Four vegetation communities were mapped by URS ecologists within the ecological study area (**Figure 8-6**). These communities are compared to those identified by the CMA and Council mapping in **Table 8-2**. **Appendix B-8** provides a full floristic list for each community.

Table 8-2 Comparison of Vegetation Communities Mapped by URS and Existing Mapping

URS (2010) Vegetation Mapping	Sydney Metro (2010) Native Vegetation of Sydney (Draft)	Sutherland Shire Council (2010) Vegetation Mapping	Comment
Modified Pasture/Exotic	N/A	N/A	No correlating vegetation mapping by either CMA or Council.
Coastal Banksia/Acacia Scrub (planted)	N/A	N/A	No correlating vegetation mapping by either CMA or Council.
Exotic Forest and Shrubland	Coastal Upland Wet Heath Swamp	Kurnell Dune Forest^	No correlation exists between URS mapping and that of the CMA and Council. Both the CMA and Council mapping is produced from aerial fly-over and soil/ geology composition mapping. This area is unlikely to be impacted by the Project given no clearing will occur here and no sedimentation or runoff impacts are expected.
Swamp Oak Floodplain Forest (disturbed)#	Coastal Sand Swamp Mahogany Forest*	Swamp Oak Floodplain Forest#	No correlation exists between URS mapping and the CMA mapping. URS mapping is consistent with the Council mapping.

^ denotes the community qualifies as the TSC listed: Kurnell Dune Forest in the Sutherland Shire and City of Rockdale Threatened Ecological Community (TEC).

* denotes the community qualifies as the TSC listed: Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions TEC.

# denotes the community qualifies as the TSC listed: Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions TEC.

Modified Pasture/Exotic

This community is highly disturbed and modified and hence is in poor condition. It is comprised of over greater than 65% weed species and a few common native grasses and herbs. No mid or overstorey exists within this community.

Existing habitat features are minimal in this community given the lack of overstorey strata, rock substrate and/or coarse woody debris. Some habitat value exists in the form of flowering grasses and herbs. Disturbed grasslands such as this one can provide foraging habitat for amphibians and common birds when they occur in close proximity to better quality habitat such as wetlands and littoral dune forest.

This community does not qualify as a TEC listed under the EPBC or TSC Acts.

Legend

- Study Area
- Project Footprint

Vegetation Communities (URS 2010):

- Coastal Banksia / Acacia Scrub (planted)
- Exotic Forest and Shrubland
- Modified Pasture / Exotic
- Swamp Oak Floodplain Forest (disturbed)*

N

0 5 10 20 30 40
Meters

BANKSMEADOW

N

KURNELL

0 100 200 400
Meters

*TSC Listed Community

Source: Aerial Imagery from ©Lands & Property Management Authority [2009]

Client: ICD (ASIA PACIFIC) PTY LTD	Project: KURNELL B LINE UPGRADE		Title: **VEGETATION COMMUNITIES (URS)**
URS	Drawn: SB	Approved: MB	Date: 23/12/2010
	Job No.: **43177740**	File No.: 43177740.007.mxd	Figure: **8-6**

Coastal Banksia/Acacia Scrub (planted)

Although this community is planted, it is in moderate condition given its patchy connection to greater tracts of vegetation along the beach front, to the Botany Bay National Park as well as through the diversity of native species present in all three strata layers. Weed invasion has occurred in the understorey. Characteristic canopy species include Coastal Banksia (*Banksia integrifolia*), Coastal Wattle (*Acacia longifolia subsp. sophorae)* and Swamp Oak (*Casuarina glauca).*

A number of habitat features are present in this community, some of which include; a dense cover in each strata layers, two small waterways and an abundance of flowering shrubs/trees. Flowering species consist of Coastal Banksia*,* Coastal Wattle*,* Coastal Tea-tree *(Leptospermum laevigatum*) and ground cover species such as Pigface (*Carpobrotus glaucescens*)). This community is likely to provide shelter as well as foraging and nesting habitat for a plethora of fauna species such as, honeyeaters, parrots, waterbirds, reptiles, amphibians and macrobats.

This community does not qualify as a TEC listed community under either the EPBC or TSC Acts.

Exotic Forest and Shrubland

This community is highly disturbed and modified and hence is of poor condition. The majority of the overstorey species are exotic weeds. The most dominant weeds include Lantana (*Lantana camara)*, Camphor Laurel (*Cinnamomum camphora*) and Blackberry (Rubus sp.). Only a few common native shrubs and trees were present including Coastal Banksia and Swamp Oak.

Some basic shelter habitat is available in this community given the dense cover that Lantana and Blackberry provides for small mobile species such as woodland birds and ground-dwelling mammals. Basic foraging resources such as fruiting Blackberry and flowering Banksia are also available. No hollows or rocky outcrops were observed in this community. Coarse woody debris is also minimal.

This community does not qualify as a TEC listed community under the EPBC or TSC Acts. However it is acknowledged that according to the Sutherland Shire Council (2009) mapping that this community qualifies as the TEC Kurnell Dune Forest in the Sutherland Shire and City of Rockdale. Given no direct or indirect impacts are expected to influence this community; no further assessment of this community has been undertaken.

Swamp Oak Floodplain Forest (disturbed)

This community is in moderate condition given its size and limited connectivity to Bonna Point Reserve and Towra Point Reserve to the west and north west. Weed invasion in this community is relatively substantial, with some areas consisting mostly of weeds in all three strata layers. Notwithstanding this, some patches had only minor weed infestations. Dominant weeds include Lantana, Blackberry, Wandering Jew (*Commelina sp.)* and Giant Reed (*Arundo donax*). Characteristic native species include Swamp Oak, Narrow-leaved Cumbungi (*Typha domingensis),* False Bracken *(Calochlaena dubia*), Native wandering Jew (*Commelina cyanea*) and Indian Pennywort (*Centella asiatica*).

It was also noted during the field surveys that stormwater runoff flows directly into this community via stormwater drains. Stormwater management controls are currently being implemented at the entry point of the storm water to the creek channel with the installation of an absorbent boom to collect polluted runoff on the surface of the water. Other local impacts such as invasive predator species (domestic cats etc.) and rubbish dumping are considered to be present given the close proximity of the community to residential and industrial areas.

The quality of habitat in this community appears to be fairly good given the presence of alluvial floodplains, wetlands, creeklines within it and to the west, fringing aquatic vegetation, flowering shrubs and trees, dense understorey and mid-storey in mosaic patches as well some coarse woody debris. This community is likely to provide foraging, breeding and shelter habitat for amphibians, waterbirds, woodland birds and reptiles. The wetland provides important habitat for a variety of native species and migratory birds. This community is discussed in more detail in **Section 8.4.7** below.

8.4.4 Noxious Weeds

According to NW Act it is essential to determine the presence of noxious weeds within a given area prior to development. Under this legislation certain noxious weeds must be controlled and/or eradicated. Each noxious weed is defined and classified under the Act and the legal requirements for management are listed per each LGA by NSW DII.

A total of 77 noxious weeds, as declared by NSW DII, were identified through the desktop investigation process (refer to **Appendix B-4**). Five of these weeds were recorded and identified through field survey, however all of these plants were found within Marton Park and the coastal scrub and not on the refinery or the right of way. The noxious weeds that were identified during the field survey are listed below:

- Blackberry (*Rubus sp*.);
- Green Cestrum (*Cestrum parqui*);
- Lantana (*Lantana camara*);
- Bitou Bush (*Chrysanthemoides monilifera*); and
- Water Hyacinth (*Eichhornia crassipes*).

Refer to **Appendix B-8** for a list of noxious weeds for each vegetation community.

The NW Act requirements for the control and/or eradication of these noxious weeds for the Sutherland Shire LGA and Botany Bay LGA are provided in **Table 8-3** below.

Table 8-3 Recorded Noxious Weeds and the Legal Obligations for Control

Noxious Weed	Class	NW Act Legal Requirements for Control
Blackberry	4	The growth and spread of the plant must be controlled according to the local control (Sutherland Shire and Botany Bay City Council's) authority.
Green Cestrum	3	The plant must be fully and continuously suppressed and destroyed.
Lantana	4	The growth and spread of the plant must be controlled according to the local control (Sutherland Shire and Botany Bay City Council's) authority.
Bitou Bush	3	The plant must be fully and continuously suppressed and destroyed.
Water Hyacinth	2	The plant must be eradicated from the land and the land must be kept free of the plant.

8.4.5 Fauna

Figures 8-7 and **8-8** show where threatened fauna species have been recorded during the desktop study close to the study area. A total of 26 avian species were recorded during diurnal bird surveys and opportunistic observations within the ecological study area. The majority of these were native species common to coastal and suburban locations. A number of forest birds were also observed within the Swamp Oak Floodplain Forest. A full fauna species list is provided in **Appendix B-9**.

8.4.6 Threatened Flora and Fauna Species

The online searches identified a total of 13 threatened flora species and 53 threatened fauna species (**Appendix B-5**). Of these threatened flora species five are listed under the TSC Act and 12 are listed under the EPBC Act. Four of these species are listed under both Acts. Of the threatened fauna species, 30 are listed under the TSC Act, 30 are listed under the EPBC Act and two are listed under the FM Act. Nine of these species are listed under both the TSC and EPBC Act.

A large number of species, from marine, aquatic and terrestrial habitats, were identified as a result of this initial search. However, the majority of these were assessed as not being of relevance due to the location, nature and magnitude of the Project.

The habitat assessments presented in **Appendix B-5** suggest that four threatened species are considered likely to be present in the ecological study area based on presence of suitable habitat and known records. These four species are discussed in **Table 8-4**. However, no threatened species including the four identified above, were observed during field surveys.

Legend

- Site Boundary
- Project Footprint
- 10km Search Buffer

Threatened Fauna (Birds):

- Australasian Bittern
- Beach Stone-curlew
- Black-tailed Godwit
- Blue-billed Duck
- Diamond Firetail
- Eastern Ground Parrot
- Glossy Black-Cockatoo
- Great Knot
- Greater Sand-plover
- Kermadec Petrel (west Pacific subspecies)
- Lesser Sand-plover
- Little Tern
- Masked Owl
- Orange-bellied Parrot
- Osprey
- Pied Oystercatcher
- Powerful Owl
- Sanderling
- Sooty Oystercatcher
- Superb Parrot
- Swift Parrot
- Terek Sandpiper
- Wandering Albatross
- White-fronted Chat
- White-fronted Chat Epthianura albifrons

N

BANKSMEADOW

KURNELL

0 1 2 4

Kilometres

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Client: ICD (ASIA PACIFIC) PTY LTD

Project: KURNELL B LINE UPGRADE

Title: **THREATENED FAUNA DECCW RECORDS (CLASS: AVES)**

Drawn: SB	Approved: MB	Date: 17-12-2010
Job No.: 43177740	File No.: 43177740.009-1.mxt	

Figure: **8-7**

Legend

- Site Boundary
- Project Footprint
- 10km Search Buffer

Threatened Fauna (Amphibians):

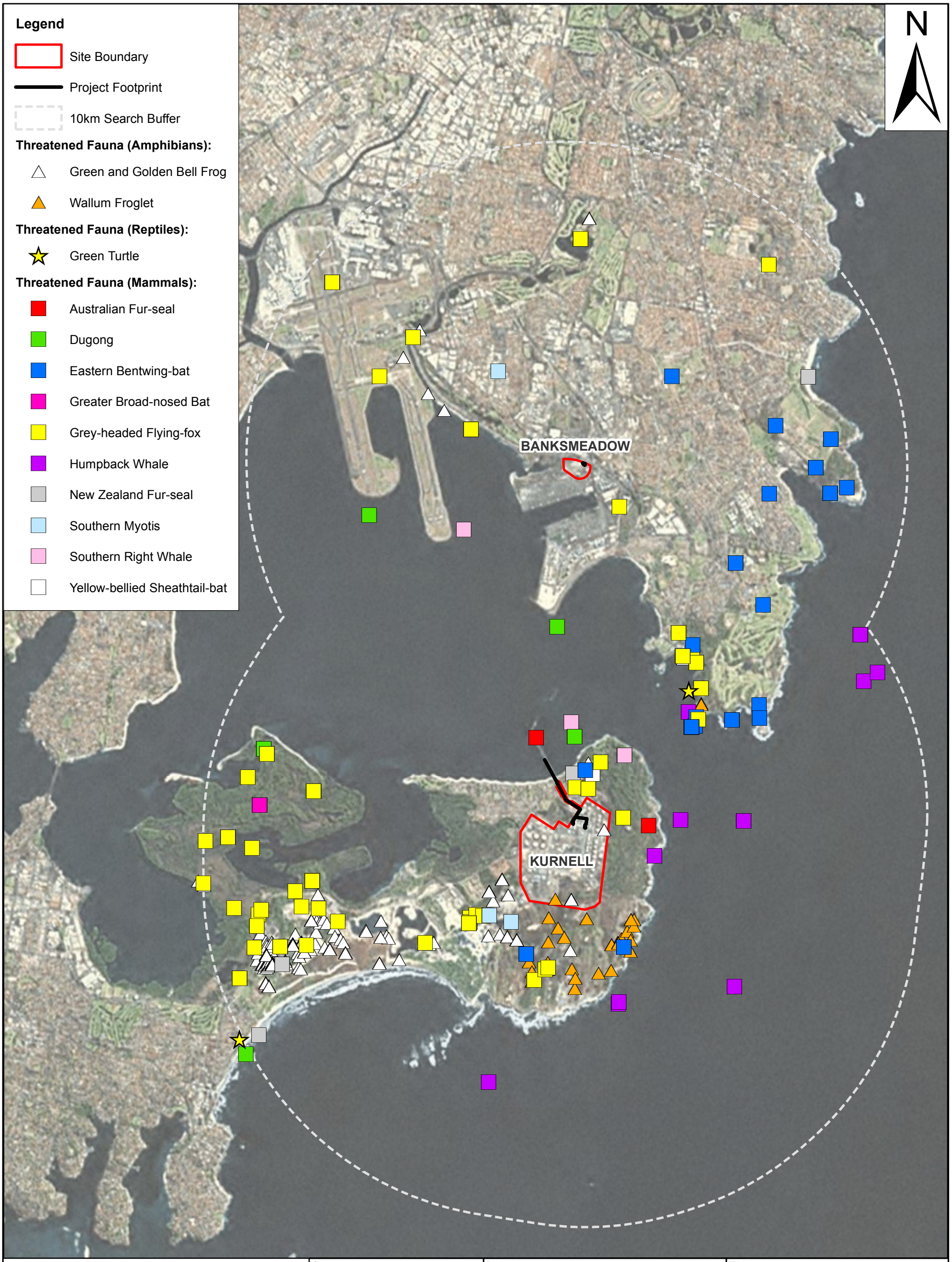
- Green and Golden Bell Frog
- Wallum Froglet

Threatened Fauna (Reptiles):

- Green Turtle

Threatened Fauna (Mammals):

- Australian Fur-seal
- Dugong
- Eastern Bentwing-bat
- Greater Broad-nosed Bat
- Grey-headed Flying-fox
- Humpback Whale
- New Zealand Fur-seal
- Southern Myotis
- Southern Right Whale
- Yellow-bellied Sheathtail-bat



0 1 2 4

Kilometers

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Client: ICD (ASIA PACIFIC) PTY LTD

Project: KURNELL B LINE UPGRADE

Title: **THREATENED FAUNA DECCW RECORDS (CLASSES: AMPHIBIA, MAMMALIA & REPTILIA)**

Drawn: SB | Approved: MB | Date: 23/12/2010

Job No.: **43177740** | File No.: 43177740.009-2.mxd

Figure: **8-8**

Table 8-4 State and Commonwealth Listed Threatened Flora and Fauna Likely to Occur in the Study Area

Common Name	Scientific Name	TSC Act Status	EPBC Act Status	Study Area Distribution and Habitat Suitability	Likelihood based on habitat suitability
White-fronted Chat	*Epthianura albifrons,*	Vulnerable, Endangered Population	N/A	Regularly observed in the saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve. This population is estimated to comprise 19-50 individuals. The species is gregarious, usually found foraging on bare or grassy ground and within modified and weedy grassland areas in wetland areas, singly or in pairs.	This species is considered likely to occur within the study area.
Orange-bellied Parrot	*Neophema chrysogaster*	Critically Endangered	Critically Endangered	The Orange-bellied Parrot spends winter mostly within 3km of the coast in sheltered coastal habitats including bays, lagoons, estuaries, coastal dunes and saltmarshes. Birds forage in low samphire herbland or taller coastal shrubland. Species can be found foraging in weedy areas associated with these coastal habitats.	This species is considered likely to occur within the study area.
Green and Golden Bell Frog	*Litoria aurea*	Endangered	Vulnerable	The species inhabits marshes, dams and stream-sides, particularly those containing sedges. Optimum habitat includes water-bodies that are unshaded, have a grassy area nearby and diurnal sheltering sites available. Species often occur in highly disturbed areas. The species will forage amongst emergent aquatic or riparian vegetation and amongst vegetation, fallen timber adjacent to and within 500m of breeding habitat, including grassland, cropland and modified pastures.	This species is considered likely to occur within the study area.
Sunshine Wattle	*Acacia terminalis subsp. terminalis*	Endangered	Endangered	Habitat is generally sparse and scattered and generally occurs within highly modified sites. Coastal scrub and dry sclerophyll woodland on sandy soils.	This species is considered likely to occur within the study area.

All marine mammals and fishes identified through desktop investigations (**Appendices B-1, B-2** and **B-3**) have not be assessed given no works will be undertaken within the water column.

8.4.7 Threatened Ecological Communities

The results of online search Commonwealth EPBC online Protected Matters Database search (using a 10km radius of the project area), identified two TECs with the potential to occur in the study area. These are the: *Eastern Suburbs Banksia Scrub of the Sydney Region* (Eastern Suburbs Banksia Scrub) and *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia* (Littoral Rainforest and Coastal Vine) (**Appendix B-2**). Eastern Suburbs Banksia Scrub is listed as endangered under both TSC Act and EPBC Act. Littoral Rainforest and Coastal Vine are listed as critically endangered under the EPBC Act.

A further three TECs have been recorded within the vicinity of the study area according to the vegetation mapping produced by Sydney Metro CMA (2009) and the Sutherland Shire Council (2010) (**Table 8-2**). Of these, one was confirmed by URS ecologists as being present within the ecological study area, namely Swamp Oak Floodplain Forest.

All three vegetation mapping series demonstrate that the TECs Eastern Suburbs Banksia Scrub and Littoral Rainforest and Coastal Vine do not occur within the ecological study area including the Project footprint. This conclusion was also confirmed during the field survey. Given these communities are not known to occur within these areas no further assessment has been undertaken.

Swamp Oak Floodplain Forest

This community occurs on the floodplains in Kurnell Peninsula, the full extent of which is illustrated in **Figure 8-4**. It correlates to the TEC listed under the TSC Act as *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*. This community is located in one portion of the ecological study area in Marton Park, to the west of Kurnell Refinery, and is referred to as Swamp Oak Floodplain Forest (disturbed) in URS mapping (refer to **Figure 8-6**).

According to the identification guidelines for the community (DECC 2007) this community can be qualified by five indicators. These are discussed in **Table 8-5**.

Table 8-5 Community Indicators for Swamp Oak Floodplain Forest (disturbed)

Indicator	Discussion
Is the site on the coastal floodplain of the NSW North Coast, Sydney Basin or South East Corner bioregion?	Yes
Is the site associated with humic clay or sandy loam soils?	Yes
Is the site subject to water logging and/or below the highest flood level?	Yes the site is subject to waterlogging
Is the site dominated by Swamp Oak or Swamp Paperbark?	Yes
Are any characteristic shrub and/or ground layer species present?	Yes: Tall Sedge (Carex appressa), Indian Pennywort (Centella asiatica) and Native Wandering Jew (Commelina cyanea)

Therefore based the above criteria, this community has been determined as consistent with the guidelines.

8.5 Assessment of Impacts

8.5.1 Threatened Species and Ecological Communities

The results of the habitat suitability assessments (**Appendix B-5**) indicate that three threatened fauna species, one threatened flora species and one threatened ecological community listed under the TSC

and/or EPBC Act have been recorded or are considered as likely to occur within the study area.. Accordingly, assessments aligned with the criteria established in Appendix 3 of the *Guidelines for Threatened Species Assessment* (DEC & DPI 2005) (the NSW assessment of significance) and Commonwealth significant impact criteria assessments for these species were undertaken and are included as **Appendix B-6** and **B-7**. These assessments are summarised in **Table 8-5** below.

Table 8-5 Summary of Assessments of Impacts for Threatened Biota

Common Name	Scientific Name	Outcome of NSW Assessment (magnitude/significance)	Outcome of Scientific Assessment (Significant/ Not Significant)
Threatened Fauna			
White-fronted Chat	*Epthianura albifrons*	None Not Significant	N/A
Orange-bellied Parrot	*Neophema chrysogaster*	None Not Significant	Not Significant
Green and Golden Bell Frog	*Litoria aurea*	Potential Not Significant	Not Significant
Threatened Flora			
Sunshine Wattle	*Acacia terminalis subsp. terminalis*	None Not Significant	Not Significant
Threatened Ecological Community			
Swamp Oak Floodplain Forest	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Potential Not Significant	Not Significant

The Commonwealth assessments have concluded that the Project would not have a significant impact on any threatened biota known or considered likely to occur within the study area due to the transient nature of the threatened fauna, if present, and the lack of direct impact on the flora and TEC.

The NSW assessments have concluded that the Project has the potential to impact to local Green and Golden Bell Frog populations and the Swamp Oak Floodplain Forest community in Marton Park. However this impact is not likely to be significant due to the nature of the impact.

8.5.2 Key Threatening Processes

A Key Threatening Process (KTP) is defined under Schedule 3 of the TSC Act as '*a threatening process*' where the process '*threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*'. The Project could potentially cause an increase in the following KTPs as listed under the EPBC and TSC Act:

- **Clearing of native vegetation**- the Project would only remove small amounts of ground-layer vegetation within the Project footprint, of which the majority is exotic with only a few native species.
- **Invasion of native plant communities by exotic perennial grasses**- the Project is unlikely to influence the spread of exotic perennial grasses through disturbances to the soil and vegetation during construction.

- **Invasion and establishment of exotic vines and scramblers**- the Project is unlikely to influence the spread of exotic vines and scramblers through disturbances to the soil and vegetation during construction.
- **Infection of amphibians with chytrid fungus resulting in *chytridiomycosis*-** the Project has the potential to influence the spread of the fungus through interactions with the underlying groundwater and soil disturbances through construction vehicle movement and stockpiling of excavated materials during the construction phase.
- **Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*) -** the Project has the potential to influence the spread of the fungus, as it is known to occur within the Sydney Metro CMA area (DECC, 2008) and the Project would involve the stockpiling and potential spread of infected soils through construction vehicle movement and stormwater run-off.
- **Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands (TSC listed only) -** the natural flow regime of waterways within the ecological study area is already highly modified given the existing residential and industrial land uses, however, the Project may cause temporary drawn down of groundwater from dewatering activities during the excavation of the existing pipeline. The extent and duration of these disturbances would be small and limited.

A number of KTPs are also listed under the FM Act; one of these is relevant to the Project:

- **Degradation of native riparian vegetation along New South Wales water courses**- the Project may influence native riparian vegetation in the adjacent wetlands and floodplain communities in Marton Park (**Figure 8-6**) through potential weed invasion, stormwater run-off and sedimentation during the construction phase if soils are stockpiled inappropriately during storm events.

8.5.3 Matters of National Environmental Significance

Five MNES could potentially be relevant for the ecological impact assessment. These are:

- listed threatened species and communities;
- listed migratory species;
- Ramsar wetlands of international importance;
- Commonwealth marine environment; and
- the Great Barrier Reef Marine Park.

As discussed above, the Project is unlikely to significantly impact any threatened species and communities. Equally the location of the works and the habitats that surround the Project work areas are unlikely to support significant umbers of any listed migratory species, including any CAMBRA or JAMBRA species. Torwa Point Wetland is a Ramsar site and is located within 5km of the Project. However few Project impacts are likely to cover the distance for the Project to this wetland. Suitable measures, as discussed in **Chapter 7 Groundwater and Surface Water**, will be put into place to ensure that no pollution impacts occur to Botany Bay or any other groundwater source. Therefore it is unlikely that the Project will impact the ecological communities and species within this reserve. Equally the Commonwealth marine environment and the Great Barrier Reef Marine Park are unlikely to be impacted.

8.5.4 Construction Impacts

A number of ecological impacts have the potential to occur during the construction phase of the Project.

The Project is unlikely to cause serious direct ecological impacts given the limited size of the Project footprint, the type and proposed procedures of works to be undertaken and the limited vegetation within the footprint. Nevertheless, the following direct impacts have the potential to occur as a result of the works:

1) Clearing of vegetation in the modified pasture/exotic community within the right of way for the KBL pipeline upgrade (approximately 900m^2) and concrete pad site for the establishment of the new pumps and associated infrastructure in Banksmeadow Terminal (10.6m^2).

2) Temporary and localised alterations to groundwater during the excavation and upgrade of the existing KBL pipeline.

3) Potential release of oil contaminants into groundwater aquifers beneath the pipeline if damage occurs to the existing pipes when removing them from the ground given the high permeability of the sandy soils found within the area.

The Project also has the potential to result in several indirect ecological impacts consisting of, but not restricted to:

- Increased sedimentation through stormwater run off into the wetlands and floodplain communities in Marton Park.

- If contaminated soils are identified during the KBL pipeline excavation, these soils would be removed from site in an appropriate manner. However, they could be stockpiled on site for up to three months. Unless these stockpiles are appropriately managed to prevent the leeching of any sediment and associated pollutants from the soils during storm events, there is potential for the release of these contaminants back into the groundwater aquifer beneath the pipeline or to enter surface runoff that flows into surrounding waterways and wetlands to the south west of the pipeline.

Sedimentation and the potential release of pollutants into Marton Park wetland are likely to be the most significant ecology related consequences of the Project. It is suspected that deteriorating run-off water quality and increased soil erosion and sedimentation could potentially reduce the areas suitability for frogs including the Green and Golden Bell Frog (DECC 2005). In addition indirect impacts are likely to further reduce the integrity and condition of the already disturbed Swamp Oak Floodplain community. However many of these potential impacts can be successfully mitigated by following a number of established measures. These mitigation measures are discussed in **Section 8.6**.

8.5.5 Operation Impacts

No ecological impacts are expected during the operation of the Project.

All work at both the Kurnell Refinery and the Banksmeadow Terminal will continue under the same controls that are currently licenced under the Protection of the Environment Operations Act 1997. The operation of the Project is unlikely to result in any additional contamination on or off site, provided the agreed controls are implemented.

Indeed the Project has the potential to reduce the risk of contamination and pollution by:

- Upgrading the existing pipeline between the refinery and terminal, thus allowing intelligent pigs to run all the way between the two facilities. This will allow more detailed assessments of pipeline integrity, which in turn will reduce the likelihood of any pollution events affecting the local ecology;
- Moving the existing pigging facilities from Kurnell Wharf into the new pump pad site within the refinery, thereby reducing the risk of a spill or pollution event on the wharf; and
- Removing contaminated soils from the study area and deposing of any contaminated soil in an appropriate manner. Any contaminated soils that are removed would be replaced by clean soils, reducing the overall contamination on site.

Significantly upgraded infrastructure would ultimately replace redundant systems, and the improvement towards facilitating the 'smart pigging' system would also inherently decrease the ongoing operational environmental risk of piping product under Botany Bay.

8.6 Ecological Mitigation Measures

The following section identifies measures to avoid and mitigate the potential impacts on ecological values associated with the Project. This section has been structured according to the principals stated in DECC (2005) guidelines for Part 3A ecology assessments. No offset strategy is provided for this Project, as the potential impacts are considered to be of low significance and are likely to be reduced to an acceptable level through the implementation of the mitigation measures provided.

8.6.1 Impact Avoidance

Impacts on ecology have been avoided by locating the Project footprint in areas where the vegetation is of poor condition and has low ecological value.

8.6.2 Impact Mitigation

An overview of the impact mitigation and environmental management measures to ensure ecological protection has been provided below.

A Construction Environmental Management Plan (CEMP) would be prepared for the construction phases of the Project and would include measures to minimise or avoid impacts on native flora, fauna and ecological communities. Management plans, mitigation measures and environmental management measures would be included in the CEMP via the following key documents:

- Flora Management Plan; and
- Fauna Management Plan.

The CEMP would also include ongoing monitoring requirements, performance indicators, timing and responsibilities.

The mitigation measures provided for each management plan are not exhaustive and would only be used as a guide to developing the full CEMP.

Flora Management Plan

A flora management plan would be developed and included in the CEMP to mitigate impacts on flora as a result of habitat clearing associated with the Project. Mitigation measures would be implemented to control weed invasion where necessary and to manage stormwater run off. The following strategies and mitigation measures would be incorporated as part of the Flora Management Plan:

1) management of weeds; and

2) management of sediment, erosion and pollutant run-off.

Management of Weeds

Five noxious weeds were recorded close to the Kurnell works. In addition, 77 species of noxious weeds are known to occur within the Sutherland Shire and Botany Bay LGA (DPI 2009). A full list of noxious weeds for each LGA area is provided in **Appendix B-4**. Should noxious weeds be found during the construction work on site then a Weed Management Plan will be established to control spread of weeds. The Weed Management Plan would include:

- strict stockpiling control and eradication of all noxious weeds as per the NW Act for each weed as per NSW DII specifications for Sutherland Shire and Botany Bay LGAs.
- wash down procedures to reduce the spread of weeds and root-rot fungus (*Phytophthora cinnamomi*) via vehicles and machinery to minimise and prevent soil movement between locations;
- target and control noxious weeds as well as areas of potential new outbreaks including soil stockpiles and any other disturbed areas; and
- monitoring programs for noxious weeds on site and in the surrounding area, during construction and operation of the Project.

Management of Sediment, Erosion and Stormwater Runoff

Sedimentation, erosion and stormwater runoff created from construction activities has the potential to influence water quality and vegetation condition for surrounding communities and catchment areas.

Standard industry measures for sediment runoff on urban developments should be implemented according to the '*The Blue Book* Volumes 1 and 2 (Landcom 2004), and *Managing Urban Stormwater: Soils and Construction Volume 1,* (DECC 2008). Specific sedimentation and stormwater runoff controls should be developed to protect sensitive ecological receptors adjacent to the Project. Sediment, erosion and stormwater run-off control measures should be implemented to manage ground and vegetation disturbances activities for the KBL pipeline to protect surrounding environments. Necessary management measures would include:

- stockpiling of material would be restricted to cleared or disturbed areas;
- Installing appropriate sediment fencing around stockpiles to avoid scouring and runoff into adjoining creeklines and vegetated areas;
- if excavated soils are found to be contaminated they should be removed from site as soon as possible and taken to an appropriate waste facility;

- in circumstances where soils need to be temporarily stored on site, contaminated materials should be stockpiled on non-permeable sheeting and covered with plastic sheeting to prevent infiltration of rain water and possible run-off (refer to **Chapter 6 Soils, Geology and Topography** for greater detail);
- excavated areas will be stabilised using matting or mulch as soon as possible to permanently stabilise the soil;
- restricting access to the adjacent TEC areas and wetlands and non-essential areas; and
- construction of diversion banks and channels to intercept and divert water away from disturbed ground and stockpiles, as well as ensuring run off does not enter wetland areas;

Other Measures

The following measures will also be implemented as part of the flora management plan in order to mitigate any adverse ecological impacts:

- wash down protocols of construction vehicles and machinery to prevent the spread of root-rot fungus (*Phytophthora cinnamomi*); and
- limiting the removal of ground covering vegetation to that required for the upgrade of the KBL pipeline.

Fauna Management Plan

A fauna management plan would be developed and included in the CEMP to mitigate impacts on fauna as a result of the Project. The following mitigation measures would be incorporated as part of the Fauna Management Plan.

Management of Fauna Species Habitat

To enable the effective management of threatened fauna and native fauna habitat, several mitigation measures would be implemented:

- wash down protocols to prevent the spread of amphibian chytrid disease *chytridiomycosis* would be included within the faunal management plan. Protocols would be consistent with DECCW guidelines (DECC, 2008b). Wash down would occur whenever vehicles enter or leave an excavation area;
- use of 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO for the control of noxious weeds. Frogs have been found to be very sensitive to some herbicide products and in particular to the surfactants, or wetting agents used to improve the effectiveness of the chemicals (Mann and Bidwell, 1998).
- appropriate containment of stockpiled soils during ground or vegetation disturbance activities to prevent stormwater runoff and increased sedimentation of Marton Park which represents known breeding and foraging habitat for the Green and Golden Bell Frog, numerous common frog species and migratory birds.

8.7 Statement of Commitments

Provided the measures outlined above are incorporate into CEMP for the Project, no adverse impacts are likely to occur on the ecological values identified within this assessment.

Table 8-6 Statement of Commitments - Ecology

Mitigation Measure and Commitment	Implementation of mitigation measures	
	Construction	Operation
Ecology – Flora Management		
A Weed Management Plan will be developed as part of the CEMP if noxious/ exotic weeds are identified on site during construction. This plan would include: • wash down procedures to reduce the spread of weeds via vehicles and machinery; • target areas of potential new outbreaks including soil stockpiles and any other disturbed areas; • recommend measures including cleaning of vehicle tyres before leaving a property, cleaning of footwear and minimising soil movement between locations; • monitoring programs for noxious and problematic weeds on sites and in the surrounding areas; and • measures to mitigate noxious and problematic weeds, should they be found, would be in accordance with the DII specifications for the Sutherland Shire and Botany Bay Council area.	✓	
Standard industry measures for sediment runoff on urban developments would be implemented according to the '*The Blue Book* Volumes 1 and 2 (Landcom 2004), and *Managing* Urban Stormwater: Soils and Construction Volume 1, and (DECC, 2008). Specifically, sediment and pollutant run-off controls would be managed to protect sensitive ecological receptors in adjacent areas to the footprint. Management methods would include: • stockpiling to be appropriately sediment fenced to avoid scouring and runoff into adjoining creeklines and vegetated areas; • if excavated soils are found to be contaminated they would be removed from site as soon as possible and taken to an appropriate waste facility. In circumstances where soils need to be temporarily stored on site, contaminated materials would be stockpiled on non-permeable sheeting and covered with plastic sheeting to prevent infiltration of rain water and possible run-off; and • wash down protocols of construction vehicles and machinery to prevent the spread of root-rot fungus (*Phytophthora* cinnamomi).	✓	
Ecology- Fauna Management		
Frog-friendly and wetland friendly herbicides such as Roundup Biactive or Weedmaster DUO will be used for the control of noxious weeds.	✓	✓
Wash down protocols In accordance with DECCW guidelines (DECC, 2008b) to prevent the spread of amphibian chytrid disease *chytridiomycosis* would be included. Wash down would occur whenever vehicles enter or leave an excavation area.	✓	