Australian Rail Track Corporation

Maitland to Minimbah Third Track Project

Submissions Report including Preferred Project Report

September 2010

H8R-REP-S2G-ENV-0019-0

Appendix B
Terrestrial Flora and Aquatic Ecological Study

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Terrestrial Flora and Aquatic Ecological Study

Australian Rail Track Corporation

Maitland to Minimbah Third Track

Submissions Report

Flora and Aquatic Ecology Study

September 2010

H8R-REP-S2G-ENV-0021-0

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Glossary of Terms

Acoustic	Pertaining to the sense of organs of hearing, or to the science of sound.
Ambient	Surrounding or existing.
Batters	The side slopes of cuttings or on embankments.
Biological diversity	The maintenance of a full and diverse range of plant and animal species.
Bund	An impervious embankment of earth or a brick wall, which may form part or all of the perimeter of a compound that is provided to retain liquid.
Central drainage	Longitudinal earth drains between the new and existing tracks. The central track drain would allow stormwater runoff to be collected and transferred to the outer cesses by a series of pits and pipes.
Cess drain	A surface drain that is located at formation level at the side of tracks to remove water.
Chainage	Chainage is generally the location in kilometres of the position of a railway in relation to Sydney (NSW only) based on the 0.00 kilometres being located at the end of Central No. 1 Platform.
Coal path	A train path that is dedicated to the movement of coal haulage.
Concept design	Initial functional layout of a concept, such as for the proposed duplication, to provide a level of understanding to later establish detailed design parameters.
Consent	Approval to undertake a development received from the consent authority.
Construction Environmental Management Plan	A document setting out the management, control and monitoring measures to be implemented during construction of a development, to avoid or minimise the potential environmental impacts identified during an environmental impact assessment process.
Construction impact zone	The area which would be affected by construction works as part of the Project. The construction impact zone incorporates the Project's extent of works, proposed site access, construction compound locations and spoil locations.
Cost-benefit analysis	An economic assessment designed to identify and quantify the benefits and costs associated with a project.
Cross drainage	Cross drainage structures allow catchment runoff from outside the rail corridor to flow through the rail corridor.
Crossover	Railway infrastructure which provides a train the ability to cross between two adjacent tracks.
Culvert	A structure that totally encloses a drain under a road or railway.
Cumulative impact	The sum on the environment resulting from the successive effects of several different impacts.
Curtilage	The area immediately adjacent to a dwelling, house, building or object which forms part of its enclosure.
Cut	An excavation for constructing below the natural ground level.

Cut and fill balance	Difference between earthwork cut and fill volumes.
Detailed design stage	The stage at which the project design is detailed on the basis of an approved concept design.
Director-General's Requirements	Requirements for an environmental assessment issued by the Director-General of the NSW Department of Planning in accordance with the Environment Planning and Assessment Act 1979.
Dispersivity	Potential for soil to break down into fine particles in water.
Down direction	The direction a train travels when proceeding away from Sydney.
Down Main	In a situation with more than one rail track in the rail corridor, the Down Main is the primary (main) rail line that trains usually traverse when they are heading away from Sydney and is usually positioned on the right when facing towards Sydney.
Down side	In a situation with more than one rail track in the rail corridor, the Down side is the side of the track on which trains travel when they are heading away from Sydney and is usually positioned on the right when facing towards Sydney.
Duplication	Construction of an additional track adjacent to an existing single track.
Earthworks	Re-shaping of the natural ground level.
Embankment	A structure constructed from fill that raises the ground level above existing ground levels.
Emission	The release of material into the surroundings (for example, gas, noise, water).
Erosion	A natural process where wind or water detaches a soil particle and provides energy to move the particle.
Facing crossover	A crossover that allows a train to continue in a forward direction by travelling through the curved leg of the turnout.
Fauna	The animals of a given region or period, taken collectively.
Flora	Plants of a particular region that make up the vegetation of a site.
Fill	Earth used to construct an embankment.
Geotechnical	A discipline of engineering associated with studying the ground and its geology.
Gradient	The degree of ascent or descent with a uniform slope.
Greenhouse gases	Gases that accumulate within the earth's atmosphere (eg primarily carbon dioxide and methane) and contribute to global climatic change/global warming (ie the 'greenhouse effect').
Groundwater	Subsurface water stored in pores of soil or rocks.
Headways	The time difference between train services.
Hydrology	The study of rainfall and surface water run-off processes.
Hunter 8 Alliance	Hunter 8 Alliance, which has been formed to deliver a new third track and ancillary infrastructure between Maitland and Minimbah.

Intergenerational equity	That the present generation should ensure that the healthy diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
Investigation area	The investigation area is the area assessed throughout the Environmental Assessment and comprises the construction impact zone and additional investigation areas.
Key threatening process	A process specified in Schedule 3 of the Threatened Species Conservation Act 1995 that adversely affects threatened species, populations or ecological communities, or could cause those that are not threatened to become so.
Level crossing	A crossing provided at grade across the railway corridor.
Mitigation	Reduction in severity.
Option	A concept design alternative developed for consideration.
Overbridge	A bridges where a road or pedestrian footway is situated over the railway line.
Particulates	Dust and other fine particles.
Plant	Construction machinery, vehicles or equipment needed to carry out mechanical or construction activities.
Precautionary principle	If there are threats of serious or irreversible damage, lack of full scientific uncertainty should not be used as a reason for postponing measures to prevent environmental damage.
Proponent	Australian Rail Track Corporation (ARTC).
Rail corridor	The area of land dedicated to the ARTC between Maitland and Minimbah.
Rail formation	The sub-grade or earthworks beneath the ballast on which the rail track sits.
Rail track	The infrastructure on which a train travels. It includes two rails, sleepers, fastenings to secure the rails to the sleepers, and ballast around and under the sleepers.
Receiver	A noise modelling term used to describe a map reference point where noise is predicted. A sensitive receiver would be a home, work place, church, school or other place where people spend time.
Regenerated noise	Also referred to as “structure-borne” noise or “ground-borne” noise which results from ground-borne vibration, for example, from construction activities and may be transmitted into building structures, causing vibration of floor slabs and other heavy structures, and hence radiating noise into internal spaces.
Ruling grade	The steepest gradient on the railway track through a section of ascending track.
Scats	Animal droppings.
Sediment	Material of varying sizes that has been or is being moved from its site of origin by the action of wind, water or gravity.
Shadow effect	The combined safety clearance zones in front of and behind a fast passenger train. Other trains are excluded from this zone.

Site compound	Area enclosing construction machinery, materials and site offices usually adjacent to construction sites.
Slewing (slew)	Moving existing track to a new location to connect to new track or to change the existing track's horizontal geometry..
Spoil	Excess of rock and/or earth material resulting from excavation activities.
Sub-grade	A layer of rock or earth levelled and graded for a foundation underneath a road, pavement or railway.
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1, 1A and 2 of the Threatened Species Conservation Act 1995.
Toe of fill batters	The base or bottom of a fill batter or embankment.
Trailing crossover	A crossover that requires a train to travel in a reverse direction to travel through the curved leg of a turnout.
Train paths	A train path is a dedicated route between two locations, which is often scheduled.
Turnout	A rail track component that connects two railway tracks. The turnout comprises 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.
Underbridge	A bridge where a road, pedestrian footway or waterway crossing is situated under the railway line.
Up direction	The direction a train travels when proceeding towards Sydney.
Up Main	In a situation with more than one rail track in the rail corridor, the Up Main is the primary (main) rail line that trains usually traverse when they are heading toward Sydney and is usually positioned on the left when facing towards Sydney.
Up Relief	Secondary rail line that runs parallel with the main line(s) that trains usually traverse when they are heading toward Sydney and is usually positioned on the left of the Up Main line when facing towards Sydney. The Up Relief usually provides a passing facility enabling trains to pass those traversing or stationary on the main line thus giving relief to the main line operations.
Up side	In a situation with more than one rail track in the rail corridor, the Up side is the side of the track on which trains travel when they are heading towards Sydney and is usually positioned on the left when facing towards Sydney.

Executive Summary

The conclusions of the Flora and Aquatic Ecological Assessment undertaken as part of the Environmental Assessment for the Maitland to Minimbah Third Track Project (the Project) remain unchanged when impacts associated with the additional investigation areas are incorporated into the assessment.

The Project, including additional investigation areas, is considered unlikely to significantly impact threatened species or endangered ecological communities (EECs) listed on the *Threatened Species Conservation Act 1995* (TSC Act), *Fisheries Management Act 1994* (FM Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), as defined within the Environmental Assessment.

Within this context it is considered that the Project can show a 'maintain and improve' outcome in line with the mitigation actions defined within the Environmental Assessment through the implementation of a Compensatory Habitat Strategy. Furthermore, the Project is considered unlikely to constitute a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* in terms of flora and aquatic ecological impacts.

1. Introduction

This Flora and Aquatic Ecological Study has been prepared by the Hunter 8 Alliance on behalf of the Australian Rail Track Corporation (ARTC) as part of the Submissions Report for the Maitland to Minimbah Third Track Project (the Project). This report has been prepared to assess how proposed modifications to the design, construction and operation of the Project may amend or increase the potential ecological impacts identified in the Environmental Assessment, and develop any additional mitigation measures required to address such amended or increased potential impacts.

1.1 Background

The ARTC proposes to construct a third train track adjacent to the existing two tracks of the Main Northern Railway between Maitland and Minimbah, within the Hunter Valley, NSW (the Project).

The Project commences in Farley approximately two kilometres west of Maitland Station and continues through the local government areas of Maitland, Cessnock and Singleton for approximately 30 kilometres, concluding at Minimbah.

The Project would facilitate the more efficient movement of coal to the Port of Newcastle.

An Environmental Assessment of the Project was completed in May 2010 (Hunter 8 Alliance, 2010) in accordance with the Director General's requirements for undertaking the Environmental Assessment received by the ARTC on 25 May 2009. The Environmental Assessment was then placed on public exhibition from 9 June 2010 to 12 July 2010 in accordance with Section 75H(3) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). During this time submissions were invited from members of the public, government agencies and stakeholders.

As a result of the community consultation process and further consideration of the Project implementation, a number of modifications to the Project as described in the Environmental Assessment, are proposed.

1.2 Description of Project Modifications

Several key modifications to the Project, as described in Chapter 7 of the Environmental Assessment, are proposed. These modifications are summarised as follows:

- 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). These deferred works are termed Phase 2.
- 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).

Further detail on the proposed modifications to the design, construction and operation of the Project are provided in Chapter 5 of the Submissions Report.

1.3 Objectives and Purposes of this Report

Under Section 75H(6) of the *Environmental Planning and Assessment Act* 1979, the Department of Planning requires the Hunter 8 Alliance to prepare and submit a response to submissions made during the public exhibition period.

The objective of the Submissions Report (to which this report forms an appendix) is to:

- Provide information about the nature of the submissions received.
- Discuss how submissions have been considered and addressed.
- Describe aspects of the Project that have been modified.
- Provide specialist reports that incorporate issues raised in submissions and address the modifications to the Project.
- Describe how the Statement of Commitments has been revised to reflect the recent community consultation.

The purpose of this Flora and Aquatic Ecological Study is to consider how the proposed modifications to the design, construction and operation of the Project may amend the impact assessment included in the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment), and whether changes or additions to the mitigation measures included in the Environmental Assessment are required.

This Flora and Aquatic Ecological Study also assists in informing the responses in the Submissions Report to issues relating to ecology raised during the Environmental Assessment exhibition period.

1.4 Revised Construction Impact Zone

The proposed Project modifications described in Section 1.2 and detailed in Chapter 4 of the Submissions Report result in revisions to the construction impact zone described in Section 7.8 and shown in Figure 7.1 of the Environmental Assessment.

Figure 1-1 shows the revised construction impact zone and revised investigation area.

1.5 Additional Investigation Areas

The revised construction impact zone includes areas outside of the 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.

Figure 1-1 shows the revised construction impact zone, and identifies the additional investigation areas assessed as part of this Flora and Aquatic Ecological Study.

1.5.1 Lot 1 DP 1127199 at Rutherford

Lot 1 DP 1127199 at Rutherford occurs within the additional investigation areas. However, this land has already 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 native vegetation. However, this land would be cleared before construction under the existing development approval for the Project commences. Therefore, this area of native vegetation has been excluded from the vegetation clearing totals for the Project.

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

- Existing Railway
- Watercourse
- Cadastre
- Revised Construction Impact Zone
- Revised Investigation Area
- Watercourse Area
- National Park

Maitland to Minimbah Third Track
Submissions Report
Flora and Aquatic Ecology

Job Number 22-14471
Revision A
Date August 2010

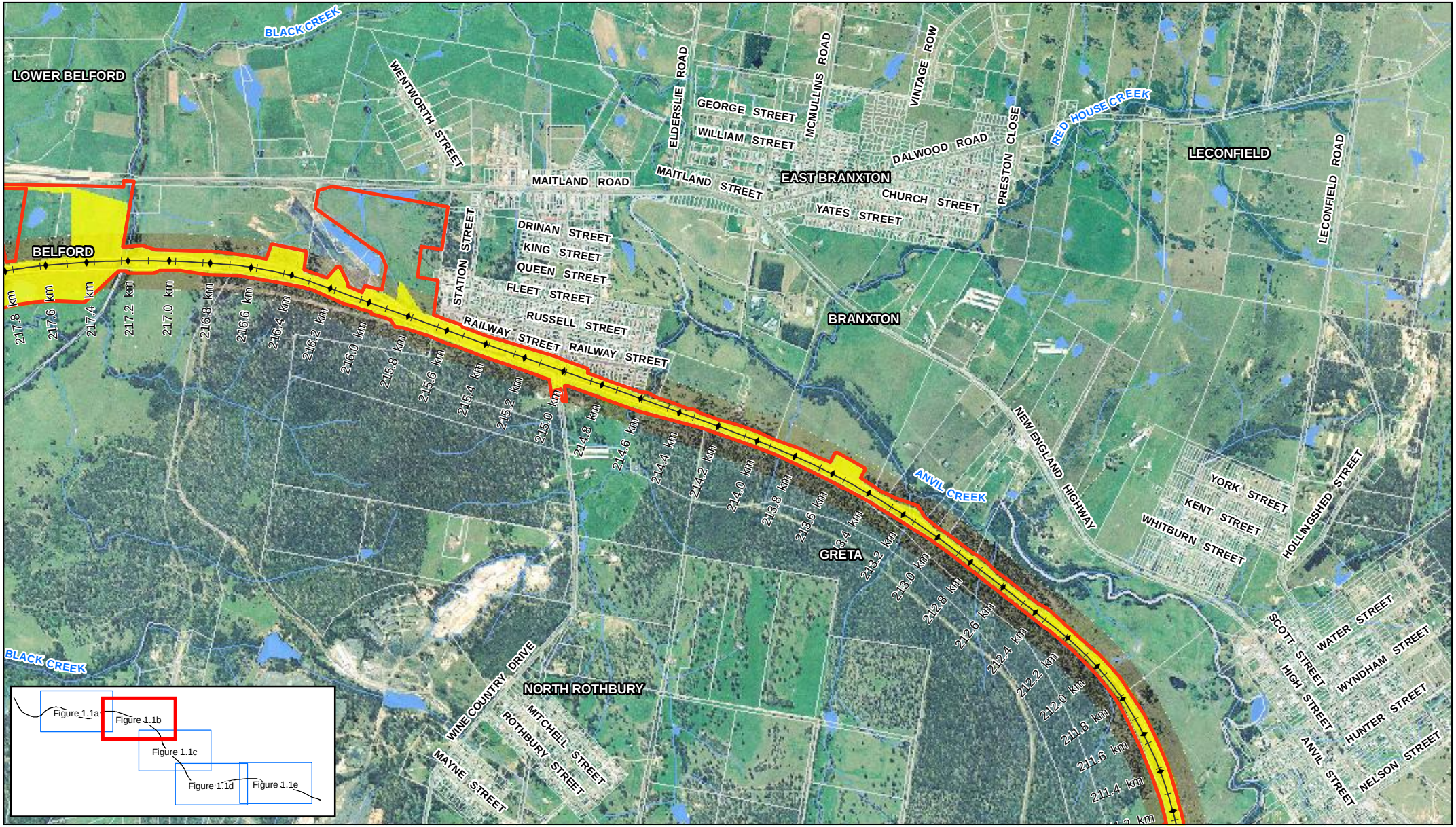
Revised Project Plan

Figure 1.1a

G:\22\14471\GIS\Maps\Deliverables\PPR\Ecology Specialist Report\PPR_ESR_StudyArea_20100701_A.mxd

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

Data Source: Geoscience Australia: Topography - 2002; Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Department of Lands: Cadastre - 2004. Created by: fmackay, tmorton



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

- Existing Railway
- Watercourse
- Cadastre
- Revised Construction Impact Zone
- Revised Investigation Area
- Watercourse Area
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Maitland to Minimbah Third Track
Submissions Report
Flora and Aquatic Ecology

Job Number	22-14471
Revision	A
Date	August 2010

Revised Project Plan

Figure 1.1b

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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

- Existing Railway
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- Watercourse Area
- National Park

Maitland to Minimbah Third Track
Submissions Report
Flora and Aquatic Ecology

Job Number	22-14471
Revision	A
Date	August 2010

Revised Project Plan

Figure 1.1c

G:\22\14471\GIS\Maps\Deliverables\PPR\Ecology Specialist Report\PPR_ESR_StudyArea_20100701_A.mxd

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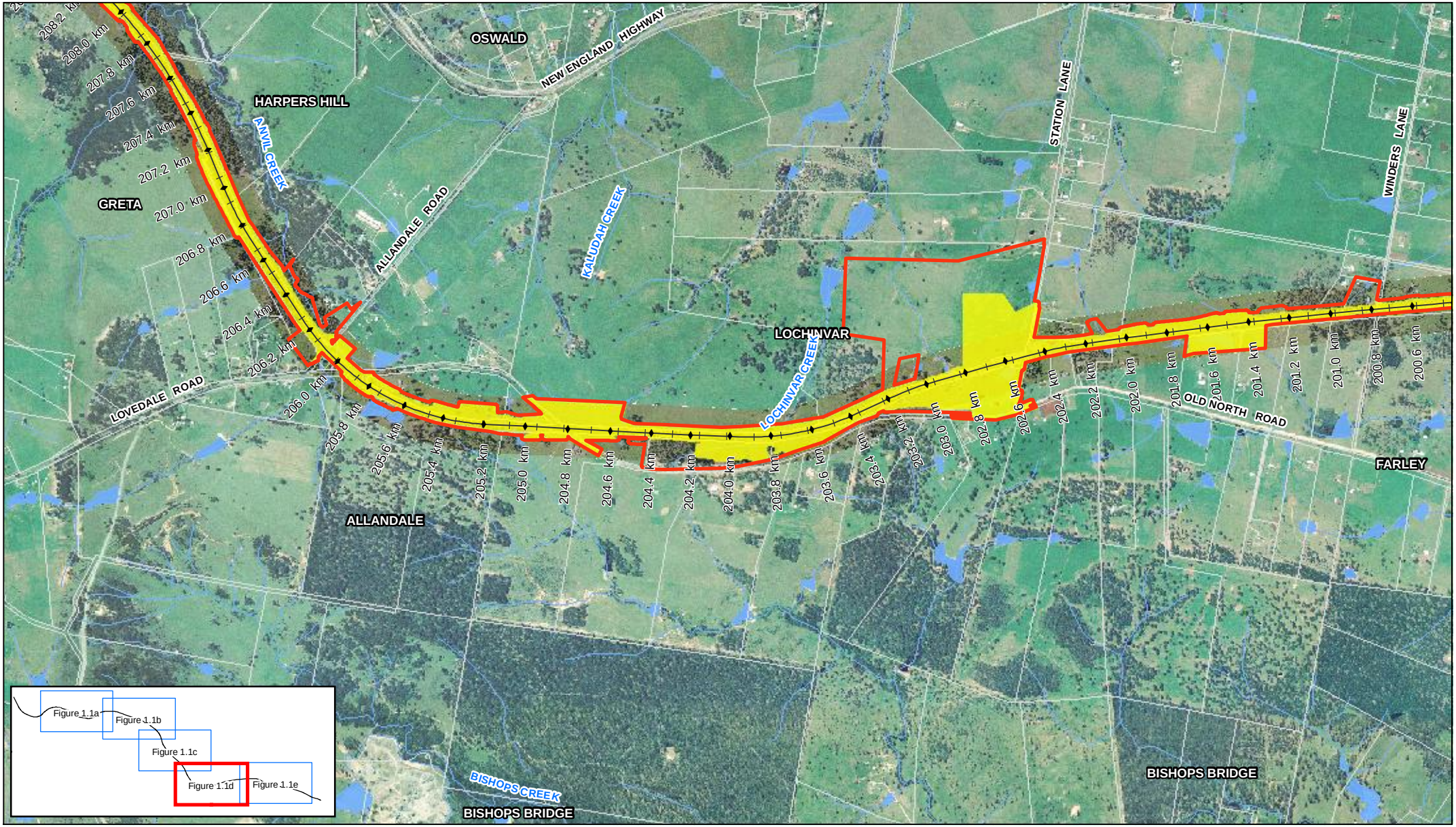

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0 95 190 380 570 760

Metres

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

N

LEGEND

- Existing Railway
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Revised Project Plan

Figure 1.1d

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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

- Existing Railway
- Watercourse
- Cadastre
- Revised Construction Impact Zone
- Revised Investigation Area
- Watercourse Area
- National Park

Maitland to Minimbah Third Track
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Flora and Aquatic Ecology

Job Number 22-14471
Revision A
Date August 2010

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Figure 1.1e

G:\22\14471\GIS\Maps\Deliverables\PPR\Ecology Specialist Report\PPR_ESR_StudyArea_20100701_A.mxd

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Data Source: Geoscience Australia: Topography - 2002; Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Department of Lands: Cadastre - 2004. Created by: fmackay, tmorton

2. Methodology

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

- Mapping of vegetation communities.
- 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.

2.1 Limitations

2.1.1 Seasonality

Surveys for the additional investigation areas were undertaken outside the optimal detection times for some threatened flora that may potentially occur in the investigation area, reducing the capacity to detect cryptic flora species (survey was outside their flowering season). Habitat assessments were undertaken throughout the additional investigation areas to address this limitation, to assess habitat suitability for cryptic threatened flora. The precautionary principle applies to circumstances where potential habitat is identified and is impacted by the Project, which is an assessment approach that is adequately consistent with industry standards.

2.1.2 Access

Due to restrictions on access, the following properties were not surveyed:

- Lot 5 DP758078.
- Lot 30 DP755209.

Lot 5/ DP758078 was surveyed from the road reserve and adjacent properties. Hunter Lowland Redgum Forest EEC extends onto this property from adjacent properties, where access is available. The extent of this EEC can be mapped accurately using aerial photography. No threatened flora is considered likely to occur on this property, no aquatic habitat occurs, and no further surveys are required.

Lot 30/ DP755209 was surveyed previously, including an aquatic habitat assessment and RARC at Sweetwater Creek, during the investigations undertaken as part of the Environmental Assessment. The extent of Swamp Oak Riparian Forest EEC on this property can be mapped accurately using aerial photography. No threatened flora is considered likely to occur on this property and no further surveys are required.

Table 2-1 details the extent of field survey for the additional investigation areas. This is in addition to the survey effort outlined in Table 4-2 of the Flora and Aquatic Ecology Ecological Assessment (Appendix E of the Environmental Assessment).

Table 2-1 Additional Investigation Area Survey Effort

Vegetation Community	Minimum Survey Requirement (DEC 2004)	Survey Effort	Approximate Number of Person Hours
Lower Hunter Spotted Gum Ironbark Forest	2 transects and 2 quadrats[3]	3 transects and 3 quadrats	6
Hunter Lowland Redgum Forest	2 transects and 2 quadrats[3]	3 transects and 3 quadrats	6
Swamp Oak Riparian Forest	2 transects and 2 quadrats[3]	2 transects and 2 quadrats	4
Grey Box Spotted Gum Ironbark Forest	2 transects and 2 quadrats[3]	2 transects and 2 quadrats	4
Freshwater Wetland	1 transect and 1 quadrats[4]	1 transect and 1 quadrat	1
Cleared with Scattered Trees/ Open Pasture/ Weedy Area	3 transects and 3 quadrats[2]	3 transects and 3 quadrats	2
Hakea Scrub	1 transect and 1 quadrats[4]	1 transect and 1 quadrat	1
Aquatic Habitat Assessments	NA	2 RARC 2 aquatic habitat assessments	4
Targeted Threatened Flora Survey	12 random meanders[5]	12 random meanders	12

Notes: [1]: based on 251- 500 hectare category in Table 5-1 and 5-2 of DEC (2004); [2]: based on 51 – 250 hectare category in Table 5-1 and 5-2 of DEC (2004); [3]: based on 2 – 50 hectare category in Table 5-1 and 5-2 of DEC (2004); [4]: based on < 2 hectare category in Table 5-1 and 5-2 of DEC (2004); [5]: based on 30 minutes for each quadrat sampled within the same vegetation community (excludes Open Pasture/ Grassland/ Weedy Area and Cleared areas) as outlined in Table 5-1 of DEC (2004).

3. Existing Environment

3.1 Vegetation Communities

Eight distinct vegetation communities are present in the original investigation area, these being:

- Lower Hunter Spotted Gum Ironbark Open Forest.
- Forest Red Gum Open Forest.
- Swamp Oak Riparian Forest.
- Grey Box Spotted Gum Ironbark Open Forest.
- Freshwater Wetland.
- Hakea Scrub.
- Cleared with Scattered Trees/ Open Pasture/ Weedy Area.
- Plantation.

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 the vegetation communities 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 5.2 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment) has been updated to include vegetation mapping of these additional investigation areas (Figure 3.1).

3.1.1 Endangered Ecological Communities

There are five EECs listed under the *Threatened Species Conservation Act 1995* (TSC Act) that occur in the investigation area as described in Section 5.2 in the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment):

- Forest Red Gum Open Forest within the investigation area is characteristic of Hunter Lowland Redgum Forest EEC.
- Spotted Gum- Ironbark Open Forest within the investigation area is characteristic of Lower Hunter Spotted Gum-Ironbark Forest EEC.
- Swamp Oak Riparian Forest within the investigation area is characteristic of Swamp Oak Floodplain Forest EEC.

- Freshwater Wetland within the investigation area is characteristic of Freshwater Wetland EEC.
- Central Hunter Ironbark Spotted Gum Grey Box Open Forest within the investigation area is characteristic of Central Hunter Ironbark Spotted Gum Grey Box Forest EEC.

The following *Threatened Species Conservation Act 1995* listed EECs are present in the additional investigation areas:

- Hunter Lowland Redgum Forest EEC Forest Red Gum Open Forest.
- 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 3.1 has been updated to include areas of EEC within the additional investigation areas.

3.2 Threatened Flora Recorded, or Likely to Occur, Within the Investigation area

One threatened flora (Slaty Red Gum (*Eucalyptus glaucina*)) was recorded in the investigation area. The Slaty Red Gum is listed as a vulnerable species under the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999*. No other threatened flora were recorded, and based on an assessment of the habitat available and species habitat requirements, it is considered unlikely that any other threatened flora would occur in the investigation area.

Slaty Red Gum was also recorded within the additional investigation areas. Figure 3.1 has been updated to include areas of Slaty Red Gum within the additional investigation areas. No other threatened flora is considered likely to occur within the additional investigation areas.

3.2.1 Other Flora of Conservation Significance

Mountain Grevillea (*Grevillea montana*), a Rare or Threatened Australian Plant (ROTAP), was recorded in the original investigation area and additional investigation areas. Figure 3.1 has been updated to include areas of Mountain Grevillea within the 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. This species occur within wet sclerophyll forest and on the edges of rainforest, in moist protected areas in loamy and clayey soils, primarily from the Hunter Valley to the Gosford- Sydney district. The occurrence of this species was observed to extend well beyond the boundaries of the additional investigation areas. This species has a ROTAP code of 2RCa, meaning it has a restricted distribution of less than 100 km, is rare but with no current identifiable threat, and is adequately reserved within a proclaimed reserve. Figure 3.1 shows the distribution of Gosford Wattle within the additional investigation areas.

3.3 Threatened Aquatic Species

The *Fisheries Management Act 1991* 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 original investigation area or the additional investigation areas. Further assessment under the *Fisheries Management Act 1991* is not required for the Project.

3.4 Aquatic Habitat Assessment

There are several named creeklines in the Project 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 Project investigation area also includes numerous permanent and ephemeral unnamed tributaries to these creeks.

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.

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 has been assessed previously in Table 5-4 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

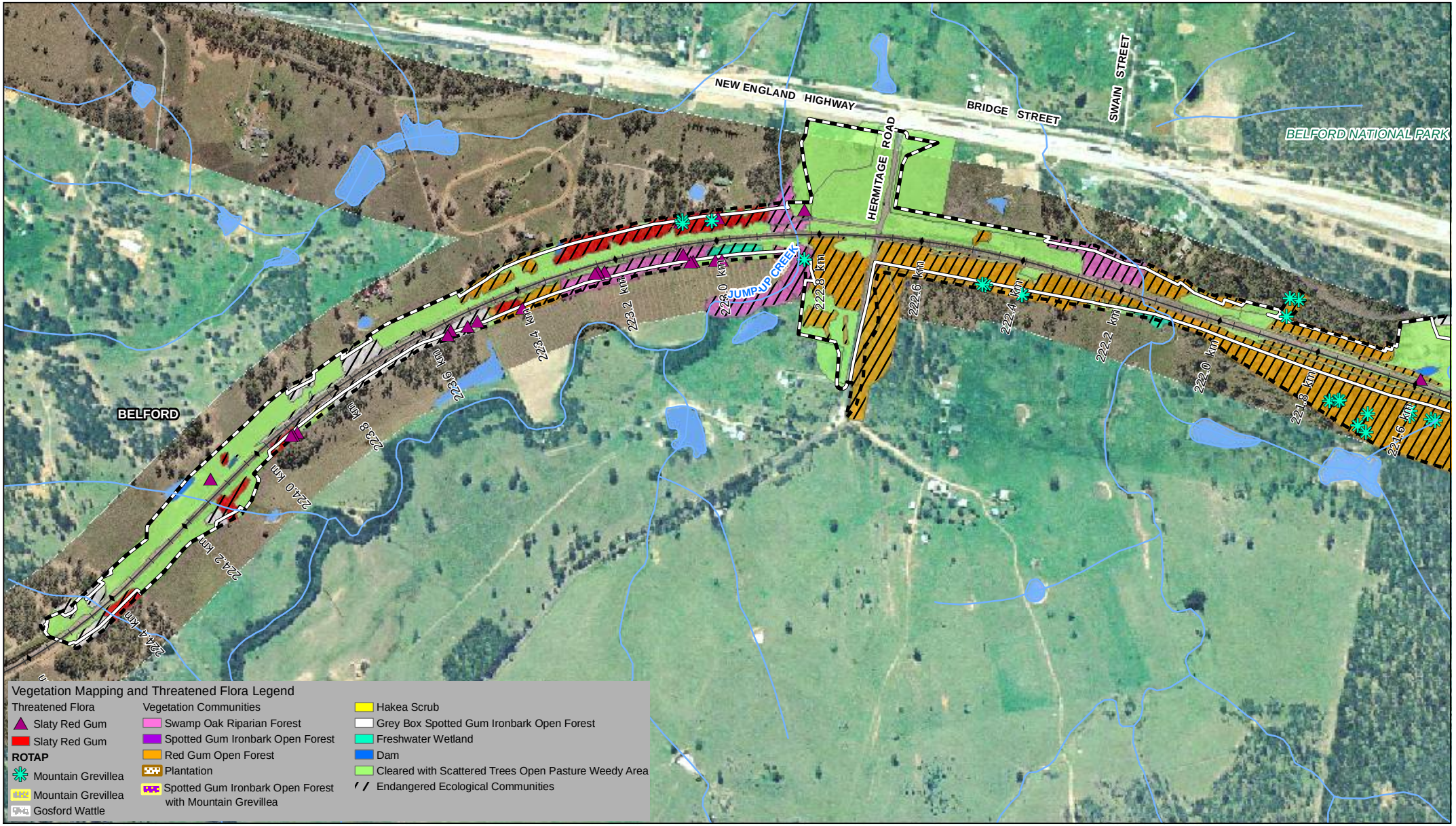
An ephemeral drainage line occurs within the additional investigation areas near Station Lane, and has been assessed previously in Table 5-4 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

Stony Creek occurred within the 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 Area. 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.

Table 3-1 Aquatic Habitat Assessment

General Waterway Morphology and Characteristics	Riparian Vegetation	Habitat Assessment	RARC Score	Photo
Sweetwater Creek is a permanent creek, with a defined channel, approximately 2-3 m wide, characterised by a narrow corridor of dense native riparian vegetation within an agricultural area. Surrounding land use is agriculture and infrastructure. Surrounding land use is rural residential, agriculture and infrastructure.	Canopy: *Casuarina glauca.* Shrub: *Casuarina glauca.* Groundcover/ Macrophytes: *Lomandra longifolia* *Typha orientalis* *Eleocharis cylindrostachys* *Phragmites australis* *Imperata cylindrica* *Tradescantia fluminensis** *Juncus acutus** *Paspalum dilatatum** *Juncus usitatus*	Sweetwater Creek provides permanent habitat for fish and aquatic macroinvertebrates. Deep pools, woody snags and abundant in-stream and overhanging native vegetation provide structural habitat. The creek was flowing slowly during the survey and water did not appear stagnant, although is affected by high turbidity. The creek is likely to provide habitat for common native fish and macroinvertebrates. The creek is suitable for platypus foraging habitat however the banks are not suitable for burrow sites. Database searches indicate no threatened aquatic species occur in the investigation area. Classed as moderate fish habitat using NSW Fisheries (1999) guidelines.	**33 - Average** High levels of native vegetation apart from groundcover, fairly continuous, good native regeneration, however lack of habitat features such as hollow-bearing trees, leaf litter and hollow logs result in an overall score of 33 and a rating of average. Habitat: 8/11 Cover: 10/12 Natives: 6/9 Debris: 4/10 Features: 5/8 Total: 33/ 50	



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

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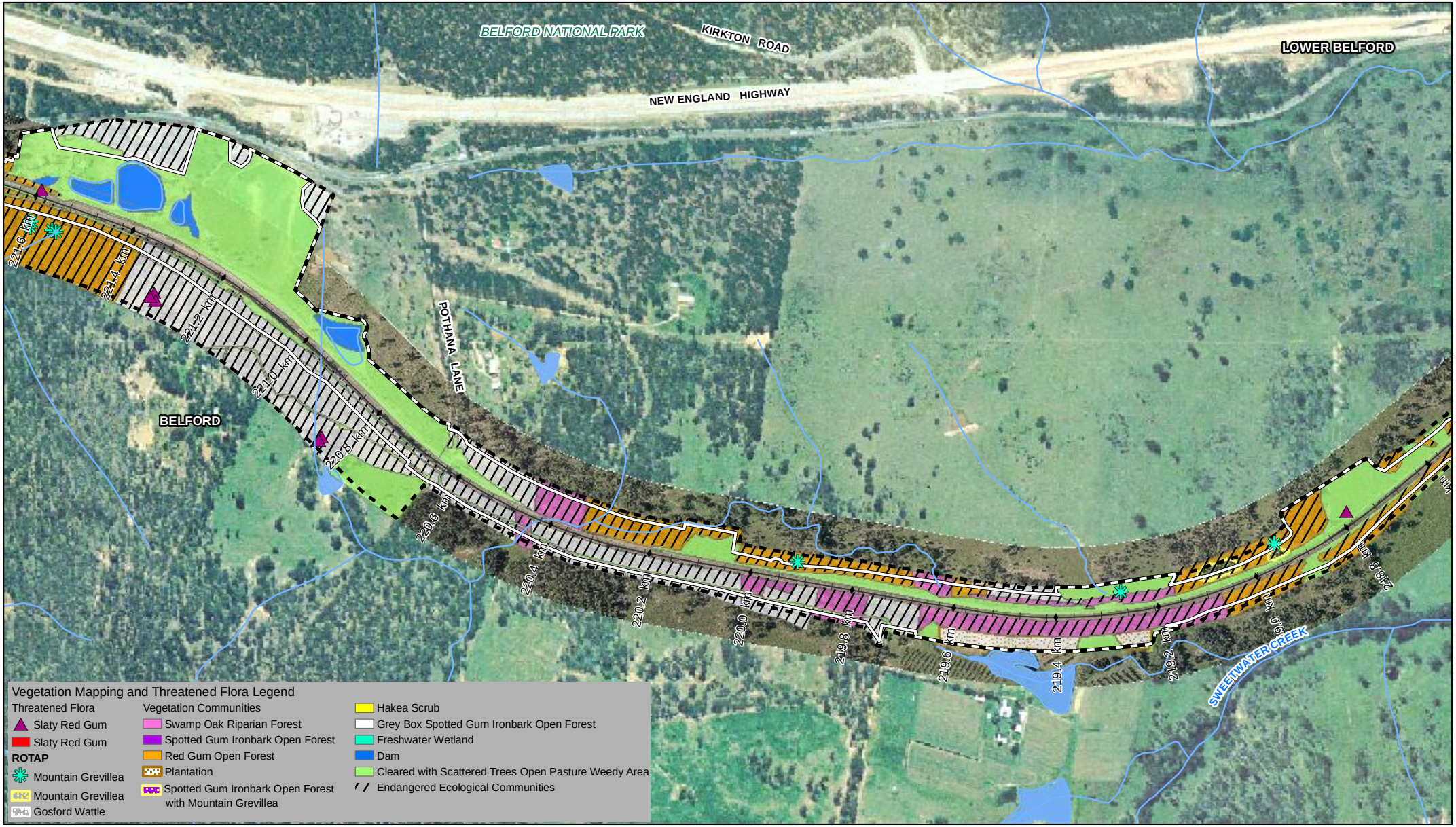
Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1a

G:\22\14471\GIS\Maps\Deliverables\PPR\Ecology Specialist Report\PPR_ESR_VegetationMapping_20100708_A.mxd

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

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: fmackay



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Metres

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

N

LEGEND
- Revised Investigation Area
- Existing Railway
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Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1b

G:\22\14471\GIS\Maps\Deliverables\PPR\Ecology Specialist Report\PPR_ESR_VegetationMapping_20100708_A.mxd

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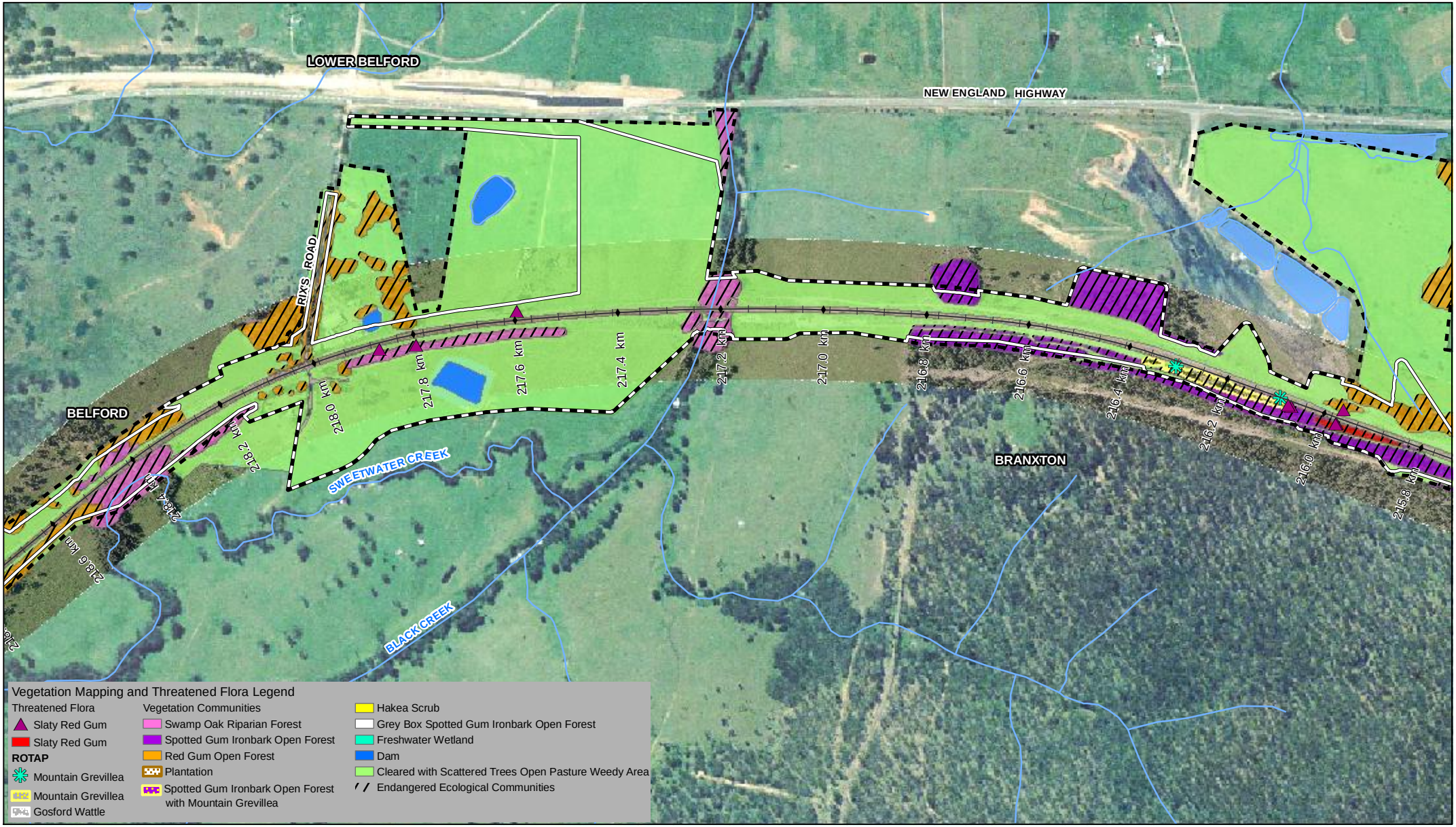

1:10,000 (at A4)

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

- Revised Investigation Area
- Existing Railway
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- Watercourse
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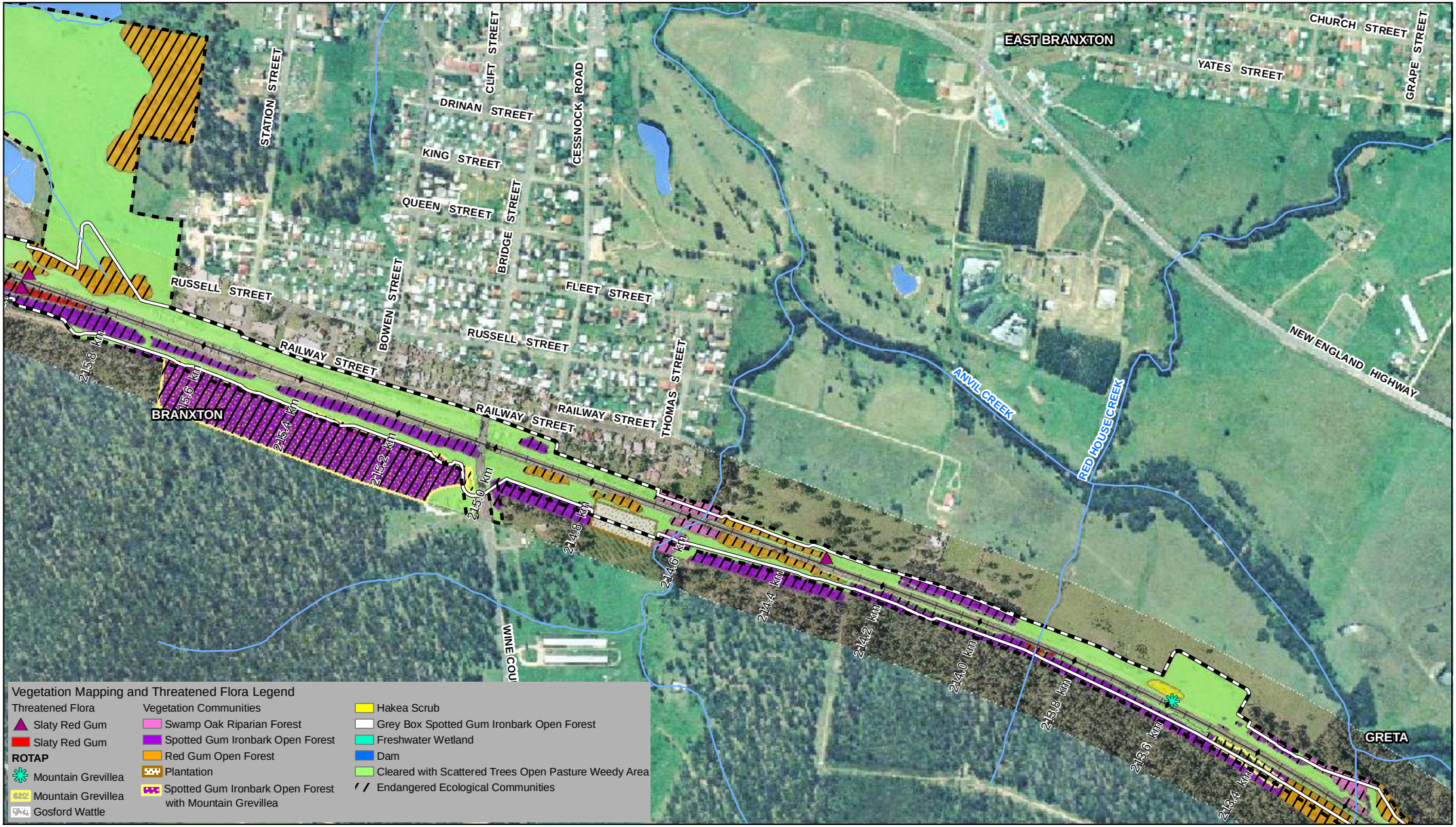
Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1c

G:\22\14471\GIS\Maps\Deliverables\PPR\Ecology Specialist Report\PPR_ESR_VegetationMapping_20100708_A.mxd

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

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: fmackay



Vegetation Mapping and Threatened Flora Legend

Threatened Flora
- Slaty Red Gum
- Slaty Red Gum

ROTAP
- Mountain Grevillea
- Mountain Grevillea
- Gosford Wattle

Vegetation Communities
- Swamp Oak Riparian Forest
- Spotted Gum Ironbark Open Forest
- Red Gum Open Forest
- Plantation
- Spotted Gum Ironbark Open Forest with Mountain Grevillea
- Hakea Scrub
- Grey Box Spotted Gum Ironbark Open Forest
- Freshwater Wetland
- Dam
- Cleared with Scattered Trees Open Pasture Weedy Area
- Endangered Ecological Communities

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
- Revised Investigation Area
- Existing Railway
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- Watercourse
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Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1d

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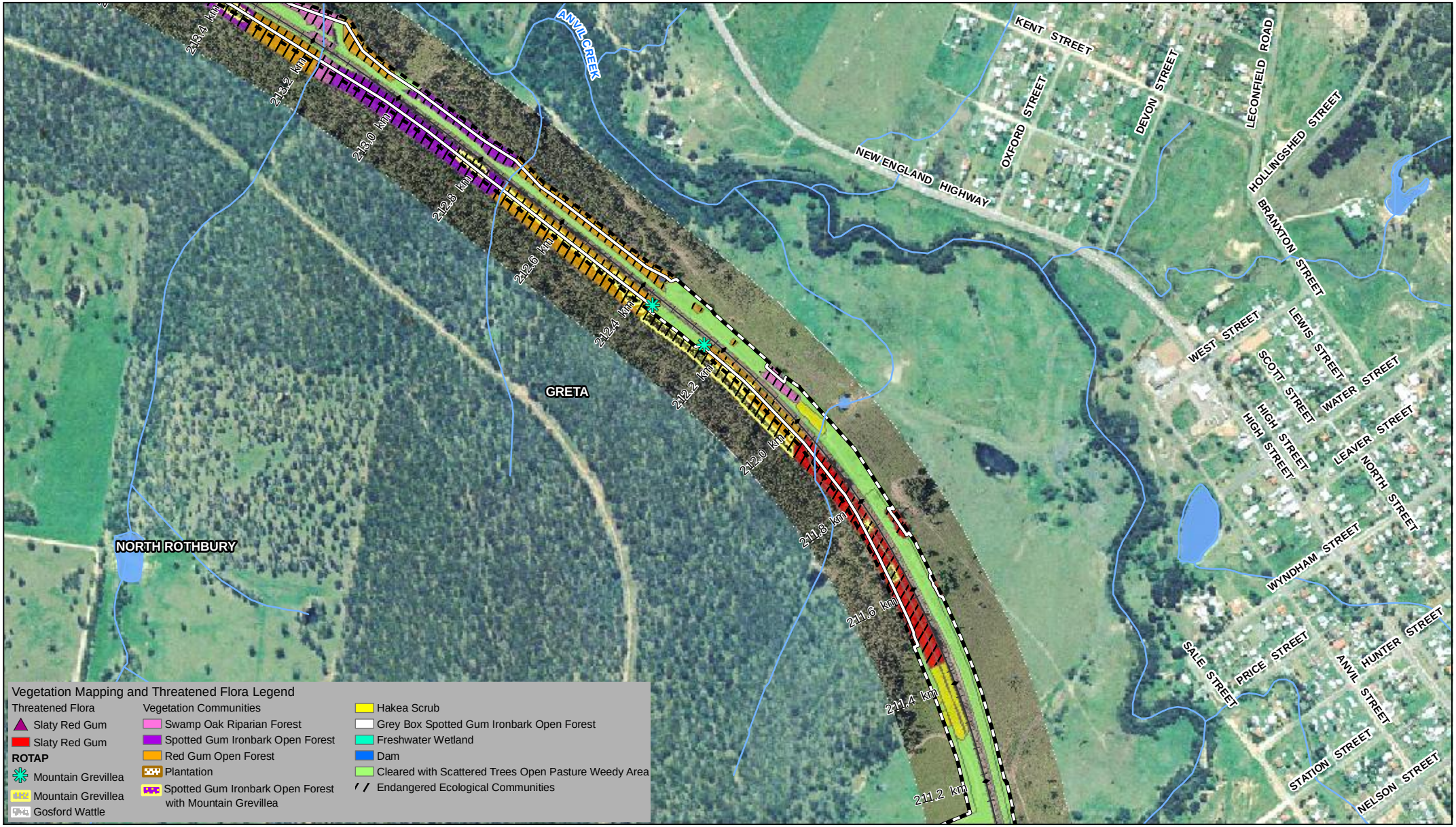
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: fmackay



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

- Revised Investigation Area
- Existing Railway
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- Watercourse
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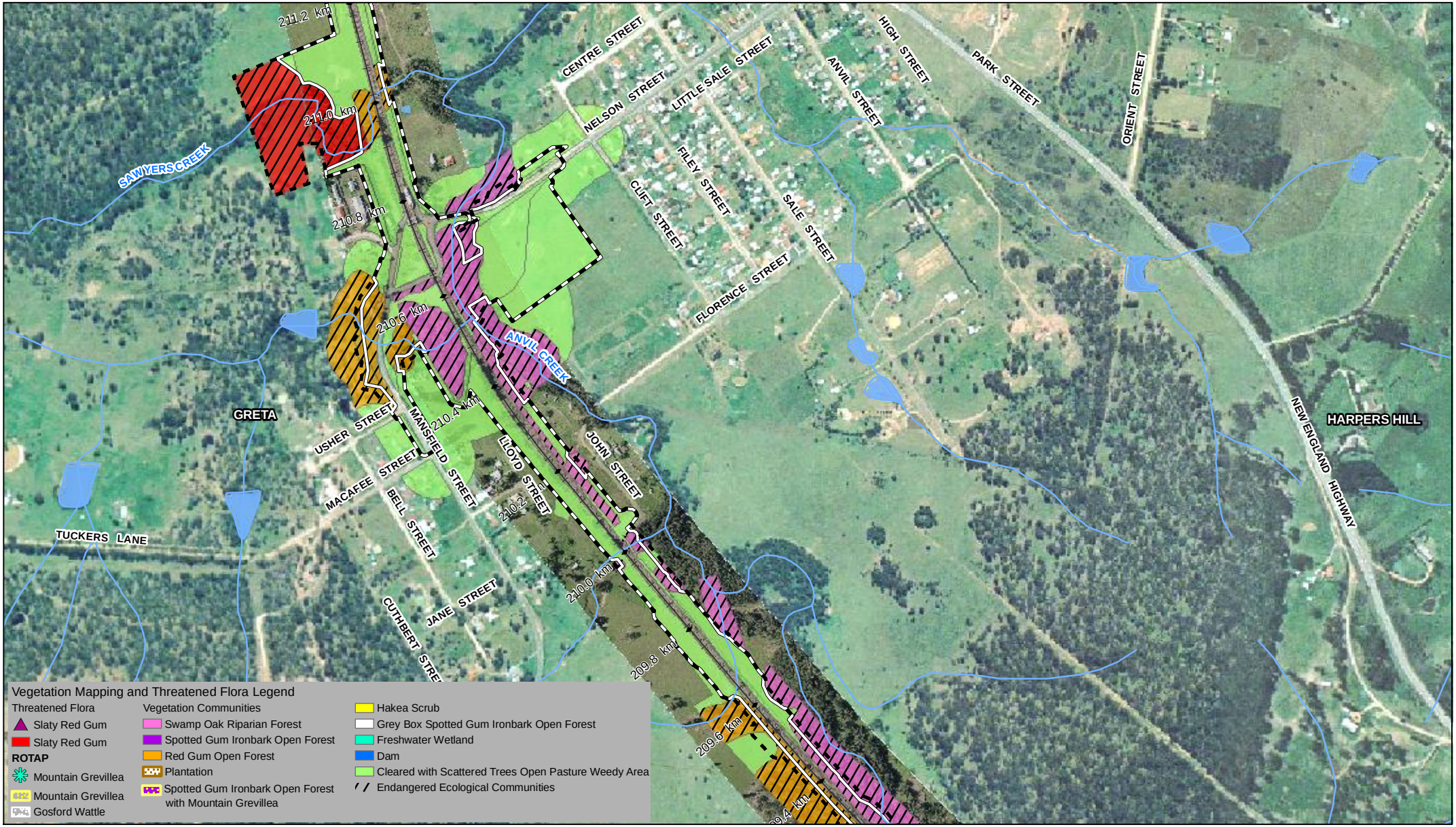
Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1e

G:\22\14471\GIS\Maps\Deliverables\PPR\Ecology Specialist Report\PPR_ESR_VegetationMapping_20100708_A.mxd

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

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: fmackay



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

- Revised Investigation Area
- Existing Railway
- Revised Construction Impact Zone
- Watercourse
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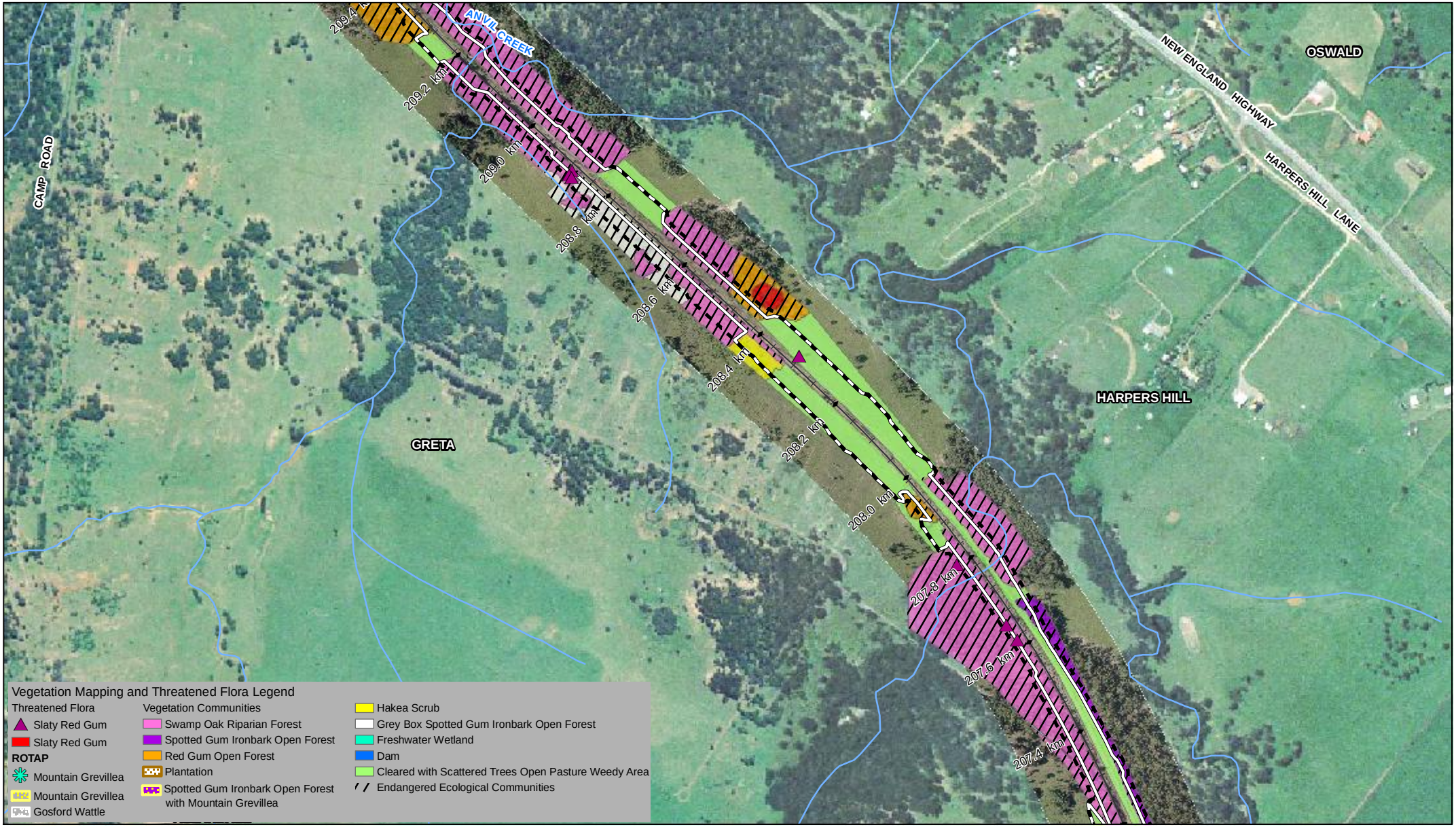
Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1f

G:\22\14471\GIS\Maps\Deliverables\PPR\Ecology Specialist Report\PPR_ESR_VegetationMapping_20100708_A.mxd

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

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: fmackay



1:10,000 (at A4)

0 40 80 160 240 320

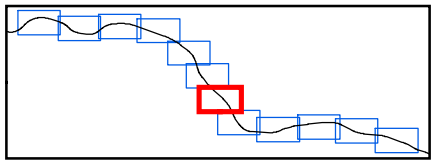
Metres

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

N

LEGEND

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



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Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1g

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Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: fmackay

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
- Revised Investigation Area
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Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1h

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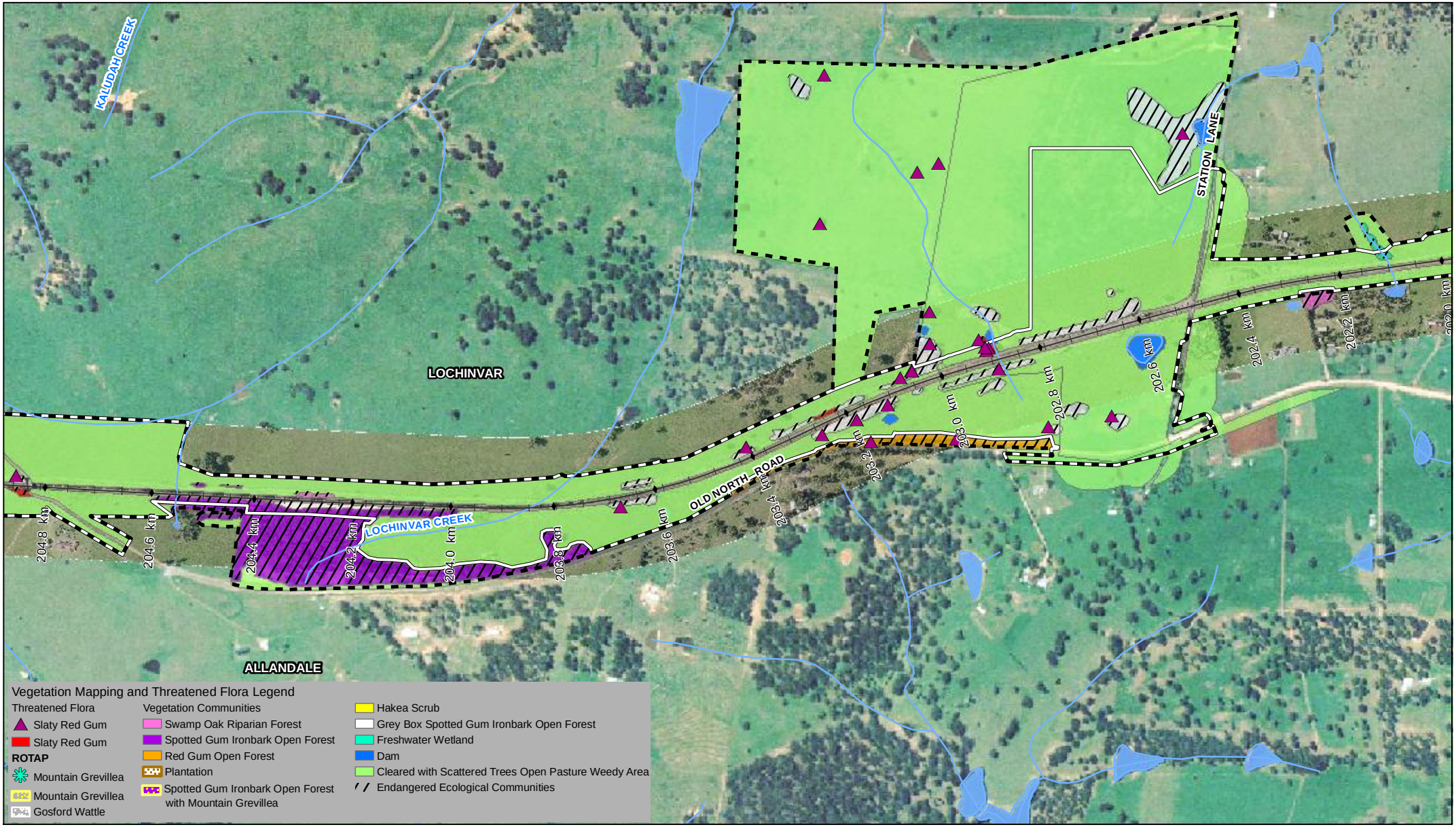
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: fmackay



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

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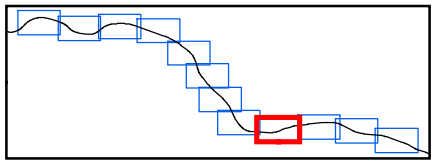
- Watercourse Area



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Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1i

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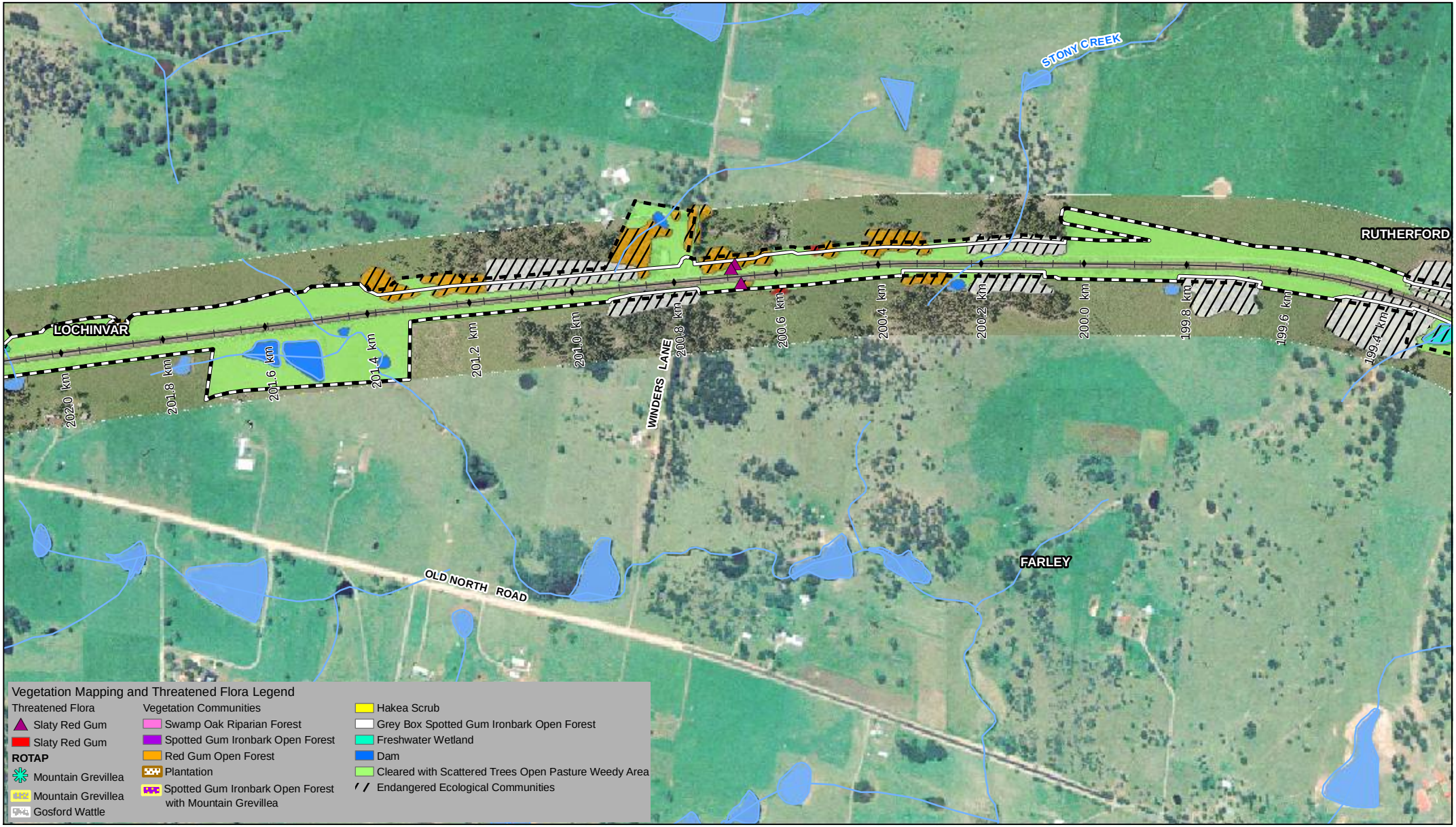
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: fmackay



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

- Revised Investigation Area
- Existing Railway
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Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1j

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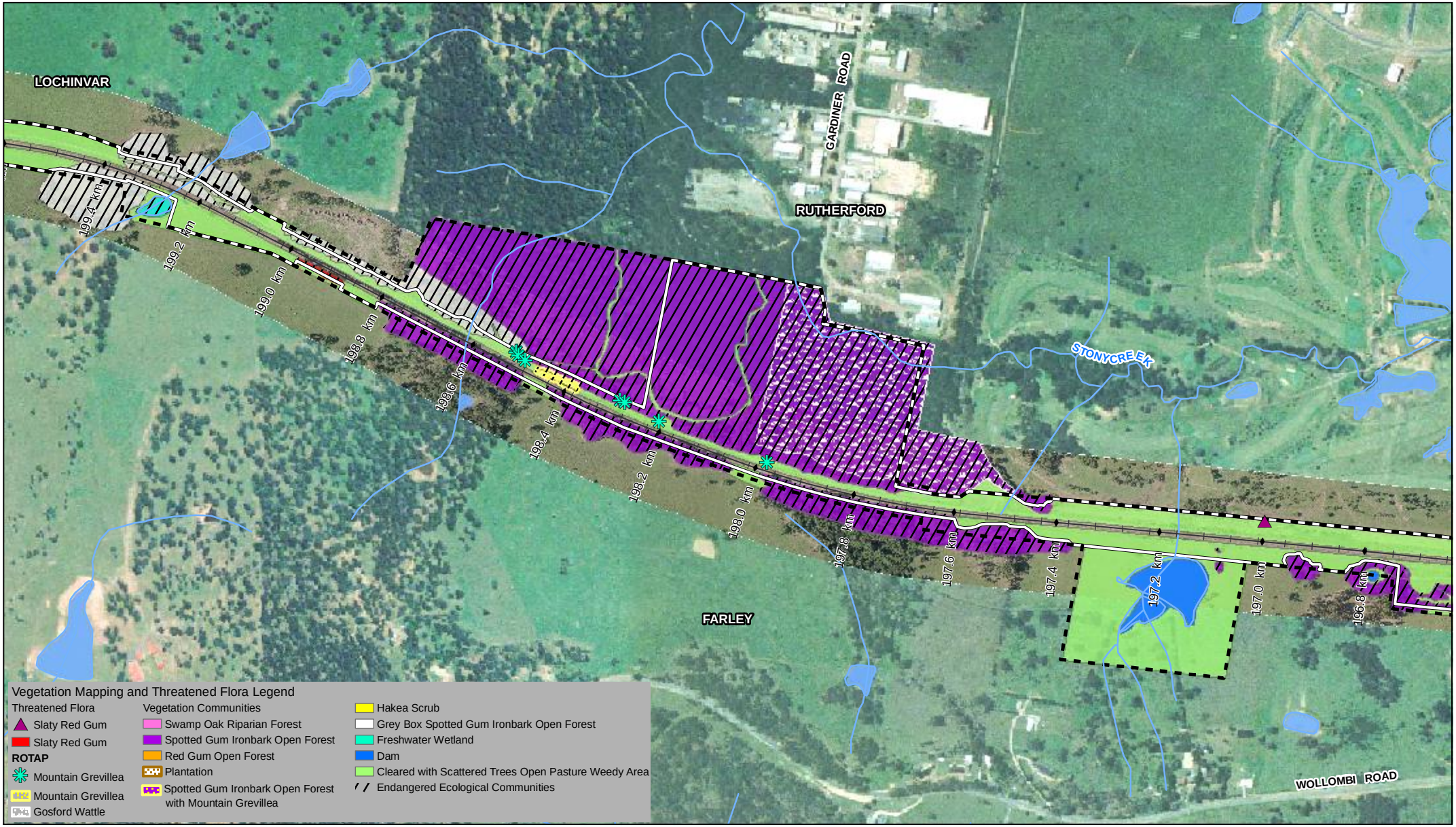
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: fmackay



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

- Revised Investigation Area
- Existing Railway
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Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1k

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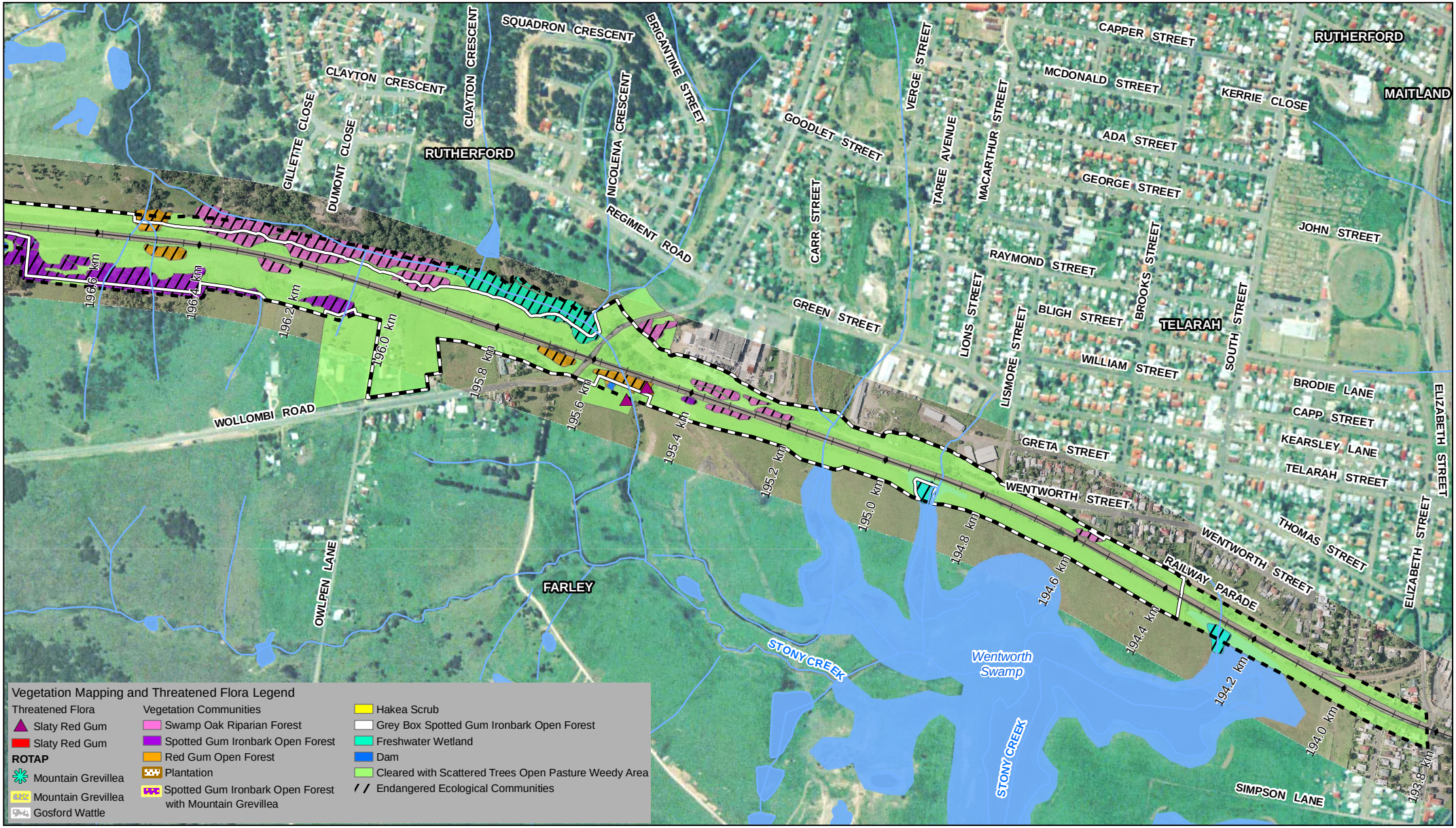
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: fmackay



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

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Vegetation Mapping and Threatened Flora in the Study Area

Figure 3.1l

G:\22\14471\GIS\Maps\Deliverables\PPR\Ecology Specialist Report\PPR_ESR_VegetationMapping_20100708_A.mxd

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4. Impact Assessment

The Project has been designed along the principles of avoidance, mitigation and offsetting in that order. Numerous 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 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 Environment Water Heritage and the Arts (DEWHA) to offset EECs and Slaty Red Gum cleared for the Project.

4.1 Revised Clearance

Since the Environmental Assessment was undertaken, several design modifications have resulted in changes to the Project. These changes have resulted in some areas included in the construction impact zone in the Environmental Assessment now not requiring clearance, and 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 in the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment) has been updated (Table 4-1) to show 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. Such as, the clearing associated with Phase 2 would not require offsetting until clearing had been undertaken.

Table 4-1 also outlines clearing associated with 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 for the Project, 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 4-1 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 occurs 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 occurs 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 occur within this vegetation community.

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
Plantation	0.1 hectares	1.4 hectares	1.4 hectares	0.3 hectares	1.1 hectares	0 hectares	None.
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 Gum[1]	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 Grevillea[2]	1.6 hectares	1.4 hectares	1.4 hectares	0.5 hectares	0.9 hectares	1.1 hectares	Medium. ROTAP species.
Gosford Wattle[3]	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	-

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
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.

4.2 Conclusion

4.2.1 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 of 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.

4.2.2 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 approximately 61.1 hectares reported in the original Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

Establishing offset areas and revegetation works for EECs cleared as discussed in Section 5 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.

All EEC clearing 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.

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.

4.2.3 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. This 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 Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment).

4.2.4 Aquatic Ecology

The Project would involve clearing and/or filling small areas of freshwater wetland and riparian vegetation, realignment of 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 (see Section 4.1 above). 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 6.5 and 6.6 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 a 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 (see Section Table 4-1 above). As this unnamed tributary is an ephemeral drainage line, no instream woody snags or aquatic vegetation would be impacted. Impacts at Sweetwater Creek associated with these works are considered similar to those described in Section 6.5 and 6.6 of the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment) and are considered unlikely to result in impacts on aquatic process, species and habitat providing appropriate erosion and sedimentation controls are implemented as part of a Spoil and Fill Management Plan.

Impacts to Stony Creek are consistent with those described in Section 6.5 and 6.6 of the Flora and Aquatic Ecological 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 (see Section 4.1 of this report).

5. 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 additional investigation areas. 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 ecological 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 5-1. 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 5-1 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 5-1 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 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: Excludes vegetation clearance on Lot 1 DP 1127199.

6. Conclusions

The impacts, mitigation measures and conclusions outlined in the Flora and Aquatic Ecological Assessment (Appendix E of the Environmental Assessment), undertaken for Stage 2 of the Maitland to Minimbah Bank Third Track Project equally apply to those identified within the additional investigation areas.

The Project, including additional investigation areas, is considered unlikely to have a significant impact on threatened species or ecological communities listed on the TSC Act provided sufficient offsetting areas for impacted EECs and Slaty Red Gum are established as part of the Compensatory Habitat Strategy.

The Project, including additional investigation areas, would not impact on threatened species or ecological communities listed under the FM Act. Impacts on aquatic species, habitat and processes are considered unlikely providing appropriate erosion and sedimentation controls are implemented as part of a Spoil and Fill Management Plan.

The Project, including additional investigation areas, is considered unlikely to have a significant impact on threatened species or ecological communities listed on the EPBC Act. Furthermore, the Project is considered unlikely to constitute a controlled action under the EPBC Act in terms of flora and aquatic ecological impacts.

7. References

Department of Environment and Conservation (DEC) (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (Working Draft). Department of Environment and Conservation, Hurstville, NSW.

Department of Environment and Conservation and Department of Primary Industries (2005) *Draft Guidelines for Threatened Species* under Part 3A of the *Environmental Planning and Assessment Act 1979*. Department of Environment and Conservation, Hurstville, NSW.

Jansen A., Robertson A., Thompson L. and Wilson A. (2005) *Rapid Appraisal of Riparian Condition Version Two. River and Riparian Land Management Technical Guideline*, Number 4A October 2005.

NSW Fisheries (1999) *Policy and Guidelines: Aquatic Habitat Management and Fish Conservation* 1999 Update, Smith, A.K. & Pollard, D.A. (eds), NSW Fisheries, Port Stephens, NSW.