

- Modification of natural river flows and temperatures as a result of river regulation (construction of dams and weirs), leading to reduced opportunities for dispersal and reduced habitat quality.
- Spawning failures resulting from cold water releases from dams.
- Competition from introduced fish species such as trout and redfin perch.
- Diseases such as EHN (epizootic haematopoietic necrosis), which is carried by redfin perch.
- Over-fishing has probably contributed to past declines. Macquarie perch are now totally protected in NSW, but illegal fishing (and possibly hooking injuries in accidentally caught fish) still poses a threat.
- **details of surveys for these species and communities and their habitat in the proposed action area or surrounding areas. This should include details of survey effort, timing, location and methodologies for studies and surveys undertaken and the regional status, population size and distribution within the area surrounding the proposed action identified for these species and communities. Survey methodology must have regard to any relevant publicly available guidance issued by the department;**

Macquarie Perch are difficult to survey since they are an evasive, nocturnal species (DSEWPC 2012c). Both the Georges River and Anzac Creek presented logistical difficulties that prevented the use of the electrofisher and the seine net. Georges River was too deep for effective electrofishing, and contained too many submerged logs for effective seine netting. To compensate for this, additional bait traps were deployed at each site (ALS 2011).

- **an assessment of the quality and importance or potential habitat for these species and communities in the proposed action area and surrounding areas;**

The Macquarie Perch was not identified from Anzac Creek or the Georges River within the study area. Anzac Creek does not support preferred habitat for the species, while the Georges River supports potential foraging and refuge habitat for the species. Large woody debris, overhanging vegetation, fallen logs, mats of sticks, submerged (*Elodea canadensis*) and floating aquatic plants (*Azola sp.*, *Salvinia molesta*) were present in the littoral and edge habitats throughout Georges River within the study area (ALS 2011).

The Georges River does not support preferred breeding habitat for the species, as there is an absence of required riffle habitat and water quality is variable. The autumn 2011 sampling effort for the Community River Health Monitoring Program included sampling of the Georges River at Cambridge Avenue, approximately 550 metres upstream of the study area. At this location, the overall grade of river health at this location was assessed as Fair. The measure of freshwater macroinvertebrates was Good, water quality was Good, and riparian and estuarine vegetation was Fair. Poor water quality and low aquatic biodiversity in the Georges River in the wider locality can be attributed to industrial discharge and urban run-off entering the river system in the upper catchment (GRCCC 2011).

Movement of the species into the study area is limited to migration from upstream reaches of the Georges River, due to the presence of the Liverpool weir, located approximately 3.5 kilometres downstream of the study area. The weir is located approximately 40 kilometres upstream from the mouth of the Georges River and forms its tidal limit. A vertical slot fishway has attempted to restore fish passage and re-establish native fish in the Georges River (NFA 2012); however, as the Macquarie Perch does not inhabit estuarine waters it should not usually be found downstream of the weir.

- **the presence of formal or informal conservation reserves for these species or communities within the proposed action area or surrounding areas;**
-

There are no formal or informal conservation reserves for the Macquarie perch in the proposed action area or surrounding areas.

- **for all species and communities that are considered unlikely to be impacted by the proposed action, but for which apparently suitable habitat is present and could be impacted by the proposed action, detailed information to demonstrate impacts of the species are unlikely to occur;**

The likelihood of occurrence of the Macquarie Perch in the study area was assessed as Possible. Due to the presence of potential foraging and refuge habitat, an Assessment of Significance has been undertaken for the species (Appendix 6).

Although the Georges River water quality is variable, the study area supports potential refuge and foraging habitat for the Macquarie Perch with a variety of habitat features present. The Georges River does not support preferred breeding habitat for the species, as there is an absence of required riffle habitat and water quality is variable. The recent (2010) remediation of the Ingleburn Weir system upstream of the study area has also removed a significant physical barrier which may have historically restricted the movement of Macquarie Perch to the study area.

The SIMTA proposal involves the construction of a rail bridge across the Georges River. Piers are expected to be located at both banks of the river as well as several piers within the river. The impacts of locating piers within the river channel present will have temporary impacts through increased sedimentation during construction and permanent localised impacts through changes to turbulence around instream pier structures and pollution to the river if any fill used for pier stabilisation. This may temporarily reduce the quality of habitat.

Installation of appropriate drainage and sediment control infrastructure (e.g. sediment basins), sediment and erosion controls will minimise this potential impacts and any long-term impacts on drainage patterns or water quality are unlikely.

The SIMTA proposal will not impose any restrictions to fish movement through the Georges River during or post construction. Given the high mobility of the Macquarie Perch (recorded to travel distances of up to 50 km), the proposal will not fragment or isolate areas of habitat for this species.

Despite these potential impacts, given that no breeding habitat occurs within the study area the SIMTA proposal is unlikely to have an adverse effect on the life cycle of the Macquarie Perch, such that a viable local population of the species is likely to be placed at risk of extinction.

Spot-tailed Quoll (*Dasyurus maculatus*)

The Spotted-tail Quoll (*Dasyurus maculatus*) is the largest carnivorous marsupial to occur on the Australian mainland (Kerr 1995). It is listed as a Vulnerable species under the TSC Act, and an Endangered species under the EPBC Act.

- **information on the abundance, distribution, ecology and habitat preferences of the species or communities**

The Spotted-tail Quoll occurs along the east coast of Australia from south-east Queensland to Tasmania and has been found on both sides of the Great Dividing Range. The Spotted-tail Quoll is partly arboreal, and is known from a variety of habitats including rainforest, open forest, woodland, coastal heathland and inland riparian forest. Preferred habitat generally comprises mature wet forest habitat, which supports a range of den sites such as trees with hollows, hollow logs on the ground, rocky outcrops, caves, rock crevices or underground borrows and an abundance of prey. The species may utilise up to 20 different den sites within their home range (Kerr 1995, NPWS 1999a, DEC 2005d, DECC 2007b).

The species requires large tracts of continuous vegetation; females establish home ranges of up to 750 hectares and males up to 3500 hectares. A study of Spotted-tail quolls at Limeburners Creek Nature Reserve (Andrew 2005) found that individuals moved widely on a daily and weekly basis. Females were recorded making daily journeys of 5 kilometres, while males were recorded travelling 8.5 kilometres. Over longer periods, males were recorded travelling over 20 kilometres in nine days.

The Spotted-tail Quoll predates upon small mammals (such as gliders, possums, small wallabies, rats and bandicoots), birds, reptile, insects and carrion from dingo and wild dog kills. The Spotted-tail Quoll is highly mobile and may forage over several kilometres in one night. The species is usually nocturnal, although it may bask in the sun during the day.

Within its home range, an individual establishes latrine sites that are often visited several times during nightly foraging activities. Latrines, that may define territories or reproductive status, may be found on exposed rocks, flat boulders, on exposed ground at the base of a cliff or adjacent to tracks. The Spotted-tail Quoll mates during late autumn to winter and the gestation period is 21 days. The young are fully independent at 18 weeks of age. Males rarely assist in the rearing of young. The species is mature at one year of age and generally lives between three and four years (in captivity) (DSEWPC 2012d).

- **discussion of the known threats to the species or communities with reference to threats posed by the proposed action**

Known threats to the Spotted-tail Quoll (DSEWPC 2012d) include:

- Loss, fragmentation, disturbance and degradation of habitat through clearing of native vegetation, timber harvesting and other forest management practices
 - Predation from Red Foxes, Dingos (*Canis lupus dingo*) and Domestic Dogs (*Canis lupus familiaris*),
 - Road mortality in forested areas fragmented by roads, and a tendency to scavenge road-killed carcasses may increase this threat
 - **details of surveys for these species and communities and their habitat in the proposed action area or surrounding areas. This should include details of survey effort, timing, location and methodologies for studies and surveys undertaken and the regional status, population size and distribution within the area surrounding the proposed action identified for these species and communities. Survey methodology must have regard to any relevant publicly available guidance issued by the department;**
-

The species was not identified in the study area during fauna surveys. There are 130 records of the Spotted-tail Quoll within 50 kilometres of the study area (OEH 2012a). The closest records (within 20 kilometres) of the species are listed in Table 44.

Table 44: Records of Spotted-tail Quoll within 20km of study area

Date recorded	Observation Type	Distance from study area	Location
2007	Seen	16 kilometres to the south-east	Royal National Park
2004	Seen	6 kilometres to the south-east	Holsworthy Military Area
2002	Trapped	9 kilometres to the north-east	Fairfield East, Fairfield LGA
1996	Seen	12 kilometres to the south	Holsworthy Military Area
1993	Dead	7 kilometres to the south-east	Holsworthy Military Area
1993	Trapped	14 kilometres to the north-east	Granville, Parramatta LGA
1990	Seen	7 kilometres to the north-west	Green Valley, Liverpool LGA

Given that the species lives for between three to four years, it is unlikely that the individuals listed most recently (Table 44) persist in the locality.

- **an assessment of the quality and importance or potential habitat for these species and communities in the proposed action area and surrounding areas;**

Habitat assessments concluded that the study area does not support required habitat features for the species. The marginal habitat of the study area is unlikely to be utilised as part of the home range of a quoll occurring in the locality as the study area contains and is bound by significant barriers to fauna movement. These barriers include Moorebank Ave, the East Hills Railway Line and chain-mesh fencing surrounding the SIMTA site, rail corridor and Royal Engineers Golf Course. These physical barriers restrict access of Spotted-tail quolls to habitat within the study area

The Spotted-tail quoll could travel through the Georges River riparian vegetation within the study area that is linked to the expanse of native vegetation contained within the Holsworthy Military Area. Holsworthy Military Area comprises approximately 18,000 hectares of forests, woodland and heath communities and may contain preferred habitat for the species. However, large areas of residential and industrial development reduce potential dispersal of this species throughout the locality.

- **the presence of formal or informal conservation reserves for these species or communities within the proposed action area or surrounding areas;**

There are no formal conservation reserves within the proposed action area or surrounding areas. Holsworthy Military Area, located to the south of the study area, contains approximately 18,000 hectares of forests, woodland and heath communities and may contain preferred habitat for the species.

- **for all species and communities that are considered unlikely to be impacted by the proposed action, but for which apparently suitable habitat is present and could be**

impacted by the proposed action, detailed information to demonstrate impacts of the species are unlikely to occur;

Due to the absence of recent records of the species in the locality, and as the study area does not support preferred foraging, breeding or den habitat for the Spotted-tail Quoll, further consideration of this species is not required.



APPENDIX 6

ASSESSMENTS OF SIGNIFICANCE

Threatened Ecological Communities (TSC Act)

Castlereagh Swamp Woodland

Castlereagh Swamp Woodland is listed as Endangered under the TSC Act.

Castlereagh Swamp Woodland (CSW) is a low woodland occurring in poorly drained depressions along intermittent watercourses; the community is restricted to alluvial deposits in the Castlereagh and Holsworthy areas (NPWS 2004).

In the rail corridor, this community occurred as narrow bands adjoining the north and south of Anzac Creek in the rail corridor lands to the south of the SIMTA site. The CSW intergrades with Castlereagh Scribbly Gum Woodland to the south and there is no clear boundary between the communities. The CSW was in variable condition, with generally high native species diversity and localised occurrence of exotic weed species. The CSW on the southern side of Anzac Creek has historically been disturbed by dumping of construction waste including large concrete blocks, bricks, metal and other rubble. This rubble is now partially buried by sediment and many of the dumpings have been overgrown by native and exotic shrub and ground layer species.

Assessment of the bushland to the east of the rail corridor, east of the existing rail spur, found there were large patches of swamp woodland in the southern sections. The vegetation in this area was observed to form a mosaic of Castlereagh Swamp Forest and Castlereagh Scribbly Gum Woodland.

The SIMTA proposal includes the construction of a 20 metre wide rail link which will result in the removal of approximately 0.05 hectares of CSW. The CSW to be removed is within the rail corridor immediately north and south of Anzac Creek, and most of the area to be removed adjoins the northern edge of Anzac Creek.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. Castlereagh Swamp Woodland is a threatened community.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. Castlereagh Swamp Woodland is a threatened community.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The local occurrence of a community is defined in DECC (2007a, p7) as follows:

...the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

The local occurrence of Castlereagh Swamp Woodland is considered to include the area of the community that occurs in the study area as well as adjacent areas along Anzac Creek to the west and east as mapped by DECCW (2009) (Figure 7). The mapped area of CSW totals 7.41 hectares.

The SIMTA proposal includes the construction of a 20 metre wide rail link which will result in the removal of approximately 0.05 hectares of CSW. The CSW to be removed is within the rail corridor immediately north and south of Anzac Creek, and most of the area to be removed adjoins the northern edge of Anzac Creek.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Construction of the rail link will create an approximately 20 metre wide fenced linear gap in the vegetation community south of the SIMTA site. This is considered unlikely to inhibit genetic exchange for most plant species within the remaining patches, but may result in the isolation of part of the community from ground-dwelling fauna, as the fenced rail line will create a barrier to fauna movement, and this may have impacts on the composition and ecological function of the community.

The rail corridor will create additional edge for the remaining patches of CSW along Anzac Creek, making them more vulnerable to weed incursion and degradation and potentially altering the vegetation structure of the community near the new edge.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and

An area of approximately 0.05 hectares of Castlereagh Swamp Woodland will be removed for the proposed rail link. This represents 0.6% of the local occurrence of the community as mapped by DECCW (2009).

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed rail corridor will result in further fragmentation of the already fragmented CSW in the study area. The area of CSW in the study area is currently fenced along Moorebank Avenue to the west, so there is already a barrier to the small area of CSW to the west of Moorebank Avenue. The existing rail spur in the east of the study area also forms a barrier between CSW in the study area and the larger mapped areas to the east. Construction of the rail line will create an approximately 20 metre wide fenced linear gap in the vegetation community. This will increase the current fragmentation between the CSW in the study area and adjacent areas of this community to the east.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Castlereagh Swamp Woodland was stated to occupy a total area of 616 ha in 204 (NPWS 2004) and most remnants of this community are small and vulnerable to threats. The Castlereagh Swamp Woodland in the study area occupies the western extent of a larger area of this community that extends east and north-east along Anzac Creek and is effectively, although not formally, conserved in the Holsworthy Military Area. The areas of this community to the east of the study area are larger and likely to be less disturbed than the vegetation in the study area. Given the large area of remnant CSW to the east and the degradation of CSW in the study area, it is not considered likely that the CSW to be removed is of high importance to the long-term survival of the ecological community in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for Castlereagh Swamp Woodland.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared specifically for Castlereagh Swamp Woodland. DECCW (2011) prepared the Cumberland Plain Recovery Plan, focusing on the threatened species, populations and ecological communities that are endemic to or primarily distributed on the Cumberland Plain. Castlereagh Swamp Woodland is one of the threatened ecological communities addressed in the recovery plan.

DECCW (2011) has identified approximately 25,566 hectares of Priority Conservation Lands (PCLs), representing the best opportunities in the region to secure long-term viable conservation outcomes. The recovery plan identifies the current extent of CSW on the Cumberland Plain as approximately 609 hectares, of which 557 hectares is located within the Priority Conservation Lands.

The native vegetation within the rail corridor lands to the south of the study area, an area of approximately nine hectares, has been mapped as part of the Priority Conservation Lands, as the north-western extent of a 2,314 hectare area extending across the Holsworthy Military Area.

There are no objectives or actions in the recovery plan that specifically target Castlereagh Swamp Woodland. The objectives of the Cumberland Plain Recovery Plan are as follows:

1. To build a protected area network, comprising public and private lands, focused on the priority conservation lands.
2. To deliver best practice management for threatened biodiversity across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation.
3. To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program.
4. To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner.

The SIMTA proposal is consistent with the objectives of the Cumberland Plain Recovery Plan. While the SIMTA proposal will include removal of a small area of threatened ecological communities, the majority of the portion of the study area within the priority conservation lands will be retained and conserved.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Final Determination for Castlereagh Swamp Woodland does not refer to any key threatening processes (KTPs) as threats to this community. However there are four that are relevant to the current assessment:

- *Clearing of native vegetation*

The proposed action will include clearing of native vegetation including Castlereagh Swamp Woodland.

- *High frequency fire resulting in the disruption of life cycle process in plants and animals and loss of vegetation structure and composition*

The proposed action is unlikely to result in the operation of, or increase the impact of high frequency fire. Fire prevention and control measures undertaken as part of the operation of the intermodal terminal should decrease the frequency of fires.

- *Invasion of native plant communities by exotic perennial grasses*

Exotic perennial grasses including *Eragrostis curvula* (African Lovegrass), *Andropogon virginicus* (Whisky Grass), *Chloris gayana* (Rhodes Grass), *Cortaderia selloana* (Pampas Grass), *Ehrharta erecta* (Panic Veldgrass), *Paspalum urvillei* (Vasey Grass) and *Pennisetum clandestinum* (Kikuyu) were recorded during the current survey. In the vicinity of the Castlereagh Swamp Woodland, exotic grasses were mostly observed at the edges of bushland or in previously disturbed areas. The rail corridor will create additional edge for the remaining patches of CSW, making them more vulnerable to invasion by exotic grasses. A weed control program is recommended as part of the conservation management of the remaining patches of CSW.

- *Infection of native plants by Phytophthora cinnamomi*

Phytophthora cinnamomi is a soil borne pathogen that infects roots and is associated with plant damage and death. *P. cinnamomi* may be dispersed over large distances in flowing water, such as storm runoff, or may be spread within a site via mycelial growth from infected roots to roots of healthy plants. Propagules of *P. cinnamomi* may also be dispersed by vehicles (e.g. cars and earth moving equipment), animals, walkers and movement of soil. There is an increased risk of *P. cinnamomi* dispersal as a result of the proposed action. Precautionary measures are recommended during construction of the rail corridor.

Conclusion

The Castlereagh Swamp Woodland in the study area forms the western extent of a 7.41 hectare area of this community that is effectively, if not formally, conserved in the Holsworthy Military Area. The CSW in the study area will be directly impacted by the SIMTA proposal: about 0.05 hectares of this community will be removed for construction of the rail corridor and the remaining patches will be fragmented and have an increase in edge length, making them more vulnerable to weed invasion and changes in vegetation structure. However, given the current fragmentation and degradation of the CSW in the study area and the large area of remnant CSW to the east, it is considered unlikely that the SIMTA proposal represents a significant impact to the community, particularly if mitigation measures are implemented.

River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions

River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is listed as Endangered under the TSC Act.

River-flat Eucalypt Forest on Coastal Floodplains (RFEF) occurs on silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. The ecological community occurs on floodplains throughout the coastal areas of NSW.

The degraded riparian vegetation adjoining the Georges River loosely meets the criteria for River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. The riparian vegetation in the study area consisted of remnant trees of *Eucalyptus botryoides* x *saligna*, *E. longifolia* and *E. baueriana* and scattered small trees of *Acacia implexa* and *Hakea salicifolia* with an understorey dominated by dense cover of *Ligustrum sinense* and *Cardiospermum grandiflorum*, which was smothering the shrub and ground layer. These weed-infested areas are considered to have little capacity for the regeneration of natural vegetation without significant resources allocated to weed control and revegetation. Further upslope of the eastern bank of the Georges River were areas of riparian forest with higher native diversity and lower exotic cover.

The SIMTA proposal includes the construction of a 20 metre wide rail link which will result in the removal of a maximum of 0.39 hectares of degraded RFEF. The RFEF to be removed is adjacent to the Georges River, north of the existing rail bridge

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. River-flat Eucalypt Forest is a threatened community.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. River-flat Eucalypt Forest is a threatened community.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The local occurrence of a community is defined in DECC (2007a, p7) as follows:

...the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

The local occurrence of River-flat Eucalypt Forest is considered to include the area of the community that occurs in the study area as well as adjacent areas mapped along the Georges

River to the north and south by DECCW (2009) (Figure 7). The mapped area of RFEF totals 49.35 hectares.

The SIMTA proposal includes the construction of a 20 m wide rail corridor which will result the removal of approximately 0.39 ha of degraded RFEF from the eastern and western banks of the Georges River. The degraded RFEF adjoining the Glenfield Waste Disposal Site may also be subject to indirect impacts from the construction of the rail link, as it is immediately downslope of the rail link.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The River-flat Eucalypt Forest in the study area is currently very degraded, with low native species diversity, dominance by weedy exotic shrubs and vines in the understorey and a lack of natural structure. Construction of the rail line will create an approximately 20 metre wide fenced linear gap in the RFEF. This is considered unlikely to modify the current composition of the community. The main impact of the SIMTA proposal on community composition will be the removal of canopy trees of *Eucalyptus botryoides* x *saligna*, *E. baueriana* and *E. longifolia* from the areas of RFEF within the study area and the subsequent alteration of plant community structure in these areas.

The SIMTA proposal may have some positive effects on the RFEF in the study area through mitigation measures to reduce the existing weed infestation.

Given that the RFEF in the study area is currently highly modified by weed invasion, impacts from edge effects are expected to be minimal.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and

The SIMTA proposal includes the construction of a 20 m wide rail corridor which will result in the removal of approximately 0.39 hectares of degraded RFEF.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The RFEF adjoining the Georges River is currently fragmented by the East Hills rail line bridge adjoining the southern boundary of the study area. Construction of the proposed rail line will increase the existing gap by at least another 20 metres. Given the existing weed dominance in the understorey of the RFEF, the proposed upgrade is unlikely to significantly affect the movement of characteristic native plant species through this community. If native groundlayer species do persist in the understorey then dispersal may be facilitated through the areas beneath the existing and proposed bridges.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

As riparian forest adjoining a major river, the RFEF in the study area has important ecological function. However, the community is currently highly modified by weed invasion and not considered to be of particular importance for the conservation of the ecological community. The native tree and shrub layer are significant and removal of these layers should be minimised as far as possible. There was no natural recruitment of eucalypts observed in the RFEF, so the long-term viability of these stands is not certain.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for River-flat Eucalypt Forest.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared specifically for River-flat Eucalypt Forest. DECCW (2011) prepared the Cumberland Plain Recovery Plan, focusing on the threatened species, populations and ecological communities that are endemic to or primarily distributed on the Cumberland Plain. River-flat Eucalypt Forest is one of the threatened ecological communities addressed in the recovery plan.

DECCW (2011) has identified approximately 25,566 hectares of Priority Conservation Lands (PCLs), representing the best opportunities in the region to secure long-term viable conservation outcomes. The recovery plan identifies the current extent of RFEF on the Cumberland Plain as approximately 5,313 hectares, of which 1,339 hectares is located within the Priority Conservation Lands.

The native vegetation within the rail corridor lands to the south of the study area, an area of approximately nine hectares, has been mapped as part of the Priority Conservation Lands, as the north-western extent of a 2,314 hectare area extending across the Holsworthy Military Area.

There are no objectives or actions in the recovery plan that specifically target River-flat Eucalypt Forest. The objectives of the Cumberland Plain Recovery Plan are as follows:

1. To build a protected area network, comprising public and private lands, focused on the priority conservation lands.
2. To deliver best practice management for threatened biodiversity across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation.
3. To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program.
4. To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner.

The SIMTA proposal is not considered to be inconsistent with the objectives of the Cumberland Plain Recovery Plan. While the proposal will include removal of a small area of threatened ecological communities, the majority of the portion of the study area within the priority conservation lands will be retained and conserved.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Seven key threatening processes (KTPs) are listed in the Final Determination for River-flat Eucalypt Forest as threats to this community:

- *Clearing of native vegetation*

The proposed action will include clearing of native vegetation including River-flat Eucalypt Forest.

- *Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands*
-

The Georges River has already been subject to alterations in flow regimes, with a number of weirs, bridges and other structures historically constructed along the river. The bridge design for the proposed rail corridor has not been finalised, but is unlikely to result in any further significant alteration of flow to the Georges River.

- *Invasion of native plant communities by exotic perennial grasses*

Exotic perennial grasses including *Eragrostis curvula* (African Lovegrass), *Ehrharta erecta* (Panic Veldgrass), and *Pennisetum clandestinum* (Kikuyu) were recorded in the RFEF in the study area. Any removal of vegetation, including exotic vines, in the RFEF will create disturbed open ground that is susceptible to invasion by exotic grasses. A weed control program is recommended as part of the conservation management of the retained RFEF.

- *Predation, habitat destruction, competition and disease transmission by feral pigs*

This KTP is not relevant to the SIMTA proposal.

- *Anthropogenic climate change*

This KTP is not directly relevant to the SIMTA proposal.

- *High frequency fire resulting in the disruption of life cycle process in plants and animals and loss of vegetation structure and composition*

The proposed action is unlikely to result in the operation of, or increase the impact of high frequency fire. Fire prevention and control measures undertaken as part of the operation of the intermodal terminal should decrease the frequency of fires.

- *Removal of dead wood and dead trees*

There may be minor removal of dead wood and trees as part of clearing for the rail corridor, but following construction and fencing of the rail corridor it is considered unlikely that any further removal will occur.

In addition to the listed KTPs, another that is currently operating in the RFEF in and adjoining the study area is:

- *Invasion and establishment of exotic vines and scramblers*

There was a large infestation of the exotic creepers *Cardiospermum grandiflorum* (Balloon Vine) and *Delairea odorata* (Cape Ivy) in the RFEF in the study area. This KTP is not considered likely to increase any further as a result of the proposed action, mainly as it is not considered possible for the infestation to get any worse. The preparation and implementation of a weed control program in the retained RFEF is recommended.

Conclusion

The RFEF in the study area will be directly impacted by the SIMTA proposal: approximately 0.39 hectares of this community will be removed from the eastern and western banks of the Georges River, and the existing gap between mapped areas of the community to the north and south will be increased. However, given the poor condition of the RFEF in the study area, it is considered unlikely that the SIMTA proposal represents a significant impact to the community, particularly if removal of the tree and shrub layers can be minimised. A Weed Control and Restoration Program is recommended for the RFEF in the study area.

Freshwater Wetlands on Coastal Floodplains

Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is listed as Endangered under the TSC Act.

Freshwater Wetlands on Coastal Floodplains is typically associated with periodic or semi-permanent inundation by freshwater, or with ephemeral or semi-permanent standing water and is dominated by herbaceous plants with a low abundance of woody species (NSW Scientific Committee 2004).

Anzac Creek supported a wetland dominated by *Typha orientalis* and *Bolboschoenus fluviatilis*. The wetland was in moderate condition with the aquatic weed *Myriophyllum aquaticum* abundant, and localised infestations of the noxious weeds *Alternanthera philoxeroides* in the west of the wetlands and *Salvinia molesta* near the culvert in the east of the study area. This wetland meets the criteria for Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. Vegetation mapping by DECCW (2009) has mapped 0.66 hectares of this community within the study area, verified during flora surveys.

The SIMTA proposal includes the construction of a 20 metre wide rail link which will result in the removal of approximately 0.03 hectares of Freshwater Wetlands on Coastal Floodplains from Anzac Creek.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. Freshwater Wetlands on Coastal Floodplains is a threatened community.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. Freshwater Wetlands on Coastal Floodplains is a threatened community.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The local occurrence of a community is defined in DECC (2007a, p7) as follows:

...the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

The local occurrence of Freshwater Wetlands is considered to include the area of the community that occurs in the study area as mapped by DECCW (2009) (Figure 7). The mapped area of Freshwater Wetlands totals 0.66 hectares.

The SIMTA proposal includes the construction of a 20 metre wide rail link which will result in the removal of approximately 0.03 hectares of Freshwater Wetlands on Coastal Floodplains from Anzac Creek.

The Anzac Creek crossing will consist of a series of box culverts; it is assumed that the culvert configuration will be appropriate for fish crossing in minimal fish habitat (Fairfull and Witheridge 2003), however this is to be confirmed at the detailed design stage.

Species diversity within Freshwater Wetlands of the study area is low and much of the community is degraded by infestations of aquatic weeds such as *Myriophyllum aquaticum* and the noxious weeds *Alternanthera philoxeroides* and *Salvinia molesta*. 14.61 hectares of Freshwater Wetlands has been mapped within five kilometres of the study area. The removal of 0.03 hectares of the 0.66 hectares of this community occurring within the study area is unlikely to have an adverse effect on the extent of Freshwater Wetlands, nor will substantially or adversely modify the composition of the community, such that the local occurrence of the community is likely to be placed at greater risk of extinction.

(d) In relation to a habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

An area of approximately 0.03 hectares of Freshwater Wetlands will be removed for the proposed rail link. This represents 4.5% of the local occurrence of the community as mapped by DECCW (2009).

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed rail corridor will result in fragmentation of Freshwater Wetlands in the study area. The area of Freshwater Wetlands in the study area is currently fenced along Moorebank Avenue to the west, and does not currently occur west of Moorebank Avenue. The existing rail spur in the east of the study area also forms a barrier between Freshwater Wetlands in the study area and areas to the east. Construction of the rail line will create an approximately 20 metre wide fenced linear gap in the vegetation community. This will increase the current fragmentation of Freshwater Wetlands in the study area.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The long-term survival of Freshwater Wetlands occurring in the study area and in the locality unlikely to be impacted by the removal of 0.03 hectares of the 0.66 hectares of this community occurring in the study area. Species diversity within Freshwater Wetlands of the study area is low and much of the community is degraded by infestations of aquatic weeds.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for Freshwater Wetlands on Coastal Floodplains.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared specifically for Freshwater Wetlands on Coastal Floodplains. DECCW (2011) prepared the Cumberland Plain Recovery Plan, focusing on the threatened species, populations and ecological communities that are endemic to or primarily

distributed on the Cumberland Plain. Freshwater Wetlands is not specifically addressed in the recovery plan, as only a small proportion of its distribution occurs in the study area.

There are 17 priority actions specified by OEH to assist the recovery of Freshwater Wetlands on Coastal Floodplains. The proposed action is not inconsistent with the strategies and actions listed in the priority action statement. There are no Threat Abatement Plans currently in operation for any Key Threatening Processes threatening Freshwater Wetlands.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Two key threatening processes (KTPs) are relevant to Freshwater Wetlands of the study area:

- *Clearing of native vegetation*

The proposed action will include clearing of native vegetation including Freshwater Wetlands on Coastal Floodplains

- *Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands.*

Alteration to natural flow regimes can occur through reducing or increasing flows, altering seasonality of flows, changing the frequency, duration, magnitude, timing, predictability and variability of flow events, altering surface and subsurface water levels and changing the rate of rise or fall of water levels (NSW Scientific Committee 2002). However, provided that construction of the Anzac Creek rail crossing incorporates appropriate culvert design that maintains current flows, it is unlikely that this KTP will operate in the study area.

Conclusion

The Freshwater Wetlands on Coastal Floodplains to be removed from in the study area forms part of an approximately 0.66 hectare area of this community. The Freshwater Wetlands in the study area will be directly impacted by the SIMTA proposal: about 0.03 hectares of this community will be removed for construction of the rail link and the remaining patches will be fragmented, making them more vulnerable to weed invasion and changes in vegetation structure. However, given the small size of the area to be impacted and poor condition of Freshwater Wetlands in the study area, it is considered unlikely that the SIMTA proposal represents a significant impact to the community, particularly if mitigation measures are implemented.

Threatened Species

Persoonia nutans (Nodding Geebung)

Persoonia nutans is listed as Endangered under the TSC Act.

Persoonia nutans is listed as Endangered under the EPBC Act and on Schedule 1 of the TSC Act. This species is an erect to spreading shrub 0.5–1.5 m high, with linear leaves and hairy young branches.

Persoonia nutans is endemic to the Cumberland Plain where it is confined to aeolian and alluvial sediments. The species has a disjunct distribution, with the majority of the population occurring in the north of the range around Agnes Banks, Londonderry, Castlereagh and Windsor Downs, and isolated and relatively small populations found at Kemps Creek, Moorebank, Holsworthy and Voyager Point and Villawood (DEC 2006b).

Persoonia nutans was recorded in the Castlereagh Scribbly Gum Woodland north of Anzac Creek, in the rail corridor lands. A targeted search for this species in the study area recorded 126 individual plants, of which 110 occurred within the rail corridor and 16 occurred in adjoining lands to the east. Seventeen of the plants identified within the rail corridor fall within the construction footprint of the rail link. There were two distinct sub-populations in the study area, separated by an approximately 170 metre gap. Plants ranged from 30 cm to about 1.8 m in height, and many individuals were observed to be flowering and/or fruiting.

The SIMTA proposal will have direct impacts on the population of *P. nutans* in the study area. The construction of the rail link will require the removal of 0.09 hectares of occupied habitat supporting 17 individuals of *P. nutans* within the rail link construction footprint. An additional two individuals will be removed from the fragmented patches of Castlereagh Scribbly Gum Woodland immediately south of the SIMTA site. The remaining individuals of *P. nutans* in the rail corridor will be fragmented by a 20 metre wide fenced gap.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The following is known about the lifecycle of *Persoonia nutans*:

- Flowering occurs from November to April, with some flowers as late as July (Robertson *et al.* 1996); a minority of plants recorded in the study area were flowering at the time of survey in May 2011, and very few were observed in flower in May 2012.
- Long-tongue bees in the *Leioproctus* and *Chalicodoma* genera have been observed carrying *P. nutans* pollen (Bernhardt and Weston, 1996) and are likely to be the primary pollinators for this species.
- Seed is likely to be dispersed by large birds such as Currawongs, and mammals such as rats, kangaroos and possums, after consumption of the fruit. Viable seed has been found in wallaby scats (DEC 2006b).
- The species is an obligate seed regenerator; plants are killed by fire and regeneration is dependent upon recruitment from a soil stored seed bank (DEC 2005a).

According to the Environmental Impact Assessment Guidelines for *Persoonia nutans* (DEC 2005a), proposals which are likely to impact on the life cycle of the species such that a local population is put at risk of extinction would include proposals that:

- *result in total destruction of habitat;*
-

Vegetation clearing for the construction of the 20 m wide rail link will result in the destruction of 0.09 hectares of occupied habitat within the *P. nutans* population north of Anzac Creek. 0.7 hectares of occupied habitat will remain in two patches of 0.27 and 0.22 hectares in the rail corridor and another patch of 0.21 hectares to the east of the rail corridor.

- *result in a partial destruction or modification of habitat (including changes to hydrology and nitrification of the soil substrate) which may result in changes to vegetation community structure;*

The proposed rail link will result in partial destruction of occupied habitat and potential habitat for *P. nutans* as well as changes to the vegetation community structure through disturbance and creation of new edges. These changes to the remaining habitat may not be entirely detrimental to this species; most *P. nutans* were found near the disturbed edge of bushland in the study area, and Robertson *et al.* (1996) suggested that the species requires disturbance to persist and is capable of surviving extreme disturbance. Nitrification of the soil substrate may occur adjacent to the construction area depending on the construction materials and methods used; this should be avoided as it would result in increased risk of weed incursions.

- *result in increased fragmentation of *P. nutans* habitat;*

The proposed rail link intersects the population of *P. nutans* to the north of Anzac Creek and will increase the fragmentation of habitat for this species. The remaining 39 plants in the west of the population will be separated from the 51 plants in the east by a fenced gap of 20 metres. While this may not prevent genetic exchange through pollination, the barrier represented by the fenced rail link would prevent dispersal of seed by mammals.

- *result in a requirement for frequent (<10 year) hazard reduction activities (fire or slashing), preventing establishment of a soil stored seed bank;*

It is unlikely that the area of occupied habitat for *P. nutans* will be subject to frequent hazard reduction activities, however this will depend on the requirements for bushfire protection adjacent to the rail link. There may be scope to co-ordinate hazard reduction activities with habitat management for this species.

- *increase vehicular, bike, pedestrian, or other, access to habitat; or*

The proposed rail corridor is unlikely to increase vehicular, bike, pedestrian, or other access to habitat; the rail link will be fenced and access to the adjoining bushland will be restricted.

- *increase rubbish dumping and associated weed invasion or arson (for example, through adjacent residential development).*

The proposed rail link will be fenced and there is no public access to the study area east of Moorebank Avenue, so no increase in rubbish dumping or arson is expected. There may be potential for weed propagules to be spread into the *P. nutans* habitat via trains.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. *Persoonia nutans* is not part of an endangered population.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable. *Personia nutans* is not an endangered ecological community or critically endangered ecological community.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and

There has been some modification of the habitat of *P. nutans* in the study area; the soils appeared to have been historically disturbed, with two parallel earthen bunds running east-west within the area of habitat. At the time of survey these bunds had been mostly overgrown by native shrubs, herbs and grasses, and *P. nutans* was occasionally recorded growing on the bunds.

The core area of occupied habitat (not including the two isolated individuals) for *P. nutans* within the rail corridor is approximately 0.58 hectares. Another 0.21 hectares of occupied habitat occurs in the study area to the east of the rail corridor. Approximately 0.09 hectares of occupied habitat for *P. nutans* will be removed as a result of the proposed rail link, representing a loss of 16% of occupied habitat within the study area.

Intensive targeted searches of the Castlereagh Scribbly Gum Woodland to the south of Anzac Creek found one individual of *P. nutans* in the south-east of this area. This individual will not be impacted by the proposed action. The Castlereagh Scribbly Gum Woodland in the south of the study area constitutes potential habitat for the species. Approximately 0.65 hectares of (non-occupied) potential habitat for *P. nutans* north and south of Anzac Creek will be removed for the proposed rail link.

DEC (2006b) mapped potential habitat for *P. nutans* based on suitable soil type (Agnes Banks or Berkshire Park soil formations) and extant vegetation as identified in NPWS (2002). A total of 370 hectares of potential habitat for *P. nutans* was mapped in the vicinity of the study area, most within the Holsworthy lands to the south and east of the study area. The removal of 0.09 hectares of occupied habitat and 0.65 hectares of potential habitat represents a reduction of 0.2% of potential habitat in the locality. There are no recent records of *P. nutans* in the Holsworthy lands, except for one individual recorded to the south of the study area in 1996 and another record in the east of the Holsworthy lands near Voyager Point from 1998. This lack of records reflects the limited targeted survey for the species in the area and the possibility that the species may not be detected by targeted survey even if present at a site given that it is an obligate seeder and the number of above ground individuals will fluctuate in space and time (DEC 2006b).

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The construction of the rail link will fragment the known area of occupied habitat, with a fenced barrier that will prevent seed dispersal by mammals. The remaining 39 plants in the west of the population will be separated from the 51 plants in the east of the rail corridor by a fenced gap of 20 metres. An additional 17 plants occur east of the existing rail spur, about 170 metres east of the plants in the rail corridor.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

According to the Environmental Impact Assessment Guidelines for *P. nutans* (DEC 2005a), any area of known habitat in the southern part of the species' distribution should be considered a

significant area of habitat. Recorded population sizes vary from only a few individuals to thousands of plants, although the majority of populations support a low number of plants; 64% of populations consist of less than ten mature individuals. Less than 1% of individuals occur within the southern part of the species range. In this context, a population of 126 plants, most of which appear to be mature, is considered to be very important to the long-term survival of the species in the locality.

Examination of the records of this species in the NSW Wildlife Atlas as well as the distribution descriptions in the species recovery plan (DEC 2006b) and the SPRAT profile (DSEWPC 2012e) indicates that the study area is close to the southern recorded limit of *P. nutans*, and that historical records to the south-west of the study area have subsequently been cleared. There are isolated records of the species in the Holsworthy Military Area to the east and south of the study area and it is considered likely that more populations occur here, given the large area of potential habitat for this species in the area.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *Persoonia nutans*.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A recovery plan has been prepared for *Persoonia nutans* (DEC 2006b). The overall objective of the recovery plan is “to ensure the continued and long-term survival of *P. nutans* in the wild by promoting the in situ conservation of the species across its natural range”.

This plan consists of six specific recovery objectives (DEC 2006b p18):

- *minimise the loss and fragmentation of P. nutans habitat using land-use planning mechanisms*

Actions associated with this recovery objective include ensuring that:

- *all relevant Environmental Planning Instruments (prepared under Pt 3 of the EP&A Act) are prepared, or reviewed, with reference to this recovery plan and any future advice from the Department of Environment and Conservation regarding the species.*
- *all relevant consent and determining authorities (under Pt 4 & 5 of the EP&A Act) will assess developments and activities with reference to this recovery plan, environmental impact assessment guidelines... and any future advice from the Department of Environment and Conservation regarding the species.*

The SIMTA proposal is being assessed with reference to the recovery plan, environmental impact assessment guidelines and all publicly available information regarding the species.

- *identify and minimise the operation of threats at sites where P. nutans occurs*

This recovery objective is aimed at minimising threats operating at known *P. nutans* sites (in addition to land clearing), including inappropriate fire regimes (particularly frequent fire), and habitat degradation and rubbish dumping related to unrestricted access.

- *implement a survey and monitoring program that will provide information on the extent and viability of P. nutans*

Not relevant to the current assessment.

- *provide public authorities with information that assists in conserving the species*

Not relevant to the current assessment.

- *raise awareness of the species and involve the community in the recovery program*

Not relevant to the current assessment.

- *promote research questions that will assist future management decisions*

Not relevant to the current assessment.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Five key threatening processes (KTPs) are listed in DEC (2005a) as likely to, or potentially, threaten *P. nutans*:

- *Clearing of native vegetation*

The proposed action will include clearing of native vegetation including occupied and potential habitat for *P. nutans*.

- *High frequency fire resulting in the disruption of life cycle process in plants and animals and loss of vegetation structure and composition*

The proposed action is unlikely to result in the operation of, or increase the impact of high frequency fire. Fire prevention and control measures undertaken as part of the operation of the intermodal terminal should decrease the frequency of fires.

- *Competition from feral honeybees *Apis mellifera**

This KTP is not relevant to the SIMTA proposal.

- *Infection of native plants by *Phytophthora cinnamomi**

Phytophthora cinnamomi is a soil borne pathogen that infects roots and is associated with plant damage and death. *P. cinnamomi* may be dispersed over large distances in flowing water, such as storm runoff, or may be spread within a site via mycelial growth from infected roots to roots of healthy plants. Propagules of *P. cinnamomi* may also be dispersed by vehicles (e.g. cars and earth moving equipment), animals, walkers and movement of soil. There is an increased risk of *P. cinnamomi* dispersal as a result of the proposed action. Precautionary measures are recommended during construction of the rail link.

- *Anthropogenic climate change*

This KTP is not directly relevant to the SIMTA proposal.

In addition to the listed KTPs, *P. nutans* is also threatened by habitat degradation due to disturbance associated with unrestricted access to *P. nutans* habitat. The *P. nutans* habitat in the study area is currently fenced with no public access, and this restricted access will continue during the construction and operation of the SIMTA proposal

Conclusion

The population of *Persoonia nutans* in previously disturbed Castlereagh Scribbly Gum Woodland north of Anzac Creek is considered highly significant. There are few remaining populations of *P. nutans* in the south of the species' distribution and most consist of less than 10 mature individuals. The core population in the study area consists of 124 plants and there are an additional two plants beneath scattered trees immediately to the south of the SIMTA site.

The proposed action will require the clearing of a 20 metre wide corridor through occupied habitat of *Persoonia nutans* for a rail link. This will result in removal of 17 individuals of *P. nutans* and 0.09 hectares of occupied habitat. The remaining plants will be separated by a 20 metre wide fenced gap. An additional 0.65 hectares of potential (non-occupied) habitat for the

species in Castlereagh Scribbly Gum Woodland north and south of Anzac Creek will be removed for the rail link.

Given the significance of the population of *Persoonia nutans* in the study area, it is considered that the removal of 14% of recorded individuals in the population, fragmentation of the remaining plants by a 20 metre wide fenced gap, and associated edge impacts constitutes a significant impact on this endangered species.



Grevillea parviflora subsp. *parviflora* (Small-flowered Grevillea)

Grevillea parviflora subsp. *parviflora* is listed as Vulnerable on Schedule 2 of the TSC Act. *G. parviflora* subsp. *parviflora* is a spindly shrub varying from prostrate to erect, usually 0.3–1 m high but growing up to 1.5 to 2 m. The species suckers readily from rhizomes, although individuals sometimes have single stems (DSEWPC 2012b).

Grevillea parviflora subsp. *parviflora* has a widespread but sporadic distribution, with the main occurrence centred south of Sydney in the Appin-Wedderburn-Picton-Bargo districts, disjunct northern populations at Kurri Kurri and Heddon Greta and on the western shores of Lake Macquarie, and small populations in western Sydney at Kemps Creek and Voyager Point (NPWS 2002). The species occurs on sandy clay loam soils, often with lateritic ironstone gravels, mostly derived from Tertiary sands or alluvium and from the Mittagong Formation (NPWS 2002).

In the study area, *Grevillea parviflora* subsp. *parviflora* was recorded in the centre of the large patch of Castlereagh Scribbly Gum Woodland south of Anzac Creek. A total of 1644 stems of *G. parviflora* subsp. *parviflora* were recorded from 4 m wide transects spaced 10 m apart; as the survey method sampled 40% of the survey area, the population estimate within the study area is approximately 4,110 stems. The number of genetic individuals is likely to be lower than this estimate given the suckering habit of this species and the localised high density of plant stems observed. The species was more widespread within the more open, grassy areas of bushland, with few plants recorded from the western parts of this patch where there was a dense tall shrub layer.

The SIMTA proposal includes construction of a 20 metre wide rail link which will intersect the western part of the core area of occupied habitat for *G. parviflora* subsp. *parviflora*.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The lifecycle of *Grevillea parviflora* subsp. *parviflora* is poorly known, with the following understood:

- The main flowering period occurs between July and December (NPWS 2002c).
- The species is insect pollinated, however the pollinator has not been identified (Benson and McDougall 2000).
- Dispersal is either not well understood, or not explained in the existing literature. Seeds are stated to be gravity dispersed, but it is also suggested that it is likely to have a food-body for ant dispersal (Benson and McDougall 2000). According to NPWS (2002d), there is limited natural seed dispersal (probably <2 m).
- Most populations are likely to be dependent on seedling recruitment for long-term viability (NPWS 2002d).
- The species can regenerate from rhizomes in the soil following fire events and may be long-lived (between 25 and 60 years) (DSEWPC 2012b).

According to the Environmental Impact Assessment Guidelines for *G. parviflora* subsp. *parviflora* (NPWS 2002d), proposals which are likely to impact on the life cycle of the species such that a local population is put at risk of extinction would include:

- Any activity that impacts on the accumulation of seed in the soil seedbank, seed germination or seed growth. Inappropriate fire regimes are most likely to have impacts on these processes; high fire frequency may cause a decline in the soil seedbank and limit seedling recruitment, whereas low fire frequency may result in poor levels of seed germination and dense shrub growth.
-

The proposed action is unlikely increase the frequency of fire. Fire prevention and control measures undertaken as part of the operation of the intermodal terminal are more likely to decrease the frequency of fires, which could have impacts on the *G. parviflora* subsp. *parviflora* population in the study area.

- Those that require regular mowing or slashing of the understorey to maintain visibility or for protection around buildings.

The 20 metre wide rail link alignment includes all areas to be impacted as a result of the construction, operation and maintenance of the rail link. It is likely that the areas between the rail link and the fence (within the 20 metre footprint) will be regularly slashed or mown to ensure continuing access and visibility.

- Urban development generally, including road construction, may result in considerable modification of habitat including overshadowing, altered hydrology, increased soil nutrients and dumping of fill and waste. This could have impacts such as preventing plants from maturing and setting seed, changes in the relative frequency of species, potential increase in weed colonisation and changes in soil conditions.

The proposed rail corridor is unlikely to have any significant overshadowing effect on the *G. parviflora* subsp. *parviflora* habitat; although the rail lines will be raised above the existing ground level they will not be high enough to cast a large shadow. It is expected that soil and water management actions will be implemented during the construction and operation of the rail corridor to prevent changes in hydrology and increases in soil nutrients in adjoining areas. The proposed action will not result in dumping of fill and waste; the population is in an area that has restricted public access and this will be maintained following construction of the project.

- The native shrub *Kunzea ambigua* (Tick Bush) is considered a threat to *G. parviflora* subsp. *parviflora* as it is an aggressive early coloniser of bare sites and has prolific seedling recruitment in disturbed areas.

Kunzea ambigua was recorded in the study area and, although locally abundant in some parts of the Castlereagh Scribbly Gum Woodland, was not dominating the shrub layer in the vicinity of the *G. parviflora* subsp. *parviflora* population. This species could aggressively colonise any areas cleared for construction operations following completion of the project.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. *Grevillea parviflora* subsp. *parviflora* is not part of an endangered population.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable. *Grevillea parviflora* subsp. *parviflora* is not an endangered ecological community or critically endangered ecological community.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and

The core area of occupied habitat (not including isolated individuals in denser bushland to the west) for *G. parviflora* subsp. *parviflora* within the study area occupies an area of approximately 4.58 hectares. The remainder of the approximately 19.93 hectare area of Castlereagh Scribbly Gum Woodland to the south of Anzac Creek, within which this 4.58 hectare core area of occupied habitat occurs, supports scattered individuals and also constitutes occupied habitat for this species, although most plants were recorded in the more open, grassy areas in the east of the bushland. Approximately 0.18 hectares of core occupied habitat for *G. parviflora* subsp. *parviflora*, with a high density of stems, will be removed as a result of the proposed rail link. A total of 464 stems of *G. parviflora* subsp. *parviflora* were counted within the footprint of the 20 metre wide rail link. The area to be removed is in the western part of the core area of occupied habitat.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed rail link will fragment *G. parviflora* subsp. *parviflora* habitat; a fenced gap of 35 metres will intersect areas of occupied and potential habitat to the south of Anzac Creek. Most of the population of *G. parviflora* subsp. *parviflora* recorded in the study area occurs to the east of the proposed rail link; there were only an estimated 100 stems occurring as scattered plants to the west of the rail link, compared with an estimated 2875 stems to the east of the proposed rail link.

G. parviflora subsp. *parviflora* is considered to be gravity dispersed (Benson and McDougall 2000) and have limited natural seed dispersal (probably less than two metres) (NPWS 2002d), so even minimal clearing may act as an effective barrier to gene flow. Given that the existing disused rail line adjoining the eastern edge of the rail corridor is at least five metres in width and raised above the ground level, there is already an existing barrier within the population in the study area.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

According to the Environmental Impact Assessment Guidelines for *G. parviflora* subsp. *parviflora* (NPWS 2002d), all sites are considered important and the habitat considered significant until there is adequate protection of this species. Sites of particular significance include: those with over 50 plants; those with a varied age structure including active recruitment of species; and areas of intact habitat away from high disturbance areas. The population of *G. parviflora* subsp. *parviflora* in the study area is considered to be of particular significance given the large number of stems (although the species is known to sucker from rootstock and the number of stems is considerably higher than the number of individuals, it is nevertheless considered likely that over 50 individuals occur on the site); evidence of a range of age classes, with mature plants and seedlings both observed; and the relatively intact habitat, although the adjoining areas have been disturbed.

This population of *G. parviflora* subsp. *parviflora* is also considered to be significant due to the isolated occurrence of the species in western Sydney. The only other known locations in the locality are at Kemps Creek and Voyager Point (NPWS 2002d).

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *Grevillea parviflora* subsp. *parviflora*

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared for *Grevillea parviflora* subsp. *parviflora*. OEH (2012b) has specified five priority actions to assist the recovery of this species:

- Liaise with land managers to encourage the preparation of site management plans and the implementation of appropriate threat abatement measures, particularly in fire management, bush regeneration, roadside management, weed control and fencing and signage.
- Monitor known populations, so that potential local extinctions are detected before they occur and mechanism can be put in place to reverse trends.
- Investigate seed viability, germination, dormancy and longevity (in natural environment and in storage).
- Investigate genetic variation in collaboration with BGT.
- Identify and survey potential habitat to detect new populations.

The SIMTA proposal is not inconsistent with these priority actions, however, the listed actions are aimed at threatened species management from a conservation agency perspective and are not directly relevant to the planning and design stage of the SIMTA proposal.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Two key threatening processes (KTPs) are identified in NPWS (2002d) as likely to, or potentially, threaten *Grevillea parviflora* subsp. *parviflora*:

- *Clearing of native vegetation*

The proposed action will include clearing of native vegetation, including known and potential habitat for *G. parviflora* subsp. *parviflora*.

- *High frequency fire resulting in the disruption of life cycle process in plants and animals and loss of vegetation structure and composition*

The proposed action is unlikely to result in the operation of, or increase the impact of high frequency fire. Fire prevention and control measures undertaken during the ongoing operation of the intermodal terminal are likely to decrease the frequency of fires.

Conclusion

The population of *G. parviflora* subsp. *parviflora* in Castlereagh Scribbly Gum Woodland to the south of Anzac Creek is considered highly significant as the population size is relatively large and due to the very low occurrence of this species in the western Sydney region.

The proposed rail link will result in the removal of 464 stems from an estimated population of 4110 stems, which represents a loss of 11% of individuals. The area of core occupied habitat to be removed is approximately 0.18 hectares from the 4.68 hectares of core occupied habitat (areas of highest density) recorded in the study area, a loss of 4%. The proposed rail link intersects the western edge of the recorded population and will not fragment a large area of known habitat from other areas of known or potential habitat. As such, it is not considered likely that the SIMTA proposal constitutes a significant impact on the Vulnerable species *Grevillea parviflora* subsp. *parviflora*.

Eastern Bent-Wing Bat (*Miniopterus schreibersii oceanensis*)

The Eastern Bent-Wing Bat (*Miniopterus schreibersii oceanensis*) is listed as Vulnerable under the TSC Act. Ultrasonic calls of the species were recorded at five locations across the SIMTA site and rail corridor.

The Eastern Bent-Wing Bat occurs along the east and north-west coasts of Australia (DEC 2005b) where it is known from a variety of habitat including rainforest, dry and wet sclerophyll forest, open woodland, paperbark forest and open grassland. The species hunts for moths and other flying insects above the canopy or open areas (DEC 2005b). Eastern Bent-wing bats are known to utilise a number of roost sites throughout the year (Churchill 2008).

Caves are the primary roosting habitat for this species; however they also use derelict mines, storm-water tunnels, buildings and other man-made structures (DEC 2005b). Of these, the most important to the species are those used through winter for hibernation and those comprising maternity roosts (DEC 2004b). Female Eastern Bent-Wing Bats congregate in specific caves that provide constant high temperate and humidity to give birth and raise young (Dwyer 1995). Maternity caves are used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within a territorial range of about 300 km from the maternity cave (Churchill 2008). Movement between territories is rare. Breeding or roosting colonies can range from 100 to 150,000 individuals. As such, they are prone to population damage if their roosting site is disturbed or modified.

The Eastern Bent-Wing Bat was recorded in remnant woodland and forest, and cleared and disturbed areas, suggesting that these areas may offer foraging habitat to this species. The species may also forage over the larger, continuous canopy of vegetation occurring in the adjoining Holsworthy Military and on occasion extend its nightly foraging flights into the study area, or simply fly through the study area enroute to foraging habitat. The study area does not support cave systems and as such, no preferred roosting habitat was identified. No roosts were identified from man-made structures although a thorough examination of warehouses and potential roost sites in the SIMTA site was not undertaken.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposed action involves staged removal of all existing vegetation from the SIMTA site, followed by staged modification and construction of buildings and associated services. Vegetation occurring within the construction footprint of the 35m rail link, within the rail corridor, will also be removed. The rail link will transect woodland and forest vegetation, Anzac Creek and Georges River; however, the exact location of the rail link within the corridor is unknown at this time. It is assumed that completion of the rail link will require construction of a crossing across Anzac Creek and a bridge spanning Georges River.

The staged development of the SIMTA site is unlikely to affect the nightly foraging activities or flight paths of the Eastern Bent-wing bat. The species hunts for moths and other flying insects above the canopy or open areas; staged development of the SIMTA site may allow the species to alter their foraging areas of flight paths to other parts of the SIMTA site in order to avoid work areas. As a result proposed actions are unlikely to have an adverse effect on the life cycle of the Eastern Bent-Wing Bat such that a viable local population is likely to be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

The TSC Act defines an 'endangered population' as 'a population specified in Part 2 of Schedule 1' of the Act. The Eastern Bentwing Bat is not an 'endangered population', as defined under the TSC Act.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The TSC Act defines an 'endangered ecological community' as an 'ecological community specified in Part 3 of Schedule 1' of the Act. The Eastern Bent-wing Bat is not an 'endangered ecological community', as defined under the TSC Act.

(d) In relation to a habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The staged development of the SIMTA site may result in the modification of nightly foraging activities or flight paths of the Eastern Bent-wing bat. Where the species may hunt for moths and other flying insects above the canopy of the rail corridor vegetation or in open areas of the SIMTA site, the species may avoid these areas during works. However, staged development of the SIMTA site may allow the species to alter their foraging areas or flight paths to other parts of the SIMTA site in order to avoid these work areas. As a result proposed actions are unlikely to modify and fragment potential foraging habitat or flight paths of the SIMT's site. The long-term survival of the Eastern Bent-wing Bat in the locality is unlikely to be affected by the proposed action.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No area has been designated as 'critical habitat' under Part 3 of the TSC Act 1995 for the Eastern Bentwing Bat.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

There is currently no Recovery Plan or Threat Abatement Plan in place for the Eastern Bentwing Bat.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The TSC Act defines a 'key threatening process' as 'a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities'. Schedule 3 of the TSC Act provides a list of the 'key threatening

processes' (KTP). Of the KTP's listed in Schedule 3 of the TSC Act the following will occur as a result of the proposed action

- *Clearing of native vegetation.*

The destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. This may result in habitat degradation of loss, population fragmentation and habitat disturbance facilitating the establishment of weeds.

Clearing of native vegetation for the proposed action is unlikely to significantly modify potential foraging habitat of flight paths of the species. The proposed action is unlikely to result in population fragmentation or habitat disturbance for the Eastern Bent-wing Bat.

Conclusion

In light of the consideration of the above seven factors (1 -7), the proposed activity is unlikely to have "a significant effect" on the Eastern Bent-wing Bat in the study area or wider locality as a result of the current proposal, as:

- The proposal will not adversely affect the lifecycle of the species;
 - The proposal will not remove, modify or further fragment or isolate a significant area of habitat for the species; and
 - The proposal does not significantly contribute to any key threatening process for the community.
-

Southern Myotis (*Myotis macropus*)

The Southern Myotis (*Myotis macropus*) (previously known as the Fishing Bat) is listed as Vulnerable under the TSC Act. A possible ultrasonic call of the species was recorded at two locations in proximity to Georges River; at the existing railway bridge abutment that adjoins the study area to the south and remnant forest, upslope of Georges River riparian vegetation within the study area.

The Southern Myotis occurs across the northern and eastern coasts of Australia (from the Kimberley to Victoria) and is rarely found more than 100 kilometres inland. Although widespread it is considered to be relatively rare and is only patchily distributed within areas of apparently suitable habitat (Lumsden and Menkhorst 1995).

The species is typically found in association with riparian vegetation, also in mangroves, paperbark swamps, rainforest, wet and dry sclerophyll forest and open woodland. The species forages over water for insects and small fish that they catch by raking their large feet over the water surface. They also forage aerially for moths, beetles, crickets and flies.

The species roosts communally in groups of up to 15 individuals in caves, mine shafts, tree hollows, under bridges and in buildings, stormwater drains and amongst dense vegetation fringing watercourses. Less commonly, the species has been recorded roosting in partly submerged dead trees and within limestone cliffs. Roosts are typically located in proximity to water.

Within the study area the Southern Myotis may forage along the slow-flowing waters of Georges River for fish and invertebrates. Hollow-bearing trees occurring on the western bank of the Georges River in riparian habitats offer potential roosting habitat to the species

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposed action involves staged removal of all existing vegetation from the SIMTA site, followed by staged modification and construction of buildings and associated services. Vegetation occurring within the construction footprint of the 35m rail link, within the rail corridor, will be removed. The rail link will transect woodland and forest vegetation, Anzac Creek and Georges River; however, the exact location of the rail link within the corridor is unknown at this time. It is assumed that completion of the rail link will require construction of a crossing across Anzac Creek and a bridge spanning Georges River.

Hollow-bearing trees occurring on the western bank of the Georges River in riparian habitats offer potential roosting habitat to the species. Approximately seven hollow-bearing trees are located within the proposed rail link will be require removal. This will result in the loss of potential roosting habitat for the Southern Myotis in the study area. This is unlikely to represent a significant area of roosting habitat for the species in the locality. The proposed actions are highly unlikely to have an adverse effect on the life cycle of the Southern Myotis, such that a viable local population is likely to be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

The TSC Act defines an 'endangered population' as 'a population specified in Part 2 of Schedule 1' of the Act. The Southern Myotis is not an 'endangered population', as defined under the TSC Act.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The TSC Act defines an 'endangered ecological community' as an 'ecological community specified in Part 3 of Schedule 1' of the Act. The Southern Myotis is not an 'endangered ecological community', as defined under the TSC Act.

(d) In relation to a habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The SIMTA proposal will not remove or fragment foraging habitat provided by Georges River in the study area. Habitat connectivity of riparian vegetation associated with Georges River is currently fragmented by existing linear infrastructure spanning the river, such as the existing Eastern Hills Railway Bridge. The construction of a similar, adjacent bridge will not further fragment habitat connectivity, and will not obstruct the movement of the Southern Myotis over the river channel itself.

The removal of approximately seven hollow-bearing trees from the proposed rail link will result in the loss of potential roosting habitat for the Southern Myotis in the study area. This is unlikely to represent a significant area of roosting habitat for the species in the locality. The SIMTA proposal is unlikely to have an adverse effect on roosting habitat of the Southern Myotis

The long-term survival of the Southern Myotis in the locality is unlikely to be affected by the construction of the rail link over Georges River.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No area has been designated as 'critical habitat' under Part 3 of the TSC Act 1995 for the Southern Myotis

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

There is currently no Recovery Plan in place for the Southern Myotis. There are no Threat Abatement Plans currently in operation for any Key Threatening Processes threatening the Southern Myotis.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The TSC Act defines a 'key threatening process' as 'a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities'. Schedule 3 of the TSC Act provides a list of the 'key threatening

processes' (KTP). Of the KTP's listed in Schedule 3 of the TSC Act the following will occur as a result of the proposed action

- *Clearing of native vegetation.*

The destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. This may result in habitat degradation of loss, population fragmentation and habitat disturbance facilitating the establishment of weeds.

The removal of approximately seven hollow-bearing trees from the proposed rail link will result in the loss of potential roosting habitat for the Southern Myotis in the study area. This is unlikely to represent a significant area of roosting habitat for the species in the locality and as a result, the proposed actions is highly unlikely to result in population fragmentation or habitat disturbance for the Southern Myotis.

Conclusion

In light of the consideration of the above seven factors (a-g), the proposed activity is unlikely to have "a significant effect" on the Southern Myotis in the study area or wider locality as a result of the current proposal, as:

- The proposal will not adversely affect the lifecycle of the species;
 - The proposal will not remove, modify or further fragment or isolate a significant area of habitat for the species; and
 - The proposal does not significantly contribute to any KTP threatening the community.
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Eastern Free-tail Bat (*Mormopterus norfolkensis*)

The Eastern Freetail-bat is listed as Vulnerable under the TSC Act. A definite ultrasonic call of the species was recorded in the riparian vegetation of the western bank of the Georges River.

The Eastern Freetail-bat is found east of the Great Dividing Range, from Brisbane in south-east Queensland to Picton in NSW. The habitat requirements of the species are poorly known, however, the species has been most commonly recorded in dry eucalypt forest and woodland, and shows a preference for open spaces in woodland or forest. The species has also been recorded in swamp forests and mangrove forests. The Eastern Freetail-bat forages in openings, forest edges and gaps, and over larger waterways (Environment Australia 1999a, Churchill 2008). The diet of this species has not been studied, but is most probably insectivorous (DEC 2005c). The Eastern Freetail-bat roost mainly in tree hollows; usually in hollow spouts of large mature trees, but will also roost under exfoliating bark or in man-made structures and buildings (DEC 2005c, Churchill 2008).

Within the study area the Eastern Free-tail Bat may forage in openings and gaps within remnant woodland, landscaped areas and over the Georges River. The species may roost in tree hollows occurring on the western bank of the Georges River, or under exfoliating bark of rough-barked eucalypts in riparian habitats.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The SIMTA proposal will involve the staged removal of all existing vegetation from the SIMTA site, followed by staged modification and construction of buildings and associated services. Vegetation occurring within the construction footprint of the 35 metre rail link, within the rail corridor, will also be removed. The rail link will transect remnant woodland and forest vegetation, riparian vegetation, Anzac Creek and Georges River. A small box culvert-style railway bridge will be constructed over Anzac Creek, and a single-track railway bridge will be constructed over the Georges River.

Hollow-bearing trees occurring on the western bank of the Georges River and exfoliating bark of rough-barked eucalypts in riparian habitats offer potential roosting habitat to the species. Approximately seven hollow-bearing trees, and any rough-barked eucalypts are located within the proposed rail link will be require removal. This will result in the loss of potential roosting habitat for the Eastern Freetail-bat in the study area. This is unlikely to represent a significant area of roosting habitat for the species in the locality.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

The TSC Act defines an 'endangered population' as 'a population specified in Part 2 of Schedule 1' of the Act. The Eastern Freetail-bat is not an 'endangered population', as defined under the TSC Act.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The TSC Act defines an 'endangered ecological community' as an 'ecological community specified in Part 3 of Schedule 1' of the Act. The Eastern Freetail-bat is not an 'endangered ecological community', as defined under the TSC Act.

(d) In relation to a habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The SIMTA proposal is unlikely to remove or significantly modify, fragment or isolate foraging habitat provided by within remnant woodland, landscaped areas or Georges River in the study area. The rail bridge spanning Georges River will not impede or obstruct foraging activities for the species. The species may continue to forage in openings and gaps within vegetated areas. The SIMTA proposal is unlikely to have an adverse effect on foraging habitat of the Eastern Freetail-bat.

Approximately seven hollow-bearing trees, and any rough-barked eucalypts are located within the proposed rail link will be require removal. This will result in the loss of potential roosting habitat for the species in the study area. This is unlikely to represent a significant area of roosting habitat for the species in the locality action. The long-term survival of the Eastern Freetail-bat in the locality is unlikely to be affected by the construction of the rail link over Georges River.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No area has been designated as 'critical habitat' under Part 3 of the TSC Act 1995 for the Eastern Freetail-bat.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

There is currently no Recovery Plan in place for the Eastern Freetail-bat. There are no Threat Abatement Plans currently in operation for any Key Threatening Processes threatening the Eastern Freetail-bat.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The TSC Act defines a 'key threatening process' as 'a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities'. Schedule 3 of the TSC Act provides a list of the 'key threatening processes' (KTP). Of the KTP's listed in Schedule 3 of the TSC Act the following will occur as a result of the proposed action:

- *Clearing of native vegetation.*

The destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. This may result in habitat degradation or loss, population fragmentation and habitat disturbance facilitating the establishment of weeds.

The Eastern Freetail-bat may continue to forage in openings and gaps within vegetated areas upon completion of the SIMTA proposal and as such, the SIMTA proposal is unlikely to have an adverse effect on foraging habitat of the Eastern Freetail-bat. Approximately seven hollow-bearing trees, and any rough-barked eucalypts are located within the proposed rail link will be require removal. This will result in the loss of potential roosting habitat for the species in the study area. This is unlikely to represent a significant area of roosting habitat for the species in the locality, the proposed actions is highly unlikely to result in population fragmentation or habitat disturbance for the Southern Myotis.

Conclusion

In light of the consideration of the above seven factors (a-g), the proposed activity is unlikely to have “a significant effect” on the Eastern Freetail-bat in the study area or wider locality as a result of the current proposal, as:

- The proposal will not adversely affect the lifecycle of the species;
 - The proposal will not remove, modify or further fragment or isolate a significant area of habitat for the species; and
 - The proposal does not significantly contribute to any KTP threatening the community.
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Grey-Headed Flying-Fox (*Pteropus poliocephalus*)

Grey-Headed Flying-Fox (*Pteropus poliocephalus*) is listed as a Vulnerable species under Part 1 of Schedule 2 of the Threatened Species Conservation Act 1995 (TSC Act). The Grey-Headed Flying fox was observed foraging amongst eucalypts in the SIMTA site and flying over remnant woodland of the proposed rail corridor south of the SIMTA site.

The Grey-headed Flying-fox occurs from Bundaberg in Queensland in the north to Melbourne in Victoria to the south, typically between the coast and the western slopes of the Great Dividing Range. In NSW, it occurs along the east coast, eastern slopes of the Great Dividing Range and the tablelands. The species may be found in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps, while additional foraging is provided by urban gardens and cultivated fruit crops.

The Grey-Headed Flying-Fox is a highly mobile species with a nightly feeding range from a roosting camp of 20 to 50 kilometres. Diet typically comprises a wide variety of flowering and fruiting plants (Tidemann 1995, Churchill 2008); in summer, diet mainly comprises fruits of rainforest trees and vines in addition to the nectar and blossom of Eucalyptus, Melaleuca and Banksia. In winter, diet is dominated by nectar and blossom. Non-indigenous and exotic tree species introduced to the urban landscape provide additional foraging habitat for this species within the locality; where previously existed a period of reduced availability of native food resource during the winter months, non-native species now supply food resources throughout the year (Parry-Jones & Augée 2001, Williams et al 2006).

Grey-headed Flying-foxes roost in large numbers, with up to tens of thousands of flying foxes using individual camps for mating, birth and rearing of young. Camps are typically located in gullies, close to water, in vegetation with a dense canopy, within 20km of a regular food source. Site fidelity to camps is high, with some camps being used for over 100 years (NPWS 2001). The closest known roosting camp to the study area is located at located at Cabramatta Creek, approximately five kilometres to the north of the study area in Jacqui Osmond Reserve adjoining Cabramatta Creek. Other roosting camps are located within the Botanic Gardens at Farm Cove to the east and Gordon to the north-east.

Habitat features of the study area which may support the Grey-Headed Flying-Fox include foraging habitat provided by a number of flowering exotic and native trees, predominantly eucalypts, located within the study area. No survey was undertaken of the study area on the western side of Georges River due to restricted access to this area and as a result, potential habitat resources that may occur in this portion of the study area are unknown. The study area does not contain roosting habitat for this species.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposed action involves staged removal of all existing vegetation from the SIMTA site, followed by staged modification and construction of buildings and associated services. Vegetation occurring within the construction footprint of the 30m rail link, within the rail corridor, will be removed. The rail link will transect woodland and forest vegetation, Anzac Creek and Georges River; however, the exact location of the rail link within the corridor is unknown at this time. It is assumed that completion of the rail link will require construction of a crossing across Anzac Creek and a bridge spanning Georges River.

A variety of known feed trees of the Grey-headed Flying Fox (ABS 2001) occur throughout the SIMTA site and rail corridor, including Spotted Gum (*Corymbia maculata*), Narrow-leaved Ironbark (*Eucalyptus crebra*), Brush Box (*Lophostemon confertus*), Broad-leaved Apple (*Angophora subvelutina*) and Parramatta Gum (*Eucalyptus parramattensis*). The diversity of

tree species across the study area provides a seasonal foraging resource to this species; availability of nectar and blossom would vary with flowering periods of each tree species. The trees proposed to be removed however do not comprise a significant area of foraging habitat within the locality for the Grey-Headed Flying Fox. Holsworthy Military Area together with smaller parks and reserves in the locality contain an abundance and diversity of potential foraging habitat for the Grey-Headed Flying-Fox. Street and garden trees in the locality offer further foraging habitat to the species. As a result, the removal of seasonal foraging habitat as a result proposed actions are highly unlikely to have an adverse effect on the life cycle of the Grey-Headed Flying-Fox such that a viable local population is likely to be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

The TSC Act defines an 'endangered population' as 'a population specified in Part 2 of Schedule 1' of the Act. The Grey-Headed Flying-Fox is not an 'endangered population', as defined under the TSC Act.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The TSC Act defines an 'endangered ecological community' as an 'ecological community specified in Part 3 of Schedule 1' of the Act. The Grey-Headed Flying-Fox is not an 'endangered ecological community', as defined under the TSC Act.

(d) In relation to a habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

A tree survey has been conducted on the SIMTA site and 590 trees occurring on the site were mapped. Of those trees identified to species, at least 147 comprise known feed tree species (ABS 2001) for the Grey-headed Flying Fox are proposed to be removed:

- 28 Spotted Gum (*Corymbia maculata*).
 - 12 Narrow-leaved Ironbark (*Eucalyptus crebra*).
 - 11 Woollybutt (*Eucalyptus longifolia*).
 - 14 Grey Box (*Eucalyptus moluccana*).
 - 23 Sydney Blue Gum (*Eucalyptus saligna*).
 - 31 Forest Red Gum (*Eucalyptus tereticornis*).
-

- 15 Brush Box (*Lophostemon confertus*).
- At least 13 additional trees of various native species.

Canopy trees of the woodland communities that offer foraging habitat that may be cleared for the rail link include Broad-leaved Apple (*Angophora subvelutina*) and Parramatta Gum (*Eucalyptus parramattensis*).

The extent of seasonal foraging habitat that will be removed as a result of the proposal does not comprise a significant area of foraging habitat within the locality for the Grey-Headed Flying Fox, considering that Holsworthy Military Area, parks, reserves and street and garden trees in the locality contain an abundance and diversity of potential foraging habitat for the Grey-Headed Flying-Fox.

Foraging habitat within the study area is currently fragmented from other areas of habitat in the locality by surrounding linear infrastructure such as the East Hills Railway, Moorebank Avenue and access tracks. Removing vegetation, including feed trees, from the study area as a result of the proposed action will not further fragment or isolate foraging habitat from other areas of habitat within the locality.

The long-term survival of the Grey-Headed Flying Fox in the locality is unlikely to be affected by the removal of native trees from the study area that may offer an seasonal foraging resource. The trees proposed to be removed do not comprise a significant area of foraging habitat within the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No area has been designated as 'critical habitat' under Part 3 of the TSC Act 1995 for the Grey-Headed Flying-Fox.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

There is currently no Recovery Plan in place for the Grey-Headed Flying-Fox. There are no Threat Abatement Plans currently in operation for any Key Threatening Processes threatening the Grey-Headed Flying-Fox.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The TSC Act defines a 'key threatening process' as 'a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities'. Schedule 3 of the TSC Act provides a list of the 'key threatening processes' (KTP). Of the KTP's listed in Schedule 3 of the TSC Act the following will occur as a result of the proposed action and may impact the Grey-Headed Flying-Fox:

- *Clearing of native vegetation.*

The destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. This may result in habitat degradation or loss, population fragmentation and habitat disturbance facilitating the establishment of weeds. Clearing of native vegetation has been identified as a threat to the Grey-Headed Flying-Fox.

As mentioned previously, the proposed action includes the removal of known feed trees that offer a seasonal foraging resource to this species, resulting in habitat loss. However, habitat that will be lost from the study area does not comprise a significant area of foraging habitat in the locality. The removal of feed trees from the study area will not result in population fragmentation or habitat disturbance for the Grey-Headed Flying-Fox.

Conclusion

In light of the consideration of the above seven factors (a-g), the proposed activity on the study area is not likely to have “a significant effect” on the Grey-Headed Flying-Fox in the study area or wider locality as a result of the current proposal, as:

- The proposal will not adversely affect the lifecycle of the species;
 - The proposal will not remove, modify or further fragment or isolate a significant area of habitat for the species; and
 - The proposal does not significantly contribute to any KTP threatening the community.
-

Macquarie Perch (*Macquaria australasica*)

Macquarie Perch (*Macquaria australasica*) is listed as Endangered under the EPBC Act and the NSW *Fisheries Management Act 1994* (FM Act).

The distribution of Macquarie Perch is restricted to the headwaters of the Lachlan, Murrumbidgee, Murray, Kiewa, Ovens, Goulburn-Broken and Campaspe Rivers in the Murray-Darling Basin to the west of the Great Dividing Range, and the Hawkesbury-Nepean, Georges River and Shoalhaven basins on the east. The species was recorded in 2008 in the Georges River near Campbelltown, approximately 15 kilometres upstream of the study area, the first record from the river since 1894. The species persists in the Burrinjuck, Cotter (Murrumbidgee) and Wyangala impoundments (ALS 2011, Faulks *et al.* 2011, DSEWPC 2012c).

The Macquarie Perch is a riverine, schooling species. It prefers clear water of upper reaches of river catchments where siltation loads are reduced and undisturbed. Habitat requirements are deep, rocky holes interspersed with shallow riffles with lots of cover, such as aquatic vegetation, large boulders, debris and overhanging banks. The area of riffles within a reach was found to be one of the best predictors of the species presence; species-habitat association modelling indicates that at least one hectare and an optimum of three hectares of riffle habitat per kilometre of stream are required for Macquarie Perch to be present (Faulks *et al.* 2011, DSEWPC 2012c).

The Macquarie Perch feeds mainly on insects and larvae. The diet of the Macquarie Perch may also include crustaceans, bugs, damselflies and molluscs. This species is generally a bottom feeder and only takes a small proportion of its food at the water surface (DSEWPC 2012c, DPI 2012).

Females do not spawn until three years of age, at approximately 300 millimetres in length. Spawning generally occurs in spring to early summer when the water temperature reaches approximately 15°C. The timing of spawning migration and spawning most likely differs from river to river due to difference in temperature regimes.

The species spawns just above riffles in shallow, fast-flowing water over gravel beds, in shallow upland streams or flowing parts of rivers. Downstream reaches of rivers or still or stagnant stretches are generally not favourable for spawning, as any silt present typically fills deep holes and settles on the river bottom, covering rocky substrates and filling small spaces between the gravel and cobbles. This prevents the eggs from settling among stones and gravel of the stream or river bed. The Macquarie Perch may undertake small-scale migrations from pools to riffles to spawn; migration may not be necessary in stream-dwelling fish. Recaptures of tagged fish suggest some fish use the same river each year for spawning (Faulks *et al.* 2011, DSEWPC 2012c, DPI 2012).

Anzac Creek does not support preferred habitat for the species, while the Georges River supports potential foraging and refuge habitat for the species. Large woody debris, overhanging vegetation, fallen logs, mats of sticks, submerged (*Elodea canadensis*) and floating aquatic plants (*Azola sp.*, *Salvinia molesta*) were present in the littoral and edge habitats throughout Georges River within the study area (ALS 2011). The Georges River does not support preferred breeding habitat for the species, as there is an absence of required riffle habitat and water quality is variable.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Georges River does not support preferred breeding habitat for the species, as there is an absence of required riffle habitat and water quality is variable. The autumn 2011 sampling effort for the Community River Health Monitoring Program included AUSRIVAS sampling of the

Georges River at Cambridge Avenue, approximately 550 metres upstream of the study area. At this location, the overall grade of river health at this location was assessed as Fair. The measure of freshwater macroinvertebrates was Good, water quality was Good, and riparian and estuarine vegetation was Fair. Poor water quality and low aquatic biodiversity in the Georges River in the wider locality can be attributed to industrial discharge and urban run-off entering the river system in the upper catchment (GRCCC 2011).

Although the Georges River water quality is variable, the study area supports potential refuge and foraging habitat for the Macquarie Perch with a variety of habitat features present. The recent (2010) remediation of the Ingleburn Weir system upstream of the study area has also removed a significant physical barrier which may have historically restricted the movement of Macquarie Perch to the study area.

The SIMTA proposal involves the construction of a rail bridge across the Georges River. Piers are expected to be located at both banks of the river as well as one instream pier. The impacts of locating a pier within the river channel may reduce the quality of habitats present through increased sedimentation during the construction phase, increased turbulence around the instream pier and pollution to the river if any fill used for pier stabilisation.

Despite these potential impacts, given that no breeding habitat occurs within the study area the SIMTA proposal is unlikely to have an adverse effect on the life cycle of the Macquarie Perch, such that a viable local population of the species is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. The Macquarie Perch does not comprise an endangered population. ***(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:***

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable. The Macquarie Perch does not comprise an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Anzac Creek does not support preferred habitat for the species, while the Georges River supports potential foraging and refuge habitat for the species. Large woody debris, overhanging vegetation, fallen logs, mats of sticks, submerged (*Elodea canadensis*) and floating aquatic plants (*Azolla* sp., *Salvinia molesta*) were present in the littoral and edge habitats throughout Georges River within the study area (ALS 2011). The SIMTA proposal involves the construction of a rail bridge across the Georges River. Piers are expected to be located at both banks of the

river as well as one instream pier. The impacts of locating the pier within the river channel may reduce the quality of habitats present through increased sedimentation during the construction phase, increased turbulence around the instream pier and pollution to the river if any fill used for pier stabilisation.

The SIMTA proposal will not impose any restrictions to fish movement through the Georges River during or post construction. Given the high mobility of the Macquarie Perch (recorded to travel distances of up to 50 km), the proposal will not fragment or isolate areas of habitat for this species.

Construction of a single track rail bridge across the Georges River is unlikely to remove, significantly modify, fragment or isolate potential foraging or refuge habitat located within the study area. Construction of the rail link across the Georges River, particularly of any piers within the main waterway, will have temporary impacts through increased sedimentation during construction and permanent localised impacts through changes to turbulence around in stream pier structures. These impacts are likely to have minor impacts on the quality of potential foraging and refuge habitat within the Georges River. No significant long-term impacts on existing habitat values of the study area are expected.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat has been identified for the Macquarie Perch.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

There is no recovery plan or threat abatement plan for the Macquarie Perch. There are nine Priority recovery strategies for the Macquarie Perch (DPI 2012) that aim to promote the recovery of the species. The SIMTA proposal is not inconsistent with these recovery strategies.

The following threats are listed within the Action Plan for Australian Freshwater Fishes as contributing to the decline of the Macquarie Perch (Wager and Jackson 1993);

1. Competition with introduced species
 - a. Brown Trout (*Salmo trutta*), Rainbow Trout (*Oncorhynchus mykiss*) and Redfin (*Perca fluviatilis*) may prey on juveniles.
 - b. Competition for food resources with trout.
2. Increased catchment erosion leading to siltation of spawning sites, destruction of invertebrate fauna (food source) and infilling of deep holes;
3. Increased nutrient loads associated with urban development (septic systems, fertilisers, etc.);
4. Over exploitation due to recreational fishing; and,
5. River regulation and water extraction.

The SIMTA proposal is not likely to exacerbate these threats within the study area.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The SIMTA proposal may contribute to the following key threatening processes within the study area.

Degradation of native riparian vegetation along NSW water courses:

Degradation of native riparian vegetation along NSW water courses is listed under the FM Act. Impacts of this KTP include:

- Increasing the amount of sediment and nutrients reaching streams as runoff, and increasing light penetration of the water body;
- Reducing the inputs of organic carbon, via leaves, twigs, and branches;
- Reducing the amount of large woody debris entering the aquatic ecosystem and thereby negatively impacting on habitat and spawning sites of several vulnerable and endangered species listed under the FM Act; and,
- Destabilising river banks.

The SIMTA proposal will require the removal of riparian vegetation from Anzac Creek and the Georges River. Vegetation to be removed will be minimised where possible. The following mitigations measures will reduce potential impacts on aquatic habitats:

- Installation of appropriate drainage infrastructure (e.g. sediment basins, diversion drains), sediment and erosion controls prior to the commencement of construction ;
- Clearing of vegetation is not to be undertaken during overland flow events;
- Locating soil or mulch stockpiles away from watercourses and key stormwater flow paths to limit potential for transport of these substances into the watercourses via runoff; and,
- Stabilisation of disturbed areas, including revegetation in accordance with the VMP, is to be undertaken as soon as practicable after disturbance.

Removal of large woody debris from NSW rivers and streams

Removal of large woody debris from NSW rivers and streams is a KTP listed under the FM Act. Any large woody debris removed from Georges River during construction of the rail link should be stockpiled, and upon the completion of work, reinstated within the river.

Changes in drainage patterns and water quality

Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands is listed under the TSC Act. Alteration to natural flow regimes can occur through reducing or increasing flows, altering seasonality of flows, changing the frequency, duration, magnitude, timing, predictability and variability of flow events, altering surface and sub-surface water levels and changing the rate of rise or fall of water levels (NSW Scientific Committee 2002).

There is potential for construction activities in proximity to and across Anzac Creek and the Georges River to adversely affect aquatic habitat, particularly the construction of piers for the Georges River rail bridge that are within the main waterway. Construction activities in proximity to these watercourses may increase the volumes of sediments carried downstream and reduce water quality occurring downstream. The mobilisation of sediments and pollutants has the potential to reduce the suitability of aquatic environments for some aquatic flora and fauna species.

Installation of appropriate drainage and sediment control infrastructure (e.g. sediment basins), sediment and erosion controls will minimise this potential impacts and any long-term impacts on drainage patterns or water quality are unlikely.

Conclusion

In light of the consideration of the above factors, the SIMTA proposal is unlikely to have “a significant impact on the Macquarie Perch in the study area or wider locality, as:

- The SIMTA proposal will not adversely affect the lifecycle of the species.
- The SIMTA proposal will not remove, modify or further fragment or isolate a significant area of habitat for the species.

