13.1 Introduction

A Traffic and Transport Study was undertaken by URS Australia between September 2006 and January 2007. The study investigates the traffic implications associated with the proposed development of an AWT and Composting Facility at the Woy Woy Waste Management Facility (WMF). The Traffic and Transport study report is provided in **Appendix E**, and is summarised in this Chapter.

13.2 Existing Environment

13.2.1 Description of the Road Environment

The road network servicing the Woy Woy WMF is shown in **Figure 13-1**. The roads which surround the WMF include Brisbane Water Drive, Woy Woy Road, Empire Bay Drive, Railway Street and Nagari Road.

Brisbane Water Drive

Brisbane Water Drive paralleling the Sydney to Newcastle railway line to the west and the shoreline of Brisbane Water to the east is classified as an arterial or main road with an AADT[1] of some 17,850 just prior to Woy Woy. The road is the primary access corridor between the peninsular suburbs of Umina, Ettalong and Woy Woy and the F3 Motorway.

Running between the Pacific Highway, at West Gosford, and Woy Woy township, Brisbane Water Drive also serves as the principle road freight link to the peninsular.

Woy Woy Road

Woy Woy Road is a 12 kilometre long sub arterial, or regional road, extending from the intersection with Pacific Highway, at Kariong, to Rawson Road, Woy Woy.

The regional road serves as an alternate connection between the peninsular suburbs of Umina Ettalong and Woy Woy with the F3 Motorway.

Typically a dual lane sealed carriageway passing through the Brisbane Water National Park, Woy Woy Road has a regulated speed environment of 80km/h through the National Park, reducing to 60km/h through the urban residential catchments of Kariong and Woy Woy.

The roadway is generally undulating and exhibits frequent sharp horizontal alignment and adverse crossfall as dictated by the surrounding topography. The vertical gradient from Phegans Bay to Correa Bay is some 8 to10%.

[1] AADT – Average Annual Daily Traffic. AADT information has been obtained from Council and the RTA fixed count locations within the Hunter Region for the year 2002. The figures presented in this report have been derived in accordance with the annual growth rates presented in the RTA's Traffic Volume Data for Hunter Region, 2001.

Chapter 13 Traffic and Transport

In addition to serving as an alternative access to the Pacific Highway, the section of Woy Woy Road, through Woy Woy south, provides access to the recreational boat ramp at Corea Bay reserve, the Pier Street public wharf and Rawson Road public wharf.

Empire Bay Drive

Empire Bay Drive runs south through Bensville, Empire Bay and Daley's Point from Avoca Drive, Kincumber. Empire Bay Drive continues west to The Rip Bridge and on to Woy Woy.

The sub arterial or regional road provides alternate access to Gosford City Centre and the beach side towns of Avoca, Terrigal and The Entrance. The AADT on Empire Bay Drive is some 20,600 at Avoca Drive and 16,800 at the Rip Bridge.

Railway Street

Railway Street is both a sub arterial corridor, between Brisbane Water Drive and Ocean Beach Road while it is a local road, under the control of Gosford City Council, between Ocean Beach Road and Nagari Road.

Railway Street runs east west, parallel to the Sydney Newcastle railway line and ends adjacent to the rail overbridge at Nagari Road.

Railway Street is a buffer between residential properties to the south of the road reserve and the railway line to the north. Providing access to the current Woy Woy WMF via Nagari Road, the carriageway carries considerable traffic in the morning and evening peaks, serving as a 'rat run' between Woy Woy Road and Rawson Road thus eliminating the need of Woy Woy Road traffic to negotiate the level rail crossing on Rawson Road, north of Railway Street.

Nagari Road

Nagari Road is a short local road connecting Railway Street with the current Woy Woy WMF.

The sealed road accommodates one travel lane in each direction catering also for the movement of heavy vehicles.

Legend

Property Boundary | Project Site Boundary | Proposed Greenwaste Maturation Area

Datum: GDA94, Projection: UTM, Grid: MGA Zone 56

Client	Project	Title
GOSFORD CITY COUNCIL	Environmental Assessment of Proposed Alternative Waste Technology and Composting Facilities at Woy Woy WMF	**MAP SHOWING ROAD NETWORK SERVICING WOY WOY WMF**
URS	Drawn: AJW | Approved: FINAL | Date: 21.08.06	Figure: **13.1**
	Job No: **43177409** | File No: 43177409-017.wor	

13.2.2 Existing Site Traffic Generation

Traffic Volumes

An indication of the traffic conditions on the road system, in the vicinity of the Woy Woy WMF, is represented in terms of the two way AADT volumes. Compiled by Council and the RTA, a summary of the volume data is detailed in **Table 13-1**.

The traffic volumes in **Table 13-1** demonstrate a general growth in traffic within the study area. It should be noted that even with the introduction of the 8 tonne load limit on Woy Woy Road, the volume of traffic has continued to rise at a more accelerated rate.

Table 13-1 Existing Average Daily Traffic Volumes (AADT)

Location	Survey Station	1988 (AADT)	1990 (AADT)	1992 (AADT)	1995 (AADT)	1998 (AADT)	2001 (AADT)	2006 (AADT)
Brisbane Water Drive M.R.349 south of S.H.10 Pacific Highway	05.042	19595	18345	20509	21069	21960	23935	
Brisbane Water Drive M.R.349 at Woy Woy Creek	05.043	-	15384	14082	14836	15618	-	
Woy Woy Road south of S.H.10 Kariong	05.293	21337	25519	27291	-	33872	39473	
Woy Woy Road west of underpass	-	-	-	-	-	-	-	% 10,670
Empire Bay Drive at The Rip Bridge	05.127	12378	14164	16925	15926	16431	16879	

Source: RTA Traffic Volume Data for Hunter Region 2001
% Denotes Woy Woy Road west of underpass ADT figures supplied by Gosford City Council

Hourly Traffic Volumes

A review of the existing peak hour traffic volumes and movement activity was undertaken at the intersections of Woy Woy Road with the railway underpass, north of Shoalhaven Drive, and Railway Street at the railway underpass and Nagari Road, Woy Woy South.

These two intersections serve as access to the Woy Woy WMF and were manually counted during the morning peak periods on Monday 18 and Tuesday 19 September, 2006, between the hours of 7:00am and 9:00am. The peak one (1) hour flow was heaviest and recorded on Tuesday 19 September, 2006, during the hours of 7:30am and 8:30am. The evening peak data (5pm to 7pm), employed in the intersection analysis, represents a mirror of the morning peak traffic movements combined with count data from the entrance of the waste management facility.

Of the vehicle numbers counted, 12 were deemed to have been made by employees of the Woy Woy WMF during each peak hour.

Woy Woy WMF Traffic Volumes

Operating between the hours of 7.00 am and 5.00 pm Monday to Friday and 8.00 am to 4.00 pm Saturday and Sunday access to the WMF is achieved via Nagari Road.

Nagari Road is primarily serviced by Railway Street, and via utilisation of the underpass, Woy Woy Road.

Railway Street provides access to the waste management facility for Council's waste services contractor and the commercial, retail and residential communities on the peninsula and Brisbane Water Drive catchments. Given the 8 tonne limit restriction placed on Woy Woy Road, at Kariong, Railway Street serves as the heavy vehicle corridor.

Vehicle classification data collected at the entrance to the waste management facility over the seven day period commencing Monday 18 September, 2006, was supplied by Council. The results are presented in **Table 13-2**.

From this data it was deduced that vehicle trips generated by Council's waste management services contractor, and the peninsula's commercial and retail activities, constitute more than 50% of the facility's traffic.

Table 13-2 Woy Woy Waste Management Facility - Current Traffic Generation

Vehicle Type	Class	Volume
Mon 18 – Fri 22 September		
Cars	1	62
Cars with trailers and light vans	2 + 3	263
Weighed Vehicles	≥3	570
	Total	**895**
Sat 23 – Sun 24 September		
Cars	1	245
Cars with trailers and light vans	2 + 3	52
Weighed Vehicles	≥3	297
	Total	**594**

13.2.3 Existing Intersection Flows

The operational performance of an intersection is best described by the indicators of Level of Service (LoS), Average Vehicle Delay (AVD) and the Degree of Saturation (DS) during the peak operation hours. The intersection performance indicators adopted in this assessment are described below.

Level of Service (LoS)

The level of service is based on the performance of Traffic Signal Control, Priority and Sign Control and Roundabout Control as shown in **Table 13.3**.

Table 13-3 Level of Service

LOS	Traffic Signal Control	Priority and Sign Control	Roundabout Control
A	Good	Good	Good
B	Good with minimal delays and spare capacity	Acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory with spare capacity	Satisfactory but accident study required	Satisfactory
D	Satisfactory but operating near capacity	Near capacity and accident study required	Operating near capacity
E	At capacity and incidents will cause excessive delays	At capacity and requires consideration of an alternate control mode	At capacity and requires alternate control mode
F	Unsatisfactory and requires additional capacity	Unacceptable and requires an alternate control mode	Unsatisfactory, requires alternate control mode

Average Vehicle Delay (AVD)

The AVD is a measure of the operational performance of a road network or an intersection as shown in **Table 13-4**. AVD is determined globally over a road network or within a cordon during an assignment model run. The AVD exhibited on comparable network models, for analogous peak periods, forms the basis of comparing the operational performance of the road network.

AVD is used in the determination of intersection LOS. Generally, the total delay incurred by vehicles through an intersection is averaged to give an indicative delay on any specific approach. Longer delays do occur but only the average over the peak hour period is reported.

Table 13-4 Average Vehicle Delay

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabout	Give Way and Stop Sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode
F	More than 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode or major treatment

Degree of Saturation (DS)

The DS of an intersection is usually taken as the highest ratio of traffic volume on an approach to the intersection compared with its theoretical capacity, and is a measure of the utilisation of available green time. The DS reported is generally of a critical movement through the intersection rather than the DS of the intersection unless equal saturation occurs on all approaches.

For intersections controlled by traffic signals, generally both queue length and delay increase rapidly as DS approaches 1.0. An intersection operates satisfactorily when its DS is kept below 0.875. When the DS exceeds 0.9, extensive queues can be expected.

Woy Woy Road and Railway Underpass Performance

Based on the intersection performance indicators described above, the performance of the Woy Woy Road and Railway Underpass Intersection is given in **Table 13-5.**

Table 13-5 Existing Intersection Performance

Intersection	D/S		AVD		LOS	
	AM	PM	AM	PM	AM	PM
Woy Woy Road and Underpass	0.68	0.59	12.0	13.2	A	A

Traffic Control

Significant traffic management controls within the study area impact the route choice of motorists in the vicinity of the WMF. The key controls are:

- Priority controlled single lane underpass beneath the Sydney Newcastle rail line between Woy Woy Road and Railway Street, near Correa Bay Reserve;
- Railway level crossing on Rawson Road, north of Railway Street; and
- 8 tonne gross vehicular load limit on Woy Woy Road between Langford Drive, Kariong, and immediately north of the F C Nichols Pty Ltd Abattoir. An exemption was conceded to Roy Lamb Sand Soil & Metal given Woy Woy Road provides the sole corridor to access the family property.

13.2.4 Existing Public Transport Services

Bus Services

Woy Woy Bay Road is utilised by the Busways company. Phegans Bay and Woy Woy via Horsfield Bay, Route 58, generally runs three (3) services between Woy Woy Railway Station and Phegans Bay Road, Phegans Bay, half hourly during the weekday morning and evening peak hour periods.

The service is predominantly caters for journey to work trips, facilitating access to the Sydney to Newcastle rail line. The route also provides access to the Woy Woy town centre retail outlets from the residential catchments around Phegans Bay. No service is provided on Sundays or Public Holidays.

Rail Services

The Sydney to Newcastle Rail Line utilises the Woy Woy Railway Station and operates seven (7) services during the morning and evening weekday peak hour period, divided between trips to Sydney and Newcastle.

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13.2.5 Existing Pedestrian and Cycle Environment

Woy Woy South and surrounds is generally a built up urban environment, bordering on National Park, offering minimal pedestrian and cycle infrastructure to encourage these modes of transport. Formalised pedestrian footways on Railway Street cater for pedestrian movements between the surrounding residential catchments and Woy Woy town centre.

13.3 Impact Assessment

13.3.1 Construction

During construction of the proposed AWT and Composting Facilities additional traffic to and from the Woy Woy WMF would be limited to the movement of construction staff vehicles and delivery of construction materials.

Parking provisions for the construction staff, service vehicles and the necessary heavy vehicle transported plant would be catered for on site, with no anticipated loss of on street parking in Nagari Road or the surrounding residential precinct.

Construction workforce

Based on an average work force of approximately 15 personnel during construction, an increase of some 30 light vehicle movements per day (15 trips per peak hour] accessing the site, in both directions, is anticipated.

Heavy Vehicles

In addition, the generation of heavy vehicle traffic movements associated with the transport of construction material to the site is expected to number 5 trips per peak hour period and consist of delivery trucks, water trucks, earthmoving equipment and concrete trucks.

Subsequently, no significant impact on the current operational performance of the surrounding road network is envisaged with the increase in heavy and light vehicle movements to and from the Woy Woy WMF facility during the construction phase.

13.3.2 Operation

Light Vehicles during Operation

There would be an increase in the number of employees at the site during operation of the AWT and Composting Facilities of approximately 15 personnel. This would result in an increase of approximately 15 light vehicles per day entering the facility. There is expected to be no significant increase in the number of light vehicles depositing waste at the facility.

Heavy Vehicles during Operation

The Woy Woy WMF currently receives approximately 75,000 tonnes per annum of waste. At its peak capacity the proposed development of an AWT and Composting Facility would increase the total amount of waste entering the Woy Woy WMF to approximately 125,000 tonnes per annum (30,000 tonnes per annum greenwaste, 15,000 tonnes per annum of biosolids, 70,000 tonnes per annum of MSW and 10,000 tonnes per annum of inert waste). In addition, there would be an increased number

of vehicles transporting final products from the AWT and Composting Facility off site. A breakdown of the anticipated increase in heavy vehicle numbers is given in **Table 13-6**.

Table 13-6 Truck Movements

Material	Amount transported per year	Truck Capacity (assumed)	Trucks per year	Trucks per day	Trucks per peak hour
Existing					
MSW received	32,000	100%-7 tonnes	4,500	14	4
Construction Demolition/VENM	8,900	100%-10 tonnes	900	3	1
Greenwaste received (by heavy vehicles only)	2,500	100%-10 tonnes	250	1	1
Greenwaste transport offsite (by heavy vehicles only)	10,000	100%-10 tonnes	1000	3	1
		Total	**6,650**	**21**	**7**
Future					
MSW received	70,000	100%-7 tonnes	10,000	32	10
Construction Demolition/VENM received	4,500	100%-10 tonnes	450	2	1
Greenwaste and biosolids received (by Heavy vehicles only)	25,000	100%-10 tonnes	2500	8	2
Recyclables and Stabilised Sludge exported from AWT	35,000	100%- 10 tonnes	3500	11	3
Compost exported (by heavy vehicles only)	13,500	100%- 10 tonnes	1350	4	1
		Total	**17,800**	**78**	**17**

13.3.3 Post Development Traffic Growth

Currently, two waste management facilities operate within the Gosford LGA at Woy Woy and Kincumber. It is planned to phase out the landfill operations at the Kincumber site from February 2008, and introduce a transfer waste station to service the domestic and commercial needs of the Gosford community in the disposal of inert waste materials.

The Kincumber facility would continue to operate as a landfill for inert waste till such time as the site is considered 'Full', which is anticipated in year 2009.

Upon the closure of the landfill operations at Kincumber, an increase in vehicle movements, predominately heavy vehicles, can be expected to the Woy Woy WMF. This increase, relating to the movement of an additional 14,300 tonnes of waste per year, would result in an increase of 2050 heavy vehicle trips annually to the Woy Woy WMF. It is noted that this increase would occur regardless of the proposed AWT and Composting Facility development proceeding.

At peak capacity, as shown in **Table 13-6,** the number of heavy vehicle trips entering and leaving the Woy Woy WMF would increase by approximately 57 vehicles per day (11,150 annually) from existing levels. This increase is unlikely to impact the surrounding road network operation.

As such, the projected traffic increase associated with the operation of the proposed development is considered negligible. It is also noted that the only anticipated growth in vehicle movements at the site would be a result of the transformation of the current Kincumber site to a waste transfer facility and any local and intra local development growth in the commercial, retail and residential sectors associated with economic growth within the region.

13.3.4 Traffic and Transport Implications

Given the stagnant growth in vehicle movements, associated with the proposed Woy Woy waste management development, no significant traffic impacts are likely on the surrounding road network.

Therefore, it is anticipated that the current access conditions are sufficient to sustain the proposed inclusion of an AWT and Composting Facility.

13.4 Conclusions

The traffic and transport implications of the proposed development at the Woy Woy WMF of an enclosed Composting Facility to process 30,000tpa of greenwaste and 15,000tpa of biosolids, and adaptation of an AWT to process 70,000tpa of municipal solid waste (MSW) have been considered, and the following has been concluded:

- The proposed development of the Woy Woy WMF would not significantly impact the surrounding road network nor increase the traffic generation associated with the increase in waste management capacity; and
- The current traffic arrangements and access conditions are considered satisfactory to sustain the planned level of development within the Woy Woy WMF.

Archaeology Chapter 14

This Chapter discusses the Aboriginal and Historic archaeological significance of the subject site, and the implications for the site of the legislative provisions under the *National Parks and Wildlife Act 1974* and the *Heritage Act 1977*. Biosis Research undertook a detailed archaeological study, with the full report given in **Appendix F**. This Chapter summarises the key findings of the archaeological study.

14.1 Methodology

The methodology undertaken in preparation of the archaeological assessment included the following key tasks:

- collate data relating to previously recorded historical and Aboriginal archaeology sites within or close to the study area;
- development of a site prediction model for the study area based on existing archaeological data and landforms
- consultation with the relevant Aboriginal stakeholders (Darkinjung Local Aboriginal Land Council (DLALC)) including participation in the field survey
- undertaking of a field survey to identify any Aboriginal and historical archaeological sites and features within the study area;
- identifying and assessing potential impacts of the proposed construction areas on Aboriginal and historic heritage values; and
- recommending appropriate management measures to minimise potential adverse impacts on Aboriginal and historical heritage values and any additional assessment requirements.

14.1.1 Survey Method

The survey methods employed were to conduct transect and targeted surveys in those parts of the study what have not been previously disturbed. The survey team, consisting of two people, walked along the sandstone escarpment, along the upper and lower level along the slope. In other areas pedestrian survey involved members walking evenly spaced transects. Areas with particularly good exposure and large open areas of sandstone platform were targeted and intensively block surveyed by the team.

14.2 Legislative Context

The following legislative requirements are relevant to this proposed development:

- *Australian Heritage Commission Act 1975;*
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984;*
- *The Heritage Act 1977;*
- *National Parks and Wildlife Act 1974; and*
- *Environmental Planning and Assessment Act 1979.*

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14.3 Aboriginal Archaeology

14.3.1 Site History

According to Tindale (1974) the study area was once inhabited by the *Darkinjang*, bordered closely by the *Kuringai* tribe who inhabited the land between them and the coastline. These two groups were on friendly terms, unlike the *Awabakal* groups that inhabited the region to the north. A number of historical accounts describe ritual warring and subsequent injury (Drew 1994).

The *Darkinjang* lands roughly extended from the Hawksbury River northwards to Wollombi and the southern drainage of the Hunter River (Tindale 1974).

Information gathered by R.H Matthews (Matthews 1897 in McDonald 1994:39) provides a valuable insight into the lives of the *Darkinjang* people, although this information was recorded within an already disjointed and decimated community. Matthews stated that all members of the *Darkinjang* community were segregated into two moieties *Dilbi* and *Kuparthin*, and each moiety was further divided into two sections (Matthews 1897 in McDonald 1994:39). On the basis of these moieties and sections, totemic affiliation and marriage relations were determined. Totems consisted of animals or inanimate objects, such as animals, plants, heavenly bodies, the elements or seasons.

It has been suggested that the *Darkinjang* would move to the coast, within *Kuringai* territory during summer months, to exploit the abundant coastal resources, and the reverse was true for the *Kuringai* who moved inland during winter months to participate in ritual kangaroo hunts (Vinnicombe 1980).

14.3.2 Aboriginal Heritage Information Collection and Review

An Aboriginal Heritage Information Management System (AHIMS) search was conducted through the NSW Department of Environment and Conservation (DEC) (formerly NPWS). The search showed there are over 30 previously recorded Aboriginal archaeology sites within the vicinity of the study area. However, none of these sites were located within the present study area, with the majority located in the Brisbane Water National Park. Many of the sites comprised rock engravings and a smaller number of stone arrangements, grinding grooves and shelters with art.

It should be noted that there are some limitations to an AHIMS search these being:

- AHIMS only includes information on Aboriginal objects and Aboriginal places that have been provided to NPWS;
- large areas of NSW have not been the subject of systematic survey or recording of Aboriginal history. These areas may contain Aboriginal objects and other heritage values which are not recorded on AHIMS; and
- recordings are provided from a variety of sources and may be variable in their accuracy. When an AHIMS search identifies Aboriginal objects in or near the area it is recommended that the exact location of the Aboriginal object be determined by re-location on the ground.

14.3.3 Consultations with Darkinjung Local Aboriginal Land Council

The study area lies within the administrative boundary of the Darkinjung Local Aboriginal Land Council (DLALC). The DLALC was forwarded a map of the study area and a brief background of the proposed project. A draft report was additionally forwarded to DLALC for review and comments, with recommendations incorporated into the final archaeological heritage report. A representative of the

DLALC (Jodi Cameron) was present during the field survey undertaken on 10 August 2006 by Biosis Research.

A report from DLALC was received regarding the results of the investigation (see Appendix F). The report states that as a result of investigations it was found that within the proposed building footprint area there were no Aboriginal sites or artefacts (including scatter material) located. Circular shaped marks located on the north-eastern boundary were found, but were located outside of the proposed building area.

DLALC recommends that Gosford City Council seek the appropriate approvals from the DEC in relation to these findings outside of the boundary area to ensure they are not impacted upon. Additionally should any artefact matter be detected during works, all work should cease immediately and the appropriate authorise be contacted.

14.3.4 Impact Assessment

Despite numerous Aboriginal archaeological sites, including stone arrangement, grinding grooves, engraving and rock art shelters, being previously recorded within the immediate region, no sites were identified during the field survey. This is as a result of the highly disturbed nature of the entire study area. Although some areas have remain intact, ground surface visibility in these areas was poor and only a small number of sensitive landforms were identified, including sandstone overhangs and sandstone platforms with possible cultural modification. Only a small number of mature trees are located within the study area. All of these were inspected and no Aboriginal scarring or modification was evident.

It is most likely that the original basalt outcrop located within the study area may have been a source of raw material for those Aboriginal people once inhabiting the study area. Unfortunately, quarrying works that occurred in the 1920s has destroyed all possible evidence of this.

The lack of Aboriginal archaeological sites that were expected to occur based on the predictive modelling, can be attributed to the relatively small size and highly disturbed nature of the study area. The results of this small scale survey do not suggest the need to alter the current site prediction modelling for the region.

Aboriginal Cultural Significance

Aboriginal sites and areas of land under the custodianship of a local Aboriginal community usually have a special significance for Aboriginal people.

All pre-contact (pre-European settlement) sites in the study area are considered to have cultural significance to the Darkinjung Local Aboriginal Land Council. The sites are evidence of past Aboriginal occupation and use of the area, and are a main source of information about the Aboriginal past. The consultants cannot comment directly on such cultural significance —– comment can only be made by the Aboriginal community.

Recorded (and unrecorded) pre-contact sites also have cultural significance because they are rare or, at least, uncommon site-types. In particular, many sites in the greater Sydney area have been destroyed by land clearance and land-use practices in the historic period.

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Specific details about cultural significance should be dealt on a case-by-case basis with the Aboriginal community. Following the completion of the field survey, the Darkinjung identified the immediate area being used in an annual way in conjunction with the other surrounding areas as part of a learning path to the Somersby and surrounding area. Numerous ceremonial and spiritual sites have been identified within the Brisbane Water National Park.

14.3.5 Mitigation Measures

No further Aboriginal archaeological work is required within the study area as no Aboriginal archaeological sites or areas of potential are located within the study area.

An area in the south eastern corner of the study comprises relatively undisturbed open swamp which contained two circular features and a number of small sandstone overhangs. According to study area plans, this area is located approximately 50 to 100m outside the eastern boundary of the Woy Woy WMF site, well away from the proposed area to be cleared and therefore would not be impacted by the proposed works. This area also contains a number of indigenous plants that were significant to Aboriginal people.

The Darkinjung Local Aboriginal Land Council has requested that:

Gosford Council seek the appropriate approvals from the Dept of Environment and Conservation in relation to the sites found just outside the boundary area to ensure they are not impacted upon, and

That should any artefact matter be detected that work cease immediately and the appropriate authorities be contacted, that is the land council, National Parks and Wildlife and an archaeologist

Council would adhere to the above recommendations, to ensure that any impacts on Aboriginal archaeology are adequately managed during construction of the proposed facilities.

14.4 Historic Archaeology

All land within NSW is subject to the provisions of the *Heritage Act* 1977. The Act provides for the protection of items of local, regional and State heritage significance. The Act makes the Heritage Council the consent authority for any works that would impact State significant heritage items. Heritage items can be listed on local, State and Commonwealth registers.

The State Heritage Inventory lists all sites identified under any planning instrument within NSW as having heritage significance. A search of the State Heritage Inventory was undertaken and the search revealed that there are no heritage items located within the Woy Woy WMF. The search was of all heritage listings including State and local listings. A further search of the Commonwealth EPBC website was undertaken. The search results revealed that there are no items of Australian Heritage located on the subject site. It is therefore considered that no further work is required in regards to non indigenous heritage.

14.4.1 History of the Area

The Woy Woy/Brisbane Water District was first explored very early after initial settlement at Port Jackson, and settlers first moved into the district in the 1820's. In 1833 the Great North Road was completed allowing easier access to the Hunter Valley region, and with that tracks were made to the east towards the coastal area. Small farming areas were located along side the Brisbane Waters, and an early site for a township was selected due to the sea access to the site and anchorage present, the town was named Gosford.

The town location was additionally established to service the farm settlement and trades that were emerging from the area. Shipbuilding became a prominent industry within the area, with the natural timbers and water frontages along the Brisbane River attracting more shipbuilders who established dockyards, which by 1880 made the Brisbane Waters area the second largest shipbuilding area in the Colony, second to Sydney Harbour.

The township of Woy Woy was not officially formalised until 1 August 1928, after completion of the railway line, which originally ran from Newcastle to Gosford, but later extended to Sydney once the Hawkesbury River Bridge was constructed. The improvements in transportation allowed for the expansion of land and people into the region.

Smaller, 40 acre land grants were commissioned as part of the Governors Model Farms Act which had then led to the establishment of smaller regional centres. Being the first station on the northern side of the Hawkesbury River, Woy Woy became a popular tourist destination for Sydney residences, resulting in many guest houses and hotels.

14.4.2 The Subject Site

The land within the study area was originally granted to a Mr Charles Dillion on 5th April 1900. In 1924, the northern portion of the study area was sold to a Mr James Warrick Brown who leased his property to Basalt Quarries Limited between December 1927 and September 1928. The land was then sold and remained with Maude Newbury Brown until her death in 1930, upon which the land remained in control of solicitors until Woy Woy Council in 1933, resumed the land. The site was then used as a waste management facility.

14.4.3 Impact Assessment

As stated above, searches of the Commonwealth, NSW and local heritage lists revealed that there are no heritage items located on or adjacent to the subject site. In addition, due to the long history of disturbance at the site, in particular the long history of use as a landfill, it is considered highly unlikely that any archaeological artefacts remain.

In the unlikely case that any non-indigenous archaeological material is found during the proposed project, it is recommended that all works cease and Gosford City Council be notified immediately, with a requirement for consultation with the NSW Heritage Office.

14.4.4 Mitigation Measures

No historic sites are located within the proposed study area therefore no further historic archaeological work or mitigation measures are required.

15.1 Overview

The Woy Woy area forms part of the growing Central Coast Region. Population growth in Gosford LGA has been rapid over recent years and this growth is projected to continue, however at lesser rate in the future. Recent growth has resulted in a population structure that shows high numbers of young families and high numbers of elderly persons. In order to meet the Gosford region's expanding population, and state government resource recovery targets, Council has decided to upgrade its waste infrastructure.

This assessment aims to analysis the existing socio-economic environment of the Woy Woy area including the existing demographic, socio-economic and employment profiles. It also describes the potential socio-economic impacts from the proposed development and relevant mitigation measures proposed.

15.2 Existing Economic Environment

15.2.1 Demography

Population

Local, state and national population counts and projections for the areas surrounding the proposed WMF Project are shown in **Table 15-1** below. The populations for all regions are characterised by a pattern of growth continuing until 2026. The population projections for Gosford area indicate an compound annual growth rate (CAGR) of 0.9% from 2001 to 2026, which is slightly higher than the CAGR projected for NSW of 0.8% over this period. These rates are lower than the nationally projected growth, which is forecast at 1.3% CAGR for Australia over the same 25 year period. The annual population growth of the Central Coast region is expected to average 2,570 people per year or approximately 0.75 per cent per year, between 2006 and 2031.

Table 15-1 Population (Census and Projections)

Area	2001 Actual	2006 Forecast	2011 Forecast	2016 Forecast	2021 Forecast	2026 Forecast
Gosford	154,654	166,020	172,540	179,730	187,080	194,230
Wyong	135,500	150,390	166,090	179,400	193,640	207,830
New South Wales	6,575,220	6,868,900	7,164,700	7,450,360	7,734,930	8,012,570
Australia	18,972,350	20,352,013	21,710,086	23,118,693	24,581,902	26,068,251

Source: DIPNR NSW SLA Population Projections 2004; ABS Population Projections Australia 2004-2051

Age Structure

Based on the 2001 ABS Census figures it is apparent that the Gosford Local Government Area (LGA) has a significantly higher proportion of residents aged between 65-89 years and a much lower proportion of residents aged between 15-34 years when compared to the NSW and Australia equivalent. The larger proportion of the population in the Gosford area is aged between 40-49 years.

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The proportion of the population over 65 is projected to increase substantially over the next 25 years to be around 24 per cent, the highest percentage for the Greater Metropolitan Region (Department of Planning, 2006 Draft Central Coast Regional Strategy). Ageing of the current population (a large proportion of which are families) and increasing life expectancy will play a major role in increasing the number of people aged over 65. Retirees are likely to continue to live in coastal areas such as Ettalong, Toukley, Kincumber and Umina and bring a number of specific infrastructure needs.

There is a gap in the number of 20–29 year olds living in the Region. Historically, this has been attributed to people in this age group moving to Sydney for lifestyle and employment reasons.

15.2.2 Workforce

In addition to the age structure and level of qualifications discussed above, further analysis of the existing Labour Force situation is detailed in the following section.

Labour Force Status

The WMF local region, Gosford, has a labour force of 68,372, which is 2.3% of NSW's total labour force (2,961,592) as shown in **Table 15-2**. In terms of unemployment levels, the Gosford LGA's unemployment level is 7.4% of the labour force. This unemployment level is higher than the state and national levels of 7.2% and 7.4% respectively based on 2001 census data.

56.8% of the total labour force were employed full-time, 33.1% were employed part-time, 2.6% were employed but did not state their hours worked and 7.4% were unemployed. 47,654 people aged 15 years and over were not in the labour force (ABS, Census 2001).

Table 15-2 Total Labour Force (aged 15 years and over)

Total labour force (includes employed and unemployed persons)	Gosford LGA	% of persons in the labour force for Gosford LGA	Australia	% of persons in the labour force for Australia
	68,372	-	8,959,315	-
Employed full-time	38,840	56.8%	5,360,693	59.8%
Employed part-time	22,664	33.1%	2,689,709	30.0%
Employed hours not stated	1,809	2.6%	248,204	2.8%
Unemployed	5,059	7.4%	660,709	7.4%
Not in the labour force	47,654	-	5,265,426	-

Labour Force Sectors

Table 15-3 shows the various sectors of the labour force in the Gosford LGA. The retail sector is the largest area of employment with almost one in three people of the total labour force employed in the retail sector. Manufacturing (17%), Property and Business Services (14.2%) and Construction are represent a significant proportion of the total labour workforce. A similar situation is found in NSW and Australia, with the three major industries also retail trade, property and business services, and manufacturing.

Table 15-3 Gosford Labour Force by Sector

Sector	Percentage
Agriculture, Forestry and Fishing	2.4%
Mining	0.4%
Manufacturing	17.0%
Electricity, Gas and Water Supply	0.7%
Construction	9.5%
Wholesale Trade	6.8%
Retail Trade	30.5%
Accommodation, Cafes and Restaurants	8.9%
Transport and Storage	4.0%
Communication Services	1.7%
Finance and Insurance	4.0%
Property and Business Services	14.2%

Source: ABS, Census, 2001 (Include Government Sector Employees)

15.3 Socio-Economic Impact Assessment

The proposed development has the potential to cause both positive and negative socio-economic impacts.

Potential negative impacts on the amenity of the local area have been identified in this Environmental Assessment and suitable mitigation measures proposed in the relevant sections as noted below:

- Noise and vibration impacts on surrounding residents during construction and operation: Chapter 11;
- Air quality impacts including dust generation during construction and odour during operation: Chapter 12; and
- Traffic impacts on local road network during construction and operation: Chapter 13.

As identified in each of the relevant sections the potential impacts can be managed, and would not have a significant impact on the local amenity of the area. The proposed facilities would be operated in accordance with all relevant environmental legislative requirements to ensure that impacts on surrounding amenity are minimal.

Potential positive socio-economic impacts of the proposal are discussed below.

15.3.1 Employment

Based on similar projects, it is anticipated that the employment generated during the separate stages of the project would be as follows:

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Construction Phase

- Site works: Approximately 10-20 jobs
- Construction of Composting Facility: Approximately 20-40 jobs
- Construction of AWT Facility: Approximately 30-40 jobs

Commissioning Phase

- Commissioning of Composting Facility: Approximately 5-10 fulltime staff
- Commissioning of AWT Facility: Approximately 5-10 fulltime staff

Operation Phase

- Operation of Composting Facility: Approximately 2-5 fulltime staff
- Operation of AWT Facility: Approximately 5-10 fulltime staff

Many of the above positions would be sourced from the local area.

15.3.2 Increased Business Activity

The proposed AWT and Composting Facilities are expected to have a combined capital cost of approximately $35 to $40 million, with an ongoing operation cost of approximately $1 to $3 million per annum. A development of this size is likely to increase business activity within the local economy through the flow on effect related to construction and ongoing operation of the proposed facilities.

15.3.3 Environmental Benefits

By reducing waste going to landfill, the proposed development would result in long term environmental benefits through land conservation, reduction in potential greenhouse gas emissions and reuse of resources, for the local Woy Woy and broader Gosford community.

15.3.4 Long Term Waste Strategy

The proposed development would secure the long term waste management strategy for the Gosford LGA, by providing a sustainable waste management solution which meets key NSW government waste avoidance and resource recovery objectives.

15.4 Conclusion

Specific mitigation measures to minimise negative potential impacts on the community surrounding the Woy Woy WMF associated with Noise, Air Quality and Traffic are detailed in the relevant Chapters of this Environmental Assessment.

The proposal would provide a range of social benefits including extending the life of the current landfill, assist in increasing resource recovery of waste materials and create new jobs for the region.

16.1 Introduction

This Chapter outlines the hazards and risks to the surrounding environment, residents and personnel at the Woy Woy WMF, associated with the construction and operation of the proposed AWT and Composting Facilities. The suitable mitigation measures to control the identified hazards and risks are also provided.

A hazard is defined as a source of potential harm or a situation with a potential loss. Hazards can relate to situation with potential for human injury, damage to property or the environment or combination of these.

Hazards associated with the proposed development would include:

- hazards during excavation and construction works; and
- hazards during operation of the proposed facilities;

16.2 SEPP 33 Overview and Risk Framework

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33) applies to potentially hazardous or offensive industries. SEPP 33 is an enabling instrument, which aims to ensure that a proposed development is properly assessed in relation to off-site risk and offence before being determined by the relevant consent authority. Clause 3 of the policy contains the definitions of potentially hazardous industry and potentially offensive industry and these are presented below.

Potentially hazardous industry *means a development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:*

(a) to human health, life or property, or

(b) to the biophysical environment,

and includes a hazardous industry and a hazardous storage establishment.

Potentially offensive industry *means a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.*

Outlined below is an assessment of the Potential Hazard and Offence of the proposed development.

Chapter 16 Hazard and Risks

16.2.1 Assessment of Potential Hazard

To determine if the proposed development is potentially hazardous, a screening level risk assessment was carried out in accordance with the Department of Planning guidelines (DoP, 1994). These guidelines provide a risk screening procedure based on the quantity of dangerous goods to be used by the proposed development and the distance these materials are stored from the sites boundary. If the proposed development plans to store quantities of these goods below the relevant thresholds it can be assumed there is unlikely to be a significant off-site risk and the proposal is therefore not classified as a 'potentially hazardous industry'. The Australian Code for the Transport of Dangerous Goods by Road and Rail classifies hazardous materials. Provided in **Table 16-1** are the hazardous materials that would be used at the proposed AWT and Composting Facilities, an estimate of the maximum quantity of these materials to be stored on site at any one time and the distance they would be stored from the site boundary. The hazardous material stored on site would be limited to engine oils stored in 20 litre or 220 litre drums within the enclosed AWT building and waste oils stored within a bunded 220 litre drum.

Table 16-1 Hazardous materials Storage

Hazardous material	Dangerous Goods Classification	Mode of Storage	Maximum Quantity Stored	Distance from Site Boundary	Screening Threshold	Transportation Screening Threshold
Engine Oils, Degreaser	Class 3 – Flammable Liquids C2	Storage room within enclosed AWT facility	Max 300L oil and 50kg Grease	20m	Excluded	Excluded
Waste Oils	C2	Waste oil tank within a bunded area of the AWT, and transferred to existing waste oil storage are in Woy Woy WMF	100L	20m	Excluded	Excluded

As shown in **Table 16.1** the hazardous materials to be stored on site are classed as C2 according to the Dangerous Goods Code. As stated in the Department of Planning Guidelines (DoP, 1994) "if Class C1 and/or C2 are present on site and are stored in a separate bund or within a storage area where they are the only flammable liquid present they are not considered to be "potentially hazardous". Therefore the hazardous material to be stored onsite during operation of the proposed AWT and Composting Facilities are not considered potentially hazardous.

16.2.2 Assessment of Potential Offensiveness

To determine whether the proposal is potentially offensive, the Department of Planning guidelines (DoP, 1994) recommend considering the following:

- Does the proposed development require a pollution control licence under legislation administered by the DECC?
- Does the proposal require pollution control approval pursuant to any legislation or bylaws administered by Council?
- Does the proposal cause offence having regard to the sensitivity of the surrounding environment?

The proposed development would require an Environmental Protection Licence (EPL) as waste storage, transfer, separating or processing facilities are activities listed in Schedule 1 of the POEO Act, and as such is considered to be 'potentially offensive' development. The Department of Planning guidelines (DoP, 1994), also states, however that the level of offence would not be considered significant if the relevant DECC licence can be obtained. It is considered that an EPL can be obtained for the proposed development and therefore it is not an offensive industry as defined by SEPP 33.

16.2.3 Conclusion

The types and volumes of materials that are to be used on site during operations are not considered to be potentially hazardous and therefore a preliminary hazard analysis (PHA) is not required. Also it is considered that an EPL can be obtained for the proposed development and therefore it is not an offensive industry as defined by SEPP 33.

16.3 Impact Assessment

Outlined below are the key hazards associated with the construction and operation of the proposed AWT and Composting Facilities.

16.3.1 Construction

General Health and Safety Hazards

The construction phase of the project would involve excavation and filling works. These works may result in increased generation of dust around the work areas. Dust may irritate the eyes, noses and throats of workers.

Earth digging equipment and other heavy equipment would be used during the earthworks. The effects of noise from the use of heavy equipment could result in noise impacts to workers being startled, annoyed or distracted; physical damage to the ear, pain, and temporary or permanent hearing loss, and communication interference that may increase potential hazards due to the inability to warn or be alerted to danger.

Potential electrical hazards may be caused by power supply systems used during construction period. The hazards may include trip overs, sparks, unsafe connection resulting in injury, burning and fatality.

There would be an increased number of heavy and light vehicle movements during the construction of the proposed facilities, and this may increase the likelihood of accidents within the Woy Woy WMF access roads.

General safety hazards such as rock ledges and uneven terrain already exist across the subject site may be increased during the construction period.

Landfill Gas Hazards

The location of the proposed AWT and Composting Facilities is in close proximity to the existing Woy Woy WMF landfill, and therefore there is a potential risk that construction of the facilities on the proposed site could be affected by the lateral migration of landfill gas from the adjacent landfill. Landfill gas is produced from the biological degradation of waste under anaerobic conditions within the landfill. The main components of landfill gas are carbon dioxide and methane, with minor quantities of nitrogen and hydrogen sulphide. Hazards associated with landfill gas are due to it being odourless

and denser than air meaning that it can displace oxygen and create an oxygen deficient area without workers in the area being aware of its presence. The risk of oxygen deficiency is limited to confined areas or areas below ground where there is limited airflow and dispersion. However, as workers involved in this development are unlikely to be exposed to landfill gas, in confined spaces, it is unlikely to represent a significant risk. Also, as reported in the October 2006 quarterly subsurface gas monitoring undertaken at the Woy Woy WMF (Golder, 2006) methane was not detected in any of the gas monitoring wells at the site (i.e 0% lower explosive limit (LEL)), therefore all concentrations were below the NSW DEC's trigger level of 25% LEL.

16.3.2 Operation

General Health and Safety Hazards

Mechanical equipment used within the operation of the proposed AWT and Composting Facilities may be potential hazards to employees and visitors to the site. Potential hazards may include moving parts, hot or sharp surfaces and failure of equipment. During operation, trucks would be entering the facilities to deposit waste, and collect products. Forklifts would be in operation at both the AWT and Composting Facility unloading and loading the waste material. This would require the vehicles to manoeuvre around the proposed facilities including reversing and turning, thereby posing a potential hazard to employees and visitors to the site.

Landfill Gas Hazards

Landfill gas from the adjoining landfill may pose a potential hazard to the operation of the proposed facilities, in a similar manner to the potential hazard during construction, however over a longer time period.

Bushfires

The Woy Woy WMF is located within a bushfire prone land zone. The risks associated with a bushfire hazard are addressed in Section 16.5.

16.4 Mitigation Measures

16.4.1 Construction

General Health and Safety Hazards

The Contractor awarded the tender for the construction of the proposed facilities, would be required to provide, maintain and be responsible for all safety measures and equipment in compliance with the relevant authorities' requirements. These requirements are to be outlined in a site-specific Occupational Health, Safety and Rehabilitation (OHS&R) Plan to be prepared by the Contractor in accordance with NSW Occupational Health and Safety legislation, for review by Council. A requirement of the OHS&R Plan would be the inclusion of an induction program for all site workers and visitors.

The risk of injury from health and safety hazards would be reduced by:

- Assessment of the risk of harm to the health or safety of site workers and other personnel onsite arising from identified hazards;
- providing induction training that covers management of health and safety at the site, hazard reporting and health and safety procedures relevant to the site works;
- providing personnel protection equipment to the site workers;
- ensuring that work carried out on the site is conducted by qualified personnel who posses the appropriate licences;
- erecting signs to indicate safety hazards at the site entrance and various locations around the site;
- maintaining site equipment, plant and facilities to reduce noise generation; and
- good housekeeping on site including keeping access paths free from obstacles.

Landfill Gas Hazards

Prior to construction works being undertaken, subsurface and surface landfill gas monitoring would be undertaken at the proposed construction work area. These results together with the results of quarterly monitoring undertaken at the Woy Woy WMF would be used to prepare a landfill gas management plan. This plan would be incorporated into the site-specific Occupational Health, Safety and Rehabilitation (OHS&R) Plan to be prepared by the Contractor in accordance with NSW Occupational Health and Safety legislation. The plan would detail ongoing monitoring to be undertaken during construction and suitable management measures to be implemented if landfill gas is detected above selected threshold levels.

Emergency Plans/Incident Management Plans

The objective of having emergency plans and incident management plans in place is to facilitate an appropriate response to an emergency situation thereby minimising any potentially hazardous incidents.

Emergency plans and incident management plans would be included in the OHS&R Plan and would be designed to incorporate the key issues included in Council's Incident Management Protocol.

16.4.2 Operation

General Health and Safety Hazards

A detailed Occupational Health and Safety (OHS) Plan would be prepared by the selected Contractor for implementation during the operation of the proposed facilities. This plan would outline suitable measures to minimise risk to human health and safety, including:

- site induction procedures for all employees and visitors to the site that covers management of health and safety at the site, hazard reporting and health and safety procedures relevant to the site works;
- safeguards, signs and correct operation methods for mechanical equipment to minimise risks;

- personal protective equipment (PPE) requirements for employees and visitors to the site;
- traffic management procedures including clearly defined and signposted access roads; and
- fitting all plant used within the facility, such as forklifts, with reversing alarms and ensuring they are maintained in accordance with manufactures recommendations and OHS regulations.

Landfill Gas

The site specific OHS Plan prepared for the operation of the proposed facilities would include suitable management measures to minimise the potential hazard associated with landfill gas migration from the adjoining Woy Woy WMF landfill towards the proposed development. These management measures would include:

- installation of permanent gas detectors within buildings where there is a potential for landfill gas to accumulate;
- installation of subsurface monitoring wells between the proposed AWT and Composting Facilities and the landfill;
- regular monitoring of potential gas migration toward the proposed facilities, by taking gas measurements in the subsurface wells; and
- evacuation procedures in the case of detection of landfill gas above specified threshold levels.

16.5 Bushfires

The Woy Woy WMF is located within a Bushfire Prone Zone and therefore appropriate measures would be taken during construction to minimise potential risk of a bushfire. While the proposed development is not required to comply with the document Planning for Bushfire Protection (DoP, 2001), as it is not a residential development, the principles of this document would be applied to the proposed development to minimise the threat of fires on the Woy Woy WMF and surrounding landuses, in particular the Brisbane Water National Park. Prior to finalisation of the detailed design of the proposed facilities a detailed Construction Environmental Management Plan and Operational Environmental Management Plan would be prepared. These plans would outline the key management measures to be adopted to minimise the fire hazard, in accordance with the key principles considered within the Planning for Bushfire Protection (DoP, 2001), including:

- **Asset protection zones**: Where a bushfire hazard exists on or adjacent to a development site, an Asset Protection Zone (APZ) is developed on the hazard side of the development. APZ's act as a buffer zone between the development and the hazard. For the proposed AWT and Composting Facilities, APZ's would be established on the eastern, southern and western boundaries of the development area, adjacent to the Brisbane Water National Park. A fire trail would be located within the APZ around the proposed development area. These APZ's including the existing fire trail, would be within the project boundary as shown on **Figure 4.1**, and would not require any clearing of vegetation outside the project boundary.
- **Site access**: Access to the proposed development would be off the existing entrance road to the Woy Woy WMF. This road, as well as the new access road onto the proposed platform, as

shown on **Figure 4.1**, would provide sufficient access to allow fire fighting vehicles to enter the Woy Woy WMF site and the proposed development area.

- **Water supply**: Water supply for fire fighting would be made available from the dedicated firewater tanks for the proposed development. These firewater tanks and the fire fighting vehicles could be topped up using the rainwater tanks, the northern sedimentation pond or the town water supply hydrant located near the entrance to the Woy Woy WMF, off Nagari Road.
- **Building construction requirements**: The material used for the construction of the proposed facilities would primary be metal sheeting, and therefore not impacted upon by radiant heat from a bushfire.
- **Vegetation management**: Vegetation management surrounding the proposed development may require hazard reduction techniques to reduce fuel loads and limit the paths available to the passage of a bushfire event. The National Parks and Wildlife Service (NPWS) a division of the NSW DEC, has prepared a bushfire management strategy (DEC, 2006) for the Brisbane Water National Park. The proposed development would comply with the requirements of this plan. In particular the vegetation located to the south of the proposed AWT and Composting Facilities located within the Woy Woy WMF site boundary adjacent to the National Park, would be managed in accordance with the measures outlined in the bushfire management strategy. These measures include prescribed burning, also known as hazard reduction burning and mechanical slashing of fire trail verges and fire breaks.

Additional Fire Management Measures

The Woy Woy WMF Landfill Environmental Management Plan (LEMP) (URS, 2006a) outlines fire management procedures for the existing site. This LEMP would be updated to take into consideration the proposed AWT and Composting Facilities including maintenance of fire fighting equipment and evacuation procedures for personnel located within the AWT and Composting Facilities. During construction works, fire extinguishers would be provided for the construction works and available and accessible at all time. In the case of fire occurring, these extinguishers, along with stockpiled soil, would be used to smother the burning material and starve the fire of oxygen. Due to the risk associated with a potential bushfire, the Rural Fire Service would be alerted regardless of the size of the fire. The site would also be evacuated and the safety officer informed.

16.6 Conclusion

The assessment above indicates that the proposed development would be unlikely to result in any high consequence hazards or high risks to human health, property and the environment relating to the use of the site and proposed activities on the site during construction and operation if the proposed mitigation measures are effectively implemented.

17.1 Introduction

This Chapter outlines the characteristics of the waste that may be generated during the construction works and operation associated with the proposed AWT and Composting Facilities development, and describes how the waste would be managed in accordance with the relevant NSW regulations and guidelines.

The NSW *Waste Avoidance and Resource Recovery (WARR) Act 2001* sets out a hierarchy of waste and resource management priorities for NSW. In order of importance, these priorities are:

- avoidance of unnecessary resource consumption;
- resource recovery (including reuse, reprocessing, recycling and energy recovery); and
- waste disposal.

The WARR Act also assists in the management of the environmental impacts arising from the generation of waste, which are regulated in accordance with the *Protection of the Environment and Operations Act 1997* (POEO Act).

The EPA document titled *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes* (DEC, 1999) provides guidelines on the classification and management of waste generated in NSW.

17.2 Existing Environment

The Woy Woy WMF is currently licensed by the EPA as a Solid Waste Class 1 Landfill (Licence number 6053), and able to receive up to 100,000 tonnes of waste per year. Operations currently carried out on the site include:

- Gatehouse and weighbridge;
- Landfilling of waste within clay lined cells;
- Resource recovery area for sorting and collection of recyclable material such as timber and steel; and
- Greenwaste collection and sorting area.

Currently the majority of residual waste entering the WMF is landfilled with limited resource recovery.

17.3 Proposed works

Council is proposing an AWT for processing of 70,000 tonnes per annum of municipal solid waste (MSW) and a Composting Facility for managing 30,000 tonnes per annum of source separated greenwaste and 15,000 tonnes per annum of biosolids. It is proposed that both the AWT and Composting Facility would be established within a 3 hectare area located towards the southern end of the Woy Woy WMF (refer to **Figure 4.1** for site layout). Key infrastructure components to be established on site include:

- An engineered platform for the proposed processing facilities with a sealed access road onto the platform, coming off the existing entrance road;

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- A concrete paved area for initial receival, sorting and shredding of greenwaste and biosolids at the entrance to the composting building;
- Two enclosed buildings to be constructed on the platform, one containing the greenwaste processing equipment, the other containing the MSW waste receival, sorting and processing facilities; and
- A biofilter for treatment and release of air collected from the MSW and composting buildings, consisting of a sub-ground concrete floor and perimeter walls, a grate floor at ground level with a layer of filter medium on top.

17.4 Waste Generation

17.4.1 Construction

No significant solid waste is expected to be generated since the earthworks on site would merely require stockpiling of excavated materials and redistribution of these materials to create the engineered platform for the proposed facilities.

During construction there would be minor amounts of wastes generated as follows:

- greenwaste from removal of all shrubs, trees and other vegetation not identified for preservation, as part of site preparation. It is not expected that in situ soil materials would be removed from the site;
- Soil removed from excavated material which has been assessed to potentially reduce geotechnical suitability, and therefore unsuitable for construction of the platform.
- building waste from site works such as installation of drainage, site office facilities and amenities, including small amounts of building materials such as rubble, concrete, metal and timber from formwork; and
- general waste from construction workforce, including recyclable waste (paper, cardboard and plastics) and non-recyclable or putrescibles wastes such as food scraps.

17.4.2 Operation

As outlined in Chapter 4, approximately 35,000 tonnes per annum of residual material from the AWT facility would be generated along with approximately 2,000 tonnes per annum from the greenwaste and biosolids Composting Facility. Small amounts of general waste and recyclables from site personnel would also be collected. Small quantities of solid and liquid wastes, such as oils, greases and spare parts, may be generated from maintenance of equipment within the AWT and Composting Facilities.

17.5 Waste Management and Mitigation Measures

17.5.1 Construction

Management measures and options for minimising construction wastes would include:

Waste Avoidance

- sourcing of materials in the correct quantities and size;
- ordering pre-cut/pre-fabricated material;
- materials to be fabricated offsite to reduce waste generation;
- materials to be imported in bulk to reduce packaging waste;
- reducing packaging at the source by returning packaging to the supplier where possible, and by purchasing in bulk; and
- undertaking construction activities in the correct order, to minimise potential rework.

Waste Reuse

- reuse of all fill from earthworks on site where possible, to minimise off-site disposal; and
- reuse timber formwork where possible.

Waste Recycle

- collection of greenwaste removed from the site at the existing greenwaste collection area within the Woy Woy WMF;
- separation and storage of construction wastes into recyclable and non-recyclable materials in skips; and
- collection of scrap metals (aluminium, copper, lead, zinc, steel) for recycling off-site.

Waste Disposal

- general waste would be collected in skips and transported for disposal to the licensed landfill located to the north of the site.

Because the facilities would be largely pre-fabricated off-site, and by implementing the above mitigation measures, it is expected that only small amounts of waste would be generated during the construction activities, and that these would be disposed of to the Woy Woy WMF landfill. It is therefore expected that there would be no significant impact on existing landfill capacity or other waste disposal facilities.

17.5.2 Operation

Residual waste material removed from the AWT and Composting Facilities would be stored in skips, before being removed to the adjoining landfill for disposal. The remaining capacity of the Woy Woy WMF landfill should accommodate the residual material, over the design life of the proposed facilities.

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Garbage and recycling bins would be provided around the AWT and Composting Facilities for disposal of general mixed waste and recyclables by employees. These bins would be transported to the waste receival area of the AWT facility for sorting and processing with the kerbside collected MSW. Any amounts of general waste which cannot be processed in the AWT would be transported to the adjoining landfill for disposal.

Waste oil generated from maintenance of equipment within the facilities would be temporarily stored on site within a 220 litre drum in a bunded area within the enclosed AWT facility. The contents of this drum would be transferred to the existing waste oil collection tank located within the resource recovery area of the Woy Woy WMF, and collected as required by a licensed waste oil recycling contractor for processing and reuse off site. If any waste classified as hazardous is generated during operation of the facilities this would be managed according to the waste classification and management guidelines (DEC, 1999), and would be removed offsite for treatment and disposal.

17.6 Conclusion

Waste management measures in accordance with the procedures outlined above would be developed, as part of the construction and operational environmental management plans prior to the commencement of the proposed works to maximise the reduction, recycling and reuse of waste materials, and ensure disposal of waste in accordance with relevant guidelines and legislation.

Flora and Fauna Assessment | Chapter 18

This Chapter discusses the flora and fauna impacts associated with the proposed development and outlines suitable management measures to be implemented to minimise the identified impacts. URS undertook a detailed flora and fauna survey and assessment, with the full report given in **Appendix G**. This Chapter summarises the key findings of the flora and fauna survey and assessment.

18.1 Introduction

URS conducted a flora and fauna survey and assessment for the proposed development of an AWT and Composting Facility at the Woy Woy Waste Management Facility (WMF), on the Central Coast of New South Wales. Baseline flora and fauna surveys were undertaken in July 2006 with additional targeted surveys undertaken in November 2006. The November 2006 targeted surveys were undertaken in order to coincide with the optimal detection period for the majority of fauna which may occur at the Site and following recommendations by the NSW Department of Environment and Conservation (DEC) in their correspondence dated 30 October 2006 (Alan Henderson – Area Manager Gosford).

This report assesses the flora and fauna impacts of the Project with regards to Commonwealth and NSW State planning and environmental legislation (including the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, the *Environmental Planning and Assessment Act 1979 (EP&A Act)*, the *Threatened Species Conservation Act 1995 (TSC Act)*, *Native Vegetation Act 2003 (NV Act)*, *State Environmental Planning Policy* (*SEPP 44*) and the *Noxious Weeds Act 1993 (NW Act)*.

18.2 Legislation Framework

Environmental Planning & Assessment Act 1979 (EP&A Act) and Threatened Species Conservation Act 1995 (TSC Act)

On 31 October 2005, the majority of the provisions under the *Threatened Species Legislation Amendment Act 2004* and all the remaining provisions under the *Threatened Species Conservation Amendment Act 2002* commenced. A key amendment, which affects this Flora and Fauna Assessment, include the replacement of the Eight Part Test of Significance with a Seven Part Assessment of Significance. This amendment affects both Section 5A of the *EP&A Act* and Section 94 of the *TSC Act*. The revised factors retain the same intent in assessing the potential impacts of a proposed development on a threatened species, population (including their habitats) or EEC, however the new Seven Part test requires assessment of significance at a local scale rather than at a regional scale.

Should the Seven Part Assessment of Significance conclude that there may be a potentially significant impact on a listed species, population or EEC, a Species Impact Statement (SIS) must be prepared. An SIS must be prepared under the Terms of Reference issued by the Director-General (DG) of the DEC. Approval for the proposal is also required by the DEC DG.

In light of changes to NSW legislation, a Seven Part Test was carried out for those *TSC Act* listed species and communities recorded and/or predicted to occur at times on the Site or within adjoining remnants. The Seven Part Tests are provided in **Appendix G.**

Chapter 18 Flora and Fauna Assessment

Native Vegetation Act 2003 (NV Act)

The NSW Government released the regulations for the *NV Act* on 14 November 2005, which came into effect on 1 December 2005. The *NV Act* regulates the clearing of native vegetation on all land in NSW except for land listed in Schedule 1 of the Act. Excluded land under Schedule 1 of the Act includes National Parks and other conservation areas, State forests and reserves, and urban areas. Specifically, urban areas, which are excluded, include areas zoned residential (but not rural residential), village, township, industrial or business.

A central feature of the NV Act is the requirement for the implementation of a Property Vegetation Plan (PVP) before the clearing of any vegetation, including a single paddock tree. The PVP is a voluntary system and are negotiated agreements between individual landholders and their local Catchment Management Authority.

The Site is currently zoned 5(a) Special Uses under the Gosford Planning Scheme Ordinance and is currently licensed by DEC as a Solid Waste Class 1 Landfill (Licence number 6053). Under Schedule 1 of the *NV Act* land within a zone designated "industrial" under an environmental planning instrument or, having regard to the purpose or substantial character of such as zone is exempt from the operation of the Act. This proposal is therefore considered exempt from the *NV Act*.

Noxious Weeds Act 1993 (NW Act)

Under the *Noxious Weeds Act 1993* (*NW Act*), Gosford City Council is responsible for the control of noxious weeds in its local government area (LGA). The *NW Act* provides for the declaration of noxious weeds by the Minister of Agriculture. Noxious weeds may be considered noxious on a National, State, Regional or Local scale. All private landowners, occupiers, public authorities and Councils are required to control noxious weeds on their land under Part 3 Division 1 of the *NW Act.*

State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 44)

This Policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas. SEPP 44 applies to land with Local Government Areas listed in SEPP 44, Schedule 1 for which a development application has been made and Council is the determining authority. As the study area exists within the Gosford Local Government Area (listed in Schedule 1 of SEPP 44) SEPP 44 applies to this assessment.

Under this policy the distinction between 'potential' and 'core' koala habitat is made. "Potential Koala Habitat" means area of native vegetation where the trees of the types listed in Schedule 2 of the Policy constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. "Core Koala Habitat' means an area of land with a resident population of Koalas, evidenced by attributes such as breeding females and recent sightings of and historical records of a population.

Where potential habitat is identified, the area must be investigated for core koala habitat. Where core koala habitat is found to occur, SEPP 44 requires that a site-specific Koala Plan of Management be prepared.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The purpose of the Commonwealth *EPBC Act* is to ensure that actions likely to cause a significant impact on a matter of national environmental significance undergo an assessment and approval process.

Under the *EPBC Act*, an action includes a project, undertaking, development or activity.

An action that "*has, will have or is likely to have a significant impact on a matter of national environmental significance*" may not be undertaken without prior approval from the Commonwealth Minister for the Environment and Heritage.

The *EPBC Act* identifies matters of national environmental significance as:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (Ramsar wetlands);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

The Administrative Guidelines for the *EPBC Act* set out criteria intended to assist in determining whether an action requires approval. In particular, the Guidelines contain criteria for determining whether a proposed action is likely to have a "significant impact" on a matter of national environmental significance. Should the proponent deem the proposal to have a significant potential impact on a mater of NES, a referral to the Commonwealth Minister of Environment and Heritage would be undertaken to obtain a confirmation as to whether the Commonwealth considers the proposal a "controlled action" requiring Commonwealth approval.

EPBC Act listed species recorded or predicted to occur on the Site are also listed under the *TSC Act* and have been assessed in relation to the current proposal under Section 5A of the EP&A Act (see **Appendix G**).

18.3 Methodology

18.3.1 Literature Review

A desktop literature review was undertaken by URS to identify the representative spectrum of Threatened species, populations and ecological communities listed under the *TSC Act* and the Commonwealth *EPBC Act* that could be expected to occur within the study area, based on habitats present.

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18.3.2 Botanical Survey

Flora surveys were conducted at and within the vicinity of the Site (the study area) on the 11 and 12 July 2006. The primary objectives of the survey were to:

- map and describe the vegetation communities occurring within the study area;
- compile a flora list of those species occurring within the vegetation communities, identifying any threatened, nationally, regionally or locally significant species and communities; and
- assess the likely impacts of the proposed development and provide recommendations to assist in minimising impacts to flora in the study area.

The botanical surveys were generally consistent with the *DEC Threatened Biodiversity and Assessment; Guidelines for Developments and Activities Working Draft* (2004), the Lower Hunter Central Coast Regional Environmental Management Strategy *(*LHCCREMS) (2002) *Survey Guide to the Threatened Species of the Lower Hunter Central Coast Region Volume 2* and DEC Scientific licence (S11381) conditions under clause 22 of the *National Parks and Wildlife Regulations 2002* and section 132C of the *National Parks and Wildlife Act 1974*.

Transect and Random Meander Surveys

On the basis of the initial site walkover and habitat assessment the study area was divided into three stratification units i.e. functionally similar units for the purposes of environmental assessment according to the Draft DEC (2004) survey guidelines. The study area consists of:

1) approximately 2.7Ha of relatively undisturbed natural vegetation;
2) approximately 2.0Ha of highly disturbed land incorporating a sediment containment pond; and
3) approximately 0.5Ha of natural vegetation immediately downslope and adjacent to the proposed site.

Vegetation surveys were undertaken on 11 and 12 July 2006 to inventory and map plant taxa and target vegetation communities within the study area. Two 100m survey transects were assessed in the natural vegetation consistent with the Draft DEC (2004) survey guidelines. The location of transects was based on the distribution of vegetation types present within the study area such that the extent of vegetation which may be disturbed as a result of the proposal was appropriately assessed. The survey incorporated concentrated searches of 10x10m quadrats adjacent to each survey transect. The smaller size of the quadrats was necessary for this study due to the difficulty of the terrain along the rocky ridges and the location of the creekline which is confined by the Site's fenced boundary.

Whilst the above sampling method provides a broad inventory of species present and enables description of the vegetation community, it does not account for threatened flora that occur at much lower densities than widespread or common species. Therefore the random meander technique was employed in an effort to capture any species overlooked during quadrat surveys recording any species not found within previous quadrat surveys. This technique involved traversing a much wider area along each transect in addition to traversing the entire Site. This survey methodology is considered appropriate by the Department of Environment and Climate Change (DEC, 2004) for targeting threatened flora.

A random meander search was considered more appropriate for the disturbed portion of the site. Targeted surveys for *Callistemon linearifolius* which is listed as Vulnerable under the *TSC Act* was also undertaken across the entire Site. Further targeted and opportunistic searches for threatened flora were conducted during all stages of fauna and weed surveys conducted in November 2006.

18.4 Fauna Survey

Baseline fauna surveys were carried out by URS Ecologists on 11 and 12 July with further targeted surveys carried out from 22nd to 26th November 2006. Surveys were generally consistent with the DEC (2004) working draft survey guidelines. Methodologies employed to survey fauna included Random Meander, opportunistic observations, diurnal bird counts, call recognition, track and scat analyses, spotlighting, stag watches, and diurnal and nocturnal active searches. Bat and herpetological surveys were undertaken by specialist subcontractors.

Weather experienced during the July surveys comprised dry, warm days (14-20°C) and cool nights (10-14°C). There was a full moon on the evening of 11 July 2006. Weather experienced during the November surveys comprised dry, warm to hot days (25-37°C) and mild nights (15-23°C). There was a waxing crescent moon on the evenings of 22nd to 24th November 2006. A southerly weather change was experience on the night of the 22nd November which resulted in very light rainfall at the Site.

Diurnal Bird Counts

Opportunistic observations of bird species were recorded throughout the day and across the whole site. Species and bird numbers were recorded by visual observation and call and were documented on proforma data sheets.

Spotlighting

Spotlighting surveys were undertaken in areas including the proposed footprint of the AWT facility and within adjoining vegetation. A 55 watt spotlights and battery packs were used over an approximate four hour period to detect any active fauna within these areas.

Call Playbacks

Call playbacks for *TSC/EPBC Act* listed frog species were projected across the two sedimentation ponds at the Site, along Patonga Creek to the south of the Site and within the hanging swamp located to the south east of the Site. The broadcasting of recorded vocalisations of listed species including the Giant Burrowing Frog, Little John's Tree Frog, the Green and Golden Bell Frog and the Red-crowned Toadlet were undertaken using a compact disc player. Playbacks were undertaken after dusk and were followed by a quiet listening period for responding males. Rain periods were experienced immediately prior to the July 2006 survey with approximately 13.5 mm of rain experienced within the vicinity of the Site seven days prior to the conduct of the call playback survey work. Only light rain was experienced on the night of the 22nd November 2006 with little or no rain experienced seven days prior to the conduct of the November survey work. Rainfall had been minimal for several seasons preceding the July and November 2006 surveys due to prevailing drought conditions.

Call playbacks were also undertaken in November 2006 at a nearby reference site for the Giant Burrowing Frog and Red Crowned Toadlet located within the locality of Warrah Trig, Patonga NSW.

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Systematic Searches

Systematic Daytime Searches for tadpoles and adult frogs were conducted at the sedimentation pond, the adjoining small pond and within Patonga Creek for up to one hour over the July and November 2006 survey period. All aspects of the ponds and creekline including under rocks, leaf litter, logs, under adjoining shrubs, and under bark were searched. Nocturnal searches alongside the ponds, Patonga Creek and within the hanging swamp were also undertaken at the Site during the July and November 2006 using a 55 watt spotlight.

Opportunistic Observations

Opportunistic and incidental observations of fauna species were recorded during the conduct of the July and November 2006 field surveys.

Bat Survey

Due to the corresponding winter torpor period, targeted bat surveying was not carried out as part of the July 2006 flora and fauna survey, however a habitat assessment undertaken at the Site indicated that the ponded areas, natural caves, tree hollows and adjacent creek may provide foraging or perhaps breeding habitat for a number of micro bats such as the listed Large-eared Pied Bat, Eastern False Pipistrelle Myotis and Little Bent-wing Bat. It is likely that other areas within the Brisbane Water National Park would also provide the main habitat for any location bat populations.

As a result of the habitat assessment, targeted surveys for micro bats were undertaken in November 2006 to confirm the presence of threatened bat species and to assess the potential impacts of removing the small area of habitat available on the Site within the context of the neighbouring National Park and local bat populations.

Fly By Night Surveys Pty Ltd were engaged by URS to undertake the bat survey at and within the vicinity of the Site between the 22nd the 24th November 2006. Harp traps were placed at four (4) locations within the site. Two traps were set side by side on the edge of the National Park adjacent to Patonga Creek near a small weir. Another set was placed within a large sandstone cave overhang located along the adjoining edge of the National Park and below rocky outcrops of sandstone within the North West portion of the Site. The forth location was under an overhang area overlooking the green waste area of the current facility.

Ultrasonic echolocation (anabat) recording for microchiropteran bats was also undertaken as part of the targeted survey. Echolocation calls of microchiropteran bats were recorded at seven locations within representative habitat on the site. Calls were recorded over the entire night using Anabat II bat detectors for subsequent computer analysis. Detectors were located adjacent to harp traps where possible. In total, 80 hours of echolocation call sampling was undertaken on the site.

Reptile and Amphibian Survey

URS engaged Molino Stewart Pty Ltd to undertake a reptile and amphibian survey at and within the vicinity of the Site between the 22nd the 26th November 2006. Survey methodology comprised of random and selective searching of shelter sites including: lifting, searching beneath and careful replacement of exfoliated sandstone sheets, turning of sandstone boulders on soil, turning of logs, searching in crevices, raking amongst leaf litter, searching beneath decorticating bark and bark deposits on the ground and

visual scanning of vegetation for active and foraging specimens along nearby creeklines, around the sedimentation ponds and amongst vegetation.

Fauna Habitat Assessment

An assessment of the quality of habitats present for both TSC/EPBC listed species was made during both the July and November 2006 surveys. Habitat quality was based on the level of breeding, nesting, feeding and roosting resources available. This technique is important in assisting in the compilation of a comprehensive list of fauna that are predicted within the vicinity of the Site, rather than relying solely on one off surveys that are subject to seasonal limitations and only represent a snapshot of assemblages present.

Koala feed tree species were also identified across the Site and mapped by GPS. All identified Koala feed trees were assessed for scratching and the bases searched for scats and other remains.

The Site and immediate surrounds were also traversed during the November 2006 surveys in order to map all hollows (both tree and branch) across the study area. Hollows were assessed for signs of use (both old and current) by observing scratch marks, white wash and presence of scats under the base and canopy of each hollow containing tree.

Other Methods Considered

Ground debris searches, including active searches for scats, were undertaken during the entire survey period while incidentally traversing the Site. Targeted searches for *Allocasuarina* was also undertaken to assess the quality and potential feed habitat for the Glossy Black Cockatoo (GBC).

No mammal trapping (terrestrial/arboreal) or call playbacks for large forest owls were undertaken during the July or November 2006 surveys as there presence on and within the vicinity of the site has been previously established from other surveys on Site (DECC, 2006; R Payne, *pers comm*., 22 November 2006).

18.4.1 Weed Survey

A weeds survey was conducted on the Site and in the surrounding Brisbane Water National Park during the November 2006 targeted flora and fauna surveys. Areas of weed infestation were surveyed using a Random Meander survey technique. The locations of significant infestations were recorded on aerial photos of the site and dominant species and severity of infestation were recorded on pro forma field sheets. The locations of spot infestations in native vegetation were captured using a hand held GPS unit. Details of patch size, dominant species and severity of infestation were recorded in data tables.

18.5 Results

18.5.1 Literature Review

Flora

The results of the desktop literature review indicate the potential for twenty (20) threatened plant species listed under the *EPBC Act* and/or the *TSC Act*, which have been previously recorded within the vicinity of

the Site. This list of threatened plant species, including their conservation status, is presented in **Table 1 (Appendix G)**.

A review of the specific habitat requirements of these species, and the habitat offered by the Site and its surrounds allowed a number of these species to be immediately eliminated as having any (or low) likelihood of occurrence at the Site. Those that remain as having a potential medium to high likelihood of occurrence at the Site and immediate surrounds are indicated in **Table 1 (Appendx G)** and are listed below:

Acacia bynoeana;

Astrotricha crassifolia;

Caladenia tessellate;

Callistemon linearifolius;

Cryptostylis hunteriana;

Darwinia glaucophylla;

Diuris bracteata;

Eucalyptus camfieldii;

Hibbertia procumbens ;

Kunzea rupestris ;

Melaleuca deanei; and

Micromyrtus blakelyi.

Fauna

Results from fauna desktop reviews indicate the potential presence of approximately eighty five (85) Threatened fauna species as listed under the *TSC Act* and/or the *EPBC Act* which have been previously recorded within the vicinity of the Site. This list of threatened fauna species, including their conservation status, is presented in **Table 2 (Appendix G).**

Of the eighty five (85) Threatened fauna species, thirty-two species (32) are regarded as having a potential occurrence at the Site and immediate vicinity based on habitat values. These species are indicated in **Table 2 (Appendix G)** and are listed below:

Giant Burrowing Frog;

Littlejohn's Tree Frog;

Stuttering Frog

Giant Barred Frog

Green and Golden Bell Frog;

Red-crowned Toadlet;

Broad-headed Snake;

Stephens' Banded Snake;

Rosenberg's Goanna;

Powerful Owl;

Barking Owl;

Turquoise Parrot;

Swift Parrot;

Glossy Black-Cockatoo;

Gang-gang Cockatoo;

Bush Stone-curlew;

Speckled Warbler;

Australian Painted Snipe;

Masked Owl;

Eastern Pygmy-possum;

Large-eared Pied Bat;

Spotted-tailed Quoll;

Eastern False Pipistrelle;

Little Bent-wing Bat;

Eastern Bent-wing Bat;

Eastern Freetail-bat;

Large-footed Myotis;

Squirrel Glider;

Long-nosed Potoroo;

Grey-headed Flying Fox;

Yellow-bellied Sheathtail Bat; and

Greater Broad-nosed Bat;

18.5.2 Aquatic habitats

Council undertakes environmental monitoring at the Woy Woy WMF in accordance with its Environment Protection Licence (issued under the *Protection of the Environment Operations Act 1997*). Surface water monitoring is conducted, with two monitoring site within Patonga Creek, located to the south of the proposed development area, while a third is located within the existing sedimentation pond. The results of the quarterly monitoring, carried out in 2006, are summarised in **Chapter 9** with reference to ANZECCs Guidelines for the Protection of Aquatic Ecosystems – 95% Fresh Water, (ANZECC 2000) criteria (where applicable). The environmental monitoring report for the period 25th January 2006 to 24th October, 2006 (Golder, 2006) found that Ammonia as N, other organics and all metals except Al were well below the adopted guidelines. Al exceeded the adopted guidelines however concentrations did not differ between sample locations up- and downstream of the Site suggesting that this is a natural feature of the aquatic environment. Similarly pH, Total Dissolved Solids, Redox Potential and temperature were within the expected natural range.

Based on these surface water quality results there are unlikely to be any limitations to the quality of aquatic habitats on Site due to contamination or other environmental factors.

18.5.3 Field Assessment

Flora

Conservation significance

No TSC or EPBC Act-listed species were recorded from the targeted field surveys conducted in July and November 2006 by URS.

There is a local population of *Callistemon linearifolius* in the western portion of the Woy Woy landfill Site as shown in Figure 7 of GHD (2005b). Potentially suitable habitat for the species is present in the stands of Hawkesbury Sandstone woodland and forest present on the Site and the species could (theoretically) be present in the soil seed bank. Accordingly a Section 5A assessment for the species was performed and is included in **Appendix G.**

The inconspicuous terrestrial orchids *Caladenia tessellata* and *Cryptostylis hunteriana* (listed as Vulnerable under the EPBC and TSC Acts) were not recorded during surveys. The timing of the flora surveys was appropriate to detect these orchid species, given that their flowering times are noted as September to November for *C. tessellata* and November to February for *C. hunteriana* (DECC, 2007). The EPBC Act Protected Matters search tool predicts that habitat for these species may occur in the study area. However there are no previous records for these species on the NPWS Atlas within 10km of the Site. Moreover, consultation with a local orchid expert indicates that these species are not known to occur within the Woy Woy area (A Dash, A, *pers. comm*. 2006). Hence, the likelihood of these species occurring at the site is considered low.

There is a previous record for the terrestrial orchid *Diuris bracteata* in Brisbane Water N.P. within 10km of the Site (DECC, 2006). The flowering period for this species occurs in September (NSW Scientific Committee, 2005) and so the current surveys are unlikely to have detected it. Known populations of the species occur at Duffys Forest, Sydney and in the vicinity of Mt White and Kulnura, approximately 30km to the south and west of the Site (P Eygelshoven, *pers. comm.* 20 July 2007; A Dash, *pers. comm.* 7 August 2007). Suitable habitat for *D. bracteata* is present at the Site and so,

despite the low likelihood of occurrence at the site, targeted surveys for this species should be carried out during September if possible.

Species

A total of 134 flora species were identified during field surveys conducted in July and November 2006 by URS Ecology Personnel. The species recorded are tabulated in **Table 3 Appendix G**.

A detailed weed survey, as detailed in **Section 4.2.3,** was undertaken at and within the vicinity of the Site during the November 2006, which identified a further 14 exotic flora species.

Communities

Descriptions of the three main vegetation communities recorded during the field surveys are summarised below.

Community No. 1 Sheltered Dry Hawkesbury Woodland

Floristic and Structure Summary

Number of Transects:	1
Number of Quadrats:	1
Number of Random Meanders:	1
Listed flora:	Nil
Legislative listing:	None
Areas on Site:	Approximately 4,900 m^2 across the site
Corresponding Map Units:	MU25 (LHCCREMS 2003). Hawkesbury Peppermint Apple Forest (Bell, 2004).

Sheltered Dry Hawkesbury Woodland is widespread across Hawkesbury Sandstone geologies of the Sydney Basin. This community is dominated by *Eucalyptus piperita* in sheltered gullies with *Angophora costata* present as a co-dominant or sub dominant canopy species. The mid-storey is characteristically comprised of *Allocasuarina torulosa* and in deeper gullies, *Pittosporum undulatum* and *Glochidion ferdinandi* above a shrubby layer of *Dodonaea triquetra, Notolea longifolia* and *Rapanea varaibilis.* The ground layer vegetation comprises *Pteridium esculentum*, *Adiantum aethiopicum*, *Poa affinis* and a diversity of other herbaceous species (LHCCREMS, 2003).

Sheltered Dry Hawkesbury Woodland was recorded immediately adjacent to the proposed AWT facility southern site boundary at an elevation of between 100m and 105 AHD. This community was recorded along the moist sheltered south facing gully and along Patonga Creek which generally runs in a west to east direction.

This community was an open forest structure and consisted of a canopy layer to twenty metres in height containing *Angophora costata, Eucalyptus piperita, Eucalyptus umbra, Corymbia gummifera, Syncarpia glomulifera* and *Livistona australis*. The mid canopy consisted of shrubs and ferns including *Dodonaea triquetra, Todea barbara, Solanum aviculare, Ceratopetalum gummiferum, Elaeocarpus reticulates, Logania albiflora,* and *Exocarpos strictu,* and the cycad *Macrozamia communis.* The ground layer was moderately dense and healthy particularly adjacent to the creek line with

characteristic species including consisted of *Lomandra cylindrica, Xanthorroea arborea,* ferns including *Adiantum aethiopicum, Calochlaena dubia, Pteridium esculentum, Doodia aspera and* herbs such as *Gonocarpus teucrioides* and *Dianella caerulea.*

This vegetation community was found to be moderately to significantly disturbed by wild fires which affected the Brisbane Water N.P. and the local area in early 2006. The wild fires resulted in a significant reduction to the ground cover including the leaf litter layer and a significant disturbance to the shrub layer in the mid to lower stratum. Despite the recent disturbance to this vegetation community, a substantial amount of regrowth was observed during the July and November 2006 surveys.

Community No 2 Exposed Hawkesbury Woodland

Floristic and Structure Summary

Number of Transects:	1
Number of Quadrats:	3
Number of Random Meanders:	1
Listed flora:	Nil
Legislative listing:	None
Areas on Site:	Approximately 15,700 m^2 across the site
Corresponding Map Units:	MU26 (LHCCREMS 2003)

Exposed Hawkesbury Woodland represents a widespread vegetation type, generally occurring on crests, ridges and exposed slopes on sandy soils of the Hawkesbury Sandstone series. Within this assemblage, canopy height is typically low and density is highly variable, leading to structural fluctuations between scrubs, woodland and low open forest. Height of this assemblage rarely exceeds 15 metres. *Corymbia gummifera, Eucalyptus haemastoma* and *Angophora costata* are the dominant canopy species, over a dense shrubby understorey of *Leptospermum trinervium*, *Lambertia umbella*, *Phyllota phylicoides*, and *Banksia serrata*. The ground cover forms the densest and most diverse stratum, combining small shrubs, such as *Platysace linearifolia* and *Xanthorrhoea media,* withsedges such as *Cyathochaeta diandra* and *Lepyrodia scariosa,* and grasses such as *Entolasia stricta* and *Anisopogn avenaceus* (LHCCREMS 2003).

Exposed Hawkesbury Woodland covers large areas across crests and flat open plateaux over northern Brisbane Water National Park, Strickland State Forest and onto the Somersby Plateau. As elevation and rainfall increases *Eucalyptus sieberi* tends to dominate the canopy (LHCCREMS 2003).

Exposed Hawkesbury Woodland was recorded on the eastern crest of the proposed AWT facility site at en elevation of between 105m to 135m AHD. This community generally consisted of open woodland to low forest with exposed areas containing higher densities of scrub and ground cover with species characteristic of heath communities.

A disturbance to the ground cover and low to mid stratum was also observed in this community as a result of the January 2006 wild fires however a substantial amount of regrowth was also observed during the July and November 2006 surveys.

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Community No 3 Disturbed Regrowth

Floristic and Structure Summary

Number of Transects:	0
Number of Quadrats:	0
Number of Random Meanders:	1
Listed flora:	Nil
Legislative listing:	None
Areas on Site:	Approximately 21, 600 m^2 across the site
Corresponding Map Units:	Not applicable

This community was recorded across the majority of the disturbed area at the base of the proposed AWT facility site within the vicinity of the sedimentation pond and extended onto previously benched sandstone rock faces on both the east and west facing slopes. The disturbed regrowth was widespread was found at elevations from 105 to 125m AHD.

The disturbed regrowth consisted of open scrub with a dense ground layer of grasses, herbs and exotic weeds and aquatic vegetation within and adjacent to the sedimentation pond. The scrub layer was generally up to five metres in height and was dominated by *Acacia irrorata* and other successional species such as *Acacia floribunda, Acacia longifolia sophorae* and *Acacia elongata.*

Fauna

The July and November 2006 targeted fauna surveying recorded a total of thirteen (13) species of reptile, thirty nine (39) species of bird, nine (9) species of amphibian, seventeen (17) native mammals (including nine species of microchiropteran bat) and one species of dragonfly. The majority of which are generally common and widespread within the region. Six species listed under the TSC and/or EPBC Acts, including the Red-crowned Toadlet, Grey-headed Flying-fox, Eastern Freetail Bat, Little Bent-wing Bat, Large-footed Myotis and the Giant Dragonfly, were recorded during the November 2006 surveys.

The Site and immediate surrounds has been moderately to significantly affected by the December 2005 wildfires. Most fauna species are seriously impacted by wildfire from its direct effects and also post fire from increased predation and lack of food resources. This is likely to have contributed to a decrease in the diversity of fauna recorded than otherwise might be expected on the Site..

The thirty nine (39) species of bird were recorded during both targeted surveys or whilst incidentally traversing the Site. The majority were woodland and forest birds, including the Bar-shouldered Dove, Black-faced Cuckoo Shrike, Common Koel, Diamond Dove, Eastern Yellow Robin, Golden Whistler, Grey Strike-thrush, Noisy Friarbird, Red-browed Firetail, Sacred Kingfisher, Spotted pardalote, Superb Fairy-wren, Striated Pardalote and Variegated Wren. Waterbirds including Australian Wood Duck, Australasian Grebe and Grey Teal were observed within the sedimentation pond. Opportunistic birds such as Ravens, Silver Gull and Sacred Ibis were abundant in operating sections of the landfill. No large forest owls were heard or spotlighted at the Site or immediate surrounds during the targeted surveys. The Southern Boobook Owl, which is the smallest and most common owl in Australia, was heard calling within the vicinity of the Site during the November 2006.

Scats and white wash was observed over the boulders surrounding the sedimentation pond, which were observed to contain fine bone fragments. Given the size and content of the scats, they are likely to belong to a predatory species such as the Australian Kestrel, which was observed flying over the site during the July 2006 surveys.

The majority of hollows observed at the Site were within mature *Angophora costata* trees. The hollows present in mature *Angophora costata* individuals were inspected for white wash and pellets, however only one hollow was observed to contain whitewash (see **Plate 8, Appendix G**). There was no direct evidence of the use of this tree by any large forest owl in the form of regurgitated pellets or prey remains. Further, its relatively small size and sparse splattering pattern suggest the whitewash was produced by a bird considerably smaller than a forest owl.

The seventeen (17) native mammal species, including ten (10) bat species, were recorded either by direct observation during the spotlighting survey, whilst incidentally traversing the Site, indirectly by scat identification or by harp trapping and echolocation recordings. Species included the Bush Rat, Common Brushtail Possum, European Red Fox, Red-necked Wallaby, Common Ringtail Possum, Short-beaked Echidna, Swamp Wallaby, Little Forest Bat, Large-footed Myotis, Little Bent-wing Bat, Gould's Wattled Bat, Chocolate Wattled Bat, Eastern Horshoe Bat, East Coast Freetail Bat, Eastern Freetail Bat, White-striped Mastiff Bat and the Grey-headed Flying-fox.

One species of invertebrate, the Giant Dragonfly, which is listed as Endangered under the TSC Act, was directly observed on the southern boundary of the Site within the hanging swamp vegetation community.

A herpetological survey was undertaken on the Site to specifically target threatened reptile and amphibian species identified in the July 2006 habitat assessment. A total of 13 reptile species were recorded on Site, including the Copper-tail Skink, Wall Skink, Delicate Litter Skink, Diamond Python, Eastern Water Skink, Lace Monitor, Leaf-tailed Gecko, Lesueurs Gecko, Mountain Dragon, Red-bellied Black Snake, Water Dragon, Whites Skink and the Yellow-faced Whip Snake. They were recorded primarily within rocky habitat on the eastern ridge of the Site. None of the reptile species recorded are listed under the TSC or EPBC Acts.

The Common Eastern Froglet, the only species of amphibian recorded at the Site during the July 2006 surveys, was recorded calling from within the sedimentation pond, the small adjoining pond and along Patonga Creek to the south of the Site. A further eight species of amphibian, including the Broad-palmed Frog, Brown Tree Frog, Dwarf Green Tree Frog, Eastern Dwarf Tree Frog, Freycinet's Frog, Green Leaf Tree Frog, Red-crowned Toadlet and the Dusky Toadlet, were either spotlighted or recorded by vocalisation during the November 2006 surveys. The Red-crowned Toadlet is listed as Vulnerable under the TSC Act.

A total of 10 species of bat, including the Grey-headed Flying-fox, White-striped Mastiff Bat, Eastern Freetail Bat, East Coast Freetail Bat, Eastern Horseshoe Bat, Gould's Wattled Bat, Chocolate Wattled Bat, Little Bent-wing Bat, Large-footed Myotis and the Little Forest Bat, were recorded on the Site. Of these, four are listed as threatened species. The Grey-headed Flying Fox is listed as Vulnerable under the TSC and EPBC Acts and the Eastern Freetail Bat, Little Bent-wing Bat and the Large-footed Myotis are listed as Vulnerable under the TSC Act.

The introduced Red Fox was observed on the northern boundary of the Site during the November 2006 surveys.

Weeds

The November 2006 targeted weed surveying recorded thirty four (34) noxious and environmental weeds at the Site and immediate surrounds. These species including those which are listed under the *Noxious Weeds Act***.**

Native vegetation on ridges to the West and especially East of the Site are relatively weed-free. Cleared areas around the sedimentation pond and landfill feature severe major infestations with a diverse range of exotic grasses, shrubs and herbaceous weeds. South of this area, between the rock wall and Patonga Creek, there are varying degrees of weed infestation with concentrations peaking in cleared areas and especially along the overflow drain.

The south bank of Patonga Creek is relatively free of weeds. This reflects the relatively undisturbed vegetation and also the topography, with the slope upwards from Patonga Creek potentially limiting weed expansion. This area was burnt in December 2005 which is likely to have removed many adult weeds and favoured the regeneration of native vegetation. However weed propagules may be present in the soil seed bank and weeds may successfully recolonise this area. The potential role of the fire in limiting weed infestation should be considered when assessing any future departure from the baseline condition observed in this study.

Patonga Creek featured minor weed invasion on its north bank for approximately 100m upstream of the Site. Downstream weed infestation was patchy, minor and largely confined to the creek channel and banks. The December 2005 bushfire may have limited weeds in this area however sheltered (unburnt) areas of native vegetation were also relatively weed-free.

The surrounding area was relatively weed free with infestations generally consisting of isolated individuals of the herbs *Phytolacca octandra* and *Conyza sumatrensis*.

18.6 Habitat Descriptions

Habitat features considered in assigning the quality of habitat on Site were:

- native diversity in ground flora;
- structural and floristic diversity of vegetation layers, particularly presence or absence of midstorey vegetation in areas of remnant vegetation (shrubs and regenerating eucalypts) and presence of native tussock grasses;
- presence and quantity of litter layer and fallen dead timber;
- level of shelter, breeding, roosting and nesting resources available;
- presence of stem hollows and quantity of mature hollow bearing trees;
- exfoliated bark, feed trees and shrubs;
- fauna movement corridors;
- position in the landform, connectivity or value as a habitat corridor;
- presence of rocky outcrops or scattered partially buried rocks; and
- presence, size and ecological integrity of remnant communities.

18.6.1 Disturbed Area

Over 50% of the proposed AWT facility site has been previously disturbed and according to site personnel this area was previously cleared for the purpose of a quarry (per comms. Brian Leslie (Woy Woy WMF Landfill Supervisor) 11th July 2006). The disturbed area currently comprises of a sedimentation pond, cleared areas, roads and other access tracks. The vegetation recorded across the disturbed area primarily comprises of regrowth including open scrub with a dense ground layer of grasses, herbs and exotic weeds.

The vegetative regrowth also extended onto both the east and west facing benched faces of the Site and was dominated by recolonising species and exotic species including listed noxious weeds for the Gosford City Council LGA *(NV Act)*.

Although no flora or fauna listed as Threatened under the *TSC Act* and/or the *EPBC Act* were observed within the cleared areas of the Site, these areas do support native flora species including grasses and given their close proximity to large stands of native vegetation these areas would provide feeding habitat for native fauna species such as macropods, echidnas, and bandicoots and birds such as the Willie Wagtail, White-faced Heron and the Australian Kestrel.

18.6.2 Sedimentation Pond

Aquatic vegetation was recorded within and adjacent to the sedimentation pond and included species such as *Juncus continuus, Schoenoplectus validus, Schoenus melanostachys* and *Ludwigia peploides* subsp*.montevidensis.*

The sedimentation pond was observed to provide habitat for a number of water birds such as the Australian Wood Duck and the Grey Teal, and a number of amphibian species. Further, the sedimentation pond is considered to provide potential habitat for a number of TSC/EPBC Act-listed frog species including the Green and Golden Bell Frog with its unshaded areas of shallow still water with nearby shrubby areas. Green and Golden Bell Frog is known to historically occur in the area at the Woy Woy-Umina sandplain swamps and from Pearl Beach Lagoons. However whilst the Site contains habitat that could be colonised by the Green and Golden Bell Frog, the most recent records of this species in the area are from Pearl Beach and are around thirty years old. Since this time this population appears to have become extinct and as a result it is unlikely that the Green and Golden Bell Frog is present in the area nor is likely to colonise the Site from the nearest known location population at Davistown.

Although the EPBC online Protected Matters Database Search predicted that habitat for the Australian Painted Snipe, which is listed under both the TSC/EPBC Acts, occurred within the locality of the Site, there are no sightings recorded within the Gosford LGA. This species prefers areas of tussock grass, or reeds or sedges or rushes within 500m and including shallow wetlands or ephemeral or permanent waterbodies, or inundated grasslands or paddocks. Due to the relatively narrow band of fringing vegetation around the sedimentation pond and the presence of predators such as raptors and the Red Fox it is considered highly unlikely that this species would utilise the Site (DECC, 2007).

The sedimentation pond is also likely to provide suitable foraging habitat for micro bats, noting that five (5) of the ten (10) species recorded, including the TSC/EPBC Act listed Eastern Freetail Bat and Large-footed Myotis, were recorded flying over the sedimentation pond. Nearby waterways including Patonga Creek, located approximately 20m south of the Site, is likely to provide local microbat populations with the main habitat in the area, noting that five microbat species were recorded in this area.

18.6.3 Rock Outcrops

The east and west facing benched faces of the Site with its rocky outcrops of sandstone and adjoining sandstone caves provides optimal habitat for a range of reptile species (See **Plates 9** and **10** of **Appendix G**). A total of thirteen (13) reptile species were directly observed in these areas during the July and November 2006. It is likely that the rocky outcrops provide habitat for other reptile species including the *TSC/EPBC Act* listed Rosenburgs Goanna, Broad-headed Snake and Stephens Banded Snake.

The rocky outcrops which provide a large number of crevices are also likely to provide habitat for ground dwelling mammals and other fauna species such as micro bats. Microbat scats were observed within sandstone rock crevices, approximately 150 m to the south of the proposed AWT facility. Sandstone benches and ridges also featured excellent quantities of rock fragments which would provide further shelter for native reptiles and other fauna.

18.6.4 Forest and Woodlands

The Sheltered Dry Hawkesbury Woodland and Exposed Hawkesbury Woodland vegetation communities were found to support a large range of flora species and a large structural and floristic diversity of vegetation layers. These communities are known to support TSC/EPBC Act listed flora species such as *Tetratheca glandulosa*, *Acacia bynoeana*, *Eucalyptus camfieldii* and *Prostanthera junonis* however these were not recorded during the July or November 2006 survey period.

There are a number of important nectar bearing plants at and within the vicinity of the Site in the genera *Eucalyptus, Banksia, Leptospermum* and *Callistemon.* These plants would provide food for nectarivorous birds including the Little Wattlebird, Rainbow Lorikeet, Red Wattlebird and the White-eared Honeyeater which were recorded at the Site during the July and November 2006 surveys. These species may provide foraging resources for the TSC/EPBC Act listed Swift Parrot, Turquoise Parrot and the Regent Honeyeater. These birds would move locally in response to variation in the availability of nectar and or pollen, which are important components of their diet.

Given the lack of a mesophytic understorey, the vegetation at the Site is likely to have low habitat value for frugivorous birds (soft billed birds and fruit eaters).

18.6.5 Ground Debris

Despite recent bushfire damage, the Sheltered Dry Hawkesbury Woodland and Exposed Hawkesbury Woodland communities were found to provide a significant number of ground dwelling hollow bearing logs, some areas of leaf litter and a structural and floristically diverse understorey which would provide habitat for a number of fauna species including woodland birds.

18.6.6 Banksia

Native vegetation at the Site would typically provide an excellent food resource for a number of nectar-feeding mammal species, including the Eastern Pygmy-possum which is listed as Vulnerable under the TSC Act, due to the presence of a large number of Banksia spp. and other understorey plants. However due to the December 2005 wildfires which significantly affected the vegetation at the Site and immediate surrounds, the amount of food source currently available is limited.

18.6.7 Hollows

A number of hollows particularly within mature *Angophora costata* trees were observed within the Sheltered Dry Hawkesbury Woodland and Exposed Hawkesbury Woodland vegetation. These hollows may provide shelter and roosting habitat for large forest owls, micro bats, some local reptile species and a number of arboreal fauna species including the Squirrel Glider which is listed as Vulnerable under the TSC Act. Consultation with a local flora and fauna expert indicates that there is no known population of the Yellow-bellied Glider on the Woy Woy peninsula (R Payne, *pers comm*. 22 November 2006).

18.6.8 Allocasuarina

Targeted surveys for *Allocasuarina littoralis* were undertaken at the Site during the July 2006 surveys as they are a known food resource for the Glossy Black Cockatoo (GBC). However only a small number of *Allocasuarina* trees were recorded at the Site with the nearest significant group located approximately 40m to the west of the Site. No direct or indirect evidence of the presence of Glossy black cockatoos was recorded during the July and November 2006 surveys. Typically this species feeds exclusively on *Allocasuarina littoralis* and *A. torulosa* and feeds intensively on trees carrying good numbers of high quality cones. The *Allocasuarina* spp recorded at and within the vicinity of the Site are in very small numbers and were found to be of low feeding quality with little or no cones observed on the trees. Further, no fresh or aged cones showing signs of Glossy Black Cockatoo feeding were observed under the canopy of the *Allocasuarinas* and as such it is unlikely that this species has foraged at the Site during recent times.

18.6.9 Koala habitat

The nearest known local population of Koala occurs as a small colony in the Pearl Beach section of Brisbane Water N.P. located approximately 5km from the Site. As such, Koala feed tree species were identified across the Site, mapped by GPS and assessed for scratching and scats and other remains.

No direct or indirect evidence (scats or scratch marks) of Koalas were observed during the July and November 2006 surveys and only a small number of *Eucalyptus punctata* (Grey Gum) and *Eucalyptus haemastoma* (Broad Leaved Scribbly Gum) individuals, which are listed Koala feed trees under SEPP 44, were recorded within the vicinity of the Site. These species were recorded in densities less than 15% of the total number of trees in the upper or lower strata of the tree component and as such the Site is not considered 'potential' Koala habitat under SEPP 44. Determination whether the Site is 'Core' Koala is therefore not required under SEPP 44.

Further, the July and November 2006 surveys identified only four sub-adult *Eucalyptus punctata* individuals within the boundaries of the Site. Given the limited number of suitable feed trees at the Site, the presence of the Red Fox, the noise from heavy machinery, and the expanse of more suitable habitat provided by the surrounding Brisbane Water N.P., it is considered unlikely that the Site and immediate surrounds would be utilised by the Koala. The proposal is also unlikely to impact on Koala movement corridors as the Brisbane Water N.P. would provide adequate connectivity for peripatetic Koalas to adjoining areas.

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18.6.10 Patonga Creek

The Patonga Creek catchment contains rocky banks and thick fringing vegetation. The Creek drains to the south and enters Broken Bay at its lower reaches. The southern catchment has little development and the remainder of the catchment is contained within Brisbane Water N.P. and is managed by DECC. The Creek reflects this protected position and shows no recent evidence of degradation or pollution (see **Plates 7** and **20 Appendix G**) and as such can be considered pristine. Water quality testing confirms there has been no detectable contamination or other impacts from the operating landfill (Golder, 2006). Accordingly Patonga Creek would be expected to contain the suite of aquatic flora and fauna expected of an intact environment.

Patonga Creek, is likely to provide local microbat populations with the main habitat in the area, noting that five microbat species were recorded at the Creek.

18.6.11 Hanging Swamp

A hanging swamp is situated approximately 10 metres to the south and south east of the Site. It is situated within the Upper Patonga Creek catchment, upstream of the Site on sandy soils adjacent to the rocky drainage line. The swamp contains numerous small waterfalls and is likely to be subject to a constant supply of water. It would appear to be predominantly groundwater-fed but would also receive significant surface runoff. The groundwater which feeds the swamp is likely to seep out of the surrounding sandstone rock faces. The hanging swamp is likely to feed and maintain the flow within the upper reaches of Patonga Creek.

18.7 Conservation significance

18.7.1 Disturbed Area

The cleared areas of the Site are unlikely to support threatened flora and fauna species. The disturbed area is up to 20m below the natural land surface and contains no intact topsoil so threatened flora are unlikely to have persisted in the seed bank. Threatened fauna species are likely to favour undisturbed habitats which contain feed species, shelter and other resources absent from degraded areas. Further, the disturbed areas of the Site are likely to provide optimal foraging habitat for the Red Fox which would limit the number of fauna species inhabiting these areas.

18.7.2 Sedimentation Pond

The sedimentation pond and the small adjoining pond are likely to provide habitat for a number of amphibian and microbat species including the including the TSC/EPBC Act listed Eastern Freetail Bat and Large-footed Myotis.

18.7.3 Rock Outcrops

The sandstone rock crevices are likely to provide optimal habitat for a range of reptile species potentially including the TSC/EPBC Act listed Broad-headed Snake, Rosenberg's Goanna and Stephens' Banded Snake.

The Rosenberg's Goanna is a wide ranging species and has been detected within the vicinity of the Site. There is a lower probability of the Broad-headed Snake on Site as there have been no previous

records in the locality. The Site contains only marginal habitat for Stephan's Banded Snake which prefers rainforest gullies.

18.7.4 Forest and Woodlands

Exposed Hawkesbury Woodland and Sheltered Dry Hawkesbury Woodland vegetation communities provide the highest quality habitat on Site. Habitat value is due to a combination of relatively intact native vegetation, structural diversity, extensive rock outcrop and continuity with large areas of intact vegetation of the Brisbane Water N.P.. It is likely that these communities provide significant habitat for native flora and fauna potentially including the TSC Act and EPBC Act listed species *Callistemon linearifolius,* Barking Owl, Masked Owl, Powerful Owl, Eastern Freetail Bat and Large-footed Myotis.

18.7.5 Hanging Swamp

The hanging swamp is considered to provide optimal habitat for the TSC/EPBC Act listed Red-crowned Toadlet, the Giant Burrowing Frog and the Giant Dragonfly.

18.7.6 Patonga Creek

The upper reaches of Patonga Creek are considered to provide optimal habitat for the TSC/EPBC Act listed Giant Burrowing Frog, Red-crowned Toadlet and the Littlejohn's Tree Frog. The lower reaches are considered to provide optimal habitat for the TSC/EPBC Act Stuttering Frog and the Giant Barred Frog.

18.8 Areas to be cleared

The proposed Site, would encompass an area of approximately 3 to 4ha. This will result in the removal of approximately 15,000m^2 of intact vegetation primarily belonging to the Sheltered Dry Hawkesbury Woodland and Exposed Hawkesbury Woodland vegetation communities. The proposed development will also result in the removal of the sedimentation pond and the adjoining small pond. A number of rock crevices and sandstone caves situated within the eastern portion of the Site will also be removed as part of the proposed development.

18.9 Flora

One hundred and thirty four (134) flora species were recorded at the Site from the field surveys conducted in July and November 2006. None of these species are listed as Threatened under the *TSC* or *EPBC Act*.

The threatened plant *Callistemon linearifolius*, listed under Schedule 2 of the TSC Act, was previously recorded within the western portion of the WMF landfill site. However, no individuals were recorded within the Site during the July or November 2006 surveys. Although the proposal will not remove any individuals of *C. linearifolius*, a 7-part test was completed as a precautionary measure and is included in **Appendix G**.

Potential habitat for cryptic terrestrial orchids occurs within the study area. This includes three TSC/EPBC Act-listed species, *Cryptostylis hunteriana, Diuris bracteata* and *Caladenia tessellata*. No populations of these species are recognised within the study area (P Eygelshoven, *pers. comm.* 20 July 2007; A Dash, *pers. comm.* 7 August 2007). The area of habitat to be impacted is small (1.5ha), well represented in surrounding reserves and equivalent to habitat contained in the proposed offset

area that will be set aside and managed. Therefore it is unlikely that the proposal will result in significant impacts upon these species.

Although vegetation will be removed as a result of the proposed development, it is unlikely that the development will result in the fragmentation of flora species habitat in the local area as the Site is surrounded by the Brisbane Water N.P. to the west, east and south of the Site which provides connectivity to adjoining areas.

However the area of intact Sheltered Dry Hawkesbury Woodland and Exposed Hawkesbury Woodland vegetation within the south eastern portion of the Site which will be removed as part of the proposal are likely to currently act as a buffer from the WMF site to the hanging swamp and the upper reaches of Patonga Creek.

18.10 Fauna

18.10.1 Bats

A total of ten (10) species of bat were recorded during the November 2006 targeted bat surveying. Four of these species including the Eastern Freetail Bat, Little Bent-wing Bat, Large-footed Myotis and the Grey-headed Flying Fox are listed as Vulnerable under the TSC/EPBC Acts. A further species, the Eastern Bent-wing Bat (also known as Large Bent-wing Bat), which is listed as Vulnerable under the TSC Act, was tentatively recorded by echolocation at the Site.

The proposal will result in the removal of significant foraging resources for microbats over the sedimentation pond and in surrounding forest and woodland. Vegetated areas also contain potential roosting habitat in tree hollows, rock fissures and caves. Relatively low quantities of these resources were present on Site and will be removed by the proposal. It is likely that local microbat populations predominantly rely on resources in the surrounding Brisbane Water N.P.

A Seven Part assessment (see **Appendix G**) for microbat species including the Eastern Freetail Bat, Little Bent-wing Bat, Large-footed Myotis, Eastern Bent-wing Bat, Yellow-bellied Sheathtail Bat, Large-eared Pied Bat, Eastern Falsistrelle, Golden-tipped Bat and the Greater Broad-nosed Bat was conducted which concluded that there should be no significant impact on these species.

18.10.2 Diurnal Birds

The proposal would result in the loss of a number of important nectar bearing plants which may impact upon nectarivorous species recorded at the Site and potentially also migratory TSC Act listed species. These birds would move locally in response to variation in the availability of nectar and or pollen, which are important components of their diet. The Site and immediate vicinity has been subject to severe wildfires in December 2005, resulting in a relative shortage of nectar currently provided by the Site. This combined with the relatively small area of vegetation to be removed, means that the proposal is likely to result in a minor loss of food resources.

The *Allocasuarina* spp recorded at and within the vicinity of the Site are in very small numbers and were found to be of low feeding quality with little or no cones observed on the trees. The loss of this resource would not constitute a significant impact on the TSC Act listed Glossy Black Cockatoo.

A number of raptor species and other carnivorous birds were recorded at and within the vicinity of the Site during the July and November 2006 surveys including the Australian Kestrel, Black-shouldered Kite, Peregrine Falcon, Wedge-tailed Eagle, White-bellied Sea-eagle, Whistling Kite, Australian

Raven, Grey Butcherbird and the Kookaburra. The presence of a large number of carnivorous birds at the Site and immediate surround is likely the result of a higher density of prey species (rodents) utilising the landfill wastes. The proposal will not result in a significant loss of foraging habitat for these species given that the majority of habitat is likely to be provided by the adjoining WMF.

The proposal is also unlikely to have a significant impact on forest and woodland dwelling birds recorded at and within the vicinity of the Site given the relatively small area of suitable habitat that the Site provides in comparison to the surrounding area.

The removal of the sedimentation pond is likely to affect water birds recorded at the Site including the Australasian Grebe, Australian Wood Duck and Grey Teal. However as all species of water bird recorded at the Site are common and highly mobile, it is unlikely that the removal of the pond will have a significant affect on these common and widespread species.

Anecdotal evidence (Wellington, R, 2006, *pers. comm*. 27 November) infers that a Bush Stone Curlew mating pair was once present at the Woy Woy Landfill site. One of the pair was reportedly predated by a Red Fox and the remaining individual subsequently disappeared from the landfill site. On the basis of this anecdotal evidence a Seven Part test for the Bush-stone Curlew was conducted (see **Appendix G**) which concluded that there is unlikely be significant impact on this species as a result of the proposal.

18.10.3 Large Forest Owls

The Barking Owl and Powerful Owl are known to occur in the Woy Woy area with known roost sites located at Woy Woy Bay. Although no large forest owls were recorded at the Site or immediate surrounds during the July and November 2006 surveys, the presence of rats associated with the landfill indicates that parts of the Site may provide potential foraging habitat for large forest owls.

Potentially more suitable roosting habitat without noise from machinery is provided within the Brisbane Water N.P. which surrounds the Site. Regardless of the hollow potential, the Site would be considered to offer supplementary or additional feeding opportunities to owls given the likelihood of a higher density of prey species (rodents) utilising the landfill wastes. The removal of the vegetation required for the current proposal is not expected not impact on these feeding opportunities.

A Seven Part assessment (see **Appendix G**) for large forest owls such as the Barking Owl and Powerful Owl was conducted and concluded that there unlikely to be a significant impact on these species.

18.10.4 Mammals

The cleared areas of the Site are unlikely to provide optimal habitat for native mammals expected to occur in the surrounding habitat. Accordingly the development of these areas is unlikely to impact on native mammals.

The proposal will result in the removal of significant habitat for native fauna in woodland and forest including dense and undisturbed vegetation adjacent to cleared areas, suitable feed trees, rock crevices and hollows. These impacted areas may provide opportunistic foraging and breeding habitat for TSC/EPBC Act listed species including the Long-nosed Potoroo, Southern Brown Bandicoot, Squirrel Glider, Spotted-tailed Quoll and the Eastern Pygmy-possum.

The presence of more suitable foraging and breeding habitat without noise from machinery and less likelihood of predation by the Red Fox however would be provided within intact vegetation within the

Brisbane Water N.P. which surrounds the Site. Given the relatively small area of potential habitat that will be removed as part of the proposal and given that the Long-nosed Potoroo, Southern Brown Bandicoot, Squirrel Glider, Spotted-tailed Quoll and the Eastern Pygmy-possum are highly mobile species, it is considered highly unlikely that the proposed development will have an impact on these species. Seven Part tests for the Long-nosed Potoroo, Southern Brown Bandicoot, Squirrel Glider, Spotted-tailed Quoll and the Eastern Pygmy-possum were therefore not considered necessary. Further, no latrine sites for the Spotted-tailed Quoll were recorded at or within the vicinity of the Site and therefore are unlikely to utilise these areas at the present time.

Although the Site may provide habitat to a number of glider species, it is highly unlikely that the Yellow Bellied Glider would occur at the Site or immediate surrounds given the lack of suitable habitat namely tall mature eucalypts. The Yellow Bellied Glider prefers tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.

18.10.5 Reptiles

The east and west facing benched faces of the Site with rocky outcrops of sandstone and adjoining sandstone caves provides optimal habitat for a range of reptile species potentially including the TSC Act listed Rosenberg's Goanna. The loss of this habitat is likely to have an impact on a range of native reptile species.

Other threatened reptile species, including the Broad-headed Snake and Stephan's Banded Snake were considered unlikely to occur on Site, due to the absence of previous records and the lack of suitable habitat. Consequently the current proposal is unlikely to directly impact on important habitat of either species on the subject land (Molino Stewart Pty Ltd (November 2006)).

The Rosenberg's Goanna is a wide ranging species and no over-wintering rock crevice refuges were recorded within the development footprint area. Accordingly the loss of the portion of habitat proposed for removal by this proposal is unlikely to have significant impact on the local population of this species (Molino Stewart Pty Ltd (November 2006)).

18.10.6 Frogs

Targeted surveys for frogs including call playbacks were undertaken at the Site during the July and November 2006 surveys which targeted threatened species including the Giant Burrowing Frog, Red-crowned Toadlet, Littlejohn's Tree Frog and the Green and Golden Bell Frog. Although no listed frog species were recorded at the Site during the July and November 2006 surveys, the November 2006 survey identified the presence of the Red-crowned Toadlet approximately 40-50m from the eastern site boundary within a small ponded area of the upper reaches of Patonga Creek.

The Patonga Creek catchment which contains rocky banks and thick fringing vegetation and associated habitat including the hanging swamp vegetation community is considered to provide optimal habitat for other threatened frog species including Littlejohn's Tree Frog, Giant Burrowing Frog, Stuttering Frog and Giant Barred Frog. Both the Giant Burrowing Frog and the Red-crowned Toadlet have been previously detected within the upper reaches of the Patonga Creek catchment which is situated within the immediate vicinity of the Site. No suitable habitat for the Stuttering Frog and Giant Barred Frog was recorded at the Site; however potential habitat for these species exists in the lower section of the Patonga Creek catchment.

Given that the proposal is likely to impact on the current drainage system at the Site and immediate surrounds and is also likely to increase the pollutant load into Patonga Creek, a 7-Part test examining

secondary impacts on the Red-crowned Toadlet, Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and the Giant Barred Frog (see **Appendix G**) was conducted.

There are currently uncertainties surrounding the significance of flow alterations which may occur at the Site as a result of the proposal. Further, engineering of flows at the Site have not yet been determined and will be subject to later detailed design. The design phase will therefore need to ensure how to minimise to the greatest extent possible impacts on the habitat and species identified in this report, to this end, no change to the natural flow regime (quality and quantity) will be required to ensure that threatened species are not significantly impacted as a result of the proposal.

The Seven Part Tests (**Appendix G**) concluded that the proposal in its current configuration and design is likely to result in significant impacts to amphibian habitat at and within the vicinity of the Site and therefore significant impacts to the Red-crowned Toadlet, Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and the Giant Barred Frog. As such a Species Impact Statement (SIS) may be required should the detailed design process identify that engineering controls are unable to mimic natural flows currently experienced at the Site both in quantity and quality.

18.10.7 Giant Dragonfly

The Giant Dragonfly lives in permanent swamps and bogs with some free water and open vegetation. This species was recorded within the vicinity of the hanging swamp just upstream from the site (approx 10-20m from the Site boundary) and is a significant local record as relatively few known locations of this species have been recorded on the Central Coast previously.

The 7-Part Test (**Appendix G**) concluded that the proposal in its current configuration and design is likely to result in significant impacts to the Giant Dragonfly habitat within the vicinity of the Site. As such a Species Impact Statement (SIS) may be required should the detailed design process identify that engineering controls are unable to mimic natural flows currently experienced at the Site both in quantity and quality.

18.11 Weeds

The November 2006 weeds survey revealed relatively minor weed infestation in undisturbed native vegetation on and adjoining the Site. Notably the bird-spread noxious weeds *Lantana camara* and *Chyrsanthemoides monilifera* subsp. *rotundata*, which are serious and widespread environmental weeds in coastal NSW, were absent from native vegetation and only small numbers were observed in cleared areas. However areas of natural vegetation adjoining Patonga Creek to the south of the existing sedimentation pond featured moderate to major weed infestations. *Lantana camara* occurred near the DECC access trail on the southern slope above Patonga Creek. Areas of native vegetation have highly significant habitat values and are continuous with Brisbane Water National Park.

Cleared areas of the Site featured some major infestations of environmental weeds including those which are listed as Noxious. These were most abundant in cleared/regrowth areas, however *Ageratina adenophora* and *Chyrsanthemoides monilifera* subsp. *rotundata* was located along the southern fenceline and adjacent to Patonga Creek.

Active management on site during construction and operation is required to ensure noxious weed species do not colonise native vegetation. It is also recommended that Gosford City Council utilise the development period to control environmental weeds present on Site.

The Class 3 weed *Ulex europus* must be fully and continuously suppressed and destroyed. For the Class 4 weeds *Ageratina adenophora, Chyrsanthemoides monilifera* and *Cortaderia selloana*, the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority, in this case Gosford City Council.

The Class 5 weeds such as *Lantana camara* and *Oxalis* sp.* are all of NSW declarations and are notifiable weeds. The requirements in the *Noxious Weeds Act* for a notifiable weed must be complied with. Landholders must notify the local control authority after finding it on their land and must also continuously suppress and destroy the infestation.

18.12 Construction and Operational Impacts

During the construction of the proposed AWT site, it is estimated that approximately 3 to 4ha of land will be disturbed in order to construct the AWT footprint and access road. This will require the removal of 1.5ha of existing native vegetation, excavation of a substantial amount of sandstone ridgeline and removal of the sedimentation pond at the Site. Heavy machinery and other vehicles should not be used or parked on any areas outside the current development footprint.

Should heavy rainfall occur during the construction period then it is likely that any disturbance to the ground will cause soil erosion and runoff. If appropriate mitigation measures are implemented then this is unlikely to result in erosion and resulting sedimentation of the natural drainage system and reduce the mobilisation of contaminants found at the Site.

The sedimentation pond is likely to contain contaminants and possibly chytrid fungus (a fungus capable of causing sporadic deaths in some amphibian populations and 100% mortality in others). Any large volumes which may be discharged into the natural drainage system through infilling of the pond is likely to have significant impacts on the natural drainage system particularly Patonga Creek which is considered a pristine watercourse.

Once the construction of the AWT facility is complete, then the Site will be utilised for the recycling and treatment of various wastes.

Runoff from waste receiving and processing areas could potentially contain high concentrations of pollutants including gross pollutants, oils and grease, heavy metals, nutrients, pathogens, oxygen demanding substances and others. All runoff from waste processing and receiving areas should be collected and reused in the process and/or discharged to the existing leachate management system. Stormwater runoff from roof tops should be contained within rainwater tanks onsite and also reused in the process. Runoff from roads and car parking areas are also likely to contain pollutants. As a result, runoff from these areas, along with any excess stormwater runoff from the roofs, should be collected in detention basins on site, treated and the effluent used in the AWT or composting process. Any treated effluent discharged into Patonga Creek should meet stringent water quality guidelines and should not exceed levels currently found within the Creek. Stormwater flowing onto the Site which may be directed into Patonga Creek should also meet stringent water quality guidelines.

The impacts on Patonga Creek have not been quantified as part of this report. Due to the amphibian and Giant Dragonfly habitat within close proximity to the Site, runoff from Site and treated flows to Patonga Creek would need to be similar to the receiving waters in quantity and quality in order to mimic natural flows.

18.12.1 Visual Screening/Earth mound

The proposed earth works including bunding on the southern boundary of the Site are proposed in areas cleared of native vegetation, however mitigation measures for erosion, sedimentation and weed control will need to be implemented for these associated works due to nearby Patonga Creek and the habitat provided by the adjoining Sheltered Dry Hawkesbury Woodland vegetation community.

18.12.2 Artificial Lighting

Night-time security or operational lighting can potentially discourage habitat use where diffuse light penetrates into adjoining areas of vegetation. Nocturnal foraging regimes could be disrupted and may advantage predators such as cats, dogs and foxes as they are not strictly nocturnal foragers.

Nocturnal species' (such as owls, gliders and possums) eyesight is hindered by bright lights, and where they are affected by this, they become more susceptible to predation.

Large floodlights should generally not be used, although it is likely that some lighting may be required for emergencies, maintenance or security. Such lighting should be designed not to spill light outside the areas of disturbance proposed by the development.

18.12.3 Roads and Access

Access via road will be within the current footprint of the Site and should not impact on any additional areas of native vegetation or habitat.

18.13 Mitigation Measures

18.14 Planning & Offsets

It is recommended that the Construction Environmental Management Plan (CEMP) and Operational Environment Management Plan (OEMP) be developed for the site and include the mitigation measures outlined below. These plans should be prepared in consultation with an appropriately qualified ecologist.

An offset package is proposed as a means to mitigate against the impacts on flora and fauna of the proposed facility. The Offset Package Report is presented as **Appendix G** and describes the vegetation and habitats of the area to be affected by construction of the proposed facilities and those of the area proposed as an offset. This comparison is summarised in **Table 18-1**below.

Table 18-1 Comparison of Impacted Area and Offset Area

Vegetation Type	Impacted Area (ha)	Offset Area (ha)
Hawkesbury Peppermint Apple Forest*	0.51	0.94
Hawkesbury Banksia Scrub–Woodland	0	0.55
Hawkesbury Rock Pavement Heath	0	0.09
Exposed Hawkesbury Sandstone Woodland	1.04	0
Hollow-bearing trees	√	√
Caves	√	√

Vegetation Type	Impacted Area (ha)	Offset Area (ha)
SEPP 44 Koala Feed Trees	√	√
Total Area	1.55	1.58

√ = present but quantity and density not known

* equivalent to 'Sheltered Dry Hawkesbury Woodland' (LHCCREMS, 2003) as described in this Report. Nomenclature of Bell (2004) was preferred for the offsets package as LHCCREMS (2003) mapping did not cover the proposed offset area.

As shown in **Table 18-1**, there is not an exact like-for-like match of vegetation types between the two areas. However, it is evident from field surveys and from the floristic data of Bell (2004) that the floristic diversity and structural features of the offset area have a high correlation to those within the impacted area. This relationship is described fully in **Appendix G**. Overall the offset area contains vegetation types and habitat features that are equivalent to or highly correlated (floristically and structurally) to those within the impacted area.

The offset will protect and conserve, in perpetuity, threatened species habitats, vegetation types, habitat types and landscape features similar or equivalent to those found within the impacted area. Moreover, the proposed offset area is 300m^2 larger than the impacted area, has superior connectivity with intact vegetation and habitats and contains higher quality habitats that are in better condition.

On the basis of the above assessment, the proposed offset is consistent with the DECC guidelines for offsets and meets the key criterion for like-for-like trade-offs of biodiversity values. Adoption of the offset would adequately compensate for the loss of threatened species habitat associated with construction of the proposed AWT facility.

Gosford City Council is committed to providing an appropriate offset area as discussed in **Appendix G**, and a commitment describing this is provided in the Draft Statement of Commitments provided in **Chapter 22**.

It is recommended that the Construction Environmental Management Plan (CEMP) and Operational Environment Management Plan (OEMP) be developed for the site and include the mitigation measures outlined below. These plans should be prepared in consultation with an appropriately qualified ecologist.

18.14.1 Tree Clearance Protocol

The removal of larger habitat trees (>60cms diameter breast height or any trees with hollows) should occur under a Tree Clearance Protocol (TCP). This measure is recommended to reduce direct impacts to any tree dwelling fauna species, particularly bats. The TCP involves the following stages:

1) Day 1 – Pre-clearing survey by qualified expert/s identifies "habitat" trees (those that have potential roost hollows for bats or arboreal mammals, bird nests in branches, hollows suitable for hole-nesting birds). Bird observations at potential roosts are made during the day.

2) Night 1 – Habitat trees are assessed for fauna presence (bat detectors operated for one hour after dusk, trees with large hollows are spotlighted at dusk).

3) Day 2 – Trees with fauna present are felled with a heavy bulldozer that pushes from the same side as the roost in question so that the roost entrance is uppermost when the tree is lying on the ground. The tree is "tapped" several times with the bulldozer blade to alert any resident fauna and is then pushed using the base of the blade at approximately 1 -2 metres from the ground until it

starts to lean. The blade is then lowered to the base of the trunk where major roots protrude, and the tree is then held in position. The tree is then gently lowered to the ground by raising the blade and the machine operator can control the rate of fall to reduce damage. It is assumed that resident fauna would depart of its own accord.

4) Habitat trees with nesting birds are not felled until they are fledged, but if this is not possible they are taken to a WIRES wildlife carer.

18.14.2 Weed and Pest Management

To limit the spread of weeds into adjoining remnant vegetation during construction it is recommended that intact areas be fenced. This should be done prior to construction, restricting access by construction crew and machinery to remnant vegetation. Additionally, stockpiles of fill or vegetation should not be placed in areas of adjoining remnant vegetation but instead within existing cleared areas.

A Weed and Pest management plan should be undertaken as part of the Construction Environmental Management Plan (CEMP) and Operation Environmental Management Plan (OEMP) for the Site. Active control of Fox and noxious weeds would be required.

Overall the November 2006 baseline weeds survey revealed relatively minor weed infestation in undisturbed native vegetation on and adjoining the Site. Notably the bird-spread noxious weeds *Lantana camara* and *Chrysanthemoides monillifera*, which are serious and widespread environmental weeds in coastal NSW, were absent from native vegetation and only small numbers were observed in cleared areas.

Cleared areas featured serious infestations with environmental weeds including noxious weeds. More active management should be undertaken to ensure these species do not colonise native vegetation. It is recommended that Council utilise the development period to control environmental weeds present on Site. Areas of natural vegetation adjoining Patonga Creek to the south of the existing sedimentation pond featured moderate to severe weed infestation. It is recommended that active control of weeds in these areas take place prior to development and that the design of the proposed development utilise control measures to limit the spread of weed propagules to the south of the Site.

The following weed management measures are recommended for the proposed development:

- Incorporate control measures in the design of the proposed development to limit the spread of weed propagules to the south/downstream of the Site.
- Hard-paved buffer zones around areas used for the storage or processing of green wastes
- installation of silt fences and other mitigation measures to isolate runoff during construction; and immediate rehabilitation of disturbed vegetation to limit the potential for colonisation by weeds
- fence off areas of vegetation to be retained during construction , restricting access by construction crew and machinery to remnant vegetation. Additionally, stockpiles of fill should not be placed in areas of remnant vegetation but instead in adjacent cleared areas.
- Post-construction landscape any open areas with indigenous native vegetation to limit the potential for colonisation by weeds

- removal and/or control of noxious weeds in accordance with the requirements of the *Noxious Weeds Act*, with particular focus on the following species:*Ageratina adenophora*, *Chyrsanthemoides monilifera* subsp. *rotundata*, *Ulex europus*, *Cortaderia selloana* and *Lantana camara* ; and
- Perform ongoing monitoring of weed infestation on and adjoining the Site utilising the baseline weeds survey of the Site and its surrounds conducted on 23 and 24 November 2006.

18.14.3 Fauna Management

Surface exfoliations of sandstone that occur within the development footprint should be manually removed and offered to DECC as micro-habitat enhancement materials for the Broad-headed Snake recovery program. This rock material could then be installed within other reserves of the DECC Central Coast Hunter Range Region or used for habitat enhancement or rehabilitation in areas that have experienced bushrock theft. This would offset any possible impact to marginal Broad-headed Snake habitat caused by the proposal.

Consideration should be given to re-establishment of an alternative pond to that proposed for removal as part of the proposal. This would replace this part of the habitat removed by the proposal. The pond should be constructed prior to infilling and removal of the sedimentation pond which will allow for the translocation of existing frog species. Translocation of existing frogs to a suitable habitat should occur prior to any proposed activities in any instance.

Water from the existing sedimentation pond is likely to be contaminated and of unsuitable quality for release to the Patonga Creek system.

18.14.4 Bushfire Management

Any Asset Protection Zone (APZ) would need to be included within the internal footprint design and should not be the justification for additional clearing. From an ecological perspective this ensures that vegetation adjacent to the current site boundary is not subject to increased fire regimes as a result of the proposed development and maintains it role as a filter to Patonga Creek and the upstream habitats.

18.14.5 Soil Erosion / Runoff

Appropriate construction and operational mitigation measures would be incorporated into the final detailed design in a manner that minimises to the greatest extent possible; soil erosion, sedimentation, alteration of natural flows and pollution run-off into Patonga Creek. The design would provide detail on the current surface and groundwater flow regime at the Site and incorporate engineering measures which would mimic the current situation as closely as possible. The proposed footprint would avoid intercepting groundwater seep flowing into the hanging swamp headwaters of Patonga creek and associated frog habitat.

Appropriate ongoing maintenance and mitigation measures to minimise soil erosion, sedimentation, alterations of flows and pollution run-off would also be incorporated into the CEMP and OEMP.

18.14.6 Site Management

The following mitigation measures are suggested to minimise operational impacts of the proposed development:

- Setting maximum speed limits during construction and operation traffic on Site to reduce fauna road fatalities;
- Limit vehicular and personnel entry into adjacent remnant vegetation during construction and operation through appropriate fencing;
- Using down-lights and motion sensor lighting in order to reduce light spill and the associated secondary impact on nocturnal fauna species potentially utilising the adjoining vegetation; and

Safeguard measures to reduce soil erosion and pollutant and sediment run-off during both construction and operation phases

18.15 Conclusion

A total of one hundred and thirty four (134) flora species were identified during field surveys conducted in July and November 2006. None of these species are listed under the TSC or EPBC Acts. Two vegetation communities, Sheltered Dry Hawkesbury Woodland and Exposed Hawkesbury Woodland, were recorded at the Site. Neither of these communities is listed as an endangered ecological community under the TSC Act and both are well represented in conservation reserves within the region. There are previous records of the threatened plant *Callistemon linearifolius* from the Site, in an area upstream and to the west of the proposed development footprint. No individuals of this species were recorded during the current surveys and none will be affected by the proposed works.

Disturbed areas of the Site feature significant infestations with noxious and environmental weeds, although the surrounding bushland is relatively weed-free. The construction and operation of the Site must include ongoing surveys and management of environmental weeds to avoid impacts on the adjoining Brisbane Water N.P.

Although approximately 1.5ha of native vegetation will be removed as a result of the proposed development, the clearing will occur adjacent to an existing cleared area. Continuity of extant vegetation will be maintained to the east of the development site providing for north-south connectivity of habitat. East-west connectivity is substantially disrupted by the existing landfill footprint. Accordingly the proposed development will not fragment or isolate an area of habitat.

A total of thirteen (13) species of reptile, thirty nine (39) species of bird, nine (9) species of amphibian, seventeen (17) native mammals and one species of dragonfly were recorded on the Site. Six of these species are listed as threatened under the TSC Act, including the Red-crowned Toadlet, Grey-headed Flying-fox, Eastern Freetail Bat, Little Bent-wing Bat, Large-footed Myotis and the Giant Dragonfly. One species, the Grey-headed Flying-fox, is also listed as nationally threatened under the EPBC Act.

The proposal will result in the removal of habitat for native flora and fauna, including threatened species. The most significant impacts are associated with the removal of native vegetation and associated habitat features, such as feed trees, tree hollows, rock outcrops and caves and ground debris (leaf litter). This habitat is known to be utilised by several threatened fauna species previously recorded from the Site and the locality, including threatened microbats, forest owls, the Bush Stone-curlew. Assessments under Section 5A of the EP&A Act (7-part tests) for these species conclude that only minor impacts are likely due to the relatively small area of habitat to be removed, limited evidence of local populations or core breeding or roosting habitat and presence of superior habitat in the area surrounding the Site. Therefore a Species Impact Statement for these species is not required.

Chapter 18 Flora and Fauna Assessment

A biodiversity offset package is presented as a means to mitigate against the impacts on flora and fauna of the proposed facility. The package describes the vegetation and habitats of the area to be affected by construction of the proposed facilities and those of the area proposed as an offset. This offset area contains threatened species habitats, vegetation types, habitat types and landscape features similar or equivalent to those found within the impacted area. Council has agreed to set aside the area for conservation purposes in perpetuity, and will negotiate a suitable administrative arrangement, which could be in the form of a Voluntary Conservation Agreement, Section 88D instrument or land divestment, with DECC. The proposed offset is consistent with the DECC guidelines for offsets and meets the key criterion for like-for-like trade-offs of biodiversity values. Adoption of the offset would adequately compensate for the loss of threatened species habitat associated with construction of the proposed AWT facility.

The proposal in its current configuration and design is likely to result in impacts to habitats in Patonga Creek and an adjacent hanging swamp, depending on the final drainage and stormwater design. 7-part tests for the Red-crowned Toadlet and the Giant Dragonfly are inconclusive, as the detailed design for surface water management from the facility is not yet complete. If the water management structures and systems proposed as part of the final design are unable to mimic the existing hydrological regime of Patonga Creek, then the proposal could have a significant impact on these species. Therefore a Species Impact Statement for these species may be required. This issue will have to be reviewed during detailed design phase.

Construction and operational mitigation measures must be incorporated into the final detailed design in a manner that minimises to the greatest extent possible alteration of natural flows and pollution run-off into downstream habitats.

19.1 Introduction

The greenhouse gas emission inventory for the proposed development is based on the Methodology detailed in the World Business Council for Sustainable Development – Global Resources Institute Greenhouse Gas Protocol, www.ghg.protocol.org (GHG Protocol, 2004), and the relevant emission factors in the Australian Greenhouse Office "Factors and Methods Workbook" 2006 (AGO, 2006a) and the "Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2004 – Energy (Stationary Sources)". The Protocol was first established in 1998 to develop internationally-accepted accounting and reporting standards for greenhouse gas emissions from companies.

The Greenhouse Gas Protocol is based on the concept of emission "scopes":

- **Scope 1: Direct greenhouse gas emissions**. Direct greenhouse gas emissions occur from sources that are owned or controlled by the company, for example:
  - Emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.;
  - Emissions from chemical production in owned or controlled process equipment.
- **Scope 2: Electricity indirect greenhouse gas emissions**. This accounts for greenhouse gas emissions from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organisational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated.
- **Scope 3: Other Indirect greenhouse gas emissions**. This is an optional reporting class that accounts for all other indirect greenhouse gas emissions resulting from a company's activities, but occurring from sources not owned or controlled by the company. Examples include extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services. For the purpose of this Environmental Assessment these indirect emissions have not been considered.

19.2 Greenhouse Gas Inventory

Estimates of diesel and electricity consumption were based on available data for similar AWT and Composting facilities (Veolia, 2006) adjusted linearly based on the throughput of 70,000 tonnes per annum of MSW and 45,000 tonnes per annum of Greenwaste / Biosolids. Outlined in **Table 19.**1 are the estimates of energy use and greenhouse gas emissions expressed in tonnes Carbon Dioxide (CO_2) equivalent based on Australian Greenhouse Office emission factors (AGO, 2006a).

Chapter 19 Greenhouse Assessment

Table 19-1 Greenhouse Gas Inventory

Scope	Energy	Proposed AWT and Composting Facility	Residue Disposal in Landfill	Total (GJ)	Total (t CO_2-e)
Scope 1 (Direct)	Electricity (GJ)				
	Diesel (GJ)	3,900	1,000	4,900	340
Scope 2 (Indirect)	Electricity (GJ)	3,800	0	3,800	950
	Diesel (GJ)				
Total (Scope 1 and 2)		7,700	1,000	8,700	1300

19.3 Emissions Impact

Based on the predictions from the Australian Greenhouse Office, Australia's greenhouse gas emissions are projected to reach 603 million tonnes annually of greenhouse emissions (Mt CO_2-e) over 2008–12, period (AGO, 2006b). Based on operating at its peak capacity the predicted greenhouse emissions from the proposed AWT and Composting Facility are approximately 1300 tonnes CO_2 equivalent per year, representing around 0.0002 percent of Australia's total predicted annual emissions. If an anaerobic process is chosen for the AWT which produces biogas for energy production, the amount of electricity obtained from the local network would be reduced, thereby further reducing (or eliminating) the net greenhouse gas emissions from the proposed development. In summary the proposed AWT and Composting Facility would have no significant impact on greenhouse gas emissions.

Ecologically Sustainable Development Chapter 20

20.1 Introduction

The *Environmental and Planning and Assessment (EP&A)* Act requires Ecologically Sustainable Development (ESD) principles to be considered in the environmental assessment and decision making process.

Schedule 2 of the EP&A Regulation requires the justification of the development or activity to be carried out in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ESD.

Justification for the proposed Alternative Waste Technology (AWT) and Composting Facility at the Woy Woy waste management facility (WMF) from a biophysical, economic and social perspective has been considered in the relevant Chapters of this Environmental Assessment.

This Chapter describes the application of ESD principles to the design, development and environmental assessment of the proposal. Project construction and operational outcomes are considered in respect of their support for, or consistency with, ESD principles.

20.2 Ecologically Sustainable Development

In June 1990, the Commonwealth Government released the document Ecologically Sustainable Development: A Commonwealth Discussion Paper which provided a definition of the term "ecologically sustainable development" and aimed to institute a process of discussion on what Australians need to do to embrace ESD. The Commonwealth Government defined ESD as:

"using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased."

As part of the process of discussion instigated by the Commonwealth Discussion Paper, nine sectoral ESD Working Groups comprising government officials, industry, environment, unions, welfare and consumer groups were set up to provide advice on future ESD policy directions and to develop practical proposals for their implementation. The policy directions and recommendations made by the ESD Working Groups provided the foundation on which the National Strategy for Ecologically Sustainable Development (DEH, 1992) was developed.

In December 1992, the Council of Australian Governments endorsed the strategy as a response to the need to implement a coordinated national approach to ensure that Australia's future development is ecologically sustainable. The Council of Australian Governments (COAG) agreed that the future development of all relevant policies and programs, particularly those that are national in character, should take place within the framework of the National Strategy for Ecologically Sustainable Development and the Intergovernmental Agreement on the Environment (IGAE) (DEH, 1992). The IGAE is an initiative that attempts to devise a national environmental strategy for Australia through intergovernmental cooperation.

The principles that would assist in the achievement of ESD have been clearly set out in Schedule 2 of the EP&A Regulation. These principles are:

- the precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Chapter 20 Ecologically Sustainable Development

- inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- conservation of biological diversity and ecological integrity – namely, that a full and diverse range of plant and animal species should be maintained.
- improved valuation, pricing and incentive mechanisms – these mechanisms would enable environmental factors to be included in the valuation of assets and services.

The four principles are inter-related. For instance, inter-generational equity can only be achieved in many instances if biodiversity is conserved for the use and enrichment of future generations. The linking of these four principles means that they must be considered both individually and collectively when assessing whether the proposed rehabilitation would contribute to ESD in Australia.

20.3 Application of ESD to Project Design and Development

The design and development of the proposal as a whole is focused on the principles of ESD, as it is designed to improve the management of waste in a more sustainable manner for existing as well as future generations in the local communities, through:

- Recovery of materials;
- Capture of energy (from the organics section) to offset electricity production; and
- Reduced greenhouse gas emissions;
- Production of compost to reduce the use of synthetic products in agriculture and horticultural uses

The four principles of ESD described above, and their relationship to the proposed rehabilitation, are outlined below.

20.4 Precautionary Principle

The EP&A Regulation 2000 provides the following definition of the precautionary principle:

“Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and an assessment of the risk-weighted consequences of various options”.

To satisfy the precautionary principle, emphasis must be placed on anticipation and prevention of environmental damage (i.e. being proactive rather than reactive). The environmental impact assessment process itself is precautionary in nature, as it provides a public procedure to assess and evaluate uncertainty about the environmental consequences of a development prior to a project proceeding.

The investigation and specialist studies that were undertaken for the proposed development included:

- air quality assessment;
- noise assessment;
- traffic and transport assessment;
- lighting impact assessment;
- ecological assessment; and
- landscape and visual impact assessment.

These investigations have been used as source materials for this Environmental Assessment and have been appended to support the various Chapters.

This Assessment identifies mitigation measures and environmental management procedures that would be implemented to minimise and monitor impacts that may occur as a result of uncertainties in the impact assessment. Such uncertainties would not pose a risk of damage to the environment, because they have been considered in the context of worst case scenarios that conservatively anticipate environmental impacts, and would be appropriately managed during the construction and operation phases.

20.5 Inter-generational Equity

Inter-generational equity has been defined in the IGAE as:

“The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.”

The principle includes both intra-generational equity (within generations) and inter-generational equity (between generations).

Intra-generational equity requires that the economic and social benefits of development be distributed appropriately among all members of the community. Inter-generational equity requires that the development be managed so that the environment is maintained or enhanced and future generations are not disadvantaged by long-term impacts of the development. The most significant aspect of this concept is that future generations should not inherit a degraded environment.

The overall aim of the proposed development is based on the principle of inter-generational equity, since the project would:

- Provide Council (and therefore the wider community) with viable waste management options for the future including extend the lifespan of the current landfill and to allow for the future planning of the WMF;
- Allow the region to move towards meeting stringent state-wide resource recovery targets set for NSW; and
- Assist in increasing resource recovery of waste materials and provide Council with an opportunity to produce compost products for beneficial reuse and sale.

Chapter 20 Ecologically Sustainable Development

The AWT Facility and Composting Facility at the Woy Woy WMF would redirect waste it receives from landfill into a potential use with a higher resource value. This would reduce material going to landfill for the region thereby reducing consumption of landfill space. The redirection of compostable material would also result in avoided (or reduced) emissions from the current landfill, and associated amenity and odour impacts of the landfill.

The recovery of recyclable materials from the waste stream (particularly the capture of metals and plastic), and the reprocessing and reuse of organic material as compost, conserves raw materials.

Generating "green" energy from the organic component of waste, if an anaerobic process is chosen for the AWT, would offset electricity production thereby preserving fossil fuels for future generations.

In summary, since the proposed project would deliver long-term environmental and social benefits without degrading the broader environment, it is consistent with the principles of inter- and intra-generational equity.

20.6 Conservation of Biological Diversity and Ecological Integrity

Preserving biological diversity and ecological integrity requires that ecosystems, species and genetic diversity within species be maintained.

Detailed flora and fauna investigations were carried out as part of preparation of the Environmental Assessment as described in Chapter 18. Key findings of the study are summarised below.

A total of one hundred and thirty four (134) flora species were identified from the targeted field surveys conducted in July and November 2006 by URS Ecology Personnel. None of these species are listed as Endangered under the *TSC* or *EPBC Act*. Two main vegetation communities, Coastal Sheltered Apple- Peppermint Forest and Exposed Hawkesbury Woodland, were recorded at the Site none of which are listed as Endangered Ecological Communities (EECs). Although approximately 15,000m^2 of intact vegetation would be removed as a result of the proposed development, it is unlikely that the development would result in the fragmentation of flora species in the local vicinity of the Site.

The July and November 2006 targeted fauna surveying recorded thirteen (13) species of reptile, thirty nine (39) species of bird, nine (9) species of amphibian, seventeen (17) native mammals [including eight (8) species of bat] and one (1) species of Dragonfly. Five of these species are listed as Threatened under the *TSC/EPBC Act* including the Red-crowned Toadlet, Grey-headed Flying-fox, Eastern Freetail Bat, Little Bent-wing Bat, Large-footed Myotis and the South-eastern Petal-tail Dragonfly (Giant Dragonfly).

Potential impacts on threatened species habitat in Patonga Creek would need to be considered in detailed design of the site to avoid significant impacts for downstream frog species and associated habitat. Protection of the hanging swamp located upstream but very close to the site boundary would also need to be closely controlled during construction and operation of the AWT.

The primary objective of the proposed proposal is to improve waste management operations by providing an AWT and Composting Facility. The proposed facility would divert significant quantities of waste from potential landfilling.

20.7 Improved Valuation and Pricing of Environmental Resources

The IGAE and the *Protection of the Environment Administration Act* 1991 both call for improved valuation, pricing and incentive mechanisms, which should form an element of policy making and program implementation. In other words, environmental factors should be included in the valuation of assets and services.

Cost-benefit analysis can be applied to help decide how to proceed towards sustainable development. It is a means of reaching decisions in an objective and rational manner, by allowing the costs of proceeding with a proposal to be measured against the benefits arising from the proposal.

The waste currently disposed of in the Woy Woy WMF landfill is generated within the Gosford LGA. The cost of the proposed facilities would be paid by Council (indirectly through the rates of residents in the Gosford LGA) thus residents would bear the cost of managing their waste. The cost savings associated with conservation of land, reduced environmental impacts from landfilling of waste and securing the long term waste strategy for the Gosford community, outweighs the costs associated with the construction and operation of the proposed facilities.

This principle is fulfilled by the cumulative beneficial impacts derived from the implementation of the proposal. It is therefore considered that the project is justified based on ecologically sustainable principles.

20.8 Conclusion

The project is a significant and long-term commitment to the need for improved waste management for the region, and represents a significant step towards an ecologically sustainable future for the management of waste in the Gosford LGA. It has been developed and designed in accordance with four key principles of ESD, and appropriate mitigation measures have been identified where necessary.

Based on the analyses outlined in this section, and the implementation of mitigation measures as identified throughout this Environmental Assessment, undertaking the proposed development in the manner proposed is justifiable, taking into consideration the principles of ESD.

21.1 Introduction

This Chapter provides an assessment of the potential cumulative impacts associated with the proposed development. Key issues which may contribute to adverse cumulative impacts include air quality, noise, traffic and water quality. The cumulative impact associated with the combination of different aspects of the proposal and the cumulative impact arising from impacts associated with the proposed development combined with those from developments surrounding the Woy Woy WMF, are discussed in this Chapter.

21.2 Air Quality

For the majority of air quality assessments, background concentrations of pollutants are added to the concentrations predicted to occur from the plant emissions in order to obtain a cumulative or total concentration. In relation to odour assessments, it is generally accepted practice to assume a zero background odour concentrations unless there are significant odour sources in the vicinity of the development.

The only potential odour source identified in the vicinity of the development is the Woy Woy Sewage Treatment Plant (STP), located in the base of the valley to the north of the site. The STP is isolated from the proposed facility by a distance of approximately 2km, and by strong terrain features with a difference in elevation of greater than 120m along the path, between the two sites. The STP has been excluded from the assessment as a potential odour source, as explained in the following sections.

The Council has not received odour complaints from the Woy Woy STP for the past 25 years, suggesting the odour from the STP is confined to the site. This is consistent with a field odour assessment conducted by URS on the eastern boundary of the STP on 8 May 2007, which did not detect sewage type odours.

Furthermore, the meteorological conditions of northerly breezes and/or surface layer convection, in which air is potentially transported from the STP, to the region of the proposed site are not synonymous with worst case odour conditions, as significant amounts of turbulence (mechanical and/or convective) would be an inherent part of these transport mechanisms. These atmospheric conditions are in contrast to stable, low wind conditions, which are conducive to poor dispersion and adverse odour impacts. Consequently atmospheric conditions likely to transport odour from the STP to the area surrounding the proposed development are conditions where low odour impacts are expected from the development.

In addition, the relative alignment of the STP, the proposed development and the sensitive receptors nearest to the proposed site also prevents the STP from forming a source of background odour during worst case conditions i.e. westerly breezes. During westerly breezes, the emissions from the proposed facility would be transported towards receptors to the east of the proposed facility. These conditions suggest that the odours from the proposed facility would be travelling in parallel to the STP odours, thus the cumulative odour impact on the residential area to the east of the proposed development would be negligible.

Furthermore, the modelling conducted, which is discussed in subsequent sections, predicts the likely odour impact from the proposed development in the vicinity of STP. The results show that the odour concentration from the proposed development at the STP is approximately 0.1 OU (nose response time).

Chapter 21 Cumulative Impacts

Given that the closest receptors to the STP are to the north east of the STP and further away from the proposed development, it follows that the added odour impact at the nearest receptors to the STP would be less than 0.1 OU (nose response time), which is considered negligible.

On this basis, the STP is unlikely to add to the predicted odour from the proposed development to cause a cumulative odour impact in exceedance of guidelines at sensitive receptors. Thus the STP has been excluded from this assessment as a significant odour source.

The key aspects of the proposal which may cause air quality impacts are the odour emissions from the existing Woy Woy landfill tip face, leachate pond and proposed AWT and Composting Facilities including the Greenwaste maturation area. The combined affect of these odour sources was modelled using the Calpuff dispersion modelling package as discussed in **Chapter 12.** The results showed the odour concentration to be approximately 1.7 OU at the sensitive receptors, falling below the NSW odour performance criteria of 2OU (nose response time).

Other air quality species examined as part of this assessment included particulate matter (dust) measured as PM_{10} , Oxides of Nitrogen, sulphur dioxide and carbon monoxide. Representative background data for these species was examined for the year 2005, and all combustion and industrial related pollutants were found to be below the limit values with the exception of PM_{10}. It is likely that this is due to a naturally occurring dust event and may be discounted from the record.

For the proposed development, the majority of site generated total suspended particulates and PM_{10} would occur as a result of site vehicles passing over unmade roads. An undertaking to seal all site access roads and main internal haul roads would reduce the potential for dust generation. Areas where vehicles pass over unmade ground would be sprayed with water to reduce dust emissions. Using these mitigation methods, it is considered that the generation of dust would be minimised, and that concentrations at the nearest sensitive receptors would not exceed the assessment thresholds.

In relation to other atmospheric pollutants, namely oxides of nitrogen, sulphur dioxide and carbon monoxide the combustion of fossil fuel including the use of motor vehicles results in the liberation of nitrogen and carbon in all oxidation states as well as particulate matter. The proposed low number of additional vehicles would not add appreciably to ambient pollutant concentrations, and given the low background levels would not result in an exceedance of the assessment criteria for nitrogen dioxide and carbon monoxide.

In conclusion, the findings of the air quality study indicate that the proposed activities would not present an adverse cumulative impact on the air quality in the area.

21.3 Noise

The noise impact assessment for the proposed AWT and Composting Facility described in **Chapter 11**, took into consideration the noise emanating from the existing industrial sources including the Woy Woy WMF and Woy Woy Sewerage Treatment Works. As part of the noise assessment, attended short-term measurements were undertaken in the evening and daytime to determine the level of noise from industry. The background noise level at the time of assessment (17:50 Friday, 13 July 2007) was typically 38 dBA and 35 dBA (15:10 Monday 23 July 2007). It was also noted that during the deployment of the logger at the 1 The Citadel (residence), no industrial noise was audible. Personnel on site associated with the sewage treatment works and waste management facility confirmed that operations were typical at the time of our assessment. It is considered that any industrial noise contribution in the vicinity of The Citadel, at the rear of the residences, would likely be less than 30 dBA.

The noise assessment has shown that noise associated with construction activities would be below 30 dBA L_{eq} at the nearest residence, and therefore would not be audible. However, despite this, a number of mitigation measures have been recommended for construction activities that would further assist in minimising any construction noise on-site.

With respect to the assessing the operational noise impact to the existing residences, noting the assumed noise levels and building constructions, the 36dBA criterion is comfortably met and the operation of the facility is likely to be inaudible.

The impact on the National Park is likely to be below the 50dBA criterion.

The potential of sleep disturbance due to the operation of the development was found to be negligible.

Impacts relating to the increased movement of heavy vehicles along Railway Street / Nagari Road were found to be below the allowance of 2dB above existing traffic noise levels at relevant residences, and are therefore considered acceptable.

21.4 Traffic

The Woy Woy WMF currently receives approximately 75,000 tonnes per annum of waste annually. At peak capacity the proposed facilities would receive 70,000 tonnes of MSW, 30,000 tonnes of Greenwaste and 15,000 tonnes of Biosolids annually. It is noted that this increase in MSW and Greenwaste being received at the Woy Woy WMF would occur irrespective of the AWT and Composting Facilities being established. However, as part of the cumulative impact assessment the impacts on the local road network due to the increased must be examined. The increased waste being received at the Woy Woy WMF would result in an increase in traffic utilising the local road network both during construction and operation as described in **Chapter 13**. As described in **Chapter 13** the local road network would be able to safely handle this increased traffic without any significant adverse impacts.

21.5 Water Quality

The proposed development site is located south of the existing Woy Woy WMF landfill. Water falling on the north of the site, flows north into Woy Woy Bay and then into Brisbane Water, and water falling on the south of the site flows south into Patonga Creek and into the Hawkesbury River system. Runoff from the high sides of the site (east and west) flows onto the site as sheet flow, however most of the rain falling on the hill to either side does not run onto the Woy Woy WMF site. Based on quarterly surface water monitoring undertaken at the site, the existing operations at the Woy Woy WMF, do not adversely affect surface water or groundwater at the site.

The proposed development has the potential to increase sediment runoff into the surrounding waterways during construction; however with implementation of the proposed mitigation measures as described in **Chapter 9**, this impact would be negligible. During operation of the proposed facility all wastewater would be reused within the AWT process or disposed to the existing leachate management system. Stormwater runoff from roofs, roads and carparks would be reused on site where possible and any excess treated effluent would be discharged into Patonga Creek. Due to the amphibian habitat downstream, runoff from site and treated flows to Patonga Creek would need to be similar to the receiving waters in quantity and quality in order to mimic natural flows. Therefore the effluent discharged to Patonga Creek would be treated to a standard which meets the existing water

Chapter 21 Cumulative Impacts

quality within the creek. The treatment device would be selected and/or designed during the detailed design phase and a maintenance, monitoring and operations plan written at this time.

The water quality and quantity criteria for discharge to Patonga creek would be outlined in the Operational Environmental Management Plan (OEMP) and Environmental Protection Licence (EPL) for the proposed facilities.

Groundwater and surface water monitoring for the proposed development would be incorporated into the existing Landfill Operation Management Plan (LEMP) for the Woy Woy WMF.

22.1 Introduction

The Draft Statement of Commitments has been prepared in accordance with section 75F (6) of the EP&A Act. The inclusion of appropriate environmental management measures into the detailed design and construction of the project would minimise adverse impacts on the environment. The proposed adoption of the relevant measures identified in the Draft Statement of Commitments into a Construction Environmental Management Plan (CEMP) and Operation Environmental Management Plan (OEMP) would be an important component of the proposal and reiterate the commitment of Gosford City Council (Council) and its contractors to mitigation of environmental impacts identified in this assessment.

The Draft Statement of Commitments describes the environmental management and monitoring to be undertaken during the construction and operation of redevelopment of the Woy Woy Waste Management Facility (WMF).

22.2 Environmental Management

Environmental management during the construction phase of the proposed project would be undertaken in compliance with the requirements of a Construction EMP (CEMP). The CEMP is an administrative tool outlining environmental management practises, safeguard measures to be implemented, timing of their implementation, and management and monitoring of the process and procedures. The CEMP must be adhered to during the construction of proposed AWT and Composting Facilities.

The key objectives of the CEMP would include:

- ensuring that works are carried out in accordance with appropriate environmental statutory requirements, the conditions of approval for the project, relevant guidelines and existing environmental management systems and procedures at the refinery;
- ensuring that works are carried out in accordance with the goals and requirements presented in the Environmental Assessment;
- ensuring that works are carried out in such a way as to minimise the likelihood of environmental degradation occurring;
- ensuring that works are carried out in such a way as to manage the impact of the works on neighbouring land uses;
- ensuring that all employees engaged in the works comply with the terms and conditions of the CEMP;
- providing clear procedures for management of environmental impact including corrective actions; and
- identifying management responsibilities and reporting requirements to demonstrate compliance with the CEMP.

The CEMP would serve as a working document to be used during the implementation of the proposal.

Generally the Construction EMP includes:

- establishment of environmental goals and objectives;
- conditions of project approval;
- lists of actions, timing and responsibilities;
- identification of areas of responsibility for environmental management of the project;
- statutory requirements – licences and approvals required;
- a structured reporting system detailing all relevant matters on a regular basis;
- procedures and forms for documentation and reporting of issues;
- training of personnel in environmental awareness;
- guidelines for emergencies, contact names and corrective actions for non-conformance and notifications to appropriate authorities and affected parties;
- auditing implementation of the CEMP;
- review procedures and protocols for modification of the CEMP;
- complaint handling procedure;
- site management and control procedures; and
- monitoring procedures.

Specifically, the CEMP would provide management actions in relation to:

- erosion and sediment control;
- surface water management;
- waste generation and disposal;
- flora and fauna management
- Aboriginal cultural heritage;
- the control of atmospheric emissions; and
- the control of construction traffic movements
- the control of noise emissions.

22.3 Operational Environmental Management Plan

An Operational EMP (OEMP) would be prepared for the proposed AWT and Composting Facility, which would address the key ongoing monitoring requirements. The OEMP for the operational phase would include information on:

- details of proposed maintenance and monitoring programs;
- responsibility for maintenance and monitoring;
- reporting requirements;

- permits, approvals and consents issued under the approval process;
- community liaison such as complaints registers and a 24-hour hotline;
- the appropriate standards and protocols for the necessary controls, monitoring and remediation measures;
- auditing procedures;
- response plans for contingency events;
- properly established operating procedures;
- environmental training and education at all levels;
- monitoring system, review of plans and progress toward achieving objectives and goals;
- non-compliance handling procedures;
- environmental quality controls; and
- plant closure and rehabilitation plan.

22.4 Mitigation Measures

A number of environmental safeguards and mitigations measures to prevent or minimise environmental impacts that may be generated by the construction and operation of an AWT and Composting Facility are proposed. These measures would be incorporated in both EMPs and implemented throughout the life of the project.

Table 22-1 summarises these safeguard measures, sets out priorities for implementation (construction and operation), and lists the responsibility for ensuring that these safeguard procedures are undertaken.

Table 22-1 Proposed Mitigation Measures

Item	Mitigation Measures / Commitments	Implementation	Responsibility
	General		
A1	Council would carry out construction and operation generally in accordance with the: • Project application • Environmental Assessment • Draft Statement of Commitments	Design, Construction and Operation	Council
A2	Council would ensure that all buildings are constructed generally in accordance with approved plans, the Building Code of Australia and the relevant parts of the EP&A Act building certification.	Design and Construction	Council
A3	Council would ensure that all practicable measures are implemented to prevent or minimise any impacts to the environment that may arise from the construction, commissioning and operation.	Design, Construction, Operation	Council

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Item	Mitigation Measures / Commitments	Implementation	Responsibility
A5	Prepare and implement: CEMP; and OEMP.	Construction and Operation	Council and Contractor
	Consultation		
B1	Consultation with landholders in proximity to the site during key phases of project development i.e. pre-construction, construction and operation.	Design, Construction and Operation	Council and Contractor
B2	Ongoing consultation with local landholders and key community groups to inform them of development progress. Such consultation could be undertaken 6 monthly or annually to identify and respond to any issues raised by stakeholders relating to the plant's operation.	Design, Construction and Operation	Council and Contractor
	Air Quality		
C1	The atmospheric dispersion modelling study undertaken as part of this assessment has been based on preliminary design information and covers a number of possible design options. As part of the detailed design of the development, the assumptions and emission estimates used in this assessment would be reviewed despite the conservative nature of emissions estimates used.	Design	Council
C2	Throughout the design process, opportunities to further minimise emissions to air would be investigated and implemented wherever feasible to ensure that off-site impacts are kept to a minimum.	Design	Council
C3	Any emissions of particulates (dust) during construction would be specifically controlled through the implementation of the following subset of mitigation measures, which would be incorporated into an environment management plan (EMP).	Construction	Council
C3.1	In dry, windy conditions, water sprays would be used to dampen down soils prior to excavation and handling. Exposed surfaces and stockpiles would also be watered, sprayed or covered where required.	Construction	Council and Contractor
C3.2	Where practical, demolition activities or particularly dusty works would be scheduled under favourable meteorological conditions only. Earth-moving activities would be stopped when wind speeds exceed 30 km/hr.	Construction	Council and Contractor
C3.3	Vehicles would only be loaded to less than the height of the side and tailboards and loads of fill would be covered during transport. Any soil adhering to the undercarriage and wheels of trucks would be removed prior to departure from the site.	Construction	Council and Contractor
C3.4	Any long-term stockpiles would be stabilised using fast-seeding grass or synthetic cover spray.	Construction	Council and Contractor
C5	All major access roads would be sealed and vehicle speeds on unsealed areas would be controlled to minimise dust.	Operation	Council

Item	Mitigation Measures / Commitments	Implementation	Responsibility
	Soils		
D1	A nominal cross fall shall be applied to the engineered platform to provide adequate site surface drainage.	Design	Council
D2	Where excavation work extends into bedrock, suitable material would be reused as engineering fill on the site.	Design and Construction	Council and Contractor
D3	Assess need for groundwater control and collection system including: • Cut of drains to collect and redirect groundwater around the proposed construction areas; and • Subsoil drains to collect and transport groundwater through the proposed platform area during operation.	Design and Construction	Council and Contractor
D4	Where practicable, material excavated from the site (except for say 150 mm of topsoil and root-affected material) would be suitable for use as engineered fill in any cut/fill operations.	Design and Construction	Council and Contractor
D5	A Construction Soil and Water Management Plan would be developed and implemented as part of the CEMP for the construction works to ensure effective management of potential soil erosion issues.	Construction	Council and Contractor
D6	Construction would be planned to minimise the time that disturbed land is exposed.	Construction	Council and Contractor
D7	Disturbed sites would be quickly revegetated or covered with a non-erodable surface following construction.	Construction	Council and Contractor
D8	Discharge from the sedimentation pond would be through an appropriately designed dissipating structure to minimise soil erosion potential.	Operation	Council
D9	Appropriately bunded areas would be installed and maintained for storage of fuels, oils and chemicals.	Construction and Operation	Council and Contractor
D10	Areas within the operational plant area would be appropriately drained so that surface runoff would be prevented from infiltrating directly onto the ground and from reaching the groundwater.	Operation	Council
	Landscape and Visual		
E1	Colour and texture of structures for the AWT and Composting facilities building should be dark in tone and utilise non-reflective materials	Design	Council
E2	Lighting of external plant areas would avoid direct line of sight from residences to the east of the site.	Design and Operation	Council
E3	Top of the biofilter stacks would not have lighting.	Design and Operation	Council
E4	Large floodlights not to be used other than for emergency lighting.	Design and Operation	Council
E5	Security lighting would not spill onto neighbouring residences This would be achieved through the use of down lights and motion sensor lighting.	Design and Operation	Council

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Item	Mitigation Measures / Commitments	Implementation	Responsibility
	Noise and Vibration		
F1	The noise modelling undertaken as part of this assessment has been based on preliminary design information and covers a number of possible design options. As part of the detailed design of the development, the assumptions and noise levels used in this assessment would be reviewed despite the conservative nature of the estimates used.	Design	Council
F2	A Construction Noise Management Plan is to be developed as part of the CEMP to confirm assumptions made in the assessment and to investigate reasonable and feasible noise mitigation measures if necessary.	Construction	Council and Contractor
F3	The Construction Noise Management Plan would consider, if appropriate, the use of temporary barriers and the positioning of plant / processes.	Construction	Council and Contractor
F4	Minimise the use of noise-producing signals including horns, whistles, alarms, and bells; limit back-up safety warning device sound levels to the minimum prescribed by law.	Construction	Council and Contractor
F5	Equip all noise-producing project equipment and vehicles using internal combustion engines with mufflers, and air-inlet silencers where appropriate, that meet or exceed original factory specification. Equip mobile or fixed "package" equipment (e.g., arc-welders, air compressors) with shrouds and noise-control features that are readily available for that type of equipment. This measure would assure that noise emissions from construction vehicles and other equipment were limited to the minimum feasible levels.	Construction	Council and Contractor
F6	Where feasible, use electrically-powered equipment instead of pneumatic or internal combustion powered equipment.	Construction	Council and Contractor
F7	The on-site construction supervisor should have the responsibility and authority to receive and resolve noise complaints. A clear appeal process to the Project Owner should be established prior to construction commencement that would allow for resolution of noise problems that cannot be immediately solved by the site supervisor	Design and Construction	Council and Contractor
F8.1	If blasting is necessary, it should be conducted at a reasonable hour of the daytime to avoid annoyance in the residential community. The blasts should also be designed to minimize noise generation.	Construction	Council and Contractor
F8.2	Public notification of the blasting is recommended and should be done in a sensitive manner to avoid alarm. The notice may include text such as “We would be conducting some minor blasting associated with the construction of the new facility. Some persons may hear a brief thump or rumble sound during blasting. The sound level is relatively low and should be of no concern outside the construction zone."	Construction	Council
F9	Construction would be restricted to between the hours of 7.00am to 6.00pm Monday to Friday and 8.00am to 1.00pm Saturday with no audible construction occurring on Sundays or Public Holidays.	Construction	Council and Contractor

Item	Mitigation Measures / Commitments	Implementation	Responsibility
	Weed Management		
G1	To limit the spread of weeds into adjoining remnant vegetation during construction it is recommended that intact areas be clearly marked using taping (or fencing). This should be done prior to construction, restricting access by construction crew and machinery to remnant vegetation. Additionally, stockpiles of fill or vegetation should not be placed in areas of adjoining remnant vegetation but instead within existing cleared areas.	Construction	Council and Contractor
G2	Incorporate control measures in the design of the proposed development to limit the spread of weed propagules to the south/downstream of the Site.	Design	Council and Contractor
G3	Hard-paved buffer zones around areas used for the storage or processing of green wastes	Design	Council and Contractor
G4	During construction: maintenance of silt fences and other mitigation measures to isolate runoff; and immediate rehabilitation of disturbed vegetation to limit the potential for colonisation by weeds	Construction	Council and Contractor
G5	During construction areas of vegetation that would not be cleared should be clearly marked using taping, restricting access by construction crew and machinery to remnant vegetation. Additionally, stockpiles of fill should not be placed in areas of remnant vegetation but instead in adjacent cleared areas.	Construction	Council and Contractor
G6	Post-construction landscape any open areas with indigenous native vegetation to limit the potential for colonisation by weeds	Operation	Council and Contractor
G7	During operations monitor and control the following species in line with legislative obligations: – *Ageratina adenophora**** – *Chyrsanthemoides monilifera*** – *Ulex europus***. – *Oxalis spp** – *Cortaderia selloana*** – *Lantana camara***	Operation	Council and Contractor
	Flora and Fauna		
H1	The Seven Part Tests for the Red-crowned Toadlet, Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog, Giant Barred Frog and Giant Dragonfly will be repeated during the detail design process to determine if Species Impact Statements (SIS) are required.	Design	Council
H2	The removal of larger habitat trees (>60cms diameter breast height or any trees with hollows) should occur under a Tree Clearance Protocol (TCP).	Design	Council and Contractor
H3	Consideration should be given to re-establishment of an alternative pond to that proposed for removal as part of the proposal.	Design	Council

** Refers to Declared Noxious weed for Gosford City Council

* Refers to Exotic Species

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Item	Mitigation Measures / Commitments	Implementation	Responsibility
H4	Consideration should be given to surface exfoliations of sandstone that occur within the development footprint should be manually removed and offered to DEC as micro-habitat enhancement materials for the Broad-headed Snake recovery program.	Construction	Council and Contractor
H5	Setting maximum speed limits during construction and operation traffic on Site to reduce fauna road fatalities;	Construction and Operation	Council and Contractor
H6	Limit vehicular and personnel entry into adjacent remnant vegetation during construction and operation through appropriate fencing;	Construction and Operation	Council and Contractor
H7	Using down-lights and motion sensor lighting in order to reduce light spill and the associated secondary impact on nocturnal fauna species potentially utilising the adjoining vegetation;	Design	Council
H8	Prepare and implement Bushfire Management Plan for the site in consultation with the Rural Fire Service and Council.	Operation	Council and Contractor
H9	Gosford City Council is committed to providing an appropriate offset area as described in Chapter 18, as a means to mitigate against the impacts on flora and fauna of the proposed AWT and Composting Facilities.	Design	Council
	Water Management – Soil Erosion		
I1	At a minimum, construction activities would comply with Gosford City Council's D6.46 *Erosion Sedimentation Control* and the measures outlined in the *Managing Urban Stormwater – Vol 1 Soils and Construction* (the Blue Book) would be implemented	Construction	Council and Contractor
I2	Minimisation of the time that disturbed land is exposed by early revegetation or installation of non-erodable surfaces;	Construction	Council and Contractor
I3	Placement of temporary surface water diversion barriers along the active excavation areas to prevent run-off entering the construction site;	Construction	Council and Contractor
I4	The stormwater outlet points for site run off shall be identified and the drain(s) would be bunded with a combination of sandbags and hay bales wrapped in silt fencing material to minimise sediment entry into the storm drains or creek system. These would also capture gross pollutants. Any hay bales used at the site would be selected and maintained to avoid propagation of non-indigenous seeds that could otherwise be contained in the hay bales;	Construction	Council and Contractor
I5	Early installation of permanent stormwater drainage structures;	Construction	Council and Contractor
I6	Installation of silt fences around the perimeter of the temporary soil stockpiles and downstream slopes of the construction site to minimise potential migration of sediment. Silt fence construction shall consist of geofabric strung between steel or timber posts with the geofabric extending into the soil excavation. Hay bales may be required if the anticipated volume of sediment is large. The silt fences would be inspected regularly by the Contractor for damage throughout construction phase. Inspections would also be required immediately after rain to ensure that the effectiveness of the system is maintained. Deposited sediment shall be removed by the Contractor and disposed of either directly into the excavation or to temporary soil stockpiles;	Construction	Council and Contractor

Item	Mitigation Measures / Commitments	Implementation	Responsibility
I7	All possible pollutant materials would be stored well clear of site boundaries and stormwater drainage lines. They would be stored in a designated covered area. Containment bunds would be constructed with provision for collection of any spilt material. Waste collection areas would be designated and appropriate bunding would be installed and appropriated containers would be provided. Waste disposal and collection would be properly undertaken. All vehicle and equipment washing and maintenance would be undertaken offsite;	Construction	Council and Contractor
I8	Vehicles leaving the site shall be inspected to ensure that soil is not transported off site through wheel treads.	Construction	Council and Contractor
I9	Soil erosion and sedimentation devices would remain in place until the surface is restored. These devices would also capture any gross pollutants.	Construction	Council and Contractor
	Water Management – Spills and Site Management		
J1	All possible pollutant materials would be stored well clear of site boundaries and stormwater drainage lines and stored in a designated covered area.	Construction and Operation	Council and Contractor
J2	Waste collection areas would be designated.	Construction and Operation	Council and Contractor
J3	Waste disposal and collection would be undertaken in an appropriate manner.	Construction and Operation	Council and Contractor
J4	All vehicle and equipment maintenance would be undertaken offsite.	Construction and Operation	Council and Contractor
J5	Any vehicle washing on-site would be restricted to specific bunded areas.	Construction and Operation	Council and Contractor
J6	Staff facilities would be provided and installed and maintained so that pollutants, including wash water are not conveyed from the site in stormwater	Construction and Operation	Council and Contractor
J7	Water for dust suppression would be sourced from the existing dams on the site or imported if required	Construction	Council and Contractor
	Water Management – Surface water		
K1	The existing dam would be emptied before placement of fill. The water in the dam would be tested prior to emptying. If conditions at the pond change significantly between testing and disposal (for example due to heavy rainfall), water would be retested before discharge. The water would be discharged to Patonga Creek or Woy Woy creek in accordance with *Protection of the Environment and Operations (POEO) Act.* Further the flow rate would be restricted to that which would not cause damage to the downstream environment, temporary erosion control measures may be constructed at the outlet of this pipe if required. If water cannot be discharged in accordance with the POEO act, it would be discharged into the sites leachate treatment system.	Construction	Council and Contractor
K2	Clean stormwater runoff would be captured in catch drains at the development area boundaries (above cuts) and directed around the area. Energy dissipation measures would be constructed at the southern outlet to minimise the effects of the concentration of this flow.	Design, Construction and Operation	Council and Contractor
K3	Flows from the waste receival, storage and processing areas	Design and	Council and

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Item	Mitigation Measures / Commitments	Implementation	Responsibility
	would be collected, treated and reused in the Composting or AWT treatment processes. Any excess flows would be discharged to the leachate collection sump.	Operation	Contractor
K4	Stormwater runoff from roof tops would be contained within rainwater tanks onsite and reused in the waste treatment process.	Design and Operation	Council and Contractor
K5	Runoff from roads and car parking areas these areas, along with any excess stormwater runoff from the roofs, would be collected in detention basins on site, treated and the effluent used in the AWT or Composting treatment process. Detention basins would be designed in order to not discharge flows higher than that from the natural situation.	Design and Operation	Council and Contractor
K6	Any excess treated stormwater runoff would be discharged into Patonga Creek. Due to the amphibian habitat downstream, runoff from site and treated flows to Patonga Creek would need to be similar to the receiving waters in quantity and quality in order to mimic natural flows. Therefore the stormwater runoff discharged to Patonga Creek would be treated to a standard which meets the existing water quality within the creek.	Design and Operation	Council and Contractor
K7	The water quality and quantity criteria for discharge to Patonga creek would be outlined in the Operational Environmental Management Plan (OEMP) and Environmental Protection Licence (EPL) for the proposed facilities.	Design and Operation	Council
	Heritage		
L1	Darkinjung Local Aboriginal Land Council request Gosford Council seek the appropriate approvals from the Dept of Environment and Conservation in relation to the sites found just outside the boundary area to ensure they are not impacted upon.	Design	Council
L2	Should any artefact matter be detected that work cease immediately and the appropriate authorities be contacted, that is the land council, National Parks and Wildlife and an archaeologist	Construction	Council and Contractor
L3	The CEMP would be developed and implemented addressing heritage issues. The CEMP would detail the management strategies to be followed in the event that an Aboriginal object or non Aboriginal archaeological relic is uncovered during construction.	Construction	Council and Contractor
	Socio-Economic Assessment		
M1	Where possible, local contractors and supply companies would be utilised for the provision of labour and services during the construction phase	Construction	Council and Contractor
	Waste Management		
N1	Prepare Waste Management Plans as part of the CEMP and OEMP addressing the management of wastes during these stages.	Construction and Operation	Council and Contractor
N2	Application of the waste minimisation hierarchy principles of avoid / reduce / reuse/ recycle and dispose in particular:	Construction and Operation	Council and Contractor
N2.1	<u>Waste Avoidance</u> • sourcing of materials in the correct quantities and size; • ordering pre-cut/pre-fabricated material; • materials to be fabricated offsite to reduce waste generation;	Construction and Operation	Contractor

Item	Mitigation Measures / Commitments	Implementation	Responsibility
	• materials to be imported in bulk to reduce packaging waste; • reducing packaging at the source by returning packaging to the supplier where possible, and by purchasing in bulk; and • undertaking construction activities in the correct order, to minimise potential rework.		
N2.2	Waste Reuse • reuse of all fill from earthworks on site where possible, to minimise off-site disposal; and • reuse timber formwork where possible.	Construction	Contractor
N2.3	Waste Recycle • collection of greenwaste removed from the site at the existing greenwaste collection area within the Woy Woy WMF; • separation and storage of construction wastes into recyclable and non-recyclable materials in skips; and • collection of scrap metals (aluminium, copper, lead, zinc, steel) for recycling off-site.	Construction	Contractor
N2.4	Waste Disposal • general waste would be collected in skips and transported for disposal to the licensed landfill located to the north of the site. • Store and dispose all hazardous and industrial waste (as defined by *Environmental Guidelines: Assessment, classification and Management of Liquid and Non-Liquid Wastes* (Environment Protection Authority 1999)	Construction and Operation	Council and Contractor
	Hazard and Risk		
O1	Preparation of a site-specific Occupational Health, Safety and Rehabilitation (OHS&R) Plan to be prepared by the Contractor in accordance with NSW Occupational Health and Safety legislation, for review by Council.	Construction	Contractor and Council
O2	Assessment of the risk of harm to the health or safety of site workers and other personnel onsite arising from identified hazards;	Construction	Contractor and Council
O3	Providing induction training that covers management of health and safety at the site, hazard reporting and health and safety procedures relevant to the site works;	Construction	Contractor and Council
O4	Providing personnel protection equipment to the site workers;	Construction	Contractor and Council
O5	Ensuring that work carried out on the site is conducted by qualified personnel who posses the appropriate licences;	Construction	Contractor and Council
O6	Erecting signs to indicate safety hazards at the site entrance and various locations around the site;	Construction	Contractor and Council
O7	Maintaining site equipment, plant and facilities to reduce noise generation;	Construction	Contractor and Council
O8	Good housekeeping on site including keeping access paths free from obstacles.	Construction	Contractor and Council

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Item	Mitigation Measures / Commitments	Implementation	Responsibility
O9	Landfill Gas Hazards Prior to construction works being undertaken, subsurface and surface landfill gas monitoring would be undertaken at the proposed construction work area. These results together with the results of quarterly monitoring undertaken at the Woy Woy WMF would be used to prepare a landfill gas management plan.	Design	Contractor and Council
O10	A detailed Occupational Health and Safety (OHS) Plan would be prepared by the selected Contractor for implementation during the operation of the proposed facilities for review by Council. This plan would outline suitable measures to minimise risk to human health and safety, including:	Operation	Contractor and Council
O10.1	Site induction procedures for all employees and visitors to the site that covers management of health and safety at the site, hazard reporting and health and safety procedures relevant to the site works;	Operation	Contractor and Council
O10.2	Safeguards, signs and correct operation methods for mechanical equipment to minimise risks;	Operation	Contractor and Council
O10.3	Personal protective equipment (PPE) requirements for employees and visitors to the site;	Operation	Contractor and Council
O10.4	Traffic management procedures including clearly defined and signposted access roads;	Operation	Contractor and Council
O10.5	Fitting all plant used within the facility, such as forklifts, with reversing alarms and ensuring they are maintained in accordance with manufactures recommendations and OHS regulations.	Operation	Contractor and Council
O11	Landfill Gas Hazards The site specific OHS Plan prepared for the operation of the proposed facilities would include suitable management measures to minimise the potential hazard associated with landfill gas migration from the adjoining Woy Woy WMF landfill towards the proposed development. These management measures would include:	Operation	Contractor and Council
O11.1	Installation of permanent gas detectors within buildings where there is a potential for landfill gas to accumulate;	Operation	Contractor and Council
O11.2	Re-Installation of subsurface monitoring wells between the proposed AWT and Composting Facilities and the landfill;	Operation	Contractor and Council
O11.3	Regular monitoring of potential gas migration toward the proposed facilities, by taking gas measurements in the subsurface wells;	Operation	Contractor and Council
O11.4	Evacuation procedures in the case of detection of landfill gas above specified threshold levels.	Operation	Contractor and Council
	Bushfire Risk Management		
P1	Prior to finalisation of the detailed design of the proposed facilities a detailed Construction Environmental Management Plan and Operational Environmental Management Plan would be prepared. These plans would outline the key management measures to be adopted to minimise the fire hazard, in accordance with the key principles considered within the Planning for Bushfire Protection (DoP, 2001), including:	Design	Council and Contractor

Item	Mitigation Measures / Commitments	Implementation	Responsibility
P1.1	**Asset protection zones**: Where a bushfire hazard exists on or adjacent to a development site, an Asset Protection Zone (APZ) is developed on the hazard side of the development. These APZ's including the fire trail, would be within the project boundary, and would not require any clearing of vegetation outside the project boundary.	Design and Operation	Council and Contractor
P1.2	**Site access**: Access to the proposed development would be off the existing entrance road to the Woy Woy WMF. This road, as well as the new access road onto the proposed platform would provide sufficient access to allow fire fighting vehicles to enter the Woy Woy WMF site and the proposed development area.	Design and Operation	Council and Contractor
P1.3	**Water supply**: Water supply for fire fighting would be made available from the dedicated firewater tanks for the proposed development. These firewater tanks and the fire fighting vehicles could be topped up using the rainwater tanks, the northern sedimentation pond or the town water supply hydrant located near the entrance to the Woy Woy WMF, off Nagari Road	Design and Operation	Council and Contractor
P1.4	**Building construction requirements**: The material used for the construction of the proposed facilities would primary be metal sheeting, and therefore not impacted upon by radiant heat from a bushfire	Design	Council and Contractor
P1.5	**Vegetation management**: Vegetation management surrounding the proposed development may require hazard reduction techniques to reduce fuel loads and limit the paths available to the passage of a bushfire event. The National Parks and Wildlife Service (NPWS) a division of the NSW DEC, has prepared a bushfire management strategy (DEC, 2006) for the Brisbane Water National Park. The proposed development would comply with the requirements of this plan.	Operation	Council and Contractor

22.5 Monitoring Programs

Environmental monitoring would be fundamental to environmental management. It has been proposed that the monitoring of air, noise, groundwater and surface water would be required to be implemented during at least initial operational phase. Detailed monitoring program would be developed by Council or consultant engaged by Council prior to completion of the construction or by the end of the proposed initial monitoring programs.

22.6 Environmental Reporting

Environmental performance reporting is a key decision support tool that provides management with the information to make meaningful and positive change. To ensure that relevant authorities are appropriately informed of how the construction contractor is managing its environmental performance, periodic reports would be prepared by the contractor during the construction phase, in accordance with the contract agreement.

If the reports identify any shortcomings in the way that the construction activities are being conducted, or in the performance of environmental control structures, the necessary changes would be made and the CEMP would be updated to reflect these changes.

Conclusions Chapter 23

23.1 Introduction

To assess whether the proposed development is justified, the following aspects of the proposal are considered:

- ability to meet the identified needs and objectives for the project;
- consistency with regulatory requirements and policy objectives;
- environmental benefits and impacts;
- social and economic benefits and impacts; and
- consistency with the principles of Ecologically Sustainable Development (ESD).

The consequences of not proceeding should also be examined. These issues are discussed throughout this Environmental Assessment (EA) and summarised below.

23.2 Ability to Meet the Needs and Objectives of the Proposal

The overall objective of the proposal is to provide Council with a viable waste management option for the future and move towards meeting NSW government resource recovery targets.

This EA has considered various alternatives, as described in **Chapter 3**. The preferred alternative has been described in detail and the potential impacts of the preferred alternative on the environment have been assessed (**Chapter 7-21**). In doing so, the EA has demonstrated that the preferred alternative meets the needs and objectives of the project, as identified in **Chapters 2** and **3**.

23.3 Environmental Benefits and Impacts

The proposed development would deliver the following environmental benefits:

- Significantly increase the landfill life at the Woy Woy WMF;
- Recovery of materials from the waste stream;
- Capture of energy (from the organics section) to offset electricity production;
- Production of compost to reduce the use of synthetic products in agriculture and horticultural uses

Potentially adverse environmental impacts would include:

- Impacts on flora and fauna located on the site and immediate surrounding area during construction and operation;
- Impacts from noise and on air quality at residences located to the east of the site during construction and operation;
- Potential changes in traffic utilising the local road network, due to the construction works and the increased usage of the Woy Woy WMF during operation of the proposed facilities; and
- Surface water quality impacts on nearby Patonga Creek during construction and operation

Chapter 23 Conclusions

Construction impacts would be temporary, and would be minimised by selection of the appropriate construction methodologies and implementation of the mitigation measures identified in this EA and detailed in Construction Environmental Management Plan (CEMP) to be developed.

The potential impacts on noise and air quality to the nearest sensitive receptors have been assessed in **Chapters 11** and **12** with the conclusion that the proposal would not cause significant impacts on local residents, and with no potential exceedances of air quality and noise criteria.

Similarly, the potential impacts on traffic of the proposal have been assessed in **Chapter 13**, and are considered to be acceptable with no significant impact on existing road network capacity.

Due to the clearing of vegetation required, there would be some impacts on flora and fauna on the site and surrounding areas. A total of one hundred and thirty four (134) flora species were identified from the targeted field surveys conducted in July and November 2006. None of these species are listed as Endangered under the *TSC* or *EPBC Act*. The flora and fauna impacts are assessed in **Chapter 18**. All possible mitigation measures to minimise significance of these impacts impact have been considered and would be detailed in the CEMP.

The major socio-economic impact of the project would be positive in terms of increase demand for local goods, services and labour, to be generated during construction and operation of the site.

23.4 Consistency with Ecologically Sustainable Development

Consideration and incorporation of the principles of ESD in the design and development of the proposal are discussed in **Chapter 20**. Undertaking the proposed development in the manner proposed is justifiable, taking into account the principles of ESD. The proposal is sustainable in terms of:

- efficiently meeting the project needs and objectives;
- the adoption of a precautionary approach to the design of the proposed facilities, and the analysis, assessment and management of impacts and risks to the environment;
- social and inter-generational equity considerations;
- conservation and protection of biodiversity and ecological integrity; and
- reflecting the value of environmental resources through the inclusion of environmental protection activities, and mitigation measures in the project development and options analysis.

The project is a significant and long-term commitment to the need for improved waste management for the region, and represents a significant step towards an ecologically sustainable future for the management of waste in the Gosford LGA. It has been developed and designed in accordance with four key principles of ESD, and appropriate mitigation measures have been identified where necessary.

23.5 Consequences of Not Proceeding

If the proposal is not implemented, Council would be primarily reliant on landfilling in the short to medium term to meet its waste disposal requirements and the export of waste outside the Gosford LGA in the long term for disposal. This option is not in-line with NSW government objectives of reducing waste going to landfill. The long term reliance on landfilling is considered to have increased environmental risks compared with the proposed development in particular impacts associated with increased leachate and landfill gas generation.

23.6 Conclusion

There would be long term beneficial impacts associated with implementation of the proposal associated with increased resource recovery from the municipal solid waste stream and extension of landfill life at the Woy Woy WMF.

Furthermore, the project complies with all legislation, regulations and guidelines. The implementation of the recommended mitigation measures would offset or reduce potential adverse impacts during construction and operation.

While the project would have significant environmental benefits, it is recognised that it would also have some unavoidable negative environmental impact. However, these are considered relatively minor, and have to be balanced against the impacts that would occur if proposal did not proceed and Council relied on landfill for its future waste disposal requirements. A range of mitigation measures have been identified to minimise the identified impacts on the environment. The environmental performance of the project would be monitored to ensure that the adopted environmental standards are met and maintained.

It is considered that the proposed development of an AWT and Composting Facility at the Woy Woy WMF is justified on the basis of its environmental acceptability, taking into account biophysical, economic and social considerations, and is in accordance with the principles of ESD.

Based on these conclusions, and considering the proposal against a wide range of criteria, undertaking the proposed development in the manner proposed is justifiable.

References Chapter 24

ABS Census (2001), *National Census 2001*, Australian Bureau of Statistics, Canberra.

ABS (2004), *Population Projection Australian 2004-2051*, Australian Bureau of Statistics, Canberra.

AGO (2006a) *Factors and Methods Workbook,* Australian Greenhouse Office, Department of Environment and Heritage, Canberra.

AGO (2006b) *Tracking to the Kyoto Target: Australia's Greenhouse Emissions Trends1990 to 2008–2012 and 2020,* Australian Greenhouse Office, Department of Environment and Heritage, Canberra.

ANZECC (2000), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality,* Australian and New Zealand Environment and Conservation Council.

APC (2006), *Litter, Recycling And Green Waste Stream Audits*, APrince Consulting Pty Ltd for Sita Environmental Solutions, Gosford.

Austroads (2005), *Modelling, Measuring and Mitigating Road Traffic Noise,* Austroads Research Report.

AWT (2001), *Odour Evaluation of the Glenlee Composting Operation* for Camden Soil Mix Pty Ltd.

Bell, S.A.J. (2004) *The natural vegetation of the Gosford Local Government Area, Central Coast, New South Wales: Vegetation Community Profiles.* Unpublished Report to Gosford City Council, April 2004. Eastcoast Flora Survey.

Bowly (2003) Masters Thesis, *New Approaches to Landfill Odour Impact Assessment*, Macquarie University

Chapman, G.A and Murphy, C.L (1989) *Soil Landscapes of the Sydney 1:100,000 Sheet*, Soil Conservation Society of NSW, Sydney.

DEC (1999), *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes,* Department of Environment and Conservation, NSW Government, Sydney.

DEC (2000), *Industrial Noise Policy* Department of Environment and Conservation, NSW Government, Sydney.

DEC (2003), *The Alternative Waste Technologies Assessment Methodology Handbook,* Department of Environment and Conservation, NSW Government, Sydney.

DEC (2004), *Threatened Biodiversity and Assessment; Guidelines for Developments and Activities Working Draft*, Department of Environment and Conservation, NSW Government, Sydney.

DEC (2005), *Approved methods for the modelling and assessment of air pollutants within New South Wales,* Department of Environment and Conservation, NSW Government, Sydney

DEC (2006), *Fire Management Strategy Brisbane Water National Park* prepared by National Parks and Wildlife Service (NPWS) a division of Department of Environment and Conservation, NSW Government, Sydney

DEC (2006), *Technical framework: Assessment and management of odour from stationary source in NSW*. Department of Environment and Conservation, NSW Government, Sydney

Chapter 24 References

DECC (2007) *Threatened Species profiles*, (http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_species.aspx). (2005). *Bush-stone Curlew - Species Profile*.

DEH (1992) *National Strategy for Ecologically Sustainable Development*, Department of Environment and Heritage, Canberra.

DIPNR (2004), *NSW SLA Population Projections,* Department of Planning (formerly Department of Infrastructure, Planning and Natural Resources), NSW Government, Sydney.

DoP (1994), *Applying SEPP 33*, NSW Department of Planning, Sydney.

DoP (2001), *Planning for Bushfire Protection* produced by NSW Rural Fire Service in collaboration with Planning NSW, NSW Government, Sydney.

DoP (2006), *Draft Central Coast Regional Strategy*, NSW Department of Planning, Sydney.

Drew, J. (1994), *Archaeological Assessment of the Emergency Operations Centre*, Woy Woy Road, Kariong, Unpublished report to Mark Lawler Architects.

GHD (2006 a), *Groundwater Monitoring review, Woy Woy Waste Depot*, GHD Pty Ltd for Gosford City Council, NSW.

GHD (2006b), *Environmental Assessment Proposed Alternative Waste Technology Facility at Jacks Gully Waste and Recycling Centre,* GHD Pty Ltd for WSN Environmental Solutions, Sydney.

GHG Protocol (2004), *Greenhouse Gas Protocol* World Business Council for Sustainable Development –Global Resources Institute http://www.ghg.prptocol.org.

Golder (2006), *Annual Report on Environmental Monitoring (25th January 2006, to 24th October, 2006) Gosford City Council Waste Depot, Nagari Road, Woy Woy,* Golder Associates Pty Ltd for Gosford City Council, NSW.

Harris, Cyril M., ed. (1991), *Handbook of Acoustical Measurements and Noise Control*, Third Edition. McGraw-Hill, Inc. New York, NY.

Haug RT (1993) *The Practical Handbook of Compost Engineering*. Lewis Publishers, Boca Raton, Florida USA.

Highways (2003) http://www.standardsforhighways.co.uk/dmrb/vol11/section3/11s3p01.pdf.

Juniper (2005), *Mechanical –Biological Treatment: A guide for Decision Makers –Processes, Policies and Markets*, Juniper Consultancy Services Ltd, http://www.sitaenvtrust.org.uk/research/overview.

Kühner M, Fischer IK, (1999) *Composting with Covers as an alternative to conventional (traditional) decomposting of organic matter in 75th Colloquium of Waste* – Practical Report 25.03.1999.

LHCCREMS (2002), *Survey Guide to the Threatened Species of the Lower Hunter Central Coast Region,* Volume 2 Lower Hunter Central Coast Regional Environmental Management Strategy.

LHCCREMS (2003) *Lower Hunter Central Coast Extant Vegetation Community Map & Technical Report* Lower Hunter Central Coast Regional Environmental Management Strategy.

McDonald, J. (1994), *Dreamtime Superhighway: An analysis of Sydney Basin Rock Art and Prehistoric Information Exchange*, PhD Thesis, Australian National University, Canberra.

References Chapter 24

Maunsell-AECOM (2007), *Environmental Assessment for Advanced Waste Treatment facility – Elizabeth Drive,* Maunsell-AECOM for SITA Environmental Solutions.

Molino Stewart (2006) *Herpetological Survey Report on the Woy Woy Waste Treatment Facility* Molino Stewart Pty Ltd for URS Australia Pty Ltd, Sydney.

Murphy, C.L. (1993), *Soil Landscapes of the Gosford Lake Macquarie 1:100 000 Sheet (Map and Report),* DLWC, Sydney.

NEPC (1998), *National Environment Protection Measure- Ambient Air Quality*, National Environment Protection Council (NEPC).

NSW EPA (1997), *Environmental Guidelines for the Use and Disposal of Biosolid Products,* NSW Environment Protection Authority, NSW Government, Sydney.

NSW EPA (2001), *Draft Policy: Assessment and Management of Odour from Stationary Source in NSW,* Department of Environment and Conservation, NSW Government, Sydney.

NSW Scientific Committee (2005) *Diuris bracteata (an orchid) - endangered species listing. NSW Scientific Committee - final determination*. NSW Department of Environment & Conservation, Sydney.

Standards Australia (2003). *AS 4454 - Composts, soil conditioners and mulches*, Standards Association of Australia, NSW.

Tindale, N.B. (1974), Aboriginal Tribes of Australia, Australian National University, Canberra.

Thiess Services, (2003) *Environmental Impact Statement for South Windsor Pre-Treatment Facility*, Thiess Services.

URS (2006a), *Landfill Environmental Management Plan for Woy Woy Waste Depot*, URS Australia Pty Ltd for Gosford City Council, NSW.

URS (2006b), *Alternative Waste Technologies and Composting Options Assessment,* URS Australia Pty Ltd for Gosford City Council, NSW.

US EPA (1971), *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances,* Prepared under contract by Bolt, et.al., Bolt, Beranek & Newman, Boston, MA for U.S. Environmental Protection Agency, Washington, DC.

Veolia (2006), *Environmental Assessment Woodlawn Alternative Waste Technology Project,* Umwelt (Australia) Pty Ltd and Veolia Environmental Services (Australia) Pty Ltd.

Vinnecomb, P. (1980), *Predilection and Prediction: A study of Aboriginal sites in the Gosford-Wyong Region*, Unpublished report to NSW National Parks and Wildlife Service.

Wright (2003), *Future Waste Disposal Strategies Gosford Local Government Area*, Wright Corporate Strategy for Gosford City Council, NSW.