Part C
Environmental Assessment

8. Environmental Risk Analysis

8.1 Assessment Approach

This chapter describes the Environmental Risk Analysis undertaken for the Project. The analysis is an important part of the environmental assessment process. It provides a framework for identifying and analysing potential environmental impacts of the Project, and enables the design to be developed in accordance with the principles of ecologically sustainable development. The Environmental Risk Assessment Report is in Appendix D.

The Director General's Environmental Assessment Requirements for the Project identifies environmental risk analysis as a key issue for the Environmental Assessment. Table 8-1 outlines the Director-General's Environmental Assessment Requirements relating to risk environmental assessment and where they have been addressed.

Table 8-1 Director-General's Environmental Assessment Requirements – Risk Assessment

Director-General's Environmental Assessment Requirements	Where Addressed
Notwithstanding the key assessment requirements [listed within the DGRs], the Environmental Assessment must include an environmental risk analysis to identify: - Potential environmental impacts associated with the project (construction and operation). - Proposed mitigation measures. - Potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this risk analysis, an appropriately detailed impact assessment of this additional key environmental impact must be included in the Environmental Assessment.	Table 8-3

The purpose of the risk assessment is to address the Director General's Requirements relating to environmental risk analysis. The approach is consistent with the *AS4360: Risk Management* and provides a structured framework for analysis.

The objectives of the risk assessment are to:

- Identify and confirm key environmental impacts of the Project which require detailed investigation and summarise the risk assessment findings, in particular identify any significant residual risks.
- Facilitate a consistent approach to risk assessment across the various environmental programs. This framework should be applied conservatively to the Project through a repeatable and robust process.
- Inform the ongoing design and construction processes of key risks and provide a clear process for the formulation and management of measures to mitigate the risk.
- Encourage the level of investigation of various project risks to be commensurate with the risk of the environmental impacts.

The approach of the Environmental Risk Assessment is an iterative style and is widely recognised and used for environmental impact assessments. The approach is outlined in Figure 8.1.

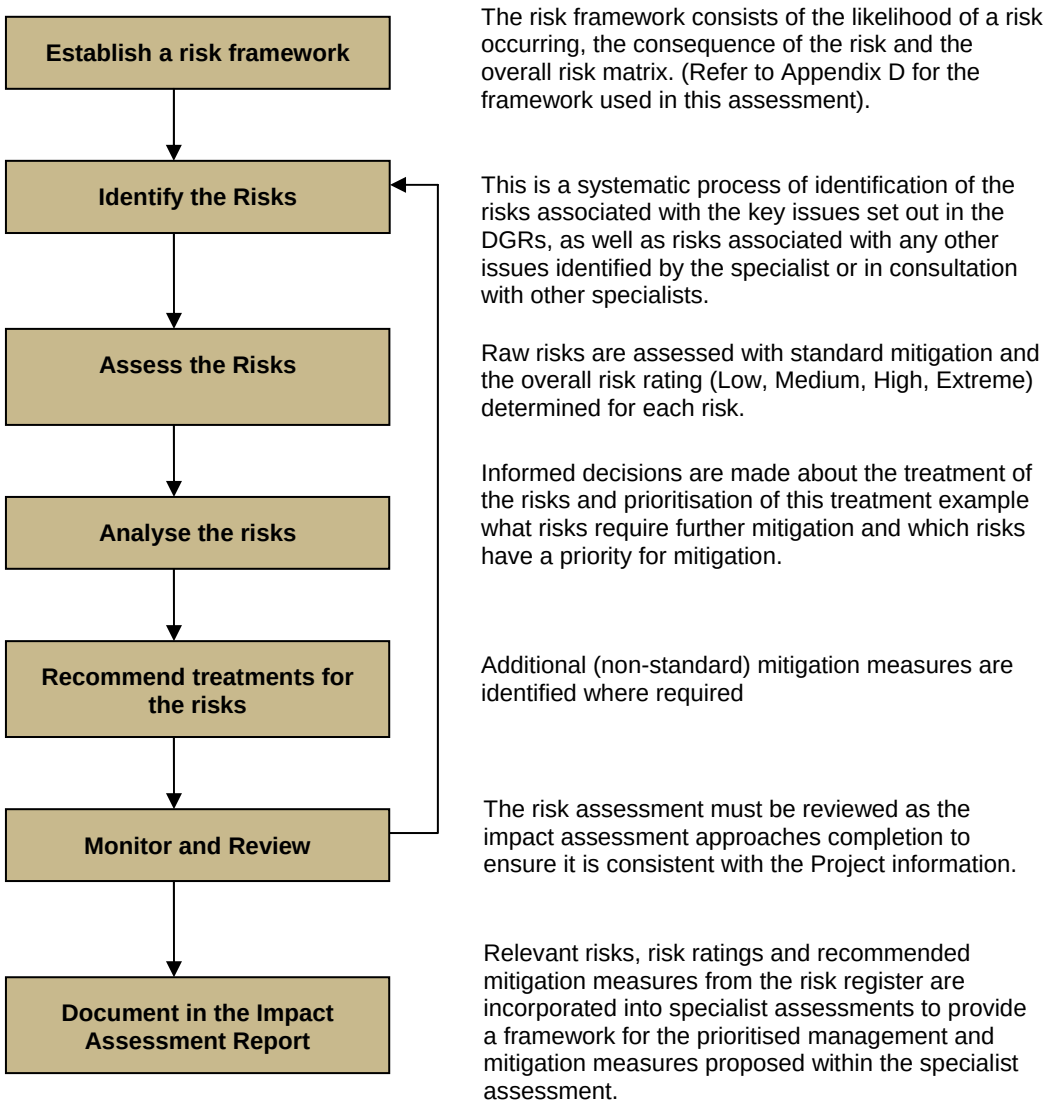
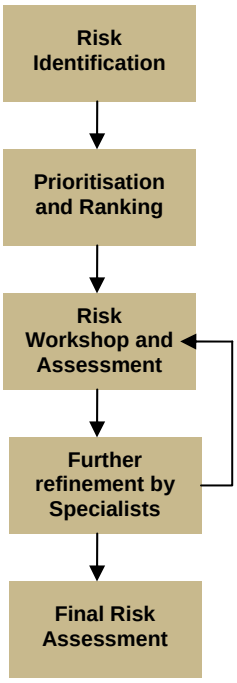


Figure 8.1 Overview of the Environmental Assessment Risk Analysis Process

A risk assessment process is adopted when dealing with uncertainty. It deals with events that could occur and, by definition, there is always inherent uncertainty in the identification and estimation of environmental impacts. It adds value to the overall process through alleviation of the uncertainty by identifying and outlining environmental issues, providing a means to prioritise these issues (through assessment of the likelihood and consequence) and apply appropriate management and mitigation measures. The framework used for risk assessment is included in Appendix D.

Risk assessment is a component of the overall integrated assessment approach for this environmental assessment and draws upon the interrelated and interdependent aspects of environmental assessment (Figure 8.2). The method outlined within this report is developed under the Hunter 8 Alliance risk assessment process and has been developed to support the environmental impact assessment process through providing a consistent framework for assessment across all environmental elements. The assessment process is also able to help design be developed in accordance with the principles of Ecologically Sustainable Development.



8.2 Methodology

Initially a broad risk identification and prioritisation was undertaken to rank potential risks to the Project. This initial workshop provided a basis for scoping the key risks for the Project. From this risk identification workshop specialists were asked to undertake further environmental assessment before application of the risk framework outlined in Figure 8.2.

A second risk workshop was undertaken on the 7 October 2009 to assess the risks under the framework provided in Appendix D. This workshop provided an opportunity for all specialties to come together and undertake an integrated risk assessment, refine the design and construction parameters of the Project and confirm if there are any key environmental issues which would require further investigation. Review of the criteria in Appendix A was also undertaken during the risk workshop.

After the workshop specialists were required to further refine the risk assessments as they complete their impact assessments and compiled into a central risk register maintained by the Environmental Manager.

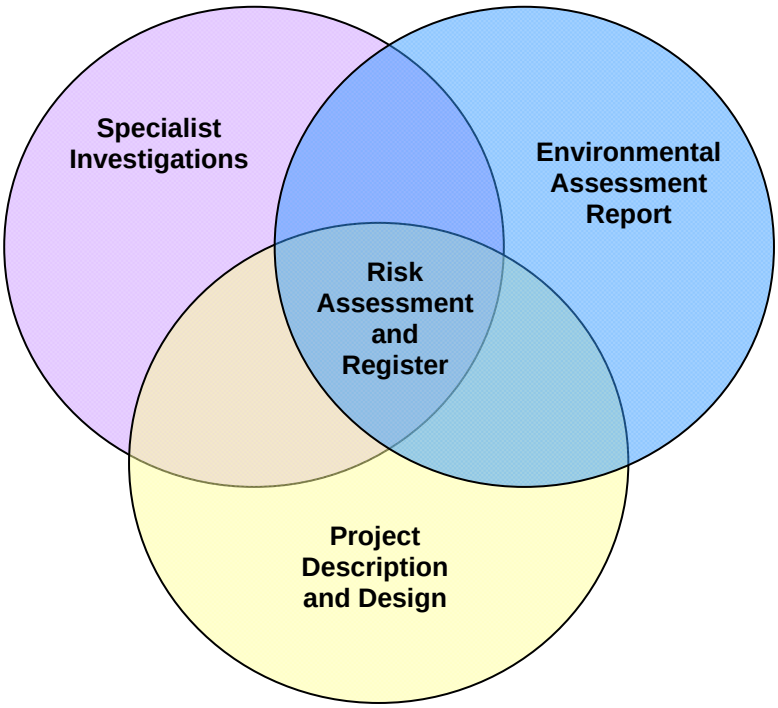


Figure 8.2 Relationship between Risk and Project

8.3 Key Environmental Impacts

The multi-disciplinary risk workshop assessed the Project with input from all specialists, design and construction teams. Detailed results of the risk assessment are included in Appendix D. A summary of potential risks/impacts, proposed management and mitigation measures and risk categories is provided in Table 8-3. Ranking of the risks has been undertaken to group risks into the three categories identified in Table 8-2. Impacts assigned a risk category level of 'A' are considered to be key issues for the Project.

Table 8-2 Environmental Risk Analysis Risk Level Definitions

Risk Level	
A	May have high or moderate impacts. Detailed assessment necessary to determine the level of potential impact and to develop appropriate measures to mitigate and manage the impacts.
B	May have high or moderate impacts but these can be mitigated by the application of standard environmental management measures.
C	Will have low impacts, which can be managed by standard environmental management measures.

The Director General's Environmental Assessment Requirements identify a number of Key Environmental Impacts that have been outlined in Table 8-3. Through the Environmental Risk Assessment process, the Hunter 8 Alliance identified that Key risks identified in the Director General's Environmental Assessment Requirements were not key risks after the application of standard mitigation measures. As such Table 8-3 does not assign a value of "A" to all Director General's Environmental Assessment Requirements, only those with significant residual risk.

Table 8-3 Environmental Risk Analysis

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Noise and Vibration	Yes	Impacts of noise and vibration due to construction activities	Mitigation measures would be implemented to limit construction noise impacts and would be refined during detailed design. This would be done with consideration of the following guidelines. *Environmental Noise Control Manual* (EPA 1994) *Assessing variation: A Technical Guideline* (Dec 2006) Construction activities would be conducted consistent with the provisions of Environment Protection Licence 3142 for construction activities. Construction noise and vibration impacts would be managed in accordance with the Construction Noise and Vibration Management Plan (CNVMP) which would be developed for the Project. Noise, Vibration and Blasting Management Plan would be implemented which would include notification to residences outside of standard construction hours. The approach to mitigating exceedances of construction targets is substantially extracted from Transport Infrastructure Development Corporation's *Construction Noise Strategy 2007* with variations specific to this Project. Approximately 44 receivers that would likely be affected by noise impacts and may require noise attenuation. Dilapidation survey would be undertaken at residences and structures likely to be impacted by vibration.	A	**Chapter 17 Noise and Vibration**

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
	Yes	Impacts of operation noise and vibration	Mitigation measures would be implemented to limit operation noise impacts and would be refined during detailed design. This would be done with consideration of the following guidelines. - *Environmental Noise Control Manual* (EPA 1994) - *Assessing variation: A Technical Guideline* (Dec 2006) Vibration control should be considered where dwellings are located within approximately 40 metres from the nearest rail track, which involves the following receivers: - 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. - Two residences at eastern end of Wollombi Road (including MMD-041) in NCA D12. - Westernmost residences on Wentworth Street and Railway Parade, Telarah in NCA U11.	B	

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Traffic and Access	Yes	Community access (both vehicle and pedestrian) to property, facilities and business services during construction	A Construction Traffic Management Plan and Traffic Control Plans would be implemented to manage delays and community consultation. Where possible access would be maintained. All relevant authorities would be notified of potential delays to roads throughout the construction of the Project. Speed limits would be reviewed and potentially reduced in areas with measurable risk. Appropriate signs warning of trucks entering should be erected on the approach to all haul road crossing points. Specifically at Allandale Road and Wollombi Road haul road crossings. Where possible, try to minimise or avoid road closures during peak times.	B	**Chapter 15 Traffic and Access**
	Yes	Road closure, traffic diversions and traffic flow during construction	As above.	B	

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Air Quality	Yes	Impacts to amenity due to construction activities	Implementation of an Air Quality Management Plan within the Construction Environment Management Plan that would include standard dust management measures and controls such as hydromulch and wetting down the construction areas. Weather and dust monitoring would be undertaken to provide warning of dusty activities to construction staff and community. Spoil would be managed with a Spoil and Fill Management Plan to maintain stockpiles are of a suitable height, width and slope and surface treatment. A Reinstatement Plan would be applied to all areas once construction works are complete. Construction traffic would be controlled by designated construction traffic speeds and routes.	A	**Chapter 16 Air Quality**
	No	Impacts on local water availability due to construction activities	Wetting down the construction site would be required. A large volume of water would be required to achieve this. Investigation of the use of hydrocarbons on stockpiles should be undertaken.	A	**Chapter 7 Description of the Project**

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Flora	Yes	Impacts to Endangered Ecological Communities	Approximately 61.1 hectares of endangered ecological communities would be removed as a result of construction. Preparation of a Compensatory Habitat Strategy (an Offset Strategy) consistent with Department of Environment, Climate Change and Water (DECCW) guidelines. A revegetation plan would be prepared, including strategies for protection and rehabilitation of Slaty Red Gum and EECs that occur in the study area.	B	**Chapter 9 Terrestrial Flora**
	Yes	Impacts to Threatened Flora Potential removal of native vegetation	Approximately 15.4 hectares of threatened flora would be removed as a result of construction. During construction exclusion fencing of sensitive environmental areas that are to be retained would be undertaken. Education of construction workers through the site induction process would be employed. Implementation of a Flora and Fauna Management Plan which would include a Reinstatement Plan, a Weed Management Strategy and a Pre-clearance Survey Protocol. The restoration, regeneration and rehabilitation of areas would be undertaken as soon as possible post construction. These activities would be carried out in such a way as to increase visual amenity and habitat value of the areas.	B	

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Fauna	Yes	Impacts to Threatened Fauna or habitat areas Vegetation clearing impacting habitat and connectivity	Pre-clearing survey would be undertaken by a qualified ecologist to relocate individuals prior to clearing activities. Action for relocation would be determined by specialist advice. Implementation of a rehabilitation management plan would be undertaken to replace lost habitat where possible Areas for habitat clearance would be minimised where practicable to reduce the potential impact to the receiving environment An Offset Strategy (or Compensatory Habitat Strategy) would be prepared consistent with Department of Environment, Climate Change and Water (DECCW) guidelines Vehicle speed would be limited to 20km/h on site to avoid vehicle collisions with macro fauna An Air Quality Management Plan and Erosion and Sedimentation Management Plan within the Environment Management Plan would be implemented to control the release of dust and sediment to the receiving environment. Flora, leaf litter and mulch from vegetation removal would be reinstated post construction Culverts identified in the environmental assessment as having a potential role in fauna crossing would be designed to facilitate fauna movements.	C	**Chapter 10 Terrestrial Fauna**

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Aquatic Ecology	Yes	Impacts to aquatic fauna and habitat areas	A Reinstatement Plan would be implemented for all new waterway crossings and re-alignments. Waterway crossings would be designed to facilitate fish passage where appropriate. Loss of riparian vegetation would be minimised and where possible avoided. A Spoil and Fill Management Plan would be implemented within the Environment Management Plan to control the release of sediment to the receiving environment. Design considerations would take into account the existing conditions and improve or maintain the status quo. Construction would be scheduled to avoid breeding cycles where possible.	B	**Chapter 11 Aquatic Ecology**
	No	Impacts to Groundwater Dependent ecosystems	A Groundwater Management Plan would be implemented. Design would minimise impacts to groundwater sources where possible.	C	**Chapter 19 Groundwater**

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Heritage	Yes	Indigenous heritage sites or places of significance	Identified Aboriginal heritage sites and potential archaeological deposits would be clearly identified on construction drawings. Monitoring for stone artefacts and skeletal remains would take place throughout construction. All project and contract staff would undergo adequate heritage training to assist in artefact identification and protection. Any Aboriginal heritage items directly affected would be managed in consultation with Aboriginal stakeholders and DECCW. Should any skeletal remains be identified, work would cease and the appropriate authorities (NSW Police, DECCW) would be notified.	A	**Chapter 12 Indigenous heritage**
	Yes	Non-Indigenous impacts to heritage and values	Survey the alignment prior to construction would be undertaken. All heritage identified would be protected where possible and managed through a Heritage Management Plan.	A	**Chapter 13 Non-Indigenous Heritage**

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Land Use and Access	Yes	Impacts to affected properties including access, severance, business viability and property infrastructure	Acquisition of farmland would be minimised, Where this occurs appropriate compensation would be made. Sterilisation of land as a result of construction. The Project would seek to minimise property disruption through appropriate notification and careful planning. Access to private property would be maintained at all times throughout the Project. Implement appropriate attenuation measures for impacts likely to affect property values (such as noise). Implement measures to compensate/offset significant impacts on dams and buildings. Measures to be developed in consultation with affected landholders.	A	**Chapter 14 Land Use**
	Yes	Integration with the current and future land uses of the region	Develop and implement a workforce accommodation strategy. Implement a public information program that addresses community values to help improve the public perception of the Project. Implement complaint monitoring and response measures.	C	**Chapter 14 Land Use**
Hydrology	Yes	Impacts to flood characteristics on surrounding land, property and infrastructure	The potential for flooding changes to private land as a result of construction is likely, however the magnitude of this change is not anticipated to create great disturbances. The detailed design would consider installation of structures to minimise flooding effects.	B	**Chapter 18 Surface Water**

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Contamination	No	Impacts to the receiving environment from contaminated land, dust or groundwater	Undertake Phase 1 and 2 assessments in areas likely to contain contaminants. If contamination is found to pose unacceptable risk to either the environment or human health, a remedial action plan would be developed and remediation works undertaken. Management and disposal of any contamination would be detailed in a Contaminated Soil Management Plan contained within the Environment Management plan. Contaminated Soil Management Plan to contain outline of the activities required to prevent contaminants escaping the site through leeching or blowing away as dust or waste. Should acid sulfate soils or asbestos be identified, an Acid Sulfate Soil Management Plan or Asbestos Management Plan would be implemented as appropriate as a part of the Environment Management Plan.	C	**Chapter 19 Other environmental issues**
Groundwater	No		Implementation of a Spoil and Fill Management Plan which would include baseline monitoring prior to construction. Groundwater quality monitoring would be undertaken across six control bores and of down gradient bores every six months following construction, and would be reviewed after 12 months (two post construction sampling rounds). These would be assessed against the baseline monitoring.	C	**Chapter 19 Other environmental issues**

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Greenhouse Gas	No		Energy efficient work practices would be adopted to limit energy use. Measures would include conducting awareness programs for all site personnel regarding energy conservation methods and conducting energy audits during the Project to identify and address energy waste.	C	**Chapter 19 Other environmental issues**
Social and Economic	No		Access would be maintained to properties at all times Negotiations for agricultural property acquisition would include consultation on property adjustments where required to limit the impact on farm management practices. Changes to land use and acquisition would be managed through appropriate consultation. The Project would seek to minimise property, community and business disruption through appropriate notification and careful planning. No adverse effects are anticipated from the existing commercial centres.	B	**Chapter 19 Other environmental issues**

Issue	Key issue in Director-General's Environmental Assessment Requirements?	Impacts	Analysis – Mitigation Measures and (if any) Key Residual Impact	Risk Category Following Analysis	Environmental Assessment Reference
Visual	No		Changes to visual amenity and landscape character would be managed through the development of a Landscape Rehabilitation Strategy and Landscape Strategy that draws together thr outcomes of the above integrated design and assessment process. In addition to this the Project would undertake early identification of landscape 'hot spots' and integration of mitigation strategies to minimise landscape and visual impacts. Communicate future changes (such as via Project newsletter/updates, advertisements) to help the community understand what the proposal site would look like after construction activities. Where adverse light impacts on residences may occur implement attenuation measures, such as screening of sensitive receptors. Disturbed areas would be progressively revegetated with consideration to related controls such as erosion and sedimentation, drainage and future safety requirements. Monitoring of the reinstatement program would be undertaken to confirm success of rehabilitation works. The schedule of species to be used in the landscaping treatments would include native and locally indigenous plants. Detailed design would seek to minimise the interference with existing landscape values.	C	**Chapter 19 Other environmental issues**
Waste	No		Waste would be minimised using the waste hierarchy principles of avoid/recover/dispose. Waste would be managed in accordance with DECCW's Waste avoidance and Resource Recovery Strategy (2007).	C	**Chapter 19 Other environmental issues**

8.4 Conclusion

8.4.1 Risk Analysis

The environmental risk analysis did not identify any additional key issues (risk category A issues) to those identified in the Preliminary Environmental Assessment and the Director General's Environmental Assessment Requirements. Chapters 9 to 18 address the Director-General's key issues. Chapter 19 addresses other environmental issues identified in the environmental risk analysis that are not considered to be key issues.

8.4.2 Risk Assessment

The Environmental Risk Assessment identified High residual risks (refer to Appendix for the risk assessment) to the Project during construction and operation phases for potential Indigenous Heritage and social and economic impacts.

It also identified a number of risk pathways that contained a medium residual risk. These included the following areas – Flora, Contaminated Land, Land Use, Noise, Non-Indigenous Heritage, Social and Economic, Surface Water, Traffic and Roads and Air Quality. Through application of project controls and additional controls the Environmental Risk assessment demonstrated a range of successful mitigation measures and management techniques to reduce the risks. These mitigation measures are typically applied to risks that are medium or greater.

9. Terrestrial Flora

9.1 Assessment Approach

9.1.1 Introduction

The Director-General's Environmental Assessment Requirements identify ecology as a key issue for the Environmental Assessment. This chapter identifies the potential terrestrial flora and the management measures proposed to reduce impacts of the Project. An assessment of potential impacts on fauna and fauna habitat are addressed in **Chapter 10** and impacts on aquatic ecology are addressed in Chapter 11. Table 9-1 outlines the Director General's Environmental Assessment Requirements relating to ecology and where they have been addressed within this report.

A detailed assessment on flora is included in the Flora and Aquatic Ecological Assessment in Appendix E.

Table 9-1 Director-General's Environmental Assessment Requirements – Ecology

Director-General's Environmental Assessment Requirements	Where Addressed
Terrestrial and aquatic flora, fauna and habitat, with specific consideration of Endangered Ecological Communities, threatened flora, fauna and populations.	Terrestrial Flora Section 9.2 Terrestrial Fauna Section 10.2 Aquatic Ecology Section 11.2
Vegetation clearing and resultant foraging, roosting and nesting habitat loss, fragmentation, connectivity and edge effects, increase in rail movements, and changes to watercourses and riparian zones.	Terrestrial Flora Section 9.3 Terrestrial Fauna Section 10.3 Aquatic Ecology Section 11.3
Taking into account of: the *Draft Guidelines for Threatened Species Assessment* (DEC), *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC), *Threatened Species survey and assessment: field survey methods for fauna Amphibians* (DECC), *Principles for use of Biodiversity offsets in NSW* (DECC) and *Fish Passage requirements for Waterway Crossings* (NSW Fisheries).	Terrestrial Flora Section 9.3 Terrestrial Fauna Section 10.3 Aquatic Ecology Section 11.3

9.1.2 Methodology

The study area for the terrestrial flora assessment is based on the investigation area which is shown in Figure 9.1 The flora survey and assessment included the following:

- Literature review of existing studies for the study area and surrounding areas, where available. This literature review is summarised in Appendix E.
- Database searches to identify threatened flora species recorded in the locality and with potential to occur on-site.
- Flora field surveys.

- Compilation of a flora species list recorded on-site.
- Preparation of descriptions of the vegetation communities occurring on-site.
- Assessment of likelihood of occurrence of threatened flora and endangered ecological communities (EECs) listed under the *Threatened Species Conservation Act 1995* (TSC Act) and / or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Preparation of assessments of significance for threatened flora species and EECs listed under the TSC Act and FM Act considered likely to occur on-site in accordance with the *Part 3A Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) and the *Threatened species assessment guidelines: The assessment of significance* (DEC 2007).
- Preparation of assessments of significance for threatened flora species and EECs listed under the EPBC Act in accordance with, the *Significant Impact Guidelines 1.1: Significant Impact Guidelines Matters of NES* (DEH 2006).

9.2 Existing Environment

Eight distinct vegetation communities were identified in the study area during the field surveys undertaken for this assessment, some of which are listed as EECs under the TSC Act. These are outlined in Table 9-2.

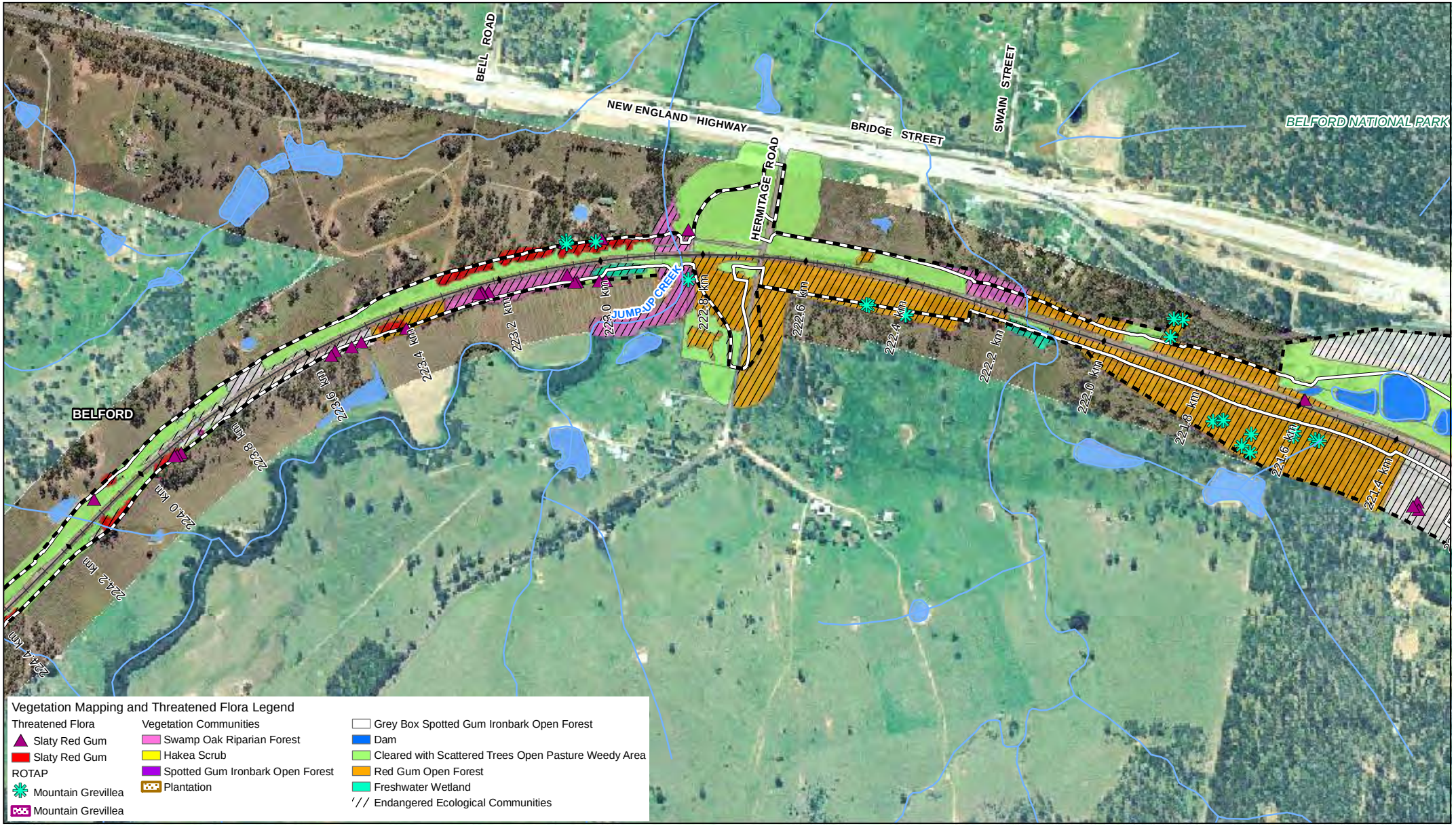
Table 9-2 Vegetation Communities

Vegetation Community	Conservation Significance
Lower Hunter Spotted Gum Ironbark Forest	High. *Lower Hunter Spotted Gum Ironbark Forest EEC* (TSC Act).
Forest Red Gum Open Forest	High. *Hunter Lowland Redgum Forest EEC* (TSC Act).
Swamp Oak Riparian Forest	High. *Swamp Oak Floodplain Forest EEC* (TSC Act).
Grey Box Spotted Gum Ironbark Forest	High. *Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC* (TSC Act).
Freshwater Wetland	High. *Freshwater Wetland EEC* (TSC Act).
Hakea Scrub	Low.
Cleared with Scattered Trees/ Open Pasture/ Weedy Area	Low
Plantation	Low

One threatened plant, Slaty Red Gum (*Eucalyptus glaucina*), listed as a vulnerable species under the TSC and EPBC Acts, was recorded in the study area. One Rare or Threatened Australian Plant (RoTAP), Mountain Grevillea (*Grevillea montana*), was also identified within the study area. No other threatened terrestrial flora are considered likely to occur within the study area.

The threatened species and EECs identified during field surveys are mapped in Figure 9.1.

The study area intersects two regional corridors mapped by National Parks and Wildlife Service (2005). These are located south of Belford and south of Greta Station. Examination of aerial photographs indicates the study area has areas of both fairly continuous native vegetation, and cleared agricultural lands, already fragmented into two parts by the existing railway.



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

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

Maitland to Minimbah Third Track Environmental Assessment

Vegetation Mapping and Threatened Flora in the Investigation Area

Job Number	22-14471
Revision	A
Date	May 2010

Figure 9.1a

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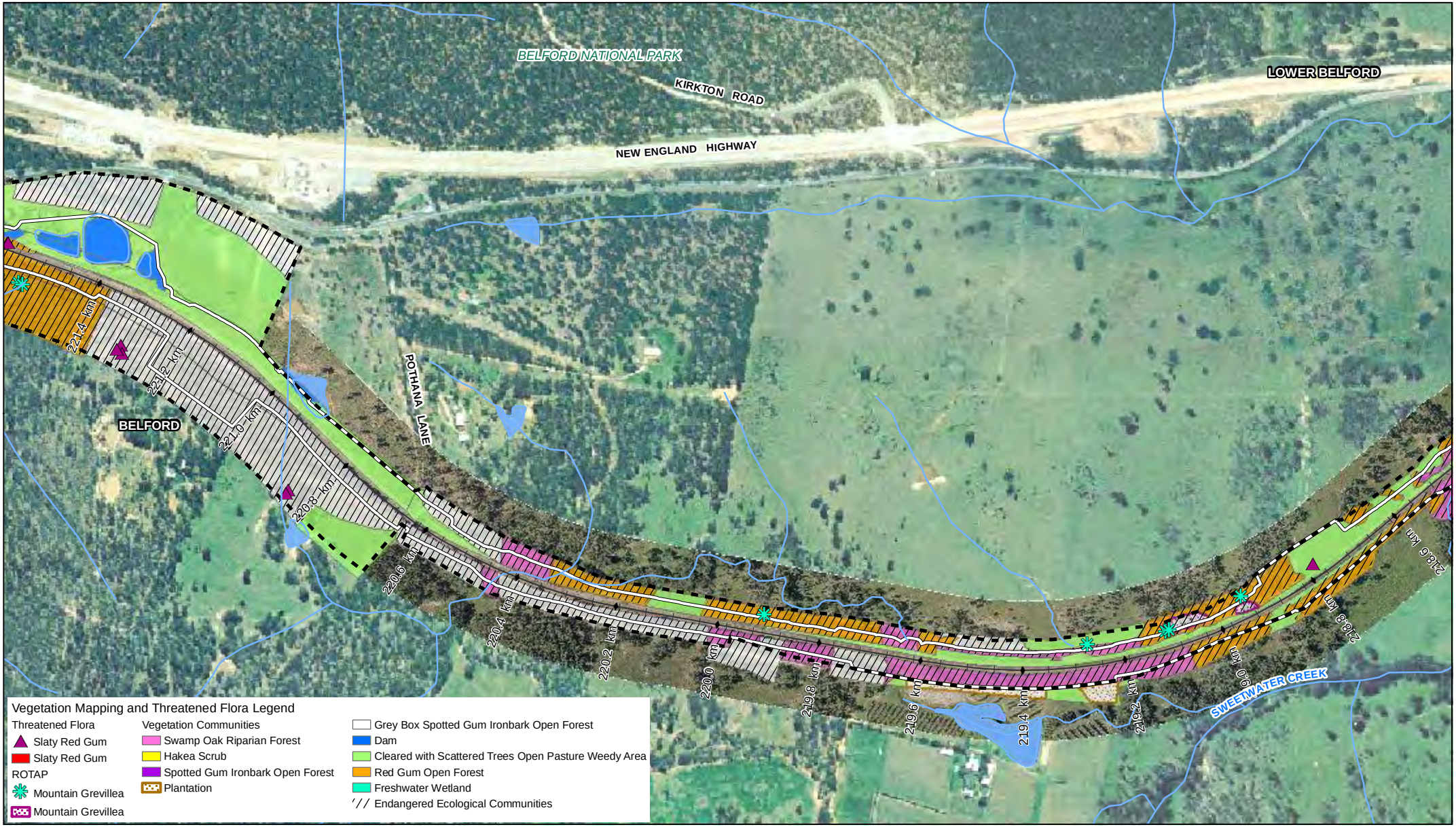

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- Watercourse Area

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Figure 9.1b

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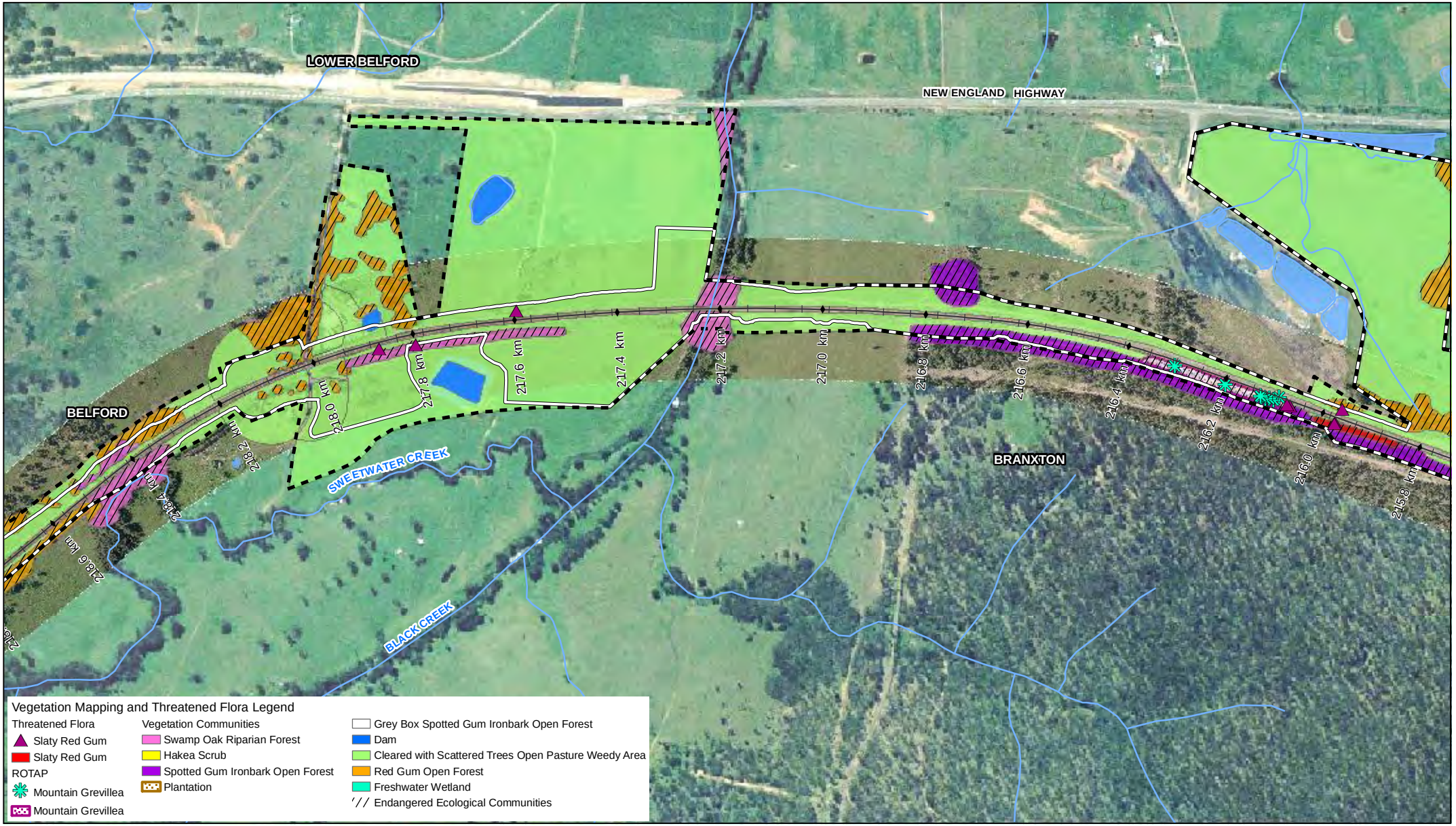

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Vegetation Mapping and Threatened Flora in the Investigation Area

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Figure 9.1c

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Map Projection: Transverse Mercator
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Figure 9.1d

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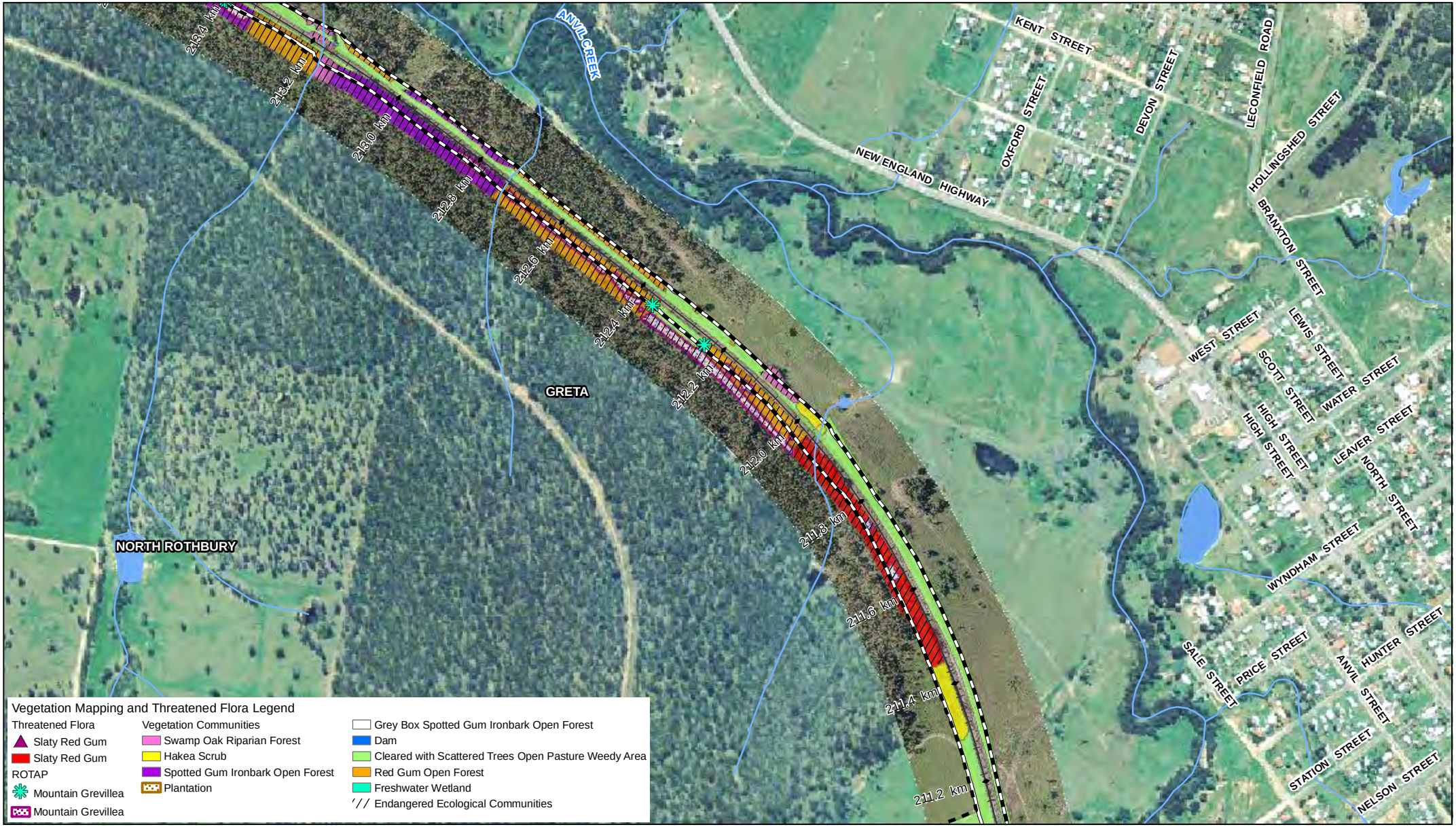

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Figure 9.1e

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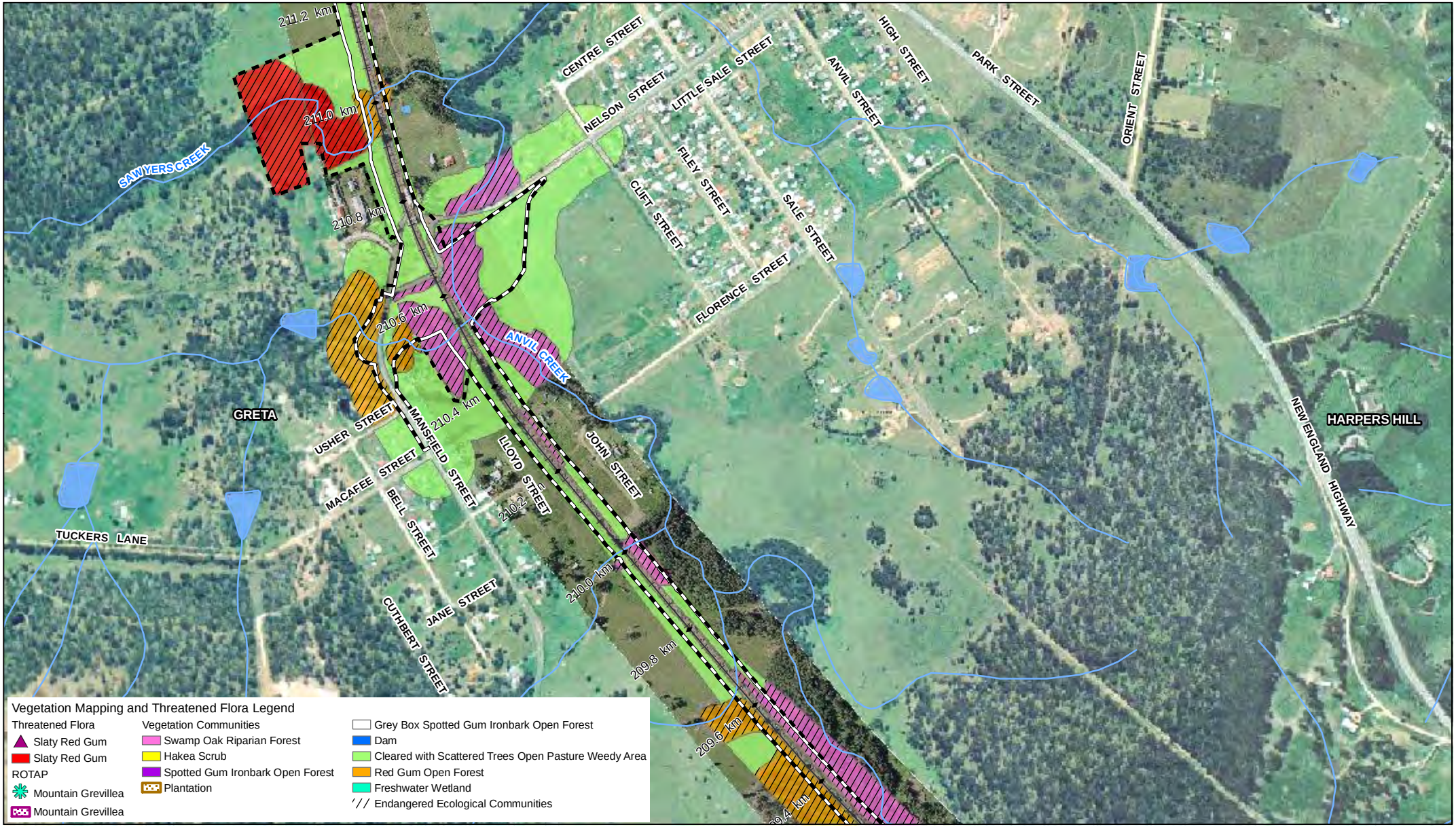

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0 37.5 75 150 225 300

Metres

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

N

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

Maitland to Minimbah Third Track Environmental Assessment

Vegetation Mapping and Threatened Flora in the Investigation Area

Job Number	22-14471
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Figure 9.1f

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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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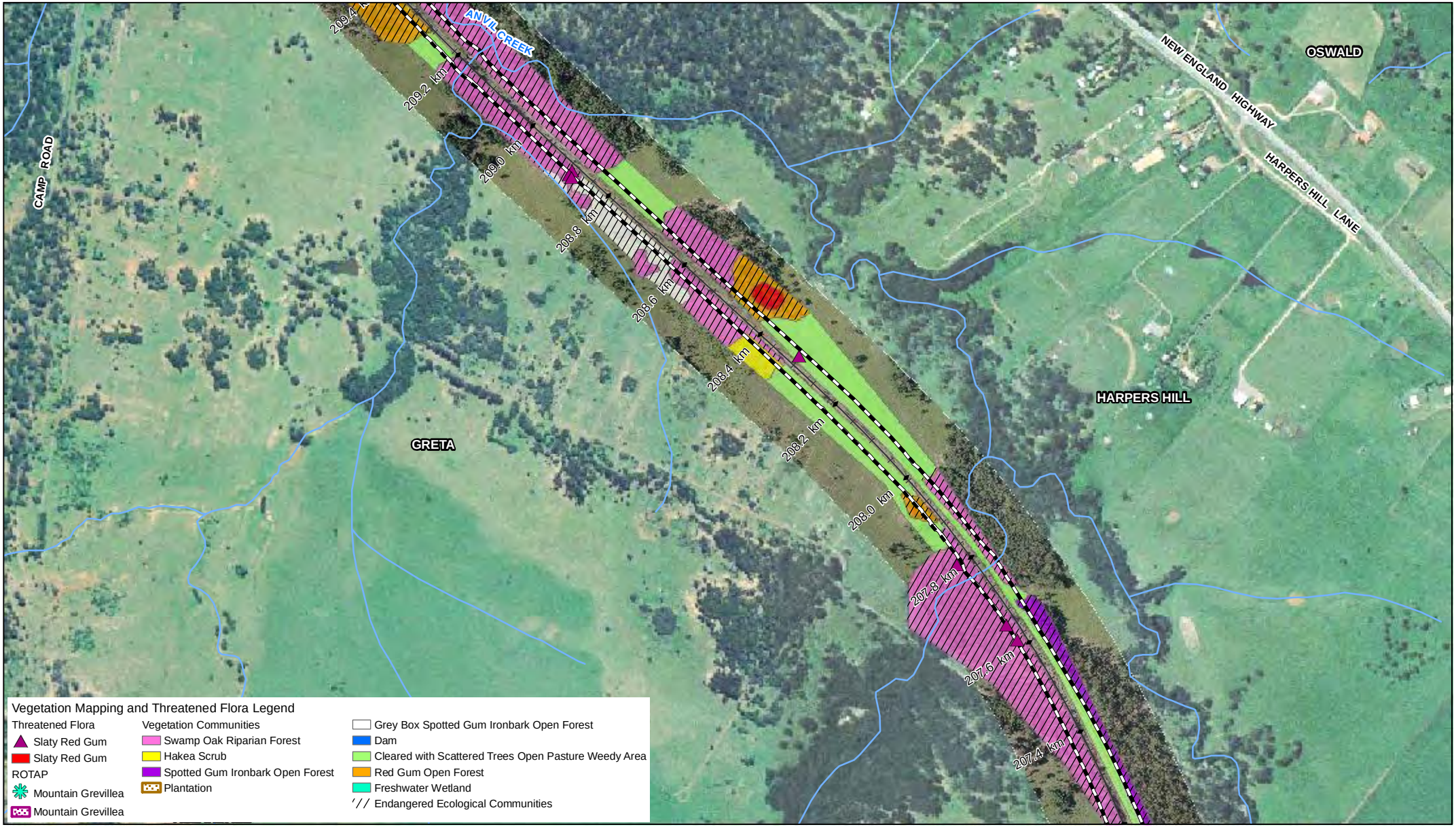

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Metres

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

N

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

Maitland to Minimbah Third Track Environmental Assessment

Vegetation Mapping and Threatened Flora in the Investigation Area

Job Number	22-14471
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Figure 9.1g

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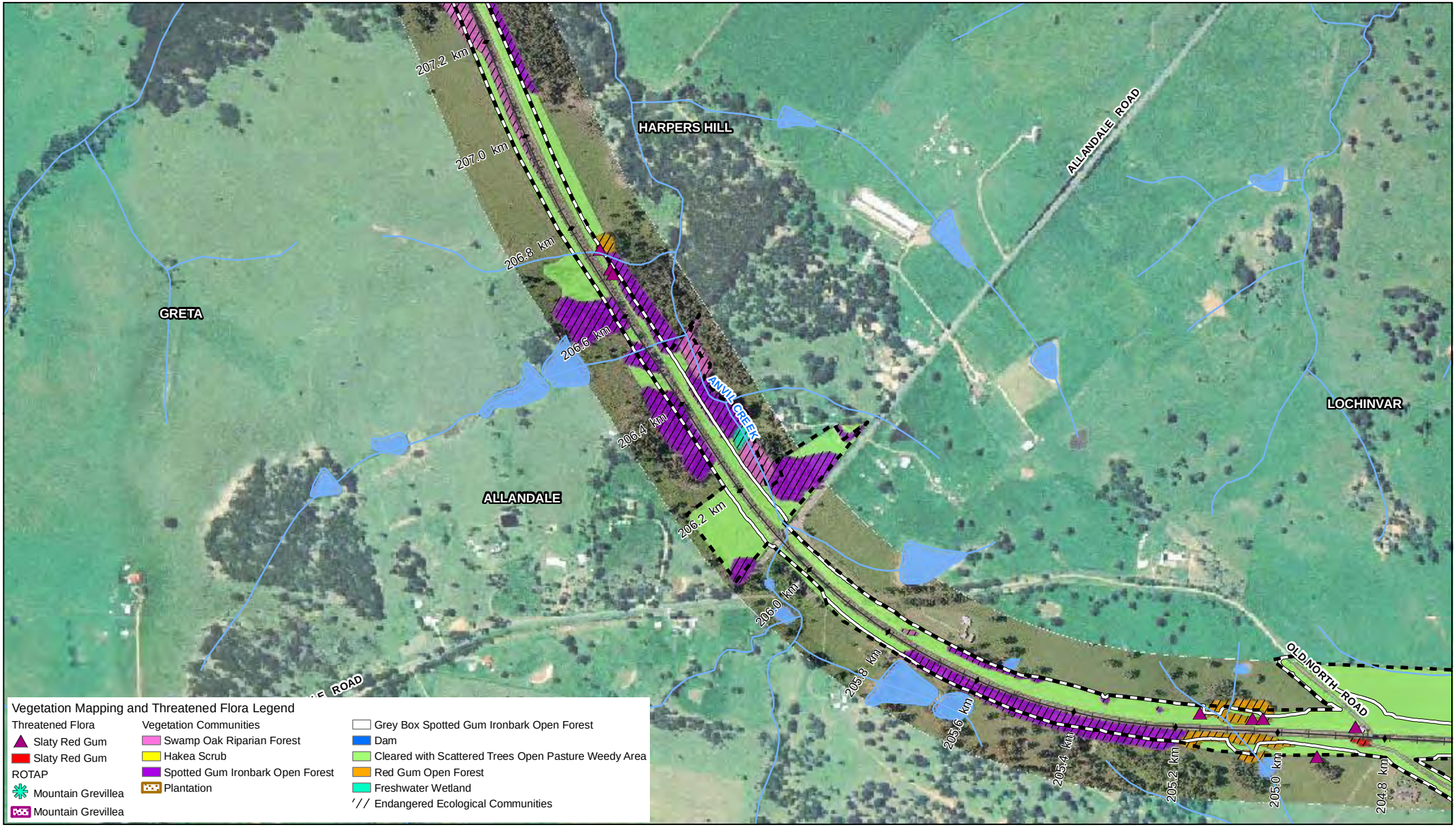

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Map Projection: Transverse Mercator
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Grid: Integrated Survey Grid, Zone 56-1

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LEGEND
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Maitland to Minimbah Third Track Environmental Assessment

Vegetation Mapping and Threatened Flora in the Investigation Area

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Figure 9.1h

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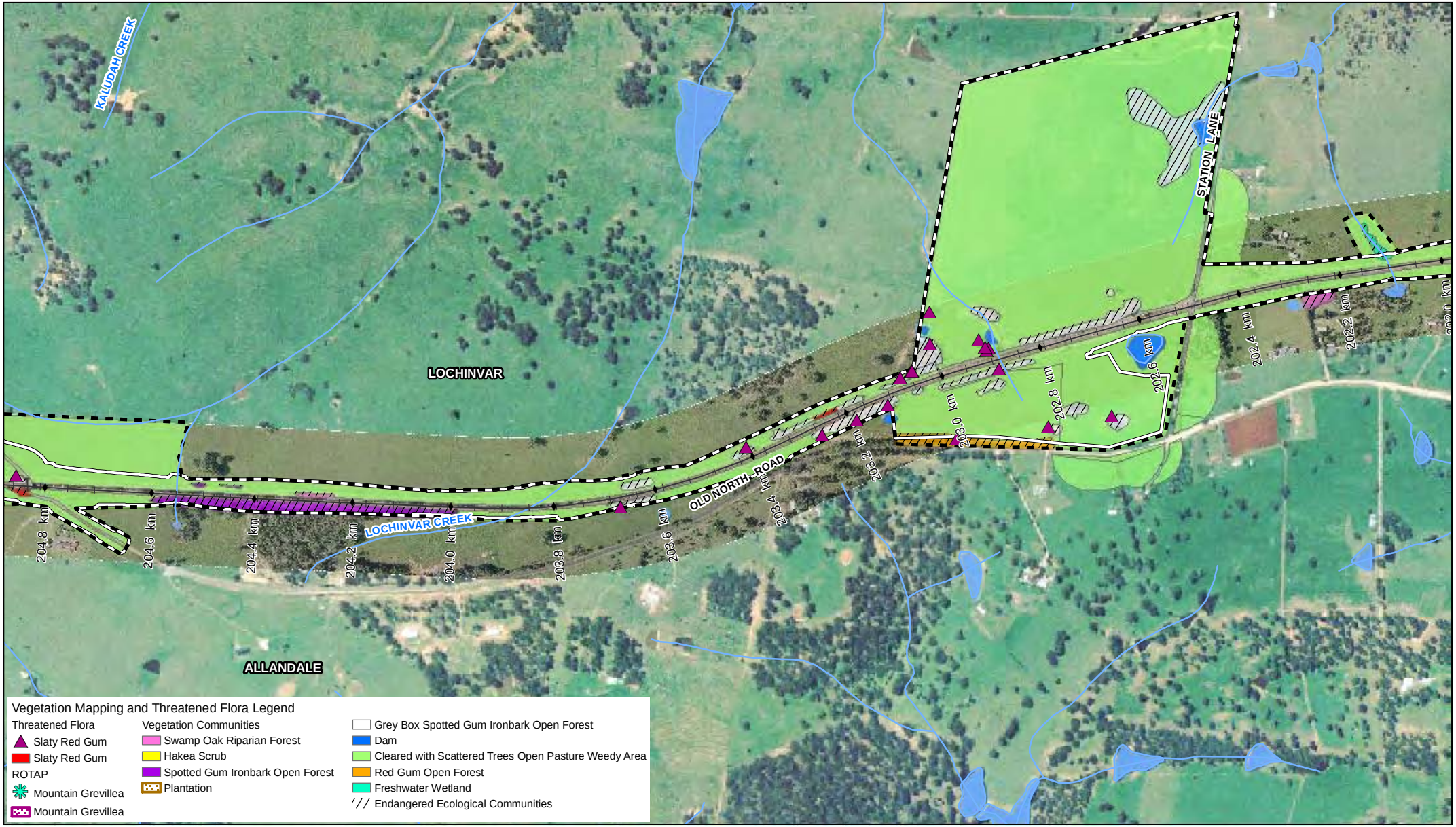

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Metres

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

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LEGEND
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Maitland to Minimbah Third Track Environmental Assessment

Vegetation Mapping and Threatened Flora in the Investigation Area

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Figure 9.1i

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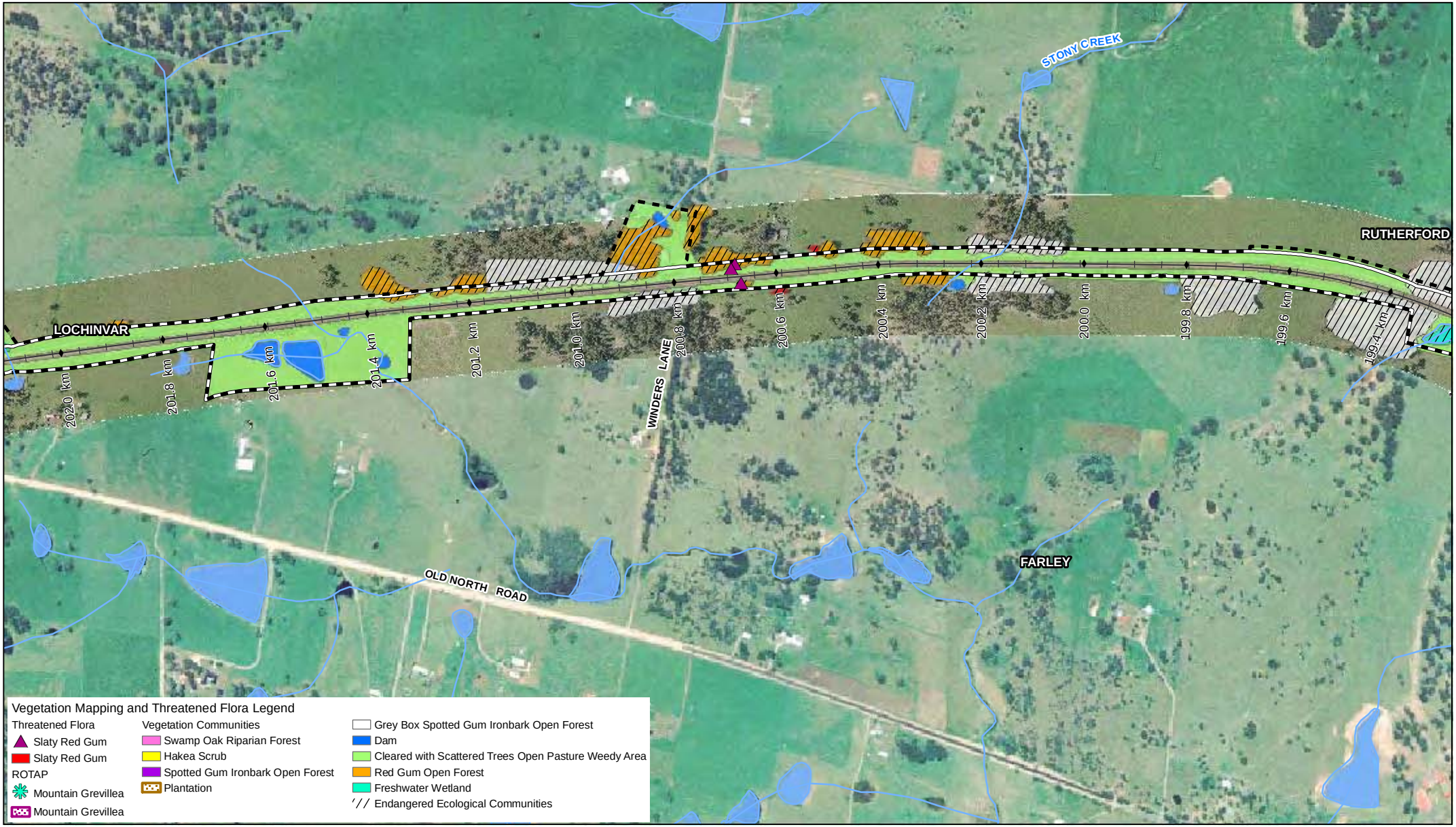

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Metres

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

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LEGEND
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Vegetation Mapping and Threatened Flora in the Investigation Area

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Figure 9.1j

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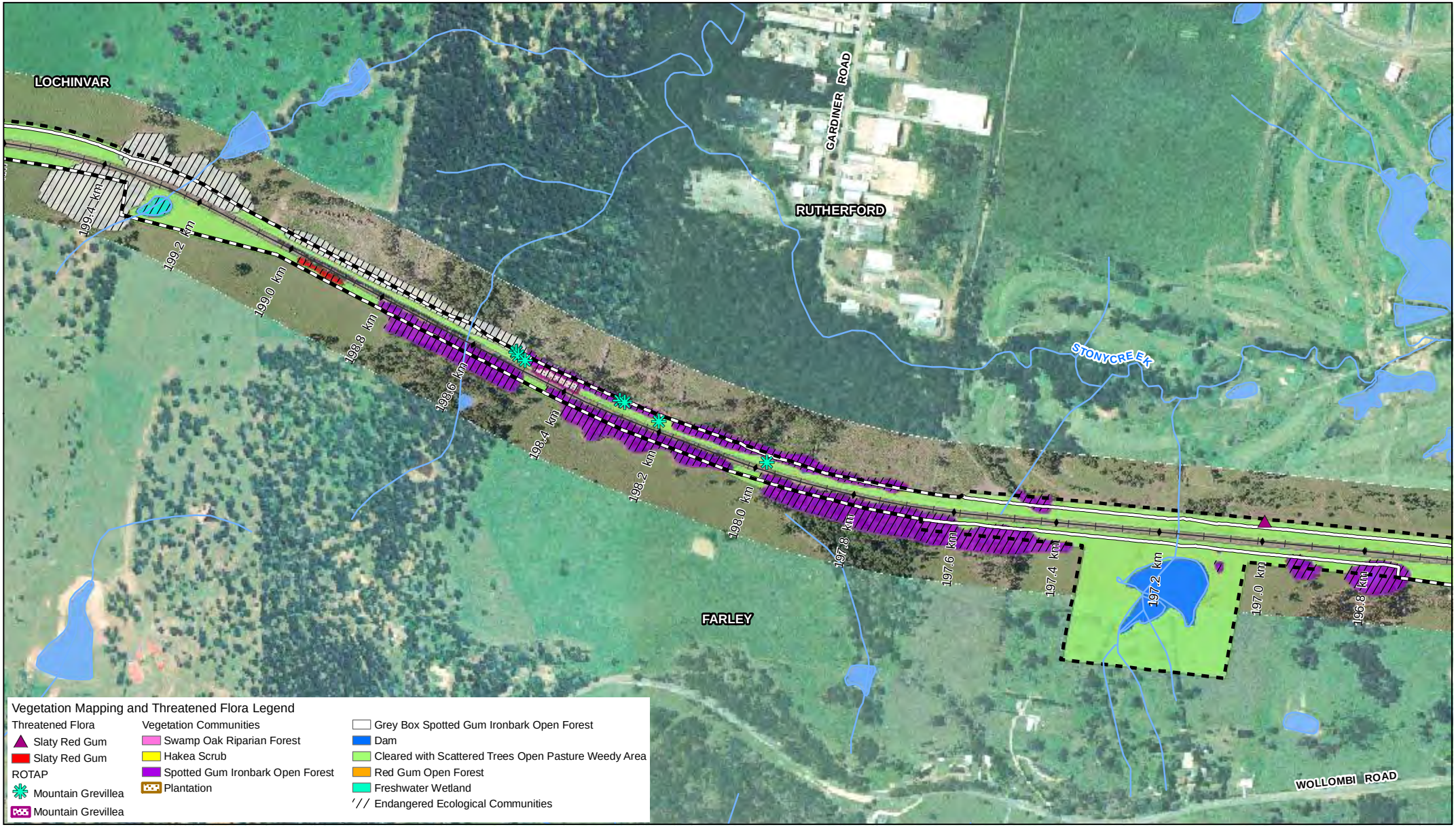

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Metres

Map Projection: Transverse Mercator
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Maitland to Minimbah Third Track Environmental Assessment

Vegetation Mapping and Threatened Flora in the Investigation Area

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Figure 9.1k

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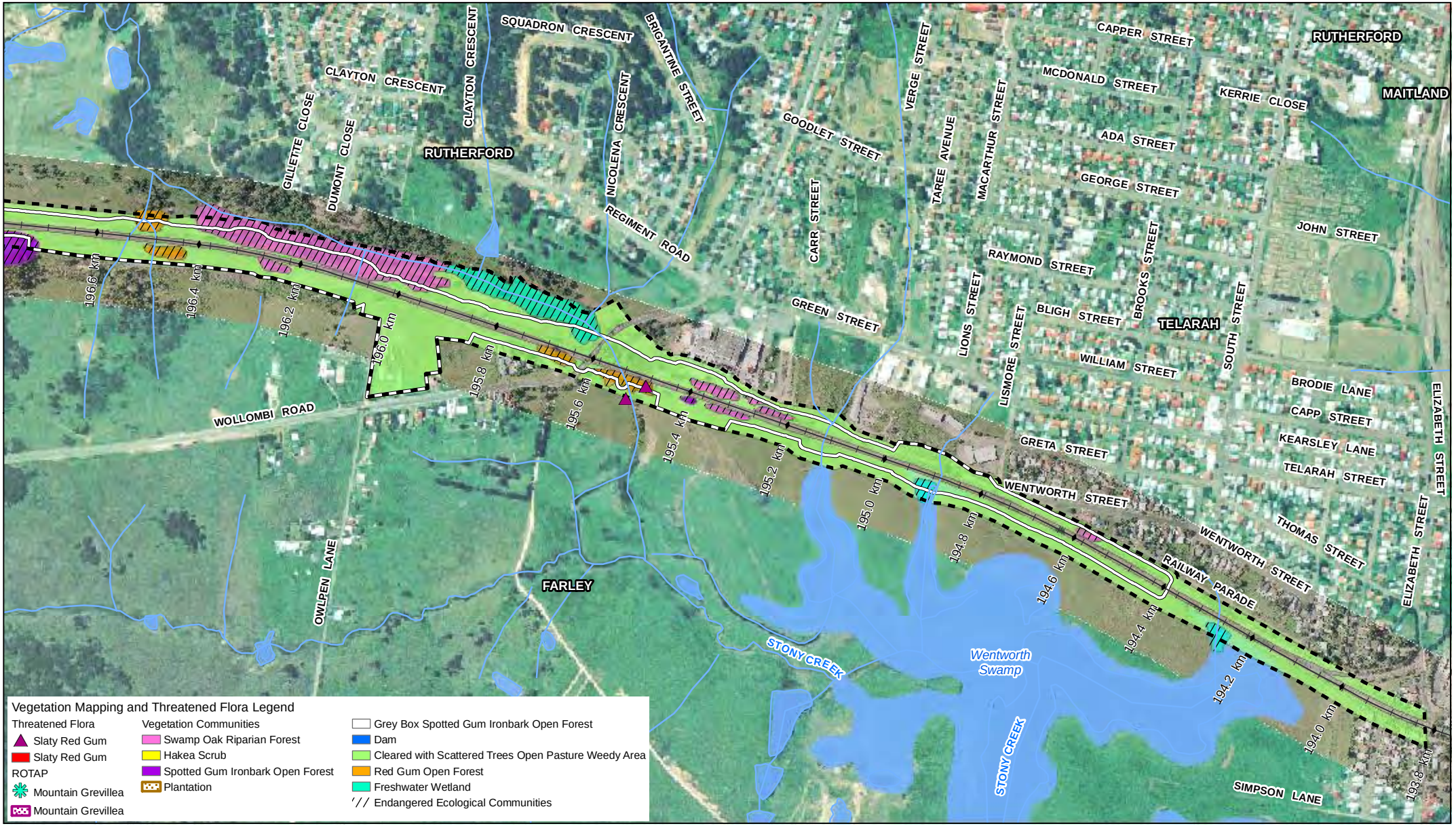

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Metres

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Maitland to Minimbah Third Track Environmental Assessment

Vegetation Mapping and Threatened Flora in the Investigation Area

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Figure 9.1l

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

9.3 Impact Assessment

The flora assessment has been prepared with consideration of the *Draft Guidelines for Threatened Species Assessment* under Part 3A of the *Environmental Planning and Assessment Act 1979* (DEC and DPI 2005), *Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities* (DEC 2004) and the Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS) *Flora and Fauna Survey Guidelines* (LHCCREMS 2003).

9.3.1 Construction

Vegetation clearing would be confined to the construction impact zone. The extent of works would remove approximately:

- 23.3 hectares of Hunter Lowland Redgum EEC (inclusive of 2.7 hectares of Slaty Red Gum and 0.8 hectares of Mountain Grevillea which forms part of the EEC).
- 13.2 hectares of Lower Hunter Spotted Gum-Ironbark Forest EEC (inclusive of 0.8 hectares of Mountain Grevillea which forms part of the EEC).
- 14.9 hectares of Swamp Oak Floodplain Forest EEC.
- 0.6 hectares of Freshwater Wetlands EEC.
- 12.7 hectares of Central Hunter Ironbark-Spotted Gum-Grey Box Forest EEC.
- 2.7 hectares and 50 scattered individual Slaty Red Gum.

The age and level of disturbance of vegetation to be cleared varies between young regrowth in disturbed agricultural areas, to mature regrowth with intact native vegetation. These vegetation types extend beyond the study area on private lands, with Hunter Lowland Red Gum Forest and Lower Hunter Spotted Gum-Ironbark Forest occurring within Belford National Park. Whilst the clearing would contribute on a small scale to further fragmentation, measures identified in this report and the Flora and Fauna Management Plan would assist in minimising impacts of the clearing. Additionally, areas of offsetting for EECs and Slaty Red Gum would be developed as part of the Compensatory Habitat Strategy in consultation with the Department of Environment, Climate Change and Water (DECCW).

As required under the provisions of Part 3A of the EP&A Act, an assessment was undertaken to determine the significance of impacts of the Project on Lower Hunter Spotted Gum – Ironbark Forest EEC, Hunter Lowland Redgum EEC, Swamp Oak Floodplain Forest EEC, Freshwater Wetland EEC and Slaty Red Gum. An assessment was also undertaken on a precautionary basis for Central Hunter Ironbark- Spotted Gum- Grey Box, listed as a preliminary EEC under the TSC Act. The Project is considered unlikely to have a significant impact on threatened species, populations, EECs or their habitat listed under the TSC Act provided areas of offsetting for EECs and Slaty Red Gum are developed as part of the Compensatory Habitat Strategy in consultation with DECCW.

Based on the assessment undertaken in accordance with the *EPBC Act Significant Impact Guidelines* (DEH 2006), the Project is considered unlikely to have a significant impact on Slaty Red Gum, provided areas of offsetting are developed as part of the Compensatory Habitat Strategy.

The study area is currently highly fragmented due to large areas of cleared land for agricultural purposes. Levels of noxious and environmental weed invasion within native vegetation (excluding pasture grasses) in the study area were highest adjacent to the existing rail corridor, and within creeks and drainage lines. The groundcover within native vegetation occurring adjacent to the existing railway was also invaded by exotic grasses and weeds. The Project is considered unlikely to result in an increase of weed invasion into the native vegetation surrounding the existing rail corridor. The level of impact is anticipated to be similar to the existing environment. Successful implementation of a weed management plan as an integral part of the Project would minimise the potential impacts of weed invasion due to edge effects. The weed management plan would be developed as part of the CEMP.

The Project would result in an incremental increase in the fragmentation of native vegetation communities in the local area, by increasing an existing easement. However, the Project would not result in the isolation of any important areas of native vegetation or habitat. The study area is already fragmented into two parts by the existing railway and vegetation clearing would occur on the edge of existing infrastructure easements that have been previously cleared, disturbed or have been invaded by weeds. The Project would remove incremental areas from the edges of the existing railway, which would slightly increase the distance of separation of habitat, but not to the extent that exchange of genetic material would be substantially compromised.

9.3.2 Operation

Operational impacts on flora and EECs would be primarily related to dust and water quality impacts. The scale of these impacts are expected to be similar to that of the existing environment. Dust and water quality mitigation measures as outlined in Sections 16.4 and 18.4 respectively would reduce any adverse operational impacts.

9.4 Mitigation Measures

The management of adverse ecological 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) detailed in the Flora and Aquatic Ecological Assessment in Appendix E.

Mitigation measures to address impacts on flora of the construction and operation of the Project are listed below.

- Minimise vegetation clearing and retain mature trees where possible.
- Pre-clearance survey to flag Slaty Red Gum and Mountain Grevillea occurring within and adjacent to the study area, with the aim to avoid clearing these individuals.
- Pre-clearance survey to flag the edge of EECs occurring in the vicinity of construction to avoid unnecessary impacts on these stands.
- Habitat features, such as fallen logs, that may be utilised by fauna would be relocated into adjacent bushland where possible.
- Provision of flagging, taping or similar marking method along the edge of the clearance area so that works would not encroach closer than necessary upon remnant bushland and minimise the footprint of construction works.

- Use of existing disturbed corridors such as paddocks, cleared areas, roads, tracks and existing easements, for set up of equipment, machinery turning circles, stockpile areas and site facilities, where possible.
- Protocols to prevent introduction or spread of *Phytophthora cinnamomi* would be implemented following DECCW guidelines.
- Development and implementation of a Spoil and Fill Management Plan. Erosion and sediment controls would be installed prior to earthworks and vegetation clearing, and would be maintained throughout construction, to minimise sediment entering EECs, creeks and drainage lines.
- Separate stockpiling of topsoil and vegetation removed from various areas to delineate soils containing seeds from native or exotic species where possible. This would include identifying and spatially tracking the topsoils and vegetation removed from the site during construction.
- Placement of soil stockpiles outside of vegetated areas and outside the drip line of trees.
- Rehabilitation and replanting of native vegetation for areas of newly-created bare soil following construction, such as batters.
- A revegetation plan would be prepared, including strategies for protection and rehabilitation of Slaty Red Gum and EECs that occur in the study area. The revegetation plan would also identify local native species appropriate for the revegetation of riparian areas surrounding creeks and drainage lines.
- A specific revegetation plan for Sawyers Creek would be developed to reinstate riparian vegetation characteristic of Red Gum Open Forest, which extends upstream from the works site.
- Weeds from areas cleared during construction would be sprayed with appropriate herbicides or removed from the site and not allowed to enter watercourses or moist areas such as drainage lines in line with a weed management strategy.

Offsetting of Impacts

There is the potential for a number of direct and indirect impacts to occur on biodiversity values as a consequence of the Project. While many of these impacts have either been avoided, minimised through design decisions or can be adequately mitigated or managed, there are some residual impacts that cannot be adequately mitigated. Residual impacts as a result of the Project would include the loss and modification of native vegetation, including 61.1 hectares of EECs listed under the TSC Act and the removal of 2.7 hectares Slaty Red Gum (and its habitat) listed as a vulnerable species under the TSC Act and EPBC Act.

To address these impacts, a Compensatory Habitat Strategy is being developed that would contribute to the long term conservation of these EECs and Slaty Red Gum, as well as fauna habitat. The Compensatory Habitat Strategy is being developed in consultation with DECCW with the aim to set aside known habitat for Slaty Red Gum and EECs.

The DECCW principles for use of biodiversity offsets in NSW have been considered in the assessment approach and development of the Compensatory Habitat Strategy. Offsetting is further discussed in the Flora and Aquatic Ecological Assessment in Appendix E.

10. Terrestrial Fauna

10.1 Assessment Approach

10.1.1 Introduction

The Director-General's Environmental Assessment Requirements identify ecology as a key issue for the Environmental Assessment. This chapter identifies the potential impacts of the Project on terrestrial fauna and the management measures proposed to reduce these impacts. An assessment of potential impacts on flora are addressed in **Chapter 9** and impacts on aquatic ecology are addressed in **Chapter 11**.

Table 10-1 outlines the Director General's Environmental Assessment Requirements relating to ecology and where they have been addressed.

The detailed Fauna Impact Assessment is included in Appendix F.

Table 10-1 Director-General's Environmental Assessment Requirements – Ecology

Director-General's Environmental Assessment Requirements	Where Addressed
Terrestrial and aquatic flora, fauna and habitat, with specific consideration of Endangered Ecological Communities, threatened flora, fauna and populations.	Terrestrial Flora Section 9.2 Terrestrial Fauna Section 10.2 Aquatic Ecology Section 11.2
Vegetation clearing and resultant foraging, roosting and nesting habitat loss, fragmentation, connectivity and edge effects, increase in rail movements, and changes to watercourses and riparian zones.	Terrestrial Flora Section 9.3 Terrestrial Fauna Section 10.3 Aquatic Ecology Section 11.3
Taking into account of: the *Draft Guidelines for Threatened Species Assessment* (DEC), *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC), *Threatened Species survey and assessment: field survey methods for fauna Amphibians* (DECC), *Principles for use of Biodiversity offsets in NSW* (DECC) and *Fish Passage requirements for Waterway Crossings* (NSW Fisheries).	Terrestrial Flora Section 9.3 Terrestrial Fauna Section 10.3 Aquatic Ecology Section 11.3

10.1.2 Methodology

The terrestrial fauna assessment was undertaken using a combination of desktop research and detailed fieldwork. Desktop research involved accessing databases of previously recorded threatened fauna species, together with a literature review of existing ecological assessments relevant to the area.

The investigation area for the terrestrial fauna assessment was based on the investigation area which is shown in Figure 10.1. The terrestrial fauna assessment included the following:

- Literature review of existing studies for the site and locality, where available. This literature review is summarised in Appendix F.

- Database searches to identify threatened fauna species recorded in the locality and with potential to occur on-site.
- Targeted fauna field surveys including bird transects, diurnal and nocturnal reptile and amphibian searches, spotlighting, nocturnal owl and mammal call playback, and Anabat micro-bat echolocation surveys.
- Compilation of a fauna species list recorded on-site.
- Assessment of the habitats occurring on-site.
- Assessment of likelihood of occurrence of threatened fauna listed under the *Threatened Species Conservation Act 1995* (TSC Act) and / or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Preparation of assessments of significance for threatened fauna species listed under the TSC Act considered likely to occur on-site in accordance with the *Part 3A Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) and the *Threatened species assessment guidelines: The assessment of significance* (DEC 2007).
- Preparation of assessments of significance for threatened fauna species listed under the EPBC Act in accordance with the *Significant Impact Guidelines 1.1: Significant Impact Guidelines Matters of National Environmental Significance* (DEH 2006).

10.1.3 Survey Sites

Survey sites were chosen to identify the key habitat areas along the investigation area for the targeted fauna surveys. Key habitat areas are those areas that provide the highest quality habitat areas for threatened species within the investigation area. Table 10-2 outlines these sites.

Table 10-2 Survey Sites for Targeted Fauna Surveys

	Location	Habitat Type	Approximate Chainage (km)
1	Lochinvar	Open woodland	200.800 to 201.300
2	Anvil Creek (Allandale to Greta)	Riparian woodland	207.000 to 210.800
3	Greta	Open woodland	211.500 to 214.600
4	Belford	Open woodland	220.200 to 222.100
5	Belford	Farm dams	221.300 to 221.600

10.2 Existing Environment

10.2.1 Fauna Habitat

Five main types of fauna habitat were recorded within the investigation area, including:

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

The majority of the investigation area is agricultural grazing land, either cleared or containing areas of remnant woodland and/or riparian vegetation. Several medium and large remnant woodland blocks occur along or adjacent to these areas and provide potential habitat for species within the region.

Six named creeks were identified in the investigation area; Stony Creek, Anvil Creek, Sawyers Creek, Black Creek, Sweetwater Creek and Jump Up Creek. There are a further five unnamed major creeks in the investigation area. All of these creeks flow directly or indirectly into the Hunter River. Creeks within the investigation area provide riparian habitat areas. These habitat areas act as linkages throughout the landscape for many species. Unnamed tributaries to these creeks also provide riparian habitat of varying density and quality.

Tiny, small and medium tree hollows were common at all woodland sites, averaging 28 to 42 hollows per hectare at open woodland sites. Large hollows were uncommon and very large hollows were rarely encountered in open woodland habitats and were absent in the areas of riparian woodland sampled.

Remnant woodland areas in the investigation area provide habitat areas and potential movement paths for species between Kurri Kurri in the south-east and Singleton in the north-west. Additionally, while there is no clear continuous corridor of remnant vegetation north-south through the local area and region, the remaining remnant woodland provides habitat areas and refuge sites for species during potential movements north-south through the investigation area.

The creeks that drain the investigation area and their associated riparian vegetation also provide potential corridors for many species in the landscape.

10.2.2 Threatened Fauna

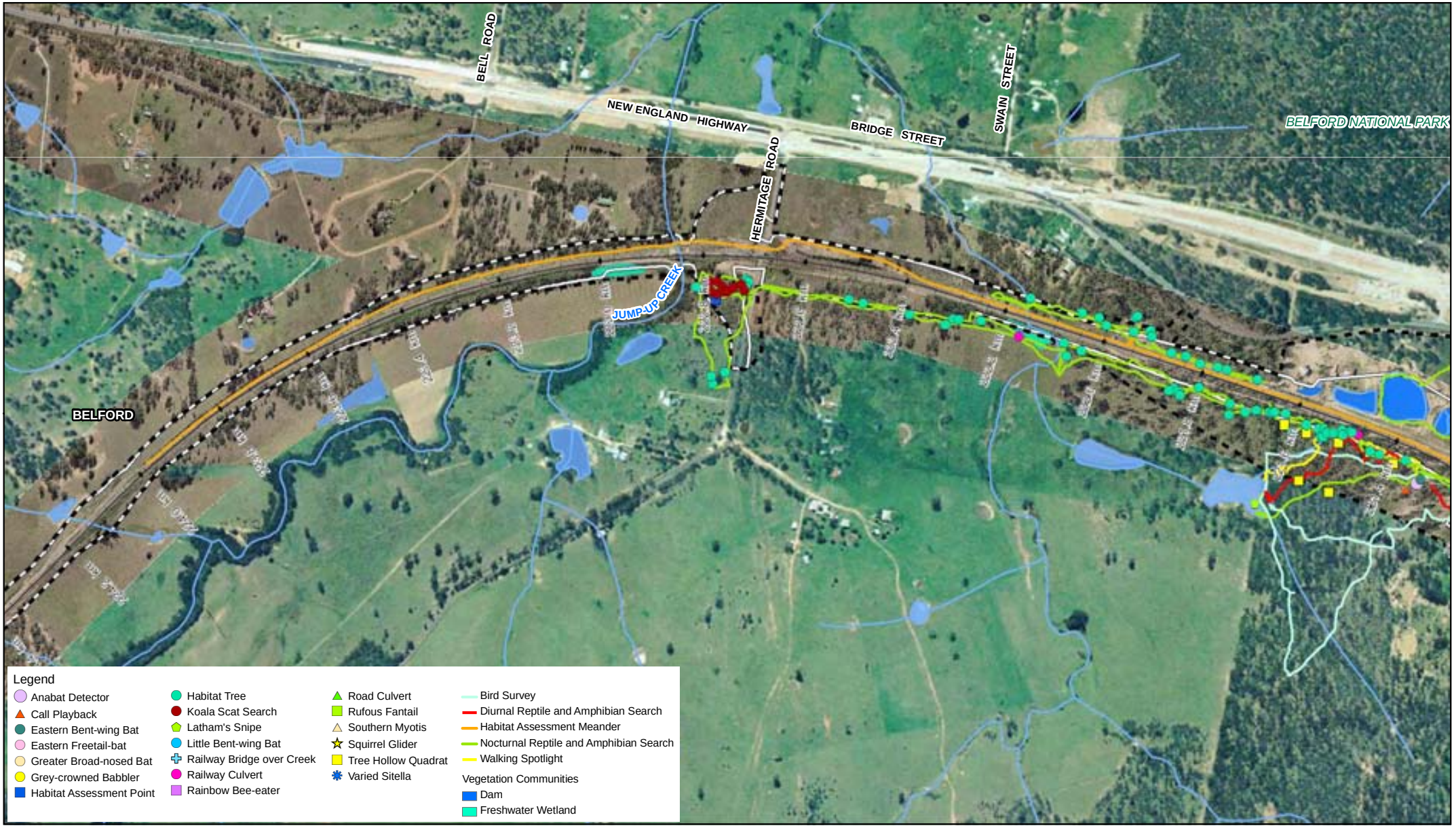
Targeted fauna field surveys were undertaken that included bird transects, diurnal and nocturnal reptile and amphibian searches, spotlighting, nocturnal owl and mammal call playback, and Anabat micro-bat echolocation surveys. Table 10-3 outlines the threatened and migratory species that were recorded during the field surveys undertaken for this assessment.

Table 10-3 Threatened and Migratory Species Recorded During Field Surveys

Common Name	*Scientific Name*	Survey Site
Vulnerable under the TSC Act		
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	All sites
Squirrel Glider	*Petaurus norfolcensis*	Greta
Eastern Freetail Bat	*Mormopterus norfolkensis*	Lochinvar, Anvil Creek
Eastern Bent-wing Bat	*Miniopterus schreibersii oceanensis*	All sites
Little Bent-wing Bat	*Miniopterus australis*	Anvil Creek, Greta
Large-footed Myotis	*Myotis macropus*	Lochinvar, Belford (farm)
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Anvil Creek
Preliminary listing as vulnerable under the TSC Act		
Varied Sitella	*Daphoenositta chrysoptera*	Greta
Migratory under the EPBC Act		
Latham's Snipe	*Gallinago hardwickii*	Belford
Rainbow Bee-eater	*Merops ornatus*	Greta
Rufus Fantail	*Rhipidura rufifrons*	Anvil Creek
Wanderer Butterfly	*Danaus plexipus*	All sites

A further 32 threatened species listed under the TSC Act and 12 threatened and/or migratory species under the EPBC Act, not recorded during the field surveys, are known or considered to have the potential to occur within the investigation area. These species are listed in the Fauna Impact Assessment in Appendix F.

Survey sites, methods of fauna surveys and threatened species recorded during the field surveys are mapped in Figure 10.1.



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Metres

Map Projection: Transverse Mercator
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Maitland to Minimbah Third Track Environmental Assessment

Survey Effort and Threatened Species Locations

Job Number 22-14471
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Date May 2010

Figure 10.1a

G:\22\14471\GIS\Maps\Deliverables\EA\EA_Fauna_Threat_Species_20091203_A.mxd

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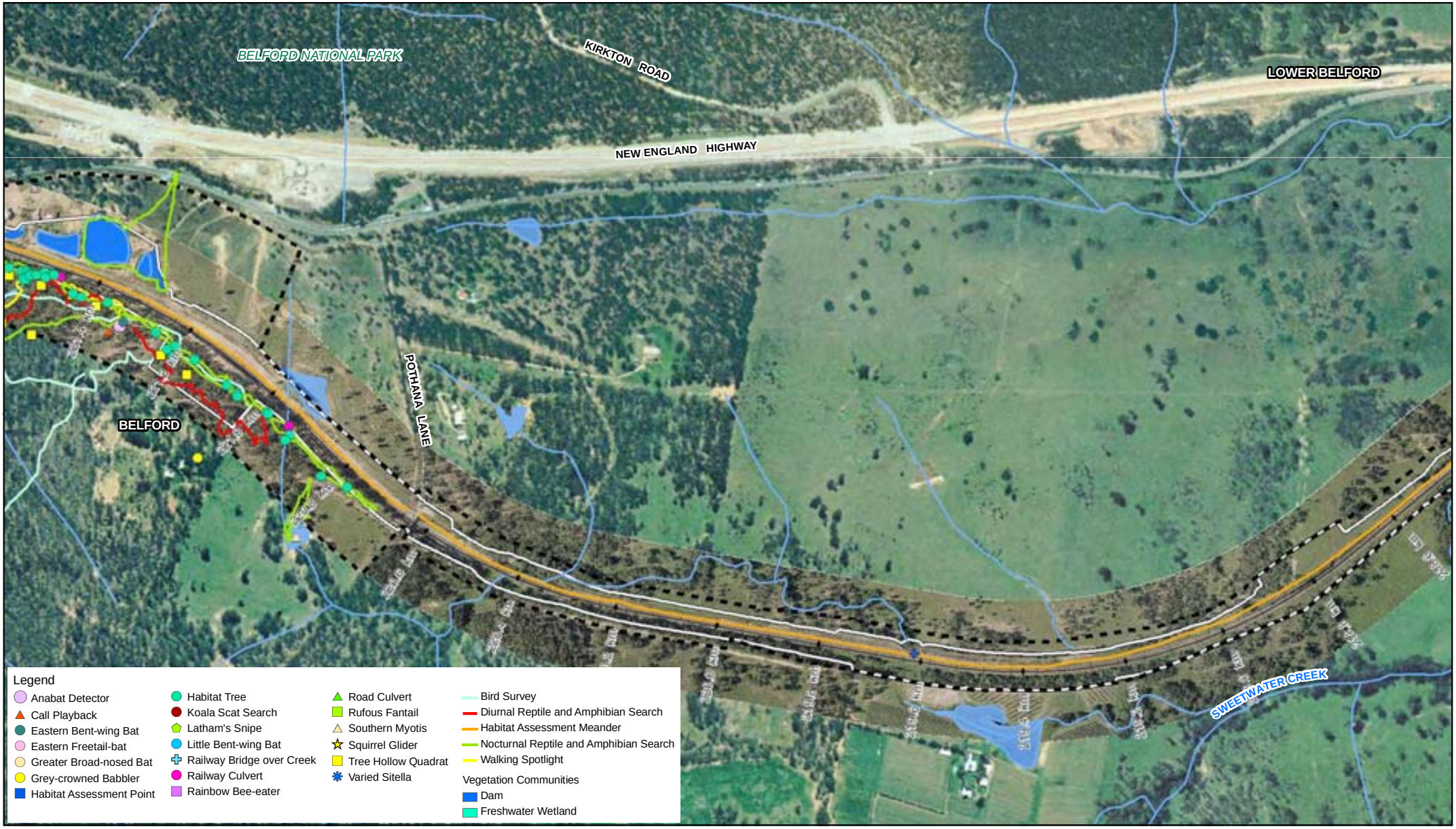

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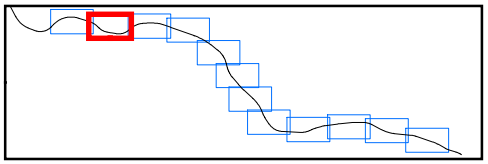

Maitland to Minimbah Third Track Environmental Assessment

Survey Effort and Threatened Species Locations

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Date May 2010

Figure 10.1b

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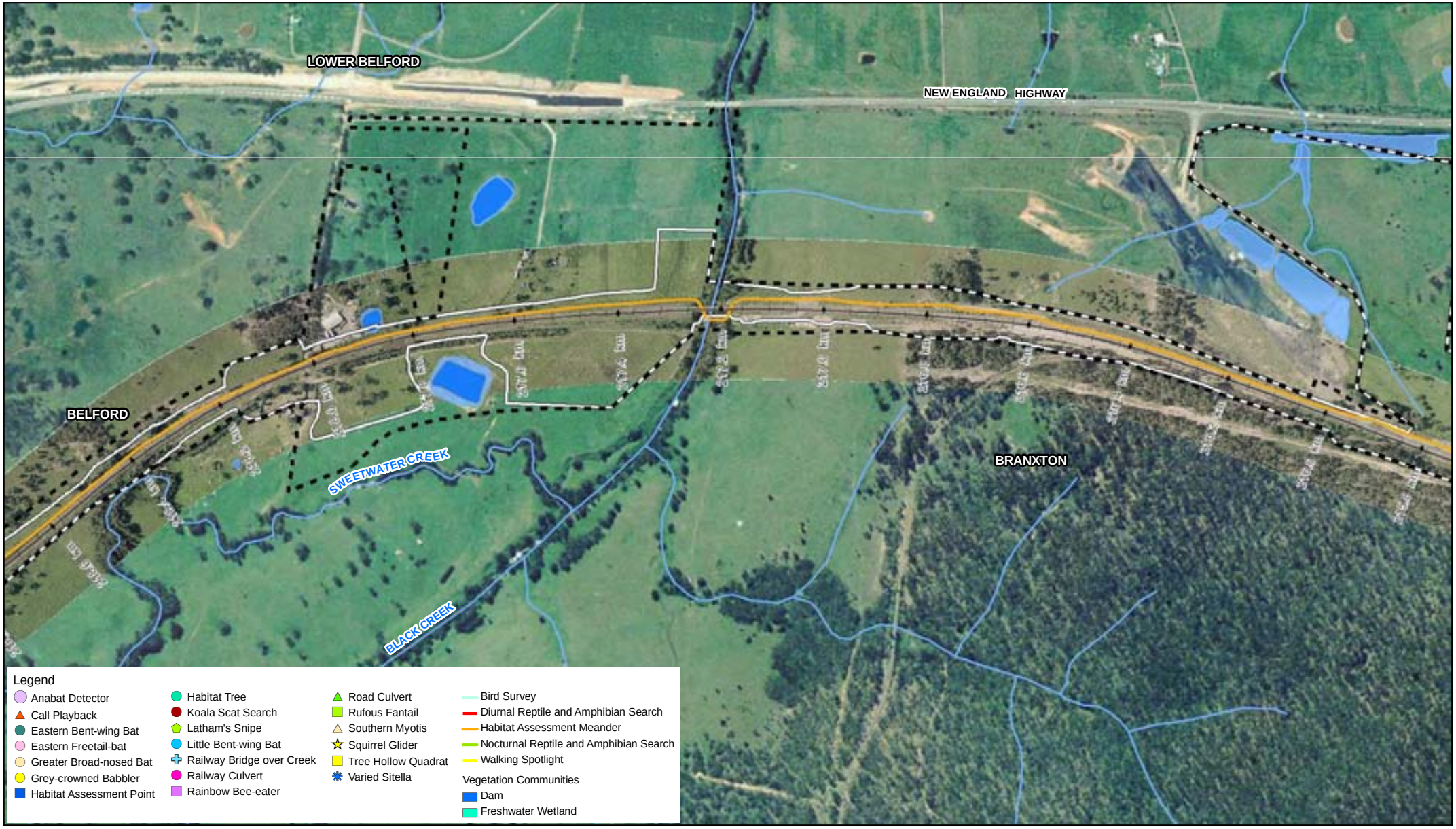

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Maitland to Minimbah Third Track Environmental Assessment

Survey Effort and Threatened Species Locations

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Date May 2010

Figure 10.1c

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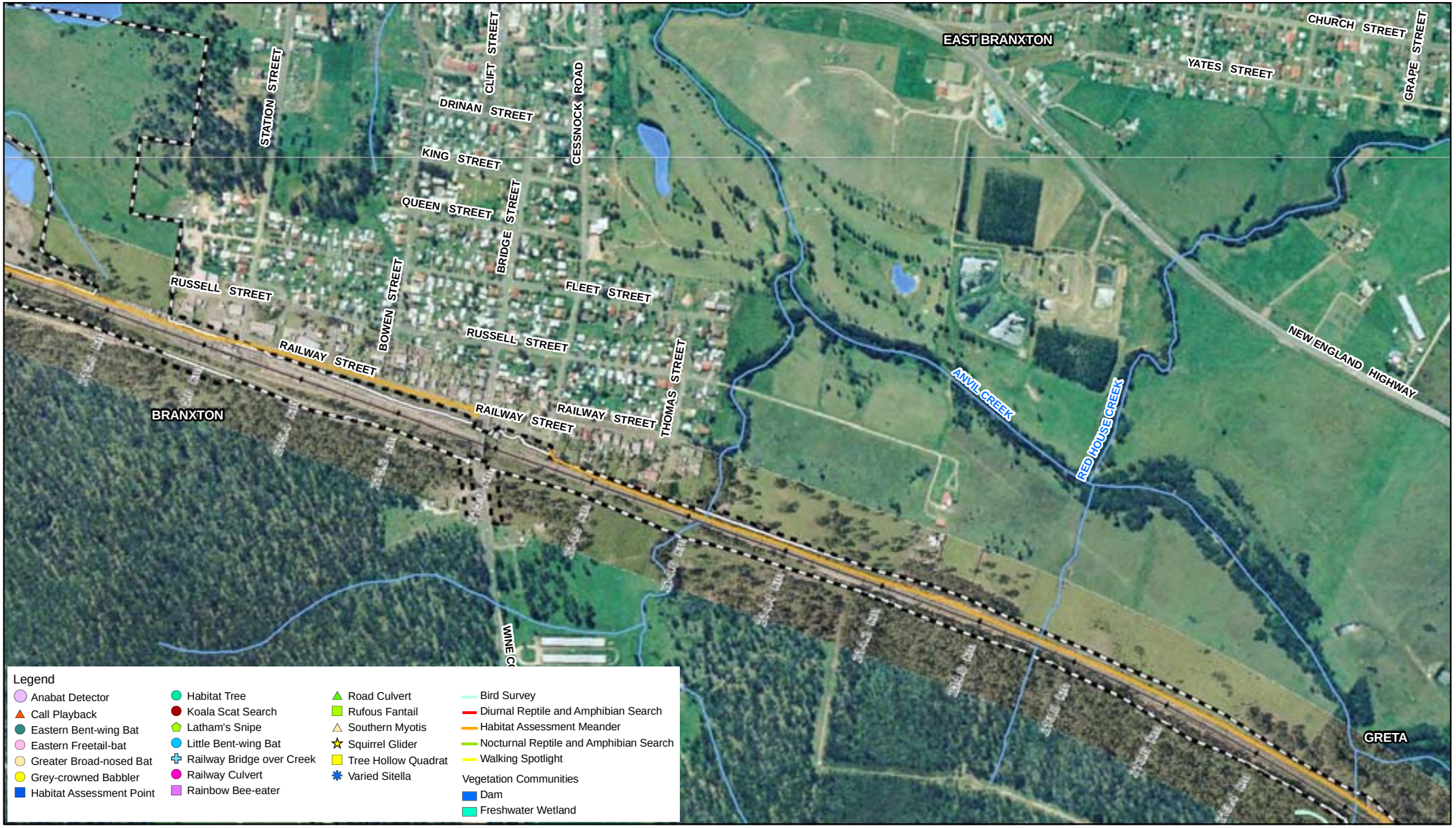
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Ecotone Ecological Consultants Pty Ltd: Fauna Mapping Data - 2009. Created by: fmackay, tmorton



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0 35 70 140 210 280

Metres

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

N

LEGEND

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

Maitland to Minimbah Third Track Environmental Assessment

Survey Effort and Threatened Species Locations

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Revision A
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Figure 10.1d

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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

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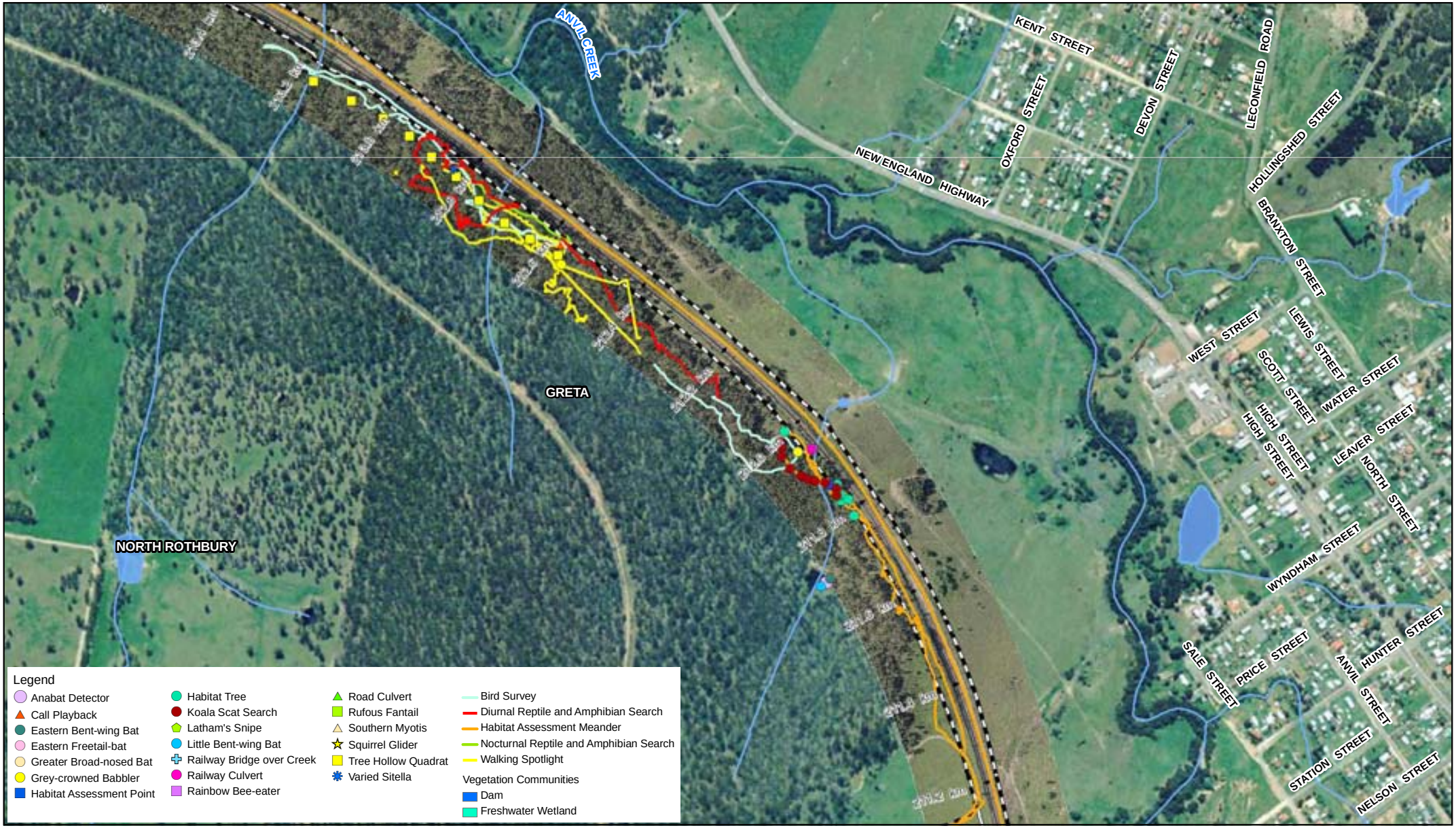

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Metres

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

N

LEGEND

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

Maitland to Minimbah Third Track Environmental Assessment

Survey Effort and Threatened Species Locations

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Figure 10.1e

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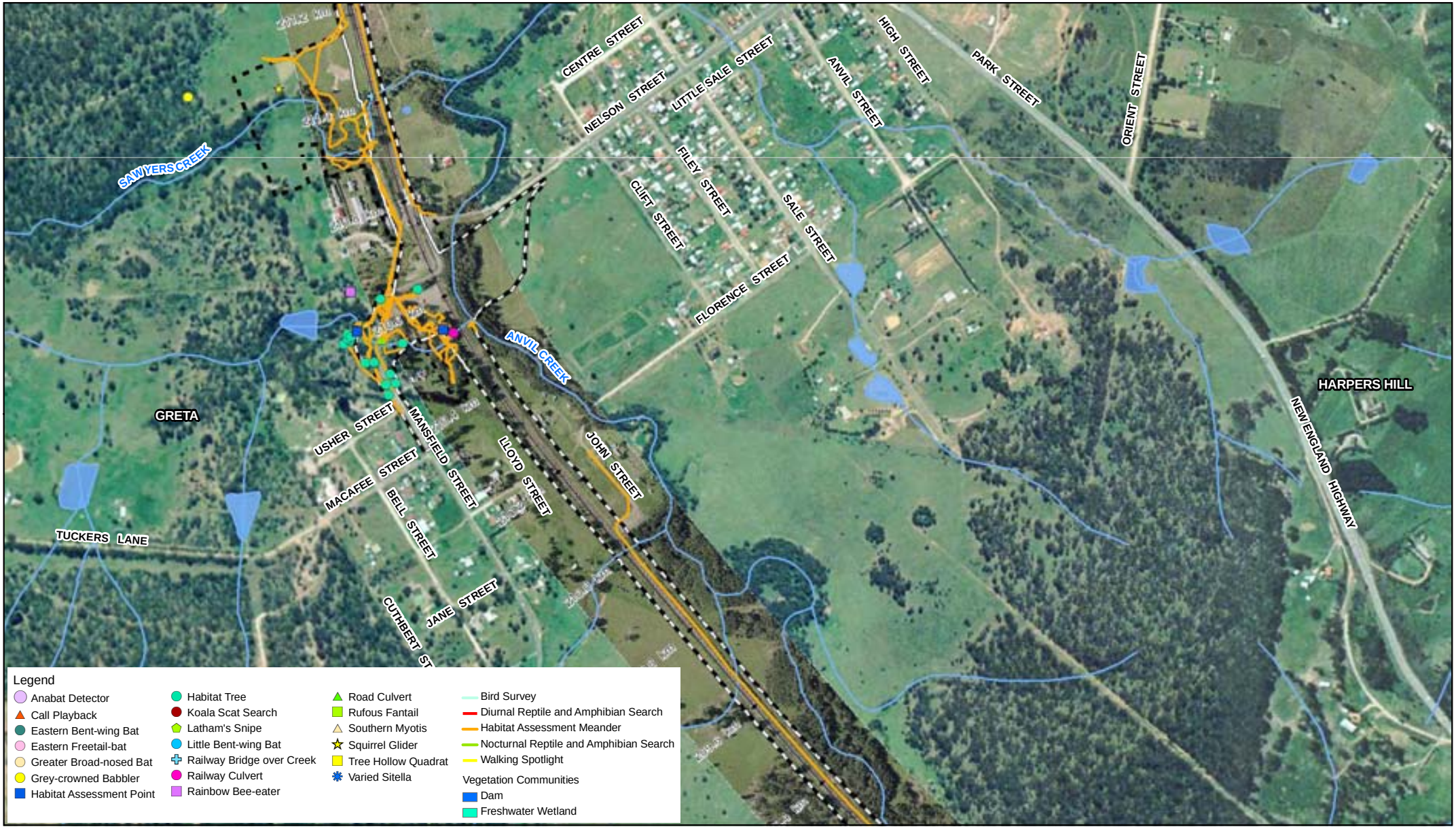
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Ecotone Ecological Consultants Pty Ltd: Fauna Mapping Data - 2009. Created by: fmackay, tmorton



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Metres

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

N

LEGEND

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

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Survey Effort and Threatened Species Locations

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Figure 10.1f

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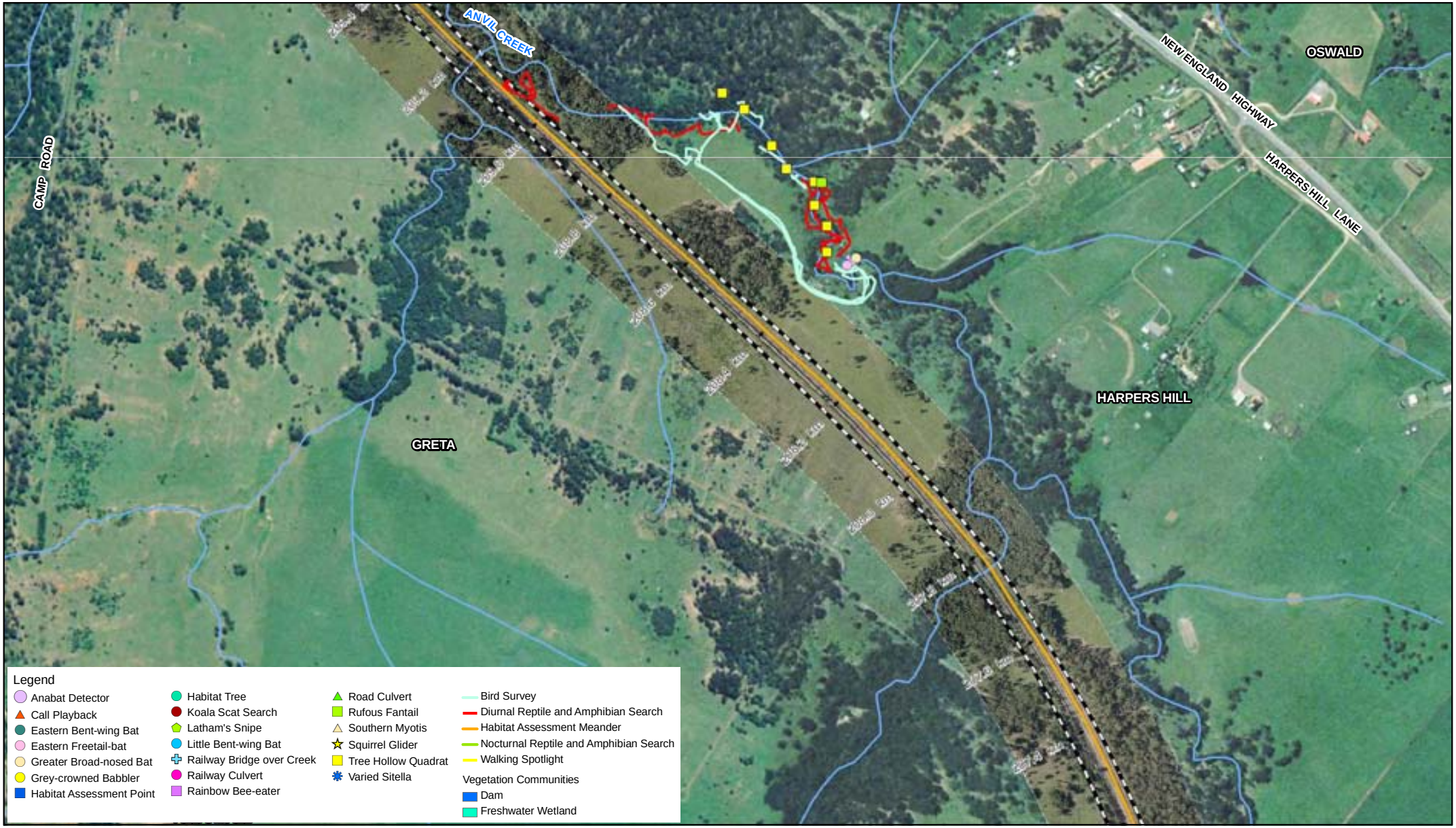
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com.au W www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Ecotone Ecological Consultants Pty Ltd: Fauna Mapping Data - 2009. Created by: fmackay, tmorton



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Metres

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

N

LEGEND

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

Maitland to Minimbah Third Track Environmental Assessment

Survey Effort and Threatened Species Locations

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Figure 10.1g

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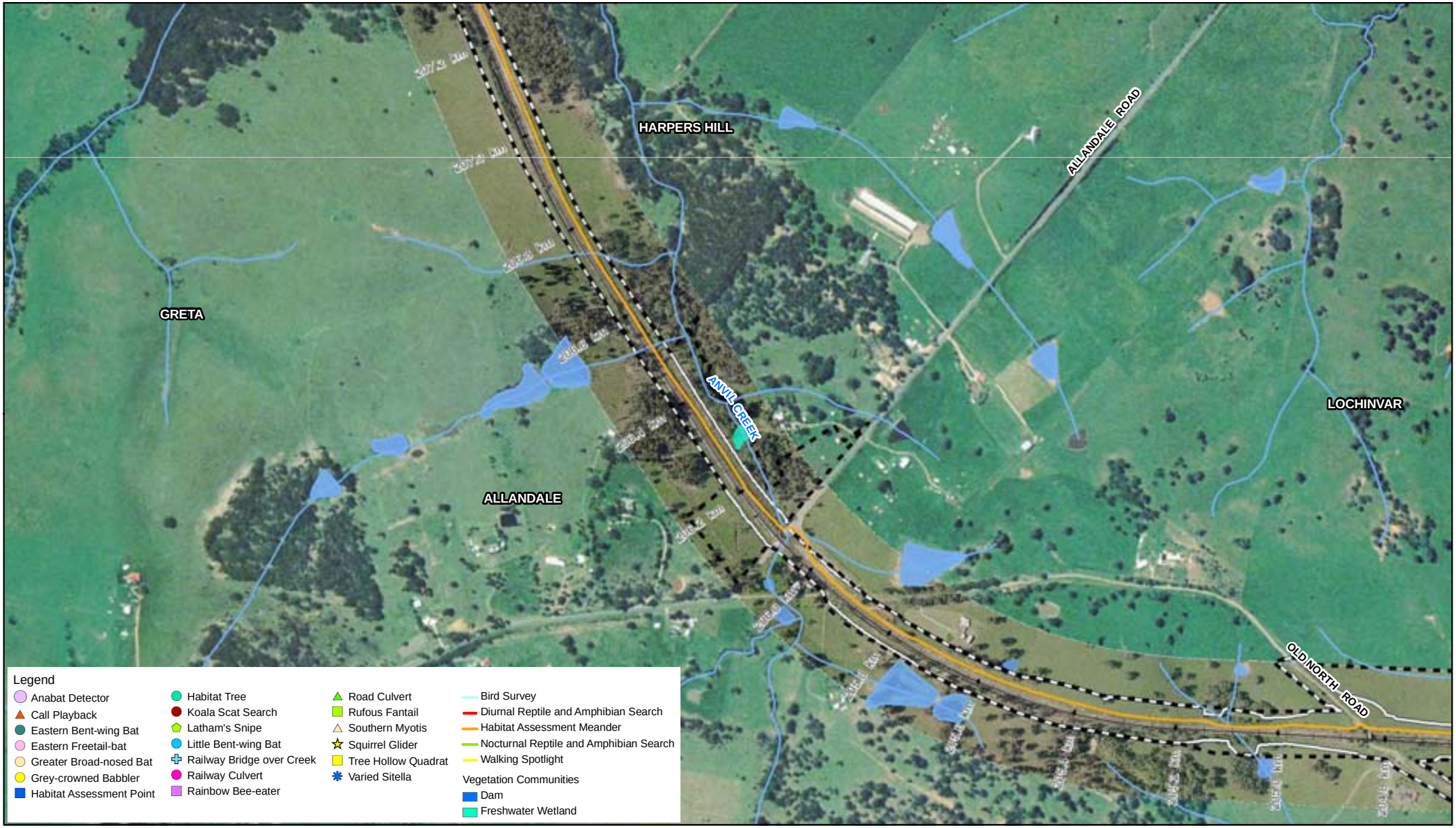
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Ecotone Ecological Consultants Pty Ltd: Fauna Mapping Data - 2009. Created by: fmackay, tmorton



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
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LEGEND

- Investigation Area
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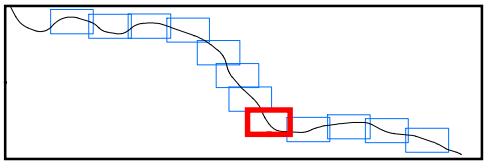
- Watercourse
- Watercourse Area



Maitland to Minimbah Third Track Environmental Assessment

Survey Effort and Threatened Species Locations

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Revision A
Date May 2010

Figure 10.1h

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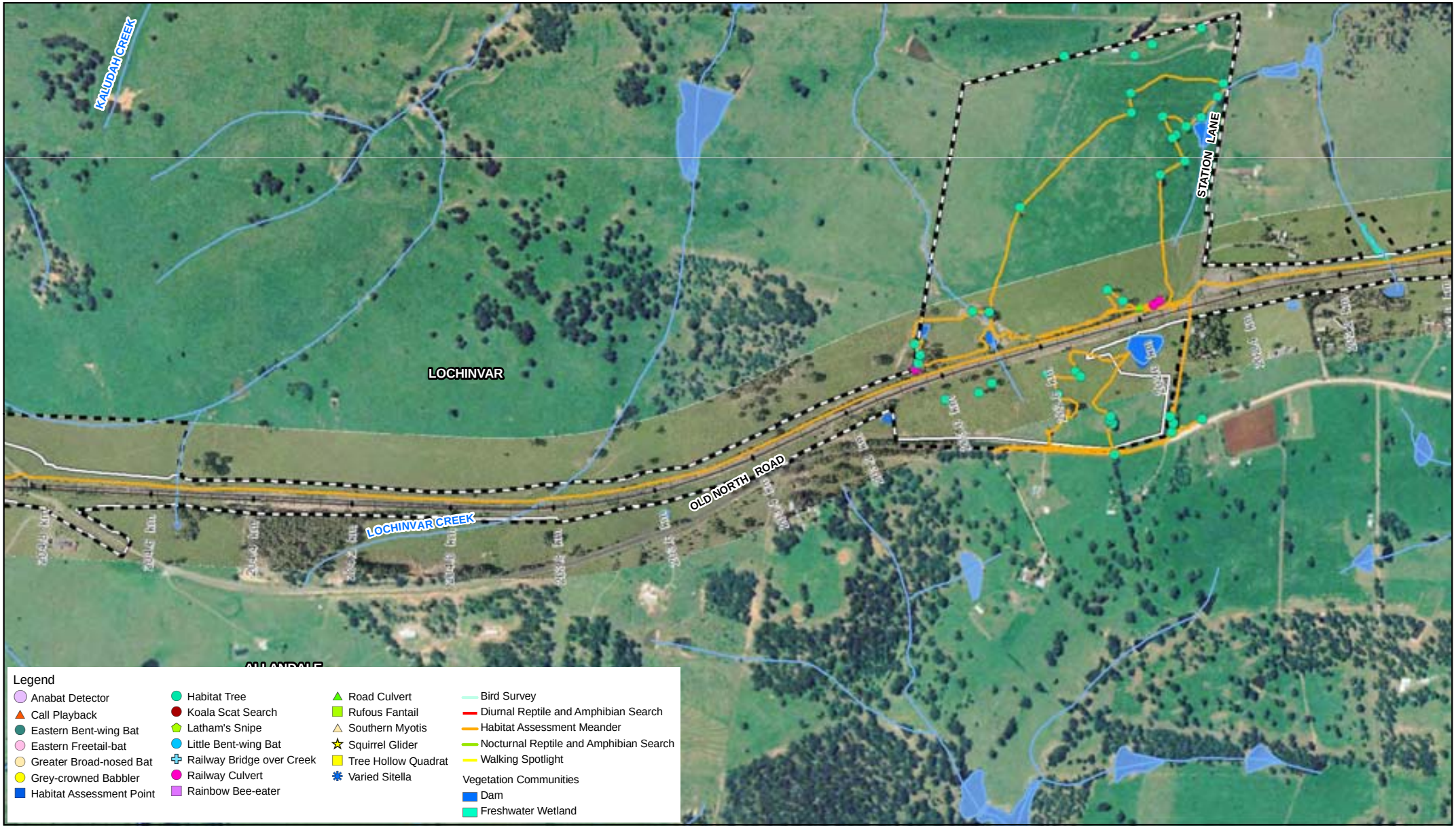
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Ecotone Ecological Consultants Pty Ltd: Fauna Mapping Data - 2009. Created by: fmackay, tmorton



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Metres

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

N

LEGEND

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

Maitland to Minimbah Third Track Environmental Assessment

Survey Effort and Threatened Species Locations

Job Number 22-14471
Revision A
Date May 2010

Figure 10.1i

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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

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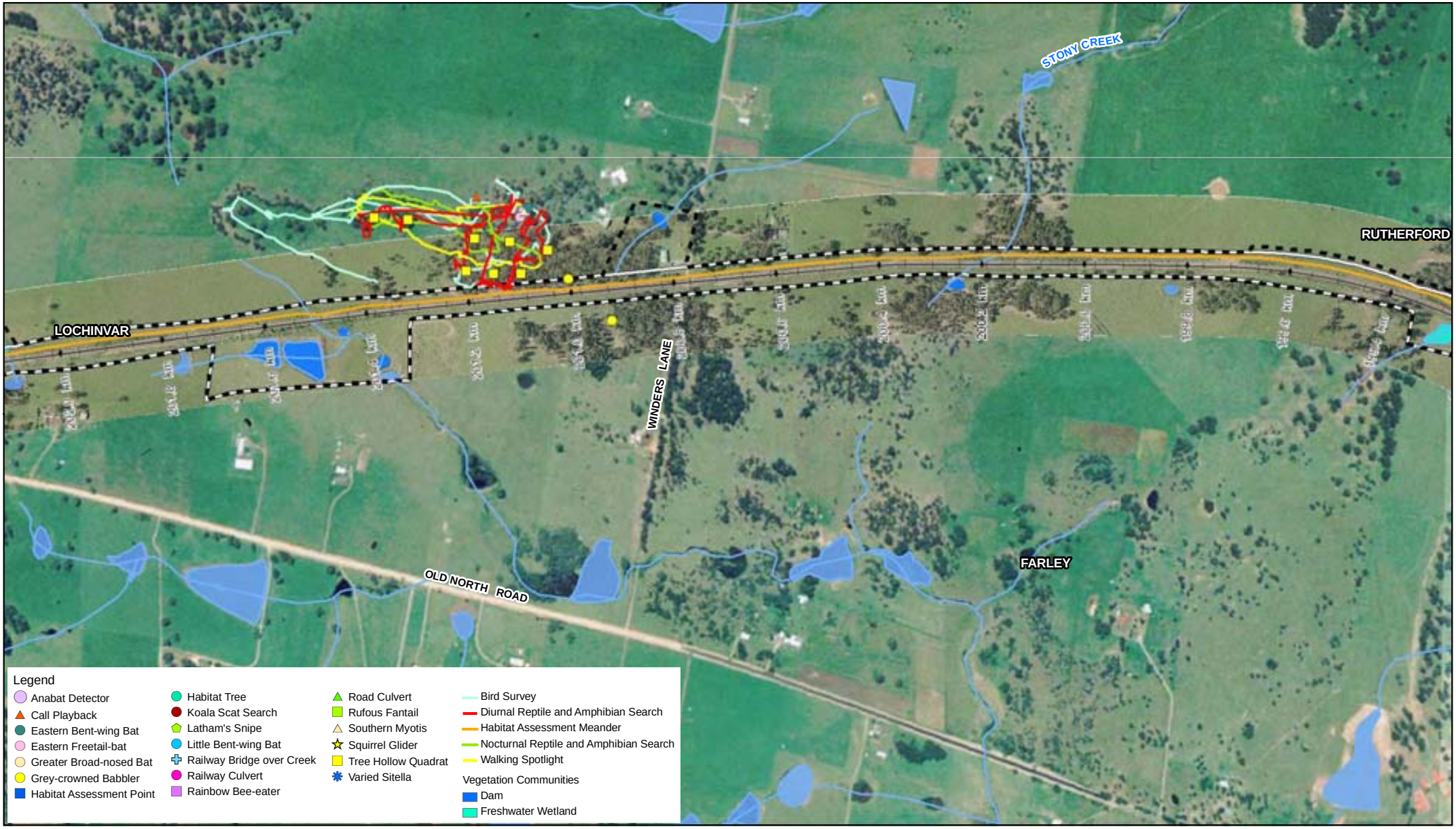

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0 35 70 140 210 280

Metres

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

N

LEGEND

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

Maitland to Minimbah Third Track Environmental Assessment

Survey Effort and Threatened Species Locations

Job Number 22-14471
Revision A
Date May 2010

Figure 10.1j

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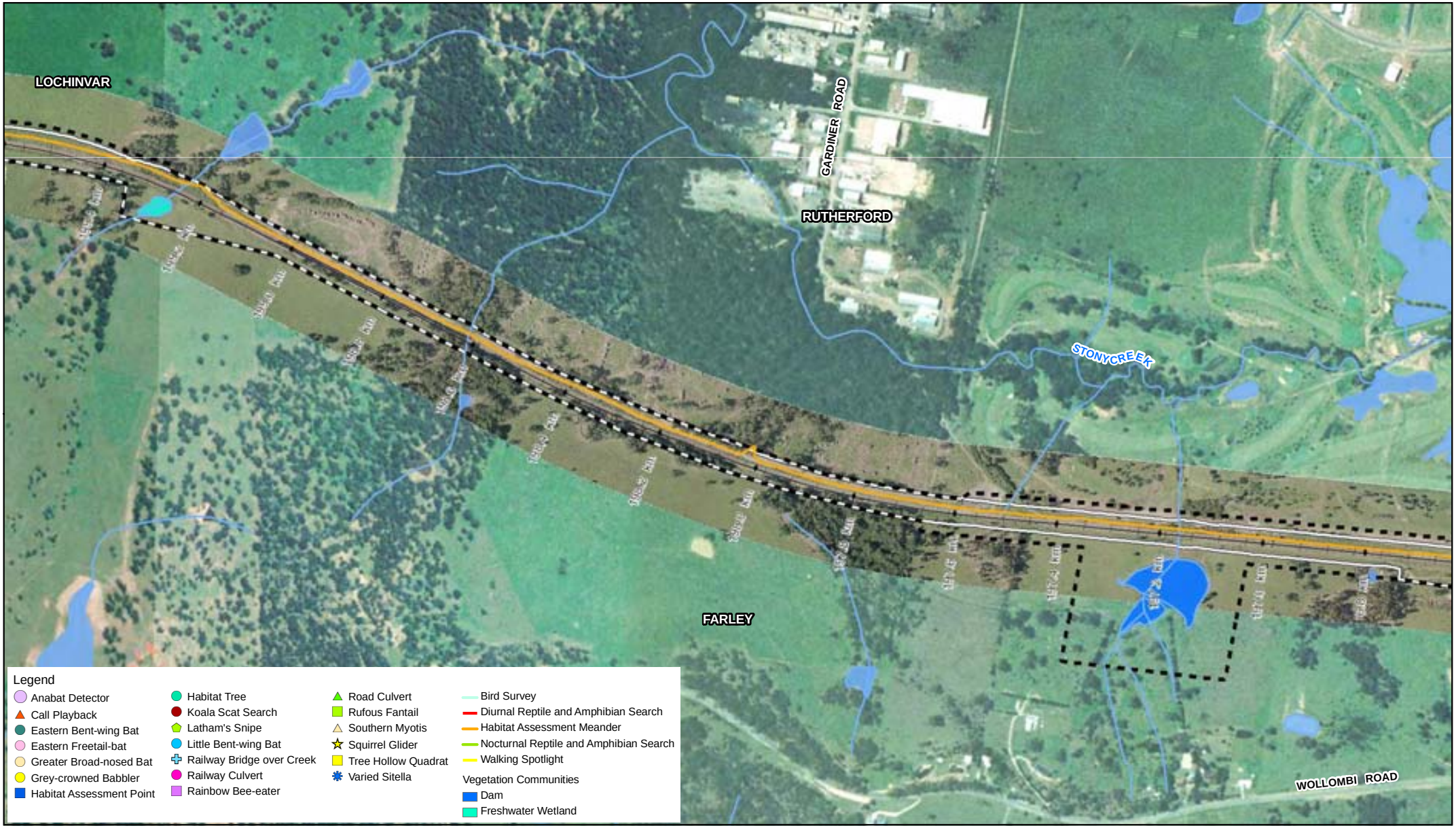
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Ecotone Ecological Consultants Pty Ltd: Fauna Mapping Data - 2009. Created by: fmackay, tmorton



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Metres

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

N

LEGEND

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

Hunter ALLIANCE

Maitland to Minimbah Third Track
Environmental Assessment

Survey Effort and Threatened Species Locations

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Figure 10.1k

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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; Ecotone Ecological Consultants Pty Ltd: Fauna Mapping Data - 2009. Created by: fmackay, tmorton

1:10,000 (at A4)

0 35 70 140 210 280

Metres

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

N

LEGEND

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

Maitland to Minimbah Third Track Environmental Assessment

Survey Effort and Threatened Species Locations

Job Number 22-14471
Revision A
Date May 2010

Figure 10.1l

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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; Ecotone Ecological Consultants Pty Ltd: Fauna Mapping Data - 2009. Created by: fmackay, tmorton

10.3 Impact Assessment

10.3.1 Construction

Fauna Habitat

The detailed fauna investigation identified fauna habitat in the investigation area that would be impacted by the Project. The Project would result in the removal or modification of areas of vegetation from the investigation area (refer to Section 9.3.1). The Project would also result in the removal of several farm dams and the re-alignment of approximately 100 metres of Sawyers Creek. No critical habitat listed on the TSC Act would be impacted by the Project.

The majority of vegetation clearing that would be required for the Project would be within pastureland. Due to the availability of similar open pasture habitat comprising farming land and grazing paddocks within the investigation area, the removal of areas of open pasture habitat within the investigation area is of low importance. The long-term survival of the threatened species, populations and ecological communities in the locality would not be affected by the removal of open pasture habitat.

The removal of areas of woodland from the investigation area would result in a minor increase in the degree of fragmentation and isolation of surrounding woodland. The loss of habitat associated with this clearance would decrease the extent of suitable habitat for foraging, roosting and nesting for fauna species in the investigation area. However, given the relatively small area of habitat to be removed along a long corridor, and the availability of nearby similar or better quality habitat, it is not expected that the Project would greatly impact habitat for fauna species.

Hollow-dependent threatened mammal species could be significantly impacted by the tree felling process if small discrete populations are present. Management measures to minimise and mitigate these impacts are provided in Section 10.4.

The loss of woodland areas is unlikely to affect species' ability to move within the landscape due to the presence of woodland areas adjacent to most areas of woodland that are to be removed. The ecological integrity and security of surrounding habitat is unlikely to be affected by the removal of the areas of woodland from the investigation area.

In addition to the removal of vegetation, and consequently habitat, the removal of areas of farm dams from the investigation area would result in an increase in the degree of fragmentation and isolation of habitat. The removal of farm dams would reduce the overall availability of habitat for species that utilise farm dams, and remaining farm dams would become separated from each other by a larger distance. However, given that no species that would rely on farm dams for habitat were detected during the detailed fauna surveys, the impact of the removal of farm dams is not expected to impact threatened species.

Further assessment of the impacts of vegetation clearance on vegetation communities and aquatic habitats is included in the Fauna Impact Assessment in Appendix F and the Flora and Aquatic Ecological Assessment in Appendix E.

Threatened Species

The assessment of threatened species listed under the TSC Act has been undertaken in accordance with the *Part 3A Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) and the *Threatened species assessment guidelines: The assessment of significance* (DEC 2007).

It is considered that the Project is unlikely to significantly impact upon 29 of the 39 threatened species listed on the TSC Act which have potential habitat in the investigation area. Ten hollow dependent threatened mammal species, as outlined in Table 10-4, could be significantly impacted by the tree felling process if only small discrete populations are present. None of the threatened species in this assessment are at the limit of their known distribution in the investigation area or surrounding areas. The assessment of the Project's impact on these fauna found that these ten species would be impacted by the tree-felling process in the absence of appropriate management measures. With the application of appropriate tree-felling procedures, these species would not be significantly impacted by the Project. Management measures are listed in Section 10.4.

Table 10-4 Hollow-Dependent Threatened Mammal Species

Common Name	Scientific Name
Powerful Owl	*Ninox strenua*
Masked Owl	*Tyto novaehollandiae*
Barking Owl	*Ninox connivens*
Brush-tailed Phascogale	*Phascogale tapoatafa*
Squirrel Glider	*Petaurus norfolcensis*
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*
East-coast Freetail-bat	*Mormopterus norfolkensis*
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*
Greater Broad-nosed Bat	*Scoteanax rueppellii*
Large-footed Myotis	*Myotis macropus*

Assessments of significance were also undertaken for threatened fauna species listed under the EPBC Act in accordance with the *Significant Impact Guidelines 1.1: Significant Impact Guidelines Matters of NES* (DEH 2006).

It is considered that the Project is unlikely to significantly impact upon any local population of the 16 threatened and/or migratory species listed on the EPBC Act which have potential habitat in the investigation area.

A full copy of the fauna assessment, incorporating assessments undertaken in accordance with the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005), the *Threatened species assessment guidelines: The assessment of significance* (DEC 2007) and the *Significant Impact Guidelines 1.1: Significant Impact Guidelines Matters of NES* (DEH 2006) is provided in the Fauna Impact Assessment located in Appendix F.

10.3.2 Operation

Operational impacts on fauna would be primarily related to water quality impacts. The scale of these impacts are expected to be similar to that of the existing environment. Water quality mitigation measures as outlined in Sections 18.4 would reduce any adverse operational impacts.

There is the potential for the operation of the Project to result in more frequent vehicle collisions with fauna on access tracks by service vehicles or on the track by trains. However, appropriate traffic controls and speed limits for service vehicles would reduce this impact.

10.4 Mitigation Measures

The management of adverse ecological 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) detailed in the Fauna Impact Assessment in Appendix F.

Measures to mitigate impacts of the construction and operation of the Project are listed below.

- The construction impact zone and areas of vegetation to be cleared would be clearly identified.
- A tree felling protocol would be developed to minimise harm to fauna species during the clearing of trees for the Project. The tree felling protocol should be developed by a suitably qualified and licensed ecologist with previous experience supervising the felling of trees. The tree felling protocol should involve, as a minimum, the following key steps of:
  - Establishment of the best time of the year for felling (depends on the likely species to be affected) where possible.
  - Pre-felling marking of habitat trees.
  - Inspections of trees on the day of felling.
  - The felling of non-habitat trees at least two days before habitat trees.
  - The inspection of non-habitat trees for koalas on the day of felling non-habitat trees (not necessarily by an ecologist).
  - The shaking of habitat trees the day before felling is planned.
  - Procedures for the safe removal of fauna species from trees prior to and post felling.
  - A stop work procedure for in the event that a threatened species is recorded in or leaving a tree hollow during tree felling. Such a stop work procedure should require as a minimum, the tree to be left standing overnight and the re-starting of the tree felling process after three days.
  - A relocation/release protocol (including the holding of nocturnal species until dusk).

  - Where possible, leaving the tree where it falls, overnight.
  - Arrangements for the treatment of injured fauna.
  - A protocol for the salvaging of tree hollows for rehabilitation works (unless nest boxes are to be used).
- Nest boxes would be established at the densities identified in Section 3.2.1.3 in the Fauna Impact Assessment (refer to Appendix F). The Fauna Impact Assessment also outlines the monitoring which would be required. All nest boxes should be established one month prior to felling operations in nearby woodland areas identified by an experienced and qualified ecologist. Nest boxes should be established at the heights recommended in *Nest Boxes for Wildlife* (Franks 2003). All nest boxes with entrance hollows between 50 and 80 millimetres should be fitted with rigid (timber or metal) Indian Myna baffles. Nest boxes should be established in trees using the Habisure method of attaching the nest box to the tree.
- Where bridges and culverts are to be removed or modified, immediately prior to removal/modification an ecologist would inspect the bridge/culvert for roosting bats, and fairy martin and welcome swallow nests. If roosting bats are present they should be left undisturbed until dusk. At dusk roosting bats can be captured and released nearby. Following removal or departure of all roosting bats the culvert should be removed or blocked off (for example cover the entrance with shade cloth) prior to dawn the following morning. If more than ten bats or any number of bats with babies/juveniles are identified, advice from a specialist bat expert would be required to determine if, how and when the bats can be removed.
- Where culverts are to be replaced or constructed, they should not restrict the use of those culverts as movement corridors for fauna species through the rail corridor
- Runoff/sedimentation from the Construction Impact Zone should be managed during the construction phase using current appropriate sediment and erosion control measures outlined within the Environmental Management Plan. In particular, management of runoff into and protection of the water quality of creeks and watercourses should be implemented.
- A weed management strategy would be implemented, possibly as part of a vegetation management plan, for any retained or rehabilitated natural vegetation within the investigation area and any offset areas. All noxious weeds within the land would be treated in accordance with their weed Class as per the *Noxious Weeds Act* 1993.
- During construction, ensure that protocols are in place to minimise the risk of importation of root-rot fungus (*Phytophthora cinnamomi*) via the transport of soil on machinery or footwear, or the importation of soil in accordance with Department of Environment, Water, Heritage and the Arts (DEWHA) 2001 guidelines. Where possible, machinery and footwear would be free of soil or washed clean before arriving on site. Any soil imported onto the site would be sourced from root-rot fungus free areas.
- Rehabilitation of highly disturbed and bare areas following completion of construction in the area would use locally-occurring species (trees, shrubs and ground cover) characteristic of the local vegetation communities.

Offsetting of Impacts

Offset areas would be required to compensate for the loss of or disturbance to vegetation communities (fauna habitat areas) across the investigation area. A Compensatory Habitat Strategy would be prepared by the Hunter 8 Alliance. The development of a comprehensive and strategic regional offset approach for the entire Project would reduce the regional impact on threatened and non-threatened species that would be likely to be affected by the Project.

Offsetting is further discussed in the Flora and Aquatic Ecological Assessment in Appendix E.

11. Aquatic Ecology

11.1 Assessment Approach

11.1.1 Introduction

The Director-General's Environmental Assessment Requirements identify ecology as a key issue for the Environmental Assessment. This chapter identifies the potential impacts of the Project on aquatic ecology and the management measures proposed to reduce these impacts. Table 11-1 outlines the Director-General's Environmental Assessment Requirements relating to ecology and where they have been addressed.

Aquatic Ecology has been assessed within a detailed Flora and Aquatic Ecological Assessment and is included in Appendix E.

Table 11-1 Director-General's Environmental Assessment Requirements – Ecology

Director-General's Environmental Assessment Requirements	Where Addressed
Terrestrial and aquatic flora, fauna and habitat, with specific consideration of Endangered Ecological Communities, threatened flora, fauna and populations.	Aquatic results are outlined in Section 11.3.
Vegetation clearing and resultant foraging, roosting and nesting habitat loss, fragmentation, connectivity and edge effects, increase in rail movements, and changes to watercourses and riparian zones.	Aquatic impact assessment is outlined in Section 11.3.
Taking into account of: the *Draft Guidelines for Threatened Species Assessment* (DEC), *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC), *Threatened Species survey and assessment: field survey methods for fauna Amphibians* (DECC), *Principles for use of Biodiversity offsets in NSW* (DECC) and *Fish Passage requirements for Waterway Crossings* (NSW Fisheries).	Aquatic survey methods are outlined in Section 11.1.

11.1.2 Methodology

The aquatic ecology survey and assessment has been prepared with consideration of the *Draft Guidelines for Threatened Species* (DEC and DPI 2005) and *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004). The study area for the aquatic ecology assessment is based on the investigation area which is described and shown in **Chapter 9** in Figure 9.1a to Figure 9.1l. The aquatic ecology survey and assessment included the following:

- Literature review of existing studies for the study area and surrounding areas. The literature review is summarised in Appendix E.
- Database searches to identify threatened aquatic species recorded in the locality and with potential to occur on-site.
- Aquatic habitat assessment.

- Assessment of likelihood of occurrence of threatened flora and endangered ecological communities (EEC) listed on the *Threatened Species Conservation Act* 1995 (TSC Act) and / or *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).
- Assessment of likelihood of occurrence of threatened aquatic species listed on the *Fisheries Management Act* 1994 (FM Act) and / or EPBC Act.
- Impact assessment for threatened flora and aquatic species listed on the TSC Act and FM Act in accordance with the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) and the EPBC Act *Significant Impact Guidelines* (DEH 2006) for species listed on the EPBC Act.

11.2 Existing Environment

There are six named creeks in the study area, Stony Creek, Lochinvar Creek, Anvil Creek, Sawyers Creek, Black Creek and Jump Up Creek. Sweetwater creek also runs adjacent to the study area (refer Figure 9.1). The study area also includes numerous permanent and ephemeral unnamed tributaries to these creeks. Most creeks within the study area have been rated as poor to average by the Rapid Appraisal of Riparian Condition (RARC) assessment criteria (Jansen et al 2005), due to the width of riparian vegetation, fragmented nature of native vegetation in the local area, high level of weeds in the groundcover, and lack of fauna habitat features such as hollow-bearing trees and fallen logs.

There are several small freshwater wetlands within the study area, and a large freshwater wetland (Wentworth Swamp) associated with Stony Creek near Wollombi Road (refer Figure 9.1). These wetlands have been rated as poor in the RARC assessment. Several unnamed tributaries of Wentworth Swamp occur in the eastern section of the study area, which have been highly degraded and are rated as very poor in the RARC assessment.

There are numerous small and large farm dams within the study area which have little or no native riparian vegetation. These farm dams are unlikely to be providing important habitat for fish and macroinvertebrates due to lack of riparian vegetation, isolation from other waterways and high levels of disturbance due to agricultural activities. The farm dams are likely to be providing habitat for mobile native fauna, such as birds and possibly bats.

Database searches indicate that no threatened aquatic species or EECs listed under the FM Act or EPBC Act are considered likely to occur in the study area.

11.3 Impact Assessment

The Flora and Aquatic Ecological Assessment covers the potential impacts of construction and operation of the Project on aquatic ecology. These are summarised below.

11.3.1 Construction

Creeks and Drainage Lines

With the exception of the Sawyers Creek realignment, no major trenching or in-stream pylons installations for any creeks are anticipated. Impacts such as an increase in turbidity on water quality during construction would be managed through the development of a Spoil and Fill Management Plan.

The works at Sawyers Creek involve realignment of approximately 100 metres of the creek line upstream of the existing rail. The realignment would include trenching a new alignment that would include deep pools, meanders, riffle habitat and revegetation works. The design would be in accordance with Industry and Investment NSW guidelines and allow the following requirements to be met:

- Maintain existing stream length (including meanders).
- Maintain existing stream gradient.
- Maintain existing channel profile (cross section).
- Reinstate riparian vegetation including suitable habitats (such as slow flow areas).

The Sawyers Creek works would result in similar flow characteristics to the existing environment, therefore, it is not considered to constitute a key threatening process as listed under the FM Act. A revegetation plan would be developed to reinstate riparian vegetation characteristic of Red Gum Open Forest, which extends upstream from the works site.

Removal of Aquatic Habitat

The Project would involve clearing and/or filling small areas of freshwater wetland and riparian vegetation, including small areas of Swamp Oak Riparian Forest EEC, macrophyte beds, native reeds and sedges (refer Figure 9.1). No in-stream woody snags would be impacted by the Project.

The Project would involve vegetation clearance adjacent to creeks and drainage lines. Removal of riparian and aquatic vegetation would result in the permanent loss of foraging habitat for a range of fauna. The Project would clear several small areas of Swamp Oak Riparian Forest associated with creeks and drainage lines, however this vegetation type is widespread and common in the local area adjacent to creeks, and clearing for the Project is considered unlikely to result in a significance impact on this EEC.

Barriers to Fish Passage

The existing culverts under the railway would be extended or augmented and would be designed with consideration to Fairfull and Witheridge (2003) for fish friendly crossings. No instream pylons are proposed and, as such, impacts on fish, platypus and macroinvertebrate foraging habitat are considered unlikely. Impacts on aquatic fauna are considered minimal providing appropriate erosion and sedimentation controls are implemented as part of a Spoil and Fill Management Plan.

The Project would not involve dewatering of permanent creeks or drainage lines. Dewatering of minor ephemeral tributaries may be necessary during construction, however this would not impact on fish passage.

Impacts on Aquatic Processes

Existing culverts along the length of the Project would either be extended or augmented to accommodate the third track.

The Project would increase the flow to creeks and drainage lines due to the introduction of more non-porous surfaces through construction of the third track. However, in consideration of the proposed design the Project is considered unlikely to significantly alter the timing, duration or velocity of flows to or from wetlands and creeks that intersect the study area. With the implementation of appropriate construction management measures, adverse impacts on aquatic process, species and habitat are considered unlikely.

Construction of the Project may result in minor changes to floodplain characteristics as discussed in **Chapter 18**. Minor increases in flows have the potential to result in a minor increase in potential riparian habitat areas for the Swamp Oak Floodplain Forest EEC and Freshwater Wetland EEC.

Groundwater Dependant Ecosystems

The Project is not anticipated to impact on availability, depth, quality or flow of groundwater. Construction impacts on groundwater dependant ecosystems are considered unlikely as no dewatering is proposed, except for Wollombi Road. At Wollombi Road localised and temporary lowering of the groundwater would occur during construction. This is considered unlikely to have a significant or lasting impact on groundwater dependant ecosystems. This is further described in the groundwater chapter in Section 17.3.2.

11.3.2 Operation

Operational impacts that could occur would be associated with the use of herbicides within the rail corridor as part of maintenance procedures. With the implementation of the proposed management measures, no other operational impacts on aquatic process, species and habitat are considered likely. Operational impacts on groundwater dependant ecosystems are also considered unlikely.

11.4 Mitigation Measures

Measures to mitigate impacts of construction and operation of the Project on aquatic ecology are listed below:

- New culverts to be designed with consideration to Fairfull and Witheridge (2003) for fish friendly crossings.
- No instream woody snags are to be removed from creeks or drainage lines except as required for structures or creek realignment. In the case of the Sawyer's Creek realignment, any woody snags that occur within the construction impact zone would be relocated or replaced up or downstream of the construction area dependant on site safety and access considerations.
- The construction areas would be clearly identified so that works would not encroach closer than necessary upon remnant riparian vegetation.
- Development and implementation of a Spoil and Fill Management Plan including erosion and sediment controls. Erosion and sediment controls would be installed prior to construction, and maintained throughout construction, to minimise sediment entering EECs, creeks and drainage lines.
- Weeds from areas cleared during construction would be removed from the study area and not allowed to enter watercourses or moist areas such as drainage lines.
- Revegetation and replanting of native vegetation for areas of newly-created bare soil following construction, such as creek banks and batters. A rehabilitation plan would be prepared, including revegetation with local native species appropriate for riparian areas surrounding creeks and drainage lines. A specific revegetation plan for Sawyers Creek would be developed to reinstate riparian vegetation characteristic of Red Gum Open Forest, which extends upstream from the works site.

12. Aboriginal Heritage

12.1 Assessment Approach

12.1.1 Introduction

This chapter provides a summary of the *Maitland to Minimbah Third Track Aboriginal Heritage Impact Assessment* report prepared by South East Archaeology Pty Limited. The detailed Aboriginal Heritage Impact Assessment is included in Appendix G.

The Director-General's Environmental Assessment Requirements identify heritage as a key issue for the Environmental Assessment. This chapter identifies the potential Aboriginal heritage impacts of the Project and the management measures proposed to reduce these impacts. Table 12-1 outlines the Director General's Environmental Assessment Requirements relating to Aboriginal heritage and where they have been addressed.

Table 12-1 Director-General's Environmental Assessment Requirements – Aboriginal Heritage

Director-General's Environmental Assessment Requirements	Where Addressed
Indigenous heritage, objects, places of significance, natural and landscape values of the corridor and surrounding area, taking into account the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC).	Sections 12.2 and 12.3.

12.1.2 Methodology

During the initial stages of the assessment, research was conducted into the environmental, cultural and archaeological background of the investigation area, and searches were undertaken of the DECCW Aboriginal Heritage Information Management System and other relevant heritage registers and planning instruments. These include:

- DECCW Aboriginal Heritage Information Management System (AHIMS).
- Previous search results reported by Kuskie (2008).
- Previous search results reported by Dyall (1979).
- State Heritage Register.
- Register of the National Estate (RNE).
- National Heritage List.
- Commonwealth Heritage List.
- *Singleton Local Environmental Plan 1996.*
- *Cessnock Local Environmental Plan 1989.*

- *Maitland Local Environmental Plan 1993.*
- *Hunter Regional Environmental Plan 1989.*
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984.*

A number of archaeological surveys and excavations have been conducted within the locality of the investigation area and within the wider Hunter Valley region, in a commercial contracting framework. Discussion of the most relevant investigations was undertaken to identify the range of site types and variety of site artefacts in the region. These investigations helped identify typical site locations, and assisted with the construction of a predictive model of site location for the investigation area.

Consultation and involvement of the Aboriginal community was undertaken following the requirements of the DECCW policy entitled *Interim Community Consultation Requirements for Applicants (2004)* and included the following procedures:

- Provide written notification of the Project to the LALC, DECCW, Registrar of Aboriginal Owners (Department of Aboriginal Affairs), NSW Native Title Services and relevant Local Councils, requesting that if they are aware of any Aboriginal persons/organisations who may wish to be consulted about the Project to provide such advice in writing, with a minimum 10 day response period. Correspondence was forwarded to the relevant organisations on 6 April 2009.
- Provide written notification of the Project directly to those Aboriginal persons/organisations that were identified in Procedure 1, requesting those who may be interested in participating in the Project to register their interest in writing, with a minimum 10 day response period. Compliance was achieved by writing on 20 April 2009 to the organisations named by DECCW with an invitation to register an interest as per the DECCW policy.
- Advertisements were placed in the Public Notices sections of The Singleton Argus and The Maitland Mercury on 7 April 2009, and The Cessnock Advertiser on 8 April 2009, requesting any Aboriginal persons/organisations who may be interested in participating in the Project to register their interest in writing. Aboriginal Native Title Consultants registered an interest in the Project and also advised the consultant to contact an additional five Aboriginal groups.

At the conclusion of Procedures 1-3, twenty organisations or individuals had registered an interest in the assessment. Additional procedures performed for stakeholder consultation, along with key comments and responses are provided within the detailed Aboriginal Heritage Impact Assessment in Appendix G.

Field inspection of the investigation area was undertaken between 24 August and 2 October 2009, assisted by representatives of the registered Aboriginal stakeholders. Where required, consultation was also undertaken with local property owners.

Due to property access restrictions at the time of the field investigation, approximately 32.9 hectares, or nine percent of the Investigation Area, could not be accessed for field investigation.

Visual inspections were made of “modified” areas to confirm that negligible potential for heritage evidence exists. Detailed archaeological survey focused on the “unmodified” investigation area using comprehensive recording of the archaeological survey areas. Due to logistical reasons, additional archaeological survey coverage was also obtained of some adjacent areas outside of the investigation area.

Each survey area was inspected on foot by the archaeologists and Aboriginal representatives, largely in accordance with the proposed methodology provided to and originally agreed by the Aboriginal stakeholders. Within each survey area:

- Inspection was made for stone artefacts, focusing on areas with ground surface visibility.
- Inspection was made for obtrusive site types such as scarred trees and grinding grooves.

During the survey Aboriginal stakeholders were also asked of their knowledge of any areas of cultural significance within the study area, for example:

- Sites or places associated with ceremonies, spiritual/mythological beliefs and traditional knowledge, which date from the pre-contact period and have persisted until the present time.
- Sites or places associated with historical associations, which date from the post-contact period and are remembered by people today (for example, plant and animal resource use areas and known camp sites).
- Sites or places of contemporary significance (apart from those areas for which Aboriginal objects remain, which are discussed above), for which the significance has been acquired in recent times.

The results of the investigation are presented in Section 12.2.

12.2 Existing Environment

12.2.1 Investigation Area and Locality

In relation to Aboriginal heritage, the investigation area comprises two distinct portions:

- *Modified investigation area* - the portion of the investigation area that has been extensively impacted by earthmoving works, typically associated with construction of the existing railway, such that there is negligible potential for any Aboriginal heritage evidence to survive. The modified investigation area comprises approximately 95.5 hectares or 27% of the investigation area.
- *Unmodified investigation area* - the remaining portion of the investigation area, in which there generally remains some potential for Aboriginal heritage evidence. The unmodified investigation area comprises approximately 262.6 hectares or 73% of the investigation area.

For the purposes of this assessment, archaeological survey coverage has been achieved of a substantial portion of the investigation area, along with additional adjacent areas outside of the investigation area that were sampled for logistical reasons.

The majority of the study area (all east of Black Creek) lies within the boundaries of the Mindaribba Local Aboriginal Land Council (LALC), while the portion west of Black Creek (two kilometres west of Branxton) lies within the boundaries of the Wanaruah LALC. The study area also lies within an area of interest to other Aboriginal persons and organisations.

12.2.2 Heritage Register Searches

A search of the AHIMS was conducted in June 2009 and August 2009. This included a 141 square kilometre zone encompassing the present investigation area.

Within this zone, 148 Aboriginal sites have previously been recorded, most of which are open artefact scatters or isolated artefacts, in addition to five Potential Archaeological Deposits (PADs). One 'burial - Aboriginal ceremonial and dreaming' site, two 'Aboriginal resource and gathering' sites and eight grinding groove sites are included in this total.

Previous search results (Kuskie 2008) were relied upon for the western-most 2.7 kilometres of the investigation area. This search of a 156 square kilometre zone extending towards Singleton listed 65 Aboriginal sites, all open artefact scatters or isolated artefacts.

Thirteen Aboriginal sites have previously been recorded within approximately 50 metres of or directly in the investigation area and are listed on the AHIMS register. These sites are all open artefact sites.

In addition, one isolated artefact ('Farley C') that is not listed on the AHIMS register but has previously been reported by Dyall (1979) also occurs within the investigation area.

No Aboriginal heritage sites are listed within the investigation area on the State Heritage Register, or under the *Environment Protection and Biodiversity Conservation Act 1999* on the Register of the National Estate, National Heritage List or Commonwealth Heritage List, or on the *Singleton Local Environmental Plan 1996*, *Cessnock Local Environmental Plan 1989*, *Maitland Local Environmental Plan 1993* or *Hunter Regional Environmental Plan* 1989, or under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*.

12.2.3 Previous Archaeological Research

A number of archaeological surveys and excavations have been conducted within the locality of the investigation area and within the wider Hunter Valley region.

Details of previous archaeological surveys, excavations, local Aboriginal culture and Aboriginal occupation are provided in the Aboriginal Heritage Impact Assessment (Appendix G).

A total of 13 Aboriginal heritage sites previously recorded on AHIMS as being in or within 50 metres of the Investigation Area could not be rediscovered during the field investigations (refer to Section 12.2.4).

12.2.4 Identified Aboriginal Heritage Items

Field inspection of the Investigation Area was undertaken between 24 August and 2 October 2009, assisted by representatives of the registered Aboriginal stakeholders.

A total of 92 Aboriginal heritage sites have been recorded in or within 50 metres of the Investigation Area comprised of the following:

- 77 open artefacts and one grinding groove site identified and recorded during the field investigations for the Project.
- 13 previously recorded open artefact sites listed on the AHIMS register but not relocated.
- One previously recorded open artefact site not listed on the AHIMS register and not relocated.

An additional four Aboriginal heritage sites were located within 10 metres of the investigation area during the field investigations.

An assessment of the significance of these sites was undertaken in accordance with the methodology detailed in Appendix G. The assessment concluded the following with regard to the significance of the identified Aboriginal heritage sites:

- Two sites as being of high significance.
- One site as being of moderate to high significance.
- One site as being of moderate significance.
- Nine sites of being of low to moderate or potentially moderate significance.
- 83 sites as being of low significance.

Further detail on the characteristics and significance of the individual Aboriginal heritage sites is included in Appendix G.

12.3 Impact Assessment

The Aboriginal Heritage Impact Assessment has identified that of the recorded 96 sites, 65 Aboriginal heritage sites would be impacted by the Project. These are comprised of:

- 56 sites of low significance.
- Eight sites of low to moderate significance.
- One site of high significance.
- The remaining sites were located outside of the Construction Impact Zone.

The Assessment also concluded that:

- There are areas of lower ground disturbance within the Construction Impact Zone that have a moderate to high potential for subsurface deposits of artefacts to occur, including deposits that may be in situ and/or of research value. This does include parts of some areas that could not be accessed.
- However, in the majority of the Construction Impact Zone, there is a low to very low density of artefacts and a low potential for shallow sub-surface deposits of artefacts to occur at many of the 65 identified sites and widely across the survey units, consistent with the survey results and occupation model.

- The potential for sub-surface deposits of artefacts that may be in situ and / or of high research value to occur within these portions of the unmodified Construction Impact Zone is generally low.
- The potential for bora / ceremonial, carved tree, scarred tree and stone arrangement sites to occur within the unmodified portions of the Construction Impact Zone (that have not been directly sampled or were not sampled at all due to access constraints), is assessed as very low or negligible.
- The potential for burial sites to occur within the unmodified portions of the Construction Impact Zone is assessed as low or very low but cannot be discounted.
- The potential for shell midden evidence to occur within the unmodified portions of the impact area is assessed as very low, but cannot be discounted in the eastern end near Wentworth Swamps.
- The potential for grinding groove sites to occur within the unmodified portions of the Construction Impact Zone is assessed as very low but cannot be discounted.
- The potential for specific evidence of lithic quarry sites to occur within the unmodified portions of the Construction Impact Zone is assessed as low.
- Sites of traditional or historical cultural significance have not been identified within the Construction Impact Zone, however the possibility cannot be excluded that such values or associations may exist that were not divulged by the persons consulted

In the absence of appropriate management and mitigation measures, it is concluded that the impacts of the Project on Aboriginal heritage would be high within a local context, but relatively low within a regional context.

The Aboriginal Heritage Impact Assessment has been issued to the registered Aboriginal stakeholders for their review, comment and agreement on the level of significance applied to the discovered sites, and the mitigation measures recommended to manage these sites.

12.4 Mitigation Measures

- Provisions relating to Aboriginal heritage would be included in an Aboriginal Heritage Management Plan (AHMP) for the Project, which would be a component of the CEMP. These provisions would be formulated in consultation with the registered Aboriginal stakeholders and DECCW, and specify the policies and actions required to manage the potential impacts of the Project on Aboriginal heritage should Project Approval be granted. The primary elements of the AHMP are outlined below:
  - In order to mitigate the impacts of development and to retrieve and conserve samples of Aboriginal heritage evidence, a program of salvage would be undertaken within the Construction Impact Zone. This work would be undertaken by representatives of the registered Aboriginal stakeholders and qualified archaeologists.
    - Management strategies for individual sites as outlined in Appendix G.
    - Systematically collecting stone artefacts from the identified Aboriginal sites that may be subject to impacts, prior to any development impacts occurring (including from any further open artefact sites that may be identified prior to or during construction).

- Conducting localised hand excavation at the three sites specified in the Aboriginal Heritage Impact Assessment prior to any development impacts occurring.
- Conducting mechanical surface scrapes at the four sites specified in the Aboriginal Heritage Impact Assessment, accompanied by localised hand excavation of any features of significance that are identified, prior to any development impacts occurring.
- Conducting broad-area hand excavation at the locations specified in the Aboriginal Heritage Impact Assessment, followed by surface scrapes and localised hand excavation of any features of significance that are identified, prior to any development impacts occurring.
- Conducting mechanical surface scrapes within a sample of the zones where there is a moderate or high potential for sub-surface deposits of artefacts that may be in situ and/or of high research value in areas of lower ground disturbance, accompanied by localised hand excavation of any features of significance that are identified, prior to any development impacts occurring.
- Curation of any collected heritage evidence in an appropriate manner, as determined in consultation with the registered Aboriginal stakeholders and DECCW during preparation of the AHMP. Application would be required to DECCW under Section 85A of the NP&W Act for the curation of any salvaged items that are removed from any heritage site. Temporary storage of items at locations off-site (for example, during analysis and recording) should be allowed.
- Analysing the collected evidence and preparing a report detailing the results of the mitigation measures consistent with the DECCW Aboriginal Heritage Standards and Guidelines Kit (1997), Project Approval and AHMP. The report should be provided to relevant stakeholders (such as DECCW and the Aboriginal community) within appropriate timeframes.
- Site records should be lodged in a timely manner with DECCW for any previously unrecorded Aboriginal heritage evidence that is identified within the Project area during the course of operations and further heritage assessments, and for any evidence that is salvaged under the AHMP.

– Where impacts can be avoided to the identified Aboriginal heritage evidence, appropriate precautionary measures, such as informing relevant staff and contractors of the nature and location of the items and need to avoid impacts, along with temporary protective fencing and signage, would be implemented for those sites within close proximity of the area of works.
– Consideration would be given, where possible, to avoiding or minimising impacts to the high significance site and the zones where there is a moderate or high potential for sub-surface deposits of artefacts that may be in situ and/or of high research value in areas of lower ground disturbance.

- All relevant contractors and staff engaged on the Project would receive heritage awareness training prior to commencing work on-site, including information about the Aboriginal culture and history of the locality, nature of the identified and potential Aboriginal heritage evidence within the Project area, heritage management measures and protocols, and legal obligations. The training package should be formulated in consultation with the registered Aboriginal stakeholders.
- Archaeological survey would be conducted to sample all of the potential impact areas that could not be sampled during the present investigation or any subsequent amendments to the impact area outside of the investigation area. The survey would be conducted in consultation with the registered Aboriginal stakeholders using the same methodology as for this investigation, prior to any impacts occurring. Subsequent to the survey, management strategies should be implemented as outlined in the AHMP for any previously unrecorded sites that may be identified.
- Provisions would be included to guide the management of any previously unrecorded Aboriginal heritage sites that may be identified within the Project area. Management provisions would vary in relation to the nature of any evidence identified, its significance and the nature of the proposed impacts, and may include temporary protection, avoidance of impacts, mitigation, monitoring or unmitigated impact.
- Should any skeletal remains be detected during the course of development, work in that location would need to cease immediately and the finds be reported to the appropriate authorities, including the Police, DECCW and Aboriginal stakeholders. Subject to the Police requiring no further involvement, if development impacts cannot be avoided, any Aboriginal skeletal remains identified should be retrieved by hand excavation and reburied outside of the impact zone at a location agreed to by the Aboriginal stakeholders.
- Archaeological investigations would only be undertaken by archaeologists qualified and experienced in Aboriginal heritage, in consultation with the registered Aboriginal stakeholders, and occur prior to any development impacts occurring to those specific areas or sites. The registered Aboriginal stakeholders should be afforded the opportunity to be involved in any field studies as per the DECC (2004) Interim Community Consultation Requirements for Applicants policy.
- The AHMP would be regularly reviewed to establish that it is functioning as designed to the standard required. This would involve review of the plan to identify the degree to which the policy objectives are being met, the suitability of the actions in terms of addressing the policy objectives, the quality of performance of the actions, and any additional policies or actions or modifications to existing policies or actions that may be required to enable better functioning of the plan.

- The involvement of the registered Aboriginal stakeholders in the ongoing management of the Aboriginal heritage items within the Project area during construction would be promoted.

13. Non-Indigenous Heritage

13.1 Assessment Approach

13.1.1 Introduction

This chapter provides a summary of the Non-Indigenous Heritage Study undertaken by Nexus Archaeology and Heritage on behalf of the Hunter 8 Alliance. The Non-Indigenous Heritage Study is provided in Appendix H. This chapter also assesses natural heritage identified along the Project route.

This chapter identifies the potential non-indigenous heritage and natural heritage impacts of the Project and the management measures proposed to reduce these impacts. The management measures are further detailed in the draft Statement of Commitments (SoC) in Section 21.1.

The Director-General's Environmental Assessment Requirements identify heritage as a key issue for the Environmental Assessment. Table 13-1 outlines the Director-General's Environmental Assessment Requirements relating to non-indigenous heritage and where they have been addressed.

Table 13-1 Director-General's Environmental Assessment Requirements – Non-Indigenous Heritage

Director-General's Environmental Assessment Requirements	Where Addressed
Non-indigenous heritage, identification of items and areas of local, state and national heritage significance along or adjacent to the corridor (including station groupings and yards and moveable heritage collections). This should include an archaeological assessment and an analysis of the potential impacts to the values, settings and integrity of items, taking into account NSW Heritage Guidelines.	Sections 13.2 and 13.3

13.1.2 Methodology

Heritage items within the vicinity of the investigation area were identified through searches of relevant heritage schedules including:

- Maitland Local Environmental Plan 1993.
- Cessnock Draft Local Environmental Plan 2009.
- Hunter Regional Environmental Plan 1989.
- Heritage and conservation register administered by the ARTC, under s. 170 of the Heritage Act 1977.
- Register of the National Estate.
- State Heritage Register.
- State Heritage Inventory.
- Register of the National Trust.

Heritage resources within the investigation area with the potential to be considered relics under the *Heritage Act* 1977 were then identified. Their historical context was established through a literature review using a variety of historical information including parish and town maps, subdivision records, publications and websites.

An archaeological surface survey of the investigation area was undertaken to make a preliminary evaluation of the heritage resources identified in the literature review. Any additional items of potential heritage significance were also identified and evaluated.

The surface survey focussed on identifying:

- Structures and/or remains of structures or demolition material.
- Signs of ground disturbance that might be associated with non-indigenous settlement and/or industrial activity, such as site levelling for buildings or infrastructure.
- Artefacts or the indication of the possible presence of artefacts that might have an association with the former uses or applications of the investigation area.
- Non-building structural modifications on the ground, such as fencing and yards or their residue.
- Landscape features that may have an operational or spatial relationship with known or suspected non-indigenous activity in the investigation area.

The heritage significance of the identified items was then assessed in accordance with NSW Heritage Guidelines and, in particular, the NSW heritage assessment criteria as set out in *NSW Heritage Manual 2 Assessing Heritage Significance* (NSW Heritage Office 2001). The NSW heritage assessment criteria are listed in Table 13-2.

Table 13-2 NSW Heritage Assessment Criteria

Criterion	Details of Criterion
(a)	An item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).
(b)	An item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area).
(c)	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).
(d)	An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.
(e)	An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area).
(f)	An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).

Criterion	Details of Criterion
(g)	An item is important in demonstrating the principal characteristics of a class of NSW's: ◗ Cultural or natural places. ◗ Cultural or natural environments. (or a class of the local area's: ◗ Cultural or natural places. ◗ Cultural or natural environments.)

13.2 Existing Environment

13.2.1 Non-Indigenous Heritage

Identified Heritage Items

The majority of identified heritage items were located within the existing rail corridor and consisted of various items of rail infrastructure. These included:

- Artefacts.
- Earthworks.
- Old North Road overbridge.
- Six underbridges comprising:
  - Stony Creek underbridge.
  - Wollombi Road underbridge.
  - An underbridge for an unnamed tributary of Anvil Creek.
  - Sawyers Creek underbridge.
  - Black Creek underbridge and the remains of a previous underbridge at Black Creek.
  - The remains of a previous underbridge at Jump Up Creek.
- Six railway station precincts, comprising:
  - Former Farley Railway Station precinct.
  - Former Rutherford Junction Railway Station precinct.
  - Former Allandale Railway Station precinct.
  - Greta Railway Station precinct.
  - Branxton Railway Station precinct.
  - Former Belford Railway Station precinct.
- 37 culverts, comprising:
  - 33 brick culverts.
  - Four stone culverts.
- Hermitage Road level crossing.

Two of the railway station precincts (at Branxton and Greta) are listed on the State Heritage Register as items significant to the State.

Other heritage items identified by the literature review and archaeological surface survey were Clifton Homestead on Station Lane, Lochinvar and the Allandale Wine Cellars / Penfold's Winery at Allandale Road.

Clifton Homestead is a restored circa 1845 residence and gardens, and is listed in the Maitland Local Environmental Plan 1993 as locally significant.

The listings of Branxton and Greta Railway Station precincts and Clifton Homestead are acknowledged and did not require further assessment for significance.

The remaining items were assessed for significance in accordance with the *NSW Heritage Manual 2 Assessing Heritage Significance* (NSW Heritage Office 2001) and the results are summarised below.

General Statement of Heritage Significance

Rail Infrastructure Heritage Items

The rail infrastructure heritage items assessed for heritage significance include the artefacts, earthworks, crossings, culverts, bridges and railway station precincts listed in Section 13.2.1, excluding the precincts at Branxton and Greta.

These rail infrastructure heritage items comprise material evidence of the engineering endeavour of the 19th Century, with many items able to be dated to the original construction of the Main Northern Railway circa 1860 and associated with the engineering era of John Witton, Engineer-in-chief to the NSW Government Railways from 1857 to 1890.

The items reflect the expansion of popular settlement west from Maitland in the mid-19th Century, while concurrently establishing the foundation for large scale extractive industry that created the environment for rapid and sustained population growth.

The rail infrastructure heritage items created the transport function that facilitated rural prosperity into distant north and northwestern hinterland and present a snapshot of the original and evolutionary technology of railway construction and maintenance between the mid-19th and early 21st Centuries.

In this context, rail infrastructure heritage items (with the exception of Branxton and Greta Railway Station precincts) have been assessed as being locally significant in the Hunter Region and the northern area of NSW. In particular, the Black Creek, Anvil Creek and Stony Creek underbridges are considered to be rare contributions to the overall significance of the railway resources in the region.

Allandale Wine Cellars/Penfold's Winery

The Allandale Wine Cellars/Penfold's Winery (the Winery) site is an archaeological site within the 'Dunoon' property at Lovedale. Dunoon is listed in the Cessnock Draft LEP 2009 as locally significant.

The site of the Winery initially reflects the expansion of the viticulture industry around Greta in the last quarter of the 19th Century. The wine growing production centre was operated at the site for at least 70 years by the Green family, who ran the Allandale Wine Cellars until 1912; and the Penfold family, who ran Penfold's Winery between 1924 and 1948. The removal of the Penfold undertaking in 1948 reflects the early phase in a shift in the local wine industry to the Pokolbin area. The site also contains the remains of worker accommodation dating to the late 19th Century and provides an opportunity for study of the daily life of vineyard and winery employees at an early stage in the settlement of the broad locality. In this context, the site of the Winery was assessed as possessing generally representative and episodically rare local significance in the Lower Hunter region.

Statement of Heritage Significance by Criteria

Table 13-3 provides a statement of heritage significance for the rail resources and the Winery using the NSW heritage assessment criteria.

Table 13-3 Statement of Heritage Significance

Criterion	Statement of Heritage Significance
(a)	The rail infrastructure heritage items represent the earliest development and subsequent maintenance of heavy transport, the resultant advancement of extractive and rural industry, and the spread and support of population and inception of communities to the west and north from Maitland. The Winery represents both the expansion and local phasing of wine growing and production in the Lower Hunter, and the daily habits of people employed in such pursuits.
(b)	The rail infrastructure heritage items have a strong relationship with the people involved in the construction of the first railway in northern NSW and the pioneer people who travelled to and settled in the remote area to support extractive and rural industry and to form local communities. Of particular note is the association with Engineer-in-chief John Whitton during the period of construction of the railway circa 1857. The Winery has a strong relationship with the Green family who established an early vineyard and commercial winery in the last quarter of the 19th Century and with employees who lived and worked on the Green property.
(c)	The rail infrastructure heritage items represent a high degree of historical technical achievement, particularly in the areas of bridging waterways, most notably at Black Creek, Anvil Creek and Stony Creek.
(d)	The rail infrastructure heritage items represent an essential part of the historical communication and transport link between the community hubs of Maitland and Newcastle and people living in communities in otherwise remote areas between the mid-19th and mid-20th Centuries.

Criterion	Statement of Heritage Significance
(e)	The rail infrastructure heritage items contain a body of material evidence that is readily accessible and contains evidence of railway construction and maintenance technology.
	The Winery is, generally speaking, an archaeological site containing a body of surface evidence of its original activities. Furthermore, from an archaeological standpoint, the winery has the potential to yield information about the technology of early winery construction and operation and the daily habits of employees in that industry.
(f)	In their constituents, the Black Creek Underbridge, the Anvil Creek Underbridge and the Stony Creek Underbridge are assessed as possessing rare significance at the local level, where the locality is defined as the Hunter Region and the northern area of NSW. In the site of its employee accommodation, the Winery is assessed as possessing rare significance at the local level, where the locality is defined as the Lower Hunter Region.
(g)	The rail infrastructure heritage items are generally assessed as possessing representative significance at the local level, where the locality is defined as the Hunter region and the northern area of NSW. The Winery is generally assessed as possessing representative significance at the local level, where the locality is defined as the Lower Hunter region.

Summary of Identified Heritage Items and Heritage Significance

Table 13-4 provides details of all the heritage items identified along the Project route and their assessed heritage significance. As shown in the Table, several of the culverts are considered to be outstanding examples of their type.

Table 13-4 Identified Heritage Items and Heritage Significance

Item No.	Heritage Item	Chainage (km)	Heritage Significance
1	Clifton Homestead	202.480	Local
2	Allandale Wine Cellars/Penfold's Winery	206.100-206.200	Local (Rare)
3	Underbridge, Jump Up Creek	222.848	None
4	Underbridge, Black Creek	217.200	Local (Rare)
5	Underbridge, Sawyers Creek	211.010	Local
6	Underbridge, unnamed tributary of Anvil Creek	207.776	Local (Rare)
7	Underbridge, Wollombi Road	195.66	Local
8	Underbridge, Stony Creek	195.555	Local (Rare)
9	Overbridge, Old North Road	204.809	Local (Rare)
10	Former Belford Railway Station precinct	222.700	Local
11	Branxton Railway Station precinct	215.500	State

Item No.	Heritage Item	Chainage (km)	Heritage Significance
12	Greta Railway Station precinct	210.600	State
13	Former Allandale Railway Station precinct	204.900 ± 200	Local
14	Former Rutherford Junction Railway Station precinct	199.071	Local
15	Former Farley Railway Station precinct	195.700	Local
16	Hermitage Road level crossing	222.700	None
17	Brick culvert – Down only	224.141	Local
18	Brick culvert – Down only	220.439	Local
19	Brick culvert – Down only	219.650	Local
20*	Brick culvert – Down only	218.448	Local
21	Brick culvert – Down only	218.318	Local
22*	Brick culvert – Down only	214.586	Local
23	Brick culvert – Down only	213.892	Local
24*	Brick culvert – Down only	213.158	Local
25	Brick culvert – Down only	212.725	Local
26	Brick culvert – Down only	212.333	Local
27	Brick culvert – Down only	211.944	Local
28	Brick culvert – Down only	210.703	Local
29*	Brick culvert – Down only	210.522	Local
30	Brick culvert – Down only	209.639	Local
31*	Brick culvert - complete	209.174	Local (rare)
32	Brick culvert- Up only, Down modified	206.519	Local
33	Brick culvert - modified	205.091	None
34	Brick culvert - modified	203.844	None
35	Brick culvert - modified	202.858	None
36	Brick culvert - modified	202.103	None
37	Brick culvert - modified	201.480	None
38	Brick culvert - modified	199.242	None
39*	Brick culvert - complete	198.613	Local

Item No.	Heritage Item	Chainage (km)	Heritage Significance
40	Brick culvert - modified	197.165	None
41*	Brick culvert - complete	196.561	Local (rare)
42*	Brick culvert - complete	196.481	Local
43	Brick culvert - modified	196.340	None
44*	Brick culvert – modified	196.280	None
45	Brick culvert - modified	196.069	None
46*	Brick culvert – box culvert	195.666	Local
47*	Brick culvert – appears complete	195.133	Local
48	Brick culvert – modified	194.912	None
49*	Brick culvert – complete	194.209	Local (rare)
50*	Stone culvert – Down only	214.566	Local (rare)
51*	Stone culvert – Down only	213.690	Local (rare)
52*	Stone culvert – Down only	213.158	Local (rare)
53*	Stone culvert – Down only	198.040	Local (rare)

* denotes an outstanding example of its type

13.2.2 Natural Heritage

The Project route passes through the Allandale Area, which is a natural heritage site listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act* 1999 and on the Register of the National Estate. The Allandale Area is approximately 80 hectares in size and is shown in Figure 13.1.

The Main Northern Railway is located within the Allandale Area between approximate chainages 204.9000 kilometres and 203.900 kilometres. Within this section, the majority of the track is within a cutting. The existing cutting is on average approximately 10 metres wide and in most locations is a straight vertical cut.

The remainder of the Allandale Area is below areas of grazing land and bushland.

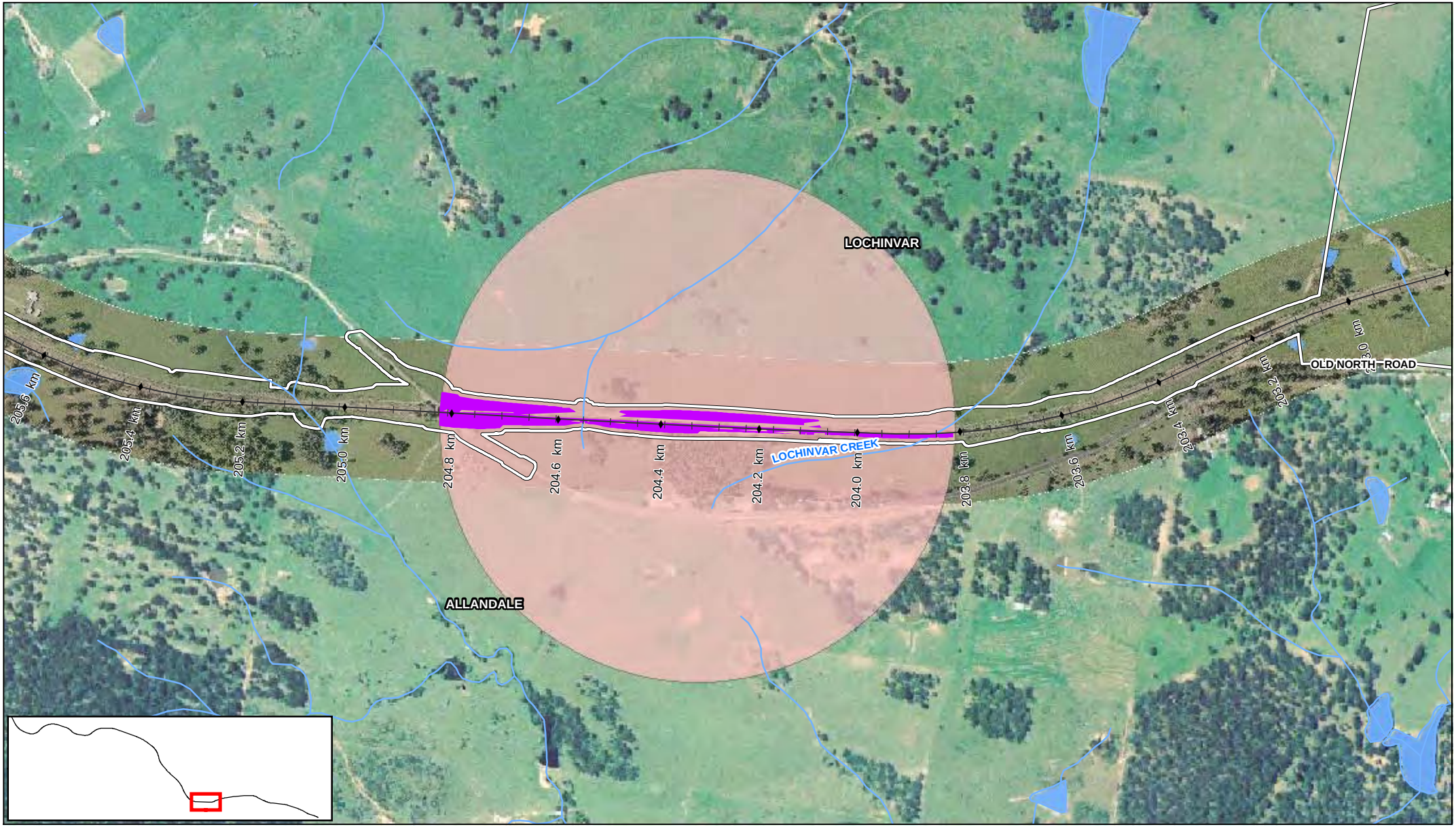
The estimation of the extent of the area appears to be based on interpretation of a number of geological maps and documents as part of the original submission to the Register of the National Estate.

Previous research (Register of the National Estate, 2010) and preliminary geotechnical investigations indicate that the key fossiliferous horizon within the Allandale Area is approximately 600 millimetres thick at a depth between 0 metres to 15 metres below natural ground surface within the Project Area, The remaining Allandale Formation rock unit surrounding the key fossiliferous horizon also contains occasional isolated fossil deposits.

The Allandale Area contains fossils that are of major significance to the study of the spatial and temporal distribution of similar formations found along the Australian east coast and are highly representative of the Early Permian Allandale Formation (Register of the National Estate 2010).

The rocks exposed in the existing Main Northern Railway cutting are coarse conglomerates, with the fossiliferous horizon 600 millimetres thick interbedded with the conglomerates. The fossiliferous horizon contains bivalves, gastropods and brachiopods typical of the Allandale fauna in its characteristic coarse grained lithology. The Allandale fauna has been recognised in Queensland, Tasmania and the south coast of NSW, and its biostratigraphic equivalents are known from Western Australia. The light colour of the broken fossils contrasts strongly with the dark green lithic matrix in which they (and the large well rounded boulders comprising the conglomerate) are embedded.

The site is very well known (it has been on the Register of the National Estate since 1982) but the existing face of the cutting has been adversely affected due to the collection of fossils over many years. The limited number of remaining fossils in the existing cutting are either damaged or inaccessible due to their height from the ground surface. The Register of the National Estate entry did not indicate that there are any other exposures of the rock formation other than the cutting (Register of the National Estate 2010).



1:10,000 (at A4)

0 75 150 225 300

Metres

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

N

LEGEND

- Existing Railway
- Watercourse
- Watercourse Area
- Construction Impact Zone
- Allandale Area - Heritage (Geologically Significant)
- Existing Fossil Exposure

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Allandale Area Location Plan

Figure 13.1

G:\22\14471\GIS\Maps\Deliverables\EA\EA_Non_Indig_Heritage_20091209_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, tmorton

13.3 Impact Assessment

Non-Indigenous Heritage

The Project has been designed with the proposed third track located on the Down side of the existing Main Northern Railway in the vicinity of Branxton and Greta Railway Stations to avoid impacts on these State Heritage Items. The Project would also retain heritage structures where possible and construct new structures either adjacent to or abutting the existing structures to minimise impacts. Nonetheless, some impacts on heritage items are unavoidable.

The construction and/or modifications of major infrastructure, along with major earthworks and the construction of new access roads, would result in varying degrees of obstruction, relocation, modification, damage and/or destruction to either the whole of a heritage resource or to components of a heritage resource. As a result, the construction of the Project would result in a collectively negative impact on non-indigenous heritage values through the loss or permanent obstruction of heritage resources. In particular, the heritage values of elements of rail infrastructure dating to original construction of the Main Northern Railway circa 1860, and duplication of the railway line in the early 1900s, would be negatively impacted.

General construction impacts are expected to result from:

- Earthworks, which would cause disturbance and modification in precincts containing heritage items as a result of industrial excavation and large scale fill for construction.
- The construction process, whereby industrial machinery, vehicles and personnel would be operating over and/ or in close proximity to heritage items.
- The establishment of site compounds within close proximity to heritage items.
- The construction and/ or modification of underbridges, overbridges and culverts which would modify and permanently obscure the existing structures on one aspect of elevation.
- The burial of heritage structures such as culverts to raise levels for track construction.
- The demolition and/or relocation of station platforms to allow track construction.

The level of impact of construction upon most resources has been interpreted through the review of concept plans. The assessed levels of impact upon heritage resources ranges from negligible to high, with some resources considered to occur rarely within the locality.

Site Inventory Sheets (including statements of heritage impact) for Clifton Homestead, Allandale Wine Cellars/Penfold's Winery, bridges, railway station precincts, Hermitage Road level crossing and the culverts considered to be outstanding examples of their type are provided in the Non-Indigenous Heritage Study in Appendix H. The potential impacts on these heritage items are summarised in Table 13-5.

Table 13-5 Potential Heritage Impact

Heritage Item	Potential for Negative Impact	Assessed Heritage Impact	Details of Heritage Impact
Clifton Homestead	Limited	Neutral	The curtilage of Clifton Homestead does not extend into any area that is projected for physical impact by the Project. A small area in the northeast of the broader Clifton Homestead holding is within an area of projected physical impact. Survey in the area did not identify any evidence of development or specific use that might suggest a possible heritage resource. The most consequential and intact component of the garden of the homestead lies between the homestead and the railway corridor. Project works and earthworks are proposed in this area and adjacent to the northern boundary of Clifton Homestead. However, there is no reason to anticipate any negative impact on the site. As discussed in Section 17.5 (Noise and Vibration), vibration measurements were taken at a number of monitoring locations and indicate that, when applied to the location of the third track, existing train pass-by vibration levels are well below the vibration limits for structural damage.
Allandale Wine Cellars / Penfold's Winery	Yes	Negative	Earthworks and the movement of construction plant and equipment across and around the Allandale Wine Cellars/Penfold's Winery site may negatively impact the circa 1890 workers cottages. There is potential for elements of this complex (such as footing to a cottage and a fire place) to be located within a road reserve between the property and the road corridor. The Project proposes earthworks within the road reserve. And therefore the cottage footings and fire place would be disturbed.
Remains of previous underbridge at Jump Up Creek	Limited	Neutral	Earthworks (fill) for the Project may obscure the remains of the previous underbridge but no further impact is anticipated.
Black Creek underbridge and remains of previous underbridge at Black Creek	Limited	Neutral	Construction of a new bridge would restrict the visibility of the existing bridge from the New England Highway, however any further impacts are considered unlikely.
Sawyers Creek underbridge	Limited	Neutral	Construction of a new underbridge would obscure visibility of the existing underbridge. It is unlikely that there would be any direct impacts on the existing underbridge.

Heritage Item	Potential for Negative Impact	Assessed Heritage Impact	Details of Heritage Impact
Underbridge for unnamed tributary of Anvil Creek	Limited	Neutral	It is unlikely that any direct impact would be caused to the existing underbridge. However, visibility of the heritage structure would be obscured by the new underbridge.
Wollombi Road underbridge	No	Neutral	Construction of a new bridge would reduce visibility of the existing Wollombi Road underbridge but would not result in any direct impact on the underbridge. There would be no perceived loss in heritage value as the new underbridge would be approximately 15 metres away from the existing structure.
Stony Creek underbridge	No	Neutral	Construction of a new bridge would reduce visibility of the existing Stony Creek underbridge but would not result in any direct impact on the underbridge. There would be no perceived loss in heritage value as the new underbridge would be approximately 15 metres away from the existing structure.
Old North Road overbridge	Yes	Negative	The overbridge would be demolished as part of the Project resulting in total loss of the heritage item and a negative impact upon the heritage values of the Main Northern Railway.
Former Belford Railway Station precinct	Limited/none	Neutral	Movement of heavy machinery across the site may expose subsurface evidence, although the potential for this is considered limited. The main anticipated impact would be the burial of any subsurface evidence with imported fill. This is considered a method of preservation and, as such, there would be no perceived loss of heritage resources at the site.
Branxton Railway Station precinct	Yes	Negative	The face of the existing down platform may require modification as part of the Project and short widths of the facing of platform awnings may need to be removed. The existing footbridge would also be decommissioned.
Greta Railway Station precinct	Yes	Negative	The face of the existing down platform may require modification as part of the Project and the existing footbridge may require demolition.
Former Allandale Railway Station precinct	Limited	Neutral	Excavation may expose relics of the former Allandale railway station structures. However, due to previous earthworks in the area the likelihood of exposing relics is considered limited.

Heritage Item	Potential for Negative Impact	Assessed Heritage Impact	Details of Heritage Impact
Former Rutherford Junction Railway Station precinct	Limited	Neutral	Construction of the Project would impact the area and may disturb sub-surface material. However, it is considered that any impact would be negligible.
Former Farley Railway Station precinct	Yes	Negative	Earthworks on the Down side would be likely to impact the former platform and may even require the demolition of the former platform.
Hermitage Road level crossing	No	None	The Project would have no impact on the heritage resources of the Hermitage Road level crossing.
Culverts	Yes	Negative	The Project would be likely to have a negative impact on all of the culverts listed as being outstanding examples of their type except for the brick culvert located at approximate chainage 194.209 kilometres (Item No. 49), which is located outside of the construction impact zone. Disturbance and modification of the culverts would result from their extension and/or earthworks to lower or raise the existing ground levels. In some cases, earthworks would result in burial and permanent obstruction of the face of the culvert. The stock crossing at approximate chainage 195.600 kilometres would be permanently closed as part of the Project.

Natural Heritage

The existing cutting through the Allandale Area would be widened on both the Up and Down sides of the Main Northern Railway to allow for the proposed third track. This widening of the cutting could expose fresh fossiliferous horizon within the Allandale Area.

It is anticipated that the width of the cutting would be approximately 50 metres between the top of the batters and approximately 25 metres between the base of the batters. Approximately 700 metres of Project within the Allandale Area requires cutting to widen the rail corridor to these dimensions. This equates to a maximum of 2.8 hectares (or approximately 3.5%) of the Allandale Area that would be disturbed by the Project. As the remaining area equates to over 96.5% of the Allandale Area, the area to be disturbed by the Project is small and would not pose a significant impact on the integrity and heritage value of the remaining Allandale Area.

As discussed in Section 1.2, preliminary geotechnical investigations indicate that the key fossiliferous horizon within the Allandale Area is approximately 600 millimetres thick at a depth between 0 metres to 15 metres below natural ground surface within the Project Area, As a result, disturbance of the fossiliferous horizon would be limited to between chainages 204.810 kilometres and 204.850 kilometres.

The Hunter 8 Alliance has undertaken consultation with the NSW Department of Industry and Investment in development of the Environmental Assessment and the mitigation measures described in Section 1.4. The Department indicated that as the Project is likely to result in the exposure of a fresh fossiliferous horizon and generate material not currently accessible, the Project represents an opportunity to conduct further research through the provision of excavated material to the public.

13.4 Mitigation Measures

Non-Indigenous Heritage

Measures to mitigate potential impacts on non-indigenous heritage resources are listed below:

- All Hunter 8 Alliance employees, contractors and sub-contractors would be made aware of the provisions of the *Heritage Act* 1977 and the requirements under the Act, including that if a relic is suspected or discovered, the person suspecting or discovering must notify the NSW Department of Planning, Heritage Branch or its delegate and suspend work that might have the effect of disturbing, damaging or destroying such relic until the requirements of Heritage Branch have been satisfied.
- Where Project activities would have the capacity to obscure, move, modify, damage or destroy any part or component of a heritage resource within the study area, the resource would be archivally recorded prior to the commencement of any Project works. Project works would then be monitored by a suitably qualified archaeologist and an archival record completed for each resource. The record would comply with requirements set out in the NSW Heritage Guidelines.
- At Greta and Branxton Railway Stations, a representative length of any of the original brick platform facing to be disturbed would be salvaged and reinstated on the new platform alignment, away from the dedicated passenger area. The re-erected brick facing would be distinguished from any original work by suitable marking or inscription detailing the date and nature of re-erection.
- Where elements of the Allandale Wine Cellars / Penfold's Winery site located within the road reserve are to be disturbed, the resource would be archivally recorded prior to the commencement of any Project works. Project works would then be monitored by a suitably qualified archaeologist and an archival record completed for each resource. The record would comply with requirements set out in the NSW Heritage Guidelines.

Natural Heritage

The widening of the cutting through Allandale Area represents an opportunity to further assess the site and gather important fossil specimens for scientific and educational purposes. In recognition of the importance of this resource, the proposed mitigation measures have been developed in consultation with the NSW Department of Industry and Investment.

- The following rock removal methodology would be implemented:
  - Blasting within the fossiliferous horizon would be designed with the objective of achieving a minimum particle size of 500 millimetres.

- A representative sample (a maximum of 10%) of the key fossiliferous horizon would be selected and transported to an open air storage area and placed in a single depth layer across the storage area.
- In consultation with and in the presence of palaeontologists and other interested parties, a rock hammer would be used to break up these boulders to further expose the fossils.
- The palaeontologists and other interested parties would be provided the opportunity to retrieve fossils and catalogue in accordance with standard procedures.
- The debris remaining after the fossil collection by the palaeontologists and other interested parties would be loaded and transported for use as fill material or to spoil disposal areas.
- Due to the nature of the material and the methods needed to remove the material, it is likely damage to fossil material could occur. However, all efforts would be implemented to avoid damage to fossils throughout this process,
- Due to the geological importance of the fossils found at the Allandale Area, it is proposed that the removed fossil material could be placed on display. This would be determined in consultation with the interested parties,

- It is also proposed that some fossil material would be made available to be placed on public exhibition in the vicinity of the cutting. This opportunity would be discussed with Maitland City Council (owner of the public road corridor adjacent to the rail corridor). The NSW Department of Industry and Investment would be consulted as to appropriate venues for the display of the material.
- The remaining cutting with the exposed fossiliferous horizon would be constructed at a 1:1 to 1.6:1 vertical to horizontal slope. This would reduce the potential for rock slips that could disturb and potentially damage fossils, and remove the need to shotcrete the cut surface.
- Security fencing and restricted access to the rail corridor would be maintained to minimise the potential for fossils to be removed from the cutting. Construction personnel would be advised during site inductions not to remove any fossils from the cutting.

14. Land Use

14.1 Assessment Approach

14.1.1 Introduction

The Director-General's Environmental Assessment Requirements identify land use and access as key issues for the Environmental Assessment. This chapter identifies the potential impacts of the Project on land use and the management measures proposed to reduce these impacts.

Table 14-1 outlines the Director General's Environmental Assessment Requirements relating to land use and where they have been addressed. Issues relating to access are addressed in **Chapter 15**.

Table 14-1 Director-General's Environmental Assessment Requirements – Land Use

Director-General's Environmental Assessment Requirements	Where Addressed
Integration with current and future land uses (such as the proposed Huntlee development, Anvil Creek and Lochinvar release areas).	Section 14.2.4
Land use and access impacts to affected properties including acquisition, severance, business viability, and property infrastructure impacts.	Land Use impacts – Section 14.3 Access – Chapter 15
Local community (services, access and amenity) related changes and the potential to enhance station facilities.	Community – Chapter 4 Station Facilities – Chapter 7

14.1.2 Methodology

An assessment of the existing land uses along the route of the Project, and the effect on those land uses, was undertaken in the first instance by the analysis of aerial photography and relevant Council planning documents. Following this, meetings were held with relevant councils to refine the information already developed and to ascertain what proposed development was located adjacent to the rail corridor and might be impacted by the Project.

14.1.3 Planning Context

The Project is located within the local government areas (LGAs) of Singleton, Cessnock and Maitland as shown on Figure 1.1 in Chapter 1.

The Lower Hunter Regional Strategy, prepared by the NSW Department of Planning, provides a broad land use planning framework for the Lower Hunter sub-region. This strategy is a policy document and sets out the strategy for future development areas, principal land use types, settlement patterns and conservation outcomes over the next 25 years.

All councils in the Lower Hunter are required to implement the outcomes and actions in the Lower Hunter Regional Strategy primarily through Local Environmental Plans (LEP). In addition, all councils in NSW are required to prepare new LEPs utilising a standard template known as the 'Standard Instrument'. Accordingly, Singleton and Cessnock Councils have prepared updated LEPs and these are currently on exhibition. Maitland Council has submitted a draft LEP to Department of Planning for approval to commence consultation.

The relevant planning documents currently affecting land use within the three local government areas are outlined in the following sections.

14.1.4 Singleton

Singleton Land Use Strategy – April 2008

This document provides the strategic framework for Singleton Council's land use planning. It comprises policies and principles to guide decisions about land use and provides the planning context for the new comprehensive Singleton Local Environmental Plan 2009.

Singleton Local Environmental Plan – 1996

The Singleton Local Environmental Plan 1996 is the planning instrument prepared by Council and approved by the Minister for Planning and provides the statutory provisions for managing land use and development. It is this document which defines the relevant land use zones.

Singleton Council has prepared a new Draft LEP based on the Standard Instrument and this is currently on public exhibition. Refer to the Table in Appendix I for proposed new zonings.

Singleton Development Control Plan – December 2007

The Singleton Development Control Plan provides detailed guidelines and standards for land use and development and expands upon the aims, objectives and provisions of the LEP.

14.1.5 Cessnock

Cessnock City Wide Settlement Strategy

This document was originally prepared in 2003 and set out the planning framework for growth within the Cessnock local government area. A revised version titled the City Wide Settlement Strategy 2009 is currently on public exhibition.

The original document was in two parts and the new document incorporates both parts into one document and generally incorporates the outcomes and actions arising from the Lower Hunter Regional Strategy.

Cessnock Local Environmental Plan 1989

The Cessnock Local Environmental Plan 1989 is the planning instrument prepared by Council and approved by the Minister for Planning. It provides the statutory provisions for managing land use and development within the Cessnock LGA. It is this document which defines the relevant land use zones.

Cessnock Council currently has its Draft Local Environmental Plan 2009, prepared in accordance with the Standard Instrument, on public exhibition.

Cessnock Development Control Plan 2006

The Cessnock Development Control Plan provides detailed guidelines and standards for land use and development and expands upon the aims, objectives and provisions of the LEP.

14.1.6 Maitland

Lochinvar Structure Plan

The Lochinvar Structure Plan has been prepared and adopted by Council to establish the framework for future growth and development of the Lochinvar area. This area was identified in the Urban Settlement Strategy as an area for future growth and is currently the subject of more detailed studies.

Maitland Local Environmental Plan 1993

The Maitland Local Environmental Plan 1993 is the legal document prepared by Council and approved by the Minister of Planning and provides the statutory provisions for managing land use and development. It is this document, which defines the relevant land use zones.

Maitland City Council is currently carrying out extensive investigations associated with the preparation of its Local Environmental Plan 2011.

Maitland City Wide Development Control Plan

As for Cessnock and Singleton, the Maitland City Wide Development Control Plan provides detailed guidelines and standards for land use and development and expands upon the aims, objectives and provisions of the LEP.

Maitland Urban Settlement Strategy (2001 – 2020)

The Maitland Urban Settlement Strategy 2001-2020 identifies various areas for potential development and is reviewed every two years to ensure that there is an adequate supply of land available across the Maitland LGA to accommodate the anticipated population growth.

14.2 Existing Environment

The existing environment adjacent to the Project consists primarily of rural and rural residential land uses. Some residential development is located adjacent to railway stations and particularly at the eastern end of the Project. Industrial development is limited with some at the eastern end of the Project. No industrial development has rail access.

14.2.1 Rural / Rural Residential

The majority of the land adjacent to the rail corridor is rural land with most being used for grazing of one form or another. However, over time, larger land holdings have been subdivided to the extent that a substantial number of rural lots within the study area would be more appropriately classified as rural residential and not supporting economically viable rural activities. These rural residential lots are scattered along the length of the rail corridor. There are some adjacent lots along the rail corridor that have common ownership and therefore may provide a better opportunity for economically viable rural activities.

While grazing is the dominant rural land use, viticulture is carried out on a number of properties, mainly in the Cessnock and Singleton LGAs. Generally, viticulture is carried out on a relatively small scale compared to other areas within the region that are located away from the corridor.

Irrespective of the size of the lots, a large number of them have farm dams used for either agricultural purposes such as irrigation or stock watering or for aesthetic reasons associated with rural lifestyle living.

14.2.2 Residential

There are a number of areas of residential development located adjacent to the rail corridor. In some cases they are associated with railway stations while in other cases the railway station is located at some distance from the residential development.

The Maitland suburbs of Telarah and Rutherford adjoin the corridor at the eastern end of the Project with a small amount of residential development adjoining the rail corridor.

Approximately eight kilometres to the west of Maitland is Lochinvar Railway Station. While Lochinvar is a substantial community, the residential area straddles the New England Highway approximately three kilometres to the north and is quite separate from the station. Maitland City Council is proposing that the area between the existing urban area of Lochinvar and Lochinvar Railway Station be developed as a major new residential development. This is discussed further in Section 14.2.4.

Approximately eight kilometres further to the west of Lochinvar Railway Station is the small township of Greta. At this point the New England Highway and the railway are approximately one kilometres apart with part of the urban area of Greta located between them.

A further five kilometres to the west lies the slightly larger urban area of Branxton. Like Greta, this urban development is partly located between the railway station and the highway.

14.2.3 Industrial

It is only at the Maitland end that industrial development of any size lies adjacent to the railway corridor. A small number of individual sites along the length of the corridor are used for light industrial purposes. No industrial development utilises rail access.

14.2.4 Proposed Urban Development

There are a number of proposals for urban development to occur adjacent to the rail corridor at various locations. These proposed development areas have either been defined in the various settlement strategies discussed in Section 14.1 and adopted by the three Councils or are privately proposed developments, which have been adopted for inclusion within the Lower Hunter Regional Strategy.

These proposed developments are outlined below and shown on Figure 14.1.

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

- Project Location
- Watercourse
- Existing Rail
- Hunter Expressway
- LocalGovernmentArea
- Property Acquisition Area
- Cadastre
- Spoil Areas
- Watercourse Area

Land Use Significant Areas

- Farley Investigation Area
- Heritage Green
- Huntlee
- Lochinvar Investigation Area
- Pacific National
- Preliminary Investigation Area
- Rutherford Industrial
- Rutherford Industrial Estate
- Rutherford Industrial Investigation Area

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Property Impacts and Significant Areas

Figure 14.1a

G:\22\14471\GIS\Maps\Deliverables\EA\EA_Property_Impacts_Land_use_A4_1in10000_20091203.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: DPT of Lands: DCDB - 2007, Aerial Photography - 2006. Created by: msmiljkovski, tmorton, 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

- Project Location
- Watercourse
- Existing Rail
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- LocalGovernmentArea
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- Spoil Areas
- Watercourse Area

Land Use Significant Areas

- Farley Investigation Area
- Heritage Green
- Huntlee
- Lochinvar Investigation Area
- Pacific National
- Preliminary Investigation Area
- Rutherford Industrial
- Rutherford Industrial Estate
- Rutherford Industrial Investigation Area

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Revision A
Date May 2010

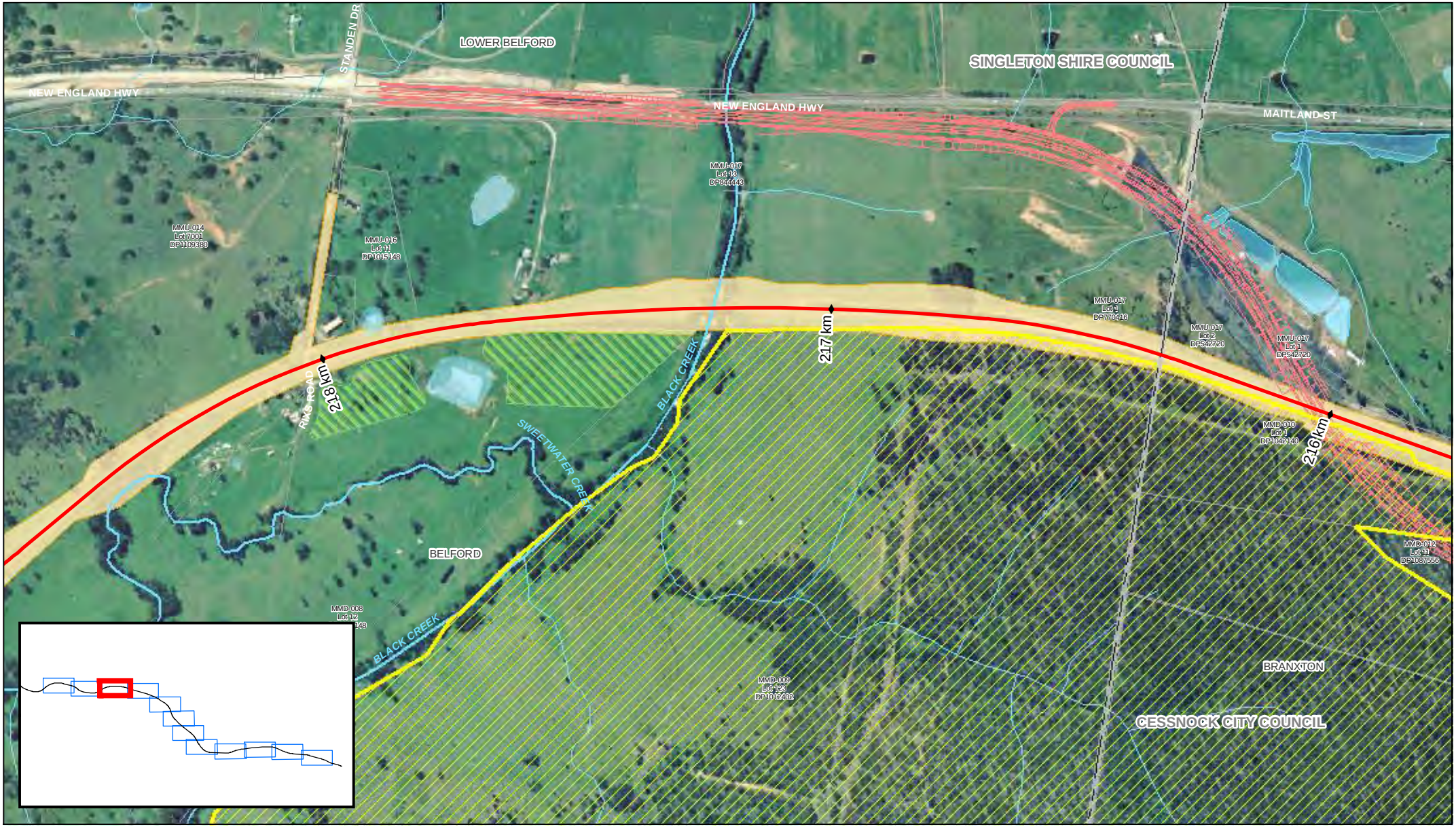
Property Impacts and Significant Areas

Figure 14.1b

G:\22\14471\GIS\Maps\Deliverables\EA\EA_Property_Impacts_Land_use_A4_1in10000_20091203.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: DPT of Lands: DCDB - 2007, Aerial Photography - 2006. Created by: msmiljkovski, tmorton, 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

- Project Location
- Watercourse
- Existing Rail
- Hunter Expressway
- LocalGovernmentArea
- Property Acquisition Area
- Cadastre
- Spoil Areas
- Watercourse Area

Land Use Significant Areas

- Farley Investigation Area
- Heritage Green
- Huntlee
- Lochinvar Investigation Area
- Pacific National
- Preliminary Investigation Area
- Rutherford Industrial
- Rutherford Industrial Estate
- Rutherford Industrial Investigation Area

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Date May 2010

Property Impacts and Significant Areas

Figure 14.1c

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

G:\22\14471\GIS\Maps\Deliverables\EA\EA_Property_Impacts_Land_use_A4_1in10000_20091203.mxd

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

- Project Location
- Watercourse
- Existing Rail
- Hunter Expressway
- LocalGovernmentArea
- Property Acquisition Area
- Cadastre
- Spoil Areas
- Watercourse Area

Land Use Significant Areas

- Farley Investigation Area
- Heritage Green
- Huntlee
- Lochinvar Investigation Area
- Pacific National
- Preliminary Investigation Area
- Rutherford Industrial
- Rutherford Industrial Estate
- Rutherford Industrial Investigation Area

Maitland To Minimbah Third Track Environmental Assessment

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Property Impacts and Significant Areas

Figure 14.1d

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

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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

- Project Location
- Watercourse
- Existing Rail
- Hunter Expressway
- LocalGovernmentArea
- Property Acquisition Area
- Cadastre
- Spoil Areas
- Watercourse Area

Land Use Significant Areas

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Hunter Alliance

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Property Impacts and Significant Areas

Figure 14.1e

G:\22\14471\GIS\Maps\Deliverables\EA\EA_Property_Impacts_Land_use_A4_1in10000_20091203.mxd

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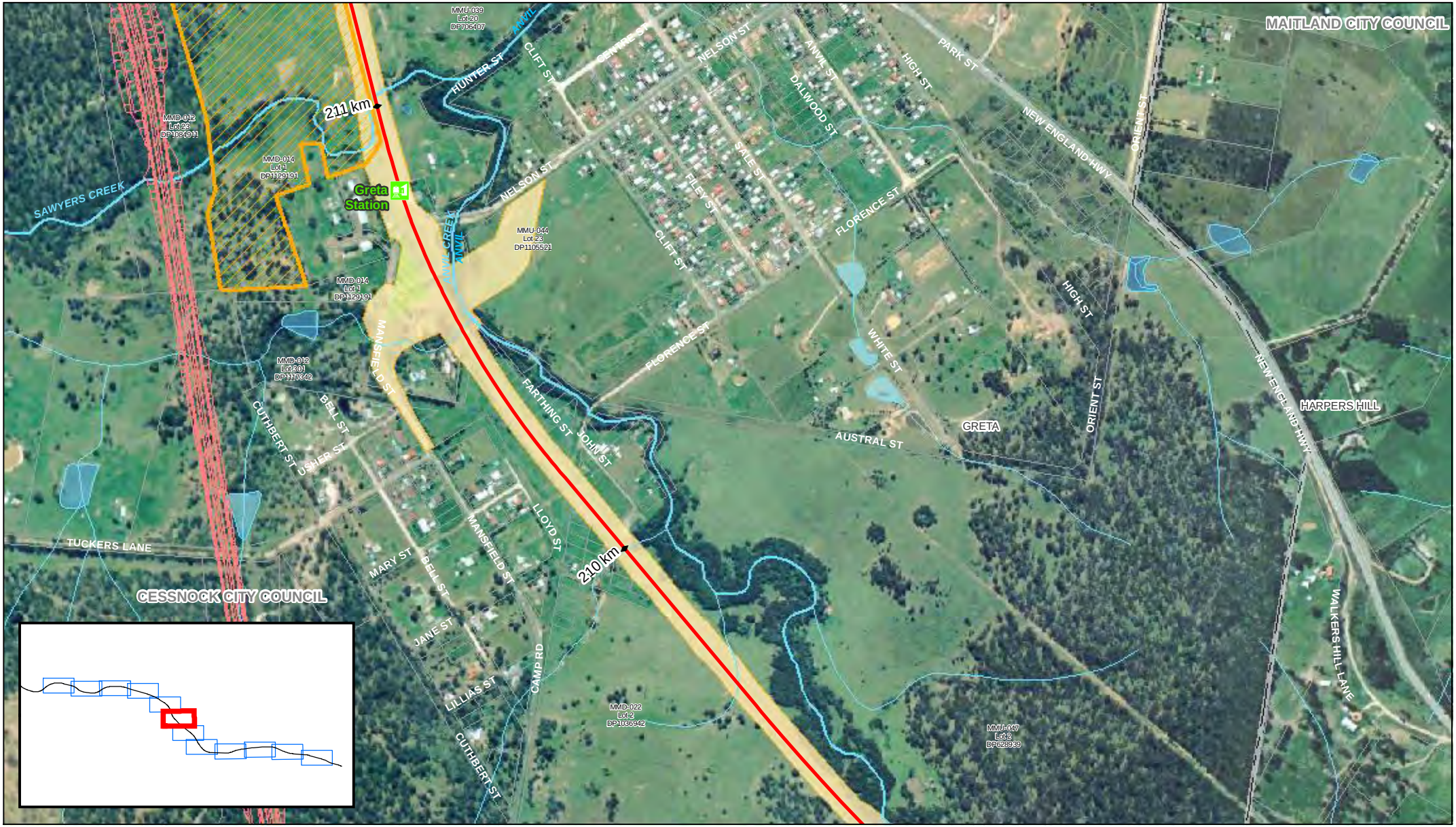

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0 40 80 160 240 320

Metres

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

N

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Hunter ALLIANCE

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Property Impacts and Significant Areas

Figure 14.1f

G:\22\14471\GIS\Maps\Deliverables\EA\EA_Property_Impacts_Land_use_A4_1in10000_20091203.mxd

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0 40 80 160 240 320

Metres

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Property Impacts and Significant Areas

Figure 14.1g

G:\22\14471\GIS\Maps\Deliverables\EA\EA_Property_Impacts_Land_use_A4_1in10000_20091203.mxd

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Metres

Map Projection: Transverse Mercator
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Property Impacts and Significant Areas

Figure 14.1h

G:\22\14471\GIS\Maps\Deliverables\EA\EA_Property_Impacts_Land_use_A4_1in10000_20091203.mxd

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0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
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Property Impacts and Significant Areas

Figure 14.1i

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Metres

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Property Impacts and Significant Areas

Figure 14.1j

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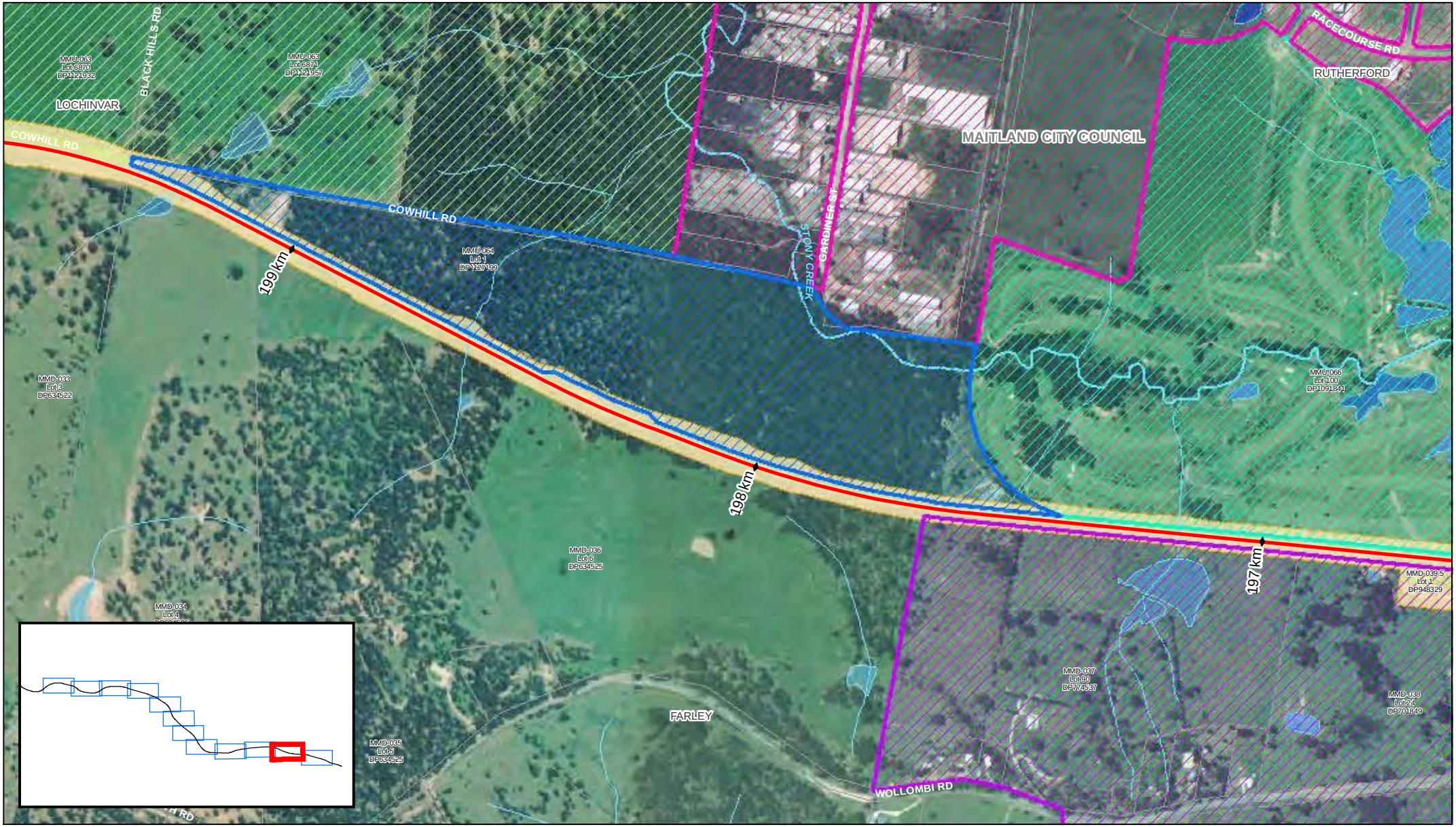

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0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
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Property Impacts and Significant Areas

Figure 14.1k

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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0 40 80 160 240 320

Metres

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Property Impacts and Significant Areas

Figure 14.1l

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Huntlee

Huntlee New Town is a proposed mixed use urban development adjacent to Branxton and North Rothbury and located to the south of the railway and the Hunter Expressway. It would abut the railway corridor between chainage 216.080 kilometres and 216.680 kilometres.

The majority of the development would be in Maitland LGA but a small part would be located in the Singleton LGA. The Project is intended to be developed over a 15 – 20 year period and would incorporate approximately 2000 residential dwellings of various sizes, approximately 300 rural residential lots, employment lands, a major town centre and extensive conservation areas.

The Project was listed as a State Significant Site under State Environmental Planning Policy (Major Development) 2005, on 9 January 2009 and a Project Application for Stages 1A and 1B has been exhibited. Both these stages are well removed from the proposed railway works.

The Concept Plan for the development showed that the Hunter Expressway would separate the majority of the development from the railway reserve, and only a small area proposed for the Town Centre with a frontage of approximately 600 metres and approximately a 400 metre frontage of Village 3 would abut the rail corridor. There is a narrow strip of land between the proposed Hunter Expressway and the railway reserve adjacent to Branxton Station shown on the Master Plan as forming part of the Town Centre.

The Minister for Planning's Concept Plan Approval for Huntlee New Town has recently been overturned. This decision was not based on environmental or planning grounds but on procedural matters. As such it is possible that a new application for the Project could be submitted to the Department of Planning. From a review of the Department of Planning website, no formal application has been made for development at this site.

Anvil Creek

Anvil Creek is a major residential and mixed-use development located on the south side of the railway corridor between chainage 206.220 kilometres and 209.880 kilometres. Cessnock City Council rezoned the area for this development in 2008 and a development application for a subdivision into 11 super lots and construction of the main spine road was submitted to Council in May 2009.

The total Project would comprise an 18 hole golf course, a clubhouse and hotel, up to 1364 dwellings, a retail/commercial precinct, an education precinct, a village centre and associated infrastructure.

Residential development adjacent to the railway corridor would not occur for a number of years.

Lochinvar Investigation Area

The Lochinvar Investigation Area is identified in Maitland City Council's 2008 Urban Settlement Strategy and is located on the northern side of the rail corridor between chainage 202.040 kilometres and 203.300 kilometres. This area is intended to be a new residential suburb and extends north to the New England Highway, thus linking the existing residential areas of Lochinvar with the Lochinvar Railway Station. Council is currently proceeding with the various studies required to prepare a Local Environmental Plan as the first step in the rezoning process.

Preliminary Investigation Area

The Preliminary Investigation Area is identified in Maitland City Council's 2008 Urban Settlement Strategy and is located on the northern side of the rail corridor between chainage 200.250 kilometres and 202.040 kilometres. This area is proposed to contain transitional forms of development and would probably be developed for rural residential housing. No detailed studies of this area have yet commenced.

Rutherford Industrial Investigation Area

The Rutherford Industrial Investigation Area is identified in Maitland City Council's 2008 Urban Settlement Strategy and is located on the northern side of the rail corridor between chainage 199 350 kilometres and 200.250 kilometres. No detailed studies of this area have yet commenced and it is not known if provision for rail facilities would be required.

Rutherford Industrial

Maitland City Council has granted development consent for an industrial development between chainage 197.400 kilometres and 199.35 kilometres. This site is on the northern side of the rail corridor and is understood to be under construction. No rail facilities are part of the industrial proposal.

Heritage Green

The Heritage Green residential development is located on the northern side of the railway corridor between chainage 196.200 kilometres and 197.400 kilometres. This area is zoned for a maximum of 450 residential lots, a golf course, hotel and associated facilities. It is understood that a development application has been submitted to Maitland City Council for the residential development but that application does not include the golf course.

Farley Investigation Area

The Farley Investigation Area is identified in Maitland City Council's 2008 Urban Settlement Strategy and is located on the southern side of the railway corridor between chainage 195.650 kilometres and 197.650 kilometres. No detailed studies of this area have yet commenced.

14.2.5 Other Proposed Development

Hunter Expressway

The Hunter Expressway is proposed to be constructed adjacent to the southern side of the rail corridor between chainage 213.500 kilometres and 214.600 kilometres and would cross the corridor between chainage 215.820 kilometres and 216.080 kilometres.

Pacific National Provisioning Facility

Pacific National is proposing the construction of a provisioning facility on the southern side of the railway corridor between chainage 211.000 kilometres and 213.400 kilometres. The extent and configuration of this facility is not known and approval has not been granted.

14.3 Impact Assessment

14.3.1 Property Acquisition

The primary land use impact of the Project is associated with property acquisition. Property acquisition would mainly occur in a narrow strip adjacent to the existing rail corridor on both the Up and Down sides of the track.

Table 14-2 summarises the number of properties impacted by the Project. Details of proposed land acquisition are provided in Appendix I. 131 parcels of land would require strip acquisition immediately adjacent to the existing rail corridor, 12 properties would be partially acquired and two properties would be completely acquired. Approximately 20 further properties impacted by the Project have been previously acquired for railway purposes and would be incorporated into the railway corridor.

Where land is acquired and added to the rail corridor there would be a potential loss of stock fencing. There would also be a number of farm dams removed or significantly impacted. The level of disturbance of farm dams and how these impacts would be managed would be confirmed during detailed design as discussed in Section 14.4.

Access to two properties would be affected by the closure of the stock crossing underpass at chainage 195.666 kilometres and the demolition of the Old North Road Overbridge at chainage 204.820 kilometres.

The acquisition of land could also affect the commercial viability of businesses located along the Project route. A vineyard at Belford and two industrial properties at Telarah would be potentially affected by property acquisition for the Project. Only small portions of the three properties are to be acquired. It is considered that there would no impact on the viability of the industrial businesses. The vineyard would lose two to three rows of low grade, low producing vines.

Table 14-2 Summary of Proposed Property Acquisition

Local Government Area	Number of Properties	Number of Private Properties	Number of Government Properties
Singleton	47	41	6
Cessnock	45	37	8
Maitland	53	50	3

ARTC recognises that a negotiated acquisition of the affected areas of the properties is the desired outcome. Efforts are currently underway to pursue this course of action. In instances where negotiation with affected landowners is not successful, and in accordance with the statutory timeframes outlined in the *Land Acquisition* (*Just Terms Compensation) Act* 1991*,* affected areas would be acquired through compulsory acquisition.

ARTC is not a state authority and is not normally authorised to acquire land. However, the ARTC has sought and been granted an agreement for the Rail Infrastructure Corporation to use its power as a state authority to acquire property for the construction of this Project. Once a property has been acquired, either through purchase or compulsory acquisition it would be incorporated into the ARTC lease.

If, during the acquisition process, an affected property becomes listed for sale on the open market, ARTC would consider purchasing the property separately from the acquisition process detailed above.

A number of farm dams are fully or partially located within the proposed property acquisition area. Where these dams and groundwater bores are located within a portion of a property subject to partial acquisition, this could have implications for the landholder due to loss of infrastructure and loss of, or restrictions to, water access. Appropriate compensation or mitigation for loss of these assets has been included in all landholder negotiations.

Based on the Project concept design, the estimated number of dams, bores and structures directly impacted by construction include:

- 16 farm dams (where there would be a structural modification/alteration required).
- No groundwater bores.
- 11 structures (such as residential properties, garages, farm sheds, pump houses and stables).

Table 14-3 identifies the properties, the number of dams on each property impacted by the Project, and the overall capacity of the dam/s on the property.

Table 14-3 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	1	9
MMU-12.5	1	2.1
MMU-016	1	0.5
MMD-028	2	1.6
MMD-032	3	4
MMD-032.2	2	0.4
MMD-034	1	0.6
MMU-038	1	0.3
MMU-053	1	0.5
MMU-055	1	0.4

The exact number of dams and groundwater bores to be disturbed, and the nature of disturbance, would be confirmed during the detail design phase.

The acquisition of Commonwealth land is subject to the *Commonwealth Property Disposals Policy*. The policy requires ARTC to make a submission to the Australian Government for consideration and recommendation for sale of the affected property to RIC for the purpose of construction of the Maitland to Minimbah Third Track. If recommended, the subsequent approval of the Minister for Finance and Administration and Deregulation would be required.

14.3.2 Construction and Operation

Construction of the Project would require both acquired lands and leased lands for temporary access. Potential impacts on land use as a result of the construction phase of the Project include amenity impacts such as noise (refer to **Chapter 17**), traffic (refer to Chapter 15) air (refer to Chapter 16), visual (refer to Section 19.6) and social (refer to Section 19.5). The potential for amenity impacts resulting from the operation of the Project are also included in these chapters.

14.3.3 Potential Impacts to Future Land Uses

In most cases, the proposed developments listed in Section 14.2 are at an early stage, either having only been identified for future investigation, in the initial investigation stages or being subject to a recent rezoning. Where initial investigations are being, or would be carried out, they would take into consideration the strip of land proposed for acquisition and any likely impact of the proposed rail development and plan accordingly.

Of that land recently rezoned, a development application has been submitted for the proposed development at Anvil Creek (on the south side of the railway corridor between approximate chainage 206.220 kilometres and 209.880 kilometres).

In this case, the development application is for a subdivision of the site into a number of super lots and the construction of an access road. Each super lot would be the subject of a future development application to allow development in accordance with the approved master plan. The super lots adjacent to the railway reserve are not proposed to be developed for a number of years and the master plan for these areas has included a buffer between proposed residential development and the railway corridor. As the extent of land acquisition in this area comprises a narrow strip, it would result in only a minor encroachment into these proposed buffer areas, and any detailed plans forming part of future development applications would be based on the impact of the rail operations at the time of the development application submission to Council.

Two development applications for land already appropriately rezoned have also been submitted to Maitland City Council.

A development application for the Rutherford Industrial development has been submitted to Maitland Council to permit an industrial subdivision. A narrow strip of land is proposed to be acquired from this site and would result in a minor reduction of lot sizes within the proposed development.

A development application for the Heritage Green residential development has also been submitted to Maitland Council. Again, a narrow strip of land would be acquired and an existing high-pressure gas main adjacent to the rail corridor would require relocation. These would reduce the developable area slightly and may require a redesign of parts of the residential development. Due to the large areas of open space proposed within the development it is possible that the actual lot yield could be retained.

14.4 Mitigation Measures

Construction of the Project and associated infrastructure would require the acquisition of land. All acquisition of land would be undertaken in accordance with the provisions of the *Land Acquisition (Just Terms Compensation) Act* 1991. It is recognised that the negotiated acquisition of the affected areas of individual properties is the desired outcome and this process is currently underway. However, where negotiation with the affected landowners is not successful, compulsory acquisition in accordance with the provisions of the *Land Acquisition (Just Terms Compensation) Act* 1991 would be carried out.

Where required, land would be acquired for the construction of the works and mutually agreed compensation made for any loss of productive agricultural land or facilities. Stock fencing would be provided along the newly defined property boundaries and be constructed prior to the removal of existing fencing or any works being carried out on the subject land.

Consultation with the landowner of the property affected by the proposed closure of the stock crossing is ongoing. The Hunter 8 Alliance is currently in negotiations with the landowner to acquire the property.

Compensation has been agreed with the owner of the property affected by the demolition of the Old North Road overbridge taking into account any disturbance associated with the loss of access from Old North Road. Compensation has also been agreed with the owners of the three businesses that would be affected by the Project through partial acquisition of land.

Measures to mitigate amenity impacts such as noise, air, visual and social are outlined in Chapters 16 and 17, and Sections 19.5 and 19.6 respectively.

Detailed management measures to reduce land use impacts on individual properties and land users would be developed in consultation with the individual landowners concerned during the detailed design and property acquisition negotiations. Access requirements for the construction phase of the Project would be discussed with individual landowners prior to the landowner's access being affected.

Where a dam would be disturbed or removed as a result of the Project, appropriate compensation or mitigation would be provided that is agreed to by ARTC, the landholder and the DECCW (responsible for the licensing of dams and groundwater bores). Such negotiations would continue throughout the detail design and property acquisition negotiations.

The Project's design has been undertaken with the aim of incorporating management measures into design elements so as to minimise the amount of land to be acquired.