

6.4 Flora and Fauna

James Warren & Associates have prepared an Ecological Assessment and several management plans (**Appendix I**) which comprise:

- Volume 1 – Ecological Assessment
- Volume 2 – Appendices to the Ecological Assessment
- Volume 3 – Saltmarsh Rehabilitation Plan
- Volume 4 – Scribbly Gum Management Plan
- Volume 5 – Site Regeneration and Revegetation Plan
- Volume 6 – Vegetation Management Plan
- Volume 7 – Fauna Management Plan
- Volume 8 – Freshwater Wetland Rehabilitation Plan

In addition Mosquito Consulting Services Pty Ltd have undertaken a Biting Midge and Mosquito Control Assessment and management Methodology Report (**Appendix J**).

6.4.1 Flora – Native Vegetation

Existing Environment

James Warren & Associates have identified 18 broad vegetation associations comprising 24 vegetation communities and 449 individual flora species on the site. Parts of the site have been disturbed due to recent land clearing and bulk excavation works, however the remaining types of vegetation associations comprise dry sclerophyll forest, rainforest, tall forest, mid-high open woodland, low closed forest, low closed grassland and grassland/fernland/ sedgeland (mixed species). The site includes 419.39ha of vegetation, 90.49ha of which is remnant bushland. **Figure 31** illustrates the different flora communities on the site, and **Figure 32** shows the areas of remnant bushland.

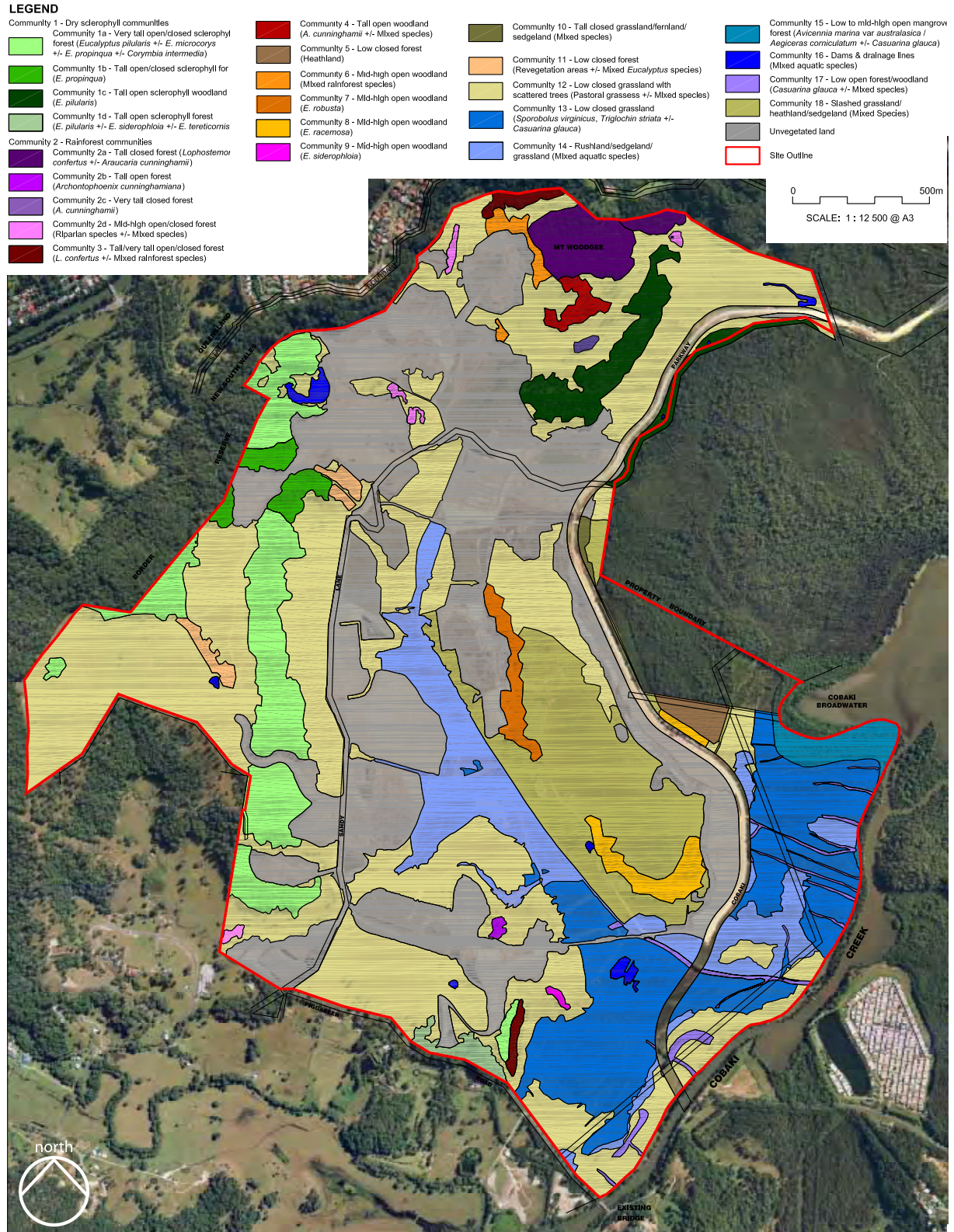


Figure 31 – Vegetation Communities

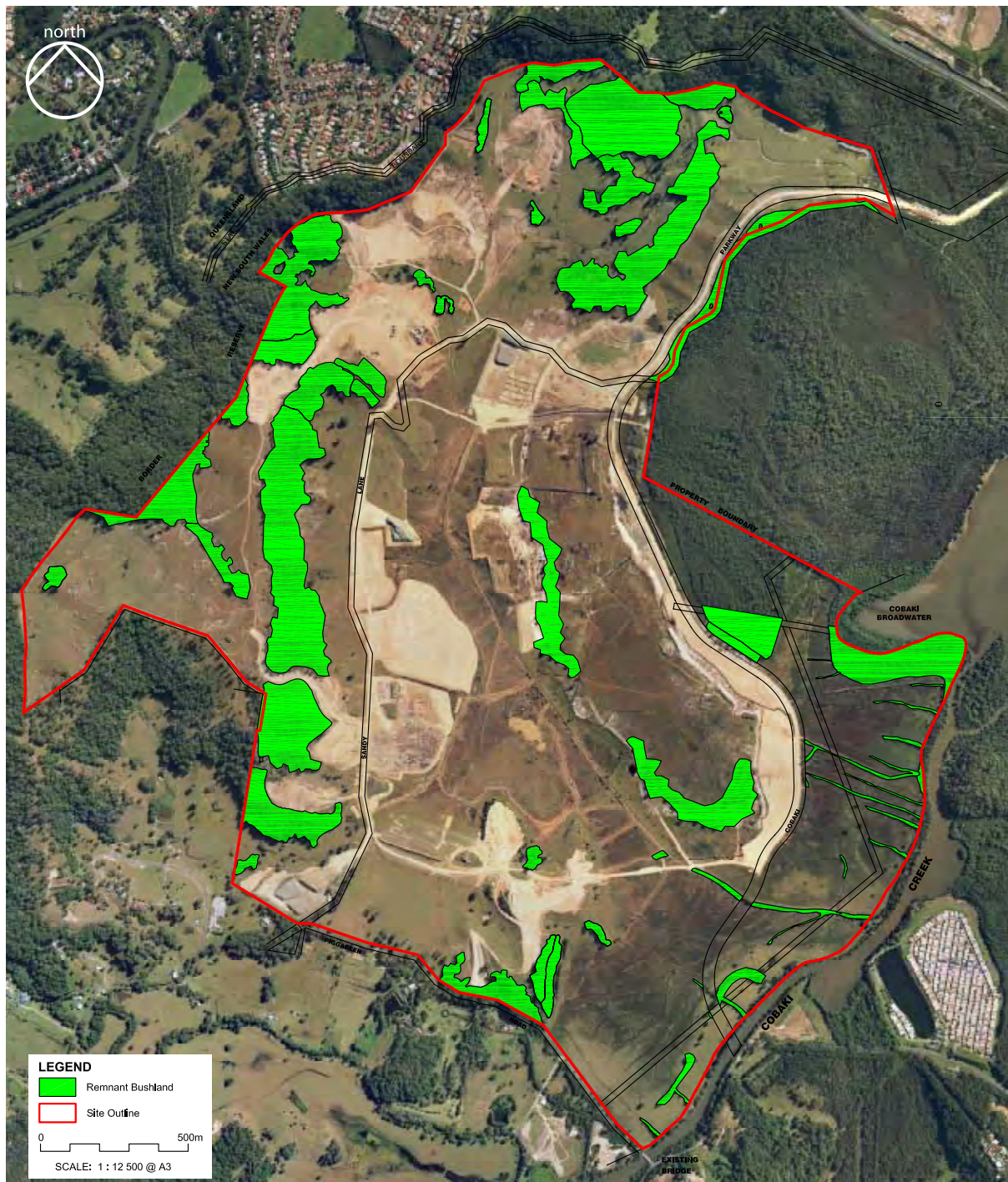


Figure 32 – Remnant Bushland

Potential Impacts

The potential impacts of the development include:

- the loss of native vegetation on the site; and
- the provision of rehabilitated/ restored vegetated land, freshwater and saltwater wetlands, and landscaped areas.

Figure 33 shows the areas of vegetation which will be cleared as a result of the development on the site.

A summary of the vegetation types that are to be removed and their respective areas is included below in **Table 13** and a summary of the potential loss of remnant bushland and their respective areas are shown in **Table 14**.

A total of 197.64ha of vegetation is to be removed from the site, 178.88ha is within the part of the site which has existing development consent and an additional 18.76ha is to be removed as part of the proposed development.

A total of 22.28ha of remnant bushland is to be removed. Of this 22.08ha of the remnant bushland to be removed falls within the part of the site which has existing development consent.

Impacts on the native vegetation communities comprise:

- clearance of areas represents a loss of habitat available for the dispersal of plants and will reduce visits by pollination and dispersal vectors;
- weed invasion and colonisation;
- loss of organic material from the site; and
- impacts from human activities, including clearing, introduced species and bushfire risk;

Whilst vegetation on the site will be lost, 221.8ha of vegetated land including 68.25ha of remnant bushland will be retained, rehabilitated and protected on the site. **Figure 34** sets out the rehabilitation and management precincts.

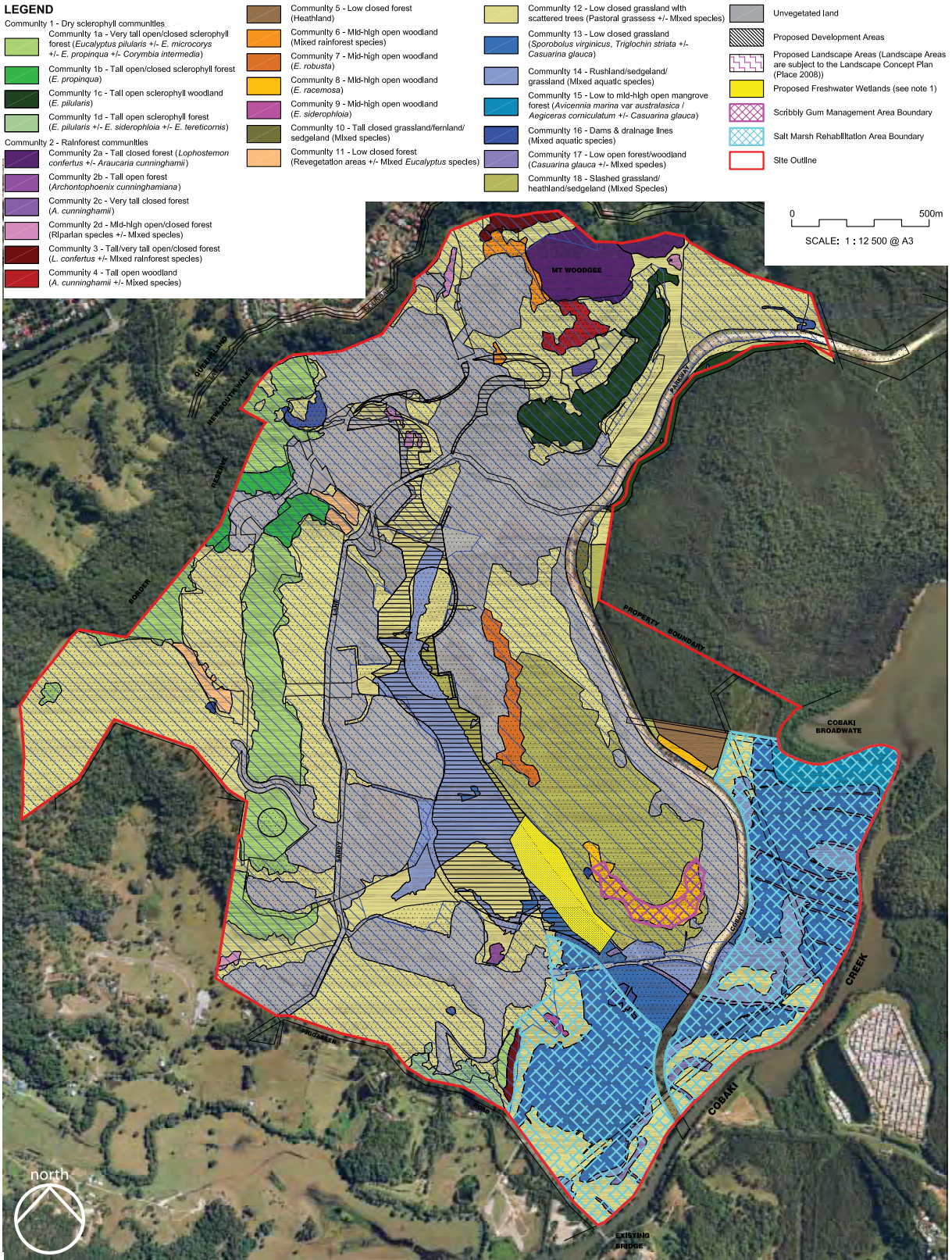


Figure 33 – Impact of Development on Vegetation Communities

Table 13 – Potential Loss of Vegetation on the Site

Community	TOTAL AREA (ha)	Existing Approved Areas					Non-Approved Areas				
		Retained - TOTAL (ha)	Retained Areas		Loss - TOTAL (ha)	Retained - TOTAL (ha)	Retained Areas		Loss - TOTAL (ha)	Retained - TOTAL (ha)	
			Open Space (ha)	Breakdown of Retained Areas Environmental Protection (ha)			Open Space (ha)	Breakdown of Retained Areas Environmental Protection (ha)			
											Breakdown of Retained Areas
1A#	33.10	28.35	3.14	25.20	4.75	0.00	0.00	0.00	0.00	0.00	0.00
1B	4.66	4.11	0.00	4.11	0.55	0.00	0.00	0.00	0.00	0.00	0.00
1C	12.87	8.23	0.03	8.20	2.91	1.54	1.51	0.03	0.20	0.00	0.00
1D	2.37	1.68	1.68	0.00	0.69	0.00	0.69	0.00	0.00	0.00	0.00
2A	9.10	0.69	0.00	0.69	0.28	8.13	0.46	7.67	0.00	0.00	0.00
2B	0.35	0.00	0.00	0.00	0.02	0.32	0.32	0.00	0.00	0.00	0.00
2C	0.35	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.00
2D #	1.43	1.07	1.07	0.00	0.17	0.19	0.19	0.00	0.00	0.00	0.00
3	2.20	1.93	0.73	1.20	0.19	0.07	0.07	0.00	0.00	0.00	0.00
4	2.13	0.00	0.00	0.00	2.12	0.02	0.00	0.02	0.00	0.00	0.00
5	2.48	0.00	0.00	0.00	0.00	2.48	0.28	2.21	0.00	0.00	0.00
6#	1.91	0.18	0.14	0.04	1.60	0.14	0.00	0.14	0.00	0.00	0.00
7	3.80	0.00	0.00	0.00	3.80	0.00	0.00	0.00	0.00	0.00	0.00
8	5.13	0.00	0.00	0.00	4.52	0.60	0.55	0.06	0.00	0.00	0.00
9	0.23	0.18	0.18	0.00	0.00	0.09	0.09	0.00	0.00	0.00	0.00
10	0.68	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00
11	2.72	2.59	0.00	2.59	0.13	0.00	0.00	0.00	0.00	0.00	0.00
12#	188.14	20.36	12.28	8.07	118.01	42.82	42.00	0.82	6.96	0.00	0.00
13#	53.95	0.13	0.13	0.00	0.42	49.04	48.20	0.83	4.36	0.00	0.00
14#	36.96	0.08	0.08	0.00	0.31	30.73	30.73	0.00	5.83	0.00	0.00
15	5.66	0.00	0.00	0.00	0.00	5.66	0.25	5.41	0.00	0.00	0.00
16	2.19	0.20	0.00	0.20	1.33	0.44	0.44	0.00	0.22	0.00	0.00
17	4.24	0.00	0.00	0.00	0.00	3.87	3.85	0.01	0.37	0.00	0.00
18#	42.74	0.00	0.00	0.00	36.06	5.86	5.85	0.01	0.82	0.00	0.00
TOTAL	419.39	69.78	19.47	50.31	178.88	152.02	134.80	17.22	18.76	0.00	0.00

Portions of these communities occur within proposed Landscape Areas and additional areas may be lost as a result of landscaping and recreational facilities located within these areas.

Table 14 – Potential Loss of Remnant Bushland on the Site

Community	TOTAL AREA (ha)		Existing Approved Areas				Non-Approved Areas			
	Retained - TOTAL (ha)	Retained Areas	Breakdown of Retained Areas		Loss - TOTAL (ha)	Retained - TOTAL (ha)	Retained Areas		Loss - TOTAL (ha)	
			Open Space (ha)	Environmental Protection (ha)			Open Space (ha)	Environmental Protection (ha)		
1a	28.35	3.14	25.20	4.75	0.00	0.00	0.00	0.00	0.00	
1b	4.11	0.00	4.11	0.55	0.00	0.00	0.00	0.00	0.00	
1c	8.23	0.03	8.20	2.91	1.54	1.51	0.03	0.20	0.20	
1d	1.68	1.68	0.00	0.69	0.00	0.00	0.00	0.00	0.00	
2a	0.69	0.00	0.69	0.28	8.13	0.46	7.67	0.00	0.00	
2b	0.00	0.00	0.00	0.02	0.32	0.32	0.00	0.00	0.00	
2c	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	
2d	1.07	1.07	0.00	0.17	0.19	0.19	0.00	0.00	0.00	
3	1.93	0.73	1.20	0.19	0.07	0.07	0.00	0.00	0.00	
4	0.00	0.00	0.00	2.12	0.02	0.00	0.02	0.00	0.00	
5	0.00	0.00	0.00	0.00	2.48	0.28	2.21	0.00	0.00	
6	0.18	0.14	0.04	1.60	0.14	0.00	0.14	0.00	0.00	
7	0.00	0.00	0.00	3.80	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	3.80	0.00	0.00	0.06	0.00	0.00	
9	0.18	0.18	0.00	0.00	0.09	0.09	0.00	0.00	0.00	
11	2.59	0.00	2.59	0.13	0.00	0.00	0.00	0.00	0.00	
15	0.00	0.00	0.00	0.00	5.66	0.25	5.41	0.00	0.00	
TOTAL	49.01	6.97	42.03	22.08	19.24	3.72	15.54	0.20	0.20	

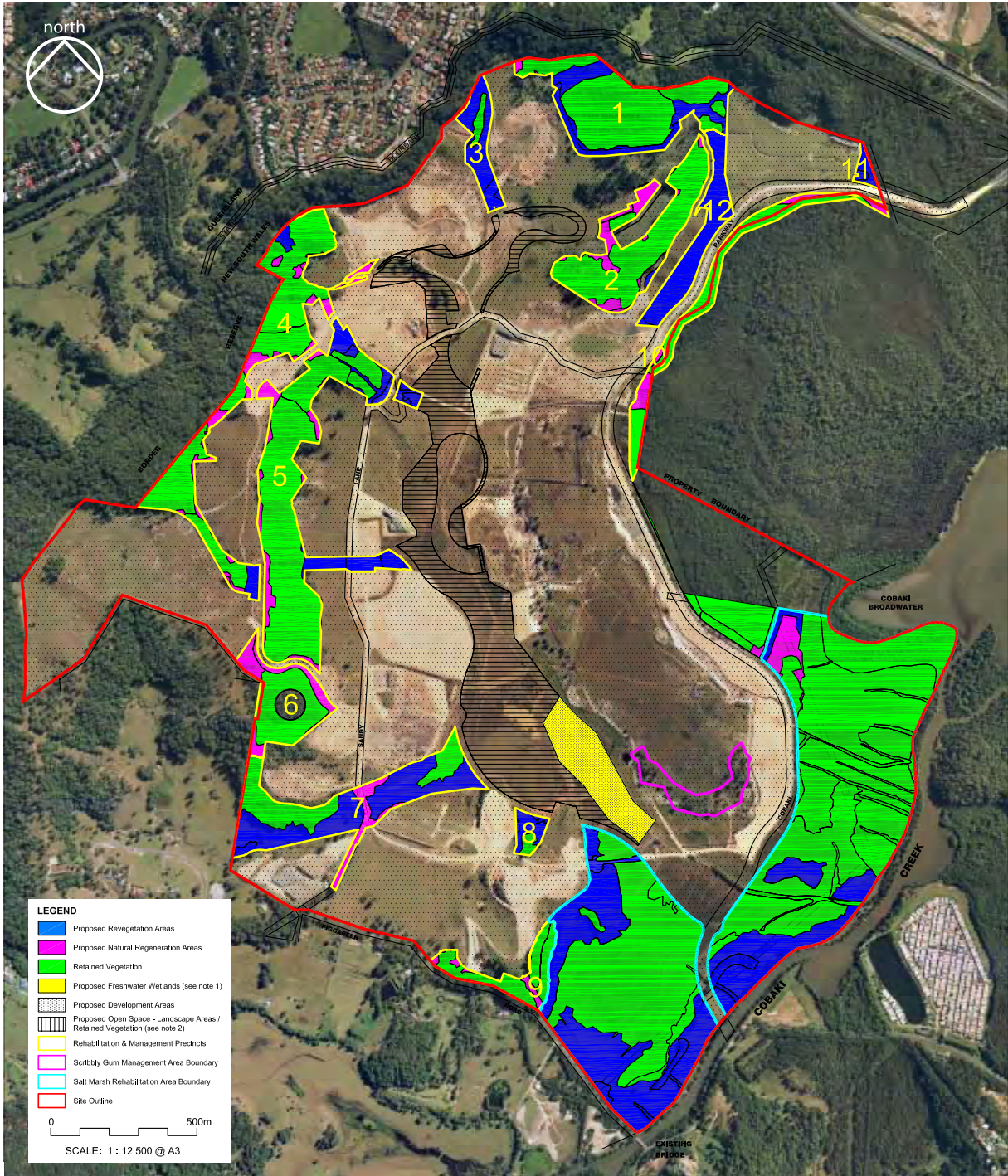


Figure 34 – Rehabilitation and Management Precincts

Environmental Management

A number of management plans have been prepared by James Warren & Associates (**Appendix I**) to manage and mitigate the potential adverse impacts of development on the existing vegetation on the site. These are listed above and management measures in relation to specific areas of the site, such as Ecological Endangered Communities etc, are discussed in more detail below.

Specifically a Vegetation Management Plan has been prepared to direct the clearing of vegetation and the strategies for weed control within the site and a Site Regeneration and Revegetation Plan has been prepared which:

- provides a plan for the revegetation and regeneration of the site;
- identifies areas of retained vegetation that will be maintained through weed control and general maintenance;
- identifies areas that will be rehabilitated using natural regeneration or enhancement plantings;
- provides management guidelines for the revegetation, natural regeneration and weed control to be implemented;
- outlines a maintenance plan and monitoring program for the site; and
- provides management guidelines for the on-going conservation of vegetation on the site.

In addition a Scribbly Gum Management Plan has been prepared. This:

- assesses the health and the potential danger of each individual Scribbly Gum on the site;
- identifies trees which may play a part in future development and conservation objectives of the area; and
- provides management guidelines for the removal of the trees and on-going conservation of those which are being preserved.

Whilst the maximum area proposed to be lost has been calculated based on the Concept Plan, there may be opportunities to retain areas of native vegetation within the proposed development footprint once the detailed design of the precincts is completed.

Conclusions

A total of 197.64ha of vegetation which includes 22.28ha of remnant bushland is proposed to be removed from the site. Existing development consents have already approved the removal of 178.88ha of vegetation and 22.08ha of remnant bushland, therefore a further 18.76ha of vegetation and 0.20ha of remnant bushland is to be removed as a result of the Concept Plan.

A total of 221.8 ha of vegetation including 68.25ha of remnant bushland is to be retained, rehabilitated and protected on the site.

The vegetation to be removed from the site lies within land zoned 2(c) Urban Expansion and land proposed to be re-zoned 2(c) Urban Expansion (as discussed in Section 3).

The management strategies, as set out within the Vegetation Management Plan, Scribbly Gum Management Plan and the Site Regeneration and Revegetation Plan will be implemented as specified in the Draft Statement of Commitments at Section 7.

It is considered that the proposed clearing is acceptable given:

- the current and proposed zonings of the land;
- the increase in the areas of vegetation and remnant bushland to be cleared is minor in relation to that already approved; and
- a considerable amount of land on the site is to be retained, rehabilitated and protected, as proposed within the Vegetation Management Plan, Site Regeneration and Revegetation Plan and the Scribbly Gum Management Plan.

6.4.2 Flora – Threatened Species

Existing Environment

Eight threatened flora species under the *Threatened Species Conservation Act 1996* (TSC Act) have been recorded at the site. **Table 15** below lists these species and their status under the TSC Act and **Figures 35, 36** and **37** show the location of the threatened fauna on the site. Two of these species, the Spiny Gardenia (*Randia Moorei*) and the Scented aronychia (*Acronychia*) are also listed as endangered under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

James Warren & Associates refer to the Coolamon (*Syzygium moorei*), which is listed as being Vulnerable under the TSC Act and the EPBC Act, whilst two specimens are recorded within the border reserve to the north of the site, no stems of the species have actually been recorded on the site.

Table 15 – Threatened Flora Species at Cobaki Lakes

Common Name	TSC Act Status	EPBC Act Status
Spiny Gardenia	Endangered	Endangered
Scented Aronychia	Endangered	Endangered
Coolamon	Endangered	Endangered
White Yiel Yiel	Endangered	Not Listed
Brush Cassia	Endangered	Not Listed
Green-leaved Rose Walnut	Endangered	Not Listed
Fine-leaved Tuckeroo	Vulnerable	Not Listed
Marblewood	Vulnerable	Not Listed

A further five threatened species have been recorded during surveys on adjacent land therefore, the site is considered to be a potential habitat for these species, which are:

- Pink nodding orchid (Endangered – TSC Act);
- Swamp orchid (Endangered – TSC Act);
- Stinking cryptocarya (Vulnerable – TSC Act and EPBC Act);
- Rough-shelled bush-nut (Vulnerable – TSC Act and EPBC Act); and
- White lace flower (Vulnerable – TSC Act).

Potential Impacts

Figures 38, 39 & 40 show the threatened species on the site which are affected by the proposed development. **Table 16** shows the number of individual plants for each species which fall within the proposed development footprint and **Table 17** shows the areas of potential habitat which will be affected.

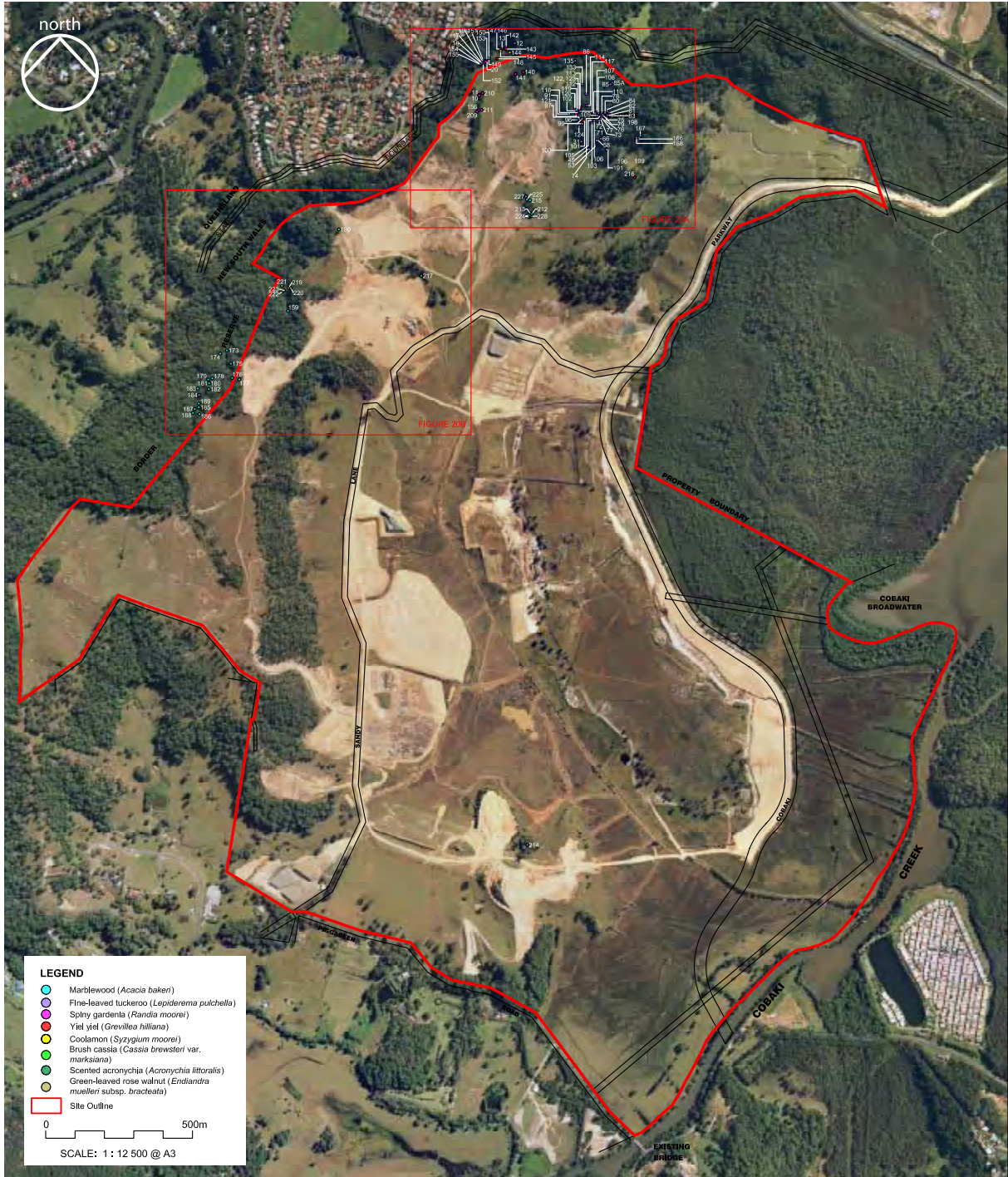


Figure 35 – Location of Threatened Flora on the Site

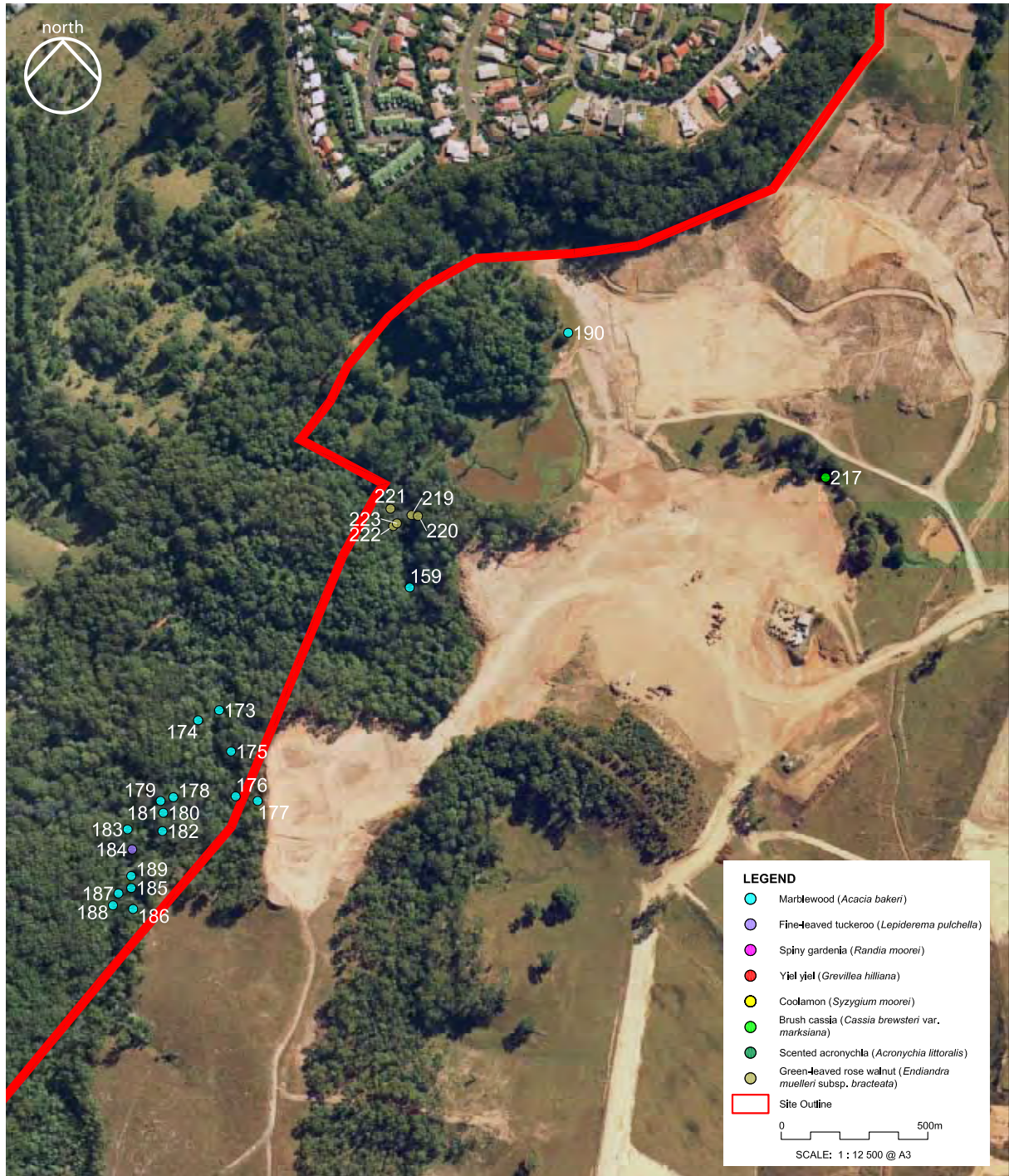


Figure 36 – Location of Threatened Flora – Eastern Area

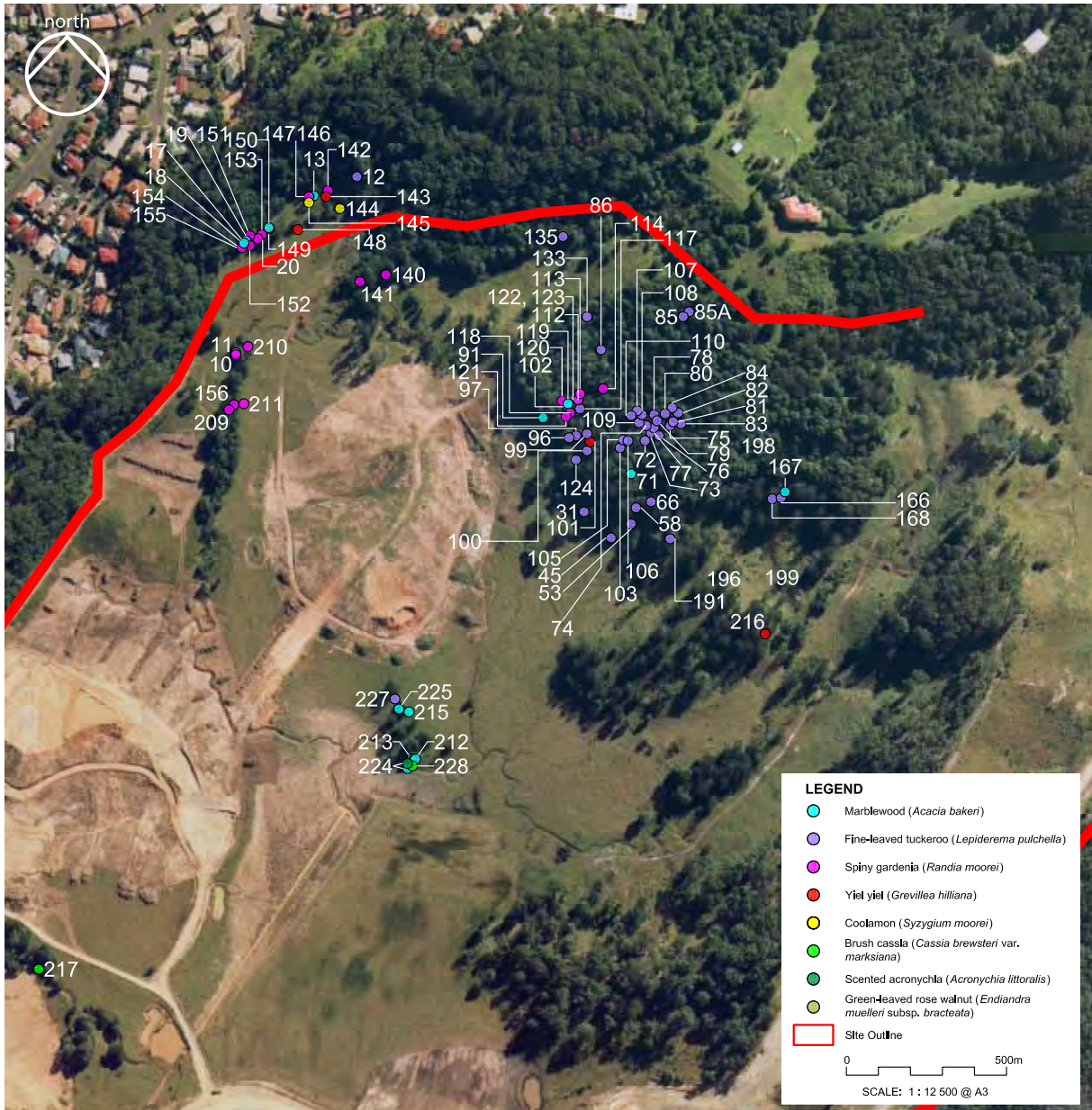


Figure 37 – Location of Threatened Flora – Northern Area

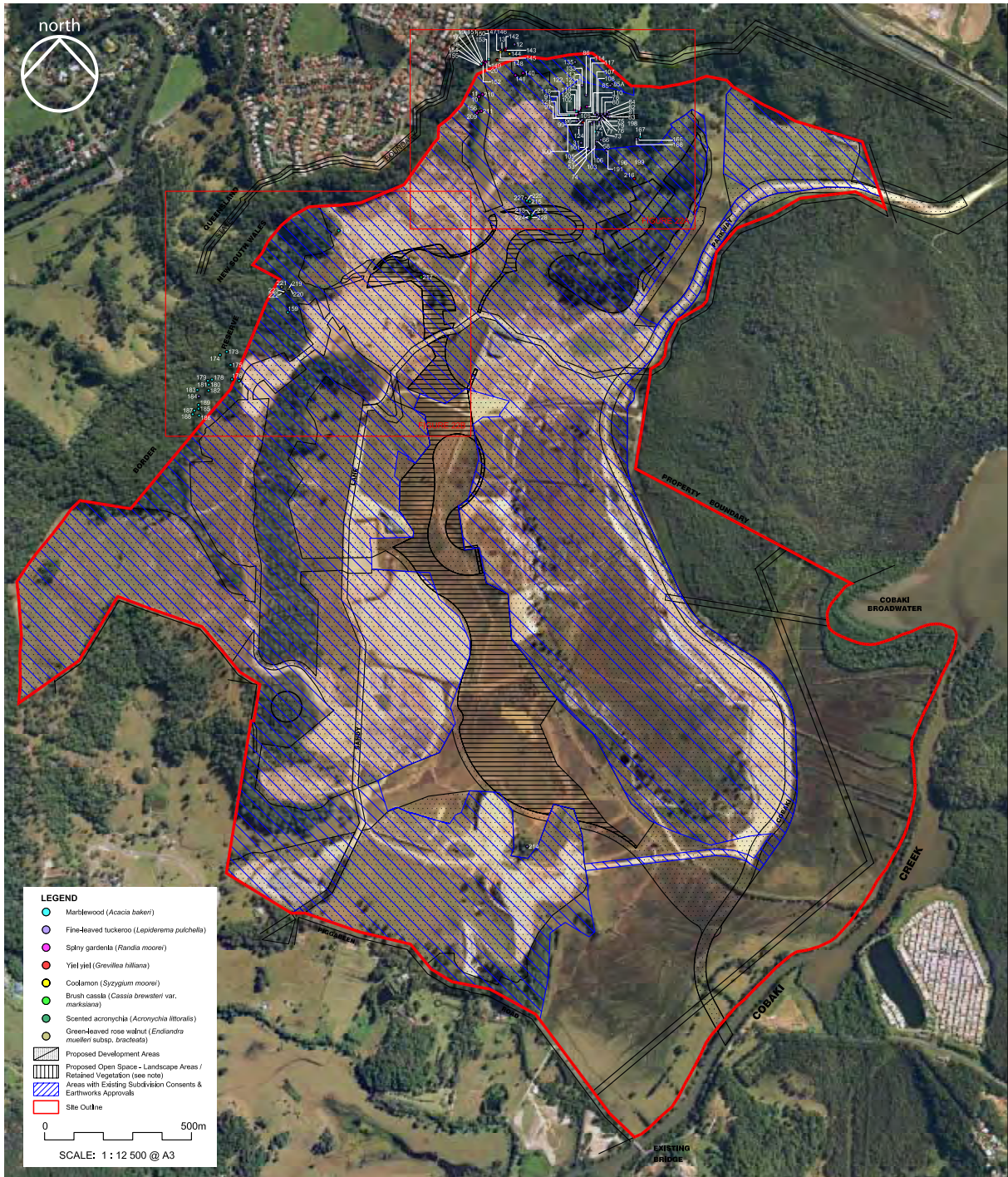


Figure 38 – Impact of the Development on Threatened Flora on the Site

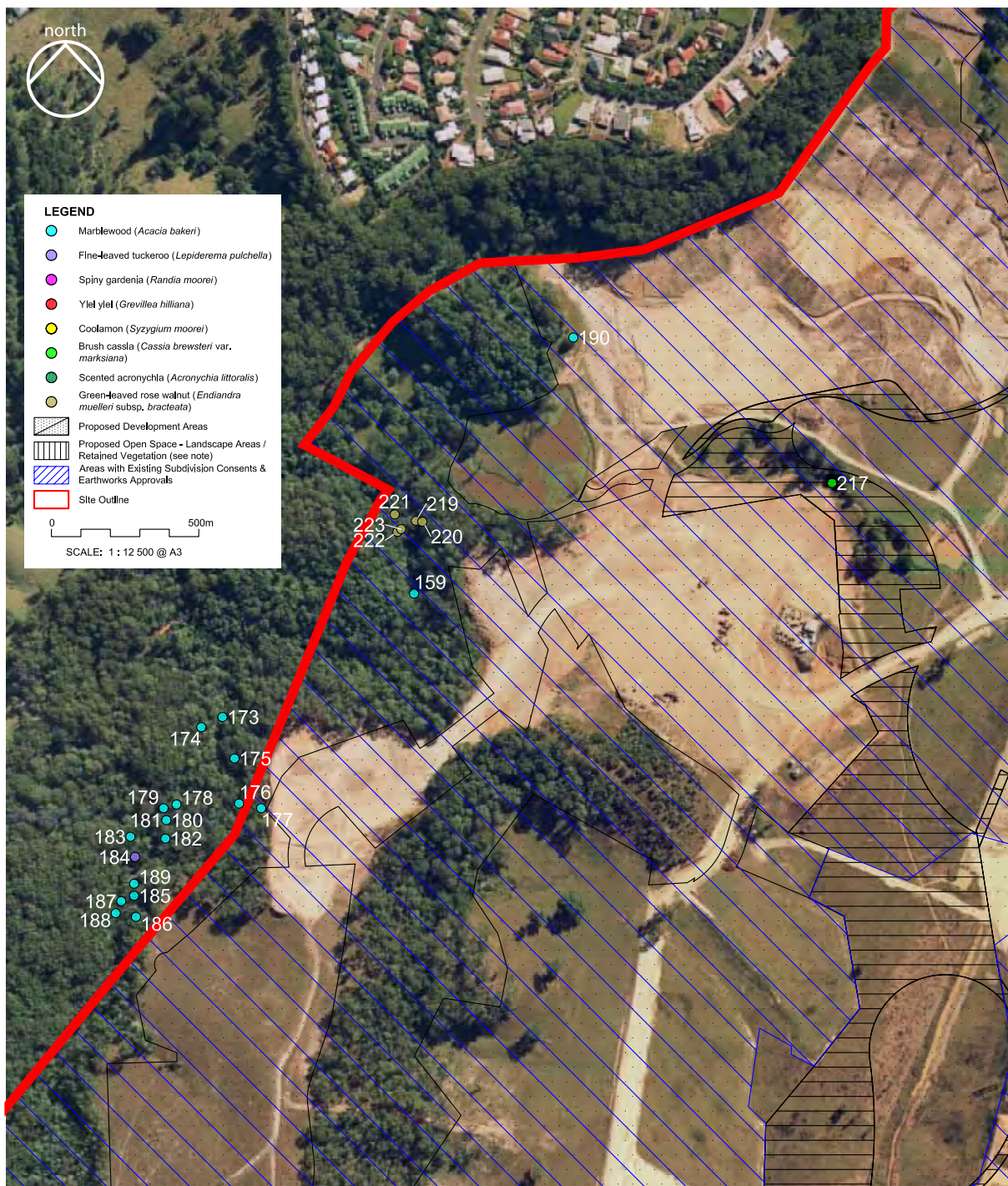


Figure 39 – Impact of the Development on Threatened Flora – Eastern Area

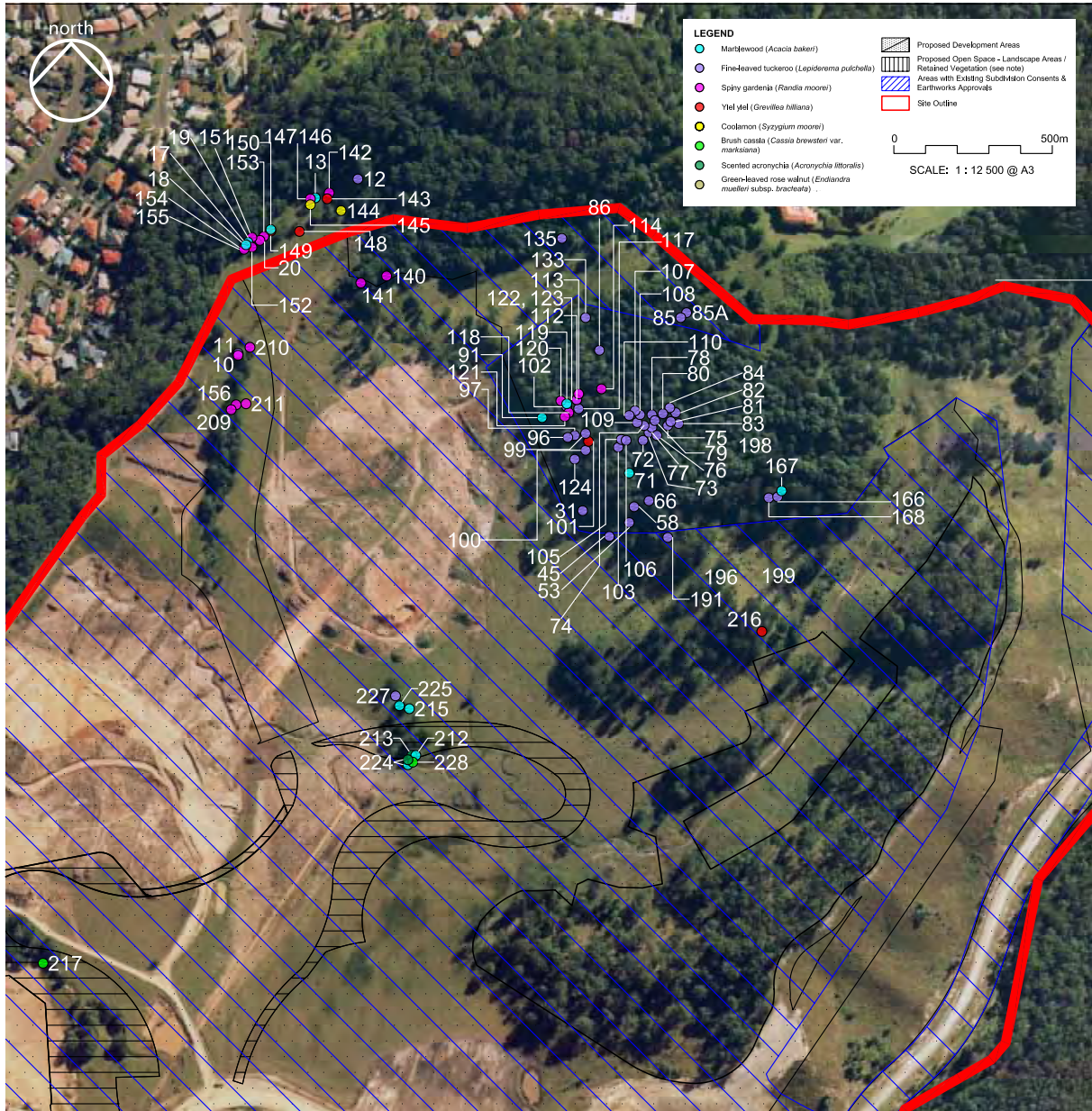


Figure 40 – Impact of the Development on Threatened Flora – Northern Area

Table 16 – Numbers of Threatened Flora Plants Potentially Affected

Species	Total number of plants on within the site boundary	Total plants within the proposed development footprint
Spiny Gardenia	14	1
Scented aronychia	1	1
White yiel yiel	2	1
Brush Cassia	2	0
Green-leaved rose walnut	5	0
Fine-leaved tuckeroo	39	6
Marblewood	9	4
Coolamon	0	0
TOTAL	72	13

Whilst a total of 13 plants are proposed to be affected, a total of 59 plants will be retained and protected on the site.

All of the threatened species recorded on and adjacent to the site, with the exception of the Swamp orchid and the Pink nodding orchid are typical of Lowland rainforest. A total of 11.23ha of Lowland rainforest exists on the site, however approximately 0.82ha of Lowland rainforest is proposed to be removed as a result of the development.

The Swamp orchid and the Pink nodding orchid have been recorded adjacent to the site and are typical of swamp sclerophyll forest communities. A total of 3.8ha of swamp sclerophyll forest currently exists on the site and this entire area will be lost as a result of the development. We note however, that the conservation significance of this community has been severely compromised by past land-use activities such as cattle grazing and periodic slashing.

Environmental Management

All of the threatened plants recorded on the site are typical of Lowland rainforest. In accordance with the Site Regeneration and Revegetation Management Plan approximately 10.4ha of Lowland rainforest will be retained and an additional 14.66ha of land will be rehabilitated as Lowland rainforest to ensure protection for the retained threatened flora species and provide additional habitat. In addition, every retained threatened plant, will be provided with a 5m vegetated buffer to ensure maximum protection.

A further 18.18ha of Swamp sclerophyll forest will be regenerated / revegetated on the site to offset the loss of the 3.8ha of forest, as proposed.

It is proposed that detailed assessments will be undertaken at the Development Application stage for each precinct (which will include 7 part tests in accordance with the TSC Act), to maximise the potential to retain the threatened flora which fall within the proposed development footprint. In addition, it is proposed that propagation of threatened flora species is undertaken as part of the rehabilitation works on the site, in an attempt to raise local populations.

Individual regeneration and revegetation plans are to be completed for each of the rehabilitation precincts (as set out in **Figure 34**), at the Operational Works stage.

Table 17 – Potential Loss of Threatened Flora Habitat

Species	Existing habitat (ha)	Existing Approved Areas				Non-Approved Areas				
		Retained Areas		Habitat Loss (ha)	Retained Areas		Habitat Retained (ha)	Breakdown of Retained Areas		Habitat Loss (ha)
		Open Space (ha)	Breakdown of Retained Areas Environmental Protection (ha)		Open Space (ha)	Environmental Protection (ha)				
White yiel yiel	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	
Scented acronychia	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	
Fine-leaved tuckeroo	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	
Spiny gardenia	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	
Marblewood	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	
Brush cassia	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	
Coolamon	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	
Green-leaved rose-walnut	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	
White lace flower	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	
Stinking cryptocarya	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	
Pink nodding orchid	3.80	0.00	0.00	0.00	3.80	0.00	0.00	0.00	0.00	
Swamp orchid	3.80	0.00	0.00	0.00	3.80	0.00	0.00	0.00	0.00	
Rough shelled bush nut	11.23	1.76	1.07	0.69	0.82	8.64	0.97	7.67	0.00	

Conclusion

A total of eight threatened flora species exist on the site and a further five are located on adjacent land. The site however includes potential habitat for all 13 species. These species are found predominantly within the Lowland rainforest and Swamp sclerophyll forest communities. Approximately 0.82ha of Lowland rainforest and 3.8ha of swamp sclerophyll forest is to be removed from the site. In addition, 13 out of the 72 threatened species plants fall within the proposed development footprint and will be potentially affected.

The location of the threatened flora species have been taken into account in the Concept Plan design. Those which fall within the development footprint, may be able to be retained and protected when the detailed design of each precinct is undertaken.

In addition, to offset the lost threatened species habitat, in accordance with the Site Regeneration and Revegetation Plan, 14.66ha of land will be rehabilitated as Lowland rainforest and 18.18ha of land will be regenerated / revegetated for Swamp sclerophyll forest.

The removal of this small area of threatened species habitat is considered to be acceptable given the proposed amount of land which is to be rehabilitated. Further investigation in regard to the retention of the threatened species within the development footprint will be undertaken. This is included in the Draft Statement of Commitments at Section 7.

6.4.3 Flora – Endangered Ecological Communities

Existing Environment

James Warren & Associates have recorded six Endangered Ecological Communities (EECs) on the site, as listed under Schedule 1 of the TSC Act. These are:

- Swamp sclerophyll forest on coastal floodplain
- Lowland rainforest on floodplain
- Lowland rainforest
- Freshwater wetlands
- Swamp oak floodplain forest
- Coastal Saltmarsh in the NSW Coast bioregion

The locations of these EECs are shown on **Figure 41** below.

Potential Impacts

The extent to which the EECs are affected by the proposed development is illustrated in **Figure 42** and the area of each EEC which falls within the proposed development footprint is set out in **Table 18** below.

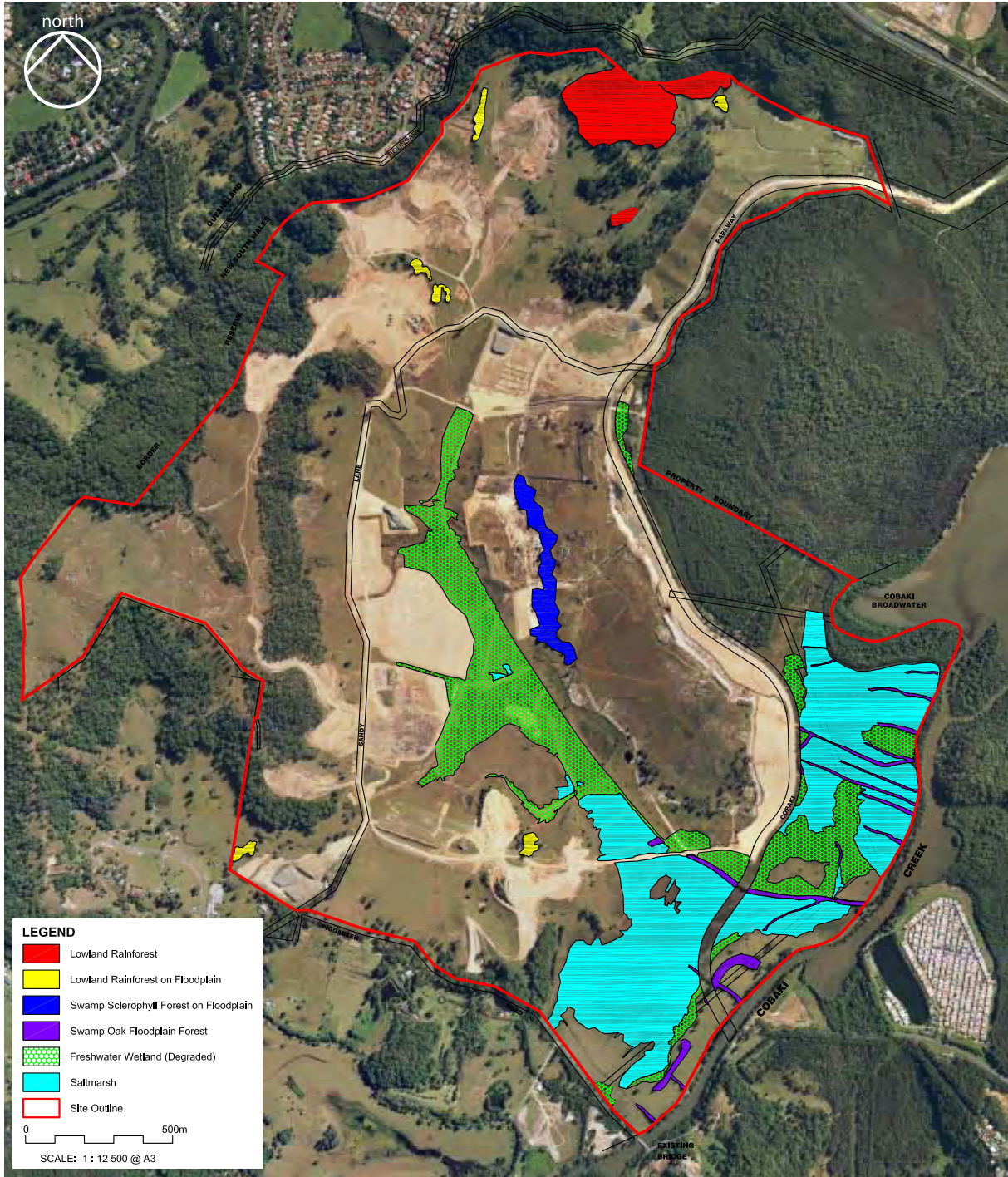


Figure 41 – Endangered Ecological Communities on the Site

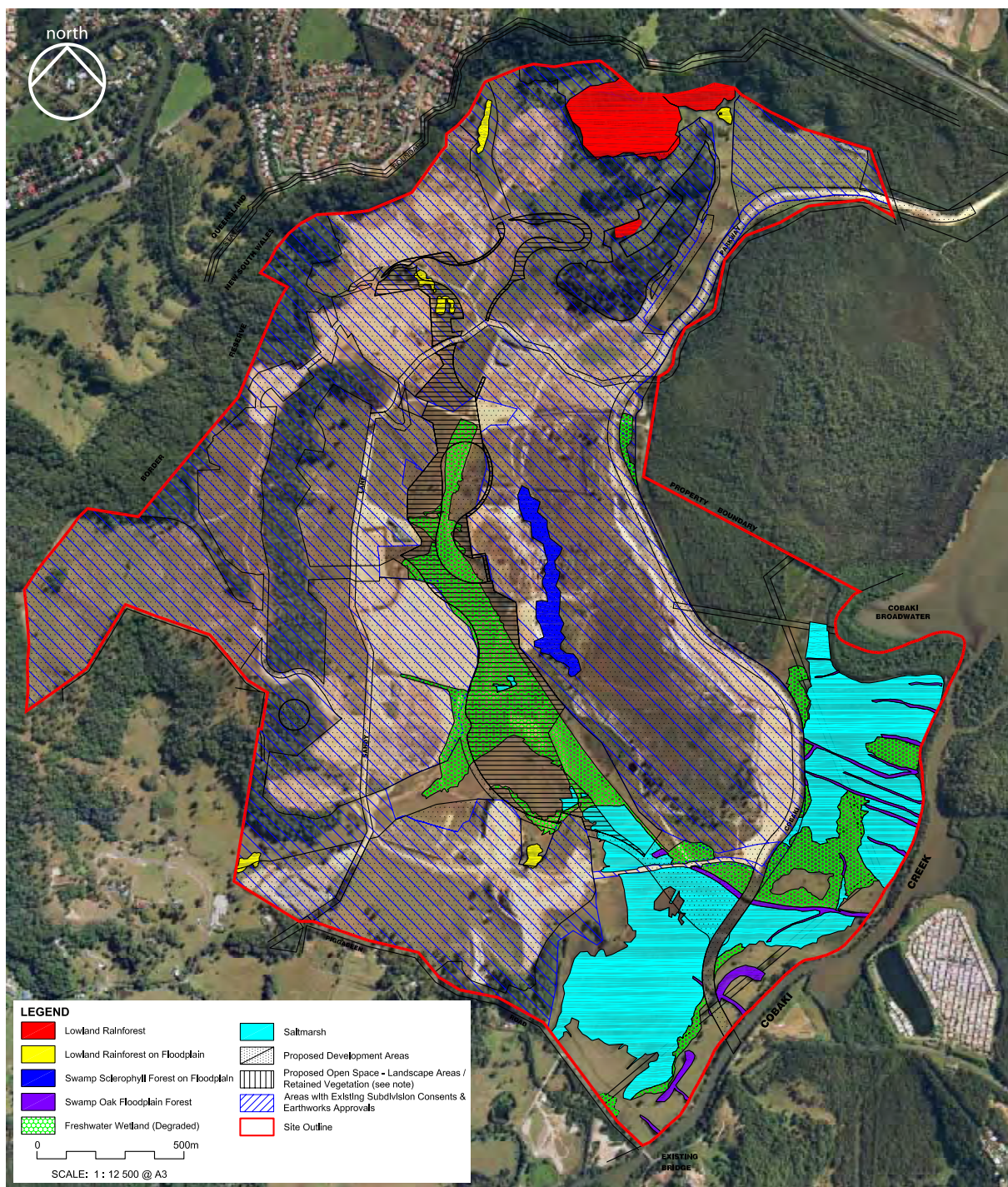


Figure 42 – Impact of the Development on Endangered Ecological Communities

Table 18 – Areas of EECs Potentially Affected

Endangered Ecological Community	Total area of EEC	Area of EEC within the proposed development footprint
Swamp sclerophyll forest on coastal floodplain	3.8 ha	3.8 ha
Lowland rainforest on floodplain	1.78 ha	0.19 ha
Lowland rainforest	9.45 ha	0.63 ha
Freshwater wetlands	37.64 ha	6.82 ha
Swamp oak floodplain forest	4.24 ha	0.37 ha
Coastal saltmarsh in the NSW North Coast bioregion	53.95 ha	4.78 ha
TOTAL	114.66ha	16.59ha

As **Table 18** above shows, 16.59ha of land designated as an EEC falls within the development footprint for the site and is proposed to be cleared. There may be opportunities to retain more EEC land which falls within the proposed development footprint. The extent to which the EEC land will be retained / removed will be subject to a more detailed assessment at the Project Application / Development Application stage (including a 7 part test).

Environmental Management

Much of the Swamp sclerophyll forest, Lowland rainforest on floodplain, Freshwater wetlands, Swamp oak floodplain forest and Coastal Saltmarsh areas have been compromised by past land-use activities including cattle grazing, periodic slashing and earthworks.

New areas of Swamp sclerophyll forest, Lowland rainforest on floodplain, Lowland rainforest, Freshwater Wetland, Saltmarsh and Swamp oak Floodplain Forest will be provided within the site (refer to **Table 19** and **Figure 43** below). In accordance with the Site Regeneration and Revegetation Plan, measures to compensate for any loss of these EECs on the site are proposed.

Table 19 – Proposed EEC off-set areas

EEC Offset Areas	Loss – TOTAL (ha)	Revegetation Areas (ha)	Natural Regeneration Areas (ha)	Total Area (ha)
Swamp Sclerophyll on Floodplain	3.80	15.82	2.36	18.18
Lowland Rainforest on Floodplain	0.19	4.81	0	4.81
Lowland Rainforest	0.63	7.62	2.23	9.85
Freshwater Wetland	6.82	2.73	3.09	5.82
Swamp oak Floodplain Forest	0.37	7.7#	0	7.7#
Coastal Saltmarsh	4.78	7.7#	0	7.7#
Freshwater Wetland / Swamp Sclerophyll Forest on Floodplain (Landscape Area*)	-	-	-	35.21

*The total area of Freshwater Wetland / Swamp Sclerophyll Forest on Floodplain EEC revegetated within Landscape Areas will be dependent on the location of landscaping and recreational facilities within these areas.

The revegetation of Saltmarsh and Swamp oak floodplain forest will occur in combination over the same area.

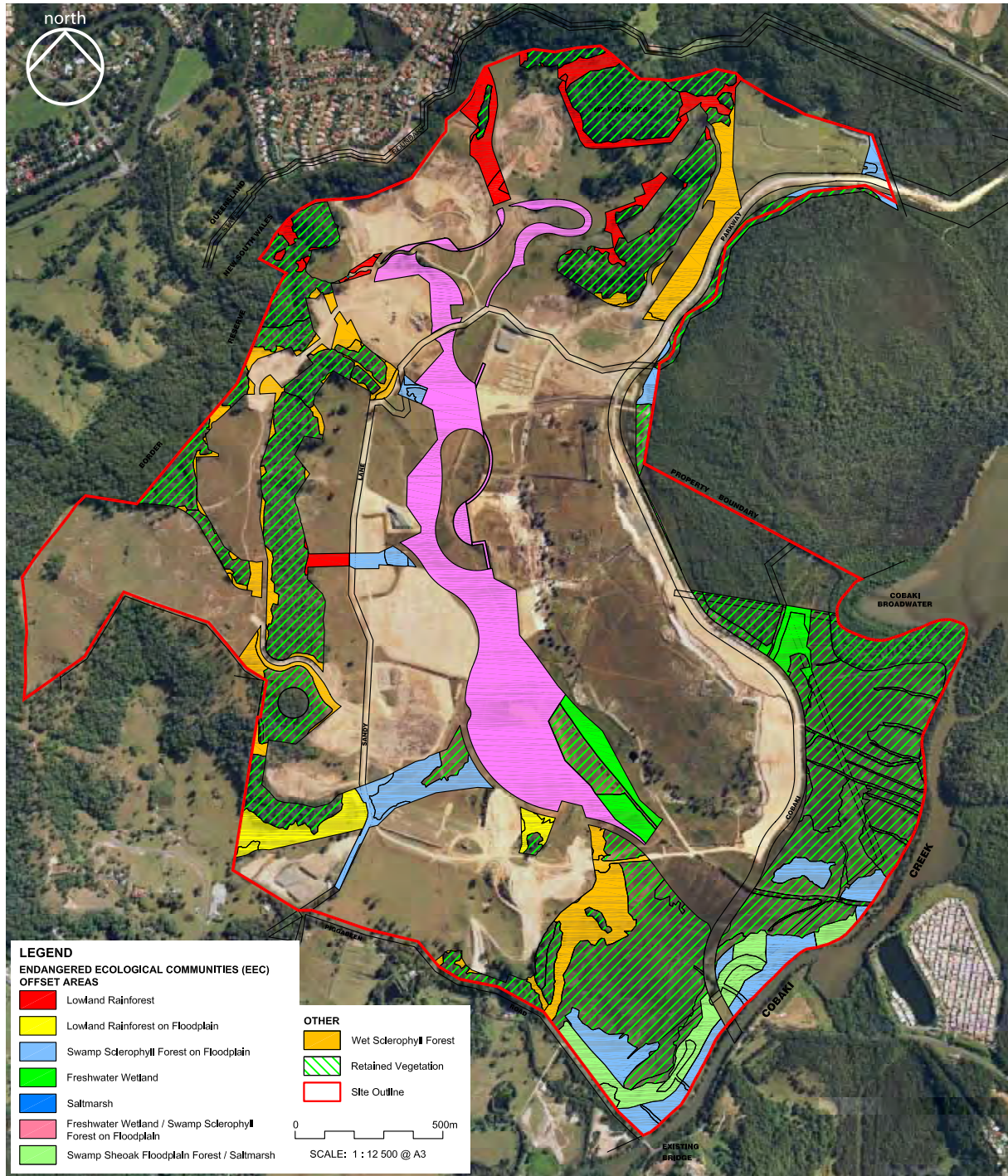


Figure 43 – EEC's Off Set Areas

A Freshwater Wetland Rehabilitation Plan has been prepared for the site which provides performance criteria as well as a detailed maintenance and monitoring program to ensure the long term persistence of the rehabilitated freshwater wetland community on the site. The objectives of the rehabilitation are:

- replace patches of degraded freshwater wetland on the subject site with a more intact wetland area;
- increase the habitat potential of the proposed rehabilitation area;
- improve the long-term viability of freshwater wetland communities on the site;
- reduce erosion and improve stability of the site;
- enhance the visual amenity of the subject site; and
- allow for educational and adjoining recreation opportunities.

In addition a Saltmarsh Rehabilitation Plan has been prepared. This considers the management issues and strategies to mitigate potential impacts on the Saltmarsh Rehabilitation Area and achieve the ecological opportunities described within the Cobaki Broadwater Management Plan.

Conclusion

Overall a total of 16.59ha of land which contains an EEC is to be cleared. Much of this land however is considered to have been compromised by past land use activities.

A total of 46.36ha of land will be revegetated to off set the land which is to be cleared.

The management and rehabilitation plans, as discussed above, will mitigate the potential adverse effects of the proposed development. The measures and strategies within them will be adopted. In addition further, more detailed assessment will be undertaken examine the extent to which areas which lie within the proposed development footprint may be able to be retained. The implementation of the management plans is included in the Draft Statement of Commitments at Section 7.

6.4.4 Flora – Wildlife Corridors

Existing Environment

A number of regional and sub-regional habitat corridors, as contained within the National Parks & Wildlife Service (NPWS) Key Habitats and Corridors database, cross through the site. These are shown in **Figure 44** below and include the following:

- Cobaki-Terranora Regional Corridor;
- Pigabeen Sub-Regional Corridor;
- McPherson Sub-Regional Corridor; and
- Cobaki Sub-Regional Corridor.

However large areas of the site that are included in the NPWS corridors have been cleared of vegetation in accordance with various development approvals.

An assessment of the wildlife corridors has identified the following:

- Cobaki-Terranora Regional Corridor – the majority of the corridor on the site comprises cleared land;
- Pigabeen Sub-Regional Corridor – the majority of this corridor on the site comprises cleared land. A small portion of the corridor contains remnant vegetation;
- McPherson Sub-Regional Corridor – a large proportion of the corridor is comprised of cleared land. The rainforests associated with Mt Woodgee are however included within this corridor as well as mature forest in the north eastern and north western portions of the site;
- Cobaki Sub-Regional Corridor – the corridor comprises saltmarsh communities in the low-lying eastern portion of the site;
- Key Habitat – the key habitat areas largely comprise cleared land.

Potential Impacts

The proposed development has the potential to reduce the overall effectiveness of the site as a wildlife corridor due to habitat loss and fragmentation.

The extent to which the proposed development encroaches on the identified Wildlife Corridors is illustrated in **Figure 45**.

Large portions of the Cobaki-Terranora Regional Corridor, Pigabeen and McPherson Sub-Regional Corridors cross parts of the site, which have existing development consent approvals or are proposed to be developed within the Concept Plan. Large areas mapped as Key Habitats also have existing development consent approvals are proposed to be developed.

The proposed development will not impact upon the Cobaki Sub-Regional Corridor.

Environmental Management

The proposed development has been designed to utilise existing cleared areas where possible. A network of existing vegetated corridors will be retained, including vegetation within the Pigabeen and McPerson Sub Regional Corridors and some of the Key Habitat areas. In addition, a total 59.5ha of revegetated / regenerated land will provide vegetated links across the site and ensure that the remaining wildlife corridors will be embellished through revegetation and natural regeneration principles.

The proposed amelioration measures for the Corridors on the site include:

- Cobaki-Terranora Regional Corridor - the retention and rehabilitation of all the intertidal communities occurring east of the Cobaki Parkway to ensure that movement opportunities for fauna species along this regional corridor will continue;
- Pigabeen Sub-Regional Corridor – some rehabilitation works will occur within the corridor. Additional corridors will be revegetated / regenerated to the north and south of the mapped location of the Pigabeen corridor to increase current movement opportunities for fauna across the site;
- McPherson Sub-Regional Corridor – some rehabilitation will occur within this corridor. The scattered clumps of vegetation in this area will be replaced by a number of smaller corridors which link the Border reserve with the central Open Space area of the site. The rainforests associated with Mt Woodgee and mature forests in the north-eastern and north-western portions of the site which occur within this corridor will be retained and rehabilitated;
- Cobaki Sub-Regional Corridor – the proposed development will not impact on the extent of vegetation. Saltmarsh communities in this portion of the site will be retained and rehabilitated;
- Key Habitats – whilst development will occur within areas of the site identified as Key Habitat, no further vegetation within these areas will be removed. All retained vegetation identified as Key Habitats will be retained, buffered and rehabilitated in accordance with the Site Regeneration and Revegetation Plan.

Conclusion

It is considered that the impact on the wildlife Corridors will be minimal given that much of the land on the site which is included within these Corridors has been cleared under existing development consents. In accordance with the Site Regeneration and Revegetation Plan, where vegetation / remaining wildlife areas exist within the Corridors, these will be embellished utilising revegetation and natural regeneration principles. Furthermore additional areas will be revegetated and rehabilitated to provide vegetated links across the site.

The measures within the Site Regeneration and Revegetation Plan will be adopted. This is included within the Draft Statement of Commitments at Section 7.

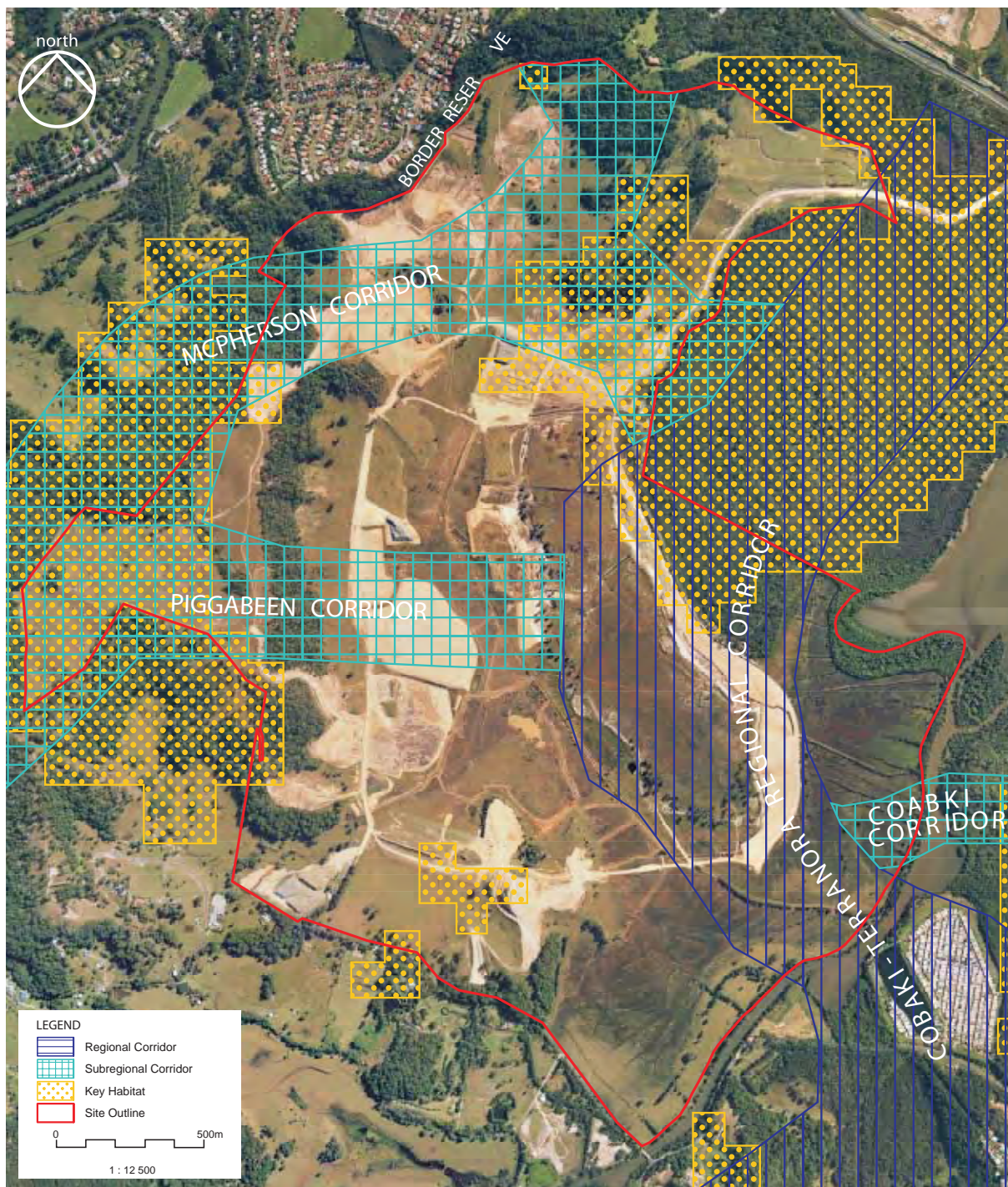


Figure 44 – Wildlife Corridors and NPWS key Habitats

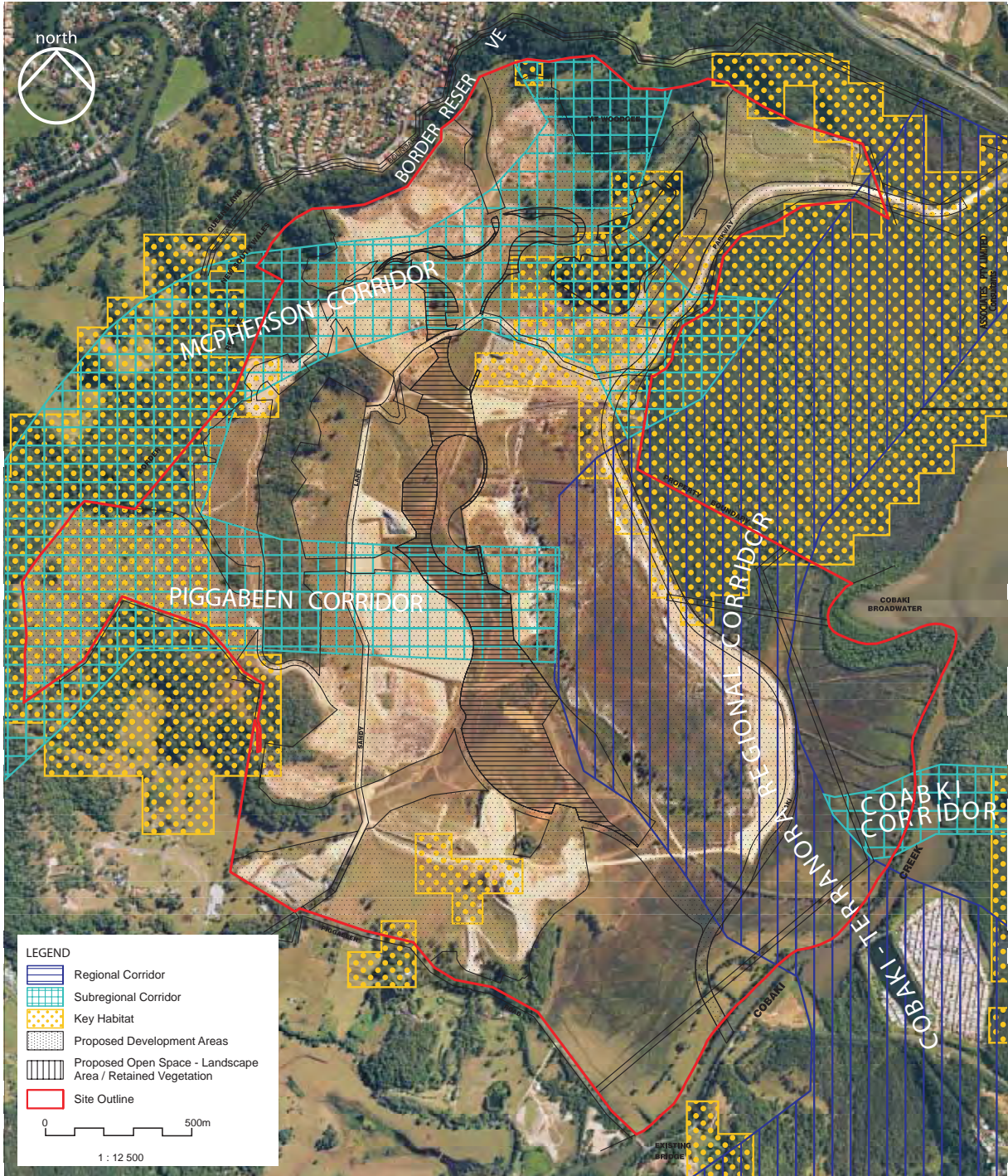


Figure 45 – Impact on Wildlife Corridors and Key Habitats

6.4.5 Flora – SEPP 14 Coastal Wetlands

Existing Environment

The Cobaki Lakes site is located adjacent to wetlands identified under State Environmental Planning Policy 14 – Coastal Wetlands (SEPP 14). Small areas of the SEPP 14 wetlands are present on the site. These are shown in **Figure 46**.

Potential Impacts

Coastal Wetlands are present on the site at four separate points along the eastern site boundary. They fall within the proposed environmental protection areas within the site and not within any area proposed for development.

The Coastal Wetlands are not likely to be directly affected by the proposed development, however may be indirectly affected by:

- changes in the water quality;
- alteration of the local hydrological regime;
- sedimentation; or
- a combination of these factors.

In addition, stormwater runoff from the site has the potential to impact on the hydrological regime of the adjacent area of wetland.

Environmental Management

Along the north eastern boundary of the site, the part of the Coastal Wetland which is within the site will be separated from any proposed development by a buffer zone and the Cobaki Parkway road, which has already been established on site.

In addition, a Stormwater Concept Plan has been prepared by Gilbert + Sutherland and is included in **Appendix E**. This includes measures to ensure that untreated stormwater does not flow directly into the Coastal Wetlands. Further planted buffer zones will also be created where necessary in accordance with the Site Regeneration and Revegetation Plan measures and strategies.

Conclusions

The Coastal Wetlands are present on the site. They mainly fall within the proposed environmental protection areas and not within any area proposed for development.

Measures set out within the Site Regeneration and Revegetation Plan and Stormwater Concept Plan will be adopted to provide a buffer zone to protect the Wetlands directly and also from indirect impacts caused as a result of stormwater runoff.

The proposed development will therefore not impact adversely upon the Coastal Wetlands adjacent to the site. The adoption of the measures within the Site Regeneration and Revegetation Plan and Stormwater Concept Plan is included within the Draft Statement of Commitments at Section 7.



Figure 46 – SEPP 14 Coastal Wetlands

6.4.6 Fauna – Threatened Species

Existing Environment

Twelve fauna species listed under the TSC Act have been recorded at the site. The known locations of threatened fauna sightings on the site are shown in **Figure 47**. **Table 20** below lists these species, their status under the TSC Act and EPBC Act and the location of the known sightings on the site.

The Grey-headed flying fox (*Pteropus poliocephalus*) is listed as being vulnerable under the EPBC Act 1999.

Table 20 – Threatened Fauna species at Cobaki Lakes

Common Name	TSC Act	EPBC Act	Location Sighted
Wallum Froglet	Vulnerable	Not Listed	Paperbark areas, sedgeland and in main drainage channel in east of site
Osprey	Vulnerable	Not Listed	Nest in south east of site
Black-necked Stork	Endangered	Not Listed	Low lying eastern and south-eastern portions of the site
Powerful Owl	Vulnerable	Not Listed	North eastern portion of the site
Masked Owl	Vulnerable	Not Listed	North eastern portion of site in 1994, no recent sightings
Koala	Vulnerable	Not Listed	Heard approx 200-300m north of south-western corner of site
Grey-headed flying fox	Vulnerable	Vulnerable	Foraging in various locations on the site
Little bent-wing bat	Vulnerable	Not Listed	n/a
Common bent-wing bat	Vulnerable	Not Listed	n/a
Eastern free-tail bat	Vulnerable	Not Listed	n/a
Yellow-bellied sheath-tail bat	Vulnerable	Not Listed	n/a
Greater broad-nosed bat	Vulnerable	Not Listed	n/a

Potential Impacts

Table 21 identifies the extent of the impact upon the Threatened Fauna habitat.

A summary of the potential impacts in relation to each of the threatened species are set out below. The potential impacts of the proposed development on the identified threatened fauna species will be discussed in detail within the 7 part tests, at the Project Application / Development Application stage.

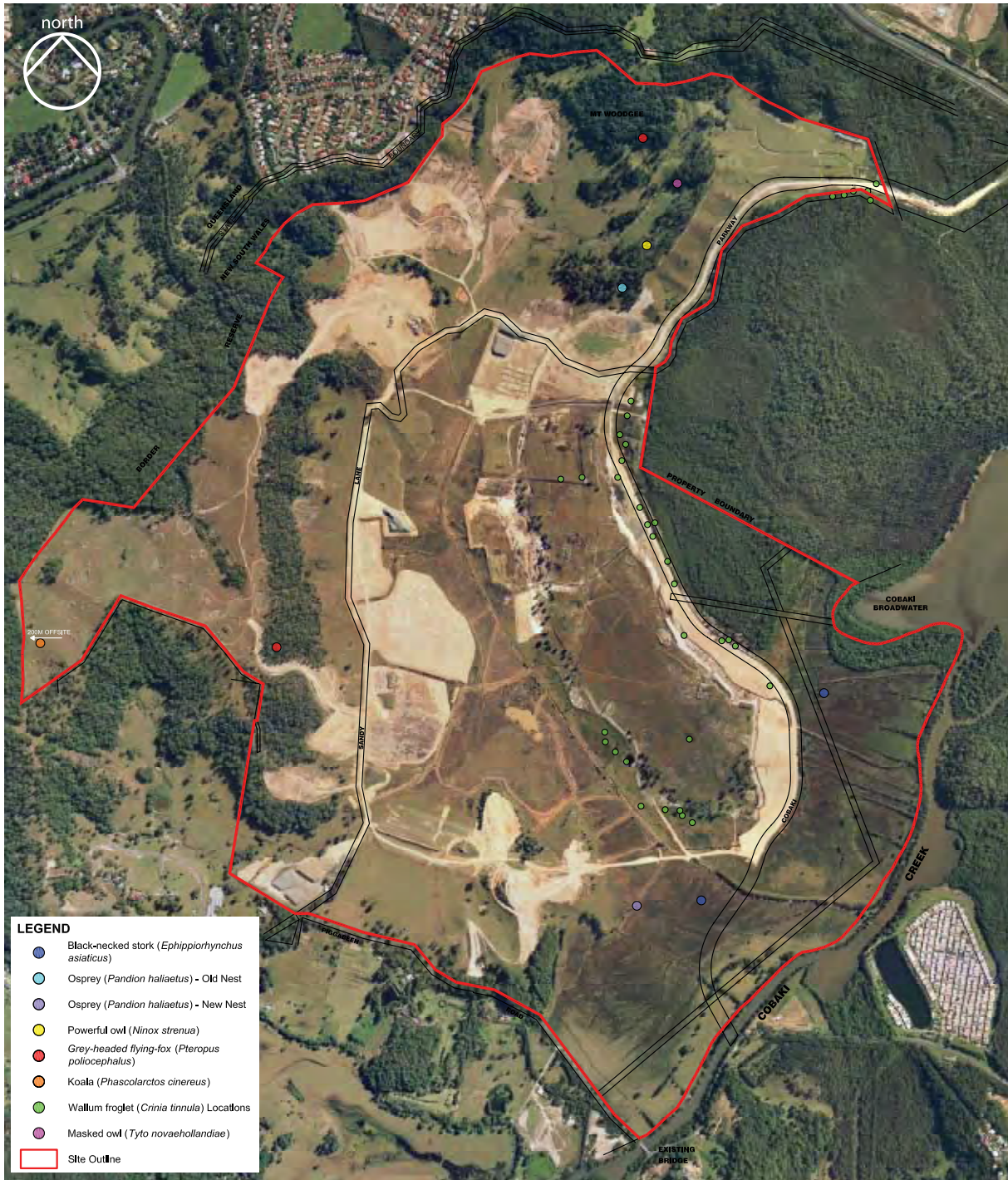


Figure 47 – Location of Threatened Fauna Sightings

Table 21 – Impact on Threatened Fauna Habitat

Species	Existing habitat (ha)	Existing Approved Areas				Non-Approved Areas				
		Retained Areas		Habitat Loss (ha)	Retained Areas		Habitat Retained (ha)	Breakdown of Retained Areas		Habitat Loss (ha)
		Habitat Retained (ha)	Open Space (ha)		Open Space (ha)	Environmental Protection (ha)				
Wallum froglet	82.86	0.08	0.08	0.00	37.05	39.07	36.86	2.22	6.65	
Black-necked stork	142.47	0.21	0.21	0.00	37.47	93.77	85.31	8.46	11.01	
Powerful owl & Masked owl	64.36	44.48	5.76	38.71	17.41	2.30	2.21	0.09	0.20	
Osprey*	-	-	-	-	-	-	-	-	-	
Koala	39.27	30.03	4.82	25.2	9.24	0.00	0.00	0.00	0.00	
Grey-headed flying-fox	82.11	46.42	6.97	39.44	21.95	13.58	3.47	10.13	0.20	
Little bent-wing bat ¹	74.42	45.73	6.97	38.75	21.32	6.84	6.58	0.26	0.57	
Common bent-wing bat ¹	74.42	45.73	6.97	38.75	21.32	6.84	6.58	0.26	0.57	
Eastern little masliff bat ¹	74.42	45.73	6.97	38.75	21.32	6.84	6.58	0.26	0.57	
Yellow-bellied sheathail bat ¹	74.42	45.73	6.97	38.75	21.32	6.84	6.58	0.26	0.57	
Greater broad-nosed bat ¹	74.42	45.73	6.97	38.75	21.32	6.84	6.58	0.26	0.57	

* Nesting habitat only

¹ Forage habitat for these species has been calculated based on more suitable habitat (i.e. forested areas). Other areas of the site (i.e. open areas) may also be utilised for foraging purposes on occasions but have not been included in this calculation.

The key impacts upon the threatened fauna species are set out below. The impacts upon the Koala are discussed in Section 6.4.7.

- Wallum Froglet
 - loss of 43.7ha of potential forage habitat;
 - alteration of water quality in the drainage lines;
 - introduction of weed species; and
 - increased competition from native domestic and introduced fauna.
- Black-necked Stork
 - removal of approximately 48.48ha of potential forage habitat;
- Osprey
 - human disturbance near to any nest site.
- Powerful and Masked Owl
 - loss of approximately 17.61ha of potential habitat; and
 - loss of Sclerophyll forest and woodland may reduce the availability of arboreal and terrestrial mammalian prey for both species.
- Grey-headed flying fox
 - loss of 22.15ha of potential forage habitats.
- Little bent-wing bat and Common bent-wing bat
 - loss of 21.89ha of potential forage habitat.
- Eastern free-tail bat, Yellow-bellied sheath-tail bat and Greater broad-nosed bat
 - loss of 21.89ha of potential forage habitat; and
 - minor loss of potential roost sites for these species.

Environmental Management

A Fauna Management Plan has been prepared which aims to ensure that:

- retained vegetation within designated conservation and Open Space areas are to be clearly marked and protected;
- tree clearing operations shall be completed in a manner that provides maximum protection of the health and livelihood of native fauna; and
- nest boxes are installed to offset the removal of hollow-bearing trees.

The amelioration measures to reduce the impacts on the threatened species habitats are summarised below:

- Approximately 59.5ha of revegetation / regeneration will be completed in accordance with the Site Regeneration and Revegetation Plan to offset any loss of remnant bushland and to provide vegetated links across the site, thus providing additional habitat for threatened fauna species.
- An area in the central portion of the site is to be rehabilitated in accordance with the Freshwater Rehabilitation Plan and designed to provide approximately 5.82ha of additional habitat for the Wallum Froglet and Black-necked Stork within the site.
- 18.18ha of Swamp sclerophyll forest and 35.21ha of landscaping within the Open Space areas will be revegetated and regenerated on the site in accordance with the Site Regeneration and Revegetation Plan. It is considered therefore that the rehabilitated / revegetated areas will provide additional suitable forage habitat for all of the threatened fauna species identified on the site to offset the loss of any forage habitat.

- An additional 93.3ha of vegetation within the south-eastern portion of the site will be retained and rehabilitated in accordance with the Saltmarsh Rehabilitation Plan to provide further suitable forage habitat for the Black-necked stork.
- The old growth trees will be retained, where possible and nest boxes for owls and bat boxes will be installed within the retained vegetation areas to improve the habitat values of the site.
- A buffer of 100m has already been established around an Osprey nest in the south-east portion of the site to ensure its protection.
- The existing Osprey nest site will not be suitable for use in the long-term. The developer is committed to erecting at least two artificial nesting platforms on the site. It is considered therefore that the proposed development is highly unlikely to adversely impact upon this species.

A Stormwater Management Plan has also been prepared (**Appendix E**). This sets out best practise management techniques to ensure that there will be no adverse impacts on the hydrology of the current core Wallum Froglet habitat. This is discussed in Sections 4.12 and 6.6.

Conclusion

The location of the threatened fauna species has been taken into account in the Concept Plan design and none of the sightings of these species are located within the proposed development footprint.

Whilst potential foraging habitat is to be lost from the site, given the provision of rehabilitated / revegetated areas and the individual management strategies for the threatened species, it is considered that suitable foraging habitat will be provided to ensure that the proposed development will not result adverse impacts to the threatened species.

The measures and strategies contained within the Fauna Management Plan, Stormwater Management Plan and additional rehabilitation and management plans are to be adopted. This is contained within the Draft Statement of Commitments at Section 7 of this report.

6.4.7 Fauna – Koalas

The Ecological Assessment (**Appendix I**) prepared by James Warren & Associates considers the provisions set out within SEPP 44 – Koala Habitat Protection. A summary assessment of the impacts of the development on areas of potential Koala habitat is set out below.

Existing Environment

No records of a resident population exist on the site however one male Koala has been heard approximately 200-300m north of the south-western corner of the site. Whilst there are no specific sightings of Koala activity on the site, the site contains a number of species listed under Schedule 2 of the TSC Act as Koala feed tree species and the Tweed Coast Koala atlas, maps part of the site as Secondary Habitat. **Figure 48** shows the extent of the identified Koala habitat on the site.

Clearing activities approved under existing consents have occurred subsequent to the Koala Habitat mapping, this has resulted in the removal of vegetation within large areas of mapped Secondary Habitat which now consists of open grassland and is not considered to represent Koala habitat.

Koalas are considered to utilise the site occasionally as they disperse throughout the locality, however large areas of more suitable habitat are considered to occur within the forested areas west of the site.

Potential Impacts

The key impact of the development on Koala habitat is the loss of approximately 9.24ha of land considered to be suitable for Koala habitat. **Figure 49** shows the extent of the Koala habitat within the proposed development footprint and **Table 22** provides a summary of the potential loss of suitable Koala habitat.

Environmental Management

The majority of the vegetation communities which provide suitable habitat for Koalas on the site will be retained. Specific trees within the Scribbly Gum community (Community 8) will also be retained and protected, in accordance with the Scribbly Gum Management Plan.

In addition, the Site Regeneration and Revegetation Plan proposes measures and strategies to provide newly vegetated and rehabilitated areas on the site, which will increase the area of available habitat in the long-term any vegetated linkages through the site.

Furthermore a Fauna Management Plan has been prepared which sets out specific management actions for Koalas.

Conclusion

No records of a resident Koala population have been found on the site, however the site contains a total of 44.40ha of suitable Koala habitat. It is proposed that 9.24ha of suitable habitat will be removed. Consent to remove this vegetation has already been granted under a separate development consent, however this Concept Plan does not seek approval to clear additional areas.

A total of 35.17ha of suitable habitat is to be retained on the site and new areas are to be regenerated and revegetated to increase the overall area of suitable habitat of the site and vegetated linkages through the site. It is considered therefore that the proposal will not impact upon the Koala population within the locality of the site.

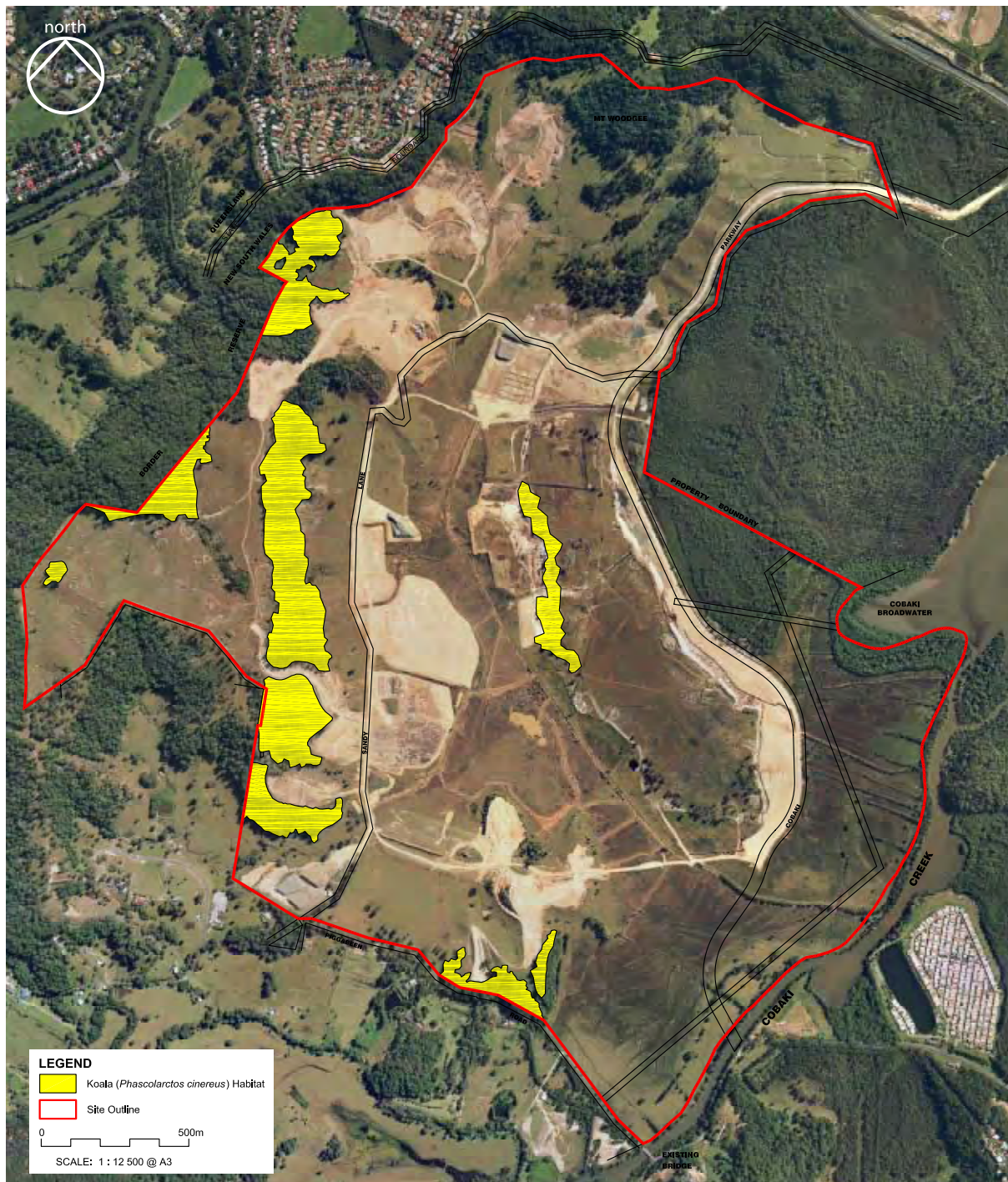


Figure 48 – Identified Koala Habitat

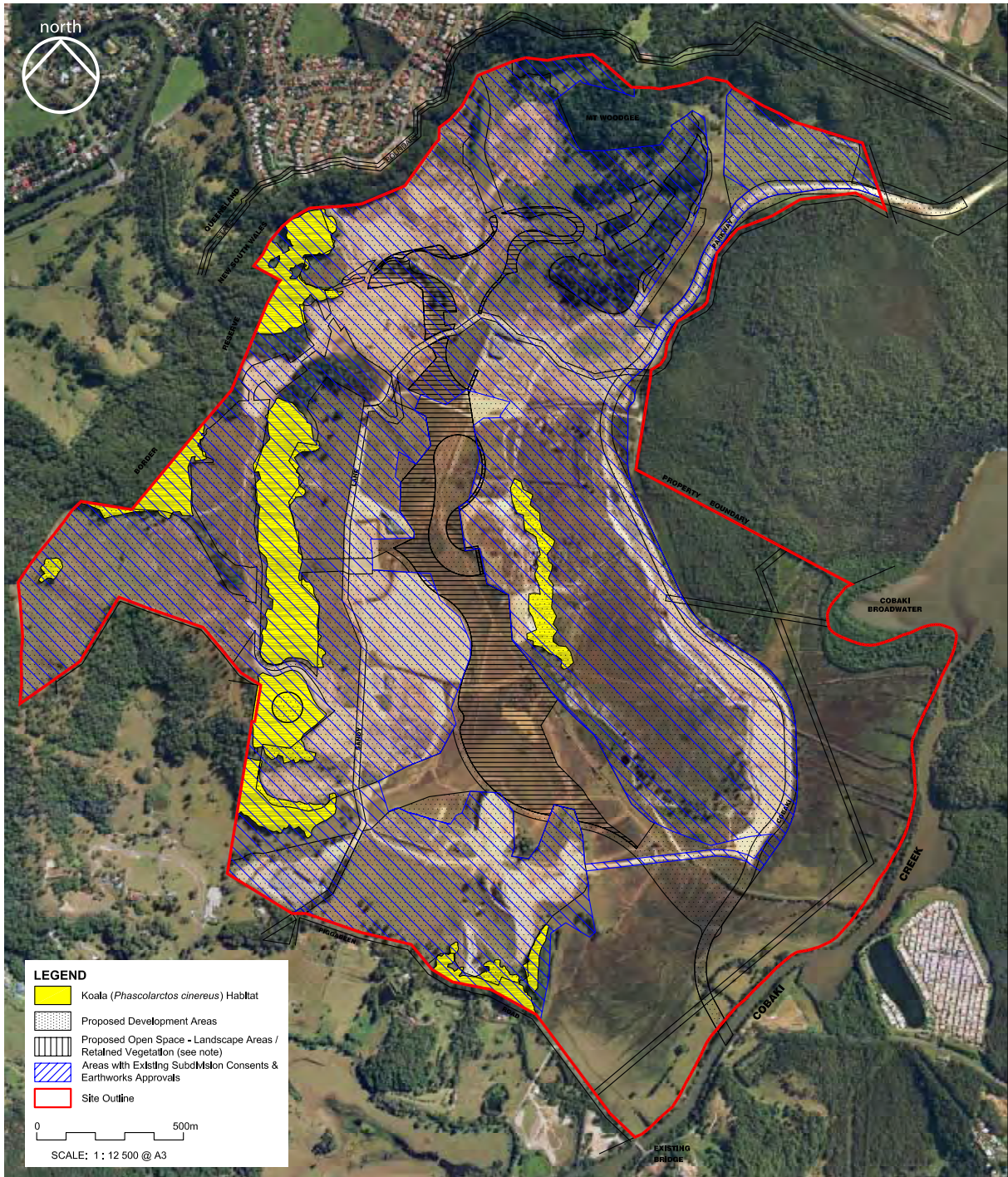


Figure 49 – Impact of Development on Identified Koala Habitat

Table 22 – Potential Loss of Koala Habitat

Community	TOTAL AREA (ha)	Existing Approved Areas				Non-Approved Areas			
		Retained Areas		Loss - TOTAL (ha)	Retained Areas		Loss - TOTAL (ha)		
		Retained - TOTAL (ha)	Breakdown of Retained Areas Open Space (ha)		Environmental Protection (ha)	Retained - TOTAL (ha)		Breakdown of Retained Areas Open Space (ha)	Environmental Protection (ha)
1a#	33.10	28.35	3.14	25.20	4.75	0.00	0.00	0.00	0.00
1d	2.37	1.68	1.68	0.00	0.69	0.00	0.00	0.00	0.00
7	3.80	0.00	0.00	0.00	3.80	0.00	0.00	0.00	0.00
8	5.13	4.53*	0.00	0.00	0.00	0.61	0.55	0.06	0.00
TOTAL	44.40	34.56	4.82	25.2	9.24	0.61	0.55	0.06	0.00

Portions of these communities occur within proposed Landscape Areas and additional areas may be lost as a result of landscaping and recreational facilities located within these areas.

* Specific trees within the Scribbly Gum community (Community 8) will be retained and protected within the development footprint (in accordance with the Scribbly Gum Management Plan)

6.4.8 Biting Midge and Mosquitoes

Existing Environment

Mosquito Consulting Services Pty Ltd have undertaken a Biting Midge and Mosquito Control Assessment and Management Methodology Report (**Appendix J**). It identifies that out of the 270 species of mosquitoes, the species which are most likely to be relevant to the site are:

- *Aedea (Ochlerotatus) vigilax (Skuse)* "The Salt-marsh Mosquito";
- *Culex (Culex) annulirostris Skuse*; and
- *Verrallina funereal* (Theobald).

Between June and August 2007, field inspections were undertaken. In conjunction with consultation and joint inspection with Mr Clive Easton, Entomologist for Tweed Shire Council the following observations were made:

- The site contains more than 50ha of highly productive breeding habitat for *Aedea vigilax* (i.e. the Saltmarsh Area).
- The salt-marsh on the site is generally in very poor condition due to the action of cattle causing significant erosion and slumping that is increasing the size and number of ground pools suitable for *Aedea vigilax* breeding.
- The site contains a further 10ha of fresh / brackish wetlands habitat suitable for *Culex annulirostris* breeding.
- The *Aedea vigilax* breeding habitat on Cobaki Lakes represents approximately 80% of such habitat in the northern Tweed.
- *Aedea vigilax* and *Culex annulirostris* disperse over distances that overlap with all the northern Tweed Shire.
- *Aedea vigilax* and *Culex annulirostris* are competent vectors of Ross River virus and Barmah Forest virus.
- The New South Wales Government identifies mosquito-borne disease as an issue that requires management.
- Notwithstanding the existing 2007 residential population of the northern Tweed Shire which is exposed to vector and biting nuisance species breeding within the Cobaki Lakes site, more than an additional 5,000 residences are planned in close proximity to this breeding habitat representing a highly significant increase for human exposure to mosquito-borne disease.
- Biting midge are not likely to significantly expose future residents to nuisance biting due to proposed separation of habitat and residential zones exceeding biting midge dispersal range.

Environmental Management

Mosquito Consulting Services Pty Ltd comments that in order to best manage the public health risks associated with mosquito-borne disease a number of integrated strategies each aimed at minimising exposure of humans to mosquito biting is required. However, in the case of Cobaki Lakes, LEDA only has the ability to address issues of mosquito management in the context of an owner on whose land mosquitoes are breeding. It is the primary focus for LEDA, therefore to attempt a reduction in mosquito abundance.

The opportunities and constraints that exist, which must be considered as part of developing a site based mosquito management program for Cobaki Lakes are:

- The site currently produces very high populations of mosquitoes that effect existing northern Tweed residents, recreational visitors and businesses.
- There is limited opportunity for Tweed Shire Council to continue to provide an operational mosquito control program on the site indefinitely.
- Short-term opportunity exists for reducing mosquito abundance by LEDA through the restriction of cattle grazing away from *Aedea vigilax* breeding habitat and providing a self-funding mosquito control operation.
- Such a self-funded mosquito control operation is not financially sustainable beyond the current owners responsibility for the land once on-sold or otherwise divested.
- Long term control of mosquitoes in salt marsh and fresh / brackish wetlands based on environmental control should be considered.
- For the fresh/ brackish wetland habitat producing *Culex annulirostris*, re-engineering of the landform to create urban water bodies also with stormwater management and water quality improvement functions would be typical. This provides opportunity to include mosquito minimisation within the design criteria for such urban water bodies.
- For salt-marsh habitat producing *Aedea vigilax*, environmentally sensitive modification of the existing habitat is recommended that produces an outcome that discriminates against mosquito breeding but otherwise maintains or enhances salt-marsh environmental function and value.
- A salt-marsh rehabilitation plan is recommended to guide these modifications and ensure high quality environmental outcomes are achieved while minimising mosquito production.

Conclusions

A Saltmarsh Rehabilitation Plan, prepared by James Warren & Associates is included at **Appendix I** and a Stormwater Concept Plan, prepared by Gilbert + Sutherland is included at **Appendix E**. Both these plans have been developed to control, repair and improve the surface water management within the site, and specifically within the Saltmarsh areas, which in turn controls the mosquito and biting midge problem.

The recommendations within the Mosquito Management Plan, the Saltmarsh Rehabilitation Plan and Stormwater Concept Plan will be adopted. This is contained within the Draft Statement of Commitments contained in Section 7.

6.5 Water Management

A Stormwater Concept Plan prepared by Gilbert + Sutherland is included in **Appendix E**. A Preliminary Flood Impact Assessment prepared by BMT WBM Pty Ltd is also included in **Appendix E**.

Existing Environment

The existing stormwater drainage on the Cobaki Lakes site comprises the following:

- Main drainage line running through the central western part of the site in a north to south direction then curving to the east to drain into Cobaki Creek and Broadwater that receives water from:
 - a number of subcatchment drainage lines on the hillsides along the western and northern parts of the site that drain to the east;
 - a number of subcatchments on the central sand ridge that drain to the west; and

- Overland sheet flow into the Cobaki Creek and Broadwater from the eastern side of the site including the eastern side of the central sand ridge and floodplains.

The Preliminary Flood Impact Assessment identifies flood levels on the site under different scenarios including sea level rises due to climate change. The flood prone land on the site is shown in **Figure 50**.

Potential Impacts

Future development on the site under the Concept Plan has potential for impacts relating to:

- the quality of water including sediment and nutrient loads entering the Cobaki Creek and Broadwater;
- increased use of water resources; and
- flooding on the site.

Gilbert + Sutherland and BMT WBM conclude that the impact of runoff from the site on flood heights in the adjacent Cobaki Creek and Broadwater would be very small without the need for on-site detention on the Cobaki Lakes site as regional creek and river floods dominate the flood heights.

Management

Gilbert + Sutherland have prepared a Stormwater Concept Plan for the site includes a series of 4 different types of water 'treatment trains' that apply according to slope gradients and soil type to manage the quality of stormwater runoff from the site. The stormwater management measures in the 'treatment trains' include the following:

- constructed wetlands;
- vegetated swales;
- bioretention trenches;
- gross pollutant traps;
- sedimentation basins at inlets to constructed wetlands
- infiltration systems;
- rainwater tanks;
- future compliance with BASIX;
- diffuse low-flow discharge and stormwater treatment;
- high flow bypass channels; and
- discharge of fully treated water to Cobaki Broadwater.

An Integrated Water Cycle Management Strategy is also proposed to conserve water resources by reduced demand, reuse and recycling of water on the site through:

- use of water efficient appliances;
- rainwater (roof)collection and reuse;
- stormwater harvesting and reuse;
- aquifer storage and recovery; and
- effluent recycling.

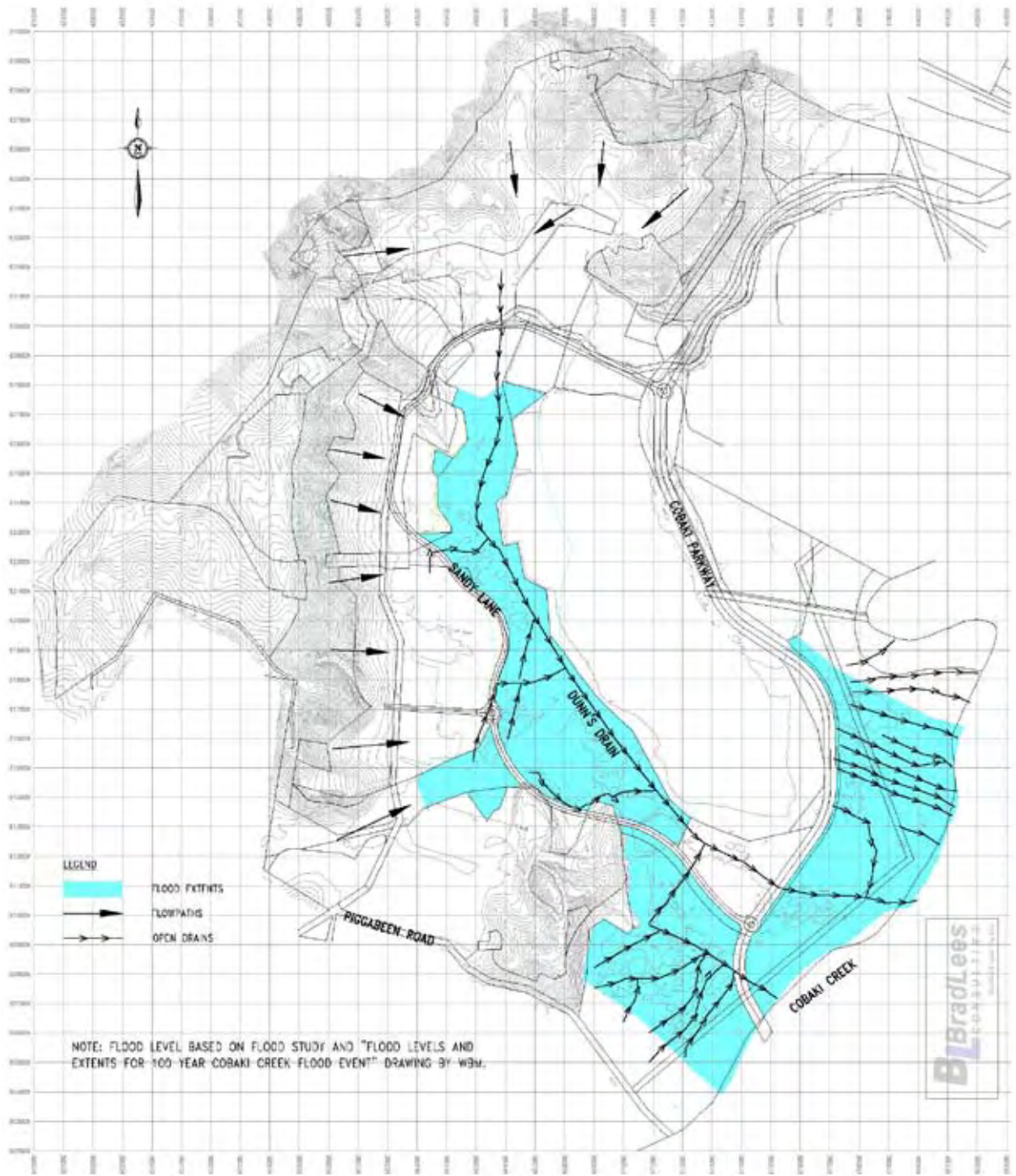


Figure 50 – Flood Extent and Drainage Lines

The flood levels identified in the appended reports by Gilbert + Sutherland and BMT WBM and in the Tweed Shire Council's DCP A3 "Development of Flood Liable Land" are to be used in setting the minimum floor levels and flood protection levels in the detailed design, construction and operation of the development. The Concept Plan sets a minimum floor level of RL 3.10m AHD for flood protection which allows for both flood modelling margins of error and climate change.

Conclusion

The Stormwater Concept Plan for the site proposes a series of treatment train options in accordance with the principles of Water Sensitive Urban Design to manage the impacts of development and improve the quality of stormwater runoff discharges from the site into Cobaki Broadwater with significantly reduced suspended sediment and nutrient loads. An Integrated Water Cycle Management Strategy is also proposed to conserve water resources by reduced demand, reuse and recycling of water on the site. The Concept Plan also includes measures to monitor and manage construction impacts, and monitor and maintain the completed development.

The Concept Plan sets a minimum floor level of 3.10m for flood protection on the site which allows for flood modelling margin of error and climate change.

The Stormwater Concept Plan and Preliminary Flood Assessment are to be implemented in the detailed design, construction and operation of the development in future Project Application and Development Applications as stated in the Draft Statement of Commitments in Section 7 of this report.

The impact of runoff from the site on flood heights in the adjacent Cobaki Creek and Broadwater would be very small without the need for on-site detention on the Cobaki Lakes site as regional creek and river floods dominate these flood heights.

6.6 Geotechnical Conditions, Groundwater, Acid Sulphate Soils, Potential Contamination

6.6.1 Geotechnical Overview

Existing Environment

Bowler Geotechnical Pty Ltd have provided the following assessment of geotechnical conditions on the site.

The site is located adjacent the Qld / NSW border, along Piggabeen Road, Cobaki Lakes and can generally best be described as vacant, pastoral land. The site varies significantly in geomorphology from high densely vegetated ridgelines to grass covered flood plains.

Fundamentally, the site consists of 4 main geological zones:

- Low lying marine clays;
- Interbedded alluvial clays / sands;
- Sand ridge;
- High relief residual clay / weathered rock area.

Marine Clay / Alluvial Soils

The low lying marine clay and interbedded alluvial soil areas are within the lower flood plains on the site. They are acid sulfate bearing soils. The weak soils are likely to undergo consolidation settlement upon imposed loads caused by fill plus building loads. However, with detailed fieldwork, assessment and planning both the acid sulfate soil and settlement issues can be alleviated.

Sand Ridge

The sand ridge comprises of alluvial sands and indurated sands through the central eastern part of the site. The RL of this area is slightly higher than that of the flood plain and would be suitable for development in its current state.

High Relief / Hillside Areas

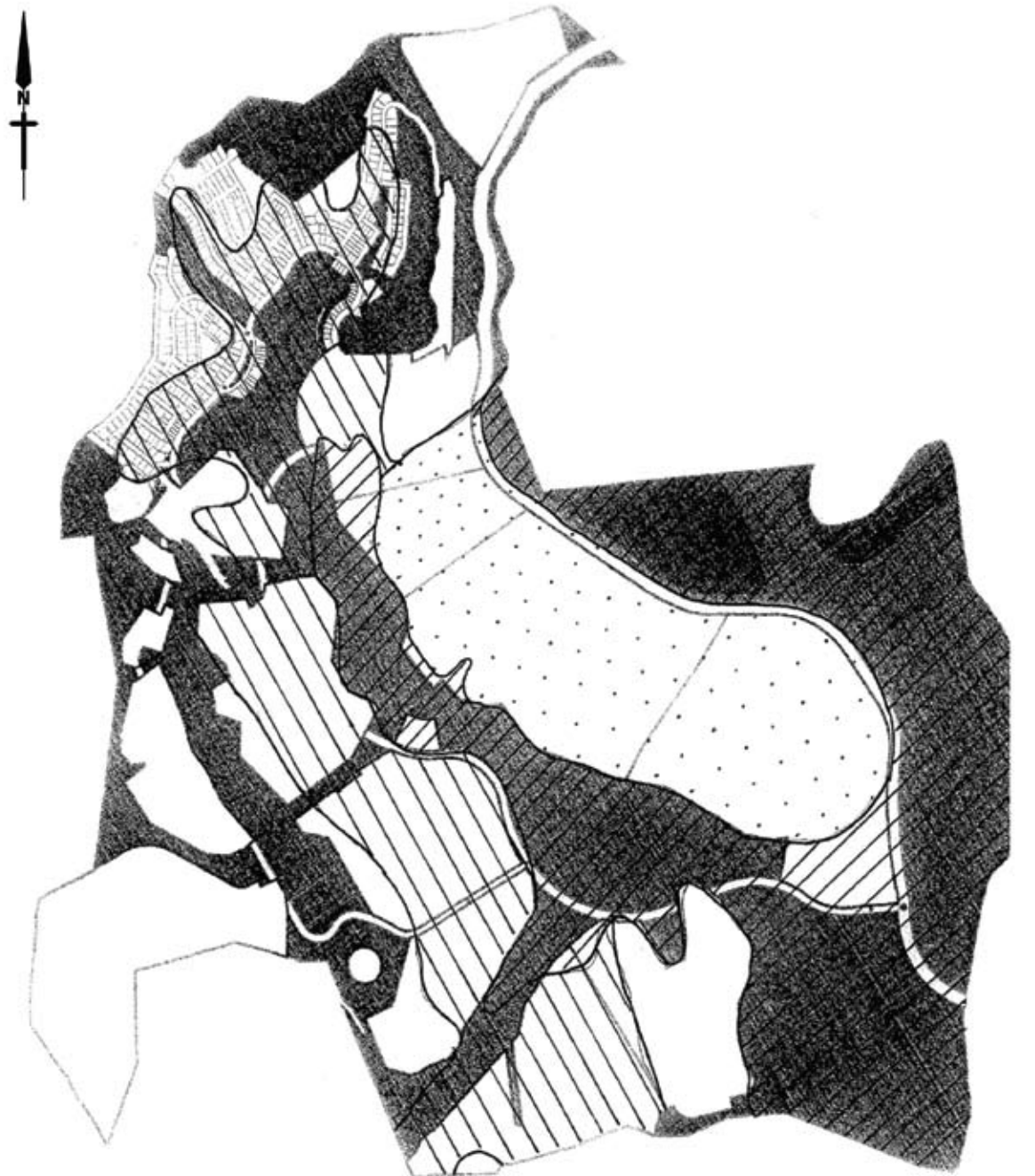
These areas generally comprise of residual clays, up to 2m thick, which overlie interbedded metasiltstone and metasandstone from the Neranleigh Fernvale beds. Weathered rock could be expected at surface in some areas.

The rock mass is generally excavatable using large D10 dozers, although some areas require the use of rock breaking equipment. The weathered rock is suitable for use as general fill provided crushing is adopted where required to reduce oversize.

With regards to development across the higher relief areas of the site, our preliminary observations indicate that no evidence of previous instability exists in the higher relief areas and as such these areas should be acceptable for the proposed usage in this regard.

Refer to **Figure 51** below for details of the inferred subsurface zones.

The above is a brief overview of the Cobaki Lakes development. Three detailed planning and design of precincts will require site specific detailed investigation at each individual investigation area prior to the commencement of any earthworks at a given location.



KEY

-  - **Marine Clay**
-  - **Sand Ridge**
-  - **Interbedded Alluvial Clays/Sands**
-  - **(Unmarked Areas) High Relief, Residual Clay/Weathered Rock Areas**

Figure 51 – Geotechnical Overview

Potential Impacts and Management

A Soil Survey, Geotechnical Review Acid Sulphate Soils Assessment prepared by Gilbert + Sutherland is included at **Appendix K**. The report identifies 5 categories of geotechnical constraints to urban development on the site based on a previous study by Golder Associates dated February 1990. Categories 1-4 describe geotechnical constraints on low lying land, and Category 5 describes geotechnical constraints (in subcategories) on the hillside areas.

Category 1 – Low lying areas – Suitable (no treatment)

- High level footing suitable for houses and low rise development, without special design or treatment.
- Sub grade CBR > = 10% in sand, > 4% in clay.
- Excavated material would be of high quality for re-use on other parts, except high plasticity clays.

Category 2 – Low lying areas – Usable (minimal treatment)

- High level footings suitable for houses and light commercial / industrial buildings with special design (e.g. stiff raft) or treatment (e.g. controlled filling or excavating shallow poor soils where appropriate, e.g. peat bogs).
- Conventional building over two storeys will require special design, such as heavy stiff raft or pile foundation.
- Sub grade CBR < 5% unless filled by 1m + .
- Excavated material would vary from soft to firm high plasticity clays to saturated clayey sand (good if dried).

Category 3 – Low lying areas: Marginal (substantial treatment)

- High level footing systems unsuitable without special treatment.
- Treatment for housing: Early filling, allowing several years of consolidation, or preloading for a typical period of 6-12 months.
- Treatment for specially designed low-rise industrial commercial (e.g. raft or articulated): preloading as for houses.
- High class structures: piles only – typical depths 10 to 15m.
- Sub grade CBR < = 2% unless area filled by 1m + .
- Excavated material would vary from soft to firm high plasticity clays (poor) to saturated clayey sand (good if dried).

Category 4 – Low lying areas: Difficult (not readily treated)

- Area underlain by deep, highly compressible alluvium.
- Long term preloading or very early site filling required to permit housing with any shallow footing type.
- Lighter commercial / industrial buildings as per houses.
- High class structures require piling – typical depth 10 to 20m
- Sub grade CBR < = 1% unless area filled by 1m + .
- Excavated material would vary from soft to very soft high plasticity clays (poor fill).
- Some saturated clayey sand (good if dried).
- Fill would be difficult to separate into useable portions.

Category 5 – Hillside areas

- 5A - This zone generally comprises land of gentle colluvial and residual soil slopes of less than 10°. No natural stability problems exist.
- 5B - The zone generally has convex moderate slopes between around 10-25°. There is expected to be considerable variation within this zone with some areas of Zone 5A (e.g. locally on ridge tops) and some areas of Zone 5C and 5D adjacent to gullies.
- 5C - This zone generally would have concave moderate slopes between 10° to 25°. As such, it generally occurs in the areas dissected by streams and gullies and often has localised sections of Zone D within it (creek banks). This zone could be potentially subject to significant erosion and instability at the creek or gully sides.
- 5D - This zone contains steep slopes generally greater than about 20°, identified as having potential general instability problems even when specially treated.

Conclusion

Geotechnical constraints have been taken into account in the layout of the proposed Concept Plan (**Figure 52**). There are no geotechnical constraints that preclude development proposed in the Concept Plan subject to appropriate management as described above. Detailed geotechnical studies will need to be carried out to support future Project Application and Development Applications for excavation and building work. This is included in the Draft Statement of Commitments in Section 7 of this report.

6.6.2 Acid Sulphate Soils

The Soil Survey, Geotechnical Review Acid Sulphate Soils Assessment prepared by Gilbert + Sutherland is included at **Appendix K** includes a review of previous acid sulphate soil (ASS) investigations prepared by Golder Associates in 1991 and Gilbert + Sutherland in 1998. The findings of these reports are described below.

Existing environment

The ASS investigations have found the following:

- High potential for ASS in marine clays and sands, particularly those in the floodplain around the south and east of the site and near Cobaki Creek;
- Low potential for ASS in the sand ridge, alluvial plains and deeper residual soils.

Areas of acid sulphate soils found on the site are included in **Figure 53**.



Key	Name	Description
	SUITABLE (no treatment)	<ul style="list-style-type: none"> High level footings suitable for houses and low-rise development, without special design or treatment. Subgrade CBR=10% in sands; >=4% in clay (ie. Cat 1C) Excavated material would be of high quality for reuse on other parts, except from Cat 1C zones (High plasticity clays).
	USABLE (minimal treatment)	<ul style="list-style-type: none"> High level footings suitable for houses and light commercial/industrial buildings with special design (eg. stiff raft) or treatment (eg. controlled filling or excavating shallow poor soils where appropriate (eg. peat bogs)). Conventional buildings over two storeys will require special design such as heavy stiffened raft or pile foundations. Subgrade CBR <=2% unless area filled by 1m. Excavated material would vary from soft to firm High Plasticity clays (poor) to saturated clayey sands (OK if dried).
	MARGINAL (substantial treatment)	<ul style="list-style-type: none"> High level footing systems unsuitable without special treatment. Treatment for housing: early filling, allowing several years for consolidation, or preloading for typical period of 6-12 months. Treatment for specially designed low-rise industrial/commercial (eg. raft or articulated); preloading as for houses. High-class structures: piles only - typical depths 10-15m. Subgrade CBR <=2% unless area filled by 1m. Excavated material would vary from soft to firm High Plasticity clays (poor) to saturated clayey sand (OK if dried).
	DIFFICULT (not readily treatable)	<ul style="list-style-type: none"> Areas underlain by deep, highly compressible alluvium. Long-term (several years ??) preloading or very early site filling required to permit housing with any shallow footing type. Lighter commercial/industrial buildings as per houses. High-class structures require piles - typical depths 10-20m. Subgrade CBR <=1% unless area filled by 1m. Bulk of excavated material would comprise soft to very soft High Plasticity clays (poor fill), some saturated clay sand (OK fill if dried). Fill would be difficult to separate into usable portions.
	HILLSIDES (mostly suitable)	<ul style="list-style-type: none"> Suitable for conventional development using normal hillside development techniques. Localised areas of restricted development across potential instability zones, mainly on the steepest slopes. Subgrade CBR > 10% where soil cover is thin, >=4% in areas of deeper alluvial or residual clay (mostly on lower slopes).

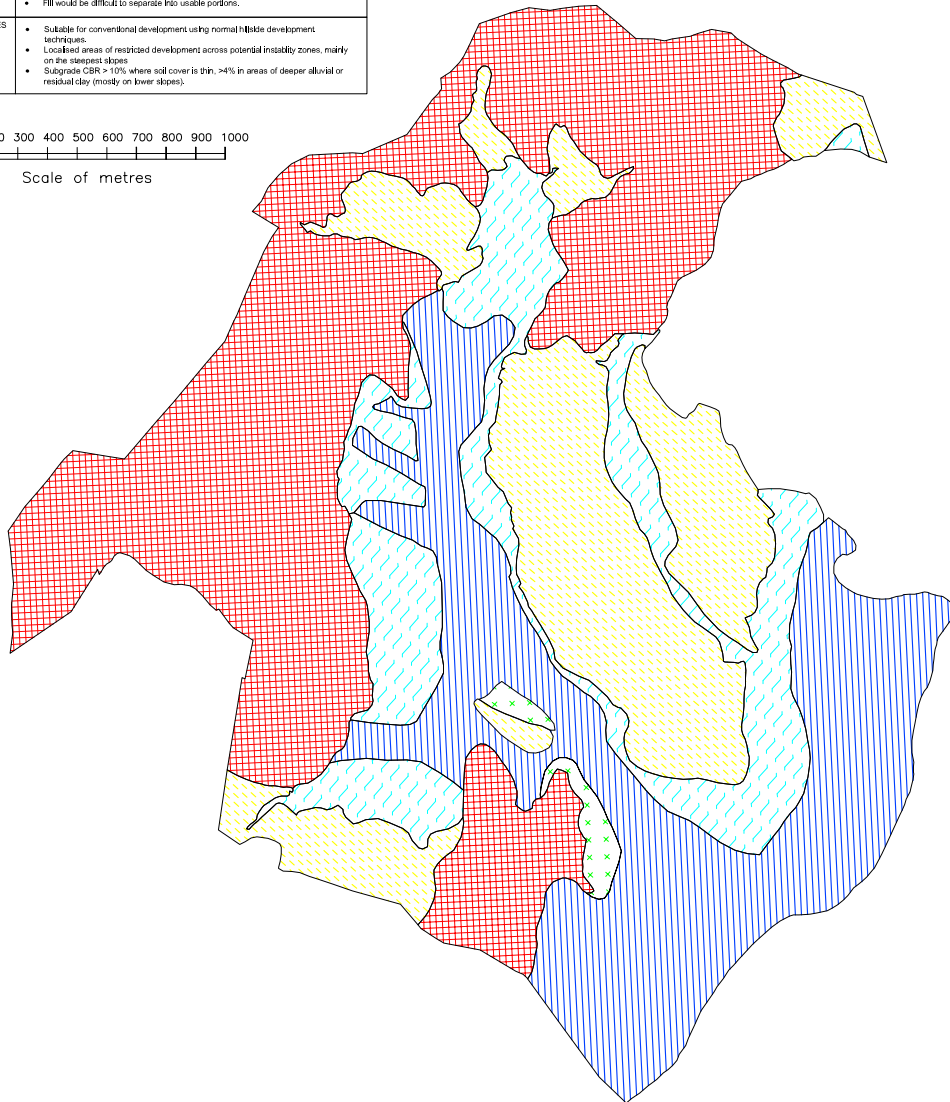
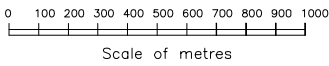


Figure 52 – Geotechnical Constraint Categories

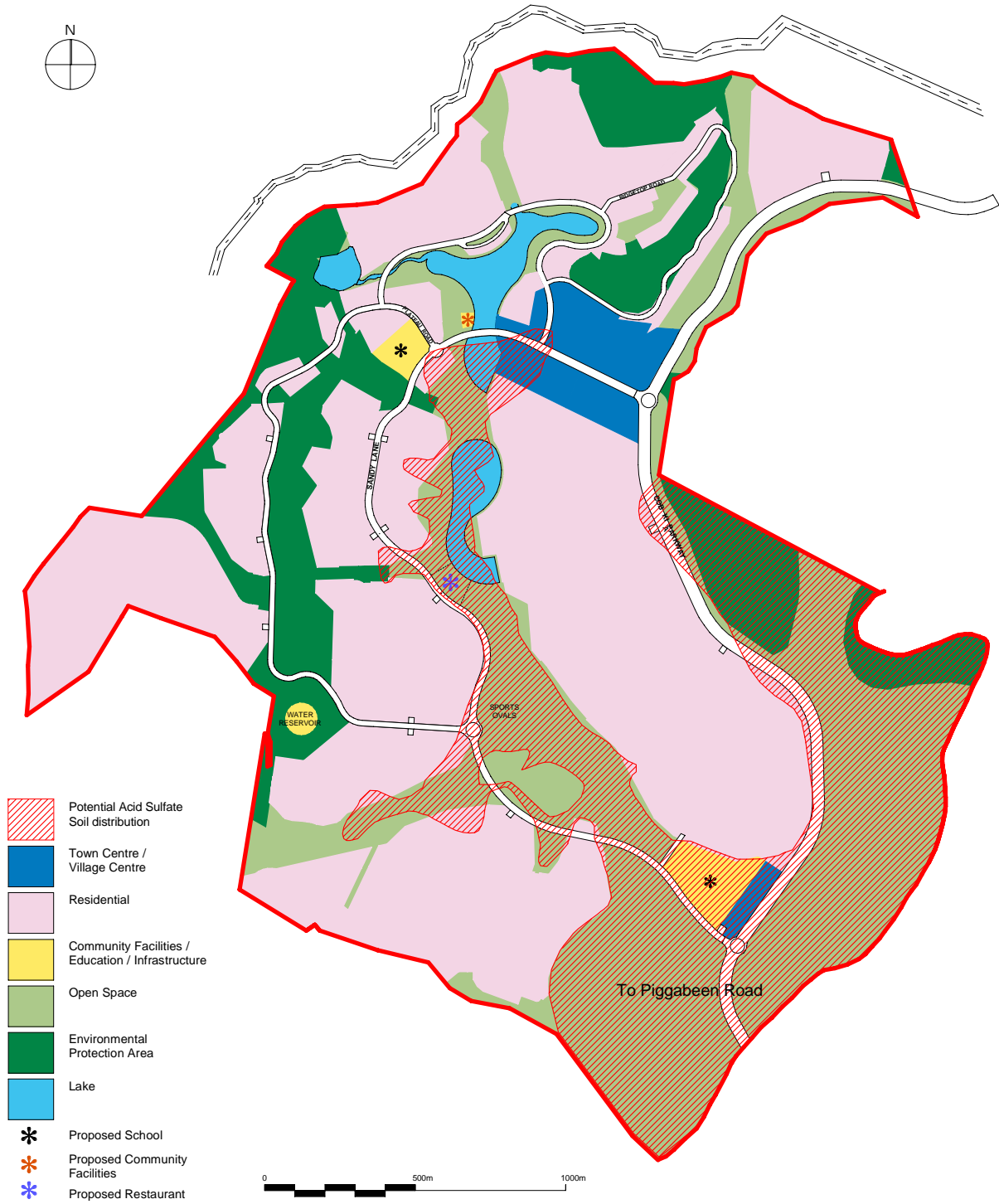


Figure 53 – Areas of Acid Sulphate Soils

Potential Impacts

Disturbance and exposure of acid sulphates soils to the atmosphere has potential to generate sulphuric acid in the surface stormwater and groundwater systems with potentially harmful effects on ecological systems, flora, fauna and their habitats, and human property.

The Concept Plan for Cobaki Lakes proposes the following:

- areas of floodplain and marine clays with highest potential for ASS be used for open space that involves minimal soil disturbance;
- excavation of soils for lakes in areas of potential marine clay bands, sand ridge, and alluvial soils with varied potential for ASS; and
- urban development that will involve excavation in areas of potential marine clay bands, sand ridge, alluvial soils and deeper residual soils with varied potential for ASS.

Management

The preferred management approach is to avoid disturbance of ASS as proposed in the Concept Plan for open space on floodplain areas with highest potential for ASS.

The Soil Survey, Geotechnical Review Acid Sulphate Soils Assessment prepared by Gilbert + Sutherland is included at **Appendix K** includes an ASS Management Plan. The ASS Management Plan deals with the following:

- identification of ASS;
- treatment of ASS;
- surface water monitoring and management;
- groundwater monitoring and management;
- sediment and erosion controls;
- management of ASS incidents; and
- contractor management.

In the future Project Application for the central open space and future Development Applications for subdivision, areas of potential ASS to be disturbed following detailed design of development will be subject to further borehole testing in accordance with relevant standards. Excavated ASS material will be placed within treated bunded fill areas, mixed with a neutralising agent such as fine agricultural lime, validated, and reused on site. Previous investigations of ASS on site have found that lime treatment of ASS is an effective method of controlling acidity.

Conclusion

The Cobaki Lakes site includes some areas in the main drainage line and flood plain with potential for ASS. These areas do not preclude development as proposed in the Concept Plan. The Concept Plan proposes open space with limited disturbance on areas with highest potential for ASS. In areas proposed for urban development and lakes, the potential impacts of ASS disturbance can be managed in accordance with a detailed ASS Management Plan that is to accompany future Project Application and Development Applications for detailed design and construction. This is included in the Draft Statement of Commitments in Section 7 of this report.

6.6.3 Groundwater

The Conceptual Groundwater Assessment prepared by Gilbert + Sutherland is included at **Appendix L** to establish groundwater characteristics and soils influences, and examine impacts of the proposed Concept Plan.

Existing Environment

Gilbert + Sutherland have modelled groundwater contours in the period between August 2007 and March 2007. The investigation finds the following:

- Groundwater levels are reasonably consistent over time, and vary concurrently with rainfall.
- Groundwater is mounding in the sand ridge through the central eastern part of the site and being drawn down in the drainage line through the central western part of the site;
- Groundwater levels range from a minimum RL -0.14m (AHD) in the northern end of the drainage line to a maximum of RL 3.53m (AHD) in the central eastern part of the site. At the same locations, the average groundwater levels ranged from RL 0.10m (AHD) to RL 3.22m (AHD).
- Groundwater flow appears to be in a south-easterly direction towards the Cobaki Broadwater

The groundwater contours (m AHD) recorded in March 2008 are shown in **Figure 54** below.

The quality of the groundwater is heavily influenced by the soil stratum and is described as follows:

- Groundwater within the sand ridge is characterised by acidic, fresh waters with low sulphate, alkalinity and chloride concentrations.
- Groundwater in the marine clay layers on the central western part of the site is characterised by acidic, fresh to brackish water with high aluminium, iron, chloride and sulphate concentrations and low alkalinity.
- Groundwater in the marine clays in the southern portion of the site is characterised by slightly acidic brackish waters with high concentrations of iron, aluminium, chloride sulphate and alkalinity.
- Groundwater in the more elevated northern and western parts of the site can be described as acidic, fresh water with high concentrations of chloride, sulphate, alkalinity and variable concentrations of iron and aluminium.
- Total nitrogen and phosphorous concentrations are variable and elevated across the site, however, results indicate phosphorous is bound to sediments and unavailable.

Gilbert + Sutherland has also found that there are no groundwater dependent users or ecosystems present in or near the Cobaki Lakes site (before the Cobaki Broadwater).

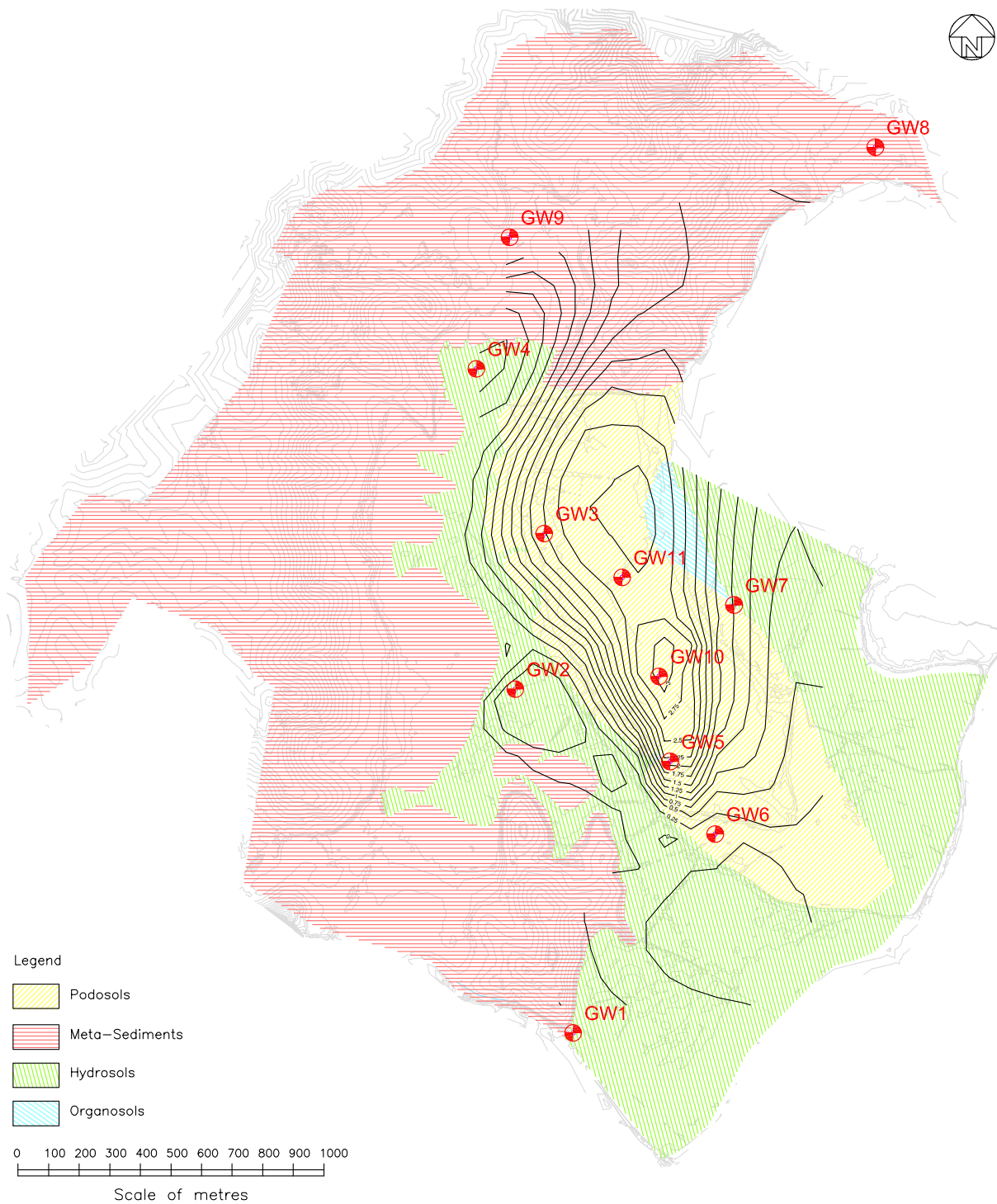


Figure 54 – Groundwater Contours (m AHD) recorded in March 2008

Potential Impacts

Gilbert + Sutherland identify the potential groundwater impacts from development proposed in the Concept Plan as follows:

- Impacts on the groundwater flow regime;
- Impacts on groundwater quality;
- Impacts on potential groundwater discharges into Cobaki Broadwater wetlands;
- Impacts on acid sulphate soils (see Section 6.6.3 below).

Management

Gilbert + Sutherland recommend that potential impacts on groundwater be managed by ensuring that detailed investigations of the groundwater regime be integrated into the detailed stormwater management plans to be prepared for future Project Applications and Development Applications for the detailed design and construction of development proposed in the Concept Plan. This is included in the Draft Statement of Commitments in Section 7.

Gilbert + Sutherland have also provided a Groundwater Management Plan as part of the Conceptual Groundwater Assessment included at **Appendix L**. It proposes measures during the construction and operational phases of development to manage and preserve existing groundwater conditions on the site. These measures include objectives, performance criteria, implementation strategy, monitoring, auditing and reporting, method of identifying incidents and failure, and corrective actions for each of the following:

- background water monitoring monthly for existing ground water levels and quality parameters to serve as a 'baseline';
- construction phase monitoring of groundwater seepage to manage generation of acidic waters entering excavation areas through seepage;
- construction phase groundwater monitoring to establish stable groundwater conditions and verify appropriate development management to achieve water quality objectives in ANZECC guidelines;
- construction phase erosion and sediment controls to prevent displacement of sediment and soil across the site during construction;
- construction phase surface water monitoring to establish and maintain background water quality conditions in accordance with ANZECC guidelines;
- operational phase groundwater monitoring to establish stable groundwater conditions and verify appropriate management.

Conclusion

The potential impacts of development proposed in the Concept Plan on groundwater are, according to Gilbert + Sutherland, readily anticipated and manageable through the integration of groundwater into the stormwater management plans for the site and the implementation of management plans in future stage Project Application and Development Applications for precincts. These management measures are included in the Draft Statement of Commitments in Section 7 of this report.

6.6.4 Site Contamination

Existing Environment and Potential Impacts

A Stage 1 Preliminary Site Contamination Assessment prepared by Gilbert + Sutherland is included at **Appendix M** to review previous site assessments, identify any potentially contaminating activities that may have been undertaken on the site, and establish the need for further investigation in future approvals stages of development to ensure the site is suitable for the urban land uses proposed in the Concept Plan.

The Stage 1 Preliminary Site Contamination Assessment finds certain areas on the Cobaki Lakes site have been subject to activities that have the potential to lead to contamination of the soil as described below:

- Abandoned cattle dip (with potential residues of arsenic, DDT + DDE + DDD);
- Cattle yards, crush, spray race, sump, and pumping station (with potential residues of insecticides and chemicals associated with cattle parasite control including organophosphate compounds and carbamate formulations);
- Farm sheds (with potential residues from chemical, fuel and machinery storage including petroleum, oil, grease, kerosene);
- Site construction compound area (with effluent disposal and potential residues from chemical, fuel and machinery storage);
- Existing dwellings (with potential for asbestos building products, lead based paint, and effluent disposal residue); and
- Mineral sand extraction and processing (with potential radiation).

These areas are shown in **Figure 55** below and are confined to small portions of the site.

The potentially contaminating activities affects the suitability of the land on which they have been located for the urban land uses proposed in the Concept Plan.

Contaminants associated with the potentially contaminating activities can affect human health and need to be either below recognised standards or remediated for the site to be suitable for the proposed land uses.

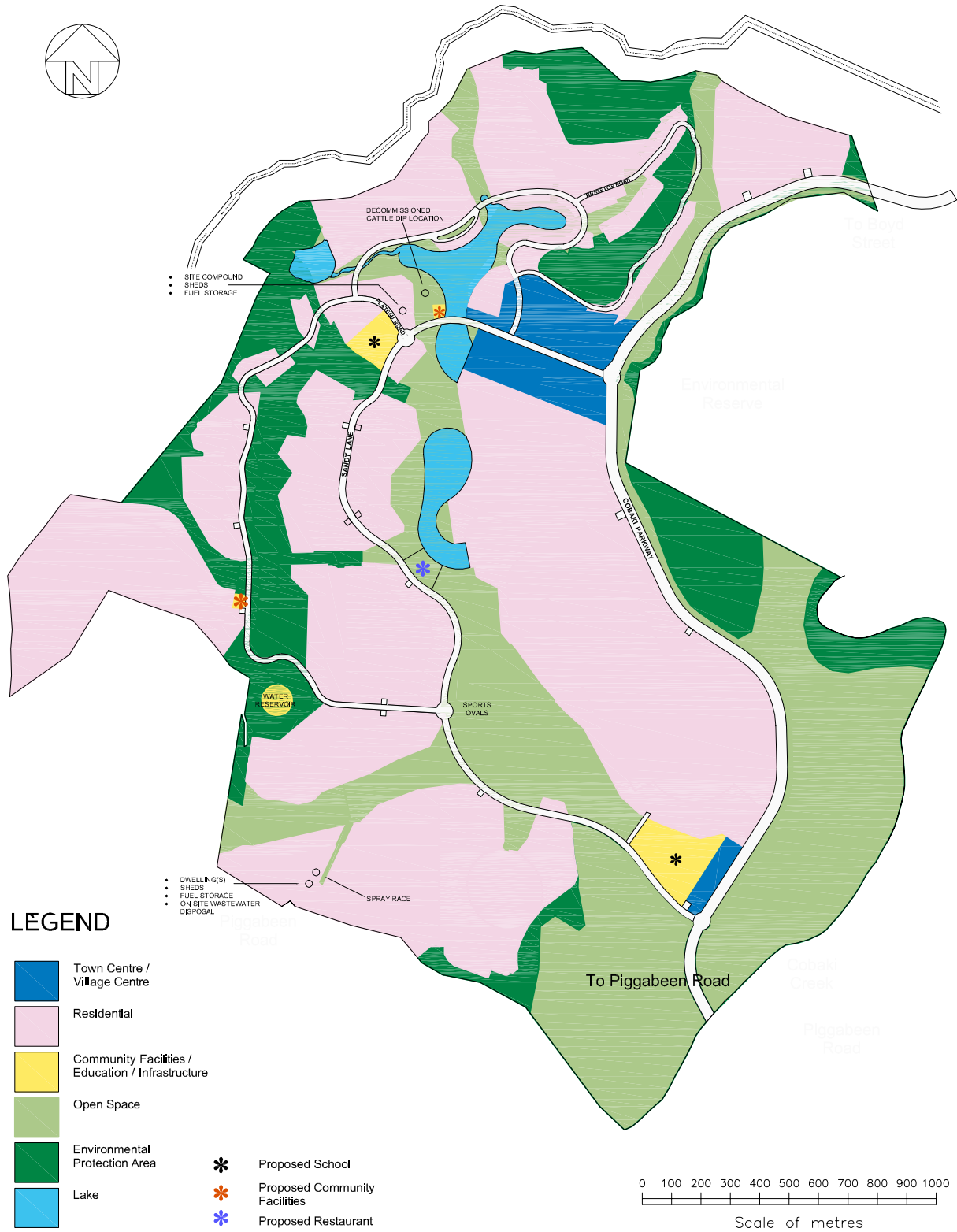


Figure 55 – Land Subject to Potentially Contaminating Activity

Management

The Stage 1 Preliminary Site Contamination Assessment prepared by Gilbert + Sutherland finds the following in relation to existing site contamination reports:

- The cattle dip has been subject to previous contamination assessments prepared by Golder Associates in 1991 and NSW Department of Agriculture in February 1992, and is subject to a Remediation Action Plan (RAP) prepared by Aargus in July 2003 which was approved by Tweed Shire Council. The RAP will make the cattle dip area suitable for the uses proposed in the Concept Plan.
- The area in which it is believed that mineral sand extraction had been undertaken has been subject to a geotechnical investigation prepared by Golder Associates dated 1990 which concluded that there was no evidence of elevated levels of radiation.

The Stage 1 Preliminary Site Contamination Assessment prepared by Gilbert + Sutherland recommends that a Stage 2 detailed site contamination assessment be carried out (and if required an RAP prepared) for all the other areas subject to potentially contaminating activities described above. This is included in the Draft Statement of Commitments in Section 7.

Conclusion

The Stage 1 Preliminary Site Contamination Assessment prepared by Gilbert + Sutherland included at **Appendix M** makes the following conclusions:

- The areas that have been subject to potentially contaminating activities are confined to a small portion of the site.
- The RAP for the cattle dip will render it suitable for the land uses proposed in the Concept Plan.
- There is no evidence found in previous studies of elevated levels of radiation associated with sand mining or mineral sand processing.

A Stage 2 detailed contamination assessment of the potentially contaminated land will be submitted as part of future Project Application and Development Applications for precincts. Based on the experience of Gilbert + Sutherland, it is likely that any contamination identified during a Stage 2 detailed contamination assessment of the potentially contaminated land will be manageable, and it will be possible to remediate the site to facilitate development proposed in the Concept Plan.

6.7 Acoustic Impacts

6.7.1 Noise Impacts from the Development on the Surrounding Land Uses

Noise emissions from the new buildings, infrastructure or activities associated with the development of the Cobaki Lakes site, could potentially impact upon surrounding land uses.

The site is self contained, relatively remote and surrounded by various types of unoccupied rural land and environmental protection areas including:

- Remnant bushland forest areas adjacent to the west and north of the site zoned for environmental protection;
- Cobaki Creek and Broadwater forest and wetlands to the east zoned for environmental protection.
- Agricultural (grazing and pastoral) uses adjacent to the south of the site and further to the north and west comprising mainly native pastures for cattle grazing; and
- Golf course and driving range adjacent to the southwest of the site zoned rural.

Residential land uses are situated to the north west of the site, however they are separated from the development site, by the hills and remnant bushland which enclose the northern sector of the site.

It is not expected therefore, that the development will give rise to any unacceptable noise impacts on the nearby residential area due to the natural buffering of the site and distances from the residential area.

6.7.2 Road Noise

The proposed roads Sandy Lane and Cobaki Parkway have potential to generate traffic volumes that have an adverse noise impact on adjacent residential properties in the Cobaki Lakes Estate.

An acoustic report will accompany each future Development Application for subdivision adjacent to Sandy Lane and Cobaki Parkway to demonstrate that residential development can meet the Environmental Criteria for Road Traffic Noise held by the Department of Environment and Conservation. Measures for acoustic mitigation may include landscape mounding, building setbacks, solid high fencing, and design of residential properties with living, sleeping and private open space areas away from the road noise source. Noise walls will be avoided wherever it is possible and practical to mitigate noise without them.

These measures for acoustic mitigation will be included in the Design Guidelines for residential development at Cobaki Lakes, and are included in the Draft Statement of Commitments in Section 7 of this report.

6.7.3 Noise Intrusion from the Gold Coast Airport Activities

The site is situated outside of the Australian Noise Exposure Forecast (ANEF) contours for the Gold Coast Airport, as set out on the ANEF Map included within the Gold Coast Masterplan 2006 (**Figure 56**).



Figure 56 – ANEF Map

6.8 Bushfire Risk

A Bushfire Assessment prepared by Land Partners is included at **Appendix N**.

Existing Environment

Areas of remnant forest and woodland on the Cobaki Lakes site are identified as bushfire prone land in the Tweed Shire Bushfire Prone Land Map as shown in **Figure 57** below. These areas are identified as:

- Bush Fire Prone Land – Vegetation Category 1 (shown in orange);
- Bush Fire Prone Land – Vegetation Category 2 (shown in yellow); and
- Bushfire Prone Land – Buffer Zones – 100m and 30m (shown in red).

Potential Impacts

The potential impacts and planning issues associated with the development of Cobaki Lakes include the risk to life and property in future development from the bushfire hazard presented by the existing vegetation on the site identified as bushfire prone land. Land Partners consider that the Cobaki Lakes site has a moderate bushfire risk.

Management

The NSW Rural Fire Services guidelines “Planning for Bush Fire Protection 2006” list six key Bush Fire Protection Measures (BPM’s) which in combination are addressed in development assessment. These are:

- Asset Protection Zones (APZs) and their subsets, inner and outer protection areas that are fuel reduced areas between buildings and the bushfire hazard;
- Access for fire fighters, emergency services, residents and evacuation;
- Services including water supply and water pressure;
- Emergency and evacuation management arrangements;
- Landscaping and property maintenance; and
- Construction standards for buildings.

Asset Protection Zones

Land Partners have prepared the concept for Asset Protection Zones at Cobaki Lakes in **Figure 58** below. It includes Asset Protection Zones of between 10m and 40m for residential zones according to forest type and slope consistent with the Planning for Bush Fire Protection 2006 guidelines, and are based on the highest Level 3 Construction Standards in AS3959-1999 (Construction of Buildings in Bush Fire Prone Areas). It is possible for the size of APZs to be varied with different construction standards in future Development Applications. An Asset Protection Zone of 60m is also proposed for the northern school site which is a Special Fire Protection Purpose.

Access

Perimeter roads, fire trails and property access are needed to provide access for firefighting, emergency services and evacuation. Cobaki Parkway acts as a perimeter road on the eastern side of the site.

The detailed design of precinct subdivisions in future Development Applications will provide perimeter roads, fire trails and property access in accordance with the performance criteria in the Planning for Bush Fire Protection guidelines.

Services

The detailed design of precinct subdivisions in future Development Applications will provide reticulated water supplies, electricity services, and gas services in accordance with the performance criteria in the Planning for Bush Fire Protection guidelines.

Emergency and evacuation management arrangements

An Emergency and Evacuation Management Plan is to be prepared and submitted with future Development Applications for any Special Fire Protection Purpose that includes schools and child care facilities. The Plan will meet the performance criteria in the Planning for Bush Fire Protection guidelines.

Landscaping and maintenance

The detailed design of precinct subdivisions and buildings in future Development Applications are to have regard to the principles for landscaping, vegetation management and property maintenance embodied in the Planning for Bush Fire Protection guidelines.

Construction standards for buildings

Future applications for the design and construction of buildings are to ensure compliance with the construction standards in AS3959-1999 (Construction of Buildings in Bush Fire Prone Areas) and the Building Code of Australia according to the distance from the bushfire hazard.

The bushfire protection measures described above are to be incorporated into the Design Guidelines and Codes for subdivision and housing. These measures are included in the Draft Statement of Commitments in Section 7 of this report.

Conclusion

The existing areas of remnant forest and woodland on the Cobaki Lakes site are bushfire prone land.

The bushfire protection measures for the Cobaki Lakes Estate required in accordance with the guidelines Planning for Bushfire Protection 2006 can be accommodated in the Concept Plan. These measures are to be included in the Design Guidelines and Codes to be prepared and incorporated into this Concept Plan and in future Development Applications for the detailed design and construction of development on the site. These measures are included in the Draft Statement of Commitments in Section 7 of this report.

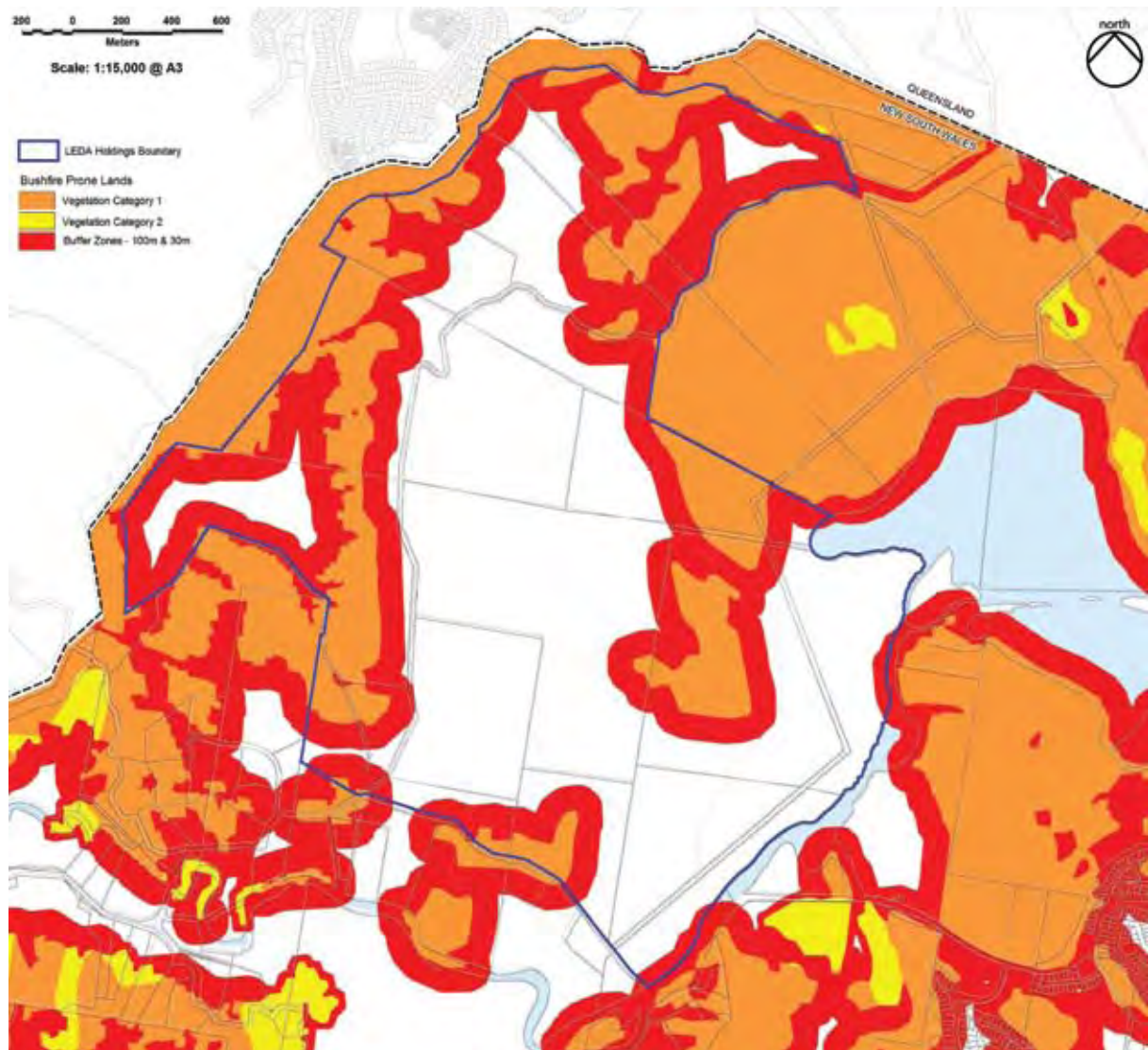


Figure 57 – Extract of Bushfire Prone Land Map (Tweed Shire Council)

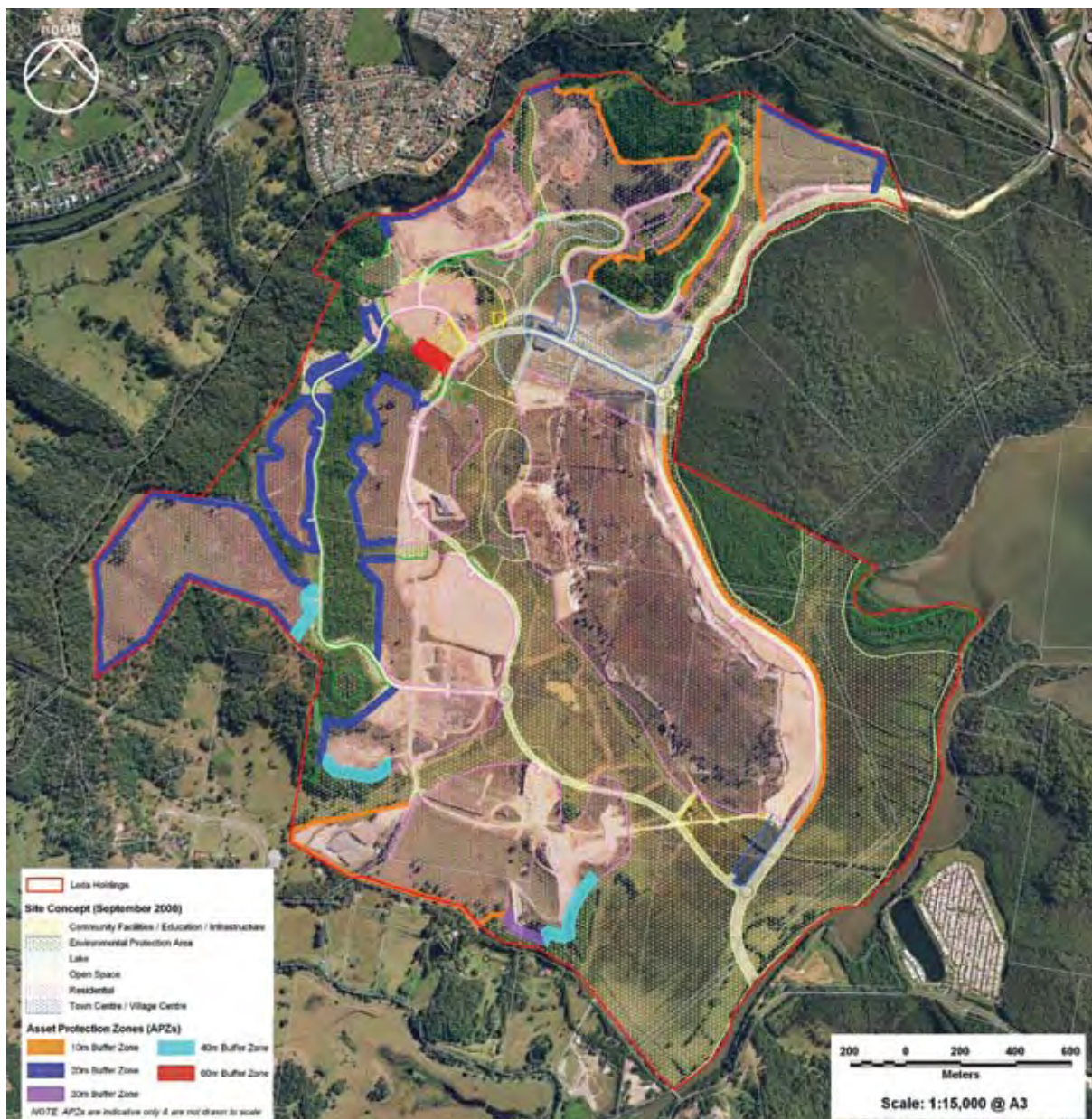


Figure 58 – Asset Protection Zones Concept Map

6.9 Heritage

Everick Heritage Consultants (Everick) have prepared assessments of the European and Aboriginal Cultural Heritage on the site. The reports are included at **Appendix O** and **P** respectively. A summary of the findings are set out below.

6.9.1 European Cultural Heritage

A search of the following heritage registers was conducted:

- The National Heritage List (Australian Heritage Council)
- Commonwealth Heritage List (Australian Heritage Council)
- Register of the National Estate (Australian Heritage Council)
- The State Heritage Register (NSW Heritage Office)
- The State Heritage Inventory (NSW Heritage Office)
- Road Transport Authority s170 Heritage and Conservation Register
- Heritage schedule from the Tweed Council local Environmental Plan 2000
- Register of the National Trust of Australia

No places or items of potential European cultural heritage value within the Cobaki Lakes site were recorded in the above heritage registers.

A site survey was also undertaken in December 2007 by Everick. This confirmed that no items of places of European cultural heritage significance exist on the site.

Everick recommend that LEDA seek to preserve tree stumps with platform holds where they are situated in parkland, open space or environmental protection zones. A commitment to this effect is included in the Draft Statement of Commitments in Section 7.

6.9.2 Aboriginal Cultural Heritage

Everick Heritage Consultants (Everick's) assessment of Aboriginal Cultural Heritage on the site is included at **Appendix P**.

Existing Environment and Potential Impacts

A search of the Department of Environment and Climate Change (DECC) Aboriginal Heritage Information Management System (AHIMS) register and the Bundjalung Mapping project database found no known cultural heritage sites or archaeological sites located within the Cobaki Lakes site. Furthermore, previous surveys for archaeological sites within the site have not found any Aboriginal cultural heritage.

Since 1981, there has been extensive clearing and earth works on the site. Due to this high level of disturbance on the site, Everick undertook an archaeological survey of the undisturbed lands, which are identified for development, where there was a reasonable likelihood of making cultural heritage finds. These areas are shown in **Figure 59** below:



Figure 59 – Areas Surveyed for Aboriginal Cultural Heritage

Nineteen locations with cultural material were identified on the site. These include eight individual artefacts, four shell and artefact scatters, three artefact scatters, three shell scatters and one possible scarred tree.

In addition, due to the complexity of the distribution of cultural material on the sand ridge which has been exacerbated by earth works, Everick had not made attempts to identify sites.

However, Everick consider that the pattern of artefacts identified indicate that the sand ridge was a place that was used by Aboriginal people for a variety of tasks, including extracting the resources of Cobaki Lake and the wetlands.

Ongoing consultation with the Traditional Owners, in accordance with the DECC *"Draft Interim Community Consultation Guidelines for Applicants"* (2005) is also being undertaken to try to identify other heritage values besides archaeological ones contained within the site.

Everick has produced an archeologically sensitivity plan for the site which is shown in **Figure 60**. The plan shows the sensitivity and likelihood of parts of the site in containing cultural heritage sites.

Everick has produced a predictive model of potential cultural heritage sites on the Mid-lower Back Slopes through its review of past assessments and heritage registers, consultation with the Aboriginal community and a site survey and disturbance analysis. Everick concludes that occasional isolated artefacts will be located within this area, similar to those identified in the site survey, and it is unlikely this area will contain any major cultural sites that would affect the proposed Concept Plan lay-out.

As a precautionary measure, Everick recommends that test excavations be conducted to confirm the extent of sub-surface artefact distribution so that all reasonable efforts are made to protect the cultural heritage values of the site.

Sand Ridge

Everick's predictive model for the Sand Ridge concludes that the general distribution of artefacts on the surface represents a reflection of the sub-surface distribution and content of cultural material. Visible on the surface are single artefacts and artefact / shell scatters. Sub-surface investigations are expected to find similar evidence. Due to previous disturbance and subsurface conditions including the level of acidity in the soil, an underlying layer of peat and proximity of a fluctuating water table, it is unlikely that any burials will be found. During Everick's survey no middens were identified on the Sand Ridge. In some areas, subsurface shell was exposed. In these instances the shell comprised thin discontinuous layers. There was no evidence of extensive shell deposits that would constitute a single major site. However, the possibility that middens exist in sub-surface soil layers cannot be discounted. Accordingly, Everick recommends a program of systematic auguring and test pitting.

Everick believes any middens identified in sub-surface excavations would almost certainly be limited to a confined area of less than 50m². Everick's experience is that such sites can be effectively protected by having a small park placed around them. This option is generally the favoured approach of the Aboriginal community, as it allows the cultural material to remain on site.

Based on the above and consultations with the Traditional Owners, Everick concludes that it unlikely any subsurface sites would be of sufficient size or quantity to require alterations to the Concept Plan layout.

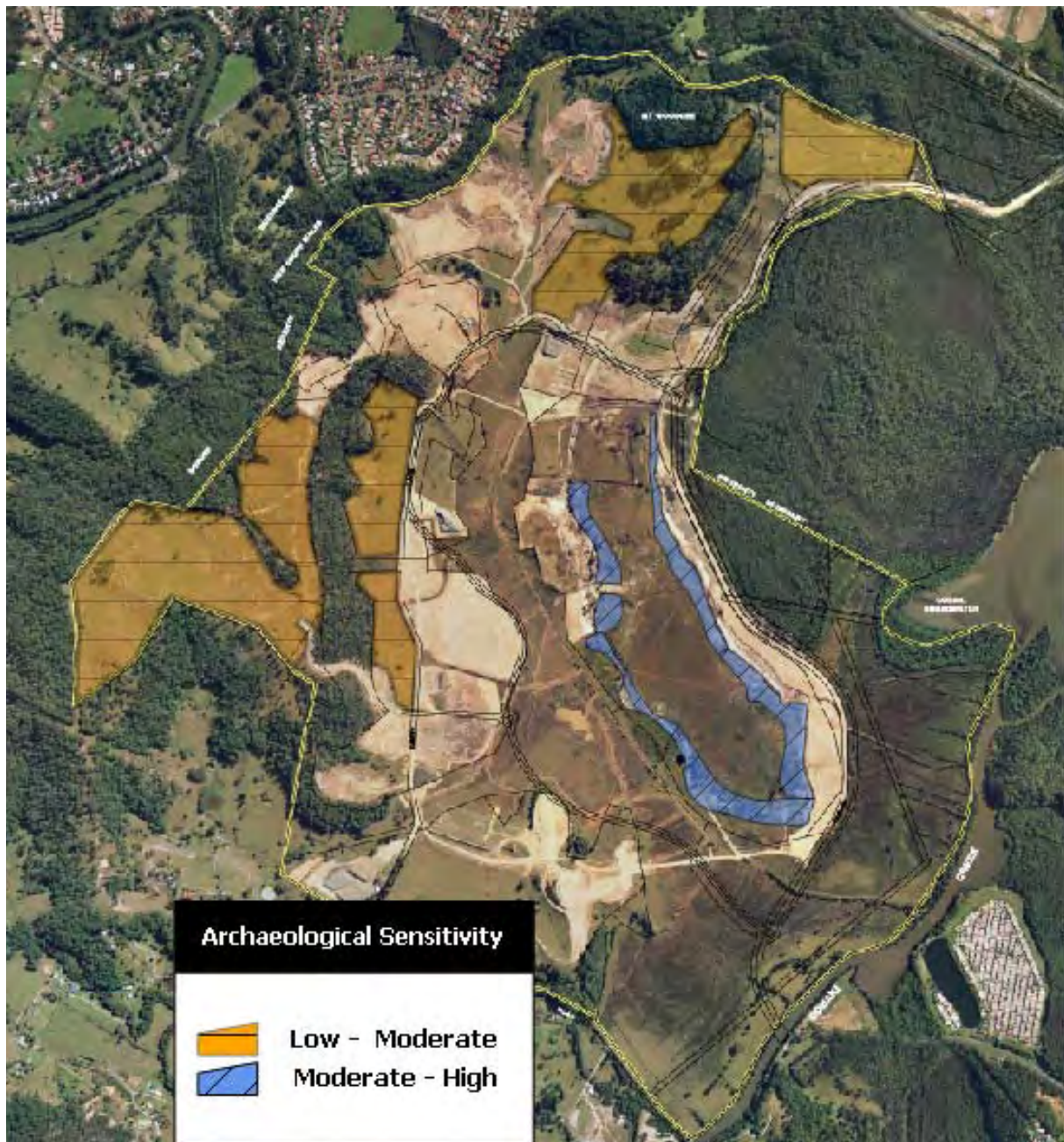


Figure 60 – Archaeological Sensitivity of Zoned Residential Land

Mid-lower Back Slopes

Management

The applicant proposes that every effort will be undertaken to avoid any impacts on Aboriginal cultural heritage values at all stages during the development works on the site.

A Cultural Heritage Management Plan (CHMP) has been prepared by Everick (**Appendix P**). It sets out the principles and processes that LEDA propose to adopt for the identification, protection and management of Aboriginal Places and Aboriginal Objects within both the disturbed and archaeologically sensitive areas of the site which have been identified, and in the environmental protection zones. (**Figure 60**).

This CHMP is based upon Everick's Preliminary Cultural Heritage Assessment, as discussed above. It is proposed to be used until such time as a more detailed management plan is prepared following further consultation and agreement with the Aboriginal community.

Further archaeological excavation is to be undertaken, subject to consultation with the Aboriginal community to assess the significance and extent of cultural material within the areas identified as being archaeologically sensitive. An excavation strategy is included in the Preliminary Cultural Heritage Assessment. Further survey of environmental protection zones is also proposed prior to rehabilitation. A Keeping Place is recommended to be provided in consultation with the Aboriginal community for any cultural material found that is not to remain on site.

Conclusion

European heritage

No places or items of potential European cultural heritage value within the Cobaki Lakes site are recorded in relevant heritage registers or have been found in site surveys.

Everick recommend that LEDA seek to preserve tree stumps with platform holds where they are situated in parkland, open space or environmental protection zones. A commitment to this effect is included in the Draft Statement of Commitments in Section 7.

Aboriginal heritage

There are no known cultural heritage sites or archaeological sites located within the Cobaki Lakes site in relevant registers and data bases. Everick has conducted a thorough investigation of aboriginal cultural heritage values on the site in consultation with the local aboriginal community, and has found 19 locations with cultural material, and prepared a plan showing the sensitivity and likelihood of parts of the site to contain cultural heritage sites.

Everick concludes that the areas that are sensitive on the site with potential for cultural heritage material would most likely yield occasional isolated artefacts similar to the material already found in existing site surveys, and it is unlikely these areas will contain any major cultural site of sufficient size or quantity to significantly affect the Concept Plan lay-out.

In order to ensure that every effort is undertaken to avoid impacts upon Aboriginal cultural heritage on the site, there are commitments for further archaeological excavation of the sensitive areas, further survey of environmental protection zones, and the continued implementation and refinement of the Cultural Heritage Management Plan all in consultation with the Aboriginal community. The Plan and commitments will be referenced in Design Guidelines to be addressed in future Development Applications for the relevant precincts, and have been incorporated into the Draft Statement of Commitments in Section 7.

6.10 Future Demographics and Demand for Infrastructure & Services

The development of the Cobaki Lakes site is to be rolled out over a period of approximately 15 years, depending upon market conditions and take-up. The proponent's expectation is that between 300 and 450 residential sales per year will be achieved, totalling a maximum of 5,500 dwellings of different types and sizes on the site.

The Far North Coast Regional Strategy sets a target for the delivery of 19,100 new dwellings in the Tweed LGA to 2031. The 5,500 new dwellings proposed at Cobaki Lakes will therefore constitute approximately 29% of this target.

6.10.1 Key Demographic Parameters

Darryl Anderson Consulting (DAC) have prepared a report on future demographics in relation to the proposed development at Cobaki Lakes (**Appendix Q**).

The Tweed LGA overall has experienced strong population growth over the past 15 years, mostly due to in-migration. This is however, expected to slow as the population ages and the amount of in-migration remains relatively constant. Despite this, there are marked differences in population between the Tweed coast and rural areas and the Tweed urban centres with the former consisting of families with children, rather than a high proportion of older people as is the case in the latter (established areas of the Tweed).

As the Cobaki Lakes site represents a large proportion (approximately one third) of the area within the Far North Coast Regional Strategy that is allocated for future population growth within the Tweed Shire, DAC consider that the demographic profile of Cobaki Lakes will essentially mirror the characteristics of the incoming population to the area as growth occurs in the Tweed.

The census data reveals that families with children are moving into greenfield developments, similar to the Cobaki Lakes site. However established urban areas of the Tweed are characterised as ageing and have a higher population of older persons. The Cobaki Lakes site will however provide a range of housing types and choices to respond to the market demands of the incoming population.

Based on the 2006 Census, key demographic parameters for the Tweed Coast and Rural Statistical Local Area were:

- 21.3% of the population was aged 14 years and younger (compared to a national average of 19.8%);
- 26.6% of the population was aged 55 or over (compared to a national average of 24.3%);
- 40.6% of the population were couples with children (compared to a national average of 45.3%);
- the percentage of couples without children (38.4%) was above the national average (37.2%);
- the percentage of detached dwellings (73.3%) was below the national average (74.8%); and
- the percentage of single person households (22.3%) was relatively equivalent to the national average (22.9%).

In addition DAC set out the dwelling occupancy rates (based on 2006 census data) as:

- Detached dwellings – 2.6 people per dwelling
- Medium density unit, villa or town house – 2.3 people per dwelling
- Medium density apartment – 1.95 people per dwelling

Estimated Projected Population

The Concept Plan proposes the delivery of 5,500 dwellings over 15 years, comprising a mix of detached dwellings, small lot integrated housing types and multi-unit apartments. The exact dwelling mix will reflect the market demands of the incoming population however it is expected that approximately 300 to 450 dwellings per year will be developed.

Based on an estimate of the dwelling mix and the occupancy rates as set out above, the total population for the site is expected to be in the region of 13,000. However as household occupancy rates are generally decreasing the total projected population is likely to be 12,000 at the completion of the development.

The forecast age distribution 6 years after initial settlement is expected to be:

Table 23 – Forecast Age Distribution 6 years after Initial Settlement

Age cohort	Tweed Cost and Rural average (%)	No. of People
0-4	6.6	92
5-14	16.0	222
15-24	10.7	148
25-54	40.6	563
55-64	11.3	157
65+	14.9	207
Total		1389

6.10.2 Facilities and Services

Community Facilities and Services

Whilst there are currently no existing facilities on the site, Tweed Heads, located approximately 5km south east of the site provides a range of facilities including:

- Hospital;
- Two sub-regional shopping centres;
- A Council office;
- Civic centre;
- Southern Cross University;
- State Government Offices;
- Five High schools; and
- Seven Primary Schools.

In addition, the site is closely located to the John Flynn Hospital, Gold Coast Airport, Gold Coast public transport system and public sports fields, beaches and parks.

It is intended that the Cobaki Lakes site will be self reliant, however it is expected that there will be some cross utilisation of these community facilities.

It is not expected that the Cobaki Lakes development will give rise to adverse impacts upon these existing facilities.

DAC consider that the Cobaki Lakes site will create demand for the provision of a range of urban services and community facilities and improvements to existing services within the nearby locality.

The Concept Plan provides for education and community facilities, including two primary schools, child care centres and recreation areas and open space. The Concept Plan also makes provision for the development of places of worship, community centres and aged car facilities, in order to respond and adapt as the community needs are ascertained. The Concept Plan facilitates these uses throughout the site, particularly in the Town Centre and neighbourhood centres to create focal points and to maximise access without vehicle trips.

Retail Facilities

The Cobaki Lakes Centre Overview prepared by Conics at **Appendix R** examines the likely support of the future resident population at Cobaki Lakes for retailing and services. The report finds that the estimated future resident population of 12,000 people at Cobaki Lakes will support local neighbourhood centres for chore shopping including full line supermarket, impulse / convenience retail, personal retail services and professional services. These are consistent with the land uses and floor space areas proposed for the town centre and village centre in the Concept Plan. Further, the report finds that the location of the town centre and village centre meet core locational criteria for local centres in being proximate to the concentration of population, located on major road access, and can be established early. The report also explains that the proposed neighbourhood centres in the Concept Plan are consistent with the Tweed Retail Strategy.

Open Space & Parkland

The Concept Plan provides a total of 267ha. of land (45% of the Cobaki Lakes site) zoned, rehabilitated and landscaped for environmental protection and recreation.

It provides a total of 81ha. of land zoned, rehabilitated and landscaped for parks and recreation. This comprises 60% structured open space for formal active recreation and sports, and 40% non-structured open space for more passive recreation.

The 81 ha. of land zoned for recreational open space is 2.4 times the area needed to serve the estimated future resident population of 12,000 people in the Cobaki Lakes Estate. (A general standard of 2.83ha. of open space per 1,000 people is used by Department of Planning and Tweed Shire Council.) Further, the proposal for both structured and non-structured open space provides for a range of recreational opportunities to meet the spectrum of recreational needs of the future population.

Utilities Infrastructure

Utilities infrastructure needed to service the future development and population in the Cobaki Lakes estate is addressed in Section 4.12.

6.10.3 Planning Agreements and / or Developer Contributions

Tweed Shire Council has a total of 28 different Section 94 Plans. It is proposed that, as has been the case with previous Development Consents issued by the Council, that contributions in accordance with the following Section 94 Plans will be negotiated:

- Section 94 Plan No.4 Tweed Road Contribution Plan
- Section 94 Plan No.6 Street tree Planting in Residential Areas
- Section 94 Plan No.10 Cobaki Lakes Public Open Space and Community Facilities
- Section 94 Plan No.11 Shirewide Library Facilities
- Section 94 Plan No.12 Bus Shelters
- Section 94 Plan No.13 Environ Cemetery
- Section 94 Plan No.16 Emergency Facilities (Surf Lifesaving)
- Section 94 Plan No.18 Council Admin Offices & Technical Support Facilities
- Section 94 Plan No. 22 Cycleway
- Section 94 plan No.26 Shirewide/ Regional Open Space

In addition, Tweed Shire Council has Development Servicing Plans (DSP) for Water Supply Services (July 2007) and Sewerage Services (2007) which set out the basis of developer charges respectively for water and sewerage services by the Council.

The developer acknowledges the Section 94 plans and DSP and accepts the application thereof to any future Development Consents given in respect of Cobaki Lakes, subject to negotiation of the specific terms as to rates, works-in-kind credits, the timing of the provision of certain facilities and the like.

6.11 Off Site Impacts

An Agricultural Buffer and Off-Site Impacts Assessment report prepared by Gilbert + Sutherland is included at **Appendix S**.

Existing environment

The land use attributes and zones surrounding the site comprise the following:

- Remnant bushland forest areas adjacent to the west and north of the site zoned for environmental protection;
- Cobaki Creek and Broadwater forest and wetlands to the east zoned for environmental protection.
- Agricultural (grazing and pastoral) uses adjacent to the south of the site and further to the north and west comprising mainly native pastures for cattle grazing; and
- Golf course and driving range adjacent to the southwest of the site zoned rural.

The surrounding land uses are shown in **Figure 61**.



Figure 61 – Surrounding Land Uses and Zones

Potential Impacts

The potential impacts and land use conflicts between development proposed in the Concept Plan and surrounding land uses are described in the report prepared by Gilbert + Sutherland is at **Appendix P** as follows:

Generic impacts

- Stormwater runoff quality and quantity;
- Erosion and sedimentation;
- Fire risk;
- Fencing and access.

Agricultural uses

- Chemical spray drift
- Odour;
- Noise;
- Dust;
- Smoke and ash;
- Sediment and stormwater runoff;
- Stock husbandry.

Environmental Protection Areas

- Disturbance of native flora and fauna;
- Feral animals;
- Fire risk;
- Weed invasion;
- Rubbish dumping; and
- Vegetation clearing.

Management

The report prepared by Gilbert + Sutherland at **Appendix P** presents the means of managing the potential impacts and land use conflicts with surrounding land uses.

Generic impacts – stormwater, bushfire, vegetation

The management of stormwater impacts on Cobaki Creek and Broadwater including erosion and sedimentation is addressed separately in Section 6.5 of this report.

The management of bushfire hazard on the site is addressed separately in Section 6.8 of this report.

The management of vegetation including weed control on the site is addressed separately in Section 6.4 of this report.

Agricultural uses

The existing grazing and pastoral land uses on agricultural lands adjacent to the site do not generate any significant impacts such as spray drift, noise, odour and dust, smoke and ash which are associated with more intensive plant agriculture and intensive livestock agriculture. The agricultural land adjacent to the site is generally suitable for grazing with native or improved pastures as reflected in its past use.

The land is generally not suitable for more intensive cultivation and agricultural uses that generate such impacts and potential land use conflicts. More intensive agricultural uses which could generate potential land use conflict would require environmental assessment and approval from relevant authorities.

The areas proposed for urban development are separated from existing pastoral uses by existing roads, roads reserves and topographical features. The Concept Plan achieves well over the minimum 30m buffer zone of open space and/or vegetation between agricultural uses and dwellings in accordance with Council DCP guidelines. The Concept Plan also proposes fencing to restrict access, particularly for cattle and dogs, between urban development proposed in the Concept Plan and adjoining land in agricultural zones.

Environmental protection areas

The measures proposed to manage impacts on the environmental protection areas include the following:

- a minimum 150m buffer of vegetated open space between urban development and Cobaki Creek on the southeast side of the site;
- a minimum 50m buffer of open space between urban development and Cobaki Broadwater littoral rainforest and wetlands
- 50m buffer of vegetated open space to existing wetlands in accordance with Council's DCP.
- Management plans for vegetation on the site including for remnant bushland, eucalypt forest, scribbly gum remnants, saltmarsh wetland, koala and fauna habitat, and the proposed freshwater wetland which are addressed separately in Section 6.5 of this report.
- Management of stormwater impacts on the Cobaki Creek and Broadwater is addressed separately in Section 6.5 of this report.
- Management of bushfire hazard is addressed separately in Section 6.8 of this report.

Conclusion

The urban development proposed in the Concept Plan has potential for off site impacts and land use conflict with adjacent agricultural land uses and environmental protection areas.

However, the adjacent agricultural land is suitable only for grazing and pastoral activities which have a low impact and do not present significant land use conflict with the urban development proposed in the Concept Plan. The areas proposed for urban development are separated from existing pastoral uses by existing roads, roads reserves and topographical features and achieve the minimum 30m separation in accordance with Council DCP guidelines. Fencing is proposed in the Concept Plan to restrict access, particularly for cattle and dogs, between urban development and adjoining land in agricultural zones.

The potential impacts on environmental protection areas adjacent to the site are proposed to be managed by environmental buffers together with the stormwater management concept plan, vegetation management plans, and commitment to comply with bushfire protection guidelines. These measures are included in the Draft Statement of Commitments in Section 7.

6.12 Ecologically Sustainable Development

The proposed Concept Plan is consistent with the principles of ecologically sustainable development in the following respects:

Pre-cautionary Principle

The Concept Plan is supported by environmental planning studies prepared by technical experts which effectively conclude that there are no environmental constraints that preclude the development of the site in accordance with the proposed Concept Plan subject to appropriate management in future planning and design stages, construction and completion/operation of the development.

Additional environmental studies and assessments will be prepared for future Project Applications and Development Applications for the detailed design and construction of development including subdivision, buildings, landscaping and engineering works.

Intergenerational Equity

The proposed development in the Concept Plan will contribute to the supply of housing choices and provision of recreational parkland and environmental conservation areas to meet the needs of current and future generations.

Climate Change

The flood modelling undertaken by BMT WBM takes into consideration sea level rise due to climate change, and also adopts the downstream boundary conditions based on DIPNR's *Floodplain Management Guidelines No.5 Ocean Boundary Conditions (2004)*. The guidelines acknowledge that climate change could result in a 0.2m increase in sea level in 20 years, however, the elevated ocean level of 2.6m AHD is recognised as conservative and therefore no additional allowance is recommended.

Biological Diversity

The proposed Concept Plan contributes to the maintenance of, and increases opportunities for, biological diversity with the proposed rehabilitation and management of the existing indigenous vegetation, fauna, and water resources.

Valuation and Pricing of Environmental Resources

The cost of infrastructure and measures to ensure an appropriate level of environmental performance of development on the site will be incorporated into the cost of development on the site.

7.0 Draft Statement of Commitments

Project Component	Environmental Outcome (Commitment)	Measure (Commitment)	Timing for Completion
1. Concept Plan	1.1 Development is carried out generally in accordance with the Concept Plan and Environmental Assessment Report.	<p>1.1.1. Design Guidelines and Development Codes for the detailed design and construction of development at Cobaki Lakes will be generally consistent with the Concept Plan and Environmental Assessment Report.</p> <p>1.1.2. Future Part 3A Project Application and Development Applications will be generally consistent with the Concept Plan and Environmental Assessment Report.</p> <p>1.1.3. Each stage of development will be generally consistent with the Concept Plan and Environmental Assessment Report.</p>	At each stage of development.
2. Visual impact of development	2.1 Key attributes of the natural visual landscape on the Cobaki Lakes site (being the topographical amphitheatre, remnant band of bushland, Cobaki Broadwater forest and wetland, and proposed new central open space and lakes precincts) are retained and rehabilitated.	2.1.1. Future Project Applications and Development Applications will retain and rehabilitate the key attributes of the natural visual landscape generally in line with the provisions of the Concept Plan and Environmental Assessment Report.	At each stage of development.
	2.2. The visual impact of subdivision and building development is managed.	<p>2.2.1. Design Guidelines for the detailed design and construction of development at Cobaki Lakes will include provisions to manage visual impact relating to:</p> <ul style="list-style-type: none"> - subdivision design, - building design, - visual landscape, - landscaping, and - roof material. <p>2.2.2. Future Project Application and Development Applications will respond to the Design Guidelines for the detailed design of subdivisions and buildings for each precinct.</p>	Prior to granting of any new approvals or consents for subdivision, buildings or landscaping on the site.
3. Road access	3.1. Road access to the north through Boyd Street and Gold Coast Highway has capacity to accommodate traffic generated by development under the Concept Plan.	3.1.1 The Developer will meet its legal obligations in the Boyd Street Road Works Deed between Gold Coast City Council and Calsonic Management Services Pty Ltd dated 8 July 1993.	As specified in the Deed.
	3.2 Road access to the south through Cobaki Lakes and over Cobaki Creek to connect with Piggabeen Road is provided to accommodate traffic generated by development under the Concept Plan.	3.2.1 The Developer will meet such of its legal obligations as have not yet been fulfilled and remain applicable in the Boyd Street Road Works Deed between Tweed Shire Council and Calsonic Management Services Pty Ltd dated 8 July 1993, and will, if so requested by Council and subject to negotiation, enter into an amended Deed that reflects the current position. The Developer will specifically meet commitments in relation thereto set out in 3.2.2 to 3.2.5 hereunder.	As specified in the Deed or any amended Deed.

Project Component	Environmental Outcome (Commitment)	Measure (Commitment)	Timing for Completion
		<p>3.2.2 The Developer will dedicate to Council all the Cobaki Parkway Road Reserve from the north eastern boundary of the property to Cobaki Creek, in such a location as directed by Council, as part of Stage 1 of any new or amended Development Consent. The road reserve width shall be generally 40metres. From time to time, it may be necessary to increase this width to contain road batters within the road reserve. The width shall allow room for Council to gain adequate and realistic access to all road facilities. Council may allow an easement over cut batters provided the area is stable and access to drainage is serviceable. The Developer will accept that as compensation for dedicating Cobaki Parkway for its full length Council's "purchase" the dedicated land by way of a credit against the developer's obligations to pay contributions under Section 94 Plan No.4, and that Council will not be required to pay any cash amount to the developer for the land dedicated.</p>	As part of the first Development Application.
		<p>3.2.3 The Developer will construct two lanes of Cobaki Parkway, in accordance with Council's requirements, from the toe of the ramp on the western side of the overpass at the intersection of Boyd Street and the Tugun Bypass to the southern-most roundabout on Cobaki Parkway at its intersection with Sandy Lane. These works will be progressively constructed to access each phase of the development as it is released, provided Cobaki Parkway is dedicated for its full length in conjunction with Stage 1 of any new or amended Development Consent. A value of such works, to be agreed between the developer and Council, will be credited against the developer's obligations to pay contributions under Section 94 Plan No. 4.</p>	As part of the first Development Application.
		<p>3.2.4 The Developer will construct two lanes of Cobaki Parkway, in accordance with Council's requirements, from the southern-most roundabout on Cobaki Parkway at its intersection with Sandy Lane to the Cobaki Creek, a two lane bridge over Cobaki Creek and a connection to Piggabeen Road, to the satisfaction of Council, provided that Council is responsible for the planning approval for Cobaki Creek Bridge and for the connection to Piggabeen Road. A value of such works, to be agreed between the Developer and Council, will be credited against the Developer's obligations to pay contributions under Section 94 Plan No.4.</p>	The Developer will negotiate with Council the timing of the construction of these works, provided that the developer shall, if so required by Council, construct such works within 12 months of the completion by the developer of the construction of such part of Cobaki Parkway as is within 500m north-east of its southern-most roundabout at the intersection of Sandy Lane.

Project Component	Environmental Outcome (Commitment)	Measure (Commitment)	Timing for Completion
	3.3 Internal roads and access arrangements are designed and constructed to contemporary standards of safety and efficiency.	3.3.1 Internal roads are designed to meet AUSTRROADS Guide to Traffic Engineering Practice. 3.3.2 Car parking and loading/ servicing facilities are to be included in Design Guidelines and Development Codes for future Development Applications generally consistent with Tweed Council DCP. 3.3.3 Direct vehicle access off Cobaki Parkway is to be restricted.	As part of each stage of development.
4. Flora and Fauna Management	4.1 Areas of saltmarsh on the site are rehabilitated and protected.	4.1.1 The provisions of the Saltmarsh Rehabilitation Plan (James Warren & Associates, August 2008) will be implemented.	Commencement of rehabilitation work prior to registration of any plan of residential subdivision. The work shall then proceed in a regular manner with the objective of achieving the timeline and milestones set out in the Rehabilitation Plan.
	4.2 Areas of Scribbly Gum trees are conserved and managed.	4.2.1 The provisions of the Scribbly Gum Management Plan (James Warren & Associates, August 2008) will be implemented. 4.2.2 Local parks that include areas of Scribbly Gum in future Development Applications will be dedicated to Tweed Shire Council.	Commencement of management works prior to registration of any plan of residential subdivision on which the Scribbly Gum is located. Management works for the relevant area shall continue in accordance with the requirements of the Management Plan.
	4.3 Native vegetation is regenerated.	4.3.1 The provisions of the Site Regeneration and Revegetation Plan (James Warren & Associates, August 2008) will be implemented.	Commencement of regeneration and revegetation work prior to registration of any plan of residential subdivision on or adjacent to the native vegetation. Work shall regularly continue and be completed prior to certification of completion of adjacent residential subdivision works.
	4.4 Removal of native vegetation is appropriately managed.	4.4.1 The provisions of the Vegetation Management Plan (James Warren & Associates, August 2008) will be implemented.	As vegetation removal occurs.
	4.5 Threatened fauna species are appropriately managed.	4.5.1 The provisions of the Fauna Management Plan (James Warren & Associates, August 2008) will be implemented.	Commencement of management work prior to registration of any plan of residential subdivision on or adjacent to the fauna habitat. Work shall regularly continue in accordance with the Management Plan.

Project Component	Environmental Outcome (Commitment)	Measure (Commitment)	Timing for Completion
	4.6 Freshwater wetlands are rehabilitated.	4.6.1 The provisions of the Freshwater Wetland Rehabilitation Plan (James Warren & Associates, August 2008) will be implemented.	Commencement of rehabilitation work prior to registration of any plan of residential subdivision. The work shall then proceed in a regular manner with the objective of achieving the timeline and milestones set out in the Rehabilitation Plan.
5. Biting Midge & Mosquito Control	5.1 Biting midge and mosquitos are appropriately managed.	5.1.1 The provisions of the Biting Midge & Mosquito Control Plan (Mosquito Consulting Services, May 2008) will be implemented.	Commencement of rehabilitation work prior to registration of any plan of residential subdivision. The work shall then proceed in a regular manner with the objective of achieving the timeline and milestones set out in the Rehabilitation Plan.
6. Stormwater and flood management	6.1 Stormwater on the site is appropriately managed.	6.1.1 The provisions of the Stormwater Management Plan (Gilbert & Sutherland, May 2008) will be implemented. 6.1.2 Stormwater management plans will be prepared as part of future Project Application and Development Applications for each stage of development, and implemented.	As part of the completion of infrastructure works for each stage of development.
	6.2 Flood protection is provided in the design of development.	6.2.1 A Flood Protection Level of RL3.10m AHD will be implemented in development.	As part of each stage of development.
7. Groundwater Management	7.1 Groundwater is appropriately managed.	7.1.1 The provisions of the Groundwater Management Plan (Gilbert & Sutherland, April 2008) will be implemented. 7.1.2 Groundwater will be integrated into Stormwater Management Plans in future Project Application and Development Applications.	As part of the completion of infrastructure works for each stage of development.
8. Soils Management	8.1 Geotechnical conditions are appropriately managed.	8.1.1 Detailed geotechnical studies, as required, will be prepared to support future Project Applications and Development Applications for earthworks, civil construction and building work, and implemented.	As part of earthworks and building works for each relevant stage of development.
	8.2 Acid sulphate soils (ASS) are appropriately managed.	8.2.1 A detailed ASS investigation and, if required an ASS Management Plan, will accompany future Project Applications and Development Applications for detailed design and construction of development on areas of potential acid sulphate soils, and implemented.	As part of earthworks and building works for each relevant stage of development.
	8.3 Contaminated sites are appropriately managed.	8.3.1 A detailed contamination assessment of potentially contaminated land will be included as part of any Project Application or Development Application applying to that land, and if required implemented with a Remediation Action Plan.	As part of earthworks and building works for each relevant stage of development.

Project Component	Environmental Outcome (Commitment)	Measure (Commitment)	Timing for Completion
9. Bushfire Protection	9.1 Bushfire protection measures are included in development.	9.1.1 Development will comply with the guidelines Planning for Bushfire Protection 2006. 9.1.2 The Asset Protection Zone concept plan is to be implemented.	As part of each stage of development.
10. Interface with surrounding land	10.1 Agricultural buffers, ecological buffers, and appropriate measures for management of generic impacts on and from adjacent land are included in development.	10.1.1 The recommendations of the Agricultural Buffer and Off-Site Impacts Assessment (Gilbert & Sutherland, May 2008) for the management of generic impacts, agricultural buffers, and ecological buffers will be implemented.	As part of each stage of development.
11. Aboriginal Cultural Heritage Conservation	11.1 Aboriginal cultural heritage on the site is appropriately conserved.	11.1.1 The recommendations of the Aboriginal Cultural Heritage Assessment (Everick November 2008) will be implemented. 11.1.2 The Aboriginal Cultural Heritage Management Plan (Everick) will be implemented and refined in consultation and cooperation with representatives of the local Aboriginal community.	Commencement of conservation measures prior to commencement of works for each stage of development, with completion prior to occupation of the stage.
12. Contributions to local infrastructure costs	12.1 Contributions are made by the developer to Council infrastructure and servicing costs at a reasonable and apportioned rate.	12.1.1 The developer will negotiate with Tweed Shire Council the application to the Cobaki Lakes development of Council's s94 Contribution Plans and s64 Sewer & Water Developer Charges in accordance with Section 6.10 of this report.	Prior to the approval of the Concept Plan.
13. Community consultation	13.1 The local community is consulted further in the detailed planning and development of Cobaki Lakes Estate.	13.1.1 The developer will implement a program of further public engagement, consisting of the elements described in Section 5.3 of this report, upon the commencement of the public exhibition of the Concept Plan. 13.1.2 Design Guidelines and Development Codes will be advertised and placed on exhibition for public submissions. 13.1.3 Future Project Application and Development Applications will be advertised and placed on exhibition for public submissions.	As part of each stage of further planning of development.

8.0 Conclusion & Justification

The Concept Plan for Cobaki Lakes Estate proposes to provide an integrated planning framework that establishes the broad planning parameters for the development of 593.5 hectares of land over the long term. It incorporates and refines existing zonings and development consents in line with contemporary market conditions and environmental standards.

The Concept Plan proposes the development of a new residential community at Cobaki Lakes with a mix of urban land uses integrated with open space and environmental protection areas. The proposed development comprises:

- town centre precinct with a mix of retail, commercial, community and multi-unit residential uses, with up to 9,500m² of retail space and 200 multi-unit dwellings covering 18ha of land;
- residential precincts with a mix of housing types including detached houses, townhouses and multi-unit housing up to 3 storeys with up to 5,300 dwellings covering approximately 283ha of developable land, excluding major roads;
- community and education precincts including two schools over 7ha. of land;
- open space, lakes and environmental protection areas covering 267 ha. of land;
- access network of roads, public transport routes, and pedestrian/ cycle paths;
- landscaping and vegetation management;
- water management; and
- utility services infrastructure.

The Concept Plan seeks the Minister's approval for the following aspects of the proposed development:

- vision and design principles for Cobaki Lakes Estate;
- general layout and siting of development into precincts;
- land uses in each precinct;
- maximum site coverage, dwelling numbers and densities, building heights and retail floor space in development precincts;
- a mix of lot sizes ranging from 120m² to 1,200m² in residential and town centre precincts;
- open space and landscape management concepts;
- access network of roads, public transport routes, pedestrian/ cycle paths;
- water management concept;
- utility services strategy; and
- statement of commitments.

Design guidelines and codes for subdivision and housing are proposed to be prepared at a later stage and incorporated into the Concept Plan.

The Concept Plan also seeks that the Minister amend the Tweed LEP 2000 to refine the existing zoning boundaries, and allow a mix of housing densities on lot sizes ranging from 120m² to 1,200m².

The subdivision, rehabilitation and construction of the central open space system is proposed to be the subject of a future Part 3A Project Application for the approval of the Minister for Planning.

The subdivision, detailed design, and construction of development on all other areas including the residential neighbourhoods, town centre, community and educational facilities are proposed to be the subject of future Development Applications for the consent of Tweed Shire Council under Part 4 of the EP&A Act.

The detailed design and construction of lower density forms of housing are proposed to be subject to complying development certification and exempt development provisions under Part 4 of the EP&A Act.

Strategic Planning Instruments

NSW Government Planning Instruments

The Cobaki Lakes site is identified for urban development in the Far North Coast Regional Strategy 2006, and the proposed Concept Plan is consistent with the key elements and principles in the Strategy.

The Concept Plan is consistent with Part 3A of the Environmental Planning and Assessment Act 1979, and with the principles and practices used in the administration of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, Threatened Species Conservation Act 1995, Water Management Act 2000, Rural Fires Act 1997, National Parks and Wildlife Act 1974, and Native Vegetation Act 2003.

The Concept Plan is also consistent with the provisions of the SEPP (Major Projects), SEPP 71 – Coastal Protection, SEPP 14 – Wetlands, SEPP 44 – Koala Habitat, SEPP 55 – Remediation of Land, SEPP (Infrastructure), SEPP 65 – Design Quality of Residential Flat Buildings, SEPP – BASIX, and the North Coast Regional Environmental Plan.

Tweed Shire Council Local Environmental Plan and Development Control Plan

The Concept Plan is generally consistent with the existing land use zonings and planning provisions applying to the Cobaki Lakes site under the Tweed LEP, with the exception of some proposed refinements to zone boundaries and a mix of lot sizes that include some lots below the current minimum of 450m² in the LEP.

The refinements to the zone boundaries are proposed to align the zonings with cadastral boundaries, existing development approvals, and the physical attributes of the land to give land use zones that are more consistent with the capacity and suitability of the land. The present zoning boundaries create a number of areas that are impractical to use as open space and environmental protection. They have low conservation value, limited potential for recreational use, are expensive to maintain, and typically become neglected and hazardous. These areas represent an inefficient and unsustainable use of the land. The proposed refinements to the zone boundaries will provide better environmental and urban outcomes consistent with State planning strategies, policies and instruments. The refinements would result in a more efficient and sustainable use of the land.

The proposed refinements to the zone boundaries result in a net gain of 1.56ha added to the total area of the 7(d) and 7(l) Environmental Protection zonings; a net reduction of 21.89ha. to the 6(b) Recreation Zone; and a net addition of 20.33 ha. to the 2(c) Urban Expansion Zone (primarily taken from the 6(b) zone).

The proposed zoning refinements result in a total of 81ha. of land zoned 6(b) Recreation in the Cobaki Lakes site to be developed, landscaped and rehabilitated for open space/ parks and a range of recreational opportunities under the Concept Plan. **The 81 hectares of land zoned for 6(b) Recreation is 2.4 times the area of open space/ parkland needed to serve the estimated future resident population of 12,000 people in the 2(c) Urban Expansion Zone on the site.** (A general standard of 2.83ha. of open space per 1,000 people is used by Department of Planning and Tweed Shire Council.) Overall, the proposed zoning refinements result in **a total of 267 hectares (45% of the Cobaki Lakes site) zoned for environmental protection and recreation** to be rehabilitated and landscaped under the Concept Plan.

The Concept Plan also seeks to depart from the minimum lot size of 450sq.m by providing a range of lots sizes from 120sq.m to 1,200sq.m. The range of lot sizes proposed in the Concept Plan is consistent with the principles of contemporary planning and the Far North Coast Regional Strategy in supplying greater housing choices to meet demographic changes and market demands, increasing densities in accessible areas with infrastructure, optimising urban form and design quality, easing urban sprawl and development pressure on environmentally sensitive land, and using natural resources efficiently.

The Concept Plan seeks that the Minister amend the Tweed LEP 2000 to refine the existing zoning boundaries, and allow a mix of housing densities on lot sizes ranging from 120m² to 1,200m².

The Concept Plan also seeks to supersede the existing part of the Tweed DCP (Section B7) that applies specifically to the Cobaki Lakes site. Design Guidelines and Codes for subdivision and housing are proposed to be prepared at a later stage and incorporated into the Concept Plan.

Environmental Assessment

The proposed Concept Plan has environmental planning merit in the following respects:

- The Concept Plan provides an integrated planning framework that establishes the broad planning parameters for the development of the Cobaki Lakes Estate over the long term with an appropriate balance of certainty and flexibility for the future detailed design of individual precincts in stages.
- The key visual landscape attributes of the site are retained and embellished including the topographical amphitheatre, remnant band of eucalypt forest, Cobaki Broadwater forest and wetlands, and proposed new lakes/ open space/wetland system.
- Views from areas surrounding the site will in most parts not be impacted by development proposed in the Concept Plan as the site is screened from view by the topography and vegetation surrounding the site, other than moderate impact on distant views from higher elevations to the south and on the coast.
- The internal road network has a hierarchy and will be constructed to AUSTRROAD standards. The external road network has the capacity to accommodate the development proposed in the Concept Plan with the implementation of recommended traffic management and road improvements. Car parking is to be provided in accordance with the Tweed Shire Council DCP.
- The conservation of native flora and fauna and ecological communities on the site is incorporated into the Concept Plan which involves the retention, rehabilitation and restoration of 221.8 hectares of vegetation on the site including 68.25 hectares of remnant bushland in accordance with a series of management plans. The management plans will mitigate the impacts of development, rehabilitate ecological communities, and contribute to the survival of threatened flora and fauna and endangered communities.
- A Stormwater Concept Plan for the site proposes a series of treatment train options in accordance with the principles of Water Sensitive Urban Design to manage the impacts of development and improve the quality of stormwater runoff discharges from the site with significantly reduced suspended sediment and nutrient loads. An Integrated Water Cycle Management Strategy is also proposed to conserve water resources by reduced demand, reuse and recycling of water on the site. The Concept Plan also includes measures to monitor and manage construction impacts, and monitor and maintain the completed development.
- A flood report is included in the environmental assessment to establish relevant flood levels including potential sea level rise due to climate change. The findings of this report are to be used as a basis for setting minimum floor levels and flood protection levels at RL 3.10m AHD in the future detailed planning and design of development at later stages.

- Geotechnical constraint categories have been taken into account in the layout of the proposed Concept Plan. There are no geotechnical constraints that preclude development proposed in the Concept Plan subject to appropriate management in future detailed planning, design and construction stages.
- The potential ASS on the site does not preclude development as proposed in the Concept Plan. The Concept Plan proposes open space with no significant soil disturbance on floodplain areas with highest potential for ASS. In areas proposed in the Concept Plan for lakes and urban development, potential impacts of ASS disturbance can be managed in accordance with an ASS Management Plan.
- Potential impacts on groundwater are readily anticipated and manageable through the integration of groundwater into the stormwater management plans for the site and the implementation of management plans.
- It is likely that any contamination identified during a Stage 2 detailed contamination assessment of the potentially contaminated land will be manageable, and it will be possible to remediate the site to facilitate development proposed in the Concept Plan.
- No noise impacts will occur from development on the site on the nearby residential areas due to the natural buffering of the site from topography and vegetation, and distances from the residential areas. Aircraft noise and traffic noise will be considered in detailed design of development. The site is situated outside of the Australian Noise Exposure Forecast (ANEF) contours for the Gold Coast Airport.
- Planning for Bushfire Protection 2006 guidelines can be achieved in the Concept Plan, and an Asset Protection Zone map is included.
- No places or items of potential European cultural heritage value are within the Cobaki Lakes site.
- A Cultural Heritage Management Plan is included that sets out the principles and processes that the proponent is adopting for the identification, protection and management of Aboriginal Places and Aboriginal Objects. The CHMP is proposed to be refined following further consultation and agreement with the Aboriginal community.
- A utility services strategy and land for social and community infrastructure are included in the Concept Plan to accommodate the demands of future occupants in the Cobaki Lakes Estate.
- The site is surrounded by various types of rural land and environmental protection areas. The adjacent agricultural land is suitable only for grazing and pastoral activities which have a low impact and do not present significant land use conflict with the urban development proposed in the Concept Plan. Potential impacts on adjacent zones of environmental protection are proposed to be managed by environmental buffers together with the stormwater management concept plan, vegetation management plans, and commitment to comply with bushfire protection guidelines.
- The Concept Plan is consistent with the principles of ecologically sustainable development.
- Design Guidelines, Development Codes, Project Applications and Development Applications will be prepared in future stages for the detailed design, construction and assessment of development on the site including subdivision, buildings, landscaping, rehabilitation and infrastructure.

Conclusion

Given the justification and environmental planning merits described above, it is requested that the Minister:

- Approve the Concept Plan under Section 75O of the EP&A Act;
- Determine under Section 75P(1) of the EP&A Act that the subdivision and development of the central open space and lakes precincts is to be the subject of a Project Application under Part 3A of the EP&A Act;
- Determine under Section 75P(1) of the EP&A Act that the subdivision and development of the town and village centre precincts, residential precincts, community and education precincts, and rehabilitation of the environmental protection precincts are to be the subject of Part 4 of the EP&A Act;
- Determine under Section 75P2(c) of the EP&A Act that further environmental assessment of development within Cobaki Lakes under Part 4 is to be undertaken in accordance with the Concept Plan including Statement of Commitments, Design Guidelines and Development Code;
- Direct under Section 75P2(c1) of the EP&A Act that any provision of the Tweed LEP prohibiting or restricting the carrying out of development in accordance with the Concept Plan under Part 4 does not have effect;
- Declare by Order under Section 75P2(d) of the EP&A Act that development identified as such in the Development Code to be incorporated into the Concept Plan is exempt and complying development for the purposes of the EP&A Act;
- Declare by Order under Section 75P2(e) that any development carried out in accordance with the Concept Plan is not Designated Development; and
- Amend by Order under Section 75R(3A) of the EP&A Act the Tweed Local Environmental Plan to align with the refinements to zone boundaries and minimum lot sizes in the Concept Plan.

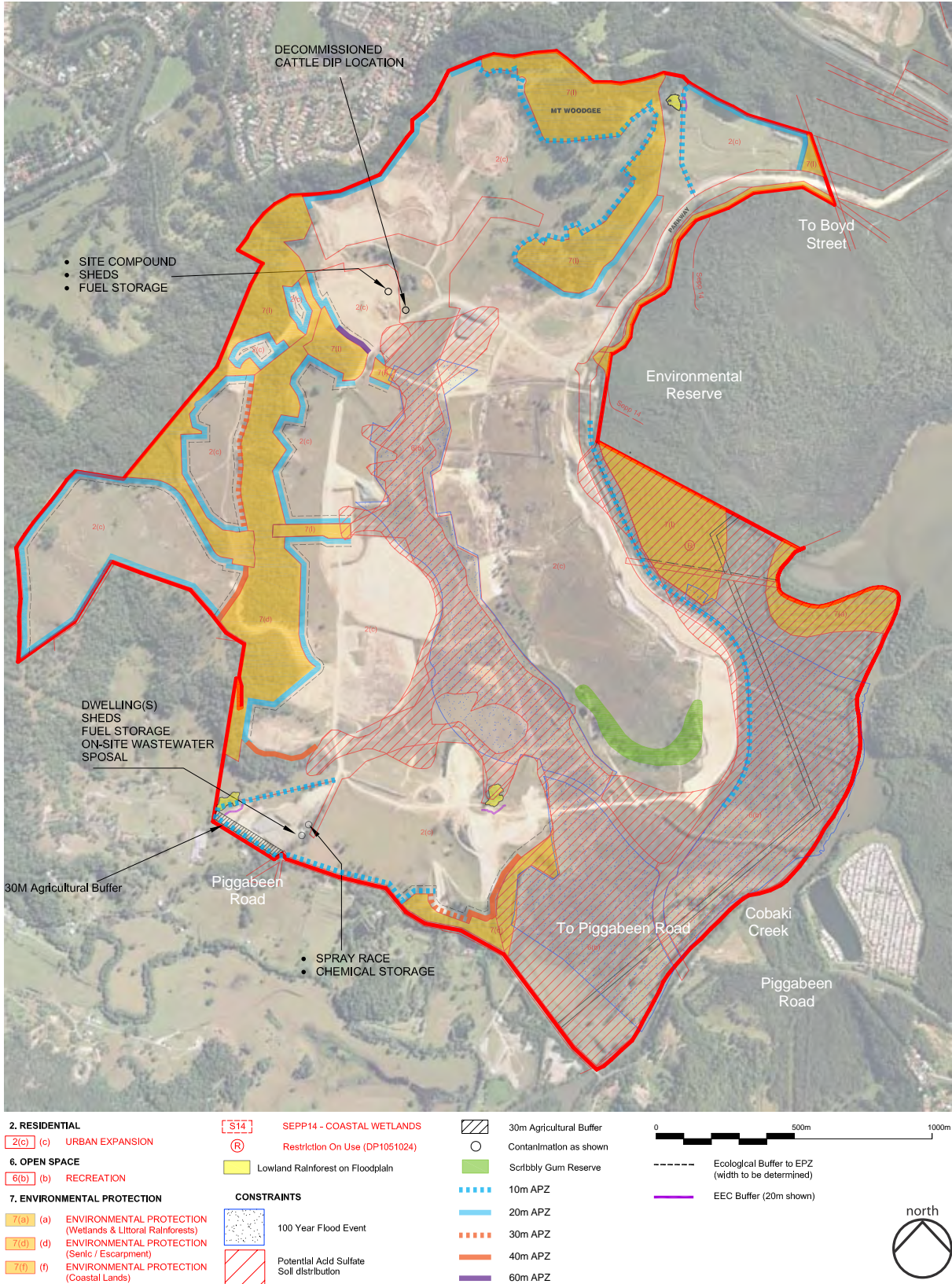


Figure 62 – Site Constraints Map