Technical Paper 5
Quakers Hill to Vineyard Duplication
Biodiversity Assessment

April 2009

Transport Infrastructure Development Corporation

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Contents

Page Number

Glossary ..... **v**

1. Introduction **1**

1.1 Background 1
1.2 Aims 1
1.3 Definitions 2

2. Legislative framework **9**

2.1 Commonwealth assessment process 9
2.2 State approval framework 9
2.2.1 Biodiversity certification and the Sydney regional growth centres 13

3. Methods **15**

3.1 Database searches and literature reviews 15
3.2 Field survey 15
3.2.1 Species of plant 15
3.2.2 Targeted surveys 15
3.2.3 Condition of vegetation communities 16
3.2.4 Faunal habitats 16
3.3 Conservation significance 17
3.3.1 Conservation significance of Cumberland Plain vegetation 18
3.4 Significance assessments 18
3.5 Personnel 19
3.6 Nomenclature 19
3.7 Limitations 19

4. Existing environment **21**

4.1 Vegetation communities 21
4.1.1 Shale Plains Woodland 22
4.1.2 Alluvial Woodland 23
4.1.3 Shale Gravel Transition Forest and derived grassland 29
4.2 Flora 31
4.2.1 Weeds 31
4.3 Fauna habitats 32
4.3.1 Maintained rail corridor and road reserve 32
4.3.2 Remnant vegetation 33
4.3.3 Regrowth vegetation and cleared areas 33
4.3.4 Aquatic habitats 35

5. Threatened biodiversity **37**

5.1 Threatened ecological communities 37
5.2 Threatened populations 38
5.3 Threatened flora 38
5.4 Threatened fauna 40
5.5 Migratory species 41
5.6 Critical habitat 41

6. Impacts **43**

6.1 Clearing of native vegetation 43
6.2 Disturbance of fauna habitats 45
6.3 Invasion and establishment of weeds 45
6.4 Invasion and establishment of pest species 45
6.5 Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands 46
6.6 Habitat fragmentation and barrier effects 46
6.7 Edge effects 47
6.8 Noise and dust 47
6.9 Cumulative impacts 47

7. Mitigation measures **49**

Contents (continued)

Page Number

7.1 Management of the mitigation process 49
7.2 Vegetation and habitat loss 49
7.3 Weed management 50
7.4 Mortality 50
7.5 Erosion and pollution 51
7.6 Monitoring 51
7.7 Summary of mitigation measures 51
7.8 Offsets 52

8. Impact assessment 53

8.1 EPBC assessment of significance 53
8.2 Assessment under TSC Act 54
8.2.1 Non-certified areas 54
8.2.2 Certified areas 55

9. Biodiversity assessment 57

10. Conclusions 61

References 63

List of tables

Table 2-1 Legislation and guidelines relevant to biodiversity 10
Table 3-1 Contributors and their roles 19
Table 4-1 Vegetation mapped as occurring within and adjacent to the study area 21
Table 4-2 Noxious weeds recorded in the study area 32
Table 5-1 Threatened ecological communities known or predicted to occur in the project locality 37
Table 5-2 Threatened species recorded or predicted to occur in the project locality 40
Table 6-1 Potential loss of vegetation 44
Table 7-1 Summary of mitigation measures 51
Table 9-1 Threatened ecological communities and species for which significance assessments were conducted 57

List of figures

Figure 1-1 Project area 3
Figure 4-1 Vegetation communities and threatened species recorded within the study area 24

List of photos

Photo 4-1 Shale Plain Woodland within the rail corridor 22
Photo 4-2 Alluvial woodland to east of rail corridor, north of Schofields Station 23
Photo 4-3 Shale Gravel Transition Forest: Area proposed for a car park at Vineyard 29
Photo 4-4 Shale Gravel Transition Forest: Area proposed for a bus interchange 30
Photo 4-5 Shale Gravel Transition Forest: Area proposed for new Vineyard Station and associated track work 31
Photo 4-6 Mature *Eucalyptus fibrosa* in the proposed location for the new Vineyard Station 34
Photo 4-7 Fissure in a mature *Eucalyptus fibrosa* in the proposed location of the new Vineyard Station 34
Photo 5-1 *Pultenaea parviflora* 39
Photo 5-2 *Pultenaea parviflora* (in centre of photo) and its habitat within the rail corridor 40

Contents (continued)

Page Number

List of appendices

Appendix A
Species of plant recorded
Appendix B
Threatened species and population of plant in the locality
Appendix C
Threatened species of animal in the locality
Appendix D
Commonwealth Assessment of significance
Appendix E
Assessment of significance

Glossary

Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: ▪ genetic diversity — the variety of genes (or units of heredity) in any population ▪ species diversity — the variety of species ▪ ecosystem diversity — the variety of communities or ecosystems.
Biodiversity Certification	Biodiversity certification identifies areas within the growth centres as either certified or non-certified. Certified areas are those that are likely to be of lower conservation value. Non-certified areas generally correspond with areas of higher conservation value (such as known locations of Threatened species habitat), and flood prone and transitional land. Biodiversity certification switches off the need to undertake further significance assessments for threatened species (under Section 5A of the EP&A Act, the Seven Part Test). In these areas, it is considered that development is not likely to significantly affect any threatened species, population or ecological community, or the habitat of any of these. In non-certified areas, there is no change to the approval process and Threatened species assessments are required as normal under section 5A of the EP&A Act. See section 2.2.1 for more detail.
Bioregion (region)	A bioregion defined in a national system of bioregionalisation. For this study this is the NSW South-western Slopes bioregion as defined in the Interim Biogeographic Regionalisation for Australia (Thackway & Cresswell 1995).
Critical Habitat	The whole, or any part or parts, of an area, or areas, of land comprising the habitat of an Endangered species, an Endangered population or an Endangered ecological community that is critical to the survival of the species, population or ecological community (Department of Environment and Conservation 2004). Critical habitat is listed under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999* and both the State (Department of Environment and Climate Change) and Commonwealth (Department of the Environment and Water, Heritage and the Arts) Directors-General maintain a register of this habitat. Capitalisation of the term 'Critical Habitat' in this report refers to the habitat listed specifically under the relevant State and/or Commonwealth legislation.
Department of Environment and Climate Change	The NSW Department of Environment and Climate Change formed on 27 April 2007 incorporating the former NSW Department of Environment and Conservation in addition to some functions of the former Department of Natural Resources, Department of Energy, Utilities and Sustainability and The Greenhouse Office.
Department of the Environment and Heritage	The former name for the Commonwealth Department of the Environment, Water, Heritage and the Arts.
Department of the Environment and Water Resources	The former name for the Commonwealth Department of the Environment, Water, Heritage and the Arts.
Department of the Environment, Water, Heritage and the Arts	The Commonwealth Department of the Environment, Water, Heritage and the Arts changed their name from the Department of the Environment and Water Resources in 2007, and was previously known as the Department of the Environment and Heritage. The department develops and implements national policy, programs and legislation to protect and conserve Australia's natural environment and cultural heritage and administers the *Environment Protection and Biodiversity Conservation Act 1999*.
Ecological community	An assemblage of species occupying a particular area.
Environmental weed	Any plant that is not native to a local area that has invaded native vegetation.

Growth centre	Growth Centres are declared under State Environmental Planning Policy. This SEPP provides for the coordinated release of land for residential, employment and other urban development in the North West and South West growth centres of the Sydney Region (in conjunction with the Environmental Planning and Assessment Regulation relating to precinct planning).
Habitat	An area or areas occupied, or periodically or occasionally occupied by, a species, population or ecological community, including any biotic or abiotic components.
Key Threatening Processes (KTP)	A process that threatens, or could threaten, the survival, abundance or evolutionary development of native species, populations or ecological communities (Department of Environment and Conservation 2004). Key threatening processes are listed under the *Threatened Species Conservation Act 1995,* the *Fisheries Management Act 1994* and the *Environment Protection and Biodiversity Conservation Act 1999.* Capitalisation of the term 'Key Threatening Processes' in this report refers to those processes listed specifically under the relevant State and/or Commonwealth legislation.
Likely	Taken to be a real chance or possibility (Department of Environment and Conservation 2004).
Local population	The population that occurs within the study area, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated (as defined by NSW National Parks and Wildlife Service 1996).
Subject site	The specific area that will be covered by the Project. This includes the Up side of the existing track from Quakers Hill to Riverstone and the Down side of the existing track from Riverstone to Vineyard, and the replacement stations at Schofields and Vineyard, including the bus interchanges and additional car parking.
Study area	The subject site and any additional areas that are likely to be affected by the Project, either directly or indirectly.
Locality	The area within a 10 kilometre radius of the study area.
Migratory species	Species listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999.* Capitalisation of the term 'Migratory' in this report refers to those species listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*.
Protected species	Those species defined as protected under the *National Parks and Wildlife Act 1974*. Includes all native animals, and all native plants listed on Schedule 13 of the *National Parks and Wildlife Act 1974*.
Recovery plan	A plan prepared under the *Threatened Species Conservation Act 1995* or the *Environment Protection and Biodiversity Conservation Act 1999* to assist the recovery of a Threatened species, population or ecological community.
Significant	Important, weighty or more than ordinary (as defined by NSW National Parks and Wildlife Service 1996).
Threatened biodiversity	Threatened species, populations or ecological communities, or their habitats as listed under either the *Threatened Species Conservation Act 1995* or the *Environment Protection and Biodiversity Conservation Act 1999*.
Threatened species, populations and ecological communities	Species, populations and ecological communities listed as Vulnerable, Endangered or Critically Endangered (collectively referred to as Threatened) under the *Threatened Species Conservation Act 1995*, *Fisheries Management Act 1994* or the *Environment Protection and Biodiversity Conservation Act 1999*. Capitalisation of the terms 'Threatened', 'Vulnerable', 'Endangered' and 'Critically Endangered' in this report refers listing under the relevant State and/or Commonwealth legislation.
Viable local population	A population that has the capacity to live, develop and reproduce under normal conditions, unless the contrary can be conclusively demonstrated through analysis of records and references (as defined by NSW National Parks and Wildlife Service 1996).

1. Introduction

1.1 Background

As part of Rail Clearways Program, the Transport Infrastructure Development Corporation (TIDC) proposes to duplicate part of the existing Richmond Branch Line by constructing an additional track between Quakers Hill and Vineyard stations ('the Quakers Hill to Vineyard Duplication' or 'the Project'). The Project would also include associated works at Schofields, Riverstone and Vineyard stations, including new stations and bus interchanges at Schofields and Vineyard, and improved provision for pedestrians and additional car parking (refer Figure 1-1). The project would be constructed in two stages, Stage 1 involving additional track and associated works from Quakers Hill Station to the new Schofields Station. Stage 2 would commence after commissioning of Stage 1 and include additional track and associated works from the new Schofields Station to Vineyard Station.

This technical report provides assessment of the likely impacts of the Project on biodiversity values of the site and surrounds. It is appended as Technical Paper 5 to the main Environmental Assessment.

1.2 Aims

The flora and fauna (biodiversity) assessment of the proposed Quakers Hill to Vineyard Duplication Project aims to:

- determine and describe the characteristics and condition of the vegetation communities and flora and fauna habitats
- determine the occurrence, or likelihood of occurrence, of Threatened species listed under the *Threatened Species Conservation Act 1995* (TSC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) occurring in the study area
- undertake significance assessments for Threatened species, populations and communities that occur or have potential habitat in the study area as required under the TSC and EPBC Acts
- propose further investigations and/or amelioration measures to mitigate identified impacts on the ecological values of the study area.

1.3 Definitions

For the purpose of this report, the following definitions apply:

- **Subject site:** the specific area that will be covered by the Project. This includes the Up and Down sides of the existing track from Quakers Hill to Riverstone and the Down side of the existing track from Riverstone to Vineyard, and the replacement stations at Schofields and Vineyard, including the bus interchanges and additional car parking.
- **Study area:** the subject site and any additional areas that are likely to be affected by the Project, either directly or indirectly.
- **Locality:** the area within a 10 kilometre radius of the study area.
- **Region:** a bioregion defined in a national system of bioregionalisation. For this study this is the Sydney Basin bioregion as defined in the Interim Biogeographic Regionalisation for Australia (Thackway & Cresswell 1995).

Figure 1-1a Project area

Note: Project detail shown is indicative only, subject to detailed design.

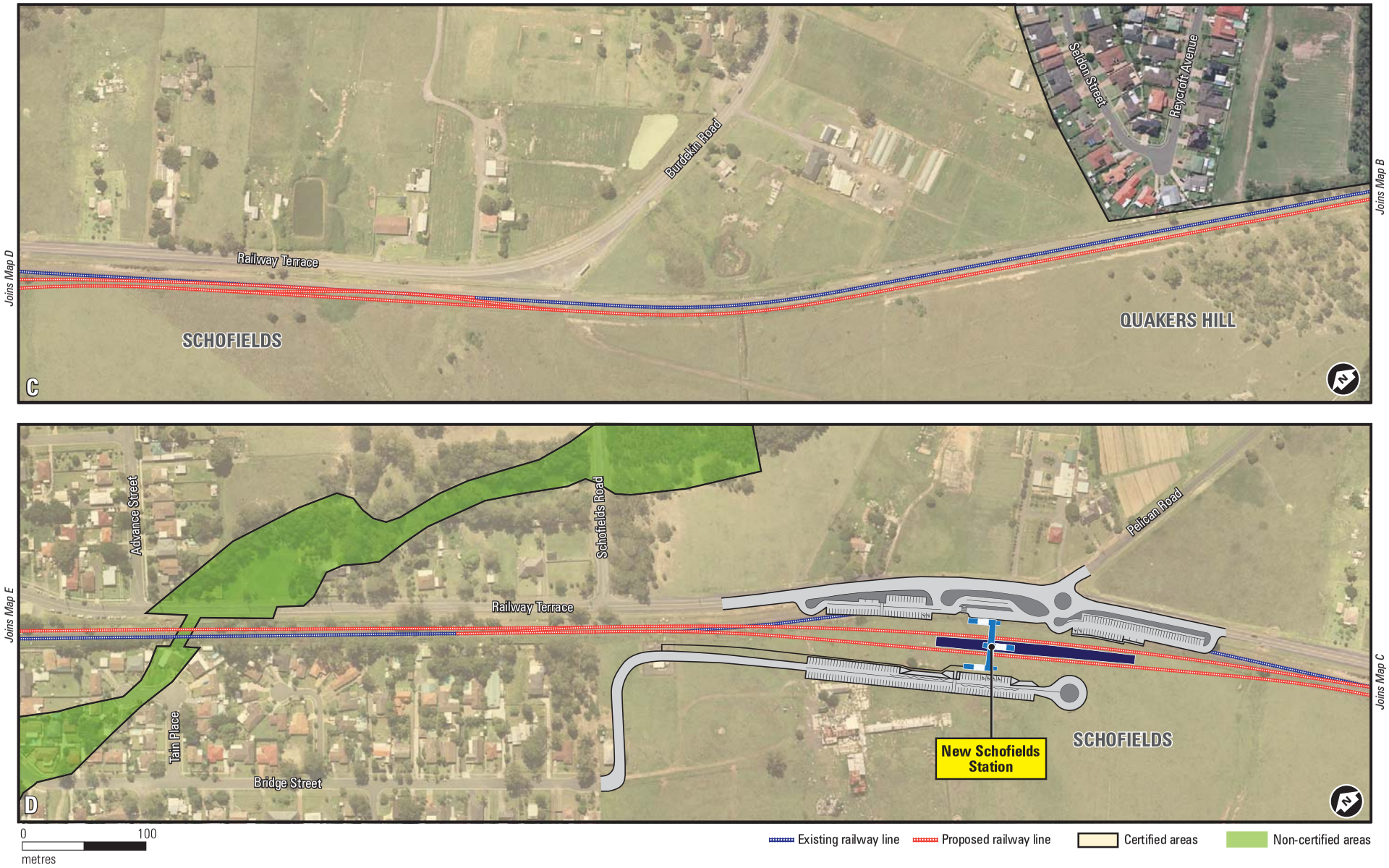

Figure 1-1b Project area

Note: Project detail shown is indicative only, subject to detailed design.

Figure 1-1c Project area

Note: Project detail shown is indicative only, subject to detailed design.

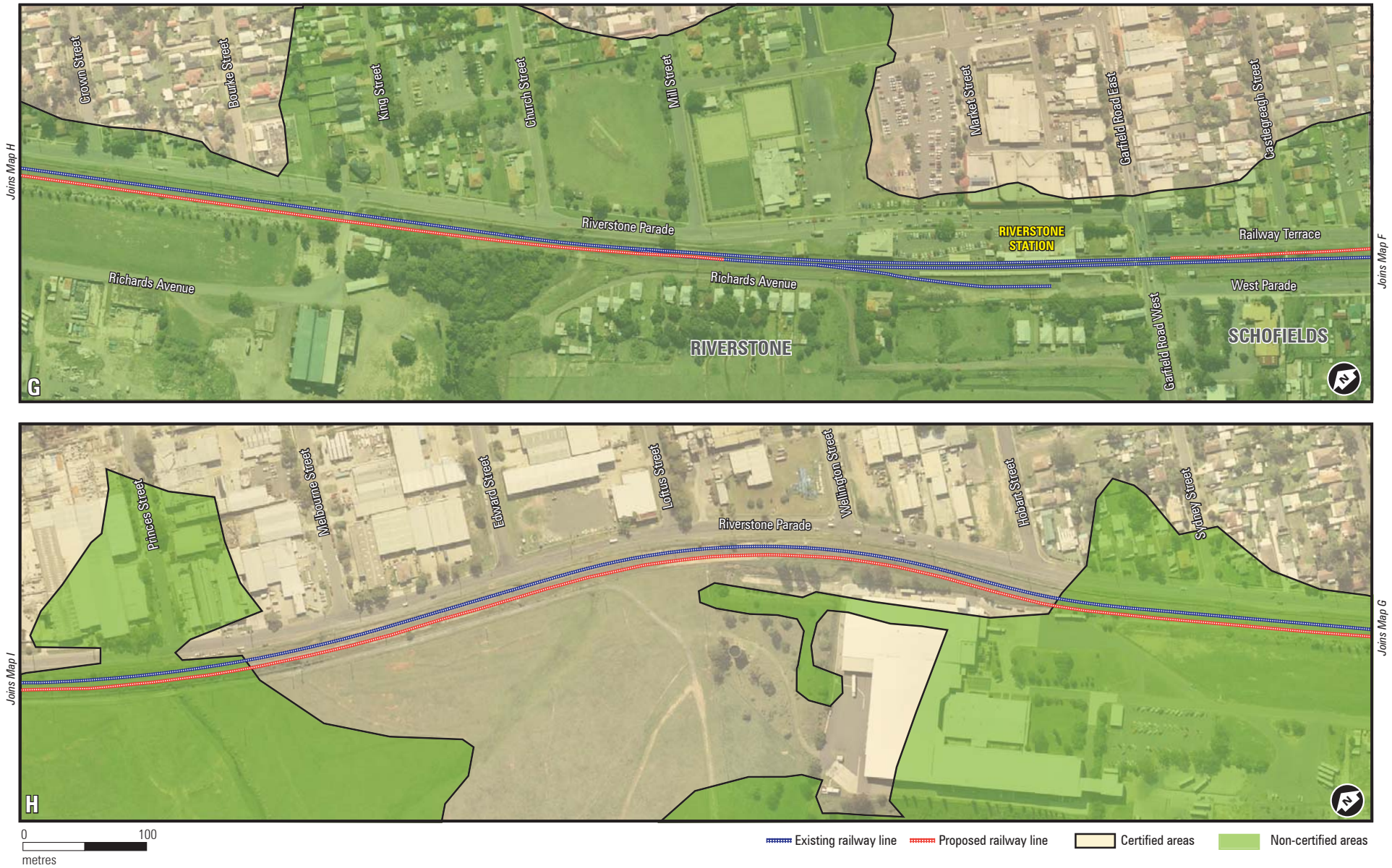

Figure 1-1d Project area

Note: Project detail shown is indicative only, subject to detailed design.

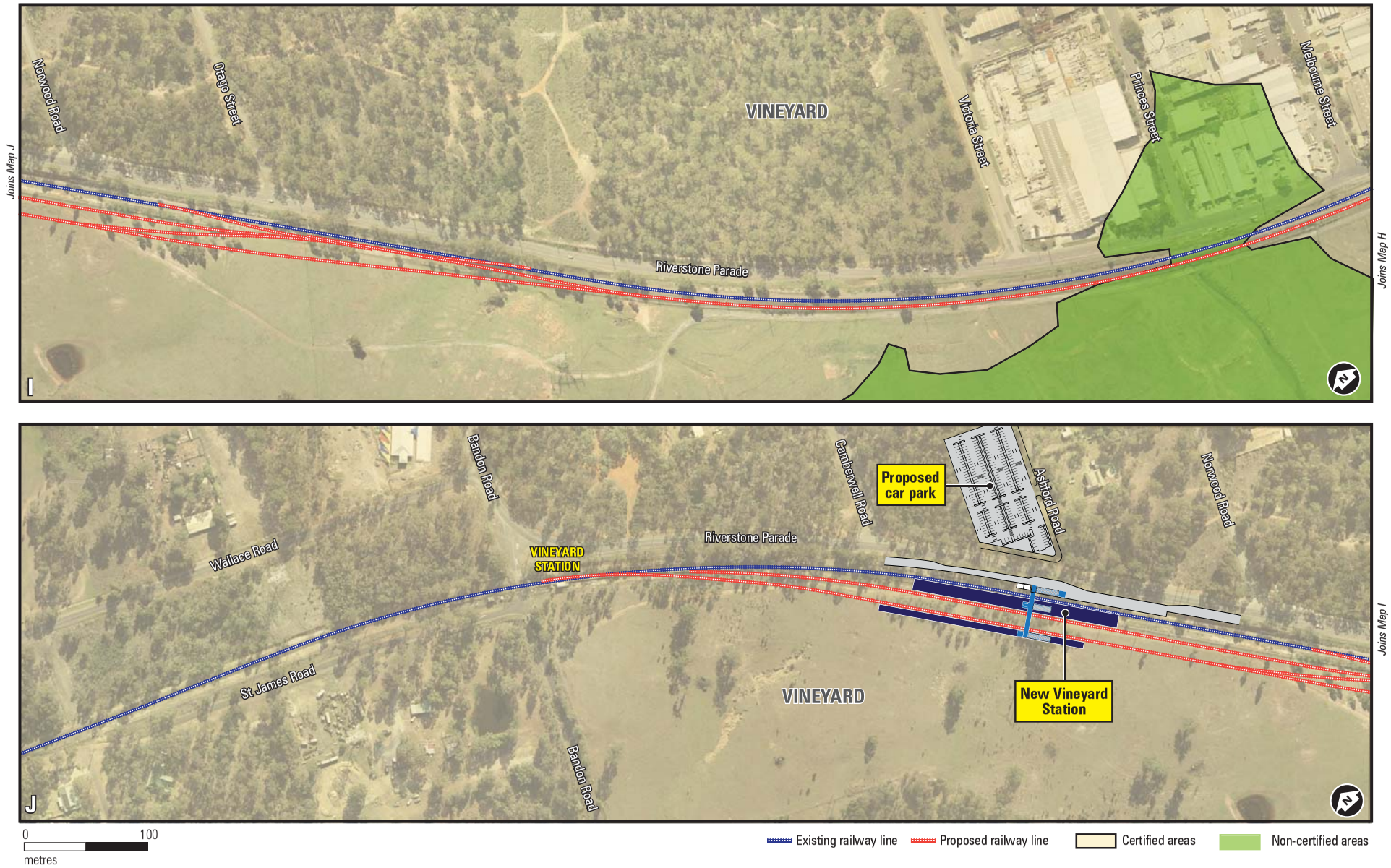

Figure 1-1e Project area

Note: Project detail shown is indicative only, subject to detailed design.

2. Legislative framework

2.1 Commonwealth assessment process

The Commonwealth EPBC Act is triggered by actions that will have or are likely to have a significant effect on a matter of national environmental significance, the environment of Commonwealth land (even if the action is taken outside Commonwealth land), the environment of a Commonwealth Heritage Place outside the Australian jurisdiction or the environment anywhere in the world (if the action is undertaken by the Commonwealth).

Matters of national environmental significance comprise world heritage properties, national heritage places, wetlands of international importance, Commonwealth-listed threatened species and ecological communities, Commonwealth-listed migratory species, nuclear actions and Commonwealth marine areas.

When the EPBC Act is triggered the project is required to be referred to the Commonwealth Minister for the Environment and Heritage for consideration. Actions determined by the Minister to require Commonwealth approval are deemed 'controlled actions' and an environmental assessment must be carried out. Under a bilateral agreement between the state of NSW and the Commonwealth consent may be granted based on the Director-General of Department of Planning's assessment report.

A referral under the EPBC Act has been required for this project as a result of the combination of the project being located on Commonwealth land and there being Commonwealth threatened communities and species and migratory species present. The Commonwealth threatened communities and species and migratory species are addressed in Section 5.

2.2 State approval framework

The Project will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A), which is the principle strategic planning and approval instrument in NSW. Part 3A outlines the approval framework for major infrastructure, or other development that in the opinion of the Minister for Planning, is of State or regional environmental planning significance.

Legislation relevant to biodiversity and the Project is summarised in Table 2-1.

Table 2-1 Legislation and guidelines relevant to biodiversity

Legislation (governing authority)	Objectives	Relevance to current project
State		
Environmental Planning and Assessment Act 1979 (Department of Planning)	To encourage the proper management, development and conservation of natural and artificial resources for the purpose of promoting the social and economic welfare of the community and a better environment.	As the principal planning instrument in NSW, this Act dictates the assessment and approval pathway for the Project and thereby the factors for assessment of the significance to biodiversity, and the requirements to consider or seek authorisation under other NSW legislation and planning policies.
Threatened Species Conservation Act 1995 (Department of the Environment and Climate Change)	To conserve biological diversity and prevent the extinction and promote the recovery of threatened species, populations and ecological communities. To ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed.	Significance assessments must be completed for all Threatened ecological communities, populations and species listed under this Act that are recorded in the study area, or likely to occur, and that would be directly or indirectly affected by the Project. Significance assessments for projects assessed under Part 3A of the EP&A Act are completed in accordance with the heads of consideration outlined in the *Draft guidelines for threatened species assessment* (Department of Environment and Conservation 2005). This Act puts in place biodiversity certification and BioBanking. *The Threatened Species Conservation Amendment (Special Provisions) Act 2008* was passed on 25 June and amends the *Threatened Species Conservation Act 1995* by inserting a new part to Schedule 7 (Savings, transitional and other provisions) of the Act. The new Part 7, Schedule 7 of the Act confers biodiversity certification on the Growth Centres SEPP. The amendment largely replicates the order to confer biodiversity certification on the Growth Centres SEPP that was issued by the Minister for the Environment on 11 December 2007 and resolves uncertainty about the certification granted on the Growth Centres SEPP in accordance with Section 126G of the *Threatened Species Conservation Act 1995*.
Fisheries Management Act 1994 (Department of Primary Industries)	The objects of this Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. Included in this objective is to conserve Threatened species, populations and ecological communities of fish and marine vegetation.	Significance assessments must be completed for all Threatened ecological communities, populations and species listed under the Act that are recorded in the study area, or likely to occur, and that would be directly or indirectly affected by the Project. Under s205 of this Act, a permit is required to harm any marine vegetation, including mangroves or seagrasses. However, actions approved under Part 3A of the EP&A Act are exempt from requiring such a permit.

Legislation (governing authority)	Objectives	Relevance to current project
National Parks and Wildlife Act 1974 (Department of the Environment and Climate Change)	The objects of this Act are the conservation of nature and objects, places or features of cultural value. This Act contains provisions that relate to the protection of native terrestrial fauna and some flora and endangered ecological communities in addition to Indigenous cultural heritage.	Stop work orders under the Act may be issued to prevent or interfere with the carrying out of the Project if the provisions of the Act are breeched.
Native Vegetation Act 2003 (Department of Environment and Climate Change)	The objective of this Act is to provide a framework for the conservation and sustainable management of native vegetation in NSW. The Act allows for the management of native vegetation on a regional basis and controls broad-scale clearing of vegetation.	Approval for clearing is not required for projects approved under Part 3A of the EP&A Act or projects in urban areas.
Water Management Act 2000 (Department of Water and Energy)	The first of these Acts provides for the sustainable and integrated management of the State's waters, including those provisions previously included in the *Rivers and Foreshores Improvement Act 1948*. The main object of the Act is to enhance and restore water sources and their associated ecosystems, ecological processes and biodiversity.	Licences under the *Water Management Act 2000* is not required for projects approved under Part 3A of the EP&A Act.
State Environmental Planning Policy No 19 — Bushland in urban areas (SEPP19)	This policy aims to protect and preserve bushland in certain urban areas, as part of the natural heritage or for recreational, educational and scientific purposes. The policy is designed to protect bushland in public open space zones and reservations, and to ensure that bush preservation is high priority when local environmental plans for urban development are prepared.	This policy applies to areas zoned or reserved for public open space purposes. No areas within the subject site are zoned or reserved for public open space and as such this policy does not apply to the Project.

Legislation (governing authority)	Objectives	Relevance to current project
State Environmental Planning Policy No 44 — Koala Habitat Protection (SEPP44)	This policy aims to encourage the proper conservation and management of natural koala habitat to ensure that there is a permanent free-living population of koalas throughout their present range and to reverse the current trend of population decline. SEPP44 imposes restrictions on certain developments in areas of 'core koala habitat'.	SEPP44 applies to land in the local government areas (LGAs) listed in Schedule 1 of the policy for which a development application has been made and the relevant local Council is the determining authority. SEPP44 does not apply to the Project as the local Council is not the determining authority. The intent of the SEPP has still been addressed.
State Environmental Planning Policy — Sydney Regional Growth Centres (2006) (Growth Centres SEPP)	The Growth Centres SEPP provides for the coordinated release of land for residential, employment and other urban development in the North West and South West growth centres of the Sydney Region (in conjunction with the Environmental Planning and Assessment Regulation relating to precinct planning).	The majority of the study area is within the North West Growth Centre, this policy applies to these areas. In order to streamline assessment and approval in the growth centres, biodiversity certification was developed. This policy is discussed in greater detail in Section 2.2.1.

2.2.1 Biodiversity certification and the Sydney regional growth centres

The majority of the proposal is located within the North West Growth Centre identified in the Growth Centres SEPP (refer Figure 1-1). The aims of this policy are to:

- co-ordinate the release of land for residential, employment and other urban development in the North West and South West growth centres of the Sydney Region
- provide for comprehensive planning of those growth centres
- provide controls for the sustainability of land in those growth centres that has conservation value
- provide for the orderly and economic provision of infrastructure in and to those growth centres
- provide development controls in order to protect the health of the waterways in those growth centres
- protect and enhance land with natural and cultural heritage value
- provide land use and development controls that will contribute to the conservation of biodiversity.

In order to streamline assessment and approval in the growth centres, an order to confer biodiversity certification on the Growth Centres SEPP was issued on the 11 December 2007 by the Minister for Climate Change, Environment and Water.

Biodiversity certification (under section 126G of the TSC Act) may be conferred on an Environmental Planning Instrument if the Minister is satisfied that the instrument, in addition to any other relevant measures to be taken, will maintain or improve biodiversity values. A draft conservation plan (Eco Logical Australia 2007) was prepared to identify biodiversity values within the growth centres and propose mechanisms to achieve positive conservation outcomes through the development assessment process. In addition to the mechanisms outlined in the draft conservation plan, the Minister's order (Minister for Climate Change Environment and Water 2007) outlines the conditions of the biodiversity certification.

The *Threatened Species Conservation Amendment (Special Provisions) Act 2008* was passed on 25 June and amends the *Threatened Species Conservation Act 1995* by inserting a new part to Schedule 7 (Savings, transitional and other provisions) of the Act. The new Part 7, Schedule 7 of the Act confers biodiversity certification on the Growth Centres SEPP. The amendment largely replicates the order to confer biodiversity certification on the Growth Centres SEPP that was issued by the Minister for the Environment on 11 December 2007 and resolves any uncertainty about the certification granted on the Growth Centres SEPP in accordance with Section 126G of the *Threatened Species Conservation Act 1995*.

Biodiversity certification identifies areas within the growth centres as either certified or non-certified. Certified areas are those that are likely to be of lower conservation value. Non-certified areas generally correspond with areas of higher conservation value (such as known locations of Threatened species habitat), and flood prone and transitional land.

Biodiversity certification switches off the need to undertake further significance assessments for threatened species (under Section 5A of the EP&A Act, the Seven Part Test). In these areas, it is considered that development is not likely to significantly affect any threatened

species, population or ecological community, or the habitat of any of these. In non-certified areas, there is no change to the approval process and Threatened species assessments are required as normal under Section 5A of the EP&A Act.

To ensure that biodiversity values are maintained or improved, the biodiversity certification order outlines requirements to offset biodiversity impacts. In certified areas, biodiversity offsets will be made as part of the Special Infrastructure Contribution. The value of the contribution will be determined in a precinct plan at a flat value per hectare (regardless of the existing biodiversity values). However, as the Special Infrastructure Contribution applies only to actions requiring development approval under Part 4 of the EP&A Act, the Project is not required to contribute to offsets for impacts to biodiversity in the certified areas as the project is being assessed under Part 3A.

Offsets are, however, required for biodiversity impacts resulting from the Project in non-certified areas (under condition 11 of the certification order, Minister for Climate Change Environment and Water 2007). These offsets should also be calculated for Threatened biodiversity or their habitats identified in the non-certified areas in accordance with the offset ratios used for BioBanking (Ray Giddins, Regional Biodiversity Conservation Officer, Department of Environment and Climate Change, personal communication 20 February 2007).

Biodiversity certification does not negate the need for assessment of all areas and all impacts under the EPBC Act.

Assessment under biodiversity certification

The biodiversity assessment was undertaken in accordance with the *Draft Guidelines for Threatened Species Assessment* (Department of Environment and Conservation 2005, (the 'Draft Guidelines')). The objective of the assessment process under the Draft Guidelines is to provide information to enable decision makers to ensure that developments deliver a number of environmental outcomes including the requirement to maintain or improve biodiversity values (i.e. there is no net impact on threatened species or native vegetation).

In a number of locations (Figure 1-1), the project impacts on areas accredited with biodiversity certification under the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (the 'Growth Centres SEPP').

Under section 126G of the *Threatened Species Conservation Act 1995*, the Minister may confer biodiversity certification on an environmental planning instrument (EPI) if satisfied that the EPI, in addition to any other relevant measures to be taken, will lead to an overall improvement or maintenance of biodiversity values. The main practical effect of certification is that it removes the need to undertake threatened species assessments for developments or activities within the area subject to certification (refer Table 2-1).

As such, for those areas subject to biodiversity certification under the Growth Centres SEPP the environmental assessment and proposed mitigation measures have been undertaken to be consistent with the biodiversity certification as conferred on the Growth Centres SEPP and specified in the Director General's (DG) requirements. Both the biodiversity certification and the Draft Guidelines have the objective to 'improve or maintain' biodiversity values. \

A precautionary approach was taken for this biodiversity assessment. Notwithstanding the provisions conveyed by biodiversity certification, significance assessments were considered in accordance with the draft *Guidelines for Threatened Species Assessment* were conducted for threatened species that had a moderate or greater likelihood of occurring within the study area (refer Section 9).

3. Methods

The biodiversity survey and assessment included desk-based searches of databases and historical records as well as field survey in the study area. This section outlines the specific methods used to survey and assess biodiversity in the study area.

3.1 Database searches and literature reviews

Records of Threatened species were obtained from the Department of Environment and Climate Change *Atlas of NSW Wildlife* within the project locality (Department of Environment and Climate Change 2008). Details of Threatened species/communities and migratory species listed under the EPBC Act that could potentially occur within the project locality were obtained using the Department of the Environment, Water, Heritage and the Arts *Protected Matters Search Tool* (Department of the Environment Water Heritage and the Arts 2008b).

3.2 Field survey

Surveys of the rail corridor were undertaken on 19 September 2007. Surveys on private properties were undertaken on:

- 6 February 2008
- 8 April 2008
- 7 May 2008
- 2-3 September 2008
- 11 March 2009.

The surveys assessed the extent and condition of vegetation communities and flora and fauna habitat. Survey effort and design was based on the Department of Environment and Climate Change Impact Assessment Guidelines (Department of Environment and Climate Change 2007c) and species specific guidelines (e.g. National Parks and Wildlife Service 2000).

3.2.1 Species of plant

Species of plants on site were assessed and recorded using the random meander technique (Cropper 1993), in which the recorder walks in a random manner throughout the site, recording all species seen. The time spent in each vegetation community is generally proportional to the size of the community and its species richness.

3.2.2 Targeted surveys

Targeted surveys for Threatened species were undertaken in the rail corridor and on private properties. These surveys (6 February 2008, 8 April 2008 and 7 May 2008) coincided with the flowering time of the cryptic *Pimelea spicata* and a known population in Prospect was observed to be flowering at the time of these surveys.

Targeted surveys were undertaken within areas of Cumberland Plain Woodland and Shale Gravel Transition Forest that provide potential habitat for Cumberland Plain Land Snail.

3.2.3 Condition of vegetation communities

The condition of vegetation was assessed using parameters such as intactness, diversity, history of disturbance, weed invasion and health. Three categories were used to describe the condition of vegetation communities:

- **Good:** vegetation retains the species complement and structural characteristics of the pre-European equivalent. Such vegetation has usually changed very little over time and displays resilience to weed invasion due to intact groundcover, shrub and canopy layers.
- **Medium:** vegetation generally retains its structural integrity, but has been disturbed and has lost some component of its original species complement. Weed invasion can be significant in such remnants.
- **Poor:** vegetation that has lost most of its species and is significantly modified structurally. Often such areas have a discontinuous canopy of the original tree cover, with very few shrubs. Exotic species, such as introduced pasture grasses or weeds, replace much of the indigenous ground cover. Environmental weeds are often co-dominant with the original indigenous species.

3.2.4 Faunal habitats

The fauna assessment of the site was based primarily on the habitats present. Threatened species are often difficult to detect and a lack of Threatened species records cannot necessarily be used to argue for the absence of the species from the site when suitable habitat is present. Suitable habitat is, therefore, the most important factor to consider when determining the potential presence of Threatened species.

Fauna habitats were generally assessed by examining characteristics such as the structure and floristics of the canopy, understorey and ground vegetation, the structure and composition of the litter layer, and other habitat attributes important for feeding, roosting and breeding. The following criteria were used to evaluate habitat values:

- **Good:** full range of fauna habitat components usually present (e.g. old-growth trees, fallen timber, feeding and roosting resources) and habitat links to other remnant ecosystems in the landscape are intact.
- **Moderate:** some fauna habitat components are missing (e.g. old-growth trees and fallen timber), links with other remnant habitats in the landscape are usually intact, but sometimes degraded.
- **Poor:** many fauna habitat elements in low quality remnants have been lost, including old growth trees (e.g. due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat links with other remnant ecosystems in the landscape are usually severely compromised by extensive past clearing.

3.3 Conservation significance

Assessment of the conservation significance of native flora and fauna is undertaken according to the following hierarchy:

1. national
2. state
3. regional
4. local.

Meaningful comparisons of significance or value at a variety of scales rely on widely accepted criteria (International Union for the Conservation of Nature 2001). The following criteria were used to assign an appropriate conservation significance category.

National: remnant ecosystems containing populations of plant or animal species considered nationally vulnerable or endangered and listed on the EPBC Act. Also includes:

- flora listed as threatened or rare in *Rare or Threatened Australian Plants* (Briggs & Leigh 1996)
- species listed as endangered, vulnerable or rare in *Australia in an Action Plan* (published by Environment Australia) and *Important habitat for migratory species* (Cogger et al. 1993; Duncan et al. 1999; Garnett & Crowley 2000; Maxwell 1996).

State: remnant ecosystems containing populations of plant or animal species, or vegetation or animal communities considered Threatened in NSW, including species and communities listed under the TSC Act. This category also includes flora listed as poorly known in Australia in Rare or Threatened Australian Plants (Briggs & Leigh 1996).

Regional: there are no widely accepted criteria for regional significance in NSW. The state is divided into bioregions (Thackway & Cresswell 1995) and much of the listing of Endangered Ecological Communities under the TSC Act and the EPBC Act are based around these regions. The NSW Government has set up Catchment Management Authorities to direct natural resource management in 13 general catchments. These authorities will incorporate earlier Regional Vegetation Management Plans that were required under the *Native Vegetation Conservation Act 1999*. In addition, numerous published studies and vegetation mapping projects have indicated the importance of vegetation and species at various spatial scales (NSW National Parks and Wildlife Service 2002c).

Local: all remnant native vegetation and fauna habitat that does not fall into the categories above is considered to be of at least local significance, as most such areas have been reduced in extent since European settlement. The overall significance of the site on a local scale can take into consideration factors such as the size of fragments, degree of intactness and connectivity.

Potentially significant: often, time constraints, the limitations of field methods or seasonal factors make it impossible to confirm the presence of significant flora or fauna species or populations. However, the habitat of an area being investigated may closely match that used by the significant species in areas nearby where it is known to occur. In these circumstances, the level of significance that would otherwise apply is qualified by 'potential'. In addition, some species or communities may possess characteristics that make them eligible for listing as threatened at either the State or National levels, although the listing has

not yet taken place. Again, the level of significance for these species and communities is qualified by the term potential.

3.3.1 Conservation significance of Cumberland Plain vegetation

Conservation significance classes have been assigned to each remnant by the *Final Native Vegetation Mapping of the Cumberland Plain, Western Sydney* (NSW National Parks and Wildlife Service 2002a, 2002b). The following four conservation significance classes have been described:

- **Core Habitat:** areas that constitute the backbone of a viable conservation and include all remnants of 10 hectares or more of the mapped vegetation category with canopy cover of less than 10%.
- **Support for Core Habitat:** areas that provide a range of support values to the Core Habitat, including increasing remnant size, buffering from edge effects, and providing corridor connections. The focus is to identify priority areas for conservation and restoration in order to enhance the biodiversity values in the region.
- **Urban Remnant Trees (Critically Endangered Communities)**: areas of critically endangered ecological communities that remain as remnant trees in an urban landscape (mapped as Canopy Cover less than 10% (Urban Areas). No areas of this category were identified in the study area, however, this is likely to be revised if the preliminary listing of Cumberland Plain Woodland as Critically Endangered is finalised.
- **Other Remnant Vegetation:** all native vegetation that does not fall within the above conservation significance classes (NSW National Parks and Wildlife Service 2002b).

3.4 Significance assessments

The impact assessments followed the definitions given in Section 1.3. Tests for significance were completed for Threatened ecological communities, populations and species that were either:

- recorded in the study area, or
- recorded in the locality, with potential to occur in the study area.

For species and communities listed under the EPBC Act significance assessments were undertaken in accordance with the administrative guidelines of the Department of the Environment, Water, Heritage and the Arts (Department of the Environment and Heritage 2006).

The majority of the study area is within the North West Growth Centre certified area. Biodiversity certification switches off the need to undertake further significance assessments for threatened species (under Section 5A of the EP&A Act, the Seven Part Test). For those areas subject to biodiversity certification under the Growth Centres SEPP, the environmental assessment and proposed mitigation measures have been undertaken to be consistent with the biodiversity certification as conferred on the Growth Centres SEPP (see Section 2.2.1) and specified in the Director Generals Requirements.

For species, populations and communities listed under the TSC Act that occur within non-certified areas, or outside the growth centre, significance assessments were carried out as required under the EP&A Act. These followed the methods suggested by the Department of

Environment and Climate Change's *Draft guidelines for Threatened species assessment under Part 3A* (Department of Environment and Conservation 2005).

3.5 Personnel

The contributors to the preparation of this report, their qualifications and roles are listed in Table 3-1.

Table 3-1 Contributors and their roles

Name	Qualification	Role
Alex Cockerill	BSc (Hons)	Ecologist — surveys, report preparation
Selga Harrington	BSc (Hons)	Ecologist — surveys, report preparation
Andrew McMillan	BSc (Hons)	Ecologist — surveys
Dr Martin Predavec	BSc (Hons), PhD	Ecologist — report review
Chris O'Dell	BSc	GIS Consultant

All work was carried out under the appropriate licences, including a scientific licence as required under Clause 22 of the National Parks and Wildlife Regulations 2002 and Section 132C of the *National Parks and Wildlife Act 1974,* and an Animal Research Authority issued by the Department of Primary Industries (Agriculture).

3.6 Nomenclature

Names of plants used in this document follow Harden (Harden 1992, 1993, 2000, 2002) with updates from PlantNet (Royal Botanic Gardens 2008). Scientific names are used in this report for species of plant. Scientific and common names (where available) are provided in plant lists in Appendix A and B.

Names of vegetation communities used in this report are based on the dominant species and structure of the community and follow those used in the existing vegetation mapping — in this case the Final Native Vegetation Mapping of the Cumberland Plain, Western Sydney (NSW National Parks and Wildlife Service 2002a) — or names of Threatened ecological community listed under the TSC Act and/or the EPBC Act.

Names of vertebrates follow the Census of Australian Vertebrates (CAVS) database maintained by the Department of the Environment, Water, Heritage and the Arts (formerly the Department of the Environment and Water Resources; Department of the Environment Water Heritage and the Arts 2008a). Common names are used in the report for species of animal.

3.7 Limitations

On all sites, varying degrees of non-uniformity of flora and fauna habitats are encountered. Hence no sampling technique can entirely eliminate the possibility that a species is present on a site (e.g. species of plant present in the seed bank). The conclusions in this report are based upon data acquired for the site and the environmental field surveys and are, therefore, merely indicative of the environmental condition of the site at the time of survey, including the presence or otherwise of species. It should also be recognised that site conditions, including the presence of Threatened species, can change with time.

Where survey was undertaken outside the optimal time for detecting some species, a precautionary approach was taken and it was assumed that the species was present if suitable habitat was observed.