

14. Biodiversity

This Chapter outlines the potential impacts of the proposed SWRL concept on existing biodiversity within and adjacent to the SWRL corridor. Existing flora and fauna within and adjacent to the corridor are described in Section 5.2.1. A detailed biodiversity assessment for the project was undertaken as part of this Environmental Assessment and is included as Technical Paper 3 in Volume 2 of this document. Key findings are summarised in this Chapter.

14.1 Assessment approach

This biodiversity assessment was completed in accordance with the *Draft Guidelines for Threatened species assessment under Part 3A* (Department of Environment and Conservation 2005a).

Database searches, field survey and data representing remnant vegetation from the *Final Native Vegetation Mapping of the Cumberland Plain, Western Sydney* (NSW National Parks and Wildlife Service 2002d) were used to map and quantify the area of vegetation and fauna habitat affected by the SWRL. The area of remnant vegetation within the subject site, and additional areas that may be adversely affected by edge effects, were calculated using geographic information system software. Further details of the assessment approach are provided in Section 2 of Technical Paper 3.

14.2 Land use context and redevelopment

As discussed in Section 5.2.1, the study area traverses numerous lots with a variety of land uses, including rural-residential properties (5 acre lots) with market gardens and/or light intensity grazing; land owned by the NSW Government (LandCom), the Commonwealth Government and other land owners that is rezoned for future residential development (Edmondson Park); roads; and an existing railway corridor (at Glenfield). The remnant vegetation and fauna habitats along the proposed SWRL have, therefore, been exposed to a range of past impacts and levels of disturbance and are located within an area planned for significant development.

The assessment provided below needs to be considered in the context of the broader land development identified by the NSW Government for the South West Growth Centre (see Chapter 5).

State Environmental Planning Policy (Growth Centres) 2006 (the Growth Centres SEPP) identifies land in the South West Growth Centre that is earmarked for conservation in public ownership; as well as flood-prone land and riparian corridors along major creeks and 'transitional areas' that are subject to additional planning provisions that aim to protect the existing environmental characteristics of the land (These areas are environmentally sensitive land that is to be retained in private ownership.) The proposed SWRL corridor crosses some areas of 'Flood Prone and Major Creeks Land' identified, applying to Kemps Creek and its tributaries.

The Growth Centres Commission will be seeking biodiversity certification for the Growth Centres SEPP in accordance with the *Threatened Species Conservation Act 1995*. Accompanying this request will be a Conservation Plan detailing potential off-sets. The Conservation Plan will be made publicly available and this document and submissions would be considered by the Minister for the Environment in determining biodiversity certification for the SEPP. At this stage, it is understood that the maps that form part of the SEPP show the areas that would otherwise be protected from redevelopment as part of the South West Growth Centre.

14.3 Construction impacts

14.3.1 Clearing of native vegetation

'Clearing of remnant vegetation' is listed as a 'key threatening process' under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*. Figure 14-1 shows the location of native vegetation clearing resulting from the project. The area of each vegetation community that would be cleared within the construction footprint of the project is included in Table 14-1 (row labelled SWRL construction footprint). Not all vegetation within the construction sites construction footprint would necessarily need to be cleared. Table 4-2 of Technical Paper 3 provides a further breakdown of the conservation significance classes affected in each community.

Table 14-1 Approximate areas (hectares) of remnant vegetation within the construction footprint and affected by edge effects

Vegetation community ¹	SWRL construction footprint ²	Construction sites construction footprint ³	Edge effects associated with SWRL ⁴	Vegetation community affected (subtotal)
Shale Hills Woodland (Cumberland Plain Woodland)	2.68	0.03	1.73	4.44
Shale Plains Woodland (Cumberland Plain Woodland)	14.06	8.88	9.62	32.56
Alluvial Woodland	3.27	6.00	1.11	10.38
Total vegetation affected	20.01	14.91	12.46	47.38
No native vegetation overstorey	44.31	62.88	-	107.19
Total construction footprint	64.32	77.79	-	142.11

Notes:

- 1) Vegetation community classes based on the *Final native vegetation mapping of the Cumberland Plain, western Sydney* (NSW National Parks and Wildlife Service 2002b).
- 2) SWRL construction footprint was determined to be the proposed 40 metre wide corridor and slightly wider areas at the Glenfield Junction, Edmondson Park Station, Leppington Station and the stabling facility as per Figure 14.1.
- 3) Construction sites construction footprint was determined to be the various construction sites that would be occupied during the construction phase of the project as per Figure 14.1. The area of native vegetation remnants located within the 'SWRL construction footprint' and the 'Construction sites construction footprint' was only counted in the 'SWRL construction footprint' summary.
- 4) Edge effects associated with the SWRL included remnant vegetation within 50 metres of the 'SWRL construction footprint' not already affected by edge effects, as per Figure 14.1.

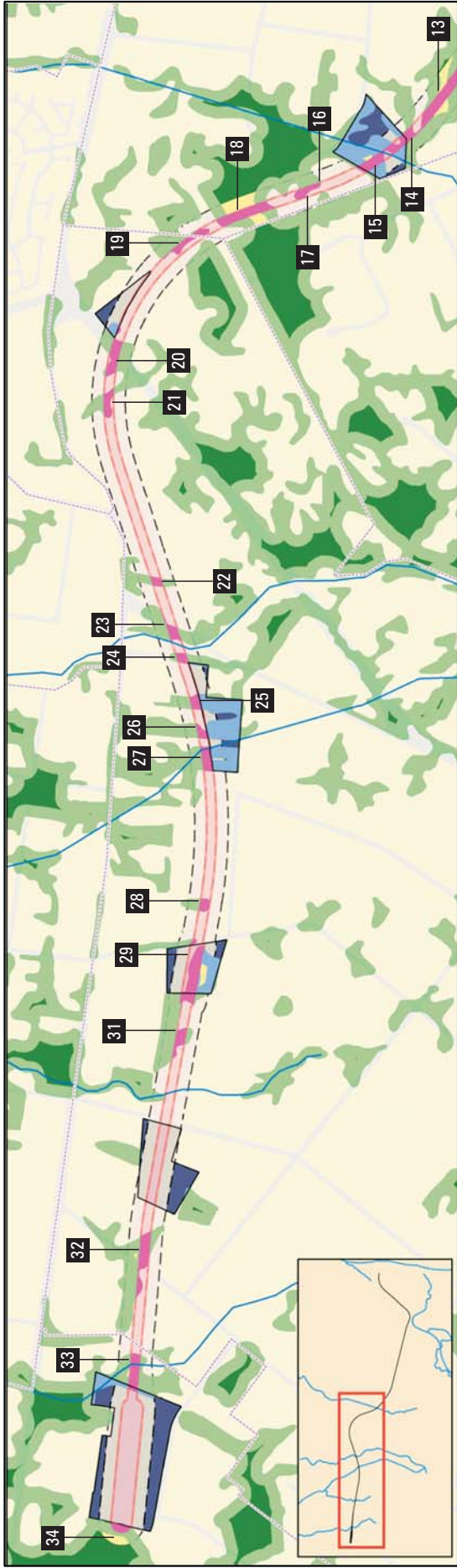


Figure 14-1 Remnant native vegetation within construction footprint and areas likely to be affected by new edge effects

The areas of derived grassland that are likely to be cleared could not be estimated as these areas have not been mapped by the broad-scale mapping projects (NSW National Parks and Wildlife Service 2002b; Tindall et al. 2004) or for this assessment.

Some of the remnant vegetation that would be cleared is located within the 'Flood Prone and Major Creeks Land' identified under State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (approximately 0.7 hectares); which is stated as having some conservation significance in the Policy. The project also crosses an area identified as habitat corridor and core habitat in the Western Sydney Parklands Structure Plan. No vegetation clearing is proposed within the main conservation zones ('Conservation/Open Space' zones or 'Public Recreational - Regional') identified under State Environmental Planning Policy (Sydney Region Growth Centres) 2006 or Edmondson Park reserved areas.

14.3.2 Removal and modification of fauna habitats

Vegetation clearing would result in loss of the associated fauna habitat along the construction footprint. The approximate areas of each fauna habitat class that would be removed are:

- 5.8 hectares of remnant woodland ('core'), with habitats in good condition
- 9 hectares of modified woodland, including shrubby regrowth ('support for core'), with habitats in poor to moderate condition
- 35 hectares of highly modified habitats, including cleared land with habitats in poor condition.

Further areas of fauna habitat have the potential to be affected by construction areas.

The project would result in the 'Removal of dead wood and dead trees', which is a listed key threatening process under the *Threatened Species Conservation Act 1995*. Logs and fallen branches provide specific habitat for native ground-dwelling mammals, reptiles and amphibians, including the Threatened Cumberland Plain Large Land Snail. Habitats, including dead wood and trees, generally occurred in low amounts within remnant woodland in the study area. The maximum amount of dead wood and trees removed would be approximately 3.5 hectares.

Construction activities would be likely to increase noise levels, and general disturbance would be associated with the presence of humans in the study area. Increased noise levels could cause disturbance to native animals, resulting in displacement of individuals out of the affected area, disturbance to foraging patterns and disturbance to breeding cycles. No threatened species of animal that are likely to be significantly affected by construction noise were identified.

14.3.3 Fauna injury

Fauna injury or death could occur during construction activities as a result of clearing of fauna habitat, collision with vehicle or plant and incidental trapping, or drowning in trenches or other earthworks. Some mobile species, such as birds, would be able to move away from the path of clearing; however, species that are less mobile, nocturnal or restricted to tree hollows, may have difficulty moving rapidly over large distances.

14.3.4 Edge effects

Edge effects refer to differences in microhabitat conditions along boundaries of native vegetation remnants; these result from differences in physical conditions, including altered light levels, wind speed, temperature and humidity (Lindenmayer and Burgman 2005).

Clearing of native vegetation would create new boundaries around the remaining remnants, thereby creating edge effects in areas formerly buffered by adjoining vegetation, albeit that many of these areas are proposed for development. Such changes to habitat arising from the introduction of edge effects into previously 'core' areas of remnants could have implications on flora and fauna, including:

- increased germination and establishment of exotic plants (weeds), resulting in changes to the floristic composition and structure along new edge areas
- increased levels of predation by introduced mammals and birds and generalist native species in edge areas.

A distance of 50 metres from the edge of the estimated construction footprint has been adopted as the likely extent of edge effects resulting from the proposed SWRL. The vegetation within the study area is already highly fragmented and subject to edge effects. The location and extent of new edge effects resulting from the project is indicated on Figure 14-1 and summarised in Table 14-1.

14.3.5 Habitat fragmentation

Habitat fragmentation is the process of sub-dividing a continuous habitat into smaller isolated fragments (Andren 1994; Ford et al. 2001). The project would result in the fragmentation of an estimated 24 of the 29 site survey remnants that would be subject to clearing of native vegetation.

Habitats within the study area are already highly fragmented as a result of past land uses and are likely to be fragmented further through future development of lands surrounding the project. The additional fragmentation resulting from the project would be unlikely to have a significant impact on the viability of species that occur within most of the fragments. Floral species in most of the remnants have a high level of resilience to disturbance and would continue to produce viable seed and germinate in the presence of disturbance factors. Fauna in most of the remnants are dominated by generalist species that would tolerate a high level of habitat disturbance.

Species most likely to be adversely affected by fragmentation are those with little mobility, such as the Cumberland Large Land Snail (*Meridolum corneovirens*). As described in Chapter 5, this species has been observed in survey route remnant 13 (within Edmondson Park). Little is known about the movement of this species (NSW National Parks and Wildlife Service 1999); however, it is likely that the project would form a barrier to its movement.

14.3.6 Alteration of natural flow regimes

'Alteration of the natural flow regimes of rivers, streams, floodplains and wetlands' is listed as a key threatening process under the *Threatened Species Conservation Act 1995*.

Fourteen watercourse and stormwater crossings are proposed along the SWRL corridor (see Chapter 13). As a minimum, culverts would be constructed at these crossings; although bridges may be considered during future design work. Culverts would be unlikely to result in additional hindrance of fish passage in the study area. Crossings 2 and 5 also involve the diversion of upstream flows; this would result in no flow to areas downstream of the SWRL alignment in these locations.

Aquatic habitats at the site and in the study area are highly degraded and in poor condition, with numerous barriers to fish migration, modification of riparian vegetation and habitats, and a general lack of in-stream habitat diversity like large woody debris. No threatened species of animal was identified that is likely to be dependent on the aquatic habitats within the study area.

14.4 Operational impacts

14.4.1 Noise

A potential operational impact of the SWRL on biodiversity would be noise from the train operations. However, as with construction noise, the majority of animal species likely to occur within the study area are accustomed to residential and industrial noise. No threatened animal species known to exist in the study area is likely to be significantly affected by operational noise.

14.4.2 Collision

It is considered unlikely that collision of native fauna (including the Cumberland Plain Large Land Snail) with trains on the proposed SWRL would result in a significant potential impact on local populations of threatened species in the study area.

The project would result in frequent train movements and, consequently, could result in collision between trains and native fauna along the length of the SWRL. Areas where there is a higher potential for collision include where the route traverses remnant woodland patches and the riparian habitats of creek systems. However, rail corridors in the metropolitan area are fenced. This would present a partial barrier to animals entering the rail corridor and as such, would limit opportunities for collision between fauna and trains.

14.4.3 Barrier effects

The creation and continued effects of physical and biological barriers associated with the proposed SWRL corridor would persist throughout the operational phase, albeit that the surrounding areas are planned to undergo redevelopment and would be largely cleared. Barrier effects are likely to be the most significant in areas near survey route remnant 13, where the SWRL would cross through remnant bushland. These barrier effects would be felt predominantly by ground-dwelling species including reptiles, amphibians and the threatened Cumberland Plain Large Land Snail. Local populations of mobile fauna, including birds and bats, are considered unlikely to be significantly disrupted by barrier effects arising from the project.

A regional habitat corridor is present between Camden Valley Way (Cabramatta Creek) and Campbelltown Road (Eco Logical Australia Pty Ltd 2003a). This corridor mainly comprises patches of remnant vegetation amongst cleared rural and urban development. It is,

therefore, unlikely that the proposed SWRL would significantly increase barrier effects along identified habitat corridors.

14.4.4 Changed hydrology/surface run-off

Alterations to hydrological regimes would primarily be associated with the construction phase; although the long-term concentration of flows resulting from the SWRL embankments and funnelling of water through structures, such as culverts, would have more permanent effects on surface flows. Changed hydrology can alter ecosystems, including vegetation communities and fauna habitats.

Adoption of recommended mitigation measures (see Section 14.6) would minimise the potential impacts of changed hydrology and surface run-off to the majority of sensitive habitats. As such, it is unlikely that changes to hydrology would impact negatively on local populations of flora and fauna during operation.

14.5 Impacts on threatened species and ecological communities

As noted in Technical Paper 3, impact assessments would need to be completed based on the final design (including mitigation measures) for biodiversity listed under the *Threatened Species Conservation Act 1995* and in accordance with *The Department of Environment and Conservation/Department of Primary Industries - Draft Guidelines for Threatened Species Assessment (2005a)*. Details of the assessment procedure are provided in Appendix G of Technical Paper 3.

Impact assessments would also need to be completed for biodiversity listed under the *Environment Protection and Biodiversity Conservation Act 1999* in accordance with the *Environment Protection and Biodiversity Conservation Act Policy Statement 1.1 Significant Impact Guidelines* (Department of Environment and Heritage, 2006a).

These assessments would be completed following detailed survey of the study area as discussed in Section 14.6.

14.5.1 Threatened species

No threatened species of plant was recorded during the site inspections for this study; although survey was not carried out at the optimal time to detect some of these species, including *Pimelea spicata*.

As discussed in Section 5.2.1, no *Pimelea spicata* was observed in the study area during the field surveys for this assessment. However, suitable habitat for the species, in medium to good condition, was identified within the study area within route survey remnants 7, 8, 10-13 and 34.

If *Pimelea spicata* does occur along the proposed SWRL corridor alignment, the project has the potential to adversely affect the species through loss of individuals (clearing), reduction of available habitat for new recruitment and displacement of the species seeds stored in the soil (the seedbank). Survey of the study area during the flowering period for this species would be necessary to determine if the species is present and hence if the project could have a significant impact on this species.

14.5.2 Threatened fauna

As detailed in Section 5.2.1, a population of Cumberland Plain Large Land Snail (*Meridolum corneovirens*), which is listed as vulnerable under the *Threatened Species Conservation Act 1995*, was recorded during field surveys in 2006 in woodland at Edmondson Park (survey reference remnants 11-14). Section 5.2.1 lists a further five threatened animal species that have been recorded previously near the site. Other threatened or migratory species are also likely to use the habitats in the study area for marginal foraging (including parrots, honey-eaters, ground-dwelling insectivorous and granivorous birds). The project could temporarily affect the roosting and foraging behaviour of these animals.

As the project stands, it may have a significant impact on the Cumberland Plain Large Land Snail, as this species is restricted to remnant woodland areas, and, therefore, would be reliant on that habitat to sustain its local population. Furthermore, little is known about the distances that this species can move (NSW National Parks and Wildlife Service 1999) and soil compaction can lead to modification of soil biota, therefore affecting the food resources of this species.

The project is unlikely to have a significant impact on other threatened species of animal as:

- No significant breeding habitats or known significant roosting sites were found to occur within the study area.
- The habitat within the construction footprint is disturbed and generally provides only marginal foraging habitat.
- The operation of the project would not affect these species due to their high mobility and large foraging ranges.
- The project would not affect their migration or dispersal ability, nor would it create a significant barrier to fauna movement.

14.5.3 Threatened ecological communities

As discussed in Section 5.2, two endangered ecological communities occur within the study area. Cumberland Plain Woodland is a threatened ecological community listed pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* and the *Threatened Species Conservation Act 1995*. Cumberland Plain Woodland (the Shale Hills Woodland and Shale Plain Woodland forms collectively) was the most abundant remnant ecological community within the study area.

Sydney Coastal River Flat Forest (Alluvial Woodland) is consistent with River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, which is listed as 'endangered' under the *Threatened Species Conservation Act 1995*. Sydney Coastal River Flat Forest was observed to occur exclusively in association with drainage lines within the study area.

The condition of these communities within the study area is detailed in Section 5.2, and is a reflection of past land use disturbance (including grazing and other agricultural practices).

The proposed SWRL could have an adverse effect on, and introduce a new disturbance regime to, these communities within the study area. This would relate primarily to the clearing of approximately 20 hectares of Cumberland Plain Woodland and Alluvial Woodland

along the proposed SWRL alignment, across 29 site survey remnants, of which, 3.7 hectares is mapped as ‘core’ habitat. The clearing and disturbance of this vegetation may affect the ecological communities in numerous ways, including:

- loss of plants and immobile animals, thereby reducing the genetic diversity of these species within the community
- loss of native seedbank (Many species may only be present in the form of seeds awaiting suitable environmental conditions to germinate.)
- loss of faunal habitat diversity, including elements that take a long time to form (such as hollow bearing trees)
- introduction of new edge effects (approximately 12.5 hectares of the remaining Cumberland Plain Woodland would be introduced to new edge effects)
- decreased connectivity within the ecological community (an estimated 27 of the site survey remnants containing endangered ecological communities would be fragmented as a result of vegetation clearing.

While the proposed SWRL would be unlikely to result in the extinction of the local extent of the ecological communities, impacts may be significant in terms of the draft criteria identified for Part 3A assessments in the *Department of Environment and Conservation/Department of Primary Industries - Draft Guidelines for Threatened Species Assessment (2005a)*, since:

- areas of high conservation value would be affected, including those mapped as core habitat for Cumberland Plain Woodland
- the duration of impacts would be permanent and irreversible
- the impacts would be permanent and irreversible.

Further mitigation measures and offsets should be determined following completion of detailed survey of the route and its biodiversity, confirmation of construction site footprints and the detailed assessment of significance following completion of the final design.

14.6 Recommendations for further assessment and mitigation

14.6.1 Further assessment

The current surveys were carried out at a time of year when some fauna are inactive (e.g. bats) and when many inconspicuous or seasonal species of plant are difficult to detect. As part of the next stage of the approvals process, targeted biodiversity assessments are proposed to be completed during suitable survey seasons in order to confirm the findings of this habitat-based assessment. This would involve specifically targeted surveys for *Pimelea spicata* (during the peak flowering season, or when other populations in western Sydney are known to be in flower) and the Cumberland Large Land Snail following suitable rain. Surveys to determine the extent and condition of derived grassland along the proposed SWRL corridor alignment would also be required.

Following completion of these further surveys and the finalisation of the design for the project, it is recommended that detailed assessment of significance is completed following the *Draft Guidelines for Threatened Species Assessment under Part 3A of the Environment Planning and Assessment Act 1979* as well as assessment under the *Environment*

Protection and Biodiversity Conservation Act 1999. Mitigation measures and offsets should also be developed based on the nature of the potential impacts.

Further assessment of the construction footprint on the various construction works sites is required to determine the extent of the impact on biodiversity and how it can be minimised.

14.6.2 Avoiding, minimising and mitigating impacts

Avoiding potential impacts to biodiversity is the preferred management strategy where possible. As discussed in Chapter 6 of this report and Section 5.2 of Technical Paper 3, the route options selection process included preliminary assessment of biodiversity (and other) potential impacts, such that the current preferred corridor alignment avoids potential impacts to remnant vegetation, particularly the ‘core’ and ‘support for core’ conservation significance classes, as far as practicable.

The proposed corridor alignment also avoids potential biodiversity impacts by avoiding key conservation areas identified in the Growth Centre, ensuring that the ‘Environment Conservation and Recreation Zones’ identified in the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 would not be directly affected. ‘Flood prone and major creeks land’ identified in this Policy is also intended to serve a conservation purpose in the locality. Although some of this area would be traversed by the proposed SWRL corridor alignment, the use of box culverts and possibly bridges would assist in maintaining the linkage along these corridors.

Where potential impacts on biodiversity cannot be avoided, they would be minimised during the construction and operation of the project where possible. A detailed Flora and Fauna Management Plan would be prepared for the construction phase of the project. It is recommended that this includes measures to address the following:

- revegetation and management of noxious weeds
- delineation of works zones
- vegetation clearing protocols, including salvage of suitable tree hollows
- consideration of translocation of any threatened species found to be present on site
- protection of waterways.

Other than the Stage A early works at Glenfield, the SWRL project is currently at concept level only and is subject to further design development, particularly in the vicinity of the proposed stations and the location of construction sites. The identified likely construction work sites also have the potential to change as construction methods are refined. If the construction footprint of the project (including the location and extent of construction work sites) changes, further biodiversity assessment would be required and the management measures refined as appropriate.

Biodiversity offsets

The need for biodiversity off-sets to compensate for the potential residual impacts of the project on biodiversity (and to maintain or improve biodiversity values where clearing of native vegetation and habitats are unavoidable), should be considered to ensure a net environmental improvement. According to the Department of Environment and Conservation (2006b), off-sets are used only to address residual environmental impacts. Thus, clearing of the construction site should be minimised as much as possible.

Biodiversity offsets are likely to be required for areas outside the Growth Centre (i.e. Liverpool, Campbelltown Council Area).

The Edmondson Park Local Environment Plans (the Campbelltown (Urban Area) Local Environmental Plan and the Liverpool Local Environmental Plan 1997) provide a planning framework for the entire Edmondson Park release area. This framework identified conservation areas within the release area, including:

- Proposed and existing National Parks and Nature Reserves - Zone 8(b)
- Environment Protection - Zone 7 (d5) (Campbelltown (Urban Area) Local Environmental Plan 2002 only).

The SWRL was incorporated within planning for the establishment of these conservation areas was also based on planning that accounted for the proposed SWRL corridor. However, part of the release area through which the SWRL corridor alignment would pass is identified in the zoning as a 'deferred matter'. Therefore, further off-sets could be required for the section of the SWRL through the Edmondson Park release area, which would be linked to a land use zoning decision regarding the deferred matter.

The remainder of the project (i.e. that within the Growth Centre) is proposed to be addressed through the biodiversity certification process for the Growth Centre, as proposed by the Growth Centres Commission (see Section 14.2). The only exception to this could be the areas of impact on the 'Floodprone and Major Creeks Land' identified in the policy maps for the State Environmental Planning Policy (Sydney Region Growth Centres) 2006. The area of this flood-prone land affected may inform, in part, the requirement for biodiversity off-sets required for the SWRL.

Within the Liverpool LGA, off-sets should be determined in accordance with Liverpool Council's Biodiversity Strategy (Eco Logical Australia Pty Ltd 2003a).

TIDC would liaise with the DEC, the Growth Centres Commission, Councils, RailCorp and the Commonwealth Department of Environment and Heritage (for Commonwealth listed species listed and endangered ecological communities) to resolve mitigation measures for residual biodiversity impacts of the project, including the need for off-sets, biobanking and other appropriate measures.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 referral

Following further detailed survey of biodiversity and the preparation of final designs for Stage B of the project, impact assessments would be completed for threatened biodiversity listed pursuant to the *Environment Protection and Biodiversity Conservation Act 1999*. If, based on these assessments, a significant impact is considered likely, then the SWRL project would be referred to the Commonwealth Department of Environment and Heritage. The referral would include discussion of the proposed mitigation measures as well as the need for biodiversity off-sets.

