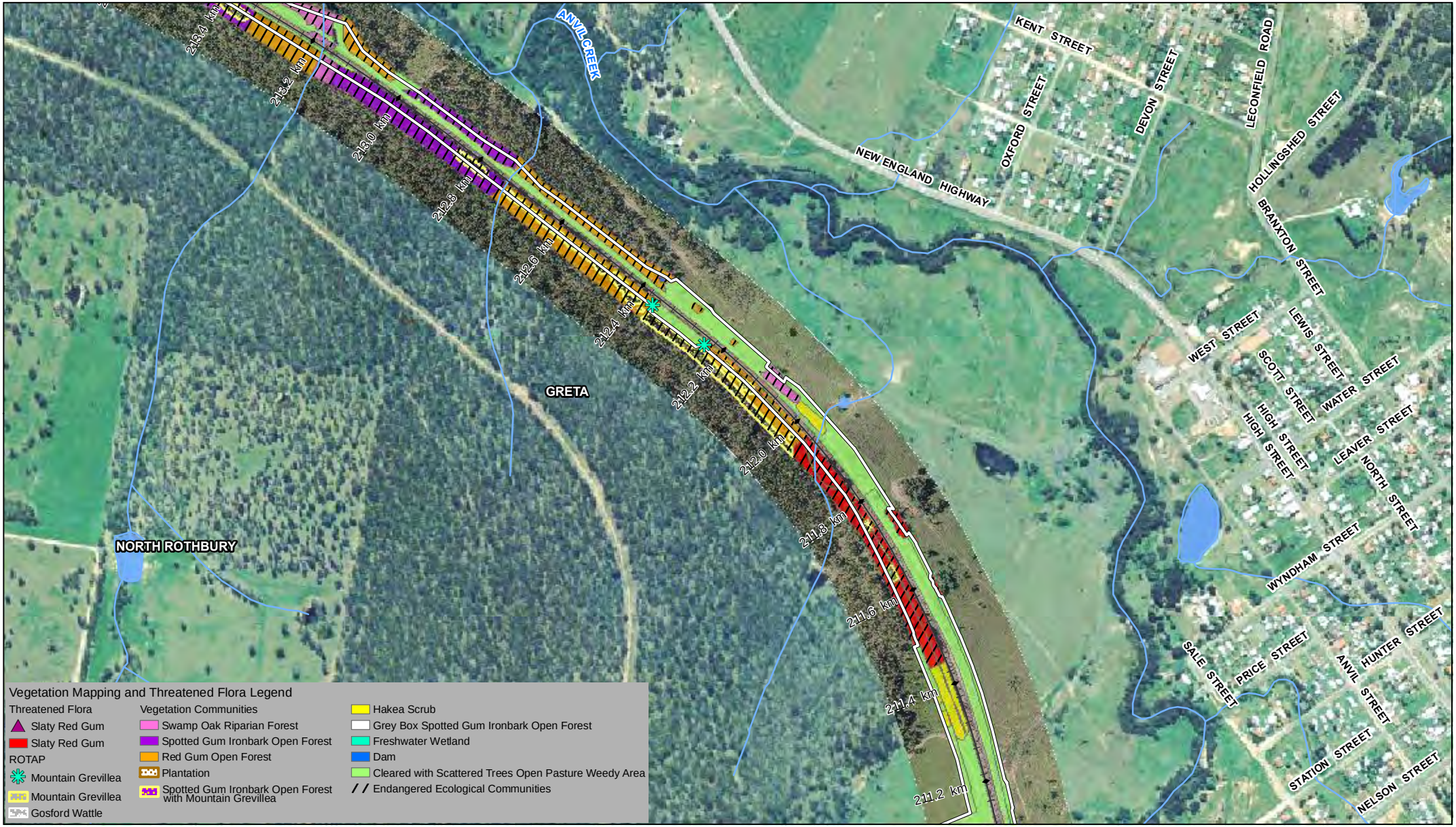

1:10,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND
- Existing Railway
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- Watercourse
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Vegetation Mapping and Revised Construction Impact Zone Figure 6.1e

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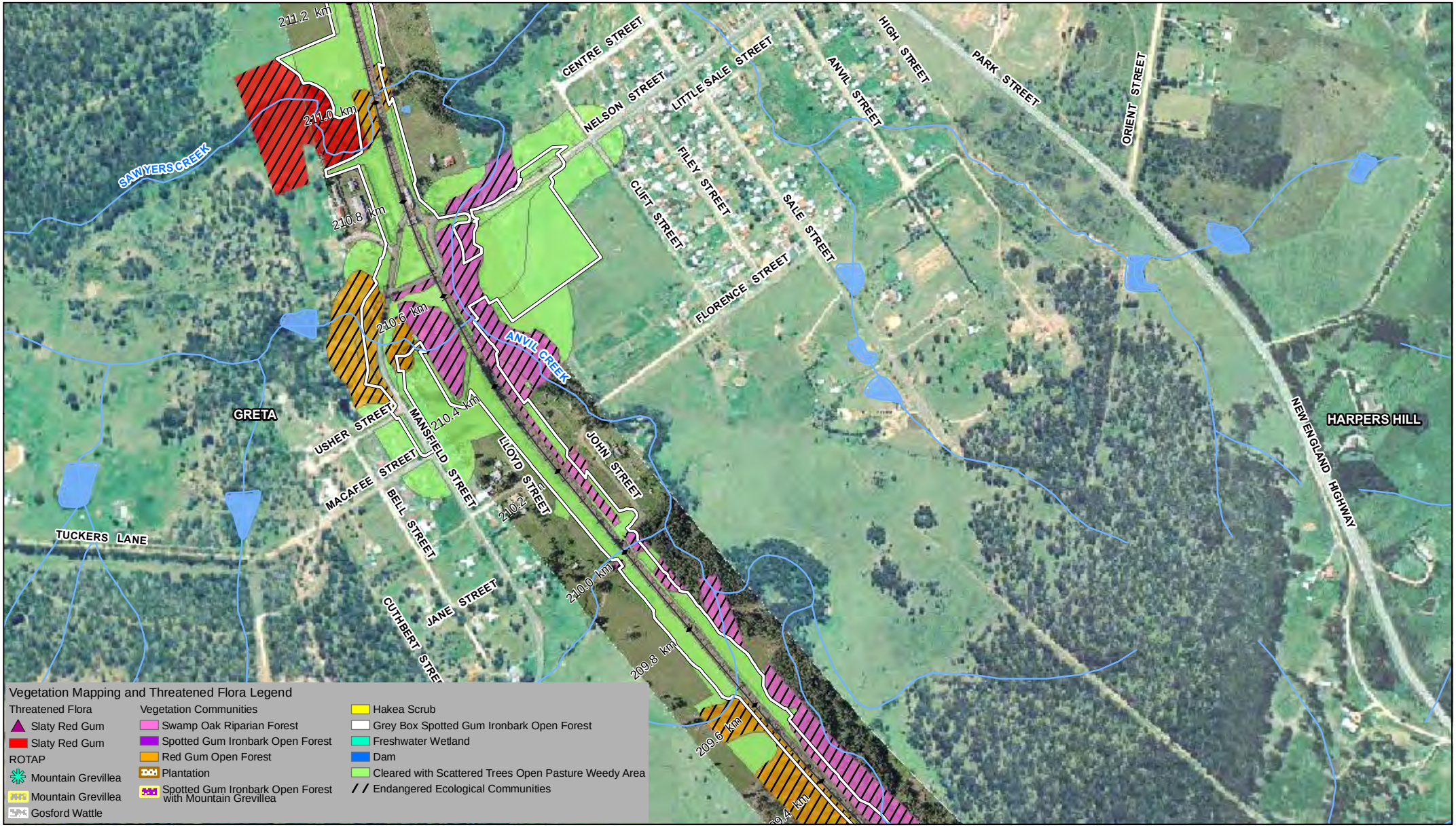

1:10,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
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Vegetation Mapping and Revised Construction Impact Zone Figure 6.1f

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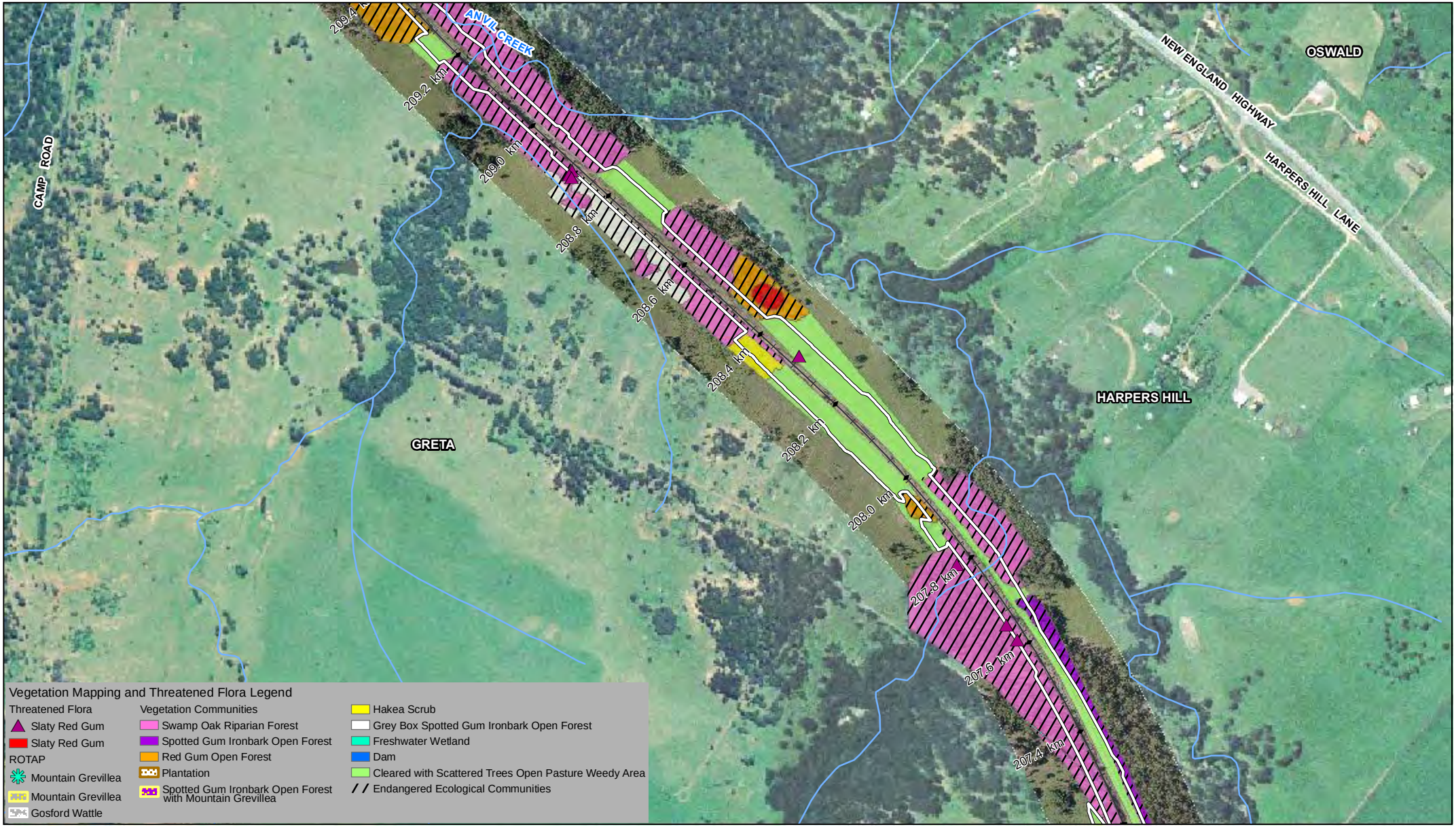

1:10,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Revised Construction Impact Zone
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Vegetation Mapping and Revised Construction Impact Zone Figure 6.1g

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1:10,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
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Vegetation Mapping and Revised Construction Impact Zone Figure 6.1h

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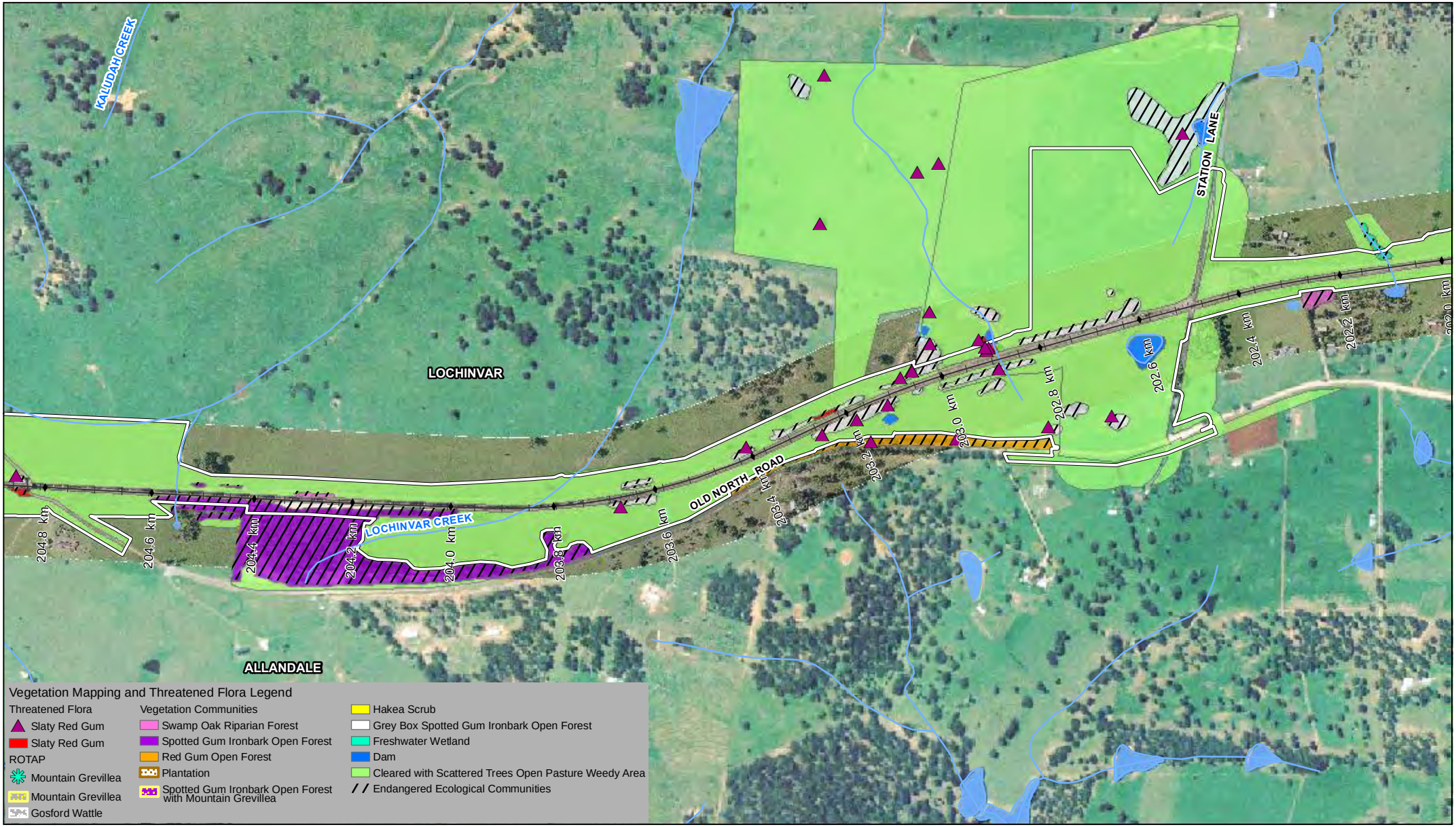

1:10,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Revised Construction Impact Zone
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Vegetation Mapping and Revised Construction Impact Zone **Figure 6.1i**

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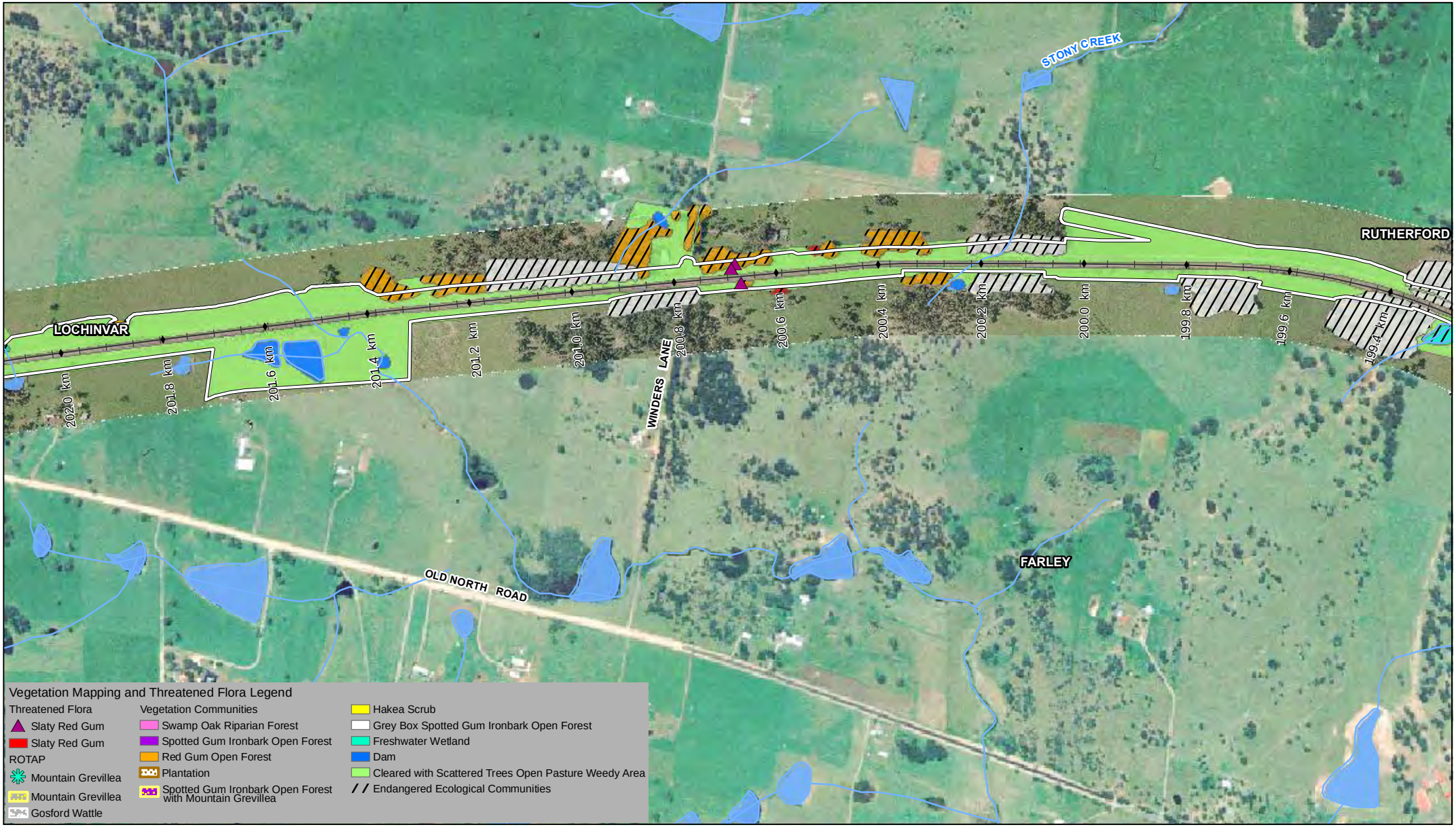

1:10,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Revised Construction Impact Zone
- Watercourse
- Watercourse Area

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Vegetation Mapping and Revised Construction Impact Zone Figure 6.1j

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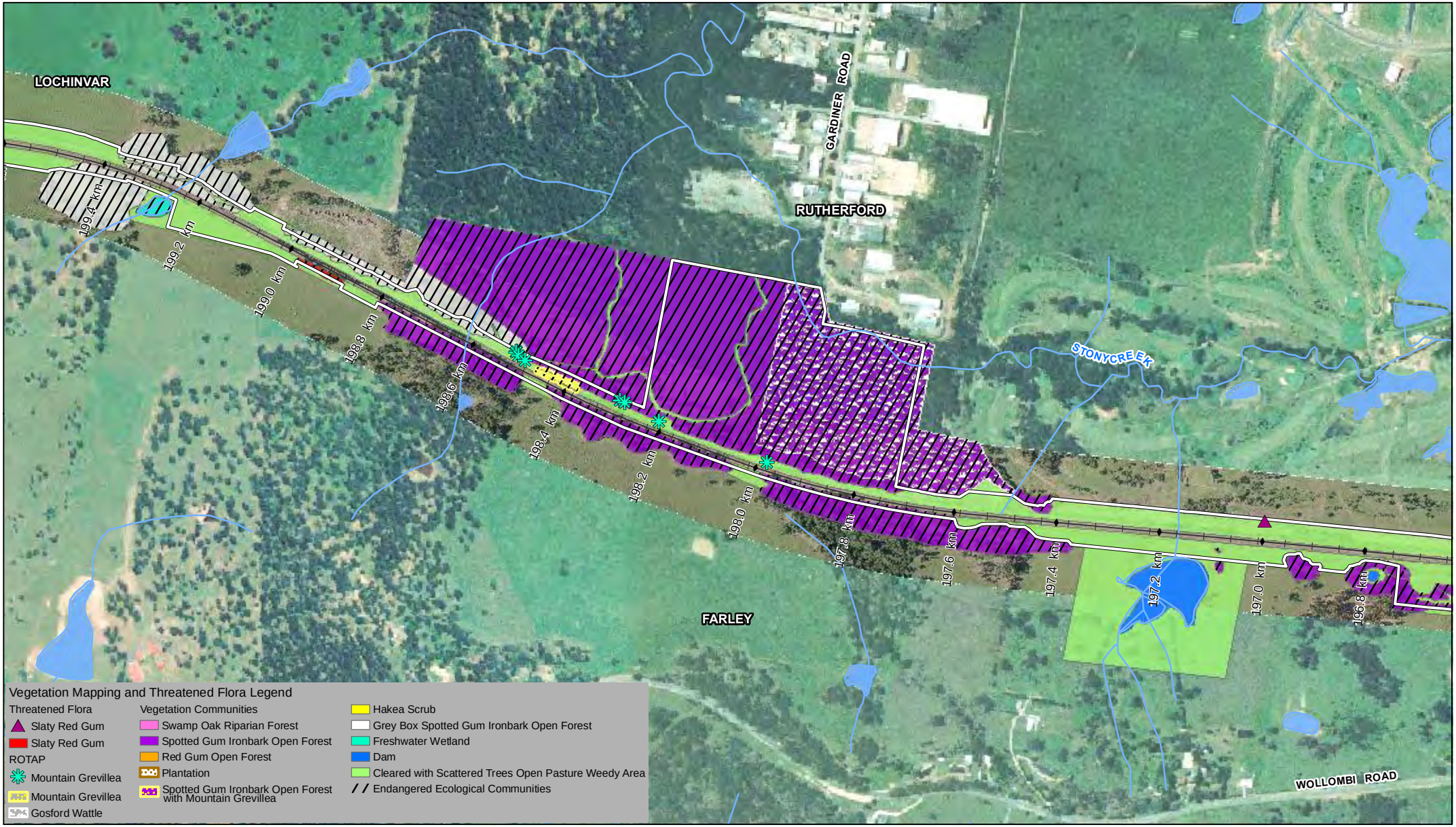

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0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Revised Construction Impact Zone
- Watercourse
- Watercourse Area

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Vegetation Mapping and Revised Construction Impact Zone Figure 6.1k

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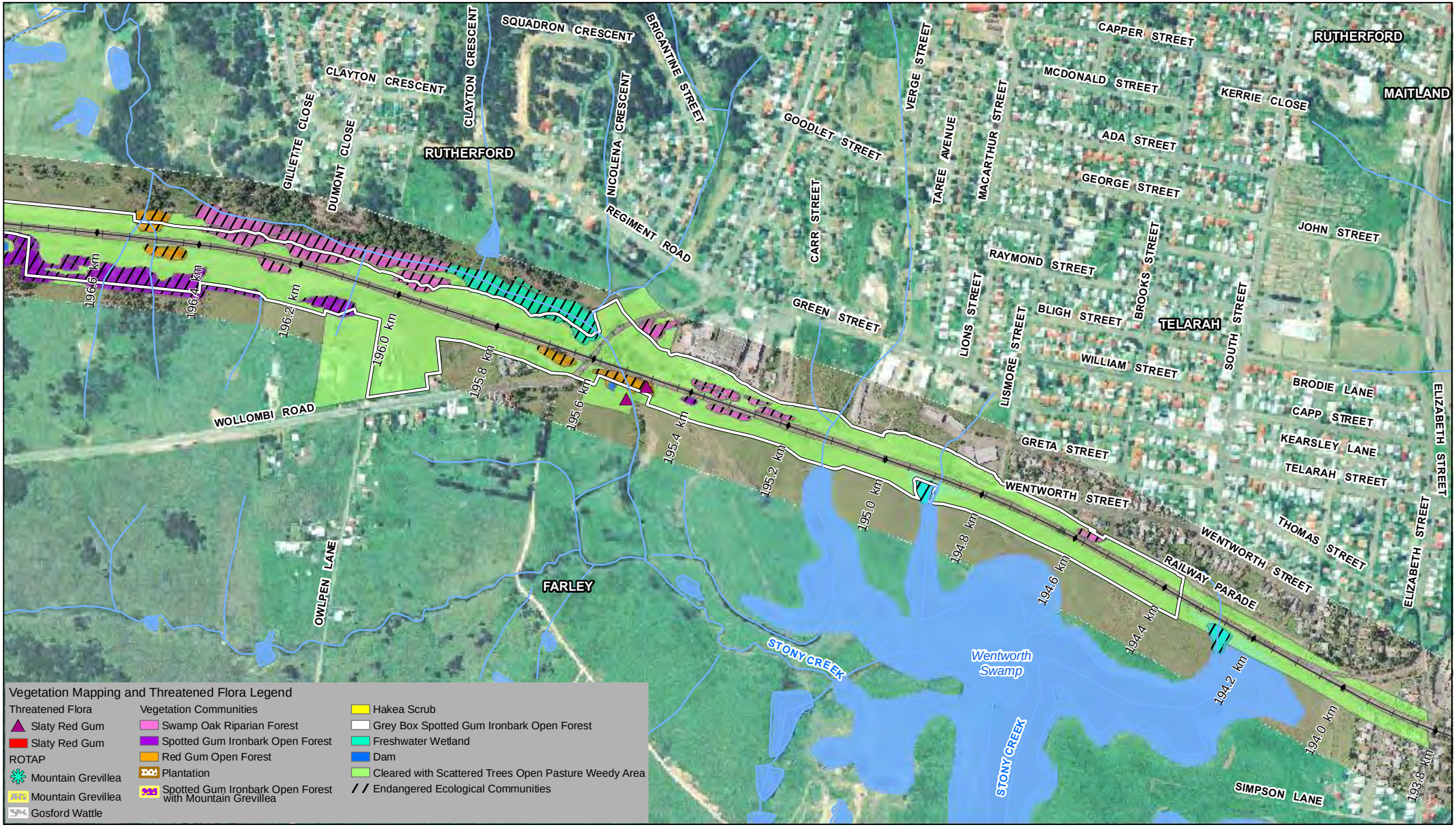

1:10,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Revised Construction Impact Zone
- Watercourse
- Watercourse Area

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Vegetation Mapping and Revised Construction Impact Zone Figure 6.1l

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Threatened Aquatic Species

The *Fisheries Management Act 1991 (*FM Act) lists threatened aquatic species, populations and EECs. Based on species distribution ranges and habitat requirements, no aquatic species, populations and EECs are likely to occur in the revised investigation area. Further assessment under the FM Act is not required for the Project.

Aquatic Habitat Assessment

There are several named creeklines in the original investigation area, Stony Creek, Lochinvar Creek, Anvil Creek, Sawyers Creek, Black Creek and Jump Up Creek. These named creeks have been assessed in Table 5-4 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

The additional investigation areas include one other named creek, Sweetwater Creek. The results of the Rapid Appraisal of Riparian Condition (RARC) assessment (Jansen et al. 2005) for Sweetwater Creek are outlined in Table 3-1 of the Flora and Aquatic Ecological Study in Appendix B. The RARC assessment indicates that Sweetwater Creek is similar in habitat value as to the other creeks outlined in Section 5.6 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

An unnamed tributary of Stony Creek occurs within the additional investigation areas, and an ephemeral drainage line occurs within the additional investigation areas near Station Lane. These have been assessed previously in Table 5-4 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

Stony Creek occurred within the original investigation area surveyed for the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment). Stony Creek extends throughout Lot 1 DP 1127199 at Rutherford within the additional investigation areas. The assessment of Stony Creek within Table 5-4 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment) is consistent with the remainder of the creek that occurs within the additional investigation areas.

There are no areas of freshwater wetlands or farm dams within the additional investigation areas.

6.1.3 Impact Assessment

Project design alterations have sought to avoid areas of EECs and Slaty Red Gum where possible. Where avoidance of impacts was not possible, the Project has been designed to minimise impacts on EECs and Slaty Red Gum by reducing the construction impact zone corridor and locating site compounds and access tracks in existing cleared areas. A Compensatory Habitat Strategy is being developed in consultation with the Department of Environment Climate Change and Water (DECCW) and Department of the Environment, Water, Heritage and the Arts (DEWHA) to offset EECs and Slaty Red Gum cleared for the Project.

Changes to the Project have resulted in some areas included in the construction impact zone in the Environmental Assessment not requiring clearance, and some parts of the additional investigation areas now being included within the revised construction impact zone. The revised construction impact zone has resulted in an overall increase in the vegetation clearing totals that were outlined in the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

Table 6-1 shows the revised areas of vegetation clearing for the Project. The clearing associated with Phase 2 has been included in this area, and also outlined separately, as clearing for Phase 2 would only occur when Phase 2 construction is confirmed. As such, the clearing associated with Phase 2 would not require offsetting until clearing had been undertaken.

Table 6-1 also outlines clearing within Lot 1 DP 1127199 at Rutherford. This land has been approved for development (including vegetation clearing) by Maitland City Council for an industrial estate. During the field surveys undertaken for the Project, the land was vegetated with mature and regenerating Lower Hunter Spotted Gum Ironbark EEC and has therefore been mapped and included in the total calculations for this vegetation community. However, this land would be cleared under the existing development approval before construction for the Project commences. Therefore, this area of Lower Hunter Spotted Gum Ironbark EEC has been removed from the vegetation clearance calculations and the area required for offsetting. As a result, the amount of proposed native vegetation clearing has only increased by 5.4 hectares from the amount of native vegetation clearing proposed in the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

Table 6-1 Proposed Vegetation Clearance

Vegetation Community	Hectares to be Cleared for the Project (presented in Environmental Assessment)	Revised Project (including additional investigation areas)	Revised Project excluding Lot 1 DP 1127199	Revised Project excluding Lot 1 DP 1127199 Phase 1	Revised Project excluding Lot 1 DP 1127199 Phase 2	Hectares within Investigation Corridor Not Impacted	Conservation Significance
Spotted Gum-Ironbark Open Forest	13.2 hectares	30.1 hectares	14.1 hectares	2.3 hectares	11.8 hectares	23.4 hectares	High. EEC listed on the TSC Act. The ROTAP Mountain Grevillea and Gosford Wattle occur in this vegetation community.
Redgum Open Forest	19.7 hectares	22.8 hectares	22.8 hectares	5.8 hectares	17.0 hectares	19.9 hectares	High. EEC listed on the TSC Act. The TSC Act and EPBC Act vulnerable Slaty Red Gum, and ROTAP Mountain Grevillea occur in this vegetation community.
Swamp Oak Riparian Forest	14.9 hectares	17.5 hectares	17.5 hectares	4.4 hectares	13.1 hectares	8.0 hectares	High. EEC listed on the TSC Act.
Grey Box Spotted Gum Ironbark Open Forest	12.7 hectares	12.0 hectares	11.3 hectares	0.3 hectares	11.0 hectares	15.3 hectares	High. Listed as EEC on the TSC Act.
Freshwater Wetland	0.6 hectares	0.5 hectares	0.5 hectares	0.2 hectares	0.3 hectares	1.8 hectares	High. EEC listed on the TSC Act.
Hakea Scrub	0.7 hectares	1.0 hectares	1.0 hectares	0.7 hectares	0.3 hectares	0 hectares	Low. Not listed as an EEC on the TSC Act or EBPC Act. No threatened flora occurs within this vegetation community.
Plantation	0.1 hectares	1.4 hectares	1.4 hectares	0.3 hectares	1.1 hectares	0 hectares	None.

Vegetation Community	Hectares to be Cleared for the Project (presented in Environmental Assessment)	Revised Project (including additional investigation areas)	Revised Project excluding Lot 1 DP 1127199	Revised Project excluding Lot 1 DP 1127199 Phase 1	Revised Project excluding Lot 1 DP 1127199 Phase 2	Hectares within Investigation Corridor Not Impacted	Conservation Significance
Cleared with Scattered Trees / Open Pasture / Weedy Area	153.1 hectares	206.5 hectares	204.7 hectares	35.0 hectares	169.7 hectares	80.5 hectares	None.
Slaty Red Gum1	2.7 hectares	3.1 hectares	3.1 hectares	1.2 hectares and 2 scattered trees	1.9 hectares and 52 scattered trees	4.7 hectares	High. Listed as vulnerable on the TSC Act and EPBC Act.
Mountain Grevillea2	1.6 hectares	1.4 hectares	1.4 hectares	0.5 hectares	0.9 hectares	1.1 hectares	Medium. ROTAP species.
Gosford Wattle3	0 hectares	8.1 hectares	0 hectares	0 hectares	8.1 hectares	0.05 hectares	Medium. ROTAP species.
Total- All Communities	215.0 hectares	291.8 hectares	273.3 ha	21.0 hectares	252.3 ha	148.9 hectares	-
Total- Native Vegetation	61.8 hectares	83.9 hectares	67.2 hectares	13.7 hectares	53.5 hectares	68.4 hectares	-
Total- Endangered Ecological Communities	61.1 hectares	82.9 hectares	66.2 hectares	13.0 hectares	53.2 hectares	68.4 hectares	-

1. The area of Slaty Redgum is included in the Redgum Open Forest vegetation community, but has also been separated out in this table to show relative abundance within the investigation area.
2. The area of Mountain Grevillea is included in the Redgum Open Forest and Greybox Spotted Gum Ironbark vegetation communities, but has also been separated out in this table to show relative abundance within the investigation area.
3. The area of Gosford Wattle is included in the Spotted Gum Ironbark Open Forest vegetation community, but has also been separated out in this table to show relative abundance within the investigation area

Clearing Native Vegetation

The revised construction impact zone results in approximately 67.2 hectares (83.9 hectares including Lot 1 DP 1127199) of native vegetation being cleared for the Project, 1.4 hectares of plantation and utilisation of 206.5 hectares cleared agricultural land. All vegetation clearing would occur on the edge of the existing cleared railway easement, and all vegetation communities recorded during the survey extended well beyond the limits of the revised construction impact zone.

Endangered Ecological Communities

The Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment) concludes that the Project is unlikely to result in a significant impact on EECs providing areas of EECs are included in adequate offset areas.

As outlined above, the revised construction impact zone results in approximately 66.2 hectares (82.9 hectares including Lot 1 DP 1127199) of EECs being cleared for the Project; compared to a 61.1 hectares reported in the original Environmental Assessment.

All clearing of EECs would occur on the edge of the existing cleared railway easement, removing only part of the wider extent of these communities in the locality. Approximately 68.4 hectares of EEC was recorded during the survey within the revised investigation area but outside the revised construction impact zone, and would not be impacted by the Project.

Establishing offset areas and revegetation works for EECs cleared as discussed in Section 6.1.4 would be the main mitigation measure to address potential impacts. By including sufficient areas of EECs within an offset it is considered that the Project would not significantly impact on these EECs.

The revised construction impact zone results in an overall increased clearing of 21.8 hectares of EEC. However, 16.7 hectares of EEC is associated with Lot 1 DP 1127199 at Rutherford, which although is included as part of the additional investigation areas, has already been approved for clearing by Maitland Council as part of a separate development consent (an industrial estate). The area would be cleared before the Project commences under that approval, thus reducing the extent of EEC clearing required for the Project. Considering the EECs associated with Lot 1 DP 1127199 at Rutherford the revised construction impact zone results in an increase of EEC clearance of approximately 4.4 hectares from that described in the Environmental Assessment. This increased impact is unlikely to significantly impact on areas of EECs providing areas of EECs are included in adequate offset areas.

Threatened Flora

The area of clearing for Slaty Red Gum outlined in the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment) was 2.7 hectares and 72 scattered individual trees. The Flora and Aquatic Ecological Assessment concludes that the Project is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the local population of Slaty Red Gum is likely to significantly decline. Development of offset areas and revegetation works would assist in minimising impacts on Slaty Red Gum. Providing areas of Slaty Red Gum are included in adequate offset areas, the Project is considered unlikely to significantly impact on Slaty Red Gum.

The revised construction impact zone would clear an additional 0.4 hectares of known Slaty Red Gum habitat. However, the amount of scattered individual trees being cleared would reduce from 72 to 54. The revised construction impact zone is unlikely to result in a significant impact on Slaty Red Gum as outlined in the Environmental Assessment.

Aquatic Ecology

As discussed in Chapter 11 of the Environmental Assessment, the Project would involve clearing and/or filling small areas of freshwater wetland and riparian vegetation, realignment approximately 100 metres of Sawyers Creek, and would increase the flow to creeks and drainage lines due to increased hardstand surfaces within the catchment. However, the Project is considered unlikely to significantly alter the timing, duration or velocity of flows to or from wetlands and creeks that intersect the investigation area. Impacts on aquatic process, species and habitat are considered unlikely providing appropriate erosion and sedimentation controls are implemented as part of the Spoil and Fill Management Plan.

The revised construction impact zone would result in potential impacts to Sweetwater Creek and an unnamed tributary of Stony Creek, and further impacts to Stony Creek. Impacts to Sweetwater Creek are anticipated to involve clearing adjacent Swamp Oak Riparian Forest, which is considered unlikely to result in a significant impact on the EEC. No instream woody snags or aquatic vegetation would be impacted. Fish passage would not be interrupted at Sweetwater Creek. Impacts at Sweetwater Creek associated with these works are considered similar to those described in Sections 6.6 and 6.7 of the Flora and Aquatic Ecology Assessment (Appendix E of the Environmental Assessment) and are considered unlikely to result in impacts on aquatic process, species and habitats providing appropriate erosion and sedimentation controls are implemented as part of the Spoil and Fill Management Plan.

Impacts on the unnamed tributary of Stony Creek would involve clearing adjacent Lower Hunter Spotted Gum Ironbark Forest, which is considered unlikely to result in a significant impact on the EEC. As this unnamed tributary is an ephemeral drainage line, no instream woody snags or aquatic vegetation would be impacted.

Impacts to Stony Creek are consistent with those described in Sections 6.5 and 6.6 of the Flora and Aquatic Ecology Assessment (Appendix E of the Environmental Assessment), and involve clearing of adjacent Lower Hunter Spotted Gum Ironbark Forest, which is considered unlikely to result in a significant impact on the EEC.

6.1.4 Mitigation Measures

The management of adverse impacts arising from the Project has been addressed according to the hierarchy of avoidance, mitigation and offsetting of adverse impacts, consistent with the approach outlined in the Part 3A Draft Guidelines for Threatened Species Assessment (DEC and DPI 2005).

Section 7.2 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment), outlines mitigation measures recommended to mitigate flora and aquatic impacts of the Project. The principles underlining the mitigation measures for the project are considered appropriate and transferable to the revised construction impact zone. No further mitigation measures other than those outlined in Section 7.2 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment), are required.

A Compensatory Habitat Strategy is currently being developed to offset impacts associated with the Project. It would include additional offsets to cater for the impacts on threatened flora and EECs within the revised construction impact zone as shown in Table 6-2. The clearing associated with Lot 1 DP 1127199 has been excluded from Table 6-2 as this lot has been approved for clearing by Maitland Council as part of a separate development consent and would be cleared before the Project under that approval.

As outlined in Section 7.3 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment), the Compensatory Habitat Strategy would further mitigate impacts of the Project and contribute to a 'maintain and improve' outcome for local and regional biodiversity values.

Table 6-2 shows the total vegetation clearance for the Project, and the breakdown between Phase 1 and Phase 2. The Hunter 8 Alliance proposes that the offsetting requirements for each phase would be determined prior to construction of the Project.

Table 6-2 Proposed Vegetation Clearance: Endangered Ecological Communities and Threatened Flora

Vegetation Community	Revised Project[2] Total	Revised Project[2] Phase 1	Revised Project[2] Phase 2
Spotted Gum-Ironbark Open Forest	14.1 hectares	2.3 hectares	11.8 hectares
Redgum Open Forest	22.8 hectares	5.8 hectares	17.0 hectares
Swamp Oak Riparian Forest	17.5 hectares	4.4 hectares	13.1 hectares
Grey Box Spotted Gum Ironbark Open Forest	11.3 hectares	0.3 hectares	11.0 hectares
Freshwater Wetland	0.5 hectares	0.2 hectares	0.3 hectares
Slaty Red Gum[1]	3.1 hectares and 54 scattered trees	1.2 hectares and 2 scattered trees	1.9 hectares and 52 scattered trees
Total	66.2 hectares	13.0 hectares	53.2 hectares

1. The area of Slaty Red Gum is included in the Redgum Open Forest vegetation community, but has also been separated out in this table to show relative abundance within the investigation area.
2. Excludes vegetation clearance on Lot 1 DP 1127199.

6.2 Fauna

This section identifies the potential changes to impacts to terrestrial fauna associated with the Project. It also discusses any additional management measures proposed to reduce these potential impacts. A detailed assessment on fauna is included in the Supplementary Terrestrial Fauna Impact Study in Appendix C.

This assessment is based on the revised construction impact zone as shown in Figure 5.2 of this report.

6.2.1 Methodology

The survey results presented in this report are supplementary to those that were completed in 2009 for the Terrestrial Fauna Impact Assessment (Appendix F of the Environmental Assessment). Assessment areas covered in this report were chosen for their apparent likely habitat in respect to the revised

construction impact zone. A targeted fauna survey (non-trapping) and habitat assessment was selected as the most appropriate and feasible method to identify the species occurring within the investigation area.

A full description of the methodology and limitations is provided in Section 4 of the Supplementary Terrestrial Fauna Impact Study in Appendix C. The key survey methods implemented were:

- Survey Site Selection.
- Targeted Site Selection and Survey Effort.
- Survey Effort.
- Bird Surveys.
- Diurnal Reptile and Amphibian Searches.
- Nocturnal Reptile and Amphibian Searches.
- Walking Spotlight Survey.
- Nocturnal Call Playback.
- Micro-bat Survey.

There were 21 sites selected for assessment from aerial photograph interpretation. Each of these potential sites was assessed in the field for habitat features and an appropriate survey effort was adopted. From this assessment 10 sites were identified for targeted survey.

These survey sites are displayed in Figure 3 of the Supplementary Terrestrial Fauna Impact Study in Appendix C.

6.2.2 Existing Environment

To identify the potential fauna species potentially present within the additional investigation areas, database searches and field surveys were undertaken.

Database Searches

A review was undertaken of the documented records of the locations of threatened fauna species within the study locality. A 10 kilometre radius search area was undertaken over the entire investigation area.

Threatened species records were accessed from the Department of Environment, Climate Change and Water (DECCW) Atlas of NSW Wildlife Database for the Cessnock (9132) and Newcastle (9232) 1: 100,000 map sheets (updated to June 2010). Threatened and migratory species protected under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) likely to occur within the study locality were determined from a Protected Matters Database search (June 2010).

A total of 64 threatened and or migratory terrestrial fauna species listed on the *Threatened Species Conservation Act* 1995 (TSC Act) have previously been recorded within the study locality on the Atlas of NSW Wildlife Database. These are listed in Table 2 of the Supplementary Terrestrial Fauna Impact Study in Appendix C.

A summary of the findings is listed below:

- Six species (green and golden bell frog, black-necked stork, swift parrot, little tern, painted snipe and regent honeyeater) are listed as endangered on the TSC Act

- 44 species are listed as vulnerable on the TSC Act.
- 24 species are also listed on the (EPBC Act):
  - Two as endangered (swift parrot and spotted-tailed quoll).
  - One as endangered and migratory (regent honeyeater).
  - Four as vulnerable (green and golden bell frog, grey-headed flying-fox, painted snipe and large-eared pied bat).
  - 16 as migratory species.

The EPBC Protected Matters Search Tool was accessed in June 2010 via the Australian Government Department of Environment, Water, Heritage and the Arts (DEWHA) website to generate a list of species protected under the EPBC Act that may occur in or nearby to the study locality (10 kilometre radius). 24 potentially relevant species are listed in Table 3 of the Supplementary Terrestrial Fauna Impact Study in Appendix C.

No endangered fauna populations have been recorded in the NSW Wildlife Atlas in the study locality.

No areas of critical habitat were identified within the study locality following a search of the Atlas of NSW Wildlife Database.

The literature review and database searches identified 75 threatened and/or migratory species which have previously been identified or are predicted to occur within the study locality. An assessment of the current likelihood of each of these threatened and/or migratory species occurring within the investigation area is undertaken in Section 6.1 of the Supplementary Terrestrial Fauna Impact Study in Appendix C and summarised in Section 6.2.3 of this report.

Field Survey Results

Fauna Habitat Features

Five main types of habitat were recorded within the investigation area. They were:

- Remnant woodland vegetation.
- Open pasture paddocks.
- Creek lines and associated riparian vegetation.
- Farm dams.
- Drainage culverts and bridges.

The habitat description of each of the survey sites is provided in Table 9 in the Supplementary Terrestrial Fauna Impact Study in Appendix C.

Fauna Species

A total of 77 fauna species were recorded during the field surveys, comprising five frogs, one reptile, 55 birds, and 16 mammals. Four introduced species were also recorded.

Of these, 69 non-threatened (protected or introduced) species were recorded during field surveys. The 51 non-threatened birds recorded comprised all the bird groups typically recorded within the region. Water birds such as the Australian wood duck (*Chenonetta jubatta*), the Grey teal (*Anas gracilis*) and the Black swan (*Cygnus atratus*) were recorded at farm dams. Species requiring tall reeds at farm dams such as the purple swamphen (*Porphyrio porphyrio*) and Australian reed-warbler (*Acrocephalus australis*) were also recorded. Common woodland bird species were recorded such as the eastern rosella (*Platycercus eximius*), laughing kookaburra (*Dacelo novaeguineae*), striated pardalote (*Pardalotus striatus*) and yellow thornbill (*Acanthiza nana*). One introduced bird species, the common myna (*Acridotheres tristis*) were recorded.

Two non-flying non-threatened mammal species were recorded, including the eastern grey kangaroo (*Macropus giganteus*) and red-necked wallaby (*Macropus rufogriseus*). Three introduced mammal species were recorded, the fox (Vulpes vulpes) the house mouse (*Mus musculus*) and rabbit (*Oryctolagus cuniculus*). Six flying non-threatened mammal species were recorded including two wattled bats (*Chalinolobus spp*.) and two forest bats (*Vespadelus spp*.).

Five non-threatened frog species were recorded including the common eastern froglet (*Crinia signifera*) and two tree frogs (*Litoria spp*.). One non-threatened reptile species, the wood gecko (*Diplodactylus vittatus*) was recorded.

Threatened Species

Eight threatened fauna species on the TSC Act were recorded during field surveys. One species, the Grey-headed flying fox, is also listed as vulnerable on the EPBC Act. These are shown in Table 6-3, while general locations of threatened fauna species can be seen in Figure 6.2 of this report. A full list is provided in the Supplementary Terrestrial Fauna Impact Study in Appendix C.

Table 6-3 Threatened and/or Migratory Species identified during Field Surveys

Scientific Name	Common Name
Vulnerable Species – TSC Act	
Pomatostomus temporalis	Grey-crowned babbler
Petaurus norfolcensis	Squirrel glider
Mormopterus norfolkensis	Eastern freetail-bat
Miniopterus schreibersii oceanensis	Eastern bent-wing bat
Myotis macropus	Large-footed or southern myotis
Daphoenositta chrysoptera	Varied sittella
Pyrrholaemus sagittatus	Speckled warbler
Pteropus poliocephalus	Grey-headed flying-fox
Vulnerable species – EPBC Act	
Pteropus poliocephalus	Grey-headed flying-fox